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11.0 NOISE AND VIBRATION

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) identifies the potential impacts and effects resulting from noise[1] and vibration that are to be considered as part of the Environmental Impact Assessment (EIA) of the Proposed Development. The assessment has been undertaken in accordance with current best practice guidance.

11.1.2 This chapter presents the assessment of potential noise and vibration impacts and effects during the construction, operation and decommissioning of the Proposed Development (including both phases 1 and 2, as outlined in Chapter 4: Proposed Development and Chapter 5: Construction Programme and Management (ES Volume I, EN070009/APP/6.2)). In particular, the chapter considers potential impacts on identified receptors in terms of:

- predicted noise and vibration levels during the construction works associated with the Proposed Development;
- predicted changes in road traffic noise levels on the local road network during the construction phase; and
- predicted noise resulting from operation of the Proposed Development.

11.1.3 This chapter is supported by the following technical appendices and figures

- Appendix 11A: Construction Noise Levels and Assumptions (ES Volume III, EN070009/APP/6.4);
- Appendix 11B: Operational Noise Information (ES Volume III, EN070009/APP/6.4); and
- Appendix 11C: Baseline Sound Monitoring and Survey Information (ES Volume III, EN070009/APP/6.4);
- Figure 11-1: Noise Sensitive Receptor and Monitoring Locations (ES Volume II, EN070009/APP/6.3);
- Figure 11-2: Construction Noise Contours (ES Volume II, EN070009/APP/6.3); and
- Figure 11-3: Operational Noise Contours (ES Volume II, EN070009/APP/6.3).

11.2 Legislation, Planning Policy Context and Other Guidance

11.2.1 This section identifies and describes legislation, planning policy and guidance that is of relevance to the assessment of noise and vibration effects.

11.2.2 The legislation, planning policy context and standards applicable to assessment of noise and vibration impacts upon ecological receptors are discussed in Chapter 12: Ecology and Nature Conservation (ES Volume I, EN070009/APP/6.2), Chapter 13:

[1] In this chapter “noise” and “sound” refer to in air noise and sound.

Ornithology (ES Volume I, EN070009/APP/6.2) and Chapter 14: Marine Ecology (ES Volume I, EN070009/APP/6.2) and on heritage receptors in Chapter 17: Cultural Heritage (ES Volume I, EN070009/APP/6.2).

Legislative Background

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations')

11.2.3 The 'EIA Regulations' states that *'A description of the development, including in particular…… an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.'* The 'EIA Regulations' continues to state *'A description of the likely significant effects of the development on the environment resulting from, inter alia….. the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste.'*

Environmental Protection Act 1990

11.2.4 The Environmental Protection Act 1990 (EPA) (UK Government, 1990) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

11.2.5 Local authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they shall serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be undertaken, or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. Right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

11.2.6 In determining if a noise complaint amounts to a statutory nuisance, the local authority can take account of various guidance documents and existing case law; no statutory noise limits exist. Demonstrating the use of 'Best Practicable Means' (BPM) to minimise noise levels is an accepted defence against a noise abatement notice.

11.2.7 A Statutory Nuisance Statement (EN070009/APP/5.6), prepared in accordance with the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(f), has been submitted as part of the DCO application.

Control of Pollution Act (1974)

11.2.8 Sections 60 and 61 of the Control of Pollution Act 1974 (CoPA) (UK Government, 1974) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Planning Authority (LPA) with instructions to cease work until specific conditions to reduce noise have been adopted.

11.2.9 Section 61 of the CoPA provides a means for applying for prior consent to undertake noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

11.2.10 The CoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to British Standard (BS) 5228 (British Standards Institute (BSI), 2014a and b) as BPM.

Environmental Permitting (England and Wales) Regulations 2016 (as amended 2020)

11.2.11 The Environmental Permitting Regulations require the application of Best Available Techniques (BAT) to activities performed within installations regulated by the legislation to manage the impact of these operations on the surrounding environment. This therefore just applies to the operational period, not construction.

11.2.12 In terms of noise specifically, the selection of BAT will have to be considered and balanced with releases to different environmental media (air, land and water) and to give due consideration to issues such as usage of energy and raw materials. Noise, therefore, cannot be considered in isolation from other impacts on the environment.

11.2.13 The definition of pollution includes *"emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment."* BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance (EPA 1990) legislation which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, *"offence of any human senses"* may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases, it may be possible, and desirable, to reduce noise emissions further at reasonable costs and this may therefore be BAT for noise emissions. Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

11.2.14 Guidance regarding Environmental Permitting and noise is available in the Environment Agency's 'Noise and Vibration Management: Environmental Permits' (Environment Agency, 2022) which was last updated in January 2022 and Method implementation document (MID) for BS 4142 published 27 March 2023 (Environment Agency , 2023).

Planning Policy Context

National Planning Policy

Overarching National Policy Statements (NPS) for Energy (EN-1) (2023)

11.2.15 In 2020 the Government launched a review of the energy NPSs. The Draft Overarching NPS for Energy (EN-1) was published in September 2021 by the former Department for BEIS, which updated the existing NPS EN-1. A final update was

published in November 2023 by the Department for Energy Security & Net Zero (DESNZ) (DESNZ, 2023a).

11.2.16 Section 5.12 of EN-1 relates to noise and vibration and retains the reference to the Noise Policy Statement for England. Paragraph 5.12.7 states that "*the nature and extent of the noise assessment should be proportionate to the likely noise impact.*"

11.2.17 At paragraph 5.12.15, with regards decision making, NPS EN-1 states "*The project should demonstrate good design through selection of the quietest or most acceptable cost-effective plant available; containment of noise within buildings wherever possible, taking into account any other adverse impacts that such containment might cause (e.g. on landscape and visual impacts; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission).*" Section 11.5 of this chapter describes the impact avoidance measures identified relevant to the Proposed Development.

National Policy Statement (NPS) for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (2023).

Liquified Natural Gas (LNG) Import Facilities

11.2.18 Paragraph 2.13.8 of NPS EN-4 (DESNZ, 2023b) states "*LNG import facilities will be located in coastal regions. Noise sources will include process plant, including compressors.*"

11.2.19 Paragraph 2.13.9 states "*In addition, noise may be generated by the LNG pumps located on board the LNG tankers, and this source of noise, including its underwater noise impacts, should be included in a noise assessment.*"

11.2.20 Paragraph 2.13.10 states "*The ES must include an assessment of noise and vibration effects including the specific issues outlined above, where they are relevant".*

Natural Gas Reception Facilities

11.2.21 Paragraph 2.17.11 states "*Gas reception facilities may be located in coastal regions and sources of noise will include above ground pipework, compressors (usually located in buildings) and process equipment such as heaters and inter-stage coolers.*"

11.2.22 Paragraph 2.17.12 states "*The compressors may either be electric motor or gas turbine driven. Electric motors are preferable in terms of environmental noise considerations.*"

11.2.23 Paragraph 2.17.13 states: "*Where gas turbines are used, the gas turbine exhausts may be a significant source of low frequency noise unless adequately controlled. Control valves may also be a source of noise which can be radiated by the associated pipework systems.*"

11.2.24 Paragraph 2.17.14 states "*The ES must include an assessment of noise and vibration effects including the specific issues outlined above, where they are relevant.*"

Natural Gas and Oil Pipelines

11.2.25 In addition, there are specific noise and vibration considerations which apply to gas and oil pipelines during the pre-construction and construction phases.

11.2.26 Paragraph: 2.21.17 states *"The applicant will need to identify all the noise and vibration sensitive receptors likely to be affected during these phases and consider any associated pipeline maintenance or protection that may be additionally required."*

11.2.27 Paragraph 2.21.18 states *"During the pre-construction phase there could be vibration effects from seismic surveys. During construction, tasks may include site clearance, soil movement, ground excavation, tunnelling, trenching, pipe laying and welding, and ground reinstatement."*

11.2.28 Paragraph 2.21.19 states *"In addition, increased HGV traffic may be generated on local roads by the movement of materials. These types of noise and vibration impacts will need to be assessed."*

11.2.29 Paragraph 2.21.20 states *"The commissioning of a new pipeline can involve extensive periods of drying after hydrotesting, using air compressors, and noise mitigation may be required for this type of activity."*

11.2.30 Paragraph 2.21.21 states *"A new gas pipeline may require an above ground installation such as a gas compression station on the route of the pipeline to boost transmission line pressure; these should be outside of protected landscapes wherever possible."*

11.2.31 Paragraph 2.21.22 states *"A new oil pipeline may require pumping stations. These may be located in quiet rural areas, and therefore the control of noise from these facilities is likely to be an important consideration."*

11.2.32 With regard to mitigation paragraph 2.10.1 states that *"Applicants should consider the following design measures which are typically taken to mitigate noise for gas supply and storage infrastructure:*

- acoustic cladding for buildings;
- the use of sound attenuators on ventilation systems;
- acoustic lagging on pipework, multi-stage (inherently quiet) control valves;
- gas turbine exhaust silencers; and
- acoustic enclosures on pumps and
- low-speed cooler fans and the use of electric rather than gas powered compressors."

National Policy Statement for Electricity Networks Infrastructure (EN-5) (2023)

11.2.33 The NPS EN-5 (DESNZ, 2023c) states the following with regard to noise impacts from electricity network infrastructure:

11.2.34 Paragraph 2.9.26 states *"All high voltage transmission lines have the potential to generate noise under certain conditions."*

11.2.35 Paragraph 2.9.39 states *"For the assessment of noise from substations, standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory."*

11.2.36 Paragraph 2.9.40 states *"For the assessment of noise from overhead lines, the applicant must use an appropriate method to determine the sound level produced by the line in both dry and wet weather conditions, in addition to assessing the impact on noise-sensitive receptors."*

11.2.37 Paragraph 2.9.41 states: *"For instance, the applicant may use an appropriate noise modelling tool or tools for the prediction of overhead line noise and its propagation over distance."*

11.2.38 Paragraph 2.9.42 states *"When assessing the impact of noise generated by overhead lines in wet weather relative to existing background sound levels, the applicant should consider the effect of varying background sound levels due to rainfall."*

11.2.39 With regard to mitigation for electricity infrastructure paragraph 2.10.9 that "*Applicants must consider the following measures:*

- the positioning of lines to help mitigate noise;
- ensuring that the appropriately sized conductor arrangement is used to minimise potential noise;
- quality assurance through manufacturing and transportation to avoid damage to overhead line conductors which can increase potential noise effects;
- ensuring that conductors are kept clean and free of surface contaminants during stringing/installation; and
- the selection of quieter cost-effective plants".

The National Planning Policy Framework (2023)

11.2.40 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), updated December 2023) sets out that planning should make sufficient provision for "*conservation and enhancement of the natural, built and historic environment"* (Paragraph 20d). Consequently, the aim is to prevent both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution.

11.2.41 Paragraph 180 (e) of the NPPF states that:

"planning policies and decisions should contribute to and enhance the natural and local environment by:

……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water

quality, taking into account relevant information such as river basin management plans."

11.2.42 Paragraph 191 states that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and the quality of life; [and]

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

11.2.43 With regards to 'adverse effects' and 'significant adverse effects' the NPPF refers to the Noise Policy Statement for England Explanatory Note (NPSE) (Department for Environment, Food and Rural Affairs (Defra), 2010), which is described below.

Noise Policy Statement for England (2010)

11.2.44 The NPSE (Defra, 2010) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The NPSE applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

11.2.45 The statement sets out the long-term vision of the government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

11.2.46 This long-term vision is supported by three aims:

- "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 improvements of health and quality of life."

11.2.47 The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

11.2.48 The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

11.2.49 The three aims can, therefore, be interpreted as follows:

- the first aim is to avoid noise levels above the SOAEL;
- the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise, whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times, as well as the enhancement of the acoustic environment, will assist with delivering this aim.

11.2.50 The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

Planning Practice Guidance- Noise (2014 (as updated))

11.2.51 The Planning Practice Guidance (PPG) was first published on 6 March 2014 to provide a web-based resource with more in-depth guidance to the NPPF. The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. The PPG noise guidance (PPG-N) was last updated in July 2019 (Ministry of Housing, communities & Local Government, (MHCLG), 2019).

11.2.52 The guidance advises that LPAs should take account of the acoustic environment and consider:

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

11.2.53 This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Relevant details of the PPG on effects are provided in Table 11-1.

Table 11-1: Relevant Planning Practice Guidance Noise Advice (MHCLG, 2019)

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
No Observed Adverse Effect Level			
Present 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	Noticeable and not intrusive
Lowest Observed Adverse Effect Level			
Present 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			
Present 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.	Significant Observed Adverse Effect	Avoid
Unacceptable Adverse Effect Level			
Present 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	Unacceptable Adverse Effect	Prevent

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
	definable harm, e.g, auditory and non-auditory		

11.2.54 Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

11.2.55 With regard to mitigating noise impacts on residential development, the guidance highlights that impacts may be partially offset if residents have access to a relatively quiet façade as part of their dwelling, or a relatively quiet amenity space (private, shared or public).

Local Planning Policy

11.2.56 As described in Chapter 7: Legislative and Planning Policy Context (ES Volume I, EN070009/APP/6.2), policy (including policy relevant to this noise assessment) is provided in the Redcar and Cleveland, Stockton-on-Tees and Hartlepool Local Plans.

