KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

Environmental Statement: Volume 1
Chapter 14: Airborne Noise and Vibration
Document Reference: 8.2.14

APFP Regulations 2009 – Regulation 5(2)(a) and 5(2)(e)
PINS Reference – TR030007

December 2022

Page intentionally left blank

Immingham Eastern Ro-Ro Terminal

Environmental Statement: Volume 1
Chapter 14: Airborne Noise and Vibration

December 2022

Document Information

Document Information	
Project	Immingham Eastern Ro-Ro Terminal
Document title	Environmental Statement: Volume 1 Chapter 14: Airborne Noise and Vibration
Commissioned by	Associated British Ports
Document ref	8.2.14
APFP Reg 2009	Regulation 5(2)(a) and 5(2)(e)
Prepared by	AECOM Ltd

Date	Version	Revision Details
15/12/2022	1	

Contents

Tables

14 Airborne Noise and Vibration

14.1 Introduction

14.1.1 This chapter provides an assessment of the potential significant effects of the proposed Immingham Eastern Ro-Ro Terminal (IERRT) project on Noise and Vibration Sensitive Receptors (NSRs) during construction and operation. This chapter has been prepared by AECOM.

14.1.2 During construction, noise and vibration emissions have the potential to impact on NSRs. Once operational, the main sources of noise associated with the IERRT project will be from site activities including vessel movements, Heavy Goods Vehicle (HGV) movements around the site, mechanical plant associated with the proposed buildings (e.g., air conditioning), HGV refrigeration units and off-site road traffic movements on the existing highway network (mainly HGVs travelling to and from the IERRT) – albeit within an existing busy operational Port area.

14.1.3 Activities on-site, once operational, will be similar to the existing activities that already occur within the port estate and on surrounding land.

14.1.4 The site of the IERRT project is located within the operational Port of Immingham (the Port), one of the busiest ports in the UK, operating 24 hours a day, 365 days a year. The landside elements of the project will replace existing port activities currently operating on parts of the proposed development site. These areas have been in active use for varying port purposes for several decades. The current use of these areas is for the storage and handling of bulk cargo, steel sections and automotive vehicles, all of which generate associated off-site vehicle movements. The marine elements of the project are similarly located in an area of the Humber Estuary that already experiences commercial vessel movements and marine maintenance activities.

14.1.5 This chapter describes the methodology used to assess the likely airborne noise and vibration effects of the IERRT project; the baseline conditions currently existing at the site and surrounding area; the measures identified to prevent, reduce or offset identified significant adverse effects; and the likely residual effects (if any) after these measures have been adopted.

14.1.6 The following NSRs have been identified as part of this assessment:
- Residential NSRs off-site along Kings Road and Queens Road; and
- Other non-residential NSRs on or in close proximity to the proposed IERRT project site within the Port, including health facilities and offices.

14.1.7 A figure supporting the description of the existing baseline environment reported in this chapter is provided in Volume 2 of this Environmental Statement (ES) (Application Document Reference number 8.3). Figure 14.1 of this ES shows the location of NSRs and sound monitoring locations in relation to the IERRT project site.

14.1.8 This chapter is supported by three appendices (Appendices 14.1 to 14.3) which are provided in Volume 3 of this ES (Application Document Reference number 8.4). The appendices are:

- Appendix 14.1 Sound Monitoring Surveys;
- Appendix 14.2 Construction Noise Levels and Assumptions; and
- Appendix 14.3 On-site Operational Noise Levels and Assumptions.

14.1.9 The effects of airborne and underwater noise on marine ecological receptors are considered in the Nature Conservation and Marine Ecology chapter (Chapter 9) of this ES and are not considered in this ES chapter.

14.1.10 The potential noise and vibration impacts on terrestrial ecology receptors are considered in the Preliminary Ecological Appraisal (Appendix 6.2 to this ES).

14.1.11 Relevant aspects of the transport assessment (Appendix 17.1 to this ES) have been used in this assessment for the calculation of changes in road traffic noise levels in the vicinity of the IERRT project.

14.1.12 For the avoidance of doubt, references to construction in this chapter include demolition and piling.

14.2 Definition of the study area

14.2.1 Different study areas are defined for the assessment of airborne noise and vibration depending upon the specific aspect of a project being considered. In general terms, the study area for this assessment is the area over which potential direct and indirect effects of the IERRT project are predicted to occur during the construction and operational periods.

14.2.2 The spatial extent of the study area is defined by the locations of the nearest NSRs, namely residential dwellings on Queens Road and Kings Road and non-residential NSRs within the Port adjacent to the proposed IERRT project. The study area also includes NSRs within 50 m of all roads with potentially significant increases in road traffic noise levels resulting from the IERRT project (a matter further explained in the methodology section that follows). The locations of the NSRs are shown on Figure 14.1 to this ES. The NSR locations selected are considered representative of the nearest and potentially most sensitive existing receptors to the IERRT project. It is considered that if noise and vibration levels are suitably controlled at the nearest and most exposed receptors identified, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area.

14.2.3 The temporal extent of the assessment covers the anticipated construction phase between early 2024 and 2025/2026 (see Chapter 3 of this ES), whilst the potential impacts associated with the operational phase are assessed during the opening year (2025) and a future year scenario (2040) so as to take into account the long-term impacts of operational road traffic noise on

NSRs, in accordance with the guidance in the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration – Revision 2 (Highways England, 2020), as discussed below.

14.3 Assessment methodology

14.3.1 To facilitate the impact assessment process and ensure consistency in the terminology used, a defined assessment methodology has been applied. This methodology has been developed from a range of sources, including:

- The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Impact Assessment' (IEMA, 2014);
- The Design Manual for Roads and Bridges LA 111 Noise and vibration – Revision 2 (Highways England, 2020);
- British Standard (BS) 5228:2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 1: Noise' (BSI, 2014a);
- BS 5228:2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration' (BSI, 2014b);
- BS 4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound' (BSI, 2019);
- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BSI, 2014c);
- 'Calculation of Road Traffic Noise' (CRTN) (Department of Transport/ Welsh Office, 1998); and
- Health Technical Memorandum (HTM) 08-01: Acoustics (Department of Health, 2013).

14.3.2 An understanding of the existing sound climate across the IERRT project site and surrounding area has been obtained through the various sound measurement surveys as described in paragraph 14.3.3, traffic count data for the local highway network and a review of details of the current and historic use of the site. This baseline information has been used to assess the effects of noise associated with construction activities and plant noise (including demolition and piling operations), construction traffic and dredging, and operational noise arising from the IERRT project.

Data and information sources

14.3.3 Current baseline conditions have been determined by sound monitoring surveys to characterise the sound climate at the nearest NSRs on Kings Road, Queens Road and along the A160 near South Killingholme. These surveys have been supplemented by a desk-based review of available baseline information. Sound monitoring surveys have also been undertaken at locations within the Port representative of non-residential NSRs and ecological receptors along the Humber Estuary.

14.3.4 The main desk-based sources of information that have been reviewed to assist in determining the baseline environment within the vicinity of the IERRT project site include:

- Satellite imagery (Google Maps);
- Ordnance Survey mapping (National Mapping Agency); and
- UK environmental noise mapping undertaken as per the requirements of the Environmental Noise Directive (END) Directive (European Commission, 2002).

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

- Construction plant and equipment (provided by ABP from experience on similar sites);
- Construction noise data referenced in BS 5228 2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 1: Noise' (BSI, 2014a)
- Construction vibration data referenced in BS 5228 2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration' (BSI, 2014b);
- Proposed site layout plans (see Figures 1.2 and 1.3 to this ES);
- Ordnance Survey (OS) mapping and aerial photography of the IERRT project site and surrounding area;
- Visit to the proposed IERRT project site and surrounding area; and
- Annual Average Weekly Traffic (AAWT) and hourly data from the Transport Assessment (TA) for the IERRT project, including daily traffic profile information.

14.3.6 Additional sound measurement surveys have been undertaken at the Port to measure existing source sound levels that will be representative of future operational activities at the proposed IERRT project site, such as roll-on/roll-off (Ro-Ro) vessels in dock, unloading and loading Ro-Ro vessels, HGV movements on site, reach stacker operations (for movement of shipping containers) and HGV refrigeration units.

Determining the magnitude of impact

Impacts - overview

14.3.7 The Noise Policy Statement for England (NPSE) (Department for Environment, Food and Rural Affairs (Defra), 2010) 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*".

14.3.8 This long-term vision is supported by three aims that are stated in NPSE paragraph 1.7, namely:

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

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life."*

14.3.9 The 'Explanatory Note' within paragraphs 2.20 and 2.21 of the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to sound 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.

14.3.10 In March 2014, the Department for Communities and Local Government (now the Department for Levelling Up, Housing and Communities) released its Planning Practice Guidance (PPG) web-based resource to support the National Planning Policy Framework (NPPF), allowing easier updates as required. The PPG noise guidance (PPG-N) was last updated in July 2019 (MHCLG, 2019).

14.3.11 The PPG provides additional context when considering noise impacts with regards to LOAELs and SOAELs. This context is presented in Table 14.1 below.

Table 14.1. PPG-N guidance on the categorisation of noise impacts

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required

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

Source: MHCLG, 2019b

14.3.12 The NPSE and PPG recognise that it is not possible to have single objective noise-based measures that define the LOAEL and SOAEL 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.

14.3.13 To determine appropriate LOAEL and SOAEL values in the context of the proposed IERRT development, reference has been made to methodologies and criteria presented in various British Standards and guidance documents. These documents are discussed in turn below.

Construction Phase Impacts

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

- Noise and vibration caused by construction site activities; and
- Noise caused by increases in traffic on the existing public road network as a result of construction traffic.

14.3.15 Vibration from traffic on the highway network during the construction phase has been scoped out as explained in more detail in paragraph 14.8.10.

Noise from construction activities

14.3.16 The potential noise impacts arising from construction site activities have been assessed in accordance with the methods and guidance in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (BSI, 2014a).

14.3.17 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.

Residential NSRs

14.3.18 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 corresponding existing ambient noise levels. For each appropriate period (day, evening, night, weekend etc.), the existing ambient noise level is determined and rounded to the nearest 5 dB and the appropriate threshold value is then derived. The predicted construction noise level is then compared with this construction noise threshold value. The construction noise thresholds are derived from Table 14.2 below.

Table 14.2. Construction noise thresholds at residential NSRs

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

Source: BSI, 2014a

14.3.19 Based upon the BS 5228 ABC method (BSI, 2014a), the criterion adopted in this assessment for the determination of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be equivalent to the SOAEL, although as stated in BS 5228, other project-specific factors, such as the number of NSR'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.

14.3.20 For the purposes of this assessment, the criterion for the LOAEL for residential NSRs 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 added by standard addition. Two noises of equal level (±1 dB) combine to raise the noise level by 3 dB.)

14.3.21 Based on the above, the magnitude of construction noise on residential NSRs is classified in accordance with the criteria below in Table 14.3. These have been based on professional judgement and precedent.

Table 14.3. Construction noise magnitude of impact for residential NSRs

Magnitude of Impact	ABC Category Relative to SOAEL $L_{Aeq,T}$ 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
Negligible	Below the ABC Threshold Value (the SOAEL) by ≥-5 dB

Non-residential NSRs

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

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

14.3.23 Based on the above, the magnitude of construction noise on non-residential NSRs is classified in accordance with the criteria below in Table 14.4. These have been based on professional judgement.

Table 14.4. Construction noise magnitude of impact for non-residential NSRs

Magnitude of Impact	Predicted construction noise level compared with total noise* level
High	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off level, by >+10 dB for duration of one month or more
Medium	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off level, by ≥+5 dB for duration of one month or more
Low	Total noise level exceedance of the pre-construction ambient noise level, or the lower cut-off level, by between 0 and <5 dB
Negligible	Below the pre-construction ambient noise level, or the lower cut-off level
Note: *Total noise = pre-construction ambient noise level + construction noise level (subject to the lower cut off)	

14.3.24 At this stage of the project, the full and final detailed construction programme is not defined, therefore as a conservative approach, and to ensure a robust assessment, it has been assumed that all assessed construction activities will be of a duration a greater than one month. This means that the initial indication of potential significant effects (before application of professional judgement) is based solely upon the total noise level exceedance of the pre-construction ambient noise level for a given working period.

Noise from construction traffic on existing roads

14.3.25 The noise impacts of construction traffic using existing roads have been assessed with reference to the National Highways document DMRB LA 111 Noise and Vibration Revision 2 (LA 111) (Highways England, 2020).

14.3.26 The change in noise level for relevant links has been predicted based on the CRTN (Department of Transport, 1998) Basic Noise Level (BNL) methodology.

14.3.27 Predictions have been undertaken for both 'with' and 'without' construction traffic scenarios for each road link in the construction traffic model, using 18-hour AAWT traffic flows from the transport assessment (Appendix 17.1 of this ES), in accordance with the CRTN methodology.

14.3.28 The criteria for the assessment of the magnitude of traffic noise changes arising from construction road traffic have been taken from Table 3.17 of DMRB LA 111 (Highways England, 2020) and are reproduced in Table 14.5 below. The magnitude descriptors in parenthesis are provided to align with the descriptors used in this assessment.

Table 14.5. Magnitude of impact at NSRs 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	<1

Source: Highways England, 2020

Vibration from construction activities

Impacts on humans

14.3.29 The nearest residential NSRs on Queens Road and Kings Road are approximately 200 m from the closest point of the IERRT project, and marine side construction piling will be over 1 km from the residential NSRs. Given the distance between the residential NSRs and the IERRT project, no significant vibration effects (i.e., those typically associated with a medium or high magnitude impact) are expected to result from the construction

(including demolition and piling) activities and therefore further assessment of vibration impacts on residential NSRs has been scoped out.

Impacts on buildings

14.3.30 In response to the statutory consultation undertaken on the IERRT project (see Section 14.4 of this ES chapter) the potential vibration impacts on nearby existing marine infrastructure was raised as a potential issue to be considered within the assessment.

