18. Noise and Vibration

Purpose of the Assessment

18.1 The construction and operation of the Proposed Development has the potential to give rise to both temporary and permanent noise and vibration impacts that may affect sensitive receptors in the area. Consequently, these impacts may generate adverse effects. The PEIR is intended to identify and assess these effects and consider how they might be avoided, reduced or mitigated.

18.2 The noise and vibration assessment considers the effects of the Proposed Development on a range of receptors including residential dwellings, care homes and schools as well as amenity/recreational areas including the canal, its associated marinas and towpaths, and existing and proposed new footpaths. The assessment will also consider the impact to ecological receptors and heritage receptors. The assessment will consider effects from the commencement and construction phases, through operation and finally decommissioning.

18.3 The Proposed Development includes the Main SRFI Site (including A43 access and all rail infrastructure); J15a works; and minor highways works.

18.4 The Proposed Development is described in **Chapter 5**. There are, however, three aspects of the minor highway works described in Chapter 5 that have not been included in this assessment, due to their late identification as appropriate mitigation for the Proposed Development. These are:

- PL29 – A43/St John's Road (signage and road surfacing scheme on the A43),
- PL 31 – A43 Northampton Road (signage scheme); and,
- Pedestrian/Cycle Way along Northampton Road and between Barn Lane to the junction of Collingtree Road (widening of existing footpaths, provision of new footpath and dropped kerbs, and realignment of the carriageway).

18.5 The first two elements listed above require no physical works to alter the footprint of the road. The pedestrian/cycle way is located within Highways land and will involve minimal disturbance of existing verges. Assessment of all three aspects will be included in the assessment undertaken for the final DCO submission.

18.6 Whilst the assessment has considered the three key scheme elements described above, the project as a whole has also been assessed.

18.7 This chapter identifies the legislative and policy context for the assessment; summarises the extent of the Study Area; summarises relevant consultation; describes the baseline surveys and data, and baseline conditions; describes the methods used to assess the effects of the Proposed Development; identifies relevant embedded mitigation; provides an assessment of likely significant effects during construction, operation and decommissioning, and provides a cumulative assessment (inter and intra project). The chapter also identifies the mitigation measures required to prevent, reduce or offset any significant adverse effects and the likely residual effects after these measures have been adopted. Monitoring is identified where

necessary, and a summary of the assumptions and limitations of the assessment is also provided.

18.8 This chapter is supported by a range of figures, and the following appendices:

- **Appendix 18.1** Glossary of acoustic terms
- **Appendix 18.2** Baseline noise and vibration monitoring locations, equipment list and calibration details
- **Appendix 18.3** Baseline noise and vibration monitoring analysis and results
- **Appendix 18.4** Construction traffic distribution plan
- **Appendix 18.5** Road traffic flow data and Basic Noise Level (BNL) calculations
- **Appendix 18.6** Road traffic Basic Noise Level (BNL) changes
- **Appendix 18.7** Road traffic operating noise contour plots and tables results at NSRs
- **Appendix 18.8** Site construction noise assumptions
- **Appendix 18.9** Site construction noise calculation procedure and tabled results
- **Appendix 18.10** Cumulative effects assessment projects
- **Appendix 18.11** Site operational noise assumptions and calculation procedures
- **Appendix 18.12** Site operational noise prediction results including source contributions at NSRs
- **Appendix 18.13** Site noise mitigation
- **Appendix 18.14** Consultation
- **Appendix 18.15** Noise and vibration impact to terrestrial ecology
- **Appendix 18.16** Noise and vibration assessment to heritage assets

18.9 This chapter should be read in conjunction with:

18.10 **Chapter 8** 'Need & Rail'; **Chapter 12** 'Cultural Heritage'; **Chapter 16** 'Ecology and Nature Conservation; **Chapter 17** 'Landscape and Visual'; and **Chapter 19** 'Highways and Transportation'.

Legislation, Policy and Best Practice

18.11 The most relevant legislation, policy and best practice relating to the assessment of potential significant noise and vibration effects are included in **Table 18.1**.

Table 18.1: Relevant legislation, policy and guidance

Relevant section of legislation, policy and best practice	Legislation/policy/best practice	Key provisions	Relevant section of this chapter where key provisions are addressed
Paragraphs 5.186 to 5.200	National Networks National Policy Statement	Noise and vibration effects on human life and on wildlife and biodiversity	National Policy Statement for National Networks (NPSN); Method of Assessment; Mitigation; Residual Effects
Paragraphs 109, 123, and 144	National Planning Policy Framework	Noise and vibration effects to be considered in planning decisions	National Planning Policy Framework (NPPF); Method of Assessment; Mitigation; Residual Effects
Paragraphs 001 to 012	Planning Practice Guidance – Noise	Practical advice relating to noise during the planning process	Planning Practice Guidance; Method of Assessment; Mitigation; Residual Effects.
Whole document	Noise Policy Statement for England	Vision, policy aims and guiding principles in relation to noise in the environment	Noise Policy Statement for England (NPSE); Method of Assessment; Potential On Site Generated Noise Impact.
Chapter 3 – The process of Assessing Noise Impacts. Chapter 5 – Establishing the Baseline Chapter 7 – Assessment Chapter 8 - Mitigation	IEMA: Guidelines for Environmental Noise Impact Assessment	Provides detailed advice on each section of a Noise Impact Assessment	Guidelines for Environmental Noise Impact Assessment, IEMA; Method of Assessment.
Part 7 HD213/11 Noise and Vibration	Design Manual for Roads and Bridges	Provides detailed guidance for noise and vibration impacts of road projects	Design Manual for Roads and Bridges (DMRB); Potential Road Traffic Noise Impacts; Road Traffic Noise Mitigation; **Tables 18.44-18.46** Summary of Residual Effects
Whole	Calculation of Road	Describes the	Calculation of Road Traffic

	Traffic Noise	procedure for calculating noise from road traffic	Noise (CRTN); Potential Road Traffic Noise Impacts; Road Traffic Noise Mitigation; **Tables 18.44-18.46** Summary of Residual Effects
Whole	Calculation of Rail Noise	Describes the procedure for calculating noise from rail traffic	Calculation of Railway Noise (CRN); Potential Railway Noise Impacts; Rail Traffic Noise Mitigation; **Table 18.44** Summary of Residual Effects
Whole	BS4142:2014 Methods for rating and assessing industrial and commercial sound	Procedure for assessment noise from industrial sites	BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound; Potential on-site generated noise impacts from main SRFI Site (including rail infrastructure); Operational Site Noise Mitigation on Main SRFI Site; **Table 18.44** Summary of Residual Effects
Chapter 6 – External noise sources	BS 8233:2014 Guidance on sound insulation and noise reduction for buildings	Considers assessment methods for noise from a range a range of sites and sound insulation of buildings	BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings; Methods of Assessment.
Part 1 Annex C and D – Sound level data on site equipment. Annex E – Significance of noise effects. Part 2 Chapter 6 - Neighbourhood nuisance. Annex B – Significance of vibration effects	BS5228:2009 (Parts 1 and 2) +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	Considers noise and vibration impact and effects associated with activity arising on construction sites.	BS5228:2009 (Parts 1 and 2) +A1:2014: Code of Practice for Noise and Vibration Control on Construction and open sites; Method of Assessment; Assessment of Construction Phase Effects; Construction Mitigation
Chapter 4.4 and Table 4.1 WHO Guideline values	World Health Organisation Guidelines for Community Noise (1999)	Research review document with guidance on the effects of noise from a range of transportation and	Guidelines for Community Noise – World Health Organisation (WHO), 1999; Method of Assessment;

		industrial sources	
Chapter 5 – Guidelines and recommendations.	World Health Organisation Europe Night Noise Guidelines (2009)	Research review document considering the effect of noise at night on human sleep and health	Night Noise Guidelines for Europe, WHO, 2009; Method of Assessment
Regulation 3 – Duty to carry out insulation work or to make grants	Noise Insulation Regulations 1975 (as amended 1988)	Provides information on the circumstances when grants are available for insulating homes affected by noise from highways.	Noise Insulation Regulations 1975 (as amended 1988); Calculation of Road Traffic Noise
Regulation 4 – Duty to carry out insulation work or to make grants	Noise Insulation (Railway and other Guided Transport Systems) Regulations 1996	Provides information on the circumstances when grants are available for insulating homes affected by noise from railways	Noise Insulation (Railway and other Guided Transport Systems) Regulations 1996; Calculation of Railway Noise
Policy G3 (D & E)	South Northamptonshire Local Plan – Saved Policies 15th December 2014	Indicates amenity and noise requirements for granting of planning permission.	BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound; Potential on-site generated noise impacts from main SRFI Site (including rail infrastructure); Operational Site Noise Mitigation on Main SRFI Site; **Table 18.44** Summary of Residual Effects
Policies S1 (D4), S10 (k) and B9(e)	West Northamptonshire Joint Core Strategy Local Plan (Part 1)	Provides information relating to the distribution of development in relation to areas of tranquillity (S1:D4); minimising pollution from noise for reasons of sustainability	BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound; Potential on-site generated noise impacts from main SRFI Site (including rail infrastructure); Operational Site Noise Mitigation on Main SRFI Site; ; **Table 18.44** Summary of Residual

		(S10k), and reducing adverse impacts of noise for pollution control (B9e)	Effects
Strategic Policy 22	Northampton County Council Transportation Plan	Seeks to reduce the impact from motor vehicles, including that from noise. Provides information relating to when a Construction and Environmental Management Plan (CEMP) is required	Method of Assessment; Potential Road Traffic Noise Impacts; Road Traffic Noise Mitigation; **Tables 18.44-18.46** Summary of Residual Effects. Construction Mitigation
Whole	Saved Policies of Northampton Borough Council Local Plan (1997)	Considers noise in general only in relation to small developments	No specific reference made
Whole	South Northamptonshire Council Supplementary Planning Guidance – Conservation Areas (undated)	Identifies conservation areas including within Milton Malsor and Blisworth	**Appendix 18.16**- Noise and Vibration Assessment to Heritage Assets
Whole	South Northamptonshire Council Supplementary Planning Guidance – Listed Buildings (undated)	Describes the Listing process and gives general guidance. Listings shown in the National Heritage List for England (NHLE) Register	**Appendix 18.16**- Noise and Vibration Assessment to Heritage Assets
Whole	South Northamptonshire Council Supplementary Planning Guidance – Nature Conservation (undated)	No reference to noise and vibration	No specific reference made
Whole	South Northamptonshire Council (Emerging Policy) Design Guide	General guidance developed and citing national guidance and	No specific reference made

	Supplementary Planning Document (Consulted on May 2017)	policy. It considers primarily detailed design issues. No specific reference to noise and vibration.	
	Code of Practice for Works Affecting the Canal and River Trust, May 2012	Considers noise impact to users and vibration impact on structurers and assets	**Appendix 18.16**- Noise and Vibration Assessment to Heritage Assets

Licences and Permits

18.12 No licences or permits are required as part of this submission.

18.13 National Policy Statement for National Networks (NPSNN)

18.14 The National Policy Statement for National Networks (NPSNN) sets out the policies by which the Secretary of State will make decisions on Development Consent Order (DCO) applications in relation to Nationally Significant Infrastructure Projects (NSIP) such as Strategic Rail Freight Interchanges (SRFI). The NPSNN was designated in January 2015 and is based on existing policy.

18.15 It is recognised that excessive noise may have an adverse impact on the quality of human life and health and also on wildlife and biodiversity. Guidance on the impact of noise on humans is well established. The NPSNN states that noise impact in relation to ecological receptors should be assessed in accordance with the Biodiversity and Geological Conservation section of the document. However, there is no specific reference to noise within this section of the policy statement.

18.16 The NPSNN states that *'the nature and extent of the noise assessment should be proportionate to the likely noise impact'* and sets out the information to be included in a noise assessment where it is considered that significant impacts are likely to arise.

18.17 Noise assessments should be carried out in accordance with relevant British Standards and other guidance. Predictions of road traffic and railway noise should be based on the methods described in Calculation of Road Traffic Noise (CRTN) and Calculation of Railway Noise (CRN).

18.18 Paragraph 5.195 states:

> *The Secretary of State should not grant development consent unless satisfied that the proposals will meet, the following aims, within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse impacts on health and quality of life from noise as a result of the new development;*

- *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development; and*

- *contribute to improvements to health and quality of life through the effective management and control of noise, where possible.*

18.19 The NPSNN also refers to the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE), to which due regard must be given in the decision making process.

National Planning Policy Framework (NPPF)

18.20 The National Planning Policy Framework (NPPF) was published in March 2012 and sets out the government's guidance for local planning authorities and planning application decision-takers.

18.21 It states that the planning system should contribute to and enhance the environment by (among other things) preventing development from contributing to, being put at risk from, or being adversely affected by unacceptable levels of noise pollution. (Para. 109)

18.22 Paragraph 123 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 put on them because of changes in nearby land uses since they were established; and*

- *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."*

Noise Policy Statement for England (NPSE)

18.23 The Noise Policy Statement for England (NPSE) was published in March 2010 and sets out the long term vision of Government noise policy as follows:

- *Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*

18.24 The NPSE aims to clarify the principles and aims in existing policy documents, legislation and guidance that relate to noise. Its long term vision is supported by the following aims:

18.25 *Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

18.26 These aims are developed by reference to concepts from toxicology, namely NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). NPSE also refers to SOAEL (Significant Observed Adverse Effect Level).

18.27 It recognises that there is no universally applicable measure for the concepts. Consequently, the SOAEL is likely to be different for different noise sources and receptors and at different times. Even so, significant effects should be avoided, taking account of sustainability aims.

18.28 Where noise impact is between LOAEL and SOAEL, the NPSE requires that all reasonable steps should be taken to mitigate adverse effects while taking account sustainable development aims. It notes (para. 2.7) that *the NPSE should consider noise alongside other relevant issues and noise should not to be considered in isolation*.

Planning Practice Guidance

18.29 The Planning Practice Guidance (PPG) refers to the NPPF and provides further guidance on the interpretation of no, lowest and significant observed adverse effect level described in the NPSE.

18.30 The PPG provides a commentary on the noise exposure hierarchy, based on the 'likely average response'.

18.31 The PPG recognises a broad range of factors that can influence the relationship between noise level and the impact on those affected. Accordingly, the examples in **Table 18.2**, copied from the PPG, may not be relevant to a specific development, which should be considered on its merits within the specific context under consideration.

Table 18.2: Summary of noise exposure hierarchy, based on likely response

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life	No Observed Adverse Effect	No specific measures required
		Lowest Observed	

		Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Environment Protection Act 1990

18.32 The Environmental Protection Act 1990 provides the principal controls over so-called statutory nuisances, including noise emitted from premises so as to be prejudicial to health or a nuisance. Under the Act, local authorities have a duty to inspect their areas from time-to-time to detect nuisances and, subject to a discretion to defer for seven days, when satisfied that a statutory nuisance exists or is likely to occur or recur, to serve an abatement notice on the person responsible. They also have a duty to investigate any complaint made by a person living within their area. Though businesses have a defence of 'best practicable means', failure to comply with a notice is a criminal offence.

Control of Pollution Act 1974

18.33 The Control of Pollution Act 1974 contains powers for local authorities to deal with noise and vibration from construction and demolition sites. It also contains powers for the Secretary of State to approve Codes of Practice for the minimisation of noise. Four currently exist, for audible intruder alarms, ice cream van chimes, model aircraft and construction noise. These may be put in evidence in legal proceedings.

Noise Insulation Regulations 1975 (as amended 1988)

18.34 The Noise Insulation Regulations 1975 (as amended 1988) set out the requirements under which buildings may qualify for both statutory and discretionary noise insulation in relation to works associated with new and modified roads. Additional guidance is given in Department of the Environment Circular 114/75.

Noise Insulation (Railway and other Guided Transport Systems) Regulations 1996

18.35 The Noise Insulation (Railways and Other Guided Transport Systems) Regulation 1996 set out the requirements under which buildings may qualify for both statutory and discretionary noise insulation in relation to works associated with new and modified railways.

Guidelines for Community Noise – World Health Organisation (WHO), 1999

18.36 Guidelines for Community Noise was published in 1999 with the aim of informing legislation and guidance produced at the national and regional levels for the purposes of minimising any potential adverse health effects resulting from noise in the community. It presents guideline noise level criteria for the avoidance of adverse effects such as sleep disturbance and annoyance in a range of specific environments. The preface to WHO states that community noise includes road, rail and air traffic, industries, construction and public work, and the neighbourhood.

Night Noise Guidelines for Europe, WHO, 2009

18.37 Night Noise Guidelines for Europe was published in 2009 as an extension to Guidelines for Community Noise (WHO) 1999. It provides additional guidance in relation to the observed adverse effects of noise on sleep and proposes two external noise level criteria for the purposes of limiting these effects. The lowest noise criterion is based on the LOAEL. However, it recognises that achieving LOAEL will not be feasible in many circumstances and suggests that a higher Interim Target (IT) may be used instead as a guideline. However, the IT is not related to health based observations and should not, therefore, be interpreted as a threshold for SOAEL, which may be higher.

18.38 The document states that *all Member States are encouraged to gradually reduce the proportion of the population exposed to levels over the IT within the context of meeting wider sustainable development objectives*. While the guidelines provide useful information relating to the effects of noise on sleep, they have not been adopted into UK legislation, standards or guidance. The suggested guideline night time noise levels presented should not therefore be applied as a standardised criteria for assessment but may be useful when interpreting the significance of the impact of noise within the wider context of the development.

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

18.39 BS 8233 provides guidance on the control of noise in and around buildings, primarily in relation to the design of new or refurbished buildings. Much of the guideline criteria presented reflects the guidelines set out by WHO. However, it also provides useful guidance in relation to common external noise sources and refers to prediction and assessment methodologies provided in other standards and guidance for each source. In particular, it refers to the assessment methodologies set out in BS 5228 in relation to construction noise, BS 4142 in relation to industrial/commercial sources, and the prediction methodologies set out in Calculation of Road Traffic Noise (CRTN) and Calculation of Railway Noise (CRN).

BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

18.40 BS 4142:2014 was published in October 2014, superseding the earlier version, BS 4142:1997, which is now withdrawn. The principle of BS 4142 is to assess the impact of industrial and commercial sound on nearby residents by comparing the Rating Level (sound level from the industrial/commercial source, with a correction applied for any acoustic features that characterise the sound) with the Background Sound Level (L_{A90} as measured in absence of the industrial/commercial source).

18.41 Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *a difference of around +10 dB or more is likely to be an indication of a significant adverse impact […]. A difference of around +5 dB is likely to be an indication of an adverse impact […]. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.* However, BS 4142 also advises that, in each case, the assessment of adverse impact must take into account the context in which the sound is placed. For example, consideration should be given to the absolute level and/or character of the existing acoustic environment, and the sensitivity of receptors.

BS5228:2009 (Parts 1 and 2) +A1:2014: Code of Practice for Noise and Vibration Control on Construction and open sites

18.42 *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* provides useful general advice together with a method for predicting noise from construction sites based on information provided on construction noise levels applicable to various plant and construction operations.

18.43 Annex E provides informative guidance on assessing the significance of noise effects due to construction activity for projects of significant size. The guidance applies to residential dwellings only. Two methods are provided.

18.44 The simpler method is based on establishing fixed noise limits for construction activity, for which suggested criteria are presented in Table E.2 of the annex. These limits have been developed for the determination of eligibility for noise insulation, which may be granted where the limits are exceeded for a specified period of time.

18.45 The second method uses an assessment of the change in noise level due to construction activity to indicate a *potential significant effect*. It provides the ABC Method, which takes into account the existing noise level in setting a threshold. Where a potential significant

effect is indicated, further consideration of other factors (number of affected receptors, duration, acoustic character, etc.) should be taken into account to establish whether or not there is a significant effect.

18.46 Further to this, it advises that where there is to be construction activity involving long term substantial earth moving, it may be appropriate to refer to guidance set out in Technical Guidance to the National Planning Policy Framework in relation to surface mineral extraction. In reference to this guidance, BS 5228 advises that where the works are likely to occur for periods in excess of six months, a limit of $L_{Aeq,1hr}$ 55dB might be applied to these activities. The Technical Guidance to the National Planning Policy Framework was withdrawn in March 2014 and replaced with the PPG. However, the PPG reflects this guidance, also stating that higher noise limits of up to $L_{Aeq,1hr}$ 70dB may be appropriate for essential site preparation work where this activity is limited in duration to eight weeks in a year.

