

Crossrail 2 Ground-borne Noise and Vibration Assessment

Block E1, The Chocolate Factory
5 Clarendon Road, Wood Green, London N22 6XJ

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IMPORTANT: This is a preliminary design-team assessment prepared using the simplified method in the Crossrail 2 Information for Developers (April 2021) and the accepted Block E2 assessment. It is subject to confirmation of the official tunnel alignment, depth and final foundation design. It should be issued to Crossrail 2 for technical pre-review before submission to the Local Planning Authority.

1. Executive summary

This technical note considers operational ground-borne noise and vibration from the proposed Crossrail 2 running tunnels at Block E1. It has been prepared by the project design team following Crossrail 2 correspondence dated 20 July 2026, which advised that the Ground Movement Assessment and Noise and Vibration assessment may be undertaken by the design team using the Crossrail 2 Information for Developers rather than appointing a separate consultant.

The assessment follows the same simplified prediction approach and input spectrum used for the adjacent Block E2, whose Condition 12 submission was accepted by Crossrail 2 and partially discharged by Haringey Council in 2022. Block E2 directly overlapped the tunnel alignment; Block E1 is shown on the current project overlay approximately 30 m horizontally from the nearest tunnel centreline.

Using conservative assumptions for tunnel depth, pile toe level, London Clay properties and maximum train speed, the predicted ground-borne noise levels are:

Assessment location	Radial distance from tunnel wall	Predicted level	Criterion
Nearest pile toe - conservative case	27.9 m	30 dB LA _{max,F}	35 dB residential
Nearest ground-floor occupied space	31.5 m	29 dB LA _{max,F}	35 dB residential

On the stated assumptions, the predicted levels comply with the residential criterion of 35 dB LA_{max,F} and therefore also comply with the 40 dB LA_{max,F} criterion adopted for commercial accommodation. No specific vibration-isolation measures are indicated by this preliminary assessment.

The conclusion must be checked when Crossrail 2 provides the official alignment snippet and tunnel level, and when JPSE confirms the final pile layout and pile toe levels. Any material reduction in separation should trigger recalculation.

2. Scope and planning requirement

Condition 12 requires the detailed below-ground design and construction method statements for Block E1 to:

- accommodate the proposed location of the Crossrail 2 structures, including temporary works;
- accommodate ground movement arising from construction of Crossrail 2; and
- mitigate the effects of noise and vibration arising from operation of Crossrail 2 within its tunnels and other structures.

This note addresses only the operational noise and vibration limb. The foundation interface, loading, exclusion/alignment adjustment zones, construction methodology and ground movement assessment are to be addressed by the structural engineer within the wider Condition 12 submission.

3. Reference information

- Crossrail 2, Tunnel Section - Information for Developers, April 2021.
- Cass Allen Associates, Block E2 Chocolate Factory - Crossrail 2 Ground-borne Noise & Vibration Assessment, TN01-21591-R0, 6 June 2022.
- MWP, Discharge of Pre-Commencement Planning Condition 12: Cross-Rail 2 Conceptual Design Submission for Block E2, 20 May 2022.
- WTEG Associates drawing WA022 / AR-DR-PR01-XX-1001_A1, Approximate Crossrail Overlay, revision PR01 dated 9 July 2026.
- Crossrail 2 correspondence to JPSE dated 1 July and 20 July 2026.

4. Development and tunnel relationship

Block E1 is a new mixed-use building forming the eastern part of Block E. The current overlay drawing places the building between and to the east of the indicative running tunnel alignments. The nearest annotated horizontal separation is approximately 30,000 mm to the nearest tunnel centreline, with a second alignment shown at approximately 35,000 mm.



Figure 1 - Approximate Crossrail 2 overlay prepared from the alignment image supplied to the design team. The drawing is preliminary and must be superseded by the official alignment snippet when issued.

The 30 m dimension is treated as a centreline separation for this assessment. This is conservative only if the final official alignment does not move closer to Block E1.

5. Assessment methodology and criteria

The simplified Crossrail 2 method predicts octave/one-third-octave band vibration velocity levels at the tunnel wall and applies propagation losses through the ground, geometrical spreading, a velocity-to-sound-pressure conversion and A-weighting. The resulting band levels are logarithmically summed to obtain an indoor ground-borne noise level during a train pass.

The assessment criteria adopted from the Crossrail 2 guidance and the accepted Block E2 note are:

Use	Maximum ground-borne noise in occupied spaces during train passes
Residential	35 dB LAmax,F
Commercial / retail	40 dB LAmax,F (office criterion adopted for generic commercial use)

The Block E2 input vibration spectrum has been retained so that the Block E1 assessment is directly comparable with the assessment previously accepted for the site.

6. Input assumptions

Parameter	Adopted value	Basis
Nearest horizontal centreline separation	30.0 m	Current WTEG approximate overlay
Tunnel radius	3.9 m	Block E2 / Crossrail 2 information
Tunnel centreline depth	18.9 m below ground level	Equivalent to 15 m to crown, as adopted for Block E2
Assumed nearest pile toe depth	8.5 m below ground level	Conservative provisional assumption based on Block E2; final JPSE design required
Ground-floor receptor depth	0.0 m	Occupied room at ground level
Compressive wave speed, Cs	1,611 m/s	Worst-case London Clay value used for Block E2
Loss factor, eta	0.1	Worst-case London Clay value used for Block E2
Train speed	100 km/h	Crossrail 2 / Block E2 worst-case assumption
Velocity-to-SPL correction	-27 dB	Crossrail 2 simplified method used for Block E2
Room correction	27 dB method retained	Conservative relative to the 32 dB correction noted by Cass Allen

