REPORT

Boston Alternative Energy Facility - Preliminary Environmental Information Report

Chapter 10 Noise and Vibration

Client: Alternative Use Boston Projects Ltd

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Boston Alternative Energy Facility

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Table of Contents

Table of Tables

Non-Technical Summary

The Boston Alternative Energy Facility (the 'Facility') is proposed to be located at Riverside Industrial Estate, Boston, Lincolnshire. The Riverside Industrial Estate is adjacent to the tidal River Witham (known as 'The Haven') and down-river from the Port of Boston.

The construction, operation and decommissioning of the proposed Facility has the potential to result in impacts from noise and vibration (including human health and the environment). To appropriately and proportionately assess the significance of potential noise and vibration impacts, a Noise and Vibration Assessment has been undertaken in consultation with key stakeholders in the area, including Boston Borough Council (BBC). The Noise and Vibration Assessment was prepared for the Preliminary Environmental Information (PEI) phase of the Environmental Impact Assessment (EIA) for the Facility and has been included within the PEI Report (PEIR).

An assessment of noise and vibration from off-site construction phase traffic was undertaken for average and peak construction traffic scenarios. For the average construction traffic scenario, a minor adverse significance was determined at a medium sensitivity receptor. For the peak construction traffic, the range of impact significance was negligible adverse to major adverse. Mitigation is required during the peak scenario, however; the impact is temporary, short-term, infrequent and local.

An assessment of on-site construction phase noise will be carried out in accordance with relevant British Standards guidance for the Environmental Statement once further phasing details are specified. Vibration impacts from construction works were determined to be of minor adverse significance. Therefore, no additional mitigation is required.

Operational noise levels at nearby receptors due to the Facility were predicted to be above background noise levels at some receptors and the impacts were therefore considered to be moderate adverse. Mitigation was proposed and with the incorporation of these measures, noise levels at nearby receptors due to operation of the Facility were predicted to be negligible above background noise levels at some receptors and the residual impacts were therefore considered to be minor adverse.

Vehicle movements generated by transportation of materials to and from the Facility during the operational phase were assessed in the context of the site and surrounding road network and residual impacts were considered to be negligible adverse.
Decommissioning impacts are anticipated to be similar to those experienced during construction and were therefore considered to be minor adverse during the peak traffic period.

10 Noise and Vibration

10.1 Introduction

10.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) describes the existing environment in relation to Noise and Vibration and details the assessment of the potential impacts during the construction, operational and decommissioning phases of the Boston Alternative Energy Facility ('the Facility'). Mitigation measures are detailed, and a discussion of the residual impacts provided, where significant impacts have been identified.

10.1.2 This chapter is supported by **Appendix 10.1 Baseline Survey.**

10.1.3 The chapter has been prepared following all relevant guidance and standards including the Noise Policy Statement for England as identified in **Section 10.2**.

10.2 Legislation, Policy and Guidance

Legislation

Environmental Protection Act 1990

10.2.1 Section 79 of Environmental Protection Act 1990 (the Act) defines statutory nuisance with regard to noise and determines that Local Planning Authorities have a duty to detect such nuisances in their area.

10.2.2 The Act also defines the concept of "Best Practicable Means" (BPM):

> "*'practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;*
> *the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;*
> *the test is to apply only so far as compatible with any duty imposed by law; and*
> *the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances*."

10.2.3 Section 80 of the Act provides Local Planning Authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

The Control of Pollution Act 1974

10.2.4 Section 60 of the Control of Pollution Act (CoP Act) provides powers to Local Authority Officers to serve an abatement notice in respect of noise nuisance from construction works.

10.2.5 Section 61 provides a method by which a contractor can apply for 'prior consent' for construction activities before commencement of works. The 'prior consent' is agreed between the Local Authority and the contractor and may contain a range of agreed working conditions, noise limits and control measures designed to minimise or prevent the occurrence of noise nuisance from construction activities. Application for a 'prior consent' is a commonly used control measure in respect of potential noise impacts from major construction works.

National Planning Policy

National Policy Statement (NPS)

10.2.6 The assessment of potential impacts upon noise and vibration receptors has been made with specific reference to the relevant NPS. These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIP). Those relevant to the proposed are:

- Overarching NPS for Energy (EN-1) (DECC 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b).

10.2.7 The specific assessment requirements for noise and vibration, as detailed in the NPSs are summarised in **Table 10.1**, together with an indication of where each is addressed within the PEIR.

Table 10.1 Summary of NPS Requirements

NPS Requirement	NPS Reference	Chapter Section Where Consultation Comment is Addressed
Where noise impacts are likely to arise, the Applicant should include: A description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise; Identification of noise sensitive premises and noise sensitive areas that may be affected; The characteristics of the existing noise environment; A prediction of how the noise environment will change with the proposed development; In the shorter term such as during the construction	EN-1, paragraph 5.11.4	Refer to **Section 10.4** for the assessment methodology for assessing potential noise and vibration impacts, **Section 10.8** 10.7.28 for details on the existing noise environment including the identification of noise sensitive receptors and **Section 10.7**

NPS Requirement	NPS Reference	Chapter Section Where Consultation Comment is Addressed
period; In the longer term during the operating life of the infrastructure; At particular times of the day, evening and night as appropriate; An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and Measures to be employed in mitigating noise. The nature and extent of the noise assessment should be proportionate to the likely noise impact.		where any changes in noise levels as a result of the Facility are assessed, and any potential impacts and potential mitigation measures are identified.
The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.	EN-1, paragraph 5.11.5	Refer to **Section 10.7** where any changes in noise levels because of the Facility from ancillary works, for example vehicle movements, are assessed and any potential impacts and potential mitigation measures are identified.
Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology-specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there are assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.	EN-1, paragraph 5.11.6	Any changes in noise levels because of the Facility are assessed in **Section 10.7** and any potential impacts and potential mitigation measures are identified. The current relevant British Standards have been used within this assessment detailed within **Section 10.2**.
The Applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.	EN-1, paragraph 5.11.7	Noise impacts on terrestrial protected species or other wildlife is considered within **Chapter 12 Terrestrial Ecology** and on marine species in **Chapter 17 Marine and Coastal Ecology**.

National Planning Policy Framework, 2019

10.2.8 The National Planning Policy Framework (NPPF) was introduced in March 2012 replacing the former Planning Policy Guidance 24: Planning and Noise. It was revised in July 2018 and in February 2019 and this document now forms the basis of the Government's planning policies for England and how these should be applied.

10.2.9 Paragraph 170 of the NPPF (MHCLG, 2018) states planning policies and decisions should contribute to and enhance the natural and local environment by:

> *"……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution……"*

10.2.10 Furthermore, Paragraph 180 of the NPPF states:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *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; and*
>
> *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

10.2.11 The NPPF also refers to the Noise Policy Statement for England (NPSE) (Defra, 2010).

NPSE

10.2.12 The Noise Policy Statement for England (NPSE) document was published by Defra in 2010 and paragraph 1.7 states three policy aims:

"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; and*
- *where possible, contribute to the improvement of health and quality of life."*

10.2.13 The first two points require that significant adverse impact should not occur and that, where a noise level falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect:

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur." (Paragraph 2.24, NPSE, March 2010).

10.2.14 Section 2.20 of the NPSE introduces key phrases including "Significant adverse" and "adverse" and two established concepts from toxicology that are being applied to noise impacts:

"NOEL - No Observed Effect Level
This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
LOAEL - Lowest Observed Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected".

10.2.15 Paragraph 2.21 of the NPSE extends the concepts described above and leads to a significant observed adverse effect level - SOAEL, which is defined as the level above which significant effects on health and quality of life occur. The NPSE states:

"it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations". (Paragraph 2.22, NPSE, March 2010).

10.2.16 Furthermore paragraph 2.22 of the NPSE acknowledges that:

> *"further research is required to increase understanding of what may constitute a significant adverse effect on health and quality of life from noise".*

10.2.17 The noise exposure hierarchy is completed by the introduction of the Unacceptable Adverse Effect Level (UAEL), an effect which should be prevented.

National Planning Practice Guidance for Noise

10.2.18 The National Planning Practice Guidance for Noise (NPPG Noise, December 2014), issued under the NPPF, states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local Planning Policy

South-East Lincolnshire Local Plan

10.2.19 The South-East Lincolnshire Local Plan (SELLP) was adopted in March 2019. It was prepared by Boston Borough Council, South Holland District Council and Lincolnshire County Council. SELLP replaces any previous policies associated with the Boston Borough Local Plan.

10.2.20 Relevant Policies in SELLP are:

10.2.21 Policy 2 states:

> *Development Management Proposals requiring planning permission for development will be permitted provided that sustainable development considerations are met, specifically in relation to:*
> *"6. impact upon neighbouring land uses by reason of noise, odour, disturbance or visual intrusion"*

10.2.22 Para 3.3.8 states:

> *"In determining applications, the Local Planning Authorities must ensure that new development takes into account and protects the amenities and operations of neighbouring properties and other lawful uses. When formulating proposals, consideration should be given to the potential for pollution from a proposed use. Guidance should be sought from the relevant council's Environmental Health Department on acceptable noise levels, standards of air quality, and*

other measures to avoid adverse environmental impacts as well as features that need to be incorporated in the design process. Where possible, proposals should strive to exceed statutory standards and show how they contribute to sustainable development."

10.2.23 Policy 30: Pollution:

Development proposals will not be permitted where, taking account of any proposed mitigation measures, they would lead to unacceptable adverse impacts upon:
1. health and safety of the public;
2. the amenities of the area; or
3. the natural, historic and built environment;
by way of:
noise including vibration

10.2.24 Para 7.4.2 states:

"Development will impact local amenities, and could, depending on the use, impact on a wider area. Development may be also impacted by the area immediately around the site. For instance, uses that emit … noise … have the ability to detrimentally impact on neighbouring uses, and if carried on the wind, those further afield. New sources of noise can also raise overall noise levels."

10.2.25 Para 7.4.3 states:

"In conjunction with Policy 2: Development Management it is important to assess proposed new uses to prevent or minimise impact on amenities by way of: … noise …. Noise assessments will be required where it is considered there is a risk of noise disturbance, following advice from Environmental Health Officers. Solutions may require, in combination with the requirements of Policy 3: Design of New Development, careful design of buildings, layout of the site and suitable plant or machinery to remove or reduce impacts and should be discussed with Environmental Health and Planning Officers."

10.2.26 Policy 31: Climate Change and Renewable and Low Carbon Energy, B. Renewable Energy:

"With the exception of Wind Energy, the development of renewable energy facilities, associated infrastructure and the integration of decentralised technologies on existing or proposed structures will be

permitted provided, individually, or cumulatively, there would be no significant harm to:
2. residential amenity in respect of: …noise, … vibration"

Guidance

British Standard (BS) 4142:2014 – Method for rating and assessing industrial and commercial sound

10.2.27 BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. Where new residential receptors are proposed close to existing industrial/commercial noise sources the standard allows for, and encourages, the use of other standards such as BS 8233 (detailed below).

British Standard (BS) 7445:2003 Parts 1 and 2 - Description and measurement of environmental noise

10.2.28 This Standard provides details of the instrumentation and measurement techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level (L_{Aeq}). Part 2 of BS 7445 replicates International Organisation for Standardisation (ISO) standard 1996-2.

British Standard (BS) 5228:2009+A1:2014 Parts 1 and 2 Code of practice for noise and vibration control on construction and open sites

10.2.29 This document provides recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The legislative background to noise and vibration control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities. This British Standard provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.

British Standard (BS) 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

10.2.30 Provides a methodology to calculate the noise levels entering a building through facades and façade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise levels which are provided for a variety of situations.

World Health Organisation (WHO) (1999) Guidelines for community noise

10.2.31 These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55 dB L_{Aeq} during the day, related to annoyance, and 45 dB L_{Aeq} or 60dB L_{Amax} at night, related to sleep disturbance.

WHO (2009) Night Noise Guidelines for Europe

10.2.32 In 2009, the World Health Organisation (WHO) published the Night Noise Guidelines for Europe, which it describes as an extension to the WHO Guidelines for Community Noise (1999). It concludes that:

> "*Considering the scientific evidence on the thresholds of night noise exposure indicated by L_{night} outside as defined in the Environmental Noise Directive (2002148/EC), a L_{night} outside of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. L_{night} outside value of 55dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach."*

WHO (2018) Environmental Noise Guidelines for the European Region

10.2.33 The guidance states:

> "*The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise*."

