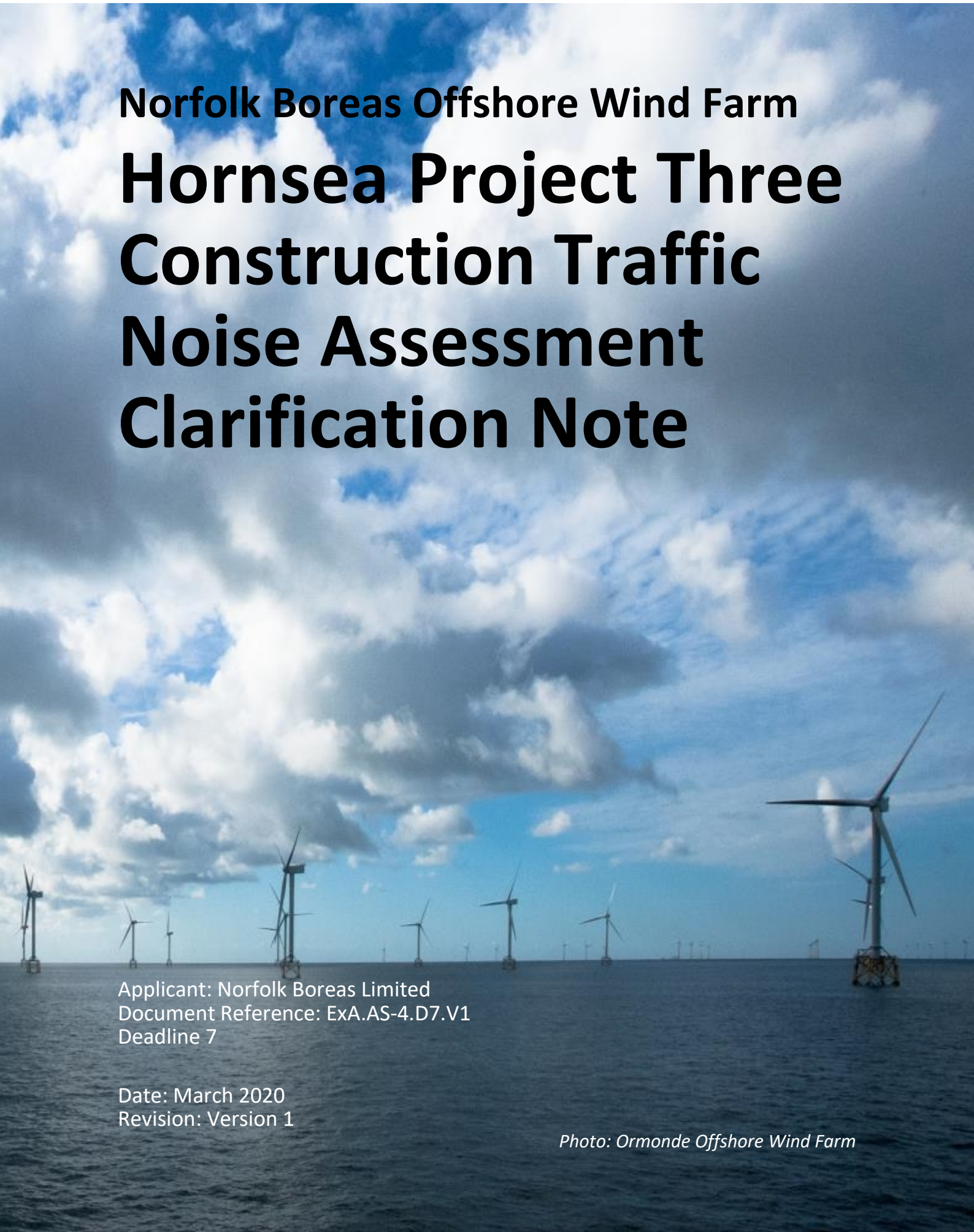
Royal HaskoningDHV
Enhancing Society Together

