17 NOISE AND VIBRATION

17.1 Introduction

This section of the EIA Report considers the potential airborne noise and vibration impacts of the proposed scheme. Specifically, this section provides an overview of the baseline noise environment, identifies potentially sensitive receptors to noise and vibration and predicts noise levels associated with construction and operational phases of the propoposed scheme at the receptor locations.

The assessment focuses on noise and vibration impacts at human receptors only. Noise predictions at waterbird and seabird receptor locations are outlined in this section; however, their impacts are assessed in **Section 12**. Cumulative noise and vibration impacts are addressed in **Section 27**.

17.2 Policy and consultation

17.2.1 Policy

Environmental Protection Act 1990
Section 79 of the Environmental Protection Act 1990 ('the EPA 1990') defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area.

The EPA 1990 also defines the concept of 'Best Practicable Means' (BPM) as:

- *"'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."*

Section 80 of the EPA 1990 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
Section 60 of the Control of Pollution Act 1974 provides powers to local planning authority officers to serve an abatement notice in respect of noise nuisance from construction works.

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 planning 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 Framework 2019
The National planning Policy Framnework (NPPF) was introduced in March 2012 replacing the former Planning Policy Guidance 24: Planning and Noise. It was revised in July 2018 and again in February 2019.

This document now forms the basis of the Government's planning policies for England and how these should be applied.

Paragraph 170 of the NPPF 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……"

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 impacts 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."

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

National Planning Practice Guidance for Noise

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 making decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Noise Policy Statement for England 2010

The Noise Policy Statement for England (NPSE) 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."*

The first two points require that significant adverse impacts 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).

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; and,

"LOAEL – Lowest Observed Adverse Effect Level; this is the level above which adverse effects on health and quality of life can be detected".

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).

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".

However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

17.2.2 Guidance

The guidance outlined in **Table 17.1** has been applied to the noise and vibration assessment.

Table 17.1 Relevant noise and vibration guidance

Document	Policy / guidance purpose
BS 5228-1:2009+A1:2014 (BS 5228-1) Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise	Part 1 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 Planning Authorities. This British Standard provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.
BS 7445-1:2003 (BS 7745-1) and BS 7445-2:1991 (BS 7445-2) – Description and Measurement of Environmental Noise	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}). BS 7445-2 replicates International Standards Organisation (ISO) 1996-2:1987.

Document	Policy / guidance purpose
Calculation of Road Traffic Noise (CRTN) 1988	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 (DMRB), 2020	LA111 Noise and Vibration, Revision 2 (formerly HD 213/11, IAN 185/15) provides guidance on the environmental assessment of noise impacts from road schemes. 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 9613-2:1996 (ISO 9613-2)	Specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a noise source.
WHO Guidelines for Community Noise, 1999 (WHO 1999)	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 55dB L_{Aeq} during the day, related to annoyance, and 45dB LAeq or 60dB L_{Amax} at night, related to sleep disturbance.
WHO Night Noise Guidelines for Europe, 2009 (WHO 2009)	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), an Lnight 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 Environmental Noise Guidelines for the European Region, 2018 (WHO 2018)	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.”

17.2.3 Consultation

Consulation with regards to noise and vibration has been undertaken with RCBC, the MMO and Natural England. Noise Sensitive Receptor (NSR) locations and the methodology for the impact assessment were agreed with the following elements of the proposed scheme to be considered: road traffic noise associated

with the construction phase; on-site construction noise at offices and other noise sensitive areas within the nearby industrial and business park (South Tees Business Parks); on-site construction noise at the identified waterbird and seabird receptor sites; and operational phase noise at the identified waterbird and seabird sites.

It has been agreed with the Environmental Health Officer (EHO) at RCBC that the following elements are not considered necessary within the assessment due to the seperation distance between the proposed scheme and potential sensitive receptors: vibration impacts, as well as construction and operational phase noise impacts at residential dwellings (**Appendix 3)**. In addition, it was agreed with the EHO that the assessment of operational phase noise impacts at commercial premesis is not necessary (see **Appendix 3**).

During the operational phase, the proposed scheme would generate approximately 20 vehicle movements per day; therefore, road traffic noise associated with the operational phase are deemed **not significant** and have not been considered further in the asessment.

