

(18 hour) road traffic noise levels on the local highway network as a result of the operation of the proposed Development.

Vibration

- 11.63 The only potential source of appreciable environmental vibration in the vicinity of the Site is associated with the railway operations, located approximately 50m to the north of the Site. However, it is considered very unusual for rail-related vibration to be perceptible 50m or more from railway tracks. Furthermore, as the trains are generally moving slowly into or out of Reading Mainline Station, they produce relatively low levels of vibration. A Site visit undertaken in December 2011 concluded that baseline vibration levels in the vicinity of the Site would be imperceptible at the northern Site boundary. Consequently, it was considered unnecessary to carry out baseline vibration measurements. Equally, there are no sources of vibration within the proposed Development capable of affecting off-site receptors. Therefore, this issue has been scoped out of the assessment of the completed Development.

Approach to Future Baseline

- 11.64 All of the Future Baseline Schemes, with the exception of 21 Caversham Road and Thames Tower, are too distant (greater than 200m) from the proposed Development to affect the future baseline noise level. Distance attenuation together with screening afforded by the intervening buildings, negates any potential effect on the future noise climate within the vicinity of the proposed Development.
- 11.65 The 21 Caversham Road development, which consists of eleven 1-bedroom flats, is located at approximately 170 metres west of the site boundary. Due to the distance and nature of the development (residential), this would not alter the future noise climate within the vicinity of the Proposed Development.
- 11.66 Thames Tower is directly adjacent to the planning application boundary of the proposed Development. A noise assessment report by Ramboll²¹ in 2014 specifies plant noise limits of 10dB below background with 15dB below if the source has an acoustic character. Provided these noise conditions are met, plant noise associated with Thames Tower would not affect the future noise level at the proposed Development. The Thames Tower development consist of an office tower above flexible office and retail uses at ground floor level with parking and servicing unchanged from previous usage, being at basement level with access retained from Garrard Street. There is the potential for retail, servicing and parking to affect the future noise climate locally. It is assumed however that through planning controls, noise emissions from these use classes will be such that they do not adversely affect the surrounding amenity and therefore the future noise climate.
- 11.67 On the basis of the above, the future baseline schemes are not considered to affect the baseline conditions and have not been considered further in this Chapter.
- 11.68 The traffic impact assessment undertaken for SH3 used the Reading Transport Development Control Forecast Model. This includes background traffic growth to 2015 plus all committed development. Chatham Place, Aldwych House and Caversham Road were all committed developments at that time and would therefore have been included. Additionally the Thames Tower and Energis House schemes while not consented when the RTM was run, as part of the SH3 supporting assessment, were included within the RTM. The included floor area of the Energis scheme reflects the current consent, while the Thames Tower Scheme now consented is for a slightly larger scheme although this is not considered to materially increase traffic

generation. It is therefore considered that the traffic data upon which the noise assessment is based, incorporates the change in traffic flows as a result of the future baseline schemes.

Approach to Outline Assessment

- 11.69 The assessment of the Development has been based on the parameter plans and area schedules set out in Chapter 5: Description of Development, to identify the likely significant effects.
- 11.70 The traffic modelling undertaken for the TA by Peter Brett Associates is based on the maximum floor space areas proposed under the outline application for the SH3 Scheme. Other than residential uses, these floor space areas remain consistent with the Telecom House / Plot E Scheme in place. Therefore, the traffic data has not been remodelled for the SH3 Scheme as amended and extended by the Telecom House / Plot E Scheme. As set out within the Transport Chapter of this ES (Chapter 9) and further detailed in the Transport Statement, there will be an overall reduction in trips as a result of the inclusion of Telecom House / Plot E Scheme compared with the consented SH3 Masterplan Scheme, particularly private vehicle and bus trips. It is therefore considered that the modelling for the EIA for the consented SH3 Scheme would demonstrate a worst case scenario.