Redcar and Cleveland Local Plan (2018)

11.2.57 The Redcar and Cleveland Local Plan (Redcar and Cleveland Borough Council (RCBC), 2018) states in Policy SD 4 *that "development proposals will be expected to:… n. minimise pollution including light and noise and vibration levels to meet or exceed acceptable limits."*

Stockton -on-Tees Local Plan (2019)

11.2.58 The Stockton-on-Tees Local Plan (Stockton-on-Tees Borough Council (STBC), 2019) in Policy ENV7 states:

"All development proposals that may cause groundwater, surface water, air (including odour), noise or light pollution either individually or cumulatively will be required to incorporate measures as appropriate to prevent or reduce their pollution so as not to cause unacceptable impacts on the living conditions of all existing and potential future occupants of land and buildings, the character and appearance of the surrounding area and the environment."

11.2.59 It also states at paragraph 4.53:

"The Tees Lowlands National Character Area description, and the Stockton-on-Tees Landscape Character Assessment and Capacity Study (2011) provide the evidence base to consider proposals in landscape terms. The NPPF supports the protection and enhancement of valued landscapes and areas of tranquillity; countryside, limits to development and green wedge policies assist in delivering this aim. Proposals within and adjacent to these designations should be designed to avoid impacts on areas within that have remained relatively undisturbed by noise and are prized for their recreational and amenity value."

Hartlepool Local Plan (2018)

11.2.60 The Hartlepool Local Plan (Hartlepool Borough Council (HBC), 2018) states:

Policy CC3: *"In determining applications for energy generation from renewable and low carbon sources, significant weight will be given to the achievement of wider environmental and economic benefits. Applications will be approved subject to the proposal satisfactorily addressing the following criteria, including cumulative impacts within and outside the Borough:…*

3) Impact on the amenity of local residents and nearby occupiers, including visual intrusion, air, dust, noise, odour, traffic generation and access …."

Policy QP6: *"The Borough Council expects development to be incorporated into the Borough with minimal impact….. Where appropriate all proposals must ensure that the following matters are investigated and satisfactorily addressed: ….*

8) The effects on, or impact of, general disturbance including noise, vibration and dust, fumes, smell, air and water quality. …".

Policy EMP4: *"Proposals will be permitted where they meet the following criteria: 1) proposals will not have a significant adverse visual impact, noise impacts, air quality, water quality and supply, health or safety risk to people in the surrounding area and also to existing and proposed land uses…"*

Other Guidance

British Standard 7445-1:2003 and 7445-2:1991

11.2.61 BS 7445 'Description and Measurement of Environmental Noise' (BSI, 1991 and 2003) defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 5228:2009+A1:2014

11.2.62 BS 5228-1 'Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise' (BSI, 2014a) provides a 'best practice' guide for noise control and includes sound power level (L_w) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 'Code of Practice for Noise and Vibration Control on Construction and Open Sites. Vibration' (BSI, 2014b) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

British Standard 6472:2008

11.2.63 BS 6472-1 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting' (BSI, 2008) presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which adverse comment is likely to occur in residential properties.

British Standard 7385:1993

11.2.64 BS 7385-2 'Evaluation and Measurement for Vibration in Buildings. Guide to Damage Levels from Groundborne Vibration' (BSI, 1993) presents guide values for

transient and continuous vibration, above which there is a likelihood of cosmetic damage. The standard establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings.

British Standard 4142:2014+A1:2019

11.2.65 BS 4142 'Methods for Rating and Assessing Industrial and Commercial Sound' (BSI, 2019) can be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise. The method compares the difference between '*rating level*' of the industrial noise, with the '*background sound level*' at the receptor position.

ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors

11.2.66 'Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation' (International Organisation for Standardization, 1996) specifies an engineering method for calculating the attenuation of sound during propagation outdoors to predict the levels of environmental noise at a distance from a variety of sources. ISO 9613-2:1996 is used in the noise modelling software used for this assessment.

Calculation of Road Traffic Noise

11.2.67 Department for Transport (DfT)/Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN) (DfT, 1998) describes procedures for traffic noise calculation and measurement and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

Design Manual for Road and Bridges LA 111

11.2.68 The National Highways 'Design Manual for Road and Bridges LA 111 (Revision 2) Noise and Vibration' (DMRB) (Highways England, 2020) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from road projects, including new construction, improvements, and maintenance. The guidance is also useful for assessing changes in traffic noise levels as a result of non-road projects such as the Proposed Development.

World Health Organization Guidelines

11.2.69 The World Health Organization's (WHO's) 'Environmental Noise Guidelines for the European Region' (WHO, 2018) provides recommendations to protect human health from noise from transportation, wind turbines and leisure. These guidelines do not cover industrial noise however, the WHO recommends that 'Guidelines for Community Noise' (WHO, 1999) should remain valid. This recommends external daytime and evening environmental noise limits, and internal night-time limits to avoid sleep disturbance.

11.2.70 The WHO 'Night Noise Guidelines for Europe' (WHO, 2009) recommend updated guidelines on night-time noise limits to avoid sleep disturbance.

The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment

11.2.71 The IEMA 'Guidelines for Environmental Noise Impact Assessment' (2014) (IEMA, 2014) provide criteria for the assessment of magnitude of impacts due to noise level changes from a project.

11.3 Assessment Methodology and Significance Criteria

Study Area

11.3.1 The extent of the study area has been defined to include the closest receptors/ communities in each direction from the Main Site, Construction Compounds, and Connection Corridors, and those that may be affected by changes in road traffic flows during the construction phase of the Proposed Development as described below:

- Construction noise: the construction noise assessment study area is typically 300 m (based on BS 5228-1 guidance (BSI, 2014a)) from the works, however the construction noise study area has been extended beyond 300 m to include the closest Noise Sensitive Receptors (NSRs) to the construction works from the Main Site and Connection Corridors.
- Construction vibration: NSRs within 100 m (based on BS 5228-2 guidance (BSI, 2014b) from the closest construction activity with the potential to generate vibration.
- Construction traffic: based on traffic links in the transport model (as discussed in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2)).
- Operational noise: based on the closest NSRs to the Main Site.

11.3.2 The NSRs included in the noise and vibration assessments are shown in Figure 11-1: Noise Sensitive Receptors (ES Volume II, EN070009/APP/6.3). It is considered that if noise and vibration levels are suitably controlled at the nearest and most exposed receptors identified, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area.

Determining Baseline Conditions and Noise Sensitive Receptors

Noise Monitoring Locations and Protocol

11.3.3 The location of potential NSRs in proximity to the Proposed Development Site has been considered when assessing the effects associated with noise and vibration levels from the construction, operational and decommissioning phases of the Proposed Development.

11.3.4 NSRs include but are not limited to residential properties, education facilities, places of worship, health buildings/ care homes and libraries. The sensitivity of receptors is discussed later in Table 11-13. Potential noise impacts upon ecological and heritage receptors are assessed in Chapter 12: Ecology and Nature Conservation (ES Volume I, EN070009/APP/6.2), Chapter 13: Ornithology (ES Volume I, EN070009/APP/6.2), Chapter 14: Marine Ecology (ES Volume I,

EN070009/APP/6.2) Chapter 17: Cultural Heritage (ES Volume I, EN070009/APP/6.2) using the levels/contours provided as a result of this assessment.

11.3.5 Adopting a 'worst case scenario' approach, key NSR locations considered to be representative of the nearest and likely most sensitive existing receptors to the Proposed Development have been identified and selected. All residential receptors are of high sensitivity. The office at Seal Sands is classed as medium sensitivity. These receptors are shown on Figure 11-1: Noise Sensitive Receptors (ES Volume II, EN070009/APP/6.3) and distances to the Proposed Development Site are shown in Table 11-2.

Table 11-2: Key Representative Noise Sensitive Receptors

RECEPTOR	ADDRESS	ASSESSED FOR	DISTANCE FROM PROPOSED MAIN SITE	DISTANCE FROM PROPOSED CLOSEST COMPOUND SITE	DISTANCE FROM PROPOSED CLOSEST PIPELINE CONSTRUCTION WORKS
H1	Manor House Farm, Cowpen Bewley, Billingham	Construction noise for the Connection Corridors.	7410 m	1254 m	53 m
H1 Buried Pipeline worst affected	Eastmost property on Cowpen Lane towards A1185, Bewley, Billingham	Buried Pipeline construction noise for the Connection Corridors.	7314 m	1202 m	57 m
H1 Trenchless Pipeline worst affected	Orchard House, Cowpen Bewley, Billingham	Above Ground Pipeline Construction noise for the Connection Corridors.	7597 m	1358 m	40 m
H2	Cresswell Road, Grangetown	Construction noise for the Connection Corridors.	4426 m	2817 m	1473 m
H3	Kirkleatham Village	Construction noise for the Connection Corridors.	4307 m	1437 m	468 m
H4	Seal Sands Office	Construction noise for the Main Site and Connection Corridors. Operational noise for the Main Site.	1707 m	1039 m	37 m
H5	Marsh House Farm, Warrenby	Construction noise for the Main Site and Connection Corridors.	1384 m	763 m	947 m

RECEPTOR	ADDRESS	ASSESSED FOR	DISTANCE FROM PROPOSED MAIN SITE	DISTANCE FROM PROPOSED CLOSEST COMPOUND SITE	DISTANCE FROM PROPOSED CLOSEST PIPELINE CONSTRUCTION WORKS
		Operational noise for the Main Site.			
H6	58 Broadway West, Redcar	Construction noise for the Main Site and Connection Corridors. Operational noise for the Main Site.	1916 m	1296 m	444 m
H6 Above Ground Worst Affected	83 Broadway West, Redcar	Construction noise for the Main Site and Connection Corridors.	1953 m	938 m	80 m
H7	Bran Sands Waste Water Treatment Plant site offices	Construction noise for the Main Site and Connection Corridors. Operational noise for the Main Site.	827 m	827 m	22 m
H1 is representative of the receptor group at Cowpen Bewley, Billingham and H6 is representative of the receptor group at Dormanstown, Redcar					

11.3.6 In order to define existing sound conditions at selected NSRs, ambient sound measurements have been undertaken at representative residential locations (H1-H3 and H5-H6) as well as at locations representative of non-residential (office use) and ecological receptors (H4, H7 and Eb1- Eb7). The monitoring locations listed in Table 11-2 are shown on Figure 11-1: Noise Sensitive Receptors (ES Volume II, EN070009/APP/6.3).

11.3.7 A description of ecological receptors in the vicinity of the Proposed Development Site is available in Chapter 12: Ecology and Nature Conservation (ES Volume I, EN070009/APP/6.2), Chapter 13: Ornithology (ES Volume I, EN070009/APP/6.2) and Chapter 14: Marine Ecology (ES Volume I, EN070009/APP/6.2). Baseline data has been collected at locations Eb1-Eb9 based on the sensitive ecological receptors as defined in the chapters above and will be used in the assessments of impacts on ecological receptors. At Eb8 and Eb9 monitoring previously completed for the Net Zero Teesside Project has been used.

Table 11-3: Monitoring Locations

MONITORING LOCATION	ADDRESS	DETAILS	DATE/TIME OF MEASUREMENTS
H1	Manor House Farm, Cowpen Bewley	Unattended sound measurement Weather station location	26/06/2023 15:17 to 04/07/2023 13:20
H2	Cresswell Road, Grangetown	Attended sound measurement	17:28 to 19:28 26/06/2023
H3	Land bounded by Kirkleatham Lane, Kirkleatham Village	Unattended sound measurement	26/06/2023 16:43 to 04/07/2023 10:13
H4	Seal Sands Office, Stockton-on-Tees	Attended sound measurement	13:55 to 14:55 27/06/2023
H5	Marsh House Farm, Tod Point Road, Redcar	Unattended sound measurement Weather station location	21/07/2023 12:15 to 31/07/2023 11:45
H6	58 Broadway West, Dormanstown	Unattended sound measurement	27/06/2023 10:51 to 04/07/2023 12:06
Eb1	Thorn Tree Lane, Greatham	Attended sound measurement	13:23 to 13:53 26/06/2023, 13:50 to 14:20 27/06/2023
Eb2	Potential Offtaker at Greatham, Tees Road, Hartlepool	Unattended sound measurement	26/06/2023 13:45 to 04/07/2023 12:17

MONITORING LOCATION	ADDRESS	DETAILS	DATE/TIME OF MEASUREMENTS
Eb3	Seal Sands Emergency Access Road, Stockton-on-Tees	Unattended sound measurement	27/06/2023 13:01 to 04/07/2023 14:25
Eb4	Land by Hospital of God, Greatham	Unattended sound measurement	27/06/2023 13:05 to 06/07/2023 13:20
Eb5	Cowpen Marsh, Stockton-on-Tess	Attended sound measurement	14:12 to 15:12 26/06/2023
Eb6	Seal Sands Office, Stockton-on-Tees	Unattended sound measurement	27/06/2023 13:30 to 04/07/2023 14:45
Eb7	Cowpen Bewley Landfill and Composting Facility off the A1185	Unattended sound measurement	27/06/2023 15:00 to 04/07/2023 14:00
Eb8	Coatham Sands	Unattended sound measurement	27/11/2020 15:23 – 02/12/2020 14:19
Eb9	Bran Sands	Unattended sound measurement	27/11/2020 13:16 – 09/12/2020 12:00

11.3.8 All measurements were made at approximately 1.2 - 1.5 m above ground level, and in accordance with the requirements of British Standard BS 7445 (BSI, 1991 and 2003). All monitoring locations were positioned at least 3.5 m from any reflecting surface, other than the ground (i.e., free-field). Details of ongoing activities and typical noise sources in the area were recorded during visits to the monitoring locations to set up and collect the measurement equipment.