18.47 BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* provides guidance on the measurement and assessment of vibration effects. Annex B sets out a range of vibration levels, in terms of the measured peak particle velocity, which provide an indication of potential effects. It advises that where these values are likely to be routinely exceeded then a further assessment in accordance with BS 6472 or other guidance might be appropriate.

BS 6472-1:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings – Part 1: Vibration sources other than blasting

18.48 BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting* provides an assessment procedure to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings.

18.49 The assessment is carried out by determining a vibration dose value (VDV) for a typical daytime and night time period and comparing these levels to a range of values for which the probability of adverse comment is defined. VDV takes into account both vibration level and the duration of vibration, thereby giving additional weight to vibration levels that are frequent or continuous or of high level.

Calculation of Road Traffic Noise (CRTN)

18.50 Procedures for the calculation of road traffic noise are set out in Calculation of Road Traffic Noise (CRTN), published by the Department of Transport, Welsh Office in 1988. CRTN is the required procedure for determination of entitlement under the Noise Insulation Regulations, however, the procedure is also appropriate for more general applications.

18.51 The procedure uses traffic flow rates to derive a Basic Noise Level at a reference speed of 75km/hr (BNL, noise level at 10m from the nearside road edge), to which corrections can be applied to account for the percentage of HGVs, average speed, and others factors such as road surface and gradient. Calculation procedures for the propagation of road traffic noise over distance are also described.

18.52 The noise level is calculated in terms of the statistical metric $L_{A10,18hr}$, which represents the noise level that is exceeded for 10% of the time over the 18 hour period. Methods for the

conversion of the $L_{A10,T}$ metric to $L_{Aeq,T}$ are given in BS 8233, which also references the TRL report commissioned by DEFRA, Converting the UK Traffic Noise Index $L_{A10,18hr}$ to EU Noise Indices for Noise Mapping.

Design Manual for Roads and Bridges (DMRB)

18.53 The Design Manual for Roads and Bridges (DMRB) consists of a set of volumes that collate previously separate Standards, Advice Notes and other documents, published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland, relating to Trunk Road works. Volume 11, Section 3, Part 7 is an Advice Note, which provides guidance on the assessment of noise and vibration impacts resulting from road projects. The latest revision to this part was published in November 2011, superseding previous versions. The assessment methodologies described may be applied to both new and existing roads.

18.54 The magnitude of impact resulting from road traffic noise is established by considering the change in the road traffic noise level that would arise as a result of the proposed development. It is considered that the relationship between the change in noise level and the magnitude of impact would be different for changes that occur over short term and long term periods. For example, a change of $L_{A10,18hr}$ 1dB is the smallest change that is considered perceptible in the short term. However, in the long term, perhaps 10-15 years after the opening of a development, the smallest perceptible change would be $L_{A10,18hr}$ 3dB.

Calculation of Railway Noise (CRN)

18.55 Procedures for calculating railway noise are described in The Department of Transport technical memorandum Calculation of Railway Noise (CRN), published in 1995. The method was introduced for determining eligibility for insulation of residential property from railway noise, under conditions specified in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1995.

18.56 The procedure uses information on the type and number of locomotives, coaches, and wagons, vehicle speed and track type, among other variables, to determine the noise level from rail activity at a receptor. The Department for Environment, Food and Rural Affairs (DEFRA) published Additional Railway Noise Source Terms for "Calculation of Railway Noise 1995" in January 2007, which provides updated data on the rolling stock fleet in operation across the rail network.

18.57 The resulting noise level is calculated in terms of the A-weighted equivalent continuous noise level, $L_{Aeq,T}$, determined over an 18 hour period (06:00-00:00) during the day and a 6 hour period (00:00-06:00) during the night.

Guidelines for Environmental Noise Impact Assessment, IEMA, 2014

18.58 The Institute of Environmental Management and Assessment (IEMA) published Guidelines for Environmental Noise Impact Assessment, October 2014. It provides examples of good practice in relation to methodologies and procedures used in environmental noise impact assessments and provides a definition of noise impact and noise effect. It recognises that, as no two situations are the same, there is no precise relationship between noise impact and noise effect that can be universally applied. However, it does provide guidance in relation to

the methods and procedures commonly used to determine the significance of a potential noise impact.

Code of Practice for Works Affecting the Canal and River Trust, May 2012

18.59 This Code of Practice gives guidance and procedures to Developers and Contractors which may affect the Waterways. It is more specifically relevant to those wishing to undertake works on the Trusts canals and rivers or to gain access over a river or canal.

Consultation and Scoping

18.60 Consultation has been initiated and concluded with key statutory stakeholders on noise and vibration matters. The consultation strategy has also been informed by the scoping opinion. A summary of the consultation undertaken is included within **Table 18.3**. This shows where within this chapter the matter of concern has been addressed.

Table 18.3 Summary of consultations undertaken

Consultation and date	Summary of consultation	Where in the PEIR is this addressed?
Consultation request made to SNC 16th February 2016	Request related to setting up a meeting to agree baseline noise and vibration monitoring positions, sensitive receptors and scope for vibration assessments. Request acknowledged, but no SNC formal response at that time.	This has been addressed in **Appendix 18.14**
Consultation request reminder 16th December 2016 issued to SNC	Reminder issued to SNC and formal response from SNC received 17th January 2017.	This has been addressed in **Appendix 18.14**
Clarifications issued to SNC.	Clarifications issued to SNC on 2nd March 2017 (Rev 0), 4th May 2017 (Rev 1) and 17th July 2017 (Rev 2 dated 15th June 2017).	This has been addressed in **Appendix 18.14**
Consultation request made to EA 6th March 2017	At the request of the Planning Inspectorate, as per their Scoping Opinion, the EA has been consulted in order to seek agreement on the baseline noise and vibration monitoring positions, sensitive receptors and scope for vibration assessments. EA letter response of 13th March 2017 received indicating they were satisfied with the choice of receptors but wished for the canals and river trust to be consulted.	This has been addressed in **Appendix 18.14**
Consultation request made to the Canals and River Trust 3rd April 2017	Consultation sent 3rd March 2017 and response received 9th June 2017. Meeting with C&RT attended 16th May 2017. C&RT requested that noise and vibration impacts on the canal structures be considered, as well as noise and vibration	This has been addressed in **Appendix 18.14**

	impacts on users of the canal, marina, and towpaths, both during construction and operation of the Proposed Development.

18.61 The Scoping Opinion on noise and vibration issues, given in the scoping response, has been considered and matters raised, along with where within this chapter they are dealt with, are summarised in **Table 18.4**

Table 18.4: Summary of Scoping Opinion

Scoping Opinion section/paragraph	Summary of issues raised	Where in the PEIR is this addressed?
3.99	Paragraph 16.3 of the Scoping Report refers to a study area of *typically 700m beyond the PDA boundary*. The Secretary of State recommends the study area is agreed with relevant consultees and that the ES should justify the study area and state whether it is based on any particular guidance.	The study areas have been agreed with SNC and the EA. This has been addressed in section Study Areas – Operational Noise and Vibration/Construction Noise and Vibration
3.105	The ES should include assessment of noise impacts on people during all phases of the proposed development, and particularly any potential disturbance at night and other unsocial hours such as weekends and public holidays. The applicant's attention is drawn to the comments made by the Canal and River Trust in relation to consideration of potential noise and vibration effects on the Grand Union Canal and its associated infrastructure, such as the marina. The Secretary of State confirms that users of the canal should be considered as sensitive receptors in this respect.	Analysis of baseline conditions during unsocial hours has been carried out. The canal and its users have been included as receptors. This has been addressed in **Table 18.1** and **18.3** in the section on Legislation Policy and Best Practice; and in the section on Baseline Conditions – Statistical analysis of noise measurement results; and in **Appendix 18.3**; and in **Appendix 18.16**; and in the sections Assessment of Operational/Construction Phase Effects.
3.101	The Secretary of State notes that the applicant intends to consult with South Northamptonshire Council in respect of further baseline noise surveys and recommends that the methodology and choice of noise receptors are also agreed with the Environment Agency. The location	The choice of receptors has been agreed with the EA. This has been addressed in **Table 18.3**, and **Appendices 18.2, 18.3, and 18.14.**

	of the noise receptors should be identified on a plan.	
3.100	It is noted that a preliminary baseline noise survey has been carried out at six potential noise monitoring locations where noise sensitive receptors have been identified in the study area, and that other locations are likely to be identified. Paragraph 16.7 of the Scoping Report states that measurements were made *…generally in accordance with procedures given in BS 4142:2014 Methods for rating and assessing industrial and commercial sound*. The ES should provide details of the baseline noise monitoring undertaken and clearly explain where and why departures from such guidance have been made.	This has been addressed in the section on Baseline Monitoring, and in **Appendices 18.2 and 18.3**
3.87	The Secretary of State recommends that the proposals should address fully the needs of protecting and enhancing biodiversity. The assessment should cover habitats, species and processes within the site and surroundings. The applicant's attention is drawn to the comments made by Natural England and the Environment Agency (see Appendix 3 of this Opinion) in relation to green infrastructure and biodiversity enhancement.	This has been addressed in **Appendix 18.15**, which outlines the noise and vibration impacts to terrestrial ecology, and **Chapter 16** 'Ecology and Nature Conservation'.
3.88	The assessment should take account of noise, vibration and air quality (including dust) impacts, and cross reference should be made to these topics in the ES Ecology chapter.	This has been addressed in the section Purpose of the Assessment
3.102	Paragraph 16.17 of the Scoping Report suggests that *noise generated during construction, especially during piling, may have the potential to affect fauna, particularly birdlife*. The Secretary of State notes that fixed plant on the operational site along with vehicles and cranes will generate noise during the day and night and recommends that consideration is also made in the assessment of the potential effects of operational noise on ecological features. The results from the noise and vibration assessments should inform the ecological assessments, and cross-reference should be	This has been addressed in **Appendix 18.15**, which outlines the noise and vibration impacts to terrestrial ecology, and **Chapter 16** 'Ecology and Nature Conservation'.

	made to information contained in the ES biodiversity chapter, in addition to that within any other relevant topic chapters, such as the transport chapter.	
3.103	The Scoping Report notes that during operation, noise will be generated by mechanical plant and ventilation components and onsite vehicle and crane movements. Bearing in mind the description of the application site provided within the Scoping Report, the Secretary of State considers that the statement in paragraph 16.37 about the *nature of the noise associated with the Proposed Development being broadly similar in character to the existing noise environment* has not been justified or explained. No further details are provided in relation to sources of noise during the construction or operational phases of the proposed development. The Secretary of State advises that information should be provided in the ES on the types and numbers of vehicles and plant to be used, and likely vehicle movements, during both the construction and operational phases of the proposed development.	This has been addressed in the section on Method of Assessment – Site Operational Noise/Construction Noise; and in Assessment of Construction Phase Effects and Assessment of Operational Phase Effects; and **Appendices 18.4** (Construction traffic distribution plan)**, 18.8** (Site construction noise assumptions)**, and 18.11** (Site operational noise assumptions and calculation procedures).
3.106	It is unclear from the Scoping Report what vibration assessments are proposed to be included within the ES, however the Secretary of State notes that there may be vibration impacts from piling during the construction phase. The Secretary of State expects all potentially significant impacts to be assessed and a clear rationale provided for the approach taken.	All potentially significant vibration impacts, including those from construction piling, have been assessed. This has been addressed in the sections on Assessment of Operational Phase Effects – Potential Vibration Impacts; Assessment of Construction Phase Effects; and Mitigation – Construction Mitigation.
3.104	The Secretary of State welcomes the classifications of potential receptors as proposed in paragraph 16.52 of the Scoping Report. Definitions of sensitivities should be provided within the ES.	This has been addressed in **Table 18.8**
3.19	At this stage, the Secretary of State does not agree that these matters can be scoped out	This refers to baseline vibration monitoring, the

	of the EIA as insufficient information has been provided in the Scoping Report by the applicant to justify such an approach.	assessment of vibration impacts resulting from road and rail traffic, and the effect of climate change on noise and vibration impacts. This has been addressed in Baseline Conditions – Rail Vibration; and Baseline Conditions – Statistical Analysis of Noise Measurement Results (climate change); **Appendix 18.14** (Letter from EA); Assessment of Operational Phase Effects – Potential Vibration Impacts; and **Appendix 18.3**.
3.20	The Secretary of State has not agreed to scope out any other topics or matters on the basis of the information provided within the Scoping Report. However, this does not prevent the applicant from subsequently agreeing with the relevant consultees to scope out other topics or matters from the ES. In order to demonstrate that topics have not simply been overlooked, where topics are scoped out prior to submission of the DCO application, the ES should still fully explain the reasoning and justify the approach taken.	This has been addressed throughout this chapter.
3.107	The noise and vibration assessment should take account of traffic movements along access routes, and as a result of any temporary roadworks and diversions, especially during the construction phase.	This has been addressed in the section Method of Assessment – Road traffic noise; and Assessment of Operational Phase Effects – Potential road traffic noise impacts. Assessment of effects of temporary roadworks and diversions is currently being undertaken.
3.108	Consideration should be given to monitoring noise complaints during construction and when the development is operational.	This has been addressed in sections on Mitigation, Monitoring, and in the CEMP.

3.119	The ES Highways and Transportation chapter should cross-reference to other topics as appropriate such as, for example, air quality, noise and vibration, and biodiversity.	This has been addressed in the section Purpose of the Assessment
Appendix 3 Letter from Blisworth Parish Council Section 2.	Details requested of mitigation of long term operational noise to meet acceptable levels and actions available to the local community if predicted levels are exceeded.	This has been addressed in sections Embedded Mitigation, and Mitigation – Operational Site Noise Mitigation on Main SRFI Site. Actions available to local community, if predicted levels are exceeded, are currently being reviewed.
Appendix 3 Letter from Blisworth Parish Council Section 10.	NPPF advises that the planning system should contribute and enhance the local environment by preventing new development from contributing to unacceptable levels of noise pollution.	This has been addressed in sections Assessment of Construction Phase Effects; and Assessment of Operational Phase Effects.
Appendix 3 Letter from Blisworth Parish Council Section 20.	The EIA needs to assess the impact of noise to the local community	This has been addressed in sections Assessment of Construction Phase Effects; Assessment of Operational Phase Effects; and Assessment of Cumulative Effects
Appendix 3 Letter from Canals and River Trust.	Clarification of the study area. Request for inclusion of amenity areas and associated infrastructure to be considered. Also vibration effects on the canal infrastructure.	This has been addressed in sections Study Areas; Baseline Surveys and Data; Method of Assessment in **Table 18.8** (including sensitivity of amenity areas); Consultation and Scoping in **Table 18.3**; **Appendix 18.14** (Consultation); and in **Appendix 18.16** (Noise and Vibration Assessment to Heritage Assets), which includes an assessment of vibration impacts to canal infrastructure.
Appendix 3 Letter from Highways England.	Need to address adverse change to noise.	This has been addressed in section Assessment of Operational Phase Effects

		– Potential road traffic noise impacts.
Appendix 3 Letter from Historic England.	Assess noise and vibration impact on designated Heritage Assets.	This has been addressed in **Appendix 18.16** (Noise and Vibration Assessment to Heritage Assets); and in sections Assessment of Construction Phase Effects; and Assessment of Operational Phase Effects.
Appendix 3 Letter from Milton Malsor Parish Council	Concern about existing high ambient noise further increasing with noise from additional vehicles and slow moving freight trains associated with the proposed development	This has been addressed in sections Baseline Conditions – Description of noise affecting the main SRFI site; and Assessment of Operational Phase Effects – Potential road traffic/railway/on-site generated noise impacts.
Appendix 3 Letter from Natural England. General Principles.	Need to assess on the natural environment expected residues and emissions (including noise and vibration)	This has been addressed in **Appendix 18.15** (Noise and Vibration Impact to Terrestrial Ecology); and **Appendix 18.16** (Noise and Vibration Assessment to Heritage Assets).
Appendix 3 Letter from South Northamptonshire Council.	Requires vibration from construction to be assessed. Further information required on vibration from road and rail traffic during operation to be submitted if any of these potential impacts are to be scoped out. Vibration monitoring of baseline conditions is not required. Agree that the effect of climate change on noise and vibration can be scoped out.	This has been addressed in sections Baseline Surveys and Data – Baseline Monitoring; Assessment of Construction Phase Effects; Consultation and Scoping in **Table 18.3;** and **Appendix 18.14** (Consultation).

Assessments Scoped Out

18.62 Discussions with stakeholders and consultees have resulted in the following potential Noise and Vibration impacts being scoped out of the assessment. The justification of this is referenced briefly but further details are included within **Appendix 18.14** (Consultation).

18.63 The effects of climate change on noise and vibration impacts from the development is not required to be assessed following a letter received from the Environment Agency. It was considered that there were no circumstances whereby changes in climate might affect the generation, propagation or reception of noise and vibration.

18.64 The potential vibration effects from HGVs travelling on public roads during both the construction and operational phases is not required to be assessed following discussions and agreement with South Northamptonshire Council. The potential effects would be predominantly generated by HGVs. TRRL RR246 'Traffic Induced Vibration in Buildings' advises that even roads with poor or worn surface condition will not transmit significant ground vibration beyond a distance of around 50m from the edge of the carriageway. Maintenance of the surface of existing public roads is a matter for the relevant highways authorities.

18.65 All newly constructed roads or alterations to road junctions associated with the Proposed Development will have new good quality surfaces and will be maintained to avoid potholes forming, and vibration from HGVs and other vehicles would be unlikely to be noticeable even at significantly closer distances.

18.66 Vibration impacts from train movements on the rail network during construction will not need to be assessed, as the number of potential trains will be very low. This follows discussions and agreement with South Northamptonshire Council. Vibration impact from trains during operation will however be assessed.

18.67 The potential for vibration impacts from operational activity on the Main SRFI Site, or other sites of the Proposed Development will not be required to be assessed. This follows discussions and agreement with South Northamptonshire Council. Sources of vibration would be associated with HGVs and the potential for vibration transmitted to nearby NSRs exists only where there is a poor or worn road surface. The road surfaces of the Proposed Development will be new and their condition such that vibration generation and perception will be unlikely to arise even adjoining the roads. Vibration impact from construction activity on the Main SRFI Site and the proposed highways works will be carried out, noting particularly the greater potential impacts should driven impact piling become necessary.

Study areas

Operational Noise and Vibration

18.68 The noise and vibration study area for the Main SRFI Site extends typically 700m beyond the Main SRFI Site boundary, and includes all nearest noise sensitive receptors (NSRs) and amenity areas around the development site. This includes the greater parts of the villages of Milton Malsor to the north and Blisworth to the south. The study area has been defined by considering the likely extent of impact from the development, beyond which any impact would be negligible.

18.69 The study area for noise and vibration for the Main SRFI Site, is identified by a red dotted line on the plan enclosed at **Figure 18.1.** Within the study area a sample of 17 of the most noise sensitive residential receptors have been identified, and a further sample of 11 recreational/amenity receptors locations have been identified, including Gayton Marina, the

canal and associated towpath, and existing and proposed footpaths in and around the Main SRFI Site.

18.70 The baseline noise and vibration monitoring positions and the study area for the Main SRFI Site have been approved both by SNC and the EA.

18.71 The study area in relation to noise impact to terrestrial ecology includes Special Protection Areas (SPA) specifically in relation to noise, notably at Nene Valley Gravel Pits. These are typically 6.5km from the boundary of the Main SRFI Site.

18.72 The study area for operational noise associated with J15a junction of the M1 is defined within DMRB and extends typically 600m from the edge of the carriageway, and this is shown on the map in **Figure 18.2**. For other road junctions, where widening or additional lanes are proposed, this is considered minor works only and assessed through evaluating changes in noise resulting from changes in road traffic flow on the wider road network.

Construction Noise and Vibration

18.73 The Main SRFI Site study area for the construction phase of the development is the same as for the operational phase. While noise from construction activities would generate potentially higher noise levels than that during operation, the threshold of significance is considered to be less onerous due to the temporary nature of the works. The required study area for construction may be smaller than that for operation. However, maintaining the same area of study as for operation is considered to be a more robust approach.

18.74 The baseline noise and vibration monitoring positions and the study area for the Main SRFI Site have been approved both by SNC and the EA.

18.75 The study area in relation to noise impact to terrestrial ecology includes Special Protection Areas (SPA) specifically in relation to noise, notably at Nene Valley Gravel Pits.

18.76 The study area for construction noise associated with J15a junction of the M1 extends up to 300m from the boundary of site and is shown in **Figure 18.3.** For other road junctions, where widening or additional lanes are proposed the study area for this shorter term work extends 200m from the boundaries of these sites.