BS 6472-1:2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings

10.2.34 This standard provides general guidance on human exposure to building vibration in the range of 1 Hz to 80 Hz and includes curves of equal annoyance for humans. It also outlines the measurement methodology to be employed. It introduces the concept of Vibration Dose Value (VDV) and estimated Vibration Dose Value (eVDV) for the basis of assessment of the severity of impulsive and intermittent vibration levels, such as those caused by a series of trains passing a given

location.

Calculation of Road Traffic Noise (CRTN) 1988

10.2.35 The Calculation of Road Traffic Noise (CRTN) document provides a method for assessing noise from road traffic in the UK and a method of calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since publication in 1988 this document has been the nationally accepted standard in predicting noise levels from road traffic. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, accounting for the percentage of heavy goods vehicles (HGV), different road surfacing, inclination, screening by barriers and relative height of source and receiver.

Design Manual for Roads and Bridges, 2011

10.2.36 Volume 11, Part 3, Section 7 provides guidance on the environmental assessment of noise impacts from road schemes. The Design Manual for Roads and Bridges (DMRB) contains advice and information on transport-related noise and vibration, which has relevance regarding the construction and operational traffic impacts affecting sensitive receptors adjacent to road networks. It also provides guideline significance criteria for assessing traffic related noise impacts.

ISO 9613-2

10.2.37 ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors to predict the levels of environmental noise at a distance from a noise source.

10.3 Consultation

10.3.1 Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this Chapter. A summary of the consultation relevant to Noise and Vibration is detailed in **Table 10.2.**

Table 10.2 Consultation and Responses

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID1: "The Scoping Report does not justify the request to scope out impacts from vibration during operation. The Inspectorate considers that there may be impacts from ground borne vibration during operation from the	Refer to **Section 10.7**.

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	gasification plant, aggregate production Facility, and potentially from Heavy Goods Vehicle (HGV) movements travelling to and from the site. The Scoping Report has not clearly demonstrated an absence of likely significant effects. Accordingly this matter cannot be scoped out of the ES."	
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID2: "The ES should clearly explain the study area used for the noise and vibration assessment which should be determined by the extent of likely impacts. The Applicant should make effort to agree the study area with relevant consultation bodies. The study area should be shown on a supporting plan contained within the ES."	Refer to **Section 10.5**.
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID3: "The Scoping Report identifies several noise sensitive receptors and identifies associated noise monitoring locations on Figure 6.1. The ES should contain a comprehensive list of noise sensitive receptors, including residential, recreational and ecological receptors both onshore and within the River Witham and these should be shown on a supporting plan. The ES should consider the need to cross refer to other aspect chapters, for example the ecology chapter where interrelated impacts may occur."	Refer to **Section 10.6**.
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID4: "The Scoping Report indicates that additional monitoring to develop the baseline will be required. The ES should clearly describe the approach taken with regard to baseline monitoring that informs the assessment. The description should include details such as; date, location, timing and weather prevalent during the surveys. The Applicant should make effort to agree the approach to baseline monitoring with relevant consultation bodies."	Refer to **Section 10.6**.
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID5: "The ES should provide details of the anticipated construction working hours (including any night time working required) and activities on which the assessment of likely significant effects has been based. This should be consistent with the working hours specified in the DCO. The ES should include sufficient information to describe and assess the construction methods and activities associated with onshore and marine works. This information will improve understanding with regards to the assessment. Should the Applicant intend to include a Deemed Marine Licence (DML) within the DCO, specific information in the ES with respect to assessment techniques and the nature of the construction activities related to the wharf should be consistent with the information within the proposed	Refer to **Section 10.4**.This section outlines the proposed approach for construction phase assessment.

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
	DML."	
The Planning Inspectorate, June 2018	Comment within scoping Opinion section 4.3 ID6: "Consistent with the Noise Policy Statement for England, LOAEL and SOAEL should be defined for all of the construction, operational and decommissioning noise and vibration matters assessed."	Refer to **Section 10.4**.
Boston Borough Council (BBC), 6th July 2018	Letter response: "Need to define the hours of operation including delivery and handling of feedstock by river and road."	Refer to **Section 10.4**.
Boston Borough Council (BBC), 6th July 2018	Letter response: Further background noise monitoring over an extended period is required.	Refer to **Section 10.6**.
Boston Borough Council (BBC), 6th July 2018	Letter response: Low frequency noise assessment is required for Boston Alternative Energy Facility and potentially feedstock/aggregate handling.	Refer to **Section 10.4**.
Boston Borough Council (BBC), 6th July 2018	Letter response: All feedstock and aggregate handling and storage activities need to be assessed.	Refer to **Section 10.4**.
Boston Borough Council (BBC), 6th July 2018	Letter response: Traffic noise assessment for feedstock delivery via Marsh Lane.	Refer to **Section 10.4** and **10.7**.
Boston Borough Council (BBC) 26th October 2018	Email from Royal HaskoningDHV to Boston Borough Council requesting the point of contact in the Planning Control department.	N/A
Boston Borough Council (BBC) 26th October 2018	Email from Boston Borough Council to Royal HaskoningDHV stating the EH Manager details.	N/A
Boston Borough Council (BBC) 26th October 2018	Email from Royal HaskoningDHV to Boston Borough Council requesting an appointment with EH Manager.	N/A
Boston Borough Council (BBC) 30th October 2018	Email from Boston Borough Council to Royal HaskoningDHV stating the week commencing 5th November 2018 would not be convenient for a meeting.	N/A
Boston Borough Council (BBC) 30th October 2018	Telephone conversation with Boston Borough Council and Royal HaskoningDHV stating an agreed meeting for the 13th November 2018.	N/A
Boston Borough Council (BBC) 31st October 2018	Email from Boston Borough Council to Royal HaskoningDHV stating the meeting scheduled for13th November 2018 would not be convenient and proposing other dates.	N/A
Boston Borough Council (BBC) 31st October 2018	Email from Royal HaskoningDHV to Boston Borough Council agreeing the meeting date of 7th November 2018.	N/A

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
Boston Borough Council (BBC) 7th November 2018	Attendance at a meeting between Royal HaskoningDHV and Boston Borough Council at the Council offices. Discussion of and agreed the baseline survey approach, subsequent assessment methodology, including Construction, Operation and Decommissioning phases. BBC requested the assessment to include: Vessel arrivals and departures, specifically at ST R6 (R6); Hours of operation for Shredders and assessing one-third octave band (16 Hz to 250 Hz) inclusive; Aggregate loading mechanism; Operational deliveries at the junction of Wyberton Low Road and Marsh Avenue; Impact on existing slaughterhouse near ST R3 (R3); Determination of background noise level (L_{A90}) with Boston 1 fully operational; Section 61 requirement for Construction phase; and Prevention of background (L_{A90}) creep in area.	Refer to **Section 10.4** and **Section 10.7.**
Boston Borough Council (BBC) 8th November 2018	Email from Royal HaskoningDHV to Boston Borough Council confirming topic of discussion from meeting held at BBC offices 7th November 2018.	N/A
Boston Borough Council (BBC) 12th November 2018	Email from Boston Borough Council to Royal HaskoningDHV detailing council tax and residency at Beeston Farm, Battery Lane, Boston, Lincs, PE21 7SJ. Contact information also provided for the slaughterhouse on Nursery Road.	N/A

10.4 Assessment Methodology

Impact Assessment Methodology

10.4.1 This section sets out the overall approach to the impact assessment for the construction and operational phases of the Facility. For the PEIR, preliminary information regarding the construction and operational phases has been used for the assessment. Should any of the information change then revised impacts will be addressed in the production of the Environmental Statement (ES). All methodologies have been agreed with BBC during consultation, detailed in **Table 10.2**.

Construction Phase Noise Assessment

10.4.2 This section outlines the proposed approach for construction phase assessment.

10.4.3 BS 5228:2009+A1:2014 describes several methods for assessing noise impacts during construction projects.

10.4.4 The approved approach used in the PEIR assessment is the threshold based 'ABC' method detailed within BS 5228, which specifies a construction noise limit based on the existing ambient noise level and for different periods of the day. The predicted construction noise levels were assessed against noise limits derived from advice within Annex E of BS 5228. **Table 10.3**Table ***10.3***, reproduced from BS 5228:2009+A1:2014 Table E.1, presents the criteria for selection of a noise limit for a specific receptor location.

Table 10.3 Construction Noise Threshold Levels Based on the ABC Method (BS 5228)

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	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
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 and 07.00–23.00 Sundays.			

10.4.5 The 'ABC method' described in BS 5228 establishes that there is no impact below the three thresholds presented above.

10.4.6 BS 5228 states:

> "*If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect*."

10.4.7 Noise levels for the construction phase are calculated using the methods and guidance in BS 5228. This Standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for:

- The 'on-time' of the plant, as a percentage of the assessment period;
- Distance from source to receptor;

- Acoustic screening by barriers, buildings or topography; and
- Ground type.

10.4.8 Construction noise impacts are assessed using the impact magnitude presented in **Table 10.4** for the daytime period, **Table 10.5** for the evening and weekend periods, and **Table 10.6** for the night time.

Table 10.4 Day Time Construction Noise Significance Criteria

Impact magnitude	Construction noise level (dB)			
	A 65dB threshold	B 70dB threshold	C 75dB threshold	NPSE/PPG Category
No change/No Impact	<65	<70	<75	NOEL
Negligible	>65.1 - <65.9	>70.1 - <70.9	>75.1 - <75.9	LOAEL
Minor/Low	>66.0 - <67.9	>71.0 - <72.9	>76.0 - <77.9	OAEL
Moderate/Medium	>68.0 - <69.9	>73.0 - <74.9	>78.0 - <79.9	SOAEL
Major/High	>70	>75	>80	UAEL

Table 10.5 Evening and Weekends Construction Noise Significance Criteria

Impact magnitude	Construction noise level (dB)			
	A 55dB threshold	B 60dB threshold	C 65dB threshold	NPSE/PPG Category
No change/No Impact	<55	<60	<65	NOEL
Negligible	>55.1 - <55.9	>60.1 - <60.9	>65.1 - <65.9	LOAEL
Minor/Low	>56.0 - <57.9	>61.0 - <62.9	>66.0 - <67.9	OAEL
Moderate/Medium	>58.0 - <59.9	>63.0 - <64.9	>68.0 - <69.9	SOAEL
Major/High	>60	>65	>70	UAEL

Table 10.6 Night Time Construction Noise Significance Criteria

Impact magnitude	Construction noise level (dB)			
	A 45dB threshold	B 50dB threshold	C 55dB threshold	NPSE/PPG Category
No change/No Impact	<45	<50	<55	NOEL
Negligible	>45.1 - <45.9	>50.1 - <50.9	>55.1 - <55.9	LOAEL
Minor/Low	>46.0 - <47.9	>51.0 - <52.9	>56.0 - <57.9	OAEL
Moderate/Medium	>48.0 - <49.9	>53.0 - <54.9	>58.0 - <59.9	SOAEL

Impact magnitude	Construction noise level (dB)			
	A 45dB threshold	B 50dB threshold	C 55dB threshold	NPSE/PPG Category
Major/High	>50	>55	>60	UAEL

Construction Phase Road Traffic Noise and Vibration Assessment

10.4.9 The road links identified by the transport assessment as carrying construction traffic are detailed in **Figure 10.1**.

10.4.10 Traffic data for the noise assessment were provided as 18 hr Annual Average Weekday Traffic (AAWT) (as required by the CRTN methodology) by the Transport Consultants for two scenarios – 2021 Construction Average and 2021 Construction Peak, see **Chapter 19 Traffic and Transport**. The data details the total traffic flow per link, the composition of the flow with percentage HGVs and speed data.

10.4.11 The data are provided for a Baseline year plus growth ('without development' scenario) and Baseline year plus growth plus development ('with development' scenario).

10.4.12 The assessment scenarios comprise of:

- Construction Average – 2021 Baseline + growth vs 2021 Baseline + growth + average construction traffic; and
- Construction Peak – 2021 Baseline + growth vs 2021 Baseline + growth + peak construction traffic.

10.4.13 Following the methodology contained in DMRB (Volume 11, Section 3, Chapter 3) an initial screening assessment was undertaken for each scenario (detailed in **Table 10.7** and **Table 10.8**) to assess whether there would be any significant changes in traffic volume and composition on surrounding local roads as a result of the Facility. Any road links with a predicted increase in traffic volume of 25% or a decrease of 20% were identified. It is stated that traffic flow variations below this level would, for short term changes (construction period), give rise to a maximum change in the noise level of less than 1 dB(A).