VATTENFALL



Norfolk Boreas Offshore Wind Farm

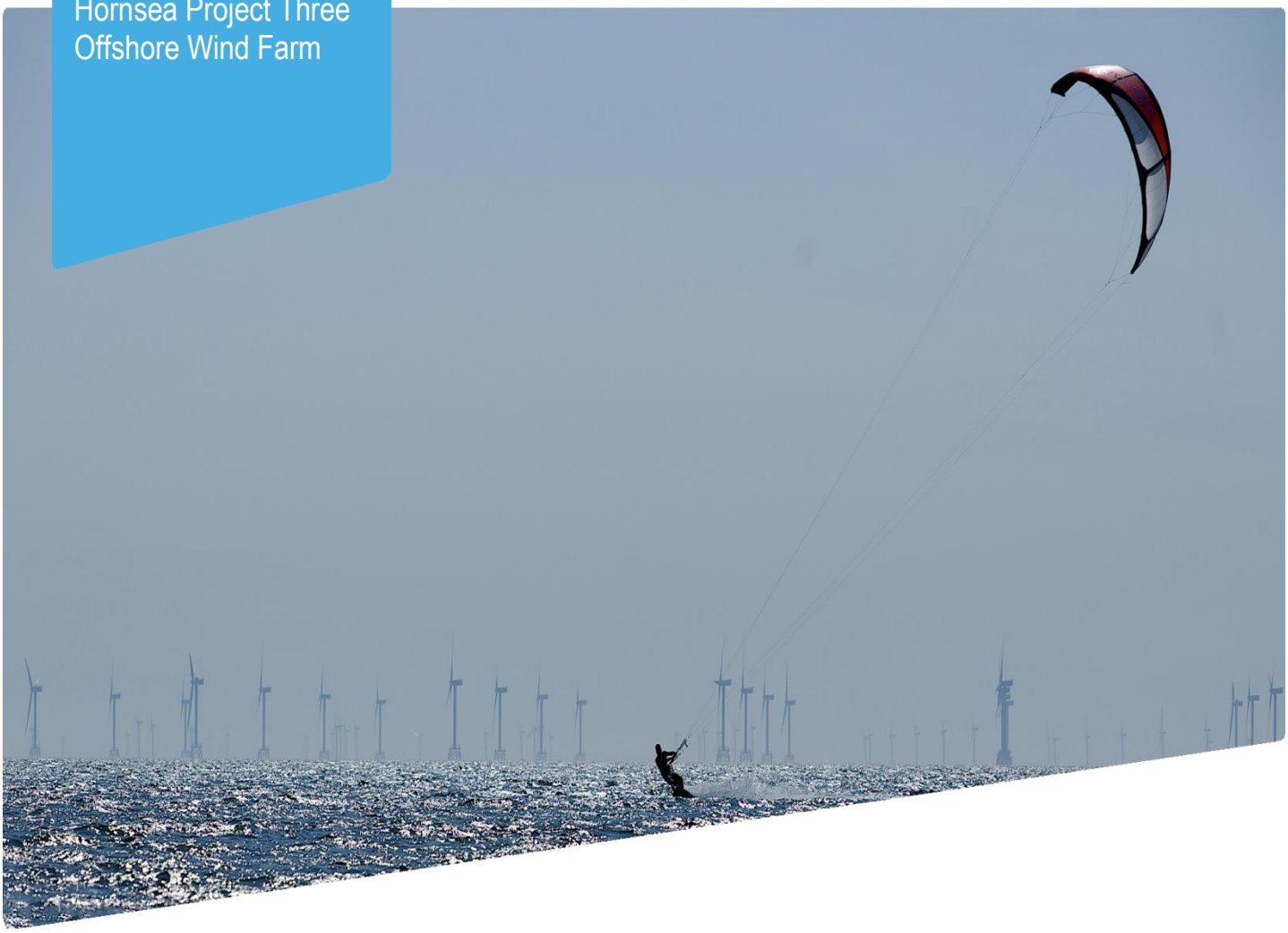
Hornsea Project Three Construction Traffic Noise Assessment Clarification Note

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-4.D7.V1
Deadline 7

Date: March 2020
Revision: Version 1

Photo: Ormonde Offshore Wind Farm

Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Appendix 24 to Deadline 7 submission – Construction Traffic Noise Assessment Clarification Note

Date: 14 March 2019

Hornsea 3
Offshore Wind Farm

Ørsted

Document Control			
Document Properties			
Organisation	Ørsted Hornsea Project Three		
Author	RPS		
Checked by	Sarah Drljaca		
Approved by	Andrew Guyton		
Title	Appendix 24 to Deadline 7 submission – Construction Traffic Noise Assessment Clarification Note		
PINS Document Number	n/a		
Version History			
Date	Version	Status	Description / Changes
14 March 2019	A	Final	Submission at Deadline 7 (14 March 2019)

Ørsted

5 Howick Place,

London, SW1P 1WG

Front cover picture: Kite surfer near a UK offshore wind farm © ØrstedHornsea Project Three (UK) Ltd., 2019.

Table of Contents

Acronyms

Acronym	Description
BS	British Standard
CRTN	Calculation of Road Traffic Noise
dB(A)	Decibels A-weighted
DMRB	Design Manual for Roads and Bridges
EHO	Environmental Health Officer
HDVs	Heavy Duty Vehicles
HGVs	Heavy Goods Vehicles
NIR	Noise Insulation Regulations
NSRs	Noise Sensitive Receptors
PPV	Peak Particle Velocity
SEL	Sound Exposure Level
VDV	Vibration Dose Values

1. Introduction

1.1 This document has been prepared in response to matters raised by Broadland District Council's Environmental Health Officer (EHO) following a meeting held on 27th February 2019, as well as matters raised in subsequent consultation, including at ISH9 on 08th March 2019. The matters in question focus on the potential for noise and vibration impacts resulting from Hornsea Three construction traffic travelling to sections of the onshore cable corridor from the main construction compound, through Cawston. This document responds to the matters raised by BDC and provides clarification on the construction traffic noise and vibration assessment undertaken at The Old Railway Gatehouse as reported in Appendix 23 of the Applicant's submission at Deadline 6 (i.e. Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037)).