Road Traffic Noise

18.77 The study area for road traffic noise is based on the extent of the road network assessed under the Highways and Transportation chapter (**Chapter 19**). Noise level calculations carried out in accordance with the Calculation of Road Traffic Noise, Department of Transport, Welsh Office, are valid up to 300m from a road. The study area reflects this.

Rail Traffic Noise and Vibration

18.78 Calculation of Railway Noise 1995, The Department of Transport, give procedure for the calculation of rail noise that are valid up to 300m from the railway line for the purposes of determining eligibility under the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1995. In accordance with this, the study area for rail noise extends 300m from the railway line, although vibration at more than 50m is normally not detectable.

The study area would coincide with the extent of the rail network assessed in relation to changes in rail traffic associated with this application.

Baseline Surveys and Data

18.79 Baseline long term noise and vibration monitoring has been carried out at sensitive receptors representing the nature and character of the relevant study areas. The large dataset has been subjected to detailed analysis to establish the baseline conditions.

18.80 Full details of the noise and vibration monitoring are presented in **Appendices 18.2 and 18.3**, including a site location plan showing the monitoring locations, images of the installed monitoring equipment at each location, details of the equipment used, calibration details, measurement results and post processing to generate baseline results.

Baseline Monitoring

18.81 Unattended long term baseline noise monitoring was carried out at eight locations representing the nature and character of the study area, over a period from February to May 2016. Measurements were made continuously at each location over three to four weeks consisting of contiguous 15 minute periods. Measurement parameters include the A-weighted broadband equivalent continuous level (L_{Aeq}) and various statistical metrics (L_{An}, the level exceeded for n% of the measurement period) such as L_{A90} (commonly referred to as the background sound level) and L_{A10} (often used in the assessment of traffic noise). All measurements were made in accordance with procedures given in BS4142:2014.

18.82 A weather station was also employed throughout the noise monitoring survey to record the meteorological conditions over the survey period. The weather station monitored continuously, recording average wind speed and direction over contiguous 15 minute periods.

18.83 Vibration monitoring was carried out over a 1-week period at a single location between 4 and 15 April 2016. The monitoring location (VML) is at West Lodge Farm to the south east of the proposed Main SRFI Site, 60m from the Northampton Loop at the intersection with the West Coast Main Line. This location would be subject to vibration from trains travelling on both of these lines and as such is considered to be a worst case in terms of existing vibration from this activity. Vibration was measured in terms of RMS acceleration between 0.5-80 Hz and in three orthogonal planes as detailed in BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting*. The vibration monitor records the vibration data in the three axes simultaneously and stores them over contiguous 5 minute periods. The measured acceleration data is weighted according to the standard to produce Vibration Dose Values directly.

Baseline Conditions

Description of noise affecting the Main SRFI Site

18.84 Noise levels across the Main SRFI Site are generally controlled by road traffic movements on the M1 to the east, the A43 to the west and also Northampton Road, running through the middle of the proposed site. Train movements on the WCML and Northampton Loop railway lines are intermittently audible.

18.85 At NML 5, on Northampton Road, noise levels are dominated by road traffic movements on Northampton Road due the road's proximity to the monitoring location.

18.86 At NML 7, Arm Farm, noise levels are dominated by road traffic movements on the A43 due to its proximity to the monitoring location.

Statistical analysis of noise measurement results

18.87 A statistical analysis of the measured data has been carried out. The results are presented in **Appendix 18.3**.

18.88 BS4142 states that caution should be exercised when measuring noise levels in poor weather conditions such as when the wind speed is in excess of 5m/s. The measured data has been filtered to exclude noise data measured during periods with an average wind speed in excess of 3.5m/s in order to exclude data where gusts in excess of 5m/s may have arisen.

18.89 The data has been further filtered by wind direction. The analysis considers wind directions of NW, NE, SE, and SW. The prevailing wind direction at the Main SRFI Site is SW.

18.90 An analysis of the data from each measurement location has been carried out considering the total unfiltered data set including all wind directions and also separately for the wind direction filtered data set, considering the condition where the measurement location is downwind of the site. The summarised results of the background and residual sound level analyses in **Tables 18.5-18.6** present the lower of the values taken from these two analyses, and consequently this represents a cautious approach to the assessment.

18.91 The long term background sound levels, presented in **Table 18.5**, are the mean values of the measured 15 minute levels represented by the statistical parameter $L_{A90,15min}$.

18.92 The long term residual sound levels, presented in **Table 18.6**, have been calculated by taking the logarithmic energy average of the measured levels over the period T, represented by the $L_{Aeq,T}$.

Table 18.5: Long term mean background sound levels (2016 baseline)

Location	Mean background sound levels $L_{A90,15min}$ (dB)			
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Sensitive early night time period (23:00-01:00)
NML 1, Lodge Farm	45	44	43	42
NML 2, Shooting School	45	44	42	40
NML 3, West Lodge Farm	46	45	44	42
NML 4, Courteenhall Road, Blisworth	46	43	41	39
NML 5, Northampton Road	51	46	43	42
NML 6, Station Road	47	45	42	40

NML 7, Arm Farm	62	57	45	48
NML 8, Gayton Road	51	49	44	44

Table 18.6: Long term residual sound levels (2016 baseline)

Location	Residual sound levels $L_{Aeq,T}$ (dB)			
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Sensitive early night time period (23:00-01:00)
NML 1, Lodge Farm	55	51	51	48
NML 2, Shooting School	51	50	49	46
NML 3, West Lodge Farm	60	57	55	52
NML 4, Courteenhall Road, Blisworth	57	54	51	48
NML 5, Northampton Road	71	67	62	61
NML 6, Station Road	61	59	55	55
NML 7, Arm Farm	67	64	59	59
NML 8, Gayton Road	63	59	54	54

18.93 The Main SRFI Site would operate over a 24 hour period. Although the rail capacity indicates that there would be a lower level of activity during the night time period, the assessment of operational noise detailed later in this chapter assumes, as a worst case, that the intensity of activity would be the same during both the daytime and night time periods. The critical period for assessment, therefore, will be the night time period when background and residual sound levels are typically lower, and particularly the earlier night time period (23:00-01:00) when people would be going to sleep. Once asleep it is known that higher ambient noise levels can be tolerated.

18.94 The results of the baseline survey indicate that the sensitive early night time period is generally quieter than the full night time period. This is due to noise levels increasing during the early morning period from around 04:00-05:00, in line with increasing road traffic movements in the area.

18.95 Background sound levels at the communities surrounding the proposed main development site (the Main SRFI Site) during the sensitive night time period are typically in the range $L_{A90,15min}$ 39-42dB and are controlled by road traffic movements on the M1 and A43. At NML 7, Arm Farm, higher background sound levels of $L_{A90,15min.}$48dB were measured due to the location's very close proximity to the A43, and at NML 8 to the north of the site, $L_{A90,15min}$ 44dB due to the nearby A43.

18.96 Residual sound levels at the surrounding community during the sensitive night time period vary significantly in the range $L_{Aeq,15min}$ 41-60dB depending upon the proximity to nearby roads, principally, the A43, M1, and Northampton Road.

18.97 During the day the background sound levels are typically in the range $L_{A90,15min}$ 45-46 dB, which is between 3-9 dB above night time levels depending on position. With background levels significantly higher during the daytime and activity and noise associated with the Proposed Development being the same during the day and night, the impact and effect of the Proposed Development, and in particular the Main SRFI Site, during the day will be significantly less than at night.

18.98 The levels show that existing road traffic noise at night from the M1 and A43 is significant at all NSRs. Residual sound levels (L_{Aeq}) vary between NMLs depending upon their proximity to nearby M1, A43 and Northampton roads. Background sound levels (L_{A90}) are more dependent upon continuous noise from the M1 and A43 roads. The results from the survey are considered to show high baseline noise levels for a rural environment, reflecting the proximity of existing motorway and trunk roads.

18.99 The results of the road traffic noise assessment, detailed later in this chapter, indicate that the future baseline scenario in 2021 and 2031 would be relatively unchanged from the existing baseline condition. Therefore, it is considered that the results of the baseline survey can be used in the assessment of future scenarios.

18.100 An analysis of the baseline noise levels during Sundays shows levels typically just 1dB lower than during the whole week. This is small enough not to be noticeable and the effects of the proposed development, on a Sunday, would not be significantly different to other days of the week. It is not anticipated that climate change would have any effect on the predicted future baseline scenario. The Environment Agency has agreed that, in relation to the assessment of noise and vibration, the effects of climate change can be scoped out.

Rail vibration

18.101 The Vibration Dose Values (VDV) measured over the survey period, representative of nearby residential property, have been converted into daytime period and night time period VDV according to the procedures set out in BS 6472-1. The results are shown in **Table 18.7**. The highest daytime and night-time levels are shown to be in the Z ordinate direction (vertical)

Table 18.7: Summary of measured vibration dose values (VDV) at VML1, West Lodge Farm

Period	Measured VDV per axis m/s$^{1.75}$)		
	x	y	z
	VDV	VDV	VDV
Daytime (16 hour)	0.004	0.004	0.015
Night time (8 hour)	0.004	0.004	0.013

18.102 The vibration baseline measurements made over a period of one week at a VML close to a residential property establish a VDV, 65 metres from the WCML and Northampton Loop Line, of 0.013 $m/s^{1.75}$ at night and 0.015 $m/s^{1.75}$ during the day. These values are around 10 times lower than the threshold above which there is a 'low probability of adverse comment', according to BS6472-1 2008 (i.e. 0.10 – 0.20 during the night and 0.20 – 0.40 during the day). Therefore, the measured baseline vibration levels are consistent with adverse comment not being expected.

Method of Assessment

18.103 The methods of assessment of noise and vibration have been agreed with key consultees, notably South Northamptonshire Council, The Environment Agency and The Canals and Rivers Trust. Full details are given within the Consultation section of this Chapter.

Assessing significance of effect – general

18.104 For each of the noise and vibration assessments, different methodologies will apply as set out in the relevant guidance and standards. Some set out assessment methodologies to establish impact, while others establish effect. Where impact is established, the resulting effect must then be considered. Determination of the significance of an effect requires the consideration of a number of factors and the exercise of professional judgement.

18.105 A systematic approach has been adopted in classifying both impacts and effects at noise sensitive receptors (NSR). For the purposes of consistency within this chapter the established impacts and effects for each area of assessment have been classified in terms of Magnitude of Impact. The Magnitude of Impact is classified as either Negligible, Low, Medium, or High.

18.106 In classifying the Magnitude of Impact for each aspect of noise and vibration, in most cases, classification of a Medium or High Magnitude of Impact will correspond broadly with a potential significant impact or effect, as defined in a particular Standard. A classification of Low or Negligible Magnitude of Impact will correspond with a potential adverse impact or effect, again as defined within the same relevant Standard.

18.107 The significance of any effects arising from these impacts is then established taking into account various factors, including the sensitivity of the receptors.

18.108 Useful guidance on how to determine the sensitivity of a receptor is provided in an article published under IEMA's EIA Quality Mark scheme titled *Guidelines for Environmental Noise Assessment – October 2014*.

18.109 A receptor is considered to be of high sensitivity where it has little ability to absorb change without fundamentally altering its character. A receptor of medium sensitivity would have a moderate capacity to absorb change without significantly altering its character. A receptor of low sensitivity would be tolerant of change without detriment to its character. A receptor of negligible sensitivity would not be sensitive to noise.

18.110 Most NSRs within the study area are residential receptors, which are considered to be of high sensitivity. Other receptors include Gayton and Blisworth Marina, the canal and associated tow paths, The Walnut Tree Inn, and existing and proposed footpaths.

18.111 Receptor locations where people may reside overnight but which are not places of permanent residence, such as the canal where boats are able to moor temporarily alongside towpaths, are considered to be of medium sensitivity. Likewise the Walnut Tree Inn is considered to be a receptor of medium sensitivity, particularly as it overlooks the WCML railway line and sidings. It is anticipated that the hotel will already have adequate glazing installed to reduce the impact of rail activity at this location to an acceptable level within rooms. Footpaths are considered to be of medium sensitivity as they are not likely to be used during the night time period and users during the daytime would be mobile and therefore only exposed to localised sections of path potentially subject to higher noise levels for limited periods of time. **Table 18.8** sets out the sensitivities of receptors considered in this assessment.

Table 18.8: Defining sensitivity of receptor

Sensitivity	Definition
High	Residential, care homes
Medium	Gayton and Blisworth Marina, The Walnut Tree Inn, canal, towpaths, footpaths
Low	-
Negligible	-

18.112 **Table 18.9** provides a matrix for the determination of the significance of any effect that may arise, based on the established Magnitude of Impact, and taking into account the sensitivity of the receptors. The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be where a 'Minor' Significance of Effect changes to a 'Moderate' Significance of Effect.

18.113 Generally, for a Negligible Significance of Effect, noise may be audible but does not cause any change in behaviour or attitude or the perceived quality of life. For a Minor Significance of Effect, noise would be audible and may cause small changes in behaviour or attitude leading to a perceived change in quality of life. For a Moderate Significance of Effect, noise would cause a material change in behaviour and diminish the quality of life in the area. For a Major Significance of Effect, noise would cause extensive and regular changes in behaviour leading to psychological stress or physiological effects. Both Moderate and Major Significance of Effects would be considered to be 'significant' effects in EIA terms and would require mitigation to be developed.

18.114 For receptors of high and medium sensitivity an effect of moderate significance is considered to be associated with a medium magnitude of impact. For a receptor of low sensitivity an effect of moderate significance is considered to be associated with a high magnitude of impact.

Table 18.9: Matrix of assessing significance of effect

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible

High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Construction Noise

18.115 Construction activity carried out within the Proposed Development Area will utilise mobile plant such as earthmoving equipment, mobile cranes and heavy goods vehicles (HGVs) as well as temporarily stationary plant such as fixed cranes, compressors and generators.

18.116 Construction site noise is assessed differently to noise from permanent installations as it is recognised that some degree of noise is an inevitable by-product of required works and that the construction works are a transient activity.

18.117 However, while construction is a transient activity, the scale of this development requires that construction activity would be phased and continue for several years. Noise levels generated, and the associated noise impact, may vary considerably depending of the particular construction activity being undertaken. The significance of any adverse effects resulting from these impacts will largely depend on the duration of each activity under consideration and the sensitivity of the receptor. The guidance provided in BS 5228 relates to residential dwellings, which are considered here to be receptors of high sensitivity.

18.118 It is anticipated that construction activity would only be carried out between the hours of 07:00 and 19:00 on weekdays and 07:00 and 13:00 on Saturdays. The significance criteria presented in **Table 18.10** have been derived taking into account values presented in a range of guidance documents, including BS 5228, PPG, and those published by WHO. The criteria are presented in terms of $L_{Aeq,T}$ (free field), where T is the time period related to the working day.

Table 18.10: Significance criteria for construction noise

Significance of effect	Long term construction noise levels, $L_{Aeq,T}$ at receptors where residual noise levels are		Short term construction noise levels, $L_{Aeq,T}$, for periods of up to 40 days in any 6 month period
	$< L_{Aeq,T}$ 63dB	$\geq L_{Aeq,T}$ 63dB	
Major	≥ 65	≥ 70	≥ 75
Moderate	60-64	65-69	70-74
Minor	55-59	60-64	65-69
Negligible	< 55	< 60	< 65

18.119 For each effect level there are two criteria; one for activities over the long term period and another that takes into account potentially noisier short term activities that would be required but that would be limited in duration. These activities might include, for example,

soil-stripping, the construction and removal of baffle mounds, soil storage mounds and heaps, construction of new permanent landforms and aspects of site road construction and maintenance, particularly where these activities occur in close proximity to residential dwellings near to the site boundary.

18.120 The long term criteria are based on those given in BS 5228-1:2009+A1:2014 Table E.1 (ABC Method) for the identification of potential significant effects. The criteria depend on the existing residual noise levels at the receptor locations, which in the standard are split into three categories; A, B, and C. For this assessment only two categories are used, which equate to BS 5228 category A (daytime residual L_{Aeq} < 63dB) and categories B and C combined (daytime residual L_{Aeq} ≥ 63dB). This results in a more onerous long term criteria that takes into account the additional assessment over the short term period. For the purposes of this PEIR, a potential significant effect as described in the Standard has been equated to an effect of moderate significance and above.

18.121 The short term criteria are based on those given in BS 5228-1:2009+A1:2014 Table E.2 for the determination of eligibility for noise insulation. For the purposes of this PEIR, where a receptor would be determined to be eligible for noise insulation under BS 5228, this is considered to be an effect of major significance.

Decommissioning Noise

18.122 It is not known when or if the Main SRFI Site would be decommissioned or how this might happen. The design life of the warehouse buildings are in the order of 60+ years and the rail infrastructure and civil engineering works will be significantly longer than this. Once the warehouses have reached their design life they may well be renewed. This would likely occur progressively across the site over a period of time as and when the need arises for each warehouse and in line with the requirements of the occupier. These works would be subject their own assessment of effects to be carried out at the relevant time.

18.123 It is not feasible to carry out an assessment of decommissioning noise at this time as the likely programme and requirements for decommissioning cannot be known and predicting the future baseline scenario so far into the future would be extremely difficult. It is entirely likely that, in 60+ years' time, assessment methodologies and criteria set out by Standards and guidance will have undergone significant revisions and that any assessment of decommissioning noise carried out now would no longer be relevant.

18.124 Notwithstanding the above, it is considered that in the worst case the effects of decommissioning noise would be similar to or less than that of construction. The equipment and machinery used for decommissioning would be similar to that of construction and it is likely that manufacturers of equipment and machinery in the future will have to meet more onerous noise limits than currently required as noise policy is updated in line with technological advancements in noise control. The assessment of construction noise and vibration is therefore considered to provide a reasonable worst case indication of the likely effects that may arise as a result of decommissioning.

Site Operational Noise

Residential receptors

18.125 The assessment of site operational noise at residential noise sensitive receptors (NSR) has been carried out using the methodology set out in BS 4142. The principle of assessment under the Standard is to compare the Rating Level from the industrial/commercial source with the Background Sound Level. The greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact.

18.126 It should be noted that assessment at residential receptors might have been undertaken using IEMA guidance procedures relating to changes in noise level, however, it is acknowledged that whilst many of the new sources of noise are similar to those existing within the area, e.g. road traffic, there are also new types of sources which mean that the nature of the new noise may differ from existing noise. Under these circumstances using BS 4142 procedures is more appropriate.

18.127 BS 4142 indicates that certain acoustic features that characterise the sound can further increase the magnitude of impact. Where such features are present at the assessment location, a character correction should be added to the Specific Sound Level to obtain the Rating Level. The subjective character corrections are summarized in **Table 18.11**.

Table 18.11: Summary of subjective corrections to be applied to specific sound levels in BS 4142

Tonality	Impulsivity	Other sound characteristics	Intermittency
+2dB just perceptible	+3dB just perceptible	Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual environment, a penalty of 3dB can be applied.	Where the specific sound has identifiable on/off conditions that are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied
+4dB clearly perceptible	+6dB clearly perceptible		
+6dB highly perceptible	+9dB highly perceptible		
The standard indicates that where tonal and impulsive characteristics are present within same reference period these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.			

18.128 Operational activities within the Main SRFI Site have the potential to generate impulsive noise events. Impulsive events in warehouse yards are unlikely to be significant as HGVs would back up to warehouse loading bays and be loaded/unloaded internally. Impulsive events on the Intermodal Platform, generated when containers are engaged or set down by

gantry cranes and reach stackers, would occur externally and could potentially be more significant.

18.129 Mitigation for impulsive noise events on the Intermodal Platform would include the use of soft landing technology on gantry cranes and by ensuring reach stacker operatives are adequately trained. These mitigation measures would reduce the levels of impulsive noise significantly.

18.130 The nearest residential receptors to the north of the Intermodal Platform would be at least 600m away, and typically more, from the source of any impulsive events, and would also benefit from screening provided as part of the proposed scheme of mitigation. The nearest residential receptors to the south would be at least 1000m away. At these locations, it is considered that noise from impulsive events might be *just perceptible* in the worst case.

18.131 At the majority of residential receptors, noise emanating from operational activities within the main SRFI site would be mainly from HGVs manoeuvring and idling in yards, and warehouse mechanical ventilation and cooling plant. Operational activities would be continuous and the noise generated would be broadband in nature. Noise generated on-site is not anticipated to have any audible tonal qualities. It is considered that these sources would be similar in character to the existing acoustic environment, which is defined by road traffic and rail movements, and that impulsive events are not likely to be perceptible at these receptors.

