The Great Grid Upgrade

Grimsby to Walpole

Preliminary Environmental Information Report

Volume 3 Part B Section Specific Assessments

Section 2 New Grimsby West Substation to New Lincolnshire Connection Substation A

Chapter 10 Noise and Vibration

Appendices

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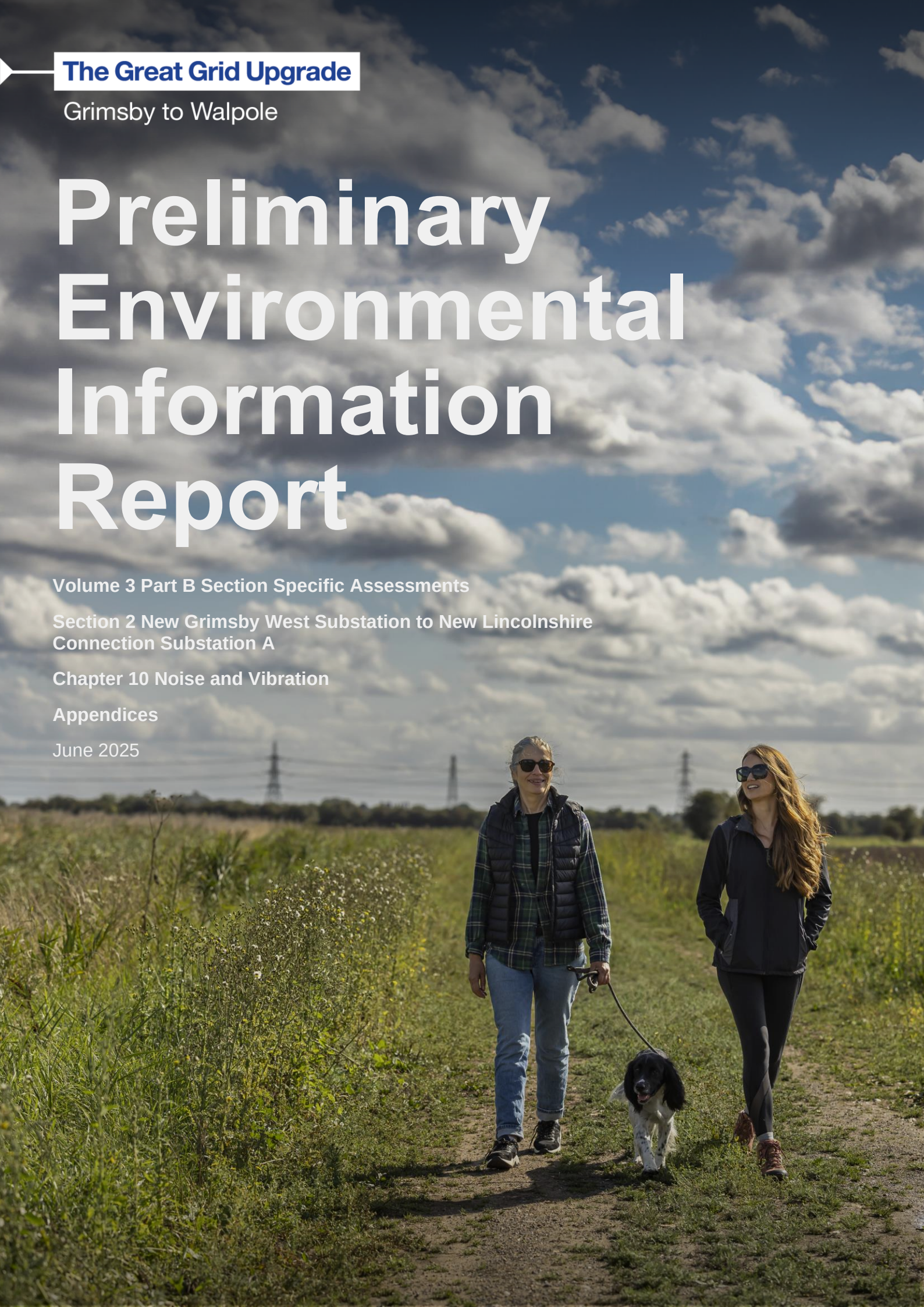