14.3.31 Buildings and structures may be damaged by high levels of vibration. The principal concern is generally transient vibration, for example due to piling. The closest point between the existing neighbouring Immingham Oil Terminal (IOT) jetty and the closest proposed piling location for the proposed vessel impact protection, if required, is approximately 8 m. The closest point between the IOT jetty and the closest piling location for the proposed fixed jetty is approximately 38 m. Given the proximity, vibration impacts on this nearby structure have been assessed.

14.3.32 BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration' (BSI, 1993) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014 (BSI, 2014b). Guide values for transient vibration, above which cosmetic damage could occur, are given in Table 14.6 below.

Table 14.6. Transient vibration guide values for cosmetic damage

Type of Building	Peak Component Particle Velocity Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Note 1: Values referred to are at the base of the building Note 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

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

14.3.34 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 (ISO, 2010) defines three different categories of building damage:

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

14.3.35 BS 7385-2:1993 (BSI, 1993) defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact as identified in Table 14.7 below.

Table 14.7. Magnitude of impact – construction vibration building damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mm/s	
		Unreinforced or light framed structures	Reinforced or framed structures
High	Major	≥30	≥100
Medium	Minor	15 to <30	50 to <100
Low	Cosmetic	6 to <15	25 to <50
Negligible	Negligible	<6	<25

14.3.36 These values for construction vibration building damage have been applied to relevant structures within the Port and surrounding area, including existing jetties. The existing jetties and pipeline are considered to be reinforced structures. The PAM building is considered to be a light framed structure.

Operational phase

Noise from the operation of the IERRT project

14.3.37 Noise emissions from the operation of the IERRT project have been predicted using CadnaA® noise modelling software which implements the calculation procedures of ISO 9613 ‘Acoustics – Attenuation of Sound During Propagation Outdoors’ (ISO, 1996). An assessment has been undertaken by comparing the predicted operational sound levels against the ambient sound levels of the working Port as it currently operates - 24 hours a day, 7 days a week.

14.3.38 The IEMA 'Guidelines for Environmental Noise Impact Assessment' (2014) has been used to assess the impact of changes in ambient sound level at NSRs due to the operation of the proposed development. 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."

14.3.39 The IEMA Guidelines (2014) provide criteria for the magnitude of impacts due to noise level changes from a project, as shown in Table 14.8 below, and these have been used within the assessment.

Table 14.8. Categorising the magnitude of the basic noise level change

Magnitude of Impact	Noise Level Change, dB
Negligible (No Change)	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	5 to 9.9

Noise from road traffic during the operational phase on the highway network

14.3.40 The noise from off-site road traffic associated with the IERRT project during operation has been assessed using guidance provided in DMRB LA 111 (Highways England, 2020).

14.3.41 The change in noise level for relevant highway links has then been calculated based on the CRTN (Department for Transport (DfT) / Welsh Office, 1998) BNL methodology. The relevant links assessed have been provided by the transport consultant (see Chapter 17 (Traffic and Transport) of this ES) and represent the relevant highway routes that would be taken by IERRT project's operational traffic between the Port and the A180. Noise impacts along the routes only need considering where there are NSRs along those routes. For project traffic utilising the Port's East Gate, the assessment therefore considers Queens Road, and for project traffic utilising the West Gate the assessment considers the A160. Operational traffic is not considered likely to travel along Kings Road for the reasons explained in the Traffic and Transport chapter (Chapter 17 of this ES).

14.3.42 Predictions have been undertaken for both 'with' and 'without' the IERRT project using 18 hour AAWT and hourly traffic flows from the Transport Assessment (Appendix 17.1 of this ES). Typically, traffic noise levels are

assessed over an 18 hour period (06:00 to 00:00) based on 18 hour AAWT traffic flows. However, as the IERRT project will be operational 24 hours a day, hourly traffic data has also been used to assess the variation in hourly traffic flows throughout the day, evening and night-time periods.

14.3.43 The criteria for the assessment of traffic noise changes arising from the operational phase road traffic have been taken from Table 3.54 of DMRB LA 111 (Highways England, 2020) and are provided in Table 14.9 below.

Table 14.9. Magnitude of impact at NSRs from operational phase traffic

Magnitude of Impact	Short-term Change in Traffic Noise Level dB
Major (high)	≥ 5
Moderate (medium)	3 to <4.9
Minor (low)	1 to <2.9
Negligible	<1
Magnitude of Impact	**Long-term Change in Traffic Noise Level dB**
Major (high)	≥ 10
Moderate (medium)	5 to <9.9
Minor (low)	3 to <4.9
Negligible	<3

Source: Highways England, 2020

14.3.44 The assessment of operational traffic movements has been based on the IERRT project operating at its maximum potential capacity on opening, which represents a worst-case scenario that in reality will not occur. The operational traffic impacts presented in this ES have been assessed against both the short-term and long-term operational road traffic noise changes set out in Table 14.9 of this ES chapter. The context of the noise climate of the existing Port being itself within a wider industrial area is also taken into consideration when determining the final significance of effect.

14.3.45 DMRB LA 111 Table 3.49.1 defines the LOAEL during the day (06:00 to 24:00) as 55 dB $L_{A10,18h}$ and the SOAEL during the day as 68 dB $L_{A10,18h}$. DMRB goes on to state in Table 3.60 that:

"Where any do-something absolute noise levels are above the SOAEL, a noise change in the short-term of 1.0 dB or over results in a likely significant effect".

14.3.46 This indicates that NSRs experiencing absolute noise levels exceeding the SOAEL are more sensitive to smaller changes in noise than NSRs experiencing absolute noise levels below the SOAEL.

14.3.47 As the BNL is calculated at 10 m from the roadside, the absolute noise level is not considered to be representative of that which nearby NSRs may experience. It is, however, appropriate for defining a change in noise level. Should an increase in noise of greater than 1 dB be identified from a road where the BNL exceeds the SOAEL, additional calculations are undertaken

to identify the absolute noise levels at nearby NSRs and the associated likelihood of significant effects.

Non-residential NSRs

14.3.48 Three non-residential NSRs have been identified within the Port in the vicinity of the IERRT project. Guideline design criteria for good internal acoustic conditions at these non-residential NSRs are set out below:

- The People Asset Management Ltd (PAM) building (a port occupational health services building) – a design criterion of 40 dB $L_{Aeq,1hr}$ from HTM 08-01 (Department of Health, 2013) for private offices, small treatment rooms, interview rooms, consulting rooms.
- Nippon Gases UK Limited Office and PK Construction (Lincs) Limited Office buildings - a design criterion of 45-50 dB $L_{Aeq,T}$ from BS 8233:2014 for open plan offices.

14.3.49 Based on site visits and correspondence with the occupiers of these non-residential NSRs it is understood that air conditioning or alternative means of ventilation are provided within these building allowing windows and doors to remain closed. It is further understood that thermal double glazing is installed in each building which would typically provide 33 dB(A) attenuation against road traffic noise, based on guidance in the now superseded PPG 24 (Office of the Deputy Prime Minister, 1994). Single glazing would typically provide 28 dB(A) attenuation.

14.3.50 Table 14.10 sets out the maximum external noise level before the design criterion is exceeded for both double and single glazed windows.

Table 14.10. Maximum external noise levels

Receptor	Maximum External noise Levels, $L_{Aeq,T}$ dB	
	Single Glazed Windows	Double Glazed Windows
PAM Building	68	73
Nippon Gases UK Limited	78	83
PK Construction (Lincs) Limited	78	83

14.3.51 Should these external noise levels be exceeded, there is the potential for adverse impacts to occur and therefore additional mitigation will be required for the non-residential NSRs.

Significance criteria

14.3.52 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 14.11 below is

based on both professional judgement and classifications adopted for other recent EIAs for Development Consent Order (DCO) applications.

Table 14.11. 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 (health)/ residential care homes • Libraries
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	• Offices • Restaurants/ retail • Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g., tennis, golf)
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	• Residences and other buildings not occupied during working hours • Factories and working environments with existing high noise levels • Sports grounds when spectator or noise is a normal part of the event

Classification of effects

14.3.53 Impacts are defined as changes arising from the IERRT 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.

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

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

14.3.55 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 14.12 below.

Table 14.12. Classification of effects

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

14.3.56 Where adverse or beneficial effects have been identified, these have been assessed against the following significance scale, derived using the matrix presented in Table 14.12 above:

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

14.3.57 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.

14.4 Consultation

14.4.1 Consultation as to whether there are likely to be any noise and vibration effects as a result of the construction and operation of the IERRT project has been undertaken with the Environmental Health Departments at North East Lincolnshire Council (NELC) and North Lincolnshire Council (NLC).

14.4.2 In addition, the outcomes of the formal EIA scoping process, as well as any feedback received during the statutory consultation in response to the publication of the Preliminary Environmental Information Report (PEIR) and supplementary statutory consultation and the publication of the Supplementary Consultation Report, have also been taken into account to inform the assessment.

14.4.3 The outcome of the consultation, together with how this has influenced the noise and vibration assessment, is presented in Table 14.13 below.

Table 14.13. Summary of consultation

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Planning Inspectorate (PINS)	Scoping Opinion, October 2021 Table ID 4.9.1	The Scoping Report seeks to scope out assessment of vibration emissions during construction and operation on the grounds that the closest NSRs is at least 270 m from the site. The Inspectorate accepts this distance is sufficient to avoid significant effects on human receptors, but ES should include an assessment of vibration emissions during construction and operation on ecological receptors or information demonstrating agreement with the relevant consultation bodies and the absence of a Likely Significant Effect (LSE).	The potential impacts of airborne noise on waterbirds are assessed in the ES chapter dealing with Nature Conservation and Marine Ecology (Chapter 9) of this ES. There is no evidence that vibration significantly effects these receptors, therefore vibration impacts have been scoped out from further assessment. There are no identified sensitive terrestrial ecological receptors within the study area. The vibration impacts on residential receptors have been scoped out.
PINS	Scoping Opinion, October 2021 Table ID 4.9.2	The ES should explain how the final study area has been defined to reflect the zone of influence of the proposed development.	Information on the study area is provided in Section 14.2 of this ES chapter.
PINS	Scoping Opinion, October 2021 Table ID 4.9.3	The ES should address effects from airborne noise and vibration on ecological receptors or provide a justification as to why LSE would not arise.	The potential impacts of airborne noise on waterbirds are assessed in the chapter dealing with Nature Conservation and Marine Ecology (Chapter 9). There is no evidence that vibration significantly effects these receptors, therefore vibration impacts have been scoped out. There are no identified sensitive terrestrial ecological receptors within the study area.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
PINS	Scoping Opinion, October 2021 Table ID 4.9.4	The Applicant is advised to seek specific agreement with NELC's Environmental Health Department around the approach to collecting baseline data and the selection of receptors. The Applicant is advised to seek advice from Natural England and NELC on the ecological receptors which should be included in the assessment.	The Environmental Health Department at NELC and NLC have been consulted. Further information on relevant local policy is provided in Section 14.5 of this chapter. Natural England has been consulted regarding the ecological receptors as detailed in Nature Conservation and Marine Ecology (Chapter 9).
NELC Environmental Health Department	Email response from Environmental Protection Officer dated 29 October 2021	Confirmation that department is happy with the proposed methodology (as stated in scoping report) and the noise measurement locations. NELC recommended that NLC Environmental Health Department are contacted regarding the noise monitoring location in South Killingholme.	As recommended by NELC, NLC has been consulted – see row below. Further details of are provided in Section 14.5 to this ES.
NLC Environmental Health Department	Email to Environmental Protection Officer dated 2 November 2021 Further email sent 8 December 2021. Further email sent 12 July 2022	No response received.	Email (sent on 12 July 2022) sought clarification as to whether there were any outstanding issues with the assessment scope and assessment methodologies. At the time of writing no further clarification has been received.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Q26, Q35, Q70	Statutory Consultation - 19 Jan - 23 Feb 2022	Concern about the increased levels of pollution, specifically noise and carbon emissions caused by additional vessels and HGV's both within the terminal and the surrounding area.	Road traffic noise during construction and operation, and on-site vehicle movements, are assessed within Section 14.8 of this ES chapter. The carbon emissions are assessed in Chapter 19 (Climate Change) of this ES.
Q26, Q35	Statutory Consultation - 19 Jan - 23 Feb 2022	Suggest that more mitigation is needed to address impacts of pollution, including a long-term plan to offset the emissions.	Noise and vibration mitigation is considered in Section 14.9 of this ES chapter. The carbon emissions are assessed in Chapter 19 (Climate Change) of this ES.
Q26	Statutory Consultation - 19 Jan - 23 Feb 2022	Proposals to implement speed limits to manage noise and dust levels are not sufficient.	Noise and vibration mitigation is considered in Section 14.9 of this ES. The potential dust impacts are assessed in Chapter 13 (Air Quality) of this ES.
Ex10	Statutory Consultation - 19 Jan - 23 Feb 2022	Suggest tree planting along A160 to act as a visual and acoustic barrier.	Trees will provide a visual barrier but not significant acoustic screening. No adverse noise impacts have been predicted along the A160; therefore, no noise mitigation is proposed.
T3	Statutory Consultation - 19 Jan - 23 Feb 2022	Queried the distance from the proposed development site to the Port Occupational Health building operated by PAM and what noise level is expected.	The PAM building has been included as an NSR in the construction and operational assessments. Section 14.8 of this ES chapter details sets out the predicted noise levels.
PCT1, PCT2	Statutory Consultation - 19 Jan - 23 Feb 2022	Concern was raised over increased noise and vibration to residents on Queens Road and along the A180 due to the noisy road surface.	The road traffic noise during construction and operation on the public highway have been assessed in Section 14.8 of this ES chapter. Vibration from traffic on highway

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
			network during the construction and operational phase has been scoped out as detailed in paragraph 14.8.10.
Exolum (PI28)	Statutory Consultation - 19 Jan - 23 Feb 2022	Concerns over piling operations close to existing foreshore pipelines.	Construction vibration impacts on sensitive industrial structures and pipelines have been assessed in Section 14.8 of this ES chapter.
Associated Petroleum Terminals (Immingham) Ltd (APT) (PI30)	Statutory Consultation - 19 Jan - 23 Feb 2022	Concerns over piling operations close to existing foreshore pipelines, jetties and equipment. APT are also concerned about the vibration impact of operational dredging on their infrastructure.	Construction vibration impacts on sensitive industrial structures and pipelines have been assessed in Section 14.8 of this ES chapter. Vibration from operational dredging is considered in Section 14.8 of this ES chapter.
DFDS (PI32)	Statutory Consultation - 19 Jan - 23 Feb 2022	Impact on noise from the HGV's travelling on local roads, particularly Queens Road, has not adequately been assessed.	Road traffic noise during construction and operation including from the HGVs on local roads is assessed within Section 14.8 of this ES chapter.
North Lincolnshire Council (PI38)	Statutory Consultation - 19 Jan - 23 Feb 2022	The Environmental Protection Officer would welcome the submission of a noise impact assessment. Further comments are expected from the Environmental Protection Team.	A noise impact assessment has been prepared and is reported in this ES chapter. The construction and operational noise impacts are assessed within Section 14.8 of this ES chapter. No further comments from the Environmental Protection Team have been received.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
North East Lincolnshire Council (PI45)	Statutory Consultation - 19 Jan - 23 Feb 2022	Happy with the noise information provided in the PEIR, some final details to be determined within the ES. Vibrations will also have to be considered through the ES.	The construction and operational noise impacts are assessed within Section 14.8. Operational vibration impacts on residential NSRs have been scoped out due to distance between the IERRT project site and the residential NSRs as stated in the EIA Scoping Report and as detailed in paragraph 14.3.29 of this ES chapter.
All	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	No comments were received with respect to climate change in response to the supplementary statutory consultation exercise.	N/A

14.5 Implications of policy, legislation and guidance

14.5.1 This section of the chapter sets out key aspects and implications of applicable legislation, policy and guidance that are relevant to the assessment of the likely effects of noise and vibration on NSRs. It builds upon the overarching chapter covering legislation and policy (Chapter 5).