Table 10.7 Construction Road Traffic Flows – 2021 Average

Link ID	Description	2021 Baseline flows AAWT		2021 Baseline + Average Construction		Average Construction Overall Change (%)		2021 Baseline + Peak Construction		Peak Construction Overall Change (%)	
		Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs
1	Marsh Lane - East of Wyberton Low Road junction	6,952	501	7,109	623	2.3	24.5	8,066	1,581	16.0	215.7
2	Marsh Lane - West of Wyberton Low Road junction	9,576	519	9,732	641	1.6	23.6	10,690	1,598	11.6	208.3
3	A16 - South of Marsh Lane Roundabout	20,002	1,087	20,180	1,210	0.9	11.3	21,138	2,167	5.7	99.3
4	A16 - North of Marsh Lane Roundabout	25,635	1,098	25,848	1,221	0.8	11.2	26,805	2,178	4.6	98.3
5	A16 Spalding Road	28,549	1,250	28,762	1,373	0.7	9.8	29,720	2,330	4.1	86.4
6	A55 Liquorpond Street	31,145	788	31,357	910	0.7	15.6	32,315	1,867	3.8	137.1
7	A16 John Adams Way	41,763	1,645	41,942	1,768	0.4	7.4	42,899	2,725	2.7	65.6
8	B1397 London Road	12,867	271	12,924	271	0.4	0.0	12,924	271	0.4	0.0
9	Wyberton Low Road	3,056	11	3,056	11	0.0	0.0	3,056	11	0.0	0.0
10	Nursery Road / Lealand Way	1,664	104	1,821	227	9.4	117.7	2,778	1,184	66.9	1038.1
11	Marsh Lane	3,329	208	3,329	208	0.0	0.0	3,329	208	0.0	0.0

Link ID	Description	2021 Baseline flows AAWT		2021 Baseline + Average Construction		Average Construction Overall Change (%)		2021 Baseline + Peak Construction		Peak Construction Overall Change (%)	
		Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs
12	Bittern Way	1,092	52	1,092	52	0.0	0.0	1,092	52	0.0	0.0
	DMRB >-20%, >+25% change in total traffic flows or composition criteria exceedance										

10.4.14 All links were assessed following the Basic Noise Level (BNL) calculation procedure within CRTN to predict a relative $L_{10,18\ hr}$ dBA change for each link. The calculation also incorporates a correction for mean traffic speed and the percentage of heavy vehicles.

10.4.15 Construction phase road link $L_{10,18\ hr}$ dBA changes were assessed using the impact magnitude criteria in **Table 10.8** reproduced from Table 3.1 detailed in DMRB. The thresholds for differentiating the criteria are taken from DMRB for short-term impacts and are an indication of the relative change in ambient noise as a result of the Facility.

Table 10.8 Magnitude Criteria for Relative Change due to Road Traffic (Short Term)

Change in noise level ($L_{A10\ (18\ hour)}$ dB)	Impact magnitude	NPSE/PPG Category
0.0	No change/No Impact	NOEL
0.1 – 0.9	Negligible	LOAEL
1.0 – 2.9	Minor/Low	OAE
3.0 – 4.9	Moderate/Medium	SOAEL
>5.0	Major/High	UAEL

Construction Phase Vibration Assessment

10.4.16 Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors, which at higher levels can cause annoyance to residents. In extreme cases, cosmetic or structural building damage can occur, however vibration levels have to be of a significant magnitude for this effect to be manifested and such cases are rare.

10.4.17 High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction. The use of piling during the construction of the Facility may be required.

10.4.18 Paragraph 3.32 of DMRB states that:

> *"PPVs in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and typically are below 1 mm/s. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from road traffic".*

10.4.19 Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant peak particle

velocity (PPV) with several other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. These prediction equations are based on the energy approach. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they can provide an indicator of the probability of these levels of PPV being exceeded.

10.4.20 The empirical equations for predicting construction-related vibration provide estimates in terms of PPV. Therefore, the consequences of predicted levels in terms of human perception and disturbance can be established through direct comparison with the BS 5228-2:2009+1A:2014 guidance vibration levels.

10.4.21 Ground-borne vibration assessments may be drawn from the empirical methods detailed in BS 5228-2:2009+1A:2014, in the Transport and Road Research Laboratory (TRRL) 246: Traffic: Traffic induced vibrations in buildings, and within the Transport Research Laboratory (TRL) Report 429 (2000): Ground-borne vibration caused by mechanical construction works.

10.4.22 However, these calculation methods rely on detailed information, including the type and number of plant being used, their location and the length of time they are in operation. Given the mobile nature of much of the plant that has the potential to impart sufficient energy into the ground, and the varying ground conditions in the immediate vicinity of the construction works, it was considered that an accurate representation of vibration conditions using these predictive methods was not possible.

10.4.23 Consequently, a series of calculations, following the methodologies referred to above, were carried out based on typical construction activities that have the potential to impart sufficient energy into the ground, applying reasonable worst case assumptions in order to determine set-back distances at which critical vibration levels may occur.

10.4.24 Humans are very sensitive to vibration, which can result in concern being expressed at energy levels well below the threshold of damage. Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.

10.4.25 BS 6472 describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements. VDV is defined by the following equation:

$$VDV_{b/d,\ day/night} = (\int_0^T a^4(t)dt)^{0.25}$$

10.4.26 The VDV is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop.

10.4.27 BS 6472 states that in homes, adverse comment about building vibrations is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception.

10.4.28 BS 6472 contains a methodology for assessing the human response to vibration in terms of either the VDV, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as PPV. The VDV is determined over a 16-hour daytime period or 8-hour night-time period.

10.4.29 The response of a building to ground-borne vibration is affected by the type of foundation, ground conditions, the building construction and the condition of the building. For construction vibration, the vibration level and effects detailed in **Table 10.9** were adopted based on BS 5228. Limits for transient vibration, above which cosmetic damage could occur, are given numerically in terms of PPV.

Table 10.9 Transient Vibration Guide Values for Cosmetic Damage

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm.s^{-1} at 4 Hz and above	
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm.s^{-1} at 4 Hz increasing to 20 mm.s^{-1} at 15 Hz	20 mm.s^{-1} at 15 Hz increasing to 50 mm.s^{-1} at 40 Hz and above

10.4.30 **Table 10.9** lists the minimum set-back distances at which vibration levels of reportable significance for other typical construction activities may occur. BS 5228 calculation methods were used to derive the set-back distances outlined in **Table 10.10**.

Table 10.10 Predicted Distances at Which Vibration Levels May Occur

Activity	Set-back distance at which vibration level (PPV) occurs			
	0.3 mm.s^{-1}	1.0 mm.s^{-1}	10 mm.s^{-1}	15 mm.s^{-1}
Vibratory Compaction (Start-up)	166 m	65 m	9 m	6 m
Vibratory Compaction (Steady State)	102 m	44 m	8 m	6 m
Percussive Piling	48 m	19 m	3 m	2 m
HGV Movement1 on uneven Haul Route	277 m	60 m	3 m	2 m

10.4.31 **Table 10.11** reproduced from research (Rockhill et al, 2014) details minimum safe separation distance for piling activities from sensitive receptors to reduce the likelihood of cosmetic damage occurrence.

Table 10.11 Receptor Proximity for Indicated Piling Methods

Building type (limits on vibrations from Eurocode 3)	Piling Method		
	Press-in	25 kJ drop hammer	170 kW 27 Hz vibrohammer
Architectural merit	2.6 m	29.6 m	27.7 m
Residential	0.5 m	11.8 m	13.8 m
Light commercial	0.14 m	5.9 m	5.5 m
Heavy industrial	0.06 m	3.9 m	3.7 m
Buried services	0.03 m	2.9 m	2.2 m

10.4.32 For construction vibration from sources other than blasting, the vibration level and effects presented in **Table 10.12** were adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Table 10.12 Construction Vibration - Impact Magnitude

Vibration limit PPV (mm/s)	Interpreted significance to humans	Impact magnitude	NPSE/PPG Category
<0.14	Vibration unlikely to be perceptible	No Impact	NOEL
0.14 to 0.3	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction	Negligible - Adverse	LOAEL

[1] *Vibration level based on a HGV moving at 5 mph.*

Vibration limit PPV (mm/s)	Interpreted significance to humans	Impact magnitude	NPSE/PPG Category
0.3 to 1.0	Vibration might just be perceptible in residential environments	Minor – Adverse	OAE
1.0 to <10.0	It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Moderate – Adverse	SOAEL
>10.0	Vibration is likely to be intolerable for any more than a brief exposure to this level	Major – Adverse	UAEL

Operation Phase Assessment

10.4.33 Where there are sound sources such as fixed plant associated with a proposed development, the most appropriate assessment guidance is BS 4142:2014. The guidance describes a method of determining the level of noise of an industrial noise source and the existing background noise level.

10.4.34 BS 4142:2014 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident, and combines procedures for assessing the impact in relation to:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

10.4.35 This standard is applicable to the determination of the following levels at outdoor locations:

"a) rating levels for sources of sound of an industrial and/or commercial nature; and

b) ambient, background and residual sound levels, for the purposes of:

1) *investigating complaints;*
2) *assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and*

3) assessing sound at proposed new dwellings or premises used for residential purposes."

10.4.36 The standard incorporates a requirement for the assessment of uncertainty in environmental noise measurements and introduces the concepts of 'significant adverse impact' rather than likelihood of complaints. BS4142:2014 requires the consideration of the characteristics of the sound under investigation, time of day and frequency of occurrence.

10.4.37 The standard applies to industrial/commercial and background noise levels outside residential buildings and for assessing whether existing and new industrial/commercial noise sources are likely to give rise to significant adverse impacts on the occupants living in the vicinity.

10.4.38 Assessment is undertaken by subtracting the measured background noise level from the rating level; the greater this difference, the greater the magnitude of the impact.

10.4.39 BS 4142 refers to the following:

"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;

A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and

The lower the rating level relative to the measured background sound level the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context".

10.4.40 When assessing the noise from a source, which is classified as the Rated Noise Level, it is necessary to have regard to the acoustic features that may be present in the noise. Section 9.1 of BS 4142 states:

> *"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."*

10.4.41 An operational assessment in accordance with BS4142 has been undertaken for the Facility.

10.4.42 For clarity, an explanation of each penalty correction type (taken from BS4142:2014, page 13 and 14) is provided here:

Tonality

10.4.43 For sound ranging from not tonal to prominently tonal a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

10.4.44 A correction of up to +9 dB can be applied for sound that is impulsive. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Other sound characteristics

10.4.45 Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Intermittency

10.4.46 When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

10.4.47 Due to the separation distance from the nearest operating sound source at the Facility and the sensitive receptors, combined with the prevailing ambient soundscape, no penalty corrections for intermittency, tonality or impulsivity have been included. These acoustic features are added based on perceptibility at the receptor location.

10.4.48 The determination of the specific sound level free from sounds influencing the ambient sound at the assessment location is obtained by measurement or a combination of measurement and calculation. This is to be measured in terms of the $L_{Aeq,T}$, where 'T' is a reference period of:

- 1 hour during daytime hours (07:00 to 23:00 hours); and
- 15 minutes during night-time hours (23:00 to 07:00 hours).

10.4.49 The assessment of noise from proposed fixed plant associated with the Facility was considered at the nearest receptors.

10.4.50 To predict the noise from the operational aspects of the Facility, SoundPLAN noise modelling software was utilised. The model incorporated proposed buildings based on elevation drawings, proposed fixed plant and additional mobile noise sources such as HGV movements and wharf activities associated with the Facility. The model also included nearby residential dwellings and other buildings in the Facility Study Area, intervening ground cover and topographical information.

10.4.51 Noise levels for the operational phase were predicted at the same Noise Sensitive Receptor (NSR) locations detailed in **Section 10.6**. The calculation algorithm described in ISO 9613 was used in the operational noise propagation modelling exercise.

10.4.52 The magnitude of impacts based on a quantitative assessment of noise impact using BS 4142:2014 and applied to the operational assessment are summarised in **Table 10.13**.

Table 10.13 Operational Noise Impact Magnitude Criteria for Industrial/ Commercial Noise Sources

Rating level ($L_{Ar, Tr}$ dB)	Impact magnitude	NPSE/PPG Category
≤ Measured L_{A90}	No change/No Impact	NOEL
= Measured L_{A90} dB to +3 dB	Negligible	LOAEL
Measured L_{A90} + 3 dB to 5 dB	Minor/Low	OAE
Measured L_{A90} + 5 dB to 9.9 dB	Moderate/Medium	SOAEL
≥ Measured L_{A90} + 10 dB	Major/High	UAEL

10.4.53 The main fixed plant noise sources associated with the proposed project have been identified through consultation with the Facility engineers and are detailed within **Table 10.14**.

10.4.54 The main fixed plant noise sources associated with the proposed power export zone have been assumed and are detailed within **Table 10.15**.

