APPENDIX 14.1
NOISE AND VIBRATION TECHNICAL APPENDICES

Technical Appendices

Appendix 14.1: Noise and Vibration

NOISE SURVEY

Introduction

14.1 Temple Group has been appointed by Bidwells to undertake a noise and vibration impact assessment for the Proposed Development at Milton Avenue, North Cambridge.

14.2 Continuous noise monitoring has been conducted over several days at a number of locations representative of noise sensitive receptors. In addition to the unattended monitoring, attended measurements have been undertaken several other locations across the Site.

The Proposed Development

14.3 The Proposed Development plot lies on the land to the north of Cambridge North Station, to the west of the railway, off Milton Avenue & Cowley Road.

14.4 The main noise sources incident upon the Proposed Development that control the noise climate are:

- The mainline Fen Line railway;
- A railway siding line feeding the Tarmac Cambridge Asphalt facility;
- Road traffic from Milton Ave & Cowley Rd;
- The Cambridgeshire Guided Busway;
- Cambridge North Station; and
- Cowley Road Industrial estate.

Relevant Guidance and Standards

British Standard 7445: 'Description and Measurement of Environmental Noise'

Part 1: Guidance to quantities and procedures

14.5 This part of BS 7445 defines the basic quantities to be used for the description of noise in community environments and basic procedures for the determination of the quantities. The methods and procedures described are intended to be applicable to sounds from all sources, individually and in combination that contribute to the total noise at a site.

Part 2: Guide to the acquisition of data pertinent to land use

14.6 This part of BS 7445 describes methods for the acquisition of data which provide descriptors that enable:

a) A description of the environmental noise in a specified area of land to be made in a uniform way

b) The compatibility of any land use activity or projected activity to be assessed with respect to existing or predicted noise

14.7 Using the data as a basis, authorities may establish a system for selecting the appropriate land use, as far as noise levels are concerned, for a specific area, or the sources of noise (existing or planned) which are respectable to land use (existing or planned).

Calculation of Road Traffic Noise (CRTN)

14.8 Department of Transport/Welsh Office Memorandum 'Calculation of Road Traffic Noise'[1] (CRTN) describes procedures for traffic noise calculation, it is suitable for environmental assessments of schemes where road traffic noise may have an impact.

ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development

14.9 Professional Practice Guidance on Planning and Noise for new residential development (ProPG) provides guidance on producing an initial site noise risk assessment pre-mitigation based on the prevailing daytime and night-time noise levels across a site, from which a site (or areas thereof) can be zoned. The assessment requires consideration of four key elements to be undertaken in parallel:

- Good Acoustic Design Process;
- Internal Noise Level Guidelines;
- External Amenity Area Noise Assessment; and
- Assessment of Other Relevant Issues.

14.10 Table A14.1.1 shows the initial noise risk assessment criteria taken from Figure 1 of ProPG:

Table A14.1.1 Initial Site Risk Assessment (measured/predicted, empty site, pre mitigation)

Risk	Day dB $L_{Aeq,\ 16h}$ (07:00-23:00)	Night dB $L_{Aeq,\ 8h}$ (23:00-07:00)
Negligible	<50	<40
Low	55	45
Medium	65	55
High	>70	>60

[1] Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988

British Standard 8233:2014: 'Guidance on sound insulation and noise reduction in buildings'

14.11 British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'[2] provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties.

World Health Organisation

14.12 The World Health Organisation "Guidelines for Community Noise 1999" states "*For a good sleep, it is believed that indoor sound pressure levels should not exceed 45 dB* L_{Amax} *more than 10-15 times per night (Vallet and Vernet 1991)".*

British Standard 5228

14.13 British Standard 5228: 'Code of practice for noise and vibration control on construction and open sites'[3] (BS 5228) provides a 'best practice' guide for noise and vibration control. It includes sound power level (SWL) data for individual plant as well as a calculation method for noise from construction activities. Part 1 of the standard relates to noise and part 2 relates to vibration.

Design Manual for Roads and Bridges

Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration

14.14 The Highways Agency 'Design Manual for Road and Bridges Volume 11 Section 3 Part 7 – Traffic Noise and Vibration'[4] (DMRB) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration impacts arising from all road projects, including new construction, improvements and maintenance.

