Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 7: Noise and Vibration

Associated British Ports

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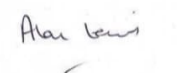
Signed		Date	20/12/2022
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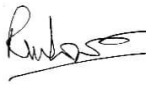
Signed		Date	20/12/2022
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7 Noise and Vibration

7.1 Introduction

7.1.1 This chapter presents the preliminary findings of the assessment regarding the likely significant noise and vibration effects of the Project on human Noise Sensitive Receptors (NSRs). The chapter also details the datasets used to inform the assessment, provides an overview of baseline conditions, and sets out how the likely significant effects have been assessed.

7.1.2 There may be interrelationships related to the potential effects on ecological receptors. Therefore, also refer to the following chapters:

a. **Chapter 8: Nature Conservation (Terrestrial Ecology);** and

b. **Chapter 9: Nature Conservation (Marine Ecology)**

7.1.2 This chapter is also supported by the following figures and appendices:

a. **Figure 7.1 Noise Study Area** (PEI Report, Volume III); and

b. **Appendix 7.A Operational Noise Information** (PEI Report, Volume IV).

7.2 Approach to Assessment

Scoping Summary

7.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the noise and vibration assessment, and the approach and methods to be followed.

7.2.2 The Scoping Report (**Appendix 1.A** in PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant noise and vibration effects of the Project on NSRs.

7.2.3 Having regard to the information presented within the Scoping Report (**Appendix 1.A** in PEI Report, Volume IV), the Planning Inspectorate (PINS) and the Environment Agency (EA) have responded within its Scoping Opinion (**Appendix 1.B** in PEI Report, Volume IV) with the responses comments as set out in **Table 7.1**. Alongside each Planning Inspectorate comment is a response to how each point is addressed in this chapter.

Table 7.1 Scoping opinion comments on noise and vibration

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report states that given the significant distance (over 450m) from the West Site to residential NSRs represented by NSR2 and NSR3, significant vibration effects are not expected to result from the proposed construction works (or decommissioning works) and seeks to scope out further assessment on these grounds. Given the distance from the DCO site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the ES.	Noted - no response required
	The Scoping Report proposes to scope out this matter owing to the large distance to identified sensitive receptors. As noted above, given the distance from the DCO site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the ES.	Noted - no response required
	The Scoping Report states that no sources of vibration are expected that could significantly affect buildings, however the assessment would be scoped back in where such sources are identified during the EIA. The Inspectorate agrees that this matter can be scoped out of the ES providing a detailed description of the Proposed Development demonstrates that no significant effects from vibration sources from on-site operations would not have any significant effects.	Noted - no response required

	The Scoping Report refers broadly to “construction activities on-site” but it is not clear whether this includes noise associated with construction vessel movements. Construction vessel noise should be included as a pathway for effects within the assessment.	An assessment of traffic noise on the local highway network is included in this PEI Report. However, given the large distance between residential receptors and the quayside (~1.5km) acknowledged in the second response above, and the nature of the sound of additional vessel movements being part of the established sound character of the area, it is considered unlikely that a significant effect would result and therefore a substantive assessment of sea vessel noise is not required.
Environment Agency	Although written for environmental permitting, guidance entitled Noise and vibration management: environmental permits - GOV.UK (www.gov.uk) is not discussed in this chapter, but will also be useful.	Noted.
North East Lincolnshire Council	The proposed methodology for the assessment of both vibration and noise impact on nearest residential receptors is satisfactory.	Noted.

7.3 Assessment Method

Construction Phase Impacts

7.3.1 To determine the potential temporary noise and vibration impacts that may arise during the construction phase of the Project, the following matters have been considered:

a. Noise and vibration caused by construction site activities; and

b. Noise caused by increases in traffic on existing public road network as a result of construction traffic.

7.3.2 Vibration from traffic on the highway network during the construction phase has been scoped out in line with Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration Revision 2 (LA111) (Ref 7-11).

Noise from Construction Sites

7.3.3 The potential noise impacts arising from construction site activities have been assessed using the data and procedures given in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (Ref 7-2).

7.3.4 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 from sound source to the NSR locations. Sound power levels are taken from manufacturers data and/or archive data given in BS 5228 Part 1. The calculated levels are then compared to nominated criteria to determine whether an adverse impact is expected.

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

7.3.6 The ABC method has then been used as a basis to define criteria that constitutes a potential significant effect at residential receptors. The ABC method is reproduced in **Table 7.2.**

Table 7.2 Construction noise thresholds at residential dwellings

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

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applies to residential receptors only.			
(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. (b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. (c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. (d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.			

7.3.7 Based upon the BS 5228 ABC method (Ref 7-2), the criterion adopted in the Environmental Impact Assessment (EIA) (and for this PEIR) 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 Significant Observed Adverse Effect Level (SOAEL), although as stated in BS 5228, other project-specific factors, such as the number of NSR's 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.

7.3.8 For residential receptors and other high sensitivity human receptors, the criterion for the Lowest Observed Adverse Effect Level (LOAEL – see **Table 7.13** for further details) is a predicted construction noise level equal to the existing ambient noise level at each NSR i.e. resulting in a 3 dB increase in noise level when combined with the existing ambient noise level. (Decibels are measured on a logarithmic scale, so noise levels cannot be summed arithmetically. Two sounds of equal level combine to raise the overall sound level by 3 dB).

7.3.9 In accordance with planning policy, significant adverse effects (at or above the SOAEL) should be avoided and other adverse effects (at or above the LOAEL) should be mitigated and minimised, where possible. The assessment focuses on the effects at the nearest existing residential NSRs on Queens Road and the eastern edge of Immingham's main urban residential area to the west.

7.3.10 Based on the above, the magnitude of construction noise impacts on residential receptors has been classified in accordance with the criteria in **Table 7.3**.

Table 7.3 Construction noise magnitude of impact for residential receptors

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

7.3.11 A preliminary quantitative assessment of construction noise has been undertaken to identify potentially significant effects and this has been based upon the available information regarding construction activities and plant requirements. The assessment will be updated as necessary when further details become available and as the construction approach becomes more clearly defined. The updated assessment will be provided in the Environmental Statement (ES).

Noise from construction traffic on existing roads

7.3.12 The noise impacts of construction traffic along existing roads have been assessed with reference to the National Highways document DMRB LA111 (Ref 7-11).

7.3.13 The change in noise level for relevant road links are predicted based on the CRTN (Ref 7-9) Basic Noise Level (BNL) methodology.

7.3.14 The relevant links assessed represent the relevant highway routes that would be taken by Project construction traffic between the Site and the A180. Noise impacts along the construction traffic routes are considered only where there are NSRs along those routes.

7.3.15 BNL predictions have been undertaken for both “with” and “without” construction traffic scenarios for each road link expected to be used by construction vehicles, using currently available daily traffic flows from the transport assessment (**Chapter 11: Traffic and Transport**).

7.3.16 The criteria for the assessment of traffic noise changes arising from construction road traffic are taken from Table 3.17 of DMRB LA111 (Ref 7-11) as reproduced in **Table 7.4**. Magnitude of impact descriptors corresponding to the terminology used in this impact assessment methodology are provided in parenthesis where they differ from DMRB terminology.

Table 7.4 Magnitude of impact at noise sensitive receptors from construction traffic

Magnitude of impact	Change in traffic noise level $L_{A10,18h}$ dB
Major (High)	≥ 5
Moderate (Medium)	3 to <5
Minor (Low)	1 to <3
Negligible (Very Low)	<1

Construction vibration impacts on humans - annoyance

7.3.17 Vibration due to construction activities has the potential to result in adverse impacts at nearby human receptors. 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' (Ref 7-2) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings/structures and annoyance to occupiers.

7.3.18 Table E.1 of BS 5228-2 contains a general method for calculation of Peak Particle Velocity (PPV) from percussive piling. This method is designed for use on any percussive piling with limited consideration of ground conditions so risks producing exaggerated worst-case levels. Calculation of PPV vibration levels will be undertaken during the EIA and presented in the ES where percussive piling may be required for construction on the West Site, although at present Continuous Flight Auger (CFA) piling is proposed, which would minimise vibration (and noise) impacts at human receptors.

7.3.19 **Table 7.5** sets out 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, for reference where assessment of construction vibration impacts on human receptors is required.

Table 7.5 Construction vibration threshold 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

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
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

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

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

7.3.22 Given the significant distance from the West Site to residential NSRs represented by NSR3 (see **Table 7.10**) significant vibration effects are not expected to result from the proposed construction (or decommissioning) activities at the Site, as acknowledged in the Scoping Opinion, and therefore further assessment is scoped out.

Construction vibration impacts on buildings and structures

7.3.23 Buildings and structures may be damaged by high levels of vibration. The closest point between the existing NSRs and the proposed development site is <5 m and therefore there is the potential for significant effects depending upon the construction works required in the vicinity of existing buildings.

7.3.24 The principal concern is generally transient vibration, for example due to piling or significant earthworks such as ground compaction.

7.3.25 BS 7385-2: 1993 ‘Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration’ (Ref 7-21) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014 (BSI, 2014b). Guide values for transient vibration, above which cosmetic damage could occur, are given in **Table 7.6**.