Limitations and Assumptions

- 11.71 At this stage in the design process, information is available on the proposed construction phasing but the specific detail on the plant and construction method associated with each phase would be determined at detailed design. The assessment has therefore been based upon generic construction plant and operations associated with the various construction phases. In this respect, a medium to high degree of confidence is assigned to the predicted construction significance levels.
- 11.72 With regards to the operational phase of the proposed Development, calculations have been based upon current national and local guidance and information provided by the Development's transport consultants. In this respect, it is considered that a medium to high confidence in predicted significance levels can be assigned for the operational phase of the Development.

Consultations

- 11.73 The baseline noise surveys, including the monitoring locations and measurement times, were agreed with Environmental Health of Reading Borough Council for the purposes of the 2013 ES.
- 11.74 In addition, a Scoping Letter was prepared by Waterman EED (now Waterman IE) and submitted to RBC, together with a request for a formal Scoping Opinion, in June 2014. No comments were made in relation to noise and vibration in the Scoping Opinion received in October 2014.

Significance Criteria

Demolition and Construction

Construction Noise

- 11.75 As outlined above, to assess the significance of effects from demolition and construction noise on existing NSRs, 'The ABC Method' provided in BS 5228-1:2014 was used. This method defines category threshold values which are determined by the time of day and existing monitored ambient noise levels. The noise level generated by construction activities (the Site Noise Level), is then compared with the 'Threshold Value'. If the Site Noise Level exceeds the 'Threshold Value', a significant effect is deemed likely to occur.

- 11.76 The criteria in Table 11.6 were adopted to provide transparency in the definition of the significance of identified effects. Full details are provided in Appendix 11.3.

Table 11.6: Significance Criteria for Construction Noise

Significance of Potential Effect	Level above Threshold Value dB(A)	Definition
Negligible	≤ 0	The effect is not of concern.
Minor adverse	0.1 to 4.9	The effect is undesirable but of limited concern.
Moderate adverse	5.0 to 9.9	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.
Major adverse	≥10	The impact gives rise to serious concern and it should be considered unacceptable.

Construction Vibration

- 11.77 Determining the magnitude of significance of vibration effects is complex due to the highly variable nature and duration of vibration impacts arising from construction works.
- 11.78 At this stage in the design process, insufficient detail is available of the methods and equipment to be used during the construction works, therefore, a detailed assessment cannot be undertaken. Consequently, the significance of vibration effects from construction work cannot be assessed quantitatively and were therefore determined using professional judgement based on the factors detailed in the BS5228-2:2009 which are summarised below.
- 11.79 People are sensitive to low levels of vibration which can result in disturbance, annoyance or interference with work activities. The significance of vibration effects on people derived from BS5228-2 is presented as Table 11.7

Table 11.7: Significance of Vibration Effects on People

Significance of Vibration Effect	Peak Particle Velocity (ppv) mm/s	Description of Effect
Negligible	0.14	Only just perceptible in the most sensitive locations. People are more sensitive to vibration of lower frequencies.
Minor adverse	0.30	Just perceptible in residential environments.
Moderate adverse	1.00	May result in complaint in residential environments.
Major adverse	10.00	Intolerable for any more than a brief exposure.

- 11.80 Information with regards to levels of vibration that are likely to give rise to cosmetic damage in respect of buildings and structures are presented as Table 11.8.

Table 11.8: Transient Vibration Guide to Cosmetic Damage

Building Type	Peak component particle velocity in frequency range of predominant pulse [1]	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 15Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4Hz increasing to 20 mm/s at 15Hz. (At frequencies below 4Hz a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded).	20 mm/s at 15Hz increasing to 50 mm/s at 40Hz and above.

Note: [1] Values referred to are at the base on the building.

- 11.81 The distance at which various construction operations are likely to give rise to a 'just perceptible' level of vibration to human receptors is presented as Table 11.9. These have been obtained from historical field measurements undertaken by Waterman and information contained within BS5228-2:2009.

