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7. Noise and Vibration

7.1 Introduction

- 7.1.1 This chapter of the Environmental Statement (ES) addresses the potential noise and vibration impacts of Post Combustion Carbon Capture (PCC) developments at the VPI Combined Heat and Power (CHP) plant (Proposed VPI Development) and the Phillips 66 Humber Refinery (Proposed Phillips 66 Development) on local Noise Sensitive Receptors (NSRs). The impacts and effects of the Proposed VPI Development and Phillips 66 Development are considered separately and for both developments together (the Proposed Developments).
- 7.1.2 Impacts during the construction, operation (including maintenance) and decommissioning of the Proposed Developments are assessed. In particular, the assessment considers:
- existing and future baseline conditions;
 - the effects of construction of the Proposed Developments on NSRs during the site clearance and construction works, including predicted changes in road traffic noise levels on the local road network during construction;
 - the effects of noise and vibration resulting from operation of the Proposed Developments; and
 - the effects of noise and vibration resulting from decommissioning of the Proposed Developments.
- 7.1.3 The cumulative effects of noise associated with the Proposed Developments and other committed developments in the vicinity are described in Chapter 18: Cumulative and Combined Effects (ES Volume I).
- 7.1.4 This chapter is supported by Figures 7.1 – 7.4, provided in ES Volume III, and Appendix 7A: Noise Surveys, Appendix 7B: Construction Sound Levels and Assumptions, and Appendix 7C: Operational Sound Levels and Assumptions, provided in ES Volume II.
- 7.1.5 This chapter assesses the impact of noise on residential and other human receptors. The assessment of noise impacts on relevant ecological receptors is presented in Chapter 13: Ecology and Nature Conservation (ES Volume I).

7.2 Legislation and Planning Policy Context

- 7.2.1 This section discusses the legislation, planning policy context and standards relevant to assessing the impacts of noise and vibration on residential and other human receptors.

Legislation

Environmental Protection Act 1990

- 7.2.2 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.
- 7.2.3 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.
- 7.2.4 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

- 7.2.5 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 planning authority with instructions to cease work until specific conditions to reduce noise have been adopted.
- 7.2.6 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.
- 7.2.7 The CoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to British Standard 5228 (British Standards Institute (BSI), 2014a and b) (herein referred to as ‘BS 5228’) which provides guidance on mitigation measures.

Environmental Permitting Regulations 2016 (as amended)

- 7.2.8 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 in order 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. The Proposed Developments will require variations to the existing permits.
- 7.2.9 In terms of noise specifically, the selection of BAT will have to be considered and balanced with releases to different environmental media (air, land and water) and to give due consideration to issues such as usage of energy and raw materials. Noise, therefore, cannot be considered in isolation from other impacts on the environment.
- 7.2.10 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 human senses or impair or interfere with amenities and other legitimate uses of the environment*”. BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, ‘offence of any human senses’ may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases, it may be possible, and desirable, to reduce noise emissions 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.
- 7.2.11 Guidance regarding Environmental Permitting and noise is available in the Environment Agency’s Integrated Pollution Prevention and Control (IPPC) H3 document ‘Horizontal Guidance for Noise Part 2 - Noise assessment and Control’ (Environment Agency, 2002a). However, ‘Horizontal Guidance for Noise Part 1 – Regulation and Permitting’ (Environment Agency, 2002b), which provided useful guidance relating to noise limits from industrial installations in terms of absolute *rating levels* and *rating levels* relative to *background sound levels* (as defined in BS 4142:1997 (now superseded)) was withdrawn in February 2016. Therefore, industry wide noise limits no longer apply.

National Policy

- 7.2.12 While National Policy Statements (NPS) apply to Nationally Significant Projects (NSIPs) rather than local planning applications, they can, however, have points of relevance in the determination of local planning applications.

7.2.13 Section 5.11 of the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy & Climate Change (DECC) 2011) refers to the Government’s policy on noise within the Noise Policy Statement for England (NPSE) (discussed further below).

7.2.14 With regards to decision making, NPS EN-1 states:

“The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission.” (paragraph 5.11.8)

7.2.15 Section 7.5 of this chapter describes the impact avoidance measures identified as relevant to the Proposed Developments.

7.2.16 The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (DECC, 2011b) sets out policy specific to fossil fuel power stations such as the VPI Immingham CHP Plant. In paragraph 2.7.1, specific sources of noise are identified. Those that are relevant to the Proposed VPI Development include *“the gas and steam turbines that operate continuously during normal operation”*. It then reiterates the point made in NPS EN-1, stating that:

“The primary mitigation for noise from fossil fuel 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’. It goes on to state that *“Noise from gas turbines should be mitigated by attenuation of exhausts to reduce any risk of low-frequency noise transmission.”* (paragraph 2.7.5)

7.2.17 Table 7.1 provides a summary of the NPS advice regarding noise and vibration and how each has been considered in this chapter.

Table 7.1: Summary of relevant NPS advice regarding noise and vibration

Summary of NPS	Consideration within chapter
NPS EN-1	
Paragraph 5.11.4 states: <i>“Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:</i>	Descriptions of noise generating aspects of the Proposed Developments, together with an assessment of construction, operational and decommissioning noise and vibration impacts are presented in Section 7.6 of this chapter.
<ul style="list-style-type: none"> • <i>A description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive, tonal, impulsive or low frequency characteristics of the noise;</i> 	NSRs including proximity of any Noise Important Areas (NIA) are identified.
<ul style="list-style-type: none"> • <i>Identification of noise sensitive premises and noise sensitive areas that may be affected;</i> 	Information relating to the existing noise environment is presented in Section 7.4 of this chapter.
<ul style="list-style-type: none"> • <i>The characteristics of the existing noise environment;</i> 	The mitigation of construction and operational noise is discussed in Section 7.5 and 7.7 of this chapter.
<ul style="list-style-type: none"> • <i>A prediction of how the noise environment will change with the proposed development;</i> 	
<ul style="list-style-type: none"> • <i>In the shorter term such as during the construction period;</i> 	
<ul style="list-style-type: none"> • <i>In the longer term during the operating life of the infrastructure;</i> 	
<ul style="list-style-type: none"> • <i>At particular times of the day, evening and night as appropriate;</i> 	
<ul style="list-style-type: none"> • <i>An assessment of the effect of predicted changes in the noise; and</i> 	
<ul style="list-style-type: none"> • <i>Measures to be employed in mitigation noise.</i> 	

Summary of NPS

Consideration within chapter

NPS EN-1

The nature and extent of the noise assessment should be proportionate to the likely noise impact.”

Paragraph 5.11.5 states: *“The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.”*

Potential construction related traffic noise effects on human NSRs have been assessed in Section 7.6 of this chapter.

Paragraph 5.11.6 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...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 British Standards and other guidance which also give examples of mitigation strategies.”*

Potential operational noise effects on human NSRs are presented in Section 7.6 of this chapter.

Paragraph 5.11.7 states: *“The applicant should consult EA and Natural England (NE), as necessary and in particular with regard to 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 taken into account.”*

Potential effects of noise on biodiversity and nature conservation are considered in Chapter 13: Ecology and Nature Conservation (ES Volume I) and the Habitat Regulations Assessment Reports submitted with each planning application.

Paragraph 5.11.8 states *“The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission.”*

Section 7.5 of this chapter describes the impact avoidance measures identified as relevant to the Proposed Developments.

NPS-EN1

Paragraph 2.7.2 states: *“The ES should include a noise assessment as described in Section 5.11 in EN-1.”*

A noise assessment is included within this chapter.

National Planning Policy Framework

7.2.18 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2021) sets out that planning should make sufficient provision for *“conservation and enhancement of the natural, built and historic environment”* (Paragraph 20d). Consequently, the aim is to prevent both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution.

7.2.19 Paragraph 174 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.”

7.2.20 Paragraph 185 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;... [and]*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.*

7.2.21 With regards to ‘adverse effects’ and ‘significant adverse effects’ the NPPF refers to the Noise Policy Statement for England Explanatory Note (NPSE) (Department for Environment, Food and Rural Affairs (Defra), 2010), which is described in the sub-section below.

Noise Policy Statement for England

7.2.22 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.

7.2.23 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 policy on sustainable development”.

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

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

7.2.25 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.

7.2.26 The ‘Explanatory Note’ within 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 no detectable effect on health and quality of life due to noise can be established;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

7.2.27 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.

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

Planning Practice Guidance – Noise

7.2.29 The Planning Practice Guidance (PPG) (MHCLG, 2019) was first published on 6th March 2014 to provide a web-based resource with more in-depth guidance to the NPPF (MHCLG, 2021). 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 2021.

7.2.30 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.

7.2.31 This guidance introduced the additional concepts of No Observed Adverse Effect Level (NOAEL), and Unacceptable Adverse Effect Level (UAEL). Full details of the PPG guidance on effects are provided in Table 7.2.

Table 7.2: Planning Practice Guidance noise advice

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. 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 (LOAEL)			
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 (SOAEL)			

Perception	Examples of outcomes	Effect level	Action
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 sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
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 or physiological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

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

Local Policy

7.2.33 The Development Plan for North Lincolnshire comprises the North Lincolnshire Local Development Framework (LDF) and the ‘Saved Policies’ of the North Lincolnshire Local Plan (NLC, 2007). The LDF includes the Core Strategy (adopted June 2011) (NLC, 2011).

7.2.34 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 which 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.

7.2.35 Policy 3 of Planning for Health and Wellbeing - “Well Designed Places” - states:

*“When considering the detail of development, proposals should:
Seek to reduce noise and air pollution through ensuring planning applications include a Noise Impact Assessment..... in areas of concern.”*

7.2.36 Paragraph 4.15 states *“the design of places also needs to take account of transport which has a direct impact on health and safety. Air pollution, noise, traffic and congestion all have a negative impact on people’s ability to enjoy their environment.”*

7.2.37 The ‘Saved’ policies of the Local Plan (NLC, 2007) that it is considered may be relevant to the determination of the planning applications include DS 1 General Requirements and DS 11.

7.2.38 Policy DS 1 General Requirements states:

“A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:

Amenity: iii) No acceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or tother nuisance, or through the effects of overlooking or overshadowing.”

7.2.39 Policy DS 11 Polluting Activities states:

“Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas.”

Other Guidance

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

- 7.2.40 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

- 7.2.41 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_{Aw}) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 ‘Code of practice provides a ‘best practice’ guide for noise and vibration control on construction and open sites. Vibration’ (BSI, 2014b) provides comparable ‘best practice’ for vibration control, including guidance on the human response to vibration.

British Standard 6472:2008

- 7.2.42 BS 6472-1 ‘Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting’ (BSI, 2008), presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration), above which adverse comment is likely to occur in residential properties.