Table 7.6 Transient vibration guide values for cosmetic damage

Peak Particle Velocity (PPV) level	Description Magnitude of impact	
	4 Hz to 15Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	

Peak Particle Velocity (PPV) level	Description Magnitude of impact	
	4 Hz to 15Hz	15 Hz and Above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Values referred to are at the base of the building
Note 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

7.3.26 BS 7385-2 (Ref 7-21) states that the probability of building damage tends to be zero for transient vibration levels less than 12.5 mm/s PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

7.3.27 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 (Ref 7-22) defines three different categories of building damage:

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

7.3.28 BS 7385-2:1993 (Ref 7-21) defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in **Table 7.7**.

Table 7.7 Magnitude of impact – construction vibration building damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mm/s
High	Major	30
Medium	Minor	15-<30
Low	Cosmetic	6-<15
Very low	Negligible	<6

7.3.29 These values for construction vibration building damage will be applied within the impacts assessment where activities of a significant producing nature are likely to be required at the development site during construction.

Operational Phase Impacts

7.3.30 To determine the potential noise and vibration impacts that may arise during the operational phase of the Project, the following matters have been considered:

a. Noise from mechanical plant associated with the West Site ammonia dissociation and hydrogen production activities.

b. Noise from traffic movements on the local highways associated with export of liquified hydrogen product.

Noise from operation of the proposed development (on-site sound sources)

7.3.31 Noise emissions from the operation of the proposed development have been predicted using CadnaA® noise modelling software which implements the calculation procedures of ISO 9613 ‘Acoustics – Attenuation of Sound During Propagation Outdoors’, (Ref 7-13) (as appropriate), and based upon information regarding the operating conditions and levels of sound generated by the Main Site mechanical/process plant on-site.

7.3.32 The assessment for this PEI Report has been undertaken using BS 4142 (see below) but a combination of methods, depending upon the applicability of the method relative to the sound source, may be used during the EIA, as set out below.

BS 4142

7.3.33 A preliminary assessment of potential noise impact at nearby NSRs has been undertaken, where applicable, using the guidance in BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ (Ref 7-5).

7.3.34 A key aspect of the BS 4142 (Ref 7-5) 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 – $L_{Ar,Tr}$ –* the *"specific sound level plus any adjustment made for the characteristic features of the sound"*.

7.3.35 BS 4142 (Ref 7-5) allows for corrections to be applied based upon the presence or expected presence of the following:

- *tonality: up to +6 dB penalty* (ranging between a sound that is not tonal and one that is prominently tonal (i.e. containing a discreet frequency/frequency band), at the NSR location);
- *impulsivity: up to +9 dB penalty* (ranging between a sound that has no impulsive character and one that is highly impulsive (i.e. containing short pulses of high frequency components), at the NSR location) (this can be summed with tonality penalty); *and*
- *other sound characteristics (neither tonal nor impulsive but still distinctive): +3 dB penalty.*

7.3.36 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."*

7.3.37 Importantly, as suggested above, BS 4142 (Ref 7-5) requires that the rating level of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

7.3.38 BS 4142 (Ref 7-5) suggests that a one-hour assessment period is considered during the day and a 15-minute assessment period at night.

7.3.39 **Table 7.8** illustrates the magnitude of impact scale to be used in the EIA based upon the numerical level difference. For BS 4142 (Ref 7-5) 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
High	No BS 4142 descriptor for this magnitude level
Medium	Indication of a significant adverse impact, depending upon context
Low	Indication of an adverse impact, depending upon context
Very low	Indication of low effect, depending upon context

IEMA 'Guidelines for Environmental Noise Impact Assessment'

7.3.40 The Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Environmental Noise Impact Assessment' (Ref 7-12) have been used to undertake a preliminary assessment of the impact of changes in ambient sound level at NSRs due to the operation of the Project, where relevant, to provide additional context regarding the potential operational noise effects of the proposed development with respect to predicted changes in ambient sound levels. On the impact of noise level changes, paragraph 2.7 of the guidelines state –

"For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions, and a 10 dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1 dB may be perceptible under some circumstances."

7.3.41 The IEMA Guidelines (Ref 7-12) provide criteria for magnitude of impacts due to noise level changes from a project, as shown in **Table 7.9**, and these have been used within the PEI Report with respect to predicted changes in ambient sound levels.

Table 7.9 Categorising the magnitude of the noise change

Magnitude of Impact	Noise Change, dB
No change	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	>5

Noise from operation of the Project (road traffic noise)

7.3.42 A preliminary assessment of noise from road traffic during the operational phase of the proposed development has been undertaken using guidance provided in DMRB LA 111 (Ref 7-11), as set out earlier under the header “Noise from construction traffic on existing roads.”

Data and information sources

7.3.43 Baseline sound monitoring survey results have been used to characterise the sound climate at the nearest NSRs to the Site boundary. The sound survey data have been supplemented by a desk-based review of other available baseline information. The main desk-based sources of information that have been reviewed to assist in determining the baseline environment within the vicinity of the Site include:

a. Satellite imagery (Google Maps);

b. Ordnance Survey mapping; and

c. UK environmental noise mapping undertaken as per the requirements of the Environmental Noise Directive (END) Directive (Ref 7-10).

7.3.44 The following sources of information have been reviewed and inform the assessment of likely significant effects of noise and vibration generated by the Project:

a. Baseline sound monitoring surveys results;

b. Construction plant and equipment based on data from similar installations;

c. Construction noise data referenced in BS 5228 2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 1: Noise’ (Ref 7-2)

d. Proposed site layout plans (**Figure 2.3** in PEI Report, Volume III, for details);

e. Ordnance Survey (OS) mapping and aerial photography of the Project Site and surrounding area;

f. Visit to the area around the Site; and

g. Construction traffic flow data from the transport assessment (see **Chapter 11: Traffic and Transport**).

Determining baseline conditions and noise and vibration sensitive receptors

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

7.3.46 Key NSR locations which are considered representative of the nearest and potentially most sensitive existing receptors to the Site have been identified, based upon knowledge of the local area and professional judgement. It is

considered that if noise and vibration levels are suitably controlled at these receptors, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area, but which are more distant. The NSRs are shown in **Table 7.10** and illustrated on **Figure 7.1** (PEI Report, Volume III). The classification of sensitivity is taken from **Table 7.11**.

Table 7.10 Representative noise sensitive receptors

Description	Sensitivity/ value of receptors	Distance and Direction from DCO site boundary (m)
Residential properties between 1-31 Queens Road. Two representative receptors have been selected as follows: - 31 Queens Road, later referred to as **NSR1** and represents other NSRs at eastern end of row of properties - 1 Queens Road, later referred to as **NSR2** and represents other NSRs at western end of row of properties (Note: not all premises on Queens Road are residential NSRs as these premises also include business uses, which are classified as lower sensitivity – see Table 7.11)	High	Immediately adjacent to western site boundary
Residential properties at Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, and Kendal Road (eastern extent of Immingham's residential urban area) Properties in this area are later referred to as **NSR3** for the purpose of this PEI Report.	High	460m west of the site boundary
Residential properties at Chestnut Avenue, Waterworks Street and Spring Street (eastern extent of Immingham's residential urban area Properties in this area are grouped together with the above and later referred to as **NSR3** for the purpose of this PEI Report.	High	480m north-west of the site boundary

7.3.47 Noise Important Areas (NIAs) are those areas identified through strategic noise mapping where the top 1% of the population are affected by the highest noise levels in England. The nearest NIA is located in Great Coates on the A1136 around the junction with Aylesby Road. This is approximately 5.6km from the Project Site boundary and beyond the study area over which noise effects are considered likely and noise impacts from the Project at this location are unlikely. No further assessment is therefore required unless this route is later identified as an important construction traffic route during the EIA.

7.3.48 A description of the study areas for ecological receptors are presented in **Chapter 8: Nature Conservation (Terrestrial Ecology)** and **Chapter 9: Nature Conservation (Marine Ecology)** which describes the key noise sensitive ecological receptors and presents a preliminary assessment of noise impacts on those receptors as relevant.

Preliminary baseline sound data collection

7.3.49 In order to help define existing sound conditions at these NSRs, preliminary ambient sound measurements have been undertaken following the requirements of BS 7445 1: 2003 'Description and measurement of environmental noise. Guide to quantities and procedures' (Ref 7-1), in particular regarding instrumentation and monitoring methodology. The sound measurements surveys were undertaken in September 2022 at two representative residential locations in the vicinity of the Project site. The monitoring locations are listed below and presented on **Figure 7.1** (PEI Report, Volume III).

a. **ML1** – outside 31 Queens Road, Immingham (representing NSRs at the eastern end of Queens Road); and

b. **ML2** – on land off Worsley Road (representing NSRs on the eastern edge of Immingham).

7.3.50 The surveys included a minimum of 1-hour measurements during the daytime (between the hours 07:00 to 23:00) and 30-minutes during the night-time (between the hours of 23:00 to 07:00). Each sound level meter was set to log the L_{AF10}, L_{Aeq}, L_{AF90} and L_{AFmax} parameters.

7.3.51 All measurements were taken at approximately 1.5m above ground level and were positioned at least 3.5m from any reflecting surface, other than the ground (i.e. free-field). All measurements were attended and details of ongoing activities and noise sources in the area recorded.

7.3.52 The weather conditions during the survey periods were all within the parameters set out in the relevant guidance documents including BS 7445 (Ref 7-1) and BS 5228-1 (Ref 7-2).

7.3.53 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.