1.2 On the basis of the above, this document should be read in conjunction with the Appendix 23 to Deadline 6 submission - Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037) and the Applicant's clarifications to BDC which is provided as Annex A to the Statement of Common Ground between the Applicant and Broadland District Council submitted at Deadline 7.

1.3 The structure of this document is as follows:

- Section 2 provides a summary of the baseline sound levels at The Old Railway Gatehouse (as reported in REP6-037), including the 90th percentile level in accordance with a request from BDC;
- Section 3 discusses the methodology applied in this report, in particular the comparison to the WHO guidelines in accordance with a request from BDC and the assumptions applied to the assessment of noise generated at the Old Railway Gatehouse by abnormal load movements;
- Section 4 discusses the likely effectiveness of the regrading of the road hump in minimising noise levels at The Old Railway Gatehouse based on a review of published research findings;
- Section 5 discusses the noise levels associated with the start/stop of HGVs using the proposed passing place close to The Old Railway Gatehouse;
- Section 6 compares the results of the modelling taking into account the start/stop of HGVs during the daytime, the regrading of the road hump and potential night-time abnormal load movements to the EIA criteria and WHO (2018) night-time guidelines;
- Section 7 considers the modelling results from section 6 against the cumulative scenario with Norfolk Vanguard;
- Section 8 quantifies the reductions in noise levels from the upgrading of the double glazing of the eastern façade of The Old Railway Gatehouse and the acoustic wall/fence along the garden of the property; and
- Section 9 provides a summary of the above.

2. Baseline Sound Levels at The Old Railway Gatehouse

2.1 Baseline sound levels at The Old Railway Gatehouse were set out in Appendix 23 to Deadline 6 submission – Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037) and are summarised below. Table 2.1 presents the baseline sound levels at The Old Railway Gatehouse expressed as overall single figures value in dB(A) which have been rounded to the nearest whole integer. Levels are reported for:

- the equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) which is a measure of the ambient or average noise level;
- the 10th percentile level ($L_{A10,T}$), which is the noise level exceeded for 10% of the time and is a measure often used to describe road traffic noise;
- the 90th percentile level ($L_{A90,T}$), which is the noise level exceeded for 90% of the time and is a measure often used to describe background noise; and
- the night-time maximum noise level ($L_{AF(Max),T}$). The table presents the linear averages for daytime and night-time period, with the highest of the nightly $L_{AF(max),T}$.

2.2 Note, the highest night time $L_{AF(Max)}$ value was actually measured as 92.2 dB(A), but in accordance with the WHO Guidelines for Community Noise and BS8233:2014, the 10th highest peak values have been used for each of the individual night time period.

Table 2.1: Baseline background, ambient and maximum sound levels dB (re 20 µPa)

	Ambient Noise Level dB $L_{Aeq,T}$	**Level exceeded 10% of the time dB $L_{A10,T}$**	**Level exceeded 90% of the time dB $L_{A90,T}$**	**Maximum Daily $L_{AF(max),T}$**
Day time (07:00 – 23:00)	59 dB	54 dB	30 dB	N/A
Night time (23:00 – 07:00)	50 dB	36 dB	25 dB	81 B

2.3 At the request of the BDC, L_{A90T} has also been included in Table 2.1 to characterise the baseline sound levels. It should be noted that this parameter is not usually used in traffic assessments dose response relationship and criteria are based on absolute levels of noise or changes in either the L_{A10} or L_{Aeq} parameters.

2.4 The existing levels of sound were as expected for the rural setting, i.e. relatively low ambient sound levels during the day and levels reducing further during the night. Peak noise levels associated with car and HGV movements passing the measurement location elevate the ambient $L_{Aeq,T}$ metric and set the maximum noise levels recorded.

3. Methodology

Traffic Flows

3.1 The traffic flows used in this clarification note are the predicted flows for the construction of Hornsea Three as presented in Appendix 23 to Deadline 6 submission – Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037). To summarise, the peak 18-hour weekday traffic flow along The Street is predicted to be 118 HGV movements and 130 non HGVs. This equates to 59 HGVs travelling to the main compound and 59 HGVs travelling out. This is presents the maximum design scenario and the need for mitigation has been assessed on this basis.

Assumptions used to Model Abnormal Load Movements

3.2 The abnormal load movements to the main construction compound are associated with the delivery of the cable drums. Under a maximum design scenario (a worst case), the cable drums will first be delivered to the main construction compound, before being transported to the relevant section of the onshore cable corridor. They may also be transported back to the main construction compound before collection or disposal.