British Standard 7385:1993

- 7.2.43 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

- 7.2.44 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

- 7.2.45 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.

British Standard 8233:2014

- 7.2.46 BS 8233 ‘Guidance on sound insulation and noise reduction for buildings’ (BSI, 2014d) defines criteria for noise levels in and around buildings.

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

- 7.2.47 ISO 9613-2:1996 ‘Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation’ (ISO, 1996) specifies an engineering method for calculating the attenuation of

sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

Calculation of Road Traffic Noise

- 7.2.48 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

- 7.2.49 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 all road projects, including new construction, improvements and maintenance. The guidance is also useful for assessing changes in traffic noise levels as a result of non-road projects such as this.

World Health Organization

- 7.2.50 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.
- 7.2.51 The WHO ‘Night Noise Guidelines for Europe’ (WHO, 2009) recommended updated guidelines on night-time noise limits to avoid sleep disturbance.

7.3 Assessment Methodology and Significance Criteria

Study Area

- 7.3.1 The extent of the study area has been defined to include the closest NSRs and communities in each direction from Proposed Developments. Study areas have also been informed by changes in road traffic flows predicted during the construction phase of the Proposed Developments. The extent of the study areas are shown in Figures 7.2a-c: Construction Noise Level Predictions, Figures 7.3a-c: Operational Noise Level Predictions (Daytime Unmitigated Scenario) and Figures 7.4a-c: Operational Noise Level Predictions (Night-time Unmitigated Scenario), found in ES Volume III.

Assessment Methodology

- 7.3.2 To facilitate the impact assessment process and ensure consistency in the terminology used, a defined assessment methodology has been applied. This methodology has been developed from a range of sources, including the guidance documents listed above in paragraphs 7.2.40 to 7.2.51.
- 7.3.3 An understanding of the existing sound climate in the vicinity of the Proposed Developments has been obtained through baseline sound measurement surveys, traffic count data for the local highway network and a review of details of the current uses on the Proposed Developments’ sites (referred to as ‘the Phillips 66 Site’ and ‘the VPI Site’, and collectively ‘the Sites’). This baseline information has been used to assess the effects of noise associated with construction, construction traffic, operational and decommissioning noise arising from the Proposed Developments.

Determining Baseline Conditions and Noise and Vibration Sensitive Receptors

- 7.3.4 The location of potential NSRs in proximity to the Phillips 66 Site and the VPI Site 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 Developments.
- 7.3.5 The NSR locations selected are considered representative of the nearest and potentially most sensitive existing receptors to the Phillips 66 Site and the VPI Site. It is considered that if noise and vibration levels are suitably controlled at the selected receptors identified, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area. The NSRs are shown in Table 7.3 and illustrated on Figure 7.1: Noise and Vibration Sensitive Receptors (ES Volume III).

Table 7.3: Potential noise sensitive receptors

Receptor	Sensitivity/ value of receptors	Direction from Phillips 66 Site	Distance from Phillips 66 Site boundary (m)*	Direction from VPI Site	Distance from VPI Site boundary (m)*
NSR 1 – Staple Road	High	West	519	West	1542
NSR 2 – Clarks Road	High	North-west	790	West	1930
NSR 3 – Church Lane	High	North-west	770	North-west	1944
NSR 4 – Hazel Dene	High	North-east	1651	East	340

*Distance from the closest point to the Phillips 66 Site and VPI Site boundaries reported

- 7.3.6 The nearest NIA is located in Great Coates on the A1136. This is approximately 9 km away from the Sites, therefore noise impacts from the Proposed Developments at this location are unlikely and no further assessment is required.
- 7.3.7 A description of the study areas for ecological receptors are presented in Chapter 13: Ecology and Nature Conservation. Further assessment is provided in the Habitats Regulations Assessment Report.

Baseline Sound Surveys

- 7.3.8 Baseline sound monitoring to inform the assessment was undertaken at the four key residential NSRs identified in Table 7.3. This comprised unattended measurements with observations made on set up and collection of equipment and weather data recorded using a weather station located at NSR 2. Further details of the baseline sound surveys can be found in Appendix 7A (ES Volume II). The results of the baseline sound monitoring are summarised in Table 7.12 in Section 7.4 of this chapter.

Construction Phase Impacts

- 7.3.9 To determine the temporary noise and vibration impacts that may arise during the construction phase the following matters have been considered:
- noise and vibration caused by construction site activities; and
 - noise caused by increases in traffic on existing roads as a result of construction traffic.

Assessment of Construction and Decommissioning Noise

- 7.3.10 At this stage in the Proposed Developments' 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 not fully available. 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 (BSI, 2014a), based upon construction information from similar projects and confirmed/ updated by Phillips 66 and VPI. Further details of the proposed construction plant can be found in Appendix 7B (ES Volume II). At this stage it is assumed the decommissioning works will be similar to the construction works.
- 7.3.11 The assessment involves the calculation of sound emissions from the construction site based on the sound power levels associated with the plant or equipment to be used, and the propagation of sound from the source to the NSR locations. Sound power levels are taken from manufacturers data and/or archive data given in BS 5228-1. The calculated levels are then compared to nominated criteria to determine whether an adverse impact is expected.
- 7.3.12 The calculation method provided in BS 5228 (2014a) also takes account of factors including the number and type of equipment operating, their modes of operation (% on-times within the working period), the distance to the NSR, and the effects of any intervening ground cover or barrier/ topographical screening. This allows the prediction of the magnitude of impact.
- 7.3.13 The subsequent assessment of construction noise impacts at residential NSR considers the guidance in 'example method 1 – the ABC method' as defined in BS 5228 (BSI, 2014a). Table 7.4 (reproduced from BS 5228-1) provides guidance in terms of appropriate threshold values for residential NSR, based upon existing ambient noise levels.

Table 7.4: Construction noise threshold values at residential dwellings

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB		
	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.

- 7.3.14 For the appropriate period (day, evening, night 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.

- 7.3.15 Based upon the BS 5228 ABC method (BSI, 2014a), the criterion adopted in this assessment for the determination of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be equivalent to the SOAEL, although as stated in BS 5228, other project-specific factors, such as the number of NSR affected and the duration and character of the impact, should also be considered by the assessor when determining if there is a potentially significant effect.
- 7.3.16 For residential receptors and other high sensitivity human receptors, the criterion for the LOAEL is a predicted construction noise level equal to the existing ambient noise level at each NSR i.e. resulting in a 3 dB increase in noise level when combined with the existing ambient noise level.
- 7.3.17 It is noted that the criteria for the LOAEL and SOAEL relate to residential NSR only, in line with the ABC method.
- 7.3.18 In accordance with the NPPF (MHCLG, 2021) and NPSE (Defra, 2010), it is important to avoid significant adverse effects (at or above the SOAEL) and also mitigate and minimise other adverse effects (above the LOAEL), where possible.
- 7.3.19 Based upon the above, the magnitude of the impact of construction noise is classified in accordance with the descriptors in Table 7.5.

Table 7.5: Magnitude of construction noise impacts

Magnitude of Impact	Comparison with Threshold Value $L_{Aeq,T}$ dB
High	Exceedance of ABC Threshold Value by $\geq +5$ dB
Medium	Exceedance of ABC Threshold Value by up to +5 dB
Low	Equal to or below the ABC Threshold Value by up to 5 dB
Negligible	Below the ABC Threshold Value by ≥ -5 dB

Assessment of Construction Works Traffic on the Public Highway

- 7.3.20 The Proposed Developments will affect traffic flows on existing roads in the area within and surrounding the Proposed Development Sites during construction. The assessment focuses on the impact at NSRs located alongside the local road network.
- 7.3.21 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).
- 7.3.22 18-hour (06:00 – 24:00) Annual Average Weekday Traffic (AAWT) data have been obtained for the year 2026 'with' and 'without' construction traffic during the peak construction period, in order to determine if any existing roads are predicted to be subject to a potentially significant change in 18-hour traffic flows. CRTN Basic Noise Level (BNL) calculations have been undertaken to predict the change in noise level between the 'with' and 'without' scenarios.
- 7.3.23 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 7.6 below. The magnitude descriptors in parenthesis are provided to align with the descriptors used in this assessment.

Table 7.6: Construction traffic noise criteria

Magnitude of Impact	Change in traffic noise level $L_{A10,18h}$ dB
Major (High)	≥ 5
Moderate (Medium)	3 to <5

Magnitude of Impact	Change in traffic noise level $L_{A10,18h}$ dB
Minor (Low)	1 to <3
Negligible (Very Low)	<1

- 7.3.24 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 $L_{A10,18hr}$.
- 7.3.25 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 and the LOAEL at ≥ 1 dB.

Assessment of Construction Vibration

Impacts on Humans - Annoyance

- 7.3.26 Due to distances between the construction works and the NSRs, significant adverse effects are unlikely, however general information and criteria are provided below.
- 7.3.27 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228-2: 2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (BSI, 2014b) provides data on measured levels of vibration for various construction works, with particular emphasis on piling.
- 7.3.28 Table 7.7 sets out Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of demolition and construction vibration impacts on human receptors, based on guidance contained in BS 5228-2 (BSI, 2014b).

Table 7.7: Construction vibration thresholds at residential dwellings

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

- 7.3.29 For residential receptors and other high sensitivity receptors, the LOAEL is defined as a PPV of 0.3 mm/s (millimetres per second); this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level

at which construction vibration could become significant with respect to human annoyance but can be tolerated with prior warning.

- 7.3.30 The nearest residential NSRs are approximately 340 m from the Proposed VPI Development and 545 m from the Proposed Phillips 66 Development. Given the distance between the residential NSRs and the Proposed Developments, no significant vibration effects (i.e. those associated with a medium or high magnitude impact) are expected to result from the proposed construction (or demolition) activities and therefore further assessment on residential NSRs has been scoped out.

Impacts on Buildings/ Existing Infrastructure

- 7.3.31 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels are controlled to those relating to annoyance (i.e. 1.0 mm/s), then it is highly unlikely that buildings will be damaged by demolition and construction vibration levels.
- 7.3.32 Given the distance to residential receptors, no significant vibration is expected to result from the proposed construction activities on such receptors and therefore further assessment of the effects of vibration on residential buildings is scoped out. However, if piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing sensitive buildings/ structures, further consideration will be given to potential impacts, once the contractor is appointed and the construction methods and requirements are known.
- 7.3.33 With respect to existing buildings within the Phillips 66 Site and VPI Site, as both the construction of the Proposed Developments and the existing buildings are both within the control of the respective Applicant, any identified issues can be effectively managed by the Applicants and their contractors. Potential measures to ensure that appropriate mitigation is in place during the works are discussed in Section 7.5 and Section 7.7 of this chapter.