11.3.9 Details of the instrumentation used at each location during the surveys are included in Appendix 11C (ES Volume III, EN070009/APP/6.4).

11.3.10 All sound level meters (SLMs) used were Class 1 precision instruments. Each has been programmed to log a range of sound indicators including L_{Aeq}, L_{A90}, L_{A10} and L_{Amax}, in 15-minute contiguous intervals.

11.3.11 The calibration levels were checked prior to and following all measurements. No significant drift, more than 0.2 dB[2] occurred.

Meteorological Conditions

11.3.12 A weather station was set up to monitor meteorological conditions during measurements, this was set up at H6 and then H5 as these are the closest residential NSRs to the Main Site.

11.3.13 Measurement periods during which the weather is not suitable for environmental sound measurements (i.e., when wind speeds >5 m/s and during precipitation or wet conditions) have been removed during analysis of the measured data based on

[2] Where decibel (dB) is used in this chapter it refers to dB re 20 mPa unless otherwise stated

the guidance in BS 7445 (BSI, 1991 and 2003). The results of the sound monitoring are presented in Section 11.4.

Impact Assessment Methodology

Assessment of Construction Noise Effects

11.3.15 As an Engineering, Procurement and Construction (EPC) Contractor is yet to be appointed, site-specific details on the construction activities, programme and numbers and types of construction plant are not yet available. Nevertheless, indicative construction noise predictions have been undertaken using the calculation methods set out in BS 5228:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' (BSI, 2014a), using the expected construction programme and methods of working, based on current understanding at this stage in the design of the Proposed Development.

11.3.16 The calculation method provided in BS 5228 (2014a) takes account of factors including the number and types of equipment operating, their associated sound power levels (Lw), their modes of operation (% on-times within the working period), the distance to NSRs, and the effects of any intervening ground cover or barrier/ topographical screening. Construction activities away from the Main Site (including the construction of the Connection Corridors) have been assessed separately from the construction assessment for the Main Site because the types of plant and activities (as listed in Appendix 11A Construction Noise Levels and Assumptions (ES Volume III, EN070009/APP/6.4)) are likely to be different and construction will extend over a greater area. Construction noise effects from activities away from the Main Site will be assessed based on the same significance criteria described in this section as for construction noise from activities within the Main Site.

Residential Noise Sensitive Receptors

11.3.17 The 'ABC' method (detailed in BS 5228 Part 1 Section E.3.2 (BSI, 2014a)) sets construction noise thresholds for residential NSRs for different time periods (e.g., day, evening, night and weekends) based on the corresponding existing ambient noise levels. For each appropriate period (day, evening, night, weekend etc.), the existing ambient noise level is determined and rounded to the nearest 5 dB and the appropriate threshold value is then derived. The predicted construction noise level is then compared with this construction noise threshold value. The construction noise thresholds are derived from Table 11-4.

Table 11-4: Construction Noise Thresholds at Residential Receptors

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE $L_{Aeq,\,T}$ dB – FREE FIELD		
	CATEGORY A (A)	CATEGORY B (B)	CATEGORY C (C)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE $L_{Aeq,\ T}$ dB – FREE FIELD		
	CATEGORY A (A)	CATEGORY B (B)	CATEGORY C (C)
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applies to residential receptors only.			
(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. (b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. (c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. (d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.			

11.3.18 Based upon the BS 5228 ABC method (BSI, 2014a), the criterion adopted in this assessment for the determination of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be equivalent to the SOAEL, although as stated in BS 5228 (BSI, 2014a), other project-specific factors, such as the number of NSRs affected and the duration and character of the impact are also considered when determining if there is a potentially significant effect.

11.3.19 For residential receptors and other high sensitivity human receptors, the criterion for the LOAEL (see Table 11-13 for further details) is a predicted construction noise level equal to the existing ambient noise level at each NSR i.e. resulting in a 3 dB increase in noise level when combined with the existing ambient noise level (decibels are measured on a logarithmic scale so noise levels cannot be summed arithmetically – two sounds of equal level combine to raise the overall sound level by 3 dB).

11.3.20 Based on the above, the magnitude of construction noise on residential NSRs is classified in accordance with the criteria in Table 11-5. These are based on professional judgement and precedent from other EIAs.

Table 11-5: Magnitude of Construction Noise Impacts for residential Noise Sensitive Receptors

MAGNITUDE OF IMPACT	$L_{Aeq,\ T}$ dB (FAÇADE)
High	Exceedance of ABC Threshold Value by >+5 dB
Medium	Exceedance of ABC Threshold Value by up to +5 dB
Low	Equal to or below the ABC Threshold Value by up to -5 dB
Very low	Below the ABC Threshold Value by >-5 dB

Non-residential Noise Sensitive Receptors

11.3.21 The '5 dB change' method (detailed in BS 5228 Part 1 Section E.3.3 (BSI, 2014a)) has been used to develop the methodology for the assessment of non-residential NSRs. Noise levels generated by site activities are deemed to be potentially significant, depending upon the sensitivity of the receptor, if:

- the total noise level (pre-construction ambient noise level plus site noise level) exceeds the pre-construction ambient noise level by 5 dB or more (subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from site noise alone, for the daytime, evening and night-time periods, respectively); and
- the exceedance occurs for a duration of one month or more, unless works of a shorter duration are likely to result in a significant effect.

11.3.22 Based on the above, the magnitude of construction noise on non-residential NSRs can be classified in accordance with the criteria in Table 11-6. These are based on professional judgement.

Table 11-6: Magnitude of Construction Noise Impacts for Non-residential Noise Sensitive Receptors

MAGNITUDE OF IMPACT	PREDICTED CONSTRUCTION NOISE LEVEL COMPARED WITH TOTAL NOISE* LEVEL
High	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off value, by >+10 dB for duration of one month or more
Medium	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off value, by ≥+5 dB for duration of one month or more
Low	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off value, by between 0 and <5 dB
Very low	Below the pre-construction ambient noise level, or the lower cut-off value
Note: *Total noise = pre-construction ambient noise level + construction noise level (subject to the lower cut off value)	

11.3.23 At this stage in the design the Proposed Development, the full and detailed Connection Corridors construction programme is not yet defined, therefore as a reasonable worst-case approach, and to ensure a robust assessment, it has been assumed that all assessed construction activities will be evaluated at their closest distance to the noise sensitive receptor with the duration of the construction activities will be greater than one month . This means that the initial indication of potential Significant effects (before application of professional judgement) is based solely upon the total noise level exceedance of the pre-construction ambient noise level for a given working period.

Assessment Daytime Construction Works Traffic on the Public Highway

11.3.24 The Proposed Development will affect traffic flows on existing roads in the area within and surrounding the Proposed Development Site during construction – refer to Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2). This assessment focuses on the impact at existing residential properties located alongside the existing local road network.

11.3.25 Construction traffic noise has been assessed by considering the increase in traffic flows during the construction works, following the guidance of CRTN (DfT/ Welsh Office, 1998) and DMRB LA 111 – Noise and Vibration (National Highways, 2020).

11.3.26 18-hour (06:00 – 24:00) Annual Average Weekday Traffic (AAWT) data have been obtained for the year 2025 'with' and 'without' construction traffic during the peak construction period, to determine if any existing roads are predicted to be subject to a potentially Significant change in 18-hour traffic flows. Basic Noise Level (BNL) calculations have been undertaken to predict the change in noise level between the 'with' and 'without' scenarios.

11.3.27 The criteria for the assessment of traffic noise changes arising from construction works have been taken from Table 3.17 of DMRB LA 111 – Noise and Vibration and are provided in Table 11-7. The magnitude descriptors in parentheses are provided to align with the descriptors used in this assessment.

Table 11-7: Construction Traffic Noise Criteria

MAGNITUDE OF IMPACT	CHANGE IN TRAFFIC NOISE LEVEL $L_{A10,18HR}$ dB
Major (High)	≥ 5
Moderate (Medium)	≥3 to <5
Minor (Low)	≥1 to <3
Negligible (Very low)	<1

11.3.28 An increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an approximate increase in road traffic noise of 1 dB L_A. A doubling of traffic flow would be required for an approximate increase in 3 dB L_A.

11.3.29 It is generally accepted that changes in noise levels of 1 dB L_A or less are imperceptible, and changes of 1 to 3 dB L_A are not widely perceptible. Consequently, at the selected road traffic noise receptors the magnitude of the predicted change in noise levels uses the scale shown in Table 11-7 with respect to construction traffic. The criteria are based on the current guidance on short-term changes in traffic noise levels in DMRB LA 111 – Noise and Vibration. The SOAEL is set at a change in traffic noise of +3 dB and the LOAEL at +1 dB.

Assessment of Construction Vibration Effects

Impacts on Humans

11.3.30 Vibration due to construction activities has the potential to result in adverse effects at nearby NSRs. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228-2: 2009+A1: 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (BSI, 2014b) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings and annoyance to occupiers.

11.3.31 Table 11-8 details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of demolition and construction vibration effects on human receptors, based on guidance contained in BS 5228-2 (BSI, 2014b).

Table 11-8: Construction Vibration Threshold at Residential Dwellings

PEAK PARTICLE VELCOCITY (PPV) LEVEL	DESCRIPTION	MAGNITUDE OF IMPACT
>= 10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High
1.0 to < 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium
0.3 to < 1.0 mm/s	Vibration might be just perceptible in residential environments.	Low
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very low

11.3.32 For residential receptors and other sensitive receptors, the LOAEL is defined as a PPV of 0.3 mm/s (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level at which construction vibration can be tolerated with warning.

11.3.33 At receptors above the SOAEL, further consideration of whether an effect is Significant is undertaken using professional judgement, taking account of the duration and frequency of the effect, as well as the time of day/ evening/night that the effect would be experienced.

11.3.34 At this stage and in the absence of specific information on likely construction activities and plant, indicative information has been provided and used to undertake a qualitative assessment based upon professional judgement. Given the Significant distance to residential receptors, no Significant vibration is expected to result from the proposed construction activities within the Main Site which is outside the vibration study area. However, works within the Connection Corridors could be much closer to residential receptors, and so construction vibration impacts are likely to be higher.

Impacts on Buildings

11.3.35 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far more than those that may cause annoyance. Consequently, if vibration levels are controlled to those relating to annoyance (i.e, 1.0 mm/s), then it is highly unlikely that buildings will be damaged by construction vibration levels.

11.3.36 The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage. The principal concern is generally transient vibration, for example due to piling.

11.3.37 BS 7385-2: 1993 'Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration' (BSI, 1993) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Vibration' (BSI, 2014b). Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 11-9.

Table 11-9: Transient Vibration Guide Values for Cosmetic Damage

TYPE OF BUILDING	PEAK COMPONENT PARTICLE VELOCITY (PPV) IN FREQUENCY RANGE OF PREDOMINANT PULSE	
	4 Hz TO 15 Hz	15 Hz AND ABOVE
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1: Values referred to are at the base of the building. NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

11.3.38 BS 7385-2:1993 (BSI, 1993) states that the probability of building damage tends to be zero for transient vibration levels less than 12.5 mm/s PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

11.3.39 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 'Mechanical vibration and shock - Vibration of fixed structures' (ISO, 2010) defines three different categories of building damage:

- cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
- minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
- major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

11.3.40 BS 7385-2:1993 (BSI, 1993) defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in Table 11-10 for both transient and continuous vibration.

Table 11-10: Magnitude of Impact – Construction Vibration Building Damage

MAGNITUDE OF IMPACT	DAMAGE RISK	CONTINUOUS VIBRATION LEVEL PPV mm/s	TRANSIENT VIBRATION LEVEL PPV MM/S		
		UNREINFORCED OR LIGHT FRAMED STRUCTURES	REINFORCED OR FRAMED STRUCTURES	UNREINFORCED OR LIGHT FRAMED STRUCTURES	REINFORCED OR FRAMED STRUCTURES
High	Major	≥30	≥100	≥60	≥200
Medium	Minor	15 to <30	50 to <100	30 to <60	100 to <200
Low	Cosmetic	6 to <15	25 to <50	12 to <30	50 to <100
Very low	Negligible	<6	<25	<12	<50

11.3.41 The proposed construction plant list has been reviewed to identify which plant and/or activities have the potential to cause adverse vibration impacts at sensitive receptors. Indicative vibration levels have been predicted using the guidance in BS 5228-2: 2009+A1:2014. Again, given the significant distance to residential and ecological receptors, no significant vibration impact is expected to result from construction on the Main Site. However, construction of the Connection Corridors may be closer to residential and ecological receptors, and thus there is the potential for higher impacts. This will depend on the nature of the construction with buried pipes having a greater potential for impact than above ground pipes.

Assessment of Operational Noise

11.3.42 A noise propagation model has been developed using the noise modelling software CadnaA to assess the 'reasonable worst case' operational layout for the Proposed

Development. CadnaA implements the noise prediction method ISO 9613-2: 1996 'Attenuation of Sound during Propagation Outdoors' (International Organisation for Standardization, 1996), which has been employed to calculate noise levels at surrounding NSRs due to noise breakout from the proposed buildings and plant at the Hydrogen Production Facility.

11.3.43 The noise model consists of a three-dimensional representation of an indicative reasonable worst case' layout of the Hydrogen Production Facility and its surroundings. Indicative noise level data for the key noise emitting plant/buildings within the Hydrogen Production Facility have been used. Details of the proposed plant and assumptions can be found in Appendix 11B (ES Volume III, EN070009/APP/6.4).