UK legislative and regulatory framework

Environmental Noise (England) Regulations 2006

14.5.2 The Environmental Noise (England) Regulations 2006 (as amended) were introduced in England to implement European Union, Assessment and Management of Noise Directive 2002/49/EC (known as the END). 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.

Environmental Protection Act 1990

14.5.3 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.

Control of Pollution Act 1974

14.5.4 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.

14.5.5 Section 61 of CoPA 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 that the agreed conditions are maintained on-site.

14.5.6 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 BS 5228 as Best Practicable Means.

National policy

National Policy Statement for Ports (NPSfP)

14.5.7 The National Policy Statement for Ports (NPSfP) (DfT, 2012) 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 impacts from the IERRT project has, therefore, been undertaken. Where potentially significant adverse effects have been identified based upon initial higher level assessment, further, more detailed assessments have been undertaken to define likely significant adverse effects.

14.5.8 NPSfP paragraph 5.10.9 also repeats the aims given in the NPSE discussed above at Section 14.3 of this ES.

14.5.9 It provides at paragraph 5.10.12 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;*
> - *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."*

National Planning Policy Framework (NPPF)

14.5.10 Whilst not the primary policy document for a nationally significant infrastructure project (NSIP) Harbour Facility development, the NPPF (MHCLG, 2021) 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.

14.5.11 The NPPF states in paragraph 185 that planning policies and decisions should:

> *"(a) 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*

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

Noise Policy Statement for England (NPSE)

14.5.12 This document is discussed in Section 14.3 above.

Planning Practice Guidance on Noise (PPG-N)

14.5.13 This document is discussed in Section 14.3 above.

14.5.14 In accordance with the NPSfP, NPPF and NPSE, significant adverse effects (above the SOAEL) should be avoided, and other adverse effects (above the LOAEL) should be mitigated and minimised, where possible.

Local policy

North East Lincolnshire Local Development Plan 2013 to 2032 (adopted 2018)

14.5.15 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.

14.5.16 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 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."

14.5.17 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"

North Lincolnshire Local Plan

14.5.18 The North Lincolnshire Local Plan was adopted in 2003. The local plan has been replaced by the Local Development Framework, which is a suite of development plan documents. The saved policies which are relevant to noise and proposed development include:

"DS1 – General Requirements
A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:
Amenity iii) No unacceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or other nuisance, or through the effects of overlooking or overshadowing."

'DS11 - Polluting Activities Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas'.

14.5.19 The relevant noise policies from the Local Development Framework are discussed in paragraphs 14.5.20 - 14.5.22 below.

North Lincolnshire Council Planning for Health and Wellbeing-Supplementary Planning Document (November 2016)

14.5.20 The NLC 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 the local planning policy towards health and wellbeing and is used to make decisions on planning applications.

14.5.21 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."

14.5.22 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.*"

14.6 Description of the existing environment

14.6.1 The existing baseline sound climate at the Port of Immingham is dominated by port operations, together with noise from the industrial/ commercial premises on the north side of the A1173 and Immingham Lorry Park, as well as road traffic noise on the A1173 and surrounding local roads.

14.6.2 There are a limited number of NSRs in the vicinity of the IERRT project site. A very small number of residential properties are located on Queens Road in Immingham to the south of the port, approximately 200 m from the nearest boundary of the IERRT project site. There are existing commercial and industrial premises opposite the residential properties on Queens Road, which will provide a level of acoustic screening of the IERRT project and will also provide an element of sound masking at times due to noise from their own operations.

14.6.3 There are some residential properties along Kings Road in Immingham between Trenchard Close and Pelham Road, approximately 270 m south-west of the nearest boundary of the IERRT project site. Similarly, to Queens Road, there are existing commercial and industrial premises opposite these residential properties on Kings Road which will provide a level of acoustic screening of the IERRT project and will also provide an element of sound masking at times due to noise from their own operations.

14.6.4 The village of South Killingholme is adjacent to the A160 and is north-west of the IERRT project site. South Killingholme is over 3 km from the site, however, some traffic from the IERRT project will travel along the A160. There are two refineries and other industrial premises in the vicinity of South Killingholme.

14.6.5 As set out at paragraph 14.3.48, three non-residential NSRs have been identified within the port in the vicinity of the IERRT project:

- PAM port occupational health building - a single storey building located near the East Gate;
- PK Construction Office - a two-storey building next to the PK Construction yard; and
- Nippon Gas Office - a two-storey building to the north of the proposed southern compound of the IERRT project site.

14.6.6 In order to help further define existing sound conditions at NSRs, ambient sound level measurements have been undertaken at three representative residential locations (M1 to M3), closest to the proposed development and potential traffic routes, as listed below. Ambient sound level measurements have also been undertaken at three additional locations representative of the on-site non-residential and ecological NSRs (M4 to M6). The monitoring locations are shown on Figure 14.1 to this ES, namely:

- M1: opposite 54 Kings Road, Immingham;
- M2: opposite Queens Road Café, Queens Road, Immingham;

- M3: No. 2, Humber Road South Killingholme;
- M4: near PAM building (also representative of PK Construction Office)
- M5: near Nippon Gas Office building; and
- M6: on northern boundary of IERRT project site, representative of the ecological receptors on the mudflats on the Humber Estuary.

14.6.7 Sound level monitoring was undertaken with reference to the procedures set out in the CRTN (Department of Transport/ Welsh Office, 1998) shortened measurement procedure (for locations M1 to M3) and the requirements of BS 7445 1: 2003 'Description and measurement of environmental noise. Guide to quantities and procedures' (BSI, 2003), as appropriate, in particular regarding instrumentation and monitoring methodology.

14.6.8 As it was not possible to find an appropriate secure location on Queens Road and Kings Road (closest NSRs to the IERRT project) to leave sound monitoring equipment unattended over a minimum 24 hour period, in November 2021 three consecutive 1 hour attended measurements were completed at locations M1 and M3 between 10:00-17:00 on a typical weekday (avoiding school holidays, bank holidays etc.). At location M2, a 1 hour measurement was undertaken during the daytime period. During the night-time period (23:00 to 07:00), two 15 minute measurements were taken at all three locations. Further attended measurements were undertaken at locations M1 and M2 in March, April and May 2022, extending the extent of baseline sound level data to cover the full 24 hour period at each location. At locations M4, M5 and M6, unattended sound monitoring equipment was left for 5 days in July 2022.

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

14.6.10 The weather conditions during the survey periods were all within the parameters set out in the relevant guidance documents including BS 7445 (BSI, 2003) and CRTN (Department of Transport/Welsh Office, 1988). The weather conditions are summarised for each location in Appendix 14.1 to this ES.

14.6.11 The sound level meters and associated microphones were field calibrated at the beginning and end of their respective measurement periods in accordance with recommended practice. No significant drift in calibration was observed. The accuracy of the calibrator can be traced to the National Physical Laboratory Standards. Full details of the equipment used can be found in Appendix 14.1 to this ES.

14.6.12 Descriptions of sound sources observed at the measurement locations during the daytime are included in Table 14.14 below and night-time sound sources are included in Table 14.15 of this ES chapter.

Table 14.14. Observed sound sources at the measurement location during the daytime survey periods

Measurement Location	Description of Sound Environment
M1	Dominated mainly by HGV traffic noise from Kings Road. Other sources comprised HGV lorry park, light aircraft, road traffic noise, industrial hum, industry cranes in background, leaves rustling in the breeze, bird song and distant lorry horns.
M2	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.
M3	Dominated by road traffic noise from the A160, contribution from traffic noise with East Field Road junction, flaring from chimney to the north of the monitoring location and occasional aircraft overhead.
M4*	Dominated by passbys on Robinson Road including vehicles passing over the level crossing, fork lift trucks and reversing beeps from PK Construction, Port Engineering Services and Drury's yard.
M5*	HGV passbys, activities and vehicle movements in Nippon Gas and Origin yards.
M6*	HGV passbys, moving of aggregate in yard to south of monitoring location.
* Observation during equipment set up and collection	

Table 14.15. Observed sound sources at the measurement location during the night-time survey periods

Measurement Location	Description of Sound Environment
M1	Dominated mainly by HGV traffic noise from Kings Road and HGV activity (loading/unloading) behind the monitoring location. Leaves rustling in the breeze and distant industrial noise to the southwest.
M2	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.
M3	Dominated by chimney flaring to the north of the monitoring location, minor contributions from distant industrial noises from the northwest. Road traffic noise from the A160.

14.6.13 Table 14.16 to Table 14.18 of this ES chapter provide a summary of the attended surveys at Locations M1 to M3, which are representative of the residential NSRs.

14.6.14 Where the noise measurements did not commence on the hour, the 100 millisecond noise levels which were logged during the measurement have

been combined to provide the $L_{Aeq,1hr}$, starting on the hour, to allow comparison with the predicted hourly traffic data.

14.6.15 A summary of the sound levels at Location M1 is provided in Table 14.16 below.

Table 14.16. Measurement Location M1 - Kings Road, Immingham

Start Time	Date	Measured Sound Levels				Combined $L_{Aeq,1hr}$ starting on the hour
		dB $L_{Aeq,1hr}$	dB $L_{AF90,1hr}$	dB $L_{AFmax,1hr}$	dB $L_{AF10,1hr}$	
23:04	22/04/2022	61.6	47.1	84.7	63.1	61.6
00:04	23/04/2022	58.1	47.0	83.6	54.4	58.1
01:04	23/04/2022	55.7	46.7	78.1	52.0	55.7
02:04	22/04/2022	57.4	46.2	81.1	53.2	57.4
03:04	23/04/2022	56.1	46.9	78.1	52.3	56.1
04:04	23/04/2022	58.1	48.2	81.1	55.7	58.1
05:04	23/04/2022	63.6	48.7	77.4	65.0	63.6
06:04	23/04/2022	63.1	48.7	79.9	68.0	63.1
07:27	23/04/2022	71.1	54.7	98.9	74.7	71.1
08:27	23/04/2022	70.0	52.6	95.1	74.0	70.1
09:27	23/04/2022	69.6	51.0	87.4	73.8	69.6
10:37	25/03/2022	69.4	49.1	91.5	73.5	69.3
11:33	25/03/2022	68.4	50.5	88.4	72.6	69.2
12:32	25/03/2022	69.6	48.2	93.6	73.4	68.9
13:32	25/03/2022	70.3	49.5	97.7	73.9	69.9
13:11*	16/11/2021	70.7	56.1	87.5	74.7	71.3
13:26*	16/11/2021	70.9	54.8	87.8	75	
13:42*	16/11/2021	72.1	56.5	92.8	75.3	
13:57*	16/11/2021	71.5	52.1	92.1	74.5	
14:32	03/05/2022	69.9	51.2	87.1	74.0	70.0
15:35	24/03/2022	69.2	51.2	85.1	73.1	70.0
16:37	24/03/2022	70.2	53.5	96.3	73.7	70.2
17:37	24/03/2022	68.0	50.5	86.4	72.4	69.7
18:35	03/05/2022	67.0	47.4	86.7	71.5	67.4
19:35	03/05/2022	65.9	45.3	84.6	70.3	67.0
20:35	03/05/2022	65.2	43.8	84.8	69.2	65.8
21:04	24/03/2022	63.0	46.9	83.2	67.4	63
22:04	24/03/2022	61.9	47.4	80.8	66.0	61.9
$L_{Aeq,16hr}$ (07:00-23:00)						68.9
$L_{Aeq,12hr}$ (07:00-19:00)						69.7
$L_{Aeq,4hr}$ (19:00-23:00)						64.9
$L_{Aeq,8hr}$ (23:00-07:00)						60.2
$L_{A10,18hr}$ (06:00-00:00)						72.3
All values are in A-weighted dB re 20 µPa, free-field						
* 15 minute measurements						

