



UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

Former Kempston Hardwick Brickworks
and adjoining land, Bedford

Appendix F – Construction Noise and Vibration Assessment

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FIGURES

NO TABLE OF FIGURES ENTRIES FOUND.

1 INTRODUCTION

- 1.1.1. This Appendix provides the technical noise and vibration assessment for the CEMP Works, including receptor identification, methodology, modelling inputs and predicted results. The controlling requirements for noise and vibration management, including monitoring, trigger/action levels, mitigation and response procedures, are set out in **Section D** of the CEMP Main Body.
- 1.1.2. The following sections set out the assessment methodology, provide information on the identified noise and vibration sensitive receptors relevant to the CEMP Works, and present the results of the construction noise and vibration assessment.
- 1.1.3. For ease of reference, the monitoring trigger and action levels relevant to the CEMP Works are reproduced in **Table 1-1** and **Table 1-2** below.

Table 1-1 - Noise Monitoring Trigger and Action levels at Noise Sensitive Receptors

Period	Measured construction noise level, $L_{Aeq,T}$ dB (façade)	
	Trigger Level	Action Level
Daytime (7am to 7pm)	62	65
Evenings and Weekends: Weekday evenings (7pm to 11pm) Saturday afternoon (1pm to 11pm) Sundays and Public holidays (7am to 11pm)	52	55
Night (11pm to 7am)	42	45

Table 1-2 - Vibration Monitoring Trigger and Action Levels

Vibration Trigger/Action Level	Vibration Level (PPV mm/s)
Trigger Level	1
Action Level	5

2 METHODOLOGY

2.1 NOISE

- 2.1.1. Construction working hours relevant to the CEMP Works are set out in **Section B** of the CEMP Main Body. For the purposes of this assessment, the relevant CEMP Works are assumed to be undertaken during the normal working hours applicable to the assessed activities.
- 2.1.2. Construction noise predictions for the CEMP Works have been undertaken using recognised best practice prediction methodology within appropriate acoustic modelling software. The model takes account of local topography and ground absorption. A ground absorption of 1.0 has been assumed, reflecting that most of the CEMP Land is acoustically soft. Noise levels are predicted at the most exposed façades of the relevant receptors, at a position 1m from façade.
- 2.1.3. The number, type and percentage on-time of construction plant for the assessed CEMP Works activities have been estimated for each phase of the works. These assumptions are reflected in the plant schedule in **Table 4-1**.
- 2.1.4. Cumulative construction noise levels from overlapping CEMP Works packages are not expected to be significant. Certain CEMP Works packages may overlap; however, the distance between adjacent CEMP Works is relatively large and construction noise levels at any individual receptor are therefore expected to be dominated by the closest CEMP Works activity.

2.2 VIBRATION

- 2.2.1. Vibration monitoring will be undertaken at locations selected to represent the identified vibration-sensitive receptors relevant to the CEMP Works, as shown in **Figure 3-1**.
- 2.2.2. CEMP Works activities such as the use of vibratory rollers will have the potential to generate relatively high levels of construction vibration.
- 2.2.3. Construction vibration predictions have been undertaken using the prediction method set out in the best practice guidance.
- 2.2.4. The controlling requirements for vibration monitoring, mitigation and response are set out in **Section D** of the CEMP Main Body.

3 SENSITIVE RECEPTORS

- 3.1.1. Noise monitoring for the CEMP Works will be undertaken at agreed accessible locations selected to represent the identified noise sensitive receptors relevant to the CEMP Works, including receptors located within the Order Land. **Figure 3-1** provides the wider context of NSRs across the Order land.
- 3.1.2. For the purposes of this Appendix, the construction noise and vibration assessment has been undertaken at the nearest receptors relevant to the CEMP Land and the CEMP Works. One of those receptors, MON03, is located within the Order Land but outside the CEMP Land and is included because of its proximity and relevance to the CEMP Works.