3.3 The precise number of abnormal loads will be dependent on the length of section of cable. As set out in Volume 1, Chapter 3: Project Description of the Environmental Statement (APP-058), the onshore export cables will typically be installed in sections of between 750 and 2,500 m at a time, with each section of cable delivered on a cable drum from which it is spooled out as it is installed. The length of cables on each drum will be informed by choice of transmission technology, phasing and various parameters at a given location including the distance between committed HDDs, constraints present on site (which may influence the location of joint bays) and the local road network (which may necessitate the use of a smaller cable drum). As such it is not possible to provide a specific number of cable drums. However, an indicative number of movements was provided in Appendix 1 to Deadline 3 submission – Main Construction Compound Briefing Note (REP3-010).

3.4 The number of abnormal loads is included within the maximum number of Hornsea Three HGVs predicted to utilise The Street on a daily basis as identified in paragraph 3.1 above. As such, should the number of abnormal load movements increase, this would not increase the total number of movements but instead comprise a greater proportion of the maximum traffic flows along The Street on a daily basis.

3.5 The timing of the cable drum deliveries to the main construction compound cannot be confirmed at this stage but will be discussed and agreed with the relevant highway authority pursuant to paragraph 2.1.6.2 of the Outline Construction and Traffic Management Plan (CTMP, updated and submitted as Appendix 25 at Deadline 7). However, consultation with Norfolk County Council has indicated that abnormal load movements outside of the standard network peaks would be encouraged where practicable.

3.6 An assessment of the abnormal load deliveries within the core working hours (set out in the Outline CoCP, updated and submitted as Appendix 39 at Deadline 7)) and within day-time hours (i.e. 07:00 to 23:00, in accordance with noise assessment criteria contained in BS 5228) are included in the noise levels set out in Appendix 23 to Deadline 6 Submission: Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037).

3.7 Appendix 23 to Deadline 6 submission – Construction Traffic Noise and Vibration Assessment at The Old Railway Gatehouse (REP6-037) scoped out the movement of abnormal loads at night as associated noise levels were not predicted to be significant due to the designed-in mitigation measures (as set out in the Outline CTMP, section 5.2, such as slow travelling speeds). However, following a request from Broadland District Council, this document provides an assessment of the potential for noise impacts from abnormal load deliveries in the early morning and late evening (23:00 – 07:00). The document considers the following scenarios:

- 50 % of abnormal load movements to occur during the daytime (07:00 – 23:00) and 50% of abnormal load movements at night (23:00 – 07:00) as a likely scenario; and
- 100% of movements at night (23:00 – 07:00) as a maximum design scenario.

WHO Guidelines

3.8 At the request of the BDC, a comparison of the modelling results to the WHO guidelines has been undertaken.

3.9 New guidance was issued by the WHO in 2018. The guidelines are intended to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation noise (road traffic, railway and aircraft), wind turbine noise and leisure noise. For traffic noise, the guidelines recommend reducing noise levels produced by road traffic noise to below 53 dB L_{den} and 45 dB L_{night}.

3.10 The WHO guidelines utilise the L_{den} and L_{night} parameters which are annual average noise levels excluding the effect of the façade. Averaging variations in traffic flow and meteorological effects over a period of a year the annual average noise level would be lower than the noise level under conditions favourable to sound propagation or during the peak traffic assessed as part of this study.

3.11 The use of yearly average parameters is a fundamental aspect of the WHO guidance. The thresholds are based on potential health effects at population level due to long-term exposure to noise. It follows that it is unlikely that exposure to higher levels of noise over a shorter period of time would result in the same health impacts. In addition, it cannot be assumed that thresholds applicable at population level for the purpose of making strategic decisions on long-term transportation policy can be applied directly to assessing the potential significance of noise on a single property due to a project of limited duration.

3.12 Furthermore, the WHO guideline values give the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and, indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.

3.13 Notwithstanding the above, following a request from BDC, the Applicant has compared the results of the assessment presented about against these thresholds.

3.14 Where abnormal load movements to the main construction compound are planned to occur outside of core working hours, and in areas of high sensitivity (i.e. through residential areas or in close proximity to residential properties), the need for additional specific management measures will be discussed with the Highways Authority. This commitment has been incorporated into the Outline CTMP (updated and submitted as Appendix 25 at Deadline 7). The exact nature of the measures, as well as the locations and timings for when they will apply, will be agreed with the Highways Authority and relevant planning authority environmental health officer post-consent as part of the detailed CTMP.

Noise Change

3.15 The methodology used to assess noise change from construction traffic noise impacts at The Old Railway Gatehouse is the same as that used in section 1.3 of Volume 6, Annex 8.2: Construction Noise Model Output of the Environmental Statement (APP-168).