British Standard 4142:2014+A1:2019

14.15 British Standard 4142:2014+A1:2019[5] (BS 4142) 'Methods for rating and assessing industrial and commercial sound' describes methods to assess the likely effect of sound of an industrial and/or

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[2] British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings', BSI, London.

[3] British Standard 5228-1: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

[4] Design Manual for Roads and Bridges, Volume 11, Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 7, LA 111, Noise and Vibration, (formerly HD 213/11, IAN 185/15), The Highways Agency, November 2019

[5] British Standards Institution (June 2019), British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

Local Planning Policy

14.16 With regard to the regional and local policies, the South Cambridgeshire Local Plan and Greater Cambridge Sustainable Design and Construction Supplementary Planning Document meets the above assessment methodology.

Survey Methodology

Noise Survey

14.17 An environmental noise survey was carried out by Temple in February 2022 in order to establish baseline noise levels across the Site.

14.18 The survey comprised of unattended noise measurements at two locations within the Site to obtain representative ambient daytime and night-time noise levels during a typical week and at a weekend. Additional attended measurements were also made during the survey at four locations around the Site to assess noise from road traffic, rail and commercial units.

Unattended noise monitoring

14.19 An unattended environmental noise survey was carried out at the Proposed Development between 03/02/2022 and 08/02/2022 to obtain full daytime and night-time ambient noise levels during weekdays and at a weekend.

14.20 The unattended sound level meter's microphones were positioned at a height of 1.2 (m) above the ground level, and more than 4 (m) away from any reflective surface and therefore are considered to be free-field measurements. The measurement microphones were fitted with a windshield and appropriate corrections applied.

14.21 The sound level meters were set to log continuously over 15-minute periods measuring octave band and A -weighted L_{eq}, L_{Fmax}, L_{10} and L_{90} parameters.

- UN1 was located on the eastern boundary of the Proposed Development, parallel to the Fen Line railway that runs through Cambridge North station, and its purpose was to collect noise data from trains passing through the station.
- UN2 was located inside a small carpark to the east of Milton Avenue, currently used as a staff carpark for the Novotel. Its purpose was to collect noise data from traffic on Milton Avenue.

Attended noise monitoring

14.22 The attended noise surveys were carried out at four locations around the Milton Avenue development plot on 03/02/2022 and on 11/02/2022.

14.23 The sound level meter was mounted on a tripod located 4m from the nearside edge of the road or railway at a height of approximately 1.5m above local ground level. The microphone was considered to be in free field conditions at all locations.

14.24 The meter was set to log in 15-minute periods measuring octave band and A-weighted L_{eq}, L_{Fmax}, L_{10} and L_{90} along with other metrics.

- AN1 was located on the north-western boundary of the Proposed Development, at the intersection of Milton Avenue and Cowley Road.
- AN2 was situated on the southern boundary of the Proposed development, adjacent to the Fen Line and Cambridge North station, and the north-easterly corner of the Novotel building.