Table 3-1 - Noise and vibration sensitive receptors relevant to the CEMP Works

Noise sensitive receptor reference	Description	Town/ village location	Receptor category	Approximate No. of properties
MON01	Individual property east of Woburn Road	Stewartby	Residential	1
MON02	Farmhouse off Broadmead Road	Stewartby	Residential	1
MON03 (within the Order Land but outside the CEMP Land)	Residential properties along Ampthill Road, Angelica Grove/Borage Walk, and properties southwest of the B530; Properties to the south of Manor Road	Kempston Hardwick	Residential	100
	Properties to the south of Manor Road	Kempston Hardwick	Residential	5
MON04	Properties off Manor Road	Kempston Hardwick	Residential	15
MON05	Properties on the east of the B530 Hardwick Hill	Wixam	Residential	2

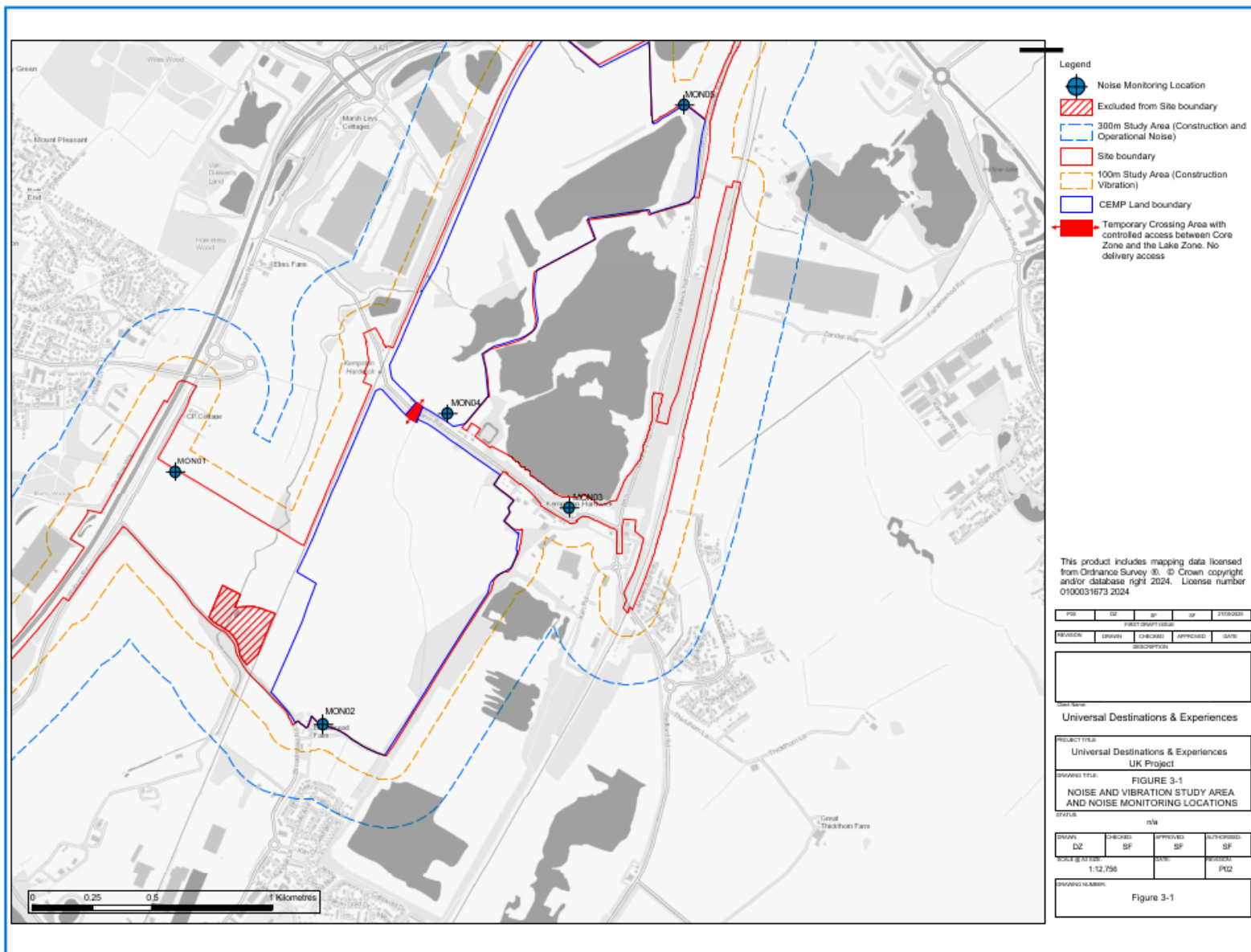


Figure 3-1 - Noise and Vibration Sensitive Receptors (showing wider Order land context) The construction noise assessment thresholds defined in the ES NVIA and applicable to the assessed NSRs listed in Table 3-1 are presented below in Table 3-2.

Table 3-2 - Construction Noise Assessment Thresholds

Noise sensitive receptor reference	Day-time baseline ambient noise level, dB LAeq (LOAEL)	Day-time BS5228-1 ABC category	Day-time ABC assessment criterion, dB LAeq,T (SOAEL)
MON01	63	B	70
MON02	51	A	65
MON03	62	A	65
MON04	51	A	65
MON05	53	A	65

4 MODELLING INPUTS AND RESULTS

4.1 CEMP WORKS DESCRIPTION

- 4.1.1. The CEMP Works considered within this assessment include site preparation, initial works to remove archaeological arisings, topsoil stripping, and earthworks (cut to fill) including materials transfer within the CEMP Land.
- 4.1.2. The assessment has been undertaken on the basis of typical construction activity associated with the CEMP Works for each assessed phase. In practice, plant will be mobile and will operate at varying locations and for differing durations across the CEMP Land on any given day. The predicted noise levels are therefore intended to represent typical phase-day conditions rather than a short-term peak day when plant may be concentrated at a particular location. Noise levels at individual receptors may be higher or lower than predicted at a given time depending on the exact plant locations and activities then taking place.
- 4.1.3. This approach is consistent with the methodology adopted within the ES NVIA, where significance was determined with reference to typical construction noise levels for each phase rather than a worst-case peak scenario.