11.3.44 Significant topographical details and buildings that may influence the transmission of noise to NSRs are included in the noise model. This does not include buildings associated with other proposed developments on the South Tees Development Corporation (STDC) Site, which may provide some screening between the source and receiver, therefore is likely to overestimate the noise effects associated with the Proposed Development. A digital terrain model created using ground elevation spot height data has been used to position buildings and other noise sources at the correct height. The model assumes that the prevailing wind direction is always from source to receiver, which is likely to overestimate the noise effect associated with the Proposed Development.

11.3.45 Based upon the predicted noise levels from the noise model, an assessment of potential noise impact at nearby NSRs has been undertaken using the guidance in BS 4142: 2014 'Methods for Rating and Assessing Industrial and Commercial Sound' (BSI, 2014c).

11.3.46 A key aspect of the BS 4142 (BSI, 2014c) assessment procedure is a comparison between the background sound level in the vicinity of residential locations and the rating level of the sound source under consideration. The relevant parameters in this instance are as follows:

- Background sound level – $L_{A90,T}$ – defined in the Standard as the "A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels";
- Specific sound level – Ls ($L_{Aeq,Tr}$) – defined as the "equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr"; and
- Rating level – $L_{Ar,Tr}$ – defined as the "specific sound level plus any adjustment made for the characteristic features of the sound."

11.3.47 BS 4142 (BSI, 2014c) allows for corrections to be applied based upon the presence or expected presence of the following:

- tonality: up to 6 dB penalty;

- impulsivity: up to 9 dB penalty (this can be summed with tonality penalty); and
- other sound characteristics (neither tonal nor impulsive but still distinctive): 3 dB penalty.

11.3.48 Once any adjustments have been made, the background sound level and the rating level are compared. The standard states that:

- "Typically, the greater the difference, the greater the magnitude of impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.
- The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant 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, depending upon the context."

11.3.49 Importantly, as suggested above, BS 4142:2014 (BSI, 2014c) requires that the rating level of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

11.3.50 BS 4142:2014 (BSI, 2014c) suggests that a one-hour assessment period is considered during the day and a 15-minute assessment period at night.

11.3.51 Table 11-11 illustrates the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 (BSI, 2014c) assessment purposes, for a residential receptor, the SOAEL is set at a rating level above the background sound level of +10 dB, and the LOAEL at +5 dB, although the consideration of context (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 11-11: Magnitude of Impact for Industrial Noise

MAGNITUDE OF IMPACT	BS 4142 DESCRIPTOR	RATING LEVEL – BACKGROUND SOUND LEVEL (dB)
High	No BS 4142 descriptor for this magnitude level	+14/> =15
Medium/ High	No BS 4142 descriptor for this magnitude level	+12/+13
Medium	Indication of a significant adverse effect, depending upon context	+9/+10/+11
Low Medium	No BS 4142 descriptor for this magnitude level	+7/+8

MAGNITUDE OF IMPACT	BS 4142 DESCRIPTOR	RATING LEVEL – BACKGROUND SOUND LEVEL (dB)
Low	Indication of an adverse effect, depending upon context	+4/+5/+6
Very low/Low	No BS 4142 descriptor for this magnitude level	+2/+3
Very Low	Indication of low impact, depending upon context	≤ 0/+1

IEMA Guidelines for Environmental Noise Impact Assessment

11.3.52 The Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Environmental Noise Impact Assessment' (IEMA, 2014) have been used to undertake a preliminary assessment of the impact of changes in ambient sound level at NSRs due to Proposed Development operation. On the impact of noise level changes, paragraph 2.7 of the guidelines state "*For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions, and a 10 dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1 dB may be perceptible under some circumstances.*" The IEMA Guidelines provide criteria for magnitude of impacts due to noise level changes from a project, as shown in Table 11-12, and these have been used within this preliminary assessment respect to predicted changes in ambient sound levels.

Table 11-12: Categorising the Magnitude of the Noise Change

MAGNITUDE OF IMPACT	NOISE CHANGE, dB
No Change	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	>5

Assessment of Operational Vibration

11.3.53 The type of equipment proposed is unlikely to pass significant levels of vibration into the ground. Taking this into account, together with the distances between the proposed indicative location of the equipment and residential NSRs, it is not anticipated that vibration levels will be significant and will not exceed the thresholds described in Table 11-8. Therefore, further assessment of operational vibration is scoped out of this assessment.

11.3.54 No significant sources of vibration are associated with the operation of the Pipeline Corridors therefore further assessment of operational vibration for these sources has been scoped out.

Value/ Sensitivity of Receptors

Receptor Sensitivity

11.3.55 Effects are classified based on the magnitude of the impact (as outlined above) for the various potential impacts during construction and operation, and the sensitivity or value of the affected receptor. A scale of receptor sensitivity is presented in Table 11-13.

Table 11-13: Sensitivity/Value of Receptors

SENSITIVITY/ VALUE OF RESOURCE/ RECEPTOR	DESCRIPTION	EXAMPLES OF RECEPTOR USAGE
Very high	Receptors where noise or vibration will significantly affect the function of a receptor.	• Auditoria/studios; • Specialist medical/teaching centres, or laboratories with highly sensitive equipment.
High	Receptors where people or operations are particularly susceptible to noise or vibration. Sensitive ecological receptors known to be vulnerable to the effects of noise or vibration.	• Residential; • Quiet outdoor areas used for recreation; • Conference facilities; • Schools/educational facilities in the daytime; • Hospitals/residential care homes; • Libraries;
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	• Offices; • Restaurants/retail; • Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	• Residences and other buildings not occupied during working hours; • Factories and working environments with existing high noise levels; • Sports grounds when spectator or noise is a normal part of the event.

Significance of Effects

11.3.56 The following terminology has been used in the preliminary assessment to define noise and vibration effects:

- adverse – detrimental or negative effects to an environmental resource or receptor;
- neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or
- beneficial – advantageous or positive effect to an environmental resource or receptor.

11.3.57 The effect resulting from each individual potential impact type above has been classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in Table 11-14, but where necessary also considering the context of the acoustic environment.

Table 11-14: Classification of Effects

SENSITIVITY/ VALUE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT			
	HIGH	MEDIUM	LOW	VERY LOW
Very high	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

11.3.58 Where adverse or beneficial effects have been identified, these have been assessed against the following significance scale, derived using the matrix presented in Table 11-14:

- Negligible – imperceptible effect of no significant consequence;
- Minor – slight, very short or highly localised effect of no significant consequence;
- Moderate – limited effect (by extent, duration or magnitude), which may be considered significant; or
- Major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

11.3.59 For the purposes of this assessment, Negligible and Minor effects are considered to be Not Significant, whereas Moderate and Major effects are considered to be Significant.

Cumulative Noise and Vibration Effects

11.3.60 An assessment of cumulative noise and vibration effects has been undertaken and is detailed within Chapter 23: Cumulative and Combined Effects (ES Volume I, EN070009/APP/6.2).

11.3.61 The assessment of cumulative effects follows the methodology described in Advice Note Seventeen (The Inspectorate, 2019a), for more information refer to refer to Chapter 23: Cumulative and Combined Effects (ES Volume I, EN070009/APP/6.2).

11.3.62 It is important to note that cumulative effects may vary from the effects of the Proposed Development considered in isolation. For example, it is possible for the Proposed Development to have greater effects cumulatively with other planned developments than if it is considered in isolation against the existing baseline reported in Section 11.4.

Sources of Information/ Data

11.3.63 The following sources of information have been reviewed and have informed the assessment:

- baseline sound monitoring survey data (see Section 11.4 and Appendix 11A)
- the outline construction methodology
- construction plant and equipment from similar construction projects;
- pipeline construction plant noise data and indicative activities;
- construction noise data referenced from BS 5228 (BSI, 2014a);
- indicative concept layout plans for the Production Facility;
- items of plant including sound power level data for the Production Facility. Where data is not currently available, noise source data from similar projects has been used;
- AAWT traffic data (refer to Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2));
- Ordnance Survey (OS) mapping of the Proposed Development and surrounding area; and
- topographical data (LIDAR data) and aerial photography.

Consultation

Scoping Opinion

11.3.64 An EIA Scoping Opinion was requested from the Inspectorate on 6 April 2023. A response was received on 17 May 2023. For the Scoping Opinion and the Applicant's responses to them, refer to Appendix 1E (ES Volume III, EN070009/APP/6.4).

Statutory Consultation

11.3.65 The PEI Report was published for consultation on 14 September 2023 and the consultation period ended on 26 October 2023. A second statutory consultation

was held between 13 December 2023 and 23 January 2024, and additional targeted consultation was held between 9 February 2024 and 10 March 2024. The matters raised have been reviewed and an explanation of how the Applicant has had regard to them is set out in the Consultation Report (EN070009/APP/5.1). For full consultation responses and the Applicant's responses to them, refer to the Consultation Report (EN070009/APP/5.1).

Use of the Rochdale Envelope

11.3.66 To ensure a robust assessment of the likely significance of the environmental effects of the Proposed Development, the EIA is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate in line with the Planning Inspectorate's ('the Inspectorate's') Advice Note 9 (The Inspectorate, 2018). This involves assessing the maximum (or where relevant, minimum)/ realistic worst-case parameters for the elements where flexibility needs to be retained (building dimensions or operational modes for example).

11.3.67 As discussed in Chapter 5 Construction Programme and Management (ES Volume I, EN070009/APP/6.2), construction of Phase 1 is anticipated to complete in Q2 2018; early enabling works and major construction of Phase 2 will start in Q2 2028 and Q3 2028 respectively. There will be no overlap between the main construction phases of Phase 1 and Phase 2. Due to construction phasing, there may be a period following opening of Phase 1 where Phase 1 will be operational and Phase 2 in construction. There will be no overlap between the main construction phases of Phases 1 and 2. Since there will be more construction activities in Phase 1 than in Phase 2, and therefore Phase 1 construction is adopted in the assessment as the worst-case scenario for construction. Assessment has also been made of the combined Phase 2 construction and Phase 1 operation. The operational stage worst case commences on completion of Phase 2 construction when both phases will be in operation.

11.3.68 In line with the Inspectorate's guidance, the following assumptions have been made with regard to the construction phase of the Proposed Development:

- Main Site and compound establishment activities are assumed to take place in the whole of the compound extent.
- Main Site and compound construction activities are modelled as area sources.
- Pipeline construction methodology is assumed to be the same for each pipeline regardless of the type of material they transport once operational. Only changes from pipeline construction come from pipeline types (e.g buried, above ground or trenchless crossing), their corresponding plant list, programme and proposed layout.
- It is assumed that Phase 1 of the Proposed Development will be operational and running from 2028 onwards. Noise contribution from the operational Phase 1 is considered for construction noise predictions after 2028.

- As a worst-case scenario, the Main Site and compound construction average monthly noise levels and the highest daily output of worst-case pipeline construction works are combined (decibel addition) to provide the total predicted construction noise levels.
- The highest construction noise level is presented for each pipeline construction activity rather than all activities at once, as only one activity could occur at the closest approach at any one time.
- Pipeline construction has been assumed to take place at the nearest part of the Connection Corridors to NSRs.
- Pipeline construction activities and plant have been assumed to be in constant operation through the 07:00 to 19:00 working day, for further information see Appendix 11A (ES Volume III, EN070009/APP/6.4).
- Predictions made for construction noise in the evening and night-time period for residential NSRs assume the same intensity of operation as during the daytime for activities listed to have working periods of 24/7 or extended hours outside the standard construction hours as detailed in Appendix 11A : Construction Noise Levels and Assumptions (ES Volume III, EN070009/APP/6.4), activities listed to have standard working hours are solely assessed for daytime noise emissions.
- For the non-residential NSRs (H4 & H7) which are offices, it has been assumed that the offices will only be occupied during daytime hours, therefore excluded from evening and night-time assessment.

11.3.69 The following assumptions have been made for the operational phase of the Proposed Development:

- Phase 1 and Phase 2 of the development are assumed to be identical and source locations and sizes in the indicative concept layout plans have been modelled as the realistic worst-case location (e.g. closest to the nearest NSR);
- where pumps have a duty and a standby, it has been assumed only the duty will operate;
- for the non-residential NSR (H4 & H7) which is an office, it has been assumed that the office will only be occupied during daytime hours, therefore excluded from evening and night-time assessment;
- the results have been sensitivity tested to determine the effects of layout changes by moving the key sources of the cooling water train and air coolers to the site boundary and the worst-case results reported, given the distance from receptors to the Main Site minor changes in the Main Site layout are unlikely to make a significant difference. The worst-case results from the sensitivity tests have been reported in this chapter;
- noise emission data assumptions are detailed in Appendix 11B (ES Volume III, EN070009/APP/6.4) and are based on sound levels provided as A-weighted

values at 1 m from the source, applying professional judgement and data from other comparable projects;

- The Hydrogen Production Facility will operate continually at full load, 24 hours a day, all plant items apart from those listed as stand by will operate for 24 hours a day;
- sound power levels (Lw) used in modelling of previous similar projects have been inputted for all principal noise emitting buildings/elements (air inlet filters, electrical buildings, transformers, workshops etc.). These sound power levels have been provided by the design team, but have been supplemented by octave band data from similar projects;
- enclosed sound sources have been modelled as steel clad buildings with an internal sound pressure level of 85 dB; and
- corrections for tonality, impulsivity, and intermittency have not been applied on the assumption that these potential features will be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding louvres and silencers/attenuators.