Contents

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10A. Construction Noise and Vibration Data

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Contents

10A. Construction Noise and Vibration Data

10A.1 Introduction

10A.1.1 This appendix presents information and data used within the assessment of Noise and Vibration effects from construction activities at Noise and Vibration sensitive receptors (NSR) in the New Grimsby West Substation to New Lincolnshire Connection Substation A Section (Section 2) as part of the Grimsby to Walpole Project (the Project). This appendix includes:

i. construction noise data; and

ii. construction vibration data.

10A.2 Construction Noise

Construction Noise Introduction

10A.2.1 The construction noise assessment has been undertaken in accordance with the methods and empirical data outlined in British Standard (BS) 5228-1:2009+A1:2014 Code of practice for Noise and Vibration control on construction and open sites – Part 1: Noise (BS 5228-1) (Ref 1).

Construction plant data

10A.2.2 Indicative construction plant and data associated with each proposed construction activity is **Table 10A.1**. The table provides the average expected sound pressure level as A-weighted decibels (dBA) for each activity at a standard distance of 10 m. The construction noise assessment takes these values and corrects for the distance between the construction activity and each NSR within the Study Area in accordance with the methodology described in BS 5228-1. For the purposes of the assessment, attenuation from mitigation measures, such as screening, is not included. This is so that noise 'hot spots' can be identified, and specific mitigation measures can be identified where they are required to avoid significant adverse effects.

Table 10A.1 Construction activity plant and noise data

Activity	Plant Item	Number of Plant Items	BS 5228-1 Ref	Per cent on time	A-weighted Sound Pressure Level at 10 m, dBA	Average Activity Sound Pressure Level at 10 m, dBA
General Works						
Site preparation	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Top soil strip	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Temporary access route	Wheeled backhoe loader	1	C2.8	70	68	79
	Dumper	2	C4.4	70	76	
	Vibratory roller	1	C2.40	70	73	
Temporary Construction Compounds						
Site preparation	Tracked excavator	2	C2.7	70	70	79
	Dozer	3	C2.1	70	75	
Road construction	Dumper	3	C4.4	70	76	82
	Road Roller	1	C5.19	70	80	
Compound buildings	Telehandler	2	C4.55	50	70	70
	Generator	2	C3.33	100	57	

Activity	Plant Item	Number of Plant Items	BS 5228-1 Ref	Per cent on time	A-weighted Sound Pressure Level at 10 m, dBA	Average Activity Sound Pressure Level at 10 m, dBA
Compound operation	Lorry	1	C2.34	25	80	76
	Telehandler	2	C4.55	50	70	
	Generator	2	C3.33	100	57	
Overhead Line Construction						
Pylon construction	Tracked excavator	1	C2.7	70	70	83
	Steel tube piling rig	1	C3.8	25	88	
	Concrete pump	1	C3.26	50	75	
Pylon Assembly	Telehandler	1	C4.55	50	70	67
Pylon installation	Crane lifting pylon	1	C4.46	10	67	57
Cable tensioning	Winder	1	Suppliers' data	60	77	78
	Rear Winder	1	Suppliers' data	60	77	

10A.3 Construction Vibration

Construction Vibration Introduction

10A.3.1 The construction vibration assessment has been undertaken with reference to the methods and empirical data outlined in BS 5228-2:2009+A1:2014 Code of practice for Noise and Vibration control on construction and open sites – Part 2: Vibration (BS 5228-2) (Ref 2).

10A.3.2 The main significant sources of vibration during construction activities are expected to be ground compaction, and percussive or vibratory piling. These processes may be required during the following activities:

i. Ground compaction with vibratory roller:
   - setup of site compounds;
   - site preparation;
   - temporary access route construction; and
   - cable laying.

ii. Piling:
   - pylon foundations.