14.6.16 A summary of the sound levels at Location M2 is provided in Table 14.17 below.

Table 14.17. Measurement location M2 - Queens Road, Immingham

Start Time	Date	Measured Sound Levels				Combined $L_{Aeq,1hr}$ starting on the hour
		dB $L_{Aeq,1hr}$	dB $L_{AF90,1hr}$	dB $L_{AFmax,1hr}$	dB $L_{AF10,1hr}$	
23:00	22/04/2022	60.8	45.6	83.7	58.8	60.8
00:00	23/04/2022	56.9	45.5	82.7	49.2	56.9
01:00	23/04/2022	55.9	45.5	79.7	49.3	55.9
02:00	23/04/2022	53.8	44.9	79.5	48.1	53.8
03:00	23/04/2022	56.1	44.7	81.6	49.8	56.1
04:00	23/04/2022	57.9	44.9	81.2	50.0	57.9
05:00	23/04/2022	63.7	46.0	92.3	64.0	63.7
06:00	23/04/2022	64.5	46.3	83.3	67.7	64.5
07:12	25/03/2022	69.5	45.9	80.0	62.2	69.5
08:12	25/03/2022	69.8	50.7	85.0	74.6	69.5
09:12	25/03/2022	68.7	51.2	86.6	73.3	69.2
10:12	25/03/2022	69.8	50.9	96.7	73.5	69.3
11:12	25/03/2022	69.3	48.9	84.0	74.2	69.1
12:09	24/03/2022	68.6	47.4	85.4	73.4	69.3
12:41	17/11/2021	70.5	50.9	87.4	74.7	69.3
13:09	24/03/2022	69.9	48.2	97.3	73.5	70.0
13:41	17/11/2021	70.6	52.8	85.6	74.9	70.0
14:09	24/03/2022	69.7	48.4	88.4	74.3	69.3
14:41	17/11/2021	69.9	52.4	85.8	74.1	69.3
15:09	24/03/2022	69.8	47.0	87.7	74.4	70.1
16:24	03/05/2022	70.6	49.3	86.1	75.1	69.9
17:24	03/05/2022	69.4	45.2	86.9	74.5	70.5
18:23	24/03/2022	67.7	45.3	87.1	71.7	68.0
19:23	24/03/2022	65.7	43.9	87.5	68.3	67.0
20:23	24/03/2022	65.0	43.6	84.0	66.9	65.3
21:00	22/04/2022	61.0	46.2	85.1	58.2	61.0
22:00	22/04/2022	62.3	46.0	84.5	62.7	62.3
$L_{Aeq,16hr}$ (07:00-23:00)						68.7
$L_{Aeq,12hr}$ (07:00-19:00)						69.5
$L_{Aeq,4hr}$ (19:00-23:00)						64.5
$L_{Aeq,8hr}$ (23:00-07:00)						60.3
$L_{A10,18hr}$ (06:00-00:00)						72.2
All values are in A-weighted dB re 20 µPa, free-field						

14.6.17 A summary of the sound levels at Location M3 is provided in Table 14.18 below.

Table 14.18. Measurement location M3 - Humber Road, South Killingholme

Start Time	Date	Duration	Measured Sound Levels				Calculated $L_{A10,18hr}$
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$	
11:16	16/11/2021	1 hour	70	56	88	75	73
12:16		1 hour	70	57	93	74	
13:16		1 hour	70	58	88	75	
02:20	17/11/2021	15 min	65	53	85	66	n/a
02:35		15 min	63	50	83	63	
All values are in A-weighted dB re 20 µPa, free-field							

14.6.18 Table 14.19 to Table 14.21 provide a summary of the unattended noise monitoring at Locations M4 to M6, which are representative of non-residential NSRs within the port site.

14.6.19 A summary of the sound levels at Location M4 is provided in Table 14.19 below.

Table 14.19. Measurement location M4 - PAM building

Date	Measured Sound Levels		
	dB $L_{Aeq,(07:00-19:00)}$	dB $L_{AF90,(07:00-19:00)}$	dB $L_{AFmax,(07:00-19:00)}$
08/07/22	59.2	46.7	85.3
09/07/22	53.8	41.2	82.4
10/07/22	52.2	42.2	79.4
11/07/22	59.4	47.9	87.8
12/07/22	59.4	48.1	84.7
All values are in A-weighted dB re 20 µPa, free-field			

14.6.20 A summary of the sound levels at Location M5 is provided in Table 14.20 below.

Table 14.20. Measurement location M5 - Nippon Gas Office Building

Date	Measured Sound Levels		
	dB $L_{Aeq,(07:00-19:00)}$	dB $L_{AF90,(07:00-19:00)}$	dB $L_{AFmax,(07:00-19:00)}$
08/07/22	53.1	47.8	78.9
09/07/22	53.2	48.9	76.9
10/07/22	51.1	46.8	84.0
11/07/22	56.2	50.1	79.9
12/07/22	54.4	49.0	85.2
All values are in A-weighted dB re 20 µPa, free-field			

14.6.21 A summary of the sound levels at Location M6 is provided in Table 14.21 below.

Table 14.21. Measurement location M6 - Northern Boundary of IERRT project site

Date	Measured Sound Levels, dB								
	$L_{Aeq,}$ (07:00-19:00)	$L_{Aeq,}$ (19:00-23:00)	$L_{Aeq,}$ (23:00-07:00)	$L_{AF90,}$ (07:00-19:00)	$L_{AF90,}$ (19:00-23:00)	$L_{AF90,}$ (23:00-07:00)	$L_{AFmax,}$ (07:00-19:00)	$L_{AFmax,}$ (19:00-23:00)	$L_{AFmax,}$ (23:00-07:00)
08/07/22	53.8	51.1	46.1	45.4	44.5	43.8	80.4	77.2	72.4
09/07/22	47.4	42.7	48.3	41.2	40.9	45.8	80.8	62.4	73.2
10/07/22	52.4	43.7	49.1	43.9	42.4	45.2	77.0	64.3	76.4
11/07/22	54.2	48.4	49.2	48.4	45.0	46.4	83.4	70.7	77.1
12/07/22	52.9	45.4	48.7	46.4	42.2	45.2	83.8	71.7	74.2
All values are in A-weighted dB re 20 µPa, free-field									

14.7 Future baseline environment

14.7.1 The site of the IERRT project, on the landside, forms part of the operational Port of Immingham. In the absence of the IERRT project the landside areas of the site would continue to be utilised for port activities.

14.7.2 Future baseline sound levels will depend largely on traffic flows on surrounding road and rail networks and the future operations at the port, other industrial/ commercial premises and future developments in the area.

14.7.3 Traffic forecasts have been used to help define the future baseline and it is assumed that port activities will also contribute to the future baseline noise levels.

14.8 Consideration of likely impacts and effects

14.8.1 This section identifies the likely impacts and effects on NSRs as a result of the construction and subsequent operation of the IERRT project.

14.8.2 As stated in Section 14.6 of this chapter, there are a limited number of NSRs in the vicinity of the IERRT project site, with the nearest being residential properties on Queens Road, Immingham (approximately 200 m south of the southern boundary of the IERRT project site) and Kings Road, Immingham (approximately 270 m north-west of the western boundary of the IERRT project site). There are also three identified non-residential NSRs within the Port in close proximity to the boundary of the IERRT project site.

14.8.3 The likely impacts and effects of airborne and underwater noise on marine ecological receptors are considered in the Nature Conservation and Marine Ecology chapter (Chapter 9) of this ES.

14.8.4 Cumulative impacts and effects on NSRs could arise as a result of other developments and activities in the Humber Estuary and the surrounding

area. Such impacts and effects are considered as necessary as part of the cumulative effects and in-combination effects assessment provided in Chapter 20 of this ES.

Matters scoped in

14.8.5 The potential impact pathways during the construction phase scoped into the assessment are:

- Potential noise impacts associated with construction activities on-site;
- Potential vibration impacts on existing infrastructure associated with construction activities on-site; and
- Potential noise impacts associated with traffic movements on local highways during construction.

14.8.6 The potential impact pathways during the operational phase scoped into the assessment are:

- Potential noise impacts associated with traffic movements on local highways during operation; and
- Potential noise impacts associated with vessel movements, other site activities and mechanical plant during operation.

Matters scoped out

14.8.7 The closest identified residential NSR is located on Queens Road approximately 200 m from the IERRT project site. As described in Section 14.3 of this ES chapter, at this distance, vibration emissions from both the construction and operation of the IERRT project are likely to be imperceptible. Assessments of construction and operational vibration from on-site activities on residential NSRs are, therefore, scoped out of the EIA.

14.8.8 In respect of this conclusion, the EIA Scoping Opinion (Table ID 4.9.1 – as summarised in Table 14.13 of this chapter) accepts that the distance is sufficient to avoid significant vibration effects on human receptors.

14.8.9 For the avoidance of doubt, however, it should be noted that the above conclusion on vibration relates to effects on human receptors. This ES chapter does include an assessment of the effect of vibration on existing infrastructure located within proximity to the IERRT project, namely the IOT jetty and pipeline. This was an issue specifically highlighted by certain responses received to the statutory consultation.

14.8.10 Vibration from traffic on the highway network during the construction and operational phase has also been scoped out. Former DMRB document HD 213/11 Rev 1 (Highways Agency, 2011) reports that extensive research on a wide range of buildings found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage. It was also stated that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating

domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances.

14.8.11 DMRB (LA 111) scopes out the assessment of road traffic vibration on the basis that a maintained road surface will be free from irregularities so operational vibration will not have the potential to lead to significant adverse effects.

14.8.12 The assessment of noise from the delivery of construction materials by sea, to the inner dock, have been scoped out due to the significant distance to the NSRs and the acoustic screening provided by the intervening buildings.

Construction phase

14.8.13 This section reports the assessment of the potential impacts on NSRs as a result of the construction phase of the IERRT project. The following impact pathways have been assessed:

- Potential noise impacts associated with construction activities on-site;
- Potential vibration impacts on existing infrastructure associated with construction activities on-site; and
- Potential noise impacts associated with traffic movements on local highways during construction.

Construction noise limits

14.8.14 Construction noise levels are likely to vary during different construction activities, depending on the location of work sites and proximity to NSRs. The nearest residential NSRs to the IERRT project site are on Queens Road and Kings Road. Based on the current ambient noise levels at M1 (Kings Road) and M2 (Queens Road) – given in Table 14.16 and Table 14.17 of this ES chapter – and the BS 5228 ABC category guidance in Table 14.2 of this ES chapter, the construction noise limits for the NSRs in the vicinity of these monitoring locations are 75 dB $L_{Aeq,12hr}$ during the daytime, 65 dB $L_{Aeq,4hr}$ during the evening and 55 dB $L_{Aeq,8hr}$ during the night-time. These limits take account of the high sensitivity of residential receptors, based upon Table 14.11 of this ES chapter. Provided these noise limits are not exceeded, the construction noise levels at NSRs will be below the SOAEL and significant effects unlikely in accordance with Table 14.3 and Table 14.12 of this ES chapter.

14.8.15 For the on-site NSRs, based on the current ambient noise levels at M4 (PAM Building/PK Construction Office building) and M5 (Nippon Gas Office building) – given in Table 14.19 and Table 14.20 of this ES chapter – the lower cut-off value of 65 dB $L_{Aeq,12hr}$ is applied to derived the construction noise limits. However, as the sensitivity of the NSR is also taken into account when defining the significance of effect, it follows that the different sensitivity of these NSRs needs to be considered when setting the construction noise limit that would lead to potentially significant effects. Due to the medical related use of the PAM building, it is assigned as being of high sensitivity based upon Table 14.11 of this ES chapter. To avoid a

significant adverse effect, a construction noise of 69 dB $L_{Aeq,12hr}$ would apply. This is based on the total noise level (from predicted construction noise plus pre-construction ambient noise – see Table 14.19 and Table 14.20 to this chapter), subject to the lower cut off value of 65 dB $L_{Aeq,12hr}$, +4 dB; +4 dB being below the +5 dB exceedance of the pre-construction ambient noise level that is potentially significant for a high sensitivity NSR in accordance with Table 14.4 and Table 14.12 of this ES chapter. However, due to the office related use of the PK Construction building and the Nippon Gas building, these are assigned as being of medium sensitivity (as a likely worst-case) based upon Table 14.11 of this ES chapter. To avoid a significant adverse effect, a construction noise of 75 dB $L_{Aeq,12hr}$ would apply. This is based on the total noise level (from predicted construction noise plus pre-construction ambient noise – see Table 14.19 and Table 14.20 to this chapter), subject to the lower cut off value of 65 dB $L_{Aeq,12hr}$, +10 dB; +10 dB being below the >+10 dB exceedance of the pre-construction ambient noise level that would be potentially significant for a medium sensitivity NSR based upon a high magnitude of impact (in accordance with Table 14.4) and a moderate adverse significance of effect (in accordance with Table 14.12 of this ES chapter).

Construction noise predictions

14.8.16 This section discusses the potential noise effects on NSRs arising during the construction phase of the IERRT project. The following have been identified as the main construction activities which have the potential to affect NSRs:

- Marine works, including piling, dredging, and installation of approach jetty, two link spans, two secured floating pontoons and two finger piers with three berths.
- Landside works:
  - Site clearance and demolition
  - Drainage works
  - Piling, installation and construction of buildings
  - Laying roads and hardstanding
  - Bridge works

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

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

14.8.18 The construction noise predictions reported in this assessment have been undertaken using noise data for items of plant and calculation methodologies from BS 5228-1. Predicted noise levels for construction of the IERRT project have been based on construction methods used for

similar developments in the UK. This gives an indication of where, at what stage, and during which construction activities, construction noise is at risk of leading to potentially adverse and significant adverse effects.

14.8.19 The construction programme is detailed in Chapter 3 of this ES. For landside construction, working hours will be 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays, with no works taking place on Sundays. Marine works and capital dredging works may be undertaken 24 hours a day, Monday to Sunday.

14.8.20 As described in Chapter 3 of this ES the construction of the whole IERRT project may be completed at the same time, or it may be sequenced such that construction of the innermost southern finger pier and Western Storage Area takes place at the same time as operation of the northernmost pier. However, all capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of the northernmost pier commences.

14.8.21 In the case of a sequenced construction scenario, the overall duration of construction activity will be extended but it will not increase the scale of construction activity and therefore it is not anticipated to increase the predicted construction noise levels (assuming no significant changes to plant or construction traffic flows). Given a conservative assessment has been undertaken with the construction works assumed to take place at the realistic closest approach to each NSR, the impact pathway assessments that have been detailed in the following paragraphs are considered a worst-case and will not be worsened by a sequenced construction period.

14.8.22 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. The predictions assume constant operation of equipment throughout the 07:00 – 19:00 periods which is a conservative worst-case assumption. Details regarding the noise prediction methodology, including a full list of indicative construction plant and associated sound power levels (L_W) for each construction phase and assumptions, are presented in Appendix 14.2 to this ES.