18.132 However, as a worst case scenario, and in accordance with BS 4142, a +3dB penalty has been cautiously applied at all receptor locations within the assessment of on-site generated operational noise, to account for any impulsive events that may be *just perceptible* or any characteristics that may otherwise be *readily distinctive against the residual acoustic environment*.

18.133 The magnitude of impact of operational noise from the Proposed Development Area, when considered in relation to BS 4142, is described in **Table 18.12**. It should be noted that the term *low impact*, as mentioned in BS 4142, is qualified as being dependent upon context, suggesting that it is actually referring to effect. The use of *Low Magnitude of Impact* in **Table 18.12** is not a comment on the effect. Determination of significance of effect is based on a subjective view taking into account a number of issues, including the sensitivity of the receptors, the absolute levels of noise, and the number and type of receptors affected.

18.134 **Table 18.12** sets out the assessment ranges that have been used to determine the Magnitude of Impact in relation to the BS 4142 assessment.

Table 18.12: Magnitude of Impact of operational noise (BS 4142)

Magnitude of Impact	Difference between Rating and Background Sound Level $L_{Ar,Tr} - L_{A90,T}$ (dB)
Negligible	2 or less
Low	3 – 7
Medium	8 – 12
High	13 or greater

18.135 **Table 18.13** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect.

Table 18.13: Matrix of Assessing Significance of Effect for Operational Noise

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Amenity/recreational receptors

18.136 An assessment of industrial/commercial noise at amenity/recreational noise sensitive receptors (NSR Rec) is beyond the scope of BS 4142, which applies to residential receptors only. The assessment of site operational noise at amenity/recreational receptors has instead been carried with reference to guidelines set out in BS 8233 and by WHO and following guidance on assessment methodologies detailed by IEMA Guidelines for Environmental Noise Impact Assessment.

18.137 BS 8233 suggests guidelines for noise levels in external spaces that are used for amenity space, such as gardens and patios. *It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline of 55 dB $L_{Aeq,T}$, which would be acceptable in noisier environments. However, it is recognised that these guideline values are not achievable in all circumstances where development might be desirable…In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*.

18.138 The results of the baseline survey indicate that many areas around the Proposed Development Area are already subject to noise levels above these guideline levels. Further assessment can be carried out by considering the change in noise level that would occur as a result of the proposed operational activities.

18.139 The Magnitude of Impact resulting from varying degrees of changes in noise level used in this assessment are set out in **Table 18.14** and are based on IEMA guidance.

Table 18.14: Magnitude of Impact of operational noise (Noise level change)

Magnitude of Impact	Noise Change – $L_{Aeq,T}$
Negligible	0.9 dB or less

Low	1.0-2.9 dB
Medium	3.0-4.9 dB
High	5 dB or greater

18.140 **Table 18.15** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect.

Table 18.15: Matrix of Assessing Significance of Effect for Operational Noise (Noise Level Change)

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Road traffic noise

18.141 Road traffic using the local road network will increase during the construction and decommissioning phases and also during the operational phase of the project.

18.142 Road traffic noise has been calculated in accordance with CRTN and assessed against the criteria set out in DMRB. DMRB recognises that subjective responses to changes in road traffic noise are different over short term and long term periods. The short term changes are assessed at the opening year of the development. Long term changes are generally assessed 10 to 15 years after the opening year, once the development has been fully built out.

18.143 **Tables 18.16-18.17** show the relationships between noise change and magnitude of impact for short term and long term changes, as taken from DMRB **Tables 3.1** and **3.2**. The descriptors of magnitude of impact in the second column have been changed for consistency with the other areas of assessment within this chapter.

Table 18.16: Classification of Magnitude of Road Traffic Noise Impacts in the Short Term

Short term noise change, $L_{A10,18hr}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Low

3 – 4.9	Medium
5+	High

Table 18.17: Classification of Magnitude of Road Traffic Noise Impacts in the Long Term

Long term noise change, $L_{A10,18hr}$	Magnitude of Impact
0	No change
0.1 – 2.9	Negligible
3 – 4.9	Low
5 – 9.9	Medium
10+	High

18.144 The DMRB recognises that research into the response to changes in road traffic noise is largely limited to the daytime period. It therefore recommends that any assessment of road traffic noise during the night time period should be limited to long term changes and that only sensitive receptors predicted to be subject to an $L_{night,outside}$ exceeding 55dB should be considered.

18.145 Determination of significance of effect is based on a subjective view taking into account a number of issues, including the sensitivity of the receptors, the absolute levels of noise, the number and type of receptors affected and whether the change is temporary or permanent. **Table 18.18** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect.

Table 18.18: Matrix of Assessing Significance of Effect for Road Traffic Noise

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

18.146 The effect of changes in traffic noise is evaluated on roads where there are residential receptors. Due to the large area the Proposed Development Area covers, there are a large number of locations that need to be considered. An evaluation is made at each major section of road that provides access to and from the site of the proposed development.

Rail traffic noise

18.147 Studies of community noise, as cited by WHO and in DMRB, have generally shown rail noise to be less annoying than road traffic noise. However, in lieu of guidance on assessment thresholds for rail noise, it is considered reasonable to apply the same significance criteria as that proposed for road traffic noise, as suggested in DMRB and presented in **Tables 18.19-18.20**. As the procedures for the calculation of rail noise set out in CRN establish noise levels in terms of the $L_{Aeq,T}$, this metric is used in the table instead of the $L_{A10,T}$ metric, which is used for road traffic noise calculations in accordance with CRTN.

Table 18.19: Classification of Magnitude of Rail Traffic Noise Impacts in the Short Term

Short term noise change, $L_{Aeq,18hr}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Low
3 – 4.9	Medium
5+	High

Table 18.20: Classification of Magnitude of Rail Traffic Noise Impacts in the Long Term

Long term noise change, $L_{Aeq,18hr}$	Magnitude of Impact
0	No change
0.1 – 2.9	Negligible
3 – 4.9	Low
5 – 9.9	Medium
10+	High

18.148 Determination of significance of effect is based on a subjective view taking into account a number of issues, including the sensitivity of the receptors, the absolute levels of noise, the number and type of receptors affected and whether the change is temporary or permanent. **Table 18.21** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect.

Table 18.21: Matrix of Assessing Significance of Effect for Rail Traffic Noise

	Sensitivity of Receptor

Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Vibration

Construction phase

18.149 Vibration impacts occurring during construction phases, can be assessed in accordance with Annex B of BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration. These are summarised in **Table 18.22**.

Table 18.22: Effects of vibration (BS 5228-2)

Effect on people/building	Vibration level Peak Particle Velocity, PPV (mm/s)
Vibration might be just perceptible in the most sensitive situations and at most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	0.14
Vibration might be just perceptible in residential environments	0.3
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.	1.0
Vibration is likely to be intolerable for any more than a very brief exposure to this level	10.0
Guide values to avoid cosmetic damage to buildings – Residential buildings	15.0 at 4Hz increasing to 20.0 at 15Hz increasing to 50.0 at 40Hz and above
Guide values to avoid cosmetic damage to buildings – Industrial buildings	50.0 at 4Hz and above

18.150 BS 5228-2 relates vibration levels from construction activities, in terms of Peak Particle Velocity (PPV), to likely observable effects within residential dwellings, which for the purposes of this assessment are categorised as being of high sensitivity. As per the general assessment methodology within this chapter, for a receptor of high sensitivity the determination of a Moderate Significance of Effect occurs where there is a Medium Magnitude of Impact (i.e. above the threshold for SOAEL). Accordingly, **Table 18.23** sets out

the assessment ranges that have been used to determine the Magnitude of Impact in relation to the BS 5228-2 assessment.

Table: 18.23: Degree of Magnitude of Impact of Construction Vibration

Magnitude of Impact	Vibration level Peak Particle Velocity, PPV (mm/s)
Negligible	0.2 or less
Low	0.3 – 0.9
Medium	1.0 – 1.9
High	2.0 or greater

18.151 Determination of Significance of Effect is based on a subjective view taking into account a number of issues, including the sensitivity of the receptors, the absolute levels of vibration and the number and type of receptors affected. **Table 18.24** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect. It should be noted that for residential receptors this agrees with BS 5228-2.

Table 18.24: Matrix of Assessing Significance of Effect for Construction Phase Vibration

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Operational phase

18.152 Assessment of vibration during operation is undertaken in accordance with BS 6472-1 and is evaluated as a vibration dose experienced over a period of time. **Table 18.25** provides the vibration dose values at which various degrees of adverse comment may be expected in residential dwellings, taken from this Standard.

Table 18.25: Likelihood of adverse comment of VDV values in accordance with table 1 of BS6472-1 2008

Vibration dose value ranges ($m/s^{1.75}$) which various degrees of adverse comment may be expected in residential buildings			
Place and time	Low probability of adverse comment $m/s^{1.75}$ – note 1)	Adverse comment possible $m/s^{1.75}$	Adverse comment probable

			$m/s^{1.75}$ – note 2
Residential buildings 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr nigh	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Note 1 Below these ranges adverse comment is not expected

Note 2 Above these ranges adverse comment is very likely

18.153 The degree of Magnitude of Impact of vibration from sources within the Proposed Development Area during the operational phase adopted for this assessment is shown in **Table 18.26**. It covers the most sensitive time periods for residential receptors, which is at night. A Medium Magnitude of Impact correlates with the case where adverse comment is possible, as defined by the Standard.

Table 18.26: Degree of magnitude of impact of vibration at residential properties during operational phase at night 23:00 – 07:00.

Magnitude of Impact	Vibration Dose Value ($m/s^{1.75}$)
Negligible	Less than 0.1
Low	0.1-0.2
Medium	0.2-0.4
High	More than 0.4

18.154 Determination of significance of effect is based on a subjective view taking into account a number of issues, including the sensitivity of the receptors, the absolute levels of vibration and the number and type of receptors affected. **Table 18.27** presents the matrix to convert the Magnitude of Impact to a Significance of Effect taking account of the sensitivity of receptors. The threshold between insignificant and significant effect (i.e. SOAEL), is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect

Table 18.27: Matrix of Assessing Significance of Effect for Operational Phase Vibration

	Sensitivity of Receptor			
Magnitude of Impact	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Cumulative Assessment

Inter-relationships

18.155 The impacts of noise and vibration from other consented or potential developments or projects that might potentially affect the NSRs for the Proposed Development will be considered together with those from the Proposed Development itself and an assessment of the cumulative effects will be carried out.

18.156 The intra-relationships between other environmental impacts and the impacts of noise and vibration will be considered and relevant assessments made.

Embedded Mitigation

Main SRFI Site

18.157 The Main SRFI Site has been designed to avoid or minimise the occurrence of adverse effects in the surrounding community resulting from noise and vibration emanating from activities arising on the site.

18.158 The embedded mitigation proposed takes into account a conservative scenario with respect to site layout, with yards, for example, in some cases orientated towards sensitive receptors. The approach reflects guidance in the Parameters Plan and recognises that warehouse size, location and orientation are not yet fixed, and therefore a worst case scenario would inform embedded mitigation.

18.159 The final layout, including the orientation and floor area of each warehouse, would be developed at a later stage. Further adaptive mitigation may then be developed as the design progresses to further enhance or complement the effectiveness of the embedded mitigation.

18.160 The main element of embedded mitigation consists of earth bunds. Further screening may also be implemented as part of the adaptive mitigation and will depend of the final layout and orientation of the warehouses. The embedded mitigation is shown in **Appendix 18.13** and comprises:

- Bund to west and north of Zone 3 and the Intermodal Platform providing screening to southern boundary of Milton Malsor;
- Bund to north east of Zone 1 providing screening to residential property on Towcester Road (NSR 2) and south west boundary of Milton Malsor;
- Bund to east of Zone 1 providing screening to residential property on Towcester Road (NSR 1);
- Bund to west and south of Zone 4 providing screening to residential properties on Northampton Road, including the Railway Cottages near the south western corner of Zone 4

- Construction activity will be carried out in accordance with BS 5228-1 and BS 5228-2 as outlined within the CEMP.

J15A works

18.161 Construction activity will be carried out in accordance with BS 5228-1 and BS 5228-2 as outlined within the CEMP. There are no other embedded noise mitigation measures proposed.

Other minor highway works

18.162 Construction activity will be carried out in accordance with BS 5228-1 and BS 5228-2 as outlined within the CEMP. There are no other embedded noise mitigation measures proposed.

All works within the proposed Order Limits

18.163 The embedded noise mitigation comprises sections of bunding located around the Main SRFI Site as described earlier. This will have a small effect of reducing noise at some locations. A comprehensive plan of adaptive mitigation in the form of methods of reducing noise at source and introducing acoustic barriers, has also been developed and its effects are included within the Assessment of Effects sections.

18.164 Apart for the need for Contractors to comply with the requirements of BS 5228-1 and BS5228-2 during the project construction phase and also the CEMP, there are no further embedded noise or vibration mitigation measures proposed either for the construction or the operation phases of the other sites of the PD namely J15A and Other Minor Highways Works.

Assessment of Construction Phase Effects

Main SRFI Site (including A43 access and all rail infrastructure)

18.165 Construction activity would be carried out on a phased basis between 2019 and 2029, with the first phase of the Proposed Development becoming operational in 2021. At 2021, during daytime construction activity there may be some contribution of noise from completed operating warehouses. However, because the predicted contributions from operating noise are likely to be 10-20 dB below those from temporary construction activity, they will not be contributory and can therefore be ignored in the construction phase assessment.

18.166 Calculations of construction noise have been carried out following the procedures set out BS 5228-1, based on a list of the likely construction equipment required for the works provided by Buckingham Group Contracting Ltd.

18.167 Construction would be phased across various zones identified at the site. As set out at **Chapter 5** 'Project Description', it is proposed that the works begin with construction of the A43 grade separated junction (GSJ) to provide access to the site. The site access road would then be built providing access to the rail freight terminal and maintenance depot areas, which would be constructed thereafter. Following these initial phases, the plateau preparation required for the various warehouse zones would be carried out, again on a

phased basis, followed in each case by the construction of the warehouse buildings themselves and associated infrastructure.

18.168 The list of construction equipment, presented in **Appendix 18.8**, is grouped in accordance with the construction activity to be carried out. An estimate of the likely duration of operation for each plant item is also given as a percentage of the working day period. Some activities may occur concurrently within each construction zone, as individual activities migrate across a construction zone giving way for another related activity to commence before the prior activity is completed. A worst case scenario has been assumed in the calculations, whereby a number of related activities are carried out simultaneously. These related activities have been grouped as follows:

18.169 Plateau preparation (bulk earthworks 220,000m^3 areas)

- Top soil stripping
- Cut/fill (Approx. 220,000m^3 areas)
- Stabilisation (Approx. 220,000m^3 areas)

18.170 Plateau preparation (bulk earthworks 665,000m^3 areas) (units 5, 6, and 7)

- Top soil stripping
- Cut/fill (Approx. 665,000m^3 areas)
- Stabilisation (Approx. 665,000m^3 areas)

18.171 Warehouse unit construction

- Buildings
- On-site highways
- Drainage

18.172 A43 GSJ and Northampton Road underpass

- Highways structures
- On-site highways
- Drainage

18.173 Rail freight terminal and maintenance depot

- Railworks
- On-site highways
- Buildings
- Drainage

18.174 Much of the plant used is mobile, such as the dump trucks, which would regularly traverse large areas of the site. Plant that is relatively stationary, such as excavators, would move gradually across the site as work is progressed. Several plant items would be operational during each activity and there may be multiple activities being carried out at the same time, each of which would operate over a defined area. Generally, for each grouping of activities, it has been assumed that the acoustic centre of the combined construction activities would typically be at least 150m from the edge of the boundary of the works. For the A43 GSJ and

Northampton Road underpass works, however, the plant would operate over a smaller area for which the acoustic centre has been assumed to be a minimum distance of 50m from the edge of the boundary of the works. It is considered that the distance to the acoustic centre of each group of activities would be greater than these minimum distances for the majority of the time.

18.175 A sample of the calculations are presented in **Appendix 18.9**, which indicate for each grouping of activities the minimum distance that would need to be maintained between the NSRs and the acoustic centre of the plant such that a potential significant effect is avoided at locations where baseline ambient noise levels are below $L_{Aeq,T}$ 63dB. At these locations the threshold of potential significant effect is $L_{Aeq,T}$ 60dB. Where baseline ambient noise levels are greater than or equal to $L_{Aeq,T}$ 63dB the threshold for potential significant effect would be $L_{Aeq,T}$ 65dB and the minimum distance required to avoid a potential significant effect would be less. These minimum distances between acoustic centres of plant groupings and any NSR will help in the detailed scheduling of construction activities in the build programme.

18.176 For the purposes however of determining the likely noise impact at each particular NSR around the Main SRFI Site, consideration is given to the distance from the acoustic centre of plant groupings on a particular zone within the site and the nearest NSR to that particular zone. For some zones the nearest NSR is as close as 40m from the boundary, for others it can be 400m or more. The results of the calculations to each of the NSRs for each group of construction activities occurring on the nearest zone, is summarised in **Table 18.28**. These are based on worst case scenarios where the acoustic centre of the plant is at the minimum distance from the boundary of the works nearest to the NSR which represents intensive activity of the plant close to the NSR.

18.177 **Table 18.29** presents the corresponding Significance of Effect for construction noise at each NSR.

Table 18.28: Predicted construction noise levels from main SRFI to residential NSRs

NSR	Plateau preparation (bulk earthworks 220,000m3 areas)	Plateau preparation (bulk earthworks 665,000m3 areas) (units 5, 6, and 7)	Warehouse unit construction	A43 GSJ and Northampton Road underpass	Rail freight terminal and maintenance depot
NSR 01: Towcester Road (south)	62	48	57	55	43
NSR 02: Towcester Road (north)	59	46	52	48	42
NSR 03: Rectory Lane, Milton Malsor	59	49	53	47	45
NSR 04: Barn Lane, Milton Malsor	55	49	49	43	51
NSR 05: West Lodge Farm	48	47	42	34	47

NSR 06: Courteenhall Road, Blisworth	47	51	45	40	48
NSR 07: Ladyfield, Blisworth	50	51	45	41	48
NSR 08: Chapel Lane, Blisworth	50	48	44	41	44
NSR 09: Walnut Tree Inn, Blisworth	54	44	52	53	40
NSR 10: Glen Ave, Blisworth	54	43	52	55	39
NSR 11: Blisworth Arm (south)	56	42	53	63	38
NSR 12: Blisworth Arm (north)	56	42	53	64	38
NSR 13: House adjacent to Arm Farm	55	41	52	63	38
NSR 14: Northampton Road (east)	63	51	58	63	47
NSR 15: Northampton Road (north)	58	49	54	59	46
NSR 16: Northampton Road (south)	59	50	55	56	47
NSR 17: Railway cottages	62	55	58	49	51

Table 18.29: Significance of predicted construction noise levels from Main SRFI Site to residential NSRs

NSR	Plateau preparation (bulk earthworks 220,000m3 areas)	Plateau preparation (bulk earthworks 665,000m3 areas) (units 5, 6, and 7)	Warehouse unit construction	A43 GSJ and Northampton Road underpass	Rail freight terminal and maintenance depot
NSR 01: Towcester Road (south)	Minor	Negligible	Negligible	Negligible	Negligible
NSR 02: Towcester Road (north)	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 03: Rectory Lane, Milton Malsor	Minor	Negligible	Negligible	Negligible	Negligible
NSR 04: Barn Lane, Milton Malsor	Minor	Negligible	Negligible	Negligible	Negligible

NSR 05: West Lodge Farm	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 06: Courteenhall Road, Blisworth	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 07: Ladyfield, Blisworth	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 08: Chapel Lane, Blisworth	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 09: Walnut Tree Inn, Blisworth	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 10: Glen Ave, Blisworth	Negligible	Negligible	Negligible	Minor	Negligible
NSR 11: Blisworth Arm (south)	Negligible	Negligible	Negligible	Minor	Negligible
NSR 12: Blisworth Arm (north)	Negligible	Negligible	Negligible	Minor	Negligible
NSR 13: House adjacent to Arm Farm	Negligible	Negligible	Negligible	Minor	Negligible
NSR 14: Northampton Road (east)	Minor	Negligible	Negligible	Minor	Negligible
NSR 15: Northampton Road (north)	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 16: Northampton Road (south)	Negligible	Negligible	Negligible	Negligible	Negligible
NSR 17: Railway cottages	Minor	Negligible	Negligible	Negligible	Negligible

18.178 The results indicate that during construction the Significance of Effect at the nearest NSRs would be **Negligible** in most cases. At some NSRs there would be a **Minor Significance of Effect** (adverse) during plateau preparation activities, particularly at NSR on Northampton Road, which are located in close proximity to the boundary of the works. There would also be a **Minor Significance of Effect** during the construction of A43 GSJ and Northampton Road underpass at NSRs that are adjacent to these construction areas such as the residential dwellings on the Blisworth Arm by the proposed A43 GSJ and the residential dwellings on Northampton Road adjacent to the proposed underpass.

