9. Noise and Vibration

Introduction

9.1. Prepared by Waterman Infrastructure & Environment Limited (Waterman), this Chapter presents an assessment of the likely significant noise and vibration effects on surrounding sensitive receptors associated with the proposed demolition, alteration, refurbishment and construction works (the Works), and in respect of noise once the Development is completed and operational.

9.2. This Chapter provides a description of the methods undertaken for the assessment. This is followed by a description of the relevant baseline conditions of the Site and surrounding area, and an assessment of the likely significant effects of the Development during the Works, and once the Development is completed and operational. Mitigation measures are identified where appropriate to avoid, reduce or offset any adverse effects identified and / or enhance likely beneficial effects. Taking account of the mitigation measures, the nature and significance of the likely residual effects are described.

9.3. Supporting information relating to the noise assessment is contained within the following appendices:

- **Appendix 9.1**: Acoustic Terminology;
- **Appendix 9.2**: Baseline Noise Monitoring;
- **Appendix 9.3:** Demolition and Construction Noise Assessment; and
- **Appendix 9.4:** Road Traffic Assessment.

9.4. As agreed via the EIA scoping process (refer to **Chapter 2: EIA Methodology**) no assessment was undertaken (or is, indeed necessary) in relation to vibration once the Development is completed and operational. This is owing to the fact that there are no significant vibration generating sources (such as London Underground Limited, or Mainline Rail Lines) within 25m of the Site (with the nearest rail line approximately 195m of the Site). Furthermore, no significant sources of vibration would be introduced as part of the Development. Accordingly, there would be no vibration effects associated with the completed and operational Development.

9.5. Further to the above, and also agreed via the EIA scoping process, an assessment of the acceptability of internal noise levels within the Development itself is a design issue and should not form part of the EIA. As such, an assessment of the suitability of the Site for residential and school development does not form part of this Chapter and has been submitted as a standalone report by Hoare Lea for planning.

Assessment Methodology and Significance Criteria

Assessment Methodology

Establishing Baseline

9.6. As indicated above and set out in detail in **Appendix 9.2**, a baseline noise survey was undertaken between Thursday 11th July to Tuesday 16th July 2019, covering a typical weekday and weekend period, to establish and quantify the existing daytime (0700-2300) and night-time (2300-0700)

baseline conditions at and within the vicinity of the Site. The baseline strategy was agreed in advance with LBRuT Environmental Health and undertaken prior to the COVID-19 pandemic. Further details of consultation are set out later within this Chapter.

Predicting Effects

9.7. The level of effect has been assessed based on the magnitude of change or absolute level of noise or vibration due to all phases of the proposed Development and then the sensitivity of the affected receptor.

9.8. **Table 9.1** presents the assigned receptor sensitivity:

Table 9.1: Receptor sensitivity

Receptor sensitivity	Receptor type
High	Residential, school, hospital
Medium	Office, commercial
Low	Industrial
Negligible	No receptors within 800m[1]

Note: [1] This has been adopted from BREEAM POL 05 'Reduction of noise pollution' and is considered to be a conservative approach.

9.9. The magnitude of the predicted change in or absolute level of noise and vibration arising from the demolition, construction and operational phases of the Development are classified having regard to Noise Policy Statement for England's (NPSE)[1] 'Effect Levels' and the noise exposure levels presented within Planning Policy Guidance-Noise[2], and are presented as **Table 9.2**:

Table 9.2: Magnitude in predicted change/absolute level

Magnitude	Description
Large	Significant Observed Adverse Effect Level (SOAEL)
Medium	Above LOAEL but below SOAEL
Small	Lowest Observed Adverse Effect Level (LOAEL)
Negligible	No Observed Adverse Effect Level (NOAEL)

9.10. The effect levels are defined as follows:

- NOEL – No Observed Effect Level: Level below which no effect on health and quality of life due to noise can be detected;
- LOAEL – Lowest Observed Adverse Effect Level: Level above which adverse effects on health and quality of life can be detected;
- SOAEL – Significant Observed Adverse Effect Level: Level above which significant adverse effects on health and quality of life occur.

9.11. Magnitude of change/absolute level as a result of the proposed Development, is considered within the range of large, medium, small and negligible.

9.12. Consideration is given to the scale, duration and extent of the proposed Development when considering the level of effect. For example, for construction effects, short-term is defined as 1-2 years, medium-term as 3-5 years, long-term as 5 years and greater, and permanent, dependent upon project timeframes.

9.13. The matrix outlined in **Table 9.3** coupled with the requirements of NPSE and relevant British Standards, guidance and policy, have been used to determine the level of the effect. The predicted level of effect is based upon the consideration of magnitude of change and sensitivity of the resource / receptor.

Table 9.3: Level of effect

Receptor Sensitivity	**Magnitude**			
	Large (SOAEL or above)	Medium (between LOAEL and SOAEL)	Small (LOAEL)	Negligible (NOAEL)
High	Major	Moderate to Major	Minor to Moderate	Negligible
Medium	Moderate to Major	Moderate	Minor	Negligible
Low	Minor to Moderate	Minor	Negligible to Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

9.14. Whilst **Table 9.3** provides ranges, the level of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. A statement is also made as to whether the level of effect is 'Significant' or 'Insignificant', again based on professional judgement.

9.15. Further explanation of the significance criteria are presented below:

- **Major effect**: where the Development is likely to cause a considerable change from the baseline conditions or large exceedance of the threshold level and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered to be 'Significant';
- **Moderate effect**: where the Development is likely to cause either a considerable change from the baseline conditions or medium exceedance of the threshold level at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is considered more likely to be 'Significant' but will be subject to professional judgement;
- **Minor effect**: where the Development is likely to cause a small, but noticeable change from the baseline conditions or small exceedance of the threshold level on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity; or where the Development is likely to cause a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or / and can recover from the change. This effect is considered less likely to be 'Significant' but will be subject to professional judgement; and

- **Negligible**: where the Development is unlikely to cause a noticeable change or threshold level is satisfied at a receptor, despite its level of sensitivity or there is a considerable change at a receptor which is not considered sensitive to a change. This effect is 'Insignificant'.

9.16. Generally, level of effects that are determined to be Moderate or greater are assessed as significant, but it is ultimately dependent on professional judgement which takes account of site specifics, duration as well as the magnitude of change and sensitivity of the receptor(s).

Noise & Vibration from the Works

9.17. Demolition and construction noise levels were calculated in accordance with the methodology prescribed within BS 5228-1:2009+A1:2014[3] for each of the major stages of construction, accounting for the typical type of plant and activities expected within the assumed major stages of work.

9.18. The 'ABC Method' provided in BS 5228:2009-1+A1:2014 has been used to determine the category threshold values, which are determined by the time of day and existing prevailing ambient noise levels. The noise generated by activities as part of the Works is compared with the threshold value and the prevailing noise level to determine the magnitude of the noise. The magnitude is as detailed within the Design Manual for Roads and Bridges (DMRB) LA 111[4] Table 3.12 'Construction time period – LOAEL and SOAEL' and Table 3.16 'Magnitude of impact and construction noise descriptors' and information provided within Appendix E of BS 5228:2009-1+A1:2014.

9.19. There are two aspects of vibration impact which need consideration according to BS5228-2:

- The impacts on people or equipment within buildings; and
- The impacts on buildings (or other structures) themselves.

9.20. There are currently no British Standards that provide a methodology for predicting levels of vibration from demolition and construction activities other than BS 5228-2:2009+A1:2014[5], which relates to percussive or vibratory rolling and piling only. People are sensitive to low levels of vibration being just perceptible at 0.3 mm/s Peak Particle Velocity (PPV) in residential environments with potential for complaints at 1.0 mm/s PPV. The magnitude of vibration on people has been derived from Table B1 of BS 5228-2:2009+A1:2014 and as detailed within DMRB LA 111 Table 3.31 'Construction vibration LOAEL and SOAELs for all receptors' and Table 3.3 'Vibration level – magnitude of impact'.

9.21. The potential for damage to buildings from vibration occurs at significantly higher levels than human perceptibility, with the probability of damage tending towards zero at ≤ 12.5 mm/s PPV.

9.22. The magnitude of noise and vibration impacts arising from the Works are presented in **Table 9.4**.

Table 9.4: Magnitude of Work noise and vibration

Magnitude	Demolition & Construction Noise Level dB $L_{Aeq,T}$	Level of Vibration mm/s PPV	Definition
Negligible	≤Baseline (Prevailing) Noise Level	<0.3	The effect is not of concern.
Small Adverse	≤Threshold Noise Level	≥0.3 to <1	The effect is undesirable but of limited concern.
Medium Adverse	>Threshold Noise Level to <Threshold +5dB (or ≤75dB $L_{Aeq,T}$, whichever is highest	≥1 to <10	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.
Large Adverse	>Threshold +5dB (or >75dB $L_{Aeq,T}$, whichever is highest	≥10	The effect gives rise to serious concern and should be considered unacceptable, except for very brief exposure depending on the absolute level.

Traffic associated with the Works

9.23. CRTN[6] methodology has been used to determine the potential change in road traffic noise as a result of the Development's construction traffic by determining the percentage change in daily traffic volume and HGVs. The magnitude of change in noise level is presented as **Table 9.5** and is based on DMRB criteria (Table 3.17 '*Magnitude of impact at receptors*').