14.8.23 The principal marine construction works will include the following typical plant:

- Pile hammer;
- Vibratory hammer;
- Backhoe dredger;
- Barge hopper;
- Crane barge including 350 T crawler crane;
- Crawler crane 150 T;
- Tug/ multi cat; and
- Hatch barge/ deck barge.

14.8.24 The capital dredge will be a 24/7 operation and will take around 80 days to complete (based on current construction schedule). Marine piling is anticipated to take approximately 24 weeks to complete (based on current construction schedule), but the actual piling activity will not be continuous over this period. Under the sequenced construction scenario, piling works for the northern finger pier, approach jetty, and pontoons would be scheduled to be carried out for the approximate 24-week period starting in early 2024, followed by a second approximate 13-week period in mid-2025 to construct the southern finger pier.

14.8.25 The principal landside construction works will comprise an upgrade of the existing port area, including the demolition of some existing buildings, land clearance, enabling works, the construction of terminal buildings and an internal bridge within the development site, road construction and creation of cargo storage areas. Typical plant will include:

- Dozers;
- Hydraulic excavators;
- Dump trucks,
- Crushers;
- Screening plant;
- Rollers;
- Road pavers;
- Asphalt/ concrete plant;
- Tractor trailers;
- Tippers;
- Concrete pumps;
- Peckers;
- Compressors;
- Pavement breakers;
- Dumpers;
- Test pump;
- Generators;
- Transformers;
- Welding sets;
- Cranes;
- Dewatering pump;
- Water pump;
- Circular saw;
- Petrol hydraulic hand breakers; and
- Telehandlers.

14.8.26 During the construction works the crusher and associated screening plant will be located a minimum of 250 m away from the on-site NSRs and temporary acoustic screening will be erected either around construction plant operating near the PAM building or around the PAM building itself throughout the construction works. A -5 dB reduction has been applied to the noise calculations as a result of this screening as a conservative approach as acoustic screening could provide more than 5 dB attenuation. These measures are considered in this assessment as embedded mitigation.

14.8.27 Apart from the crusher and screening plant, predictions have been carried out assuming all of the plant is operating at the realistic closest point to the NSRs, therefore presenting a worst-case scenario as not all the plant will be at the closest approach for the full duration (or at all), and the construction plant is likely to spread across the IERRT project site. For NSRs on Kings Road and Queens Road, a -5 dB reduction has been applied, to allow for partial barrier screening due to the existing buildings and structures between the IERRT project site and the NSRs. For most construction works that will be fully visually screened from the NSRs, this correction for barrier screening is conservative as there could be more than a 5 dB reduction. This assumption leads to a worse-case assessment.

14.8.28 The potential construction noise levels have also been predicted at the PAM building, PK Construction Office building and Nippon Gas Office building within the port, due to their close proximity to the boundary of the IERRT project site. For the PK Construction Office building and the Nippon Gas Office building no screening correction due to existing on-site structures has been applied. As already indicated, for the PAM building, it has been assumed that there will be some temporary screening and a -5 dB reduction has been applied as a conservative approach as discussed in paragraph 14.8.26.

14.8.29 Predictions have also been carried out assuming that all of the above construction activities occur concurrently. The worst-case predicted construction noise levels at the residential NSRs are summarised in Table 14.22, together with the corresponding magnitude of impact descriptor.

Table 14.22. Predicted construction noise levels - residential NSRs

Activity	Predicted Construction Noise Level $L_{Aeq,T}$ dB			
	NSRs on Queens Road	Magnitude of Impact	NSRs on Kings Road	Magnitude of Impact
Marine works	49	Negligible	47	Negligible
Site clearance and demolition	64	Negligible	62	Negligible
Drainage works	59	Negligible	57	Negligible
Piling, installation and construction of buildings	50	Negligible	45	Negligible
Laying roads and hard standing	52	Negligible	50	Negligible
Bridge works	42	Negligible	37	Negligible
Cumulative- worst case all daytime activities	66	Negligible	63	Negligible
All values are in A-weighted dB re 20 µPa, free-field				

14.8.30 The worst-case predicted construction noise levels at the on-site non-residential NSRs are summarised in Table 14.23, together with the difference between the Total Noise and the 65 dB $L_{Aeq,12hr}$ lower cut-off level, and the corresponding magnitude of impact descriptor from Table 14.4.

Table 14.23. Predicted construction noise levels – on-site non-residential NSRs

Activity	Predicted Construction Noise + Existing Ambient Noise Level $L_{Aeq,\ T}$ dB (Total Noise)					
	PAM building	Difference compared with 65 dB $L_{Aeq,12hr}$ lower cut-off level	PK Construction office building	Difference compared with 65 dB $L_{Aeq,12hr}$ lower cut-off level	Nippon Gas office building	Difference compared with 65 dB $L_{Aeq,12hr}$ lower cut-off level
Marine works	65	0 (Low)	66	1 (Low)	61	-4 (Negligible)
Site clearance and demolition	69	4 (Low)	78	13 (High)	67	2 (Low)
Drainage works	67	2 (Low)	76	11 (High)	74	9 (Medium)
Piling, installation, and construction of buildings	64	-1 (Negligible)	74	9 (Medium)	66	1 (Low)
Laying roads and hard standing	64	-1 (Negligible)	68	3 (Low)	67	2 (Low)
Bridge works	65	0 (Low)	76	11 (High)	58	-7 (Negligible)
Cumulative- worst case all daytime activities	73	8 (Medium)	83	18 (High)	76	11 (High)
All values are in A-weighted dB re 20 µPa, free-field						

14.8.31 At the residential NSRs on Kings Road and Queens Road in Immingham, for all scenarios, the predicted noise levels from construction activities are below the daytime construction noise level described in paragraph 14.8.14 of this ES chapter. The magnitude of impact has been identified as likely to be negligible for Queens Road and Kings Road residential NSRs, as the predicted worst-case when all daytime construction activities are assumed to be occurring at the same time (which is unlikely for long extended periods, or at all, in practice). The evening and night-time marine works would also result in negligible magnitude of impact. Based on the sensitivity of the NSRs (high) as shown in Table 14.11 of this ES chapter, the likely construction noise effects (based on Table 14.12 of this ES chapter) on nearby residential NSRs are **minor adverse** (not significant).

14.8.32 For the PAM building, based on the assumption there will be temporary acoustic screening during the construction works, the total noise level (pre-existing ambient noise level + predicted construction noise level) as shown in Table 14.23 of this ES chapter is less than 5 dB above the daytime lower cut off value of 65 dB $L_{Aeq,T}$ apart from during the cumulative worst-case if all activities were undertaken at the same time. However, as already indicated this is unlikely to occur in practice, and even if it did this would not be for long extended periods. Therefore, based on the sensitivity of the PAM building (high) as shown in Table 14.11 of this ES chapter and using professional judgement in respect of the likelihood and potential duration of the cumulative worst-case scenario, the likely construction noise effects (based on Table 14.12 of this ES chapter) are considered to be **minor adverse** (not significant) during construction works. Also, the main NSRs (i.e., the staff and visitors) will, however, be located inside the PAM building. It is understood that external windows and doors to sensitive rooms facing the construction works can be kept closed and alternative means of cooling/ ventilation can be utilised. Based upon thermal double glazing providing typically 33 dB(A) attenuation, the internal design criterion for private offices, small treatment rooms, interview rooms, consulting rooms (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the construction works. On this basis, the classification of effects at PAM building would reduce further to **minor adverse or less** (not significant).

14.8.33 For the PK Construction Office building the total noise level as shown in Table 14.23 of this ES chapter exceeds the daytime lower cut off value of 65 dB by more than 10 dB during site clearance and demolition, drainage, bridge works and the cumulative of all activities, and therefore the magnitude of impact has been identified as high. Based on the sensitivity of these office buildings (medium as a likely worst-case) as shown in Table 14.11 of this ES chapter, the likely construction noise effects (based on Table 14.12 of this ES chapter) for these high magnitude of impact construction activities are considered to be **moderate adverse** (significant).

14.8.34 The main NSRs (i.e., the office staff) will, however, be located inside the office building. It is understood that external windows and doors to sensitive rooms facing the construction works can be kept closed and alternative means of cooling/ ventilation can be utilised. Based upon thermal double

glazing providing typically 33 dB(A) attenuation, the internal design criterion for open plan offices (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the construction works. On this basis, the classification of effects at PK Construction Office building reduces to **minor adverse or less** (not significant) during different phases of the works.

14.8.35 For the Nippon Gas Office building, the total noise level as shown in Table 14.23 of this chapter is less than 10 dB above the daytime lower cut off value of 65 dB $L_{Aeq,T}$ apart from during the cumulative worst-case scenario if all activities were undertaken at the same time (which as explained above is unlikely for long extended periods, or at all, in practice). The magnitude of impact has been identified as high for the cumulative scenario. Based on the sensitivity of the office building (medium as a likely worst-case) as shown in Table 14.11 to this ES chapter, the likely construction noise effects (based on Table 14.12 to this ES chapter) are considered **moderate adverse** (significant) for the worst-case cumulative scenario whilst the effects during all other activities are predicted to be **minor adverse or less** (not significant). Again, however, the main NSRs (i.e., the office staff) will be located inside the office building. Again, on the basis that external windows and doors to sensitive rooms facing the construction works are kept closed and alternative means of cooling/ ventilation is utilised, the internal design criterion for open plan offices (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the construction works. On this basis the classification of effects at the Nippon Gas Office building reduces to **minor adverse or less** (not significant)**.**

14.8.36 Additionally, the mitigation proposed in Section 14.9 of this chapter and contained within the Construction Environmental Management Plan (CEMP) (Application Document Reference number 9.2) will help to minimise the construction noise levels further and reduce them below those assessed and reported above.

Construction traffic

14.8.37 As reported in the Traffic and Transport chapter (Chapter 17 of this ES), it is estimated that, on average, there would be a total of 200 HGV movements per day over an approximate 78 week construction programme (early 2024 to mid-2025). There may be days where the peaks in construction traffic will be considerably higher, with other days much lower, and therefore as stated in Chapter 17, as a worst-case scenario, a total of 280 construction HGV movements per day has been assessed.

14.8.38 The BNL of traffic on Queens Road and the A160 has been calculated ‘with’ and ‘without’ the construction traffic, using 18 hour AAWT traffic data provided by the Transport Consultant from traffic models reported in Chapter 17 of this ES. The difference between the ‘with’ and ‘without’ construction traffic BNL has been compared to the short-term change in noise levels as shown in Table 14.5 of this ES.

14.8.39 The calculated noise levels show the additional construction traffic would result in a predicted increase in road traffic noise levels of 0.2 dB on the A160 and 1.8 dB on Queens Road. These magnitudes of noise change are negligible and low respectively in the short-term as detailed in Table 14.5 of this chapter. In the context of existing road traffic and other environmental noise at NSRs close to the road network to be used by construction traffic, it is considered the effect of temporary construction traffic is **minor adverse** (not significant) at worst.

Construction vibration

14.8.40 As detailed in Chapter 3 of this ES, piling will be required for the marine works (vessel impact protection, approach jetty, linkspan and pontoons and finger piers) and landside works (IERRT buildings and bridge construction).

14.8.41 For the marine works, the majority of the piling will be vibro-piling to refusal and then percussive piling techniques to reach the final level.

14.8.42 For the landside works, rotary piling is proposed for the new building foundations and continuous flight auger (CFA) for the bridge abutments and sheet piling for the bridge ramps.

14.8.43 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.

14.8.44 To provide an initial assessment of likely vibration impacts, empirical formulae derived by Hiller and Crabb (2000) has been used to predict a resulting peak particle velocity (PPV) based on various piling parameters. The equations are summarised in Table E.1 in BS 5228 Part 2 (BSI, 2014b) and the relevant ones shown below.

14.8.45 The equation used to predict PPV for percussive piling is:

$$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}}\right]$$

where:

- k_p is the scaling factor which is dependent on ground conditions. A value of 3 has been used (pile toe to be driven through: very stiff cohesive soils, dense granular soils, fill containing obstructions which are large relative to pile cross section).
- W is the nominal hammer energy. 47100 J and 300000 J have been used for this assessment.
- r is the slope distance from the pile toe in metres, the closest slope distance from the IOT jetty to the piling area for the vessel impact protection is approximately 15 m and the slope distance from IOT jetty to the piling area for the IERRT jetty is approximately 40 m. The closest distance from the PAM building to the bridge piling is approximately 43 m.

14.8.46 Predicted PPV for vibratory piling in mm/s:

$$v_{res} = \frac{k_v}{x^{\delta}}$$

- k_v is the scaling factor for vibratory piling, and for a worst-case assessment 266 has been used;
- x is the distance measured along the ground surface in metres from the piling rig to the receptor. The closest distance from the IOT jetty to the vessel impact protection piling area is approximately 8 m, the closest distance from the IOT jetty to the proposed IERRT jetty piling area is 38 m and the closest distance from the PAM building to the bridge piling is approximately 43 m. The closest distance from the PAM building to the proposed IERRT buildings is 109 m; and
- δ is 1.3 for all operations.

14.8.47 The resultant predicted PPV for percussive and vibratory piling are shown in Table 14.24 below together with the resultant magnitude of impact based upon Table 14.7 of this ES chapter. As stated in paragraph 14.3.36 the existing jetties and pipeline are considered to be reinforced structures. The PAM building is considered to be a light framed structure.

Table 14.24. Resultant PPV for percussive and vibratory piling

Receptor	Percussive Piling (47100 J)		Percussive Piling (300000 J)		Vibratory Piling	
	Predicted ppv Levels mm/s	Magnitude of Impact	Predicted ppv Levels mm/s	Magnitude of Impact	Predicted ppv Levels mm/s	Magnitude of Impact
IOT Jetty (vessel impact protection)	18.8	Negligible	47.5	Low	17.8	Negligible
IOT Jetty (proposed IERRT Jetty)	5.4	Negligible	13.5	Negligible	2.4	Negligible
PAM Building – Bridge works	4.9	Negligible	12.4	Low	2.0	Negligible
PAM building – IERRT Building construction	n/a	n/a	n/a	n/a	0.6	Negligible

14.8.48 This initial vibration assessment shows the predicted PPV levels for percussive piling using a piling rig with 47100 J hammer energy are likely to result in a negligible magnitude of impact (based on Table 14.7 of this chapter) for building damage, which will result in a **negligible adverse** effect (not significant).