18.179 A noise model simulation has also been run assuming all construction activities across all phases of the development are carried out simultaneously. A noise contour plot showing the results of this simulation are presented in **Appendix 18.9** along with the tabulated results for each receptor. While this scenario would not occur in practice, it demonstrates that noise from construction would be of **Negligible Significance of Effect** at the communities of Milton Malsor and Blisworth with noise levels generally below L_{Aeq} 50dB at these locations. Higher levels are shown at receptors closer to the site, particularly at residential receptors on the Blisworth Arm and those on Northampton Road. At these locations, residual noise levels are higher than they are at Blisworth and Milton Malsor and are generally equal to or greater

than L_{Aeq} 63dB. The threshold for Moderate Significance of Effect at these locations is therefore L_{Aeq} 65dB. The highest construction noise levels calculated at these receptors is below this threshold at L_{Aeq} 64dB, which indicates a **Minor Significance of Effect**.

18.180 The levels of vibration generated during the construction phase and impacting residential NSRs will depend upon the type of machinery and the set-back distances. Whilst a range of construction equipment has the potential for generating vibration transmitted into the ground, such energy attenuates rapidly with distance. For example, HGVs on roads with poor surfaces and potholes can generate vibration, however this is rarely detectable beyond 50m. **Table 18.22** advises levels of 0.3mm/s PPV are values of vibration that are just perceptible and the threshold of significance during construction phase is 1.0 mm/s PPV. No general construction equipment is predicted to generate vibration levels of as much as 1.0 mm/s PPV at 50m and this would include vibratory compactors and most types of piling, including CFA and vibratory driven piling. In the event that impact driven piling has to be used for a short period in ground that vibratory driven piling is found to be inadequate, vibration levels transmitted into the ground will increase. Precise levels of vibration are dependent upon local ground conditions, however levels could be up to 3.0 mm/s PPV at 50m and 1.0 mm/s PPV at 100m.

18.181 Any piling would be required in relation to major civils engineering works. It is not expected to be required in relation to constructing foundations for the main warehouse zones, which are all in excess of 100m from residential NSRs anyway. It would be more likely to be associated with construction of the rail terminal platform and the train maintenance depot. These are however at least 300m from any residential NSR and so the magnitude of impact would be **low** and the significance of effect either **Minor** or **Negligible**. Work undertaken on the on-site underpass would be more than 100m from a residential NSR and unlikely to result therefore in a significant effect. If driven impact piling is required for part of the works at the A43 access junction then residential NSRs in some places could be within 100m of the activity. In this instance there is the potential for a significant effect to arise in terms of vibration perception, although not one in terms of potential property damage. However, driven impact piling carried out within 100m of a residential NSR, or a heritage asset, should generally be accompanied by a programme of vibration monitoring. This would include notification of occupied affected residential NSRs advising the activity, its duration and likely effect and advising that monitoring will be undertaken.

18.182 An assessment of the potential noise and vibration effects to Heritage Assets is included in **Appendix 18.16**. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

18.183 The impact of noise during the construction phase, on recreational/amenity receptors is not being determined as they are short term and there is no correlation between short term construction noise and vibration and general and publicly accessible recreation/ amenity requirements. Furthermore there is no clear guidance on assessment available for reference. It may be noted that some of the important new amenity receptors will be located within the construction site initially and only accessible once operations commence. It may be concluded that the significance of effect of construction noise on recreational/amenity receptors will likely be **Negligible** or **Minor**. Predictions of noise during operational phase is however considered within this chapter later.

J15A Works

18.184 Calculations of construction noise have been carried out following the procedures set out BS 5228-1. The equipment list is based on that advised for the highways works at the Main SRFI Site provided by Buckingham Group Contracting Ltd.

18.185 It has been assumed that the acoustic centre of the plant equipment would be a minimum distance of 50m from the edge of the boundary of the works.

18.186 Calculations of construction noise at the J15a site are presented in **Appendix 18.9**, indicating the minimum distance that would need to be maintained between the NSRs and the acoustic centre of the plant such that a potential significant effect is avoided at locations where baseline ambient noise levels are below $L_{Aeq,T}$ 63dB. At these locations the threshold of potential significant effect is $L_{Aeq,T}$ 60dB. Where baseline ambient noise levels are greater than or equal to $L_{Aeq,T}$ 63dB the threshold for potential significant effect would be $L_{Aeq,T}$ 65dB and the minimum distance required to avoid a potential significant effect would be less.

18.187 The calculations indicate that the minimum distance required to be maintained between the boundary of the works and any residential NSR, to avoid a potential significant effect, would be 140m. The nearest residential NSRs to the boundary of the works are the dwellings on Teal Close, 160m to the north east. Therefore, potential significant effects, as determined in accordance with BS 5228, are not expected as a result of construction of the proposed junction and the Significance of Effect is considered to be **Minor** in the worst case.

18.188 A noise model simulation has also been run assuming all construction activities are carried out simultaneously at the nearest potential location of the J15a works to the nearest residential receptor on Teal Close. A noise contour plot showing the results of this simulation is presented in **Appendix 18.9**. The results indicate that at the nearest receptor to the works, noise form construction activities would be below L_{Aeq} 55dB. This indicates that the Significance of Effect would be **Negligible**.

18.189 The level of vibration impact from construction activity on the J15A works depends on the type of equipment used and the set-back distance to the NSR or other sensitive receptor.

18.190 An assessment of the potential noise and vibration effects to Heritage Assets is included in **Appendix 18.16**. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

18.191 No general construction equipment is predicted to generate vibration levels of as much as 1.0 mm/s PPV at 50m and this would include vibratory compactors and most types of piling, including CFA and vibratory driven piling. For residential receptors, the set-back distances at this site are at least 100m from construction equipment being used. For most items of construction the vibration levels at this distance will be less than 0.5mm/s PPV. This would be a **Minor** significance of effect. If impact piling is necessary, this would rise up to 1mm/s PPV at 100m but for this site the significance of effect would remain Minor. It is recommended that within the CEMP, any driven piling planned within 100m of a NSR or other sensitive receptor should include provision for vibration monitoring to be carried out.

Other minor highway works

18.192 The level of noise and vibration impact associated with other minor works at other road junctions will depend again on the type of equipment being used and the setback distances. It is unlikely that the amount of work at these junctions will be extensive compared to that at J15A or for the Main SRFI Site. It would be highly unlikely for example that impact piling would be necessary. The predicted vibration levels from construction equipment are unlikely to exceed 0.5mm/s PPV at 50m. At NSR's closer than this the vibration levels will rise, and may on occasions exceed 1 mm/s PPV; the noise levels may also rise, however they are likely to be short-lived and the significance of effect is not considered to be any more than **Minor**.

All works within proposed Order Limits

18.193 In the event that some or all of the various parts of the Proposed Development are developed at the same time, the noise and vibration effects during the construction phase will be localised to NSRs close to each particular area (e.g. Main SRFI Site, or work on existing road junctions). The NSRs that are close to Main SRFI Site are different ones to those around the existing road junction NSRs. The distances between NSRs associated with one site in the Proposed Development and another are large enough that any noise or vibration impacts will not augment each other.

Assessment of Operational Phase Effects

18.194 Once into operation, the potential impact from some activities from different parts of the Proposed Development can be considered together. These include changes in road traffic and rail traffic noise. Operational noise generated from on-site activities on the Main SRFI Site can be considered in isolation of other areas of the Proposed Development such as M1 Junction 15a.

18.195 The operation of initial phases of the Proposed Development will commence in 2021 and will become fully operational in 2031 when all phases are complete. In considering the impact of operational noise and vibration, the level of activity in 2031 with the development completed, represents the potential worst case scenario, and will be the only scenario considered.

18.196 Prior to full operation the impact will be less as fewer zones will have been developed. There will be construction activity at this time, however it will be limited to daytime only and will not impact on operational noise at night.

18.197 The Proposed Development has the potential to generate adverse impacts from noise and vibration as follows:

1. Change in road traffic flows on existing local public roads and introduction of access road running from the A43 junction through the centre of the Main SRFI Site to the intermodal platform.

2. Change in rail traffic movements on the West Coast Main Line (WCML), both via Blisworth and Northampton.

3. On-site activities including Rail Mounted Gantry cranes (RMG) loading and unloading containers on the intermodal platform, HGVs and forklifts manoeuvring in yards and in the express freight cross-dock platform, and operation of any warehouse mechanical ventilation or cooling plant.

18.198 Each of these activities has been assessed according to current guidance and standards.

18.199 Noise emanating from railway and road traffic movements have been calculated using the procedures set out in Calculation of Road Traffic Noise (CRTN) and Calculation of Rail Noise (CRN). The prediction of environmental noise levels propagated to the surrounding community has been calculated using B&K's Predictor software, which follows the procedures set out in ISO 9316-2. Vibration from rail is assessed by considering changes to the baseline VDV data as a result of intensification of the number of trains. Vibration from normal site activities is not considered to arise. Vibration from vehicles (HGVs) on public roads has been scoped out.

Potential road traffic noise impacts

Assessment scenarios

18.200 During the operational phase of the development traffic flows on existing roads that give direct or indirect access to the Proposed Development are likely to increase as a result of the development, as well as other external factors.

18.201 The principle of assessment under DMRB is to calculate the Basic Noise Level (BNL) for each road section, in accordance with the procedures set out in CRTN, and to compare the changes in BNL over both the short and long term periods.

18.202 The DMRB recognises that research into the response to changes in road traffic noise is largely restricted to the daytime period. It states that until further research becomes available, assessments of night time road traffic noise should be restricted to long term changes only and should only be considered for receptors predicted to be subject to an $L_{night,outside}$ exceeding 55dB.

18.203 The BNL has been calculated for the following scenarios:

- Do-Minimum 2021 (DM 2021) – opening year (2021); without development
- Do-Something 2021 (DS 2021) – opening year (2021); with development (Based on preliminary data for partially built out and operational site and including only partially built highways mitigation. Final data for this scenario will be available following completion of the mitigation phasing assessment.)
- Do-Minimum 2031 (DM 2031) – future year (2031); without development
- Do-Something 2031 (DS 2031) – future year (2031); with development fully built and operational and including all highways mitigation

18.204 The road traffic flow data for each scenario has been taken from the Northamptonshire Strategic Traffic Model (NSTM).

18.205 Short term changes would occur during the proposed opening year of the Proposed Development and are defined as the difference between DS 2021 and DM 2021.

18.206 Long term changes describe the change in BNL from the opening year without the development (DM 2021) to the future year with the development (DS 2031), taking into account changes related to the Proposed Development but also including any other external traffic growth factors.

18.207 The proposed new access road for the Main SRFI Site, which would connect the proposed A43 junction to the east section of the site including the intermodal platform, would cross Northampton Road by way of an underpass. Residential NSRs on Northampton Road would be potentially impacted by the cumulative effects of changes in traffic flow on Northampton Road and the newly introduced road traffic on the proposed site access road. To account for this, road traffic noise level changes at NSRs near to the Main SRFI Site have been modelled using the noise propagation package Predictor V11.

18.208 The BNLs for each public road are calculated in terms of the $L_{A10,18hr}$ metric, as per CRTN. For modelling purposes, these have been converted to $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ levels, for both the day and night time periods respectively, using the procedures set out in Method 3 of *Method for converting the UK road traffic noise index $L_{A10,18h}$ to the EU noise indices for road noise mapping (Defra 2006)*. As vehicle movements on the on-site access road would not follow typical diurnal patterns, the day and night time L_{Aeq} noise levels have been calculated following the procedures set out in Method 1, which considers the anticipated flow rates on an hourly basis over a 24 hour period.

18.209 The anticipated hourly flow rates have been based on those observed at similar existing facilities, as described in the Traffic Assessment in **Chapter 19**. The number of vehicles on each segment of the on-site access road has been calculated as a proportion of the available floor space within each zone. The proposed access road speed limit of 40mph has been used as the basis for the CRTN calculation.

18.210 During the opening year the site will only be partially built and operational and there will be continued construction activity in some areas of the site. Construction traffic on the on-site access road and public roads local to the main SRFI site has therefore been incorporated into the Predictor model. The anticipated construction traffic flows for the opening year scenario (DS 2021) are presented in **Appendix 18.4**.

18.211 The calculated L_{Aeq} noise levels have been converted to sound power levels $L_{w/m}$ for input to the Predictor model as line sources. The Predictor model has been validated by comparing the results of the model simulation using the NTSM baseline scenario data with the results of the baseline noise measurement survey. Where baseline noise monitoring locations were close to roads which are the dominant noise source at that location, the Predictor model calculated noise levels to within 1dB of the baseline measurement results. Therefore, the model is considered to be validated and suitable for accurately predicting noise levels for future scenarios.

Road section BNL changes

18.212 Work in relation to the assessment of road section BNL changes is ongoing. The preliminary road traffic data for the unmitigated scenarios used in the assessment and the resulting

calculated BNLs for each scenario are presented in **Appendices 18.5**. The calculated short and long term changes in BNL are presented in **Appendix 18.6**. The final assessment, however, will show the results for the mitigated scenarios.

Noise level changes at NSRs

18.213 The noise levels from public roads and the new site access road at residential and recreational NSRs are shown both graphically and in tabular form in **Appendix 18.7**.

18.214 **Table 18.30** summarises the short term road traffic noise level changes for the daytime period that would occur as a result of changes in traffic flow relating to the Proposed Development and those generally anticipated on the wider road network. The column indicating the significance of effect only contains entries where the effects would be adverse (i.e. an increase in noise level). Where effects would be beneficial (i.e. a decrease in noise level), this is indicated by the corresponding colour highlights in the column showing the numerical noise level change results.

Table 18.30: Summary of short term daytime road traffic noise level changes at residential and recreational NSRs (The road traffic data used in this scenario is preliminary. The final data will take into account the junction phasing assessment, which is currently being undertaken)

NSR	DM 2021 $L_{Aeq,16hr}$	DS 2021 $L_{Aeq,16hr}$	DS 2021 – DM 2021	Significance of effect
NSR 01: Towcester Road (south)	57.9	57.4	-0.5	
NSR 02: Towcester Road (north)	59.5	59.0	-0.5	
NSR 03: Rectory Lane, Milton Malsor	49.1	49.1	0.0	
NSR 04: Barn Lane, Milton Malsor	51.3	51.2	-0.1	
NSR 05: West Lodge Farm	43.9	43.8	-0.1	
NSR 06: Courteenhall Road, Blisworth	61.2	60.7	-0.5	
NSR 07: Ladyfield, Blisworth	46.4	46.3	-0.1	
NSR 08: Chapel Lane, Blisworth	54.8	53.9	-0.9	
NSR 09: Walnut Tree Inn, Blisworth	52.7	54.1	1.4	Minor
NSR 10: Glen Ave, Blisworth	58.2	60.0	1.8	Minor
NSR 11: Blisworth Arm (south)	59.3	61.2	1.9	Minor
NSR 12: Blisworth Arm (north)	59.9	56.6	-3.3	
NSR 13: House adjacent to Arm Farm	63.0	61.5	-1.5	
NSR 14: Northampton Road (east)	59.7	56.1	-3.6	
NSR 15: Northampton Road	55.0	52.8	-2.2	

(north)				
NSR 16: Northampton Road (south)	59.7	57.3	-2.4	
NSR 17: Railway cottages	55.1	53.3	-1.8	
NSR Rec 1: Gayton Mariner	60.3	60.5	0.2	Negligible
NSR Rec 2: Canal near Walnut Tree Inn	56.3	57.6	1.3	Minor
NSR Rec 3: Footpath by X-Dock Platform	43.0	43.9	0.9	Negligible
NSR Rec 4: Footpath by maintenance depot	44.1	44.3	0.2	Negligible
NSR Rec 5: Footpath south Intermodal	44.9	47.2	2.3	Minor
NSR Rec 6: Footpath north Intermodal	48.6	48.5	-0.1	
NSR Rec 7: Footpath south M. Malsor	47.3	47.1	-0.2	
NSR Rec 8: Footpath east N'Hampton Rd	59.2	58.3	-0.9	
NSR Rec 9: Footpath west N'Hampton Rd	50.0	50.2	0.2	Negligible
NSR Rec 10: Footpath Gayton Road	54.0	54.5	0.5	Negligible
NSR Rec 11: Footpath west of Zone 1	57.7	60.2	2.5	Minor

18.215 During the daytime period, the significance of effect of road traffic noise levels changes over the short term range from **moderate beneficial** to **negligible adverse** at the majority of NSRs. At three of the residential NSRs the significance of effect would be **minor adverse** and at three of the recreational NSRs the significance of effect would also be **minor adverse**.

18.216 **Table 18.31** summarises the long term road traffic noise level changes for the daytime period that would occur as a result of changes in traffic flow relating to the Proposed Development and those generally anticipated on the wider road network. The column indicating the significance of effect only contains entries where the effects would be adverse (i.e. an increase in noise level). Where effects would be beneficial (i.e. a decrease in noise level), this is indicated by the corresponding colour highlights in the column showing the numerical noise level change results.

Table 18.31: Summary of <u>long term daytime</u> road traffic noise level changes at residential and recreational NSRs

NSR	DM 2021	DS 2031	DS 2031	Significance

	$L_{Aeq,16hr}$	$L_{Aeq,16hr}$	– DM 2021	of effect
NSR 01: Towcester Road (south)	57.9	58.5	0.6	Negligible
NSR 02: Towcester Road (north)	59.5	59.6	0.1	Negligible
NSR 03: Rectory Lane, Milton Malsor	49.1	50.2	1.1	Negligible
NSR 04: Barn Lane, Milton Malsor	51.3	52.9	1.6	Negligible
NSR 05: West Lodge Farm	43.9	44.5	0.6	Negligible
NSR 06: Courteenhall Road, Blisworth	61.2	61.4	0.2	Negligible
NSR 07: Ladyfield, Blisworth	46.4	47.2	0.8	Negligible
NSR 08: Chapel Lane, Blisworth	54.8	57.9	3.1	Minor
NSR 09: Walnut Tree Inn, Blisworth	52.7	54.7	2.0	Negligible
NSR 10: Glen Ave, Blisworth	58.2	60.4	2.2	Negligible
NSR 11: Blisworth Arm (south)	59.3	61.5	2.2	Negligible
NSR 12: Blisworth Arm (north)	59.9	58.1	-1.8	
NSR 13: House adjacent to Arm Farm	63.0	62.3	-0.7	
NSR 14: Northampton Road (east)	59.7	57.3	-2.4	
NSR 15: Northampton Road (north)	55.0	54.5	-0.5	
NSR 16: Northampton Road (south)	59.7	57.8	-1.9	
NSR 17: Railway cottages	55.1	53.9	-1.2	
NSR Rec 1: Gayton Mariner	60.3	60.8	0.5	Negligible
NSR Rec 2: Canal near Walnut Tree Inn	56.3	58.0	1.7	Negligible
NSR Rec 3: Footpath by X-Dock Platform	43.0	48.2	5.2	Moderate
NSR Rec 4: Footpath by maintenance depot	44.1	45.0	0.9	Negligible
NSR Rec 5: Footpath south Intermodal	44.9	51.0	6.1	Moderate
NSR Rec 6: Footpath north Intermodal	48.6	48.9	0.3	Negligible
NSR Rec 7: Footpath south M. Malsor	47.3	47.7	0.4	Negligible

NSR Rec 8: Footpath east N'Hampton Rd	59.2	60.1	0.9	Negligible
NSR Rec 9: Footpath west N'Hampton Rd	50.0	50.8	0.8	Negligible
NSR Rec 10: Footpath Gayton Road	54.0	54.5	0.5	Negligible
NSR Rec 11: Footpath west of Zone 1	57.7	59.8	2.1	Negligible

18.217 During the daytime period, the significance of effect of road traffic noise level changes over the long term are **Negligible** at the majority of residential and recreational NSRs.