7. Separation distances

The radial distance from the tunnel wall is calculated from the horizontal centreline separation and the vertical separation to the tunnel centreline, less the tunnel radius:

$$r = \sqrt{H^2 + V^2} - r_0$$

$$\text{Nearest pile toe: } \sqrt{30.0^2 + (18.9 - 8.5)^2} - 3.9 = 27.9 \text{ m}$$

$$\text{Ground-floor occupied space: } \sqrt{30.0^2 + 18.9^2} - 3.9 = 31.5 \text{ m}$$

8. Prediction calculations

The adopted tunnel-wall spectrum and A-weighting values are those shown in the accepted Block E2 calculation. Material damping is calculated as:

$$\text{Ground loss} = -4.343 \times \eta \times (2 \pi f) \times r / C_s$$

To avoid understating attenuation, geometrical spreading is referenced to the accepted Block E2 nearest-pile case ($r = 8$ m; distance correction = -4.84 dB) and adjusted using cylindrical spreading, $-10 \log_{10}(r/8)$. This is a conservative comparison because it does not apply any additional building or pile attenuation.

8.1 Nearest pile toe - conservative transmission route

Radial distance from tunnel wall: 27.9 m. Calculated geometrical distance correction: -10.26 dB. Predicted total: 30.3 dB LA_{max,F} (rounded to 30 dB).

Hz	Tunnel wall Lv	Ground loss	Distance corr.	Unweighted	A-weight	A-weighted
20	76.0	-0.94	-10.26	37.80	-50.5	-12.70
25	90.2	-1.18	-10.26	51.76	-44.7	7.06
31.5	84.6	-1.49	-10.26	45.86	-39.4	6.46
40	83.1	-1.89	-10.26	43.96	-34.6	9.36
50	77.7	-2.36	-10.26	38.08	-30.2	7.88
63	78.7	-2.97	-10.26	38.47	-26.2	12.27
80	85.5	-3.77	-10.26	44.47	-22.5	21.97
100	80.4	-4.72	-10.26	38.43	-19.1	19.33
125	84.1	-5.90	-10.26	40.95	-16.1	24.85
160	85.1	-7.55	-10.26	40.29	-13.4	26.89

8.2 Nearest ground-floor occupied space

Radial distance from tunnel wall: 31.5 m. Calculated geometrical distance correction: -10.80 dB. Predicted total: 29.0 dB LA_{max,F} (rounded to 29 dB).

Hz	Tunnel wall Lv	Ground loss	Distance corr.	Unweighted	A-weight	A-weighted
20	76.0	-1.07	-10.80	37.13	-50.5	-13.37
25	90.2	-1.34	-10.80	51.07	-44.7	6.37
31.5	84.6	-1.68	-10.80	45.12	-39.4	5.72
40	83.1	-2.14	-10.80	43.17	-34.6	8.57
50	77.7	-2.67	-10.80	37.23	-30.2	7.03
63	78.7	-3.37	-10.80	37.54	-26.2	11.34
80	85.5	-4.27	-10.80	43.43	-22.5	20.93
100	80.4	-5.34	-10.80	37.26	-19.1	18.16
125	84.1	-6.68	-10.80	39.62	-16.1	23.52
160	85.1	-8.55	-10.80	38.75	-13.4	25.35

9. Sensitivity and limitations

The following limitations are material to reliance on this note:

- The tunnel alignment is based on a preliminary image overlay rather than an official georeferenced alignment drawing.
- The tunnel centreline depth is assumed from the accepted Block E2 assessment and has not yet been reconfirmed for the nearest Block E1 alignment.
- The 8.5 m pile toe is provisional. JPSE must confirm the final pile depths and identify the closest pile to the tunnel.
- The prediction is a simplified screening assessment. It does not include a site-specific transfer function, soil layering model, pile-soil-structure interaction model or measured baseline vibration data.
- The input train spectrum and operating assumptions are inherited from the accepted Block E2 assessment to maintain consistency.
- The assessment addresses operational train noise and vibration, not construction vibration from future tunnel boring or other Crossrail 2 works.

A simple sensitivity check shows that the nearest-pile radial separation would have to reduce substantially before the 35 dB criterion is approached. Nevertheless, the calculation should be re-run using the official alignment and final foundations because the planning condition requires the approved design rather than an indicative arrangement.

10. Conclusion and recommendations

On the current information and conservative assumptions, operational Crossrail 2 ground-borne noise at Block E1 is predicted to be approximately 30 dB LA_{max,F} at the nearest pile transmission route and approximately 29 dB LA_{max,F} at the nearest ground-floor occupied space. Both predictions are below the 35 dB LA_{max,F} residential criterion and the 40 dB LA_{max,F} commercial criterion.

The simplified assessment therefore indicates that the proposed Block E1 structure can mitigate operational Crossrail 2 noise and vibration without specific resilient foundation or room-isolation measures, subject to the following actions:

- Crossrail 2 to confirm the official alignment and tunnel depth.
- JPSE to confirm the final foundation arrangement, nearest pile position and maximum pile toe depth.
- The assessment to be updated if the confirmed radial separation is less than 27.9 m.
- The completed note to be issued to Crossrail 2 for technical pre-review before being incorporated into the Condition 12 submission to Haringey Council.

This note is not an acoustic design certificate and does not replace any review or further information requested by Crossrail 2, TfL or the Local Planning Authority.

Document control

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P01	06/08/2026	Draft for Crossrail 2 pre-review	WTEG Associates	Preliminary