Table 9.5: Magnitude of Works change in road traffic noise

Magnitude	Change in Road Traffic noise with Construction Traffic (dB)	Definition
Negligible	<1.0	The effect is not of concern.
Small	≥1.0 to ≤3.0	The effect is of limited concern.
Medium	>3.0 to <5.0	The effect gives rise to some concern depending on absolute levels and duration.
Large	≥5.0	The effect gives rise to serious concern and it should be considered unacceptable where it increases the prevailing noise levels by this amount, depending on absolute level and duration. Note: noise from another road link may be the dominant source so the predicted increase may not be realised.

Complete and Operational Development

Fixed External Plant and Building Services

9.24. BS 4142:2014+A1:2019[7] '*Methods for Rating and Assessing Industrial and Commercial Sound*', provides an assessment and rating method to assess the potential impact from a range of commercial and industrial noise sources, including fixed building services plant.

9.25. The measured or predicted noise level from the source in question, the specific sound level ($L_{Aeq,T}$), immediately outside the dwellings is compared with the background sound level ($L_{A90,T}$). Where the sound contains certain acoustic features at the assessment location (such as but not limited to tones, impulses, intermittency), then a scaled character correction is added to the specific sound level to obtain the rating level ($L_{Ar,Tr}$). The greater the difference the greater the magnitude, not taking 'context' into account. Context partially overlaps with significance of effect as it takes account of the sensitivity of the receptor. Further to this, context also takes account of the level and nature of the sound and inherent design measures (such as façade insulation treatment and acoustic treatment).

9.26. **Table 9.6** presents the magnitude of noise emissions from fixed external plant and building services based on guidance within BS4142. Environmental Health of LBRuT's general requirement is that the plant noise rating level should be at least 10dB below the L_{A90} background level (L_{A90}-10dB).

Table 9.6: Magnitude of building services and fixed plant noise emissions

Magnitude	Rating Level dB $L_{Ar,Tr}$ (without context) Compare to Background Sound Level	Definition
Negligible	Rating Level ≤L_{A90}	The effect is not of concern
Small	Rating Level ≤L_{A90}+5dB	The effect is undesirable but of limited concern
Medium	Rating Level >L_{A90}+5dB	The effect gives rise to some concern but is dependent on context
Large	Rating Level ≥ L_{A90}+10dB	The effect gives rise to serious concern and should be considered unacceptable

Road Traffic Noise

9.27. Road traffic noise has been calculated using the calculation methodology of Calculation of Road Traffic Noise[8]. This has been used to predict the dB $L_{A10,18\ hour}$ Basic Noise Levels (BNL) for 2024, the earliest date that part of the Development could be operational, with and without Development.

9.28. The calculations use the forecast 18-hr Average Annual Weekday Traffic (AAWT) flow, % HGV composition and average vehicle speed for each road link provided by the transport engineers (Stantec).

9.29. The magnitude of the change in road traffic noise were evaluated by considering the estimated change in the $L_{A10,18\ hour}$ road traffic noise level on the local highway network as a result of the operation of the completed Development. The DMRB LA 111 provides magnitude criteria for short-term changes in operational road traffic noise levels which are reproduced in **Table 9.7**.

9.30. An increase in road traffic noise level is termed adverse whereas a reduction is termed beneficial.

Table 9.7: Magnitude of change in road traffic noise

Magnitude	Short-Term Change Road Traffic Noise Level (dB)
Negligible	<1.0
Small	1.0 to 2.9
Medium	3.0 to 4.9
Large	≥5.0

Retail, Commercial, Community Flexible Space Uses and Servicing Noise

9.31. Specific details concerning the end users of the commercial elements of the Development are not known at this stage and would be dependent on the future tenants. As such, a qualitative assessment has been undertaken of noise sources associated with the commercial elements of the development which includes:

- delivery and servicing;
- noise breakout from units; and
- basement car parking.

9.32. Due to the nature of the noise source, the magnitude would be assessed in line with BS4142:2014+A1:2019 as detailed in **Table 9.6**.

Noise from Proposed School and Play Space

9.33. In the absence of guidelines for assessing the effects of noise generated by schools including playground and outdoor activity noise, the potential noise effects have been assessed by calculating the increase in ambient noise levels from those currently experienced on and in the vicinity of the Development. The magnitude of change is presented in **Table 9.8** which are based on human perception and response to changes in environmental noise levels.

Table 9.8: Magnitude of change in prevailing noise level

Magnitude	Change in Ambient Noise Level (dB)	Definition
Negligible	<1.0	The effect is not of concern
Small	≥1.0 to ≤3.0	The effect is of limited concern
Medium	>3.0 to <5.0	The effect gives rise to some concern depending on absolute levels and duration
Large	≥5.0	The effect gives rise to serious concern, and it should be considered unacceptable where it increases the prevailing noise levels by this amount, depending on absolute level and duration.

9.34. Where Sensitive Receptors (SRs) have no prior knowledge of the existing noise climate, for example new receptors introduced as part of the proposed Development, assessment would be completed against guidance provided by Sports England in their document *'Artificial Grass Pitches (AGP) – Acoustics – Planning Implications'*[9] which suggests a noise limit of 50dB L_{Aeq} at 1m from any residential façade.

Assumptions, Exclusions and Limitations

The Works

9.35. The BS 5228 calculation methodologies allow accurate noise levels to be determined for various demolition and construction activities. However, at this stage specific detail on the construction plant and machinery to be used (make/model) is not known. A number of assumptions have therefore been made regarding the number and type of plant to be utilised, their location, and detailed operating arrangements. Some of this information would be clarified as the detailed design progresses and later when resources are mobilised and the contractor is appointed, but other information (such as exactly where the plant operates and for how long) would remain uncertain, even after works have commenced.

9.36. Construction noise levels have been based on generic plant detail contained within BS5228-1:2009+A1:2014 and information as set out in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**. The available information is considered sufficient to undertake a noise assessment of the Works, focussing on key activities operating at the Site, with the aim of identifying whether a significant, albeit temporary, adverse noise effect is likely to arise at the nearest sensitive receptors. Full details of assumed plant complement and distance to receptors are presented within **Appendix 9.3**. In this respect, a medium to high degree of confidence is assigned to the predicted significance of the potential effects.

Baseline

9.37. This assessment is based upon noise monitoring conducted at and within the vicinity of the Site in July 2019 which are considered to be representative of pre COVID-19 conditions and takes account of noise from the surrounding land-uses, such as local road network. The survey was conducted from Thursday 11th July to Tuesday 16th July 2019, covering both a weekday and weekend period. The survey is, therefore, suitably robust and acceptable for undertaking the assessment.

9.38. There are no existing sources of vibration proximate to the Site, or its immediate surrounds, such as railway line or London Underground Line (LUL). On this basis vibration measurements were not conducted as baseline vibration is taken as zero, which is considered to be representative of baseline conditions.

Fixed Plant & Building Services

9.39. The specific type and configuration of fixed plant are not defined. Consequently, it is not possible to undertake predictions to determine whether appropriate standards would be met, so instead appropriate plant noise emission limits have been set.

Operational Vibration

9.40. The operational phase of the Development does not introduce activities that would give rise to vibration. As set out in the EIA Scoping Report (**Appendix 2.1**) on this basis, assessment of operational vibration has been scoped out of the assessment.

Baseline Conditions

Sensitive Receptors

9.41. The area surrounding the Site is urban in nature predominantly consisting of residential and commercial uses. Existing receptors within the vicinity of the Site are identified in **Table 9.9** together with their sensitivity with their illustrated in **Figure 9.1**.

Table 9.9: Sensitive receptors

Sensitive Receptor Number	Type of Receptor	Address / Name	Sensitivity	Approximate Distance from Site Boundary
SR A	Existing Residential	11-61 Watney Road	High	25 m west of Stag Brewery site Boundary.
SR B	Existing Residential	2-26 Williams Lane	High	10 m north-west of Stag Brewery site Boundary.
SR C	Existing Residential	1-69 Lower Richmond Road	High	10-20 m south of Stag Brewery Site Boundary.
SR D	Existing Residential	Chertsey Court	High	10 m from S278 Boundary.
SR E	Existing Residential	139 Lower Richmond Road	High	5 m from S278 Boundary
SR F	Existing Residential	Thames Bank	High	10m north of Stag Brewery site Boundary
SR G	Existing Residential	Parliament Mews	High	10m north of Stag Brewery site Boundary
SR H	Existing Residential	Boat Race House	High	10m east of Stag Brewery site Boundary.
SR I	Future Residential & School	Within proposed Development	High	Within Site, dependent on phasing

9.42. Where a number of sensitive receptors are located close to each other, the nearest sensitive receptor is given to represent the immediate area.

9.43. Given the phased nature of the Works associated with the Development, some of the new residential / school elements of the Development could be occupied whilst construction continues on other plots. As such, when considering the Works in relation to the Development consideration has also been given to potential future noise sensitive receptors which form part of the Development.

9.44. In addition to the sensitive receptors outlined above, there would be a number of structures retained as part of the Works. These include the Maltings, the former Hotel (façade retention only) and the former Bottling Building, retained historic elements of the boundary wall, railway tracks, paving and moorings. Potential effects in terms of construction vibration upon these receptors has also been considered. The memorial plaques and historic gates would be stored for protection in containers on the Site during the Works and re-instated post-construction.