18.218 At receptors NSR 12-17 road traffic noise levels decrease slightly as a result of the development, although these decreases are considered to also be **Negligible** over the long term period.

18.219 At one receptor, NSR 08 (Chapel Lane, Blisworth), the daytime noise level change is +3.1dB, which is considered to be of **Minor** significance of effect over the long term period, as indicated by a noise level change in the range 3.0 – 4.9dB.

18.220 At two of the recreational NSRs the daytime noise level change is +5.2dB (NSR Rec 3) and +6.2dB (NSR Rec 5), which is considered to be of **Moderate** adverse significance of effect, as indicated by a noise level change in the range 5.0 – 9.9dB. These receptors are on public footpaths that are distant from local roads but in close proximity to on-site access roads leading to the Intermodal Platform and Express Freight Cross Dock Platform.

18.221 **Table 18.32** summarises the long term road traffic noise level changes for the night time period that would occur as a result of changes in traffic flow relating to the Proposed Development and those generally anticipated on the wider road network. The column indicating the significance of effect only contains entries where the effects would be adverse (i.e. an increase in noise level). Where effects would be beneficial (i.e. a decrease in noise level), this is indicated by the corresponding colour highlights in the column showing the numerical noise level change results.

18.222 As set out earlier in this chapter, the assessment methodology set out in the DMRB states that assessment of road traffic noise during the night time period should be limited to long term changes and that only sensitive receptors predicted to be subject to an $L_{night,outside}$ exceeding 55dB should be considered. The $L_{night,outside}$ metric is defined as a façade level, which is typically 3dB higher than a free field level. This corresponds to noise levels in **Table 18.32** greater than or equal to $L_{Aeq,8hr}$ 52dB. The significance of effect is only indicated in **Table 18.32** where this condition is met.

Table 18.32: Summary of long term night time road traffic noise level changes at residential NSRs

NSR	DM 2021 $L_{Aeq,8hr}$	DS 2031 $L_{Aeq,8hr}$	DS 2031 – DM 2021	Significance of effect

NSR 01: Towcester Road (south)	51.4	53.9	2.5	Negligible
NSR 02: Towcester Road (north)	52.9	53.2	0.3	Negligible
NSR 03: Rectory Lane, Milton Malsor	45.5	46.9	1.4	
NSR 04: Barn Lane, Milton Malsor	46.4	47.9	1.5	
NSR 05: West Lodge Farm	40.3	41.4	1.1	
NSR 06: Courteenhall Road, Blisworth	53.8	54.1	0.3	Negligible
NSR 07: Ladyfield, Blisworth	41.5	43.3	1.8	
NSR 08: Chapel Lane, Blisworth	48.2	51.2	3.0	
NSR 09: Walnut Tree Inn, Blisworth	49.5	51.8	2.3	
NSR 10: Glen Ave, Blisworth	54.4	56.5	2.1	Negligible
NSR 11: Blisworth Arm (south)	56.1	58.3	2.2	Negligible
NSR 12: Blisworth Arm (north)	56.6	55.3	-1.3	
NSR 13: House adjacent to Arm Farm	59.6	58.7	-0.9	
NSR 14: Northampton Road (east)	52.8	55.0	2.2	Negligible
NSR 15: Northampton Road (north)	49.0	52.7	3.7	Minor
NSR 16: Northampton Road (south)	52.7	52.1	-0.6	
NSR 17: Railway cottages	48.8	48.5	-0.3	

18.223 During the night time period, ten of the seventeen residential NSRs would be subject to noise levels that exceed $L_{Aeq,8hr}$ 52dB at night. At all but one of these NSRs the significance of effect of road traffic noise level changes over the long term are **Negligible**. At one of these receptors, NSR 15, the night time noise level change is +3.7dB, which is considered to be of **Minor** significance of effect over the long term period, as indicated by a noise level change in the range 3.0 – 4.9dB.

18.224 In summary, the significance of effect of road traffic noise level changes over the short and long term periods, both day and night, are **Negligible** at the majority of NSRs. Some residential NSRs would be subject to a **Minor** adverse significance of effect in the worst case, while two of the recreational NSRs on the boundary of the Proposed Development would be subject to a **Moderate** adverse significance of effect. Overall, the significance of effect of road traffic noise level changes as a result of the Proposed Development is considered to be **Minor**.

Potential railway noise impacts

18.225 The operation of the development would introduce additional rail freight movements on the WCML, both via Blisworth and Northampton.

18.226 Freight trains handled on the intermodal platform would consist either of Class 4 type intermodal wagons or Class 6 type conventional wagons. Freight trains handled in the express freight cross-dock platform would consist of Class 1 type express wagons.

18.227 It is anticipated that in the opening year, when the site would be only partially complete, there would be two freight trains arriving and departing from the intermodal platform per day and two freight trains arriving and departing from the express freight cross-dock platform per day. This would increase gradually as the site is further developed and until operational activities on site reach full capacity. **Table 18.33** presents the anticipated number of freight trains that would be handled per day at each platform over a number of years.

Table 18.33: Anticipated number of freight trains handled on each platform per day (24 hour)

	2023	2033	2043
Intermodal platform	2	13	17
Express freight cross-dock platform	2	4	4

18.228 The assessment of rail traffic noise has been carried out considering a worst case scenario where freight trains arrive and depart from the same direction. Therefore, where two freight trains are handled on the intermodal platform per day, four freight train movements have been considered in the calculations.

18.229 In practice, the majority of freight trains handled on the intermodal platform are likely to follow this pattern, however, express freight trains handled on the express freight cross-dock platform would be more likely to continue on the same trajectory.

18.230 **Table 18.34** shows the number of rail freight movements expected during the daytime period on the WCML over a number of years, both via Blisworth and via Northampton, and for the combined case where these lines run in parallel. The data shows the number of rail freight movements attributable to the operation of the site, along with those that would be generated by other developments on the wider network, and the total of both of these. The noise level changes resulting from the total number of rail freight movements anticipated on each line, as referenced to the 2017 baseline year, are also shown.

Table 18.34: Anticipated number of rail freight movements during the 18 hour daytime period (06:00-00:00) and resulting noise level changes relative to the 2017 baseline

	Rail Line	2017	2023	2033	2043
Site generated rail movements	WCML (Northampton)	0	3	18	23
	WCML (Blisworth)	0	2	6	6
	WCML (combined)	0	5	24	29
Rail movements not related to site	WCML (Northampton)	38	47	58	66
	WCML (Blisworth)	3	2	0	1
	WCML (combined)	41	49	58	67
Total rail movements	WCML (Northampton)	38	50	76	89
	WCML (Blisworth)	3	4	6	7
	WCML (combined)	41	54	82	96
Noise level changes (total traffic)	WCML (Northampton)	-	+1.2 dB	+3.0 dB	+3.7 dB
	WCML (Blisworth)	-	+1.2 dB	+3.0 dB	+3.7 dB
	WCML (combined)	-	+1.2 dB	+3.0 dB	+3.7 dB

18.231 The results of the calculations during the daytime period indicate that the short term noise level changes from rail movements on the WCML (as calculated for 2023) would be up to +1.2dB. For the short term period this is considered to be a **Low Magnitude of Impact**, which is associated with a short term increase of 1.0 – 2.9dB.

18.232 The greatest long term change in noise level during the daytime period from rail movements on the WCML (as calculated for 2033 and 2043) would be +3.7dB. For the long term period this is considered to be a **Low Magnitude of Impact**, which is associated with a long term increase of 3.0 – 4.9dB.

18.233 **Table 18.35** shows the number of rail freight movements expected during the night time period on the WCML over a number of years. The noise level changes resulting from the total number of rail freight movements anticipated on each line, as referenced to the 2017 baseline year, are also shown.

Table 18.35: Anticipated number of rail freight movements during the 6 hour night time period (00:00-06:00) and resulting noise level changes relative to the 2017 baseline

	Rail Line	2017	2023	2033	2043
Site generated rail movements	WCML (Northampton)	0	1	8	11
	WCML (Blisworth)	0	2	2	2
	WCML (combined)	0	3	10	13
Rail movements not related to site	WCML (Northampton)	5	6	2	1
	WCML (Blisworth)	16	18	30	35
	WCML (combined)	21	24	32	36
Total rail movements	WCML (Northampton)	5	7	10	12
	WCML (Blisworth)	16	20	32	37
	WCML (combined)	21	27	42	49
Noise level changes (total traffic)	WCML (Northampton)	-	+1.5 dB	+3.0 dB	+3.8 dB
	WCML (Blisworth)	-	+1.0 dB	+3.0 dB	+3.6 dB
	WCML (combined)	-	+1.1 dB	+3.0 dB	+3.7 dB

18.234 The results of the calculations during the night time period indicate that the short term noise level changes from rail movements on the WCML (as calculated for 2023) would be up to +1.5dB. For the short term period this is considered to be a **Low Magnitude of Impact**, which is associated with a short term increase of 1.0 – 2.9dB.

18.235 The greatest long term change in noise level during the night time period from rail movements on the WCML (as calculated for 2033 and 2043) would be +3.8dB. For the long term period this is considered to be a **Low Magnitude of Impact**, which is associated with a long term increase of 3.0 – 4.9dB.

18.236 The results show that during both the daytime and night time periods the increases in the total rail freight movements on the WCML, when considered in isolation, would result in a **Low Magnitude of Impact** over both short term and long term periods.

18.237 The calculated noise level changes would only occur at locations where noise from freight trains is dominant. In practice, there will also be a significant number of passenger train movements and the increases in rail noise levels as a result of increases in freight train movements would consequently be lower.

18.238 Additionally, the total anticipated rail freight movements on the WCML are based on Network Rail's national forecasts. It may be considered that without the Proposed Development the gap left in rail freight movements would be picked up by other SRFIs.

18.239 Given the above, it is considered that the Magnitude of Impact of rail noise as a result of rail freight traffic generated by the Proposed Development would be **Negligible**.

18.240 The Significance of Effect of changes in rail noise is therefore considered to be **Negligible**.

Potential on-site generated noise impacts from Main SRFI Site (including rail infrastructure)

18.241 The assessment of noise emanating from activities within the Main SRFI Site has been assessed according to BS 4142. The noise modelling assumptions made are presented in **Appendix 18.11**.

18.242 The main sources of noise considered in the model are HGVs idling and manoeuvring in yards and in the truck park; tugs moving containers between the intermodal platform and warehouse units; forklift trucks operating in yards and on the express freight cross-dock platform; locomotives idling at intermodal and express freight cross-dock platforms; rail shunters moving wagons between the intermodal platform, rail served warehouses, and maintenance depot; rail mounted gantry cranes (RMG) and reach stackers operating on the intermodal platform; broadband reversing alarms on RMGs and other vehicles; and finally warehouse unit mechanical ventilation and cooling plant.

18.243 Movements of vehicles on the access road connecting the A43 junction to the warehouses and intermodal platform to the east would be regular and would consist of HGVs, cars, and buses. It is considered that noise emanating from this activity would likely be perceived by local residents as road traffic noise, rather than industrial/commercial sound, particularly in the context of road traffic already being the dominant ambient noise source defining the existing acoustic character in the area. Therefore, noise from traffic flow on the access road has been considered within the assessment of road traffic noise.

18.244 BS 4142 requires that a character correction is applied to a specific sound that is readily distinctive against the residual acoustic environment, as detailed in **Table 18.11**. The correction to be applied depends on the character of the sound and its perceptibility.

18.245 The baseline survey established that the existing acoustic environment in the study area is dominated by road traffic noise. Generally, noise generated from within the Proposed Development, particularly from HGVs, locomotives and mechanical ventilation and cooling plant, would be similar in character to the existing acoustic environment. However, noise from RMGs, forklifts, and any broadband reversing alarms associated with these operations might be readily distinctive where they are audible at a receptor.

18.246 It is anticipated that noise from some activities would be impulsive in character, particularly on the intermodal platform. This would likely be 'just perceptible' at some residential receptors. At other receptors where impulsivity is not perceptible there may be other acoustic features that are readily distinctive against the residual acoustic environment. Therefore as the sound may be 'readily distinctive', a term referred to within the Standard, a precautionary +3dB correction has been applied to the Specific Sound Level, in order to calculate the Rating Level at all receptors.

Operational impacts from the Main SRFI Site, without mitigation

18.247 A noise model simulation has been run without mitigation to establish the potential significance of effects that may arise from operation of the Proposed Development. As the site would operate continuously over a twenty-four hour period the same daytime and night time operating scenarios have been modelled for both periods. Further details are given in **Appendix 18.11**.

18.248 The results of the initial operational noise model simulation are presented in **Appendix 18.12**.

18.249 The results of the initial operational noise model simulation for the sensitive night time period are summarised in **Table 18.36**. Noise levels at residential receptors for the night time period are calculated at first floor level except for NSR 10 and NSR 14, which are ground floor only. Operational noise levels will typically be higher at first floor level than at ground floor level due to reduced screening and ground effects. The baseline survey indicates that the Background Sound Levels are lowest during the sensitive night time period. Therefore, the assessment during this period represents the worst case scenario.

Table 18.36: Summary of operational noise results at residential NSRs during the sensitive night time period (23:00-01:00) (without mitigation).

NSR	Rating Level dB(A)	Background Sound Level, dB(A)	Rating - Background	Significance of Effect
NSR 01: Towcester Road (south)	57	42	15	Major
NSR 02: Towcester Road (north)	54	42	12	Moderate
NSR 03: Rectory Lane, Milton Malsor	54	42	12	Moderate
NSR 04: Barn Lane, Milton Malsor	54	42	12	Moderate
NSR 05: West Lodge Farm	47	42	5	Minor
NSR 06: Courteenhall Road, Blisworth	50	39	11	Moderate
NSR 07: Ladyfield, Blisworth	48	39	9	Moderate
NSR 08: Chapel Lane, Blisworth	46	39	7	Minor
NSR 09: Walnut Tree Inn, Blisworth	54	40	14	Major
NSR 10: Glen Ave, Blisworth	49	40	9	Moderate
NSR 11: Blisworth Arm (south)	50	48	2	Negligible
NSR 12: Blisworth Arm (north)	52	48	4	Minor
NSR 13: House adjacent to Arm Farm	53	48	5	Minor

NSR 14: Northampton Road (east)	55	42	13	Major
NSR 15: Northampton Road (north)	55	42	13	Major
NSR 16: Northampton Road (south)	53	42	11	Moderate
NSR 17: Railway cottages	58	42	16	Major

18.250 The results indicate that the effects would generally be of **mino**r to **moderate** significance at most receptors. At five of the residential receptors the effects would be of **major** significance.

18.251 The receptors that would potentially be subject to effects of **major** significance are those on Northampton/Towcester Road, which are located centrally between the two sides of the Main SRFI Site. These would be the nearest NSRs to the Proposed Development. The Walnut Tree Inn would also be subject to effects of major significance due to its elevated location. Receptors on Glen Avenue, in the residential park behind the Walnut Tree Inn, and other nearby residential receptors are less affected due to the local topography and would be subject to effects of **moderate** significance.

18.252 The dominant operational noise sources at these most affected receptor locations would be the warehouse mechanical ventilation and cooling plants and trailer mounted diesel chillers operating in the yards. These sources would require significant noise control mitigation applied at source. Noise from HGVs manoeuvring in yards would also be significant at receptors on Northampton/Towcester Road, particularly where the aforementioned sources have been mitigated. Noise from manoeuvring HGVs at these locations may be mitigated using local bunds and/or screening.

18.253 Residential receptors at the north and east end of Blisworth on Courteenhall Road would potentially be subject to effects of **moderate** significance. Significant sources at these locations would be the warehouse mechanical ventilation and cooling plants, trailer mounted diesel chillers operating in the yards and on the intermodal platform, diesel rail shunters manoeuvring wagons on site, and reach stackers operating on the intermodal platform.

18.254 Residential receptors on the southern boundary of Milton Malsor would be potentially subject to effects of **moderate** significance. Significant sources would be the RMGs and reach stackers operating on the intermodal platform, particularly at the south eastern corner of Milton Malsor (NSR 4: Barn Lane), trailer mounted diesel chillers operating in yards, warehouse mechanical ventilation and cooling plants, and HGVs manoeuvring in yards.

18.255 Noise simulation results for recreational/amenity receptors are calculated for the daytime period only at a height of 1.5m. These results are summarised in **Table 18.37**.

Table 18.37: Summary of operational noise results at recreational/amenity NSRs during the daytime period (07:00-19:00) (without mitigation).

NSR	Site operation noise level	Residual noise level	Total noise level	Noise level change	Significance of Effect
NSR Rec 1: Gayton Mariner	49	67	67.1	+0.1	Negligible
NSR Rec 2: Canal near Walnut Tree Inn	51	61	61.4	+0.4	Negligible
NSR Rec 3: Footpath by X-Dock Platform	55	57	59.1	+2.1	Minor
NSR Rec 4: Footpath by maintenance depot	48	57	57.5	+0.5	Negligible
NSR Rec 5: Footpath south Intermodal	63	51	63.3	+12.3	Moderate
NSR Rec 6: Footpath north Intermodal	57	55	59.1	+4.1	Moderate
NSR Rec 7: Footpath south M. Malsor	54	55	57.5	+2.5	Minor
NSR Rec 8: Footpath east N'Hampton Rd	52	71	71.1	+0.1	Negligible
NSR Rec 9: Footpath west N'Hampton Rd	53	63	63.4	+0.4	Negligible
NSR Rec 10: Footpath Gayton Road	44	63	63.1	+0.1	Negligible
NSR Rec 11: Footpath west of Zone 1	62	63	65.5	+2.5	Minor

18.256 Most of the recreational/amenity receptors would be subject to effects of **negligible** to **minor** significance, apart from those near the intermodal platform (NSR Rec 5 and 6) where effects would be of **moderate** significance. The most affected location would be where the footpath runs adjacent to the east of the intermodal platform (NSR 5), near to where the RMGs would operate. Other significant sources would be a locomotive or rail shunter idling or operating near to the footpath, and trailer mounted diesel chillers operating on the intermodal platform.

Operational impacts from the SRFI site, with mitigation

18.257 A noise model simulation has been run incorporating mitigation measures to address the potential impacts identified above. The mitigation measures include the embedded mitigation and some additional potential adaptive mitigation. The modelled adaptive mitigation is based on an assumed worst case illustrative layout for the warehouses with

yards facing outwards from the development. The additional potential adaptive mitigation is in the form of acoustic screening around the perimeter of some of the warehousing zones such as to reduce noise levels to amenity receptors near to the yards, including the canal and nearby footpaths. The adaptive mitigation also includes a limit on the allowable sound power output of warehouse unit mechanical ventilation and cooling plant.

18.258 The results of the noise model include the embedded mitigation, and potential adaptive mitigation based on a worst case site layout for noise, where yards face outwards. The results are presented in **Appendix 18.12**, including a noise contour plot, which also shows the location of acoustic screening assumed in this case. The results for residential receptors during the sensitive night time period are summarised in **Table 18.38**.

Table 18.38: Summary of operational noise results at residential NSRs during the sensitive night time period (23:00-01:00) (with embedded and illustrative adaptive mitigation).

NSR	Rating Level dB(A)	Background Sound Level, dB(A)	Rating - Background	Significance of Effect
NSR 01: Towcester Road (south)	50	42	8	Moderate
NSR 02: Towcester Road (north)	47	42	5	Minor
NSR 03: Rectory Lane, Milton Malsor	48	42	6	Minor
NSR 04: Barn Lane, Milton Malsor	48	42	6	Minor
NSR 05: West Lodge Farm	47	42	5	Minor
NSR 06: Courteenhall Road, Blisworth	47	39	8	Moderate
NSR 07: Ladyfield, Blisworth	45	39	6	Minor
NSR 08: Chapel Lane, Blisworth	42	39	3	Minor
NSR 09: Walnut Tree Inn, Blisworth	49	40	9	Moderate
NSR 10: Glen Ave, Blisworth	43	40	3	Minor
NSR 11: Blisworth Arm (south)	45	48	-3	Negligible
NSR 12: Blisworth Arm (north)	47	48	-1	Negligible
NSR 13: House adjacent	48	48	0	Negligible

to Arm Farm				
NSR 14: Northampton Road (east)	46	42	4	Minor
NSR 15: Northampton Road (north)	48	42	6	Minor
NSR 16: Northampton Road (south)	46	42	4	Minor
NSR 17: Railway cottages	50	42	8	Moderate

18.259 The results of the assessment during the sensitive night time period, with both the embedded and illustrative potential adaptive mitigation, indicate that the proposed mitigation can reduce operational noise levels significantly at many of the receptor locations. The resulting potential effects would be of either **negligible** or **minor** significance at the majority of receptors. At four residential receptor locations (NSR 1, 6, 9, and 17) the potential effects would be **Moderate** adverse, which is 'significant'.