11.3.70 Given the above, this assessment presents a reasonable 'worst-case' approach.

Limitations

Construction

11.3.71 Information on the expected construction programme and methods of working are based on the current understanding at this stage in the design of the Proposed Development. A detailed construction programme is not currently available as this is determined by the EPC Contractor(s) which has not yet been appointed. Where construction details cannot be confirmed, reasonable worst-case estimates have been made based on experience gained on similar developments and professional judgement.

11.3.72 Mitigation measures detailed in Section 11.5 and Section 11.7 will be included in the Framework CEMP (Appendix 5A (ES Volume III, EN070009/APP/6.4)) to minimise construction noise and vibration effects. However, it is inevitable, as with most construction projects, that some temporary adverse noise effects will be experienced.

11.3.73 It should also be noted that the detail for the proposed Connection Corridor is to be further refined. At present, construction effects are predicted on the assumption that construction activities may occur at the closest point on the Connection Corridor to each NSR (as a worst case), but the refinement of the Connection Corridors has the potential to increase the distance from the works to some NSRs. This will reduce the impact and associated effects.

11.3.74 Details of the construction plant associated sound power levels (L_w) and assumed percentage on time for each construction activity are presented in Appendix 11A (ES Volume III, EN070009/APP/6.4).

Operation

11.3.75 A list of assumptions made during the noise modelling and operational assessment for the operational Proposed Development are detailed in the Modelling Assumptions sub-section of Section 11B.1 (Appendix 11B, ES Volume III, EN070009/APP/6.4)'

Decommissioning

11.3.76 Detailed information regarding the decommissioning works is not available at this stage. The preliminary assessment has been undertaken based on typical site clearance activities and demolition plant on the Main Site.

11.4 Baseline Conditions

Existing Baseline

Sound Survey Results

11.4.1 The processed results from each sound survey position are provided in Table 11-15. The L_{Aeq} values presented combine all measurements taken in each time period (day/night). The L_{A90} values presented are those deemed to be 'representative' of Background Sound Levels, for use in the BS 4142 assessment. Representative Background Sound Levels have been selected through consideration of the outcome of different methods of analysing the measured 15-minute measurement data.

11.4.2 Observations regarding the general baseline sound environment at each monitoring location are presented below in Table 11-15. The observations of the general baseline sound environment were recorded during the daytime for all locations except receptor H5 where both night-time and daytime observations were recorded as this is the closest receptor for the operational noise assessment.

Table 11-15: Baseline Sound Survey Results

MONITORING LOCATION	TIME PERIOD	$L_{Aeq,T}$ dB	HIGHEST L_{Amax} dB	$L_{A90,T}$ dB
H1	Daytime	50	98	43
	Night-time	44	90	36
H2	Daytime	51	73	48
	Night-time*	-	-	-
H3	Daytime	51	92	47
	Night-time	49	78	42
H4	Daytime	57	84	53
	Night-time*	-	-	-
H5	Daytime	51	96	39
	Night-time	44	80	36
H6	Daytime	56	102	46

MONITORING LOCATION	TIME PERIOD	$L_{Aeq,T}$ dB	HIGHEST L_{Amax} dB	$L_{A90,T}$ dB
	Night-time	45	77	42
Eb1**	Daytime	51	78	43
	Night-time*	-	-	-
Eb2**	Daytime	67	95	50
	Night-time	62	90	47
Eb3**	Daytime	48	92	42
	Night-time	46	79	42
Eb4**	Daytime	51	101	45
	Night-time	49	85	36
Eb5**	Daytime	57	79	45
	Night-time*	-	-	-
Eb6**	Daytime	53	76	51
	Night-time	53	88	51
Eb7**	Daytime	47	88	41
	Night-time	42	82	37

*Only attended daytime measurements made at H2, H4, Eb1 and Eb5.
**Eb1 to Eb7 are not used in this chapter but are used to inform Chapter 12: Ecology and Nature Conservation (ES Volume I, EN070009/APP/6.2), Chapter 13: Ornithology (ES Volume I, EN070009/APP/6.2) and Chapter 14: Marine Ecology (ES Volume I, EN070009/APP/6.2) .

H1 - Manor House Farm, Cowpen Bewley

11.4.3 The dominant sound source at this location was observed to be road traffic from the A1185 which is to the north-east of the receptor. There was an additional sound source of the wind.

H2 – Cresswell Road, Grangetown

11.4.4 The dominant sound source at this location was observed to be road traffic from local roads, Broadway/Trunk Road and Greystone Road, A1053. Occasional light aircraft sound was also observed.

H3 – Kirkleatham Village

11.4.5 The dominant sound source at this location was observed to be road traffic from the A1042 and A174 as well as local roads. Additionally, there was sound from birdsong and the wind in the trees. It was observed there was some sound of an industrial character most likely from the nearby Wilton International site.

H4 – Seal Sands Office

11.4.6 Industrial sound from the nearby Sembcorp site was dominant with additional contributions from other industrial facilities in the area. Road traffic sound from the Seal Sands Road was an additional source.

H5 – Marsh House Farm

11.4.7 During the daytime, industrial sound came from operations to the east along Tod Point Road, and additionally from more distant industrial sources to the west made the largest contribution. There were also contributions from road traffic along Tod Point Road and from birdsong.

11.4.8 During the night-time the dominant sound source was the more distant industrial sources to the west. This was characterised as a whirring sound with occasional clanging and horns. There was additionally noise from occasional cars on Tod Point Road.

H6 – 58 Broadway West

11.4.9 The dominant sound sources at this location during the daytime were noted to be road traffic on Broadway West and other nearby roads. Additional sound sources were the industrial estate to the north and birdsong.

Future Baseline

11.4.10 In the absence of the Proposed Development, future baseline noise levels at NSRs will depend largely on traffic flows on surrounding road networks, and the future operations at other industrial and commercial premises. There is the potential for noise levels to increase in the future baseline as other developments become operational. However, as a worst-case scenario the assessments are based on the baseline sound surveys undertaken in 2023 as the ambient and background sound levels are likely to be lower. Therefore, the change between the existing baseline sound levels and the predicted noise levels will be greater.

11.5 Proposed Development Design and Impact Avoidance

11.5.1 The EIA process aims to avoid, prevent, reduce or offset potential environmental effects through design and/or management measures. These are measures that are inherent in the design and construction of the Proposed Development (also known as 'embedded measures').

11.5.2 The following impact avoidance measures have either been incorporated into the design or are standard construction or operational practices. These measures have, therefore, been taken into account during the impact assessment and will be secured through the draft DCO (EN070009/APP/4.1).

Construction

11.5.3 A Framework Construction Environmental Management Plan (CEMP) (EN070009/APP/5.12) is included as part of the DCO Application, which sets out the key measures to be employed during the construction of the Proposed Development, to control and minimise the impacts on the environment. The

Framework CEMP will set out how impacts upon NSRs will be managed during construction. A Final CEMP(s) will be prepared by the EPC Contractor(s) in accordance with the Framework CEMP prior to construction. The submission, approval, and implementation of the Final CEMP(s) will be secured by a Requirement of the draft DCO (EN070009/APP/4.1).

11.5.4 Construction activities will typically be undertaken during weekday daytimes (07:00 to 19:00) and Saturdays (07:00 to 16:00) plus, up to one hour before and / or after for mobilisation (start-up and close down) procedures as well as some level of flexibility allowed for some activities such as concrete pours, surface water pumping and trenchless crossings that cannot be stopped or paused subject to LPA approval. This is secured via a Requirement of the draft DCO (EN070009/APP/4.1).

11.5.5 Some works will need to take place outside of normal working hours, if they do not give rise to unacceptable noise impacts (this would be where they do not exceed construction noise thresholds) as described in Appendix 11A: Construction Noise Levels and Assumptions (ES Volume III, EN070009/APP/6.4). Measures to mitigate noise and vibration will be implemented during the Proposed Development construction phase to minimise impacts at local residential receptors and ecological receptors, particularly with respect to activities required outside of normal working hours. Mitigation (included in the Framework CEMP (EN070009/APP/5.12) or Framework Construction Traffic Management Plan (CTMP) (Appendix 15C, ES Volume III, EN070009/APP/6.4) as relevant and thenceforth in the final version of those documents) will include, but not be limited to:

- abiding by agreed construction noise thresholds at nearby NSRs;
- avoidance of working in the more sensitive evening and night times where practicable;
- ensuring that processes are in place to minimise noise before works begin and ensuring that BPM are being achieved throughout the construction programme;
- using modern plant, complying with the latest European noise emission requirements (“Noise Emission in the Environment by Equipment for Use Outdoors Regulations 2001”). Selection of inherently quiet plant where practicable;
- hydraulic techniques for breaking to be used in preference to percussive techniques where practical;
- use of rotary bored rather than driven piling techniques (if required), where possible;
- off-site pre-fabrication where practical;
- all plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;

- all contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (BSI, 2014a and b);
- loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Proposed Development Site to be conducted in such a manner as to minimise noise generation;
- where practicable, the noisiest items of plant will be located the furthest distance from the nearby NSRs. Plant known to emit noise strongly in one direction will, where practicable, be orientated so that the noise is directed away from NSRs; Machines such as cranes that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum. Machines will not be left running unnecessarily;
- appropriate routing of construction traffic on public roads and along access tracks, to minimise noise level increase as will be described in the CTMP (EN070009/APP/5.16);
- consultation with the local authorities (RCBC, STBC and HBC) and local residents to advise of potential noisy works that are due to take place; and
- noise complaints should be monitored, reported to the contractor and immediately investigated.

11.5.6 Method statements regarding construction management, traffic management and overall site management will be prepared prior to construction in accordance with best practice and relevant British Standards, to help minimise impacts of the construction works with reference to the measures outlined in the Final CEMP(s). One of the main aims of such method statements will be to minimise noise disruption to local residents during the construction phase.

11.5.7 Regular communication with the local community throughout the construction period will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed. This will be included in the Final CEMP(s).

11.5.8 The appointed EPC Contractor(s) would be encouraged to be a member of the 'Considerate Constructors Scheme' which is an initiative open to all contractors undertaking building work. This will be included in the Final CEMP(s).

11.5.9 As mentioned above, a Final CEMP(s) will be prepared, including setting out provisions to ensure that noise and vibration impacts relating to construction activities are minimised based on the measures outlined above. To assist in the preparation of the Final CEMP(s), a detailed noise and vibration assessment will be undertaken, if required, once the EPC Contractor(s) is appointed to identify specific mitigation measures for the Proposed Development (including construction traffic).

Operation

11.5.10 Details of the sound performance and breakout noise from on-site buildings can be found in Appendix 11B (ES Volume III, EN070009/APP/6.4).

11.5.11 The control and monitoring of noise during operation will be secured by a Requirement under Schedule 2 of the draft DCO (EN070009/APP/4.1).

11.5.12 The Hydrogen Production Facility will require an Environmental Permit and will comply with this under the Environmental Permitting (England and Wales) Regulations 2016. This will require operational noise from the Hydrogen Production Facility to be controlled using BAT, which will be determined through the Environmental Permit application. The Applicant has also begun engagement with the Environment Agency under the enhanced pre-application scheme and is finalising an application for an Environmental Permit anticipated to be submitted in 2024.

11.5.13 The Proposed Development Site will be operated in line with appropriate standards, whilst the operator will implement and maintain an Environment Management System (EMS) which will be attested to International Standards Organisation (ISO) 14001 (International Organisation for Standardization, 2015). The EMS will outline requirements and procedures required to ensure that the Proposed Development Site is operating to the appropriate standard.

Decommissioning

11.5.14 The decommissioning phase is anticipated to involve the removal of all above surface structures. It is assumed that all underground infrastructure would remain in-situ; however, all connection and access points would be sealed or grouted to ensure disconnection. The mitigation measures set out in this section for construction noise and vibration will also be appropriate mitigation during the decommissioning stage.

11.5.15 Decommissioning activities would be conducted in accordance with the appropriate guidance and legislation for the closure of the Proposed Development Site. A Decommissioning Environmental Management Plan (DEMP) will be prepared which would consider in detail all potential environmental risks on the Proposed Development Site and contain guidance on how risks can be removed or mitigated.

11.5.16 The DEMP is secured via a Requirement of the draft DCO (EN070009/APP/4.1), if granted. The DEMP will consider in detail all potential environmental risks arising from the Proposed Development Site and contain guidance on how risks can be removed or mitigated. This will include details of how noise and vibration should be managed on the Main Site during decommissioning and demolition, and likely include the mitigation measures set out for construction noise as detailed above.

11.6 Impacts and Likely Significant Effects

Construction

11.6.1 The measured ambient baseline sound levels have been used to determine indicative BS 5228 ‘ABC’ noise threshold categories as shown in Table 11-16 at each

of the representative residential NSRs (as detailed in Table 11-2). Where baseline data is not available for a NSR, a category has been assigned using conservative assumptions as follows:

- if evening data is unavailable, it has been categorised as the same as the lowest category of day and night;
- if there is no representative baseline data available, the NSR has been categorised as 'BS 5228 ABC Category A'.