Baseline Noise Surveys

9.45. A comprehensive environmental noise survey was undertaken from Thursday 11th July to Tuesday 16th July 2019, covering a typical weekday and weekend period, to establish and quantify the existing noise climate at and within the vicinity of the Site.

9.46. The noise monitoring locations are shown on **Figure 9.1** and described below in **Table 9.10**.

Table 9.10: Noise Monitoring Locations

Monitoring Location (Refer to Figure 9.1)	Description	Observations and Predominant Noise Sources
LT1	Free-field measurement at the south-western Site boundary overlooking Lower Richmond Road (the A3003). Microphone located approx. 1.2m above ground level (AGL).	Noise climate dominated by constant vehicular traffic on Lower Richmond Road / Mortlake High Street. Although intermittent in comparison, noise from low flying aircraft movements in to Heathrow Airport (located approx. 11km to the west) was significant. Contributory noise from human activities, distant road noise and distant aircraft also influence the noise climate to some extent.
LT2	Façade measurement on the second floor of the Former Hotel and Bottling building at the south-eastern Site boundary overlooking Mortlake High Street. Microphone located approx. 6.0m AGL.	
LT3	Façade measurement on the boundary wall to the north-east of the Site overlooking the River Thames. Microphone located approx. 4.0m AGL.	Noise climate dominated by aircraft noise, as detailed above. Contributory noise from local and distant road traffic and occasional passing cyclists and pedestrians on the footpath over the river.
LT4	Free-field measurement at the south-western boundary of the Site orientated towards Clifford Avenue/Chiswick Bridge (the A316). Microphone located approx. 2.5m AGL.	Noise climate influenced by constant vehicular traffic on Clifford Avenue. Contributory noise from domestic activities at nearby residential dwellings.
ST1	Free-field measurement along Lower Richmond Road (A3003) approx. 3m from carriageway edge. Microphone located approx. 1.2m AGL	Noise climate dominated by road traffic along Lower Richmond Road. Traffic flow was intermittent with periods of idling due to the traffic lights at the Lower Richmond Road / Clifford Avenue junction.
ST2	Free-field measurement along Clifford Avenue approx. 5m from carriageway edge. Microphone located approx. 1.2m AGL	Noise climate dominated by road traffic along Clifford Avenue. Traffic flow was intermittent with periods of idling due to the traffic lights at the Lower Richmond Road / Clifford Avenue junction.

Monitoring Location (Refer to Figure 9.1)	Description	Observations and Predominant Noise Sources
CRTN1	Free-field measurement within Chertsey Court car park approx. 40m from Lower Richmond Road / Clifford Avenue Junction. Microphone located approx. 1.2m AGL	Noise climate in the area dominated by noise from both Lower Richmond Road (A3003) and Clifford Avenue. Occasional cars passing through the Chertsey Court car park and aircraft passing overhead also contributed to the noise climate at this location.
CRTN2	Free-field measurement along Williams Lane approx. 1m from road edge. Microphone located approx. 1.2m AGL	Noise climate in the area dominated by distant road traffic from Lower Richmond Road and the surrounding transport network. Occasional cars passing along Williams Lane and aircraft passing overhead also contributed to the noise climate at this location.

9.47. **Table 9.11** presents a summary of the unattended baseline noise measurements at the un-attended long-term location, with **Table 9.12** presenting a summary of the attended noise measurements at the short-term and CRTN shortened measurement locations.

9.48. The highest ambient ($L_{Aeq,T}$) noise levels, were measured to the south (LT1) of the Site adjacent to Lower Richmond Road. Average ambient noise levels of 71 dB $L_{Aeq,12hr}$, 71 dB $L_{Aeq,4hr,}$ and 66 dB $L_{Aeq,8hr,}$ were recorded during the day, evening and night-time periods respectively. High noise levels were also measured at Mortlake High Street with average ambient noise levels of 68 dB $L_{Aeq,12hr}$, 69 dB $L_{Aeq,4hr,}$ and 63 dB $L_{Aeq,8hr,}$ were recorded during the day, evening and night-time periods respectively All long-term locations exhibited typical diurnal variation in environmental noise levels, with lower noise levels during the night-time period when traffic volumes are reduced together with reduction human activity.

9.49. Full details of the survey are presented in **Appendix 9.2**.

Table 9.11: Summary of un-attended long-term baseline noise measurements (free-field)

Monitoring Location (Figure 9.1)	Period	Duration	$L_{Aeq,T}$ dB		$L_{A10,T}$ dB		$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB	
			Range	Ave[1]	Range	Ave[2]	Range	Ave[2] (Mode)	Range	90th Percentile[3]
LT1	Day	12hr	65 – 82	71	68 – 77	74	41 – 66	59 (60)	75 – 110	86
	Evening	4hr	66 – 81	71	70 – 79	74	40 – 66	55 (52)	76 – 109	87
	Night	8hr	45 – 79	66	36 – 77	66	31 – 63	41 (37)	43 – 103	84
LT2	Day	12hr	62 – 83	68	66 – 73	69	49 – 66	61 (62)	69 – 103	85
	Evening	4hr	61 – 81	69	65 – 77	69	45 – 64	57 (59)	69 – 101	86
	Night	8hr	37 – 82	63	38 – 73	64	28 – 64	42 (36)	46 – 102	77
LT3	Day	12hr	49 – 72	59	50 – 80	60	45 – 57	51 (50)	54 – 94	75
	Evening	4hr	46 – 62	55	49 – 66	56	41 – 56	49 (50)	53 – 925	72
	Night	8hr	36 – 65	53	41 – 69	50	29 – 54	41 (41)	44 – 87	70
LT4	Day	12hr	45 – 69	56	47 – 67	57	42 – 53	48 (48)	50 – 92	74
	Evening	4hr	44 – 64	55	46 – 69	56	38 - 52	47 (47)	51 – 77	73
	Night	8hr	34 – 65	53	37 – 70	48	28 – 53	38 (35)	41 – 80	72

Notes: [1] Logarithmic average over the day/evening/night survey periods; [2] Arithmetic average over the day/evening/night survey periods; [3] The 90th percentile L_{AFmax} value (equivalent to the 10th highest measured L_{AFmax} level) is presented and considered representative of typical L_{AFmax} levels experienced. All figures rounded to nearest whole decibel, only full periods reported

Table 9.12: Summary of attended (short term) baseline noise measurements (free-field)

Monitoring Location	Period	Duration	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB	$L_{AFmax,5min}$ dB
			Ave[1]	Ave[2]	Ave[2]	Ave[2]
ST1	Day	1-hour	73	74	62	85
ST2	Day	1-hour	70	73	61	78
CRTN1	Day	3-hour	63	65	57	76
CRTN2	Day	3-hour	58	61	45	74

Notes: [1] Logarithmic average over the daytime survey periods; [2] Arithmetic average over the daytime survey periods. All figures rounded to nearest whole decibel.

Likely Significant Effects

The Works

Demolition and Construction Noise

9.50. **Table 9.13** presents the predicted demolition and construction noise levels at the existing and future (i.e. new occupants of the Development and School) sensitive receptors identified in **Table 9.9** for the main 'noisy' works. The results are worst-case, as they assume works are being undertaken at the closest point to the identified receptors. For earthworks and pavement operations this is taken as the Site boundary, for CFA piling and concreting this is taken as the nearest point to the Development buildings, for sheet piling this is taken at the nearest point to Basement works and for demolition this is based on the shortest distance to the buildings being demolished. All predicted noise levels assume that there is no mitigation in place. Calculation details together with assessment methodology to determine magnitude are presented in **Appendix 9.3**. **Table 9.14** presents the level of effect taking account of the sensitivity of the receptor and absolute predicted noise level in relation to the baseline noise level and threshold construction noise level.

9.51. Given the Works associated with the Development is phased, and as indicated within **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction,** the School and some of the Development Plots would be occupied whilst Works are ongoing. To take account of this, calculations for future receptors which form part of the Development were based on a minimum distance of 15 m from construction works to determine the likely significant effects. This is considered to be a reasonable conservative approach as in most cases it is likely that works would be undertaken at greater distance.

9.52. Full details of the calculations undertaken are presented in **Appendix 9.3**.

Table 9.13: Predicted Demolition & Construction (un-mitigated) Noise Levels dB L_{Aeq}

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure	Floor Slab (superstructure	Public Realm & Landscaping	Highways Pavement
A	11-61 Watney Road	67	79	77	65	67	67	67	68	85	80
B	2-26 Williams Lane	83	87	67	81	82	82	82	83	85	80
C	1-69 Lower Richmond Road	84	87	76	76	77	78	77	79	85	80
D	Chertsey Court	65	87	60	60	61	62	61	62	85	80
E	139 Lower Richmond Road	63	87	62	63	64	65	64	65	85	80
F	Thames Bank	87	87	85	81	82	82	82	83	85	80
G	Parliament Mews	90	87	65	81	82	82	82	83	85	80
H	Boat Race House	72	87	71	81	82	82	82	83	85	80
I	Future Residential & School	n/a	84	85	81	82	82	82	83	81	77

Table 9.14: Demolition & Construction Noise Effect Level (un-mitigated)

Fig 9.1 Ref	Construction Threshold Level	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	65 (58)	Mod	Maj	Maj	Min	Mod	Mod	Mod	Mod	Maj	Maj
B	65 (58)	Maj	Maj	Mod	Maj	Maj	Maj	Maj	Maj	Maj	Maj
C	75 (71)[1]	Maj	Maj	Mod	Mod	Mod	Mod	Mod	Mod	Maj	Mod
D	70 (63)	Min	Maj	Neg	Neg	Neg	Neg	Neg	Neg	Maj	Maj
E	75 (71)[1]	Neg	Maj	Neg	Neg	Neg	Neg	Neg	Neg	Maj	Maj
F	65 (59)	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj
G	65 (59)	Maj	Maj	Min	Maj	Maj	Maj	Maj	Maj	Maj	Maj
H	65 (59) (north area)	Mod	Maj	Mod	Maj	Maj	Maj	Maj	Maj	Maj	Maj
I	65	n/a	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj

Note: Neg – negligible; Min – minor; Mod – moderate; Maj – major: [1] Where construction threshold level is 75dB $L_{Aeq,T}$ then noise limit is 80dB $L_{Aeq,T}$. This may however be lowered to 75dB $L_{Aeq,T}$ by LBKuT.