4. Effectiveness of Regrading of the Existing Road Hump

4.1 The Street passes over a section of disused non-designated railway, which is associated with an existing hump in the road in line with the private drive of The Old Railway Gatehouse. The top of the hump (approximately 48.5 m AOD) corresponds with the level of the private drive. As set out in the Outline CTMP (updated and submitted as Appendix 25 of Deadline 7), in order to assist with the movement of low loaders, as well as to mitigate potential noise and vibration impacts of HGV movements on the Old Railway Gatehouse, the Applicant has committed to undertake highway works to the hump. The works include for approaches to the top of the hump to be formed over an extended length meaning the severity of the change in level would be greatly reduced compared to the existing condition, with a longer and more gradual incline. As these works form part of the intervention scheme along The Street, Oulton (see section 5.2 of the Outline CTMP submitted as Appendix 25 of Deadline 7), they would be implemented prior to the use of the main construction compound by Hornsea Three. As part of the assessment presented in Section 6, a correction has therefore been determined to account for this reduction in traffic noise due to the regrading of the road. The methodology for determining this correction is set out below.

4.2 Transport Research Laboratory (TRL) Report 180 (DoT, 1995) presents an empirical study of the impact of traffic calming measures such as road humps on vehicle noise. The study encompassed a range of commercial vehicles and road types, a summary of which is shown in TRL Report 180 and is reproduced here in Figure 4.1.

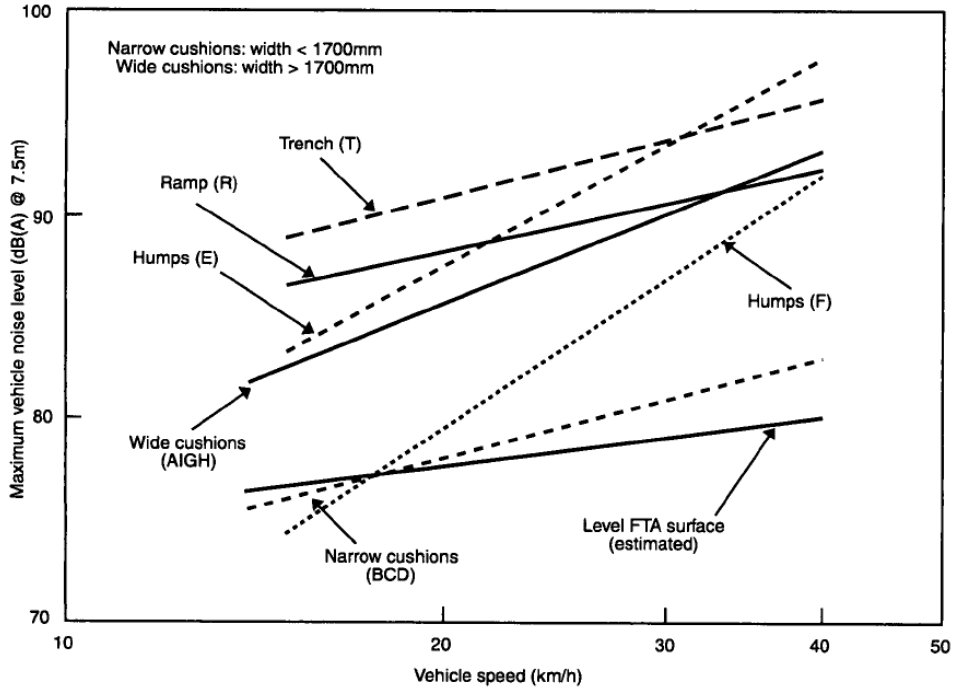


Figure 4.1: Comparing average noise levels for commercial vehicles alongside different road profiles. Reproduced from TRL Report 180

4.3 Taking the speed of an HGV (or abnormal load) to be 30 km/h (19 mph) and approximating the profile of the road hump to that of a round topped hump (Humps (F)), the difference in sound level between the flat surface and the hump is 8 dB.

4.4 Given the lack of a standardised approach to the subject, an additional sensitivity check was performed using a correction derived from Transport Research Laboratory (TRL) Report 416 (DETR, 1999). This report extends the study performed in TRL Report 180 to include a wider selection of road hump profiles but the vehicle speed tested was limited to 25 km/h (16 mph). The results from TRL Report 416 presented a difference in sound level between the flat road and a ramp as 5 dB.

4.5 As a result, the updated assessment has been performed for the two scenarios of 5 and 8 dB reduction due to regrading of the road hump for HGVs and abnormal loads. The former is considered the represent a maximum design scenario, with a precautionary estimate of the effectiveness of the road hump regrading in terms of mitigating potential noise impacts. The latter is provided within the report as a reasonable prediction of the likely effects.

4.6 From Figure 4.1 it is clear that lower speeds result in a corresponding lower noise level. Thus, it can be concluded that the imposition of a lower speed limit during the construction period would result in an even greater reduction in noise levels than predicted in this study. It is therefore concluded that the assumed reductions of 5 to 8 dB due to regrading of the road hump are precautionary estimates and that with a lower speed limit in place, noise reductions would be greater than assumed in this report.

4.7 It is noted that within the Statement of Common Ground with NCC (REP4-019), it has been agreed that the works planned to the road hump, adjacent to The Old Railway Gatehouse, will be permanent and remain in place after the completion of Hornsea Three construction works. As such, following the completion of Hornsea Three construction, the regrading of the road hump is considered to represent a long-term improvement in respect to amenity impacts at the Old Railway Gatehouse.