Table 10.14 Fixed Plant Noise Sources

Name	Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
				31.5	63	125	250	500	1K	2K	4K	8K
A2	Fuel Wharf Baler Shed	n/a	85*	n/a	34	49	61	77	80	81	76	64
A3	Fuel Wharf Personnel Facility	n/a	55*	n/a	46	47	47	47	47	45	43	39
A4	Fuel Wharf WC – Unisex Extract	n/a	53@3 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A5	Fuel Wharf - Mobile Plant refuelling	n/a	73@10 m	49	54	58	64	69	67	61	52	49
A7	Bale Transfer Roller Conveyers Covered	n/a	88*	19	42	61	75	81	84	82	76	67
A8	Bale Transfer Roller Conveyers Covered	n/a	88*	19	42	61	75	81	84	82	76	67
A9	Damaged Bale Storage	n/a	85*	n/a	34	49	61	77	80	81	76	64
A10	Mobile Plant Workshop including WC	n/a	85*	n/a	34	49	61	77	80	81	76	64
B1	RDF Processing Plant eight Lines	n/a	100*	n/a	82	86	86	90	92	95	95	87
B2	Processed RDF Transfer Conveyers	n/a	88*	19	42	61	75	81	84	82	76	67
B3	Processed RDF Silos	86	n/a	n/a	48	60	67	76	78	81	76	86
B4	Gasifier Plant Feed Conveyers	n/a	88*	19	42	61	75	81	84	82	76	67
B5	Bio Filter	n/a	85*	n/a	47	57	64	73	75	78	73	83
B6	Make Up Water Facility	88	n/a	n/a	55	65	72	78	81	82	82	80
C1	Gasifier Plant three Lines	n/a	88*	62	71	76	81	82	82	79	77	73
C2	Gasifier Plant Stack	88	n/a	62	71	76	81	82	82	79	77	73
D1	Turbine Generator Hall	n/a	85*	50	60	68	76	79	82	77	66	50

Name	Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
				31.5	63	125	250	500	1K	2K	4K	8K
E1	Air Cooled Condenser	112	n/a	n/a	91	101	105	107	107	100	96	90
F1	ASCO Plant – Carbon Capture	n/a	85*	47	57	64	73	75	78	73	83	47
G1	RDF Fines De-stoning Plant	n/a	85*	n/a	67	71	75	78	81	79	74	69
H1	Offices, Visitor Centre and Control Room	n/a	55*	n/a	46	47	47	47	47	45	43	39
H1a	Air Conditioning Units	76	n/a	56	56	58	68	70	70	68	64	54
H2	Plant Workshops	n/a	85*	n/a	34	49	61	77	80	81	76	64
H3	Black Start Diesel Generators	n/a	80*	n/a	47	57	64	70	73	74	74	72
H4	Plant Feed Transformer Pens	98	n/a	68	75	59	86	88	88	82	81	96
H5	Gasifier MCC/Compressor Room	n/a	70*	n/a	29	39	52	62	61	67	62	60
H5A	BMH MCC Room	n/a	70*	n/a	29	39	52	62	61	67	62	60
H6	CO_2 Tank	101	n/a	n/a	77	82	86	92	97	95	89	80
H7	Liquid Nitrogen Plant	101	n/a	n/a	77	82	86	92	97	95	89	80
H10	Bunded Diesel Storage Tank	101	n/a	n/a	77	82	86	92	97	95	89	80
H11	Site WC	n/a	53@3 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
J1	Lightweight Aggregate Plant	n/a	85*	n/a	67	71	75	78	81	79	74	69
J3	Filter Bank and Stack	n/a	88*	62	71	76	81	82	82	79	77	73
J6	Offices and Control Room	n/a	55*	n/a	46	47	47	47	47	45	43	39

Name	Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
				31.5	63	125	250	500	1K	2K	4K	8K
J7	Workshops for LWA Plant ONLY	n/a	85*	n/a	34	49	61	77	80	81	76	64
Building Material Kingspan AWP/60 no lining SRI		n/a	n/a	9	15	16	19	23	26	22	39	39
Note:	*Reverberant sound pressure level All plant 100% on-time, except A4, H11 (5 min/hr), H1 (15 min/hr), H7, H10 (10 min/hr).											

Table 10.15 Power Export Zone Fixed Plant Noise Sources

Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
			31.5	63	125	250	500	1K	2K	4K	8K
Statcom	67.2	n/a	n/a	63	56	52	49	42	40	58	54
Aux Transformer	60.9	n/a	55	56	49	45	42	35	33	51	54
Filter Capacitor Bank	82.6	n/a	44	80	45	77	75	18	14	14	54
Filter Aircore Reactor	69.7	n/a	31	67	32	64	62	5	1	1	54
Filter Aircore Reactor	82.6	n/a	31	67	32	64	62	5	1	1	54
Power Export Building	n/a	85*	n/a	50	60	68	76	79	82	77	66
Building Material Sheet-steel 1 mm double corrugated SRI	n/a	n/a	n/a	15	18	23	33	43	48	39	39
Note:	*Reverberant sound pressure level All plant 100% on-time.										

10.4.55 The main on-site plant noise sources associated with the wharf and aggregate handling facility zones have been identified through consultation with the Facility engineers and are detailed within **Table 10.16.**

Table 10.16 Mobile Plant Noise Sources

Name	Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
				31.5	63	125	250	500	1K	2K	4K	8K
Liebherr LH110	Aggregate*	103	n/a	51	76	88	93	97	96	96	93	87
Liebherr LH110	Wharf Vessel Cranes x 4 No.	103	n/a	51	76	88	93	97	96	96	93	87
Forklift electric	Lifting x4 No.	65	n/a	n/a	32	42	49	55	58	59	59	57
Forklift electric	Moving x 4 No.	53	n/a	n/a	20	30	37	43	46	47	47	45
MAFIs	10 Movements/hr x 2No.	118	n/a	n/a	112	116	109	102	102	99	94	93
HGVs IN/OUT	Deliveries x50 No. per day	120	n/a	n/a	119	107	105	102	99	97	92	89
Vessels	1.6 movements per day	101	n/a	n/a	75	94	90	93	97	93	86	76

Note :

All aggregate handling cranes 100% on-time between 07:00 to 19:00 hrs ONLY.
All RDF plant 100% on-time, 24 hrs.
Forklift each - operating at 50 events/hr, 24 hrs.
Forklift each - driving operating at 50 events/hr, 24 hrs.
MAFI truck moving at 10 mph.
HGVs – 50 movements split over 24 hrs, 1/hr 23:00 to 07:00, 3/hr 07:00 to 23:00.
HGVs travelling at 10 mph, slowing to 5 mph at RDF silos.
HGVs Idling at Weighbridge IN – 1 minute per HGV.
HGVs Idling at Weighbridge OUT – 30 seconds per HGV.

Name	Description	LwA dB(A)	SPL (dBA)	Frequency (Hz) [dB(A)]								
				31.5	63	125	250	500	1K	2K	4K	8K
	HGVs Idling before shutting off – 30 seconds. HGVs Idling before pulling off – 30 seconds. Vessels travelling at 4 knots. 1 movement 12:00 to 13:00, 1 movement 00:00 to 01:00 to represent daytime and night time respectively.											

Operational Phase Road traffic noise and vibration emission assessment

10.4.56 The road links identified by the transport assessment as carrying construction traffic are detailed in **Figure 10.1**.

10.4.57 Traffic data for the noise assessment were provided as 18 hr AAWT (as required by the CRTN methodology) by the Transport Consultants for a 2025 Operational Peak scenario. The data also details the total traffic flow per link, the composition of the flow with percentage HGVs, and speed data.

10.4.58 The data are provided for a Baseline year plus growth ('without development' scenario) and Baseline year plus growth plus development ('with development' scenario) and presented in **Table 10.17**.

10.4.59 The assessment scenarios comprise of:

- Operational Peak – 2025 Baseline + growth vs 2025 Baseline + growth + peak operational traffic

10.4.60 Following the methodology contained in DMRB (Volume 11, Section 3, Chapter 3) an initial screening assessment for the scenario was undertaken to assess whether there would be any significant changes in traffic volume and composition on surrounding local roads because of the Facility. Any road links with a predicted increase in traffic volume of 25% or a decrease of 20% were identified. It is stated that traffic flow variations below this level would, for short term changes (construction period), give rise to a maximum change in the noise level of less than 1 dB(A).

Table 10.17 Operational Road Traffic Flows – 2025 Peak

Link ID	Description	2025 Baseline flows AAWT		2025 Baseline + Average Operational		Overall Change (%)	
		Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs
1	Marsh Lane - East of Wyberton Low Road junction	7,435	535	7,663	585	3.1	9.3
2	Marsh Lane - West of Wyberton Low Road junction	10,241	555	10,469	605	2.2	9.0
3	A16 - South of Marsh Lane Roundabout	21,392	1,163	21,468	1,213	0.4	4.3
4	A16 - North of Marsh Lane Roundabout	27,417	1,174	27,618	1,224	0.7	4.3
5	A16 Spalding Road	30,533	1,337	30,708	1,387	0.6	3.7
6	A55 Liquorpond Street	33,309	842	33,422	892	0.3	5.9
7	A16 John Adams Way	44,665	1,760	44,777	1,810	0.3	2.8
8	B1397 London Road	13,762	290	13,788	290	0.2	0.0
9	Wyberton Low Road	3,268	12	3,268	12	0.0	0.0
10	Nursery Road / Lealand Way	1,780	111	2,008	161	12.8	44.9
11	Marsh Lane	3,560	223	3,560	223	0.0	0.0
12	Bittern Way	1,168	56	1,168	56	0.0	0.0

Link ID	Description	2025 Baseline flows AAWT		2025 Baseline + Average Operational		Overall Change (%)	
		Total Vehicles	Total HGVs	Total Vehicles	Total HGVs	Total Vehicles	Total HGVs
	DMRB criteria exceedance						

10.4.61 All links were assessed following the Basic Noise Level (BNL) calculation procedure within CRTN to predict a relative $L_{10,18\ hr}$ dBA change for each link. The calculation also incorporates a correction for mean traffic speed and the percentage of heavy vehicles.

10.4.62 Operational phase road link $L_{10,18\ hr}$ dBA changes were assessed using the impact magnitude criteria in **Table 10.18**, reproduced from Table 3.2 detailed in DMRB. The thresholds for differentiating the criteria are taken from DMRB for long-term impacts and are an indication of the relative change in ambient noise because of the Facility.

Table 10.18 Magnitude Criteria for Relative Change due to Road Traffic (Long Term)

Change in noise level ($L_{A10\ (18\ hour)}$ dB)	Impact magnitude	NPSE/PPG Category
0.0	No change/No Impact	NOEL
0.1 – 2.9	Negligible	LOAEL
3.0 – 4.9	Minor/Low	OAE
5.0 – 9.9	Moderate/Medium	SOAEL
>10.0	Major/High	UAEL

Operational Phase Vessel emission assessment

10.4.63 The vessels required for the delivery and distribution of materials to the Boston Alternative Energy Facility will use the existing channel of The Haven. During consultation, BBC requested an assessment of changes in vessel movements be undertaken at the nearest sensitive receptors to the channel i.e. R4, R5 and R6.

10.4.64 The assessment scenarios comprise of:

- Daytime Operational – 2018 Baseline Daytime $L_{Aeq,T}$ vs 2018 Baseline + predicted 2025 operational vessels $L_{Aeq,T}$
- Night time Operational – 2018 Baseline Night time $L_{Aeq,T}$ vs 2018 Baseline + predicted 2025 operational vessels $L_{Aeq,T}$

10.4.65 Operational $L_{Aeq,T}$ dBA changes were assessed using the impact magnitude derived from criteria in **Table 10.19**, reproduced from Table 3.1 detailed in DMRB. The thresholds for differentiating the criteria are taken from DMRB for short-term impacts and are an indication of the relative change in ambient noise because of the Facility.

Table 10.19 Magnitude Criteria for Relative Change due to Vessel Movements

Change in noise level ($L_{Aeq,T}$ dB)	Impact magnitude	NPSE/PPG Category
0.0	No change/No Impact	NOEL
0.1 – 0.9	Negligible	LOAEL
1.0 – 2.9	Minor/Low	OAE
3.0 – 4.9	Moderate/Medium	SOAEL
>5.0	Major/High	UAEL

Sensitivity

10.4.66 The aims of the NPPF and the NPSE require that a SOAEL should be 'avoided' and that where a noise level which falls between SOAEL and LOAEL, then according to the explanatory notes in the statement:

> *"…reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."*

10.4.67 Further guidance can be found in the Planning Practice Guidance (PPG) notes which summarise the noise exposure hierarchy based on the likely average response, as summarised in **Table 10.20**.