9.53. The current construction programme indicates that the School would be occupied around 2.5 years from start of construction with occupation of the first residential blocks approximately 3.5 years from start of construction. On this basis, all effects on future receptors are considered to be

medium-term (between 3 and 5 years), temporary and local. For existing residential receptors the effects are considered to be long-term, based on a demolition and construction period of 8 years, although the level of effect presented are worst-case when works are undertaken at the shortest distance to the receptor.

9.54. Overall, the level of effect is identified as predominantly **temporary, medium to long-term, local major adverse** and therefore **significant**. It should be noted that in reality, Works would be transient in nature and for the most part taking place at locations significantly removed from the SRs. As major adverse effects are predicted mitigation measures would be required to reduce noise levels from the demolition and construction phase of the proposed Development.

Construction Traffic Noise

9.55. Construction traffic flow data as provided by Stantec show that for this Development there is anticipated to be a peak in construction vehicle movements in 2028 of 138 one-way vehicle trips accessing the Site per day, of which 110 one-way trips are likely to be undertaken by Heavy Goods Vehicles (HGVs) and 28 one-way trips by Light Goods Vehicles (LGVs) (a total of 276 two-way daily vehicle trips as reported in **Chapter 6**). During the peak construction period, access to the Site for construction vehicles would be taken via two access points off Lower Richmond Road, via Ship Lane, and Mortlake High Street, adjacent to Bulls Alley. The AAWT 18-hour baseline traffic flows along the construction route reveals construction traffic accounts for less than 2% as a proportion of 2028 forecast do-minimum base flows. This equates to a noise level increase of less than 1dB, which is not large enough to cause any discernible effect. As such, the likely effect of construction traffic noise generated by the Development on existing and future sensitive receptors is concluded to be **negligible** and therefore **insignificant**.

Demolition and Construction Vibration

9.56. The primary source of vibration associated with the Works is likely to be sheet piling and to a lesser extent CFA piling, although some vibration may arise during demolition, Site preparation works and construction works. It is understood that sheet piling would be required as part of the substructure works to form a retaining wall for the basement structure and for sections of the river wall. Where piled foundations are required, rotary bored / CFA piling would be used to minimise noise and vibration effects.

9.57. With regard to the human perception of vibration levels, **Table 9.15** indicates that perceptible PPV levels arising from sheet piling can occur up to 40-60 m depending on ground conditions.

Table 9.15: Distance at Which Vibration May Just be Perceptible

Construction Activity	Distance from Activity when Vibration may Just be Perceptible (metres)[1]
Heavy vehicles	5 – 10
Excavation	10 – 15
CFA Piling	15 – 20
Rotary Bored Piling	20 – 30
Vibratory Piling	40 – 60
Sheet Piling (driven)	40 - 60

Note: [1]Distances for perceptibility are only indicative and dependent upon a number of factors, such as the radial distance between source and receiver, ground conditions, and underlying geology.

9.58. It is a widely held belief that if vibration can be felt, then damage to property is inevitable. However, vibration levels at least an order of magnitude higher than those for human disturbance are required to cause damage to buildings. The probability of building damage tends towards zero at PPV levels below 12.5 mm/s. Threshold levels are however normally set lower at 10mm/s PPV, which is the level at which it is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

9.59. **Table 9.16** presents typical levels of vibration with distance from CFA and rotary bored vibration together with those arising from driven sheet piling.

Table 9.16: Typical Levels of Vibration Resultant from CFA/Rotary Bored and Sheet Piling (Driven)

Distance (m)	Peak Particle Velocity[1] (PPV) mm/s	
	CFA Rotary Bored Piling	Sheet Piling (Driven)
5	0.54	≤13.5
10	0.38	≤4.0
20	0.30	No equivalent data in BS5228-2
30	0.03	≤3.0

Note: [1]Indicative derived from BS5228-2:2009. Dependent on ground conditions and underlying geology.

9.60. The vibration arising from sheet piling using a ‘pressed’ method rather than driven, would however give rise to vibrations levels lower than those presented within **Table 9.16** which are based on ‘driven’ sheet piles.

9.61. At this stage the detail of the methods and equipment to be used during the construction works is unconfirmed as they will be established in detailed design stages. Therefore, a detailed assessment cannot be undertaken. Consequently, the vibration effect level from the Works cannot be assessed quantitatively and was therefore assessed qualitatively based on typical plant used and distance of works to the SRs. Vibration level data was drawn from BS5228 Part 2.

9.62. **Table 9.17** presents the qualitative level of vibration effects based on distance of piling and demolition works from the receptor and sensitivity of the receptor.

Table 9.17: Qualitative Level of Effect From Vibration

SR ID	SR	Shortest Distance from Demolition Works	Shortest Distance from Sheet Piling Works	Shortest Distance from CFA Piling Works	Level of Effect On Disturbance to Humans
A	11-61 Watney Road	150	**35**	85	Minor
B	2-26 Williams Lane	22	110	**15**	Minor
C	1-69 Lower Richmond Road	20	**40**	25	Minor
D	Chertsey Court	180	250	160	Negligible
E	139 Lower Richmond Road	215	205	115	Negligible
F	Thames Bank	15	**15**	15	Moderate
G	Parliament Mews	10	135	**15**	Minor
H	Boat Race House	85	75	**15**	Minor
I	Future Residential & School	N/A	**15**	15	Minor to Moderate

Note: **Bold** type denotes works likely to result in highest vibration levels at SR location.

9.63. Due to the proximity of piling and demolition works to SRs, there is the potential for some **temporary**, **short-term, local adverse moderate effects** to occur. Mitigation will therefore be required.

9.64. With regard to potential damage to buildings, provided the PPV is less than 10 mm/s the potential for building damage is considered to be negligible. Based on the distance of SRs to works, the potential for damage to buildings at all SRs is considered to be **negligible** and therefore **insignificant**.

9.65. Vibration from piling operations has the potential to affect utilities and will be a function of the distance of the works from the utility location. Some statutory undertakers have introduced criteria governing the maximum level of vibrations to which their services should be subjected. In the absence of specific criteria from the undertakers BS5228-2 recommends the following limits:

- maximum PPV for intermittent or transient vibrations 30 mm/s; and
- maximum PPV for continuous vibrations 15 mm/s.

9.66. In the event of encountering aging and dilapidated brickwork sewers, the base data should be reduced by 20% to 50%. For most metal and reinforced concrete service pipes however, BS85228-2 consider that the values stated within BS5228-2 should be tolerable.

9.67. It is not possible at this stage to accurately predict the significance of the effect from vibration on underground utilities such as the main water mains sewer, which Thames Water has identified runs immediately adjacent to the Site. Nonetheless, a comparative study has been carried out comparing measured values of ground vibration from similar piling activities with British Standard guideline values for underground structures and buildings. Empirical models for the estimation of piling vibration levels were discounted for this assessment as they are considered to be highly variable over short propagation distances. British Standard BS 5228-2 offers guidance on

vibration levels from piling activities and provides a summary of measured levels from particular sites, a selection of which is included as **Table 9.18**.

Table 9.18: Summary of measured historic vibration levels (BS5228-2:2009+A1:2014)

Piling Methodology	Location and source	Activity	Measured Level (Peak Particle Velocity mm/s)
Impact (Driven) Piling	C1 1972, London EC2 in overburden and London Clay	Driving Casing (Tripod Bored Piling)	12.5 mm/s at 1 m
	C8 1971, London WC2 in overburden and London Clay	Diesel hammer (Driven Sheet Piling)	20 mm/s at 1 m
	C8 1972, London WC2 in overburden and London Clay	Air hammer (Driven Sheet Piling)	10 mm/s at 1 m
	C53 1979, Molesey (Surrey) in gravel over London Clay	Driving Sheets (Vibratory Pile Driver)	4.3 mm/s at 5 m
	C56 1979 Bromley (Greater London) in gravel	Driving Sheets (Vibratory Pile Driver)	42 mm/s at 3 m
Pressed In/CFA/Rotary Bored Piling	2000 New Orleans	Pressed in steel sheet piles	4.3 mm/s at 5 m
	1992 Utrecht	Pressed in steel sheet piles	0.7 mm/s at 7 m
	1971 London EC2 in made ground/gravel and London Clay	Rotary Bored Pile	1 mm/s at 4 m
	1981 London EC3 Fill dense ballast and London Clay	Auguring	0.23 mm/s at 20 m
Excavation and Breaking Out[1]	Hydraulic breakout of concrete	Hydraulic Breaker	2.3 mm/s at 8 m
	Excavation of materials	Excavator	1 mm/s at 8 m

9.68. Provided works are at least 10 metres from utilities, potential damage to utilities is anticipated to be negligible, depending on the structural integrity of the utility structures. As specific details are unknown at this stage in terms of distance of piling works to the utility structure and its condition, mitigation, including monitoring where required, is recommended.