Attended Vibration Monitoring

14.25 An attended vibration survey was carried out at two locations on 03/02/2022 and on 11/02/2022.

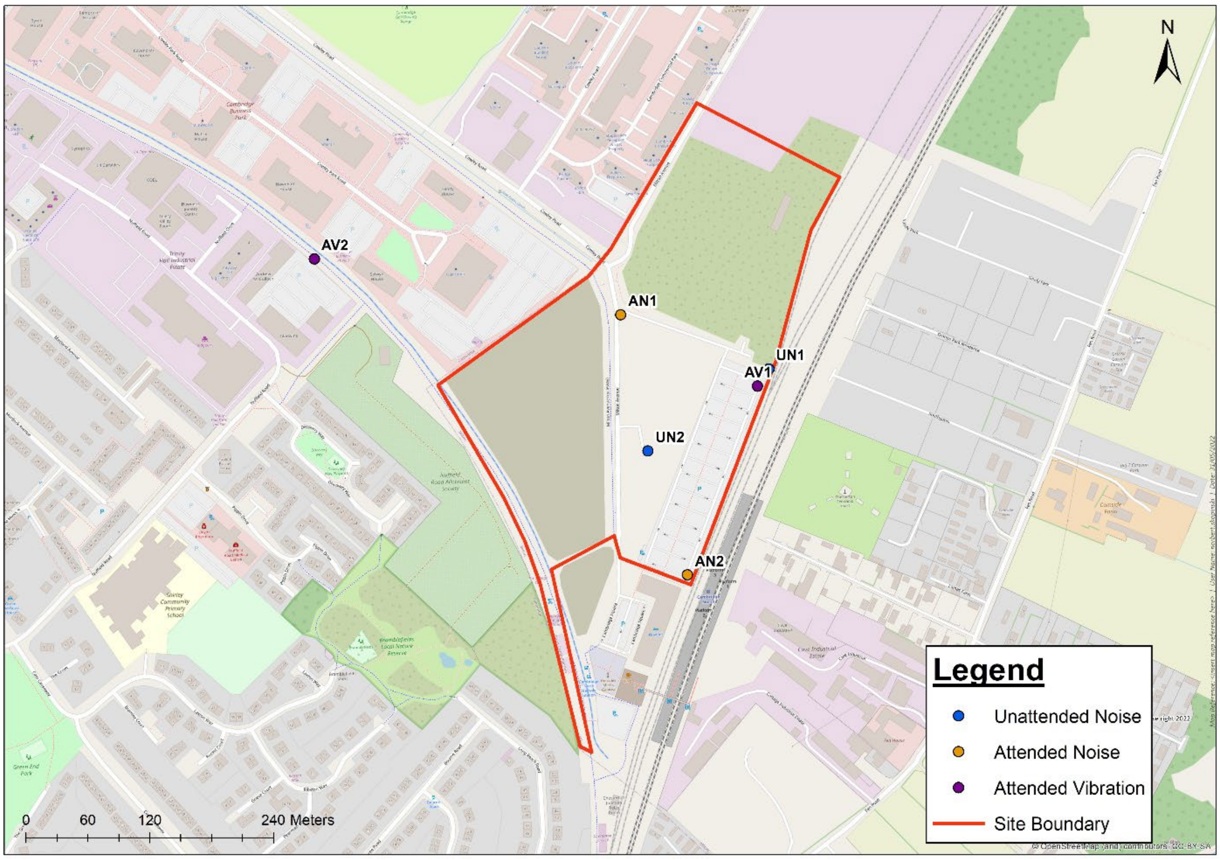
14.26 Vibration measurements were carried out using a vibration monitor and a triaxial accelerometer. VDV and PPV measurements were taken in all three axes (X, Y, Z) with the X-axis parallel to the road/railway, Y-axis perpendicular to the road/railway and Z as the vertical axis.

- At AV1, the accelerometer was mounted on a DIN plate and placed on a flat block-paved surface within the application site approximately 30m away from the mainline Fen Line to the east of the site to determine the vibration levels caused by passing trains.
- At AV2, the accelerometer was mounted on a DIN plate and placed on a flat tarmac surface at the nearest suitable representative location to the application site boundary

approximately 5m away from the nearest (west-bound) lane of the Cambridgeshire Guided Busway to determine the vibration levels caused by guided buses.

14.27 Figure A14.1.1 shows the locations of the attended and unattended noise measurements.

Figure A14.1.1 Survey measurement locations



Equipment and weather conditions

14.28 The equipment used is detailed in Table A14.1.2 below. The sound level meters were field calibrated before and after their respective measurement periods and no significant variation in level was observed. The equipment is subject to manufacturer's certificates of periodic verification within one year for the field calibrator, and two years for sound level and vibration meters. Copies of these certificates are available upon request.

Table A14.1.2 Survey equipment

Manufacturer	Item	Type	Serial Number	Calibration Date
RION	Sound Level Meter	NL-52	00410086	27/08/2021
RION	Sound Level Meter	NL-52	00510141	27/08/2021
RION	Sound Level Meter	NA-28	00881067	28/01/2022
RION	Sound Level Meter	NA-28	01260205	28/01/2022
RION	Vibration Meter	VM-56	00680014	15/07/2021
RION	Calibrator	NC-74	34936353	29/10/2021

14.29 The weather conditions during the survey were dry with light winds. Wind speeds were below the recommended maximum limit of 5m/s for the majority of the monitoring period.

Survey Results

Unattended Noise Survey

UN1 – Railside

14.30 The noise climate at this location was dominated by rail noise when present and road traffic accessing carpark. Other noise source contributing to a lesser degree included distant aircraft noise

UN2 – Small carpark adjacent to Milton Avenue

14.31 The noise climate at this location was dominated by road traffic noise on Milton Avenue and construction noise from One Cambridge Square when present. Other noise sources contributing to a lesser degree included rail noise and distant aircraft noise.

