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9. Noise and Vibration

9.1. Introduction

9.1.1. This chapter of the Environmental Statement (ES) addresses the potential effects of noise and vibration resulting from the Proposed Development on local noise sensitive receptors (NSR).

9.1.2. Impacts during the construction, operation (including maintenance) and decommissioning of the Proposed Development are assessed. In particular, the assessment considers:

- existing and future baseline conditions;
- the effects of construction of the Proposed Development on NSR during the site clearance and construction works including predicted changes in road traffic noise levels on the local road network;
- the effects of noise and vibration resulting from operation of the Proposed Development; and
- the effects of noise and vibration resulting from decommissioning of the Proposed Development.

9.1.3. The cumulative effects of noise and vibration associated with the Proposed Development and other committed developments in the vicinity are described in **ES Volume I Chapter 21**: Cumulative and Combined Effects (**Application Document Ref. 6.2**).

9.1.4. This chapter is supported by **ES Volume III Figure 9.1:** Study Area (**Application Document Ref. 6.4)** and **ES Volume II Appendix 9A:** Construction Noise and Vibration Assumptions and **Appendix 9B:** Operational Noise Assumptions (**Application Document Ref. 6.3**).

9.1.5. This chapter assesses the impacts of noise and vibration on residential and other human receptors. The assessment of noise and vibration impacts on relevant ecological receptors is presented in **ES Volume I Chapter 11**: Biodiversity and Nature Conservation (**Application Document Ref. 6.2**) and the Habitat Regulations Assessment (HRA) Report (**Application Document Ref. 5.2**).

9.2. Legislation, Planning Policy and Guidance

9.2.1. This section discusses the legislation, planning policy context and standards relevant to assessing the impacts of noise on residential and

other human receptors. The legislation, planning policy context and standards applicable to assessment of noise impacts on the relevant ecological and cultural heritage receptors are discussed respectively in **ES Volume I Chapter 12**: Water Resources and Flood Risk and **Chapter 15**: Cultural Heritage (**Application Document Ref. 6.2**).

Legislation

Environmental Protection Act 1990

9.2.2. The Environmental Protection Act (EPA) 1990 Part 3 identifies that noise (and vibration) emitted from premises (including land) can, at certain levels, be prejudicial to health or give rise to statutory nuisance.

9.2.3. 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 must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either the abatement of the nuisance or works to abate the nuisance to be undertaken, or it prohibits or restricts the relevant 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.

9.2.4. 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; however, 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.

Control of Pollution Act 1974

9.2.5. Sections 60 and 61 of the Control of Pollution Act 1974 (CoPA) 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 authority with instructions to cease work until specific conditions to reduce noise have been adopted.

9.2.6. 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. dCoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site.

Environmental Permitting Regulations 2016 (as amended)

9.2.7. The Environmental Permitting (England and Wales) Regulations 2016 (EPR) 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. The environmental permit applies only to the operational and decommissioning phase, not to the construction phase.

9.2.8. In terms of noise specifically, the selection of BAT is 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.

9.2.9. The definition of pollution in Regulation 2 of the EPR includes emissions "*which may be harmful to human health or the quality of the environment, cause offence to a human sense, result in damage to material property, 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 statutory nuisance legislation which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, "offence to a human sense" 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 still further at reasonable costs and this may therefore be BAT for the control of noise emissions from an installation. Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

9.2.10. Guidance regarding environmental permitting and noise is available in the Environment Agency's 'Noise and vibration management: environmental permits' (Environment Agency, 2022)

Planning Policy Context

National Planning Policy

9.2.11. National Policy Statements (NPS) are, where in place, the primary basis for the assessment and determination of applications for Nationally Significant Infrastructure Projects (NSIP), such as the Proposed Development. Section 5.12 of the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy Security & Net Zero (DESNZ) 2023) refers to the Government's policy on noise within the Noise Policy Statement for England (NPSE) (discussed further below) and sets out requirements for noise and vibration assessment for NSIP.

9.2.12. With regards to 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)." (paragraph 5.12.15)

9.2.13. Section 4 of NPS EN-1 describes general policies and considerations relevant to the Proposed Development.

9.2.14. The NPS for natural gas electricity generation infrastructure (EN-2) (DESNZ, 2023) sets out policy specific to nationally significant gas electricity generating infrastructure. In respect of the consideration of noise mitigation, NPS EN-2 states:

> "As described in Section 5.12 of EN-1, the primary mitigation for noise from natural gas electricity generating stations is through good design, including enclosure of plant and machinery in noise-reducing buildings wherever possible and to minimise the potential for operations to create noise. Noise from gas turbines should be mitigated by attenuation of exhausts to reduce any risk of low-frequency noise transmission.
>
> Noise from apparatus external to the main plant may be unavoidable. This can be mitigated through careful plant selection." (paragraph 2.5.10 and 2.5.11)

9.2.15. The NPS for natural gas supply infrastructure and gas and oil pipelines (EN-4) (DESNZ, 2023) sets out policy specific to nationally significant natural gas and oil infrastructure.

9.2.16. Specific sources of noise are identified within NPS EN-4. Those that are relevant to the Proposed Development include 'noise from the compressors and drivers (usually contained in buildings), associated pipework and external coolers'. With respect to pipelines and mitigation, NPS EN-4 states:

> "Where it is not considered practicable to select a route that avoids below surface usage, applicants must demonstrate in the ES that mitigating measures will be put in place to avoid adverse effects both on other below ground works and on the pipeline." (paragraph 2.22.1)

"Noise mitigation measures applicants should consider for gas and oil pipelines, in particular their associated above-ground installations, include screening or enclosure of compressors and pumps." (paragraph 2.22.3)

"Other measures could include the use of sound attenuators on ventilation systems, acoustic lagging on pipework, multi-stage (inherently quiet) control valves, gas turbine exhaust silencers, and high efficiency low speed cooler fans, depending on the specific issues." (paragraph 2.22.4)

9.2.17. On 24 April 2025, DESNZ published a consultation on revisions to the NPS, which concluded on 29 May 2025 (DESNZ, 2025). The outcome of the Consultation is still awaited, however it is not anticipated to result in changes which would materially alter the conclusions as set out in this Chapter.

9.2.18. Table 9.1 provides a summary of the NPS advice regarding noise and vibration and how each has been considered in this chapter.

Table 9.1: Summary of relevant NPS advice regarding noise and vibration

Summary of NPS	Consideration within chapter
NPS-EN1	
Paragraph 5.12.6 states: "Where noise impacts are likely to arise from the proposed development, the Applicant should include the following in the noise assessment: • A description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal characteristics, if the noise is impulsive, whether the noise contains particular high or low frequency content or any temporal characteristics of the noise; • Identification of noise sensitive receptors and noise sensitive areas that may be affected; • The characteristics of the existing noise environment; • A prediction of how the noise environment will change with the proposed development;	Descriptions of noise generating aspects of the Proposed Development, together with assessment of construction, operational and decommissioning noise and vibration impacts are presented in Section 9.6. NSR including proximity of any Noise Important Areas (NIA) are identified in Section 9.2. Information relating to the existing noise environment is presented in Section 9.4. The mitigation of construction and operational noise is discussed in Section 9.5 and 9.7.

Summary of NPS	Consideration within chapter
○ In the shorter term such as during the construction period; ○ In the longer term during the operating life of the infrastructure; ○ At particular times of the day, evening and night (and weekends) as appropriate, and at different times of the year; • An assessment of the effect of predicted changes in the noise environment on any noise-sensitive receptors, including an assessment of any likely impact on health and quality of life / well-being where appropriate, particularly among those disadvantaged by other factors who are often disproportionately affected by noise-sensitive areas; • If likely to cause disturbance, an assessment of the effect of underwater or subterranean noise; • All reasonable steps taken to mitigate and minimise potential adverse effects on health and quality of life. The nature and extent of the noise assessment should be proportionate to the likely noise impact."	
Paragraph 5.12.8 states: "Applicants should consider the noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation"	Potential construction related traffic noise effects on human NSR have been assessed in Section 9.6.
Paragraph 5.12.9 states: "Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant	Potential operational noise effects on human NSR are presented in Section 9.6.

Summary of NPS	Consideration within chapter
British Standards and other guidance which also give examples of mitigation strategies..”	
Paragraph 5.12.10 states: “Some noise impacts will be controlled through environmental permits and parallel tracking is encouraged where noise impacts determined by an environmental permit interface with planning issues (i.e. physical design and location of development). The applicant should consult the EA and/or the SNCB, and other relevant bodies, such the MMO or NRW, as necessary, and in particular regarding assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be considered.”	Potential effects of noise on biodiversity and nature conservation are considered in **ES Volume I Chapter 11:** Biodiversity and Nature Conservation (**Application Document Ref. 6.2**) and HRA Report (**Application Document Ref. 5.2**). The Applicant has also prepared an Environmental Permit Application that will be submitted shortly after the Application.
Paragraph 5.12.15 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 9.5 of this chapter describes the impact avoidance measures identified as relevant to the Proposed Development.
Section 5.12 sets out generic considerations to be given to the impacts of noise and vibration.	A noise assessment is included within this chapter.
NPS EN-2	
NPS EN-2 includes policy on noise and vibration, and in paragraph 2.4.29 it notes that the ES must include a noise assessment as described in EN-1, including an assessment of the effect of underwater or subterranean noise. In paragraph 2.5.10 it notes that the primary mitigation for noise from natural gas electricity generating stations is through good design,	A noise impact assessment is included within this chapter. Mitigation measures which may be employed to minimise any potential noise impacts are described in section 9.8.

Summary of NPS	Consideration within chapter
including enclosure of plant and machinery in noise-reducing buildings wherever possible. It then notes that noise from gas turbines should be mitigated by attenuation of exhausts and that noise from external plant may be mitigated throughout careful plant selection.	

National Planning Policy Framework

9.2.19. The National Planning Policy Framework (NPPF) (DLUHC, 2025) is a matter which the Secretary of State is likely to consider both *"relevant and important"* in determining an application for a DCO. NPPF sets out the Government's planning policies for England and how these are expected to be applied.

9.2.20. Paragraph 187 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."

9.2.21. Paragraph 198 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:
> - mitigate and reduce to a 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;
> - identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".

9.2.22. With regards to 'adverse effects' and 'significant adverse effects' the NPPF (DLUHC, 2025) 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

9.2.23. 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 (Defra, 2010) applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

9.2.24. 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".

9.2.25. 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 improvement of health and quality of life."

9.2.26. 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.

9.2.27. The Explanatory Note for the NPSE (Defra, 2010) 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, there is no detectable effect on health and quality of life due to noise;
- Lowest Observable 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.