7.3.54 In addition to the preliminary baseline surveys undertaken in September 2022 for the Project, baseline data collected during 2021-22 for The Applicant's separate 'Immingham Eastern Ro-Ro Terminal' ('IERRT') project (on port land to the east and north of the Project site) and for the 2013 Brocklesby Estate 'Kings Road Industrial Development' application (to develop the proposed Project West Site) have also been referenced as below and assigned monitoring location IDs specific to this Project:

a. **I_ML3 –** opposite Queens Road Café, Queens Road, Immingham (taken from location M2 in IERRT Environmental Statement) (representing the western end of Queens Road NSRs);

b. **K_ML4* –** adjacent to the West Site south of 31 Queens Road (taken from location 1 in Kings Road Industrial Development Environmental Statement) (representing eastern end of Queens Road NSRs);
K_ML5* – adjacent to the West Site west of 1 Queens Road (taken from location 2 in Kings Road Industrial Development Environmental Statement) (representing western end of Queens Road NSRs);

c. **K_ML6* –** end of Waterworks Street to the northwest of West Site (taken from location 3 in Kings Road Industrial Development Environmental Statement); and

d. **K_ML7* –** off Somerton Road to the west of the West Site (taken from location 4 in Kings Road Industrial Development Environmental Statement).

***** this baseline data from 2013 has been referenced to provide context, or where applicable, to present a conservative approach to defining baseline.

Defining Significance of Effect

Sensitivity / value of receptors

7.3.55 Noise and vibration effects are classified based on the relevant 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. The scale of receptor sensitivity presented in **Table 7.11** is based on professional judgement and classifications adopted for other recent EIAs for Development Consent Order (DCO) applications.

Table 7.11 Sensitivity / value of receptors

Sensitivity/ Value of Resource/ Receptor	Description	Example 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

Sensitivity/ Value of Resource/ Receptor	Description	Example of Receptor Usage
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	• Offices • Restaurants/ retail • Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf)
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	• Residences and other buildings not occupied during working hours • Factories and working environments with existing high noise levels • Sports grounds when spectator or noise is a normal part of the event

Classification of effects

7.3.56 Impacts are defined as changes arising from the Project, 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.

7.3.57 The following terminology has been used in the assessment to define effects:

a. adverse – detrimental or negative effects to an environmental resource or receptor;

b. neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or

c. beneficial – advantageous or positive effect to an environmental resource or receptor.

7.3.58 The effect resulting from each individual potential impact type detailed above has been classified according to the relevant magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in **Table 7.12**. Where necessary the context of the acoustic environment has also been considered in determining the classification of effect.

Table 7.12 Classification of effects

Sensitivity/ Value of Resource/ Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
Very high	Major	Major	Moderate	Minor

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

7.3.59 Where adverse or beneficial effects are identified, these will be assessed against the following significance scale, derived using the matrix presented in **Table 7.12**:

a. negligible – imperceptible effect of no significant consequence;

b. minor – slight, very short or highly localised effect of no significant consequence;

c. moderate – limited effect (by extent, duration or magnitude), which may be considered significant; or

d. major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

7.3.60 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 existing acoustic environment has also been taken into account in determining the classification of effect.

7.4 Legislation, Policy and Guidance

7.4.1 **Table 7.13** presents the legislation, policy and guidance relevant to the noise and vibration assessment and details how their requirements will be met during the assessment.

Table 7.13 Relevant legislation, policy and guidance regarding noise and vibration

Legislation / Policy / Guidance	Consideration within the PEI Report
Environmental Noise (England) Regulations 2006 (Ref 7-18)	
The UK Government Environmental Noise (England) Regulations 2006 (as amended 2008, 2009, 2010) were introduced in England to implement European Union, Assessment and Management of Noise Directive 2002/49/EC (known as the END) (The European Parliament and Council of the European Union, 2002). The aims of the END are to define a common approach in order to avoid, prevent or reduce the harmful effects of environmental noise. Under the END, strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England and Round 3 results were published in 2019.	The location of Noise Important Areas (NIA) defined under the END have been identified in **Paragraph 7.3.47** and referenced with respect to assessment of changes in road traffic noise.

Legislation / Policy / Guidance	Consideration within the PEI Report
Environmental Protection Act 1990 (Ref 7-19)	
The Environmental Protection Act 1990 (EPA) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.	Reference is made in **Section 7.10** to the EPA with respect to operational noise control.
Control of Pollution Act 1974 (Ref 7-6)	
Sections 60 and 61 of Control of Pollution Act 1974 (CoPA) provide the principal legislation regarding demolition and construction site noise and vibration. If noise complaints are received by the local planning authority from local residents, 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. Section 61 of the CoPA 1974 provides a means for applying for prior consent to carry out 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. The CoPA requires that 'Best Practicable Means' (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to BS5228 as Best Practicable Means.	Reference is made **Section 7.10** the CoPA with respect to construction noise control.
Noise Policy Statement for England (NPSE) (Ref 7-7)	
The NPSE (Ref 7-7) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The NPSE (Ref 7-7) applies to all forms of noise, including environmental noise, neighbour noise and neighborhood noise. 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".* 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." 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. The 'Explanatory Note' within the NPSE (Ref 7-7) provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the concepts:	NPSE is considered in **Sections 7.3** and **7.8** with respect to assessing significant adverse and other adverse noise effects and defining LOAELs and SOAELs for the different potential effect types.

Legislation / Policy / Guidance	Consideration within the PEI Report
• 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 Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and • Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur. 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. The NPSE (Ref 7-7) 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.	

Legislation / Policy / Guidance	Consideration within the PEI Report
National Planning Policy - National Policy Statement for Ports (NPSfP) (Ref 7-8)	
The National Policy Statement for Ports (NPSfP) (Ref 7-8) states in paragraph 5.10.4 that "the nature and extent of the noise assessment should be proportionate to the likely noise impact". A staged approach to assessing the operational noise has, therefore, been undertaken. Where potentially significant adverse effects have been identified based upon preliminary higher-level assessment, further, more detailed assessments may be necessary to confirm likely significant adverse effects during the EIA. NPSfP paragraph 5.10.9 also repeats the aims given in the NPSE discussed above. It provides at paragraph 5.10.12 and 5.10.13 that: *"Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:* • *engineering: reduction of noise at point of generation and containment of noise generated;* • *lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural barriers or other buildings; and* • *administrative: limiting operating times of source; restricting activities allowed on the site; specifying acceptable noise limits; and taking into account seasonality of wildlife in nearby designated sites.* *In certain situations, and only when other forms of mitigation have been exhausted, it may be appropriate for the decision maker to consider requiring noise mitigation through improved sound insulation to dwellings, or in extreme cases, compulsory purchase of affected properties, as a means of consenting otherwise unacceptable development."*	NPSfP is referenced to provide further guidance on the approach to noise assessment, specifically related to port projects, as set out in **Sections 7.3** and **7.8**.
National Planning Policy Framework (NPPF) (Ref 7-15)	
Whilst not the primary policy document for a NSIP Harbour development, the National Planning Policy Framework (NPPF) (Ref 7-15) contains policy on noise and vibration that has relevance to this chapter. It sets out the Government's planning policies for England and how these are expected to be applied. The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from being adversely affected by unacceptable levels of noise pollution. The NPPF states in paragraph 185 that planning policies and decisions 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*	Consideration is given to NPPF as the overarching framework for mitigating the adverse and significant adverse effects of noise and vibration, and is used in conjunction with NPSE and PPG-N to define the assessment approach as set out in **Sections 7.3** and **7.8**.

Legislation / Policy / Guidance	Consideration within the PEI Report
"identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".	
Planning Practice Guidance – Noise (Ref 7-14)	
The Planning Practice Guidance for Noise (PPG-N) (Ref 7-14) was first published on 6th March 2014 to provide a web-based resource with more in-depth guidance to the NPPF (Ref 7-14). The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. The PPG was last updated for noise in July 2019. 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. This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). The NPSE and PPG recognise that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that is applicable to all sources of noise in all situations. The levels are likely to be different for different sound sources, receptors and at different times of the day. To determine appropriate LOAEL and SOAEL values in the context of the Project, reference has been made to methodologies and criteria presented in various British Standards and guidance documents. These documents are discussed in the Guidance section of this table below. 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. With particular regard to mitigating noise impacts on residential development, the guidance highlights that impacts may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling, or a relatively quiet amenity space (private, shared or public).	PPG-N is referenced to provide supplementary guidance to NPPF with respect to mitigation of adverse and significant adverse effects of noise and vibration. As such it is used to define the assessment approach as set out in **Sections 7.3 and 7.8.**
Local Planning Policy - North East Lincolnshire Local Development Plan 2013 to 2032 (adopted 2018) (Ref 7-16)	
The North East Lincolnshire Local Plan (LP) (2013 to 2032) was adopted in 2018 and sets out a strategic vision for the area. The plan is centred around set challenges for NELC and policy which has been implemented to solve them and support local economic sectors. Paragraph 6.38 of the LP states: *"The Borough's economy is heavily reliant on good rail and road freight links, along with sea traffic. The LTP3 outlines a number of freight transport*	Local planning policies are reviewed to ensure the assessment approach set out in **Sections 7.3** and **7.8** incorporates consideration of local authority requirements.

