

APPENDIX 9.2

Temporary Bus Station and Bus Stops Noise Assessment

Introduction

A noise assessment of the proposed Temporary Bus Station and Bus Stops has been undertaken based on layout configurations illustrated in drawings 1466 Rev 02 (northwest proposed layout Plot 113) and 1470 Rev 02 (southwest proposed layout Plot 114). For noise modelling purpose they were provided together with highway alignments in drawing SK-1466-rev02-Temp Bus station layout-bound. Worst-case bus operations, of 154 movements per hour, detailed within the Temporary Bus Stations Revised Strategy (**Appendix 2.3**), has been used for the daytime (0700-2300) noise assessment. A worst-case assessment of the night-time period between 0500-0600 and 0600-0700 was under taken when operations are planned at Plot 113. At other periods of the night it is understood that operations will be restricted to Plot 114 only.

CADNA-A noise modelling software has been used to predict façade noise levels of dwellings on both Brent Park Road and Layfield Close resultant from noise emissions from the Temporary Bus Station configuration, including bus movements on the Western Estate Road to bus stops adjacent to Plot 113. Octave noise source levels of bus operations including; bypass, idling and arriving and releasing hydraulic breaks, measured by Waterman on the 8th September 2014 at the existing Brent Cross bus station, has been input into the noise model. Table 9.2.1 presents the measured octave noise data and the equivalent sound power level.

It should be noted that the model assumes flat ground and does not take account of screening afforded by intervening topography or engineered structure which may form part of the layout configuration, and therefore represents worst-case scenario.

Table 9.2.1: Bus Operations Noise Source Data

Description	Octave Band Noise Level dB (un-weighted)								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1kHz	2kHz	4kHz	8kHz
By Pass 1m Lmax	87.3	82.4	78.9	76.6	76.7	72.6	71.5	69.8	62.7
By Pass Lw	95.3	90.4	86.9	84.6	84.7	80.6	79.5	77.8	70.7
Idling Leq 2.5m	83.4	81.0	71.0	72.0	74.8	76.7	70.9	67.1	62.7
Idling Lw	99.4	97.0	87.0	88.0	90.8	92.7	86.9	83.1	78.7
Pull in/hydraulic breaks and stop Leq 2.5m	87.6	83.6	74.8	78	70.1	71.6	68.1	65.1	63.3
Pull in Stop Lw	103.6	99.6	90.8	94.0	86.1	87.6	84.1	81.1	79.3

Amenity Assessment

Noise Sensitive Receptors

The south west car park is an existing operational car park located to the south west of the Brent Cross Shopping Centre (Plot 114). It is bound to the north by the River Brent, to the east by Stadium Road and to the south by the M1 slip-road and the North Circular Road (A406). The nearest residential receptors

are located on Brent Park Road to the north of the south west car park (Plot 114) approximately 80m from the plot boundary. The residential properties on Layfield Close are approximately 165m to the north-north-east from boundary of Plot 114 but are approximately 35m from the bus stops adjacent to Plot 113.

Prevailing Baseline Noise Levels

A noise survey was conducted on Monday the 8th September 2014 within the vicinity of the residential dwellings on Brent Park Road and between 4th and 8th September 2014 within the vicinity of the residential properties on Layfield Close. This was supplemented by an additional noise survey at the south west car park (Plot 114) and within the vicinity of dwellings on Brent Park Road. **Table 9.2.2** presents a summary of the measured noise levels. The noise climate at both locations was noted as being dominated by road traffic noise from the surrounding road network.

Table 9.2.2: Summary of Prevailing Noise Levels

Location	Noise Level dB (rounded to nearest whole decibel)		
	L _{Aeq}	L _{A90} (average)	L _{Amax} (90th Percentile)
Brent Park Road Day	59	57	72
Brent Park Road Night	54	50	68
Layfield Close Day	58	50	77
Layfield Close Night	56	45	71

Predicted Façade Noise Levels Bus Operations Only

Figure 9.2 presents the predicted night-time façade noise levels based on 108 bus movements per hour between 0600-0700 within Plot 114 and Plot 113 and movements on the Western Estate Road. **Figure 9.3** presents the predicted daytime façade noise levels based on 154 bus movements per hour. Calculations are based on an average idling time of 20 seconds per bus at the bus stop. For a worst-case scenario assessment has also been undertaken based on 60 seconds idling time.