9.2.28. 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.

9.2.29. The NPSE (Defra, 2010) recognises that it is not possible to have uniform objective noise-based measures that define the SOAEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and times of the day.

Planning Practice Guidance - Noise

9.2.30. The Planning Practice Guidance (PPG) (MHCLG, 2019b) was first published on 6th March 2014 to provide a web-based resource with more in-depth guidance to the NPPF (DLUHC, 2025). The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. The PPG was last updated for noise in July 2019.

9.2.31. The guidance advises that local planning authorities 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.

9.2.32. This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). A summary from PPG of the likely average response to noise of those affected is provided in Table 9.2.

Table 9.2: Planning Practice Guidance noise exposure hierarchy

Perception	Examples of outcomes	Effect level	Action
Not present	No effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard but does not cause any change in behaviour, attitude or other physiological response. It can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to	Significant Observed Adverse Effect	Avoid

Perception	Examples of outcomes	Effect level	Action
	sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.		
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

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

9.2.34. With particular regard to mitigating noise impacts on residential development, the guidance highlights that impacts may be partially off-set 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 Development Plan Policy – North Lincolnshire Council (NLC)

9.2.35. North Lincolnshire Council does not have a specific policy relating to noise. However, the council adopted its Core Strategy in June 2011 (NLC, 2011) as part of the Local Development Framework and has a Supplementary Planning Document entitled Planning for Health and Wellbeing that was published in November 2016 (NLC, 2016). It recognises that noise is an issue that can have an effect on physical and mental health.

9.2.36. Policy 3 of Planning for Health and Wellbeing - “Well Designed Places” - states:e“When considering the detail of development, proposals should:

Seek to reduce noise and air pollution through ensuring planning applications include a Noise Impact Assessment and Air Quality Assessment in areas of concern."

9.2.37. Details of additional consultation with NLC regarding the scope of noise and vibration assessment are given in Table 9.3.

Other guidance

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

9.2.38. 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

9.2.39. 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 6472-1:2008

9.2.40. 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 7385-2:1993

9.2.41. BS 7385-2 'Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne 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.

International Organization for Standardization (ISO) 4866:2010

9.2.42. ISO 4866:2010 'Mechanical Vibration and Shock – Vibration of Fixed Structures – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures' (ISO, 2010) establishes the principles for carrying out vibration measurement and processing data with regard to evaluating vibration effects on structures.

British Standard 4142:2014+A1:2019

9.2.43. BS 4142 'Methods for rating and assessing industrial and commercial sound' (BSI, 2014c) 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 sound, with the '*background sound level*' at the receptor position.

NANR45 Procedure for the assessment of low frequency noise disturbance

9.2.44. BS4142 is not applicable to the assessment of low frequency noise. NANR45 aims 'to assist Environmental Health practitioners to handle complaints of low frequency noise'. In the absence of any definitive guidance, NANR45 has been considered in the assessment of risk of likely significant effects, although NANR45 'is not intended as a means of predicting when disturbance might occur, for example in a planning situation'.

British Standard 8233:2014

9.2.45. BS 8233 'Guidance on sound insulation and noise reduction for buildings' (BSI, 2014d) defines criteria for noise levels in and around buildings.

ISO 9613-2:2024

9.2.46. ISO 9613-2:2024 'Attenuation of Sound during Propagation Outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors' (ISO, 2024) 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.

Calculation of Road Traffic Noise

9.2.47. Department for Transport (DfT)/ Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN) (DfT/Welsh Office, 1988) 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 (2020)

9.2.48. The Highways England 'Design Manual for Road and Bridges LA 111 (Revision 2) Noise and Vibration' (DMRB) (Highways England, 2020) provides guidance on the appropriate approach to be taken when assessing the noise and vibration effects arising from roads, including 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 this.

World Health Organization

9.2.49. The World Health Organization's (WHO) '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, recommend 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.

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

Consultation

9.2.51. The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised via the formal scoping opinion, is summarised in Table 9.3.

Table 9.3: Consultation summary table

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
The Planning Inspectorate The Planning Inspectorate The Planning Inspectorate	Scoping Opinion (June 2024) Scoping Report (April 2024) Scoping Opinion (June 2024) Scoping Report (April 2024) Scoping Opinion (June 2024)	**Noise and vibration (road traffic) – operational phase** Road traffic noise and vibration is not expected to significantly increase during operation. The Inspectorate is content that this matter may be scoped out. The ES should cross reference with the findings in the traffic and transport chapter to justify this position.	Noise and vibration (road traffic) during the operational phase has been scoped out. The ES cross references **ES Volume I Chapter 10**: Traffic and Transport (**Application Document Ref. 6.2**) to confirm insignificant road traffic increases which are considered to be negligible and thus not significant.

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
The Planning Inspectorate	Scoping Report (April 2024) Scoping Opinion (June 2024)	**Noise and vibration – Decommissioning phase including road traffic** The ES should provide a prediction of activities and works (including the anticipated duration) which are likely to be required during decommissioning which could impact human health and ecological receptors. Differences between construction and decommissioning phases should be highlighted.	The ES provides a prediction of noise and vibration from activities and works (including their duration) likely to occur during decommissioning. Shown in section 9.6. Differences between construction and decommissioning phases are highlighted.
The Planning Inspectorate	Scoping Report (April 2024) Scoping Opinion (June 2024)	**Vibration – Operational phase** Scoped out from detailed analysis on the basis of unlikely significant vibration impacts due to the distance between the Proposed Development and receptors.	Vibration during the operational phase has been scoped out.

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
The Planning Inspectorate	Scoping Report (April 2024) Scoping Opinion (June 2024)	**Ecological receptors** There are sensitive ecological sites which have the potential to be impacted by noise and vibration emission from the Proposed Development however no relevant ecological receptors are provided in the Scoping Report. The ES should identify the ecological receptors that require consideration in respect of noise and vibration impacts and cross reference to other assessments. Criteria will be discussed in the ES for determining the significance of noise and vibration impacts on relevant sensitive ecological receptors.	The ES identifies the ecological receptors requiring consideration of noise and vibration impacts. The effects on ecological receptors are assessed using data from this noise and vibration chapter and are described in **ES Volume I Chapter 11:** Biodiversity, Ecology and Nature Conservation (**Application Document Ref. 6.2)**.
North Lincolnshire Council	Scoping Opinion (June 2024)	**Sensitive receptors**	Noise and vibration sensitive receptors are identified in this chapter of the ES. Shown in section 9.4.

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
		Noise sensitive receptors have been agreed upon. Vibration sensitive receptors should be identified in the ES.	
The Planning Inspectorate	Scoping Opinion (June 2024)	**Vibration assessment – construction phase** The ES should include details on the method to be used, expected duration, and timing of vibration generating construction activities. Potential impacts on sensitive receptors where significant effects are likely should be assessed.	The ES includes details of vibration generating activities including duration and timings. Impacts from these activities on sensitive receptors are assessed. Shown in paragraphs 9.6.16. – 9.6.23.
The Planning Inspectorate	Scoping Opinion (June 2024)	**Underwater noise and vibration** Should activities impactful to aquatic species in the aquatic environment occur during construction, the ES should assess underwater noise and vibration	No underwater noise and vibration sensitive receptors were identified by the ecology team so this was not assessed further. In addition, the only works proposed in the water environment are the temporary works associated with the temporary cofferdam and canal water

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
		impacts on underwater receptors where significant effects are likely to occur.	abstraction point located within the Stainforth and Keadby Canal. There are no works proposed in the River Trent.
North Lincolnshire Council (NLC)	Consultation letter (January 2025)	**Construction noise** Construction, demolition and site clearance working hours should be Monday to Friday, 08:00 to 18:00hrs and Saturday, 08:00 to 13:00hrs, with no work done on Sundays or Public holidays Installation of equipment and HGV movements shall not be permitted without prior written approval from the LPA	**ES Chapter 5:** Construction Programme and Management (**Application Document Ref. 6.2.5)** includes details of working hours which were agreed for Keadby CCS Power Station and have now been agreed with the Environmental Protection Team from NLC for the Proposed Development.
North Lincolnshire Council (NLC)	Consultation letter (January 2025)	**Operational Vibration** Justification for unlikely significant vibration impacts due to distance	Vibration sensitive receptors are identified in the ES where appropriate. No significant sources of operational vibration are likely outside the Main Site and there are no receptors sensitive to

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
		between development and receptors is requested	vibration located near to the Main Site. Therefore, operational vibration is scoped out.
North Lincolnshire Council (NLC)	Consultation letter (January 2025)	**Operational Noise** This department highlights that BS4142 states “A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.” We would not therefore consider a rating level of +5dB above background to be acceptable. This department would expect to see background levels to be met, where possible, to avoid impact on residential receptors and background creep.	Mitigation measures proposed in the ES will be sufficient to reduce impact on background sound levels, and subsequent effects, in accordance with Government policy. See section 9.7. The proposed operational noise limits have been refined since the PEI stage to +3dB which was the level agreed for Keadby CCS Power Station. This proposed operational noise limit has now been agreed with the Environmental Protection Team from NLC for the Proposed Development.
North Lincolnshire Council (NLC)	Consultation letter (January 2025)	**Cumulative Effects** Noise and vibration effects on receptors experiencing minor adverse or worse	The cumulative effect of noise and vibration effects on receptors are considered in **ES Volume I Chapter 9:**

Consultee approached	Date and nature of consultation	Summary of comments	Summary of response
		during operation or construction should be analysed cumulatively	Noise and Vibration (**Application Document Ref. 6.2**).
Canal and River Trust (CRT)	Consultation letter (February 2025)	Highlight that any vibrations could result in damage to the wash walls, unless effectively controlled. Request additional information to fully confirm the vibrations from the cofferdam installation will not result in damage to the canal.	Awareness of impact management from the construction of the Proposed Development on the Canal and Keadby Lock. Risk to the canal and lock are investigated and the significance of the effect shown in sections 9.6.16. – 9.6.23.

Study area

9.2.52. The extent of the study area has been defined to include the NSR and communities in each direction from the Proposed Development and those that may be affected by changes in road traffic flows predicted during the construction phase of the Proposed Development. The extent of the study area is shown in **ES Volume III Figure 9.1**: Noise Sensitive Receptors (**Application Document Ref. 6.4**).

9.2.53. For construction noise, a study area of 300m around the Proposed Development is considered sufficient to assess impacts, based on precedent from other projects and the limitations of prediction methods beyond this distance, as noted in British Standard BS 5228-1. For construction vibration, a study area of 100m is considered sufficient since it is unlikely that significant effects from vibration would occur at greater distances.

