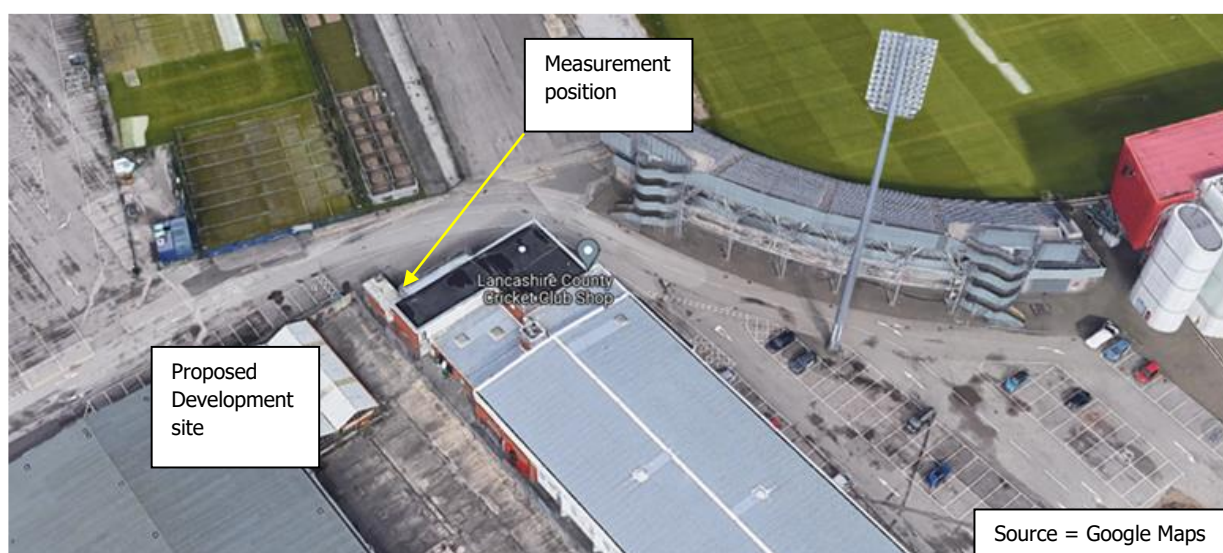


## PROJECT NOTE

DOCUMENT CONTROL			
<b>DOCUMENT TITLE</b>	NOISE FROM CONCERTS AT LCCG	<b>REVISION</b>	R01
<b>DOCUMENT NUMBER</b>	050636-0820-0-PN-0001	<b>ISSUE DATE</b>	30 <sup>TH</sup> NOVEMBER 2021
<b>PROJECT NAME</b>	SITE AT FORMER B&Q, GREATSTONE ROAD, TRAFFORD, M32 0YP	<b>AUTHOR</b>	DANI FIUMICELLI
<b>STATUS</b>	DRAFT	<b>CHECKED</b>	JONTY STEWART
<b>ISSUED TO</b>	PINS	<b>PASSED</b>	JONTY STEWART

- 1.1. Previous information submitted to Trafford Council by Vanguardia used acoustic modelling to predict concert noise at the facade of the Proposed Development.
- 1.2. To provide real world data, measurements were taken near to the boundary of the B&Q site and Lancashire County Cricket Ground (LCCG) at a height of 11 metres during a 50,000 person concert headlined by The Courteeners on Saturday 25<sup>th</sup> September 2021.
- 1.3. Figure 1 shows the location of the noise measuring equipment and its relationship to the development site.