Table 10.20 Definitions of the Different Sensitivity Levels for Noise and Vibration

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable 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
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of outcomes	Increasing effect level	Action
	of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.		
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable 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

10.4.68 Sensitive receptors, in the context of noise and vibration, are typically residential premises but can also include schools, places of worship and noise sensitive commercial premises. **Table 10.21** presents the definitions used relating to the sensitivity of the receptor.

Table 10.21 Definitions of the Different Sensitivity Levels for Noise and Vibration

Sensitivity	Definition	Examples
High	Receptor has very limited tolerance of effect	Noise Receptors have been categorised as high sensitivity where noise may be detrimental to vulnerable receptors. Such receptors include certain hospital wards (e.g. operating theatres or high dependency units) or care homes at night. Vibration Receptors have been categorised as high sensitivity where the receptors are listed buildings or Scheduled Monuments.
Medium	Receptor has limited tolerance of effect	Noise Receptors have been categorised as medium sensitivity where noise may cause disturbance and a level of protection is required but a level of tolerance is expected. Such subgroups include residential accommodation, private gardens, hospital wards, care homes, schools, universities, research facilities, national parks, (during the day); and temporary holiday accommodation at all times. Vibration Receptors have been categorised as medium sensitivity where the structural integrity of the structure is limited but the receptor is not a listed building or Scheduled Monument.
Low	Receptor has some tolerance of effect	Noise Receptors have been categorised as low sensitivity where noise may cause short duration effects in a recreational setting although particularly high noise levels may cause a moderate effect. Such subgroups include offices, shops, outdoor amenity areas, long distance footpaths, doctor's surgeries, sports facilities and places of worship. Vibration Receptors have been categorised as low sensitivity where the structural integrity of the structure is expected to be high. The level of vibration required to cause damage is very high and such levels are not expected to be reached during the Facility.
Negligible	Receptor generally tolerant of effect.	Noise Receptors have been categorised as negligible sensitivity where noise is not expected to be detrimental. Such subgroups include warehouses, light industry, car parks, and agricultural land. Vibration Receptors have been categorised as negligible sensitivity where vibration is not expected to be detrimental.

10.4.69 The closest human receptors to the Facility were determined during consultation with relevant stakeholders. Indicative sensitive receptors are detailed in **Table 10.22**.

10.4.70 For each identified receptor or group of receptors a representative location was chosen for the assessment as detailed on **Figure 10.2** and in **Table 10.22**.

Table 10.22 Receptor Identification, Sensitivity and Classification

Receptor Identifier	Baseline Measurement Location ID	Receptor Classification	Receptor Sensitivity	British National Grid Coordinates	
				X	Y
R1	ST R1	Residential	Medium	533941.53	341622.4
R2	ST R2	Residential	Medium	533532.28	342101.33
R3	ST R3	Residential	Medium	533665.84	342446.35
R4	ST R4	Residential	Medium	534150.89	342647.31
R5	ST R5	Residential	Medium	534024.37	342812.69
R6	ST R6	Residential	Medium	533546.84	343116.8

Magnitude and Significance

10.4.71 In the EIA process, a significant impact (or change) is determined as one where the predicted net impact of the activity or process would exceed the normal variation in baseline conditions with respect to a relevant receptor without the development in place.

10.4.72 It should be noted that although the impact assessment matrix provides a good framework for the consistent assessment of impacts across all environmental parameters, there is still an important role for professional judgement and further objective assessment to play in moderating an impact's significance (where applicable). Given that the criteria represent levels on a continuum, professional judgement and awareness of the relative balance between magnitude and importance / sensitivity is required.

10.4.73 Where adverse impacts are identified, potential mitigating measures must be examined and recommended to reduce potential impacts, as far as possible, to environmentally acceptable levels. Residual impacts must then be stated.

Magnitude of Impact – Noise and Vibration

10.4.74 Impact magnitude has been defined with consideration to the PPG guidance, spatial extent, duration, frequency and severity of the effect. Impact magnitude is defined in **Table 10.23**.

Table 10.23 Definitions of Magnitude Levels for Noise and Vibration Receptors

Magnitude	Definition
High	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the receptor's character or distinctiveness. The impact gives rise to serious concern; it should be considered as unacceptable.
Medium	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the receptor's character or distinctiveness. The impact gives rise to some concern, but it is likely to be tolerable (depending on its scale and/or duration).
Low	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the receptor's character or distinctiveness. The impact is undesirable, but of limited concern.
Negligible	Discernible, temporary (for part of the Facility duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the receptor's character or distinctiveness. The impact is at a threshold of predictive quantification and is not of concern.
No Impact	No discernible, temporary change, or change for any length of time, over a small area of the receptor, and/no alteration to key characteristics or features of the receptor's character or distinctiveness.

Impact Significance – Noise and Vibration

10.4.75 Following the identification of receptor sensitivity and magnitude of the effect, it is possible to determine the significance of the impact. A matrix is presented in **Table 10.24** and will be used wherever relevant.

Table 10.24 Impact significance matrix

		Negative magnitude				
		High	**Medium**	**Low**	**Negligible**	**No Impact**
Sensitivity	**High**	Major	Major	Moderate	Minor	Minor
	Medium	Major	Moderate	Minor	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible

10.4.76 For example, in terms of PPG guidance, an Unacceptable Adverse Effect Level (UAEL) is considered to align with a major impact in **Table 10.25** for a medium sensitivity receptor.

10.4.77 Assessment of impact significance is qualitative and reliant on professional experience, interpretation and judgement. The matrix should therefore be viewed as a framework to aid understanding of how a judgement has been reached, rather than as a prescriptive, formulaic tool.

Table 10.25 Impact Significance Definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. PPG - Unacceptable Adverse Effect (UAE)
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level. PPG - Significant Observed Adverse Effect (SOAEL)
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process. PPG – Observed Adverse Effect (OAE)
Negligible	No discernible change in receptor condition. PPG – Lowest Observed Adverse Effect (LOAEL)
No impact	No change, therefore no impact to receptor condition. PPG – No Observed Effect (NOEL)

10.4.78 Note that for the purposes of this ES chapter, major and moderate impacts are considered to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

Cumulative Impact Assessment

10.4.79 For a general introduction to the methodology used for the CIA, please refer to **Chapter 6 Approach to EIA**. This chapter will focus on those cumulative impacts that are specific to noise and vibration.

10.4.80 Cumulative impacts from noise and vibration occur where different project time lines overlap potentially causing greater impacts. Typically, this can occur when noise generating activities from different projects are occurring within the same vicinity and simultaneously.

Transboundary Impact Assessment

10.4.81 There are no transboundary impacts with regards to noise and vibration as the Facility area including access would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

10.5 Scope

Study Area

10.5.1 The Study Area for noise and vibration assessment generally comprises the area adjacent to the proposed scheme footprint and was determined by the extent of the Transport assessment Study Area. The closest noise sensitive receptors (as agreed with BBC during consultation) in each geographical direction are taken into account, on the basis that receptors further from the site would experience lower noise effects from potential noise generating sources due to the increased separation distance.

10.5.2 The Facility Study Area is detailed on **Figure 10.1**.

Data Sources

10.5.3 The assessment was undertaken with reference to the sources provided in **Table 10.26.**

Table 10.26 Key Information Sources

Data Source	Reference
Google Maps Aerial Photography	2018
OS Mastermap	2018
Environment Agency Open Licence LIDAR data 2 m	2018

Data Source	Reference
Operational Data (Provided by project engineers and technology providers for the elements of the Facility)	2019

Construction Phase Assumptions

10.5.4 The following assumptions for the construction phase were made:

10.5.5 Noise modelling scenarios will be derived from the proposed construction phase programme detailing duration, deliveries and equipment requirements for each phase and scenario. From this, an indicative list of construction equipment will be developed as detailed in **Table 10.27**.

Table 10.27 Construction Plant Example

Location/Activity	Name	No.	Source type	BS5228 Reference	L_{Aeq} (dB) at 10 m	On time correction (%)
Wharf/Groundworks	D6 Dozer	3	Point	C2.11	84.0	85

10.5.6 The results of the calculations will be presented as the dB $L_{Aeq,T}$ noise level covering the BS5228 daytime (07:00 to 19:00 hours) reference construction period.

Operation Phase Assumptions

10.5.7 The following assumptions for the operation phase were made:

- No specific noise mitigation has been embedded into the design of the infrastructure;
- All sound power levels were calculated using typical sound power level data for associated plant taking source type, dimensions and relative height into consideration within calculations;
- All sources were modelled using 100% output at all times, unless otherwise stated, to present a conservative assessment;
- Residential properties were modelled as two-storey buildings at a height of 8.5 m (industry standard);
- Receiver levels were predicted at ground floor (+1.5 m) and 1st floor level (+4.0 m) considered representative of both daytime and night time, resting and amenity space; and
- Acoustic propagation effects were calculated using the ISO 9613-2 method. The calculation methodology considers distance attenuation, barriers and

ground absorption, air absorption, topographical screening effects and light downwind conditions from source to receptor.

10.5.8 The results of the calculations are presented as the dB $L_{Aeq,T}$ noise level covering the daytime (07:00 to 23:00 hours) and night time (23:00 to 07:00 hours) reference periods.

10.6 Existing Environment

10.6.1 The existing ambient noise environment around the site is influenced, both day and night, by road traffic noise on the local road network and noise from nearby commercial/industrial premises in the Riverside Industrial Estate, industrial premises on the opposite side of the river, and Port of Boston. There are several existing residential noise-sensitive receptors in proximity (some within 200 m) to The Facility at the following locations:

- Slippery Gowt Lane;
- Heron Way;
- Nursery Road;
- Marsh Lane;
- Wyberton Low Road;
- The opposite bank of the Haven;
- Powell Street;
- River Way; and
- Rectory Road.

10.6.2 Havenside Country Park, which is located nearby but on the opposite bank of the river to the site, is a potential receptor in respect of noise impacts.

10.6.3 It is envisaged that these receptors may be adversely affected by both construction-related and operation-related activities.

Baseline Monitoring

10.6.4 To characterise the existing noise climate within the vicinity of the Facility, a baseline noise survey was undertaken at the receptor locations detailed on **Figure 10.2**, **Appendix 10.1** and in **Table 10.28**. The survey was undertaken between 23rd and 28th November 2018.

10.6.5 The surveys were conducted in accordance with current guidance including BS4142:2014 Method for rating and assessing industrial and commercial sound and BS7445:2003 Description and measurement of environmental noise. This data will be used within the assessment for the Facility.

Residential Receptors

10.6.6 Baseline noise measurements have been conducted at the nearest identified sensitive receptors and adjacent corresponding site boundary locations, detailed in **Table 10.33** and **Figure 10.2**.

Table 10.28 Baseline Noise Monitoring Locations

Usage	Location	Receptor ID
Residential	Ivy House, Slippery Gowt Lane	ST R1
Residential	Anacary, Marsh Lane	ST R2
Residential	Beeston Farm, Nursery Road	ST R3
Residential	Lodge/ Bank View, Powell Street	ST R4
Residential	No. 21, River Way	ST R5
Residential	No. 35 and 37 Rectory Road	ST R6

Construction Phase

10.6.7 As agreed with Boston Borough Council (BBC), baseline sound levels were measured for a longer duration in November 2018; including daytime, night time, weekday and weekend time periods; therefore, a statistically repeatable representative dataset.

10.6.8 The baseline data were analysed following the guidance detailed in BS5228:2009+A1:2014. **Table 10.29** details the current noise levels in the area, corresponding BS5228 categories and suggests significant effect threshold values for the construction phase of the Facility.

Table 10.29 Summary of Measured levels and recommended criteria limits

Assessment category and threshold period	Location ID	Measured level ($L_{Aeq,T}$) (1)	BS5228 Category	Suggested significant effect threshold value ($L_{Aeq,T}$)
Daytime and Saturdays (2)	ST R1	50.0	A	65
	ST R2	49.6	A	65
	ST R3	51.6	A	65
	ST R4	57.5	A	65

Assessment category and threshold period	Location ID	Measured level ($L_{Aeq,T}$) (1)	BS5228 Category	Suggested significant effect threshold value ($L_{Aeq,T}$)
	ST R5	61.4	A	65
	ST R6	52.7	A	65
Evenings and weekends(3)	ST R1	41.1	A	55
	ST R2	43.7	A	55
	ST R3	44.8	A	55
	ST R4	51.6	A	55
	ST R 5	53.9	B	60
	ST R6	62.4	C	65
Night-time (4)	ST R1	39.4	A	45
	ST R2	37.3	A	45
	ST R3	42.1	A	45
	ST R4	52.7	C	55
	ST R5	55.6	C	55
	ST R6	46.5	B	50

(1) Based on data measured in 2018
(2) 07:00 – 19:00 weekdays and 07:00 – 13:00 Saturdays
(3) 19:00 – 23:00 weekdays, 13:00-23:00 Saturdays and 07:00 – 23:00 Sundays
(4) Every day 23:00 – 07:00

Deriving Background Levels

10.6.9 Background noise levels used in the assessment were obtained from the baseline measurements. The measurement locations used were considered to be representative of the nearest sensitive receptors and were agreed with stakeholders during the consultation process.

