

			ground, whilst still being experienced as a balanced integral element of the street. The Project would form an enhanced focal feature for the street scene, without adversely affecting the character of the closer street scene, and therefore would be a beneficial change.
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Viewpoint	14	Description of Effect	
Sensitivity	High		
Year 1 – Winter	Size/scale	Low to Medium	Much of the Project would be partially screened in winter and fully screened in summer by the neighbouring buildings and trees in the foreground. The density of branch structure of the existing trees is sufficiently effective to diffuse the visual awareness of change to the view. Whilst this would be a discernible change, it would not adversely affect the broader treed character of the park.
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Neutral	
	Significance	MODERATE NEUTRAL	
Year 15 - Summer	Size/scale	Low to Medium	The main influence on the view would be the presence of Tower C, which would be clearly visible on the skyline, forming a taller built feature than the other neighbouring buildings surrounding the park. The residential tower would not be disproportionate in size and scale to the existing trees within the view, forming a subsidiary visual feature. The trees would remain as the key feature and characteristic of the park and the associated view. The changes to the view would occupy a relatively small part of a much wider park view. The residential towers, would introduce a higher architectural quality to the existing buildings within the view, although the proposed vernacular would be less evident, being experienced as a clearly more distant aspect of the view. On balance the change is considered neutral.
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Neutral	
	Significance	MODERATE NEUTRAL	

Viewpoint	15	Description of Effect	
Sensitivity	Medium		
Year 1 – Winter	Size/scale	Low	The stadium would form a new focal feature at the centre of the view. This would replace the existing partial view of residential tower of
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Beneficial	

Year 15 - Summer	Significance	MINOR BENEFICIAL	Stella House (more apparent in winter), which would be located behind the stadium. The stadium and hotel would be evidently taller features, appearing above the roofline of the existing buildings in the mid-distant street scene. However, the changes would not be disproportionate to the overall massing of buildings within the view or disproportionately occupy the view. Much of the stadium and hotel, would be screened by the existing buildings and the existing street trees. The trees would provide a partial screen in winter and more effective screen in summer. The extreme sports building and residential towers would largely be screened by the existing buildings within the view, with only the very tops being visible above the roofline, and consequently would have very little influence on the view. The combination of glazed cladding and perforated aluminium screen used within the elevations of the proposed stadium and hotel, would create a modern distinctive appearance that would be clearly different to the existing built character. This would help to emphasise that the change is occurring within a separate part of the street scene, marking the presence of the stadium and hotel, whilst retaining the visual integrity of the existing High Road. The Project would be experienced as a change to the view, occurring beyond and separate from the main street thoroughfare in the fore and mid ground, whilst still be experienced as a balanced integral element of the street. The stadium and hotel would become sufficiently evident within the view that it would define the presence of the stadium as a landmark for fans and visitors arriving from the south, whilst not overwhelming and retaining the broad character of the street scene. The stadium and hotel would form an enhanced focal feature for the street scene, without adversely affecting the broader visual integrity, and therefore would be a beneficial change
	Size/scale	Low	
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Beneficial	
	Significance	MINOR BENEFICIAL	

Viewpoint	16	Description of Effect
Sensitivity	Medium	
Year 1 – Winter	Size/scale	High
	Geograph.Inf.	Medium
	Duration/Rev.	High
	Magnitude	High Neutral
	Significance	MODERATE NEUTRAL
Year 15 - Summer	Size/scale	High
	Geograph.Inf.	Medium
	Duration/Rev.	High
	Magnitude	High Neutral
	Significance	MODERATE NEUTRAL
		The stadium would form a prominent new feature within the view, with only the very top of residential Tower C and the proposed hotel being visible just above the proposed stadium. Most of the existing buildings within and adjacent to the site would be retained within the view i.e. Paddy Power bookmakers through to Dial House. The integrity of these buildings would consequently be retained as a continuous built form. The proposed stadium would appear as a prominent new feature above the roofline of these buildings. The form and appearance of the stadium would be evidently different to the existing buildings. This would create a contrasting character that would be clearly discernible and separate from the existing historic built character of the High Road. The use of vertical panel elements, with glazing and proportioned mixed perforated aluminium screen panels, echoes the fenestration of the existing building. This helps to reflect and relate the proposed stadium to the existing street scene, whilst still clearly providing a new identity and presence. The change would enable the stadium and THFC to provide a stronger visual presence within the High Road and create a clearly defined visual centre that more closely reflects the role of the Club in the community. This would also reflect the broader vision of providing a catalyst for much of the planned wider urban regeneration, whilst retaining the more valued local visual features. The changes to the view would provide a mixture of adverse and beneficial influences, which on balance are considered to create a neutral effect.

Viewpoint	17	Description of Effect
Sensitivity	High	
Year 1 – Winter	Size/scale	High
	Geograph.Inf.	High
	Duration/Rev.	High
	Magnitude	High Neutral
		The existing buildings visible within the view would be retained, other than the existing stadium and the residential properties set

Year 15 - Summer	Significance	MAJOR NEUTRAL	back to the western side of Worcester Avenue (the roofline of two of the houses is visible above the existing tree within the view). The existing residential character of Worcester Avenue is already noticeably affected by the existing stadium. This would be removed and replaced with a stadium of much larger form and massing, and consequential presence within the view. This would be set above the roofline of the existing houses. The form and appearance of the stadium would be evidently different in character, further reinforcing the separation between the stadium and residential part of the street. The use of glazing and a regular pattern of perforated aluminium screen panels, echoes the fenestration of the existing buildings within the view, whilst also providing greater coherence and consistency in the built character of the stadium. This use of these materials would also give a visual lightness to the building mass set against the skyline. The north building and residential towers, complement the appearance of the proposed stadium, whilst also contrasting with the curved solidity of the stadium massing. The tiered nature of the built shape and the use of chamfered forms to the top of the residential towers and the incorporation of deep reliefs and garden roof terraces, create visual interest, whilst also helping to 'root' the proposed stadium within the street scene. The stadium would provide an enhanced appearance in comparison to the existing stadium. The architecture and use of materials would be clearly different to the retained existing buildings, but would not be unexpected within street scenes that have experienced extensive modification and change in the past. The proposed buildings would introduce a high quality architecture and use of materials. This would reflect the broader objectives for change envisaged through the further planned urban regeneration within Northumberland Park. When considered in the broader context of the view, the Project would form a very
	Size/scale	High	
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Neutral	
	Significance	MAJOR NEUTRAL	

			prominent change to the view, without dominating or being overwhelming, whilst also introducing a well defined and new high quality architecture within a modified street scene. On balance this considered a neutral change to the view.
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Viewpoint	18	Description of Effect	
Sensitivity	Low		
Year 1 – Winter	Size/scale	High	The stadium, residential towers and top of the hotel would form prominent new features set against the skyline. This existing stadium would be demolished, removing the substantial metal roof gantries from the view. The proposed buildings would be seen above and beyond the existing Northumberland Park Community School, which provides a low profile but expansive built massing in the foreground of the view. The tall residential block of Trulock Court, within the immediate foreground, would remain as the most dominant feature within the view. The proposed residential towers would reflect form of Trulock Court.
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	
Year 15 - Summer	Size/scale	High	The view currently lacks a defined built character, with a mixed and poorly formed urban fabric and street scene. This reflects the modified and varied nature of land use within this part of the local setting. The Project would introduce buildings of high quality, enhanced architecture, with distinctive use of building materials. This would improve quality of the urban fabric within the view and reflect the broader objectives of providing a catalyst and vision for the future planned urban regeneration within Northumberland Park. This would have a beneficial effect on the view.
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	

Viewpoint	19	Description of Effect	
Sensitivity	Low		
Year 1 – Winter	Size/scale	High	The existing stadium, at the end of the street scene, would be removed and replaced with a proposed stadium of clearly taller and larger massing. This would form a prominent new feature at the centre of the view, whilst
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	

Year 15 - Summer	Size/scale	High	remaining proportionate to the overall built massing within the street scene. The southern single glazed façade would be an evident feature, providing a visual lightness to the structure. The verticality and scale of the varied perforated aluminium panels on the remaining visible elevation, would create visual coherence and relate to the fenestration within the existing buildings. The residential towers would form a prominent new feature on the skyline, above the roofline of the existing terraced houses. This would be experienced as a change separate from and beyond the immediate street scene, with the visual continuity of the existing built line and form being retained within the view. Whilst clearly different, the strong vertical rhythm of solids and voids, deep reliefs, and balanced mixture of glazing, white masonry frame and natural coloured terracotta cladding panels, would reflect the continuity, form and harmony of the existing built form within the view. The use of deep reliefs, balconies and garden roof terraces would also add visual interest to the view, relating to the varied vernacular of the existing terraced houses. The changes would introduce a clearly different character, but one that nevertheless relates well to the existing built setting, providing high quality buildings that would form the catalyst and basis for the future planned urban regeneration in Northumberland Park and therefore a beneficial effect.
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	

Viewpoint	20	Description of Effect	
Sensitivity	Low		
Year 1 – Winter	Size/scale	High	The stadium, hotel and extreme sports building would not be visible within the view. The proposed residential towers would form prominent new features within the view, with Towers C and A being most evident. The tall mature street trees at the centre of the view would provide an effective screen of the lower half of the residential towers in summer
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Neutral	
	Significance	MODERATE NEUTRAL	
Year 15 - Summer	Size/scale	High	
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Neutral	

	Significance	MODERATE NEUTRAL	and a partial filtered screen in winter. The buildings to the south of the stadium would reflect the residential character of the street scene, and would be seen in the same visual context as the existing three and four storey residential blocks to the right of the view. The existing trees would also help to integrate harmoniously the new buildings into the existing built character. The design and detailing of the buildings to the south of the stadium would form an important aspect of the change to the view. The residential towers would provide well proportioned, harmonious and coherent built elevations, with a strong vertical rhythm of solids and voids. The use of deep reveals, garden roof terraces, balconies and balance of glazing, masonry and terracotta panels would provide a high quality built character. This would be of higher architectural quality to the existing residential blocks along Park Lane and provide a new focal feature within the view. Due to the prominence of the residential towers, this would be an important influence on other future built development and planned urban regeneration within Northumberland Park. The increased prominence of the built form within the view would be balanced against the introduction of a higher quality of built character and visual interest within the view, resulting a neutral effect on the view.
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Viewpoint	21	Description of Effect
Sensitivity	High	
Year 1 – Winter	Size/scale	Very High
	Geograph.Inf.	Very High
	Duration/Rev.	High
	Magnitude	Very High Beneficial
	Significance	SUBSTANTIAL BENEFICIAL
Year 15 - Summer	Size/scale	Very High
	Geograph.Inf.	Very High
	Duration/Rev.	High
	Magnitude	Very High Beneficial
	Significance	SUBSTANTIAL BENEFICIAL
		The Project would remove the existing stadium, with its large massed solidity and relatively austere appearance with limited vernacular treatment or detailing. This would be replaced with buildings of more varied form, massing, articulated design and high quality detailing. The proposed changes would be predominantly defined by the buildings to the south of the stadium. The residential towers would introduce a substantial new feature into the view, much taller than the existing

			stadium, but providing a residential character at street level and an enhanced building of greater visual interest and aesthetic appearance. In close proximity, the viewer's focus of attention would be at street level and similar to that illustrated within the AVR. Whilst there would be a peripheral awareness of a greater height, the effect of the taller parts of the towers would be relatively limited due to the effects of perspective. The design of the residential towers would create a vertical rhythm of solids and voids with deep reliefs, balconies, defined by a visually strong white masonry framework, and composed of a balanced contrast of glazing and terracotta panels. This would create a building of harmonious and coherent pattern and proportions, will providing visual interest and diversity. The existing poor definition, visual clutter and aesthetic appearance of the public realm, would be replaced with an enhanced public realm. The Project would, remove bollards and kerbs along Worcester Avenue and the poor quality paving and trees of average form. The public realm would be enhanced by a shared pedestrian and vehicular surface with new high quality paved surfaces and new tree planting along Park Lane and Worcester Avenue. The proposed changes would be substantial but would enhance the appearance of the street scene in terms of the quality and appearance of the buildings, public realm and urban fabric. This would provide an important aspect within the future planned urban regeneration for Northumberland Park.
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Viewpoint Sensitivity	22 High	Description of Effect
Year 1 – Winter	Size/scale	Very High
	Geograph.Inf.	Very High
	Duration/Rev.	High
	Magnitude	Very High Neutral
	Significance	SUBSTANTIAL NEUTRAL
		The harsh industrial elevation of the existing southern stand, with metal gantry roofs would be removed from the view. The existing stadium relates poorly to the residential character of the street scene and would be

Year 15 - Summer	Size/scale	Very High	replaced with the well defined residential form and appearance of the buildings to the south of the stadium. In particular, the proposed lower storey townhouses on the southern elevation, would relate to the scale and form of the existing houses. The residential apartments would form a separate element with the towers set above the townhouses. The residential towers would be substantially larger than the existing houses, forming the dominant feature within the view. The proposals would significantly increase the extent of the building mass set against the skyline and occupying a large proportion of the view. The buildings to the south of the stadium would also significantly enhance the built character and appearance, currently provided by the existing stadium and at the centre of the view. The residential towers would provide well proportioned, harmonious and coherent built elevations, with a strong vertical rhythm of solids and voids. The use of deep reveals, garden roof terraces, balconies and balance of glazing, masonry and terracotta panels would provide a high quality built character. The proposed buildings would be of a higher quality to the existing buildings within the view, helping to raise the quality of the residential built character. On balance the combination of adverse and beneficial influences, is considered to create a neutral effect.
	Geograph.Inf.	Very High	
	Duration/Rev.	High	
	Magnitude	Very High Neutral	
	Significance	SUBSTANTIAL NEUTRAL	

Viewpoint		23		Description of Effect
Sensitivity		Medium		
Year 1 inter	-	Size/scale	High	The stadium would a new focal feature at the centre of the view. This would replace the existing view of residential tower of Stella House, which would be located behind the proposed stadium. The proposed stadium and hotel would be evidently taller features, appearing above the roofline of the existing buildings in the mid-distant street scene. The extreme sports building and most of residential towers would largely be screened by the existing buildings within the view, with only the very tops being visible above the
		Geograph.Inf.	High	
		Duration/Rev.	High	
		Magnitude	High Neutral	
		Significance	MODERATE NEUTRAL	
Year 15 Summer	-	Size/scale	High	
		Geograph.Inf.	High	
		Duration/Rev.	High	
		Magnitude	High Neutral	
		Significance	MODERATE NEUTRAL	

			roofline. The taller Tower C would form a more clearly evident feature of the view. Whilst the stadium, hotel and Tower C would be evidently taller and larger than the existing buildings within the view, the changes would not be disproportionate to the overall massing of buildings or disproportionately occupy the view. The existing visual continuity of the existing built line and massing would be retained and, in the main, clearly understood and appreciated. Whilst the proposed buildings would be seen above this existing street frontage, it would not intrusively impose or overwhelm within the street scene. The combination of glazed cladding and perforated aluminium screen used within the elevations of the proposed stadium and hotel, would create a modern distinctive appearance that would be clearly different to the existing built character. This would help to emphasise that the change is occurring within a separate part of the street scene, marking the presence of the Club, whilst still retaining the visual integrity of the existing High Road. The proposals would be experienced as a change to the view, occurring predominantly beyond and separate from the main street thoroughfare in the fore and mid ground. The proposed stadium would create a prominent new building mass within the view and combined with the hotel would become new landmark features that would define the presence of the stadium for fans and visitors arriving from the south. The stadium and hotel would form an enhanced focal feature for the street scene, and on balance is considered a neutral change to the view.
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Viewpoint	24	Description of Effect
Sensitivity	High	
Year 1 – Winter	Size/scale	High
	Geograph.Inf.	High
	Duration/Rev.	High
	Magnitude	High Neutral
	Significance	MAJOR NEUTRAL
Year 15 - Summer	Size/scale	High
	Geograph.Inf.	High
	Duration/Rev.	High
	Magnitude	High Neutral
	Significance	MAJOR NEUTRAL
		The stadium and hotel would form prominent, new large scale buildings, seen above the existing buildings within the street scene. This would form a large scale change on the skyline and occupying a large extent of the view. The existing stadium and Valentino's pub on the High Street would be removed from the end of the street scene and replaced with the proposed Tottenham Experience building. This would introduce a building of similar scale and massing to the existing buildings along the High Road. The use of cast iron panelling would create a distinctive feature at the centre of the street scene. The curved and sweeping forms of the proposed stadium glazed curtain walls, and the use of varying degrees of perforations within the aluminium screen of the stadium and hotel would create visual interest and diversity to the built form. The Project would introduce a clearly different built form and materials within the view, contrasting within the existing street scene. However, this is set against an existing view composed of a poorly defined built form, mixed use and appearance, which lacks visual integrity and cohesiveness and is generally of poor visual character. The Project would introduce a new built character, helping to raise the quality of built appearance and architecture present in much of the view. This would form an important element of the future vision for the urban regeneration planned as part of the High Road West Masterplan. The combination of beneficial and adverse changes, would create a neutral effect.