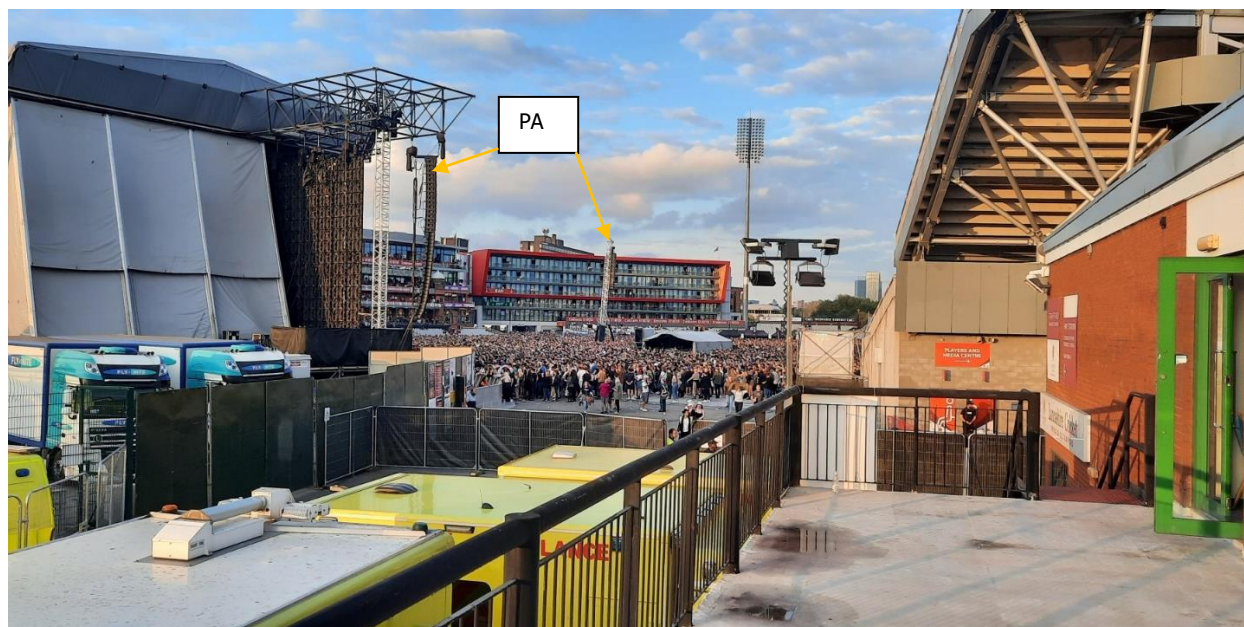
**Figure 1** Measurement location and development site

- 1.4. Figure 2 provides a photograph taken during the survey looking towards the venue, showing the measurement microphone mounted on a pole and two of the stage-right PA arrays.



**Figure 2** View of measurement location looking towards the venue

- 1.5. Figure 3 presents a photograph of the stage and crowd taken from the measurement location.



**Figure 3** View of stage, stage right side hang, stage left delay stack and crowd from measurement location



1.6. Figure 4 presents a view towards the development site taken from the measurement location.



**Figure 4** View towards development site from measurement location

1.7. The measurements taken at the front of house mixing desk in the concert arena and at the above location (described as Boundary with Development) are shown in Table 1 and Figure 5 below. The corresponding level at the existing off-site critical control point (Trent Bridge Walk<sup>1</sup>) and the licensing limit are also provided for comparison.

**Table 1** Music Noise Levels

Time	FoH Mixing Desk $L_{Aeq,15 \text{ min}} \text{ dB}$	Boundary with Development $L_{Aeq,15 \text{ min}} \text{ dB}$	Trent Bridge Walk <sup>2</sup> $L_{Aeq,15 \text{ min}} \text{ dB}$	Licence Limit $L_{Aeq,15 \text{ min}} \text{ dB}$
17:00:00	96	81	73	80
17:15:00	98	83	75	80
17:30:00	87	73	64	80
17:45:00	83	71	60	80
18:00:00	97	82	74	80
18:15:00	97	83	74	80

<sup>1</sup> Experience of concerts at the LCCG over many years has demonstrated that, provided the music noise level is no more than the license's permitted limit of 80 dB  $L_{Aeq,15 \text{ min}}$  on Trent Bridge Walk (in the car park at the end of Edgbaston Drive), then the noise level is also compliant with the permitted limit at all other sensitive receivers

<sup>2</sup> Derived using an average difference between measurements at the FoH mixer and at Trent Bridge Walk of 23 dBA, established during multiple sample measurements during the performance of each band during the event.

Time	FoH Mixing Desk L <sub>Aeq,15 min</sub> dB	Boundary with Development L <sub>Aeq,15 min</sub> dB	Trent Bridge Walk <sup>2</sup> L <sub>Aeq,15 min</sub> dB	Licence Limit L <sub>Aeq,15 min</sub> dB
18:30:00	97	82	74	80
18:45:00	83	72	60	80
19:00:00	92	78	69	80
19:15:00	97	83	74	80
19:30:00	98	84	75	80
19:45:00	98	83	75	80
20:00:00	92	79	69	80
20:15:00	84	74	61	80
20:30:00	88	76	65	80
20:45:00	99	85	76	80
21:00:00	98	84	75	80
21:15:00	98	84	75	80
21:30:00	98	84	75	80
21:45:00	91	77	68	80
22:00:00	98	83	75	80
22:15:00	100	87	77	80