Table 11-16: Measured Free-Field $L_{Aeq,T}$ Noise Levels and Associated 'ABC' Assessment Category - Residential Receptors

RECEPTOR	WEEKDAY DAYTIME 07:00-19:00		WEEKDAY EVENING 19:00 – 23:00		NIGHT 23:00-07:00	
	L_{Aeq} dB	ABC	L_{Aeq} dB	ABC	L_{Aeq} dB	ABC
H1	51	A	46	A	44	B
H2	51	A	-	A	-	A
H3	52	A	50	A	49	C
H5	51	A	49	A	44	B
H6	57	A	51	A	45	B

11.6.2 Construction noise limits have been derived for each NSR in Table 11-17 using the BS5228 ABC methodology (described in Table 11-4) and the results of the baseline sound surveys. Where baseline data is not available for H2 during the evening, weekend and night-time periods, limits have been assigned using conservative assumptions.

Table 11-17: Indicative Construction Noise Limits for residential Noise Sensitive Receptors

RECEPTOR	CONSTRUCTION NOISE LIMIT $L_{Aeq,T}$ dB (FREE-FIELD)					
	Weekday daytime 07:00 – 19:00	Evenings 19:00 – 23:00	Night 23:00 – 07:00	Saturday 07:00 – 13:00	Saturday 13:00 – 23:00	Sunday 07:00 – 23:00
H1	65	55	50	65	55	55
H2	65	55	45	65	55	55
H3	65	55	55	65	55	55
H5	65	55	50	65	55	55
H6	65	55	50	65	55	55

11.6.3 Location H4 (Seal Sands Office) and H7 (Bran Sands Waste Water Treatment Site Offices) are non-residential receptors. Based on the BS 5288 '5 dB change' method described in Section 11.3 and the receptor being assigned as Medium sensitivity (based upon Table 11-13), a construction noise limit of 75 dB $L_{Aeq,12hr}$ should be

applied to avoid a significant adverse effect in accordance with Table 11-6. This is based on the total noise level from predicted construction noise plus the lower cut off value of 65 dB $L_{Aeq,12hr}$, which can be exceeded by up to 10 dB (i.e. 65+10 =75) to avoid a significant adverse effect.

Construction Noise Predictions

11.6.4 This section discusses the potential noise and vibration effects on sensitive receptors arising during the construction of the Proposed Development, construction noise effects are assessed for:

- construction of the Hydrogen Production Facility;
- construction of the Connection Corridors; and
- construction compounds and temporary construction compounds.

11.6.5 Noise levels experienced by NSRs during such works depend upon several variables, the most significant of which are:

- the noise generated by plant or equipment used on site, generally expressed as sound power levels (Lw) or the vibration generated by the plant;
- the periods of use of the plant on site, known as its on-time;
- the distance between the noise/vibration source and the receptor;
- the noise attenuation due to ground absorption, air absorption and barrier effects;
- in some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- the time of day or night the works are undertaken.

11.6.6 The closest residential NSRs to the Main Site are Marsh House Farm (NSR H5) (approximately 1.3 km to the east) and residential properties Dormanstown (NSR H6) (approximately 1.9 km to the south-east).

11.6.7 The Proposed Development Site covers the full area in which construction may take place, including the Connections Corridors. NSRs located near to the Proposed Development Site have been assessed for the likely noise impact during construction. Distances between the NSRs and the closest construction areas are included in Table 11-18.

Table 11-18: Distances Between Noise Sensitive Receptors and the Nearest Construction Activities

RECEPTOR	ADDRESS	APPROXIMATE MINIMUM DISTANCE TO CONSTRUCTION (m)									
		THE MAIN SITE	ABOVE GROUND PIPELINE CONSTRUCTION	BURIED PIPELINE CONSTRUCTION	TRENCHLESS CROSSINGS	COMPOUNDS					
						BEWLEY	BILLINGHAM	GREATHAM	RBT	SEAL SANDS	WILTON
H1	Manor House Farm, Cowpen Bewley, Billingham	7410	1403	71	53	1254	2618	2536	6634	4568	9630
H1 Buried Pipeline worst affected	Eastmost property on Cowpen Lane towards A1185, Bewley, Billingham	7314	1388	57	123	1202	2640	2470	6555	4495	9559
H1 Trenchless Pipeline worst affected	Orchard House, Cowpen Bewley, Billingham	7597	1456	167	40	1358	2639	2696	6807	4742	9846
H2	Cresswell Road, Grangetown	4426	1473	3364	5220	7005	8017	5740	5740	3984	2817
H3	Kirkleatham Village	4307	468	3218	5137	10160	11624	8749	8709	6372	1437
H4	Seal Sands Office	1707	48	2685	37	4853	6886	3387	1352	1039	4221
H5	Marsh House Farm, Warrenby	1384	1474	947	2821	8724	10691	7261	2580	4793	2468

RECEPTOR	ADDRESS	APPROXIMATE MINIMUM DISTANCE TO CONSTRUCTION (m)									
		THE MAIN SITE	ABOVE GROUND PIPELINE CONSTRUCTION	BURIED PIPELINE CONSTRUCTION	TRENCHLESS CROSSINGS	COMPOUNDS					
						BEWLEY	BILLINGHAM	GREATHAM	RBT	SEAL SANDS	WILTON
H6	58 Broadway West, Redcar	1916	444	1157	3061	8745	10572	7304	3250	4807	1296
H6	83 Broadway West, Redcar	1953	80	1104	2794	8585	10284	7104	3307	4611	938
H7	Bran Sands Waste Water Treatment Plant site offices	827	340	22	1780	7480	9300	6030	1900	3500	1800

11.6.8 The indicative construction programme for the Proposed Development is set out in Chapter 5: Construction Programme and Management (ES Volume I, EN070009/APP/6.2). Construction working hours have been outlined in this chapter in Section 11.5.

11.6.9 As exact construction activities are unknown at this stage, predicted noise levels for construction programme and methods of working are based on the current understanding at this stage in the design of the Proposed Development. This gives an indication of where construction noise is at risk of leading to potentially significant effects. These levels will be reviewed and reassessed if required as information becomes available once the EPC Contractor(s) has been appointed.

11.6.10 The construction noise predictions have been undertaken using noise data for plant and calculation methodologies from BS 5228 (2014a). The Main Site and compound construction follows the plant list provided in combination with the Works Plans (EN070009/APP/2.4). The noise levels have been calculated based on a quarterly programme and the worst-case quarter presented for the construction of the Main Site and compounds. For the Connection Corridor construction elements it is assumed that all plant and activities take place at the closest approach to each NSR along the Connection Corridors. The levels reported for Connection Corridor construction works belong to the activity which has the greatest daily noise emission, an assumption has been made that it is unlikely for multiple activities to occur simultaneously at each worst-case location.

11.6.11 The predicted levels apply to normal weekday daytime (07:00 – 19:00) working, although they could approximate to other time periods where working at the same rate and intensity is proposed. Details on the noise prediction methodology, including a full list of construction plant and associated sound power levels (L_w) for each construction activity, are presented in Appendix 11A (ES Volume III, EN070009/APP/6.4).

11.6.12 A summary of noise predictions for construction works at the Main Site and the Compounds is presented in Table 11-19 and indicative noise predictions at all NSR locations for the Connection Corridor construction works are presented in Table 11-20 to Table 11-21. Free-field noise levels have been predicted to allow subsequent comparison with the ABC categories derived from free-field baseline ambient noise levels at the residential NSRs.

11.6.13 The predictions at H4 and H7 are for daytime only as it has been assumed that the offices will only be occupied during the day.

11.6.14 As advised by BS 5228 (BSI, 2014a), noise levels predicted at distances over 300 m (of which both NSRs for the Main Site are significantly greater than) should be treated with caution due to the increasing importance of meteorological effects. However, given that predicted noise levels at NSRs greater than 300 m from the Main Site are significantly below the LOAEL, the margin of uncertainty is considered insignificant.

11.6.15 With respect to the construction noise for the Connection Corridors, noise predictions have been undertaken for the following activities: buried pipelines,

above ground pipelines, trenchless crossings (HDD) ROW Fencing and Prep, testing and street works. Due to uncertainty of construction locations a and programme, indicative layouts have been used and modelling has been undertaken to predict worst case construction activity.

11.6.16 Indicative noise predictions have been based on the current proposed temporary construction compound locations.

11.6.17 There are electrical connections between the H2 Teesside substation and the NZT PCC banking compound and Pellet Sinter 66KV substation. The shortest approximate distance between any of the proposed substations and the nearest NSR (H5) is approximately 600 m. Given that these works will be carried out in a significant distance away from receptors, with a shorter duration and less plant utilised than the works required for the buried or above ground pipelines, it is not considered these works are likely to result in any significant effects.

Table 11-19: Construction Noise Predictions for the Main Site and Compounds

TIME PERIOD	PREDICTED FREE-FIELD NOISE LEVEL FOR DAYTIME CONSTRUCTION ACTIVITY dB $L_{Aeq,12h}$						
	H1	H2	H3	H4	H5	H6	H7
STANDARD WORKING HOURS (07:00 TO 19:00 WEEKDAY, 07:00 TO 16:00 SATURDAY)	40	42	45	50	47	48	42
EXTENDED WORKING HOURS (OUTSIDE OF STANDARD WORKNIG HOURS)	38	30	32	N/A	36	39	N/A

Table 11-20: Standard Working Hours (07:00 to 19:00 Weekday, 07:00 to 16:00 Saturday) Construction Noise Predictions away from the Main Site

RECEPTOR	PREDICTED FREE-FIELD NOISE LEVEL FOR DAYTIME CONSTRUCTION ACTIVITY dB $L_{Aeq,12h}$						
	H1	H2	H3	H4	H5	H6	H7
Buried Pipeline	68	N/A	N/A	N/A	39	42	43
Above Ground pipeline	31	42	60	82	N/A	52	49
Trenchless (Horizontal Directional Drilling)	78	N/A	N/A	65	22	N/A	38
Testing Works	66	33	51	65	34	44	62

RECEPTOR	PREDICTED FREE-FIELD NOISE LEVEL FOR DAYTIME CONSTRUCTION ACTIVITY dB $L_{Aeq,12h}$						
	H1	H2	H3	H4	H5	H6	H7
ROW Fencing and Prep Construction Works	63	36	55	76	32	47	70
Street Works	62	N/A	52	72	28	49	46
Receptors marked as N/A where they are more than 3000 m away from construction activity or does not occur in extended hours							

Table 11-21: Extended Working Hours Construction Noise Predictions away from the Main Site (for Residential Noise Sensitive Receptors only)

RECEPTOR	PREDICTED FREE-FIELD NOISE LEVEL FOR DAYTIME CONSTRUCTION ACTIVITY dB $L_{Aeq,12h}$				
	H1	H2	H3	H5	H6
Buried Pipeline	61	N/A	N/A	27	29
Above Ground pipeline	14	24	41	N/A	35
Trenchless (Horizontal Directional Drilling)	78	N/A	N/A	22	N/A
Testing Works	66	33	51	34	44
Street Works	62	N/A	52	28	49
Receptors marked as N/A where they are more than 3000 m away from construction activity or does not occur in extended hours					

Construction Noise Effects

Daytime Effects

11.6.18 The effects of the predicted daytime construction noise levels for the Main Site and Compounds (as presented in Table 11-19) and the Connection Corridors (as presented in Table 11-20), have been classified by considering the construction noise thresholds in Table 11-17 and section 11.6 and using the semantic scales in Table 11-5, Table 11-6, Table 11-13 and Table 11-14. These effects are summarised in Table 11-22 and Table 11-23.

Table 11-22: Indicative Construction Noise (free field) Effects for The Main Site and Compounds – Daytime and Saturday (07:00 to 13:00)

RECEPTOR	CLASSIFICATION OF EFFECTS
	MAIN SITE CONSTRUCTION WORKS
H1	NEGLIGIBLE
H2	NEGLIGIBLE
H3	NEGLIGIBLE
H4	NEGLIGIBLE
H5	NEGLIGIBLE
H6	NEGLIGIBLE
H7	NEGLIGIBLE

Table 11-23: Indicative Construction Noise Effects for Pipeline Construction -Daytime and Saturday (07:00 to 13:00)

RECEPTOR	CLASSIFICATION OF EFFECTS						
	H1	H2	H3	H4	H5	H6	H7
Buried Pipeline	Moderate	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Above Ground pipeline	Negligible	Negligible	Negligible	Moderate	Negligible	Negligible	Negligible
Trenchless (Horizontal Directional Drilling)	Major	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Testing Works	Negligible	Negligible	Negligible	Minor	Negligible	Negligible	Negligible
ROW Fencing and Prep Construction Works	Minor	Negligible	Negligible	Moderate	Negligible	Negligible	Minor
Street Works	Minor	Negligible	Negligible	Minor	Negligible	Negligible	Negligible

11.6.19 Construction noise effects at all receptors during construction works at the Main Site and Compounds are predicted to be Negligible (Not Significant) during the daytime period due largely to the distances between the works and NSRs.

11.6.20 There is the potential for Moderate and Major Adverse (Significant) noise effects and exceedance of the SOAEL during daytime Connection Corridor construction at the following NSRs:

- NSR H1 during the daytime for the Buried Pipeline Construction and Trenchless Construction for Pipelines
- NSR H4 during the daytime for Buried Pipeline and ROW Fencing.

11.6.21 Otherwise, all Connection Corridor construction effects are Minor or Negligible Adverse (Not Significant) during the daytime.

Evening and Night-time Effects

11.6.22 It will be necessary for some construction activities to take place continuously, including evening and night periods. This is as expressed by the plant list (as shown in Appendix 11A: Construction Noise Levels and Assumptions (ES Volume III, EN070009/APP/6.4)), defining activities operating either 24/7 or listed as extended hours, during peak construction times of the Proposed Development, although the exact nature of the works is uncertain at this stage. Noise limits for residential NSRs during non-weekday daytime periods have been defined in Table 11-17. The effects of the indicative construction noise levels during evenings and weekends based on the activities occurring outside of standard hours are shown in Table 11-24 to Table 11-27. It is assumed the office buildings at NSR H4 and H7 will not be used during evenings and weekends and so is not included in these tables.