Viewpoint	25	Description of Effect
Sensitivity	High	
Year 1 – Winter	Size/scale	High
	Geograph.Inf.	High
	Duration/Rev.	High
	Magnitude	High Neutral
	Significance	MAJOR NEUTRAL
		The stadium would introduce a prominent large scale and massed building, replacing the existing stadium and visually intrusive roof gantries. This would occupy a large part

Year 15 - Summer	Size/scale	High	of the centre of the view and would be experienced on the skyline above the existing back of houses along the High Road. The built character and appearance of the proposed stadium would also be very different to the existing buildings, but the use of varied proportions of perforated aluminium vertical panels, would help to relate it to the fenestration pattern of the existing buildings. This, combined with the extent of glazing, would also help to reduce the solidity and scale of the massing of the proposed stadium, helping to provide a visual lightness to the structure. The residential towers would form a peripheral new feature, with mainly only Tower C forming an evident change in the view. The existing street scene has a poor visual appearance, due to: the garages and back of houses along the High Road; the poorly defined street frontage and boundary treatments; car parks and poor public realm; the ordinary and ubiquitous vernacular elevation treatments to the residential blocks; and the mixed built form and character. The Project would introduce a new built character, helping to raise the quality of built appearance and architecture present in much of the view. This would form an important element of the future vision for the urban regeneration planned as part of the High Road West Masterplan. The combination of beneficial and adverse changes, would create a neutral effect.
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Neutral	
	Significance	MAJOR NEUTRAL	

Viewpoint	26	Description of Effect	
Sensitivity	Low		
Year 1 – Winter	Size/scale	Medium	Most of the Project would be screened by the existing building and street trees within the view. In summer, this would limit the extent of change to a small part of the view, where the upper part of the proposed stadium, would be visible above the four storey residential block in the foreground of White Hart Lane. A more extensive view of the Project would occur in
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	Medium Beneficial	
	Significance	MINOR BENEFICIAL	
Year 15 - Summer	Size/scale	Low	
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Beneficial	

	Significance	MINOR BENEFICIAL	winter, when filtered views through the existing trees would occur. This would incorporate most of the upper part of the proposed stadium and Tower C, the tops of Tower A and D, and the very edge of the hotel. This would provide a more clearly apparent change to the view and awareness of the extent and size of the Project. The partial screening effect of the trees would limit the influence of the change occurring on the skyline and would help visual integrate within the wider existing building mass present within the street scene. The changes in winter would be experienced with the same context as the other residential towers, such as Charles House, and the three and four storey residential blocks in the view. The proposed buildings would appear as reflecting a similar scale and massing and be proportional to the existing buildings and extent occupied within the view. The Project would introduce a high quality of architecture, detailing and use of materials in comparison to the existing buildings within the view. This would form an important new landmark feature for fans and visitors arriving from White Hart Lane Station and catalyst and benchmark of the future urban regeneration planned as part of the High Road West Masterplan. The Project would create a beneficial effect.
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Viewpoint	27	Description of Effect	
Sensitivity	Medium		
Year 1 – Winter	Size/scale	Very High	The existing Georgian buildings to the east of the High Road would be retained. The more distant Victorian buildings on the eastern side of the High Road and existing stadium would be removed. Warmington House, not visible within the view, would be retained and incorporated as part of the proposed Tottenham Experience building. The form, shape and use of materials proposed would provide a creative and distinctive new building that relates in scale and massing to the retained buildings within the High Road, whilst also visually linking and relating it to the proposed stadium and hotel. This would
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	Very High Neutral	
	Significance	MAJOR NEUTRAL	
Year 15 - Summer	Size/scale	Very High	
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	Very High Neutral	
	Significance	MAJOR NEUTRAL	

		provide an important visual role integrating The Project with this part of the High Road. The existing stadium poorly relates to the existing street scene, and with the demolition of the intervening buildings between the existing buildings within the view, a large unformed gap exists that opens up the street to the former industrial estate and car park to the front of the existing stadium. This has arisen as part of the vision for enabling the proposed stadium to have the required to enable it to engage actively with the High Road at the centre of the community. This inevitably leads to a large scale change, within the immediate proximity of the stadium. The proposed stadium would be substantial and much larger than the existing buildings within the view, becoming the dominant feature. It would be seen well above the roofline of the existing Georgian buildings. The proposed form, shape and appearance would be clearly and evidently different to the Georgian buildings. This provides a contrast that enables both types of building to be clearly understood and appreciated in their own right and role they play within the street scene. The vertical rhythm and consistency provided by the perforated aluminium screen and glazing echoes the fenestration within the retained building and helps visually relate it to the street scene. Only part of the proposed hotel and none of the residential towers would be visible within the view. The Project seeks to retain the existing locally valued buildings, whilst introducing a clearly different modern, high quality architecture that provides the future vision for the planned urban regeneration within Tottenham, whilst also enabling the stadium to provide a visual active role within the street scene. This needs to be balanced against the difference in size and scale between the proposed and existing buildings, and thus is assessed as a neutral effect.
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Viewpoint	28	Description of Effect
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Sensitivity	High		
Year 1 – Winter	Size/scale	Low	The belt of trees in the mid-distance provides a complete screen for the proposed buildings, other than the residential towers. Even in winter the vegetation is dense enough, combined with other existing buildings to provide an effective screen. Mainly the upper part of Tower C and A would be visible as new features within the view. This would be seen within the same visual context as Kenneth Robbins House, which appear as having a similar massing within the view. The introduction of the proposed residential towers into the view would also be consistent with other tall buildings within the view, such as Brook House. The view is already affected by the power station, sub-station, pumping station, overhead powerlines and pylon towers, reservoir embankment and industrial units. The Project would introduce a high level of architecture and built form in comparison to the existing buildings, but would be difficult to discern, due to the large distance from the viewer. The proposals would have limited influence on the view and would be experienced as being consistent with the existing more distant built features within the view.
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Neutral	
	Significance	MODERATE NEUTRAL	
Year 15 - Summer	Size/scale	Low	
	Geograph.Inf.	Low	
	Duration/Rev.	High	
	Magnitude	Low Neutral	
	Significance	MODERATE NEUTRAL	

Viewpoint Sensitivity	29 Low		Description of Effect
Year 1 – Winter	Size/scale	High	The trees in the fore to mid ground provide an important role in providing a partial screen and integrating the proposed changes into the view. In summer, the proposed stadium, Tottenham Experience building and parts of the Southern Development would be screened. In winter, the density of branch structure would create a visual tracery that provides only glimpses of the proposed buildings through the trees. The main change to the view would be the introduction of the proposed hotel, with secondary limited and partial views of the extreme sports building and residential
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	
Year 15 - Summer	Size/scale	High	
	Geograph.Inf.	High	
	Duration/Rev.	High	
	Magnitude	High Beneficial	
	Significance	MODERATE BENEFICIAL	

			towers. These would be experienced as balanced and visually proportionate to the existing building mass within the street scene. The Project would replace the existing stadium, and introduce buildings of modern and high quality architecture, contrasting with the existing buildings within the view. The proposed hotel would partially utilise a perforated aluminium screen as external skin, introducing diagonal and vertical voids to create visual diversity. The aluminium screen would provide a visual connection with the proposed stadium and extreme sports building. The proposed residential towers would introduce further visual diversity and interest through use of deep reliefs, balconies, garden roof terraces, visually strong white masonry framework, and balanced contrasting of glazing and terracotta panels. Whilst prominent, the changes are well balanced and proportioned, introducing visual character and diversity, and raising the quality of built architecture within the view and would therefore be a beneficial effect. This would provide an important aspect within the future planned urban regeneration for High Road West.
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Viewpoint	30	Description of Effect	
Sensitivity	High		
Year 1 – Winter	Size/scale	No Change	The extent and density of the intervening vegetation would prevent views of the Project, both in summer and winter. Therefore there would be no change to the view.
	Geograph.Inf.	No Change	
	Duration/Rev.	High	
	Magnitude	No Change	
	Significance	No Change	
Year 15 - Summer	Size/scale	No Change	
	Geograph.Inf.	No Change	
	Duration/Rev.	High	
	Magnitude	No Change	
	Significance	No Change	

12.6 Additional Mitigation, Compensation and Enhancement Measures

Construction

12.6.1 Consideration should be given to the visual treatment of the boundaries of development construction

zone. This would typically be provided by hoarding to appropriate barrier to define the area of construction for health and safety reasons and to provide security for the Site. Opportunities should be sought for artwork, visual representations of the Project, temporary green barriers etc.

Occupation

- 12.6.2 No additional mitigations measures are recommended. However, it should be noted that future urban regeneration planned for High Road West and Northumberland Park should ensure a consistency in terms of layout, form, appearance and use of materials. Public realm is a key aspect, as this often forms the links, connectivity and legibility between buildings and street scenes.

12.7 Assessment Summary and Residual Environmental Impacts and Effects

Construction

- 12.7.1 The significant effects during the Construction Phase to the Townscape Site Features would occur to the built form. Much of the site comprises open land following the demolition of many of the existing buildings as part of the partial implementation of the existing consented development that has created a transitional character. The removal of most of the remaining existing townscape site features would occur early on in the construction phase of the Project, with the exception being parts of the existing stadium, where there would be a phased approach to its removal to facilitate continued use for matches. Most of the changes during the construction period would relate to the construction of the new buildings and the public realm, which would form significant new site features. The demolition works and the construction of the new buildings would also create a major or substantial change to the character of Townscape Character Area (TCA) 1: Stadium and TCA 2: Tottenham High Road and within views approximately up to 400m from the Project.
- 12.7.2 The effects during the construction phase would not be substantively greater, in terms of size/scale and geographical influence, to that of the effects at Operation stage from Year 1. However, there would be noticeable activity through the process of continual change, visual disruption, movement, the visually intrusive appearance of the inner core of new buildings and partial demolition of the existing stadium, and the need for tall cranes to complete specific parts of the Project. With the exception of TCA 1: Stadium, the effects on townscape and views during Construction would be adverse. In the case of TCA 1, the change is assessed as neutral, due to the extensive amount of demolition work that has already occurred and is ongoing, and the sense of transition that is taking place within the Area.
- 12.7.3 The construction period would be phased in terms of staged completions and would represent a number of years of construction activity. However, in townscape and visual assessment terms this would be a relatively short period of time compared to the total life expectancy of the Project.
- 12.7.4 In comparison to consented development, the construction requirements and type of works would be broadly the same due to the similar nature of the proposed development. The proposed phasing of the work would also be undertaken in a similar manner.
- 12.7.5 The key differences between the consent and current Project would be a slightly longer construction period, with the proposed Stadium requiring an additional 6 months to the 3 years and 4 months to construct the consented Stadium, and an additional 8 months to the 2 years for the consented mixed use

development. The other main difference would be the additional height of the proposed residential towers. This would include the requirement to utilise much taller cranes to construct the tops of the towers, in particular Tower C. The additional timescale for completion of the construction works would be a relatively small proportion of the overall construction period. The visual disruption resulting from the construction of the towers and requirement to use cranes of much greater height would create an additional adverse effect over a wider area, but would form a short-term temporary effect.

Occupation

- 12.7.6 There are no additional mitigation measures proposed, with mitigation being incorporated as an inherent element of the design process prior to assessment. Consequently, the assessed effects can be regarded as being residual effects.
- 12.7.7 As for the construction phase, the Project would create substantial and major changes to the site. These would noticeably affecting the built features within the site, the character of the townscape within and immediately adjacent to it and for views principally within approximately 400m. The Project incorporates the demolition of the existing stadium and Spurs Store, similar to the consented development, but also incorporates the demolition of the retained locally listed Victorian buildings of 746, 748 and 750 High Road and the residential properties of 20-32 Worcester Avenue. In common with the consented development, the Project would introduce: a substantially larger stadium compared with the existing stadium by occupying much of the site; the provision of a southern mixed used development, incorporating a predominantly residential use; and the addition of an extensive new area of public realm. In contrast to the consented scheme, the Project also incorporates a hotel, an extreme sports building, a revised layout and design for the southern development and the addition of the proposed north building in the location of the demolished houses on Worcester Avenue.
- 12.7.8 The design of the built form, layout and appearance of the proposed buildings and public realm to the south of the proposed stadium has substantially changed in comparison to the consented development, representing a significant change. The Project would create a more varied and diverse visual form, breaking up the massing of the built form, but also noticeably increasing the height of the buildings, in particular through the inclusion of the proposed hotel to the south-west of the site, and to a lesser extent the neighbouring proposed extreme sports building, and the much larger four residential towers to south-east of the site. The location and heights of the towers have been designed to ensure that the tallest tower lies closest to the proposed stadium and within the centre of the cluster of towers. The use of a chamfered profile applied to the most prominent outer elevation on the lower and upper parts of the towers, enables a greater efficiency of space and maximising of the public realm, whilst also helping reduce the visual massing of the towers. Within the top of the towers this would be combined with garden roof terraces to establish a greater sense of openness, as well as visual interest.
- 12.7.9 Within close proximity to the site, the Project would result in significant effects (i.e. Substantial or Major significance of effect) to the site's built form, TCA 2: Tottenham High Road, and representative viewpoints: 17 (Northumberland Park and the junction with Worcester Avenue); 21 (Corner of Vicarage Road and Park Lane); 22 (Bromley Road); 24 (Breton Road); 25 (Whitehall Street); 27 (High Road at the junction with White Hart Lane). Changes to the built form, TCA 2, and Viewpoint 21 would be Beneficial, with a Neutral effect on the other views. A small number of townscape and visual effects were assessed as adverse in nature including; TCA8 Bruce Castel Mixed Open Space and Viewpoints, 10 (Tottenham Cemetery), 11 and 12 (Bruce Castle Park). However, the level of these effects were considered no

greater than Moderate.

- 12.7.10 Further from the site the effects would dissipate with distance. In relation to townscape character areas other than TCA 1 and TCA2, the changes from the Project would largely be understood as occurring beyond and separate from the character area and would thereby retain the existing continuity and integrity of the townscape, whilst introducing a new focal feature to some streetscapes. Within views, the extent of change experienced is influenced by the presence of existing buildings of varying size and scale and intervening vegetation that filters or completely screens views of the Project. Typically, the changes would be experienced as part of a wider view that already incorporates varied built form, scale and appearance, often of relatively poor quality and limited vernacular treatment. The Project would introduce new buildings that are of higher quality, and due to the influence of distance and perspective, would be experienced as being proportionate to the existing features within the view. The most noticeable long distance view that would be effected, would be from Viewpoint 1: Alexandra Palace where there would be a Moderate Beneficial significance of effect.
- 12.7.11 A number of fully rendered Accurate Visual Representations (AVRs) have been provided from a number of viewpoints to illustrate the appearance of the Project. In addition a number of wireframes have been produced to appreciate the scale and location of the Project within views. The assessed effects include a mix of Adverse, Neutral and Beneficial influences. The nature of the change primarily relates to a comparison with the existing urban fabric, condition, architectural quality and appearance, and the extent of change relative to similar features and character.
- 12.7.12 The additional loss of existing buildings compared to the consented scheme would be detrimental to the built form, but would be limited to a localised context and offset by other beneficial changes to the public realm and townscape arising from the Project. Within Worcester Avenue the change in built form would result in the reduction in the remaining residential part of the street scene and replaced with a three storey commercial building. Whilst of different character to the remaining residential properties, the proposed north building would provide enclosure and redefinition of the street frontage. 746, 748 and 750 High Road provide a piecemeal frontage to the street. The gaps between the buildings, combined with the much larger opening in the street frontage, results in the existing stadium, car parking and areas of cleared land exerting a much more notable visual influence on the townscape character of the High Road corridor. The poor visual appearance of the remaining existing buildings, the ordinary appearance of the existing Spurs Store and the disjointed alignment of the building line, would be replaced with a clearly defined layout form and appearance, creating a more integrated built character that links the High Road to an extensive area of public realm, whilst also providing a continuity and visual containment to the street built frontage. The poor condition of Warmington House would be restored to its former historic appearance securing its future as an integral part of the streetscape. The introduction of retail units, café and museum would revitalise the space around a new area of public realm on the High Road, creating an active frontage. The proposed Tottenham Experience and museum would create a new 3 storey built form that includes distinctive cast iron panels to the facades. The elevational treatment would be a contrast but sympathetic to the historic built character of the retained Warmington House enabling the historic buildings to be understood in the context of the new modern architecture.
- 12.7.13 The stadium would be larger than the consented development in the immediate local context, but the extent of change would not be significantly different. The predominantly oval curving form of the proposed stadium would be retained, but the elevational treatments would be noticeably different. The stadium would present positive interface with the site boundaries and neighbouring streets which would be a

notable improvement over the existing stadium. The proposed stadium would relate to the new Sainsbury's Store building, in terms form, massing and appearance, as originally envisaged as part of the consented development. The balanced mixture of glazing and cladding, with form and pattern varied on different elevations, and the use of varying degrees of perforation within the aluminium panels that express an outer skin would create a sense of lightness, free flowing shapes and animation to the elevations. This would also create visual interest and detailing that would help to reduce the building's scale and mass, yet still provide a building with a uniform appearance. The articulation of the elevations with a mix of solid panels, voids and varying degrees of perforation, as well as openings for vents, would provide visual relief and interest that provides a relationship with the fenestration pattern of the neighbouring existing buildings.