17.3 Methodology

17.3.1 Study area

The study area for this section of the EIA Report is the area that has the potential to be directly and/or indirectly affected by noise associated with the proposed scheme during construction and operational phases. The study area comprises of noise sensitive receptors within South Tees Business Parks and the local road network affected by construction traffic.

17.3.2 Existing environment

Consideration of the existing noise environment was initially conducted by undertaking a desk-based study of existing available geographical information (including aerial and satellite photography and mapping data) in order to determine the nearest NSRs and noise sources present within the noise and vibration study area.

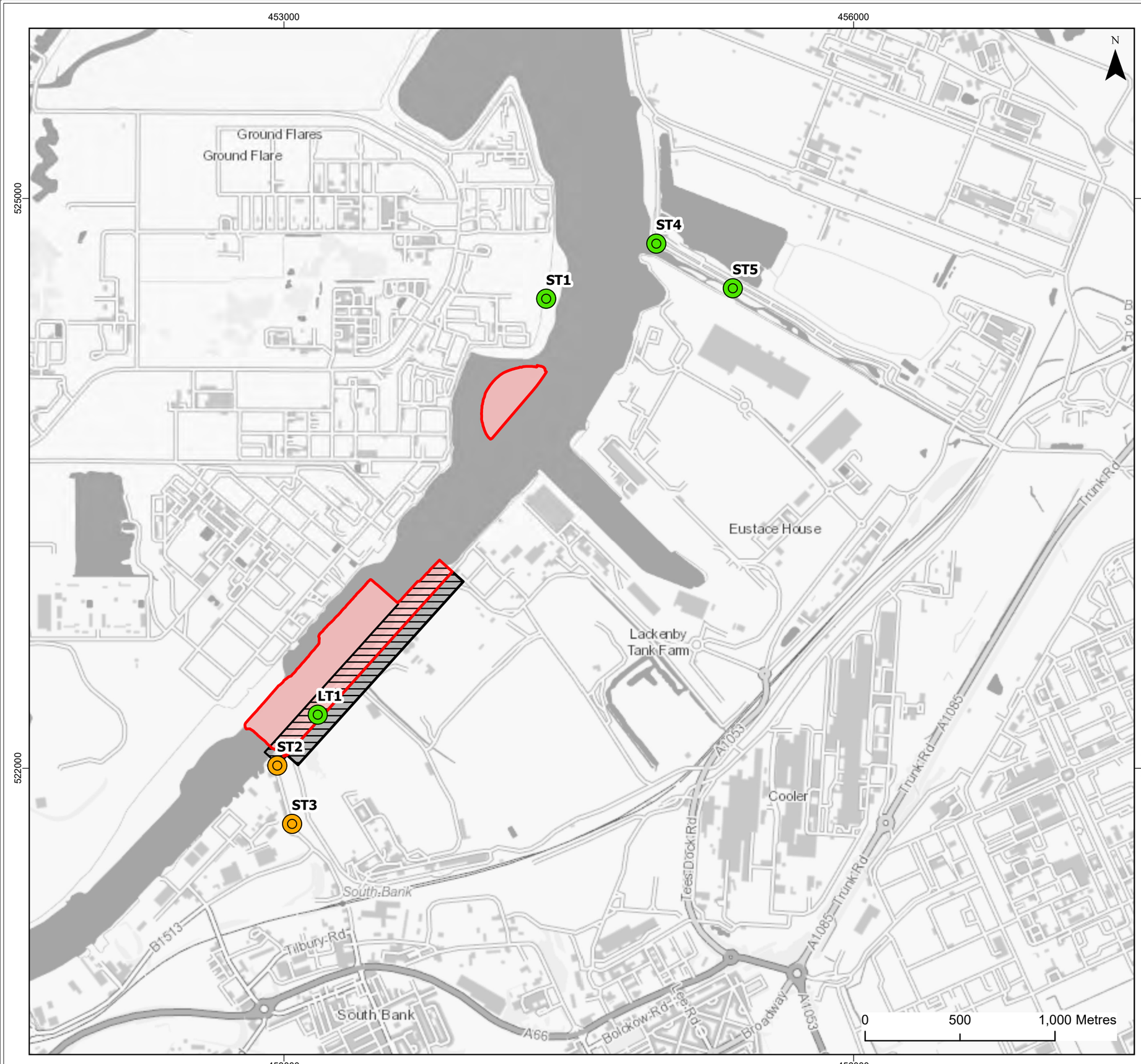
From the desk-based study and consultation with RCBC and Natural England, the NSR locations outlined in **Table 17.2** were identified.