Attended Noise Survey

AN1 – Corner of Milton Avenue & station carpark access

14.32 The noise climate at this location was dominated by road traffic noise on Milton Avenue. Other noise sources contributing to a lesser degree included construction noise from One Cambridge Square and distant aircraft noise.

AN2 – Novotel, north east corner

14.33 This location was not directly exposed to a singular continuous noise source and was affected by rail noise, railway PA-system, construction noise from One Cambridge Square and road traffic accessing carpark. Other noise source contributing to a lesser degree included distant aircraft noise.

Attended Vibration Survey

AV1 – Railway

14.34 During the survey, there was no perceptible vibration felt by the surveyor at this location.

AV2 – Cambridgeshire guided busway

14.35 During the survey, there was no perceptible vibration felt by the surveyor at this location.

Monitoring Results

14.36 The results of the measured daytime and night-time continuous noise measurements at the unattended monitoring locations are presented in Table A14.1.3.

Table A14.1.3 Unattended noise survey results

Location	Date	$L_{Aeq,T}$, dB		10th Highest L_{AFmax}, dB		Typical L_{AF90}, dB		Typical Lowest L_{AF90}, dB	
		Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00
UN1	03/02/22	55	49	73	66	44	38	40	37

UN1	04/02/22	53	48	72	72	48	39	42	37
UN1	05/02/22	50	46	73	62	44	40	42	38
UN1	06/02/22	50	49	70	60	46	42	43	37
UN1	07/02/22	51	45	73	62	45	39	40	36
UN1	Whole period	52	48	79	74	46	40	42	37

Location	Date	$L_{Aeq,T}$, dB		10th Highest L_{AFmax}, dB		Typical L_{AF90}, dB		Typical Lowest L_{AF90}, dB	
		Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00
UN2	03/02/22	54	43	68	61	48	38	40	37
UN2	04/02/22	52	44	69	62	48	39	43	38
UN2	05/02/22	48	45	67	61	44	41	42	39
UN2	06/02/22	51	46	67	61	47	42	43	38
UN2	07/02/22	52	41	72	53	45	38	40	36
UN2	Whole period	51	44	73	64	46	40	42	37

14.37 The results from the attended daytime noise survey are presented in Table A14.1.4.

Table A14.1.4 Attended noise survey results

Date/Time	Location	$L_{Aeq,15min}$ (dB)	$L_{Amax,15min}$ (dB)	$L_{A10,15min}$ (dB)	$L_{A90,15min}$ (dB)
03/02/22 14:15	AN1	55	73	57	49
03/02/22 15:00	AN1	56	72	60	49
03/02/22 15:40	AN1	54	71	57	48
03/02/22 14:40	AN2	56	70	58	54
03/02/22 15:20	AN2	53	68	54	52
03/02/22 16:00	AN2	57	79	58	54

14.38 The results from the attended daytime vibration survey are presented in Table A14.1.5 and Table A14.1.6.

Table A14.1.5 Attended vibration survey results for AV1 (Railway)

Date	Time	X-axis VDV $mm/s^{1.75}$	Y-axis VDV $mm/s^{1.75}$	Z-axis VDV $mm/s^{1.75}$	Train type	Vehicle direction
11/02/22	16:01	0.0003	0.0005	0.0037	170	South
11/02/22	16:06	0.0002	0.0004	0.0029	377	South
11/02/22	16:08	0.0004	0.0005	0.0032	377	North
11/02/22	16:22	0.0003	0.0003	0.0021	755 FLIRT	North
11/02/22	16:32	0.0003	0.0004	0.0025	377	South
11/02/22	16:38	0.0001	0.0001	0.0003	755 FLIRT	South
11/02/22	16:40	0.0004	0.0005	0.0031	377	North

Date	Time	X-axis VDV mm/s$^{1.75}$	Y-axis VDV mm/s$^{1.75}$	Z-axis VDV mm/s$^{1.75}$	Train type	Vehicle direction
11/02/22	16:59	0.0002	0.0003	0.0018	377	South
11/02/22	17:03	0.0003	0.0005	0.0040	170	North
11/02/22	17:06	0.0003	0.0005	0.0034	170	South

Table A14.1.6 Attended vibration survey results for AV2 (Busway)