The predicted noise levels include a 2.5 metre acoustic grade fence within the western area of Plot 113, which is inherent to the scheme design. The location of the acoustic screen is indicated within both **Figures 9.2** and **9.3**.

The predicted night-time and daytime façade noise levels at Brent Park Road and Layfield Close are presented as **Table 9.2.3** together with the prevailing noise level and predicted change in the prevailing noise level. Given the relative close proximity of Plot 113 to the sensitive receptors of Layfield Close, and in response to the requirements of Environmental Health of LBB, measured average noise levels within the relevant night-time assessment period for Layfield Close have been used for assessment purpose. The measured noise levels are presented for completeness at the end of this report.

Table 9.2.3: Summary of Predicted Change in Noise Levels

Location	Noise Level (rounded to nearest whole decibel)			
	Predicted Façade Noise Level dB L _{Aeq,1h}		Prevailing Free-Field Noise Level dB L _{Aeq}	Predicted Change in Noise Level dB L _{Aeq,1h}
	20 sec	60 sec		
Brent Park Road Day (154 buses/hr)	44-46	49-51	59	<+1
Brent Park Road Night 0500-0600 (44 buses/hr)	42-44	44-46	54	<+1
Brent Park Road Night 0600-0700 (108 buses/hr)	43-46	45-47	54	<+1
Layfield Close Day (154 buses/hr)	44-45	46-49	58	<+1
Layfield Close Night 0500-0600 (44 buses/hr)	38-41	42-44	52	<+1
Layfield Close Night 0600-0700 (108 buses/hr)	42-43	45-48	56	<+1

Based on forecast hourly bus movements provided by URS together with bus idling times, the predicted increase in the prevailing noise level is predicted to be less than 1dB(A) for both the day and the night-time period.

It should be noted that generally a 3dB increase in an existing noise source (e.g. transportation) is just perceptible. As such, the potential impacts associated with the operation of the bus station would be **negligible**.

Layfield Close Baseline Noise Survey Data (0500-0900) 5th to 8th September 2014

Time	5th Sept			6th Sept			7th Sept			8th Sept		
	LAeq	LAm _{ax}	LA90	LAeq	LAm _{ax}	LA90	LAeq	LAm _{ax}	LA90	LAeq	LAm _{ax}	LA90
05:00	70.5	82.9	63.1	50.8	72.3	47.2	48.0	71.5	42.2	56.3	47.2	47.2
05:05	71.7	86.3	61.5	50.3	71.5	47.2	46.7	57.9	43.5	53.3	47.2	47.2
05:10	75.4	92.8	64.5	51.5	74.4	48.0	47.2	72.1	42.3	58.6	47.8	47.8
05:15	68.9	83.4	57.2	50.5	57.9	49.0	47.0	65.1	43.1	63.0	47.7	47.7
05:20	70.3	85.2	60.1	50.0	57.6	48.4	47.3	58.1	43.3	71.5	48.2	48.2
05:25	64.6	81.2	50.4	50.7	57.3	48.9	47.0	58.2	43.1	71.4	50.4	50.4
05:30	52.4	76.4	48.8	52.9	73.9	47.9	46.5	56.8	43.8	68.9	50.2	50.2
05:35	51.7	72.7	48.2	52.1	64.7	50.2	48.7	60.7	45.3	71.7	50.7	50.7
05:40	49.5	56.5	47.8	53.8	72.5	50.4	50.9	75.6	45.5	61.0	51.4	51.4
05:45	50.7	72.5	48.1	53.6	64.4	51.3	46.9	52.9	43.8	74.7	50.8	50.8
05:50	49.8	60.9	47.2	53.0	71.7	50.6	50.4	74.3	44.3	62.6	52.0	52.0
05:55	50.2	63.9	47.5	54.9	73.1	49.9	46.8	71.9	42.9	73.2	51.9	51.9
06:00	49.7	64.3	47.7	52.8	73.6	50.2	47.0	53.3	43.8	68.7	52.9	52.9
06:05	50.3	71.2	48.2	51.5	64.1	49.8	46.4	51.3	44.1	59.7	54.5	54.5
06:10	50.2	73.6	47.6	53.2	72.5	49.8	49.0	73.2	45.0	60.3	53.6	53.6
06:15	50.3	59.0	48.3	55.2	73.1	50.5	50.7	71.8	44.7	73.2	53.9	53.9
06:20	49.7	58.4	48.4	53.1	73.2	50.1	56.0	72.7	51.3	57.5	53.6	53.6
06:25	52.3	71.7	49.8	51.5	56.1	49.8	56.8	75.3	51.2	73.5	53.2	53.2
06:30	59.2	72.6	54.8	51.0	59.7	49.0	52.0	74.0	46.1	76.9	54.1	54.1
06:35	55.9	73.2	51.6	53.3	64.2	49.2	54.5	72.2	46.6	73.2	53.8	53.8
06:40	58.4	74.2	54.6	57.0	66.4	50.9	50.1	75.6	46.3	70.8	52.5	52.5
06:45	55.0	73.4	51.2	59.6	71.0	56.3	53.8	73.3	46.7	73.3	52.6	52.6
06:50	56.4	73.3	50.4	57.6	73.6	53.8	50.3	74.0	45.3	69.9	52.9	52.9
06:55	56.9	74.5	50.6	55.2	73.6	51.9	46.7	51.9	45.0	72.7	52.2	52.2