Prediction of Construction Vibration

10A.3.3 Peak particle velocity (PPV) vibration levels in millimetres per second (mm/s) generated by ground compaction and piling activities can be predicted using the guidance and empirical formulae in Table E1 of BS 5228-2. The formulae are shown below.

Vibratory roller calculation formula

$$v_{res} = k_s\sqrt{n_d}\left[\frac{A}{x+L_d}\right]^{1.5}$$ (Equation 1)

Where:

i. V_{res} = Resultant PPV, in millimetres per second (mm/s).

ii. k_s = Scaling factor (and probability of predicted value being exceeded).

iii. n_d = Number of vibrating drums.

iv. A = Maximum amplitude of drum vibration, in millimetres (mm).

v. x = Distance measured along the ground surface, in metres (m).

vi. L_d = vibrating roller drum width, in metres (m).

Percussive piling calculation formula

$$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}}\right] \quad \text{(Equation 2)}$$

Where:

i. V_{res} = Resultant PPV, in millimetres per second (mm/s).

ii. K_p = Scaling factor (depending on soil conditions).

iii. W = Nominal hammer energy, in joules (J).

iv. r = Slope distance from the pile toe, in metres (m).

Assumptions

10A.3.4 The following conservative assumptions have been made to predict vibration levels to assess a reasonable worst-case:

i. Vibratory Roller assumptions:

- scaling factor of 75, representative of average conditions; and
- vibratory roller data based on worst case Bomag BW 213, 1 drum of 2.13 m width and maximum amplitude of 1.1 mm.

ii. Percussive piling assumptions:

- typical value of nominal hammer energy of 25 kJ; and
- scaling factor of 1.5 representative of typical soil conditions.

Vibration prediction results

10A.3.5 Equations 1 and 2 have been used to predict the minimum distances within which the vibration threshold values human comfort impacts from vibration in terms of the significant observed adverse effect level (SOAEL) and potential cosmetic building damage threshold may be exceeded (1.0 mm/s, and 12.5 mm/s PPV respectively). The calculated distances in **Table 10A.2** are used in the preliminary assessment to identify areas where NSR, and buildings and structures are potentially affected by construction vibration.

Table 10A.2 Indicative construction vibration threshold distances

Activity	Distance Within Which SOAEL May Be Exceeded (m)	Distance Within Which Cosmetic Building Damage May Occur (m)
Ground compaction	18	<2
Percussive piling	70	<10

References

Ref 1 BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, British Standard Institution, 2014.

Ref 2 BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration, British Standard Institution, 2014.

10B. Initial Construction Traffic Noise Assessment

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Contents

10B. Initial Construction Traffic Noise Assessment

10B.1 Introduction

10B.1.1 This appendix presents the initial assessment of construction traffic noise affecting Noise and Vibration sensitive receptors (NSR) in the New Grimsby West Substation to New Lincolnshire Connection Substation (LCS) A Section (Section 2) as part of the Grimsby to Walpole Project (the Project).

10B.2 Assessment Methodology

10B.2.1 The assessment of construction traffic noise has been conducted following the guidance detailed in Design Manual for Roads and Bridges LA 111 (DMRB LA 111) (Ref 1). This provides guidance for the assessment and Noise and Vibration impacts from road projects; however, the guidance is widely used in the assessment of construction Noise and Vibration impacts from other types of project, particularly with regards to construction traffic noise in lieu of other guidance.

Data Sources

10B.2.2 The assessment is based on traffic data and assumptions that has been produced by National Grid Electricity Transmission plc (National Grid) to support the transport assessment, including the proposed numbers of heavy goods vehicles (HGV).

Study Area

10B.2.3 Noise from construction traffic on the existing local road network has been assessed based on the proposed construction traffic routes. The Study Area is defined following the guidance detailed in DMRB LA 111 which states that the construction traffic Study Areas shall be defined to include a 50 m width from the kerb line of public roads with the potential for an increase in basic noise level (BNL) of 1dB(A) or more because of the additional construction traffic to existing traffic levels.