Date	Time	X-axis VDV mm/s$^{1.75}$	Y-axis VDV mm/s$^{1.75}$	Z-axis VDV mm/s$^{1.75}$	Vehicle type	Vehicle direction
03/02/22	14:38	0.0002	0.0002	0.0042	Guided bus	South
03/02/22	14:40	0.0002	0.0002	0.0043	Guided bus	North
03/02/22	15:30	0.0002	0.0002	0.0039	Guided bus	South
03/02/22	15:33	0.0002	0.0002	0.0043	Guided bus	North
03/02/22	15:42	0.0002	0.0002	0.0047	Guided bus	South
03/02/22	15:44	0.0003	0.0003	0.0062	Guided bus	North
03/02/22	15:58	0.0034	0.0005	0.0046	Guided bus	South
03/02/22	16:00	0.0002	0.0002	0.0051	Guided bus	North
03/02/22	16:16	0.0002	0.0002	0.0045	Guided bus	South
03/02/22	16:19	0.0002	0.0005	0.0122	Guided bus	North
11/02/22	13:46	0.0001	0.0002	0.0027	Guided bus	South
11/02/22	13:49	0.0002	0.0005	0.0059	Guided bus	North
11/02/22	14:09	0.0002	0.0003	0.0033	Guided bus	South
11/02/22	14:11	0.0002	0.0007	0.0076	Guided bus	North
11/02/22	14:19	0.0002	0.0002	0.0026	Guided bus	South
11/02/22	14:22	0.0002	0.0004	0.0048	Guided bus	North
11/02/22	15:32	0.0001	0.0002	0.0024	Guided bus	South
11/02/22	15:35	0.0002	0.0006	0.0062	Guided bus	North

ASSUMPTIONS AND LIMITATIONS OF NOISE CALCULATIONS

Construction Noise

14.39 Calculations of construction noise have been carried out in accordance with BS 5228 Part 1 in order to calculate the likely noise levels at varying receptor distances during the worst-case construction period. Construction plant has been based on indicative typical plant and equipment presented in Table A14.1.7.

14.40 The assessment includes assumed likely percentage on times for the construction plant and assumes screening provided by site hoarding where required.

Table A14.1.7 An indication of typical types of plant and equipment associated with the construction phases as part of CEMP

Plant and Equipment	Stage of Works					
	Enabling and Site Preparation	Substructure	Frame construction	Façade Construction	Fit-out	Landscaping
Excavator	x	x	x			x
Excavator + Breaker	x	x				
Cranes	x	x	x	x		
Floodlights	x	x				
Articulated Dump Truck	x	x				x
Drills / Cutters		x	x	x	x	
Concrete generation		x	x	x		x
Generators	x	x	x			
Scaffolding		x	x	x	x	
Asphalt Plant	x	x				x
Fork Lift Truck		x	x	x	x	
Skips and skip trucks	x	x	x		x	x
Piling Plant	x	x				
Lorries/vans	x	x	x	x	x	x

14.41 Table A14.1.8 below gives input information used regarding the plant for the construction activities presented.

Table A14.1.8 Construction Noise calculations input information

Plant Category	BS5228 Description	BS5228 Reference	BS5228 Leq@10m	Assumed Quantity	% On-Time	Correction to $L_{Aeq,10h}$	Screening Attenuation	Activity $L_{Aeq(10h)}$
Excavator	Tracked excavator	C.2.21	71	2	25	-6	-5	63
Excavator + Breaker	Breaker mounted on excavator	C.1.1	92	2	15	-8.2	-5	82

Plant Category	BS5228 Description	BS5228 Reference	BS5228 Leq@10m	Assumed Quantity	% On-Time	Correction to $L_{Aeq,10h}$	Screening Attenuation	Activity $L_{Aeq(10h)}$
Cranes	Tracked mobile crane (lifting)	C.4.50	71	2	25	-3	-5	63
Floodlights	Diesel generator (power for lighting)	C.8.24	59	2	50	-6	-10	49
Articulated Dump Truck	Articulated dump truck 25T	C.5.16	81	1	25	-8.2	-5	70
Drills / Cutters	Hand-held hammer	C.5.36	87	1	15	-7	-10	69
Concrete generation	Concrete pump	C.3.26	75	1	20	0	-5	63
Generators	Generator (power for site cabins)	C.8.24	59	2	100	-13	-10	52
Scaffolding	Scaffold poles and clips (dismantling)	D.7.1	80	1	5	-5.2	-5	62
Asphalt Plant	Asphalt spreader, chip spreader, road roller, lorry	D.8.26	80	1	30	-7	-5	70
Fork Lift Truck	Telescopic handler	C.2.35	75	2	20	-7	-5	66
Skips and skip trucks	Skip wagon ж	C.8.21	78	2	20	-6	-5	69
Piling Plant	CFA Piling Rig	C.12.42	80	1	25	-10	-5	65
Lorries/vans	Tipper lorry ж	C.8.20	79	1	20	-7	-5	67