Table 17.2 Noise sensitive receptor locations

Receptor ID	Description
NSR1	Offices and other noise sensitive areas within South Tees Business Parks
ECO1	Waterbird and seabird site at North Tees Mudflat
ECO2	Waterbird and seabird site at Vopak foreshore
ECO3	Waterbird and seabird site at Dabholme Gut

A baseline noise survey was undertaken between 10th and 11th September 2020 to determine the existing noise environment at the site and the surrounding area. Measurements of the ambient noise level were taken both on-site and at off-site locations that were representative of nearby NSRs that had the potential to be affected by the construction and operation of the proposed scheme. The nearest potential noise sensitive area within South Tees Business Parks was taken into account, on the premise that receptors further from the site will experience lower noise effects due to the increased separation distance.

Baseline noise survey monitoring locations are detailed in **Table 17.3** and displayed in **Figure 17.1**.



Legend

- Proposed Dredge and Excavation Envelope (including side slopes)
- Proposed Quay Envelope
- Proposed Demolition Area

Noise Monitoring Locations

Receptor type

- Ecological
- Human

Client:	Project:
Tees Valley Combined Authority	South Bank Quay

Title: Baseline Noise Survey Locations

Figure: 17.1

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	29/10/2020	TC	SC	A3	1:20,000

Co-ordinate system: British National Grid

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Table 17.3 Baseline noise survey locations

Measurement location	X	Y	Description	Dominant noise sources
LT1	453178	522282	Long term monitoring location at the proposed scheme footprint. Representative of receptor ECO1.	Noise from nearby industrial sites on both sides of the River Tees.
ST1	454381	524472	Short term monitoring at Vopak foreshore, representative of noise receptor ECO2.	Noise from wildlife and tidal movements. Noise from mechanical plant associated with nearby industrial premises audible and constant.
ST2	452965	522014	Short term monitoring at South Tees Business Parks / Teesport Commerce Park (Smith's Dock Road) representative of noise receptor NSR1.	Noise from adjacent industrial premises dominant. Impulsive noise from crane and material movements highly perceptible.
ST3	453043	521707	Short term monitoring at South Tees Business Parks / Teesport Commerce Park (Smith's Dock Road) representative of noise receptor NSR1.	Noise from adjacent industrial premises dominant. Impulsive noise from crane and material movements highly perceptible. Noise from safety alarms and mechanical plant also clearly audible.
ST4	454961	524762	Short term monitoring at the confluence of Dabholme Gut, representative of noise receptor ECO3.	Noise from mechanical plant associated with the nearby tunnel head house dominant. Impulsive noise from other nearby industrial just perceptible.
ST5	455364	524527	Short term monitoring at the centre of Dabholme Gut, representative of noise receptor ECO3.	Noise from nearby industrial premises dominant; specifically, noise from safety alarms, movement of materials/goods. Noise from wildlife also perceptible.

Sound Level Meters (SLM) were fully calibrated, traceable to UKAS standards and satisfied the requirements of BS EN 61672-1:20131F for a 'Class 1' SLM. The measurements were taken using a SLM and associated equipment detailed in **Table 17.4**.

Table 17.4 Noise survey instrumentation

Instrument	Type	Serial number	Calibration due date at time of survey
Sound Level Meter	Rion NL-52	00864982	2 November 2020
Preamp	Rion NH-25	65109	2 November 2020
Microphone	Rion UC-59	09912	2 November 2020
Sound Level Meter	Rion NL-52	00864983	30 October 2020
Preamp	Rion NH-25	65110	30 October 2020
Microphone	Rion UC-59	13790	30 October 2020
Calibrator	Rion NC-75	01020506	21 January 2021

Baseline survey measurements were conducted in accordance with the procedure described in BS 7445 parts 1 & 2, with the SLMs mounted on tripods at a height of between 1.2m and 1.5m above ground level and 3.5m away from any reflecting surface other than the ground, i.e. in free-field conditions. The instruments were calibrated before and after the survey using a portable calibrator with no significant drift noted.