Assessment Criteria

10B.2.4 Noise from construction traffic on the public highway has been calculated in accordance with the Calculation of Road Traffic Noise (CRTN) (Ref 2) and assessed against the criteria detailed in DMRB LA 111. The BNL from public roads used as construction traffic routes has been calculated in accordance with CRTN for the Do-minimum and Do-something scenarios in the construction period. The calculated BNL values were compared to determine the magnitude of the impact.

10B.2.5 The BNL is a standardised metric for determining the noise level from a road and is defined as the noise level exceeded for 10 per cent of the time at a reference of 10 m away from the nearside carriageway edge obtained from traffic flow, speed, and is calculated in line with the methodology described in CRTN.

10B.2.6 Calculations are based on the Annual Average Weekday Traffic over the 18-hour period between 06:00 and 00:00 (AAWT,18 h). The standard CRTN BNL calculation is applicable where the AAWT,18 h traffic flows are greater than 4000 vehicles per 18-hour day. Where flows are between 1000 and 4000 vehicles per day, a 'low flow' correction can be applied which is a function of the distance from the carriageway. For the purposes of the initial assessment, a typical worst-case distance of 10 m has been assumed (the correction reduces with increased distance, with no correction applied beyond 30 m).

10B.2.7 Where there are potential changes in the BNL on roads greater than or equal to 1dB(A) a subsequent assessment of the impacts has been conducted on NSR within 50 m of routes where there are potential significant effects. NSR include dwellings, healthcare facilities, education facilities or other buildings where noise can cause disturbance to people using the buildings.

10B.2.8 Construction traffic noise effects are significant where there are medium or large magnitude impacts for a duration of ten or more days in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months. A detailed program of works is not currently available. However, for the purpose of this initial assessment it is assumed that the above temporal thresholds may be exceeded, as a worst-case.

10B.2.9 There are also potential significant effects were there is a small magnitude impact at NSR located within Noise Important Areas (NIA), which are more sensitive to increases in noise. NIAs are determined via strategic noise maps and highlight the residential areas experiencing the highest 1 per cent of noise levels from road and rail sources in England.

10B.3 Assessment

10B.3.1 The results of the construction traffic noise assessment are provided in **Table 10B.1**. It is assumed that there is no change in average speed between the do-minimum and do something scenarios. The results are colour coded as follows:

i. Green – Negligible magnitude impact (neutral)

ii. Yellow – Small magnitude impact (no NIA) (negative)

iii. Orange – medium magnitude impact, or small magnitude with NIA (negative)

iv. Red – Large magnitude impact (negative)

10B.3.2 Construction traffic noise impacts have been assessed on 33 construction traffic road links in Section 2 where data is available. The assessment indicates that construction traffic would lead to the following impacts:

i. no change in noise level on 14 road links;

ii. a negligible increase in noise level on 15 road links; and

iii. a small increase in noise level on 4 road links, none of which include NIAs.

10B.3.3 No medium or large magnitude construction traffic noise impacts are expected in Section 2. Additionally, there are no small magnitude impacts in locations which include NIAs (where a small magnitude impact may be considered significant). Therefore, there are no likely significant effects from construction traffic noise in Section 2.

Table 10B.1 Construction traffic noise assessment

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
CR18-1	A18	3854	12.9	4359	24.9	67.3	69.4	2.1	Small magnitude. Not Significant
CR21-1	A1173	5089	8.8	5613	19.0	69.3	71.1	1.8	Small magnitude. Not Significant
CR18-2	A18	6047	10.0	6557	18.2	68.7	70.4	1.7	Small magnitude. Not Significant
CR7	A16	8238	7.1	8651	12.1	71.1	72.1	1.0	Small magnitude. Not Significant
CR6-4	A16	9671	9.2	10235	13.1	72.1	73	0.9	Negligible magnitude. Not Significant
CR20-1	A18	14842	4.8	15366	8.6	73.2	74.1	0.9	Negligible magnitude. Not Significant
CR20-2	A18	15916	4.3	16476	7.9	73.4	74.2	0.8	Negligible magnitude. Not Significant