- 12.7.14 The proposed hotel, extreme sports building and residential towers would constitute a major change to the built form, within the site and surroundings. The introduction of town houses and residential towers on Park Road and Worcester Road would provide a more appropriate townscape character compared with the rear facades of the existing stadium. This would create more active street frontages that relate to the residential character of the neighbouring street scenes. The large scale of the Project in comparison to neighbouring houses would only be clearly evident in close proximity. However, the viewer would be predominantly aware of changes at the street level, where the view would be greatly enhanced by the improved quality of the built form and appearance (e.g. Viewpoint 21). The use of chamfered profile to the residential towers set above the townhouses, would enable an efficient use of space, enabling a greater depth of public realm. The residential towers would incorporate deep reliefs, balconies, garden roof terraces, a strong white masonry framework and balanced mixture of glazing and natural coloured terracotta panels. This would create strong architectural quality and detailing, providing an enhanced built quality and appearance to the townscape. The proposed hotel would utilise glazing and varied proportions and forms of outer skin of perforated aluminium panels, visually relating it to the proposed stadium. The elevation treatment would create visual interest and diversity to local street scenes and townscape character. The proposed extreme sports building would create a simple but distinctive form and articulation, which extends into the elevation treatments through the use contrasting tonal pre-cast concrete and glazing. This would provide a striking building between the proposed hotel and residential towers.
- 12.7.15 The proposed public realm works, would contribute a greatly enhanced area of benefit to both fans on match days and to the wider local community and visitors at other times. This would improve legibility and movement, as well as providing dynamic spaces at different levels. In common with the consented development, the Project would use high quality paved materials, creating areas for interaction, seating and planting, as well as clearly defined areas for the movement of large numbers of people on match days. Tree planting would be increased in comparison to the consented development, which would be particularly beneficial within the local street scenes of the High Road, Park Lane and Worcester Avenue.
- 12.7.16 The scale and mass of the proposed buildings would be much greater than the existing built character along High Road. This would change the historical context of the street scene, in terms of the scale, form and appearance of the existing buildings that define the character at this part of the route. Nevertheless, the proposals would reflect the evolving character of the High Road, and whilst a major change, would create a significant destination along the High Road, defined by high quality architecture. The presence of THFC within the community of Tottenham would be more positively and effectively engaged with the street scene of the High Road. The proposals also enable a more extensive area of public realm to be created along the High Road, within enhanced public access, movement and legibility, which extends into

the adjoining parts of the site. The use of high quality paving materials, water features, raised planting beds, seating and additional new trees, would all enhance the character and appearance of this part of the part of the High Road corridor.

- 12.7.17 Despite the height and scale of buildings, the changes would provide buildings of high quality modern architecture and detailing, creating a positive attribute to the site. These changes would introduce distinctive modern architectural buildings, which would define the site and act as a catalyst for further urban regeneration within the locality. The buildings would become landmark features that evidently enhances the existing built quality in the site and local townscape character.
- 12.7.18 Overall on balance the Project would create a notable enhancement to the townscape character and views by providing a well-defined and formed built character and public realm, through high quality architecture and materials. The Project would create a unity and coherence of built character, whilst also providing visual diversity. The changes are seen as an important element in the proposed vision for the wider townscape regeneration of the locality.

13. Noise and Vibration

13.1 Introduction

- 13.1.1 This chapter of the ES has been produced by WSP | Parsons Brinckerhoff. It presents an assessment of the potential noise and vibration effects that the Project may have on the surrounding environment. The assessment includes a summary of the baseline conditions within the area and identifies mitigation measures where appropriate for significant effects that may arise as part of the project.
- 13.1.2 An assessment of the suitability of the site for residential development is presented at the end of this chapter.
- 13.1.3 This chapter is necessarily technical in nature. As such, a glossary of acoustic terminology is presented in Appendix 13.1.
- 13.1.4 Whilst this chapter has been produced by WSP | Parsons Brinckerhoff it incorporates noise predictions undertaken by Vanguardia Consulting (who specialises in stadium acoustic design) for the purpose of the detailed design work. It has been stated at the appropriate points where Vanguardia's work has been used.

13.2 Assessment Criteria and Methodology

Previous Assessment

- 13.2.1 The May 2010 planning application submitted to Haringey Council (application reference HGY/2010/1000) for a new stadium along with retail, residential and a hotel included a noise assessment prepared by WSP in the form of a technical chapter in the environmental statement. The retail element of the previous planning application related to the Sainsbury store in the north of the development. This has subsequently been built and, therefore, does not form part of this current application.
- 13.2.2 This chapter builds on the findings of the May 2010 assessment. It also uses the baseline noise survey data gathered for the 2010 assessment.

Scoping Opinion

- 13.2.3 Although a formal Scoping Opinion was not sought the Scope of the EIA was based on the technical scope for the original 2010 ES and the Southern Addendum. A draft Scoping Report was sent to the Council on the 19th June 2015, for their informal comments and discussion. No informal comments were received in relation to the Noise and Vibration draft Scope.

Legislative Context

- 13.2.4 There is no legislation that specifies noise emission limits from development proposals such as these. Relevant noise legislation is either EC-derived and focussed on specific items of noise-emitting plant or is part of UK statutory nuisance law including provisions such as those within the Control of Pollution Act 1974 or the Environmental Protection Act 1990.
- 13.2.5 Sections 60 and 61 of the Control of Pollution Act give the local authority special powers for controlling

noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start or after they have started.

- 13.2.6 Section 60 enables a local authority to serve a notice of its requirements for the control of site noise on the person who appears to the local authority to be carrying out, or to have control over, the works. Greater detail regarding the matters that local authorities should take account of when preparing such a notice and the appeal provisions that exist are to be found in BS 5228-1:2009+A1:2014.
- 13.2.7 Section 61 of the Control of Pollution Act provides a mechanism for the contractor or developer to take the initiative and approach the local authority to ascertain its noise requirements before construction work starts.
- 13.2.8 Currently statutory nuisance encompasses a range of matters that has broadened to include topics such as noise and vibration where potential health effects may be less obvious. Section 79 of the Environmental Protection Act 1990 (as amended) declares a range of matters to be statutory nuisances that includes:
- "(g) noise emitted from premises so as to be prejudicial to health or a nuisance;
- (ga) noise that is prejudicial to health or a nuisance and is emitted from or caused by a vehicle, machinery or equipment in a street;"
- 13.2.9 For the purposes of the Environmental Protection Act, 'noise' includes vibration.
- 13.2.10 Under the provisions of the Environmental Protection Act, the local authority is required to periodically inspect its area to detect any nuisance and, where a complaint of a statutory nuisance is made by a person living within its area, take such steps as are reasonably practicable to investigate the complaint.
- 13.2.11 If as a result of investigations the local authority is satisfied of the existence of a statutory nuisance it is obliged to serve an abatement notice. This may require various measures including cessation of the noise, its attenuation or restriction to certain times. At its discretion the local authority can delay the service of a notice for up to seven days if it is pursuing alternative means of securing abatement of the nuisance.
- 13.2.12 In situations where some part of the activity for which planning permission has been sought may be subject to another more appropriate means of statutory control, e.g. a licensing condition, planning guidance draws attention to the benefits of the local planning authority consulting with the relevant bodies and authorities. A planning permission should not seek to duplicate such controls. For example, the Government considers that the Building Regulations are the most appropriate means of control for sound insulation between dwellings and local planning authorities should not therefore use planning conditions to control sound insulation in such cases.
- 13.2.13 With the implementation of the Licensing Act 2003 came clear guidance that duplication of controls should be avoided wherever possible. Although intended for licensing the following paragraphs reproduced from Government Guidance makes this clear:

- 13.2.14 "The Statement of Licensing Policy should indicate that planning, building control and licensing regimes will be properly separated to avoid duplication and inefficiency... This would enable the planning committee to have regard to such matters when taking its decisions and avoid any unnecessary overlap."

Planning Policy and Guidance

National Planning Policy

- 13.2.15 The NPPF sets out the following generic guidance in paragraph 123.

- 13.2.16 "Planning policies and decisions should aim to:

- *avoid noise giving rise to significant adverse impacts²⁷ on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts²⁷ on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established²⁸; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

- 13.2.17 Reference numbers 27 and 28 point respectively to the Explanatory Note to the Noise Policy Statement for England (NPSE) and the provisions of the Environmental Protection Act 1990 and other relevant law.

- 13.2.18 No alternative detailed guidance has been proposed by the Government as a direct replacement for Planning Policy Guidance 24: *Planning and Noise*, although a review of technical guidance is being undertaken.

Noise Policy Statement for England 2010

- 13.2.19 The NPSE was published in March 2010 by the Department for Environment Food and Rural Affairs (DEFRA) and is the overarching statement of noise policy for England. It applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

- 13.2.20 That vision is supported by the following aims which are reflected in the aims for planning policies and decisions in paragraph 123 of the NPPF (see 13.2.15 above):

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

- 13.2.21 The Explanatory Note to the NPSE introduces three concepts to the assessment of noise in this country:

NOEL – No Observed Effect Level – This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

- 13.2.22 None of these three levels are defined numerically in the NPSE and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent a SOAEL for noise is acknowledged and the NPSE asserts that not stating specific SOAEL values provides policy flexibility in the period until there is further evidence and guidance.

Planning Practice Guidance

- 13.2.23 In March 2014 the Government published the web-based Planning Practice Guidance (PPG). The section on noise includes a table which summarises the noise exposure hierarchy and offers examples of outcomes relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE. There is still no numerical guidance regarding the NOEL, LOAEL and SOAEL.

Local Planning Policy

Current Planning Policy

- 13.2.24 The current Haringey Council development plan comprises three main documents:

- Local Plan: Strategic Policies (adopted March 2013);
- Saved UDP (Unitary Development Plan) Policies; and
- London Plan 2011.

- 13.2.25 The pertinent parts of the above documents are set out below.

Local Plan: Strategic Policies

- 13.2.26 Prior to the Government publishing the NPPF, this document was titled Core Strategy. However, in March 2013 the Local Plan: Strategic Policies was formally adopted.

- 13.2.27 The Local Plan states in Section 7.1 *Health and Wellbeing* (inter alia):

“Many measures set out in the Local Plan play a part in promoting good health and addressing health inequalities, for example:

Lessening environmental impacts including air and noise pollution (see SP6).”

- 13.2.28 Additionally, in Section 7.1 it states:

"Spatial planning can also reduce and mitigate adverse impacts on health, by managing noise and air pollution, and designing walking routes and cycle lanes."

13.2.29 No other references are made to noise and vibration.

Saved UDP Policies

13.2.30 The UDP was adopted by the Council July 2006 and was the main statutory plan that related to the development and use of land and buildings for Haringey. It contained policies on housing, jobs, leisure, transport education and health. The plan has been superseded by the Local Plan: Strategic Policies document. However, some of the UDP policies have been saved; those which relate to noise are set out below (inter alia).

"UD3: GENERAL PRINCIPLES

The Council will require development proposals to demonstrate that:

- a) there is no significant adverse impact on residential amenity or other surrounding uses in terms of loss of daylight or sunlight, privacy, overlooking, aspect and the avoidance of air, water, light and noise, pollution (including from the contamination of groundwater/water courses or from construction noise) and of fume and smell nuisance;"*

"ENV6: NOISE POLLUTION

The Council will ensure that new noise sensitive development is located away from existing, or planned sources of noise pollution. Potentially noisy developments should only be located in areas where ambient noise levels are already high and where measures are proposed to mitigate its impact.

13.2.31 The informative text to Policy ENV6 states:

"Noise pollution has a major effect on amenity and health and therefore the quality of life in general. Its effect can be minimised by separating new noise sensitive development from major noise sources, by separating new noisy development from existing noise sensitive development and by taking measures to reduce any impact. The Council will support new technologies and encourage sensitive design and construction, for example by positioning buildings and landscaping as noise barriers. Noise sensitive development includes housing, schools and hospitals.

In assessing planning applications the Council will have regard to PPG24 'Planning and Noise' (Annex 1), and the Mayor of London's Ambient Noise Strategy and the prevention of a gradual upward creep in background noise levels. Potentially noisy developments should only be located in areas where ambient noise levels are already high. In cases where separation is not possible, the impact of noisy development on ambient noise levels should be assessed, for example by an Environmental Assessment, the application of Best Available Techniques and relevant technology and design guidance. Where new noise-sensitive development is proposed in areas already exposed to high ambient noise levels, the Council may require the submission of an acoustic report to comply with PPG 24. Mitigation measures will be secured by planning conditions or planning obligations where appropriate. The issue of measures to control noise from restaurants, cafes, drinking establishments and hot food takeaways is addressed in Policy TCR5."

"CLT4: HOTELS, BOARDING HOUSES AND GUEST HOUSES

Applications for hotels, boarding houses and guest houses will be permitted provided that:

c) the proposal does not have an adverse impact on the amenity of nearby residential properties or other uses.

Proposals should not have an adverse impact on the environment by reason of noise, disturbance, traffic generation, exacerbation of parking problems, or detract from the character of the area. In general the local need for uses will be assessed in light of a strong presumption against the loss of residential accommodation."

London Plan 2011

13.2.32 The London Plan 2011 sets out planning policies, strategies and guidance at national and regional level, and collectively provides a framework within which local people and councils can produce their own local and neighbourhood plans.

13.2.33 It provides the following policies (inter alia) which relate to noise.

"Policy 5.3 Sustainable design and construction

Strategic

A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning decisions

B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

D minimising pollution (including noise, air and urban run-off).

LDF preparation

13.2.34 D Within LDFs boroughs should consider the need to develop more detailed policies and proposals based on the sustainable design principles outlined above and those which are outlined in the Mayor's supplementary planning guidance that are specific to their local circumstances."

"Policy 7.15 Reducing noise and enhancing soundscapes"

Strategic

A The transport, spatial and design policies of this plan will be implemented in order to reduce noise and support the objectives of the Mayor's Ambient Noise Strategy.

Planning decisions

B Development proposals should seek to reduce noise by:

- a minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals*
- b separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation*
- c promoting new technologies and improved practices to reduce noise at source.*

LDF preparation

C Boroughs and others with relevant responsibilities should have policies to:

- a reduce the adverse impact of noise through the distribution of noise-making and noise-sensitive uses, and in highway management and transport policies (see Chapter 6)*
- b protect Quiet Areas, to be formally identified under the Environmental Noise (England) Regulations 2006 (as amended) and consider protection of spaces of relative tranquillity or high soundscape quality, particularly through borough open space strategies."*

13.2.35 On October 11th 2013 the Mayor published Revised Early Minor Alterations to the London Plan (REMA). From this date, the REMA are operative as formal alterations to the London Plan and form part of the development plan for Greater London. The REMA make no alterations to Policy 5.3, whilst a single sentence is added to Paragraph 7.52, which supports Policy 7.15. This additional sentence makes the point that London Plan policies may require further alteration *"depending on the spatial implications of the Noise Policy Statement for England"*.

13.2.36 On 10th March 2015, the Mayor published Further Alterations to the London Plan (FALP). From this date, the FALP are operative as formal alterations to the London Plan and form part of the development plan for Greater London. The FALP also do not alter Policy 5.3, but Policy 7.15 has been substantially re-drafted as reproduced below.

"Policy 7.15 Reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes"

Strategic

A The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor's Ambient Noise Strategy.

Planning decisions

B Development proposals should seek to manage noise by:

- a avoiding significant adverse noise impacts on health and quality of life as a result of new development;*
- b mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business;*
- c improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*
- d separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;*
- e where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;*
- f having particular regard to the impact of aviation noise on noise sensitive development;*
- g promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

LDF preparation

C Boroughs and others with relevant responsibilities should have policies to:

- a manage the impact of noise through the spatial distribution of noise making and noise sensitive uses;*
- b identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations."*

Emerging Planning Policy

13.2.37 Haringey Council is currently preparing the Development Management Development Plan Document (DPD), the Sites Allocation DPD and the North London Waste Plan which will add to the above three documents to comprise the LDF portfolio. The latter two documents are not relevant to this assessment.

13.2.38 The Development Management DPD consultation document was published in February 2015. Policy DM34 *Environmental Protection* states:

"Noise and Vibration

C. The Council will seek to ensure that new noise sensitive development is located away from existing or planned sources of noise pollution. Potentially noisy developments may be refused if it cannot be suitably demonstrated that measures will be implemented to mitigate its impact.

D. A noise assessment will be required to be submitted if the proposed development is a noise sensitive development, or an activity with the potential to generate noise."

13.2.39 The supporting text to Policy DM34 states:

"Noise pollution has a major effect on amenity and health and therefore the quality of life in general. Its effect can be minimised by separating new noise sensitive development from major noise sources, by separating new noisy development from existing noise sensitive development and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals.

Any mitigation measures should be incorporated into the design prior to the submission of an application."

Guidance/ Best Practice

13.2.40 Guidance relating to the prediction and assessment of demolition and construction phase noise and vibration effects has been taken from the following documents.

- BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

13.2.41 The following documents are appropriate to the measurement of baseline noise levels and assessing noise of an industrial or commercial nature emanating from existing, new or proposed commercial premises.

- BS 7445 Description and measurement of environmental noise – Part 1:2003: Guide to quantities and procedures, Part 2:1991: Guide to the acquisition of data pertinent to land use and Part 3:1991: Guide to application to noise limits.
- BS 4142:2014 Methods for rating and assessing industrial and commercial sound.

13.2.42 The following documents are relevant to the prediction and assessment of traffic noise affecting existing and proposed developments:

- Calculation of Road Traffic Noise (CRTN) 1988.
- HD 213/11, revision 1, Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration.

13.2.43 The following documents are relevant when assessing noise affecting sensitive receptors, whether proposed or existing:

- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.
- The World Health Organisation's (WHO) Guidelines for Community Noise (2000).

13.2.44 The following document is relevant for assessing noise from music events:

- The Noise Council's Code of practice on environmental noise control at concerts (1995).