Table 11.9: Distance of Perceptible Vibration from Construction Operation

Construction Activity	Distance from Activity when Vibration May be Just Perceptible (m)
Excavation	10 - 15
Heavy Vehicles	5 - 10
Continuous Flight Auger (CFA) Piling	15 – 20 ^[1]
Rotary Bored Piling	20 – 30 ^[1]
Vibratory Piling	40 – 60 ^[1]

Note: [1] Distances for perceptibility are dependent on ground conditions and may be greater than indicated.

- 11.82 It is generally accepted that, for the majority of people, vibration levels of 0.14 mm/s peak particle velocity (PPV) are just perceptible, with complaints likely at 1 mm/s (PPV). Below 12.5 mm/s (PPV) the probability of cosmetic damage to buildings and structures tends towards zero.

Completed Development

Residential Amenity

- 11.83 Following the publication of the NPPF and subsequent revocation of PPG 24 there is little guidance available with regards to the assessment of the suitability of a site for residential development with regards to noise and vibration. As such, for the purpose of this assessment significance criteria have been adopted based upon the guideline external noise levels presented in the WHO 'Guidelines for Community Noise' and summarised in Table 11.4. The adopted significance criteria are presented in Table 11.10.

Table 11.10: Significance of Noise Effects upon Proposed Residential Dwellings

Night Noise Level (level difference between monitored level and 45dB L _{Aeq,8 hour} night-time criteria)	Day Noise Level (level difference between monitored level and 55dB L _{Aeq,16 hour} night-time criteria)	Magnitude of Effect
>15	>10	Substantial Adverse
10 to 15	5 to 10	Moderate Adverse
5 to 10	3 to 5	Minor Adverse
<0 to 5	<0 to 3	Negligible

- 11.84 It should be noted that with reference to Table 11.10 night-time criteria are less stringent. This is because, for the most part during the night-time residents would be expected to be indoors and as such at least partially protected by the façade of the proposed dwellings.

Fixed Mechanical Plant & Building Service Noise

- 11.85 When assessing the significance of effects from fixed plant and building service noise on nearby NSRs, the criteria presented in Table 11.11 are used. These criteria are based on the significance of the impact as provided in BS 4142 having regard to RBC requirement that “noise from new plant will be lower than the existing background noise level and therefore will not impact on the existing noise climate”.

Table 11.11: Plant noise significance criteria

Significance	Difference in rating and background levels (dB(A))
Negligible	≤ -10
Minor adverse	>-10 < 5
Moderate adverse	5 - <10
Major adverse	≥ 10

Delivery & Servicing Noise

- 11.86 In the absence of guidelines for assessing the significance of noise generated by servicing (deliveries), the criteria provided in Table 11.12 have been used which is based on the change in the prevailing noise level.

Table 11.12: Significance of Noise from Delivery and Servicing

Significance	Change in noise levels dB(A)	Definition
Negligible	< 3	The effect is likely to be imperceptible and is therefore not of concern.
Minor adverse	3.0 to 4.9	Perceptible. The effect is undesirable but of limited concern.
Moderate adverse	5.0 to 9.9	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.
Major adverse	≥ 10	A doubling of loudness and above. The effect gives rise to serious concern and it should be considered unacceptable.

- 11.87 The criteria provided in Table 11.12 are derived by considering how changes in noise levels can be categorised by significance based on key benchmarks that relate to human perception of sound. For example, a change in noise levels of 3dB is generally considered to be the smallest change in noise which is perceptible and a 10dB change in noise represents a doubling or halving of the noise level.

Proposed Uses

- 11.88 The significance criteria presented in Table 11.12 are used in the assessment of noise from proposed uses.

Car Park Noise

- 11.89 In the absence of guidelines for assessing the effects of noise generated by car parking activities, the significance criteria provided in Table 11.12 have been used in the assessment of Car Park noise.