Assessment of Operational Sound - Residential NSRs

- 7.3.34 The assessment of operational sound levels has been based upon calculations taking account of proposed plant and equipment (refer to Appendix 7C: Operational Noise Appendix in ES Volume II) sound power levels (L_w) relating to the proposed plant, distance between the proposed plant and NSRs and the acoustic screening offered by existing topography and existing and proposed new buildings.
- 7.3.35 Three-dimensional sound propagation models have been developed using the modelling software SoundPlan Version 8.2 to assess the current layout options for the Proposed Developments. SoundPlan implements the prediction method ISO 9613-2: 1996 'Attenuation of sound during propagation outdoors' (ISO, 1996), which has been employed to calculate sound levels at surrounding NSR due to proposed operations at the Sites.
- 7.3.36 Topographical features and buildings that may influence the transmission of sound from the Proposed Developments to NSR are included in the model. A digital terrain model created using publicly available ground elevation spot height data have been used to position buildings and other noise sources at the proposed heights relative to ground. Areas of acoustically soft (e.g. vegetation) and hard (e.g. concrete) ground have been identified from the Ordnance Survey MasterMap Topographic Layer and modelled accordingly.
- 7.3.37 The prediction method assumes that the prevailing wind direction is always from source to receiver, which is likely to overestimate sound from the Proposed Developments for much of the time for the vast majority of NSRs, given the predominant wind direction in the UK is from the south-west.
- 7.3.38 Based upon the predicted sound levels from the model, an assessment of potential impacts 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).

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

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

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

- tonality: up to +6 dB penalty;
- impulsivity: up to +9 dB penalty (this can be summed with tonality penalty); and
- other sound characteristics (neither tonal nor impulsive but still distinctive): +3 dB penalty.

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

“Typically, the greater the difference, the greater the magnitude of impact.

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending 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.”

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

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

7.3.44 Table 7.8 illustrates the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 (BSI, 2014c) assessment purposes, the SOAEL is set at a *rating level* above the *background sound level* of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 7.8: Magnitude of impact for industrial sound

Magnitude of impact		BS 4142 descriptor	Rating level minus background sound level (dB)
High	No BS 4142 descriptor for this magnitude level		>15
Medium	Indication of a significant adverse impact, depending upon context		+10 approx.
Low	Indication of an adverse impact, depending upon context		+5 approx.

Magnitude of impact	BS 4142 descriptor	Rating level minus background sound level (dB)
Very low	Indication of low impact, depending upon context	≤ 0

7.3.45 It is intended for the Proposed Developments that the *rating level* will be limited to no greater than +5 dB above the *background sound level* in order to not exceed the LOAEL. Achieving no greater than the LOAEL would ensure that significant adverse effects are avoided, and that other adverse effects are minimised; primary and secondary aims of NPSE. However, both Phillips 66 and VPI are aiming to achieve a lower *rating level* of +3 dB above *background sound level* where practicable.

Assessment of Road Traffic Noise During the Operational Phase

7.3.46 The traffic generation associated with the operational phase of the Proposed Developments is predicted to be limited and has been scoped out of the transport assessment as stated in ES Chapter 8: Traffic and Transport (ES Volume I) and therefore is not considered further in this chapter.

Assessment of Operational Vibration Impacts

7.3.47 No significant sources of vibration are likely to be present due to the Proposed Developments and given the distances to the residential NSRs, it is not anticipated that vibration levels will be significant. Therefore, further assessment of operational vibration is scoped out of this assessment.

Receptor Sensitivity

7.3.48 Effects are classified based on the magnitude of the impact (as outlined above for the various potential impacts during construction and operation) and the sensitivity or value of the affected receptor. A scale of receptor sensitivity is presented in Table 7.9.

Table 7.9: Sensitivity/ value of receptors

Sensitivity/ value of receptor	Description	Examples of receptor usage
Very high	Receptors where noise or vibration will significantly affect the function of a receptor	Auditoria/ studios Specialist medical/ teaching centres, or laboratories with highly sensitive equipment
High	Receptors where people or operations are particularly susceptible to noise or vibration	Residential Quiet outdoor areas used for recreation Conference facilities Schools/ educational facilities in the daytime Hospitals/ residential care homes Libraries
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	Offices Restaurants/ retail Sports grounds when spectators or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf)
Low	Receptors where distraction or disturbance of people	Residences and other buildings not occupied during working hours

Sensitivity/ value of receptor	Description	Examples of receptor usage
	from noise or vibration is minimal	Factories and working environments with existing high noise levels Sports grounds when spectators or noise is a normal part of the event

Classification of Effects

7.3.49 Impacts are defined as changes arising from the Proposed Developments, and consideration of the result of these impacts on environmental receptors enables the identification of associated effects, and their classification (major, moderate, minor and negligible, and adverse, neutral or beneficial). Each effect has been classified both before and after mitigation measures have been applied.

7.3.50 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.

7.3.51 The effect resulting from each individual potential impact type above is classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in Table 7.10 below, but where necessary also considering the context of the acoustic environment.

Table 7.10: Significance of Effects Matrix

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

7.3.52 Where adverse or beneficial effects have been identified, these have been assessed against the following significance scale, derived using the matrix presented in Table 7.10.

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

7.3.53 For the purposes of this assessment, negligible and minor effects are considered to be not significant, whereas moderate and major effects are considered to be significant. Where necessary the context of the acoustic environment has also been considered in determining the classification of effect.

Data Sources

7.3.54 The following sources of information that define the Proposed Developments have been reviewed and form the basis of the assessment of likely significant effects of sound, noise and vibration from the Proposed Developments:

- Chapter 3: Proposed Developments Description, Need and Alternatives Considered;
- Chapter 4: Construction Programme and Management;
- Indicative Layout 3D Model and Block Plan for the Proposed Phillips 66 Development as provided by Phillips 66's design team;
- Indicative Layout and Zoning Plan for the Proposed VPI Development as provided by VPI's design team;
- items of plant including sound power level data for the Proposed Phillips 66 Development as provided by Phillips 66's design team;
- items of plant including sound power level data for Proposed VPI Development as provided by VPI's design team ;
- AAWT traffic data from the Transport Assessment (TA) (Appendix 8A ES Volume II) for the construction phase of the Proposed Developments; and
- Ordnance Survey (OS) MasterMap mapping, topographical data (LiDAR data) and aerial photography of the Proposed Developments and surrounding area.

Use of Rochdale Envelope

7.3.55 The assessment of sound, 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 Developments are not able to be confirmed when an application is submitted and flexibility is needed to address design uncertainty. The three key principles an assessment should adopt are as follows:

- use a cautious worst-case approach;
- the level of information assessed should be sufficient to enable the likely significant effects of a proposed development to be assessed; and
- the allowance for flexibility should not be abused to provide inadequate descriptions of projects.

7.3.56 In line with these principles, the following approach has been taken for the construction stage:

- within each of the Sites, plant has been distributed across the development site and adjacent laydown areas;
- 24-hour construction is proposed at the Phillips 66 Site, with plant assumed to be in constant operation as a worst-case scenario (see Appendix 9A: Construction Noise Assessment Methodology (ES Volume II)); and
- construction activities and plant for the Proposed VPI Development have been assumed to be in constant operation through the 07:00 to 19:00 working day and Saturday 08:00 to 13:00 (see Appendix 9A: Construction Noise Assessment Methodology (ES Volume II)).

7.3.57 The following approach has been taken for the operational assessment:

- for each of the Sites a block/ zoning plan was used to identify approximate locations for each piece of plant. The closest location for the closest receptor in each block has been used for predicting worst-case sound levels at the NSRs.
- The free-field design criterion assumed for each piece of sound producing plant at each site is provided in Appendix 7C. There are different sound levels for equipment (e.g. fans) between the two developments due to differences in design, specification or size.

7.3.58 In relation to both construction noise and operational sound effects, mitigation, if considered necessary, would be integrated into the detailed design, in order to meet the limits to be agreed at the nearest NSR.

Consultation

7.3.59 The EIA scoping opinion stated *‘the general approach to the noise and vibration assessment is supported. The noise assessment which will accompany the ES will include the following:*

- *construction and decommissioning noise and vibration impacts (including impacts related to traffic on public roads);*
- *operational noise impacts from the Proposed Developments, including the potential air-cooling infrastructure; and*
- *operational noise impacts from road traffic on public roads’.*

7.3.60 The scoping opinion confirmed that operational traffic related noise impacts can be scoped out of the assessment if justification can be provided.

7.3.61 The scoping response also states *‘the methodology and details regarding the assessment will be agreed in advance with North Lincolnshire Council’.*

7.3.62 During the public consultation, concerns were raised about the noise impacts on residential properties during construction and regarding operational traffic impacts (see the Consultation Report submitted to accompany the Applications).

7.3.63 The Environmental Protection Officer at North Lincolnshire Council has been contacted to confirm the assessment methodology adopted in the assessment.

7.4 Baseline Conditions

Existing Baseline

7.4.1 The existing baseline sound climate in the vicinity of the Proposed Developments is dominated by sound from the industrial/ commercial operations at the Phillips 66 Humber Refinery and VPI Immingham CHP Plant and other nearby industrial operations as well as rail noise and road traffic noise from A160 and other local roads.

7.4.2 In order to help further define the existing sound conditions at NSRs, *ambient* and *background sound level* measurements have been undertaken at four representative residential locations (NSRs 1-4). The monitoring locations are shown on Figure 7.1 (ES Volume III).

7.4.3 Sound level monitoring was undertaken to the requirements of BS 7445 1: 2003 ‘Description and measurement of environmental noise. Guide to quantities and procedures’ (BSI, 2003), in particular regarding instrumentation and monitoring methodology.

7.4.4 All measurements were taken at approximately 1.5 m above ground level, and were positioned at least 3.5 m from any reflecting surface, other than the ground (i.e. free-field measurements). Each sound level meter was set to log the L_{AF10} , L_{Aeq} , L_{AF90} and L_{AFmax} parameters.

7.4.5 The observations shown in Table 7.11 are the general baseline sound environment at each monitoring location recorded during the set-up and collection of the equipment.

Table 7.11: Sound climate observations at receptors

Receptor	Sound Climate Observations
NSR 1 – Staple Road	Noise from Phillips 66 Humber Refinery, wind generated noise.
NSR 2 – Clarkes Road	Noise from Phillips 66 Humber Refinery, bird song and nearby railway.

Receptor	Sound Climate Observations
NSR 3 – Church Lane	Sound from Phillips 66 Humber Refinery, together with other sources including bird song, wind generated noise, power tools and local residents.
NSR 4 – Hazel Dene	Sound from VPI Immingham CHP Plant, together with other sources include bird song, distant road traffic, trains, industrial moving sounds e.g. cranes.