9.2.54. Construction traffic routes, diversions or road closures resulting from the construction will also be considered where a traffic noise change of more than 1dB(A) is indicated, with assessments conducted up to 50m from the affected road.

9.2.55. For operational noise, a study area of 1km is adopted. Sound levels are expected to be well below those likely to cause a risk of a significant effect at or beyond 1km. Operational vibration has been scoped out of this assessment since the nature of the plant is unlikely to transmit any appreciable vibration into the ground. Moreover, the distances to any sensitive receptors will attenuate any residual vibration.

Sensitive receptors

9.2.56. The Proposed Development will be located within and in the vicinity of existing industrial facilities, including Keadby 1 Power Station, Keadby 2 Power Station, the 400kV National Grid substation and the operational Keadby Windfarm. There are residential receptors and potentially sensitive ecological sites which have the potential to be impacted by noise and vibration emissions from the construction and operation of the Proposed Development and its proposed utility connection corridors.

9.2.57. The location of potential NSR in proximity to the Site boundary has been considered when assessing the effects associated with noise and vibration levels from the construction, operational (including maintenance) and decommissioning phases of the Proposed Development.

9.2.58. Key NSR locations considered representative of the nearest and potentially most sensitive existing receptors to the Proposed Development have been identified. It is considered that if noise and vibration levels are suitably controlled at the key receptors identified, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area. The NSR are shown in **ES Volume III Figure 9.1** (**Application Document Ref. 6.4**) and are as follows (with an indicative distance and direction from the centre of the Main Site):

- NSR1 – Vazon Bridge (700m South East);
- NSR2 - Hawthorne House (1100m East);
- NSR3 - Keadby Village (1300m East);
- NSR4 - Mariners Arms Flats (1400m South East);
- NSR5 - Trent Side (1600m South East);
- NSR6 - Queens Crescent (1600m South East);
- NSR8 - North Pilfrey Farm (1200m South West);
- NSR9 - Ealand Poultry Farm (1800m North West); and
- NSR11 - South Pilfrey Farm (2300m South West).

9.2.59. Receptor 'NSR 1A – Roe Farm' identified in the PEIR has been confirmed no longer to be an inhabited residential property and has been excluded from the ES.

9.2.60. The nearest NIA is located in Scunthorpe on the A18 between the A1077 and Scotter Road roundabouts. This is approximately 4km from the Site and beyond the study area in which noise effects could occur. Traffic increases are minimal and therefore, significant effects from the Proposed Development at this location are unlikely and no further assessment is required.

9.2.61. A description of the study areas for ecological receptors is presented in **ES Volume I Chapter 11**: Biodiversity, Ecology and Nature Conservation (**Application Document Ref. 6.2**).

Baseline sound and vibration surveys

9.2.62. The Environmental Impact Assessment (EIA) Scoping Report (**ES Volume II Appendix 1A**, **Application Document Ref. 6.3**) confirms that the baseline sound monitoring completed in May 2023 for the Keadby CCS Power Station project would be appropriate to inform the assessments in this ES.

9.2.63. The monitoring procedures conformed to BS 7445:2003 'Description and Measurement of Environmental Noise' (BSI, 2003) and monitoring was undertaken in close proximity to eight NSRs during weekend and week days, over a minimum five-day unattended monitoring period. A long-term measurement was not performed at NSR 5 as NSR 6 was considered representative.

9.2.64. Baseline vibration surveys have not been undertaken, which is consistent with normal practice as there is generally negligible baseline vibration in the environment. Vibration impacts are assessed only on absolute rather than change in levels.

Assessment of construction and decommissioning noise

9.2.65. At this stage in the project design development, before the appointment of a construction contractor, site specific details regarding the construction activities, programme and numbers and types of construction plant are unavailable. Therefore, detailed construction noise predictions have not been undertaken. Nevertheless, indicative construction noise predictions have been undertaken using the calculation methods set out in BS 5228-1 (BSI, 2014a), based upon construction information from other power station projects, including those undertaken by SSE.

9.2.66. The calculation method provided in BS 5228-1 (2014a) takes account of factors including the number and types of equipment operating, their associated sound power levels (L_w), their modes of operation (% on-times within the working period), the distance to NSR, and the effects of any intervening ground cover or barrier/ topographical screening. This allows prediction of the magnitude of impact. Construction activities away from the Main Site are assessed separately to the construction assessment for the Main Site because the types of plant and activities are expected to be different. This excludes laydown areas, which are included in predictions for the Site. The same significance criteria have been used to assess construction noise from activities on the Site and away from it.

9.2.67. The assessment of construction noise effects at residential NSR considers the guidance in 'example method 1 – the ABC method' as defined in BS 5228-1 (BSI, 2014a). Table 9.4 (reproduced from BS 5228-1) provides guidance in terms of appropriate threshold values for potential significant effects at residential NSR, based upon existing ambient noise levels.

Table 9.4: Thresholds for potential significant effects at dwellings

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings and weekends (d)	55	60	65
Night-time (23:00 – 07:00)	45	50	55

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 value.

(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.

9.2.68. For the appropriate period (day, evening, night, weekend etc.), the 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 noise threshold value.

9.2.69. The criterion adopted in this assessment for the determination of potentially significant effects is exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. Consistent with BS 5228-1, other project-specific factors, such as the duration and character of the impact, are considered when determining if there is a significant effect.

9.2.70. For residential and other human receptors, the SOAEL for construction noise is defined by the relevant Category C level. The LOAEL is defined by the relevant Category A level.

9.2.71. NPPF (DLUHC, 2025) and NPSE (Defra, 2010) state that significant adverse effects (at or above the SOAEL) should be avoided within the context of Government policy on sustainable development. This does not mean that significant effects must not occur. Adverse effects (above the LOAEL and below SOAEL) should be mitigated and minimised within the context of Government policy on sustainability.

9.2.72. Based upon the above, the magnitude of the impact of construction noise is classified in accordance with the descriptors in Table 9.5.

Table 9.5: Magnitude of construction noise impacts

Magnitude of Impact	Comparison with threshold value $L_{Aeq,T}$ dB
High	Exceedance of ABC threshold by 5 dB or more
Medium	Exceedance of ABC threshold 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 or less

Assessment of construction works traffic on the public highway

9.2.73. The Proposed Development will affect traffic flows on existing roads in the area within and surrounding the Site during construction. The assessment focuses on the impact at NSR located alongside the local road network.

9.2.74. 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, 1988) and DMRB (Highways England, 2020).

9.2.75. 18-hour (06:00 – 24:00) Annual Average Weekday Traffic (AAWT) data has been estimated for the year 2031 'with' and 'without' construction traffic during the peak construction period. The data has been used to determine whether any existing roads would be subject to a potentially significant change in traffic noise level. CRTN Basic Noise Level (BNL) calculations have been undertaken to predict the change in noise level between the 'with' and 'without' scenarios.

9.2.76. The criteria for the assessment of traffic noise changes arising from construction works have been taken from Table 3.17 of DMRB (Highways England, 2020) and are provided in Table 9.6 below.

Table 9.6: Construction traffic noise criteria

Magnitude of impact	Change in traffic noise level $L_{A10,18hr}$ dB
High	5 or more
Medium	3 to 4.9
Low	1 to 2.9
Very low	Less than 1

9.2.77. DMRB advises that 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 $L_{A10,18hr}$. A doubling in traffic flow would be required for an approximate increase of 3 dB $L_{A10,18hr}$.

9.2.78. The criteria are based on the current guidance on short-term changes in traffic noise levels in DMRB. 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. Therefore, the SOAEL is set at a change in traffic noise of 3 dB or more and the LOAEL at an increase of 1 dB or more.

Assessment of Construction Vibration

Impacts on Humans - Annoyance

9.2.79. Vibration due to construction activities has the potential to result in adverse impacts at nearby NSR. BS 5228-2:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (BSI, 2014b) provides empirical methods and data on

measured levels of vibration for various construction works. Impacts are considered for both damage to buildings and annoyance to occupiers.

9.2.80. Table 9.7 sets out PPV levels and a semantic scale of impacts for demolition and construction vibration, based on BS 5228-2 (BSI, 2014b).

Table 9.7: Construction vibration threshold at residential dwellings

Magnitude of impact	Peak Particle Velocity (PPV) mm/s	Description
High	10 or above	Vibration is likely to be intolerable for any more than a very brief exposure to this level.
Medium	1.0 to 9.9	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.
Low	0.3 to 0.9	Vibration might be just perceptible in residential environments.
Very low	0.14 to 0.29	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.

9.2.81. For residential and other sensitive receptors, the LOAEL is defined as a PPV of 0.3 mm/s; 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 prior warning.

9.2.82. 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.

9.2.83. Given the considerable distance between the Main Site and the closest residential NSR (minimum 400m), no significant vibration effect due to perceptible vibration is expected to result from construction (or demolition as part of decommissioning) activities at the Main Site and therefore further assessment is scoped out. Assessment of perceptible

vibration from the cofferdam piling, which is outside the Main Site but still within the Site boundary, is scoped in.

Impacts on buildings – damage risk

9.2.84. 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 (BSI, 2014b). Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 9.8.

Table 9.8: Transient vibration guide values for cosmetic damage

Type of building	Peak component particle velocity 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.		

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

9.2.86. These values relate to cosmetic damage to residential buildings, the lowest of three categories given in ISO 4866:2010 (ISO, 2010):

- 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.

9.2.87. BS 7385-2 (BSI, 1993) defines that minor damage is possible at a level twice that of cosmetic damage and major damage may occur at four times the tabulated values. On this basis, magnitude of impact criteria for transient or intermittent vibration are defined in Table 9.9.

Table 9.9: Magnitude of impact – construction vibration residential building damage

Magnitude of impact	Damage risk	Transient vibration PPV mm/s	Continuous vibration PPV mm/s
High	Major	Higher than 30	Higher than 15
Medium	Minor	13 - 30	7 - 15
Low	Cosmetic	6 - 12	3 - 6
Very low	Negligible	Below 6	Below 3

9.2.88. These values are worst-case categories for construction vibration building damage which will apply to relevant receptors and structures in the vicinity of any cofferdam works during construction, including residential receptors, the canal wash wall, and infrastructure in the vicinity of Keadby Lock.

9.2.89. BS5228-2 recommends that for slender and potentially sensitive masonry walls, threshold limits for PPV of 10 mm/s at the toe and 40 mm/s at the crest should generally be adopted. Propped or tied walls, mass gravity walls, well supported steel pile and reinforced concrete retaining walls can be subject to values 50% to 100% greater than these limits. Where walls are found to be in poor condition, the allowable values should be diminished and additional support measures implemented. For continuous vibrations, all the above levels should be reduced by a factor of 1.5 to 2.5 according to individual circumstances. Hence the criteria in Table 9.9 are considered appropriate to the canal walls.