Road Traffic Noise

- 11.90 Noise effects arising from road traffic have been assessed in accordance with the significance criteria detailed in Table 11.13. These significance criteria are widely used by acoustic practitioners and are based on the subjective response of people to noise e.g a noise level change of 3dB(A) is generally imperceptible whereas a noise level change of 10dB(A) is generally perceived as a doubling or halving of the noise level.

Table 11.13: Road traffic noise significance criteria

Change in noise levels dB(A)	Definition	Effect Significance
> -10	The effect provides a significant positive gain.	Major beneficial
-9.9 to -5.0	The effect provides some gain to the environment.	Moderate beneficial
-4.9 to -3.0	The effect is of minor significance but has some environmental benefit.	Minor beneficial
-2.9 to +2.9	The effect is likely to be imperceptible and is therefore not of concern.	Negligible
3.0 to 4.9	The effect is undesirable but of limited concern.	Minor adverse
5.0 to 9.9	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.	Moderate adverse
> 10	The effect gives rise to serious concern and it should be considered unacceptable.	Major adverse

Baseline Conditions

Noise

- 11.91 As previously discussed baseline noise surveys were undertaken over a typical weekday period from Tuesday 13th December until Thursday 15th December 2011.
- 11.92 Sources of noise in the vicinity of the Site principally comprise the following:
- Road traffic from all surrounding local roads;
 - Bus traffic associated with the bus station at Station Hill adjacent to the north of the Site;

- Trains approaching and departing from Reading Mainline Station north of the Site; and
- Adjacent building services plant.

- 11.93 The dominant noise source at the Site was considered to be from road traffic noise.
- 11.94 It should be noted that the measured ambient noise levels take into account all noise sources in the vicinity of the Site, including the Reading Mainline Station public address system. As a result, further assessment of the potential effects of public address noise from Reading Mainline Station is not warranted.
- 11.95 A summary of the measured noise levels are presented as Table 11.14 and presented in full within Appendix 11.2.

Table 11.14: Summary of Measured Noise Levels (Adjusted to First Floor Level)

Location (Ref Figure 11.1)	Period	Noise Level dB(A) (free-field) to nearest whole dB				
		L _{Aeq}	L _{Amax} [1]	L _{A10}	L _{A90}	L _{A90 min}
LT1 Friar Street	Daytime	67	89	70	58	56
	Night-time	64	88	65	52	42
LT2 Station Hill	Daytime	66	85	67	61	58
	Night-time	61	79	60	52	39
LT3 Greyfriars Road	Daytime	66	89	68	59	54
	Night-time	60	82	61	61	49
LT4 Garrard Street	Daytime	66	84	67	63	61
	Night-time	61	81	62	57	52

Note: [1] – 90th Percentile to take account of outliers (atypical events).

- 11.96 The noise levels presented in Table 11.14 are considered representative of worst-case scenario as they are at the Site boundaries and along Garrard Street directly adjacent to the surrounding road network. The measured noise levels of are typical for an urban location adjacent to main roads.

Potential Effects

Demolition and Construction of Wider Development

Demolition and Construction Noise

- 11.97 Calculations were undertaken using the data and procedures set out in BS 5228-1:2009+A1:2014 for the noisiest construction phases, to derive indicative noise levels at selected NSRs. The highest construction noise levels tend to be associated with demolition and plant used during earth works, piling, concreting and pavement operations.
- 11.98 Table 11.15 sets out the results of the assessment based on the existing monitored noise levels and in line with the significance criteria provided in BS 5228 in the absence of mitigation. The assessment was undertaken on a worst-case scenario when works are being undertaken in the closest Development Plot to the NSR. Based on the indicative construction phasing programme for the Development, there is the potential for the residential elements of Plot E to be occupied whilst Plot F is constructed, although based on the current programme this would only be for a short period of approximately 4 months. There is also the potential for both Plots E and F to be occupied during the construction of Plot C, although the potential impacts would be reduced

through distance and screening afforded by the intervening buildings on Plots D and G. Construction impacts are therefore presented should these scenarios arise. Full details of the predicted demolition and construction noise levels are within Appendix 11.3.