Legislation / Policy / Guidance	Consideration within the PEI Report
related issues, which have a direct bearing on the Borough's economic performance: *1. local access to sites such as ports, affecting their day-to-day operations;* *2. transit routes that affect communities through high levels of HGV traffic and the severance, noise and pollution this can bring;* *3. access to main trunk routes, especially the motorway network;* *4. capacity constraints some distance from the area, such as constraints on the M1, A1 and East Coast Mainline; and,* *5. rail freight capacity in terms of train paths, line speeds and height restrictions."* Policy 5 of the LP states: *" Policy 5 – Development boundaries* *1. Development boundaries are identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to:* *D. impact upon neighbouring land uses by reason of noise, air quality, disturbance or visual intrusion"*	
Local Planning Policy - North Lincolnshire Council Planning for Health and Wellbeing- Supplementary Planning Document (November 2016) (Ref 7-17)	
The NELC Planning for Health and Wellbeing- Supplementary planning document was adopted in July 2016, it builds on policies in the Core Strategy and North Lincolnshire Local Plan and sets out our planning policy towards Health and Wellbeing and is used to make decisions on planning applications. Policy 3 – Well designed places states that when considering the detail of development, proposals should: *"Seek to reduce noise and air pollution through ensuring planning applications include a Noise Impact Assessment and Air Quality Assessment in areas of concern."* 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."	Local planning policies are reviewed to ensure the assessment approach set out in **Sections 7.3** and **7.8** incorporates consideration of local authority requirements.

Stakeholder Engagement

7.4.2 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the noise and vibration assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) and summarised in **Table 7.1** .

7.4.3 Further consultation will be undertaken with North East Lincolnshire Council (NELC) Environmental Health Department as part of the EIA and documented in the ES.

Limitations and Assumptions

7.4.4 This preliminary assessment reflects the data obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation and subsequent demolition (of the hydrogen production facilities alone).

7.4.5 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed.

7.4.6 Detailed information about the construction methods and plant requirements is not yet available and therefore the construction noise assessment, whilst quantitative, is regarded as indicative as it has been based primarily on construction plant which is likely to be used and professional judgement.

7.4.7 Detailed traffic predictions for the operational phase of the development are not yet available. However, as stated in **Chapter 2: The Project** the hydrogen production facility is expected to generate up to 98 daily HGV movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day. Any additional HGV movements associated with the operational jetty alone are likely to be a small fraction of this. An initial qualitative appraisal of potential impacts is provided here and will be updated in the ES.

7.5 Study Area

7.5.1 There is no change to the overall study area set out in the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV).

7.5.2 The study area covers the spatial extents over which potential direct and indirect airborne noise and vibration effects of the Project may occur during construction, operation and decommissioning at human receptors.

7.5.3 For construction noise on-site, considering NSRs up to 300m of the Project Site boundary is considered to be adequate to capture all significant effects, although additional residential receptors approximately 460m - 500m from the Project Site boundary at the south-eastern edge of Immingham have also been considered for completeness.

7.5.4 For operational noise on-site, the study area extending to NSRs up to approximately 500m from the Project Site boundary has been included, which includes the residential NSRs at the south-eastern edge of Immingham.

7.5.5 For assessment of changes in road traffic noise, NSRs within 50m of the roads which would be used by vehicles associated with construction phase and operational activities define the study area.

7.5.6 The airborne noise and vibration ES chapter will, through further desk-based analysis and assessment, refine the extent of the study area used in this PEI Report where necessary.

7.6 Baseline Conditions

Current Baseline

7.6.1 The typical sources contributing to the baseline sound environment at NSRs along Queens Road (in the vicinity of ML1, I_ML3, K_ML4 and K_ML5, and represented by NSR1 and NSR2 – as detailed in paragraphs 7.3.49 and 7.3.54, and Table 7.10) are road traffic and industrial/commercial/ port activities. More specifically, sound sources comprise road traffic on Queens Road outside the front of the properties, more distant road traffic from the A1173 to the west, industrial/commercial activities from premises to the north side of the Queens Road (Knauf Plant) and more general distant sound from industrial premises including power production, manufacturing, waste, port facilities in the wider area, and occasional distant aircraft.

7.6.2 At NSRs to the west of the Project on the eastern edge of Immingham (in the vicinity of ML2, K_ML6 and K_ML7, and represented by NSR1 and NSR2) sources likely to influence/dominate the baseline sound environment are the road traffic on the A1173 and A180, more distant industrial/commercial premises to the east of the A1173 (associated with power production, manufacturing, waste and port facilities) and occasional distant aircraft.

7.6.3 Descriptions of noise sources observed on site during the measurements for the Project at ML1, ML2 and I_ML3 during the daytime are included in **Table 7.14** and night-time noise sources are included in **Table 7.15**.

Table 7.14 Daytime measurement details

Location	Date	Time of day	Description of sound environment
ML1	04/10/2022	11:46-12:46	Dominated mainly by traffic noise from Queens Road. Other sources comprised a continuous, tonal sound from a factory north of Queens Road and distant traffic.
ML2	04/10/2022	11:30-13:00	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant traffic on A1173, drivebys of vehicles turning around, distant playground noise from nearby schools.
I_ML3	17/11/2022 24/03/2022 25/03/2022 03/03/2022	07.00 – 23.00 (number of visits undertaken to cover the full daytime period)	Dominated by road traffic noise from Queens Road with some contribution from a welding and fabrication workshop in the vicinity. Other sources include a steady industrial hum, and birdsong.

Table 7.15 Night-time measurement details

Location	Date	Time of day	Noise Description
ML1	04/10/2022	01:00-02:00	Dominated mainly by continuous, tonal sound from a factory north of Queens Road. Other sources comprised of traffic passing on Queens Road, the occasional release of steam from the factory in the north, distant industry, distant road noise from A1173 or A180.
ML2	04/10/2022	02:30-03:30	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant road noise from A1173 or A180, unidentified whirring from west.
I_ML3	22/03/2022 23/03/2022	23.00 – 07.00	Dominated by a hum from a building to the northwest, intermittent and irregular high frequency bursts. Contribution from road traffic noise on Queens Road and other local roads.

7.6.4 A summary of the 2021-22 daytime sound levels for ML1, ML2 and I_ML3 are presented in **Table 7.16**.

Table 7.16 Daytime sound levels during survey periods

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	11:46	15 min	69	50	92	72
	12:01	15 min	70	49	89	73
	12:16	15 min	69	48	87	73
	12:31	15 min	69	49	88	73
ML2	11:30	15 min	41	48	68	53
	11:45	15 min	50	47	61	52
	12:00	15 min	49	46	58	51
	12:15	15 min	53	46	77	52
	12:30	15 min	51	46	74	53
	12:45	15 min	49	46	62	51
I_ML3	07:12	1 hour	70	46	80	62
	08:12	1 hour	70	51	85	75

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
	09:12	1 hour	69	51	87	73
	10:12	1 hour	70	51	97	74
	11:12	1 hour	69	49	84	74
	12:09	1 hour	69	47	85	73
	12:41	1 hour	71	51	87	75
	13:09	1 hour	70	48	97	74
	13:41	1 hour	71	53	86	75
	14:09	1 hour	70	48	88	74
	14:41	1 hour	70	52	86	74
	15:09	1 hour	70	47	88	74
	16:24	1 hour	71	50	86	75
	17:24	1 hour	71	45	87	75
	18:23	1 hour	68	45	87	72
	19:23	1 hour	66	44	88	68
	20:23	1 hour	65	44	84	67
	21:00	1 hour	61	46	85	58
	22:00	1 hour	62	46	85	63

All values are in A-weighted dB re 20 µPa, Free-field

7.6.5 A summary of the 2021-22 night-time sound levels for ML1, ML2 and I_ML3 are presented in **Table 7.17**.

Table 7.17 Night-time sound levels during survey periods

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	01:00	15 min	58	41	84	47
	01:15	15 min	60	42	87	47

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
	01:30	15 min	62	42	90	48
	01:45	15 min	54	41	81	45
ML2	02:30	15 min	41	38	51	53
	02:45	15 min	41	37	51	53
	03:00	15 min	40	36	51	53
	03:15	15 min	41	38	51	53
I_ML3	23:00	1 hour	61	46	84	59
	00:00	1 hour	57	46	82	49
	01:00	1 hour	56	46	80	49
	02:00	1 hour	54	45	80	48
	03:00	1 hour	56	45	82	50
	04:00	1 hour	58	45	81	50
	05:00	1 hour	64	46	92	64
	06:00	1 hour	65	46	83	68

All values are in A-weighted dB re 20 µPa, Free-field

Additional Available Baseline Data from 2013

7.6.6 An application for the proposed redevelopment of the site as Kings Road Industrial Development was submitted in 2013 by Brocklesby Estate. An Environmental Statement was prepared by ECUS in support of the application. Baseline surveys were undertaken at four locations as presented on **Figure 7.1** Noise Study Area (PEI Report, Volume III). Further details related to the baseline sound surveys for the Kings Road Industrial Development can be found in the ES Noise and Vibration chapter (Ref 7-23). Sound levels from this ES have been reviewed and comparison of the available preliminary baseline sound level data.

Representative Background Sound Levels

7.6.7 Representative background sound levels have been established for daytime and night-time periods based upon review and comparison of the available preliminary baseline sound level data.

7.6.8 **Table 7.18** summarises the defined *ambient sound levels* and *background sound levels* taken forward within this PEI Report for the NSRs in the vicinity of each noise monitoring location within the BS 4142 assessment. Additional baseline

surveys will be undertaken as the EIA progresses and these values are likely to be updated. Lower values have been used from the available data so as to undertake a conservative assessment.