9.2.90. While predictions are made for vibration levels for sheet piling of a cofferdam for the canal water abstraction, most typical construction working routines would not generate levels of vibration above which building damage would be expected (subject to final plant, canal wash wall inspection and working requirements).

9.2.91. With respect to existing buildings within the Keadby Power Station site, as both the construction of the Proposed Development and the existing buildings are within the control of companies related to the Applicant, any identified issues can be effectively managed by the Applicant and their contractor(s). Potential measures to ensure that appropriate mitigation is in place during the works are discussed in Section 9.5.

Construction vibration impacts (disturbance) on ecological receptors

9.2.92. Where construction works take place at locations close to, or within, the Humber Estuary SSSI, there is potential for vibration impacts on ecological receptors. This is considered further in **ES Volume I Chapter 11:** Biodiversity and Nature Conservation (**Application Document Ref. 6.2**) and the **Habitat Regulations Assessment Report (Application Document Ref. 5.2).** Construction vibration will be controlled by the Construction Environmental Management Plan (CEMP); an **Outline CEMP** is included with the Application (**Application Document Ref. 7.4**).

Assessment of operational noise impacts on human beings

9.2.93. The assessment of operational sound levels has been based upon calculations using plant emissions data available at this stage. Predictions take account of equipment sound power levels (L_w), distance between the proposed plant and NSR and any acoustic screening offered by existing topography and existing and proposed new buildings.

9.2.94. A three-dimensional model has been developed, using the software SoundPlan 9.1, to assess the current layout options for the Proposed Development. SoundPlan implements the sound attenuation method ISO 9613-2: 2024 ‘Acoustics - Attenuation of sound during propagation outdoors’, which has been used to calculate sound levels at surrounding NSR due to operations at the Site (from both proposed external plant and breakout of sound from plant within buildings).

9.2.95. The model consists of a three-dimensional representation of the 5th revision layout of the Site and its surroundings. Operational noise modelling has been based on the 5th revision layout and sound power level data provided by the Applicant.

9.2.96. For sources for which specific information has not been made available, data have been supplemented with sound level data available from similar CCGT projects to allow modelling of the combined key sound sources). The model is based upon the 5th revision of the layout of the Site – see **ES Volume III Figure 4.1:** Indicative Layout of Main Site and Ancillary Facilities (**Application Document Ref. 6.4**).

9.2.97. Topographical features and buildings that may influence the transmission of sound from the Proposed Development to NSR are included in the noise model. A digital terrain model created using ground elevation spot height data has been used to position buildings and other noise sources at the proposed maximum heights relative to ground. Areas of acoustically soft and hard ground have been identified from the Ordnance Survey MasterMap topographic layer and modelled accordingly.

9.2.98. The prediction method assumes that the wind direction is always from source to receiver, consistent with ISO 9613-2:2024, which gives a reasonable worst case at all NSR.

9.2.99. Based upon the sound levels predicted from the model, an assessment of potential noise impact at nearby NSR has been undertaken using the guidance in BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BSI, 2014c).

9.2.100. 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 are the background sound level ($L_{A90,T}$) and the rating level ($L_{Ar,Tr}$) of the plant source at each NSR.The rating level accounts for the presence of acoustic characteristics such as tonality and impulsivity.

9.2.101. The assessment compares the *background sound level* and the *rating level* to assess likely significance:

- "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 on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative 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 on the context."

9.2.102. Importantly, as suggested above, BS 4142 (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.

9.2.103. Table 9.10 provides the magnitude of impact scale used in this assessment based upon the numerical level difference, although the context assessment (including the absolute level of the sound under consideration) can vary the overall assessment of effects. The SOAEL is set at a *rating level* 10 dB above the *background sound level* and the LOAEL is set at 5 dB above the *background sound level*.

Table 9.10: Magnitude of impact for industrial noise

Magnitude of impact	BS 4142 descriptor	*Rating level* minus *background sound level* (dB)
High	Indication of a significant adverse impact, depending upon context	10 or above
Medium	Indication of an adverse impact, depending upon context	5 - 9
Low	The lower the rating level, the lower the likelihood of an adverse impact, depending upon context	1 – 4
Very low	Indication of a low impact, depending on the context	Less than 1

The assessment of low frequency noise is not within the scope of BS 4142 and therefore consideration has also been given to the guidance in NANR45. The criterion curve provided to help determine if low frequency noise could be responsible for disturbance is given as shown in Table 9.11. If the noise occurs only during the day, then a 5dB relaxation can be applied.

Table 9.11: Low frequency noise criterion

Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB, L_{eq}	92	87	83	74	64	56	49	43	42	40	38	36	34

Assessment of operational vibration impacts on human beings

9.2.104. The operational equipment at the Main Site will comprise precision rotating machinery, which will be monitored and maintained in a high state of balance. This type of equipment therefore does not transmit significant vibration into the ground. Taking this into account, and the distances between the Site and NSR, it is anticipated that operational vibration effects will be not significant. Therefore, operational vibration from the Main Site is scoped out of this assessment.

9.2.105. No significant sources of operational vibration are likely outside the Main Site and therefore, operational vibration is scoped out.

Operational noise and vibration impacts on ecological receptors

9.2.106. Noise and vibration impacts on ecological receptors, including the River Trent, resulting from operation of the Proposed Development on the Main Site are not anticipated to be significant due to the distances involved (>1km) and the control of noise and vibration under the Environmental Permit for the Proposed Development. Further assessment is therefore scoped out.

Receptor sensitivity

9.2.107. Effects are classified based on the magnitude of the impact (as outlined above for the various potential impacts during construction and operation). All potentially affected human receptors are residential and are therefore considered to be sensitive.

Classification of effects

9.2.108. Impacts are defined as changes arising from the Proposed Development. Consideration of the result of these impacts on environmental receptors enables the identification of associated likely significant effects. Each effect has been assessed both before and after mitigation measures have been applied.

9.2.109. The following terminology has been used in the assessment to define 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.

9.2.110. The significance of effect resulting from each individual potential impact is assessed according to the magnitude of the impact using the matrix presented in Table 9.12 below and where relevant, also considering the context of the acoustic environment.

Table 9.12: Classification of effects

Magnitude of impact	Likely significance of effect
High	Significant
Medium	
Low	Not significant
Very low	

Data sources

9.2.111. The following sources of information that define the Proposed Development have been reviewed and form the basis of the assessment of likely significant effects from noise and vibration:

- **ES Volume I Chapter 4**: Proposed Development (**Application Document Ref. 6.2.4);**
- **ES Volume I Chapter 5**: Construction Programme and Management (**Application Document Ref. 6.2.5);**
- **ES Volume I Chapter 10:** Traffic and Transport (**Application Document Ref. 6.2.10)**;
- **ES Volume III Figure 3.3**: Indicative Parts of the Site Plan **Application Document Ref. 6.4.4)**;
- Sound power level data from the Keadby CCS Power Station Project (SSE, 2021); and
- Geospatial datasets used for the noise model of the Keadby CCS Low Carbon Gas Power Station Project (SSE, 2021).

9.3. Use of Rochdale Envelope

9.3.1. The assessment of operational noise and vibration has been undertaken using the Rochdale Envelope approach having regard to the Planning Inspectorate (PINS) Advice Note 9 (PINS, 2018). The Rochdale Envelope is applicable where some of the details of a Proposed Development are not able to be confirmed when an application is

submitted, and flexibility is needed to address design uncertainty. At this stage, the assessment has adopted a cautious worst-case approach. Further refinement will be undertaken during the detailed design.

9.3.2. The construction assessment has been based on the worst-case assumption of activities occurring at the closest part of the Site to each NSR. This includes construction activities within the Main Site, construction laydown areas, and the electrical connection and water connection corridors.

9.3.3. The operational stage assessment has undergone sensitivity testing of the key sound source locations to determine the reasonable worst-case scenario. This has included moving the highest contributing sound sources to various locations within the respective indicative parts of the site (**ES Volume III, Figure 3.3 (Application Document Ref. 6.3**) and reporting the highest predicted sound levels at each NSR.

9.3.4. In relation to both construction and operational effects, any mitigation required would be integrated into the detailed design to meet noise threshold values at the nearest NSR.

9.4. Baseline Conditions

Existing Baseline

9.4.1. The results from the Keadby CCS Power Station sound monitoring are provided in Table 9.13. Surveys were undertaken in May 2023 (with Keadby 1 and 2 Power Stations in operation). NSR 6 was considered representative of NSR 5. NSR 1A, 7, and 10 were found to be no longer in residential use and thus were excluded from the survey.

9.4.2. The L_{Aeq} values presented in Table 9.13 combine all measurements taken in each time period, whilst the L_{AF90} values presented are the 'representative' BS 4142 *background sound levels*, determined from analysis of the measured values undertaken for the Keadby CCS Power Station ES.

Table 9.13: Baseline sound levels (using representative data from Keadby CCS Power Station ES)

Receptor	Time period	May 2023 survey	
		$L_{Aeq,T}$ dB	$L_{AF90,T}$ dB
NSR 1 - Vazon Bridge	Daytime	60	41
	Evening	58	N/A
	Night-time	54	42
NSR 2 - Hawthorne House, Chapel Lane	Daytime	52	41
	Evening	49	N/A
	Night-time	45	35
NSR 3 - Keadby Village	Daytime	53	36
	Evening	56	N/A
	Night-time	53	36
NSR 4 - Mariners Arms Flats	Daytime	55	35
	Evening	57	N/A
	Night-time	54	35
NSR 6 – No. 9 Queens Crescent	Daytime	54	35
	Evening	56	N/A
	Night-time	54	35
NSR 8 - North Pilfrey Farm	Daytime	52	31
	Evening	56	N/A
	Night-time	54	31
	Daytime	54	31

Receptor	Time period	May 2023 survey	
		$L_{Aeq,T}$ dB	$L_{AF90,T}$ dB
NSR 9 - Ealand Poultry Farm	Evening	56	N/A
	Night-time	55	34
NSR 11 - South Pilfrey Farm	Daytime	59	42
	Evening	58	N/A
	Night-time	54	27

9.4.3. The observations shown in Table 9.14 are taken from the Keadby CCS Power Station ES Appendix E regarding the general baseline sound environment at each monitoring location.