- 7.4.6 The weather conditions during the survey periods were all within the parameters set out in the relevant guidance documents including BS 7445 (BSI, 2003) and BS 4142 (BSI, 2014c). The weather conditions are summarised for each location in Appendix 7A (ES Volume II).
- 7.4.7 The sound level meters and associated microphones were field calibrated at the beginning and end of their respective measurement periods in accordance with recommended practice. No significant drift in calibration was observed. The accuracy of the calibrator can be traced to the National Physical Laboratory Standards. Full details of the equipment used can be found in Appendix 7A (ES Volume II).
- 7.4.8 Section 8.1.1 of BS 4142 states that *background sound level* should be determined in “*weather conditions that are representative or comparable to the weather conditions when the specific sound occurs*”. The propagation of sound from outdoor sources is significantly influenced by the weather. In particular the propagation down wind of a source can be 10 to 15 dB greater than that upwind. The prediction methodology used to derive the *specific sound level* for all noise sources (based on ISO 9613 (ISO 1996)) assumes downwind conditions to the receptor. Therefore, the predicted *specific sound levels* will only occur when the receptor is downwind of the source. Representative *background sound levels* must therefore be measured in similar conditions. The dataset was therefore filtered so that only measurement sessions where the average wind direction was within a 120 degree arc (60 degrees each side) of the downwind condition were included for further analysis.
- 7.4.9 Section 8.1.4 of BS 4142 states that to obtain a representative value the dataset should be analysed statistically and then a judgment made. It clearly states that the lowest measured level should not be taken as representative. Therefore, after filtering for wind direction as described above the remaining levels were analysed and a representative value was selected.
- 7.4.10 The results from the baseline sound surveys are provided in Table 7.12. Surveys were undertaken during April and May 2022 during operational periods. The L_{Aeq} values presented in Table 7.12 combine all measurements taken in each time period (e.g. day/ night), whilst the L_{AF90} values presented are the ‘representative’ BS 4142 *background sound levels*, determined from analysis of the measured values.

Table 7.12: Baseline sound levels

Receptor	Time Period	$L_{Aeq,T}$ dB	$L_{AF90, 15min}$ dB
NSR 1 – Staple Road	Daytime	54	49
	Night-time	52	48
NSR 2 – Clarkes Road	Daytime	52	46
	Night-time	50	45
NSR 3 – Church Lane	Daytime	52	46
	Night-time	49	45
NSR 4 – Hazel Dene	Daytime	55	50
	Night-time	55	51

Future Baseline

- 7.4.11 In the absence of the Proposed Developments, future baseline sound levels at NSRs will continue to be influenced by traffic flows on surrounding road and rail networks, operations at Phillips 66, VPI and other industrial/ commercial premises, plus any future developments in the area.

7.5 Development Design and Impact Avoidance

Construction Noise

- 7.5.1 The proposed construction programme and working hours are described in Chapter 4: Construction Programme and Management (ES Volume I). However, it is likely that some construction works for the Proposed VPI Development may need to take place outside of the normal working hours and could be 24/7, although these would be limited to manage critical periods where required. Where on-site works are to be conducted outside the normal construction working hours, they will comply with any restrictions agreed with the local planning authority regarding control of noise. Normal construction working hours for the Proposed Phillips 66 Development could be 24/7 where required as per the existing Humber Refinery operating and maintenance working hours.

- 7.5.2 Measures to mitigate noise will be implemented during the construction phase of the Proposed Developments in order to minimise impacts at local NSRs and ecological receptors, particularly with respect to activities required outside of core working hours. Mitigation (included in the Outline CEMP) 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;
- use of hydraulic techniques for breaking, 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 Developments, 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 Sites 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 Chapter 8: Traffic and Transport ES Volume I);
- provision of information to NLC and local residents to advise of potential noisy works that are due to take place; and
- monitoring of any noise complaints and reporting to the Applicant for immediate investigation.

- 7.5.3 Method statements regarding construction management, traffic management, and overall site management will be prepared in accordance with best practice and relevant British Standards, to help to reduce the impacts of construction works. One of the key aims of such method statements will be to minimise noise disruption to local residents during the construction phase as far as reasonably practicable.
- 7.5.4 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 any complaints can be addressed.
- 7.5.5 The selected contractors for each of the Proposed Developments would be encouraged to be a member of the ‘Considerate Constructors Scheme’, which is an initiative open to all contractors undertaking building work.
- 7.5.6 As mentioned above, a Final CEMP will be prepared for each of the Proposed Developments which will set out provisions to ensure that the noise and vibration impacts relating to construction activities are reduced, as far as reasonably practicable, based on the measures outlined above. An Outline CEMP is provided as Appendix 4A (ES Volume II).
- 7.5.7 To assist in the preparation of the Final CEMP for each of the Proposed Developments, a detailed noise and vibration assessment will be undertaken for each of the Proposed Developments once the contractor is appointed and further details of construction methods are known, in order to identify specific mitigation measures for each of the Proposed Developments.

Carbon Dioxide and Other Venting During Commissioning and Operation

- 7.5.8 A CO₂ venting system will be designed to collect and safely disperse abnormal CO₂ releases generated in the Proposed Developments and needing to be discharged during start up venting, emergency venting or for safety reasons, for example due to plant over-pressurisation situations or due to maintenance activities. This venting system will comprise:
- small individual vents for minor emissions from equipment e.g. during routine maintenance;
 - larger vents sized to safely dispose of larger volume emissions in an emergency scenario. The sizing of these vents is subject to ongoing work and would be confirmed at detailed design stage; and
 - venting of steam lines and traps.
- 7.5.9 No planned operational venting of CO₂ or steam lines is expected during normal operation of the Proposed Developments and it is considered that noise associated with minor CO₂ venting from the Proposed Developments would be not significant in the context of the prevailing acoustic environment and in any event would be controlled by the Environmental Permit.
- 7.5.10 Measures to mitigate noise associated with any CO₂ venting during commissioning will include those listed above for construction.
- 7.5.11 As CO₂ venting during operation would only take place during emergency scenarios, it is not considered that any further consideration of effects or potential mitigation is required within this noise assessment for this activity.

Operational Noise

- 7.5.12 During the detailed design stage, potential significant residual effects of industrial sound will be mitigated by location and design. This will include appropriate stack design, use of cladding and shielding where appropriate and, where practical siting of equipment away from site boundaries and NSRs.

- 7.5.13 The Sites will be operated in accordance with Environmental Permits, issued and regulated by the Environment Agency. This will require operational noise to be controlled through the use of BAT, which will be determined through the Environmental Permit application.

Decommissioning Noise and Vibration

- 7.5.14 Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP) for each of the Proposed Developments to control noise effects. This is proposed to be secured by planning condition. No additional mitigation for decommissioning of the Proposed Developments beyond such best practice is considered necessary at this stage. The predicted noise and vibration effects of eventual decommissioning of the Proposed Developments are considered to be comparable to, or less than, those assessed for construction activities.

7.6 Likely Impacts and Effects of the Proposed Developments

Construction Phase Noise

- 7.6.1 Construction noise levels are likely to vary during the different construction phases, depending on the location of work sites and the proximity to NSRs.
- 7.6.2 Based upon the analysis and summary of the results of the free-field baseline ambient sound surveys undertaken, Table 7.13 sets out the BS 5228 ‘ABC’ noise threshold categories and construction noise criteria (BSI, 2014a) at each NSR for the day, evening and night-time periods as set out in Table 7.4. A 3 dB correction has been added to measured free-field levels to present façade levels in the below table. These noise thresholds apply to both the Proposed Phillips 66 Development and Proposed VPI Development as well as the Proposed Developments together. Provided these construction noise criteria are not exceeded, the construction noise levels at NSRs will be below the SOAEL.

Table 7.13: Façade $L_{Aeq, T}$ noise levels and associated “ABC” assessment category

Receptor	Time Period	$L_{Aeq, T}$ dB	ABC Category	Indicative Construction Noise Criteria / SOAEL values
NSR 1 – Staple Road	Daytime*	57	A	65
	Evening*	54	A	55
	Weekend*	56	B	60
	Night-time*	55	C	55
NSR 2 – Clarkes Road	Daytime	55	A	65
	Evening	52	A	55
	Weekend	53	A	55
	Night-time	53	C	55
NSR 3 – Church Lane	Daytime	55	A	65
	Evening	52	A	55
	Weekend	54	A	55

Receptor	Time Period	$L_{Aeq,T}$ dB	ABC Category	Indicative Construction Noise Criteria / SOAEL values
NSR 4 – Hazel Dene	Night-time	52	C	55
	Daytime	58	A	65
	Evening	53	A	55
	Weekend	56	B	60
	Night-time	58	C	55

*Daytime is Monday to Friday 07:00 to 19:00 and Saturdays 07:00 to 13:00

Evening is Monday to Friday 19:00 to 23:00

Weekend is Saturday 13:00 to 23:00 and Sunday 07:00 to 23:00

Night is 23:00 to 07:00

Construction Noise Predictions

7.6.3 The following have been identified as the main construction phases which have the potential to affect NSRs:

- Phase 1 Enabling and Earthworks;
- Phase 2 Foundations (including CFA piling); and
- Phase 3 Mechanical and Electrical works.

7.6.4 The noise levels that will be generated by construction activities and experienced by nearby NSRs, such as residential properties, will depend upon a number of variables, including:

- the noise generated by plant or equipment used on each of the Sites, generally expressed as sound power levels;
- the periods of use of the plant on each of the Sites, known as its 'on-time';
- the distance between the noise source and the NSR;
- the attenuation due to ground absorption, air absorption and any barrier effects; and
- the existing noise environment and noise levels at the time of the works.

7.6.5 The construction noise predictions reported in this assessment have been undertaken using noise data for items of plant and calculation methodologies from BS 5228-1. Predicted noise levels for construction of the Proposed Developments have been based on construction methods used for similar developments in the UK. This gives an indication of where, at what stage, and during which construction activities construction noise is at risk of leading to potentially adverse and significant adverse effects.

7.6.6 The predicted levels apply to weekday daytime (07:00 – 19:00) working, although these could also be applied to other time periods where working at the same rate and intensity is proposed. The predictions assume constant operation of equipment throughout the 07:00 – 19:00 period which is a conservative worst-case assumption. Details regarding the noise prediction methodology, including a full list of indicative construction plant and associated sound power levels (L_{Aw}) for each construction phase, together with assumptions made during the predictions, are presented in Appendix 7B (ES Volume II).

7.6.7 Predictions have been carried out assuming all of the plant for each phase is operating at the same time, therefore presenting a worst-case scenario, as not all of the plant will be operating all of the time.