For all measurement locations during the noise survey, SLMs were set to record the following:

- L_{Aeq} – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445;
- L_{Amax} – the maximum sound pressure level occurring within the defined measurement period;
- L_{A90} – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level; and,
- L_{A10} - the sound pressure level exceeded for 10% of the measurement period. The L_{A10} index is used within the CRTN as an appropriate descriptor of traffic noise.

A weather station was employed to record of the meteorological conditions during the survey. All noise monitoring periods during adverse weather conditions (i.e. precipitation or when average wind speeds exceed 5 m/s) have been removed and are not considered within the baseline noise survey results; as per the guidance within BS 7445.

17.3.3 Noise propogation calculations

Construction road traffic noise

In order to assess the noise impact of increased traffic flows along the local road network, Basic Noise Level (BNL) calculations were undertaken in accordance with CRTN using the 18-hour AAWT traffic flows. BNL calculations, outlined in CRTN Charts 3 applying HGV percentage corrections from Chart 4, were conducted for baseline, and construction phase traffic flows. The calculation uses the 18-hour AAWT traffic flows, HGV percentage and average vehicle speed to calculate the $L_{A10,18hour}$ at a reference distance of 10m from the nearest carriageway.

On-site construction and operational phase noise

To predict the noise from on-site plant to be used for the proposed scheme, the assessments utilised SoundPLAN noise modelling software. The software implements accepted national and international acoustic calculation standards.

Predicted noise levels at waterbird and seabird sites were undertaken in accordance with ISO 9613-2 for both construction and operational phases; accounting for spherical propagation, air absorption and acoustic screening due to the intervening buildings and structures between the receptor points and the on-site noise sources.

Predicted noise levels for on-site construction noise at human receptor locations were undertaken in accordance with the methodology described in BS 5228-1. On-site operational levels at human receptors were undertaken in accordance with ISO 9613-2.

A three-dimensional model was created using geo-referenced OS mapping data, topographical data of the local area incorporating buildings, plans and elevations of the site. All identified receptor points within the noise model were positioned at heights of 1.5m above the local ground level; keeping consistency with the measured baseline noise levels. Ground surfaces within the study area are generally considered ‘hard’ such as paved areas and waterbodies; therefore, an assumed ground factor of 0.0 was employed.

17.3.4 Impact assessment methodology

Receptor sensitivity

Definitions relating to the sensitivity of receptors considered within the noise assessment are presented in **Table 17.5**.

Table 17.5 Sensitivity level for noise receptors

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.
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.
Low	Receptor generally tolerant 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.

Magnitude of effect - construction road traffic noise

Increases in road traffic associated with the proposed scheme are determined by assessing the change in BNL. Impact magnitude criteria for construction traffic, as detailed in Table 3.17 of the DMRB, are displayed in **Table 17.6**. For clarity, an additional magnitude of effect criterion of **no impact** is introduced to represent no change in the predicted BNL.

Table 17.6 Construction road traffic noise magnitude of effect

Magnitude of effect	Increase in BNL of closest public road used for construction traffic (dB)
Major / high - very high	> 5.0
Moderate / medium	3.0 - 4.9
Minor / low	1.0 - 2.9
Negligible / very low	< 1.0
No change / no impact	0.0

It is believed that there are residential dwellings along several of the identified road links; therefore, a **medium** receptor sensitivity, as defined in **Table 17.5**, is assumed for the construction road traffic noise assessment.

Magnitude of effect - on-site construction noise

BS 5228-1 describes several methods for assessing noise impacts during construction projects. The assessment approach utilised in this assessment defines fixed noise thresholds for human receptors within the nearby business parks based on the example criteria provided in BS 5228-1.

The "5 dBA change" method, described in BS 5228-1 E3.3, specifies a construction noise limit based on the existing ambient noise level and for different periods of the day with respect to the pre-construction ambient noise level. The guidance states:

"Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from site noise alone, for the daytime, evening and night-time periods, respectively"

Therefore, daytime construction noise levels below the lower cut-off value, 65 dB $L_{Aeq.T}$, are considered **very low** magnitude at human NSRs within the nearby business park.

The "fixed noise limit" method, described in BS 5228-2 E.2, is derived from the Wilson Committee report where it is stated:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. The noise can be measured with a simple sound level meter, as we hear it, in A-weighted decibels (dB(A))– see note below. Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- *70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*

These limits are for daytime working outside living rooms and offices. In noise-sensitive situations, for example, near hospitals and educational establishments."