Table 11-24: Indicative Construction Noise (free field) Effects for The Main Site and Compounds – Evenings and Weekends

RECEPTOR	CLASSIFICATION OF EFFECTS (SATURDAY 13:00 TO 16:00/OTHER WEEKEND AND EVENING)
	MAIN SITE CONSTRUCTION WORKS
H1	Negligible/Negligible
H2	Negligible/Negligible
H3	Negligible/Negligible
H5	Negligible/Negligible
H6	Negligible /Negligible

Table 11-25: Indicative Construction Noise Effects for Pipeline Construction - Evening and Weekends – Buried

RECEPTOR	CLASSIFICATION OF EFFECTS (SATURDAY 13:00 TO 16:00/OTHER WEEKEND AND EVENING)				
	H1	H2	H3	H5	H6
Buried Pipeline	Major/Major	N/A	N/A	Negligible/Negligible	Negligible/Negligible
Above Ground pipeline	Negligible/Negligible	Negligible/Negligible	Moderate/Negligible	N/A	Minor/Negligible
Trenchless (Horizontal Directional Drilling)	Major/Major	N/A	N/A	Negligible/Negligible	N/A
Testing Works	Major/Major	Negligible/Negligible	Minor/Minor	Negligible/Negligible	Negligible/Negligible
ROW Fencing and Prep Construction Works	Major/ N/A	Negligible/ N/A	Minor/ N/A	Negligible/ N/A	Negligible/ N/A
Street Works	Major/Major	N/A	Minor/Minor	Negligible/Negligible	Negligible/Negligible
Receptors marked as N/A where construction activity or does not occur in extended hours					

11.6.23 Comparison of the predicted daytime noise levels for construction on the Main Site and Compounds against the construction noise limits for evening and weekend working indicate Negligible effects (Not Significant) for all NSRs.

11.6.24 There is the potential for Moderate and Major Adverse (Significant) noise effects and exceedance of the SOAEL during evening and weekend Connection Corridor construction at the following NSRs:

- At NSR H1 for the Buried Pipeline construction methods, Trenchless construction for pipelines, Testing and Street Works and, during Saturday 13:00 to 16:00 for ROW Fencing and Prep; and
- At NSR H3 for Above Ground Pipeline Construction Methods (only Saturday 13:00 to 16:00).

11.6.25 Otherwise, all Connection Corridor construction effects are Minor Adverse or Negligible Adverse (Not Significant) during the evening and weekend.

11.6.26 The effects of the indicative construction noise levels during the night, if the same intensity of working as for the daytime is assumed as worst case, are shown in Table 11-26 for residential NSRs closest to the Main Site and Compounds and Table 11-27 for Pipeline construction effects at residential NSRs. It is assumed that the office buildings at NSRs H4 and H7 will not be used during the night-time and so is not included in these tables.

Table 11-26: Indicative Construction Noise Effects for the Main Site and Compounds - Night-Time - Nearest Residential Noise Sensitive Receptors

RECEPTOR	CLASSIFICATION OF EFFECTS
	FOUNDRY CONSTRUCTION WORKS
H1	Negligible
H2	Negligible
H3	Negligible
H5	Negligible
H6	Negligible

Table 11-27: Indicative Construction Noise Effects for Pipeline Construction - Night-Time

RECEPTOR	CLASSIFICATION OF EFFECTS				
	H1	H2	H3	H5	H6
Buried Pipeline	Major	N/A	N/A	Negligible	Negligible
Above Ground pipeline	Negligible	Negligible	Negligible	N/A	Negligible
Trenchless (Horizontal Directional Drilling)	Major	N/A	N/A	Negligible	N/A
Testing Works	Major	Negligible	Minor	Negligible	Negligible
Street Works	Major	N/A	Minor	Negligible	Negligible

11.6.27 Comparison of the predicted night-time noise levels for construction on the Main Site and Compounds against the construction noise limits for night-time working indicate Negligible effects (Not Significant) for all NSRs.

11.6.28 There is the potential for Moderate and Major Adverse (Significant) noise effects and exceedance of the SOAEL during Connection Corridor construction at night at the following NSR:

- At NSR H1 for the Buried Pipeline Construction Works, for Trenchless Construction for Pipelines, Testing and Street Works.

11.6.29 Otherwise, all Connection Corridor construction effects are Minor or Negligible Adverse (Not Significant).

11.6.30 Major Adverse (Significant) effects are predicted at some of the assessed receptors when working at the closest approach. This is largely due to the short distance from these properties to the Connection Corridors. It is unlikely that the noisiest construction activities associated with the construction of the Connection Corridors will take place as close to properties as assumed in the calculations for a significant period and further design refinements will better define the Connection Corridors and increase the separation distance to identified sensitive noise receptors. Also, as the site works progress and move further away from NSRs, adverse effects will reduce. This should therefore reduce the predicted disruption.

11.6.31 Construction activities taking place outside normal working hours will need to be planned, managed and controlled appropriately so they do not exceed the limits for construction noise that have been defined in Table 11-17. Provided noise limits are not exceeded, construction activities outside of normal working hours will not exceed the SOAEL and can be considered as having a Minor Adverse or Negligible Adverse effect (Not Significant). Potential measures to ensure that appropriate embedded mitigation is in place during the works have already been discussed in Section 11.5.

Construction Traffic Noise

11.6.32 The potential changes in road traffic noise as a result of the Proposed Development have been considered by calculating the BNL at 10 m as per the methodology in CRTN (DfT, 1998)_ from the road and comparing the change.

Table 11-28: Changes in Road Traffic Noise due to the Construction of the Proposed Development

LINK	'WITHOUT' PROPOSED DEVELOPMENT CONSTRUCTION FLOWS 2026			'WITH' PROPOSED DEVELOPMENT CONSTRUCTION FLOWS 2026			CHANGE IN BNL, dB	MAGNITUDE OF IMPACT
	AAWT	% HGV	SPEED (KM/H)	AAWT	% HGV	SPEED (KM/H)		
A1085 Trunk Road, 100 m east of Ennis Road	14,003	7.9	60	14,292	7.7	60	0.1	Very Low
A1085 Trunk Road, 1345 m south of West Coatham Lane	17,194	10.8	60	18,264	11.2	60	0.3	Very Low
A1042 Kirkleatham Lane, 85 m south of Staintondale Avenue	13,273	7.2	50	13,418	7.1	50	0.0	No Change
A1085 Trunk Road, 500 m north of A1053 Tees Dock Road	18,324	14.0	97	19,394	14.1	97	0.2	Very Low
A1085 Broadway, 235 m east of Birchington Avenue	9,377	7.7	50	9,615	7.5	50	0.1	Very Low
A1380 High Street, 50 m east of Lackenby Lane	11,069	9.1	50	11,126	9.0	50	0.0	No Change
A66, 140 m east of Whitworth Road	23,115	20.2	80	23,834	19.9	80	0.1	Very Low
A1046 Port Clarence Road, 20 m north of Beech Terrace	9,718	12.1	50	9,943	12.2	50	0.1	Very Low
A178 Seaton Carew Road, 535 m north of Huntsman Drive	9,813	13.2	81	10,038	13.3	81	0.1	Very Low
Unnamed Road, 725 m east of A178 Seaton Carew Road	5,256	19.0	81	5,519	18.8	81	0.2	Very Low

LINK	'WITHOUT' PROPOSED DEVELOPMENT CONSTRUCTION FLOWS 2026			'WITH' PROPOSED DEVELOPMENT CONSTRUCTION FLOWS 2026			CHANGE IN BNL, dB	MAGNITUDE OF IMPACT
	AAWT	% HGV	SPEED (KM/H)	AAWT	% HGV	SPEED (KM/H)		
A1053 Greystone Road	14,844	10.5	97	15,041	10.9	97	0.1	Very Low
A174 (West of Greystone Roundabout)	35,341	7.7	97	35,482	7.9	97	0.0	No Change
B1275 Belasis Avenue	2,882	3.1	50	2,994	3.6	50	0.2	Very Low
A1185 (west of A178 Seaton Carew Road)	5,667	23.7	81	5,740	24.0	81	0.1	Very Low
A1046 Haverton Hill Road	16,289	8.7	?	16,402	8.8	?	0.0	No Change

11.6.33 Table 11-28 shows either no change or very low change in road traffic noise due to traffic flows along the construction traffic routes of the Proposed Development. This is a worst-case assessment as the traffic data includes predicted flows from other committed developments in the vicinity. This will result in Negligible Adverse (Not Significant) effects at local residential NSRs and are below the LOAEL. Based upon the above, no further specific mitigation measures are proposed in addition to those as detailed in Section 11.5.

Construction Vibration from the Main Site

11.6.34 The level of vibration impact at different receptors will be dependent upon a number of factors including the distance between the works and receptors, ground conditions, the nature and method of works required close to receptors and the specific activities being undertaken at any given time.

11.6.35 There are no residential receptors within proximity to the Main Site to be significantly affected by construction vibration. Due to distances of at least 1.3 km to residential receptors vibration effects are likely to be Negligible Adverse (Not Significant).

Construction Vibration from the Connection Corridors

11.6.36 The Hydrogen Pipeline Corridor is in close proximity (less than 100 m) to NSRs H1 and H4. However, according to the pipeline corridors and their corresponding plant list, there is no equipment that can damage properties via vibration, the only receptors susceptible to vibratory equipment are H1 and H4. Whilst it is considered unlikely that most typical construction working routines will generate levels of vibration above which building damage would be expected to be sustained (subject to final plant and working requirements), there is the potential that vibration impacts could cause annoyance to occupants of the NSRs and exceed the LOAEL and SOAEL as set out in Section 11.3 unless appropriate control measures are applied.

11.6.37 Predictions of vibration levels are made in Table 11-29 at receptors H1 and H4 for the items plant identified as potential sources of vibration.

Table 11-29: Vibration Equipment Peak Particle Velocity Indicative Predictions

VIBRATORY EQUIPMENT	DISTANCE	PEAK PARTICLE VELOCITY (V_{res}),mm/s	CLASSIFICATION OF EFFECT
H1			
Hydraulic Hammer	61 m	0.25	Negligible
Tracked Drilling Rig	61 m	0.25	Negligible
H4			
Hydraulic Hammer	57 m	0.28	Negligible
Tracked Drilling Rig	57 m	0.28	Negligible

11.6.38 Table 11-29 shows a negligible construction vibration effect based upon the construction vibration thresholds set out in Table 11-8 and are below the LOAEL. Based upon the above, no further specific mitigation measures are proposed in addition to those as detailed in Section 11.5.

Operation

11.6.39 Operational noise modelling has been undertaken using available sound data for the Proposed Development plant and information based on similar projects. The assessment presented below sets out the realistic worst case potential impacts and effects associated with the operation of the Production Facility.

11.6.40 The following assumptions have been made when undertaking the operational noise modelling:

- the Production Facility will operate continually at full load, 24 hours a day;
- sound power levels (Lw) used in modelling of previous similar projects have been inputted for all principal noise emitting buildings/elements (air inlet filters, electrical buildings, transformers, workshops etc.). These sound power levels have been supplemented by octave band data from similar projects;
- enclosed sound sources have been modelled as steel clad buildings with an internal sound pressure level of 85 dB; and
- corrections for tonality, impulsivity, and intermittency have not been applied on the assumption that these potential features will be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding louvres and silencers/attenuators.

11.6.41 For the NSRs assessed for operational noise (H4, H5 and H6), there are other industrial sound sources closer than the Proposed Development Site. The predicted sound levels produced by the Hydrogen Production Facility are below the existing Background Sound Levels at NSR H4 and NSR H6 as shown in Table 11-31 and at NSR H5 below the existing ambient sound levels for both day and night. It is therefore not expected that noise from operation of the Hydrogen Production Facility will be distinctive above the residual acoustic environment at these NSRs. Therefore, no correction has been applied for other sound characteristics.

11.6.42 Details of the noise source sound power level (Lw) data, the settings used in the noise modelling software and the list of assumptions used are presented in Appendix 11B (ES Volume III, EN070009/APP/6.4).

11.6.43 The predicted free-field operational specific sound levels at the NSRs around the Hydrogen Production Facility are presented in Table 11-30. The results presented are for the storey of the residence with the highest predicted level. Assuming continual 24-hr operation, the predicted noise levels could apply to 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

Table 11-30: Predicted Operational Sound Levels

RECEPTOR	PREDICTED OPERATIONAL SPECIFIC SOUND LEVEL $L_{Aeq,1h,}$ dB
H4	37
H5	40
H6	36
H7	38

11.6.44 The daytime and night-time BS 4142 assessments are presented in Table 11-31. In addition, the magnitude of impact and effect classification has been included based upon the BS4142 assessment outcomes, with reference to the semantic scales in Table 11-11, Table 11-13 and Table 11-14.