- 7.6.8 Predictions have also been carried out assuming that the phases occur concurrently. The worst case predicted construction noise levels at the NSRs are provided individually for both the Proposed Phillips 66 Development and the Proposed VPI Development, as well as the combined noise levels of the construction of both the Proposed Developments taking place at the same time.
- 7.6.9 The daytime construction noise contours (Figures 7.2a-c) are free-field construction: noise levels at ground floor level (1.5 m above ground) using 20 m x 20 m grid and are provided for illustration purposes.

Phillips 66 Construction Noise

- 7.6.10 For the Proposed Phillips 66 Development, 24-hour construction is proposed as work at Phillips 66 Humber Refinery already takes place 24 hours a day, 7 days per week. Therefore, the predicted façade construction noise levels during the daytime, evening, weekend and night-time periods have been included in Table 7.14.
- 7.6.11 The predicted daytime construction noise levels have been assumed, as a conservative approach, to be the equivalent to weekend daytime, evening and night-time levels. The daytime, evening and weekend construction noise levels have been predicted a ground floor level and the night-time construction noise levels have been predicted at first floor level (representative of bedrooms).
- 7.6.12 The predicted construction noise levels at NSRs are summarised in Table 7.14. The values in **bold** indicate where the construction noise threshold is exceeded.

Table 7.14: Predicted façade construction noise levels, Proposed Phillips 66 Development

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	58	60	56	62	61	63
	Evening	58	60	56	62	61	63
	Weekend	58	60	56	62	61	63
	Night-time	60	61	58	64	63	65
NSR 2 – Clarkes Road	Daytime	54	56	53	59	58	60
	Evening	54	56	53	59	58	60
	Weekend	54	56	53	59	58	60
	Night-time	55	57	54	59	58	60
NSR 3 – Church Lane	Daytime	55	57	54	59	59	61
	Evening	55	57	54	59	59	61
	Weekend	55	57	54	59	59	61
	Night-time	56	58	54	60	59	61
NSR 4 – Hazel Dene	Daytime	48	50	47	52	52	53
	Evening	48	50	47	52	52	53

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					All Phases
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	
	Weekend	48	50	47	52	52	53
	Night-time	49	51	47	53	52	54

7.6.13 The effects of the predicted daytime construction noise levels (as presented in Table 7.14) have been compared against the absolute construction noise criteria in Table 7.13, and using the semantic scale in Table 7.5, the classification of effects is summarised in Table 7.15 below.

Table 7.15: Construction noise effects – Proposed Phillips 66 Development

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Evening	Moderate adverse (significant)	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Weekend	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)
	Night-time	Major adverse (significant)	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
NSR 2 – Clarkes Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Evening	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Weekend	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Night-time	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
NSR 3 – Church Lane	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
	Evening	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
	Weekend	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Night-time	Moderate adverse (significant)	Moderate adverse (significant)	Minor adverse (not significant)	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
NSR 4 – Hazel Dene	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Evening	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Weekend	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Night-time	Negligible adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)

- 7.6.14 Construction noise effects at the above NSRs during the daytime periods are predicted to be **negligible or minor adverse (not significant)**. Phillips 66 has indicated that some construction works may take place during the evening, weekend and night-time periods.
- 7.6.15 At NSR 1, NSR 2 and NSR 3 there is the potential for **moderate and major adverse (significant)** effects during some of the phases of construction works during the evening weekend and night-time periods, especially when one or more phases may take place concurrently.
- 7.6.16 At NSR 4 there are no exceedances of the construction noise criteria during any assessment period, resulting in **negligible or minor adverse (not significant)** effects.

VPI Construction Noise

- 7.6.17 For the VPI development 24-hour construction may be required for some construction activities. Therefore, the predicted façade construction noise levels during the daytime, evening, weekend and night-time periods have been predicted.
- 7.6.18 The predicted daytime construction noise levels have been assumed, as a conservative approach, to be the equivalent to weekend daytime, evening and night-time levels. The daytime, evening and weekend construction noise levels have been predicted a ground floor level and the night-time construction noise levels have been predicted at first floor level (representative of bedrooms).
- 7.6.19 The predicted construction noise levels at NSRs are summarised in Table 7.16. The values in bold indicate where the construction threshold is exceeded.

Table 7.16: Predicted façade construction noise level – Proposed VPI Development

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	49	48	48	51	51	53
	Evening	49	48	48	51	51	53
	Weekend	49	48	48	51	51	53
	Night-time	45	44	44	47	47	49
NSR 2 – Clarkes Road	Daytime	48	46	46	50	49	51
	Evening	48	46	46	50	49	51
	Weekend	48	46	46	50	49	51
	Night-time	48	47	47	50	50	52
NSR 3 – Church Lane	Daytime	48	47	48	51	50	52
	Evening	48	47	48	51	50	52
	Weekend	48	47	48	51	50	52

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
	Night-time	49	47	48	51	50	52
NSR 4 – Hazel Dene	Daytime	61	59	60	63	63	65
	Evening	61	59	60	63	63	65
	Weekend	61	59	60	63	63	65
	Night-time	62	60	61	64	64	66

7.6.20 The effects of the predicted daytime construction noise levels (as presented in Table 7.16) have been compared against the absolute construction noise criteria in Table 7.13 and using the semantic scales in Table 7.5, the classification of effects is summarised in Table 7.17 below.

Table 7.17: Predicted construction noise effects – Proposed VPI Development

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Evening	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Weekend	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Night-time	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
NSR 2 – Clarkes Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Evening	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
	Weekend	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
	Night-time	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
NSR 3 – Church Lane	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible (not significant)	Negligible adverse (not significant)
	Evening	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
	Weekend	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
	Night-time	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
NSR 4 – Hazel Dene	Daytime	Minor adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Evening	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Weekend	Moderate adverse (significant)	Minor adverse (not significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Night-time	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)

- 7.6.21 Construction noise effects at the above NSRs during the daytime periods are predicted to be **negligible or minor (not significant)**.
- 7.6.22 At NSR 4 there is the potential for **moderate and major adverse (significant)** effects during some of the phases of construction works during the evening, weekend and night-time periods, especially when one or more phases may take place concurrently.
- 7.6.23 At NSR 1, NSR 2 and NSR 3 there are no exceedances of the construction noise criteria during any assessment period, resulting in **negligible or minor adverse (not significant)** effects.

Combined Construction Noise of the Proposed Developments

- 7.6.24 The combined assessment of the construction works for both the Proposed Phillips 66 Development and the Proposed VPI Development occurring at the same time have been predicted.
- 7.6.25 The predicted daytime construction noise levels have been assumed, as a conservative approach, to be the equivalent to weekend daytime, evening and night-time levels. The daytime, evening and weekend construction noise levels have been predicted a ground floor level and the night-time construction noise levels have been predicted at first floor level (representative of bedrooms).
- 7.6.26 The predicted construction noise levels at NSRs are summarised in Table 7.18. The values in bold indicate where the construction threshold is exceeded.

Table 7.18: Predicted façade construction noise levels –Proposed Developments

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	58	60	57	62	62	63
	Evening	58	60	57	62	62	63
	Weekend	58	60	57	62	62	63
	Night-time	60	62	59	64	63	65
NSR 2 – Clarkes Road	Daytime	55	57	54	59	59	60
	Evening	55	57	54	59	59	60
	Weekend	55	57	54	59	59	60
	Night-time	56	57	54	59	59	61
NSR 3 – Church Lane	Daytime	56	58	55	60	60	61
	Evening	56	58	55	60	60	61
	Weekend	56	58	55	60	60	61
	Night-time	56	58	55	60	60	61
	Daytime	61	60	60	64	63	65

Receptor	Time Period	Predicted Construction Noise Levels $L_{Aeq,T}$, dB (façade)					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 4 – Hazel Dene	Evening	61	60	60	64	63	65
	Weekend	61	60	60	64	63	65
	Night-time	62	61	61	64	64	66

7.6.27 The effects of the predicted construction noise levels (as presented in Table 7.18) have been compared against the absolute construction noise criteria in Table 7.13, and using the semantic scales in Table 7.5, the classification of effects is summarised in Table 7.19 below.

Table 7.19: Predicted Construction noise effects – Proposed Developments

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 1 – Staple Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Evening	Moderate adverse (significant)	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Weekend	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)
	Night-time	Major adverse (significant)	Major adverse (significant)	Moderate adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
NSR 2 – Clarkes Road	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)
	Evening	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Weekend	Minor adverse (not significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Night-time	Moderate adverse (significant)	Moderate adverse (significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)

Receptor	Time Period	Predicted Effect					
		Phase 1 Enabling & Earthworks	Phase 2 Foundations	Phase 3 Mechanical & Electrical	Phase 1 & 2	Phase 2 & 3	All Phases
NSR 3 – Church Lane	Daytime	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)
	Evening	Moderate adverse (significant)	Moderate adverse (significant)	Minor adverse (not significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Weekend	Moderate adverse (significant)	Moderate adverse (significant)	Minor adverse (not significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Night-time	Moderate adverse (significant)	Moderate adverse (significant)	Minor adverse (not significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
NSR 4 – Hazel Dene	Daytime	Minor adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)
	Evening	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)
	Weekend	Moderate adverse (significant)	Minor adverse (not significant)	Minor adverse (not significant)	Moderate adverse (significant)	Moderate adverse (significant)	Major adverse (significant)
	Night-time	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)	Major adverse (significant)

- 7.6.28 Construction noise effects at the above NSRs during the daytime periods are predicted to be **negligible or minor adverse (not significant)**.
- 7.6.29 At all NSRs there is the potential for **moderate** and **major adverse (significant)** effects during some of the phases of construction works during the evening, weekend and night-time periods, especially when one or more phases may take place concurrently.

Construction Traffic Noise for the Proposed Developments

- 7.6.30 As reported in Chapter 8 Traffic and Transport, the peak period for construction traffic is expected in 2025. The CRTN traffic noise BNL on nine local roads has been calculated 'with' and 'without' construction traffic, using 18 AAWT traffic data provide by the Transport Consultant from traffic models reported in Chapter 8: Traffic and Transport (ES Volume I).
- 7.6.31 It has been assumed as a worst-case approach that the traffic speeds will remain the same 'with' and 'without' the construction traffic. The difference between the 'with' and 'without' construction traffic BNL has been compared to the short-term change criteria in noise levels as shown in Table 7.6.
- 7.6.32 The potential changes in road traffic noise as result of the construction traffic from the Proposed Developments as a whole is presented in Table 7.20. The change in road traffic noise levels due to each development individually would be smaller, therefore the results presented are a worst case.