Table 11.15: Significance of Demolition and Construction Noise Effects

NSR (Ref Figure 11.1)	Phase / Operations				
	Demolition	Earthworks	Piling (Rotary Bored)	Concreting	Pavement
A). Three Guineas PH (Grade II Listed)	Major Adverse	Minor Adverse	Moderate Adverse	Minor Adverse	Minor Adverse
B). Bridewell House/Samuel House	Minor Adverse	Negligible	Negligible	Negligible	Negligible
C). The Gateway PH	Major Adverse	Negligible	Moderate Adverse	Minor Adverse	Minor Adverse
D). Stanshawe Road	Major Adverse	Minor Adverse	Moderate Adverse	Negligible	Minor Adverse
E). Vachel Road	Moderate Adverse	Negligible	Minor Adverse	Negligible	Negligible
F). Novotel & Ibis	Negligible	Negligible	Negligible	Negligible	Negligible
G). Malthouse PH	Major Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Minor Adverse
H). 39 Friar Street (Grade II Listed)	Major Adverse	Moderate Adverse	Major Adverse	Moderate Adverse	Moderate Adverse
I). Merchant Place	Major Adverse	Minor Adverse	Moderate Adverse	Negligible	Minor Adverse
J) 5-21 Tudor Road	Moderate Adverse	Negligible	Minor Adverse	Negligible	Negligible
K) Telecom House/Plot E	Not Applicable	Major Adverse	Major Adverse	Major Adverse	Major Adverse
L) Garrard House	Not Applicable	Major Adverse	Major Adverse	Moderate Adverse	Moderate Adverse
M) Plots E and F	Not Applicable	Negligible	Negligible	Negligible	Negligible

- 11.99 The results indicate that there is the potential for some temporary **minor adverse** to temporary **major adverse** noise effects to occur during demolition, earth moving, piling, concreting and pavement operations at the closest NSRs to the Site boundary and at onsite NSR should the residential elements of Telecom House/Plot E be occupied before completion of the construction phase (see Appendix 11.3).

Demolition and Construction Traffic

- 11.100 In addition to construction plant operating on the Site, there would be some movement of materials to and from the Site by road. The maximum peak flow forecast, which is unchanged from the SH3 Scheme, is 35 heavy goods vehicles (HGVs) per day. This is a small amount when compared with the total number of vehicles on the surrounding local road network; Greyfriars Road over 4,000 vehicles/18h period, Friar Street over 1,500 vehicles/18h period and Garrard St over 5,000 vehicles/18h period (see Appendix 11.5). In light of this, it is anticipated that noise and

vibration arising from construction vehicles should not be any greater than can presently arise from existing local heavy duty vehicle movements. As such, it is considered that construction related traffic would have a **negligible** effect upon the existing ambient noise climate.

Demolition and Construction Vibration

- 11.101 The structural loads generated by the proposed tall buildings would necessitate the use of piled foundations, as outlined in Chapter 6: Development Programme Demolition and Construction. At this stage it is anticipated that the rotary bored piling method would be used to form piles down to depths of 30 to 50 metres.
- 11.102 Table 11.9 indicates the distances at which certain activities are likely to give rise to a just perceptible level of vibration. Preliminary indications are that 'just' perceptible effects from vibration may be possible at the Gateway Public House, Malthouse Public House, 39 Friar Street (Grade II Listed Building²²), Garrard House and Telecom House/Plot E during rotary bored piling operation. Just perceptible vibration effects are also possible at Malthouse Public House when excavation works are being conducted at the western boundary of Building Plot A and possibly at Garrard House when excavation works are being conducted at the southern boundary of Plot G.
- 11.103 This is a preliminary qualitative assessment and is subject to ground conditions at the Site which may increase or reduce the transmission of vibration from demolition and construction activities compared with those indicated in Table 11.9. Based on the information within Table 11.9 demolition and construction vibration effects of **negligible** to temporary, short-term local **moderate adverse** significance may be possible.
- 11.104 The potential for damage to buildings would be negligible based on the rotary bored piling technique, however due to the uncertainty of effects from ground conditions and the proximity of some to the NSRs, in particular 39 Friar Street Grade II listed building, monitoring of vibration during piling would ensure agreed limits are adhered to. This is discussed further during the mitigation section of this Chapter.