14.8.49 If a piling rig with 300000 J hammer energy is used for percussive piling, the predicted PPV values are likely to result in a low magnitude of impact (based on Table 14.7 of this chapter) for building damage, which will result in a **minor adverse** effect (not significant).

14.8.50 Different piling rigs may be used during construction, but the pile hammer energy associated with the CG300 rig (300000J) is considered a worst case.

14.8.51 The predicted PPV levels for vibratory piling are likely to result in a negligible magnitude of impact (based on Table 14.7 of this chapter), resulting in a **negligible adverse** effect (not significant).

Operational phase

14.8.52 This section discusses the potential impacts on NSRs as a result of the operational phase of the IERRT project. The following impact pathways have been assessed:

- Potential noise impacts associated with vessel movements, other site activities and mechanical plant during operation; and
- Potential noise impacts associated with traffic movements on local highways during operation.

14.8.53 The issue of potential vibration impacts from maintenance dredging on existing infrastructure located within proximity to the development was highlighted in some responses received during the statutory consultation process. The maintenance dredging will be undertaken by a backhoe dredger on a barge hopper, similar to dredging activities currently taking place in the Humber Estuary near the Port of Immingham. The vibration levels associated with the backhoe dredger on a barge hopper will be lower than the marine side construction piling which the initial assessment has indicated is likely to result in a minor significance of effect (not significant) at the nearest infrastructure. Therefore, the operational vibration impacts will not be significant and have not been assessed further.

Operational noise – on-site activities

14.8.54 The IERRT project will service the embarkation and disembarkation of Ro-Ro cargo as described in Chapter 2 of this ES.

14.8.55 It is anticipated that, when fully operational, the new facility will service three arrivals and departures per day (i.e., one per berth). The timings of the vessels' arrivals and departures cannot be definitively known at this stage, but the current understanding – which is based upon other such activity which occurs on the Humber Estuary – is that the vessels will generally arrive in the morning after an overnight crossing from Europe and depart in the evening for an overnight sailing. During their time on the berth, the vessels will be connected to ship-to-shore power plug-ins where practicable.

14.8.56 The nearest residential NSRs on Queens Road and Kings Road are approximately 1.6 km and 1.8 km from the proposed IERRT berths. The on-site NSRs of the PAM building, PK Construction Office building and Nippon Gas Office building are approximately 800 m, 700 m and 970 m respectively from the proposed IERRT berths.

14.8.57 The ship-to-shore inverters for the power plug-ins are typically quiet, and will not be a significant sound source, especially given the distance to the nearest residential properties (approximately 1.6 km and 1.8 km away). Therefore, ship-to-shore inverters have not been included in the operational on-site noise assessment.

14.8.58 At this stage of the project, the precise location and details of fixed plant associated with the IERRT terminal building are not yet confirmed but fixed plant will likely be required for heating/cooling and ventilation. Due to the existing noise climate of this busy operational port, it is considered that, assuming fixed plant is appropriately specified (with respect to noise emissions) and/ or located away from NSRs, significant adverse noise impacts on the NSRs on Queens Road and Kings Road and on-site are unlikely and therefore they have not been included in the operational assessment.

14.8.59 As stated in Section 14.6 of this ES chapter, noise measurements were undertaken in March 2022 of a Ro-Ro vessel arriving, unloading, loading and departing in the inner harbour at the Port of Immingham. The loudest sound source was from the vessel ramp being opened and HGVs/ land tugs driving off the vessel. Short-term measurements of other on-site noise sources, including land tug movements, HGV drive-bys, reach stacker movements and diesel refrigerated HGVs, were also undertaken.

14.8.60 The reasonable worst-case number of HGVs/ land tugs travelling to/ from and around the IERRT project site has been determined for a 1 hour period. This has assumed that three vessels (one per berth) arrive in that 1 hour period. Vessel arrival times will be the busiest for on-site HGV and land tug movements as operators seek to unload the vessel as soon as possible - a target period of 4 hours is common. The majority of the vessel loading prior to departure commonly takes place over the following 7 to 8 hour period (on the basis that the vessel is typically in dock for 12 hours). This means that the on-site HGV and land tug movements associated with the loading of the vessel are more usually spread out over the daytime period.

14.8.61 The noise from unloading and loading the vessels, with the associated on-site HGV and land tug movements, are likely to be one of the noisiest activities from the operation of the proposed development and therefore operational noise levels have been predicted for the following scenario during arrival of up to three vessels. The scenario includes three ships arriving into dock, mooring up, vessel doors opening, vessel unloading (either accompanied HGVs or by land tugs), HGV and land tugs movements on port roads and over the proposed bridge (travelling to the southern

compound), a reach stacker operating in Northern compound and HGV trailers with refrigerated units parked in the trailer parks.

14.8.62 Full details of the sound levels measured for each activity and the assumptions about the on-site activities can be found in Appendix 14.3 to this ES.

14.8.63 As the IERRT project will be operational 24 hours a day, the operational noise levels have been predicted over a 1 hour period and have been combined with the quietest hourly ambient noise level during the day and night-time periods. The change in noise level between the daytime and night-time combined noise levels and the existing quietest ambient noise levels for the daytime and night-time is reported in Table 14.25 below, along with the magnitude of impact based on Table 14.8 of this ES chapter.

Table 14.25. Operational noise – on-site activities

NSR	Predicted Noise Level, dB	Ambient Noise Level, dB	Combined Noise Level, dB	Level Difference, dB	Magnitude of Impact
Queens Road (day)	44.7	61.0	61.1	0.1	Low
Queens Road (night)	44.7	53.8	54.3	0.5	Low
Kings Road (day)	38.4	61.9	61.9	0.0	Negligible/ No change
Kings Road (night)	38.4	55.7	55.8	0.1	Low
PAM Building*	65.0	59.2	66.0	6.8	High
PK Construction Office*	62.3	59.2	64.0	4.8	Medium
Nippon Gas Office*	59.1	53.1	60.1	7.0	High
* Day-time assessment only as these NSRs are not occupied during the evening and night-time periods.					

14.8.64 Based on the results presented in Table 14.25 above, it is predicted that there would be a very slight increase in noise levels at residential NSRs on Queens Road due to the on-site operations. Based on Table 14.8 of this ES chapter the magnitude of impact is low for NSRs on Queens Road during the day and night-time periods. This will result in a **minor adverse** effects (not significant) during both the day and night assessment periods.

14.8.65 There will be no change in the noise levels at residential NSRs on Kings Road during the on-site daytime operations and a very slight increase in noise levels during the night-time period. This would result in a **negligible/ no change** effect (not significant) during the day and **minor adverse** effect (not significant) during the night at residential NSRs on Kings Road.

14.8.66 For the on-site NSRs, which are located in the vicinity the IERRT landside activities, Table 14.25 of this ES chapter shows that there would be an increase in noise levels. Based on Table 14.8 of this ES chapter the magnitude of impact is high for the PAM building and Nippon Gas Office building and medium for the PK Construction Office building. As shown in Table 14.11 of this ES chapter, the sensitivity for the PAM building (health use) is high, and the Nippon Gas and PK construction offices are medium. This will result in a **major adverse** effect (significant) at the PAM building, a **moderate adverse** effect (significant) at the Nippon Gas Office building and a **minor adverse** effect (not significant) at the PK Construction Office building. The higher level difference at the Nippon Gas Office building is due to the lower measured existing ambient noise levels near this office.

14.8.67 However, NSRs at these buildings – i.e., the employees and other users – will be located inside. On the basis that all external windows and doors facing the IERRT project are kept closed and alternative means of ventilation is used, and based upon thermal double glazing providing typically 33 dB(A) attenuation, the internal design criterion of open plan offices and consulting rooms (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the operation of the IERRT project. Therefore, on this basis and using professional judgement, the classification of effects at the PAM building and the Nippon Gas Office building would be expected to reduce to **minor adverse or less** (not significant).

Operational - road traffic noise

14.8.68 Data have been provided from the Transport Assessment (see the Traffic and Traffic chapter (Chapter 17) and the accompanying Appendix 17.1 to this ES) for the traffic scenario 'without' and 'with' IERRT project traffic for 2025 (opening year) and 2040 (future year) for all roads within the scope of the transport assessment as follows:

- Scenario 1- 'without' IERRT traffic: 2025 base flows + committed developments;
- Scenario 2- 'with' IERRT traffic: 2025 base flows + committed developments + IERRT; and
- Scenario 3 - with' IERRT traffic: 2040 base flows + committed developments + IERRT.

14.8.69 The IERRT traffic data are based on 3 berths operating at the IERRT project's identified maximum capacity in the opening year (2025). The traffic speed used is based on the road speed limit for each road link, and it has been assumed that traffic speeds will remain the same for all scenarios. Based on the 18 hr AAWT flows, % HGVs and speed, the potential changes in road traffic noise from these road links as a result of the IERRT (i.e., by comparing the with and without IERRT scenarios) have been considered by calculating the CRTN BNL at 10 m from each road link.

14.8.70 Table 14.26 below presents the results of the assessment together with the magnitude of impact classifications as set out in Table 14.9 of this ES chapter.

Table 14.26. Predicted change in operational road traffic noise levels

Road Link	Short-term Change in BNL (dB $L_{A10,18hr}$)	Magnitude of Impact	Long-term Change in BNL (dB $L_{A10,18hr}$)	Magnitude of Impact
West Gate	0.7	Negligible	1.0	Negligible
East Gate	2.8	Low	3.0	Low
Queens Road	3.1	Medium	3.3	Low
A1173	1.7	Low	1.8	Negligible
A160	0.1	Negligible	0.4	Negligible
A180	0.4	Negligible	0.8	Negligible
M180 (J4-J5)	0.4	Negligible	1.0	Negligible
M180 (J3-J4)	0.4	Negligible	1.0	Negligible
M180 (J2-J3)	0.3	Negligible	0.9	Negligible
M180 (J1-J2)	0.3	Negligible	0.8	Negligible
M18 (J3-J4)	0.1	Negligible	0.8	Negligible
M18 (J5-J6)	0.0	Negligible	0.5	Negligible
A1 (J35-J36)	0.0	Negligible	0.5	Negligible
A1 (J36-J37)	0.0	Negligible	0.6	Negligible
M1 (J24A-J25)	0.0	Negligible	0.6	Negligible
M1 (J25-J26)	0.0	Negligible	0.7	Negligible
M1 (J28-J29)	0.0	Negligible	0.7	Negligible
M1 (J30-J31)	0.0	Negligible	0.6	Negligible
M1 (J32-J33)	0.0	Negligible	0.5	Negligible
M1 (J33-J34)	0.0	Negligible	0.6	Negligible
M1 (J34-J35)	0.0	Negligible	0.6	Negligible
M1 (J36-J37)	0.0	Negligible	0.6	Negligible
M1 (J37-J38)	0.0	Negligible	0.6	Negligible
M1 (J38-J39)	0.0	Negligible	0.6	Negligible
M1 (J39-J40)	0.0	Negligible	0.7	Negligible
M18 (J1-J2)	0.0	Negligible	0.6	Negligible
M62 (J29-J30)	0.0	Negligible	0.6	Negligible
M62 (J27-J28)	0.0	Negligible	0.7	Negligible
M62 (J26-J27)	0.0	Negligible	0.6	Negligible
M62 (J22-J23)	0.0	Negligible	0.6	Negligible
M62 (J21-J22)	0.0	Negligible	0.5	Negligible
M62 (J35-J36)	0.0	Negligible	0.5	Negligible

14.8.71 Table 14.26 above shows predicted changes in traffic noise on all road links will result in a negligible magnitude of impact at nearby NSRs in both short-term and long-term scenarios, with the exception of East Gate link, A1173 and Queens Road. The predicted changes in traffic noise level on East Gate link will result in a low magnitude of impact at nearby NSRs in both the short-term and long-term, whilst predicted traffic noise level changes on the A1173 will result in a low magnitude of impact at nearby NSRs in the short-

term. At NSRs along Queens Road, predicted changes in traffic noise level will result in medium magnitude of impacts in the short-term and low magnitude in the long-term.

14.8.72 These predicted changes in traffic noise level will result in **negligible** and **minor adverse** effects (not significant) at NSRs along all road links apart from Queens Road. For NSRs along Queens Road, there is potential for **moderate adverse** effects (significant) in the short-term due to IERRT traffic.

14.8.73 Therefore, further, more detailed assessment of potential impacts has been undertaken for NSRs located on Queens Road using both the Port of Immingham and the typical operator traffic profiles (further detailed in Chapter 17 (Traffic and Transport) of this ES). The assessment has used both 18 hour AAWT flows to predict $L_{A10,18hr}$ and hourly flows to derive the L_{night} ($L_{Aeq,8\ hr}$) and daytime $L_{Aeq,16hr}$ levels. Where hourly flows on Queens Road are predicted to be below 50 vehicles per hour, which is outside the calculation range of CRTN, the hourly noise level ($L_{Aeq,1hr}$) has been predicted using Noise Advisory Council (NAC) method (NAC,1978). The predicted $L_{A10,1hr}$ levels, using CRTN methodology, have been converted to $L_{Aeq,1hr}$ following Method 1 in Transport Research Laboratory (TRL) 'Method for converting the UK road traffic noise index $L_{A10,18h}$ to the EU noise indices for road noise mapping' (TRL, 2006). This allows for a comparison to be made with the predicted low flow noise levels using the NAC method. The traffic noise levels are predicted at 1 m from the façade of the closest residential property on Queens Road, but are free-field (i.e., without addition of a +2.5 dB façade correction) to allow direct comparison with the ambient sound measurements undertaken on Queens Road.

14.8.74 As discussed in Section 14.6 of this ES chapter, there are a number of sources which contribute to the sound climate on Queens Road. Data from the Transport Assessment (see Chapter 17 of this ES) and the ambient hourly ($L_{Aeq,1hr}$) sound levels over the full 24 hour period as shown in Table 14.17 of this ES chapter has been used to derive the following scenarios to assess the potential short-term impacts at residential NSRs on Queens Road in more detail:

- Scenario 1 – 'without' IERRT traffic: 2022 ambient sound levels + committed developments; and
- Scenario 2 – 'with' IERRT traffic: 2022 ambient sound levels + committed developments + IERRT traffic flows.