Noise Model Assumptions

14.42 The following assumptions have been made in the development of the model:

- activity noise levels input into the noise model have been derived from the plant list and operational plant percentage usages presented in Table A14.1.7 and Table A14.1.8.
- an indicative programme of phases has been used to undertake the assessment, which considers the loudest activities (enabling and substructure works) and any overlapping between the phases.
- the ground in the noise model has been modelled as hard, flat ground; all plant on-site has been modelled as an area source, 1.5 m above ground.
- 2.4 m high hoarding has been modelled around the perimeter of the construction site.
- receptor heights have been set 1.5 m above ground.
- noise levels have been predicted 1 m from the façade of the property of interest.
- the effects of acoustical screening by barriers and buildings have been included in the noise model in accordance with the BS 5228 calculation method. Screening effects using this method are calculated by applying a minus 10 dB correction to the calculated noise level where there is no line-of-sight between a receptor and a source or a minus 5 dB

correction to the calculated noise level where there is a partial line-of-sight between a receptor and a source.

- A number of receptors have been identified for calculation purposes as listed in Table A14.1.4 and shown on Figure 14.1.2.
- All activities have been predicted as core hours works (0800 to 1800 weekdays and 0800 to 1300 on Saturday).

Calculation Results

Table A14.1.9 Predicted Typical $L_{Aeq,T}$ at Receptors during Enabling and Substructure Works

Programme	Duration		Predicted typical construction noise level at distance representative of the closest receptor $L_{Aeq,10hr}$ ($L_{Aeq,5hr}$ for Saturdays) (dB)									
			R1 80m	R2 135m	R3 60m	R4 70m	R5 150m	R6 20m	R7 20m	R8 20m	R9 60m	R10 20m
Enabling works	03/04/23	31/08/23	54	51	55	55	54	77	57	58	55	56
Phase 1	31/08/23	02/11/23	51	51	59	57	53	66	62	52	51	57
Phase 2	02/11/23	01/04/24	57	58	55	51	48	67	60	50	53	63
Phase 3	01/04/24	07/04/25	58	52	52	51	49	81	55	55	59	56
Phase 4	07/04/25	28/08/25	52	50	53	57	53	74	53	58	56	52
Phase 5	28/08/25	06/10/25	54	53	57	55	51	74	58	53	54	58

Table A14.1.10 Predicted Typical $L_{Aeq,T}$ at Receptors during Enabling and Substructure Works with Overlapping Phases

Programme	Duration		Predicted typical construction noise level at distance representative of the closest receptor $L_{Aeq,10hr}$ ($L_{Aeq,5hr}$ for Saturdays) (dB)									
			R1 80m	R2 135m	R3 60m	R4 70m	R5 150m	R6 20m	R7 20m	R8 20m	R9 60m	R10 20m
Enabling works	03/04/23	31/08/23	54	50	55	55	54	n/a	57	58	55	56
Enabling works and Phase 1	31/08/23	02/11/23	56	50	60	59	56	n/a	63	59	57	60
Phase 1 and 2	02/11/23	01/04/24	58	55	61	58	54	n/a	64	54	55	64
Phase 1, 2 and 3	01/04/24	07/04/25	61	57	61	59	55	n/a	64	57	61	65