13.2.45 The above guidance is set out in more detail in Appendix 13.2.

Baseline Data Collection

13.2.46 A noise survey was carried out in 2008 in order to establish the existing noise climate at the potentially sensitive areas surrounding the Project Site. The noise climate in the area is mostly dominated by road traffic noise. As the road traffic flows are unlikely to have changed such that they would significantly influence the measured noise levels, it is considered that the data gathered during the 2008 survey are valid for use in this assessment.

13.2.47 The baseline noise survey was conducted at various locations and over different periods between Tuesday 11 November and Monday 24 November 2008 using a combination of unattended continuous monitoring locations and attended short term measurement locations.

13.2.48 An attended noise survey was conducted at the current White Hart Lane stadium to determine the noise levels associated with a typical near capacity Premier League football match, including the arrival of supporters' coaches, and the arrival and departure of supporters. This was undertaken on the evening of Wednesday 12 November 2008 for a Carling Cup match between Tottenham Hotspur and Liverpool, with a 19:45 hours kick off time. This happened to be a relatively high scoring game with a final result of 4:2 to Tottenham Hotspur and as such the data collected are considered to be representative of existing 'worst case' conditions for noise during a match.

Consultation

13.2.49 The proposed duration and sites of the baseline noise monitoring for the project were discussed and agreed with the Haringey Council Environmental Health Officer by correspondence in November 2008 in relation to the May 2010 planning application. The data gathered for the purpose of the previous application and have been approved verbally for use in the current assessment by Haringey Council.

13.2.50 The measurement locations are marked on Figures 1, 2 and 3 in Appendix 13.3.

13.2.51 Five unattended noise monitoring sites were used to obtain weekday and weekend data by continuous measurement. A further eight attended measurements locations were used on the evening of 12 November 2008, two inside the stadium, five outside, and another external location for a 3-hour attended CRTN road traffic noise measurement on Park Road on 19 November 2008. The locations have been prefixed by the letter P for the long term positions, S for the two within the stadium and R for the short term rotational measurements outside the stadium. The monitoring sites are described in detail in Appendix 13.3.

13.2.52 Details of the noise measurement equipment used for the baseline noise survey are given in Appendix 13.4.

13.2.53 The sound level meters and the sound level calibrator used with them were all respectively within two years and one year of calibration by a UKAS accredited laboratory. The measurement systems were checked for their calibration level at the commencement and end of each series of measurements and no significant drift in the measured level was found to have occurred. Typically the accuracy of Type 1 sound level meters, such as those used for the baseline survey, when employed in the field is within ± 1 dB. However, the measurements may also be subject to meteorological effects. In the case of the measurement locations used, such meteorological effects are likely to have been small due to the relative

proximity of the major source of ambient noise at each site, i.e. the adjacent road.

- 13.2.54 The weather during the survey generally was conducive to sound measurement, being predominantly dry and with wind speeds of generally less than 5ms^{-1} .
- 13.2.55 The measurement data were post-processed to yield statistical noise levels for hourly periods, including the $L_{Aeq,1h}$, $L_{A90,1h}$, $L_{A50,1h}$, $L_{A10,1h}$, L_{AFmax} and the L_{Amin} . Explanation of these terms is included in Appendix 13.1.
- 13.2.56 Data for longer periods, such as the 16 hour day (07:00 to 23:00) and the 8 hour night (23:00 to 07:00) have been analysed directly from the logged measurement data.

Assessment Methodology

- 13.2.57 The assessment methodology differs slightly from that set out within Chapter 2. For this assessment, it is considered that there would be very little or no difference in an impact of 'low' and 'very low' as shown in Chapter 2. Similarly, there would be little difference between 'high' and 'very high'. Instead the following scale has been adopted for the noise assessment.

Table 13. 1: Receptor Sensitivity and Impact Magnitude

Receptor	Impact
Sensitivity to Change	Magnitude of Change
Major	Major
Moderate	Moderate
Minor	Minor
Negligible	Negligible

Table 13. 2: Effect Significance

Criteria			Receptor Sensitivity			
			Major	Moderate	Minor	Negligible
Impact Magnitude	Positive	Major	Major	Moderate	Moderate	Minor
		Mod	Moderate	Moderate	Minor	Minor
		Minor	Moderate	Minor	Minor	Minor-Neutral
	Negligible		Neutral	Neutral	Neutral	Neutral
	Negative	Minor	Moderate	Minor	Minor	Minor-Neutral
		Mod	Moderate	Moderate	Minor	Minor
		Major	Major	Moderate	Moderate	Minor

- 13.2.58 A description of the above terms is set out below.

- Major negative or positive impact: Where the project could be expected to have a very significant impact (either negative or positive) on the existing noise environment;
- Moderate negative or positive impact: Where the project could be expected to have a noticeable impact (either negative or positive) on the existing noise environment;

- Minor negative or positive impact: Where the project could be expected to result in a small, barely noticeable impact (either negative or positive) on the existing noise environment; and
- Negligible impact: Where no discernible impact is expected as a result of the project on the existing noise environment.

13.2.59 The impact significance for the construction and operational phases are set out below along with a general approach to the assessment.

Construction Noise

13.2.60 The methodology adopted for the prediction of construction noise impacts follows that set out in BS 5228 (see Appendix 13.2).

13.2.61 The BS 5228 calculation methods allow accurate noise levels to be determined for various construction activities. However, the value of any such predictions necessarily is limited by the number of assumptions that have to be made regarding the number and type of plant to be utilised, their location and detailed operating arrangements. Some of this information will be clarified as the project design progresses and later when resources are mobilised, but other information (such as exactly where the plant operates and for how long) will remain uncertain, even after works have commenced.

13.2.62 As a consequence, the available information is considered sufficient to perform a generic construction phase noise assessment, focussing on key activities, with the aim of identifying whether a significant, albeit temporary, noise impact is likely to arise at the nearest sensitive receptors.

13.2.63 Construction activities may be undertaken over a seven day period. As such, assessment criteria have been derived for the typical construction working day (Monday to Friday 08:00 to 18:00 hours and Saturday 08:00 to 13:00 hours) and for the possible extended period of Saturday 13:00 to 18:00 hours and Sunday 08:00 to 18:00 hours. The criteria for the extended period are 5 dB lower than those for the typical construction working day.

13.2.64 The following assessment criteria apply.

Table 13. 3: Impact Significance for Construction Noise – Core Working Day, Façade dB L_{Aeq,T}

Level of Noise Solely from Construction Works	Scale of Effect Significance	Significance of Noise Effect
<65 dB L _{Aeq,T} (T – the time period over the core working day)	Negligible	Insignificant
66 to 70 dB L _{Aeq,T} (T – the time period over the core working day)	Minor negative	
71 to 75 dB L _{Aeq,T} (T – the time period over the core working day)	Moderate negative	Significant
>76 dB L _{Aeq,T} (T – the time period over the core working day)	Major negative	

Table 13. 4: Impact Significance for Construction Noise – Extended Period, Façade dB L_{Aeq,T}

Level of Noise Solely from Construction Works	Scale of Effect Significance	Significance of Noise Effect
<60 dB L _{Aeq,T} (T – the time period over the core working day)	Negligible	Insignificant
61 to 65 dB L _{Aeq,T} (T – the time period over the core working day)	Minor negative	
66 to 70 dB L _{Aeq,T} (T – the time period over the core working day)	Moderate negative	Significant
>71 dB L _{Aeq,T} (T – the time period over the core working day)	Major negative	

Construction Vibration

- 13.2.65 Vibration may arise at several stages of the construction process, the most common being during demolition and the construction of the foundations. Dropping heavy elements of a demolished building can result in very high energy impacts that may generate significant levels of vibration at considerable distance from the point of impact. More commonly the deployment of large mechanical excavators with pneumatic breakers to take up concrete foundations and hardstandings can be a source of vibration to more local sensitive receptors.
- 13.2.66 The other common source of vibration is piling activity. Although auger piling, the method predominantly intended to be used in this project, is likely to produce much lower vibration levels than an alternative such as driven piling there are elements of the process that can produce significant vibration. Driving the pile casing or the auger striking an underground obstruction are two examples. There may be some sheet piling required and this process of piling usually generates a higher vibration level than auger piling.
- 13.2.67 The construction vibration assessment criteria are set out below. These criteria should apply to construction at all times, whether that is during typical construction working hours or the extended period noted in paragraph 13.2.63.

Table 13. 5: Impact Significance for Construction Vibration, PPV mm/s

Level of Vibration Solely from Construction Works	Scale of Effect Significance	Significance of Noise Effect
<0.29	Negligible	Insignificant
0.3 to 0.9	Minor negative	
1.0 to 4.9	Moderate negative	Significant
>5.0	Major negative	

- 13.2.68 The levels of vibration likely to cause even cosmetic building damage are generally an order of magnitude greater than those levels which occupiers are likely to find disturbing. Therefore, for this particular situation it is highly unlikely that vibration sufficient to cause damage to property will occur and no significance criteria have been allocated to the building damage criteria – see Appendix 13.2.
- 13.2.69 Guide values for cosmetic damage to buildings that might arise from construction activity are described in BS 5228-2:2009+A1:2014 (Table B.2 of Annex B to the BS) and reproduced in Appendix 13.2. Minor damage is possible at vibration magnitudes which are greater than twice those given in Table B.2 of BS 5228 Part 2 and major damage can occur at values greater than four times the guide values.
- 13.2.70 The vibration limits relate to the maximum ground vibration occurring in any one of three mutually perpendicular axes (one of which will be vertical). As a practicable means of control for construction

works the vibration normally would be measured at the foundation of the building being monitored or alternatively a point low on the main load bearing wall at ground level.

Operational Road Traffic Noise

- 13.2.71 The likely change in road traffic noise as a result of development related traffic movements has been predicted in accordance with the methodology contained within the Department of Transport technical memorandum *Calculation of Road Traffic Noise* (CRTN) (1988). The road traffic noise predictions with and without the proposed development have been undertaken using the Annual Average Daily Traffic (AADT) flows provided in Chapter 15 'Traffic and Transport' and based on the following assumptions:
- 50kph vehicle speed on all roads;
 - Zero gradient on all roads; and
 - Standard bituminous, impervious surface (e.g. hot rolled asphalt) on all roads.
- 13.2.72 Whilst it is recognised that using the AADT data is a departure from the CRTN methodology, it is considered that this does not have an impact on the assessment as it is the change in noise levels that is being explored and not the absolute noise levels.
- 13.2.73 One limitation of the CRTN methodology, being based on the $L_{A10,T}$ parameter, is that there is a minimum traffic flow required to generate valid levels. For the 1-hour period, this threshold is 50 vehicles and for the 18-hour period is 1,000 vehicles.
- 13.2.74 The assessment criteria used for operational road traffic noise are set out below.

Table 13. 6: Impact Significance for Operational Road Traffic Noise (Short Term), dB(A)Stadium

Change or Difference	Noise Level, dB(A)	Scale of Effect Significance	Significance of Noise Effect
Increase or positive difference	5.0 or more	Major negative	Significant
	3.0 – 4.9	Moderate negative	
	1.0 – 2.9	Minor negative	
None/Negligible	0 – 0.9	Negligible impact	Insignificant
Decrease or negative difference	1.0 – 2.9	Minor positive	Significant
	3.0 – 4.9	Moderate positive	
	5.0 or more	Major positive	

Football Match Noise

- 13.2.75 The existing noise sensitive residential areas around the site already experience the noise from the existing stadium and have done so for many years. The noise assessment for the extant permission (HGY/2010/1000) detailed predicted noise levels from the stadium, as proposed at that time. The stadium noise assessment presented in this chapter assesses noise levels from the proposed stadium against the existing stadium noise (as measured in November 2008) and the predicted stadium noise levels set out in the extant permission (i.e. the extant permission forms the baseline scenario). The November 2008 noise levels were gathered during the match with Liverpool with an attendance of 33,242 (92% of current capacity). The character of the new stadium is essentially very similar to that of the existing one and that approved under the extant permission being totally enclosed around the perimeter and although larger, it is a more substantial structure and so would be expected to provide a generally improved sound reduction performance with respect to noise break-out.
- 13.2.76 Because the nature of much of the noise from the football stadium is intermittent and may vary quite suddenly from being inaudible to the sound of the crowd cheering a goal, the approach adopted has been for the assessment of crowd noise to be undertaken using measurement data taken over very short periods, typically 30 seconds. This time period encompasses most of the significant occurrences of crowd noise, for example when a goal has been scored. The use of longer time periods such as 16 hours (0700 to 2300 hours) as used under different circumstances for proposed residential development, or shorter periods such as 1 hour or 15 minutes as specified for assessments using BS 4142:2014, tends to render short duration events insignificant and provide no clear indication of how crowd noise might interfere with residential amenity.
- 13.2.77 However, Vanguardia has taken a different approach in its calculations and provided predicted noise levels for the entire duration of the football match including the pre-match announcements, pre-match music, crowd noise and half-time entertainment. An event level has been provided over a 2 hour and 45 minute period. This method, in combination with the assessment over the shorter duration (as detailed above) is considered a robust approach.
- 13.2.78 The changes in match day noise levels have been considered in terms of the potential uplift in ambient (L_{Aeq}) levels using the assessment criteria as have been set out for road traffic noise in Table 13. 6 above.

Non-Football Match Stadium Event Noise

- 13.2.79 Large events involving high powered amplification are regularly held in sporting stadia, arenas, open air sites and within lightweight buildings all over the UK. In this instance the events are likely to include up to six music concerts and up to ten major sporting events of which at least two will be National Football

League (NFL) games (i.e. American football).

- 13.2.80 Use of the football stadium for events on the pitch would be confined to the daytime/evening period, thereby avoiding the night period (23:00 to 07:00) which covers the times when the general adult population are preparing for sleep or are actually sleeping. The assessment has been made on the basis that the proposals for the new stadium follow such a pattern of use.
- 13.2.81 Noise break-out from the non-football events within the stadium will depend upon a number of factors but of particular significance can be the placement of the stage and the orientation of the loudspeaker systems in relation to that. For this reason detailed acoustic modelling has been carried out by Vanguardia using the IMMI industry standard environmental software in order to predict the noise levels from such events.
- 13.2.82 The model takes account of ground effect, natural and architectural barriers, spherical spreading and air absorption. The model assumes mild downwind propagation although variations in wind velocity and direction may affect the sound propagation.
- 13.2.83 Generally noise levels of about $L_{Aeq,T}$ 96 dB measured at the concert mixer position (typically about 40m from the main loudspeakers and at a height of 2.5m) are regarded as the minimum for a concert audience to be entertained. The WHO Guidelines (see Appendix 13.2) recommend a maximum $L_{Aeq,4h}$ of 100 dB.
- 13.2.84 For musical events such as classical or pop concerts that might be held within the stadium, the Noise Council's *Code of Practice on Environmental Noise Control at Concerts* (1995) is the most appropriate source of guidance for noise, at least as far as the level at sensitive premises is concerned. This guidance is currently under review but is considered applicable. The guidance is in terms of absolute noise criteria (see Appendix 13.2) and the assessment of concert noise has been made against these rather than on a graduated scale of impact. Recent stadia have set a precedent for more concerts per year than would typically be allowed under the Code. For example, the Olympic stadium has permission for the 2014/2015 season for six concerts per year including one on a Sunday and one on a bank holiday.
- 13.2.85 The stadium would fall within the "urban stadia or arenas" category and has been assessed against the relevant criteria for that as set out in the Code. Assuming that events will conclude by 23:00 hours and that there will be six per year, the relevant guideline from the Code of Practice suggests that the music noise level (MNL) should not exceed the background noise level by more than 15 dB(A) over a 15 minute period whereas for 1 to 3 events, an absolute level 75 dB(A) over a 15 minute period is proposed. These noise levels apply at a point one meter from the façade of noise sensitive premises. However, it is only a guide based on best practice at the time of publication. The limits are not prescriptive and where arrangements are satisfactory, venues may continue with limit levels which are higher or lower.
- 13.2.86 The noise condition relating to the L_{Aeq} measured over a 15 minute time period is based on the guidance within Table 1 of the existing Code of Practice. This document is over 10 years old and, as stated above, is currently under review.
- 13.2.87 Although based on best practice at that time, research (Proc IOA Vol. 28. Pt.7 2006; Griffiths and Staunton) suggests that Table 1 of the Code would benefit from further refinements; in particular, noise levels, number of concerts and category. One of the issues that has been raised is the step change from 3 to 4 concerts per year which in many cases means a reduction in permitted music noise level of at least

10 dB depending upon the prevailing baseline level. In practice, this change is rarely achievable for many venues. It is unlikely that the increase in concerts by one reflects the change in community response that warrants a change of 10 dB.

13.2.88 Considering the measured baseline data (see Appendix 13.4) the step change in noise levels based upon the prevailing baseline level for four events compared with the absolute level recommended in the guidance for three events is a substantial reduction.

13.2.89 The existing baseline A-weighted $L_{eq,16h}$ values measured in the area indicate that most locations surrounding the proposed Stadium already experience noise levels above the music noise level recommended by the Code for more than 3 events.