[1] Source: Federal Transit Association

Completed Development

Building Services Plant Noise

9.69. At this stage of the Development, the specific type, configuration (or location for the outline area) of fixed plant are not defined and therefore appropriate plant noise emission limits have been set, as detailed later in the relevant mitigation section of this Chapter.

9.70. As part of the detailed element of the Development (Application A – Development Area 1), plant areas are to be provided throughout the single level basement area (and double level basement in the cinema building) as well as at roof level for each individual block.

9.71. Space provision shall be made at roof level to allow ground floor retail unit tenants to install their own condensers. Noise data for this is not available at this time as this is a fit-out item. The current proposal is to locate all ASHP plant on Block 5 during Phase 1. There will be 7No. 613kW units complete with attenuation packs as required. During Phase 2 current proposal is to locate ASHP plant on Blocks 15 and 18. There will be 3No. units on Block 15 and 2No. units on Block 18, all complete with attenuation packs as required. Further to this on Block 5 roof, current indication is 6no Air Handling Units (AHUs) serving office, hotel, and flexible use) together with 19no. VRF Condensers (Daikin RYQ20T typical). On Block 1 (Cinema) at roof level will be Air Handling Units (AHUs) and 8no. VRF Condensers (Daikin RYQ20T typical).

9.72. At this stage in the design, plant specification would be sufficiently flexible to ensure that suitably quiet, non-tonal plant can be procured and / or mitigation options such as screening (such as acoustic louvres) could be installed as necessary to ensure that the plant noise criteria is met. In the absence of not setting maximum plant noise levels or the stipulated noise levels not achieved, the likely level of effect on existing surrounding receptors and future receptors within the Development from building services noise would be **permanent**, **local** up to **moderate adverse** and, therefore, potentially **significant**.

Retail Commercial Uses and Services

9.73. The detailed element of the Development (Application A – Development Area 1) includes a mix of uses, including employment, retail, community and leisure uses, sui generis uses, a hotel and residential units. Basement car park and servicing area also forms part of the detailed Development and would be located to the east of Ship Lane. Vehicular access and egress to the eastern basement would be via dedicated access points on Ship Lane at Building 3 and Mortlake High Street at Building 10 of the Development. The outline element of the Development located to the west of Ship Lane (Application A – Development Area 2) includes residential use with basement level car parking for residents.

9.74. During future design stages of the Development, the sound insulation performance requirements of the external building fabric would be appropriately specified to control noise break-out, having regard to the nature of future uses and occupants of each unit. This is to ensure internally generated noise would be attenuated to a level as to be unobtrusive at the nearest residential areas. Standard controls, secured through planning conditions relating to the noise emissions, building construction, opening hours and use of outside space would be used to minimise likely noise effects. Therefore, noise effects associated with non-residential, retail / commercial uses of the Development, on existing receptors surrounding the Development, and future sensitive receptors within the Development are expected to be **negligible** and, therefore, **insignificant**.

9.75. The majority of service vehicles would enter the Site from Mortlake High Street onto the new high street via a controlled access. The number of delivery vehicles associated with non-residential retail / commercial uses would be largely dependent upon the final occupants, however, it is currently predicted by Stantec that there would be less than 45 one-way delivery and servicing trips per day. Vehicle movement on the highway network are accounted for in the road traffic assessment below. However, consideration of delivery activities is required. It is considered that standard controls, secured through planning conditions relating to hours of delivery, combined with acoustic attenuation measures, would be used to minimise likely noise effects. Therefore, noise effects associated with servicing and deliveries on existing receptors surrounding the Development and future sensitive receptors within the Development would be **negligible** to at worst **permanent**, **local**, **intermittent**, **minor adverse** level of effect.

9.76. Mitigation would be required to reduce the effect from this source should it occur during the night-time period.

9.77. With regard to bedrooms located directly above the main access points to the basement car parking there is the potential for **permanent**, **local**, **intermittent**, **minor adverse** level of effect during peak hours or if large numbers of vehicles enter or exist the car park during the night-time period.

Road Traffic Noise

9.78. The likely change in road traffic noise resulting from operational traffic associated with the Development was determined in accordance with CRTN; the results of which are presented in **Table 9.19**. The 2029 baseline scenario '*without Development'* includes traffic increases due to natural traffic growth and committed developments. The '*with Development'* scenario (which includes the S278 highways works at Chalkers Corner) is intended to identify the likely effects solely as a result of the Development. Full details of the road traffic noise assessment are provided within **Appendix 9.4**.

Table 9.19: Summary of Road Traffic Noise Assessment

Road Link	dB $L_{A10,18hr}$ BNL		
	2029 - Without Development (Base)	2029 - With Development (Base + Development)	Change
A316 Clifford Ave	75.1	75.2	+0.1
A316 Lower Richmond Road	73.3	73.3	0.0
South Circular (north of A316)	69.5	69.5	0.0
South Circular (south of A316)	70.3	70.4	+0.1
A3003 Lower Richmond Road (Watney's Sports Ground)	70.9	71.1	+0.2
A3003 Lower Richmond Road (Mortlake Green)	71.0	71.2	+0.2
Williams Lane	Note 1	56.3	Note 2
Mortlake High Street	71.4	71.5	+0.1
The Terrace (west of Barnes Bridge Station)	71.1	71.2	+0.1

Road Link	dB $L_{A10,18hr}$ BNL		
	2029 - Without Development (Base)	2029 - With Development (Base + Development)	Change
White Hart Lane (south of Mortlake High Street)	64.9	65.0	+0.1
Sheen Lane (north of Level Crossing)	64.9	65.2	+0.3
Sheen Lane (south of Level Crossing)	64.4	64.7	+0.3
Sheen Lane (south of South Circular)	63.3	63.5	+0.2
South Circular Road (west of Sheen Lane)	71.2	71.2	0.0

Note: [1]18-hour AAWT flow of 764 is below low flow CRTN predictive limit of 1,000. [2] The vehicle flow with Development along Williams Lane is predicted to increase by 83.2% to 1399 with %HGV of total flow reducing from 7.1% to 5.3%. A doubling in traffic volume (100% increase) would normally result in a +3dB increase in road traffic noise. The increase in vehicles along Williams Lane is below this value. It is likely that noise from Lower Richmond Road, which has high traffic volumes and high road traffic noise, significantly contributes to the noise climate at Williams Lane and therefore likely to offset the increase in traffic volume. The measured daytime noise level in 2019 of 58dB $L_{Aeq,3h}$ adjacent to Williams Lane illustrates that this is likely to be the case.

9.79. For all road links assessed presented as **Table 9.19**, the difference in operational road traffic noise (considering the 2029 baseline situation both 'with' and 'without' Development) is less than 1dB(A) and, therefore, **negligible** and **insignificant**, except along Williams Lane. Further consideration has been given to the highways works at Chalkers Corner as this involves slight reconfiguration of Lower Richmond Road junction with Chalkers Corner, which will be dealt with under a Section 278 (S278) agreement.

9.80. When considering vehicle movements along Williams Lane they are predicted to increase by 83.2% from 764 to 1,399. CRTN calculation methodology cannot be used to predict 2029 road traffic noise levels without development as the forecast traffic volume is below the low flow criteria of 1,000 18-hour AAWT and, therefore, outside the predicted accuracy of CRTN methodology. Normally a doubling in traffic volume results in 3dB increase in road traffic noise, which is of small magnitude and the increase in traffic volume on Williams Lane is below this. Further to this, it is anticipated that any increase in road traffic noise along Williams Lane would be masked by the dominance of road traffic noise from Lower Richmond Road located to the south. The measured daytime noise level in 2019 of 58dB $L_{Aeq,3h}$ adjacent to Williams Lane illustrates that this is likely to be the case. On balance therefore the increase in road traffic noise along Williams Lane is anticipated to result in **permanent**, **local, minor adverse** level of effect, which is considered to be **insignificant**.

9.81. Chalkers Corner highways works include a new left-hand lane west bound on Lower Richmond Road which will be accommodated within the highway boundary and will be dealt with under a S278 agreement. The S278 works would move the road edge at Chalkers Corner, and therefore road traffic noise source, closer to the receptors south of Lower Richmond Road proximate to the junction due to the new left-hand lane west bound.

9.82. To allow assessment of changes in road traffic noise due to the proposed S278 highways works, CadnaA noise modelling software has been used to predict road traffic noise in terms of the L_{Aeq} index rather than the L_{A10} noise parameter. CadnaA has converted the predicted L_{A10} noise

parameter from the road input data to an L_{Aeq} value using Transport Research Laboratory[10] methodology. Due to traffic congestion and traffic light controls, vehicles proximate to Chalkers Corner spend time stationary, idling and moving slowly. Vehicle speeds below 20 kph however fall below CRTN calculation methodology and therefore a vehicle speed of 20 kph has been adopted for all vehicles within the CadnaA noise model, which is in-line with CRTN methodology. Due to the road traffic noise assessment being comparative, this approach is considered to be acceptable.