Table 9.14: Receptor noise climate observations

Receptor	Noise climate observations
NSR 1 - Vazon Bridge	"The sound sources at this NSR included occasional noise from passing trains and the nearby rail level crossing, construction noise from some nearby work by the rail line including a generator, bird song and Keadby Power Station, which was identified to be the dominant source and described as a humming sound. Analysis of the background sound levels measured at NSR 1 has shown a lower background sound level during periods where the wind was blowing from the north. While power station noise was identified to be the dominant sound source at this NSR, this was observed to be most prominently from Keadby 2 Power Station and including the cooling towers. Analysis of the data has not shown a difference in background sound levels when Keadby 1 Power Station was operating. The background sound level selected during the night is the lower measured level during periods of wind from the north."
NSR 2 - Hawthorne House, Chapel Lane	"The sound sources identified at this location included local roads, domestic animals, bird song and Keadby Power Station. As Keadby Power Station noise was identified in the observations, an analysis of the levels with and without Keadby 1 was made. Measured background sound levels were higher at night when Keadby 1 operated so the value presented represents

Receptor	Noise climate observations
	the representative background sound value when Keadby 1 was not operational." (NSR 2) is on Chapel Lane. The noise climate is similar to Red House.
NSR 3 - Keadby Village	"At this location sound sources included bird song, overhead aircraft, noise from other gardens including a lawn mower and Keadby Power Station. As power station noise was identified in the observations, an analysis of the sound levels while Keadby 1 Power Station was operational and non-operational was made. Measured background sound levels were not significantly different when Keadby 1 Power Station was operational. The variation of the background sound levels with wind direction was also analysed and it was not found to contribute significantly. The background sound levels have been selected based on the results through the full measurement period."
NSR 4 - Mariners Arms Flats	"At this NSR location, noise from local roads was identified to be the dominant source with additional birdsong noise. As Keadby Power Station noise was identified in the observations, an analysis of the levels with and without noise from Keadby 1 Power Station was made. Measured background sound levels were higher at night when Keadby 1 Power Station was operational. Therefore, the value presented represents the representative background sound value when Keadby 1 Power Station was not operational."
NSR 6 – No. 9 Queens Crescent (South Bank data)	"At this NSR location, bird song was identified to be the dominant noise source with some occasional noise from overhead aircraft and a train passing by. As this location is situated closer to Keadby 1 Power Station than Keadby 2 Power Station, an analysis of background sound levels with and without Keadby 1 Power Station was made. Measured background sound levels were higher at night when Keadby 1 Power Station was operating. Analysis of the background sound levels measured at NSR 1 have also shown a lower background sound level during periods where the wind was from the north. The representative background sound value selected for the night therefore represents the night for which Keadby 1 Power Station was not operational and the wind direction was from the north."

Receptor	Noise climate observations
NSR 8 - North Pilfrey Farm	"At this NSR location, bird song was identified to be the dominant noise source with some occasional noise from overhead aircraft and a train passing by. At this NSR location, analysis did not show that either Keadby 1 Power Station operation or the wind direction were significant factors in the background sound level. The representative background sound levels have been selected based on the results through the full measurement period."
NSR 9 - Ealand Poultry Farm	"At this NSR location, bird song was identified to be the dominant noise source with some noise from distant road traffic and a train pass by identified. At this NSR location, analysis did not show that either Keadby 1 Power Station operation or the wind direction were significant factors in the background sound level. The representative background sound levels have been selected based on the results through the full measurement period."
NSR 11 - South Pilfrey Farm	"The main sources were road traffic from the nearby A18 and bird song along with some noise from the ventilation system of the house. Wind turbines are located close to the measurement location, but at the times of set up and collection, no noise was identified from these as they were not moving. At this NSR location, analysis did not show that either Keadby 1 Power Station operation or the wind direction were significant factors in the background sound level. The representative background sound levels have been selected based on the results through the full measurement period."

Future Baseline

9.4.4. In the absence of the Proposed Development, future baseline sound levels at NSR will continue to be influenced by any changing traffic flows on surrounding road and rail networks and the future operations at other industrial and commercial premises in the area.

9.5. Development Design and Impact Avoidance

Construction noise

9.5.1. The construction programme is set out in **ES Volume I Chapter 5**: Construction Programme and Management (**Application Document Ref. 6.2.5**).

9.5.2. Measures to mitigate noise will be implemented during the construction phase of the Proposed Development to minimise impacts at local NSR and ecological receptors, particularly with respect to activities required outside core working hours. Mitigation will be included in the final CEMP and shall include, but not be limited to:

- abiding by agreed construction noise limits at locations to be agreed with NLC;
- ensuring that processes are in place to minimise noise before works begin and ensuring that BPM are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities;
- ensuring that modern plant is used, complying with applicable UK noise emission requirements, and selection of inherently quiet plant where possible;
- hydraulic techniques for breaking to be used in preference to percussive techniques, where reasonably practicable;
- use of lower noise piling (e.g. rotary bored or hydraulic jacking) rather than driven piling techniques, where reasonably practicable;
- off-site pre-fabrication for components of the Proposed Development, where reasonably practicable;
- 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), which should form a prerequisite of their appointment;
- loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Site to be conducted in such a manner as to minimise noise generation, as far as reasonably practicable;
- appropriate routing of construction traffic on public roads and along access tracks, to reduce construction traffic noise, as far as

reasonably practicable (see **ES Volume I Chapter 10**: Traffic and Transportation (**Application Document Ref. 6.2.10**);

- provision of information to NLC and local residents to advise of potential noisy works that are due to take place; and
- monitoring of noise complaints and reporting to the Applicant for immediate investigation.

9.5.3. Method statements for construction management, traffic management, and overall site management will be prepared in accordance with best practice and relevant British Standards, to mitigate and minimise impacts of construction works as far as is reasonably practicable.

9.5.4. 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.

9.5.5. The selected contractor would be encouraged to be a member of the 'Considerate Constructors Scheme', which is an initiative open to all contractors undertaking building work.

9.5.6. To assist in the preparation of the final CEMP, a detailed noise and vibration assessment will be undertaken once the contractor is appointed and further details of construction methods are known, in order to identify specific mitigation measures for the Proposed Development (including construction traffic).

9.5.7. The control and monitoring of noise during construction is secured by a Requirement of the **Draft DCO** (**Application Document Ref. 3.1)**.

Construction Vibration

9.5.8. Restriction of piling to daytime working hours would mean that residential NSR would be unaffected outside core working hours.

9.5.9. Regular communication with the local community, particularly during canal water abstraction cofferdam installation and removal will publicise the works schedule, giving notification to residents regarding periods when vibration may occur during specific operations and providing lines of communication should there be any concerns.

9.5.10. Vibration mitigation approaches similar to those described in 9.5.1paragraph 9.6.1 for noise will be included in the final CEMP and

may also include the use of a resonance-free vibratory driver for sheet piling and non-vibratory methods of compaction, where required.

Operational Noise and Vibration

9.5.11. During the detailed design stage, potential significant residual noise effects will be mitigated by location and design (see Section 9.7). This will include appropriate stack design, use of cladding and shielding where appropriate and, where practicable, siting of equipment away from site boundaries and NSR.

9.5.12. The control and monitoring of noise during operation is secured by a Requirement of the **Draft DCO** (**Application Document Ref. 3.1)**.

9.5.13. The Proposed Development will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency. This will require operational noise from the generating station to be controlled through the use of BAT, which will be determined through the Environmental Permit application. Operational noise limits will also be secured by a Requirement of the **Draft DCO** (**Application Document Ref. 3.1**).

Decommissioning

9.5.14. Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP) to control noise effects. This is secured by a Requirement in the **Draft DCO** (**Application Document Ref. 3.1**).

9.6. Likely Impacts and Effects

Construction Noise and Vibration Effects

9.6.1. Based upon the analysis and summary of the results of the existing free-field baseline ambient sound surveys, Table 9.15 sets out the BS 5228-1 (BSI, 2014) 'ABC' noise threshold categories at each NSR for the day, evening and night-time periods, as set out in Table 9.5.

Table 9.15: Measured free-field $L_{Aeq,T}$ sound levels and associated ABC assessment category

Receptor	Weekday daytime 07:00 – 19:00		Weekday evening 19:00 – 23:00		Night-time 23:00 – 07:00	
	$L_{Aeq,T}$ dB	Category	$L_{Aeq,T}$ dB	Category	$L_{Aeq,T}$ dB	Category
NSR 1 - Vazon Bridge	60	A	58	C	54	C
NSR 2 - Hawthorne House, Chapel Lane	52	A	49	A	45	B
NSR 3 - Keadby Village	53	A	56	B	53	C
NSR 4 - Mariners Arms Flats	55	A	57	B	54	C
NSR 5 - Trent Side	54	A	56	B	54	C
NSR 6 – No. 9 Queens Crescent (South Bank data)	54	A	56	B	54	C
NSR 8 - North Pilfrey Farm	52	A	56	B	54	C
NSR 9 - Ealand	54	A	56	B	55	C

Receptor	Weekday daytime 07:00 – 19:00		Weekday evening 19:00 – 23:00		Night-time 23:00 – 07:00	
	$L_{Aeq,T}$ dB	Category	$L_{Aeq,T}$ dB	Category	$L_{Aeq,T}$ dB	Category
Poultry Farm						
NSR 11 - South Pilfrey Farm	59	A	58	C	54	C

9.6.2. Construction noise threshold values have been derived for each NSR in Table 9.16 using the BS 5228-1 ABC methodology (described in Table 9.4). Saturday and Sunday threshold values have been based on survey data from the corresponding time periods.

Table 9.16: Construction noise threshold values

Receptor	Construction noise threshold value $L_{Aeq,T}$ dB (free-field)					
	Weekday daytime 07:00 – 19:00	Weekday evening 19:00 – 23:00	Night 23:00 – 07:00	Saturday 07:00 – 13:00	Saturday 13:00 – 23:00	Sunday 07:00 – 23:00
NSR 1 - Vazon Bridge	65	65	55	65	60	65
NSR 2 - Hawthorne House, Chapel Lane	65	60	50	65	60	55
NSR 3 - Keadby Village	65	60	55	65	55	55
NSR 4 - Mariners Arms Flats	65	60	55	65	55	55

Receptor	Construction noise threshold value $L_{Aeq,T}$ dB (free-field)					
	Weekday daytime 07:00 – 19:00	Weekday evening 19:00 – 23:00	Night 23:00 – 07:00	Saturday 07:00 – 13:00	Saturday 13:00 – 23:00	Sunday 07:00 – 23:00
NSR 5 - Trent Side	65	60	55	65	55	55
NSR 6 – No. 9 Queens Crescent (South Bank data)	65	60	55	65	55	55
NSR 8 - North Pilfrey Farm	65	60	55	65	55	55
NSR 9 - Ealand Poultry Farm	65	60	55	65	55	55
NSR 11 - South Pilfrey Farm	65	65	55	65	60	60

Construction noise effects

9.6.3. This section discusses the potential noise effects on NSR arising during construction. Effects will 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 (L_w) generated by the plant;
- the periods of use of the plant on site, known as its on-time;
- the distance between the 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 day and time of day, evening or night during which the works are undertaken.