Table 13. 7: Comparison of Recommended Music Noise Levels Based on Current Guidance

Location*	Existing L_{A90}	$L_{A90}+15dB$ (>3 events)	Absolute Level (<4 events)	Difference	Existing L_{Aeq16h}
P1	54 dB	69 dB	75 dB	-6 dB	64 dB
P3	45 dB	60 dB	75 dB	-15 dB	67 dB
P4	51 dB	66 dB	75 dB	-9 dB	64 dB
P5	41 dB	56 dB	75 dB	-19 dB	50 dB

*see Appendix 13.3 for locations

13.2.90 Research which studied the relationship between the noise level, location of events, number of events and community response based on complaints demonstrated that higher noise limits can be adopted without causing unacceptable disturbance. Examples of this are the concerts that used to be held at Maine Road, Manchester, where environmental levels were in excess of 80 dB L_{Aeq} and Lancashire Cricket Ground where the agreed premises licence condition is 80 dB $L_{Aeq,15m}$ for the nearest residential premises with 75 dB $L_{Aeq,15m}$ for premises further from the ground. The City of Manchester Stadium has an off-site limit of 75 dB $L_{Aeq,15m}$ which is supplemented by a front of house limit of 104 dB(A) averaged over a 10 minute period and Coventry Ricoh which now also has an off-site limit of 75 dB L_{Aeq} for up to 5 concerts per year. As mentioned above, the Queen Elizabeth Olympic Park has secured planning permission for the 2014 to 2015 concert season for up to six concerts with an off-site noise limit of 75 dB(A). Any additional concerts are subject to a noise limit that does not exceed the background noise level +15 dB.

13.2.91 A criterion of 75 dB $L_{Aeq,15min}$ has been used for concerts and a criterion of 75 dB $L_{Aeq,event}$ has been used for the major sporting events. The criterion of 75 dB $L_{Aeq,T}$ is stated in the *Code of Practice on Environmental Noise Control at Concerts*. The noise during major sporting events is likely to be different than during a football match, both in terms of the level and possibly, at times, the characteristics (for example more frequent use of the public address system and more music). As such, it is considered that major sporting events should be assessed differently to football matches, the noise from which will be familiar to the existing residents in the area. As these events will be sporadic throughout the year, much like the concerts, it is considered appropriate to assign the assessment criterion of 75 dB $L_{Aeq,T}$ with the time period (T) being the duration of the event.

Operational Noise from Fixed Plant

13.2.92 BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing the following:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

- 13.2.93 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes and upon which sound is incident.
- 13.2.94 Sound from any plant associated with the Project should be considered in accordance with the requirements of BS 4142:2014 and for both existing and proposed noise-sensitive receptors.
- 13.2.95 The Standard effectively compares and rates the difference between the specific sound level of the source ($L_{Aeq,T}$) and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound. If appropriate, the specific sound level is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$).
- 13.2.96 The 2014 version of the standard allows the following additive corrections for character: 0 dB to +6 dB for tonality and 0 dB to +9 dB for impulsivity. Where the specific sound features characteristics that are neither tonal nor impulsive, but otherwise are readily distinctive, a penalty of +3 dB can be applied. Finally, should the specific sound contain identifiable on/off conditions and so be readily distinctive, a penalty of +3 dB can be applied.
- 13.2.97 The Standard advises that the time interval of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future. The specific sound level should be evaluated over a one hour period during the day and over a 15 minute period during the night.
- 13.2.98 Comparing the rating level with the background sound level, BS 4142 states:
- "Typically, the greater this difference, the greater the magnitude of impact
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."
- 13.2.99 It is assumed that providing the cumulative effect from all building services plant on site can be designed to meet a rating level that is equal to the existing background noise level(s), at worst only negligible residual effects would remain.

Site Suitability for Noise-sensitive Uses

- 13.2.100 The road traffic noise levels measured during the baseline noise survey have been used to undertake an assessment of the site's suitability for residential development. In addition, the conclusions of the operational road traffic noise assessment have been considered to determine the potential uplift in noise levels on the surrounding roads due to the Project.
- 13.2.101 The site suitability assessment has been undertaken in accordance with the criteria in British Standard 8233 and the World Health Organisation's *Guidelines for Community Noise* (see Appendix 13.2).

Cumulative Assessment

- 13.2.102 The cumulative assessment has considered the following schemes in the area in terms of operational road traffic noise:
- Image House, Station Road, N17 9LR. A 96 bed hotel (low car use).
 - 5 Bruce Grove, N17 6RA. Four apartments and ten houses (low car use)
 - Vacant land between 17 and 34 Pretoria Road, N17 8DX. Extra care facility of 52 units (low car use).
 - The Goods Yard, White Hart Lane. Construction compound.
- 13.2.103 Other developments in the area are either at a significant distance, are operational and have been included in the 2015 traffic survey and are, therefore accounted for, or are small in scale such that they would not be of influence.
- 13.2.104 The Goods Yard is a construction compound for which planning permission is yet to be determined. If planning permission is granted, it will provide concrete batching facilities, aggregate washing and a storage area for the main stadium.

Geographical Scope

- 13.2.105 The extent of the study area includes the site itself and sensitive receptors beyond the site boundary. The extent of the study area beyond the site boundary is defined by the proximity of the noise-sensitive uses to the site. There are existing noise-sensitive receptors close to the site, as set out below:
- Worcester Road;
 - Schools on Worcester Road;
 - Park Lane; and
 - High Road.

- 13.2.106 The road traffic noise effects associated with the Project are considered on a wider geographic scale.

Assumptions and Limitations

- 13.2.107 It has been necessary to make various assumptions as detailed throughout this report. A summary of the assumptions is set out below.

Construction Phase

- 13.2.108 As is usual at this stage of a development, the exact details regarding the construction phase plant and type, their locations etc are unknown. Generic calculations have been undertaken based on experience of similar sites. However, these calculations provide only an indication of the likely noise and vibration levels that may be generated.
- 13.2.109 A detailed assessment should be undertaken once contractors are on board to determine the noise and vibration levels that will be generated and any necessary mitigation measures.

Operational Road Traffic Noise

- 13.2.110 The likely difference in road traffic noise comparing various scenarios has been predicted using the Basic Noise Level ($L_{A10,18\text{hour}}$) at 10 metres from the nearside kerb as defined in the CRTN. The predictions incorporate the AADT vehicle flows and the proportion of heavy vehicles, as provided by Tim Spencer & Co, along with the following assumptions:
- 50kph vehicle speed on all roads;
 - Zero gradient on all roads; and
 - Standard bituminous, impervious surface (e.g. hot rolled asphalt) on all roads.
- 13.2.111 One limitation of the CRTN methodology is that with the $L_{A10,T}$ being a statistical parameter, there is a minimum traffic flow required to generate valid levels. For the 18-hour period, this threshold is 1,000 vehicles. Where the vehicle flow is between 1,000 and 4,000 a low flow correction has been added in accordance with the CRTN methodology. Where flows are below this level (as is the case for some of the road links considered) no prediction has been made, although it would be reasonable to assume in such instances that road traffic noise would not be particularly significant.

Operational Noise from Fixed Plant

- 13.2.112 At this stage in the scheme design, no information regarding the proposed plant types and locations has been assessed – this will be determined during the detailed design stages. As a consequence, it is not possible to undertake meaningful predictions to determine the significance of the likely noise effect, so instead noise emission limits have been set that apply to activities covered by BS 4142, including external fixed plant.
- 13.2.113 Vanguardia Consulting is providing detailed design advice and, where necessary, will be specifying mitigation measures to achieve the recommended noise emission limits.

13.3 Baseline Conditions

- 13.3.1 The hourly measurement results are presented in Appendix 13.5. A summary of the results for each of the five unattended, continuous monitoring sites is given in the following table.

Table 13. 8: Summary of Unattended Free-field Noise Measurements (in dB)

Starting Date	L _{Aeq,16h} (07:00 to 23:00)	L _{Aeq,8h} (23:00 to 07:00)	Lowest L _{A90,1h} (07:00 to 23:00)	Lowest L _{A90,1h} (23:00 to 07:00)	Lowest L _{A90,5m} (23:00 to 07:00)
Location P1 (Park Lane at south west corner of stadium opposite Concorde House)					
Tuesday 11 November 2008	61.7*	58.2	54.7*	51.9	51.6
Wednesday 12 November 2008	65.6	61.2	56.7	56.6	56.5
Thursday 13 November 2008	63.7	58.4	54.9	52.5	52.3
Friday 14 November 2008	65.0	61.3	55.3	52.9	52.4
Saturday 15 November 2008	61.3	59.8	53.8	52.6	52.3
Sunday 16 November 2008	63.0	58.5	53.1	52.6	52.3
Monday 17 November 2008	62.5*	-	55.1*	-	-
Location P2 (748 High Road front façade)					
Tuesday 11 November 2008	74.3*	70.7	58.2*	45.2	40.4
Wednesday 12 November 2008	75.8	70.8	60.0	45.9	42.8
Thursday 13 November 2008	75.0	71.2	58.8	47.5	42.1
Friday 14 November 2008	74.0	74.2	60.6	53.6	45.1
Saturday 15 November 2008	73.9	73.0	55.6	53.4	44.7
Sunday 16 November 2008	74.5	71.5	54.3	45.7	42.7
Monday 17 November 2008	74.8*	-	59.3*	-	-
Location P3 (Forecourt of Unit 9, 12-48 Northumberland Park opposite 38 Northumberland Park)					
Tuesday 11 November 2008	67.7*	-	51.6*	-	-
Wednesday 19 November 2008	68.2†	62.6	47.7†	41.2	39.9
Thursday 20 November 2008	66.6	62.1	46.1	40.1	38.8
Friday 21 November 2008	67.3	62.0	48.9	42.0	40.6
Saturday 22 November 2008	64.9	61.7	45.8	36.3	34.1
Sunday 23 November 2008	64.9	60.7	42.4	40.1	38.4
Monday 24 November 2008	66.6†	-	50.6†	-	-
Location P4 (41 Worcester Avenue, front façade)					
Tuesday 11 November 2008	55.6	55.7	51.5	50.3	48.7
Wednesday 12 November 2008	58.1	56.1	52.7	50.4	49.4
Thursday 13 November 2008	57.8	52.4	51.5	50.6	49.3
Friday 14 November 2008	71.7	59.6	51.6	50.7	48.8
Saturday 15 November 2008	56.3	57.7	51.6	50.5	48.9
Sunday 16 November 2008	56.8	53.1	50.8	50.3	49.6
Monday 17 November 2008	56.8	-	52.6	-	-
Location P5 (17 Worcester Avenue, rear façade)					
Friday 14 November 2008	48.7	46.0	41.9	39.1	38.3
Saturday 15 November 2008	50.5	49.9	43.0	38.1	37.4
Sunday 16 November 2008	51.3	48.7	40.9	41.5	40.2
Monday 17 November 2008	53.6	-	48.1	-	-

Notes: *The daytime (07:00 to 23:00) data for Tuesday 11 November and Monday 17 November 2008 are only for 5 hours and 2 hours periods respectively.

† The daytime (07:00 to 23:00) data for Wednesday 19 November and Monday 24 November 2008 are only for 5 hour and 7 hour periods respectively.

- 13.3.2 The dominant influence on all of the long term unattended measurement locations was road traffic noise although at several locations background noise levels were determined by the noise of fixed plant at the existing stadium or other commercial/industrial sources in the vicinity of a particular location.
- 13.3.3 At location P1, on the flat roof of the building at the southwest corner of the stadium, whilst noise from fans on that corner of the stadium and from the pitch heating plant exhaust trunking on the roof of the building used were apparent at the time of installation it was anticipated that these would not be running constantly. In fact, it appears that the plant did operate intermittently but judged by the constancy of the lowest $L_{A90,1h}$ and $L_{A90,5m}$ background noise levels recorded in Table 13. 8 there may always have been at least one item running by day and by night. The ambient noise levels measured were always well above the background $L_{A90,1h}$ but for those $L_{Aeq,T}$ that were within 10dB of the background noise level there will have been a contribution to the ambient noise level from that fixed plant. For that reason and to ensure that the site suitability assessment is accurate, an attended measurement of three consecutive $L_{Aeq,1h}$ (the shortened measurement procedure of CRTN) was made on Park Lane at a location screened from the stadium plant noise. Table 13. 9 presents the results of that measurement and the $L_{Aeq,16h}$ that was derived from these using the procedures set out in CRTN and the Transport Research Laboratory (TRL) Document *Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping*.

Table 13. 9: Summary of Attended CRTN Measurements below Location P1 on Park Lane

Time Period	$L_{A10,T}$ (dB)	$L_{Aeq,1h}$ (dB)	$L_{A90,1h}$ (dB)
14:00 – 15:00	65.2	62.6	53.3
15:00 – 16:00*	67.2	68.9*	53.4
16:00 – 17:00	67.2	65.7	52.4
Arithmetic mean of $L_{A10,1h}$	66.5		
Conversion to $L_{A10,18h}$	65.5		
Conversion to $L_{Aeq,16h}$	63.1		

Notes: The $L_{A10,18h}$ is calculated in accordance with the shortened measurement procedure of CRTN as the arithmetic mean of the three $L_{A10,1h}$ measured during the survey on Park Lane -1dB. That figure is then converted to an $L_{Aeq,16h}$ using the conversions in the TRL document.

* The $L_{Aeq,1h}$ between 15:00 and 16:00 was influenced by the noise of passing school children.

- 13.3.4 The calculated $L_{Aeq,16h}$ noise level in Table 13. 9 agrees very closely with those measured on the weekdays at location P1 and demonstrates that these are reliable for use in the site suitability assessment.
- 13.3.5 Location P2 was located overlooking High Road and the noise levels there were very consistent from day to day, as is to be expected with a heavily trafficked road.
- 13.3.6 Measurements at location P3 were disrupted by a cable fault which was not discovered until the equipment was retrieved on 17 November 2008. The repeat survey conducted between Wednesday 19 November and Monday 24 November 2008 again showed the consistency to be expected of ambient noise dominated by road traffic. The background noise levels at this location, being further from High Road than locations P1 and P2, were significantly lower than at either of those.
- 13.3.7 The results for location P4 in Table 13. 8 demonstrate the effect on the $L_{A90,T}$ background noise levels there of constant fan noise from the north stand of the existing stadium. The atypical $L_{Aeq,16h}$ result for Friday 14 November 2008 was influenced by two very high noise level events of unknown origin occurring

between 10:41 and 10:46 ($L_{Aeq,280s}$ of 93.7 dB) and the second event between 12:57 and 13:10 ($L_{Aeq,760s}$ of 81.4 dB). Both events appear to have been very local to the microphone position as they are not present in the time histories of the other locations. The data gathered on Friday 14th November 2008 at P4 have, therefore, not been used further in this assessment.

- 13.3.8 Location P5 was used as a proxy for the rear of Worcester Avenue houses in the area. Consequently these are some of the lowest ambient and background noise levels recorded during the survey. This is to be expected for a situation in which road traffic noise from Northumberland Park is partially screened by properties on the south side of that road and there is screening by the terrace from plant noise from the stadium and commercial/industrial areas to the west and south west.
- 13.3.9 Results from the two sound level meters installed within the stadium during the match on 12 November 2008 are described in detail in Appendix 13.6. A significant point to note from those is that there is a clear difference between the noise level at the two positions when the goal scored is by the visiting team (the fourth and sixth goals) where the measured level at the mid-tier location in the west stand (S7) was approximately 9 dB less than at the south west corner (S6). Except for lulls during the interval and the cheers for full time, the noise levels at the southwest corner location were invariably higher than at the mid-tier location in the west stand.
- 13.3.10 The remaining measurement locations were used for attended measurements of relatively short duration outside the stadium during the match. A commentary on these is provided in the tabulated results at Appendices 13.7 and 13.8. It is noteworthy that the difference between results following a goal measured close to the stadium and further away at 41 Worcester Avenue is only about 3 dB (e.g. the difference between locations R17 and P4 for the first and second goals) or 6 dB taking into account the fact that the latter position was 1m in front of a reflective façade. An analysis of this is provided in Appendix 13.9 with further numerical analysis of the remaining five goals.
- 13.3.11 Measurement location R11 in front of 30 Park Lane (approximately 20m from the south stand) was where the highest noise level immediately following a goal was recorded. The free-field noise level measured there was 75.8 dB $L_{Aeq,30s}$ for a home team goal. The next highest level following a goal was measured at location R12, another free-field measurement made on the south side of Park Lane in the junction with Lancaster Close. The noise level at that position was 74.7 dB $L_{Aeq,30s}$ for an away team goal. At 41 Worcester Park (location P4) the same home team goal was measured at 66.3 dB $L_{Aeq,30s}$.
- 13.3.12 The sixth goal measured simultaneously at the location in front of 16 Bromley Road (location R10) and at 41 Worcester Avenue (location P4) is 1.4 dB less at the Bromley Road location than at the Worcester Road one, or 1.6 dB more if allowance is made for the latter being a façade level measurement. The distance of the 16 Bromley Road location from the south stand, at 105m, is the same as the minimum distance between 41 Worcester Avenue and the north stand although the latter has a more direct and open view of the stadium.
- 13.3.13 Ordinarily one might expect the noise level to reduce at a rate of 6 dB per doubling of distance but in this case there are two particular factors that tend to reduce the decay rate of sound arising within the stadium as the distance from it increases. The stadium structure is so large that for crowd noise at least, it is likely to be behaving as a plane source (see Appendix 13.1) and therefore the measurements in the near vicinity are within the near field where the decay rate with distance will be less. Additionally there is likely to be some effect from sound breakout through the opening in the roof of the stadium above the pitch

which will be more significant for receptors at a distance from the stadium where they might have a line of sight to the top of the stadium roof.