5. Noise Levels from the "Stop/Start" of HGVs

5.1 The section of The Street immediately adjacent to The Old Railway Gatehouse is sufficiently narrow that vehicles travelling in opposite directions have difficulty passing, particularly when one or more of them is an HGV. The intervention scheme proposed along The Street, Oulton (as set out in section 5.2 of the Outline CTMP, updated and submitted as Appendix 25 of Deadline 7) proposes a formal passing place close The Old Railway Gatehouse. The give-way location is set back from The Old Railway Gatehouse at a distance of approximately 40 m which is the point where a loaded HGV is predicted to traverse through gears. Thus, the scheme has been designed to avoid HGVs changing gear directly outside the property. Furthermore, there is an existing 'informal' passing bay which is used already by vehicles waiting to pass at the Old Railway Gatehouse, thus the introduction of a passing bay as part of the intervention scheme is to some extent, formalising as existing arrangement, albeit the intensity of the frequency of the events would increase.

5.2 Only a small proportion of passing vehicles would be required to stop at the proposed passing place at The Old Railway Gatehouse, and only a small proportion of those would be HGVs. For the purpose of this clarification note, it is assumed (based on professional judgement) that during the daytime 10% of the total HGVs from Hornsea Three travelling to the main construction compound would have to stop at the passing place. Abnormal loads will not have to stop at the passing place as they will be travelling under escort which will manage traffic such that there is no conflict with vehicles approaching from the opposite direction. For the purposes of this assessment, it has been assumed that the number of vehicles accelerating past The Old Railway Gatehouse and the number decelerating will be approximately equal due to vehicles entering egressing the main construction compound along The Street (i.e. 5% will be accelerating and 5% will be decelerating).

5.3 Corrections to the overall HGV sound level for these vehicles have been derived from the CNOSSOS European noise model which are summarised in the following equations:

$$\Delta L_{WR,acc,i,m} = C_{R,m,k} \cdot \mathrm{Max}\left(1 - \frac{|x|}{100}; 0\right)$$

$$\Delta L_{WP,acc,i,m} = C_{P,m,k} \cdot \mathrm{Max}\left(1 - \frac{|x|}{100}; 0\right)$$

Where x is the distance (in m) from the source to the receiver.

5.4 The following corrections have been derived for each movement:

- $C_{P,m,k}$ = +9 dB for acceleration from stationary; and
- $C_{R,m,k}$ = -4 dB for deceleration to stationary.

6. Modelling Results (including Comparison Against WHO Criteria)

Modelling Results

6.1 Table 6.1 below sets out the predicted noise levels at The Old Railway Gatehouse (the façade closest to The Street) based on the noise survey and representative SEL calculated for a HGV pass-by. The modelling takes into account the influence of the stop/start of HGVs at the passing place using the corrections in section 5 of this report.

6.2 Table 6.1 also sets out the predicted noise levels at The Old Railway Gatehouse following the regrading of the road hump. A sensitivity test has been undertaken following the approach in section 4 of this report and the results are presented for the expected reduction in noise levels and the maximum design scenario.

6.3 The noise modelling of abnormal loads are also presented in Table 6.1.

Table 6.1: A-weighted Sound Pressure Levels

	Daytime $L_{Aeq,T}$	Night-time $L_{Aeq,T}$ 4 abnormal loads	Night-time $L_{Aeq,T}$ 8 abnormal loads
Baseline	59	50	50
Baseline + Construction traffic (no mitigation)	67	56	58
Baseline + Construction traffic + correction for passing place (no noise and vibration mitigation)	68	56	58
Baseline + Construction traffic + correction for passing place - 8dB correction for road hump regrade (expected)	60	48	50
Baseline + Construction traffic + correction for passing place - 5dB correction for road hump regrade (maximum design scenario)	63	51	53

Noise Change Assessment

6.4 The results of the revised calculations are provided in Table 6.2, along with an assessment against the noise change criteria.

Table 6.2: Noise change assessment for construction traffic

	Daytime (0700 - 23.00)	Night-time (2300 - 0700) 4 abnormal loads	Night-time (2300 - 0700) 8 abnormal loads
Construction traffic (no mitigation)	+8 (Moderate)	+6 (Moderate)	+8 (Moderate)

	Daytime (0700 - 23.00)	Night-time (2300 - 0700) 4 abnormal loads	Night-time (2300 - 0700) 8 abnormal loads
Construction traffic + correction for passing place (no noise and vibration mitigation)	+9 (Moderate)	+6 (Moderate)	+8 (Moderate)
Construction traffic + correction for passing place - 8dB correction for road hump regrade	+1 (Negligible)	-2 (Negligible Beneficial)	0 (No change)
Construction traffic + correction for passing place - 5dB correction for road hump regrade	+4 (Minor)	+1 (Negligible)	+3 (Minor)

6.5 From tables 6.1 and 6.2, it can clearly be seen that the implementation of the intervention scheme along The Street, Oulton (including passing places which may result in the stop/start of traffic, and the regrading of the road hump) will reduce the magnitude of impact from moderate to negligible or minor during the daytime, depending on the effectiveness of the regrading of the road hump. During the night-time, the implementation of the intervention scheme along The Street, Oulton, would reduce the magnitude of impact from moderate to negligible or minor, depending on the effectiveness of the regrading and number of abnormal load movements which occur at night. The results also show that there could be a small improvement in noise levels during the night if the regrading of the existing road hump achieves the potential reduction in noise levels of 8 dB.