Table 7.20: Changes in road traffic noise as a result of construction of the Proposed Developments

Link	'Without' the Proposed Developments construction flows (2025)			'With' the Proposed Developments construction flows (2025)			Change in BNL, dB (‘with’- ‘without’)	Magnitude of Impact
	AAWT	% HGV	Speed (km/h)	AAWT	% HGV	Speed (km/h)		
Ropser Road	4,657	30	64	4,801	29	64	0.1	Negligible
Eastfield Road	8,201	12	45	10,011	12	45	0.9	Negligible
A160 Humber Road (near Killingholme Primary School)	15,112	51	75	16,910	46	75	0.5	Negligible
A180 (near Ulceby Skitter)	31,190	37	99	32,727	36	99	0.2	Negligible
A180 (near Immingham)	13,203	16	87	13,427	16	87	0.1	Negligible
A1173 Manby Road	9,394	13	65	9,473	13	65	0.0	Negligible
A160 Humber Road (south of Phillips 66 Site)	12,569	52	83	12,812	52	83	0.1	Negligible
Humber Road	11,473	21	49	11,550	21	49	0.0	Negligible
A15	25,284	9	88	26,031	9	88	0.1	Negligible

- 7.6.33 Table 7.20 shows that there is very small increase in road traffic noise due to construction traffic along the construction routes of the Proposed Developments during the peak construction phase. These will result in **negligible adverse** effects (**not significant**) at local residential NSRs. Based upon the above, no specific mitigation measures are required beyond those listed in Section 7.5.

Construction Phase Vibration

- 7.6.34 There are no residential receptors in close proximity to the Proposed Developments which have the potential to be affected by construction vibration. However, there is the potential for some vibration impacts upon buildings/ structures within the existing Phillips 66 or VPI Sites. It is considered unlikely that most typical construction working routines would generate levels of vibration above which building damage, as set out in Section 7.3, would be a possibility.
- 7.6.35 If piling, heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to any existing sensitive buildings, further consideration will be given to potential impacts, once the contractors are appointed and the construction methods and requirements are developed. As the construction of the Proposed Developments and the use of many of the existing buildings and structures within the Phillips 66 and VPI Sites are both within the control of the Applicants, any identified issues can be effectively managed by the Applicants and their contractor. Potential measures to ensure that appropriate mitigation is in place during the works are discussed in Section 7.5 and Section 7.7.

Operation Phase

Operational Sound Criteria

- 7.6.36 Using the representative *background sound levels* presented in Table 7.12 and following the approach proposed by the Applicants, operational sound criteria are set as the *rating level* at the NSRs. As stated in paragraph 7.3.45, *rating level* will be limited to no greater than +5 dB above the *background sound level* in order to not exceed the LOAEL.
- 7.6.37 Table 7.21 presents the operational sound criteria, in the form of a *rating level*, for each of the Proposed Developments.

Table 7.21: Operational Sound Criteria (*Rating Levels, L_{A,r,Tr} dB*)

Receptor	Time Period	Phillips 66: <i>Background Sound Level + 5 dB</i>	VPI: <i>Background Sound Level + 5 dB</i>
NSR 1 – Staple Road	Daytime	54	54
	Night-time	53	53
NSR 2 – Clarkes Road	Daytime	51	51
	Night-time	50	50
NSR 3 – Church Lane	Daytime	51	51
	Night-time	50	50
NSR 4 – Hazel Dene	Daytime	55	55
	Night-time	56	56

BS 4142 Assessment

- 7.6.38 The predictions of operational sound from the Proposed Developments have been based on information provided by the Applicants' engineering design teams. This information has included sound power levels for the major sound sources and details of the acoustic performance of noise mitigation measures already embedded into the designs. Using the Rochdale Envelope principle, reasonable worst-case operational sound impacts and effects are presented. The data are summarised in Appendix 7C (ES Volume II) which also lists the assumptions applied to the prediction methodology.
- 7.6.39 In accordance with BS 4142:2014 (BSI 2014c) the daytime assessment considers a 1-hour period, and the night-time assessment considers a 15-minute period. When in operation the sound produced by the plant will be constant in nature. As the plant may operate at any time of day or night the predicted *specific sound levels* will be the same for both day and night. No on-time correction is applicable due to the continuous nature of the operation. The predicted free-field operational *specific sound levels* at the NSRs during the daytime have been predicted at the ground floor and the night-time levels have been predicted at the upper floor.
- 7.6.40 The assessment has assumed that the potential sound of a tonal, impulsive or intermittent nature will be designed out of the Proposed Developments during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, a +3 dB correction for has been included at this stage to account for the potential, as a conservative approach, that NSRs might identify 'other distinctive character' in the new sound source in the future acoustic environment.
- 7.6.41 The daytime operational noise contours (Figures 7.3 a-c) present free-field operational sound levels at ground floor level (1.5 m above ground), and the night-time operational noise contours (Figures 7.4 a-c) present free-field operational sound levels at first floor (4 m above ground). All Figures use 20 m x 20 m grids and are provided for illustration purposes.

Proposed Phillips 66 Development

- 7.6.42 In the absence of additional mitigation, the predicted free-field operational *specific sound levels* at the NSRs around the Proposed Phillips 66 Development are presented in Table 7.22 below.

Table 7.22: Predicted Operational Sound Levels – Proposed Phillips 66 Development

Receptor	Daytime <i>specific sound level</i> <i>L</i> _{Aeq,Tr} dB	Night-time <i>specific sound level</i> <i>L</i> _{Aeq,Tr} dB
NSR 1 – Staple Road	57	57
NSR 2 – Clarkes Road	53	54
NSR 3 – Church Lane	55	55
NSR 4 – Hazel Dene	42	45

The daytime BS 4142 assessments are presented in Table 7.23 and the night-time BS 4142 assessments are presented in

- 7.6.43 Table 7.24. The magnitude of impact and significance of effect classifications have been included in the tables, to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in Table 7.8, Table 7.9 and Table 7.10.
- 7.6.44 The values presented are the difference between the representative *background sound level* at each NSR (Table 7.12) and the predicted *rating level* (the *specific sound level* *L*_{Aeq,Tr} presented in Table 7.22 plus the character correction). Positive values in the table indicate an excess of the *rating level* over the *background sound level*.

Table 7.23: Daytime BS4142 assessment without additional mitigation – Proposed Phillips 66 Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	57	53	55	42
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	60	56	58	45
Representative <i>background sound level</i> ($L_{A90,T}$), dB	49	46	46	50
Excess of <i>rating level over background sound level</i> ($L_{Ar,Tr} - L_{A90,T}$), dB	+11	+10	+12	-5
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of low impact
Magnitude of impact (assigned from Table 7.8)	Medium	Medium	Medium	Very low
Initial classification of effect (assigned from Table 7.10)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)	Negligible adverse (not significant)

Table 7.24: Night-time BS4142 assessment without additional mitigation – Proposed Phillips 66 Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	57	54	55	45
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	60	57	58	48
Representative <i>background sound level</i> ($L_{A90,T}$), dB	48	45	45	51
Excess of <i>rating level over background sound level</i> ($L_{Ar,Tr} - L_{A90,T}$), dB	+12	+12	+13	-3
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of low impact

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
Magnitude of impact (assigned from Table 7.8)	Medium	Medium	Medium	Very low
Initial classification of effect (assigned from Table 7.10)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)	Negligible adverse (not significant)

7.6.45 In accordance with Table 7.10, the values in Table 7.23 and

7.6.46 Table 7.24 for the worst-case scenario produce a range of impact magnitudes from very low to medium adverse at the NSRs. This would result in effects between **negligible adverse (not significant)** to **moderate adverse (significant)**, subject to consideration of context.

7.6.47 Phillips 66 and VPI are already a continuously operating industrial source in the study area, and there are other industrial/ commercial activities around the Sites. This is likely to mean that residents at all NSR are already accustomed to industrial sources. Nevertheless, based upon the desire to reduce *rating levels* to +3 dB, or where not possible no greater than +5 dB, above the *background sound level* to achieve the operational sound criteria in Table 7.21, potential mitigation options to reduce sound levels have been considered and are discussed in Section 7.7.

Proposed VPI Development

7.6.48 In the absence of additional mitigation, the predicted free-field operational *specific sound levels* at the NSR around the Proposed VPI Development are presented in Table 7.25 below.

Table 7.25: Predicted Operational Sound Levels – Proposed VPI Development

Receptor	Daytime <i>specific sound level</i> $L_{Aeq,Tr}$ dB	Night-time <i>specific sound level</i> $L_{Aeq,Tr}$ dB
NSR 1 – Staple Road	44	44
NSR 2 – Clarkes Road	41	41
NSR 3 – Church Lane	43	43
NSR 4 – Hazel Dene	56	56

7.6.49 The daytime BS 4142 assessments are presented in Table 7.26 and the night-time BS 4142 assessments are presented in Table 7.27. The magnitude of impact and significance of effect classifications have been included in the tables, to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in Table 7.8, Table 7.9 and Table 7.10.

7.6.50 The values presented are the difference between the representative *background sound level* at each NSR (Table 7.12) and the predicted *rating level* (the *specific sound level* $L_{Aeq,T}$ presented in Table 7.25 plus the character correction). Positive values in the table indicate an excess of the *rating level* over the *background sound level*.

Table 7.26: Daytime BS4142 assessment without additional mitigation – Proposed VPI Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	44	41	43	56

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
Acoustic feature correction, dB	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	47	44	46	59
Representative background sound level ($L_{A90,T}$), dB	49	46	46	50
Excess of rating level over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	-2	-2	+0	+9
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of low impact	Indication of low impact	Indication of low impact	Indication of a significant adverse impact
Magnitude of impact (assigned from Table 7.8)	Very low	Very low	Very low	Medium
Initial classification of effect (assigned from Table 7.10)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Moderate adverse (significant)

Table 7.27: Night-time BS4142 assessment without additional mitigation – Proposed VPI Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
Specific sound level $L_s (L_{Aeq,Tr})$, dB	44	41	43	56
Acoustic feature correction, dB	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	47	44	46	59
Representative background sound level ($L_{A90,T}$), dB	48	45	45	51
Excess of rating level over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	-1	-1	+1	+8
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of low impact	Indication of low impact	Indication of a low to adverse impact, depending upon context	Indication of an adverse to significant adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Very low	Very low	Very Low/Low	Low/Medium
Initial classification of effect (assigned from Table 7.10)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible/Minor adverse (not significant)	Minor/Moderate adverse (significant)

- 7.6.51 In accordance with Table 7.10, the values in Table 7.26 and Table 7.27 for the worst-case scenario produce a range of impact magnitudes from very low to medium adverse at the NSRs. This would result in effects between **negligible adverse (not significant)** to **moderate adverse** (significant), subject to consideration of context.
- 7.6.52 Phillips 66 and VPI are already a continuously operating industrial source in the study area, and there are other industrial/ commercial activities around the Sites. This is likely to mean that residents at all NSR are already accustomed to industrial sources. Nevertheless, to achieve the operational noise criteria in Table 7.21, potential mitigation options to reduce sound levels have been considered and are discussed in Section 7.7.