- 13.3.14 In the case of the noise of spectators making their way to and from the stadium on foot, the noise source grows and declines fairly steadily over periods typically of the order of 45 minutes for the arrival and 15 minutes for the dispersal of pedestrians using the main routes to the public transport links. This is based upon the noise measurement time histories and direct observations of spectators leaving the evening match at White Hart Lane on 12 November 2008. An exception to this was on Park Road in the vicinity of the away supporters entrances to the south stand where entry to and exit from the stadium was much slower than for home supporters in other stands. There the pre-match build up was more like 1 hour 15 minutes and the dispersal a period of 30 minutes.

13.4 Inherent Design Mitigation

- 13.4.1 Vanguardia Consulting has been commissioned to undertake the acoustic detailed design work for the stadium. Its RIBA Stage E report has built the following design mitigation measures into the stadium design:

- Stadium roof envelope to achieve a minimum sound insulation of 30 dB R_w with the polycarbonate section providing a minimum sound insulation of 20 dB R_w .
- Enclosure of the upper bowl – relevant sections of the glazed curtain walling to provide sound insulation of 30 dB R_w .
- Enclosing the upper tier to the south of the stadium so that there are no gaps around the upper edge of the stadium and the continuation of the roof shall connect to the vertical bowl façade. Minimum sound insulation of the stadium façade should be 20 dB R_w excluding areas of corporate activities (see below).
- Minimum sound insulation for glazing for corporate and conference areas on Levels 02, 03, 04 and 09a re set out below:
 - Level 02 boxes – 39 dB R_w
 - Level 03 corporate – 39 dB R_w
 - Level 04 boxes – 39 dB R_w
 - Level 04 control room – 45 dB R_w
 - Level 04 studios – 45 dB R_w
 - Level 09 Sky lounges – 39 dB R_w
 - Level 09 Sky bridge – 50 dB R_w

13.5 Potential Environmental Impacts and Effects

- 13.5.1 In accordance with the noise and vibration section of the scoping report informally submitted to Haringey Council, this chapter of the ES considers effects during the construction and operational stages of the Project, as detailed below.
- the noise and vibration effects during the construction phase on existing sensitive receptors close to the Project;
 - the effects of operational road traffic noise on the existing road network;
 - the effects of match day noise levels on the existing receptors close to the site;
 - the effects of non-football event noise levels on the existing receptors close to the site; and

- the noise effects of the proposed external fixed plant items on existing receptors close to the site insofar as setting a cumulative noise emission limit for external plant for use at the detailed design stage.

13.5.2 The assessment of the suitability of the site for residential development has been undertaken separately and is set out in Section 13.8 below.

Construction

Noise

- 13.5.3 It is inevitable with any development that there will be some disturbance caused to those nearby during the site clearance and construction phases. However, disruption due to construction is a localised phenomenon and temporary in nature. In general, only people living within approximately 100m of the site are likely to be significantly affected by construction noise.
- 13.5.4 The techniques available to predict the likely noise and vibration effects from site preparation and construction operations, such as those contained within BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 respectively (see Appendix 13.2), necessarily are based on quite detailed information on the type and number of plant being used, their location and the length of time they are in operation. Although such detail is not available at this stage of the development process, an estimate of the likely effects of noise and vibration from the site clearance and construction phases has been made for those receptors closest to each key area of work.
- 13.5.5 The predictions, based on generic plant and WSP's experience of similar developments and using the methodology contained within BS 5228, are in terms of the $L_{Aeq,T}$ noise level over the core working day. The predictions are a 'worst case' in that it is assumed that any mitigation measures (such as those identified later in this chapter e.g. Goods Yard) have not been implemented. Both 'worst case' and 'average case' scenarios have been considered assuming that the works are being undertaken at the closest point of the relevant area of the site to each receptor, and at the mid point of the area of works, respectively.
- 13.5.6 The construction programme assumes a 12 hour working day and a seven day working week. If the construction programme follows Haringey Council's standard construction hours (Monday to Friday 08:00 to 18:00 hours and Saturday 08:00 to 13:00 hours) the programme will be extended by one year.
- 13.5.7 Table 13. 10 below sets out the approximate programme considering a 12 hour working day and a seven day working week.

Table 13. 10: Approximate Phasing of Construction Works

Stage	Works	Anticipated Duration
Phase 1 – Stadium Phase (A)		
1a	Ground excavation and remediation	September 2015 to October 2015
1b	Piling	March 2015 to February 2016
1c	Stadium construction (northern section) and north-east building	March 2016 to February 2018
1d	Demolition of existing stadium	May 2017 to October 2017
Phase 2 – Stadium Phase (B)		

2a	Ground excavation and remediation	May 2017 to September 2017
2b	Piling	June 2017 to October 2017
2c	Stadium construction (southern section)	May 2017 to August 2018
Phase 3 – Mixed-use Phase		
3a	Ground excavation and remediation	May 2017 to January 2019
3b	Piling	August 2018 to July 2019
3c	Construction of hotel, THFC experience and residential	January 2018 to 2022

- 13.5.8 The expected plant and associated sound power levels assumed for the predictions are given in the table below along with the reference to the origin of this source information from Annexes C and D of BS 5228-1:2009+A1:2014.

Table 13. 11: Construction Plant Noise Levels

Plant	Data Source	L _{WA} (dB) (each item)	% On Time of 10-Hour Day (each item)
Phase 1d – Demolition			
2 no. 360° excavators	BS 5228 - D.3/40	108	80
1 no. breaker mounted on excavator	BS 5228 - C.1/3	108	60
2 no. tracked crushers	BS 5228 - C.1/15	112	70
1 no. roller	BS 5228 - C.2/37	107	10
1 no. dozer	BS 5228 - C.2/10	108	70
20 no. lorries removing material	BS 5228 - C.2/34	108	2
Phases 1a, 2a and 3a – Site Preparation			
2 no. 360° excavators	BS 5228 - D.3/40	108	70
2 no. dumper lorries tipping	BS 5228 - C.2/30	107	50
1 no. grader	BS 5228 - D.3/75	112	10
1 no. roller	BS 5228 - C.2/37	107	10
Phases 1b, 2b and 3b – Piling/Foundation Works			
2 no. auger piling rigs	BS 5228 - C.3/21	107	50
2 no. 360° excavators	BS 5228 - D.3/40	108	50
1 no. dumper lorry tipping	BS 5228 - C.2/30	107	10
1 no. concrete mixer truck discharging	BS 5228 - C.4/18	103	10
1 no. concrete batching plant	BS 5228 – D6.10	106	50
Phases 1c, 2c and 3c – Construction			
1 no. tower crane	BS 5228 - C.4/48	104	30
1 no. concrete mixer truck idling	BS 5228 - C.4/19	99	10
1 no. concrete mixer + concrete pump	BS 5228 - C.4/32	106	30
2 no. forklift trucks	BS 5228 - D.7/93	104	30
20 no. hammering	BS 5228 - D.7/80	107	2
1 no. scaffolding erection/dismantling	BS 5288 - D.7/1	108	20
10 no. lorries delivering materials	BS 5228 - C.2/34	108	2

Notes: BS 5228 data from Annexes C and D to BS 5228-1:2009+A1:2014.

"% On-Time" is the percentage of the working day over which the plant is assumed to be operating.

13.5.9 For the purpose of these predictions, it is assumed that the intervening ground between the construction noise sources and the noise-sensitive properties, for both the 'worst case' and 'average case' scenarios, will be acoustically hard such that there is no significant attenuation of sound due to ground absorption.

13.5.10 The predictions are undertaken for the following groups of noise-sensitive receptors :

- Worcester Road (No. 41 used as the closest existing dwellings to the works);
- Schools on Worcester Road (in each instance the school closest to each phase has been assessed);
- Park Lane (no. 32 used as the closest existing dwelling to the works); and
- High Road (No. 741 used as the closest existing dwelling to the works).

Based on the programme, activities and plant described above, the predicted noise levels are given in Table 13. 12 (worst case) and

13.5.11 Table 13. 13 (average case).

Table 13. 12 Predicted Worst Case Construction Noise Levels – Façade $L_{Aeq,T}$ dB

Location of Nearest Receptors	Activity	*Predicted Noise Level, dB $L_{Aeq,T}$		
		Phase 1	Phase 2	Phase 3
Worcester Avenue (dwellings)	Demolition	71	-	-
	Site Prep	73	65	60
	Piling and foundations	72	64	59
	Construction	70	62	57
Worcester Avenue (schools)	Demolition	81	-	-
	Site Prep	74	75	75
	Piling and foundations	73	74	74
	Construction	71	72	72
Park Lane	Demolition	82	-	-
	Site Prep	60	64	76
	Piling and foundations	60	64	77
	Construction	57	62	75
High Road	Demolition	72	-	-
	Site Prep	75	76	68
	Piling and foundations	74	76	67
	Construction	72	73	65

*Time interval (T) is for either a 10 hour working day or a 12 hour working day.

Table 13. 13: Predicted Average Case Construction Noise Levels – Façade $L_{Aeq,T}$, dB

Location of Nearest Receptors	Activity	*Predicted Noise Level, dB $L_{Aeq,T}$		
		Phase 1	Phase 2	Phase 3
Worcester Avenue (dwellings)	Demolition	65	-	-
	Site Prep	64	61	58
	Piling and foundations	63	60	57
	Construction	61	58	55
Worcester Avenue (schools)	Demolition	71	-	-
	Site Prep	65	64	65
	Piling and foundations	65	63	64
	Construction	63	61	62
Park Lane	Demolition	72	-	-
	Site Prep	59	62	70
	Piling and foundations	58	64	69
	Construction	59	60	67
High Road	Demolition	66	-	-
	Site Prep	64	64	61
	Piling and foundations	63	64	61
	Construction	61	62	59

*Time interval (T) is for either a 10 hour working day or a 12 hour working day.

- 13.5.12 It can be seen from Table 13. 12 that the predicted worst case noise levels at some of the nearest properties to the site could exceed 75dB $L_{Aeq,T}$ during the demolition, site preparation and/or piling and foundation phases. In accordance with the criteria adopted for this assessment, as set out at previously, the effect on the associated residents, prior to mitigation, could be significant. During core construction site hours, there is likely to be a direct, temporary negative effect of negligible to major significance on some of the nearest dwellings, prior to the implementation of mitigation measures. If these works were to be undertaken during the extended working hours (Saturday 13:00 to 18:00 hours and Sunday 08:00 to 18:00 hours) there is likely to also be a direct, temporary, negative effect of negligible to major significance.

However,

- 13.5.13 Table 13. 13 demonstrates that the predicted average case noise levels are below the 75dB $L_{Aeq,T}$ limit, indicating that during core construction site hours for the majority of the time there is likely to be no more than a direct, temporary, effect of moderate negative significance, prior to the implementation of mitigation measures. If these works were to be undertaken during the extended working hours there is likely to be a direct, temporary, negative effect of negligible to major significance.
- 13.5.14 Construction traffic will approach the site from the north via the A406 North Circular and High Road. During the worst-case month of construction, there will be 98 trips made by construction vehicles per day. On these already highly trafficked roads this will result in an increase of approximately 0.2 dB. This will result in a direct, short-term negligible impact.

Vibration

- 13.5.15 For the purposes of calculating the vibration impact from the site preparation and construction works, measurement data have been taken from BS 5228-2:2009+A1:2014 and from measurements undertaken by WSP at other sites. The measurement data obtained from BS 5228-2:2009+A1:2014 relate to augured piling operations, whilst the measurement data obtained by WSP relate also to the use of pneumatic breakers deployed for the removal of concrete hardstanding and the demolition of structures during the preparation of other sites.
- 13.5.16 The predictions are undertaken for the same receptors as considered in the construction noise predictions. Potentially auger piling could be required, whilst pneumatic breakers are likely to be used during demolition.
- 13.5.17 The predicted maximum levels of vibration at each of the vibration-sensitive receptors are detailed in Table 13. 14. The predicted vibration levels are those that would occur when the works are being undertaken at the closest point to each of the sensitive receptors and, therefore, represent a worst case scenario.

Table 13. 14: Predicted PPV Vibration Levels on Internal Floors

Location of Nearest Receptors	Predicted PPV, mm/s			
	Large Pneumatic Breaker		Auger piling	
	Demolition	Phase 1b	Phase 2b	Phase 3b
Worcester Avenue (dwellings)	0.25	0.67	0.14	0.09
Worcester Avenue (schools)	0.71	0.40	0.40	0.44
Park Lane	1.25	0.10	0.21	1.00
High Road	0.25	0.20	0.20	0.14

- 13.5.18 Comparing the above levels with the criteria presented in Table 13. 5 it can be seen that, with the exception of Park Lane during demolition, only a minor negative effect or less on the receptors/ occupants has been predicted. At Park Lane a moderate negative effects has been predicted. Therefore as a worst case at Park Lane there will potentially be a direct, temporary, moderate negative effect. At other receptors there will be a direct, temporary negligible to minor negative effect.
- 13.5.19 However, the above predictions assume that the operations are at the areas of the Project Site closest to the receptors and do not represent the conditions that will prevail for the majority of the works. The activities at the assumed distances are likely to be of a relatively short duration.
- 13.5.20 Based on the vibration limits presented in Appendix 13.2, the effect of the works on any buildings (as opposed to the occupants) will be negligible, being very much below the lowest levels at which even cosmetic building damage might be expected.

Occupation

Operational Road Traffic Noise

- 13.5.21 Using traffic flow data provided for the TA the changes in road traffic noise level on each of the road links modelled for the transport assessment have been predicted as described above.
- 13.5.22 The results for the change in the Annual Average Daily Traffic (AADT) flows between the baseline year of

2015 and the year 2018 with the Project are summarised in Table 13. 15. The assessment for the baseline year of 2015 and the year 2021 with the Project are summarised in

13.5.23 Table 13. 16.

Table 13. 15: Predicted Changes in Road Traffic Noise BNL between AADT 2015 Baseline and Baseline including 2018 Proposed Development.

1. White Hart Lane, just west of A1010 High Road	0
2. White Hart Lane, just west of Fenton Road	0
3. A1010 High Road, just south of White Hart Lane	0
4. A10 High Road, just south of Bruce Grove	0
4A. A10 High Road, just south of Monument Way	0
6. A1010 High Road, just south of Park Lane	0
7. Northumberland Park, between Worcester Avenue and Bennetts Close - east of Sainsbury	0
10. A1010 High Road, just south of Brantwood Road	0
11. A1010 Fore Street, just south of A406	0
12. Lordship Lane, just west of A1010 High Road	0
15. White Hart Lane, just east of the A10 Great Cambridge Road	0
16. Leaside Road, just east of Willoughby Lane	0

Table 13. 16: Predicted Changes in Road Traffic Noise BNL between AADT 2015 Baseline and Baseline including 2021 Proposed Development

Link/Description	Change in BNL dB(A)
1. White Hart Lane, just west of A1010 High Road	0
2. White Hart Lane, just west of Fenton Road	0
3. A1010 High Road, just south of White Hart Lane	+0.1
4. A10 High Road, just south of Bruce Grove	0
4A. A10 High Road, just south of Monument Way	0
6. A1010 High Road, just south of Park Lane	+0.1
7. Northumberland Park, between Worcester Avenue and Bennetts Close - east of Sainsbury	0
10. A1010 High Road, just south of Brantwood Road	+0.1
11. A1010 Fore Street, just south of A406	0
12. Lordship Lane, just west of A1010 High Road	0
15. White Hart Lane, just east of the A10 Great Cambridge Road	0
16. Leaside Road, just east of Willoughby Lane	0

13.5.24 Comparing the changes in road traffic noise levels between the 2015 Baseline and 2018 baseline plus development with the assessment criteria in Table 13. 6 shows that there will be a direct, permanent negligible impact on all road links.

13.5.25 Comparing the changes in road traffic noise levels between the 2015 Baseline and 2021 baseline plus development with the assessment criteria in Table 13. 6 also shows that there will be a direct, permanent

negligible impact on all road links.

- 13.5.26 As stated in paragraph 13.2.111, it is not possible to undertake predictions for road links where flows are below the CRTN threshold. This is the case for the following three road links:
- Park Lane, just east of A1010 High Street;
 - Worcester Avenue, just north of Park Lane; and
 - Worcester Avenue, just south of Northumberland Park.
- 13.5.27 At Park Lane the AADT flows show that there is an increase in flows between the baseline and 2018 and 2021 scenarios. There is an increase of 45% between the baseline and 2021. However, the flows do not consider the restrictions on car movements to the proposed residential and hotel developments on match-days which will result in a decrease in the impact.
- 13.5.28 Similarly, at Worcester Road just north of Park Lane there is likely to be an increase in flows between the baseline and 2021 (worst-case) of 132%. For the reasons stated above, it is likely that there will be a reduction in the impact.
- 13.5.29 For Park Lane and Worcester Road (just north of Park Lane), there is likely to be a direct, permanent, minor negative (insignificant) impact.
- 13.5.30 There will be no increase in traffic flows on Worcester Avenue south of Northumberland Park. As such, there will be a direct, permanent negligible impact.