Programme	Duration		Predicted typical construction noise level at distance representative of the closest receptor $L_{Aeq,10hr}$ ($L_{Aeq,5hr}$ for Saturdays) (dB)									
			R1 80m	R2 135m	R3 60m	R4 70m	R5 150m	R6 20m	R7 20m	R8 20m	R9 60m	R10 20m
Phase 1, 2, 3 and 4	07/04/25	28/08/25	61	58	62	61	57	n/a	65	61	62	65
Phase 2, 3 and 4	28/08/25	06/10/25	61	58	59	58	55	n/a	62	60	61	64
Phase 2, 3, 4 and 5	06/10/25	05/12/25	62	59	61	60	57	n/a	63	61	62	65
Phase 3, 4 and 5	05/12/25	02/10/26	60	56	60	59	56	n/a	61	60	62	61
Phase 4 and 5	02/10/26	10/11/27	56	54	59	59	55	77	59	59	58	59
Phase 4	10/11/27	19/11/27	52	50	53	57	53	74	53	58	56	52

Table A14.1.11 Predicted Typical Impact Magnitude at Receptors during Enabling and Substructure Works with Overlapping Phases

Programme	Duration		Impact Magnitude									
			R1 80m	R2 135m	R3 60m	R4 70m	R5 150m	R6 20m	R7 20m	R8 20m	R9 60m	R10 20m
Enabling works	03/04/23	31/08/23	minor adverse	negligible	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Enabling works and Phase 1	31/08/23	02/11/23	minor adverse	negligible	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 1 and 2	02/11/23	01/04/24	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 1, 2 and 3	01/04/24	07/04/25	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 1, 2, 3 and 4	07/04/25	28/08/25	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 2, 3 and 4	28/08/25	06/10/25	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 2, 3, 4 and 5	06/10/25	05/12/25	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 3, 4 and 5	05/12/25	02/10/26	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	n/a	minor adverse	minor adverse	minor adverse	minor adverse
Phase 4 and 5	02/10/26	10/11/27	minor adverse	minor adverse	minor adverse	minor adverse	minor adverse	major adverse	minor adverse	minor adverse	minor adverse	minor adverse
Phase 4	10/11/27	19/11/27	minor adverse	negligible	minor adverse	minor adverse	minor adverse	major adverse	minor adverse	minor adverse	minor adverse	minor adverse

Road Traffic Noise

14.43 Changes in road traffic noise emissions during the construction and operational phases of the development have been calculated using the prediction method outlined in CRTN. Road traffic data input in these calculations has been provided by the applicant's transport consultant and is presented below in Table A14.1.12 to Table A14.1.14.

Table A14.1.12 2019 Baseline Traffic Data

Road Link Name	AAWT 18hr Total Flow	AAWT 18hr HGVS	Speeds (kph)
Milton Road	31426	5%	80
A1134 Elizabeth Way	28289	2%	50
A1303 Newmarket Road	25683	3%	65
Histon Road	25926	2%	65
Cowley Road	2368	12%	50
A14 between slip roads (near A1309)	20713	20%	110
A14 between slip roads (near A1309)	20683	20%	110
A14 west of A1309	20396	21%	110
A14 west of A1309	29346	22%	110
A14 EB off slip road (near A1309)	9016	15%	20
A14 EB on slip road (near A139)	6482	10%	20
A14 WB off slip road (near A1309)	6736	10%	20
A14 WB on slip road (near A1309)	8785	16%	20
A14 between slip roads near B1049	24918	23%	110
A14 between slip roads near B1049	25107	20%	110
A14 EB off slip (near B1049)	5945	9%	20
A14 EB on slip (near B1049)	4547	4%	20
A14 WB off slip (near B1049)	4494	6%	20
A14 WB on slip (near B1049)	6296	7%	20
A14 west of B1049	25205	20%	110
A14 west of B1049	24913	23%	110

Table A14.1.13 2024 Peak Construction Traffic

Road Link Name	AAWT 18hr Total Flow	AAWT 18hr HGVS	Speeds (kph)
Milton Road	31921	5%	80
A1134 Elizabeth Way	28784	2%	50
A1303 Newmarket Road	26178	3%	65
Histon Road	26421	2%	65
Cowley Road	2863	12%	50
A14 between slip roads (near A1309)	21208	20%	110
A14 between slip roads (near A1309)	21178	20%	110
A14 west of A1309	20891	21%	110
A14 west of A1309	29841	22%	110
A14 EB off slip road (near A1309)	9511	15%	20
A14 EB on slip road (near A139)	6977	10%	20
A14 WB off slip road (near A1309)	7231	10%	20
A14 WB on slip road (near A1309)	9280	16%	20
A14 between slip roads near B1049	25413	23%	110
A14 between slip roads near B1049	25602	20%	110
A14 EB off slip (near B1049)	6440	9%	20
A14 EB on slip (near B1049)	5042	4%	20
A14 WB off slip (near B1049)	4989	6%	20
A14 WB on slip (near B1049)	6791	7%	20
A14 west of B1049	25700	20%	110
A14 west of B1049	25408	23%	110