Table 7.18 Representative daytime ambient (L_{Aeq}) and background (L_{A90}) sound levels

Receptor / Monitoring Location	NSR1 (eastern end of Queens Road) / ML1, K_ML4	NSR2 (western end of Queens Road) / I_ML3, K_ML5	NSR3 (vicinity of Worsley Road & Somerton Road) / ML2, K_ML6, K_ML7
Daytime L_{Aeq} dB (07.00 – 19.00)	52 - 55	58	48
Daytime L_{A90} dB (07.00 – 23.00)	48 - 45	45 - 55	46 - 45
Night-time L_{A90} dB (23.00 – 07.00)	41 - 42	45 - 57	36 - 42

Future Baseline

7.6.9 Much of the Project Site boundary bounds the operational Port of Immingham, which has been in active use for port purposes for a number of decades. The A1173 provides a major route for traffic to and from the A180 to the south and A160 to the northwest. Queens Road provides key access to the eastern side of the Port and other industrial premises to the east and south off the A1173.

7.6.10 In the absence of the Project, the sound environment at NSRs in the vicinity would continue to be influenced/dominated by road traffic noise and port/commercial/industrial activity.

7.6.11 Future Do-Minimum traffic will be reviewed as the EIA progresses to confirm the potential change in future baseline sound levels at NSRs. However, at this PEIR stage, background *sound levels* presented in **Table 7.18** have not been increased to try to predict future levels, as a conservative approach to assessment of The Project.

7.7 Development Design and Impact Avoidance

Construction Phase Noise and Vibration

7.7.1 As described in **Chapter 2: The Project**, core construction working hours would be between 07:00 and 19:00 Monday to Friday and 08:00 and 13:00 Saturdays. However, some activities such as dredging would need to be undertaken on a 24-hour basis and continue until completion for safety or quality reasons. Some construction activities, such as major concrete pours, often take longer than twelve hours and so extended hours may be required. Where on-site construction works are to be conducted outside the core hours, extended hours would be agreed with NELC. Any such works would be minimised and be

carefully managed to reduce effects on local people. Piling will be undertaken within the proposed core working hours, with a minimum 12-hour continuous break in piling within each 24-hour period.

7.7.2 Measures to mitigate noise and vibration would be implemented during the construction phase in order to minimise impacts at local NSRs, particularly with respect to any activities required outside of core working hours. Mitigation to be included in a Construction Environmental Management Plan (CEMP) will include, but not be limited to:

a. Ensuring that processes are in place to minimise noise and vibration before works begin and ensuring that best practical means (BPM) are being achieved throughout the construction programme, including the use of localised screening around the main noise producing plant and activities;

b. All contractors will be familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (Ref 7-2; Ref 7-3), which will be a prerequisite of their appointment;

c. Ensuring that modern plant is used, complying with applicable UK noise emission requirements, and selection of inherently quiet plant where possible;

d. All pneumatic percussive tools will be provided with effective silencers / acoustic covers;

e. Acoustic covers to engines will be kept closed when the engines are in use and idling;

f. Hydraulic techniques for breaking to be used, where practical, in preference to percussive techniques where reasonably practicable;

g. Use of lower noise and vibration piling (e.g. rotary bored or hydraulic jacking) rather than driven piling techniques, where reasonably practicable;

h. No start-up or shut down of vibratory rollers near to receptors;

i. Off-site pre-fabrication for components of the Project, where reasonably practicable;

j. All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and vibration and switched off when not in use;

k. Machines such as cranes that may be in intermittent use will be shut down between work periods or should be throttled down to a minimum. Machines will not be left running unnecessarily;

l. Where reasonably practicable, the contractor will use quieter working methods, the most suitable plant and, reasonable hours of working for noisy operations;

m. Where possible, the items of plant will be located the furthest distance from the nearby NSRs. Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from NSRs;

n. Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Project Site to be

conducted in such a manner as to minimise noise and vibration generation, as far as reasonably practicable;

o. No employees, subcontractors and persons employed on the site will cause unnecessary noise from their activities e.g. excessive 'revving' of vehicle engines, shouting and general behaviour etc. No radios or other audio equipment will be allowed on site;

p. When operating plant, the use of noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs and cranes will be implemented;

q. Electrically powered plant will be used over diesel power generators where possible and feasible;

r. Audible warning systems (including reversing alarms) will be switched to the minimum setting required by the Health and Safety Executive;

s. The use of any tannoy system on site will be used for emergency use only;

t. All contractor communication devices will be used at a minimum audible level;

u. Appropriate routing of construction traffic on public roads and along access tracks, to reduce construction traffic noise, as far as reasonably practicable (see **Chapter 11: Traffic and Transport**);

v. Provision of information to NELC and local residents to advise of potential noisy works that are due to take place; and

w. Monitoring of noise and vibration complaints and reporting to the Applicant for immediate investigation.

7.7.3 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 impacts of construction works. One of the key aims of such method statements will be to minimise noise and vibration disruption to local residents during the construction phase as far as reasonably practicable.

7.7.4 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 and vibration may occur during specific operations, and providing lines of communication where complaints can be addressed.

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

7.7.6 A CEMP will be prepared which will include setting 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 will accompany the DCO Application.

7.7.7 The timing details of decommissioning of the hydrogen production facilities are uncertain at this time. However, the mitigation measures set out in this Section

for construction noise and vibration will also be appropriate mitigation during the decommissioning stage.

7.7.8 The control and monitoring of noise and vibration during construction and decommissioning is proposed to be secured by a draft Requirement under Schedule 2 of the draft DCO, which will be submitted with the application.

Operational Phase Noise and Vibration

7.7.9 During the detailed design stage, any significant noise effects will be mitigated by plant location, site layout and design. This may include use of enhanced building cladding, and use of acoustic enclosures and screening where appropriate and, where practical siting of equipment away from site boundaries and NSRs.

7.7.10 It is anticipated that the control and monitoring of noise during operation would be secured by a draft Requirement under Schedule 2 of the draft DCO.

7.7.11 The Site will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency. This will require operational noise from the generating station to be controlled through the use of Best Available Techniques (BAT), which will be determined through the Environmental Permit application.

Decommissioning Phase Noise and Vibration

7.7.12 Appropriate best practice mitigation measures will be applied during decommissioning works for the hydrogen production facility and documented in a Decommissioning Environmental Management Plan (DEMP) to control noise effects. This is proposed to be secured by a Requirement in the draft DCO. No additional mitigation for decommissioning of the Project beyond such best practice is considered necessary at this stage. The exact approach would be determined by the legislative requirements that are required at that point in time.

7.8 Potential Impacts and Effects

7.8.1 This section contains a preliminary assessment of the impacts and effects on NSRs as a result of the construction, operational and decommissioning phases of the Project. The main focus of the assessment is on the landside operations for the hydrogen production facilities on the West Site. This is the part of the Project closest in proximity to the residential NSRs at Queens Road and the residential areas at the eastern edge of Immingham to the west and is also most likely to be impacted by the Project related road traffic.

7.8.2 The following impact pathways have therefore been assessed:

a. Potential noise and vibration impacts associated with activities on-site, during construction;

b. Potential noise impacts associated with traffic movements on local highways, during construction;

c. Potential noise impacts from mechanical plant associated with the West Site ammonia dissociation and hydrogen production activities, during operation;

d. Potential noise impacts associated with traffic movements on the local highways associated with export of liquified hydrogen product, during operation.

e. Potential noise and vibration impacts associated with activities on-site, during decommissioning of the hydrogen production facilities; and

f. Potential noise impacts associated with traffic movements on the local highways, during decommissioning of the hydrogen production facilities.

Construction Phase

7.8.3 Detailed construction information and a detailed programme is not yet available. However, likely construction activities and the typical plant likely to be used during construction works have been considered based upon preliminary information and using professional judgement.

7.8.4 The landside construction works have been broadly categorised into:

a. Site clearance;

b. Piling and foundations;

c. Underground drainage and services;

d. Roads and hardstanding; and

e. Buildings and plant installation.

7.8.5 Typical plant for the landside works in the West Site are likely to include:

a. Cranes

b. Telehandlers

c. Diesel generators

d. Hydraulic excavators

e. Dump trucks

f. Wheeled/front loaders

g. Tippers

h. Rollers

i. Asphalt/concrete plant

j. Concrete mixers and pumps

k. Compressors

l. Continuous flight auger piling rig

7.8.6 It is envisaged that the construction works for the construction of the hydrogen production facility will be based on a six phase construction timeline likely to commence in the second quarter of 2025. Phase 1 is expected to last 3 years. The exact programme and build out of the phases beyond the first Phase will ultimately depend on market demand for the green hydrogen product. Construction of Phases 2 – 6 may take up to eight years if built consecutively.

Further details of the construction phases are presented in **Chapter 2: The Project**.

Construction Noise Limits

7.8.7 Construction noise levels are likely to vary during different construction phases, depending on the location of work sites and proximity to NSRs. The nearest residential NSRs to the DCO Site boundary are on Queens Road (NSRs 1 and 2) and on the eastern edge of Immingham (NSR3). Based on the current ambient available noise levels at monitoring locations in both of these areas and the BS 5228 ABC category guidance in **Table 7.2**, preliminary construction noise limits based upon the lower measured data are:

a. **NSR1 and NSR2** – representative of residential NSRs on Queens Road:
   i 65 dB $L_{Aeq,12hr}$ during daytime
   ii 55 dB $L_{Aeq,8hr}$ during the night-time
b. **NSR3** – residential NSRs in vicinity of Worsley Road/Somerton Road:
   i 65 dB $L_{Aeq,12hr}$ during daytime
   ii 50 dB $L_{Aeq,8hr}$ during the night-time.