14.8.75 The traffic speed used in the predictions is based on the road speed limit for Queens Road, and it has been assumed that traffic speed will remain the same for both scenarios. The predicted hourly levels for 'with' and 'without' IERRT traffic are presented Table 14.27 below together with the short-term change in noise level based on both the Port of Immingham and the typical operator traffic profiles.

Table 14.27. Predicted change in operational road traffic noise levels at NSRs on Queens Road

Time Period	Short-term Change (2025) – Port of Immingham Profile	Magnitude of Impact	Short-term Change (2025) – Typical Operator Profile	Magnitude of Impact
00:00:00	3.9	Medium	1.7	Low
01:00:00	5.9	High	1.8	Low
02:00:00	7.3	High	2.7	Low
03:00:00	6.4	High	1.8	Low
04:00:00	7.4	High	2.3	Low
05:00:00	5.3	High	2.2	Low
06:00:00	4.1	Medium	2.9	Low
07:00:00	1.9	Low	1.6	Low
08:00:00	2.0	Low	1.7	Low
09:00:00	2.1	Low	3.6	Medium
10:00:00	1.9	Low	1.8	Low
11:00:00	2.4	Low	1.8	Low
12:00:00	2.2	Low	1.8	Low
13:00:00	2.3	Low	1.9	Low
14:00:00	2.3	Low	1.9	Low
15:00:00	2.2	Low	2.3	Low
16:00:00	2.3	Low	2.8	Low
17:00:00	1.5	Low	2.6	Low
18:00:00	1.3	Low	4.1	Medium
19:00:00	2.5	Low	4.1	Medium
20:00:00	1.4	Low	2.5	Low
21:00:00	3.9	Medium	3.4	Medium
22:00:00	3.6	Medium	1.8	Low
23:00:00	2.9	Low	0.9	Negligible
$L_{Aeq,16hr}$	1.3	Low	1.5	Low
L_{night}	4.5	Medium	2.4	Low

14.8.76 This more detailed assessment of the potential impact of IERRT traffic on NSRs along Queens Road has predicted, based on the Port of Immingham traffic profile, medium impacts during the whole night-time period (L_{night}). When taking the hourly traffic data into consideration, with either the Port of Immingham or typical operator traffic profiles, there are some hourly periods where either medium or high adverse impacts are predicted, resulting in up to **moderate/ major adverse** effects (significant) at residential NSRs along Queens Road, although the above table shows less significant effects from the typical operator profile compared with the Port of Immingham profile**.**

14.8.77 Given the above, mitigation measures have been considered to minimise/ avoid the likely significant effects due to the operation of IERRT project, which are discussed in Section 14.9 of this chapter.

14.9 Mitigation measures

Construction noise

14.9.1 For landside construction, working hours will be 07:00 to 19:00 Monday to Friday and Saturday (07:00 to 13:00) with no works taking place on Sundays. Marine works and dredging works which may be undertaken 24 hours a day Monday to Sunday. Some landside construction works may need to take place outside of these core working hours and would be undertaken providing that they comply with any restrictions agreed with the local authority via a Section 61 application under CoPA.

14.9.2 In addition to the standard mitigation measures that are described below, and as already highlighted, the crusher and screening plant required during construction will be located a minimum of 250 m away from the on-site non-residential NSRs. In addition, temporary acoustic screening will be erected around either the construction plant or around the PAM building when construction works are taking place near the PAM building. These measures have already been included in the predictions and assessment in Section 14.8 of this chapter.

14.9.3 There are a range of standard mitigation measures that will be implemented on-site as best practice to minimise noise from the construction works. The contractor will follow the advice contained within BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' (BSI, 2014a). The following measures will also be implemented on-site to reduce as far as practicable the potential adverse environmental impacts associated with noise and vibration from construction activities:

- Where reasonably practicable, the contractor will use quieter working methods, the most suitable plant and reasonable standard construction hours of working for noisy operations;
- Where possible, the items of plant will be located the furthest distance from the nearby NSRs and ecological receptors. Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from noise-sensitive areas;
- Acoustic covers to engines will be kept closed when the engines are in use and idling;
- 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;
- Materials will be lowered whenever practicable and should not be dropped. Any chutes and skips will be lined with sound attenuating material to reduce impact noise;
- 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;

- When operating plant, the use of noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs arid cranes will be implemented;
- All plant machinery permitted to site and used on-site will be maintained to the appropriate standards. Checks for adequate lubrication to reduce squeaks and the tightening of loose nuts and bolts to minimise rattles will form part of a routine maintenance cycle;
- Any tannoy system on-site to be used for emergency purposes only;
- Where required and achievable, temporary screening between the source and the receiver of noise emissions will be installed;
- All plant machinery will conform with relevant standards and directives on permitted noise emissions levels;
- The hoods and doors on compressors and cranes will be closed but also be tightly fitting and well-sealed - these doors will be checked on a regular basis;
- All pneumatic percussive tools will be provided with effective silencers / acoustic covers;
- Audible warning systems (including reversing alarms) will be switched to the minimum setting required for health and safety; and
- All contractor communication devices will be used at a minimum audible level.

14.9.4 It is also noted that electrically powered plant will be used over diesel power generators where possible and feasible in future years as their use becomes more common.

14.9.5 Regular communication with the local community throughout the construction period will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and provide lines of communication through which questions and complaints can be addressed.

14.9.6 The CEMP (Application Document Reference number 9.2) sets out provisions to ensure that noise impacts relating to construction activities are reduced, as far as reasonably practicable, based on the measures outlined in paragraphs 14.9.1 to 14.9.5 of this ES chapter. The CEMP also details the mechanism to apply for Section 61 CoPA, if required.

Construction traffic noise

14.9.7 Although the assessment indicates that significant effects due to construction traffic noise are unlikely, a construction traffic management plan has been included as part of the CEMP. This presents the road management procedures which will be used to manage traffic movements within the works and on the local road network in the vicinity of the closest NSRs. Designated construction traffic routes will be used, which will avoid the use of the busiest roads and residential streets near the IERRT project, where practicable.

Construction vibration

14.9.8 Although the initial vibration assessment indicates that significant effects on nearby buildings or structures due to construction vibration are unlikely, a piling specific community liaison protocol will be developed so that businesses/ occupiers are kept informed of the piling activities, their duration, and their expected impact. Although the vibration may be perceptible, based upon the initial vibration assessment the levels predicted structural and/or cosmetic damage to properties is not expected to occur.

14.9.9 The CEMP sets out provisions to ensure that vibration impacts relating to construction activities are reduced, as far as reasonably practicable. This includes:

- Where feasible use of alternative methods to impact driven piles;
- Use of vibratory piling to drive piles to refusal;
- Verification of the construction vibration predictions once the piling methods and piling rig are known to confirm that there are no significant effects expected; and
- If necessary, reduction of the effective energy per blow by decreasing the drop height of the hammer during piling.

14.9.10 Prior to piling works commencing, pre-construction condition surveys will be undertaken of the IOT jetty and other nearby sensitive buildings and structures. Monitoring will also be required to verify that the thresholds are not exceeded.

Operational noise – on-site activities

14.9.11 Although the assessment of vessels arriving/ departing and on-site activities indicates that that significant effects at the nearest NSRs are unlikely, there are a number of operational best practices which will help to reduce noise in general from the IERRT project site. These include:

- The prohibiting of unnecessary engine idling of all vehicles on-site;
- The enforcement of mandatory speed limits on site; and
- Orientation of plant within the IERRT project site to provide screening of low height noise sources by other buildings and structures, or orientating sound source (i.e., fans and their air inlets) away from sensitive receptors.

14.9.12 It is also noted that the use of electric reefers across the lorry parks to power refrigerated units (to minimise the need for diesel power), the phasing out of diesel-powered land-tugs for electric battery powered land-tugs, and the use of other electric powered site plant, are all likely to become more common in future years to which will help reduce the noise associated with diesel engines.

Operational road traffic noise

14.9.13 The operational road traffic noise assessment has identified that significant adverse effects may occur at the residential NSRs on Queens Road at various times for both traffic profiles assessed. A number of mitigation scenarios have been considered; however, these measures did not remove all significant effects at all times. The use of roadside barriers to avoid significant effects along Queens Road would not be practicable due to access requirements of the properties and associated adverse visual effects.

14.9.14 An alternative means of mitigation has, however, been identified. ABP will offer additional noise insulation to sensitive/ habitable rooms at the affected facades of residential properties on Queens Road (No.s 1 to 31) which are predicted to experience significant adverse effects due to road traffic noise from the IERRT project. This is consistent with other major projects such as HS2 and Crossrail and is consistent with the NPSfP paragraph 5.10.13.

14.9.15 Noise insulation will offer additional protection to the residential properties internal acoustic environment in sensitive/ habitable rooms such as bedrooms and living rooms.

14.10 Limitations

14.10.1 This assessment has been undertaken based on a number of assumptions and /or limitations:

- It was not possible to leave sound monitoring equipment unattended over a number of days as secure locations could not be identified. Therefore, attended measurements were undertaken at monitoring locations on Kings Road and Queens Road over a number of visits to site, to gather ambient sound level data to cover a full 24 hour period;
- The noise and vibration assessment has been based on the available data at the time of writing (and as detailed herein);
- The construction noise and vibration assessments draw upon the experience and assessments undertaken for other similar projects. The construction assessments are quantitative yet indicative by nature, although considered conservative. Construction noise thresholds (limit values) are based upon existing ambient sound levels at NSRs;
- At this stage of the project, the full detailed construction programme is not available, therefore as a conservative approach this assessment assumes all construction phases will be of a duration a greater than one month;
- The final piling rigs are not yet confirmed. Different piling rigs may be used during construction, but the pile hammer energy and noise levels associated with CG300 used in this assessment is considered a worst-case;
- The assumptions relating to construction and operational noise predictions are presented in Appendix 14.2 and 14.3 to this ES. It is

considered that the assumptions result in the outcomes of these assessments being conservative; and
- Vehicle speeds have been based on the speed limit of the roads.

14.10.2 Whilst there are some limitations as stated above, the assessments within this chapter have considered worst-case scenarios.

14.11 Residual effects and conclusions

14.11.1 A summary of the impact pathways that have been assessed, the identified residual effects and level of confidence is presented in Table 14.28 of this ES chapter.

14.11.2 The assessment has considered noise and vibration impact pathways in detail. This has addressed the potential for both construction and operational noise impacts on the nearest residential NSRs to IERRT on Kings Road and Queens Road and on-site NSRs. The construction vibration assessment considered the potential impacts on the PAM building and the IOT jetty within the port estate.

14.11.3 The construction noise assessment on the nearest residential NSRs predicts **negligible adverse** effects (not significant). Standard construction mitigation measures will be set out in the CEMP and CoPA Section 61 applications will be used for construction works outside the core construction hours. It is considered that the residual effects are not significant.

14.11.4 The construction assessment for the on-site NSRs predicts overall **minor adverse** effects (not significant) for the PAM building, based on the assumption that appropriate temporary acoustic screening will be provided during the construction works in the vicinity of the PAM building, and on the basis that the internal acoustic environment at the building is expected to meet with the internal design criteria. It is therefore considered that the residual effects are **not significant**. For the PK Construction Office and Nippon Gas Office building there is the potential for **moderate adverse** effects (significant)**.** However, on the basis that the external windows and doors facing the construction works can remain closed and alternative means of cooling/ ventilation are used, the internal design criterion of open plan offices (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the construction works. Therefore, on this basis, the classification of effects on the internal NSRs at PK Construction Office and Nippon Gas Office buildings reduce to **not significant.**

14.11.5 The assessment of construction traffic on Queens Road and A160 near South Killingholme predicts **minor adverse** effects (not significant). Although the effects are not significant, a construction traffic management plan is included as part of the CEMP. It is considered that the residual effects are not significant.

14.11.6 The construction vibration assessment indicates that the effects on the IOT jetty and PAM building are **negligible/minor adverse** (not significant). Nevertheless, once the final piling method and plant is known the predicted vibration levels will be verified by the construction contractor and a liaison protocol with local businesses/occupiers within the Port site will be developed. Pre-construction condition surveys will also be undertaken on nearby buildings and structures where required. It is considered that the residual effects would be **minor adverse** (not significant) or less.

14.11.7 The assessment of on-site operational activities, including vessel arrivals, predicts **minor adverse** (not significant) daytime effects on the nearest NSRs on Queens Road and **minor adverse** (not significant) effects during the night period. At residential NSRs on Kings Road **negligible adverse/no change** (not significant) effects are predicted during the day and **minor adverse** effects (not significant) at night. For the on-site NSRs, the operation of the IERRT has the potential for **major adverse** effects (significant) at PAM building, **moderate adverse** effect (significant) at Nippon Gas Office building and a **minor adverse** effect (not significant) at PK Construction Office building. However, on the basis that the external windows and doors of the on-site NSRs facing the IERRT remain closed and alternative means of ventilation is used, the internal design criterion of open plan offices and consulting rooms (as detailed in paragraph 14.3.48 of this ES chapter) is likely to be met during the operation of the IERRT. Therefore, on this basis, the classification of effects for internal NSRs at the PAM building, Nippon Gas Office building and PK Construction Office building are all expected to reduce to **minor adverse or less** (not significant).

14.11.8 The implementation of standard best practice site operations, the move towards electric land tugs and the use of electric reefers for refrigerated units in the future will help to minimise noise from the IERRT. Therefore, it is considered that the residual effects will be **minor adverse or less** (not significant).

14.11.9 The assessment of operational road traffic noise has predicted up to **moderate/ major adverse** (significant) effects at the residential NSRs on Queens Road at various times, depending on the traffic profile assessed. ABP will offer a package of noise insulation to the owners of relevant properties, with the aim of offering additional protection to the residential internal acoustic environment in sensitive/ habitable rooms on the affected facades facing Queens Road. The use of noise insulation will also improve the internal noise climate from existing noises sources (other commercial units and traffic movements). Following installation of an appropriate package of noise insulation, the classification of effects at these NSRs should reduce to **minor adverse or less** (not significant).