10.6.10 The background noise levels for the unattended measurement periods (up to five days) were assessed using statistical analysis of the measured L_{A90} values.

10.6.11 Full details of the baseline noise survey are presented in **Appendix 10.1**.

10.6.12 There are potential inter-relationships with other disciplines, namely, **Chapter 8 Cultural Heritage, Chapter 12 Terrestrial Ecology, Chapter 17 Marine and Coastal Ecology, Chapter 19 Transport, Chapter 20 Socio-Economics** and **Chapter 22 Health Impacts**. The potential impacts could be related to the

construction and operational phases of the Facility.

Anticipated Trends in Baseline Conditions

10.6.13 The baseline noise survey detailed in **Section 10.6** and **Appendix 10.1** outlines the existing soundscape within the Study Area of the Facility. Noise is managed and driven by EU, UK and local legislation and policies. The UK's noise strategy and standards are enacted through management actions at a local authority level as detailed in Section 10.2.

10.6.14 There is a policy trend towards the achievement and maintenance of the noise environment across the UK, which is reflected in the local planning policies detailed in Section 10.2.19. Predicted noise levels due to a change in land use, new developments and associated vehicles are assessed as part of the development planning and consent process. Potential impacts to the prevailing soundscape should be minimised, avoided, or mitigated to suitable levels (in accordance with current legislation, policy and guidance), avoiding an adverse impact, where possible. In addition to planning controls there is a clear trend for noise from vehicle, commercial and industrial sources to be reduced, in compliance with stricter legislation and guidance.

10.6.15 Consequently, in relation to the Facility and its immediate receiving environment it is reasonable to predict a general steady baseline soundscape would be maintained.

10.7 Potential Impacts

Embedded Mitigation

10.7.1 As part of the Facility design, embedded mitigation measures have been proposed to reduce potential impacts on Noise and Vibration and are detailed in **Table 10.30**. These measures are considered standard industry practice for this type of the development.

10.7.2 Good environmental practices during construction works will be followed in accordance with BS5228:2009+A1:2014.

10.7.3 Embedding mitigation into the Facility design is a type of primary mitigation and is an inherent aspect of the EIA process.

10.7.4 The PEIR assessment provides indicative information on the level of mitigation which may be required within the final design of the Facility.

Table 10.30 Embedded Mitigation for Noise and Vibration

Parameter	Embedded mitigation for noise and vibration	Notes
Operation of Boston Alternative Energy Facility	The Application Site will operate and be managed by adhering to Development Consent Order (DCO) requirements at the site. Applying the principles of Best Available Techniques (BAT) when designing the Facility and for any sound emitting mobile and fixed plant. The principle of BAT ensures that suitable mitigation measures are embedded into the design and operation of the installation.	See **Section 10.7** for more details on potential impacts during operation.
Construction	An Outline Code of Construction Practice (OCoCP) in line with requirements detailed in BS5228:2009+A1:2014 to minimise noise and vibration impacts will be implemented by the Principal Contractor for adoption during construction.	See **Section 10.7** for more details on potential impacts during construction.

Worst Case

10.7.5 This section establishes the Worst Case Scenario (WCS) for each key impact category, forming the basis for the subsequent impact assessment.

10.7.6 A description of the Facility is provided within **Chapter 5 Project Description**.

10.7.7 For the noise and vibration chapter, only those design parameters with the potential to influence the level of impact to relevant receptors are identified. Therefore, if the design parameter is not described below in **Table 10.31**, it is not considered to have a material bearing on the outcome of this assessment.

Table 10.31 Worst Case Assumptions

Impact	Parameter
Construction	
Impacts relating to the construction of the Facility.	Temporary off-site highway related traffic movements. Temporary, on-site mobile plant and activity associated with the construction of the development, including buildings, infrastructure, through demolition, groundworks, foundations, steel erection, piling and concrete slip-forming.
Operation	
Impacts relating to the operation of the Facility.	Off-site highway related traffic movements. On-site fixed and mobile plant associated with the operation of the Facility. Vessel movements to and from the wharf.
Decommissioning	

Impact	Parameter
Impacts relating to the decommissioning of the Application Site.	No decision has been made regarding the final decommissioning policy for the Facility. It is recognised that industry best practice, rules and legislation change over time. However, the Facility will likely be removed or refurbished. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant authorities. A decommissioning plan will be provided. As such, for the purposes of a worst case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.

Potential Impacts during Construction

Impact 1: Increased Noise on Sensitive Receptors from On-Site Construction

10.7.8 Construction impacts will be temporary in nature and include noise and vibration generating activities associated with:

- Earthworks and general construction activities at the site, along the wharf and flood defence;
- Piling works during the wharf construction; and
- Heavy goods vehicles (HGVs) delivering to site.

10.7.9 Temporary increases in noise levels at nearby receptors are expected during the construction of the Facility. Estimates of these temporary noise increases were undertaken using the nationally recognised code of practice for construction noise; BS5228:2009+A1:2014 Code of practice for noise and on construction and open sites, Part 1: Noise and Part 2: Vibration.

10.7.10 It is recommended that an Outline Code of Construction Practice is provided pursuant to a suitable wording in the DCO to cover construction working practices (which can reflect Section 72 of COPA and which requires a contractor to use "Best Practicable Means", to minimise noise from construction works). An OCoCP can include:

- Informing local residents about the construction works, including the timing and duration of any particularly noisy elements, and providing a contact telephone number to them;
- Avoiding operating particularly noisy equipment at the beginning and end of the day;
- Carrying out any piling using the quietest methods available, i.e. augured piling instead of driven piling;

- Keeping potentially noisy deliveries, such as skips ad concrete, to the middle or less sensitive times of the day where possible;
- Locating noisy static plant, such as diesel generators, away from residential properties;
- Using the most modern equipment available and ensuring equipment is properly maintained; and
- Where possible, using silencers/mufflers on equipment.

10.7.11 Although the combined effect of adopting such methods cannot be quantified, it is expected that these methods would reduce noise levels by some 5 - 10dB.

10.7.12 To ensure impacts are mitigated as far as reasonably possible, the aforementioned standard mitigation, coupled with more site-specific solutions such as the use of screening, temporary noise barriers and/or temporary spoil bunds, could be applied.

10.7.13 Careful scrutiny of plant selection at procurement stage would ensure that the associated noise impact of the aforementioned plant is reduced as much as reasonably possible.

10.7.14 As an example of the relative effectiveness of applying a temporary localised noise barrier BS 5228 states:

> *"as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation."*

10.7.15 There are several 'best practice' measures that should always be implemented to minimise vibration impacts while retaining productive efficiency. Examples include:

- choosing alternative, lower impact equipment or methods wherever possible;
- scheduling the use of vibration-causing equipment, at the least sensitive time of day;
- routing, operating or locating high vibration sources as far away from sensitive areas as possible;

- sequencing operations so that vibration-causing activities do not occur simultaneously;
- isolating the equipment causing the vibration on resilient mounts; and
- keeping equipment well maintained.

Impact 2: Increased Noise on Sensitive Receptors from Off-Site Construction Traffic

Magnitude of impact

10.7.16 **Table *10.32* 10.32** shows road links identified as carrying construction traffic. All road links have been assessed further by undertaking calculations of basic noise level (BNL). Assessment against the 2021 baseline is presented in **Table 10.32.**

Table 10.32 Calculated BNL – 2021 Baseline + Growth vs. 2021 Baseline + Growth + Average Construction Traffic

Link ID	Description	Speed (mph)	2021 Baseline + Growth BNL, dBA $L_{10,18\ hr}$	2021 Baseline + Growth + Average Construction Traffic BNL, dBA, $L_{10,18\ hr}$	Overall Change dBA	Impact Magnitude
1	Marsh Lane - East of Wyberton Low Road junction	30	66.9	67.4	0.5	Negligible
2	Marsh Lane - West of Wyberton Low Road junction	30	67.8	68.2	0.4	Negligible
3	A16 - South of Marsh Lane Roundabout	40	72.5	72.7	0.2	Negligible
4	A16 - North of Marsh Lane Roundabout	40	73.3	73.4	0.1	Negligible
5	A16 Spalding Road	40	73.8	73.9	0.1	Negligible
6	A55 Liquorpond Street	30	72.0	72.2	0.2	Negligible
7	A16 John Adams Way	30	73.8	73.9	0.1	Negligible
8	B1397 London Road	30	68.1	68.1	0.0	No change

Link ID	Description	Speed (mph)	2021 Baseline + Growth BNL, dBA $L_{10,18\ hr}$	2021 Baseline + Growth + Average Construction Traffic BNL, dBA, $L_{10,18\ hr}$	Overall Change dBA	Impact Magnitude
9	Wyberton Low Road	30	61.1	61.1	0.0	No change
10	Nursery Road / Lealand Way	30	60.5	62.3	1.8	Minor
11	Marsh Lane	30	63.5	63.5	0.0	No change
12	Bittern Way	30	58.2	58.2	0.0	No change

10.7.17 **Table 10.33** presents the peak construction traffic year from the start of construction and is considered the worst case scenario for assessment.

Table 10.33 Calculated BNL – 2021 Baseline + Growth vs. 2021 Baseline + Growth + Peak Construction Traffic

Link ID	Description	Speed (mph)	2021 Baseline + Growth BNL, dBA $L_{10,18\ hr}$	2021 Baseline + Growth + Peak Construction Traffic BNL, dBA, $L_{10,18\ hr}$	Overall Change dBA	Impact Magnitude
1	Marsh Lane - East of Wyberton Low Road junction	30	66.9	70.0	3.0	Moderate
2	Marsh Lane - West of Wyberton Low Road junction	30	67.8	70.5	2.6	Minor
3	A16 - South of Marsh Lane Roundabout	40	72.5	73.7	1.3	Minor
4	A16 - North of Marsh Lane Roundabout	40	73.3	74.3	1.1	Minor
5	A16 Spalding Road	40	73.8	74.7	1.0	Negligible
6	A55 Liquorpond Street	30	72.0	73.2	1.2	Minor
7	A16 John Adams Way	30	73.8	74.6	0.8	Negligible

Link ID	Description	Speed (mph)	2021 Baseline + Growth BNL, dBA $L_{10,18\ hr}$	2021 Baseline + Growth + Peak Construction Traffic BNL, dBA, $L_{10,18\ hr}$	Overall Change dBA	Impact Magnitude
8	B1397 London Road	30	68.1	68.1	0.0	No change
9	Wyberton Low Road	30	61.1	61.1	0.0	No change
10	Nursery Road / Lealand Way	30	60.5	67.9	7.4	Major
11	Marsh Lane	30	63.5	63.5	0.0	No change
12	Bittern Way	30	58.2	58.2	0.0	No change

Sensitivity of receptor

10.7.18 Road traffic receptors are all considered to be of a medium sensitivity (residential) to provide a conservative assessment.

Significance of effect

10.7.19 **Table 10.32** shows that predicted impacts for the average construction traffic scenario are at worst of a minor adverse impact magnitude at Link 10. For all other assessed links, the impact magnitude is of No change or Negligible adverse.

10.7.20 **Table 10.33** shows that predicted impacts are at worst of a major adverse impact magnitude at Link 10 for the peak construction traffic scenario. Link 8, 9, 11 and 12 were determined as No change, Link 5 and 7 Negligible adverse, Link 2, 3, 4 and 6 as Minor Adverse, and Link 1 as a Moderate adverse impact magnitude.

Results

10.7.21 For the average construction traffic scenario, in accordance with **Table 10.8** at a medium sensitivity receptor this is a **minor adverse** significance using the matrix presented in **Table 10.24** as a worst case. This is not considered significant in EIA terms, the impact is temporary, infrequent, short-term and local, therefore no additional mitigation is required.

10.7.22 For the peak construction traffic in accordance with **Table 10.8** at a medium sensitivity receptor this is a **major adverse** significance using the matrix presented in **Table 10.24** as a worst case. For all other medium sensitivity receptors the impact significance is **negligible adverse** (4 links), **minor adverse**

(6 links), and **moderate adverse** for 1 link. The **moderate** and **major adverse** impacts are considered significant in EIA terms, therefore, mitigation is required, however; the impact is temporary, short-term, infrequent and local.