- 4.1.4. Noise levels are predicted for construction plant within the CEMP Works boundary only. Noise arising from construction vehicles using the surrounding road network was assessed as part of the ES NVIA and does not form part of the scope of this Appendix.

4.2 CEMP LAND PREPARATION

- 4.2.1. CEMP Works are expected to be focused on the CEMP Land access and compound areas, including improvement of the existing access arrangement, establishment of CEMP Works facilities (gatehouse, CEMP Land offices/welfare) and associated temporary services. Deliveries are expected via CEMP Land accesses, with intermittent lifting/handling activities associated with cabin installation.
- 4.2.2. For the purposes of the CEMP Works noise modelling, the CEMP Land preparation works were represented as an area noise source located 1.5 m above local ground level, covering the approximate area associated with the access improvements and gatehouse/site office compound.

4.3 REMOVAL OF ARCHAEOLOGICAL ARISINGS

- 4.3.1. CEMP Works comprise localised removal of archaeological arisings, with materials transported outside the CEMP Land via the Manor Road access. CEMP Works are expected to include bulk excavation/loading, local materials handling and stockpiling, and HGV movements for disposal outside of the Order land. For the purposes of this assessment, it is assumed that the initial works will be undertaken concurrently across the three main zones, with plant operating across the relevant areas rather than progressing sequentially zone-by-zone.
- 4.3.2. For the purposes of the construction noise modelling, the initial CEMP Works were represented as an area noise source located 1.5 m above local ground level. This covers the approximate areas associated with the archaeological arisings' stockpiles, as well as the access/transfer routes from Manor Road and the north–south transfer route between the stockpile areas.

4.4 TOPSOIL STRIP

- 4.4.1. CEMP Works comprise stripping of topsoil within the identified zones and transfer to designated storage areas/stockpiles within the CEMP Land. CEMP Works are expected to include excavation/stripping, dozing/spreading to form stockpiles/bunds, and on-site materials movements associated with transfer and placement. For the purposes of this assessment, it is assumed that topsoil stripping works will be undertaken concurrently across the CEMP Land, with plant operating across the relevant areas rather than progressing sequentially zone-by-zone.
- 4.4.2. For the purposes of the CEMP Works noise modelling, the topsoil stripping works were represented as an area noise source located 1.5 m above local ground level and covering the CEMP Land.