Table A14.1.14 2027 Baseline Traffic Data

Road Link Name	AAWT 18hr Total Flow	AAWT 18hr HGVS	Speeds (kph)
Milton Road	33738	5%	80
A1134 Elizabeth Way	30614	2%	50
A1303 Newmarket Road	27974	3%	65
Histon Road	28268	2%	65
Cowley Road	2542	12%	50
A14 between slip roads (near A1309)	21991	20%	110
A14 between slip roads (near A1309)	21959	20%	110
A14 west of A1309	21654	21%	110
A14 west of A1309	31157	22%	110
A14 EB off slip road (near A1309)	9573	15%	20
A14 EB on slip road (near A139)	6882	10%	20
A14 WB off slip road (near A1309)	7151	10%	20
A14 WB on slip road (near A1309)	9327	16%	20
A14 between slip roads near B1049	26455	23%	110
A14 between slip roads near B1049	26656	20%	110
A14 EB off slip (near B1049)	6312	9%	20
A14 EB on slip (near B1049)	4827	4%	20
A14 WB off slip (near B1049)	4771	6%	20
A14 WB on slip (near B1049)	6685	7%	20
A14 west of B1049	26760	20%	110
A14 west of B1049	26450	23%	110

Table A14.1.12 2027 'Do something' Traffic Data with Committed Development Traffic

Road Link Name	AAWT 18hr Total Flow	AAWT 18hr HGVS	Speeds (kph)
Milton Road	34951	5%	80
A1134 Elizabeth Way	31717	2%	50
A1303 Newmarket Road	29077	3%	65
Histon Road	28268	2%	65
Cowley Road	4858	12%	50
A14 between slip roads (near A1309)	21991	20%	110
A14 between slip roads (near A1309)	21959	20%	110
A14 west of A1309	21786	21%	110
A14 west of A1309	31337	22%	110
A14 EB off slip road (near A1309)	9704	15%	20
A14 EB on slip road (near A139)	7011	10%	20
A14 WB off slip road (near A1309)	7355	10%	20
A14 WB on slip road (near A1309)	9506	16%	20
A14 between slip roads near B1049	26587	23%	110
A14 between slip roads near B1049	26836	20%	110
A14 EB off slip (near B1049)	6312	9%	20
A14 EB on slip (near B1049)	4827	4%	20
A14 WB off slip (near B1049)	4771	6%	20
A14 WB on slip (near B1049)	6685	7%	20
A14 west of B1049	26760	20%	110
A14 west of B1049	26450	23%	110

Table A14.1.13 Resultant VDV Levels for AV1 (Railway)

	Max X-axis VDV mm/s1.	Max Y-axis VDV mm/s1.75	Max Z-axis VDV mm/s1.75	pass day	pass night
Total - all measured events	0.00041	0.00054	0.00404	200	32
vdv day	0.002	0.002	0.015		
vdv night	0.001	0.001	0.010		

Table A14.1.14 Resultant VDV Levels for AV2 (Busway)

	Max X-axis VDV mm/s1.	Max Y-axis VDV mm/s1.75	Max Z-axis VDV mm/s1.75	pass day	pass night
Total - all measured events	0.00335	0.00071	0.01220	56	4
vdv day	0.009	0.002	0.033		
vdv night	0.005	0.001	0.017		

Construction Vibration

14.44 For sheet piling, based on assumptions of a reasonable worst-case scaling factor, free-field resultant PPVs have been calculated from the following equation from Table E.1 from BS 5228: Part 2 ‘Vibratory Piling’:

$$V_{res} = \frac{k_v}{x^{\delta}}$$

14.45 Where:

14.46 V_{res} is the resultant Peak Particle Velocity

14.47 K_v is the scaling factor (and probability of predicted value being exceeded), assumed 126 (33%)

14.48 x is the ground distance measured along the ground distance, m (up to a maximum of 100m)

14.49 δ is the constant that represents the operation of the piling. Calculations done using 1.4 representing steady state operation and 1.2 representing start up and run down (worst case).