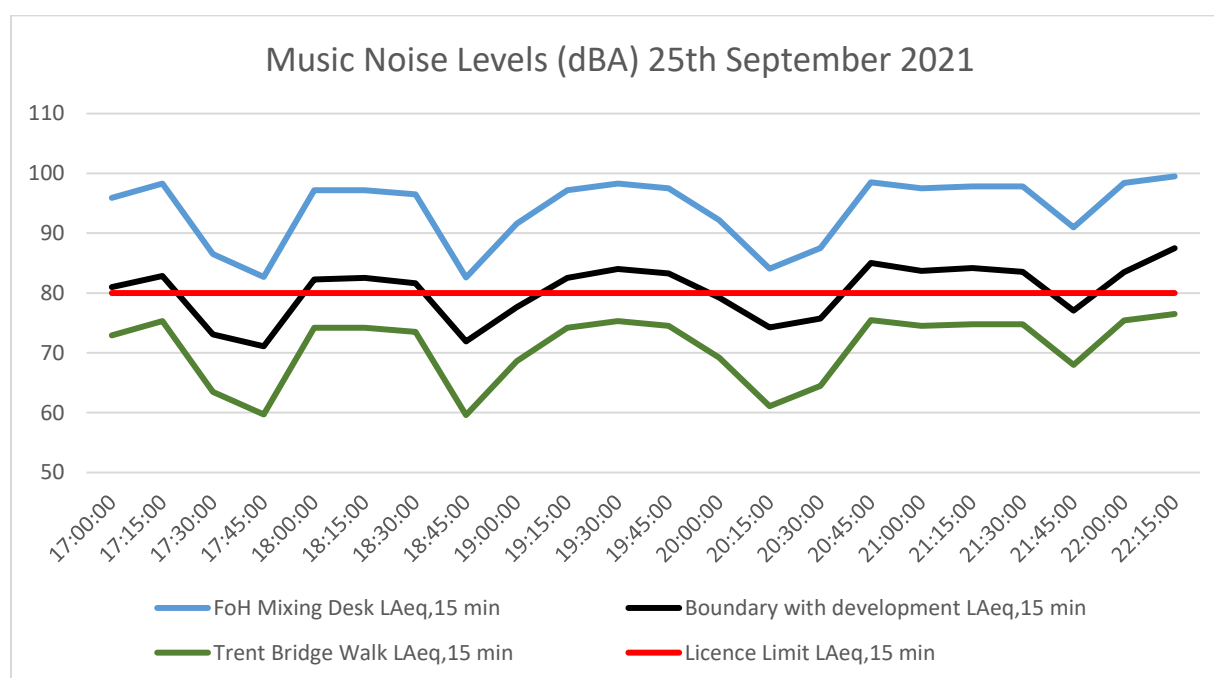


Figure 5 Chart showing profile of MNLs during the concert at LCCG on 25<sup>th</sup> September 2021

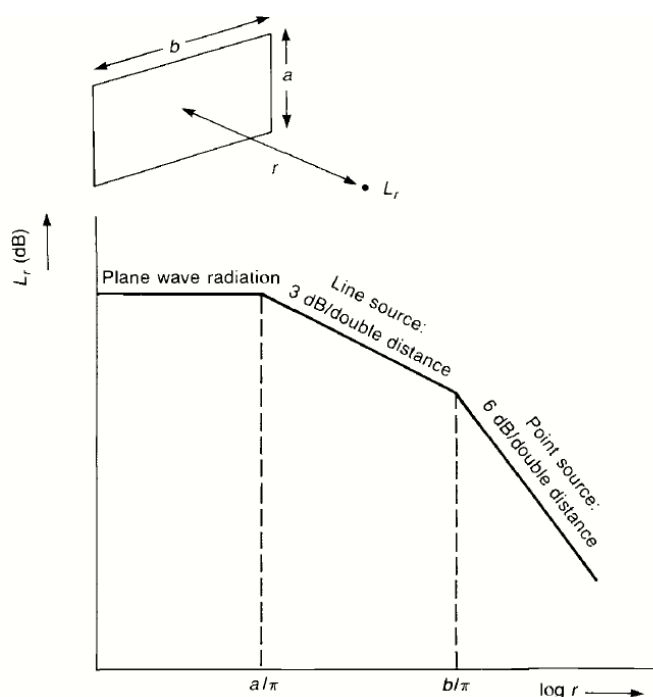
- 1.8. Details of the sound system type and configuration have been used to model the predicted music noise levels at the façades of the proposed scheme that would face the LCCG, with music noise levels at the permitted limit of 80 dB  $L_{Aeq,15 \text{ min}}$  at Trent Bridge Walk.
- 1.9. The modelling results are presented in Table 2.