18.260 The threshold between insignificant and significant effect (i.e. SOAEL), as established by PPG, is considered to be the threshold between a 'Minor' and a 'Moderate' Significance of Effect. For these residential receptors, which are of high sensitivity, this threshold is considered to be where the Rating Level exceeds the Background Sound Level by 8dB.

18.261 NSRs 1 and 17 are both on Northampton/Towcester Road between the two halves of the Main SRFI Site. These are the residential receptors that would be nearest to the proposed operational activities on site. At both of these locations this worst case assessment indicates that the Rating Level would exceed the Background Sound Level by 8dB, which is the threshold for what would be considered a Moderate Significance of Effect.

18.262 NSR 6 is located at the north east corner of Blisworth and is situated at an elevated location with respect to the Proposed Development. At this location the assessment indicates that the Rating Level would exceed the Background Sound Level also by 8dB.

18.263 NSR 9 is the Walnut Tree Inn, to the south west of the Main SRFI Site, which is situated at an elevated location with respect to the Proposed Development. At this location the assessment indicates that the Rating Level would exceed the Background Sound Level by 9dB, which is 1dB above the threshold for Moderate Significance of Effect.

18.264 During the daytime period, background sound levels in the area are significantly higher than they are during the sensitive early night time period. Consequently, the potential for effects as a result of noise from operational activities during the daytime period would be lower.

18.265 The results of the daytime operational noise model simulation at residential receptors, including embedded and illustrative potential adaptive mitigation, are summarised in **Table 18.39**. Daytime operational noise levels are assessed at ground floor level where noise levels from the Proposed Development would be typically one to three decibels lower than at first floor level.

Table 18.39: Summary of operational noise results at residential NSRs during the daytime period (07:00-19:00) (with embedded and illustrative adaptive mitigation).

NSR	Rating Level dB(A)	Background Sound Level, dB(A)	Rating - Background	Significance of Effect
NSR 01: Towcester Road (south)	48	51	-3	Negligible
NSR 02: Towcester Road (north)	46	51	-5	Negligible
NSR 03: Rectory Lane, Milton Malsor	47	45	2	Negligible
NSR 04: Barn Lane, Milton Malsor	47	45	2	Negligible
NSR 05: West Lodge Farm	45	46	-1	Negligible
NSR 06: Courteenhall Road, Blisworth	45	46	-1	Negligible
NSR 07: Ladyfield, Blisworth	42	46	-4	Negligible
NSR 08: Chapel Lane, Blisworth	40	46	-6	Negligible
NSR 09: Walnut Tree Inn, Blisworth	47	47	0	Negligible
NSR 10: Glen Ave, Blisworth	43	47	-4	Negligible
NSR 11: Blisworth Arm (south)	42	62	-20	Negligible
NSR 12: Blisworth Arm (north)	45	62	-17	Negligible
NSR 13: House adjacent to Arm Farm	46	62	-16	Negligible
NSR 14: Northampton Road (east)	46	51	-5	Negligible
NSR 15: Northampton Road (north)	45	51	-6	Negligible
NSR 16: Northampton Road (south)	44	51	-7	Negligible
NSR 17: Railway cottages	49	51	-2	Negligible

18.266 The results indicate that during the daytime period the effects of operational noise at all residential receptors would be of negligible significance.

18.267 The results of the daytime operational noise model simulation at recreational/amenity receptors, including embedded and illustrative adaptive mitigation, are summarised in **Table**

18.40. Noise at recreational/amenity receptors is assessed in terms of the change in noise level as a result of operational activities at the Proposed Development.

Table 18.40: Summary of operational noise results at recreational/amenity NSRs during the daytime period (07:00-19:00) (with embedded and illustrative adaptive mitigation).

NSR	Site operation noise level	Residual noise level	Total noise level	Noise level change	Significance of Effect
NSR Rec 1: Gayton Mariner	43	67	67.0	0.0	Negligible
NSR Rec 2: Canal near Walnut Tree Inn	44	61	61.1	+0.1	Negligible
NSR Rec 3: Footpath by X-Dock Platform	53	57	58.5	+1.5	Minor
NSR Rec 4: Footpath by maintenance depot	46	57	57.3	+0.3	Negligible
NSR Rec 5: Footpath south Intermodal	63	51	63.3	+12.3	Moderate
NSR Rec 6: Footpath north Intermodal	48	55	55.8	+0.8	Negligible
NSR Rec 7: Footpath south M. Malsor	43	55	55.3	+0.3	Negligible
NSR Rec 8: Footpath east N'Hampton Rd	44	71	71.0	0.0	Negligible
NSR Rec 9: Footpath west N'Hampton Rd	45	63	63.1	+0.1	Negligible
NSR Rec 10: Footpath Gayton Road	40	63	63.0	0.0	Negligible
NSR Rec 11: Footpath west of Zone 1	50	63	63.2	+0.2	Negligible

18.268 The results indicate that at the majority of recreational/amenity receptor locations, the effects of operational noise would be of **negligible** or **minor** significance. At one of the receptors the effects would be of **moderate** significance.

18.269 The most affected recreational/amenity receptors would be those adjacent to the intermodal and express freight cross-dock platforms. The receptor that would be subject to effects of **moderate** significance (NSR Rec 5) is in close proximity to an RMG, idling locomotive, and the trailer mounted diesel chillers at the south end of the intermodal platform.

18.270 Overall, the Significance of Effect at both residential and recreational receptors during the daytime period would be **Negligible** at all locations except at footpaths adjacent to the express freight cross-dock and intermodal platforms. During the most sensitive early night time period the Significance of Effect would be **Minor**, or below, at all residential receptors, except NSR 1 (Towcester Road), NSR 6 (Courteenhall Road, Blisworth), NSR 9 (Walnut Tree Inn), and NSR 17 (Railway Cottages), which are generally at the threshold of **Moderate** Significance of Effect. It should be noted that the predicted noise impacts used in this assessment would be a worst case, based on robust assumptions relating the extent of activity at the site, the number of noise sources and their respective sound outputs, and by testing a fully operational scenario that would not occur until at least 2031 against the 2016 baseline noise environment. In practice, the operational noise impact of the Proposed Development is likely to be lower. It is considered, therefore, that the Significance of Effect of the on-site operational activities as a whole would be **Minor**.

18.271 An assessment of the potential noise and vibration effects to Heritage Assets is included in **Appendix 18.16**. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

Potential on-site generated noise impacts from J15A and other minor junctions

18.272 During operation of the J15A and other junctions, there will be no noise and vibration impacts other than that associated with road traffic. This aspect is dealt with earlier within this chapter.

Potential Vibration Impacts

18.273 During the operational phase of the project, potential vibration effects may arise at residential NSRs and other potentially sensitive receptors close to the Proposed Development.

18.274 The potential vibration effects from HGVs travelling on public roads during operations is not required to be assessed following discussions and agreement with South Northamptonshire Council. This includes modified roads at Junction 15A and minor modifications at other junctions.

18.275 Activity on the Main SRFI Site will include moving goods into and out of warehouse and storage facilities. Vehicles and equipment in yards operate on pneumatic tyres, which do not allow for the transmission of vibration into the ground. The only potential sources of ground vibration from the Main SRFI Site are slow moving trains and shunters and the rail mounted gantry crane. The intermodal platform is at least 500m from the nearest residential receptor. Vibration transmission through the ground attenuates rapidly with distance such that even very substantial levels of this type of vibration tend to be attenuated to insignificance over distances of more than 50 - 100m. Potential vibration entering the ground may arise as a result of stacking containers. However proper site management of this activity including the use of soft landing technology in the Gantry Crane handling protocols, designed to avoid impact noise, will also have the benefit of reducing vibration into the ground. Again, any ground vibration will be localised to 50-100m distance, and with NSR at 500m distance or more, these will not be detectable. The magnitude of impact at residential NSRs will be **negligible** and the Significance of Effect will also be **negligible**.

18.276 Freight trains travelling on the rail network have the potential for generating vibration. The rail network in this context is considered to be the Network Rail lines WCML(Blisworth) and the WCML(Northampton), in the vicinity of the Main SRFI Site. Freight trains leaving the rail network and entering the Main SRFI Site will be travelling more slowly than freight and other trains continuing on the rail network. The vibration forces entering the ground will therefore be less than for faster travelling trains. Residential NSRs near this section of the line are at least 35m from the rail network lines, and vibration effects at these distances would be highly unlikely to be perceived. Baseline vibration monitoring of the existing high speed passenger and freight traffic at a distance of 65m from the line is shown earlier within this chapter and recorded very low existing vibration levels.

18.277 The vibration baseline measurements were made over a period of one week close to a residential property. The measured VDV, 65m from the rail network was 0.013m/s$^{1.75}$ at night and 0.015m/s$^{1.75}$ during the day. These values are around 10 times lower than the threshold above which there is a 'low probability of adverse comment'. A value of less than 0.1m/s$^{1.75}$ is considered to have a negligible magnitude of impact and that between 0.1m/s$^{1.75}$ and 0.2m/s$^{1.75}$ to have a low magnitude of impact. The measured values at no greater than 0.015m/s$^{1.75}$ have a negligible magnitude of impact and also a negligible significance of effect. These are existing values at 65m; at closer distances of 35m where there are some properties, the significance of effect for baseline conditions would still likely be **negligible**, although it might just rise slightly into **minor** depending upon local ground conditions.

18.278 This assessment so far looks at the existing baseline conditions which are found to be **negligible** or **minor** in terms of significance of effect. The assessment of the potential for vibration impacts during operation needs to consider the freight traffic visiting the SRFI, along with other increases in freight trains not associated with the SRFI. These are shown in **Tables 18.34** and **18.35** within the railway noise operational noise section of this chapter. The predicted maximum potential percentage increase number in freight trains on either of the two rail networks either during the day or night, is no greater than 140% or an increase by a factor of 2.4. Assuming that the vibration from slow moving freight trains entering or leaving the main SRFI is no greater than from fast moving trains, an increase in freight trains of 140% would increase a VDV from at worst, 0.10m/s$^{1.75}$ up to no more than 0.15m/s$^{1.75}$. Both the baseline VDV and the VDV with full rail operation would remain within the 0.1 – 0.2m/s$^{1.75}$ range which is consistent with a low magnitude of impact and a minor significant of effect. If the baseline were to be significantly lower than 0.10m/s$^{1.75}$, which the baseline vibration monitoring suggests it is most likely to be, then the level with full rail operation would likely be both a **negligible** magnitude of impact and a **negligible** significance of effect.

18.279 An assessment of the potential noise and vibration effects to Heritage Assets is included in **Appendix 18.16**. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

Assessment of Decommissioning Phase Effects

Main SRFI Site (including A43 access and all rail infrastructure)

18.280 As set out earlier in this chapter, it is considered that in the worst case the effects of decommissioning noise would be similar to or less than that of construction. The equipment and machinery used for decommissioning would be similar to that of construction and it is likely that manufacturers of equipment and machinery in the future will have to meet more onerous noise limits than currently required as noise policy is updated in line with technological advancements in noise control. The assessment of construction noise and vibration is therefore considered to provide a reasonable worst case indication of the likely effects that may arise as a result of decommissioning.

18.281 The assessment of construction noise and vibration carried out for the Main SRFI Site has indicated that the Significance of Effect would be Negligible to Minor. Therefore, it is considered that for decommissioning the Significance of Effect would also be **Negligible** to **Minor**, in the worst case.

J15A Works

18.282 The level of noise and vibration impact associated with decommissioning roads at J15A will depend upon the type of equipment being used and the setback distances. Any decommissioning of this motorway junction would be highly unlikely, however if it did arise it could involve breaking up road surfaces, removing material off site and recycling materials on site. The noise associated with this activity is considered to be no noisier than that associated with the original construction. The significance of effect of decommissioning noise to residential receptors would be **Minor**, which is the same as predicted for the construction phase.

18.283 The predicted vibration levels from construction equipment are unlikely to exceed 0.5mm/s PPV at 50m. The setback distances at this site are however at least 120m and so the significance of effect of vibration would be **Negligible**.

18.284 An assessment of the potential noise and vibration effects to Heritage Assets is included in Appendix 18.16. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

Minor highway works

18.285 The level of noise and vibration impact associated with decommissioning minor highways works at other road junctions will depend upon the type of equipment being used and the setback distances. Any decommissioning of a road system would be unusual however could involve breaking up road surfaces, removing material off site and recycling. The noise associated with this activity is considered to be no noisier than that associated with the original construction.

18.286 The predicted vibration levels from construction equipment are unlikely to exceed 0.5mm/s PPV at 50m. At NSR's closer than this the vibration levels will rise, and may on occasions

exceed 1 mm/S PPV; the noise levels may also rise, however they are likely to be short lived and the significance of effect is not considered to be any more than **Minor**.

18.287 An assessment of the potential noise and vibration effects to Heritage Assets is included in Appendix 18.16. During both construction and operational phases of the project the significance of effect is considered to be **Minor**.

All works within Proposed Order Limits

18.288 It is unlikely that the various parts of the Proposed Development would be decommissioned at the same time. However, in the event that this did happen, the noise and vibration effects during the decommissioning phase will be localised to NSRs close to each particular area (e.g. Main SRFI Site, or work on road junctions). The NSRs that are close to Main SRFI Site are different ones to those around the road junction NSRs. The distances between NSRs associated with one site in the Proposed Development and another are large enough that any noise or vibration impacts will not augment each other.

Cumulative Effects

Cumulative Assessment: Intra-Project Effects

18.289 The potential for intra-project effects as a result of noise and vibration issues, can arise at sensitive receptors, particularly those close to the Proposed Development.

18.290 During the construction phase, the noise and vibration impacts are typically local, but can be associated with other impacts such as those from dust and also road traffic.

18.291 During operation, vibration impacts remain very local, however noise impacts may extend further from the Proposed Development in line with the ZOI. Intra-project effects can arise on some projects when the impact from road traffic, rail traffic and visual impact in particular are considered together.

18.292 A factor to be considered in the consideration of cumulative intra-project effects is where within the 'significance of effect category', an assessment conclusion is drawn. If the assessment concludes a significance of effect moving from negligible, just into the minor adverse category, then its importance in a Cumulative Assessment is less than if it were to be at the upper end of the minor adverse category.

Cumulative Assessment: Inter-Project Effects

18.293 PINS Advice Note 17 states the CEA should be proportionate and not be any longer than is necessary to identify and assess any likely significant cumulative effects that are material to the decision making process, rather than cataloguing every conceivable effect that might occur.

18.294 Full evaluation of the potential of other developments to contribute to a potential cumulative noise effect is included within **Appendix 18.10**. This is a long list with those then considered to proceed to for further assessment highlighted. A summary of the cumulative effects is shown in **Table 18.41**. It considers both the construction and operation phases of

the Proposed Development/ and details these where they are considered to be potentially significant.

Table 18.41: Cumulative Inter-Project Effects

ID	Description	Assessment summary	Significance of cumulative effect
CI.2	Northampton Gateway	Within ZOI for operation. Affected Rail Central receptors are NSR 4 and NSR 5 where there is Minor effect during operations at night currently and at least 2dB and 3dB headroom available respectively, before moving up into Moderate effect. The Intermodal Platforms at Rail Central and Northampton Gateway would be at a similar distance from these receptors, generate similar noise levels, and have similar mitigation schemes. The impact from each development would also, therefore, be similar. Assuming similar impacts at these NSRs from Northampton Gateway, the cumulative effect is likely to just remain potentially within minor (significance of effect), or be just at the threshold of moderate, depending upon mitigation in the Northampton Gateway scheme. Cumulative effect during construction likely to be negligible/minor.	Minor
CI.4	Northampton South SUE	Cumulative effect during construction likely to be negligible/minor.	Minor
CI.6	Towcester South SUE	Cumulative effect during construction likely to be negligible/minor.	Minor
CI.15	Milton Ham Farm Distribution Centre	Cumulative effect during construction likely to be negligible/minor.	Minor
CI.22	Roade/Hartwell wind farm (9 turbines)	Project PEIR predicted operating levels at NSR 600m to be less than 42dBA. This is equivalent to less than 27dBA at nearest RC NSRs which is non-contributory. This wind farm is in operation and forms part of the baseline if sufficient wind to be generating electricity.	Minor
CI.33	West Lodge Farm AD Plant	Plant immediately east of West Lodge Farm. Nearest receptors include West Lodge Farm 200m to NW which is NSR 5 in the RC PEIR. Background at night at West Lodge Farms	Minor

		typically 42dBA; AD plant consent allows specific sound level here +4dB at 46dBA. Predicted specific sound level from RC is 44dBA. Cumulative total is 48dBA which with a +3dB character penalty is 51dB. Allowing for the expected increase in traffic flows of at least 1dB, the cumulative effect is likely to remain just within the minor significance of effect.	
CI.34	Change of use to C3 (B)	Yes, but for operation only - Change of use from residential dwelling house to a dwelling house for us to 6 people receiving care such as those with learning disabilities or mental health problems. Remains an NSR of high sensitivity. Consider the impact on particular facades potentially. Not necessarily a material change of use. Little detail submitted.	Negligible
CI.48	AD Plant, Blisworth Hill Farm	This is likely to be constructed and may be operational already. 400m from nearest residential receptor SE on Stoke Road. Processes silage. I x CHP unit, with estimated sound power level of 105dBA based on other AD plants. This would give 43dBA at 400m. This site and receptor is at least 1.5km beyond the Rail Central ZOI for noise and is too distant to have any cumulative effect. It contribution to RC NSRs at the north end of Blisworth would be <29dBA and not contributory.	Negligible
CI.50	500kW single wind turbine, Blisworth Hill Farm	Yes, for operation only. One unit only; typical sound power level at low wind speed would be 102dBA for this sized unit. Expected noise level at nearest residential receptor to this development 500m away is 42dBA. However substantially (1500m) from the RC site and contribution to RC NSR 7 in north Blisworth would be <28dBA which would not have any cumulative effect for this and nearby.	Minor
CI.60	Residential development, Chapel Lane, Blisworth	Cumulative effect during construction likely to be negligible/minor	Minor
CI.62	Residential development at 20 Chapel Lane, Blisworth	Cumulative effect during construction likely to be negligible/minor	Minor

Cl.68	Salt storage dome, Rothersthorpe Services	Cumulative effect during construction likely to be negligible/minor. In relation to construction at J15a	Minor
Cl.70	Four wind turbines, Hill Farm, Bugbrooke	Yes. Although planning permission refused. Typical levels from four wind turbine would be 39dBA at 600m. Level at Rail Central NSR 02 would be < 25dBA and therefore not contributory.	Minor
Cl.81	Sand extraction east of Milton Malsor	Yes, for operation only. PPG for minerals advises background noise level +10dB to be limit for daytime extraction at NSR. Daytime background noise in this area measured is at least 46dBA, so limit for extraction would be 56dBA, but capped to 55dBA according to PPG, and at NSR 04 around 49dBA. RC operating noise is no greater than 44dBA, and therefore total at 50dBA would be just within the Minor significance of effect.	Minor
Cl.86 -99	Various developments	All these developments are large distances from the potential development and the cumulative effect for noise and vibration is likely to be the same as the effect solely from each of these developments,	Negligible

Mitigation

18.295 Mitigation measures have been identified based on the impacts identified for the various stages of development. Some of the mitigation measures are embedded in the proposed development, while others may be adaptive to the meet the requirements of the development as the design progresses. The proposed mitigation for each stage of the development, as assumed in the assessments detailed earlier in this chapter, is described in the following sections.

Construction Mitigation

18.296 Construction noise and vibration mitigation should be implemented to reduce the impact of this activity as far as is reasonably practicable through the implementation of best practicable means. Methods to achieve this will be set out in the Construction Environmental Management Plan (CEMP).

18.297 The CEMP includes ways to ensure environmental issues, including noise, are managed and if necessary monitored, on an ongoing basis once development commences. There exist also the mechanism of further requirements to be put in place within the DCO for any further information to be provided. This could for example include the requirement to monitor noise levels during construction and operation and submit results to a local planning authority.

18.298 The assessment of construction noise considers a worst case scenario in which the works are carried out continuously throughout the working day at the locations nearest to noise sensitive residential receptors.