6.6 It is therefore concluded that the residual significance of effect due to construction traffic will be minor adverse and therefore not significant.

Comparison Against WHO Night-time Noise Thresholds

6.7 The results of the construction traffic assessment presented in

6.8 **Table 6.1** indicate that the WHO threshold of 45 dB L_{night} is already exceeded for the baseline case. Assuming an 8 dB reduction due to the road regrading, the levels predicted will still exceed the 45 dB L_{night} recommended by the WHO, although noise levels will be the same or lower than the baseline case. If the regrading only achieves a 5 dB reduction in noise due to HGV pass-bys, then there will be a small increase in noise which will exceed the WHO thresholds by a larger margin than the baseline case.

6.9 It is important to take into account the effect of the road hump regrading on individual event L_{Amax} noise levels. It is estimated that current maximum noise levels of 80 dB L_{AFmax} would reduce by 5 to 8 dB as a result of the regrading of the road hump. In practice, this would mean that although there would be more vehicle movements associated with the construction traffic during the 30 month active use of the main construction compound, the individual noise levels of each pass-by event would be lower. Furthermore, the improvement achieved by the regrading of the existing road hump would permanent and therefore represent a long-term improvement in respect to the amenity impacts on The Old Railway Gatehouse.

7. Cumulative Scenario with Norfolk Vanguard

7.1 The results from the modelling also takes into account the effects of the road hump regrading and the start/stop of HGVs at the passing place for the cumulative scenario of Hornsea Three and Norfolk Vanguard traffic moving along The Street at the same time. The assessment has been undertaken on the basis that no additional abnormal loads (other than for Hornsea Three) will occur at night. The results of the cumulative assessment are shown in Table 7.1.

Table 7.1: A-weighted Sound Pressure Levels for Cumulative Assessment (Hornsea Three and Norfolk Vanguard)

	Daytime $L_{Aeq,T}$
Baseline + Construction traffic + Norfolk Vanguard + correction for passing place - 8dB correction for road hump regrade (expected)	61
Baseline + Construction traffic + Norfolk Vanguard + correction for passing place - 5dB correction for road hump regrade (maximum design scenario)	64

7.2 The results of the revised cumulative assessment are provided in Table 7.2, along with an assessment against the noise change criteria.

Table 7.2: Noise change assessment for construction traffic

	Daytime (07.00 - 23.00)
Baseline + Construction traffic + Norfolk Vanguard + correction for passing place - 8dB correction for road hump regrade (expected)	+2 (Negligible)
Baseline + Construction traffic + Norfolk Vanguard + correction for passing place - 5dB correction for road hump regrade (maximum design scenario)	+5 (Moderate)

7.3 From the table, it can be seen that the cumulative effect reduces to negligible if the regrading of the road hump reduces noise levels by 8 dB, and moderate if the regrading reduces noise levels by only 5 dB.

7.4 Consequently, the Applicant has committed to offering the installation of an acoustic wall or fence along the garden adjacent to The Street and acoustic glazing along the eastern façade of the property in order to further mitigate noise levels during the daytime period.

7.5 The effect of additional mitigation measures is further discussed in Section 8.

8. Reductions in Noise Levels from Acoustic Glazing and Acoustic Fencing

8.1 As identified in the preceding section, a moderate and therefore potentially significant impact is predicted for the daytime cumulative scenario with Norfolk Vanguard if the regrading of the road hump only reduces HGV noise by 5 dB. Consequently, should the construction phase of the projects in the vicinity of The Street overlap, the Applicant has committed to the offer of acoustic glazing along the façade closest to The Street and the offer of an acoustic wall or fence along the boundary of the garden adjacent to The Street. Further consideration of mitigation measures with particular emphasis on night-time noise levels is provided below.

8.2 The results of the noise modelling for a 2 m high acoustic barrier are shown in Table 8.1 and Table 8.2. The tables also present a comparison against the BS 8233 recommended internal level of 45 dB L_{AFmax} with standard glazing (15 dB attenuation allowing for a partially open window for ventilation) and an acoustic double glazing system (assuming a 6/16/6 acoustic insulating glass unit with a sound reduction of 33 dB Rw). It is understood that there are no bedrooms on the eastern façade of the house and the BS 8233 night-time thresholds are therefore not applicable for this façade. Nevertheless, noise levels with an acoustic glazing system in place have been presented in order to understand the effectiveness of this mitigation measure.