7.8.8 Provided these noise limits, or any updated limits based upon additional baseline data collection during the EIA, are not exceeded, the construction noise levels will be below the SOAEL.

Construction noise predictions from on-site works

7.8.9 The noise levels generated by construction activities and experienced by nearby NSRs, such as residential properties, will depend upon a number of variables, the most important of which are:

a. The noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL);
b. The periods of operation of the plant on the site, known as its 'on-time';
c. The distance between the noise source and the receptor;
d. The attenuation due to ground absorption, air absorption and barrier effects; and
e. The existing noise environment and noise levels at the time of the works.

7.8.10 Due to the early stage of project design, indicative predicted construction noise levels reported in this chapter have been undertaken using noise data for items of plant and calculation methodologies from BS 5228-1 and been based on construction methods used for similar projects.

7.8.11 The predictions relate to construction activities being undertaken at the closest process unit to each NSR irrespective of the phase of development i.e. the predicted noise level could occur at some stage during the full six phase build-out. The predictions also assume that where activities could be undertaken concurrently, this is the case and this therefore represents a conservative

approach. This gives an indication of whether, during a potential worst-case scenario, construction noise is at risk of leading to significant adverse effects by comparison with construction noise LOAEL and SOAEL for each residential NSR.

7.8.12 The predicted levels apply to core 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. Details regarding the noise prediction methodology, including a full list of indicative construction plant and associated sound power levels (L_w) for each construction phase and assumptions, are presented in **Appendix 7.A** of PEI Report, Volume IV.

7.8.13 A summary of indicative daytime noise level predictions at the NSR locations associated with the West Site construction are presented in **Table 7.19**.

7.8.14 As advised by BS 5228, noise levels predicted at distances over 300m (i.e. at NSR 3 - residential NSRs at the eastern edge of Immingham) should be treated with caution due to the increasing importance of meteorological effects and should represent an overestimate.

Table 7.19 Predicted worst-case daytime construction noise levels - residential NSRs

Activity	Predicted construction noise level $L_{Aeq,T}$ dB (free-field)					
	NSR1 (eastern end of Queens Road)	Magnitude of Impact	NSR2 (western end of Queens Road)	Magnitude of Impact	NSR3 (eastern edge of Immingham)	Magnitude of Impact
Site clearance	83	High	80	High	61	Low
Piling and foundations	79	High	75	High	50	Very Low
Underground drainage and services	70	High	72	High	52	Very Low
Roads and hard standing	82	High	79	High	58	Very Low
Buildings and plant installation	72	High	73	High	53	Very Low
All values are in A-weighted dB re 20 µPa, free-field						

7.8.15 Based on the above, using professional judgement for the West Site construction works, there is the potential for short-term temporary high adverse impacts to arise if significant construction works are undertaken at the closest approach within the Project Site boundary to the nearest NSRs on Queens Road. Based

on the sensitivity of the NSRs (High) as shown in **Table 7.11** of this chapter, this could result in up to **major adverse** effects which are significant. Localised acoustic screening provided by existing commercial premises and the mitigation measures outlined in **Section 7.7** would further assist in minimising construction noise impacts. This will be assessed further in the ES in order to further define any required mitigation measures.

7.8.16 At the NSRs on the eastern edge of Immingham, for example around Worsley Road, Somerton Road and Waterworks Road, due to the much greater separation distance of between 460 – 500m from the Project Site boundary, predicted worst-case construction noise levels would result in short-term temporary low or very low adverse impacts. Based on the sensitivity of the NSRs (High) as shown in **Table 7.11** of this chapter, this could result in up to **minor/negligible adverse** effects which are not significant.

7.8.17 Should construction activities be required outside of the core hours, effects at NSRs may be increased depending upon prevailing representative ambient sound levels during those times and may be significant depending upon the works being undertaken. The proposed construction plant and programme will be reviewed again in preparing the ES and construction noise levels at NSRs will be reassessed.

Construction vibration impacts on humans from on-site activities

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

7.8.19 Typically construction works requiring piling or heavy machinery such as vibratory rollers can be associated with potentially significant levels of vibration. Piling is currently expected to be required on the West Site, however, continuous flight auger piling is currently proposed, rather than impact driven piling. As stated in *BS5228* (Ref 7-2) vibration associated with continuous flight auger piling is minimal "*as the processes do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions*"

7.8.20 Road rollers are currently proposed to be used at the West Site, but it is not yet known whether vibratory rollers are required. Should vibratory rollers be required in close proximity of receptors on Queens Road, based upon professional judgement, there is the potential for medium/major adverse impacts (in terms of vibration annoyance to occupants), potentially resulting in effects of **moderate/major adverse** significance (significant). Measures to further mitigate adverse effects are presented in **Section 7.9**.

7.8.21 Due to large distances (minimum of 450m) between residential receptors on the east edge of Immingham and the Site boundary, vibration effects on both humans and buildings would be **negligible.** As with the construction noise, further assessment of construction vibration will be undertaken and presented in the ES. The potential to reduce the magnitude of construction vibration impacts (for example, through the use of low vibration plant) will be presented in the Outline CEMP.

Construction vibration impacts on the Immingham Oil Terminal Pipeline

7.8.22 As detailed in **Chapter 2: The Project**, piling will be required for the marine works (piling design is not yet complete but at this stage it is anticipated that this would likely use vibro/percussive techniques).

7.8.23 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receiver and the activities being undertaken.

7.8.24 Construction effects at the Immingham Oil Terminal Jetty/ Pipeline may be significant, before mitigation, depending upon separation distances. If distances are increased the residual effect would be not significant.

7.8.25 An assessment of likely vibration impacts will be undertaken during the EIA and presented in the ES, based upon empirical formulae and based upon the piling type and parameters proposed at that stage, in order to ensure that significant vibration effects are identified and mitigated as necessary.

Construction noise impacts from sea vessel movements

7.8.26 As detailed in **Chapter 2: The Project**, a small number of sea vessel movements will be required during the construction phase. In particular, the ammonia storage tank are likely to be constructed by transporting large sections to site via sea vessel, before being transported within the Port to the East Site for installation.

7.8.27 However, given the large distance between the nearest residential NSRs on Queens and the quayside (~1.5 km), and the nature of the sound of a small number of additional vessel movements in an area where this source is an established part of the sound character of the area, it is considered unlikely that a additional sea vessel noise would be perceptible and therefore a significant effect is considered unlikely.

7.8.28 Nevertheless, further consideration will be given to this potential pathway during the EIA and the findings presented in the ES, where necessary.

Construction traffic on the local highway network

7.8.29 Preliminary construction traffic data is available and has been used to undertake a preliminary assessment of traffic noise on the NSRs.

7.8.30 It is estimated that Queens Road will experience the greatest percentage increase in traffic flows during construction as traffic reaches the Site. Based upon current two-way baseline flows on Queens Road, between A1173/Kings Road and Queens Road/Laporte Road, future baseline flows on Queens Road in 2025 are forecast to total 4121 per day, of which 601 (15%) will be Heavy Duty Vehicles (HDV).

7.8.31 Construction traffic in 2025 associated with the Project is expected to total 1666 two-way movements per day, of which 194 (12%) will be Heavy Goods Vehicle (HGV) movements per day. This equates to a 40% increase in total flows per day on Queens Road over the predicted future baseline, although the overall the %

HGVs is forecast to reduce compared with baseline flows which will slightly offset some of the increase in noise level.

7.8.32 For context, an increase in traffic flows of 25% would result in a 1 dB(A) increase in road traffic noise and a 100% increase would result in a 3 dB(A) increase, assuming average speeds and the percentage of HGVs remains unchanged. Therefore, on the basis that average traffic speed on Queens Road remains unchanged during construction in 2025, the predicted change in road traffic noise levels at the front façade of properties on Queens Road resulting from a 40% increase in total flow, together with a slightly reduced % HGV component, would be <1.5 dB(A).

7.8.33 This magnitude of noise change would be considered as low in the short-term as detailed in **Table 7.4.**

7.8.34 The extent of the required traffic management is not currently known and therefore it has not been included in this assessment. However, further assessment will be undertaken as the EIA progresses to confirm the predicted noise impacts due to the changes in construction traffic flows and identify if additional and practicable mitigation measures are available.

Operational Phase

Operational sound predictions from on-site plant

7.8.35 The final layout of the Project is yet to be finalised and so noise modelling has been undertaken based upon the indicative locations of operational facilities and equipment associated with the hydrogen production facility on the West Site. However, it is understood that the whilst the layout is not yet finalised, there is relatively limited scope for substantive change in layout of the different 'zones' of plant (e.g. hydrogen production units and liquefiers) around the West Site, due to the necessary process flows. Given this modelling of the project layout without additional noise mitigation it is considered a reasonably representative worst-case.

7.8.36 The operational noise modelling comprises two main scenarios: Phase 1 operation of the associated development, potentially representative of the first three years after opening, and then full operation of Phases 2-6 thereafter.