9.83. **Table 9.20** presents the predicted changes in road traffic noise due to the proposed S278 works scheme using CRTN and TRL conversion methodology the CadnaA at ground floor level.

Table 9.20: Noise assessment S278 works at Chalkers Corner (2029)

Receptor	Baseline dB $L_{Aeq,T}$	Light Scheme dB dB $L_{Aeq,T}$	Change in Noise Level	Magnitude	Level of Effect
135-137 Lower Richmond Road	70.3	70.5	+0.2	Negligible	Negligible
139 Lower Richmond Road	69.6	70.1	+0.5		
141 Lower Richmond Road	68.9	69.6	+0.7		
143 Lower Richmond Road	68.2	68.8	+0.6		
145 Lower Richmond Road	68.1	68.5	+0.4		
151-153 Lower Richmond Road	68.2	68.4	+0.2		
155-157 Lower Richmond Road	68.7	68.8	+0.1		
159-161 Lower Richmond Road	69.3	69.3	0.0		
163-165 Lower Richmond Road	70.2	70.2	0.0		
167-169 Lower Richmond Road	71.4	71.4	0.0		
171 Lower Richmond Road	72.5	72.4	-0.1		
Chertsey Ct Facing Chalkers Corner	64.2	64.3	+0.1		
Chertsey Ct Lower Richmond Road	66.5	66.7	+0.2		
Chertsey Ct Clifford Avenue	67.7	67.7	0.0		

9.84. The highest increase in road traffic noise with the S278 works are experienced at those properties south of Lower Richmond Road nearest to proposed new left-hand lane. The predicted increase in noise level however is less than 1dB. The reason for this is due to the significant contribution from all the other road links and not just the west-bound lanes of Lower Richmond Road.

9.85. In summary, with the proposed S278 works the predicted change in road traffic noise level is **negligible** in magnitude and level of effect and therefore considered to be **insignificant**. On this basis mitigation is not proposed.

Noise from Proposed School and Play Space

9.86. Up to 7,534 m^2 GEA would be children's play space for future residents and 9,320 m^2 GEA including the roof top play space which would be provided as part of the proposed school

(excluding indoor use). Play facilities for different age groups are positioned within residential courtyards, parks, plazas and open space areas.

9.87. Play elements and facilities are provided in a range of forms within the public and private realms of the Development, including designated and fenced playgrounds, unfenced but contained play spaces with a range of play elements and carer seating, topographic variation and play opportunities in the landscape (within planting areas) and 'play on the way' elements within circulation spaces and public realm areas. Refer to Parameter Plan P10736-00-004-123 for the location of play space provision in the outline component of the Development (Application A – Development Area 2) and the Landscape Design and Access Statement for the detailed component of the Development (Application A – Development Area 1).

9.88. Although there would be the potential for local play facilities to generate a degree of noise, the levels generated would be relatively low and would in general not be of concern to local residents. Of primary concern would be noise effects associated with larger more formalised play space and sports pitches such as those associated with the proposed school.

9.89. The proposed school would provide semi enclosed play space at roof level, an indoor sports hall and activity studio on the first floor, an external Multi Use Games Area (MUGA) to the south of the school building and a full sized artificial all weather 3G artificial grass sports pitch with spectator facilities to the west of the school building.

9.90. With regards to noise effects there would be the potential for noise associated with the proposed school facilities to affect both existing receptors surrounding the Development and future sensitive receptors within the Development. The primary sources of noise associated with the school are likely to include the semi-enclosed play space at roof level, the external MUGA and the sports pitch.

9.91. In order to assess the potential effects associated with this school element of the Development noise levels have been predicted using CadnaA noise modelling software calibrated to Sport England "free-field noise level of 58 dB $L_{Aeq(1\ hour)}$ at a distance of 10 metres (m) from the side line halfway marking" which Sport England regard as being representative for noise from an AGP.

9.92. For those receptors introduced as part of the Development which have no prior knowledge of the existing noise climate, assessment against the absolute criteria of 50dB L_{Aeq} as recommended by Sports England has been undertaken. The assessment has been completed for the closest SRs to the sports pitch and MUGA only. The assessment results are presented as **Table 9.21**.

Table 9.21: Assessment of Noise Effects Associated with Sports Pitch and MUGA

SR (Figure 9.1)	Existing Ambient Noise Level (dB(A))	Predicted Noise Level from Sports Pitches (sports pitch & MUGA) (dB (A))	Combined Ambient and Predicted sports pitch & MUGA Noise Level (dB (A))	Change in Noise Level (dB (A))	Level of Effect
SR A – Watney Road	58 day (CRTN 2)	54	59	1	Minor Adverse
	55 evening (LT4)	54	58	3	Minor Adverse
SR B – Williams Lane	58 day (CRTN 2)	53	59	1	Minor Adverse
	55 evening (LT4)	53	57	2	Minor Adverse
SR C – Lower Richmond Road	71 day (LT1)	53	71	0	Negligible
	71 evening (LT1)	53	71	0	Negligible
Closest Future SR (Block 18)	n/a	55	n/a	n/a	Note 2

Note: [1]Daytime period 07:00-19:00; evening period 19:00-23:00, although this does not necessarily reflect operational (usage) times of sports pitch and MUGA. [2] Above Sport England recommended noise level of 50dB LAeq,T but does not exceed WHO benchmark criteria of 55dB LAeq,T for residential amenity.

9.93. The predicted change in noise levels at the nearest SRs on Williams Lane and Watney Road are predicted to be of small magnitude and, therefore, **local, intermittent, minor adverse** level of effect. It should be noted that the existing ambient noise levels presented in **Table 9.21** do not take into account the intermittent noise from the existing sports on the fields (two existing pitches), which residents already experience. The intermittent noise levels of the proposed sports pitch and MUGA is therefore not expected to be any higher than the existing intermittent noise levels of play on the two existing sports pitch which currently do not have any fencing or noise mitigation in place. At properties on Lower Richmond Road, due to relatively high prevailing noise levels due to road traffic noise no increase in the prevailing ambient noise level in terms of dB $L_{Aeq,1\text{-}hour}$ is predicted. On this basis the overall impact on existing receptors is considered to be **insignificant**.

9.94. At the nearest future residential receptors, the predicted noise level from sports pitch and MUGA use is 55dB $L_{Aeq,1\text{-}hour}$. Although this is above Sport England's recommended noise level of 50dB $L_{Aeq\ (1hour)}$ it does not exceed the WHO benchmark criteria of 55dB $L_{Aeq,T}$ for residential amenity. Given the intermittent use, prevailing noise levels from road traffic noise and absolute level from sports pitch and MUGA use, this is considered to be on balance insignificant. Despite this the following engineered solutions will be included in the design as a minimum:

9.95. A weld mesh (twin bar super rebound fence with EPDM rubber inserts and fixings to reduce rattle and ball impact noise during play. The above product with inclusion of EPDM rubber inserts is quieter to ball impacts compared to rebound boards. Based on test data provided by the manufacturer, impact ball noise levels reduced from 93dB(A) at a measurement distance of

300mm from the fence to 66dB(A). The above measure in combination with control of operational hours, both of which could be secured via planning condition, will mitigate noise impact and reduce noise to an acceptable level.

9.96. Furthermore, residential building will be designed such that internal noise levels do not exceed 35 dB $L_{Aeq,16h}$ during the daytime and 30 dB $L_{Aeq,8h}$ & 45 dB L_{Amax} at night from anonymous sources of noise such as road traffic. As noise levels from anonymous sources will be greater than those expected from the sports pitch and MUGA, the façade will be sufficient to reduce noise to an appropriate level.

9.97. Other mitigation measures will however be considered to reduce mitigation further, should this be considered necessary.

Mitigation Measures and Likely Residual Effects

The Works

9.98. As detailed in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, a Construction Environmental Management Plan (CEMP) would be formulated in consultation with LBRuT, relevant legislation and other relevant guidance. The CEMP would set out a range of mitigation measures and environmental controls which would include the management of demolition and construction related noise and vibration. The Site would also be registered for the Considerate Constructors Scheme. Control measures to minimise noise would include:

- use of hoarding to the required height and density appropriate to the noise sensitivity of the Site;
- Demolition works to have consideration to Demolition Code of Practice BS6187[11] (2011);
- Using low impact techniques where possible (demolition munchers);
- Off-site prefabrication or preparation of building elements where possible to reduce on-site works;
- Changing, where possible, methods and processes to keep noise and vibration levels low as reasonably practicable (e.g. dismantling rather than traditional demolition works where adjoining or immediately adjacent to buildings);
- Removal of obstructions at piling locations (old basements/foundation) prior to piling to reduce generated vibration levels, although coring through existing piles at urban locations is an accepted approach but may give rise to higher vibration levels;
- Use of broad-band audible alarms wherever practicable including reversing alarms and other equipment such as mobile elevated work platforms;
- use of modern, quiet and well maintained machinery such as electric powered plant, where possible and hoists should use the Variable Frequency Converter drive system;
- vehicles and mechanical plant used for the works would be fitted with exhaust silencers, which would be maintained in good and efficient working order and operated in such a manner as to minimise noise emissions in accordance with the relevant EU / UK noise limits applicable to that equipment or no noisier than would be expected based the noise levels quoted in BS 5228. Plant should be properly maintained and operated in accordance with

manufacturers' recommendations. Electrically powered plant would be preferred, where practicable, to mechanically powered alternatives;

- establish noise and vibration target levels (a Section 61 agreement under the Control of Pollution Act 1974[12] (COPA)) to reduce noise and vibration to a minimum in accordance with best practicable means, as defined in Section 72 of COPA;
- where required, monitoring of noise and vibration levels;
- positioning plant as far away from residential property as physically possible;
- works would be limited to the specified hours and would be subject to agreement with LBRuT and hours worked on noisy operations would be limited; and
- liaison with the occupants of adjacent properties most likely to be affected by noise or vibration from activities on the Application Site should also take place. The occupants should be informed of the nature of the works, proposed hours of work and anticipated duration prior to the commencement of activities.