**Table 2** Predicted MNLs at the proposed development facades relative to the permitted limit

Height m	dB $L_{Aeq, 15 \text{ min}}^1$		
	Trent Bridge Walk Licence Limit	Development North-East Façade	Development North-West Façade
1.5	80	76	85
10	80	86	85
20	80	86	84
30	80	86	84

Note1 : Free-field i.e. unaffected by acoustic reflections from a façade

- 1.10. As a simplification of the calculation process, the above predictions assume that the PA propagates as a point source, i.e. attenuating at the rate of 6 dB per doubling of distance along the whole of the propagation pathway.
- 1.11. However, the PA used at LCCG (as at virtually every other concert of this type) was a line array.
- 1.12. These types of PA are designed to project sound at as even and high a level across as large an audience area as possible. To do this line arrays combine the wave from each of a column of multiple loudspeakers to create a single waveform that acts approximately like a line source, with the sound decaying at a much lower rate of 3 dB per doubling of distance for part of the propagation pathway, as shown in Figure 6 below.



**Figure 6** Theoretical propagation from a line array PA

- 1.13. Plane wave radiation occurs close to the PA and then line source propagation takes over for a longer distance. A line array decays at 3 dB with doubling of distance between the plane source and point source zones on the propagation pathway.
- 1.14. The distance at which the transition to a point source occurs is dependent on both the length of the array and the frequency, but a typical 12 cabinet line array can be regarded as a single point source (reducing by 6 dBA with doubling of distance), beyond approximately 80m for broadband levels<sup>3</sup>.
- 1.15. The arrays typically used at LCCG are considerably longer, with close examination of figure 3 revealing 20 boxes visible in the stage-right side-hang array, so this 3 dB per doubling of distance propagation zone is longer than 80 m.
- 1.16. To mitigate the differences between line and point source propagation, the Vanguardia modelling was based on directivity data taken at a distance of 150 m, where the line array would appear acoustically small, and its propagation would resemble that of a point source.

<sup>3</sup> Creedy & Murphy, Acoustic predictions of high power sound systems. software modelling and verification measurements Proceedings of the Institute of Acoustics & Belgium Acoustical Society Noise in the Built Environment, Ghent, 29-30 April 2010

- 1.17. For more distant receptors, like the Trent Bridge Walk position (some 200 m from the main PA hangs), this provides a robust estimation methodology which has been verified against measurements taken at this location during the 25<sup>th</sup> September 2011 concert which are similar to those Vanguardia have taken at multiple previous events at LCCG.
- 1.18. For receptors closer than 150 m, however, this methodology under-predicts because it assumes a decay rate of 6 dB per doubling of distance for the entire propagation pathway, whereas a significant proportion of the propagation calculation (if not all) should in fact be closer to 3 dB per doubling of distance.
- 1.19. The significance of assuming point source propagation along the whole of the transmission pathway from the line array PA to the measurement position means the predictions in table 2 above of Music Noise Levels at the most exposed facades of the scheme inherently underestimate the likely noise levels at the façades of the proposed scheme nearest to the LCCG which are less than 70 m from the closest PA array, probably by an order of up to around 3 dBA.

## CONCLUSIONS

- 1.20. Measurements taken close to the LCCG boundary with the development site throughout the large-scale rock concert on the 25<sup>th</sup> September, coupled with the prediction of the propagation of music noise from the concert at LCCG; demonstrate that Music Noise Levels at the facades of the proposed scheme closest to the LCCG are highly likely to be greater than the permitted licence limit.
- 1.21. The music noise levels during the concert on the 25<sup>th</sup> September were below the permitted licence limit at existing noise sensitive receptors. This means that for other concerts the music noise level in the audience area and therefore beyond the boundary of the LCCG could be higher than on the 25<sup>th</sup>, but still comply with the licence limits.
- 1.22. Consequently, if the scheme went ahead there is a substantial risk that in order to comply with the licence limits the music noise levels in the audience arena of large concerts would have to be reduced to below values that provide satisfactory entertainment and such concerts would become unviable.