4.5 BULK EARTHWORKS (CUT TO FILL) INCLUDING ON-SITE MATERIALS TRANSFER

- 4.5.1. CEMP Works comprise bulk, cut and fill operations across the CEMP Land, including excavation/loading, haulage of material within the CEMP Land, placement/spreading and compaction to formation. Material movements within the CEMP Land are expected to be predominantly undertaken using Articulated Dump Trucks (ADTs) along defined haul routes, with supporting grading and compaction plant. For the purposes of this assessment, it is assumed that earthworks will be undertaken concurrently across the CEMP Land, with plant operating across the relevant areas rather than concentrated in a single dominant work front.
- 4.5.2. For the purposes of the construction noise modelling, the earthworks were represented as an area noise source located 1.5 m above local ground level and covering the relevant mass grading work areas within the CEMP Land.

SIMULTANEOUS ACTIVITIES / SEQUENCING

- 4.5.3. Cumulative construction noise levels from overlapping CEMP Works packages are not expected to be significant. Certain CEMP Works packages will overlap, however the distance between adjacent CEMP Works is likely to be large, and therefore construction noise levels at any individual NSR are expected to be dominated by the closest CEMP Works.

4.6 RESOURCE SCHEDULE

- 4.6.1. Details of the main plant items to be used during the CEMP Works, including sound power levels (i.e. the noise levels for each item of plant), and the expected “on-time” (the percentage of time that the plant is expected to be operational over each working day) are summarised in **Table 4-1** below.
- 4.6.2. Plant items will move around the CEMP Land, operate at different times or for different durations and at different locations on any one day. The plant list and assumed on-times in **Table 4-1** reflect the CEMP Works activities over the relevant time period (e.g. the standard working hours set out in **Section B – Construction Working Hours** of the CEMP Main Body).

Table 4-1 - Plant list for CEMP Works

Activity	Plant item	Sound power level/Item (dB LWA)	% on-time	Resulting daily sound power level/Item (dB LWA)
CEMP Land preparation (access improvement, gatehouse, and CEMP Land offices installation)	Tracked excavator (8–14 t class)	97	60	95
	Tracked excavator (8–14 t class)	97	60	95
	Vibratory roller (small)	102	40	98
	Vibratory roller (small)	102	40	98
	Vibratory plate compactor (petrol)	108	20	101
	Telehandler	99	50	96
	Telehandler	99	50	96
	HIAB/flatbed lorry (deliveries)	108	30	103
	HIAB/flatbed lorry (deliveries)	108	30	103
	Mobile crane (intermittent)	95	10	85
	Generator (temporary power)	90	100	90
	Water bowser (dust suppression)	109	30	103
	Road sweeper	104	100	104
Initial CEMP Works (remove archaeological arisings via Manor Road access)	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Wheeled loader	104	50	101
	Dozer	103	100	103
	Site dumper (6–9 t)	104	40	100
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	HGV tipper lorry (32 t)	108	40	104
	Water bowser	109	100	109
	Road sweeper	104	100	104
	Telehandler (general support)	99	15	90
	ADT (40 t)	115	100	115

Activity	Plant item	Sound power level/Item (dB LWA)	% on-time	Resulting daily sound power level/Item (dB LWA)
Topsoil strip (6 zones, concurrent)	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Tracked excavator (20–25 t class)	104	100	104
	Dozer	103	100	103
	Dozer	103	100	103
	Dozer	103	100	103
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	Water bowser	109	100	109
	Water bowser	109	100	109
	Road sweeper	104	100	104
Bulk Earthworks (cut to fill) including on-site materials transfer	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107