7.8.37 Further details of the sound source sound power level (Lw) data, the settings used in the noise modelling software and the list of assumptions used are presented in **Appendix 7.B** (PEI Report, Volume IV). Note that the predictions do not currently include tanker filling operations and HGV movements on-site. These will be added to the predictions when further information becomes available as the EIA progresses.

7.8.38 In the absence of additional mitigation, the predicted free-field operational specific sound levels at the NSRs around the Project Site are presented in **Table 7.20**.

Table 7.20 Predicted worst-case operational specific sound levels

Phase	Predicted operational specific sound level $L_{Aeq,Tr}$ dB free-field		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Phase 1 Only	56	62	46-50
Phases 1-6 (full operation)	66	65	52-55

7.8.39 The NSRs presented represent the worst affected within the study area. It is anticipated that once constructed, the plant on-site will operate 24/7 and therefore the predicted sound levels could apply to both the 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

BS4142 assessment results

7.8.40 The daytime BS 4142 assessments are presented in **Table 7.21** and the night-time BS 4142 assessments are presented in **Table 7.22**. 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 7.9**, **Table 7.10** and **Table 7.11**.

7.8.41 The values presented are the differences between the representative background sound level at each NSR (**Table 7.18**) and the predicted rating level (the specific sound level LAeq,T presented in **Table 7.20** plus the character correction). Positive values in the table indicate an excess of the rating level over the background sound level. The lower of the measured background sound levels from the different source dataset have been taken from **Table 7.18** as a conservative approach. Additional surveys undertaken as the EIA progresses will further inform the representative baseline environment at NSRs.

7.8.42 The assessment has assumed that potential noise of a tonal, impulsive or intermittent nature will be designed out of the Project during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, inclusion of a +3 dB correction for other distinctive character has been included at this stage as a conservative approach for NSR with the potential to identify the new sound source in their existing acoustic environment.

Table 7.21 Daytime BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only			Phase 1-6 (full operation)		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Specific sound level L_s ($L_{Aeq,Tr}$), dB	56	62	46 – 50	66	65	52 – 55
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	59	65	49 – 53	69	68	55 – 59
Representative *background sound level* ($L_{A90,T}$), dB	45	45	45	45	45	45
Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	+14	+20	+4 – +8	+24	+23	+10 – +14
Magnitude of impact (assigned from Table 9.12)	High	High	Low / Low-Medium	High	High	Medium / High
Initial BS 4142 classification of effect (assigned from Table 9.14)	Major adverse	Major adverse	Minor / Minor-Moderate adverse	Major adverse	Major adverse	Moderate / Major adverse
Uncertainty: Given the use of sound level data from a number of sources, and the variance in some of the sound level values, significantly different 'representative' *background* and *ambient sound level* values could be obtained using additional baseline data, particularly long-term, allowing the use of different statistical analysis methods.						

Table 7.22 Night-time BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only			Phase 1-6 (full operation)		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Specific sound level L_s ($L_{Aeq,Tr}$), dB	56	62	46 – 50	66	65	52 – 55
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	59	65	49 – 53	69	68	55 – 59
Representative *background sound level* ($L_{A90,T}$), dB	41	45	36	41	45	36
Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	+18	+20	+13 – +17	+28	+23	+19 – +23
Magnitude of impact (assigned from Table 9.12)	High	High	Medium-High / High	High	High	High
Initial BS 4142 classification of effect (assigned from Table 9.14)	Major adverse	Major adverse	Moderate-Major / Major adverse	Major adverse	Major adverse	Major adverse
Uncertainty: Given the use of sound level data from a number of sources, and the variance in some of the sound level values, significantly different 'representative' *background* and *ambient sound level* values could be obtained using additional baseline data, particularly long-term, allowing the use of different statistical analysis methods.						

7.8.43 In accordance with **Table 7.9**, the values presented in **Table 7.21** and **Table 7.22** produce a range of impact magnitudes resulting in effects ranging between minor adverse (not significant, and below the LOAEL) to major adverse (significant, and at or above the SOAEL), subject to consideration of context as below.

Consideration of context

7.8.44 The Project Site is adjacent to the operational area of the Port of Immingham, one of the busiest ports in the UK, operating 24 hours a day, 365 days a year. The area surrounding the Port is also primarily industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Beyond the industrial facilities, the wider area is largely agricultural.

7.8.45 The landside elements of the Project will replace some temporary storage activities currently operating on parts of the Project site and also use areas zoned for future light industrial use. This, as well as the existing operational port traffic using Queens Road, Laporte Road and other nearby access routes is likely to mean that many residents in the local communities are already accustomed to an industrial sound environment. The Project will be somewhat similar to existing port uses and will generate additional off-site movements, most notably along Queens Road.

7.8.46 **Table 7.23** presents existing and future predicted ambient sound levels (assuming constant operation of the Project) and compares them to the BS8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h}$, which would be equivalent to an external criteria of 45 dB $L_{Aeq,8h}$ assuming open bedroom windows for ventilation. The predicted change in ambient sound levels can also be contextualised in accordance with **Table 7.9**.

Table 7.23 Comparison of ambient sound levels without additional mitigation

Receptor	Time Period	Existing *ambient sound level* $L_{Aeq,T}$, dB ^	Predicted *specific sound level*, $L_{Aeq,Tr}$, dB	Sum of existing *ambient sound level* and predicted *specific sound level* $L_{Aeq,Tr}$, dB	Predicted increase in existing *ambient sound level* due to the proposed development, $L_{Aeq,Tr}$, dB
NSR1 (eastern end of Queens Road)	Daytime (16 hour)	52*	66	66	+14
	Night-time (8 hour)	50*	66	66	+16
NSR2 (western end of Queens Road)	Daytime (16 hour)	58*	65	66	+8
	Night-time (8 hour)	60**	65	66	+6

Receptor	Time Period	Existing *ambient sound level* $L_{Aeq,T}$, dB ^	Predicted *specific sound level*, $L_{Aeq,Tr}$, dB	Sum of existing *ambient sound level* and predicted *specific sound level* $L_{Aeq,Tr}$, dB	Predicted increase in existing *ambient sound level* due to the proposed development, $L_{Aeq,Tr}$, dB
NSR3 (eastern edge of Immingham)	Daytime (16 hour)	48*	52-55	53-56	+5 – +8
	Night-time (8 hour)	41***	52-55	52-55	+11 – +14
^ Note, additional baseline surveys will be undertaken as the EIA progresses and therefore these values are subject to update. Lower values have been used from the available data as a conservative approach. * Taken from Kings Road Industrial Development ES Chapter ** Taken from Kings Road Industrial Development ES Chapter and baseline surveys for this Project *** Taken from baseline surveys for this Project					

7.8.47 As shown in **Table 7.23**, ambient sound levels increase due to the predicted levels from the Project, and all are above the BS8233:2014/WHO external criterion of 45 dB $L_{Aeq,8h}$. The predicted levels of increase in ambient sound level would be classified as high in accordance with Table 7.**9**.

7.5.2 On this basis of the above BS 4142 assessment, and that there is likely to be a desire to reduce noise levels to the LOAEL (no greater than +5 dB excess of rating level over background sound level) or lower, potential options to reduce noise levels are discussed in **Section 7.9** (Mitigation and Enhancement Measures).

Operational Road Traffic

7.8.48 Detailed traffic predictions for the operational phase of the development are not yet available. However, as stated in **Chapter 2: The Project** the hydrogen production facility is expected to generate up to 98 daily HGV movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day. Any additional HGV movements associated with the operational jetty alone are likely to be a small fraction of this. Project related daily flows are therefore considered likely to be considerably lower than during construction.

7.8.49 On this basis, the magnitude of road traffic noise change at NSRs fronting onto Queens Road would likely be very low in the short-term, based upon **Table 7.4**, with corresponding negligible adverse significance of effect (not significant).

7.8.50 However, further assessment of operational traffic noise impacts will be undertaken during the EIA and presented in the ES as traffic flows are finalised.

Decommissioning of the hydrogen production facilities

7.8.51 The potential for adverse noise effects would require further consideration at the decommissioning stage of the Project, but potential measures to ensure that

appropriate mitigation is in place during such works are detailed in **Section 7.7**. The effects of eventual decommissioning the hydrogen production facilities are considered to be comparable to, or less than, those assessed for construction activities.

7.8.52 Decommissioning would require submission of a Decommissioning Environmental Management Plan (DEMP) to NELC for its approval, secured by a Requirement of the draft DCO. Appropriate best practice mitigation measures will be applied during any decommissioning works, as described in **Section 7.7**, and documented in a DEMP; no additional mitigation for decommissioning of the Proposed Development beyond such best practice specified in BS 5228 and **Section 7.7** mitigation is considered necessary to specify at this stage.

7.9 Mitigation and Enhancement Measures

7.9.1 The following mitigation measures are being considered as part of the design development of the Project for both the construction and operational phases:

a. Applying the noise hierarchy;

b. Selecting where possible lower noise generating equipment;

c. Limits on noise emissions from plant and equipment at source;

d. Layout design to optimise noise attenuation;

e. Enclosures and buildings for compressors and other equipment, silencers for vents and acoustic insulation on pipework to the extent technically and economically feasible;

f. Planning plant operating modes to minimise start up, shut down and venting;

g. Maintenance activities will be carried out with due consideration to eliminate or minimise noise;

h. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the western site;

i. Specific training for plant personnel and contractors;

j. In the operational phase, as part of the EPR permit, its required to demonstrate to the regulator (Environment Agency) the use of relevant the Best Available Techniques to prevent, minimise or mitigate noise as part of an Operational Noise Management Plan (ONMP); and

k. Recommendation for provision of a package of sound insulation to nearby NSRs, as a last resort, where other applied measures are unlikely to be adequate.