Daytime construction noise levels greater than 75 dBA at human NSRs within the nearby business park are therefore considered **very high** magnitude.

Guideline values in specific environments are outlined in WHO Guidelines for community noise (WHO 1999) with potential effects within industrial areas occurring at 70 dBA. A value of greater than 70 dBA is therefore considered **high** impact magnitude.

Receptors within the business park are only considered noise-sensitive during "typical" daytime office hours; between 07:00 and 19:00 hrs.

Construction phase noise impacts were assessed using the derived impact magnitude presented in **Table 17.7** for the daytime period.

Table 17.7 Daytime construction noise magnitude of effect

Magnitude of effect	Construction noise level, decibels (dB) ($L_{Aeq,T}$)
Very low	≤65
Low	>65 - <68
Medium	>68 - ≤70
High	>70 - ≤75
Very high	≥75

Human noise sensitive receptors for the on-site construction noise assessment are offices and other noise sensitive areas within the nearby business park; therefore, **low** receptor sensitivity is assumed in the subsequent assessment, as defined in **Table 17.5**.

17.4 Existing environment

Results from the baseline noise survey undertaken between 10th and 11th September 2020 are displayed in **Table 17.8**.

Table 17.9 Baseline noise survey results, dB

Measurement Location	Start Date and Time	Duration (hh:mm:ss)	$L_{Aeq,T}$	L_{AFmax}	L_{A10}*	L_{A90}*
LT1	10/09/20 11:09:00	11:51:00	49.3	74.6	49.2	45.8
LT1	10/09/20 23:00:00	03:36:00**	44.1	60.9	44.9	42.4
ST1	10/09/20 12:43:01	00:33:04	44.3	57.7	44.3	42.9
ST2	10/09/20 14:02:52	00:08:12	51.3	63.0	51.8	50.3
ST2	10/09/20 14:42:02	00:15:06	52.5	70.2	52.4	51.2
ST3	10/09/20 14:15:14	00:15:31	50.2	64.8	50.5	48.2
ST3	10/09/20 14:59:15	00:16:02	49.1	63.7	49.4	48.2
ST4	11/09/20 09:57:18	00:16:05	63.3	65.9	63.9	62.8
ST5	11/09/20 10:21:51	00:18:13	49.9	65.8	50.5	49.0

** Displayed as the as the arithmetic mean of the results during the reference period*
*** Measurements affected by prolonged period of adverse weather conditions*

17.5 Potential impacts during the construction phase

17.5.1 Construction road traffic noise

To inform the road traffic noise assessment, construction traffic data in the form of Annual Average Weekday Traffic (AAWT) flows and percentage Heavy Goods Vehicles (HGVs) on the surrounding road network were used; values are presented in **Table 17.9**.

Table 17.9 18-hour AAWT construction traffic flows

Link	Link description	Average speed (kph)	Baseline traffic flows		Baseline + construction traffic flows	
			18hr AAWT	HGV%	18hr AAWT	HGV%
1	Tees Dock Road	48.3	5,408	30.8	5,649	30.2
2	Old Station Road	48.3	5,612	15.9	5,854	15.9
3	Dockside Road	80.5	6,098	14.3	6,339	14.4
4	A66 (East)	80.5	53,719	7.8	53,896	7.9
5	A66 (West)	80.5	25,062	13.4	25,203	13.5
6	A1053	112.7	25,056	7.8	25,197	7.9

In accordance with the DMRB guidance, the change in predicted BNL along each link were calculated using the methodology outlined in CRTN. The calculation method accounts for HGV percentage and average road speed. Results for predicted construction road traffic impacts are shown in **Table 17.10**.

Table 17.10 Construction road traffic noise impact assessment

Link	Baseline BNL, $L_{A10,18hr}$ (dB)	Baseline + construction BNL, $L_{A10,18hr}$ (dB)	Change BNL (dB)	Magnitude of effect	Impact
1	69.7	69.8	0.1	Very low	Negligible
2	67.8	68.0	0.2	Very low	Negligible
3	70.3	70.5	0.2	Very low	Negligible
4	78.7	78.7	0.0	No Change	No Impact
5	76.3	76.4	0.1	Very low	Negligible
6	78.1	78.1	0.0	No Change	No Impact

Predicted changes in BNL, displayed in **Table 17.10**, indicate impacts of **negligible** significance at worst from the short term, local and reversible construction phase road traffic at the human receptors. This is considered **not significant**.