Football Matches

- 13.5.31 The capacity of the current White Hart Lane stadium is 36,000 and the capacity of the stadium approved in the extant permission is 56,250. The capacity of the proposed stadium is 61,100. Based simply on the increased number of spectators, the noise that they create within the stadium would be expected to increase by 0.4dB when comparing the proposed development with the extant permission and 2.3dB when comparing the proposed development with the existing stadium. This can be taken as representing the worst case increase in the crowd noise source, the aspect that is most difficult to control other than by means of the stadium structure. A similar assumption can be made for the noise from supporters making their way to the stadium on foot on the major routes between the stations and the ground for which the proportional change in numbers has been assumed to be similar to that of the increase in stadium capacity.
- 13.5.32 During a typical season there are 26 matches played in the stadium. Additionally it is proposed that there will up to 16 non-football events in the stadium annually and these have been assumed to include up to six concert events for the purpose of assessment under the Noise Council's Code of Practice on Environmental Noise Control at Concerts (see the following section).
- 13.5.33 Except for the tunnel at the southeast corner of the existing stadium and the open roof above the pitch, the existing stadium provides a total enclosure of the ground. The southeast corner is a home supporters area and therefore one of the noisiest parts of the existing stadium. The tunnel provides a direct line of sight from Park Lane into the stadium although not to the pitch itself.
- 13.5.34 The proposed new stadium will provide a complete bowl around the pitch but with its centre relocated

approximately 110m to the north of the existing stadium. This will place it further from properties to the south where existing houses on the south side of Park Lane for example are currently within approximately 20m of the south stand but would be approximately 100m from the closest point of the proposed stadium.

- 13.5.35 As far as effects on the existing properties on the south side of Park Lane are concerned, the proposed THFC Foundation/hotel/residential development will have a beneficial impact as a result of the greater distance separation and physical screening from the proposed new stadium that this part of the Project will introduce. The reduction in match day noise levels at existing Park Lane houses due to relocation of the stadium will be of the order of 9 dB(A) when comparing the existing stadium with the extant and proposed stadia based on the measured data and the analysis set out in Appendix 13.9. Assuming up to a further 5 dB(A) attenuation due to the screening afforded by the intervening proposed commercial/residential development the combined effect will be to more than halve the loudness of noise heard there following a goal for example.
- 13.5.36 The potential impact of football matches and other events held within the stadium has been assessed mainly on the basis of the noise level measurements made during the Tottenham Hotspur -v- Liverpool Carling Cup match played on the evening of Wednesday 12 November 2008. Detailed results and commentary for the measurements made at locations S6 and S7 inside the stadium are presented in Appendix 13.6 and those for external measurement locations R8 to R21 in Appendices 13.7 and 13.8.
- 13.5.37 Based on the immediate post goal noise levels reported in paragraph 13.3.10 it is anticipated that the noise levels experienced at 30 Park Lane and 41 Worcester Avenue effectively will be reversed with properties in Park Lane and side roads off it seeing a beneficial change of at least approximately 8.5 dB(A) and those in Worcester Avenue seeing a negative change of about the same value. These changes would rate as major positive and negative impacts respectively, but will be confined to specific 'events' occurring during matches rather than necessarily to the general ambient noise at those times.
- 13.5.38 There are also a number of residential properties on the east side of High Road that may experience smaller increases in noise as a result of the proposed stadium being closer to them. 30 Park Lane effectively serves as a proxy assessment location for a significantly greater number of properties than does 41 Worcester Avenue because of the alignment and relative position of these roads with respect to both the existing and the proposed stadia. To that extent, although any change may be unwelcome to residents in Worcester Avenue, the corresponding benefit to residents in Park Lane, Bromley Road and Lancaster Close for example will be more widely felt. The properties on Park Lane within 25m of the south stand of the current stadium include the east half of Concorde House (comprising 22 flats in the entire block), number 1 Lancaster Place, and the even numbers from 28 to 56 Park Lane of which 14 are residential or have residential accommodation above a ground floor commercial premises. On Worcester Avenue, within a similar distance of the proposed stadium, there are only three houses. Within 100m of the existing south stand there is approximately 100 residences compared with approximately 40 within a similar distance of the north east corner of the proposed stadium. It is anticipated that the structure of the new stadium will afford greater sound insulation resulting in less noise break-out to residential areas although this has not been assumed in the predictions made in paragraph 13.5.37 above.
- 13.5.39 Currently the main noise sources associated with the stadium on non-match days include:
- Fixed plant noise, mainly fans serving kitchen extracts air cooling units and the under pitch heating

system;

- Visits by service vehicles making deliveries or collecting refuse, etc.

13.5.40 On match days, because of the existence of the Controlled Parking Zone, vehicular traffic in the immediate vicinity of the stadium assumes less significance than the following:

- Home supporters making their way to the stadium on foot from local stations and bus stops;
- Away supporters congregating in the vicinity of the entrances to their areas of the South Stand;
- Fixed plant noise, mainly fans serving kitchen extracts air cooling units;
- Temporary vendor stalls in the front garden of properties on the south side of Park Lane and other locations beside the stadium in Worcester Avenue and Paxton Road;
- TV outside broadcast vehicles and Police horse boxes with generator sets parked in the car/lorry park and in Worcester Avenue north of the stadium;
- Crowd noise from within the stadium, particularly following a goal when PA noise also is evident; and
- Rhythmic drumming on the profiled steel cladding of upper stand sections of the north and south stands following a goal.

13.5.41 As can be seen in paragraph 13.5.31 the worst-case increase in noise levels during football matches will be in the order of 0.4dB when comparing the proposed development with the extant permission and 2.3 dB when comparing the existing and proposed stadia. When making this similar assumption in terms of noise from supporters, a direct, permanent effect of negligible significance would result at existing receptors during football matches when comparing the extant permission and the proposed development. A direct, permanent minor negative (insignificant) effect is likely when comparing the existing and proposed development.

Music Concert and NFL Noise

13.5.42 The project includes use of the stadium for up to 16 non-football related events each calendar year. There will all be up to six concerts per year and up to ten major sports events per year with a minimum of two NFL games.

13.5.43 As discussed above it is recommended that for the use of the stadium for 16 non-football related events each year the absolute noise level limit of $L_{Aeq,15m}$ 75 dB should be adopted.

Music Concert Noise

13.5.44 In order to assess the impact of concerts held within the stadium a computer generated model has been constructed by Vanguardia to predict off site noise levels. The predicted levels have been provided to WSP in spreadsheet format and are summarised below for the existing receptors close to the site.

Table 13.17: Predicted Off-site Music Noise Levels at Existing Dwellings

Location	Predicted Music Noise Levels ($L_{Aeq,15m}$)
Park Lane	68 dB
Northumberland Park	60 dB
Worcester Avenue	67 dB
High Road	73 dB

13.5.45 The results of the modelling of concert noise have been plotted as a map with noise level contours at 1.8m above the height of the south podium (i.e. approximately 7.4m above ground level on Park Lane)

and this is reproduced in Appendix 13.10. It can be seen that generally the noise is well contained.

13.5.46 The predicted noise levels at existing receptors meet the criterion of 75 dB L_{Aeq} and so no mitigation measures are considered necessary.

13.5.47 It is considered that a direct, temporary, effect of negligible to minor negative significance would result at existing receptors during concerts.

13.5.48 Major Sporting Event Noise Levels

13.5.49 There will be up to ten major sporting events with a minimum of two NFL games. Noise levels during the NFL games have been predicted by Vanguardia, as set out below.

Table 13. 18: Predicted Off-site NFL Levels at Existing Dwellings

Location	Predicted NFL Noise Levels ($L_{Aeq,event}$)
Park Lane	51 dB
Northumberland Park	46 dB
Worcester Avenue	54 dB
High Road	64 dB

13.5.50 With the exception of Worcester Avenue, the predicted noise levels during NFL games are at least 10 dB below the lowest daytime $L_{Aeq,16hour}$ noise levels shown in Table 13. 8. At Worcester Avenue the predicted NFL noise levels are between 2 and 10 dB lower than the existing daytime $L_{Aeq,16hour}$ noise levels. It is therefore possible that NFL games will be audible at the existing dwellings on Worcester Avenue. However, Vanguardia has predicted that the NFL noise levels at each receptor will be at least 10 dB lower than noise levels during concerts.

13.5.51 The NFL matches meet the target criterion of 75 dB $L_{Aeq,event}$ and so no mitigation is considered necessary.

13.5.52 It is considered that a direct, temporary, effect of negligible to minor negative significance would result at existing receptors during NFL games.

13.5.53 External Fixed Plant Noise

13.5.54 The exact locations of external plant and indeed the type and number have not been finalised at this stage. It is, therefore, appropriate to set a performance standard for cumulative plant noise from the proposed development. Please note that the performance standard below relates to all noise sources controlled by BS 4142as set out in paragraph 13.2.92 above.

Table 13. 19: Cumulative Fixed Plant Noise Control Limit at Receptor

Noise Sensitive Receptor	$L_{Ar,1h}$ (dB) 07:00 - 23:00 Hours	$L_{Ar,5m}$ (dB) 23:00 - 07:00 Hours
Park Lane	53 ¹	45 ²
Northumberland Park	42 ¹	45 ²
Worcester Avenue	51 ¹	45 ²
High Road	54 ¹	45 ²

Notes 1 From minimum $L_{A90,T}$ in Table 13. 8.

2 From WHO Guidelines maximum $L_{Aeq,8h}$ outside a bedroom with window open (Appendix 13.2)

13.5.55 Note that the above limits are set as rating levels – see Appendix 13.2.

13.6 Additional Mitigation, Compensation and Enhancement Measures

Construction Noise

- 13.6.1 The assessment has found that the noise impacts during the construction works may be significant when taking place in close proximity to existing noise sensitive properties. It will therefore be necessary to consider the available measures to reduce the levels of noise that will arise during the works.
- 13.6.2 The mitigation measures for construction noise recommended in this chapter will be incorporated within a comprehensive Construction Environmental Management Plan (CEMP) for the project.
- 13.6.3 Several legislative safeguards exist to minimise the effects of construction noise and would be applicable during the construction of the proposed development. These safeguards include:
- The various EC Directives and UK Statutory Instruments that limit the noise emissions of a variety of construction plant; and
 - The powers that exist for local authorities under Sections 60 of the Control of Pollution Act 1974 and Section 80 of the Environmental Protection Act 1990 to control noise (and vibration) on construction sites and statutory nuisance respectively.
- 13.6.4 The Considerate Constructors Scheme, details of which can be found at the web page www.considerateconstructorsscheme.org.uk, is a scheme under which registered sites are monitored by an experienced industry professional to assess their performance against the eight point Code of Considerate Practice which includes the categories: 'Considerate', 'Environment', 'Cleanliness', 'Good Neighbour', 'Respectful', 'Safe', 'Responsible' and 'Accountable.' The main contractor will be required to register the site under this scheme.
- 13.6.5 Contract documents supplied to contractors will require that the effects of environmental noise are considered during the design and execution of the works. Such an assessment will require a noise control plan that provides a noise management system tailored to the specific needs of the construction works, the site and the surrounding area. As a minimum, any noise control plan will cover:
- Procedures for ensuring compliance with statutory or other identified noise control limits;
 - Establishment of noise Action Levels (to be agreed with Haringey Council) above which consideration will be given to the use of alternative techniques and/or other means of reducing noise with the aim on ensuring that the Action Level (or below) is achieved. All practicable measures would be considered and implemented where appropriate together with additional consultation with the occupiers of potentially affected receptors;
 - Review of demolition and construction techniques, especially in response to exceedences of the Action Level and/or complaints;
 - Procedures for ensuring that all works are carried out according to the principle of "Best Practicable Means" as defined in the Control of Pollution Act 1974;
 - General induction training for site operatives and specific training for staff having responsibility for particular aspects of controlling noise from the site;
 - A monitoring / auditing programme; and
 - Liaison with Haringey Council and the local business community.

13.6.6 The adoption of Best Practicable Means is usually the most effective way of controlling noise from construction sites and should be enforced rigorously. In order to demonstrate the adoption of Best Practicable Means to control noise emission from the site, the following conditions and measures would be imposed on the construction works:

- Local hoarding, screens or barriers will be erected as necessary to shield particularly noisy activities;
- Contractors will be required to bring to the site and employ on the works only the most environmentally acceptable and quietly operating plant and equipment compatible with the safe and efficient execution of the works;
- Noise emitted by any plant item will be required not to exceed the limits quoted in either the relevant EC Directive or UK Statutory Instrument and will be required to be no greater than the relevant values quoted in the current version of BS 5228;
- All plant items will be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise;
- All plant will be sited so that the noise impact at nearby noise sensitive properties is minimised;
- All items of plant operating on the site in intermittent use will be shut down in the periods between use;
- Any compressors brought on to site will be silenced or sound reduced models fitted with acoustic enclosures;
- All pneumatic tools will be fitted with silencers or mufflers;
- The excavation of any existing structures will, wherever possible, be undertaken without the use of pneumatic breakers;
- Wherever possible, the use of hydraulic attachments or other means of crushing concrete and hard materials will be used in preference to pneumatic breakers. Where the use of impact breakers is necessary, their attachment to larger and heavier excavators often can reduce the level of vibration;
- Care will be taken when erecting or striking scaffolds to avoid impact noise from banging steel. All operatives undertaking such activities should be instructed on the importance of handling the scaffolds to reduce noise to a minimum;
- Care will be taken when unloading vehicles to minimise noise. Delivery vehicles should be routed so as to minimise disturbance to local residents and all vehicles to enter/exit the site during the working hours to be agreed with Haringey Council. Construction traffic routeing will be agreed with Haringey Council. Delivery vehicles should be prohibited from waiting on the highway or within the site with their engines running; and
- No radios or music will be permitted to be played on the site.

13.6.7 Problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach to relations with the local residents and businesses.

13.6.8 A large amount of the material excavated during the construction process will be reused on the site, including gravel and sand. There is the opportunity to use a close-by off-site location to process this material rather than sending it to a more remote location.

13.6.9 The off-site construction compound, known as Goods Yard, is on White Hart Lane to the north-west of the site. It is located to the east of White Hart Lane railway station and to the west of Peacock Industrial Estate.

- 13.6.10 Should planning permission be granted for the construction compound, it will act as a mitigation measure in that vehicles will not be required to transport excavated material to a remote location and then make the return journey to the site will be processed material. Instead, it will be the shorter trip to the Construction Compound.
- 13.6.11 Without the Construction Compound, the vehicles would use High Road and A406 North Circular.
- 13.6.12 The noise assessment submitted with the planning application for the Construction Compound assessed potential noise impacts from the operations within the site as well as those associated with off-site vehicle movements. The assessment concluded that during core working hours (08:00 to 18:00 Monday to Friday and 08:00 to 13:00 hours on Saturdays) there would be a negligible impact at all receptors assessed. During extended working hours (13:00 to 18:00 Saturdays and 08:00 to 18:00 Sundays) there is likely to be a negligible impact with the exception of Rivers Apartments Tower (to the north of the Construction Compound) during on-site operations and properties on White Hart Lane with respect to construction vehicles where a minor adverse (insignificant) impact has been predicted.
- 13.6.13 The assessment concluded that no significant noise-related impacts are expected to arise as a result of the operation of the Construction Compound. Please see Appendix 13.11 for the Construction Compound noise assessment.

Construction Vibration

- 13.6.14 As for noise, Best Practicable Means should be adopted – the mitigation measures set out in paragraphs 13.6.4 to 13.6.7 include those relevant to construction vibration. In particular, the means of demolishing the existing buildings and removal of areas of hardstanding that are close to existing dwellings should be given due consideration. Due to the lack of a detailed construction programme at this stage of the development process, it is not possible to determine the most suitable mitigation measures for vibration. However, it is likely that some vibration will be experienced at sensitive properties close to the site. In situations where the detailed construction programme enables these impacts to be determined more precisely, other measures may need to be in place, such as leaflet drops informing occupiers of the duration of the works and explaining that building damage is highly unlikely to occur. Vibration control measures will be incorporated within the CEMP for the project.
- 13.6.15 As building damage is highly unlikely, it is human disturbance resulting from vibration for which mitigation may be required. Liaising with the local community will be important as this type of vibration is generally less of an issue if residents can anticipate it. It may be that for vibration generating works, a “two hours on/two hours off” approach can be employed to allow residents respite. This may reduce the impact to direct, short-term minor negative (insignificant).

Operation

Operational Road Traffic Noise

- 13.6.16 The assessment of operational road traffic noise is a worst-case assessment and does not consider the restrictions on car movements to the proposed residential and hotel developments on match days. Furthermore, it does not consider the on-street parking restrictions enforced on match days. These will result in a decrease in the impacts stated in above with respect to Park Lane and Worcester Avenue. As such, no specific mitigation measures are considered necessary.

Stadium Noise

- 13.6.17 The noise levels during football matches, music concerts and NFL games are predicted by Vanguardia to meet the 75 dB $L_{Aeq,T}$ criterion at the existing receptors. As such, no mitigation measures are considered necessary. However, this is not to say that such events will not be audible. As such, it is anticipated that there will be a direct, long-term (although short in duration when they occur) negligible to minor negative (insignificant) impact.
- 13.6.18 However, the public address system and other such noise sources will be addressed at the detailed design stage with mitigation measures recommended, where necessary.
- 13.6.19 Notwithstanding the above, it is recommended that residents are notified prior to any non-football events such that they can anticipate an increase in noise level for a short period.

13.7 Assessment Summary and Residual Environmental Impacts and Effects

Construction

Construction Noise

- 13.7.1 Following implementation of the recommended mitigation measures, it is anticipated that at the closest existing noise sensitive properties the magnitude of impact could still be such that there may be a direct, temporary residual effect of moderate or even major negative significance on occasion. Accordingly, every effort should be made to keep noise levels to a minimum, with an emphasis on adopting Best Practicable Means and maintaining good communication between the various parties, i.e. the developers/contractors, Haringey Council and the occupants of the affected buildings.
- 13.7.2 At the majority of the existing receptors in the area, as opposed to the minority discussed above, the residual effect is likely to be negligible to minor negative and there will be no permanent effects.