	5th Sept			6th Sept			7th Sept			8th Sept		
Time	LAeq	LAmaz	LA90	LAeq	LAmaz	LA90	LAeq	LAmaz	LA90	LAeq	LAmaz	LA90
07:00	65.0	79.9	52.3	64.4	77.5	50.2	46.7	51.5	44.6	52.7	68.2	51.5
07:05	52.2	63.7	50.8	50.0	59.1	49.2	47.1	51.5	45.5	55.6	72.7	52.1
07:10	53.3	61.9	51.3	50.4	57.8	48.1	48.1	55.1	45.8	55.1	72.8	52.2
07:15	53.5	73.6	50.7	49.1	54.8	47.6	48.4	71.0	44.6	59.3	73.7	55.0
07:20	53.9	71.7	51.1	50.3	57.0	48.2	47.4	58.0	44.8	59.5	72.5	57.0
07:25	54.1	72.9	50.4	49.6	58.7	48.3	50.1	70.5	44.8	57.4	74.8	54.6
07:30	54.1	72.2	50.9	50.8	71.7	48.3	51.6	62.5	47.6	55.3	72.4	53.4
07:35	53.2	69.3	50.7	52.1	66.4	49.9	49.8	58.7	47.2	62.9	78.9	50.4
07:40	51.8	72.2	49.3	51.1	67.8	47.8	58.7	77.6	46.5	52.5	72.6	49.6
07:45	51.5	60.1	49.0	51.5	64.0	48.2	64.9	79.0	45.9	54.4	73.8	50.3
07:50	52.9	63.5	49.1	53.0	63.7	49.5	47.8	57.8	44.6	56.0	71.6	52.2
07:55	51.2	60.7	49.1	52.5	63.9	49.5	47.0	56.8	44.9	63.5	75.1	52.0
08:00	52.3	60.7	49.6	52.1	61.4	49.5	49.1	59.3	45.0	61.6	75.8	51.3
08:05	51.6	60.0	49.7	51.9	59.9	50.0	53.0	71.2	46.3	50.1	61.8	48.8
08:10	51.1	59.0	49.6	52.6	68.3	48.9	58.8	71.5	51.9	50.3	58.4	48.9
08:15	60.3	77.5	50.7	55.4	73.4	49.0	52.0	72.7	45.8	50.5	59.2	48.8
08:20	63.4	77.0	58.4	53.6	68.0	50.8	47.6	54.7	45.0	50.5	58.4	48.8
08:25	71.3	93.3	58.3	55.2	73.8	51.4	46.8	50.7	45.2	50.0	55.0	48.5
08:30	61.4	77.9	58.6	53.2	62.7	50.4	52.0	65.6	48.7	51.6	69.8	47.2
08:35	62.4	81.0	58.9	56.4	77.2	51.1	52.9	60.2	50.0	49.5	60.6	47.1
08:40	62.0	76.0	59.1	54.9	78.0	51.2	57.1	67.6	54.4	48.7	58.4	46.3
08:45	63.0	77.4	58.4	53.9	64.6	50.1	59.1	72.9	55.5	49.4	66.6	46.9
08:50	72.6	93.6	57.7	53.8	64.5	50.4	57.4	70.2	51.9	50.2	70.3	47.8
08:55	62.0	86.4	57.6	53.9	61.8	50.6	57.7	73.1	50.8	53.0	78.6	48.7
09:00	59.6	73.1	58.1	56.1	67.5	51.8	66.1	81.4	50.4	50.7	61.5	47.5