Mitigation measures and residual impact

No mitigation measures are required. The residual impact would be of **negligible** significance.

17.5.2 On-site construction noise

To inform the on-site construction noise assessment, an indicative construction programme and construction plant estimate was developed based on previous experience of similar projects within the Tees estuary. The period during the indicative construction programme whereby the greatest number of construction plant and piling rigs has been used in the construction phase noise assessment to assess a wort-case scenario.

The works during this period consist of:

- Demolition of the existing South Bank Wharf;
- Installation of tubular king piles and spigots;
- Installation of infill sheet piles;
- Installation of anchor wall;
- Installation of heavy load area piles;
- Heavy load slab;
- Filling and compaction;
- Installation of pile plugs and cope beam;
- Installation of quay furniture;
- Lighting and ducts;
- Excavation of front wall;
- Dredging; and
- Vessel deliveries

It is understood that construction works are to be undertaken 24 hours a day and therefore this has been included within the model.

Table 17.11 outlies the assumed construction plant that informed the noise predictions. Noise levels associated with construction plant were derived from the values provided in BS 5228-1 and from Royal HaskoningDHV's library from previous projects; maximum sound power level data, L_{WAmax}, for percussive piling activities were also included in the noise predictions. On-times for construction plant were generally assumed to be 60% with 30% on-time for percussive piling activities. Where construction plant is to be shared between two separate working areas, 2 no. noise sources were input into the model with 30% on-time each.

From the construction programme there will be approximately 1 vessel call per day on average during the construction phase to deliver materials to the site. Assuming an unloading time of 3 - 6 hours within a 24-hour period, an on-time of 25% was implemented for the noise predictions.

Table 17.11 Assumed construction plant and equipment list

Activity	Plant	Number of plant	BS 5228 reference	On-time (%)	Sound Power (dB)
Demolition of existing South Bank Wharf	Jack up with crawler crane	1	C4.50	60	98.6
	Slave barge (400t)	1	C7.2	60	110.3
	Safety/workboat	1	C7.2	60	110.3
	Concrete crusher	1	C1.14	60	109.4
	Excavator	1	C5.18	60	108.1
Installation of tubular king piles and spigots	Percussive piling rig	1	C3.2 / RHDHV Library	30	115.3 140.0 L_{WAmax}
	Piling rig power pack	1	C3.5	60	96.8
	Excavator (shared with anchor wall)	1	C5.18	30	108.1
	Dump truck	1	C6.24	60	114.5
	Crane	1	C3.28	60	94.5
Installation of infill sheet piles	Percussive piling rig	1	C3.2 / RHDHV Library	30	115.3 140.0 L_{WAmax}
	Piling rig power pack	1	C3.5	60	96.8
	Crane	1	C3.28	60	94.5
Installation of anchor wall	Percussive piling rig	1	C3.2 / RHDHV Library	30	115.3 140.0 L_{WAmax}
	Piling rig power pack	1	C3.5	60	96.8
	Excavator (shared with tubular king piles and spigots)	1	C5.18	30	108.1
	Dump truck (shared with heavy load area)	1	C6.24	30	114.5
	Crane	1	C3.28	60	94.5
Installation of heavy load area piles	Auger piling rig	1	C3.21	60	107.3
	Concrete pump	1	C3.26	60	102.9

Activity	Plant	Number of plant	BS 5228 reference	On-time (%)	Sound Power (dB)
	Excavator	1	C5.18	30	108.1
	Dump truck (shared with anchor wall)	1	C6.24	30	114.5
Heavy load slab	Excavator (shared with tie rod and pile plug and cope beam)	1	C5.18	30	108.1
Filling and compaction	Excavator	1	C5.18	60	108.1
	Dump Truck	1	C6.24	60	114.5
	Roller	1	C5.20	60	103.0
Installation of pile plugs and cope beam	Excavator (shared with heavy load slab)	1	C5.18	30	108.1
Installation of quay furniture	Crane	1	C3.28	60	94.5
	JCB	1	C4.14	60	94.8
Lighting and ducts	Dump truck	1	C6.24	60	114.5
	JCB	1	C4.14	60	94.8
Excavation of front wall	Excavator	1	C5.18	60	108.1
	Dump truck	1	C6.24	60	114.5
Dredging	THSD/backhoe	1	C7.2	60	110.3
Vessel deliveries	Vessel	1	RHDHV Library	25	103.0

Predicted noise levels at the identified receptors, using the methodologies described in **Section 17.3.3**, are displayed in **Table 17.12**.