Table 11-31: BS 4142 Assessment Without Further Mitigation

RECEPTOR	NSR H4	NSR H5		NSR H6		NSR H7
TIME PERIOD	DAYTIME	DAYTIME	NIGHT-TIME	DAYTIME	NIGHT-TIME	DAYTIME
Specific sound level *L*s ($L_{Aeq,Tr}$), dB	37	40	40	36	36	38
Acoustic feature correction, dB	+0	+0	+0	+0	+0	+0
Rating level ($L_{Ar,Tr}$), dB	37	40	40	36	36	38
Representative background sound level ($L_{A90,T}$), dB	53	39	36	45	43	39*
Excess of rating level over background sound level ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	-16	+1	+4	-7	-5	-1
BS 4142:2014 assessment outcome	Low impact	Low impact	Adverse impact depending on the context**	Low impact	Low impact	Low impact
Magnitude of impact (assigned from Table 11-11)	Very low	Very Low	Low	Very low	Very low	Very low
Receptor Sensitivity	Medium	High	High	High	High	Medium

RECEPTOR	NSR H4	NSR H5		NSR H6		NSR H7
Classification of effect (assigned from Table 11-14)	Negligible	Negligible	Minor	Negligible	Negligible	Negligible
*background sound level data not available at H7 so the daytime background sound level at H5 is used, this is the lowest measured so a conservative value **As per the guidance in BS 4122 the context is also considered. See below						

11.6.45 For NSRs H4, H6 and H7, the BS 4142 rating level is below the background sound levels. Predicted effects are therefore categorised as Negligible Adverse (Not Significant) with no specifically designed mitigation in place. For NSR H5 the BS 4142 rating level is 1 dB above the daytime background sound level, which is categorised as Negligible Adverse(Not Significant) and 4 dB above the night-time background sound level, which is categorised as Minor Adverse (Not Significant). The predicted noise levels at NSRs are below the LOAEL (+5 dB) for residential receptors at NSRs H4, H5 and H6 during the day and night for the BS 4142 assessment comparison of rating levels and background sound levels.

Consideration of Context Working

11.6.46 There are other industrial noise sources in the vicinity of the selected NSRs. Several new industrial sources will be introduced by the Proposed Development, noting that the area has a history of industrial noise sources, including from the former Redcar Steelworks site. This is likely to mean that many residents in the local communities are already accustomed to an industrial sound environment.

11.6.47 NSR H5 (Marsh House Farm) is representative of a single dwelling rather than a receptor group. The predicted Minor Adverse (Not Significant) effects only at this single dwelling.

11.6.48 Table 11-32 presents the existing ambient sound levels and future predicted specific sound levels during the operation of the Proposed Development at NSR H5 (Marsh House Farm) which is the closest residential receptor to the Main Site. Table 11-32 also presents the future predicted ambient sound levels (assuming constant operation of the Production Facility) and compares them to the BS 8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for bedrooms and sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h}$ at night and 35 dB $L_{Aeq,16h}$ during the day, which would be equivalent to an external criterion of 45 dB $L_{Aeq,8h}$ and 50 dB $L_{Aeq,16h}$ assuming open bedroom windows for ventilation. The predicted change in ambient sound levels can also be contextualised in accordance with Table 11-12.

Table 11-32: Comparison of Ambient Sound Levels at NSR H5

TIME PERIOD	EXISTING AMBIENT SOUND LEVEL $L_{Aeq,T,}$ dB	WHO 'GUIDELINES FOR COMMUNITY NOISE' EXTERNAL CRITERION	EXISTING DIFFERENCE FROM WHO CRITERION	PREDICTED SPECIFIC SOUND LEVEL, L_S ($L_{Aeq,T}$) dB	LOGARITHMIC SUM OF EXISTING AMBIENT SOUND LEVEL WITH PREDICTED SPECIFIC SOUND LEVEL, $L_{Aeq,T,}$ dB	PREDICTED INCREASE IN AMBIENT SOUND LEVEL DUE TO THE PROPOSED DEVELOPMENT, $L_{Aeq,T,}$ dB	MAGNITUDE OF IMPACT OF NOISE CHANGE USING IEMA GUIDELINES AS PRESENTED IN TABLE 11-12.	PREDICTED FUTURE DIFFERENCE FROM WHO CRITERION
Daytime (16hr)	51	50	+1	40	51	+0.3	Low	+1.3
Night-time (8hr)	44	45	-1	40	46	+1.5	Low	+1.5

11.6.49 As shown in Table 11-32, there is a predicted increase in the daytime ($L_{Aeq,16hr}$) ambient sound level of +0.3 dB and during the night-time the ambient sound level ($L_{Aeq,8hr}$) is predicted to increase by +1.5 dB. These predicted levels of increase in ambient sound would be classified as low for both the daytime and night-time periods.

11.6.50 WHO 'Guidelines for Community Noise' recommend indoor ambient sound levels for resting during the daytime and sleeping at night-time. The recommended internal criterion is 35 dB $L_{Aeq,16hr}$ during the day and 30 dB $L_{Aeq,8hr}$ at night, which would be equivalent to an external criterion of 50 dB $L_{Aeq,16hr}$ and 45 dB $L_{Aeq,8hr}$ respectively assuming open windows for ventilation. During the day this criterion is exceeded without the Proposed Development and there is an increase of 0.3 dB in ambient sound level due to noise from the Proposed Development. In accordance with Table 11-12, the magnitude of impact due to noise level changes from the Proposed Development is categorised as Low during the daytime and the significance of effect is assigned Minor Adverse (Not Significant) from Table 11-14.

11.6.51 At night, the criterion is not exceeded without the Proposed Development however, there is an increase of 1.5 dB, due to noise from the Proposed Development. This is below the level of change in a sound level that would be just perceptible under normal environmental conditions. In accordance with Table 11-12, the magnitude of impact due to noise level changes from the Proposed Development is categorised as Low, and the significance of effect assigned from Table 11-14 is Minor Adverse (Not Significant).

11.6.52 Even though above BS 4142 assessment does not predict significant adverse effects potential options to minimise noise levels at NSR H5 are discussed in Section 11.7.

Combined Construction and Operation

11.6.53 There will be a period following opening of Phase 1 when Phase 1 will be operational and Phase 2 in construction. The predicted operational sound levels presented in Table 11-30 are more than 10 dB below the construction noise limits presented in Table 11-17 for day, evening and night. This means that where construction noise effects are reported these will not be worsened by operation of phase 1 and the effects reported for construction will apply to the combined construction and operation phase.

Decommissioning

11.6.54 The full details of the decommissioning of the Hydrogen Production Facility are uncertain at this time. However, the assessment of the decommissioning has been undertaken using the same methodology as the construction assessment and at this stage assume the same construction noise limits will apply for the decommissioning work. The mitigation measures set out in Section 11.5 for construction noise and vibration will also be appropriate mitigation during the decommissioning stage. The indicative predicted decommissioning noise levels include 5 dB to 10 dB attenuation (based on guidance in BS 5228 Table B.1 (BSI 2014a) due to the standard mitigation as detailed in Section 11.5.

11.6.55 The potential decommissioning noise levels from the demolition of the Main Site have been predicted at the closest representative NSRs as presented in Table 11-33.

Table 11-33: Indicative Predicted Decommissioning Noise Level

RECEPTOR	PREDICTED DECOMMISSIONING NOISE LEVEL $L_{Aeq,T,}$ dB	CLASSIFICATION OF EFFECTS DAYTIME	CLASSIFICATION OF EFFECTS EVENING/ WEEKEND	CLASSIFICATION OF EFFECTS NIGHT
H4*	38-43	Negligible	N/A	N/A
H5	40-45	Negligible	Negligible	Minor
H6	38-44	Negligible	Negligible	Negligible
H7*	46-51	Negligible	N/A	N/A

* H4 and H7 (Offices) are assumed to only be occupied during daytime hours

11.6.56 During decommissioning of the Main Site, Negligible (Not Significant) noise effects are predicted during the daytime. If the decommissioning work were to be undertaken during the evening/weekend, at the same intensity as the daytime activities, Negligible (Not Significant) effects would be expected at all NSRs. If decommissioning works were to be undertaken during the night-time, at the same intensity as the daytime activities, Minor Adverse (Not Significant) effects at NSR H5, and Negligible (Not Significant) effects at NSR H6 would be expected.

11.7 Essential Mitigation and Enhancement Measures

Construction

Essential Mitigation

11.7.1 The working methods and extents of the Connection Corridors are currently being refined, noting that evening, weekend and night-time working will be kept to a minimum.

11.7.2 The preferred approach for controlling construction noise and vibration is to reduce levels at source where possible, but with due regard to practicality. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

11.7.3 In addition to the noise control measures presented within Section 11.5 where significant construction effects are predicted, additional noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs and cranes will be considered and implemented where practicable. The use of temporary barriers or screens may also provide additional mitigation. These additional mitigation measures can provide up to 15 to 20 dB sound reduction (based on Table B.1 in BS 5228). These additional methods, along with further measures identified through further detailed assessment, if required, will be detailed once the final construction plant and methods have been confirmed.

11.7.4 Residual effects after mitigation are described in Section 11.8.

Operation

Essential Mitigation

11.7.5 Based on the current assessment, significant adverse effects are not predicted during the daytime and night-time periods at the closest NSRs including NSR H5.

11.7.6 The assessment has assumed that potential noise of a tonal, impulsive or intermittent nature will be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary.

11.7.7 During the detailed design stage mitigation measures and general principles to minimise noise will be considered as part of BAT. These measures may include, but not limited to the following depending on the potential benefits achieved from such measures:

- Partial enclosure of the open doors of the compressor houses by installing roller shutter doors to allow access for maintenance. Note the bottom section of the compressor house will be kept open for air flow;
- use of quieter fin fans (potential to reduce from 85 dB at 1 m to 80 dB at 1 m); and
- orientation of plant within the site to provide screening of low-level noise sources by other buildings and structures, or orientating fans and the air inlets away from sensitive receptors.

11.7.8 Initial predictions show that the partial enclosure of the compressor houses and use of quieter fin fans would result in a 1 dB reduction in the specific sound level at NSR H5.

11.7.9 During detailed design of the Proposed Development, it may be desirable or more practical to apply higher attenuation to some plant items/buildings and to reduce the attenuation applied to other plant items/buildings and still achieve noise levels below the LOAEL.

Decommissioning

Essential Mitigation

11.7.10 As no significant effects are predicted, no further mitigation measures are required for the decommissioning of the Proposed Development.

11.8 Residual Effects and Conclusions

11.8.1 A summary of the residual noise effects, assuming the implementation of all appropriate mitigation to reduce noise and vibration during construction, operation and decommissioning of the Proposed Development is presented in Table 11-34.

11.8.2 Table 11-34 indicates that with the specification of additional mitigation measures associated with the construction, operation and decommissioning of the Proposed Development, it is currently anticipated that noise and vibration effects can be reduced to non-significant levels.

Table 11-34: Residual Noise Effects

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
Construction	Noise effects during construction on the Main Site and Compounds.	Negligible (Not Significant) at the nearest NSRs (NSRs, H5, H6 and H7) during the daytime, and during the evening and weekends and night-time for NSRs H5 and H6.	Further detailed assessment particularly regarding working outside of daytime working hours.	Negligible (Not Significant) on the basis that similar construction techniques to those used in indicative calculations are used.	St, T, D
Construction	Noise effects during construction of the Connection Corridors.	Up to Major Adverse (Significant) effects at the NSR H1 during the daytime for Buried Pipeline Construction Works and Trenchless Construction for Pipelines. Up to Moderate Adverse (Significant) effects at the non-residential NSR H4 for the Buried Pipeline Construction Works and ROW Fencing.	Further detailed assessment particularly regarding working outside of daytime working hours.	Minor Adverse or less (Not Significant) on the basis that BS 5228 ABC noise limits are met.	St, T, D

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
		Up to Major Adverse (Significant) effects during the evening and weekend period at NSR H1 for the Buried Pipeline Construction Works, Trenchless Construction for Pipelines, Testing and Street Works and, during Saturday 13:00 to 16:00 for ROW Fencing and Prep Up to Moderate Adverse (Significant) effects at NSR H3 for Above Ground Pipeline Construction Methods (only Saturday 13:00 to 16:00). Up to Major Adverse (Significant) effects during the night-time period at NSR H1 for Buried Pipeline Construction Works and Testing and Street Works.			

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
Construction	Noise effects due to construction traffic.	Negligible (Not Significant).	None.	Negligible (Not Significant).	St, T, D
Construction	Vibration effects during Pipeline Construction	Negligible (Not Significant).	Further detailed assessment, avoid the use of vibratory plant in proximity to NSRs where possible.	Negligible (Not Significant).	St, T, D
Operation	Operation of the Production Facility.	Negligible Adverse effects at the nearest NSR. (NSR H5) during the daytime and Minor Adverse (Not Significant) effects at H5 during the night-time. Negligible Adverse (Not Significant) effects at all other receptors	Limits on noise emissions from plant and equipment at source secured via a Requirement of the draft DCO. Further detailed assessment at design stage in conjunction with design engineers.	Up to Minor Adverse at NSR H5 (Not Significant). Negligible Adverse (Not Significant) effects at all other receptors	Lt, P, D
Decommissioning	Noise effects during decommissioning of the Main Site.	Negligible (Not Significant) at the nearest NSRs (NSRs H4, H5, H6 and H7) during the daytime. Negligible (Not Significant) at the	Further detailed assessment prior to decommissioning, particularly regarding	Negligible Adverse (Not Significant) on the basis that similar decommissioning	St, T, D

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
		nearest residential NSRs (NSRs H5 and H6) during the evening and weekend period. During the night-time period, Negligible (Not Significant) at NSR H6 and Minor Adverse (Not Significant) at NSR H5.	working outside of daytime working hours.	techniques to those used in indicative calculations are used.	

11.9 References

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