9.6.4. Core construction working hours would be 07:00 to 19:00 Monday to Friday except bank holidays and Saturday 08:00 to 13:00. Some works (e.g. continuous concrete pouring or internal fit out works) may need to take place outside these core working hours and would comply with any restrictions agreed with the local planning authority, in particular regarding control of noise and traffic.

9.6.5. A summary of indicative noise predictions at the NSR locations for construction activities associated with the Proposed Development is presented in Table 9.17. As advised by BS 5228, noise levels predicted at distances over 300m should be treated with caution due to the increasing importance of meteorological effects. There are no NSR within 300m of the Main Site. The closest NSR to construction activities at the Main Site is NSR 1 – Vazon Bridge at approximately 475m from the Main Site.

Table 9.17: Predicted free-field construction noise levels during daytime construction activity

Receptor	Predicted free-field construction noise levels during daytime construction activity (dB $L_{Aeq,12h}$)				
	Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
NSR 1 - Vazon Bridge	52	56	56	49	64
NSR 2 - Hawthorne House, Chapel Lane	41	46	45	38	47
NSR 3 - Keadby Village	44	49	48	41	48

Receptor	Predicted free-field construction noise levels during daytime construction activity (dB $L_{Aeq,12h}$)				
	Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
NSR 4 - Mariners Arms Flats	42	47	46	39	48
NSR 5 - Trent Side	41	46	45	38	47
NSR 6 - No. 9 Queens Crescent (South Bank data)	41	46	45	38	52
NSR 8 - North Pilfrey Farm	40	45	44	37	34
NSR 9 - Ealand Poultry Farm	36	41	40	33	30
NSR 11 – South Pilfrey Farm	34	39	38	31	33

9.6.6. It is anticipated that the Proposed Development will have a direct connection into the existing 400 kV substation to the east of the Main Site. For the purposes of worst-case predictions, construction activities have been assumed at the closest point to each NSR. As it is likely that cabling would be primarily below ground, predictions have been made for topsoil striping as the potentially most significant noise source during this activity. Construction of a cooling water abstraction point will be required at the Stainforth and Keadby Canal. New pipework would be installed adjacent to the Keadby 2 Power Station cooling water intake structure and routed to the Main Site. This is anticipated to include above and below ground pipework.

9.6.7. Water discharge pipework from the Main Site will be underground until it reaches the existing water discharge pipes north of Keadby 2 Power Station. There are no receptors in close proximity and therefore it is not considered likely that any significant effects could result.

9.6.8. Installation of a cofferdam within the Water Connection Corridor would be required and it is this activity that would be expected to produce the highest noise levels at NSR 1 during the construction works. Noise levels have been predicted at NSR resulting from installation of the cofferdam using sheet piling by vibratory driving, as this activity would be expected to result in the highest noise levels during cofferdam installation and removal.

9.6.9. As a conservative approach, the predicted daytime construction noise levels (presented in Table 9.17) have been assumed to be the same for weekday daytime, evening and night-time noise levels. The predicted effects during each time period have been classified by considering the relevant ABC noise limit values given in Table 9.16, and using the semantic scales in Table 9.5 and Table 9.12. These effects, without any mitigation, are summarised in Table 9.18.

Table 9.18: Construction noise effects without additional mitigation

Receptor	Time period	Site construction – significance of effects				
		Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
NSR 1 - Vazon Bridge	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant. Above LOAEL	Not significant. Above LOAEL	Not significant	N/A
	Night-time	Not significant	**Significant.** Above LOAEL; below SOAEL	**Significant.** Above LOAEL; below SOAEL	Not significant	N/A
NSR 2 - Hawthorne House	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant, Above LOAEL	Not significant	Not significant	N/A
NSR 3 - Keadby Village	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A

Receptor	Time period	Site construction – significance of effects				
		Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
	Night-time	Not significant	Not significant. Above LOAEL	Not significant. Above LOAEL	Not significant	N/A
NSR 4 - Mariners Arms Flats	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant. Above LOAEL	Not significant. Above LOAEL	Not significant	N/A
NSR 5 - Trent Side	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant. Above LOAEL	Not significant. Equal to LOAEL	Not significant	N/A
NSR 6 - No. 9 Queens Crescent (South	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant. Above LOAEL	Not significant. Equal to LOAEL	Not significant	N/A

Receptor	Time period	Site construction – significance of effects				
		Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
Bank data)						
NSR 8 - North Pilfrey Farm	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant. Equal to LOAEL	Not significant	Not significant	N/A
NSR 9 - Ealand Poultry Farm	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant	Not significant	Not significant	N/A
NSR 11 - South Pilfrey Farm	Daytime	Not significant	Not significant	Not significant	Not significant	Not significant
	Evening	Not significant	Not significant	Not significant	Not significant	N/A
	Night-time	Not significant	Not significant	Not significant	Not significant	N/A

Receptor	Time period	Site construction – significance of effects				
		Site enabling and preparation	Main civil works (including piling and foundations)	Plant installation	Electrical connection construction	Canal water abstraction
Daytime (07:00 – 19:00 weekdays) also represents Saturday mornings (07:00 – 13:00)						
Evening (19:00 – 23:00 weekdays) also represents Saturday afternoons (13:00 – 23:00) and Sundays (07:00 – 23:00)						
Night-time (23:00 – 07:00 all week)Effects are below LOAEL except where identified						

9.6.10. Construction noise effects at all residential NSR during construction of the Site within core daytime hours and, if applicable, Saturdays (during the day and evening) and Sundays during the morning, are predicted to be **not significant**, due largely to the distances between the works and NSR.

9.6.11. Working outside core hours is not expected to be required, however, it may be necessary for some construction activities to take place continuously over day, evening and night periods, although the exact nature of such works is unknown at this stage.

9.6.12. Comparison of the predicted daytime noise levels for construction of the Site against the limit values for night-time working with no mitigation, mean likely **significant** effects would be predicted at one NSR (NSR 1) if construction activities were to continue into the night-time period. The night-time effects at NSR 1 would be above LOAEL but below SOAEL. Adverse effects that are not significant but are equal to or above the night-time LOAEL are predicted at most NSR (but not NSR 9 and 11) if main civil works were to take place at night.

9.6.13. Predicted noise effects during topsoil stripping for laying the cable to the 400 kV Substation east of the Main Site are assessed as not significant at all NSR at any time.

9.6.14. During the daytime core hours and Saturday mornings, predicted noise effects during piling for the replacement of Mabey Bridge are assessed as not significant. Should it be necessary to undertake piling works at night, effects would be significant at NSR 1.

9.6.15. It may be possible that the assessed construction activities presented in Table 9.17 could overlap, however, the cumulative noise resulting from overlapping activities is predicted not to exceed the noise impact thresholds presented in Table 9.16.

Site construction - vibration effects

9.6.16. The level of impact at different receptors will be dependent upon a number of factors, including 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.

9.6.17. Due to large distances (minimum of 400m) between residential receptors and the static plant that is likely to produce higher levels of vibration (e.g. piling rigs) on the Main Site, vibration effects on both humans and buildings are likely to be **not significant**.

9.6.18. NSR 1 is the closest receptor to the mobile construction plant likely to be associated with the Site construction, being circa 40m from a potential laydown area. However, these types of mobile plant are unlikely to produce appreciable levels of vibration. Effects on humans and buildings would therefore be **not significant**.

9.6.19. The Stainforth and Keadby Canal lies approximately 300m to the south of the Main Site, whilst Keadby Lock (NSR 12) is over 1km from any vibration sources on the Main Site. Given these distances, vibration effects on canal infrastructure due to Main Site construction works are likely to be **not significant**.

Water connections construction - vibration effects

9.6.20. Assuming sheet piling would be used for the water abstraction cofferdam, predictions have been made for the nearest receptors.

9.6.21. There is the potential for some vibration impacts upon humans and buildings during sheet piling. It is unlikely that the works would generate vibration above building damage criteria (subject to final plant and working requirements). However, vibration impacts could cause annoyance to occupants and exceed the LOAEL and SOAEL set out in Section 9.6. Therefore, vibration during sheet piling for the cofferdam has been predicted based upon a worst-case assumption that vibratory piling may be required. Predictions are shown in Table 9.19.

Table 9.19: Predicted vibration effects due to construction of a cofferdam for canal water abstraction options

	Vibration impacts and effects	
	Human perception	**Structural damage**
NSR	Vazon Bridge (NSR 1)	Stainforth and Keadby Canal walls
Predicted PPV (mm/s)	0.1	6
Magnitude of impact	Low (refer to Table 9.7 and Table 9.9)	Low (refer to paragraph 9.3.36)
Initial classification of effect	Not significant	Not significant

*NSR 1 is residential so impact assigned using Table 9.7 for impacts on humans; Keadby Lock and the Stainforth and Keadby Canal Walls are structures so assigned using Table 9.9 for risk of building damage

9.6.22. Vibration effects at residential receptors resulting from sheet piling for cofferdam installation/ removal are classified as **not significant** for the water abstraction works at the worst-affected receptor, although vibration may be just perceptible within NSR 1.

9.6.23. The PPV predicted is below the level at which damage would be expected to occur at the residential NSR. Effects on any masonry walls in the Stainforth and Keadby Canal close to the piling would be not significant if the walls are in a good state of repair and any signs of damage or weakness should be considered before piling commences. There would then be negligible risk of damage to these buildings and other structures. Since their condition is currently unknown, the risk of damage to walls from vibratory piling is assessed as a likely **significant** effect, therefore control and mitigation of vibration will be considered in the final CEMP. Potential mitigation measures are discussed above in Section 9.5.

Construction Traffic Noise Effects

9.6.24. The assessment assumes that construction traffic access to the proposed construction area will be via the A18. Data have been provided from C**hapter 10 (Application Document Ref. 6.2.10)** for the traffic scenario 'without' and 'with' Proposed Development construction traffic in 2036 for the roads within the scope of the transport assessment, as follows:

- scenario 1 – without Proposed Development construction: 2036 Base + Committed development; and
- scenario 2 – with Proposed Development construction: 2036 Base + Committed development + Proposed Development construction traffic.