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
CR6-2	A16	12964	7.3	13417	10.4	73.1	73.8	0.7	Negligible magnitude. Not Significant
CR6-3	A16	14128	6.8	14664	9.6	73.4	74	0.6	Negligible magnitude. Not Significant
CR6-1	A16	18814	5.7	19268	7.9	74.4	74.9	0.5	Negligible magnitude. Not Significant
LK5	A157	7248	5.0	7553	6.4	70.2	70.6	0.4	Negligible magnitude. Not Significant
LK4-2	Ashby Hill	2031	10.0	2055	11.0	61.7	62	0.3	Negligible magnitude. Not Significant
LK6	B1200	6280	11.4	6341	12.2	70.6	70.8	0.2	Negligible magnitude. Not Significant
W33	A1104 Beesby Road	5380	3.7	5479	3.6	68.6	68.7	0.1	Negligible magnitude. Not Significant
CR5-4	A16	12381	3.8	12459	3.8	72.2	72.3	0.1	Negligible magnitude. Not Significant

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
CR5-5	A16	11838	11.6	11980	11.8	73.4	73.5	0.1	Negligible magnitude. Not Significant
LK23	A157	3627	11.3	3816	10.7	68.2	68.3	0.1	Negligible magnitude. Not Significant
W1	Main Road/ Aylesby Lane	2515	9.5	2551	9.4	66	66.1	0.1	Negligible magnitude. Not Significant
W83	A1031	3131	2.0	3165	1.9	64	64.1	0.1	Negligible magnitude. Not Significant
CR5-2	A16	24275	2.6	24323	2.6	74.9	74.9	0.0	No change. Not Significant
CR5-3	A16	22594	3.6	22673	3.6	71.2	71.2	0.0	No change. Not Significant
CR19	A46	18874	6.2	18902	6.3	75.3	75.3	0.0	No change. Not Significant
CR24	A46	8327	2.6	8351	2.5	70.3	70.3	0.0	No change. Not Significant
LK4-1	Ashby Hill	2836	18.6	2836	18.6	65.2	65.2	0.0	No change. Not Significant

Access Route Name/ID	Road Name	Baseline Data		Baseline Data Plus Construction Traffic		BNL, dB $L_{A10,18h}$		Change, dB	Outcome magnitude and effect.
		Total Daily Vehicles	Per cent HGV	Total Daily Vehicles	Per cent HGV	Baseline	Baseline Plus Construction Traffic		
LK17	Station Road	276	14.6	300	21.5	very low flow	very low flow	0.0	No change. Not Significant
LK21	Westfield Road	740	9.2	768	12.5	very low flow	very low flow	0.0	No change. Not Significant
W5	A46 Grimsby Road	15139	2.0	15139	2.0	69.9	69.9	0.0	No change. Not Significant
W6	A46 Laceby Road	16249	1.3	16249	1.3	68.9	68.9	0.0	No change. Not Significant
W8	Scartho Road	24957	0.9	24968	0.9	70.7	70.7	0.0	No change. Not Significant
W9	Louth Road	14424	0.4	14435	0.4	68.1	68.1	0.0	No change. Not Significant
W11	Cheapside	5403	9.0	5404	9.0	69.6	69.6	0.0	No change. Not Significant
W12	A153 Horncastle Road	3743	4.6	3746	4.6	67.2	67.2	0.0	No change. Not Significant
W38	Bluestone Heath Road	976	3.2	1024	3.1	very low flow	58.5	0.0	No change. Not Significant

References

Ref 1 Highways England et al. (2020). Design Manual for Roads and Bridges LA 111 Noise and vibration.

Ref 2 Department of Transport. (1988). Calculation of Road Traffic Noise.

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