Mitigation Measures

10.7.23 Development of a Traffic Management Plan to reduce the traffic flows along affected links will reduce the impact magnitude and the relative noise change along these links.

Residual Impacts

10.7.24 Following the implementation of a Traffic Management Plan, the impact magnitude is expected to reduce to minor during the peak construction traffic scenario; this is a **minor adverse** significance using the matrix presented in **Table 10.24**. This is not considered significant in EIA terms, the impact is temporary, short-term, infrequent and local.

Impact 3 Construction Vibration

10.7.25 Operation of Piling rigs and ancillary equipment is expected to produce the greatest vibration impacts and is therefore taken forward as the worst case for vibration assessment.

10.7.26 Vibration levels decay very rapidly with distance from a source (BS 5228-2:2009+A1:2014). A representative example of Piling is given within **Table 10.10** and **Table 10.11**.

10.7.27 Given the separation distances between sources of vibration during the construction works and the nearest sensitive receptors it is clear that PPV levels would be below the criteria outlined in **Table 10.12** at the receptors around the proposed application site. Vibration impacts from construction works would be of negligible magnitude on receptors of medium sensitivity and therefore of **minor adverse** significance. Therefore, no additional mitigation is required.

Potential Impacts during Operation

Impact 1 Increased Daytime Noise on Sensitive Receptors from The Boston Alternative Energy Facility

10.7.28 The impact assessment has been undertaken using the unmitigated worst case scenario for the potential components that could be used at the proposed development and based on the fixed, mobile and servicing plant requirements detailed in **Table 10.14**, **Table 10.15**, and **Table 10.16**.

10.7.29 Operations at the proposed development are proposed 24 hours a day. A detailed SoundPLAN noise model was created to assess noise levels because of the proposed plant required. Ground absorption was incorporated into the SoundPLAN model using a coefficient of 0 to represent hard ground between the sound sources and receiver for the topographical data.

10.7.30 Calculated operational noise levels have been determined at GF – Ground Floor (Daytime) level and compared with the background noise levels at each receptor, which have been derived from the measured baseline noise data contained within **Appendix 10.1**.

10.7.31 The impact of the predicted unmitigated noise levels from the proposed development at surrounding residential receptors (medium sensitivity) are presented in **Table 10.34**.

Table 10.34 Predicted Operational Noise Impact - Daytime

Name	Receptor Sensitivity	Measured Background Noise Level (dBA)	Predicted Rating Noise Level Daytime	Difference (dBA)	BS4142 Impact magnitude	NPSE/PPG Category
R1	Medium	35.7	46.2	+10.5	Major	UAEL
R2	Medium	37.3	46.1	+8.8	Moderate	SOAEL
R3	Medium	41.3	43.7	+2.4	Negligible	LOAEL
R4	Medium	43.9	42.7	-1.2	No Impact	NOEL
R5	Medium	44.1	34.4	-9.7	No Impact	NOEL
R6	Medium	42.4	35.1	-7.3	No Impact	NOEL

Magnitude of impact

10.7.32 Using the BS4142 criteria detailed in **Table 10.13**, the predicted noise levels shown in **Table 10.34** show that noise levels would be of no impact magnitude at receptors R4, R5 and R6 and negligible impact magnitude at R3.

10.7.33 A **moderate** and **major adverse** impact is predicted at R2 and R1 respectively using the BS4142 criteria.

Sensitivity of receptor

10.7.34 All receptors are of medium sensitivity.

Significance of effect

10.7.35 Using the BS4142 criteria detailed in **Table 10.13** and combined with the impact significance matrix presented in **Table 10.24**, a n**egligible adverse** impact is expected at receptor R4, R5 and R6 and a m**inor adverse** impact is expected at receptor R3.

10.7.36 Using the BS4142 criteria detailed in **Table 10.13** combined with the impact significance matrix presented in **Table 10.24**, a m**oderate adverse** impact is expected at R2 and a m**ajor adverse** impact is expected at receptor R1.

Results

10.7.37 Impacts at receptor R3, R4, R5 and R6 are not considered significant in EIA terms, the impact is continuous, long-term and local.

10.7.38 Impacts at receptor R2, and R1 are considered significant in EIA terms, the impact is major, continuous, long-term and local.

Mitigation Measures

10.7.39 Analysis of the predicted operational noise levels at receptor R1 to R6 identified the Air Cooled Condensers as the dominant noise source. Mitigation in the form of attenuating the noise level at source is required by approximately 10dBA. This can be achieved by altering the design of this site element, for example by additional cladding to the unit.

10.7.40 The impact of the predicted mitigated noise levels from the proposed development at surrounding residential receptors (medium sensitivity) are presented in **Table 10.35**.

Table 10.35 Predicted Operational Noise Impact - Daytime

Name	Receptor Sensitivity	Measured Background Noise Level (dBA)	Predicted Rating Noise Level Daytime	Difference (dBA)	BS4142 Impact magnitude	NPSE/PPG Category
R1	Medium	35.7	39.5	+3.8	Minor	OAE
R2	Medium	37.3	41.0	+3.7	Minor	OAE
R3	Medium	41.3	41.6	+0.3	Negligible	LOAEL
R4	Medium	43.9	38.2	-5.7	No Impact	NOEL
R5	Medium	44.1	33.7	-10.4	No Impact	NOEL
R6	Medium	42.4	30.6	-9.6	No Impact	NOEL

Residual Impacts

10.7.41 Impacts at receptor R1, R2, R3, R4, R5 and R6 are not considered significant in EIA terms, the impact is continuous, long-term and local.

Impact 2 Increased Night time Noise on Sensitive Receptors from The Boston Alternative Energy Facility

10.7.42 The impact assessment has been undertaken using the unmitigated worst case scenario for the potential components that could be used at the proposed development and based on the fixed, mobile, servicing plant requirements detailed in **Table 10.14**, **Table 10.15**, and **Table 10.16**.

10.7.43 Calculated operational noise levels have been determined at 1st Floor levels (Night time) and compared with the background noise level at each receptor, which have been derived from the measured baseline noise data contained within **Appendix 10.1**.

10.7.44 The impact of the predicted unmitigated noise levels from the proposed development at surrounding residential receptors (medium sensitivity) are presented in **Table 10.36**.

Table 10.36 Predicted Operational Noise Impact – Night time

Name	Receptor Sensitivity	Measured Background Noise Level (dBA)	Predicted Rating Noise Level Night time	Difference (dBA)	BS4142 Impact magnitude	NPSE/PPG Category
R1	Medium	39.0	46.2	+8.8	Moderate	OAE
R2	Medium	40.0	46.0	+6.0	Moderate	OAE
R3	Medium	43.0	43.6	+0.6	Negligible	LOAEL
R4	Medium	46.0	43.3	-2.7	No Impact	NOEL
R5	Medium	47.5	36.2	-11.3	No Impact	NOEL
R6	Medium	41.2	36.4	-4.8	No Impact	NOEL

Magnitude of impact

10.7.45 Using the BS4142 criteria detailed in **Table 10.13**, the predicted noise levels shown in **Table 10.36** show that noise levels would be of no impact magnitude at receptors R4, R5 and R6 and a **negligible** adverse impact is predicted at R3.

10.7.46 A **moderate** adverse impact is predicted at R2 and R1 using the BS4142 criteria.

Sensitivity of receptor

10.7.47 All receptors are of medium sensitivity.

Significance of effect

10.7.48 Using the BS4142 criteria detailed in **Table 10.13** and combined with the impact significance matrix presented in **Table 10.24**, a **negligible adverse** impact is expected at receptor R4, R5 and R6 and a **minor adverse** impact is expected at receptor R3.

10.7.49 Using the BS4142 criteria detailed in **Table 10.13** combined with the impact significance matrix presented in **Table 10.24**, a **moderate adverse** impact is expected at receptors R1 and R2.

Results

10.7.50 Impacts at receptor R3, R4, R5 and R6 are not considered significant in EIA terms, the impact is continuous, long-term and local.

10.7.51 Impacts at receptor R2, and R1 are considered significant in EIA terms, the impact is moderate, continuous, long-term and local.

Mitigation Measures

10.7.52 As described above the Air Cooled Condensers were identified as the dominant noise source. Mitigation in the form of attenuating the noise level at source (as suggested above) is required by approximately 10dBA.

10.7.53 The impact of the predicted mitigated noise levels from the proposed development at surrounding residential receptors (medium sensitivity) are presented in **Table 10.37**.

Table 10.37 Predicted Operational Noise Impact – Night time

Name	Receptor Sensitivity	Measured Background Noise Level (dBA)	Predicted Rating Noise Level Night time	Difference (dBA)	BS4142 Impact magnitude	NPSE/PPG Category
R1	Medium	39.0	41.0	+2.0	Negligible	LOAEL
R2	Medium	40.0	40.8	+0.8	Negligible	LOAEL
R3	Medium	43.0	41.7	-1.3	No Impact	NOEL
R4	Medium	46.0	42.7	-3.3	No Impact	NOEL
R5	Medium	47.5	35.9	-11.6	No Impact	NOEL
R6	Medium	41.2	32.6	-8.6	No Impact	NOEL

Residual Impacts

10.7.54 Impacts at receptor R1, R2, R3, R4, R5 and R6 are not considered significant in EIA terms, the impact is continuous, long-term and local.

Impact 3: Increased Noise on Sensitive Receptors from Off-Site Operational Traffic

Magnitude of impact

10.7.55 **Table *10.32*Table 10.38** shows road links identified as carrying operational traffic. All road links have been assessed further by undertaking calculations of basic noise level (BNL). Assessment against the 2025 baseline is presented in **Table 10.38**.

Table 10.38 Calculated BNL – 2025 Baseline + Growth vs. 2025 Baseline + Growth + Peak Operational Traffic

Link ID	Description	Speed (mph)	2025 Baseline + Growth BNL, dBA $L_{10,18\ hr}$	2025 Baseline + Growth + Average Operational Traffic BNL, dBA, $L_{10,18\ hr}$	Overall Change dBA	Impact Magnitude
1	Marsh Lane - East of Wyberton Low Road junction	30	67.2	67.5	0.2	Negligible
2	Marsh Lane - West of Wyberton Low Road junction	30	68.1	68.3	0.2	Negligible
3	A16 - South of Marsh Lane Roundabout	40	72.8	72.8	0.1	No change
4	A16 - North of Marsh Lane Roundabout	40	73.6	73.6	0.1	No change
5	A16 Spalding Road	40	74.1	74.1	0.1	No change
6	A55 Liquorpond Street	30	72.3	72.4	0.1	No change
7	A16 John Adams Way	30	74.1	74.1	0.0	No change
8	B1397 London Road	30	68.3	68.4	0.0	No change
9	Wyberton Low Road	30	61.4	61.4	0.0	No change
10	Nursery Road / Lealand Way	30	60.8	61.8	1.0	Negligible
11	Marsh Lane	30	63.8	63.8	0.0	No change
12	Bittern Way	30	58.5	58.5	0.0	No change

Sensitivity of receptor

10.7.56 Road traffic receptors are all considered to be of a medium sensitivity (residential) to provide a conservative assessment.

Significance of effect

10.7.57 **Table 10.38** shows that predicted impacts are at worst of a negligible adverse impact magnitude for the peak operational traffic scenario.

Results

10.7.58 For the peak operational traffic in accordance with **Table 10.18** at a medium sensitivity receptor this is a **negligible adverse** significance using the matrix presented in **Table 10.24**. This is not significant in EIA terms; the impact is continuous, long-term and local.

Mitigation Measures

10.7.59 Mitigation measures are not required as the impact is not significant in EIA terms.

Residual Impacts

10.7.60 For the peak operational traffic in accordance with **Table 10.18** at a medium sensitivity receptor this is a **negligible adverse** significance using the matrix presented in **Table 10.24**. The impact is continuous, long-term and local.

Impact 4 Operational Vessel Movements

10.7.61 The impact of the predicted daytime operational noise levels from the proposed vessel movements to and from the Facility at surrounding residential receptors (medium sensitivity) are presented in **Table 10.39**. The assessment was based on a 1 hr reference period to present a conservative approach.