Activity	Plant item	Sound power level/Item (dB LWA)	% on-time	Resulting daily sound power level/Item (dB LWA)
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Tracked excavator (30–40 t)	107	100	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Dozer (30–40 t)	108	70	107
	Motor grader	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	ADT (25–30 t)	115	100	115
	Padfoot roller (compaction)	102	100	102
	Padfoot roller (compaction)	102	100	102
	Padfoot roller (compaction)	102	100	102
	Padfoot roller (compaction)	102	100	102
	Vibratory roller (haul routes)	104	100	104
	Vibratory roller (haul routes)	104	100	104
	Water bowser	102	100	102
	Water bowser	102	100	102

	Water bowser	102	100	102
	Fuel bowser	117	100	117
	Fuel bowser	117	100	117
	Road sweeper	104	100	104
	Road sweeper	104	100	104
	Telehandler (general support)	99	15	90

4.7 MODELLING RESULTS – NOISE

4.7.1. Predicted construction noise levels for the CEMP Land preparation, initial works, topsoil stripping and earthworks phases of the CEMP Works are presented in **Table 4-2** and **Table 4-3**.

Table 4-2 - Construction noise prediction results (site preparation and initial works)

	Predicted construction façade noise level, LAeq,T dB					
	Site Preparation			Initial Works		
NSR reference	Daytime	Evening and Weekends	Night-time	Daytime	Evening and Weekends	Night-time
MON01	32	-	-	39	-	-
MON02	32	-	-	52	-	-
MON03	42	-	-	50	-	-
MON04	49	-	-	54	-	-
MON05	28	-	-	34	-	-

Table 4-3 - Construction noise prediction results (topsoil strip and earthworks)

	Predicted construction façade noise level, LAeq,T dB					
	Topsoil Strip			Earthworks		
NSR reference	Daytime	Evening and Weekends	Night-time	Daytime	Evening and Weekends	Night-time
MON01	46	-	-	49	-	-
MON02	64	-	-	65	-	-
MON03	56	-	-	60	-	-
MON04	62	-	-	64	-	-
MON05	39	-	-	41	-	-

The highest predicted typical level is 65 dB LAeq,T at MON02 during the earthworks aspect of the CEMP Works, which is equal to the relevant daytime action level in **Table 1-1**. All other predicted levels are below the relevant action level and below the applicable assessment criterion in **Table 3-2**.

- 4.7.2. Although significant adverse effects are not predicted on a typical phase-day basis, the CEMP Works will be undertaken using Best Practicable Means, with the controlling monitoring, mitigation and response requirements set out in **Section D** of the CEMP Main Body.
- 4.7.3. Given that the worst-case results occur at MON02 (and MON04), where earthworks levels are predicted to be close to the threshold), monitoring will be undertaken at agreed locations representing the most affected noise sensitive receptors during the CEMP Works.

4.8 MODELLING RESULTS – VIBRATION

- 4.8.1. Predicted construction vibration levels for the site preparation, initial works, topsoil strip and earthworks are presented in **Table 4-4** and **Table 4-5**.

Table 4-4 - Construction vibration prediction results (site preparation and initial works)

	Predicted construction vibration level, PPV, mm/sec	
NSR reference	Site Preparation	Initial Works
MON01	0.0	0.0
MON02	0.1	0.0
MON03	0.1	0.0
MON04	0.3	0.0

Table 4-5 - Construction vibration prediction results (topsoil strip and earthworks)

	Predicted construction vibration level, PPV, mm/sec	
NSR reference	Topsoil Strip	Earthworks
MON01	0.0	0.1
MON02	0.0	1.9
MON03	0.0	0.3
MON04	0.0	2.4
MON05	0.0	0.0

- 4.8.2. CEMP Work vibration levels are predicted to range between 0.0 and 2.4 mm/s PPV. The highest predicted levels occur during the earthworks aspect of the CEMP Works, with predicted PPV of 1.9 mm/s at MON02 and 2.4 mm/s at MON04.
- 4.8.3. For context, vibration levels of up to 5 mm/s PPV are the prescribed Action levels set out in **Section D** of the CEMP Main Body, so vibration effects at MON02 and MON04 during earthworks are below the threshold.
- 4.8.4. The controlling requirements for vibration monitoring, mitigation and response are set out in **Section D** of the CEMP Main Body.