9.6.25. It has been assumed, as a worst-case approach, that traffic speeds will remain the same for both scenarios although temporary speed restrictions may be sought and used (as have been in place for the Keadby 2 Power Station construction) during construction. This would result in reduced speeds from 60 mph to 40 mph in the vicinity of the Proposed Development access from the A18.

9.6.26. The potential changes in road traffic noise as a result of the Proposed Development have been considered by calculating the change in the

CRTN BNL (basic noise level). Table 9.20 presents the results of the assessment.

Table 9.20: Changes in road traffic noise during construction of the Proposed Development

Link	Scenario a Without Proposed Development construction traffic			Scenario b With Proposed Development construction traffic			Change in BNL, dB (Scenario a minus Scenario b)	Classification of impact
	AAWT	%HGV	Speed (km/h)	AAWT	%HGV	Speed (km/h)		
A18 (west of construction site access)	9970	7.8%	86	10715	8.3%	86	+0.3	Very low
A161 (between M180 Jct 2 and the A18)	7536	10.6%	71	8143	11.2%	71	+0.3	Very low
A18 Station Road (immediately to the west of King George V Bridge)	15366	5.9%	50	15643	5.8%	50	+0.1	Very low
A18 High Levels Bank (east of Tudworth Roundabout)	8777	11.9%	86	8916	11.7%	86	+0.1	Very low
A18 Doncaster Road (between Station Road	14927	5.70%	61	15194	5.60%	61	+0.1	Very low

and Frodingham Grange Roundabout)

9.6.27. Table 9.20 shows very low changes in road traffic noise due to construction traffic. This will result in **not significant** effects at residential NSR. No mitigation measures are required beyond those listed in Section 9.7.

Construction noise and vibration effects on sensitive ecological receptors

9.6.28. Noise and vibration effects on designated sites and ecological receptors have been assessed as negligible (not significant) due to the distance to the site and the existing background noise. This are referenced in **ES Volume I Chapter 11**: Biodiversity and Nature Conservation (**Application Document Ref. 6.2.11**) and the Habitat Regulations Assessment Report (**Application Document 5.2**).

Operational noise effects

9.6.29. The final design of the Proposed Development is yet to be determined. Therefore, noise modelling has been undertaken based upon the indicative locations of operational equipment taken from **ES Volume III Figure 4.1:** Indicative Layout of Main Site and Ancillary Facilities (**Application Document Ref. 6.4**)**.** Using the Rochdale Envelope principles, reasonable worst-case operational noise impacts and effects have been assessed.

9.6.30. Details of the sound source sound power level (L_w) data, the settings used in the noise modelling software and the assumptions used are presented in **ES Volume II Appendix 9B**: Operational Noise Information (**Application Document Ref. 6.3**).

9.6.31. Predicted free-field operational *specific sound levels*, without additional mitigation, are presented in Table 9.21. The NSR assessed represent those worst affected.

9.6.32. The plant will be designed to operate flexibly. Given the anticipated load regimes for the generating station, the predicted noise levels apply to both the 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

Table 9.21: Predicted worst-case operational *specific sound levels*

Receptor	Predicted operational *specific sound level* $L_{Aeq,T}$ dB
NSR 1 - Vazon Bridge	44

Receptor	Predicted operational *specific sound level* $L_{Aeq,T}$ dB
NSR 2 - Hawthorne House, Chapel Lane	44
NSR 3 - Keadby Village	42
NSR 4 - Mariners Arms Flats	41
NSR 6 - No. 9 Queens Crescent	39
NSR 8 - North Pilfrey Farm	40
NSR 9 - Ealand Poultry Farm	37
NSR 11 – South Pilfrey Farm	35

BS4142 assessment results

9.6.33. The assessments using BS 4142 are presented in Table 9.22 for daytime and Table 9.23 for night-time. The magnitude of impact and effect classification has been included in the tables to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in Table 9.10, and Table 9.12.

9.6.34. The assessment has assumed that potential noise of a tonal, impulsive or intermittent nature, as perceived at the NSR, will be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding, louvres, silencers or attenuators, as necessary. This is consistent with the Keadby 2 Power Station ES. However, inclusion of a +3 dB correction for any other distinctive character has been included as a conservative assessment approach to allow for any potential to identify the new sound source in the existing acoustic environment.

Table 9.22: Daytime BS4142 assessment without additional mitigation

Receptor	NSR 1 Vazon Bridge	NSR 2 Hawthorne House, Chapel Lane	NSR 3 Keadby Village	NSR 4 Mariners Arms Flats	NSR 6 Queens Crescent	NSR 8 North Pilfrey Farm	NSR 9 Ealand Poultry Farm	NSR 11 South Pilfrey Farm
Specific sound level L_s ($L_{Aeq,Tr}$), dB	44	44	42	41	39	40	37	35
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	47	47	45	44	42	43	40	38
Representative *background sound level* ($L_{A90,T}$), dB	41	41	36	35	35	31	31	42
Excess of *rating level* over *background*	+6	+6	+9	+9	+7	**+12**	+9	0

Receptor	NSR 1 Vazon Bridge	NSR 2 Hawthorne House, Chapel Lane	NSR 3 Keadby Village	NSR 4 Mariners Arms Flats	NSR 6 Queens Crescent	NSR 8 North Pilfrey Farm	NSR 9 Ealand Poultry Farm	NSR 11 South Pilfrey Farm
sound level ($L_{Ar,Tr}$ - $L_{A90,T}$), dB								
BS 4142:2014 **impact** description	Adverse	Adverse	Adverse	Adverse	Adverse	Significant adverse	Adverse	Low
Magnitude of **impact** (assigned from Table 9.10)	High	Medium	Medium	Medium	Medium	High	High	Very low
Initial **classification of effect** (assigned from Table 9.12)	**Significant**	**Significant**	**Significant**	**Significant**	**Significant**	**Significant and above SOAEL**	**Significant**	Not significant

Values shown in bold are significant

Table 9.23: Night-time BS4142 assessment without additional mitigation

Receptor	NSR 1 Vazon Bridge	NSR 2 Hawthorne House, Chapel Lane	NSR 3 Keadby Village	NSR 4 Mariners Arms Flats	NSR 6 Queens Crescent	NSR 8 North Pilfrey Farm	NSR 9 Ealand Poultry Farm	NSR 11 – South Pilfrey Farm
Specific sound level L_s ($L_{Aeq,Tr}$), dB	44	44	42	41	39	40	37	35
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	47	47	45	44	42	43	40	38
Representative *background sound level* ($L_{A90,T}$), dB	42	35	36	32	35	31	34	27
Excess of *rating level* over *background*	+5	**+12**	+9	**+12**	+7	**+12**	+6	**+11**

Receptor	NSR 1 Vazon Bridge	NSR 2 Hawthorne House, Chapel Lane	NSR 3 Keadby Village	NSR 4 Mariners Arms Flats	NSR 6 Queens Crescent	NSR 8 North Pilfrey Farm	NSR 9 Ealand Poultry Farm	NSR 11 – South Pilfrey Farm
sound level ($L_{Ar,Tr}$ - $L_{A90,T}$), dB								
BS 4142:2014 **impact** category	Low	Significant adverse	Adverse	Significant adverse	Adverse	Significant adverse	Adverse	Significant adverse
Magnitude of **impact** (assigned from Table 9.10)	Very low	High	Medium	High	Medium	High	Medium	High
Initial **classification of effect** (assigned from Table 9.12)	Not significant	**Significant and above SOAEL**	**Significant**	**Significant and above SOAEL**	**Significant**	**Significant and above SOAEL**	**Significant**	**Significant and above SOAEL**

Values shown in bold are significant

9.6.35. In accordance with Table 9.12, the values presented in Table 9.23 and Table 9.24, for the worst-case scenario, produce a range of impact magnitudes from very low to high impact. This would result in effects between **not significant** to **significant**, subject to consideration of context.

Consideration of context

9.6.36. Table 9.24 below presents existing *ambient sound levels* ($L_{Aeq,T}$) assuming constant operation through the night of both Keadby 1 Power Station, Keadby 2 Power Station, and the Proposed Development rating level. The future ambient levels are compared to the BS8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h,}$ which would be equivalent to an external criterion of 45 dB $L_{Aeq,8h}$ assuming open bedroom windows for ventilation.

Table 9.24: Comparison of night-time *ambient sound levels* without additional mitigation

Receptor	Proposed Development predicted operational *rating sound level* ($L_{Ar,Tr}$ dB)	Night-time *ambient sound level* measured before the Proposed Development ($L_{Aeq,8h}$ dB)	Night-time future *ambient sound level* predicted with the Proposed Development in operation ($L_{Aeq,8h}$ dB)	Change in night-time future *ambient sound level* due to the Proposed Development (dB)
NSR 1 - Vazon Bridge	47	54	55	+1
NSR 2 - Hawthorne House, Chapel Lane	47	45	49	+4
NSR 3 - Keadby Village (slightly different locations)	45	53	54	+1
NSR 4 - Mariners Arms Flats	44	54	54	+0
NSR 6 - No. 9 Queens Crescent (slightly different locations)	42	54	54	+0
NSR 8 - North Pilfrey Farm	43	54	54	+0
NSR 9 - Ealand Poultry Farm	40	55	55	+0

Receptor	Proposed Development predicted operational *rating sound level* ($L_{Ar,Tr}$ dB)	Night-time *ambient sound level* measured before the Proposed Development ($L_{Aeq,8h}$ dB)	Night-time future *ambient sound level* predicted with the Proposed Development in operation ($L_{Aeq,8h}$ dB)	Change in night-time future *ambient sound level* due to the Proposed Development (dB)
NSR 11 – South Pilfrey Farm	38	54	54	+0

9.6.37. As shown in Table 9.24 at NSR 1, NSR 2, and NSR 3, whilst ambient sound levels increase due to the predicted levels from the Proposed Development, they were already above an external criterion of 45 dB $L_{Aeq,8h}$, based on BS8233:2014/WHO. The resulting indoor ambient sound levels are at or below the internal criterion from BS8233:2014/WHO with windows open at night.

9.6.38. At all receptors, predicted ambient sound levels would be above the guideline external value and compared with the baseline would increase by up to 4 dB without any mitigation for the Proposed Development. It is noted that the existing baseline is already above the external criterion of 45 dB at all receptors.

9.6.39. Partially open windows provide up to 15 dB of attenuation, as stated in BS8233. All receptors exceed the internal noise criterion of 30 dB prior to operation of the Proposed Development. Even with mitigation in place, discussed in Section 9.5, the exceedance of the criterion could not be removed due to external ambient sound levels above or equal to 45 dB.