Table 17.12 On-site construction noise predictions

Receptor ID	Predicted $L_{Aeq,T}$ (dB)	Predicted L_{AFmax} (dB)
NSR1	52.2 - 59.2	71.8 - 81.0
ECO1	46.8 - 59.5	68.8 - 80.0
ECO2	38.5	56.6
ECO3	35.5 - 36.8	53.1 - 56.4

Table 17.13 demonstrates the predicted impact at human receptors.

Table 17.13 On-site construction phase noise impact assessment

Receptor ID	Predicted $L_{Aeq,T}$ (dB)	Magnitude of effect	Impact
NSR1	52.2 - 59.2	Very low	Negligible

Predicted noise levels displayed in **Table 17.13** with regard to human receptors are below 65 dB; therefore, indicating **negligible** impact at human receptor locations. This is considered **not significant** and impact is deemed short-term, local and reversible.

The predicted noise levels to ecological receptors from construction phase noise are considered in detail in **Section 12**.

Mitigation measures and residual impact
No mitigation measures are required. The residual impact would be of **negligible** significance.

17.6 Potential impacts during the operational phase

Operational phase noise sources associated with the proposed scheme that were considered in within the noise predictions relate to the following activities:

- Movement of materials over the quay via crane;
- Operation of the substation on the quay and use of shore power; and,
- Vessel movements and docking.

Noise predictions were undertaken assuming two cranes operating in the heavy load areas, both operating with an on-time of 100%. Substation and shore power infrastructure are also assumed to operate 100% of the time. Both of these on-times represent a very worst-case scenario and therefore the assessment is precautionary.

It is estimated that there will be approximately 390 vessel calls per year at the proposed quay. The duration that vessels will remain at the port is unknown; therefore, four vessels are assumed to be docked and connected to shore power within the noise model with 100% on-time. It is anticipated that whilst connected to the onshore power, vessels will turn engines off but ancillary operations such as ventilation systems and pumps will still be operating.

Operational phase noise predictions have been undertaken assuming the plant and equipment displayed in **Table 17.13**, below, with assumed sound power levels and operational on-time.

Table 17.13 Assumed operational phase noise sources

Plant	Number of plant	On-time (%)	Sound Power (dB)
Crawler crane	4	100	106.2
Crane winch	2	100	104.2
Material handling	2	100	123.0 L_{WAmax}
Substation	1	100	80.0
Cold ironing transformers	4	100	80.0
Vessels - ancillary operations	4	100	91.0

Predicted operational phase noise levels at the identified receptors, using the methodologies described in **Section 17.3.3**, are displayed in **Table 17.14**.

Table 17.14 Operational phase noise predictions

Receptor ID	Predicted $L_{Aeq,T}$ (dB)	Predicted L_{AFmax} (dB)
NSR1	42.5 - 48.4	52.2 - 61.7
ECO1	36.8 - 49.3	50.0 - 61.9
ECO2	29.5	40.6
ECO3	26.1 - 26.9	37.2 - 38.1

As noted earlier, the assessment of operational phase noise impacts at human receptors was not considered necessary following discussion with RCBC's Environmental Health Officer. However, an assessment has been included for completeness.

WHO 1999 provides a guideline external noise level at industrial and commercial premises of 70 dB $L_{Aeq,T}$ during both daytime and night time reference periods. **Table 17.15** displays the predicted noise level at the eastern boundary of South Tees Business Parks in addition to the logarithmically averaged ambient sound level from the baseline survey, displayed in **Table 17.3**. Cumulative noise levels were calculated by the logarithmic sum of the existing ambient sound level and the predicted noise level associated with the proposed scheme.

Table 17.15 Operational phase noise impact assessment

Receptor ID	Existing ambient sound level $L_{Aeq,T}$ (dB)	Predicted $L_{Aeq,T}$ (dB)	Cumulative noise level $L_{Aeq,T}$ (dB)
NSR1	51.0	48.4	52.9

The predicted cumulative noise level at NSR1 is 17.1 dB below the guideline level provided in WHO 1999; therefore, operational phase noise impacts at South Tees Business Parks are considered **not significant**.