Interim Condition: Temporary Flexible Event Space

Event Noise

- 11.105 The key noise sources likely to be present with the operation of the Temporary Flexible Event Space are:
- Noise from speakers, amplified music etc; and
 - Noise from people attending the events.
- 11.106 Quantification of this is not possible at this stage as specific details on events are not available. However, assuming as a worst case that noise levels at the boundary of the event Site would be 85dB $L_{Aeq,1 \text{ hour}}$, and allowing for attenuation as a result of distance and partial screening by intervening structure, noise levels at the nearest NSR façade on Projection East and West at Merchants Place and Garrard House would be in the region of 50 to 55dB $L_{Aeq,1 \text{ hour}}$ and 45 to 50dB $L_{Aeq,1 \text{ hour}}$ respectively.
- 11.107 Guidance provided in BS 8233:1999 'Sound Insulation and Noise Reduction for Buildings' states that noise reduction through a partially open window would be around 10 to 15dB(A). As such, based upon the predicted noise levels presented above, internal noise levels of between 35 and 40dB(A) at Garrard House and 30 and 35dB(A) at Projection East and West at Merchants Place. Noise levels of this magnitude would be in compliance with the adopted night-time limiting criteria set out above.

- 11.108 When considering the daytime period, it should be noted that predicted noise levels fall below the monitored background noise level (L_{A90}). As such, adverse comment or complaint by local residents is unlikely to arise during this period. The likely effect of event noise is therefore considered to be **negligible**.

Plant Noise

- 11.109 Temporary plant installed as part of the Temporary Flexible Event Space would have the potential to generate noise. At this stage, details of the proposed nature, type and number of such plant are unavailable. However, given the distance between the nearest NSRs and the Temporary Flexible Event Space (Garrard House approximately 80m away and Projection East and West at Merchants Place approximately 110m away) it is considered that effects from plant noise would be **negligible**.

Traffic Noise

- 11.110 The proposed uses of the Temporary Flexible Event Space are not considered likely to attract primary trips into Reading, with people drawn to the attraction from pass-by trips while travelling for other purposes, or from existing town centre retail trips. On this basis traffic generated from the Temporary Flexible Event Space Site would be limited to low levels of servicing. Given the effects of traffic are considered to be **negligible**, as set out in Chapter 9: Transportation and Access, the resultant effects from traffic noise are also considered to be **negligible**.

Completed Development

Suitability for Residential Development

- 11.111 As indicated in Parameter Plan 7 'Upper Floor Uses' (Drawing 698_E_PP_07_007) residential use is proposed within Telecom House/ Plots E. Parameter Plan 7 'Upper Floor Uses' (Drawing 698_PP_07_007) illustrates the residential use with Plot F. Combined, these areas would provide up to 475 residential units of mixed tenure. It should be noted that this is a net increase of 175 residential units from the consented SH3 scheme.
- 11.112 As previously discussed, the dominant noise sources in the area of the Site were noted to be road traffic noise with rail traffic noise contributing to the noise climate within the northern part of the Site. Given that Telecom House/Plot E and Plot F are located within the southern area of the Site and that the proposed building heights are lower than those proposed for the northern area, as indicated in Parameter Plan 3 'building Plot Parameter Including heights' (Drawing 689_E_PP_003 for Telecom House/Plot E and Drawing 698_PP_07_003 for the consented SH3), the dominant noise prevalent on residential Buildings of Telecom House/Plots E and Plot F would be road traffic noise.
- 11.113 The predicted noise levels at the facades of Telecom House/Plot E and F are presented as Table 11.16 together with the significance of the noise effect.