18.299 BS 5228 provides guidance on the implementation of best practicable means for the control of noise and vibration during construction activities. It provides the following potential methods for the control of noise at source:

- avoid unnecessary revving of engines;
- switch off equipment when not required;
- good maintenance of internal haul routes;
- selection of quiet equipment;
- modification of equipment to improve sound reduction measures (e.g. install better exhaust silencers, install acoustic canopies over engines, stiffen resonant body panels);
- good equipment maintenance;
- minimise metal-on-metal impacts during construction of steel structures;
- install full or partial enclosures around noisy equipment.

18.300 Noisy processes should be avoided wherever practicable. Where this is not possible, noise can be further reduced by controlling the spread of noise between the site and the receptors. The following procedures may be implemented:

- noisy processes and equipment should be located as far as is reasonably practicable from receptor locations;
- temporary acoustic screens installed as close as possible to either equipment or receptor locations;
- making use of screening such as that which may be provided by site buildings, earth bunds and other structures.

18.301 Construction hours should ideally be limited to daytime only (07:00-19:00 weekday and 07:00-13:00 Saturday). In the event that some construction activity may be allowed at other times, this might be limited to work undertaken within buildings and warehouses, and should in any case generate noise levels that are no greater than those generated by operations.

18.302 Construction processes that have the potential to generate significant noise and vibration at nearby residential receptors should be limited in duration as far as is practicable. Residents should be given advance notice of any such activities being carried out and be kept informed as to their likely duration.

18.303 Employees should be made aware of the importance of noise reduction at this site and the best practicable means with which they can reduce noise and vibration.

18.304 Where piling is to be undertaken, preference will be given to using intrinsically quiet equipment such as CFA and other rotary rigs. Where noisier rig types have to be used, preference will be for vibratory driven types rather than impact driven.

18.305 Driven impact piling carried out within 100m of a residential NSR should generally be accompanied by a programme of vibration monitoring.

18.306 **Table 18.42** summarises the mitigation for construction noise and vibration.

Table 18.42: Schedule of Proposed Mitigation Measures for Construction Noise and Vibration

Potential effect	Proposed mitigation	Means of Implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Noise impacting NSRs during construction	Implementation of guidance in BS 5228	Implementation of the CEMP.	A Requirement in the DCO will require the Applicant to prepare, have approved and implement a Construction Environmental Management Plan.
Construction noise disturbance at night	Construction hours limited to daytime only (07:00-19:00 weekday and 07:00-13:00 Saturday	Implementation of the CEMP.	A Requirement in the DCO will require the Applicant to prepare, have approved and implement a Construction Environmental Management Plan.
Short term daytime disturbance from exceptional essential construction activity	Residents or stakeholders should be given advance notice of any excessively noisy activities being carried out and be kept informed as to their likely duration.	Implementation of the CEMP.	A Requirement in the DCO will require the Applicant to prepare, have approved and implement a Construction Environmental Management Plan.
Short term daytime disturbance from	Preference for use of quietest piling rig types with low vibration impact	Implementation of the CEMP.	A Requirement in the DCO will require the Applicant to prepare, have approved and implement a

essential piling if required			Construction Environmental Management Plan.
Vibration from piling impacting NSRs and heritage assets during construction	Piling within 100m of a residential NSR or heritage asset should be accompanied by a programme of vibration monitoring	Implementation of CEMP	A Requirement in the DCO will require the Applicant to prepare, have approved and implement a Construction Environmental Management Plan.

Road Traffic Noise Mitigation

18.307 No specific road traffic noise mitigation is proposed as the significance of effect of increasing road traffic as a result of the proposed development is anticipated to be **Negligible**. This will be confirmed following completion of the ongoing road traffic noise assessment.

18.308 However, mitigation in relation to noise from the site access road is considered within the section on site operation below.

Rail Traffic Noise Mitigation

18.309 No railway noise mitigation of train movements on the public rail network is proposed as the significance of effect of increasing rail traffic was **Negligible**.

Operational Site Noise Mitigation on Main SRFI Site

18.310 Noise mitigation measures for the Main SRFI Site operation have been identified based on a worst case operating scenario and site layout in relation to noise, taking account of the potential impacts identified in the assessment. The effects of the embedded and adaptive mitigation have been simulated in a noise model, as detailed earlier in this chapter.

18.311 Mitigation in the form of earth bunds would be embedded into the proposed development. Other mitigation measures would be adaptive and therefore be subject to detailed design as the design is further developed.

18.312 The following earth bunds, as shown in **Appendix 18.13** would form part of the embedded mitigation of the proposed development:

- Bund to west and north of Zone 3 and the Intermodal Platform providing screening to southern boundary of Milton Malsor;
- Bund to north east of Zone 1 providing screening to residential property on Towcester Road (NSR 2) and south west boundary of Milton Malsor;
- Bund to east of Zone 1 providing screening to residential property on Towcester Road (NSR 1);

- Bund to west and south of Zone 4 providing screening to residential properties on Northampton Road, including the Railway Cottages near the south western corner of Zone 4.

- The results of the assessment have indicated that, at many of the NSRs, there could be potential significant effects as a result of HGV mounted diesel driven chillers operating in yards and also any mechanical ventilation and cooling plant that may be required in the warehouse units. Noise emanating from these items can be mitigated at source.

- Any HGV mounted diesel driven chillers would be required to operate in electric standby mode while in the yards. This would reduce the noise output significantly, as indicated in the equipment list sound power level table in **Appendix 18.11**.

- Noise from mechanical ventilation and cooling plant zones can be mitigated through the appropriate design of noise control. This would be developed as part of the detailed design and would consist of suitably specified silencers, acoustic enclosures, screening, and layout, as required. The assessment has assumed four plant zones per warehouse, one on each corner at high level, with an indicative sound power level limit per zone applied of L_{wA} 90dB. Where possible, these plant zones should be located such that they are screened from NSRs by the warehouses themselves. Where this is not possible and where the indicative sound power level limit for a plant zone is exceeded, additional screening may be required.

- Additional screening may also be required where NSRs have direct line of sight to yards. The final layout of the warehouses would be developed at a later stage and would depend on the requirements of each operator. The assessment of on-site operational noise has been based on a worst case layout where yards face outwards with direct line of sight to the NSRs. This worst case layout, and the acoustic screening assumed in the noise model, is shown on the noise contour plot of the mitigated noise model simulation presented in **Appendix 18.12**. Noise emanating from yard activities could be reduced further by orientating yards away from NSRs such that the warehouses themselves inherently provide acoustic screening. Additional screening, however, may still be required around the perimeters of some zones where gaps between warehouses allow line of sight from NSRs to yards or where design constraints do not allow for yards to be inward facing. One such scenario is shown in **Appendix 18.13** on the Illustrative Masterplan. The screening shown would also provide additional mitigation to those recreational/amenity receptors within the proposed development area.

- Acoustic screening has also been assumed to the north of NSRs 14 and 15 to reduce noise at these locations from road traffic on the site access road and Northampton Road underpass.

- The assessment has shown that diesel rail shunters operating on site would be significant sources at NSR 6. Acoustic screening can reduce noise at this location from rail shunting activities on the on-site lines between the south end of the intermodal platform, train maintenance depot, and rail served warehouses. The acoustic screens should be located as close to the south side of the on-site rail lines as possible. It is understood that this would be a minimum of around 4m back from the line for safety reasons. Details of the proposed acoustic screening are shown in **Appendix 18.13**.

- Rail squeal has the potential to be generated where the radius of curvature of the line is less than 200m. The curvature of the proposed on-site line is limited to 200m to avoid the potential for rail squeal. Additional mitigation can be implemented, however, if rail squeal is generated. Rail squeal can be mitigated effectively by ensuring the rail line is adequately maintained, by applying lubrication to the line as required, and by reducing the speed of trains on the line.

- Acoustic screening at the north of intermodal platform would provide additional mitigation for NSRs at the south east of Milton Malsor from activities carried out close to the northern end of the platform, particularly from container impacts, RMG broadband alarms, and reach stacker movements.

- Gantry cranes would be fully electric Rail Mounted Gantry (RMG) cranes, which are significantly quieter than the equivalent diesel powered cranes. It has been assumed that there would be four broadband alarms fitted at low level (2m high), one on each leg of the crane. Broadband alarms fitted at low level would be closer to those operating on the intermodal platform who need to be aware of the RMGs movements and benefit from more screening to NSRs.

- In order to reduce impulsive noise when engaging and landing containers, additional mitigation can be provided through a range of technologies available for gantry cranes. Such technologies include soft landing systems, which automatically reduce the speed of the crane when a container comes within a set distance, and dampening plates that are installed in the steel structure of the crane, particularly the spreader, to reduce noise being radiated from the structure following an impact. Additionally, noise from high level drives on the trolley platform can be acoustically enclosed to further reduced noise emission from this source.

- Reach stackers would potentially be a significant noise source on the intermodal platform, particularly in relation to impulsive noise events when engaging and landing containers. The level of impulsive noise generated by these events can vary significantly and is proportional to the skill level and care taken by the operator. Reach stacker operators should be appropriately trained so as to reduce impulsive noise events when handling containers as far as is reasonably practicable and to minimise the revving of engines.

- A programme of noise monitoring may be put in place during the operation of the proposed development to ensure that any impulsive noise events that may be audible at NSRs resulting from activities on the intermodal platform are reduced to an acceptable level.

- Furthermore, reach stackers should be fitted with high performance exhaust silencers, have acoustic canopies installed over engines, have any resonant panels stiffened, and be regularly inspected and maintained to ensure these noise mitigation systems are in optimum condition.

- A noise management plan could also be applied more generally to the proposed development to ensure that employees are trained to recognise and reduce any potentially noisy activities that may arise as a result of normal operations, particularly during the night time period. A noise management plan may also include, for example, noise monitoring during operations to identify any particularly noisy activities so that further enhanced mitigation can be developed accordingly.

18.313 **Table 18.43** summarises the mitigation for operational noise on the main SRFI site.

Table 18.43: Schedule of Proposed Mitigation Measures for Main SRFI Site Operational Noise

Potential effect	Proposed mitigation	Means of Implementation	Mechanism for securing mitigation and DCO reference (where applicable)
Noise from on-site operational activities impacting NSRs	Earth bunds would be installed to reduce noise levels at NSRs, as per Appendix 18.13	Embedded in proposed development	
Noise from HGV mounted diesel driven chillers impacting NSRs	HGV mounted diesel driven chillers to operate in electric standby mode when in yards	Adaptive mitigation	
Noise from warehouse unit mechanical ventilation and cooling plant impacting NSRs	Recommended sound power level limits for mechanical ventilation and cooling plant of L_{wA} 90dB (based on four plant zones per unit, located at each corner at high level)	Adaptive mitigation. To be achieved through appropriate selection of plant at detailed design stage, including noise control elements such as silencers, acoustic	

		shrouds and acoustic enclosures. Ideally locate plant such that the warehouses provide inherent screening of plant to NSRs. Alternatively, provide additional screening as required.
Noise from on-site operational activities impacting NSRs	Additional acoustic screening of yards to block line of site to nearby residential and recreational/amenity NSRs, as per **Appendix 18.13**	Adaptive mitigation. To be implemented as part of detailed design in conjunction with warehouse unit layout.
Noise from on-site access road and underpass impacting NSRs 14 and 15	Additional acoustic screening to block line of site to access road and underpass from NSRs 14 and 15, as per **Appendix 18.13**	Adaptive mitigation
Noise from on-site rail shunting activities impacting residential NSRs at north east of Blisworth	Acoustic screening as close as practicable to south side of on-site lines between intermodal platform, maintenance deport, and rail served warehouse, as per **Appendix 18.13**	Adaptive mitigation
Noise from rail squeal at NSRs during operation	On-site rail line minimum radius of curvature of 200m	Embedded in proposed development
Noise from rail squeal at NSRs during operation	Potential for on-site rail lubrication and reduced speed limit	Adaptive mitigation to be implemented in the case that additional mitigation is required
Noise from operational activities at the north end of the intermodal platform	Acoustic screen located at north end of intermodal platform, as per **Appendix 18.13**	Adaptive mitigation

impacting NSRs at south east of Milton Malsor		
Noise from gantry cranes impacting on NSRs	Installation of fully electric RMG cranes with broad band alarms fitted at low level. Potential for high level drives on trolley platform to be installed within an acoustic enclosure.	Adaptive mitigation
Impulsive noise from gantry cranes impacting on NSRs	RMG cranes have options for soft landing technology and dampening plates in steel structure to be installed as required.	Adaptive mitigation
Impulsive noise from reach stackers impacting on NSRs	Appropriate training of reach stacker operators and monitoring of noise events	Adaptive mitigation
Noise from reach stackers impacting on NSRs	Potential for installation of high performance exhaust silencers, acoustic canopies over engines, and stiffening of resonant panels as required. Equipment should be regularly inspected and maintained.	Adaptive mitigation
Noise from on-site operational activities impacting NSRs	Train employees to recognise and reduce any potentially noisy activities and carry out on-site operational noise monitoring to establish where further enhanced mitigation can be developed	Adaptive mitigation. To be implemented as part of a noise management plan.

Operational Vibration Mitigation

18.314 No mitigation is proposed to reduce vibration resulting from train movements on the public rail network as the significance of effect of increasing rail traffic would be **Negligible**.

Residual Effects

Main SRFI Site (including A43 access and all rail infrastructure)

18.315 The assessment has shown that the construction of the Main SRFI Site has the potential to generate a **negligible** to **minor** significance of effect at NSRs. Mitigation measures would be set out in the CEMP, which would ensure noise and vibration from the construction of the site is kept to a minimum. The assessment of construction noise and vibration assumes that these mitigation measures would be in place.

18.316 With the implementation of the mitigation detailed earlier in this chapter, noise from operation of the Main SRFI Site would generate a **negligible** to **minor** significance of effect depending on the receptor location. Vibration generated by operation of the site would be of **negligible** significance of effect.

18.317 Decommissioning of the site would have a similar significance of effect as that generated by the construction of the site, in the worst case, which would be **negligible** to **minor**.

Table 18.44: Summary of Residual Effects for Main SRFI Site

Description of impact	Potential significance of effect	Possible additional mitigation measures	Residual effect
Construction			
Noise impacting receptors	Negligible to minor	CEMP; BS 5228 compliance; hierarchy of piling rig use	Negligible to minor
Vibration impacting receptors	Negligible to minor	CEMP; BS 5228 compliance; hierarchy of piling rig use; vibration monitoring	Negligible to minor
Operation			
Noise impacting receptors	From negligible to major depending on receptor location.	As described in section on Operational Site Noise Mitigation on Main SRFI Site	From negligible to minor depending on receptor location.
Vibration impacting receptors	Negligible	-	Negligible
Decommissioning			

Noise impacting receptors	Negligible to minor	BS 5228 compliance	Negligible to minor
Vibration impacting receptors	Negligible to minor	BS 5228 compliance	Negligible to minor
Cumulative (inter-projects)			
Construction noise	Minor	None proposed	Minor
Construction vibration	Minor	None proposed	Minor
Operational noise	Minor	None proposed	Minor
Operational vibration	Minor	None proposed	Minor

J15A Works

18.318 The assessment of construction noise and vibration has indicated there to be a **Minor** significance of effect. Additional mitigation would be set out within the CEMP.

18.319 During operation the significance of effect of noise is anticipated to be **Negligible**, however, this will be confirmed following completion of ongoing assessment work in relation to road traffic noise. For vibration, the significance of effect would be **Negligible**.

18.320 The significance of effect of decommissioning noise and vibration would be similar or less than for the construction phase which is **Minor**

Table 18.45: Summary of Residual Effects for J15a

Description of impact	Potential significance of effect	Possible additional mitigation measures	Residual effect
Construction			
Noise impacting receptors	Minor	CEMP	Minor
Vibration impacting receptors	Minor	CEMP	Minor
Operation			
Road traffic noise impacting receptors	TBC - Assessment work ongoing		
Vibration impacting receptors	Negligible	None proposed	Negligible
Decommissioning			
Noise impacting	Minor		Minor

receptors			
Vibration impacting receptors	Minor		Minor
Cumulative (Inter-projects)			
Construction noise	Minor	None proposed	Minor
Construction vibration	Minor	None proposed	Minor
Operational noise	TBC - Assessment work ongoing		
Operational vibration	Negligible	None proposed	Negligible

Other Minor Highway Works

18.321 The assessment of construction noise and vibration has indicated there to be a **Minor** significance of effect. Additional mitigation would be set out within the CEMP.

18.322 During operation the significance of effect of noise is anticipated to be **Negligible**, however, this will be confirmed following completion of ongoing assessment work in relation to road traffic noise. For vibration, the significance of effect would be **Negligible**.

18.323 The significance of effect of decommissioning noise and vibration would be similar or less than for the construction phase which is **Minor**

Table 18.46: Summary of Residual Effects for Other Minor Highway Works

Description of impact	Potential significance of effect	Possible additional mitigation measures	Residual effect
Construction			
Noise impacting receptors	Minor	CEMP	Minor
Vibration impacting receptors	Minor	CEMP	Minor
Operation			
Road traffic noise impacting receptors	TBC - Assessment work ongoing		
Vibration impacting receptors	Negligible	None proposed	Negligible
Decommissioning			
Noise impacting receptors	Minor		Minor
Vibration impacting	Minor		Minor

receptors

Cumulative			
Construction noise	Minor	None proposed	Minor
Construction vibration	Minor	None proposed	Minor
Operational noise	TBC - Assessment work ongoing		
Operational vibration	Negligible	None proposed	Negligible

All works within the Proposed Order Limits

18.324 It is unlikely that the various parts of the Proposed Development would be constructed or decommissioned at the same time. However, in the event that this did happen, the noise and vibration effects during will be localised to NSRs close to each particular area (e.g. Main SRFI Site, or work on road junctions). The NSRs that are close to Main SRFI Site are different ones to those around the road junction NSRs. The distances between NSRs associated with one site in the Proposed Development and another are large enough that any noise or vibration impacts will not augment each other.

18.325 During operation it is unlikely that different sites of the Proposed Development will generate noise and vibration which augments each other. This is because these sites are well separated.

Monitoring

18.326 Monitoring of noise and vibration will be required, and further details are included within the draft CEMP. These are likely to cover:

- Noise and vibration monitoring during construction
- Noise monitoring during operations

Limitations and Assumptions

18.327 Noise from construction activity has been assessed using sound power data obtained from manufactures' data and BS 5228-1. The assessment of noise generated during construction has considered the case where several activities from different phases are carried out simultaneously and therefore represents a robust assessment.

18.328 As set out earlier in this chapter, the assumptions made for operational noise sources on the main SRFI site are presented in Appendix 18.11. It is considered that the full list of noise sources incorporated into the noise model represent a worst case scenario in terms of impact. Additionally, the assessment of operational noise generated by these sources is made against baseline noise levels established during the most sensitive early night time period when background sound levels are lowest. This provides for a more rigorous and

robust assessment. Assessments carried out against background sound levels established over other periods, such as the full night time or daytime periods, would subsequently indicate a lower significance of effect, as would be experienced for the majority of the time.

18.329 Calculations of road traffic noise are based on the traffic flow data output by the NSTM.

References

18.1 Department for Transport (2014). National Policy Statement for National Networks

18.2 Department for Communities and Local Government. Planning Practice Guidance- Noise

18.3 Department for Communities and Local Government (2012). National Planning Policy Framework

18.4 Department for Environment, Food and Rural Affairs (2010). Noise Policy Statement for England

18.5 BS4142:2014 Methods for rating and assessing industrial and commercial sound

18.6 BS8233:2014 Guidance on sound insulation and noise reduction for buildings

18.7 BS5228:2009 (Parts 1 and 2) +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites

18.8 BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.

18.9 Guidelines for Community Noise (1999), World Health Organisation

18.10 Europe Night Noise Guidelines (2009), World Health Organisation

18.11 ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors.

18.12 Highways Agency, (2011) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7 – Noise and Vibration,

18.13 Calculation of Road Traffic Noise, Department of Transport and Welsh Office, (1988)

18.14 Calculation of Railway Noise, Department of Transport, 1995

18.15 Guidelines for Environmental Noise Impact Assessment, IEMA, 2014

18.16 Noise Insulation Regulations 1975 (as amended 1988), HMSO

18.17 Noise Insulation (Railway and other Guided Transport Systems) Regulations 1996, HMSO

18.18 Department for Environment, Food and Local Government (2012) Strategic Noise Maps for England (Major Roads and Major Railways). www.extrium.co.uk/noiseview.html

18.19 Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD213/11 – Revision 1, Noise and Vibration