9.6.40. With windows closed (assuming 33 dB of attenuation provided by a typical insulating glass unit, as stated in BS8233), internal sound levels would be below the recommended internal criterion at all NSR, with Keadby 1 and Keadby 2 Power Stations, and the Proposed Development combined.

9.6.41. It is noted from consultation with NLC that they 'expect to see background levels to be met'. This requirement is not met by the initial BS 4142 predictions, although the further assessment above demonstrates that, within the context of the existing sound environment, the effects are likely to be lower than suggested by the initial assessment.

9.6.42. To reduce operational noise to achieve NLC's expectation that background levels are met, potential mitigation options to reduce sound levels are discussed in Section 9.7 (Mitigation, Monitoring and Enhancement Measures).

Decommissioning noise effects

9.6.43. The potential impacts and effects would require further consideration at the decommissioning stage of the Proposed Development, but potential measures to ensure that appropriate mitigation is in place during such works are detailed in Section 9.5. The effects of decommissioning are considered to be comparable to, or less than, those assessed for

construction activities and are therefore considered to be **not significant**.

9.6.44. Decommissioning would require submission of a DEMP. No additional mitigation for decommissioning of the Proposed Development beyond such best practice specified in BS 5228 and Section 9.5 mitigation is considered necessary at this stage.

9.7. Mitigation, Monitoring and Enhancement Measures

Construction

9.7.1. This assessment has identified no more than negligible/ minor adverse (**not significant**) noise effects at all residential NSR for construction works during daytime or Saturday morning working hours.

9.7.2. If construction activities are required during evening or night-time periods, levels in excess of the SOAEL could occur at all NSR, if the activities undertaken and intensity of working are comparable to daytime works. This could result in **significant** noise effects in the absence of additional mitigation. Measures would therefore be put in place to control or restrict activities during evenings and at night so as not to exceed the SOAEL or relevant noise limit to be agreed with NLC. By timing construction works and avoiding noisier activities outside core working hours, significant adverse effects can therefore be avoided.

9.7.3. The preferred approach for controlling construction noise and vibration is to reduce levels at source, where reasonably practicable. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

9.7.4. The list of noise control measures presented within Section 9.5 of this chapter provides a detailed but not exhaustive list of construction noise management measures. The measures listed will be implemented and supplemented as necessary with further bespoke measures identified through further detailed assessment as part of the final CEMP. Noise and vibration monitoring will also be undertaken.

9.7.5. Residual effects of construction noise and vibration are described in Section 9.9.

Operational noise

9.7.6. The operational assessment has assumed that potential sound perceived at NSR of a tonal, impulsive or intermittent nature (according to BS4142: 2014) will be designed out of the Proposed Development

during the detailed design phase through the selection of appropriate plant, building cladding, louvres, silencers and attenuators, as necessary. Nevertheless, a +3 dB correction for distinctive character has been applied to the predicted *specific sound levels*.

9.7.7. Based on the worst-case results presented in Table 9.22 and Table 9.23, further mitigation would be required to achieve operational sound levels that comply with the NLC criteria and are below the SOAEL and LOAEL at the following NSR:

- All NSR except NSR 11 during the daytime; and
- All NSR except NSR 1 during the night-time.

9.7.8. Table 9.25 outlines the overall range of attenuation required to achieve the daytime and night-time LOAEL criterion of *rating level* no greater than +5 dB above the defined representative *background sound level* at each NSR, and the lower NLC expectation that the LOAEL is +3 dB above background levels at each NSR.

Table 9.25: Calculated sound attenuation requirements

NSR	Attenuation required to achieve LOAEL dB $L_{Aeq,T}$	Attenuation required to achieve NLC criterion dB $L_{Aeq,T}$	Attenuation required to achieve LOAEL dB $L_{Aeq,T}$	Attenuation required to achieve NLC criterion dB $L_{Aeq,T}$
	Daytime		Night-time	
NSR 1 - Vazon Bridge	1	3	0	2
NSR 2 - Hawthorne House, Chapel Lane	1	3	7	9
NSR 3 - Keadby Village (slightly different locations)	4	6	4	6
NSR 4 - Mariners Arms Flats	4	6	7	9
NSR 6 - No. 9 Queens Crescent (slightly different locations)	2	4	2	4
NSR 8 - North Pilfrey Farm	7	9	7	9
NSR 9 - Ealand Poultry Farm	4	6	1	3
NSR 11 – South Pilfrey Farm	-	-	6	8

Receptors marked by a "-" already achieve the criteria

9.7.10. Mitigation required to achieve the defined noise criteria at the NSR will be developed with the plant engineers during detailed design. The assessment will focus on attenuation options for the modelled sources that make the largest contribution to the *specific sound level*.

9.7.11. Mitigation measures and general principles to achieve this may include, but not be limited to, the following depending upon potential benefits achieved from such measures:

- implementation of best available techniques
- reducing the breakout noise from plant through use of enhanced enclosures, or potentially containing them within a building;
- reducing air inlet noise emissions by addition of further in-line attenuation;
- reducing stack outlet noise emissions by addition of silencers or sound attenuating panels;
- reducing fin fan cooler noise emissions by screening, re-sizing, fitting low noise fans or attenuation;
- screening or enclosing the compressors or other equipment;
- use of screening or bunding to shield receptors from noise sources; or
- 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.

9.7.12. The proposed noise sources likely to require mitigation include:

- Transformer yard;
- Reverberant level inside industrial buildings and;
- Water cooling towers;
- Water abstractions station

Residual effects after mitigation are described in Section 9.9 and are considered to be not significant if noise levels are reduced to the NLC expectation to see +3dB above background levels met, which is below the LOAEL (no greater than +5 dB excess of rating level over the background sound level).

9.8. Limitations or Difficulties

Construction

9.8.1. Detailed construction information is not yet available (given that the construction contractor has not yet been appointed) and therefore this assessment draws upon the experience and assessments undertaken for other similar projects. The assessment is quantitative but indicative, although it is considered to be reasonable. However, construction noise thresholds (limit values) are based upon existing ambient sound levels at NSR. Further assessment will be required once the contractor is appointed to ensure that appropriate and sufficient mitigation measures are developed. This and other mitigation measures detailed in Section 9.5 and Section 9.7 will be included in the final CEMP to minimise construction noise and vibration effects.

Operation

9.8.2. Assumptions made during the noise modelling are considered to result in a conservative assessment.

9.8.3. Sound emission data for key sound emitting plant and buildings within the Proposed Development (including turbine halls, Heat Recovery Steam Generator (HRSG), peaking plant) have been taken from the Keadby CCS Power Station ES data. Detailed cladding specifications for the Keadby CCS Power Station buildings have not been available for this assessment therefore, a reasonable worst-case sound power per unit side of these buildings has been applied.

9.8.4. The final design of the Proposed Development is yet to be determined. Therefore, the operational noise modelling undertaken has considered a representative worst-case using the Rochdale Envelope principles, assessing both unmitigated and mitigated scenarios. Given the requirement for additional mitigation measures, further assessment will be undertaken at the detailed design stage, to meet the noise criteria.

9.8.5. Consistent with ISO 9613-2, the assessment assumes gentle downwind conditions for the predicted sound levels at all NSR. Sound levels from the Proposed Development will be lower during periods when NSR are upwind.

9.9. Summary of likely significant residual effects

9.9.1. A summary of the likely significant residual effects, following the implementation of appropriate mitigation to reduce noise and vibration

during construction, operation and decommissioning phases, is presented in Table 9.26 below.

Table 9.26: Summary of likely significant residual effects

Development stage	Predicted Impact	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Residual effect	Nature of effect (Lt/ Mt/ St and P/ T and D/ In)[1]
Construction	Noise effects on residential NSR during construction of the Site, Electrical Connection, Mabey Bridge replacement, and Canal water abstraction (daytime)	**Not significant**	Not required	**Not significant** on the basis that mitigation is employed such that the BS 5228 ABC noise limits are met, and the Section 9.5 mitigation guidance is followed	St, T, D
Construction	Noise effects on residential NSR during construction of the Site, Electrical Connection, Mabey Bridge	**Not significant** to **Significant**	Further detailed assessment and CEMP once contractor appointed	**Not significant** on the basis that mitigation is employed such that the BS 5228 ABC noise limits are met, and the	St, T, D

[1] Note: Lt = long term, Mt = medium term, St = short term, P = permanent, T = temporary, D = direct and In = indirect

Development stage	Predicted Impact	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Residual effect	Nature of effect (Lt/ Mt/ St and P/ T and D/ In)[1]
	replacement, and Canal water abstraction (evening/ night-time)			Section 9.5 mitigation guidance is followed	
Construction	Noise effects due to construction traffic	**Not significant**	Not required	**Not significant**	St, T, D
Construction	Vibration effects on sensitive receptors from works on Main Site (humans and buildings)	**Not significant**	Not required	**Not significant**	St, T, D
Construction	Vibration effects on sensitive receptors from Canal Water Abstraction cofferdam installation (humans, buildings, and structures)	**Significant**	Further detailed assessment and CEMP once contractor appointed.	**Not significant**	St, T, D

Development stage	Predicted Impact	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Residual effect	Nature of effect (Lt/ Mt/ St and P/ T and D/ In)[1]
Construction	Noise and vibration effects on ecological receptors within River Trent	**Not significant**	Agreement of appropriate sensitive timings for any cofferdam installation and removal taking into account potential for migrating river and sea lamprey and other fish. Provision of a Fish Management Plan to support the relevant permitting for these works.	**Not significant**	St, T, D
Operation	Operational effects on residential NSR	**Not significant** to **Significant**	Application of practical sound mitigation to reduce relevant noise at source compressors, absorber stack, absorber stack exhaust, HRSG	**Not significant**	Lt, P, D

Development stage	Predicted Impact	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Residual effect	Nature of effect (Lt/ Mt/ St and P/ T and D/ In)[1]
			walls and roof, all pumps, Hybrid cooling towers and turbine intake as shown in Section 9.7. During detailed design, an operational noise control scheme (including agreed noise limits) will be prepared, secured by a Requirement of the draft DCO (**Application Document Ref 2.1**), which would demonstrate use of Best Available Techniques (BAT) for the control of noise for the Environmental Permit.		

Development stage	Predicted Impact	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Residual effect	Nature of effect (Lt/ Mt/ St and P/ T and D/ In)[1]
Decommissioning	Noise effects during daytime decommissioning of the Main Site/ Electrical connections, Mabey Bridge replacement, and Canal water abstraction	**Not significant**	Not required	**Not significant**	St, T, D

Note: Lt = long term, Mt = medium term, St = short term, P = permanent, T = temporary, D = direct and In = indirect.

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