9.99. With regards to traffic management during the Works, as detailed in **Chapter 8: Transport and Access**, all traffic logistics would be agreed between LBRuT, contractors and the Applicant. Such measures would be set out within a Construction Logistics Plan. Consideration would also be given to the avoidance (or limited) use of road during peak hours, where practicable.

Noise

9.100. Accounting for the implementation of mitigation, as set out above, which should afford 10 dB(A) reduction, **Table 9.22** presents the predicted mitigated noise levels and **Table 9.23** the level of the residual effects. All adverse effects would be localised and medium term in nature.

9.101. It should be noted that the assessment is worst-case when operations are being undertaken at the shortest distance to the receptor. For some operations, such as demolition works within 15 metres of the receptor and enabling works within 10 metres then additional mitigation affording up to 15dB may be required. This may include provision of additional shielding, change in method of working or reducing on-times. **Table 9.22** indicates where additional mitigation (attenuation) may be required.

Table 9.22: Predicted Demolition & Construction (mitigated) Noise Levels dB L_{Aeq}

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure	Floor Slab (superstructure	Public Realm & Landscaping	Highways Pavement
A	11-61 Watney Road	57	69	67	55	57	57	57	58	75	70
B	2-26 Williams Lane	73	72[1]	57	71	72	72	72	73	75	70
C	1-69 Lower Richmond Road	74	72[1]	66	66	67	68	67	69	75	70
D	Chertsey Court	55	72[1]	50	50	51	52	51	52	75	70
E	139 Lower Richmond Road	53	72[1]	52	53	54	55	54	55	75	70
F	Thames Bank	72[1]	72[1]	75	71	72	72	72	73	75	70
G	Parliament Mews	75[1]	72[1]	55	71	72	72	72	73	75	70
H	Boat Race House	62	72[1]	61	71	72	72	72	73	75	70
I	Future Residential & School	n/a	74	75	71	72	72	72	73	71	67

Note: [1] Additional mitigation assumed when works proximate to site boundary thereby allow up to 15dB attenuation to be achieved. This would be achieved either by additional shielding, change in method of working. reducing on-time etc.

Table 9.23: Demolition & Construction Noise Effect Level (mitigated)

Fig 9.1 Ref	Construction Threshold Level (Prevailing noise level)	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	65 (59)	Min	Mod	Mod	Neg	Neg	Neg	Neg	Neg	Mod	Mod
B	65 (59)	Mod	Mod	Neg	Mod	Mod	Mod	Mod	Mod	Mod	Mod
C	75 (71)[1]	Min	Min	Neg	Neg	Neg	Neg	Neg	Neg	Min	Neg
D	70 (63)	Neg	Mod	Neg	Neg	Neg	Neg	Neg	Neg	Mod	Min
E	75 (71)[1]	Neg	Min	Neg	Neg	Neg	Neg	Neg	Neg	Min	Neg
F	65 (59)	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod
G	65 (59)	Mod	Mod	Neg	Mod	Mod	Mod	Mod	Mod	Mod	Mod
H	65 (59) (north area)	Min	Mod	Min	Mod	Mod	Mod	Mod	Mod	Mod	Mod
I	65	n/a	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod

Note: Neg – negligible; Min – minor; Mod – moderate; Maj – major: [1] Where construction threshold level is 75dB $L_{Aeq,T}$ then noise limit is 80dB $L_{Aeq,T}$. This may however be lowered to 75dB $L_{Aeq,T}$ by LBRuT.

9.102. **Table 9.24** presents the significance of the effect level based on site specifics and absolute noise level. All are considered to be insignificant.

Table 9.24: Significance of Effect Level

SR ID	SR	Description	Significance
A	11-61 Watney Road	When works are conducted at the shortest distance there is the potential for the construction threshold noise level of 65dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP all do not exceed 75dB $L_{Aeq,T}$ which is regarded as the construction threshold limit for this area.	Insignificant
B	2-26 Williams Lane	When works are conducted at the shortest distance there is the potential for the construction threshold noise level of 65dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP all do not exceed 75dB $L_{Aeq,T}$ which is regarded as the construction threshold limit for this area.	Insignificant
C	1-69 Lower Richmond Road	Prevailing noise levels adjacent to Lower Richmond Road are relatively high. For the majority of the Works, with mitigation, levels are predicted to be below prevailing and therefore negligible. For some operations when works are conducted at the shortest distance there is the potential for the construction threshold noise level of 75dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP all are below 80dB $L_{Aeq,T}$ which is regarded as the threshold limit, subject to agreement with LBRuT, but with provision of additional mitigation where required all are predicted to be below the threshold level of 75dB $L_{Aeq,T}$.	Insignificant
D	Chertsey Court	Predominantly, due to distance for works from receptors, with CEMP measures noise levels are predicted to be below the construction threshold level of 70dB $L_{Aeq,T,}$ and baseline noise level of 63dB $L_{Aeq,T}$, with the exception of enabling, landscaping and pavement works, which are below the limit of 75dB $L_{Aeq,T}$.	Insignificant
E	139 Lower Richmond Road Court	Prevailing noise levels adjacent to 139 Lower Richmond Road are relatively high. For the majority of the Works, with mitigation, levels are predicted to be below prevailing and therefore negligible. For some operations when works are conducted at the shortest distance there is the potential for noise levels above prevailing but with CEMP all are below the construction threshold noise level of 75dB $L_{Aeq,T.}$	Insignificant
F	Thames Bank	When works are conducted at the shortest distance there is the potential for the construction threshold noise level of 65dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP, including additional attenuation when demolition and enabling works are undertaken at the shortest distance, all do not exceed 75dB $L_{Aeq,T}$ which is regarded as the construction threshold limit for this area.	Insignificant
G	Parliament Mews	When works are conducted at the shortest distance there is the potential for the construction threshold noise level of 65dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP, including additional attenuation when demolition and enabling works are undertaken at the shortest distance, all do not exceed 75dB $L_{Aeq,T}$ which is regarded as the construction threshold limit for this area.	Insignificant
H	Boat Race House (north)	When works are conducted at the shortest distance there is the potential for the construction threshold noise level of 65dB $L_{Aeq,T}$ to be exceeded. With provision of CEMP, including additional attenuation when enabling works are undertaken at the shortest distance, all do not exceed 75dB $L_{Aeq,T}$ which is regarded as the construction threshold limit for this area.	Insignificant

SR ID	SR	Description	Significance
I	Future Receptors (school and residents)	With CEMP measures the predicted noise levels when works are undertaken at the shortest distance do not exceed the construction noise limit of 75dB $L_{Aeq,T}$.	Insignificant

9.103. With mitigation, residual effect levels are predicted to reduce, ranging from **negligible**, to **temporary, medium-term**, **local**, **moderate adverse**. With CEMP measures all are predicted to not exceed the construction threshold limit of 75dB $L_{Aeq,T}$, so although prevailing noise levels will increase during demolition and construction works they are in-line with current guidance and therefore the level of effect, although adverse, is considered **insignificant**. This could be controlled through a live noise monitoring system which would provide notification to the Principal Contractor before the noise limit is exceeded so that action can be taken, where required.

9.104. Should the construction threshold limit of 75dB $L_{Aeq,T}$ (or 80dB $L_{Aeq,T}$ adjacent to Lower Richmond Road) be exceeded resulting in 'Significant' adverse effects, this would reduce to insignificant where the number of days that the noise levels are greater than the threshold limit does not exceed 10 or more consecutive days (excluding Sunday's and Bank Holidays) or the total number of days does not exceed 40 in any 6 consecutive months. This reflects guidance contained within BS5228-1:2009+A1:2014 where above these levels, residents may qualify for temporary rehousing and DMRB LA 111.

9.105. It should be borne in mind that the assessment is worst case based on when works are being undertaken at the shortest distance to the receptors. Predominantly noise levels will be lower as works are undertaken at greater distance.

Vibration

9.106. **Table 9.25** presents the potential residual vibration effect level assuming the introduction of the CEMP and the qualitative significance of this.