7.9.2 Further consideration will be given to the above during the EIA and presented in the ES.

Construction Phase

7.9.3 Based upon the current assessment, noise effects of up to major adverse (significant, and above the SOAEL) are predicted at Queens Road (represented by NSR1 and NSR2) during on-site weekday daytime and Saturday morning works. Similar effects would be expected if works were to take place at the same

intensity during evenings/ night-time and/ or other weekend periods. Potentially significant adverse effects are also predicted as a result of construction traffic passing residential NSRs on Queens Road as the worst-case estimate.

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

7.9.5 The list of noise control measures presented within **Section 7.7** of this chapter provides a detailed but not exhaustive list of construction noise and vibration management measures that may be implemented, supplemented as necessary with further bespoke measures identified through further detailed assessment as part of the EIA and the CEMP.

7.9.6 The need for monitoring of noise and vibration levels during construction will also be determined through the detailed assessment undertaken.

7.9.7 Residual effects after mitigation are described in **Section 7.10**.

Operational sound from on-site plant

7.9.8 Based upon the current assessment, major adverse noise effects (significant) are predicted during daytime and night-time at Queens Road NSRs (NSR1 and NSR2).

7.9.9 At NSRs on the eastern edge of Immingham to the west (NSR23), predicted effects range between minor/moderate adverse (potentially significant, with some NSRs being at or above the LOAEL and approaching the SOAEL) to major adverse (significant, and above the SOAEL) depending upon time period and phase of Project buildout.

7.9.10 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 Project 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 distinctive character has been applied to the *specific sound levels* predicted from the Project, for NSR with the potential to identify the new sound source in their existing acoustic environment.

7.9.11 The sound reductions required to mitigate operational sound will be considered further as the Project design progresses and presented in the ES, with the overall aim of achieving the 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. This is likely to be achievable at NSRs at the eastern edge of Immingham (NSR3), for example by using acoustic barriers/screens or earth bunds on the edge of the West Site to reduce transmission of noise.

Operational Road Traffic Noise

7.9.12 This preliminary assessment identifies that due to relatively low numbers of vehicles associated with operation of the Project, for significant adverse effects at residential NSRs along Queens Road are not expected.

7.10 Preliminary Assessment of Residual Effects

Construction

7.10.1 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific measures (including further assessment work to be undertaken and presented in the ES), which will help minimise the risk of noise complaints and potential enforcement action under the CoPA by NELC, this preliminary assessment concludes that residual construction noise effects at residential NSRs on Queens Road (represented by NSR1 and NSR2) may be of moderate adverse significance (significant) from both on-site works and off-site traffic. However, as explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the Project. Air Products is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

7.10.2 At residential NSRs to the west at the eastern edge of Immingham (represented by NSR3), residual construction noise effects are likely to be of negligible adverse significance (not significant, and below the LOAEL).

Operation

7.10.3 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific mitigation measures, which will help minimise the risk of noise complaints and potential enforcement action under the EPA by NELC, this preliminary assessment concludes that residual effects at residential NSRs on Queens Road (represented by NSR1 and NSR2) from operational sound may be of up to moderate/major adverse significance (significant, and above the SOAEL) from on-site operations. With respect to off-site traffic, this preliminary assessment concludes that residual road traffic noise effects at residential NSRs on Queens Road is likely to be of negligible adverse significance (not significant).

7.10.4 At residential NSRs at the eastern edge of Immingham (represented by NSR3), residual effects of operational sound are likely to be of negligible/low adverse significance (not significant, and below the LOAEL) once mitigation measures have been deployed.

7.10.5 During detailed design, an operational noise control scheme (including agreed noise limits) will be prepared, secured by a Requirement of the draft DCO, which would demonstrate use of BAT for the control of noise for the Environmental Permit.

Decommissioning

7.10.6 Residual effects during decommissioning of the hydrogen production facilities are expected to be equivalent to those presented above for construction.

7.11 Summary of Preliminary Assessment

7.11.1 A summary of the impact pathways that have been assessed, and the identified residual effects and level of confidence are presented in **Table 7.24**.

Table 7.24 Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Residential NSRs on Queens Road	Construction Noise - Landside works	Potentially up to major adverse (significant) (daytime)	Standard impact avoidance construction noise and vibration mitigation measures, plus additional specific measures where possible	Potentially up to moderate/major (significant)*	Medium
Residential NSRs on eastern edge of Immingham	Construction Noise - Landside works	Potentially up to minor adverse (not significant) (daytime)	Standard impact avoidance construction noise and vibration mitigation measures, plus additional specific measures where possible	Negligible/minor (not significant)	Medium
Residential NSRs on Queens Road	Construction Traffic	Minor adverse (not significant) (daytime)	Potentially construction traffic management, to be confirmed as the EIA progresses	Minor/negligible adverse (not significant)*	Medium
Residential NSRs on eastern edge of Immingham	Construction Traffic	Negligible/minor adverse (not significant) (daytime)	N/A	Negligible/minor adverse (not significant)	Medium
Immingham Oil Terminal Jetty/ Pipeline	Construction/Piling Vibration	Potentially significant, depending upon distance separation	Increase distance between The Project jetty and the existing Immingham Oil Terminal Jetty/ Pipeline	Negligible/minor adverse (not significant)	Medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Operational Phase					
Residential NSRs on Queens Road	On-site plant noise and operations	Up to major adverse (significant) (daytime and night-time)	Limits on noise emissions from plant and equipment at source. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the Site to NSRs. Recommendation for provision of a package of sound insulation to nearby NSRs, as a last resort, where other applied measures are unlikely to be adequate.	Up to moderate/major adverse (significant) (daytime and night-time)*	Medium/High
Residential NSRs on eastern edge of Immingham	On-site plant noise and operations	Up to moderate/major adverse (significant) (daytime) and up to major adverse (significant) (night-time)	Limits on noise emissions from plant and equipment at source. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the Site to NSRs.	Minor adverse (not significant)	Medium/High
Residential NSRs on Queens Road	Project traffic on local roads	Negligible adverse (not significant) (daytime and night-time)	N/A	Negligible (not significant)	Medium
Residential NSRs on eastern edge of Immingham	Project traffic on local roads	Negligible/minor adverse (not significant) (daytime and night-time)	N/A	Negligible/minor adverse (not significant)	Medium
Decommissioning Phase – as per construction phase					

* As explained in Chapter 22: Major Accidents and Disasters, Table 22.2, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the

Project. The Applicant is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

7.12 References

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7.13 Abbreviations and Glossary of Terms

Table 7.25 Glossary and Abbreviations

Term	Acronym	Definition
Annual average weekday traffic (for the 18-hour period between 06.00 – 24.00)	AAWT	Total volume of traffic, weekdays only, on a road or motorway for a year divided by the number of weekdays in the year.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Basic Noise Level	BNL	A measure of source noise.
British Standard	BS	Standard produced by the British Standards Institution.
British Standards Institution	BSI	A group which produces British Standards across industry sectors ad which is formally designated as the National Standards Body for the UK.
Calculation of Road Traffic Noise	CRTN	A technical memorandum that describes the procedures for calculating noise from road traffic.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department for Environment, Food and Rural Affairs	DEFRA	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Design Manual for Roads and Bridges	DMRB	The Design Manual for Roads and Bridges contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Protection Act 1990	EPA	Act of Parliament of the UK that defines the fundamental structure and authority for waste management and control of emissions into the environment.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.

Term	Acronym	Definition
His Majesty's Stationery Office	HMSO	A former British government organisation that was responsible for publishing certain important government documents, including official reports and papers detailing laws.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Lowest Observable Adverse Effect Level	LOAEL	Level above which adverse effects on health and quality of life can be detected.
Likely Significant Effect	LSE	Any effect that may reasonably be predicted as a consequence of the plan or project.
Ministry of Housing, Communities and Local Government	MHCLG	A department of His Majesty's Government responsible for housing, communities, local government in England and the levelling up policy. (Now called Department for Levelling Up Housing and Communities)
No Observed Adverse Effect Level	NOAEL	The level below which no adverse effect can be detected.
No Observed Effect Level	NOEL	The level below which no effect can be detected.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
Noise Policy Statement for England	NPSE	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally Significant Infrastructure Projects, including energy, transport and water, wastewater and waste and against which applications for Development Consent Orders are assessed.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Projects	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Noise Sensitive Receptors	NSR	Receptors which are potentially sensitive to noise. These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship.
Preliminary Environmental Information Report	PEIR	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.

Term	Acronym	Definition
Planning Practice Guidance	PPG	A series of guidance documents which support the content of the National Planning Policy Framework.
Significant Observed Adverse Effect Level	SOAEL	The level above which significant adverse effects on health and quality of life occur.
Sound Pressure Levels	SPL / L_p	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0 dB, while the threshold of pain is approximately 120 dB. Normal speech is approximately 60 dB at a distance of 1 metre and a change of 3 dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10 dB is subjectively twice, or half as loud.
Sound Power Levels	SWL / L_{wA}	A measure of the acoustic energy emitted from a source of noise, expressed in decibels.
Unacceptable Adverse Effect Level	UAEL	Noise perceived as noticeable and very disruptive.