Table 8.1: Modelling results in the case of a reduction of 5 dB achieved by the regrading of the existing road hump

Façade	Pass-by dB L_{AFmax}		Partially open window		Acoustic double glazing	
	No Barrier	2m Barrier	No Barrier	2m Barrier	No Barrier	2m Barrier
Eastern	75	75	60	60	42	42
South-western	59	56	44	41	26	23
South-eastern	67	62	52	47	34	29

Table 8.2: Modelling results in the case of a reduction of 8 dB by the regrading of the existing road hump

Façade	Pass-by dB L_{AFmax}		Partially open window		Acoustic double glazing	
	No Barrier	2m Barrier	No Barrier	2m Barrier	No Barrier	2m Barrier
Eastern	72	72	57	57	39	39
South-western	56	53	41	38	23	20
South-eastern	64	59	49	44	31	26

8.3 The results indicate that for windows situated along the southern façade of The Old Railway Gatehouse, a reduction of between 3 and 5 dB is predicted as a result of including a 2 m high barrier along the boundary of the garden facing The Street. No additional benefit would be achieved by extending the barrier along the southern boundary of the garden.

8.4 Based on the results of the modelling, it is concluded that the only façade that would require an acoustic fence to meet the WHO and BS 8233 night-time noise thresholds is the south-eastern façade. However, as the eastern façade (which is closest to The Street) would not benefit from the mitigation associated with the proposed acoustic fence, the Applicant has also committed to offering acoustic glazing along this façade.

8.5 Provision for this commitment will be incorporated into the Outline CTMP to be submitted at Deadline 9.

8.6 It should be noted that baseline noise levels already exceed the criteria at this location and maximum noise levels for the baseline case are higher than they would be during the Hornsea Three construction period with the regrading of the road hump. In other words, the residents of The Old Railway Gatehouse will benefit from the combined effect of reduced individual L_{AFmax} levels (due to regrading of the road hump) in addition to the benefits of improved acoustic fencing/glazing.

8.7 The Applicant has committed to undertake noise monitoring at The Old Railway Gatehouse during the active use of the main construction compound. This would be to verify the effectiveness of the mitigation proposed and to ensure that noise levels do not reach a level which would be considered a significant effect. Should an exceedance be identified through this monitoring, additional traffic management measures would be discussed and agreed with NCC and BDC.

9. Summary and Conclusions

9.1 This clarification note provides additional information in relation to:

- the likely effect on noise levels at The Old Railway Gatehouse following the regrading of the road hump;
- the effect associated with the start/stop of HGVs using the proposed passing place;
- a comparison of the predicted levels against EIA criteria and WHO Guidelines; and
- the reductions in noise levels from acoustic glazing at The Old Railway Gatehouse and the acoustic wall/fence along the garden of the property.

9.2 The findings show that the predicted effect of regrading of the road hump will reduce the magnitude of impact from Hornsea Three from moderate to negligible or minor during the daytime (depending on the effectiveness of the regrading of the road hump). During the night-time, the mitigation would have the effect of reducing the magnitude of impact due to abnormal loads from moderate to negligible or minor, depending on the effectiveness of the regrading and number of abnormal loads at night. The results also show that it is possible that there could be a small improvement in noise levels during the night if the regrading results in a reduction in noise levels by 8 dB.

9.3 The results of the baseline noise survey show that the WHO threshold of 45 dB L_{night} is already exceeded. Assuming an 8 dB reduction due to the road regrading, the levels predicted will still exceed the 45 dB L_{night} recommended by the WHO, although noise levels will be the same or lower than the baseline case. If the regrading only achieves a 5 dB reduction in noise due to HGV pass-bys, then there will be a small increase in noise which will exceed the WHO thresholds by a larger margin than the baseline case.

9.4 The results of the cumulative assessment conclude that, with Norfolk Vanguard construction traffic, the regrading of the road hump will reduce the magnitude of impact from major to minor or moderate during the daytime, depending on how effective the regrading of the road hump is at mitigating noise due to HGVs.

9.5 Consequently, the Applicant has committed to offering acoustic glazing along the eastern façade (i.e. closest to The Street) as well as installation of a 2 m high acoustic barrier along the south-eastern boundary of the property (along the boundary to the garden). Provision for this commitment will be incorporated into the Outline CTMP to be submitted at Deadline 9. With these mitigation measures in place, the residual effect reduces to minor for all scenarios, including the cumulative scenario with Norfolk Vanguard.

10. References

Berglund, B. et al. Guidelines for Community Noise. World Health Organisation. 2000.

Stylianos Kephalopoulos, Marco Paviotti, Fabienne Anfosso-Lédée. Common Noise Assessment Methods in Europe (CNOSSOS-EU). 2012.

Environmental Noise Guidelines for the European Region. World Health Organisation. 2018.

RPS (2016) Vibration and Noise Level Monitoring Regarding Application Ref: TA/2012/902 for the Periodic Review of a Mineral Site Planning Permission Land at Oxted Quarry, Chalkpit Lane, Oxted, Surrey RH8 0QW. JAE7869_036-REPT-01-R0. RPS