Table 9.25: Significance of vibration level with CEMP

SR ID	SR	Shortest Distance from Demolition Works	Shortest Distance from Sheet Piling Works	Shortest Distance from CFA Piling Works	Level of Effect On Disturbance to Humans	Significance
A	11-61 Watney Road	150	**35**	85	Minor	Insignificant
B	2-26 Williams Lane	22	110	**15**	Minor	Insignificant
C	1-69 Lower Richmond Road	20	**40**	25	Minor	Insignificant
D	Chertsey Court	180	250	160	Negligible	Insignificant
E	139 Lower Richmond Road	215	205	115	Negligible	Insignificant
F	Thames Bank	15	**15**	15	Moderate	Insignificant[1]
G	Parliament Mews	10	135	**15**	Minor	Insignificant
H	Boat Race House	85	75	**15**	Minor	Insignificant

SR ID	SR	Shortest Distance from Demolition Works	Shortest Distance from Sheet Piling Works	Shortest Distance from CFA Piling Works	Level of Effect On Disturbance to Humans	Significance
I	Future Residential & School		**15**	15	Minor to Moderate	Insignificant[1]

Note: [1] Provided works are for a short period and residents are informed. **Bold values indicate the operation predicted to result in a significant effect level.**

9.107. With the implementation of the vibration related mitigation measures as detailed above, human perception residual effect level is likely to be predominantly **negligible** to **temporary, short-term, local**, **minor adverse** and therefore insignificant. At two locations, namely Thames Bank and future residential and school, there is still the potential for **temporary, short-term, local**, **moderate adverse effects** due to distance of sheet piling to the receptor. This will be dependent on the method of sheet piling used. It is recommended that pressed in method is used should site conditions allow. Irrespective of this it is considered that on balance the overall significance of these effects is **insignificant**, provided these works are short-term and residents are informed prior to the works.

9.108. With regard to the potential of damage to buildings the level of effect is considered to be **negligible** and, therefore, **insignificant**.

9.109. With regard to the potential of damage to utilities, the level of effect is considered to be **negligible** provided works are at a sufficient distance from the utilities, the utilities are in good condition and live monitoring is conducted where works are undertaken in close proximity to ensure threshold vibration levels are not exceeded. The potential level of effect with a CEMP in place is, therefore, considered to be **insignificant**.

Traffic

9.110. Although negligible effects are predicted as a result of construction traffic resulting in **negligible (insignificant**) residual effects, mitigation to lower levels further is proposed by implementation of a Construction Traffic Logistics Plan (CLP).

9.111. A CLP may include deliveries on a 'just in time basis' to avoid queuing of vehicles together with avoidance (or limited) use of roads adjacent to the site during peak hours, where practicable. It is anticipated that traffic logistics would be secured by planning condition and agreed between LBRuT, the contractors and the Applicant.

Completed Development

Building Services Plant Noise

9.112. Based upon BS4142 and requirements of LBRuT, noise emissions from fixed mechanical plant would be limited to at least 10 dB below background at the nearest identified noise receptor with a minimum value of 45 and 40 dB $L_{Ar,Tr}$ (as defined by BS4142:2014) recommended during the day and night-time periods respectively for non-residential receptors, taking account of prevailing noise levels. With regard to residential receptors a minimum night-time noise limit of 35dB $L_{Ar,Tr}$ is recommended where prevailing background noise levels are less than 45dB $L_{A90,T}$ with a

maximum daytime noise limit of 45dB $L_{Ar,Tr}$ where prevailing background noise levels are greater than 55dB L_{A90}. **Table 9.26** presents the recommended plant noise limits based on the establish prevailing noise levels to safeguard the existing amenity.

Table 9.26: Recommended Plant Noise Limits

SR ID	SR	Period[1]	Representative $L_{A90,5min}$	Plant Noise Emission Limit ($L_{Ar,Tr}$ as defined by BS4142)
A	11-61 Watney Road	Day (CRTN 2)	45	35
		Night (LT4)	35	35
B	2-26 Williams Lane	Day (CRTN 2)	45	35
		Night (LT4)	35	35
C	1-69 Lower Richmond Road	Day (LT1)	60	45
		Night (LT1)	37	35
D	Chertsey Court	Day (CRTN 1)	57	45
		Night (LT1)	37	35
E	139 Lower Richmond Road	Day (LT1)	60	45
		Night (LT1)	37	35
F	Thames Bank	Day (LT4)	48	38
		Night (LT4)	35	35
G	Parliament Mews	Day (LT4)	48	38
		Night (LT4)	35	35
H	Boat Race House (north)	Day (LT3)	50	40
		Night (LT3)	41	35
I	Future Residential & School	Day	-	40
		Night	-	35

Note: [1] Day 0700-2300, Night 2300-0700.

9.113. Typical mitigation includes the following measures:

- procurement of ‘quiet’ non-tonal plant;
- locate plant and air vents away from sensitive receptors;
- acoustic enclosures;
- in-duct attenuators;
- acoustic louvres; and
- isolation of plant from building structures.

9.114. Should the recommended plant noise limits be achieved, the likely residual level of effect would be **negligible** and, therefore, **insignificant.**

Retail Commercial Uses & Services

9.115. During the detailed design stages of the Development, the sound insulation performance requirements of the external building fabric would be appropriately specified to control noise break-out, having regard to the nature of future uses. As stated previously, noise from non-residential uses would be subject to standard controls that could be secured through planning conditions. The residual noise effect level associated with non-residential uses of the Development on existing and future sensitive receptors are expected to be **negligible** and therefore **insignificant**.

9.116. At this stage, it has not been possible to quantify the noise effect from deliveries and servicing as details regarding the final tenants and associated servicing and delivery areas are not known. Prior to the occupation of each Development area, a detailed Delivery and Servicing Plan (DSP) (based on the outline DSP submitted for planning) should be prepared to include:

- managing the deliveries (including by courier) and servicing requirements of retail, office and leisure tenants;
- hours of operation of the servicing areas and loading bays; and
- refuse and recycling collections.

9.117. With the implementation of the DSP, the residual effect level of noise from the servicing and deliveries within the Development to existing receptors surrounding the Development and future sensitive receptors within the Development is likely to be **negligible** and therefore **insignificant.**

9.118. Potential adverse effects from ingress / egress of cars to the basement car park to residential units located above could be mitigated through internal layouts so bedrooms do not directly overlook the access point, or provision of enhanced glazing to potentially affected rooms thereby rendering the residual level of effect **negligible** and therefore **insignificant**.

Road Traffic Noise

9.119. Mitigation is not proposed given the predicted level of effect is negligible (minor adverse on Williams Lane). The residual level of effect is also **negligible** and therefore **insignificant**.

Noise from Proposed School and Play Space

9.120. The predicted level of effect on existing receptors ranges from **negligible** to **local, intermittent, minor adverse** and therefore **insignificant**. On balance taking account of the absolute predicted noise level, intermittent use, façade sound insulation and inherent mitigation the overall effect is considered to be comparable to existing receptors and, therefore, **insignificant**. Despite this, the following additional mitigation could be considered to further reduce potential adverse effects, such as:

- A maintenance scheme to prevent deterioration in performance of the sports facilities that could result from damaged panels, loose brackets, worn AV bushing and squeaky gates. This could be secured via planning condition by LBRuT; and
- In terms of operational solutions, the hours of play could also be restricted to up to 9pm Monday to Saturday and 8pm on Sundays and Bank Holidays (as per the proposed Community Use Agreement), reducing the impact during the evening period.

Summary

9.121. **Table 9.27** summarises the likely significant effects, mitigation measures, and likely residual effects identified within this Chapter.

Table 9.27: Summary of Likely Significant Effects, Mitigation Measures and Likely Residual Effects

Issue	Likely Significant Effect	Mitigation Measures	Likely Residual Effect	Significance of Residual Effect Level
The Works				
Temporary increase in noise levels from work activities affecting receptors close to the Site.	**Temporary, medium to long-term local adverse** effects of **major** level.	Implementation of a CEMP.	**Negligible** to **temporary, medium-term, local residual adverse effect** of **minor** to **moderate** level, provided construction threshold limit not exceeded.	**Insignificant**
Vibration generated during sheet piling operations affecting receptors close to the Site.	**Negligible** to **temporary, short-term, local adverse** effects of **moderate** level.		**Negligible** to **temporary, short-term, local adverse** effects of **minor** to **moderate** level.	**Insignificant**
Vibration effects on building structures and underground utilities (assuming CFA or rotary bored piling techniques).	**Negligible effect.**	Although negligible predicted, implementation of a CEMP recommended.	**Negligible effect**.	**Insignificant**
Increase in heavy plant movements on strategic roads.	**Negligible.**	No mitigation required, although, a Construction Traffic Logistics Plan would also be implemented.	**Negligible.**	**Insignificant**
Completed Development				
Noise from fixed plant and building services.	**Permanent, local adverse effects** of up to **moderate** level.	Inherent mitigation would allow plant and building services noise to	**Negligible.**	**Insignificant**

Issue	Likely Significant Effect	Mitigation Measures	Likely Residual Effect	Significance of Residual Effect Level
		meet the required plant noise limit of LBRuT.		
Noise from non-residential land-uses.	**Permanent, local, intermittent adverse effects** up to **minor** level from ingress / egress of vehicles to the basement parking areas during peak hours or should this occur during the night-time period.	Control through sound insulation of building envelope, planning conditions and implementation of Delivery and Servicing Plan.	**Negligible**.	**Insignificant**
Noise from changes in road traffic.	**Negligible to permanent, local adverse effect of minor** level.	No mitigation required.	**Negligible to permanent, local adverse effect of minor** level.	**Insignificant**
Noise from proposed school and play space (including sports pitch and MUGA).	**Negligible** to **permanent, local**, **intermittent adverse effects** up to **minor** level.	Inherent (weld mesh, twin bar super rebound with EPDM rubber inserts & fixing. Opening hours. Additional mitigation considerations: (maintenance, restricted opening hours)	**Negligible** to **permanent**, **local**, **intermittent adverse effects** up to **minor level** during usage of sports pitch and MUGA.	**Insignificant**

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