Combined Operational Sound from the Proposed Developments

- 7.6.53 In the absence of additional mitigation, the predicted free-field operational *specific sound levels* at the NSRs around the Proposed Developments as a whole are presented in Table 7.28 below.

Table 7.28: Predicted Operational Sound Levels – Both Proposed Developments – Unmitigated

Receptor	Daytime <i>specific sound level</i> L_{Aeq} dB	Night-time <i>specific sound level</i> L_{Aeq} dB
NSR 1 – Staple Road	57	57
NSR 2 – Clarkes Road	53	54
NSR 3 – Church Lane	55	55
NSR 4 – Hazel Dene	56	56

- 7.6.54 The daytime BS 4142 assessments are presented in Table 7.29 and the night-time BS 4142 assessments are presented in Table 7.30. 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 7.8, Table 7.9 and Table 7.10.
- 7.6.55 The values presented are the differences between the representative *background sound level* at each NSR (Table 7.12) and the predicted *rating level* (the *specific sound level* $L_{Aeq,T}$ presented in Table 7.25 plus the character correction). Positive values in the table indicate an excess of the *rating level* over the *background sound level*.

Table 7.29: Daytime BS4142 assessment without additional mitigation – Both Proposed Developments

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	57	53	55	56
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	60	56	58	59
Representative <i>background sound level</i> ($L_{A90,T}$), dB	49	46	46	50
Excess of <i>rating level</i> over <i>background sound level</i> ($L_{Ar,Tr} - L_{A90,T}$), dB	+11	+10	+12	+9

Receptor	NSR 1 – Staple Road	NSR 2 – Clarks Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Medium	Medium	Medium	Medium
Initial classification of effect (assigned from Table 7.10)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)

Table 7.30: Night-time BS4142 assessment without additional mitigation – Both Proposed Developments

Receptor	NSR 1 – Staple Road	NSR 2 – Clarks Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	57	54	55	56
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	60	57	58	59
Representative <i>background sound level</i> ($L_{A90,T}$), dB	48	45	45	51
Excess of <i>rating level over background sound level</i> ($L_{Ar,Tr} - L_{A90,T}$), dB	+12	+12	+13	+8
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of a significant adverse impact, depending upon context	Indication of an adverse to significant adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Medium	Medium	Medium	Low/Medium
Initial classification of effect (assigned from Table 7.10)	Moderate adverse (significant)	Moderate adverse (significant)	Moderate adverse (significant)	Minor/Moderate adverse (significant)

7.6.56 In accordance with Table 7.10, the values in Table 7.29 and Table 7.30 for the worst-case scenario produces an impact magnitude of low/medium or medium at the NSRs. This would result in minor/moderate adverse or moderate adverse (significant) effects, subject to consideration of context.

7.6.57 Phillips 66 and VPI are already a continuously operating industrial source in the study area, and there are other industrial/ commercial activities around the Sites. This is likely to mean that residents at all NSR are already accustomed to industrial sources. Nevertheless, to

achieve the operational noise criteria in Table 7.21, potential mitigation options to reduce sound levels have been considered and are discussed in Section 7.7.

Decommissioning Phase

- 7.6.58 The potential impacts and effects would require further consideration at the decommissioning stage of the Proposed Developments, but potential measures to ensure that appropriate mitigation is in place during such works are detailed in Section 7.5.
- 7.6.59 The effects of eventual decommissioning are considered to be comparable to, or less than, those assessed for construction activities.
- 7.6.60 Decommissioning would require submission of a DEMP to the relevant planning authority for its approval, secured by a planning condition. Appropriate best practice mitigation measures will be applied during any decommissioning works, as described in section 7.5, and documented in a DEMP; no additional mitigation for decommissioning of the Proposed Developments beyond such best practice specified in BS 5228 and section 7.5 is considered necessary to specify at this stage.

7.7 Mitigation and Enhancement Measures

Construction Phase

- 7.7.1 This assessment has identified no greater than negligible/ minor adverse (not significant) noise effects during construction works during core daytime and Saturday morning working hours, and up to moderate/ major adverse (significant) noise effects if Phillips 66 and/or VPI construction work were to take place at the same intensity during evenings/ night-time and/or weekend periods.
- 7.7.2 In the event that Phillips 66 and VPI construction activities are required during evening/ night-time periods, levels in excess of the SOAEL for night-time works could occur (depending on the nature of activities undertaken and the intensity of working). This could result in a moderate/ major adverse (significant) noise effect at NSRs in the absence of additional mitigation. Measures would therefore be put in place to control or restrict activities during evenings/ night-times so as to not exceed the SOAEL or relevant noise criteria at locations to be agreed with NLC. Control of construction noise and vibration, for example construction noise and vibration limits, is proposed to be secured by a planning condition. By timing construction works and avoiding noisier activities being undertaken during the evening, weekend and night, significant adverse effects can therefore be avoided.
- 7.7.3 The list of noise control measures presented within Section 7.5 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. With respect to reduction of noise levels, this may include, but is not limited to, use of temporary acoustic barriers and use of a partial enclosures around items of plant. The need for monitoring of noise and vibration levels during construction will also be determined through the detailed assessment to be undertaken.
- 7.7.4 Residual effects after mitigation is implemented are described in Section 7.8.

Operation Phase

- 7.7.5 The operational assessment has assumed that potential sound of a tonal, impulsive or intermittent nature (according to BS4142: 2014) will be designed out of the Proposed Developments during the detailed design phase through the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, a +3 dB correction for has been included at this stage to account for the potential, as a conservative approach, that NSRs might identify 'other distinctive character' in the new sound source in the future acoustic environment.

7.7.6 Based on the worst-case results presented in Section 7.6, further mitigation would be required to achieve the operational daytime and night-time LOAEL criterion of a *rating level* no greater than +5 dB above the defined representative *background sound level* at each NSR.

7.7.7 The potential mitigation measures and general principles to achieve this may include, but are not limited to, the following measures, depending upon the potential benefits achieved from such measures:

- reducing the breakout noise from plant through the use of enhanced enclosures, or potentially containing them within a building;
- reducing air inlet noise emissions by the addition of further in-line attenuation;
- reducing stack outlet noise emissions by the addition of silencers or sound proofing 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.

Proposed Phillips 66 Development

7.7.8 Table 7.31 outlines the overall attenuation required to achieve the daytime and night-time operational sound criteria i.e. the *rating level* to be no greater than +5 dB above the defined representative *background sound level* at each NSR.

Table 7.31: Overall attenuation (dB) required to achieve operational sound criteria

Receptor	Required attenuation to achieve daytime +5 dB criterion	Required attenuation to achieve night-time +5 dB criterion
NSR 1 – Staple Road	6	7
NSR 2 – Clarkes Road	5	7
NSR 3 – Church Lane	7	8
NSR 4 – Hazel Dene	-	-

7.7.9 The sound contribution at each NSR from each modelled sound source across the Proposed Phillips 66 Development has been ranked. The potential attenuation required from the source sound power levels of the key noise emitting plant in order to meet a *rating level* of no greater than +5 dB above the defined representative *background sound level* at each NSR is listed in Table 7.32. These reductions could be achieved either through reduction of sound power level at source or by application of the mitigation measures listed in paragraph 7.7.7 above.

Table 7.32: Attenuation required (dB) from individual plant items – Proposed Phillips 66 Development

Plant Ref. (see Appendix 7C for plant details)	Attenuation required to achieve a <i>rating level</i> no greater than +5 dB above the defined <i>background sound level</i>
P66-33, P66-34, P66-35, P66-36, P66-37	-11
P66-13, P66-51, P66-52, P66-55, P66-58	-10

Plant Ref. (see Appendix 7C for plant details) Attenuation required to achieve a rating level no greater than +5 dB above the defined background sound level

P66-39, P66-56, P66-57 -9

7.7.10 During the detailed design of the Proposed Phillips 66 Development it may be desirable or more practical to apply higher attenuation to some plant items/ buildings than listed in Table 7.32 in order to reduce the attenuation applied to other plant items/ buildings and still achieve the +5 dB criterion.

7.7.11 The daytime and night-time BS 4142 assessment results for these mitigated predictions are presented in Table 7.33 and Table 7.34.

Table 7.33: Daytime BS4142 assessment with additional mitigation (to achieve up to +5dB above the background sound level) – Proposed Phillips 66 Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	50	45	47	36
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	53	48	50	39
Representative background sound level ($L_{A90,T}$), dB	49	46	46	50
Excess of rating level over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	+4	+2	+4	-11
BS 4142:2014 effect category (assigned from Table 7.8)	Indication of an adverse impact, depending upon context	Indication of a low to adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of a low impact
Magnitude of impact (assigned from Table 7.8)	Low	Very Low/ Low	Low	Very low
Initial classification of effect (assigned from Table 7.10)	Minor adverse (not significant)	Negligible/ minor adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)

Table 7.34: Night-time BS4142 assessment with additional mitigation (to achieve up to +5 dB above the *background sound level*) – Proposed Phillips 66 Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,T_r})$, dB	50	46	47	37
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> (L_{A_r,T_r}), dB	53	49	50	40
Representative <i>background sound level</i> ($L_{A90,T}$), dB	48	45	45	51
Excess of <i>rating level</i> over <i>background sound level</i> ($L_{A_r,T_r} - L_{A90,T}$), dB	+5	+4	+5	-11
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of low impact
Magnitude of impact (assigned from Table 7.8)	Low	Low	Low	Very low
Initial classification of effect (assigned from Table 7.10)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Negligible adverse (not significant)

7.7.12 Residual effects after mitigation has been implemented are described in Section 7.8.

Proposed VPI Development

7.7.13 Based on the worst-case results presented in Table 7.26 and Table 7.27 mitigation would be required to achieve operational sound levels equal to the LOAEL, or lower, at each NSR. Table 7.35 outlines the overall attenuation required to achieve the daytime and night-time operational sound criteria i.e. the *rating level* to be no greater than +5 dB, above the defined representative *background sound level* at each NSR.

Table 7.35: Overall attenuation (dB) required to achieve operational sound criteria – Proposed VPI Development

Receptor	Required attenuation to achieve daytime +5 dB criterion	Required attenuation to achieve night-time +5 dB criterion
NSR 1 – Staple Road	-	-
NSR 2 – Clarkes Road	-	-
NSR 3 – Church Lane	-	-
NSR 4 – Hazel Dene	-4	-3

7.7.14 The sound contribution at each receptor from each modelled sound source across the Proposed VPI Development has been ranked. The potential attenuation required from the

source sound power levels of the key noise emitting plant in order to meet the operational sound criteria of +5 dB above the *background sound level* is listed in Table 7.36. These reductions could be achieved either through reduction of sound power levels at source or by application of the mitigation measures listed in paragraph 7.7.7 above.