Table 10.39 Predicted Daytime Operational Noise Impact – Vessels

Name	Receptor Sensitivity	Measured Ambient Daytime Noise Level $L_{Aeq,T}$ (dBA)	Predicted Noise Level Daytime $L_{Aeq,T}$ (dBA)	Combined absolute noise level Daytime $L_{Aeq,T}$ (dBA)	Change in Absolute Noise Level (dBA)	Impact magnitude	NPSE/PPG Category
R1	Medium	50.0	14.0	50.0	0.0	No Impact	NOEL
R2	Medium	49.6	16.4	49.6	0.0	No Impact	NOEL
R3	Medium	51.6	21.0	51.6	0.0	No Impact	NOEL
R4	Medium	57.5	31.7	57.5	0.0	No Impact	NOEL
R5	Medium	61.4	30.6	61.4	0.0	No Impact	NOEL
R6	Medium	52.7	40.1	52.9	+0.2	Negligible	LOAEL

Sensitivity of receptor

10.7.62 Vessel traffic receptors are all considered to be of a medium sensitivity (residential) to provide a conservative assessment.

Significance of effect

10.7.63 **Table 10.39** shows that predicted impacts are at worst of a negligible adverse impact magnitude for the peak operational vessel traffic scenario.

Results

10.7.64 For the peak operational vessel traffic in accordance with **Table 10.19** at a medium sensitivity receptor this is a **negligible adverse** significance using the matrix presented in **Table 10.24**. This is not significant in EIA terms; the impact is continuous, long-term and local.

Mitigation Measures

10.7.65 Mitigation measures are not required as the impact is not significant in EIA terms.

10.7.66 The impact of the predicted night-time operational noise levels from the proposed vessel movements to and from the Facility at surrounding residential receptors (medium sensitivity) are presented in **Table 10.40**. The assessment was based on a 1 hr reference period to present a conservative approach.

Table 10.40 Predicted Night time Operational Noise Impact – Vessels

Name	Receptor Sensitivity	Measured Ambient Night time Noise Level $L_{Aeq,T}$ (dBA)	Predicted Noise Level Night time $L_{Aeq,T}$ (dBA)	Combined absolute noise level Night time $L_{Aeq,T}$ (dBA)	Change in Absolute Noise Level (dBA)	Impact magnitude	NPSE/PPG Category
R1	Medium	39.4	8.6	39.4	0.0	No Impact	NOEL
R2	Medium	37.3	8.7	37.3	0.0	No Impact	NOEL
R3	Medium	42.1	15.3	42.1	0.0	No Impact	NOEL
R4	Medium	52.7	31.0	52.7	0.0	No Impact	NOEL
R5	Medium	55.6	25.6	55.6	0.0	No Impact	NOEL
R6	Medium	46.5	35.1	46.8	+0.3	Negligible	LOAEL

Sensitivity of receptor

10.7.67 Vessel traffic receptors are all considered to be of a medium sensitivity (residential) to provide a conservative assessment.

Significance of effect

10.7.68 **Table 10.40** shows that predicted impacts are at worst of a negligible adverse impact magnitude for the peak operational vessel traffic night time scenario.

Results

10.7.69 For the peak operational vessel traffic in accordance with **Table 10.19** at a medium sensitivity receptor this is a **negligible adverse** significance using the matrix presented in **Table 10.24**. This is not significant in EIA terms; the impact is continuous, long-term and local.

Mitigation Measures

10.7.70 Mitigation measures are not required as the impact is not significant in EIA terms.

Residual Impacts

10.7.71 For the peak operational vessel traffic in accordance with **Table 10.19** at a medium sensitivity receptor this is a **negligible adverse** significance using the matrix presented in **Table 10.24**. The impact is continuous, long-term and local.

Impact 5 Operational Vibration

10.7.72 Operation of the Facility is not expected to produce significant vibrational impacts due to embedded engineering design to minimise vibrational effects on the plant at source, thus minimising transmission of vibration to the surrounding structures and environment. An example is the incorporation of a concrete slab for mounting of plant in the Turbine Hall to provide sufficient isolation.

10.7.73 Given the separation distances between sources of vibration during the operational phase and the nearest sensitive receptors it is expected that PPV levels would be below the criteria outlined in **Table 10.12** at the receptors around the proposed application site. Vibration impacts would be of no impact magnitude on receptors of medium sensitivity and therefore of **negligible adverse** significance. Therefore, no additional mitigation is required.

Potential Impacts during Decommissioning

Impact 1

10.7.74 No decision has been made regarding the final decommissioning policy for the Facility as it is recognised that industry best practice, rules and legislation change over time. However, the Facility will likely be removed and be reused or recycled.

10.7.75 The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the relevant authorities. A decommissioning plan will be provided. As such, for the purposes of a worst case scenario, impacts no greater than those expected for the construction phase are expected for the decommissioning phase.

10.8 Cumulative Impacts

10.8.1 The assessment of cumulative impacts has been undertaken here as a two-stage process. Firstly, all the impacts from previous sections have been assessed for potential to act cumulatively with other projects. This summary assessment is set out in **Table 10.41**.

Table 10.41 Potential Cumulative Impacts

Impact	Potential for cumulative impact	Rationale
Construction		
Other proposed and consented developments and their associated road traffic.	Yes	There is potential for impacts associated with noise and vibration generated during the construction phase site works to lead to a cumulative impact with other proposed developments (already consented and those in the planning system) where the construction phases of other schemes overlap with the Boston Alternative Energy Facility and where activities will occur in proximity to the same receptors. There is a potential for a cumulative impact associated with construction phase road traffic to occur during the Facility construction in conjunction with other proposed schemes. Further details are contained within **Chapter 19 Traffic and Transport**.
Operation		
Other industrial processes within the vicinity of the Facility	Yes	There is a potential for a cumulative impact associated with operational phase to occur during operation of the Facility in conjunction with other operational noise sources within the vicinity of the Facility. Implementation of appropriate

Impact	Potential for cumulative impact	Rationale
		mitigation within the detail design should ensure that any impacts will be of negligible significance.
Decommissioning		
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.		

10.8.2 The projects identified for potential cumulative impacts with the Facility have been discussed with Boston Borough Council. **Table 10.42** summarises those projects which have been scoped into the CIA due to their temporal or spatial overlap with the potential effects arising from the Facility.

Table 10.42 Summary of Projects Considered for the CIA in Relation to the Topic

Project	Status	Development period	Distance from the Facility (km)	Project definition	Project data status	Included in CIA	Rationale
Boston Barrier Flood Defence	Transport and Works Act Order consented	2017 - ongoing	Boston Barrier at closest point to the Application Site is 500 m.	Environmental Statement	Complete/high	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction. It is expected that this development will implement site-specific measures to mitigate noise associated with construction works which would be implemented as part of a CoCP.
Triton Knoll Offshore Wind Farm	DCO consented	2008 - ongoing	Onshore cable corridor and Construction compound at Langrick 9.7 km from the Application Site	Environmental Statement	Complete/ high	No	Triton Knoll Sequencing Document ((J.Murphys, 2018) document indicates a construction finish of Q3 2019. Which is before the 2021 start of the Facility construction.
Viking Link Interconnector B/17/0340	Application approved	2014 - 2023	Bicker Fen substation 14.4 km from the Application Site	Environmental Statement	Incomplete	No	Given the large separation distances between the projects it is considered that significant cumulative impacts are not likely to arise.
Battery Energy Storage Plant (Marsh Lane) B/17/0467	Application approved	2017 - ongoing	Beeston Farm less than 10 m from the Application Site	Detailed application	Incomplete	No	Given the large separation distances between the projects it is considered that significant cumulative impacts are not likely to arise.

Project	Status	Development period	Distance from the Facility (km)	Project definition	Project data status	Included in CIA	Rationale
The Quadrant Mixed-use development of 502 dwellings and commercial/ leisure uses B/14/0165	Application approved Construction started	2014 – ongoing	Quadrant 1 1.2 km from the Application Site	Details within ES	Quadrant 1 – Complete/ high Quadrant 2 - Incomplete/low	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction. It is expected that this development will implement site-specific measures to mitigate noise associated with construction works which would be implemented as part of a CoCP.
Land to the west of Stephenson Close Residential Development of up to 85 dwellings B/17/0515	Application not yet determined	2017 – ongoing	From the most eastern part of the Scheme to the Application Site is 550 m.	Outline only	Incomplete/low	No	Given the separation distance between the projects it is considered that significant cumulative impacts are not likely to arise. Operational phase impacts from the Facility have been assessed at closer receptors than these future receptors; therefore the impact is not expected to be significant. It is expected that this development will implement site-specific measures to mitigate noise associated with construction works which would be implemented as part of a CoCP.

10.9 Transboundary Impacts

10.9.1 There are no transboundary impacts with regards to noise and vibration as the Facility area including access would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

10.10 Inter-Relationships with Other Topics

10.10.1 There are inter-relationships with the following chapters with regard to the environmental impact of noise emissions generated by road traffic, vessel movements and from fixed and mobile plant during the construction and operation of the Facility, as detailed in **Table 10.43**.

Table 10.43 Noise and Vibration Inter-Relationships

Topic and description	Related Chapter	Where addressed in this chapter	Rationale
Construction related traffic noise impacts	**Chapter 8 Cultural Heritage;** **Chapter 12 Terrestrial Ecology;** **Chapter 18 Navigational Issues;** **Chapter 19 Transport;** **Chapter 20 Socio-Economics; and** **Chapter 22 Health Impacts.**	**Section 10.7**	There could be potential noise impacts related to the construction phase traffic and from construction works at the Facility.
Operational noise impacts	**Chapter 8 Cultural Heritage;** **Chapter 12 Terrestrial Ecology;** **Chapter 18 Navigational Issues;** **Chapter 19 Transport;** **Chapter 20 Socio-Economics; and** **Chapter 22 Health Impacts.**	**Section 10.7**	There could be potential impacts as a result of operational noise from the Facility.

10.11 Interactions

10.11.1 The impacts identified above have the potential to interact with each other,

which could give rise to synergistic impacts because of that interaction. The interactions are detailed in **Table 10.44**.

Table 10.44 Interaction between impacts

Potential interaction between impacts		
Construction		
	1 Construction Traffic using Highways and Watercourses	**2 Construction related activities/plant**
1 Construction traffic using Highways and Watercourses	-	Yes
2 Construction related activities and plant	Yes	-
Operation		
	1 Operational noise at Ecological receptors	**2 Operational noise at Human receptors**
1 Operational noise at Ecological receptors	-	No
2 Operational noise at Human receptors	No	-
Decommissioning		
It is anticipated that the decommissioning impacts will be no worse than those of construction.		

10.12 Summary

10.12.1 An assessment of construction and operational phase noise and vibration impacts was undertaken based on the available information at PEIR.

10.12.2 A summary of the findings of the PEIR for noise and vibration is presented in **Table 10.45**. In accordance with the assessment methodology presented in **Section 10.4**, this table should only be used in conjunction with the additional narrative explanations provided in **Section 10.7**. This demonstrates that, post mitigation, all impacts have a maximum residual impact of **minor** significance during construction, and a **negligible** significance during the operational phase.

10.12.3 A summary of the potential noise and vibration impacts are detailed in **Table 10.45**.

Table 10.45 Impact Summary

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1: Increased Noise on Sensitive Receptors from On-Site Construction	Residential	Medium	To be assessed during ES stage.			
Impact 2: Increased Noise on Sensitive Receptors from Off-Site Construction Traffic	Residential	Medium	No Impact to Major Adverse	Negligible to Major Adverse	Traffic Management Plan	Minor Adverse
Impact 3: Construction Vibration	Residential	Medium	No Impact	Negligible to Minor Adverse	Best Practice Measures (BPM)	Negligible Adverse
Operation						
Impact 1 Increased Daytime Noise on Sensitive Receptors from The Boston Alternative Energy Facility	Residential	Medium	No Impact to Major	Negligible to Major Adverse	BPM, Noise attenuation from engineering, enhanced cladding and enclosure design, procurement of quieter design plant,	Negligible to Minor Adverse
Impact 2 Increased Night time Noise on Sensitive Receptors from The Boston Alternative Energy Facility	Residential	Medium	No Impact to Moderate	Negligible to Moderate Adverse	BPM, Noise attenuation from engineering, enhanced cladding and enclosure design, procurement	Negligible to Minor Adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
					of quieter design plant,	
Impact 3: Increased Noise on Sensitive Receptors from Off-Site Operational Traffic	Residential	Medium	No Impact to Negligible	Negligible Adverse	n/a	Negligible Adverse
Impact 4 Operational Vessel Movements	Residential	Medium	No Impact to Negligible	Negligible Adverse	n/a	Negligible Adverse
Impact 5 Operational Vibration	Residential	Medium	No Impact to Negligible	Negligible Adverse	n/a	Negligible Adverse
Decommissioning						
No decision has been made regarding the final decommissioning policy for the Facility as it is recognised that industry best practice, rules and legislation change over time. However, the Facility will likely be removed or retro-fitted to continue use. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the appropriate authority. A decommissioning plan will be provided. As such, for the purposes of a worst case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.						

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