Table 14.28. Summary of potential impacts, mitigation measures and residual impacts

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
Construction Phase					
Residential NSRs on Queens Road and Kings Road	Construction Noise	**Negligible adverse** (not significant)	Standard construction mitigation as set out in the CEMP. Section 61 application for construction works outside the standard construction hours.	**Negligible adverse** (not significant)	Medium
	Construction Traffic	**Minor adverse** (not significant)	Construction traffic management plan included in the CEMP.	**Minor adverse** (not significant)	High
PAM building, (adjacent to the IERRT project site)	Construction Noise	**Minor adverse** (not significant)	Embedded mitigation includes the screening and crusher plant being located a minimum of 250 m away from NSRs and temporary acoustic screening around construction plant or PAM building during construction works in the vicinity of the PAM building. These measures have been included within the assessment in Section 14.8 of this chapter.	**Minor adverse or less** (not significant)	Medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
			In addition, measures will include standard construction mitigation as set out in Section 14.9 of this chapter (and to be included in the CEMP), and also include the ability for the external windows and doors facing the construction works to remain closed and alternative means of cooling/ ventilation used.		

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
PK Construction Office and Nippon Gas Office buildings (on-site NSRs)	Construction Noise	Up to **moderate adverse** (significant) external to the office building	Embedded mitigation includes the screening and crusher plant being located a minimum of 250 m away from NSRs. This measure has been included within the assessment in Section 14.8 of this chapter. In addition, measures will include standard construction mitigation as set out in Section 14.9 of this chapter (and to be included in the CEMP), and also include the ability for the external windows and doors facing the construction works to remain closed and alternative means of cooling/ ventilation used.	There is the potential for reduction in predicted impact significance external to the office buildings following implementation of additional measures outlined in the CEMP. However, as the main NSRs will be located inside the office buildings, provided the internal design criterion is not exceeded following implementation of the mitigation measures, the classification of effects at these internal NSRs would be expected to reduce to **minor adverse or less** (not significant).	Medium
IOT Jetty and PAM Building	Construction Vibration	**Minor adverse or less** (not significant)	Pre-construction condition surveys on nearby buildings and structures to be undertaken. Liaison protocol with local businesses/ occupiers to be established. Verification of the construction vibration	**Minor adverse or less** (not significant)	Medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
			predictions once the piling methods and piling rig are known to confirm that there are no significant effects expected; Monitoring to verify the thresholds are not exceeded.		
Operational Phase					
Residential NSRs on Queens Road	On-site activities	**Minor adverse** (not significant)	Standard best practice for operational activities.	**Minor adverse or less** (not significant)	High/medium
Residential NSRs on Kings Road	On-site activities	**Minor/ negligible adverse / no change** (not significant)	Standard best practice for operational activities.	**Minor/ negligible adverse** (not significant)	High/medium
PAM Building	On-site activities	Up to **major adverse** (significant)	Standard best practice for operational activities, together with keeping all PAM building external windows and doors facing the IERRT closed.	There is the potential for reduction in predicted impact significance external to the PAM building following implementation of standard best practices. However, as the main NSRs will be located inside the PAM building, provided the internal design criterion is not exceeded following	High/medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
				implementation of the mitigation measures, the classification of effects at these internal NSRs would be expected to reduce to **minor adverse or less** (not significant).	
PK Construction Office building	On-site activities	**Minor adverse** (not significant)	Standard best practice for operational activities.	**Minor adverse or less** (not significant)	High/medium
Nippon Gas Office building	On-site activities	**Moderate adverse** (significant)	Standard best practice for operational activities, together with keeping all Nippon Gas Office external windows and doors facing the IERRT closed.	There is the potential for reduction in predicted impact significance external to the office building following implementation of standard best practices. However, as the main NSRs will be located inside the office building, provided the internal design criterion is not exceeded following implementation of the mitigation measures, the classification of effects at these internal NSRs would be expected to reduce to **minor adverse or less** (not significant).	High/medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
Residential NSRs on Queens Road	Road traffic noise	Up to **moderate/ major adverse** (significant)	Offer noise insulation to affected residential NSRs	Predicted external noise levels and significance would remain unchanged as presented in Section 14.8 of this ES chapter, although the potential increase in the internal noise levels within those residential NSRs predicted to be significantly affected would be minimised by the provision of noise insulation to qualifying sensitive rooms. Following installation of an appropriate package of noise insulation, the classification of effects at these NSRs would reduce **minor adverse or less** (not significant).	High

14.12 References

British Standards Institute (BSI). (2014a). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site– Part 1: Noise'.

British Standards Institute (BSI). (2014b). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site – Part 2: Vibration'.

British Standards Institute (BSI). (2014c). BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.

British Standards Institute (BSI). (2019). BS 4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound'.

British Standards Institute (BSI). (2003). BS 7445-1:2003: 'Description and measurement of environmental noise - Guide to quantities and procedures'.

British Standards Institute (BSI). (1993) BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'.

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

Department of Health (2013). HTM 08-01 Health Technical Memorandum (HTM) 08-01: Acoustics.

Department for Transport (DfT). (2012). National Policy Statement for Ports.

Department of Transport (DfT)/ Welsh Office. (1998). Calculation of Road Traffic Noise.

European Commission (2002). Directive 2002/49/EC Environmental Noise Directive - END.

Highways Agency (2011) Design Manual for Roads and Bridges Volume 11 Section 2 Part 7 (HD 213/11) Noise and vibration.

Highways England. (2020). Design Manual for Roads and Bridges LA 111 Noise and vibration – Version 2.

Hiller, D. M. and Crabb, G. I. (2000). Groundborne vibration caused by mechanised construction works. [Online] Available at: [redacted] (accessed October 2022).

Institute of Environmental Management and Assessment (IEMA). (2014). Guidelines for Environmental Noise Impact Assessment.

International Standards Organization (ISO) (Part 1: 1993, Part 2: 1996) ISO 9613 – Acoustics – Attenuation of sound during propagation outdoors, ISO.

International Standards Organization (ISO) (2010). ISO 4866:2010(en) – Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures.

Ministry of Housing, Communities and Local Government (MHCLG). (2019). Planning Practice Guidance.

Ministry of Housing, Communities and Local Government (MHCLG). (2021). National Planning Policy Framework.

Noise Advisory Council (1978). A guide to measurement and prediction of the Equivalent Continuous Sound Level, Leq.

North East Lincolnshire Council. (2018). North East Lincolnshire Local Plan.

North Lincolnshire Council (2003) North Lincolnshire Local Plan.

North Lincolnshire Council (2016) North Lincolnshire Council Planning for Health and Wellbeing-Supplementary Planning Document.

Office of the Deputy Prime Minister (1994), Planning Policy Guidance (PPG) 24 - Planning and Noise

TRL (2006) Method for converting the UK road traffic noise index LA10,18h to the ES noise indices for road noise mapping.

14.13 Abbreviations/Acronyms

Acronym	Definition
AAWT	Annual average weekday traffic (for the 18 hour period between 06.00 – 24.00)
ABP	Associated British Ports
APT	Associated Petroleum Terminals (Immingham) Ltd
BNL	Basic Noise Level
BS	British Standard
BSI	British Standards Institute
CadnaA®	Computer Aided Noise Abatement - modelling software (DataKustik)
CEMP	Construction Environmental Management Plan
CFA	Continuous Flight Auger
CoPA	Control of Pollution Act 1974
CRTN	Calculation of Road Traffic Noise
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EC	European Commission
EIA	Environmental Impact Assessment
END	Environmental Noise Directive
EPA	Environmental Protection Act
ES	Environmental Statement
EU	European Union
HGV	Heavy Goods Vehicle
HTM	Health Technical Memorandum
ID	Identity
IEMA	Institute of Environmental Management and Assessment
IERRT	Immingham Eastern Ro-Ro Terminal
IOT	Immingham Oil Terminal
ISO	International Organization for Standardization
LOAEL	Lowest Observed Adverse Effect Level
LP	Local Plan
LSE	Likely Significant Effect
MHCLG	Ministry of Housing, Communities and Local Government
NAC	Noise Advisory Council
NELC	North East Lincolnshire Council

NLC	North Lincolnshire Council
NOAEL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
NPSfP	National Policy Statement for Ports
NSIP	Nationally Significant Infrastructure Projects
NSR	Noise Sensitive Receptors
OS	Ordnance Survey
PAM	The People Asset Management Ltd
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPG	Planning Practice Guidance
PPG-N	The PPG noise guidance
PPV	Peak Particle Velocity
Ro-Ro	Roll on-Roll off
SOAEL	Significant Observed Adverse Effect Level
SWL	Sound Power Levels
TA	Transport Assessment
TRL	Transport Research Laboratory
UK	United Kingdom

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

14.14 Glossary

Term	Definition
Attenuation	Amount by which sound or vibration is reduced when passing through a structure or system
A-weighting L_A or L_{pA}, L_{WA},	The human ear does not sense all frequencies of sound equally. Our sensitivity is at a maximum at around 2 kHz and steadily decreases above and below. Below 20 Hz and above about 20 kHz we can't hear at all. Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA}.
Decibels (dB)	The decibel is not a true measurement unit nor is it exclusive to acoustics. The decibel is a logarithmic ratio of two values of a variable. Decibels are used because they can represent very wide ranges of ratios (from trillionths and billionths to billions and trillions) with a small range of decibel values. Decibels can be used to represent measured values by using a known reference value in the ratio. When using decibels to measure something it is therefore important to specify what variable is actually being measured and what reference level has been used. This is done by adding a reference value statement in the form "dB re x units", where the units indicate the variable being measured and x is the reference value. Decibels are used in acoustics because the human ear responds to sound in a logarithmic way and the quantities measured in acoustics vary over wide ranges. However, decibels are used in acoustics to measure several different things which it is important not to confuse with each other. To avoid confusion there is a notation system that identifies what a decibel value is for. The notations take the form of an italic capital letter and some subscript characters. The capital identifies the general type of value and the subscripts give specific details of what is being represented. L_{xxx} denotes a level (i.e., a value measured in dB by comparison with a reference value); D_{xxx} denotes a difference between two levels;

Term	Definition
	R_{xxx} denotes a rating (or index), which is measure of the generalised acoustic performance of a material or construction based on a difference between two levels; C_{xxx} denotes a correction (or constant). Of these only those with *L* notations require a reference value statement. Those with *D* or *R* notations are effectively ratios of two measured values not one measured value and a reference value and those with *C* notations are not based on reference values at all. A reference value statement therefore has no meaning when describing *D*, *R* and *C* decibels. Because decibels are logarithmic they have to be added, subtracted, multiplied, divided and averaged using different techniques from normal numbers.
Indicator	A value used to indicate the likelihood of a particular response of effect e.g., $L_{10,18hr}$ is an index based on statistical processing of sound pressure data that is used as an indicator for road traffic noise response.
$L_{eq,T}$ $L_{Aeq,T}$ T = measurement time e.g., $L_{Aeq,5min}$	The *equivalent continuous sound pressure level over period T* ($L_{eq,T}$), *The A-weighted equivalent continuous sound pressure level over period T* ($L_{Aeq,T}$). This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value. The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation
Level	Used solely to describe values measured in decibels
L_{max} L_{Amax} L_{AFmax} L_{min} , L_{Fmin}	*The maximum instantaneous sound pressure level* (L_{max}), *The A-weighted maximum instantaneous sound pressure level* (L_{Amax}) *The A-weighted maximum instantaneous sound pressure level with a FAST time constant* (L_{AFmax}). This is the highest instantaneous sound pressure level reached during a measurement period. The opposite of the L_{max} is the *minimum instantaneous sound pressure level* or L_{min} etc. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.

Term	Definition
$L_{N,T}$ $L_{AN,T}$ $L_{AFN,T}$ $_N$ = %age value, 0-100 $_T$ = measurement time e.g., L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$	*The percentage exceedance sound pressure level ($L_{N,T}$), The A-weighted percentage exceedance sound pressure level ($L_{AN,T}$), the A-weighted percentage exceedance sound pressure level with a FAST time constant ($L_{AFN,T}$).* This is the sound pressure level exceeded for *N*% of time period *T*. e.g., If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. L_{A0} (the level exceeded for 0% of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100% of the time) is equivalent to the L_{Amin}. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
Loudness	The human perception of the level of sound
L_p L_{pA} (or L_A) L_{AF}, L_{AS}	*The instantaneous sound pressure level* (L_p) *The A-weighted instantaneous sound pressure level* (L_{pA} or L_A) This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125 s (FAST time constant) or the previous 1 s (SLOW time constant). The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
Noise	No strict definition and is often used interchangeably with sound however it is usually taken to mean unwanted sound
Pitch, frequency Tonal sound Broadband sound	The sound we perceive can have different characteristics. These can range from low-pitched hums to high-pitched squeals and impulsive sounds. In engineering acoustics, the word frequency rather than pitch tends to be used when describing the characteristics of a sound. The unit of frequency is the Hertz (Hz), which is the number of pressure fluctuations per second.

Term	Definition
Impulsive sound	Any sound can be defined by its frequency content. Some sounds comprise just one discrete frequency (tonal sounds). Others are distributed over wide frequency ranges (broad band sound). Impulsive sounds are made up short pulses of high frequency components. Sources often produce all of these types of sound at the same time.
Sound	Used to describe the physical phenomenon of the transmission of energy through gaseous or liquid media via rapid fluctuations in pressure.
Sound Pressure Level L_p	This is the basic measure of how much sound there is at a given location. It is a measure of the size of the pressure fluctuations in the air that we perceive as sound. Sound Pressure Level is expressed in decibels with a reference level of 20 μPa (L_p in dB re 20 μPa)
Vibration	Used to describe the transmission of energy through solid media by oscillation
Weighted	Values modified to reflect sensitivities at particular frequencies.

Contact Us

ABPmer

Quayside Suite,
Medina Chambers
Town Quay, Southampton
SO14 2AQ

T +44 (0) 23 8071 1840
F +44 (0) 23 8071 1841
E enquiries@abpmer.co.uk

[redacted]