Table 7.36: Attenuation required (dB) from individual plant items – Proposed VPI Development

Plant Ref. (See Appendix 7C for plant details)	Attenuation required to achieve a <i>rating level</i> no greater than +5 dB above the <i>background sound level</i>
VPI-19	-5
VPI-54	-10
VPI 99a-99d	-10
VPI 70	-9
VPI-29-39	-5
VPI-46-48	-5

7.7.15 During detailed design of the Proposed VPI Development it may be desirable or more practical to apply higher attenuation to some plant items/ buildings than listed in Table 7.32 in order to reduce the attenuation applied to other plant items/ buildings and still achieve the +5 dB.

7.7.16 The daytime and night-time BS 4142 assessment results for these mitigated predictions are presented in Table 7.37 and Table 7.38.

Table 7.37: Daytime BS4142 assessment with additional mitigation to achieve +5dB above background – Proposed VPI Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	42	39	41	52
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	45	42	44	55
Representative <i>background sound level</i> ($L_{A90,T}$), dB	49	46	46	50
Excess of <i>rating level</i> over <i>background sound level</i> ($L_{Ar,Tr} - L_{A90,T}$), dB	-4	-4	-2	+5
BS 4142:2014 impact category (assigned from Table 7.8)	Indication of low impact	Indication of low impact	Indication of low impact	Indication of an adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Very low	Very low	Very low	Low

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
Initial classification of effect (assigned from Table 7.10)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)

Table 7.38: Night-time BS4142 assessment with additional mitigation to achieve +3/+5dB above background – Proposed VPI Development

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,T})$, dB	42	39	41	53
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,T}$), dB	45	42	44	56
Representative background sound level ($L_{A90,T}$), dB	48	45	45	51
Excess of <i>rating level</i> over <i>background sound level</i> ($L_{Ar,T} -$ $L_{A90,T}$), dB	-3	-3	-1	+5
BS 4142:2014 effect category (assigned from Table 7.8)	Indication of low effect	Indication of low effect	Indication of low effect	Indication of an adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Very low	Very low	Very low	Low
Initial classification of effect (assigned from Table 7.10)	Negligible adverse (not significant)	Negligible adverse (not significant)	Negligible adverse (not significant)	Minor adverse (not significant)

7.7.17 Residual effects after mitigation has been implemented are described in Section 7.8.

Combined Proposed Developments

7.7.18 Based on the worst-case results presented in Table 7.29 and Table 7.30, mitigation would be required to achieve operational sound levels equal to the LOAEL at each NSR. Table 7.39 outlines the overall attenuation required to achieve the daytime and night-time operational sound criteria i.e. the *rating level* to be no greater than +5 dB, above the defined representative *background sound level* at each NSR.

Table 7.39: Overall attenuation (dB) required to achieve operational sound criteria

Receptor	Required attenuation to achieve daytime (+5 dB) criterion	Required attenuation to achieve night-time (+5 dB) criterion
NSR 1 – Staple Road	6	7
NSR 2 – Clarkes Road	5	7
NSR 3 – Church Lane	7	8

Receptor	Required attenuation to achieve daytime (+5 dB) criterion	Required attenuation to achieve night-time (+5 dB) criterion
NSR 4 – Hazel Dene	4	3

7.7.19 The sound contribution at each receptor from each modelled sound source across the Proposed Developments have been ranked. The potential attenuation required from the source sound power levels of the key noise emitting plant in order to meet the operational noise criterion of *rating level* +5 dB above the *background sound level* is listed in Table 7.40. These reductions could be achieved either through reduction of sound power level at source or by application of the mitigation measures listed in paragraph 7.7.7 above.

Table 7.40: Attenuation required (dB) from individual plant items – Both Proposed Developments

Plant Item	Attenuation required to achieve a <i>rating level</i> no greater than +5 dB above the defined <i>background sound level</i>
P66-13, P66-33, P66-34, P66-35, P66-36, P66-37, P66-51, P66-52, P66-55, P66-58, P66-67	-11
P66-39, P66-56, P66-57	-10
P66-32	-8
VPI-19	-5
VPI-54	-10
VPI-99a-99d	-10
VPI-70	-9
VPI-29-39	-5
VPI 46-48	-5

7.7.20 During detailed design of the Proposed Developments it may be desirable or more practical to apply higher attenuation to some plant items/ buildings than listed in Table 7.32 in order to reduce the attenuation applied to other plant items/ buildings and still achieve the +5 dB criteria.

7.7.21 The daytime and night-time BS 4142 assessment results for these mitigated predictions are presented in Table 7.41 and Table 7.42.

Table 7.41: Daytime BS4142 assessment with additional mitigation to achieve +5dB above the *background sound level* – Combined Proposed Developments

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> $L_s (L_{Aeq,Tr})$, dB	50	45	47	52
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	53	48	50	55

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
Representative <i>background sound level</i> ($L_{A90,T}$), dB	49	46	46	50
Excess of <i>rating level</i> over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	+4	+2	+4	+5
BS 4142:2014 effect category (assigned from Table 7.8)	Indication of an adverse impact, depending upon context	Indication of a low to adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Low	Very Low/Low	Low	Low
Initial classification of effect (assigned from Table 7.10)	Minor adverse (not significant)	Negligible/ minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)

Table 7.42: Night-time BS4142 assessment with additional mitigation to achieve +5dB above the *background sound level* – Combined Proposed Developments

Receptor	NSR 1 – Staple Road	NSR 2 – Clarkes Road	NSR 3 – Church Lane	NSR 4 – Hazel Dene
<i>Specific sound level</i> L_s ($L_{Aeq,Tr}$), dB	50	46	47	53
Acoustic feature correction, dB	+3	+3	+3	+3
<i>Rating level</i> ($L_{Ar,Tr}$), dB	53	49	50	56
Representative <i>background sound level</i> ($L_{A90,T}$), dB	48	45	45	51
Excess of <i>rating level</i> over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	+5	+4	+5	+5
BS 4142:2014 effect category (assigned from Table 7.8)	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context	Indication of an adverse impact, depending upon context
Magnitude of impact (assigned from Table 7.8)	Low	Low	Low	Low
Initial classification of effect (assigned from Table 7.10)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)

7.7.22 Residual effects after mitigation has been implemented are described in Section 7.8.

Decommissioning Phase

7.7.23 Consistent with construction mitigation, it has been assumed that relevant best practice mitigation measures would be in place during any decommissioning works. No additional

mitigation has been identified as necessary for the decommissioning phase of the Proposed Developments.

7.8 Residual Effects and Conclusions

A summary of the likely residual effects, following the implementation of appropriate mitigation to reduce sound, noise and vibration during construction, operation and decommissioning phases, is presented in Table 7.43 below.

Table 7.43: Summary of effects

Phase	Description of Effect	Time Period	Significance of Effect (Before Mitigation)	Mitigation Measures	Significance of Effect (After Mitigation)	Duration (short/ medium/ long term) and Reversibility
Construction	Noise effects on residential NSRs during construction of the Proposed Phillips 66 Development	Daytime	Negligible/ minor adverse (not significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible
		Evening, Weekend, Night-time	Negligible up to major adverse (significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible
Construction	Noise effects on residential NSRs during construction of the Proposed VPI Development	Daytime	Negligible/ minor adverse (not significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible
		Evening, Weekend, Night-time	Negligible up to major adverse (significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible

Phase	Description of Effect	Time Period	Significance of Effect (Before Mitigation)	Mitigation Measures	Significance of Effect (After Mitigation)	Duration (short/ medium/ long term) and Reversibility
	Combined noise effects on residential NSR during construction of both Proposed Developments simultaneously	Daytime	Negligible/ minor adverse (not significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible
		Evening, Weekend, Night-time	Minor up to major adverse (significant)	Further detailed assessment and implementation of a CEMP once a contractor appointed and appropriate mitigation is employed such that the BS 5228 ABC noise criteria are met and the section 7.5 mitigation guidance is followed	Up to minor adverse (not significant)	Short term, reversible
		Noise effects due to construction traffic	All time periods	Negligible adverse (not significant)	No further mitigation considered necessary, unless number of proposed construction vehicle movements changes.	Negligible adverse (not significant)
	Vibration effects on existing structures on site	All time periods	Minor adverse or less (not significant)	Further assessment once construction methods confirmed and appropriate mitigation implemented so as not to exceed the vibration SOAEL	Minor adverse or less (not significant)	Short term, reversible
Operation	Effects of operational sound on residential NSRs – Proposed Phillips 66 Development	Daytime and Night-time	Negligible adverse (not significant) to moderate adverse (significant)	Application of practical mitigation to reduce relevant sound at source to meet the operational sound criteria in Table 7.21	Negligible to minor adverse (not significant)	Long-term, reversible
	Effects of operational sound on residential NSRs – Proposed VPI Development	Daytime and Night-time	Negligible adverse (not significant) to moderate adverse (significant)	Application of practical mitigation to reduce relevant sound at source to meet the operational sound criteria in Table 7.21	Negligible to minor adverse (not significant)	Long-term, reversible

Phase	Description of Effect	Time Period	Significance of Effect (Before Mitigation)	Mitigation Measures	Significance of Effect (After Mitigation)	Duration (short/ medium/ long term) and Reversibility
	Combined effects of operational sound on residential NSRs – Both Proposed Developments	Daytime and Night-time	Minor/ moderate to Moderate adverse (significant)	Application of practical mitigation to reduce relevant sound at source to meet the operational sound criterion in Table 7.21	Minor adverse (not significant)	Long-term, reversible
Decommissioning	Noise effects during decommissioning of the Proposed Phillips 66 Development	All time periods	As detailed above for construction effects.	Further detailed assessment and Decommissioning Environmental Management Plan (DEMP), particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effects at NSRs, although they would be expected to be similar or less than those during construction.	Short-term, reversible
	Noise effects during decommissioning of the Proposed VPI Development	All time periods	As detailed above for construction effects.	Further detailed assessment and Decommissioning Environmental Management Plan (DEMP), particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effects at NSRs, although they would be expected to be similar or less than those during construction.	Short-term, reversible
	Combined noise effects during decommissioning of the Both Proposed Developments simultaneously	All time periods	As detailed above for construction effects.	Further detailed assessment and Decommissioning Environmental Management Plan (DEMP), particularly regarding working outside of daytime working hours.	Further assessment would need to confirm the potential level of effects at NSRs, although they would be expected to be similar or less than those during construction.	Short-term, reversible

7.9 References

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