Construction Vibration

- 13.7.3 Like noise, vibration impacts (on neighbouring occupants) during demolition works are inevitable, particularly when dwellings are in close proximity. Following implementation of mitigation measures that it is assumed would maintain levels of vibration below 1.06 mm/s, it is anticipated that the magnitude of impact will be such that at worst there may be a direct, temporary residual effect of moderate negative significance.
- 13.7.4 The impact on the fabric and structure of neighbouring buildings will be negligible, which means that there will be no permanent effects buildings.

Operation

Operational Road Traffic Noise

- 13.7.5 Due to negative growth in terms of baseline traffic and the context in which the operational road traffic noise assessment has been presented, it is anticipated that there will be mostly direct, permanent negligible impacts on the surrounding road network as a result of the proposed development.
- 13.7.6 At Park Lane and Worcester Avenue there is likely to be a direct, permanent minor negative (insignificant) effect.

Stadium Noise

- 13.7.7 There will be a direct, permanent, negligible to minor effect at existing receptors as a result of stadium noise.

External Fixed Plant Noise

- 13.7.8 Assuming that all plant can be designed to achieve the noise limits stated in Table 13. 19 there will be a direct, permanent, negligible effect.

Site Suitability Assessment

- 13.7.9 This section presents an assessment of the suitability of the site for residential development.
- 13.7.10 The baseline noise measurement results and the predicted future noise levels have been assessed against the target internal noise levels in BS 8233:2014 and the WHO *Guidelines for Community Noise*. The target noise levels are 35 dB $L_{Aeq,16h}$ for daytime habitable rooms and 30 dB $L_{Aeq,8h}$ and 45 dB L_{AFmax} for bedrooms.
- 13.7.11 The primary noise source affecting the proposed residential element in the south of the site is road traffic on Park Lane and Worcester Avenue. Additionally, whilst the stadium is in use, noise from football matches, concerts and NFL games will contribute to the noise climate.
- 13.7.12 During the baseline noise survey the road traffic noise levels from Park Lane and Worcester Avenue were measured at locations P1 and P4 respectively.
- 13.7.13 The highest log average weekday daytime $L_{Aeq,16h}$ at measurement location P1 was 66 dB and the night-time $L_{Aeq,8h}$ was 61 dB. At P4 the highest log average weekday daytime $L_{Aeq,16h}$ was 58 dB and the highest night-time $L_{Aeq,8h}$ was also 58 dB.
- 13.7.14 These data were gathered in 2008 and it is recognised that noise levels in the area may have changed a little since then. The results of the operational road traffic noise assessment have been drawn on to determine any changes in road traffic noise levels on Park Lane and Worcester Avenue since 2008. The operational road traffic noise assessment has concluded that any changes in noise levels are insignificant. On this basis the measured noise levels are considered appropriate for use in this assessment.
- 13.7.15 The approximate road traffic noise levels at the proposed residential towers are summarised in Table 13. 20 below.

Table 13. 20: Predicted Road Traffic Noise Levels at Proposed Residential Towers, dB

Proposed Residential Building	Facade	***Daytime $L_{Aeq,16h}$	***Night-time $L_{Aeq,8h}$	Typical *Night-time L_{AFmax}
Tower A	Eastern	58	56	73
Tower B	Eastern	58	56	73
	Southern	66	61	73
Tower C**	Eastern	49	47	54
	Southern	57	52	54
Tower D	Southern	66	61	73

*Predicted from the measured noise levels considering a moving point source

**Noise levels include corrections for distance and angle of view to the road.

***Daytime is from 07:00 to 23:00 hours and night-time from 23:00 to 07:00 hours.

- 13.7.16 Vanguardia has predicted noise levels at the proposed residential towers in the south of the site with respect to noise from the proposed stadium events. The highest of these noise levels are summarised in Table 13. 21 and in each instance is the noise level predicted at the northern façade of the proposed tower.

Table 13. 21: Highest Predicted Stadium Noise Levels at Proposed Residential Towers, dB

Proposed Residential Building (northern façade)	Concert Noise Level $L_{Aeq,15mins}$	Football Noise Level $L_{Aeq,Event}$	NFL Noise Level $L_{Aeq,Event}$
Tower A	78	69	70
Tower B	73	64	64
Tower C	81	68	69
Tower D	74	67	68

- 13.7.17 The noise levels in Table 13. 20 and Table 13. 21 set out the noise levels at the proposed facades with respect to road traffic and stadium noise respectively. These levels have been used to determine the generic sound insulation performance requirements for the glazing and the ventilation strategy.
- 13.7.18 The mitigation for the daytime (07:00 to 23:00 hours) habitable rooms of the residential towers have been derived considering the noise levels during concerts as well as the road traffic noise levels. In each instance, the higher of these values has been used to specify the glazing for daytime habitable rooms. The night-time (23:00 to 07:00 hours) noise levels will consider the road traffic noise from Park Lane and Worcester Avenue. Given that the residential aspect is being submitted in outline only, this simplified approach is considered acceptable.
- 13.7.19 The sound reduction performance requirements for the building façade can be calculated by subtracting the target criteria from the derived noise levels. Since glazing is typically the weak link in the acoustic performance of the building façade, at this stage, these values can be taken as a requirement for the glazing units.
- 13.7.20 BS 8233 identifies two methods to determine the degree of noise attenuation required from a building façade based on a known external noise level, one of which is a 'simple calculation' and the other a 'more rigorous calculation' which considers the frequency spectrum of the noise source and the acoustic absorption in the room. With respect to the simple calculation, BS 8233 (Section G.1) includes the following advice:
- "Strictly, the insulation values used here relate to a pink noise spectrum, and actual values achieved are lower for traffic noise. Furthermore, the method does not take account of the absorption (e.g. furnishings) in the room. However, the R_w values suffice for a rough calculation, although it is likely to underestimate the level in the room by up to 5 dBA. Where the estimate is within 5 dBA of the target noise level, a more rigorous calculation needs to be carried out using octave bands..."*
- 13.7.21 The following table sets out the sound insulation performance requirements for the glazing units for habitable rooms in the residential towers. Both the L_{Aeq} and L_{Amax} noise levels are considered, as required

in BS 8233 and the WHO guidelines. Given the outline application for the residential aspect of the scheme, the calculations have adopted the BS 8233 simple method and the +5 dB adjustment to allow for the frequency content of the noise source and the acoustics of habitable rooms has cautiously been included.

Table 13. 22: Sound Reduction Requirements for Proposed Residential Facades, dB

Location	Period	External Noise Level*	Target Criteria	Sound Reduction (R _w)
Tower A	Daytime L _{Aeq}	83	35	48
	Night-time L _{Aeq}	61	30	31
	Night-time L _{AFmax}	78	45	33
Tower B	Daytime L _{Aeq}	78	35	43
	Night-time L _{Aeq}	66	30	36
	Night-time L _{AFmax}	78	45	33
Tower C	Daytime L _{Aeq}	86	35	51
	Night-time L _{Aeq}	57	30	27
	Night-time L _{AFmax}	59	45	14
Tower D	Daytime L _{Aeq}	79	35	44
	Night-time L _{Aeq}	66	30	36
	Night-time L _{AFmax}	78	45	33

*Includes +5dB correction in accordance with the BS 8233 simple calculation.

- 13.7.22 The above calculations have been undertaken using the methodology described to demonstrate that a workable solution exists which would result in the WHO internal target values being achieved. Detailed glazing calculations (based on the frequency spectrum of the source, building façade dimensions and internal room acoustics) will be required at the later design stage to determine the precise glazing requirements.
- 13.7.23 As an example, a Protec Classic 9-16-10 argon plus 9mm secondary pane would achieve an R_w of 50 dB. Whilst this specification falls 1 dB short of the requirements in Table 13. 22 it is considered appropriate to specify, given that concerts may occur up to six times per year. It is recommended that this assessment is revisited at the detailed design stage and that possibly another baseline noise survey be undertaken to validate the 2008 data.
- 13.7.24 The above assessment assumes that windows remain closed. Consequently, it is necessary to consider how adequate ventilation is to be provided to the most noise exposed building façades. On ventilation, BS 8233 advises that:
- 13.7.25 "The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice".
- 13.7.26 It is recommended that the residential units are provided with mechanical ventilation and that windows remain openable for rapid or purge ventilation.
- 13.7.27 With the above mitigation measures, there should be a direct, long-term negligible impact.

Cumulative Assessment

- 13.7.28 The following schemes have been included in the cumulative assessment of operational road traffic noise (i.e. the potential impact of development related road traffic noise on the surrounding road network).
- Image House, Station Road, N17 9LR. A 96 bed hotel (low car use).
 - 5 Bruce Grove, N17 6RA. Four apartments and ten houses (low car use)
 - Vacant land between 17 and 34 Pretoria Road, N17 8DX. Extra care facility of 52 units (low car use).
- 13.7.29 Table 13. 23 below sets out the changes in noise levels between the 2015 baseline and the 2021 baseline including the proposed development and the above cumulative schemes.
- 13.7.30 As with the operational road traffic noise assessment presented above, the road links where the flows are below the required threshold in CRTN have been excluded from the assessment.

Table 13. 23: Predicted Changes in Road Traffic Noise BNL between AADT 2015 Baseline and Baseline including 2021 Proposed Development Plus Cumulative Developments

Link/Description	Change in BNL dB(A)
1. White Hart Lane, just west of A1010 High Road	+0.1
2. White Hart Lane, just west of Fenton Road	0
3. A1010 High Road, just south of White Hart Lane	+0.2
4. A10 High Road, just south of Bruce Grove	+0.1
4A. A10 High Road, just south of Monument Way	+0.1
6. A1010 High Road, just south of Park Lane	+0.2
7. Northumberland Park, between Worcester Avenue and Bennetts Close - east of Sainsbury	+0.1
10. A1010 High Road, just south of Brantwood Road	+0.1
11. A1010 Fore Street, just south of A406	+0.1
12. Lordship Lane, just west of A1010 High Road	+0.1
15. White Hart Lane, just east of the A10 Great Cambridge Road	+0.1
16. Leaside Road, just east of Willoughby Lane	0

- 13.7.31 Comparing the result of the cumulative operational road traffic noise assessment with the assessment criteria in Table 13. 6 it can be seen that on all road links assessed, there will be a direct, permanent negligible impact.
- 13.7.32 As with the operational road traffic noise assessment for the proposed development only, the following road links have flows below the CRTN threshold and have, therefore, not been assessed in Table 13. 23:
- Park Lane, just east of A1010 High Street;
 - Worcester Avenue, just north of Park Lane; and
 - Worcester Avenue, just south of Northumberland Park.
- 13.7.33 The cumulative schemes do not add to the road traffic flows on the above road links. As such, there is no impact on these roads as a result of the above cumulative schemes.

Environmental Effect	Sensitivity of Receptor	Nature of Impact	Impact Magnitude	Significance	Additional Mitigation	Residual impact Magnitude	Residual Significance of Effect
Construction Effects							
Construction noise	High	Negative	Negligible to major	Negligible to major	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to major	Negligible to major
Construction vibration	High	Negative	Negligible to moderate	Negligible to moderate	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to moderate	Negligible to moderate
Operational Effects							
Operational road traffic noise	High	Negative	Negligible to moderate	Negligible to moderate	None	Negligible to minor	Negligible to minor
Match day noise	High	Neutral	Negligible to major	Negligible to major	None	Negligible to minor	Negligible to minor
Music concert noise	High	Negative	Negligible to minor	Negligible to minor	None	Negligible to minor	Negligible to minor
NFL noise	High	Negative	Negligible to minor	Negligible to minor	None	Negligible to minor	Negligible to minor
External fixed plant noise	High	Negative	Not assessed but potentially major	Not assessed but potentially major	Mitigation to be considered at the detailed design stage to ensure all relevant noise sources meet the noise limits in Table 13.19.	Negligible	Negligible

14. Socio-Economics

14.1 Introduction

- 14.1.1 This chapter of the ES has been produced by Quod. It addresses the potential socio-economic effects of the Project against an identified baseline of the local and wider area around the Project Site. The assessment includes a summary of the current relevant economic, employment, housing and community infrastructure conditions in the local area, Tottenham and administrative areas of Haringey, Enfield and London where relevant (see Section 14.2), a quantitative and qualitative assessment of the effects of the Project on these receptors, and identification of mitigation measures where appropriate for any significant effects that may arise.

14.2 Assessment Criteria and Methodology

Previous Assessment

- 14.2.1 A socio-economic assessment was submitted as part of the previous planning application on the Project Site in May 2010 (application reference HGY/2010/1000).
- 14.2.2 This was followed by two separate applications which required addendums to the original May 2010 ES. The addendums dealt with Phase 1 the Northern Development (application reference HGY/2011/2350, and Addendum No.1) and Phase 3 the Southern Development (application reference HGY/2011/2351 and Addendum No. 2). The Northern Development has since been completed and is operational.
- 14.2.3 There has also been a Section 73 application (HGY/2015/0964) which comprised a new basement under the proposed north, east and west stands of the approved stadium, which measures 19,618 sqm GIA. These changes have reconfigured parking between levels, and provided additional changing rooms and media facilities to allow the stadium to host tournament football.
- 14.2.4 Demolition and site preparation works have commenced on the northern part of the Project Site, to the south of Lilywhite House.

Scoping Opinion

- 14.2.5 Although a formal Scoping Opinion was not sought the Scope of the EIA was based on the technical scope for the original 2010 ES and the Southern Addendum. A draft Scoping Report was sent to the Council on the 19th June 2015, for their informal comments and discussion. No informal comments were received in relation to the Socio-Economic draft Scope.

Planning Policy and Guidance

- 14.2.6 This section refers to relevant policy and guidance at a National (UK), Sub-national (London), and Local (Haringey Borough and Tottenham (i.e. east Haringey)) level. The assessment has regard to relevant spatial planning policies related to housing, employment and economic growth and the adequate provision of community facilities.

National Planning Policy

- 14.2.7 The **National Planning Policy Framework (NPPF)** was published by DCLG in 2012, consolidating previous planning policy statements, promoting sustainable development, and prioritising strong, vibrant and healthy communities and contributing to building a strong, responsive and competitive economy.
- 14.2.8 As part of a commitment to securing local economic growth, the NPPF aims to plan proactively to meet the development needs of business and support an economy fit for the 21st Century, promote the vitality and viability of town centres, create sustainable, inclusive and mixed communities, including through the regeneration and renewal of areas of poor housing, and create a built environment that facilitates social integration and inclusive communities.
- 14.2.9 At the heart of the NPPF is a presumption in favour of sustainable development. The purpose of the planning system is to contribute to the achievement of sustainable development which includes social, economic and environmental roles (Paragraph 6-7). Paragraph 14 states that "Local Authorities should positively seek opportunities to meet the development needs of their area."
- 14.2.10 Paragraph 17 of the NPPF sets out several core land-use planning principles that should underpin decision-taking. These include the need for planning decisions to:
- Proactively drive and support sustainable economic development to deliver the homes, businesses and industrial units, infrastructure and thriving local places that the country needs;
 - Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of land and buildings; and
 - Promote mixed use developments and encourage multiple benefits from the use of land in urban and rural areas.
- 14.2.11 The planning system has three key, interdependent roles (set out at Paragraph 7):
- An economic role: ensuring that the right amount of land is available at the right time and place in order to support growth and innovation;
 - A social role: providing the supply of housing and local services required to meet the needs of present and future generations and to support health, social and cultural well-being; and
 - An environmental role: contributing to protecting and enhancing our natural, built and historic environment.
- 14.2.12 The NPPF outlines a number of objectives to deliver sustainable development. These include:
- Objective 1: Building a strong, competitive economy (Paragraphs 18-22): significant weight should be placed on the need to support economic growth in the planning system. Planning policies should recognise and seek to address potential barriers to investment, including a poor environment or a lack of infrastructure, services or housing.

- Objective 6: Delivering a wide choice of high quality homes (Paragraphs 47-55): Housing applications should be considered in the context of the presumption in favour of sustainable development. Local authorities should aim to deliver a wide choice of high quality homes and widen opportunities for home ownership and create sustainable, inclusive and mixed communities. Where there is an identified need for affordable housing, this should be brought forward on-site unless off-site provision or a financial contribution of broadly equivalent value can be robustly justified.
- Objective 8: Promoting healthy communities (Paragraphs 69-78): Planning policies and decisions should promote social interaction, including through mixed use developments, neighbourhood centres and active street frontages. They should promote safe and accessible environments where crime or fear of crime do not undermine quality of life, and which encourage active and continual use of public areas. Consideration should be given to the provision of shared space, community facilities and local services to enhance the sustainability of communities.

Sub-National Planning Policy

- 14.2.13 The **London Plan** (2015) sets out the Mayor's vision for London, and proposals for how to achieve this. The London Plan sets out the strategic plan for the integrated economic, environmental, transport and social development of London over the next 20 to 25 years. The changes made to the now adopted London Plan in the form of further alterations sought to reflect the need to plan for the housing and economic capacity needed for London's sustainable development against the background of the growth trends revealed by the 2011 Census.
- 14.2.14 The London Plan sets out a 'new focus on quality of life,' stating that issues such as accessible homes; deprivation and exclusion; health inequalities; the natural environment; vibrant town centres; and safety and community should be valued alongside economic growth.
- 14.2.15 The Plan seeks to promote mixed use development maximising the potential of previously developed sites. It supports the provision of high quality open space and play space, and appropriate community provision and the encouragement of the tourism and leisure sectors. It also promotes the creation of local employment in developments and the promotion of skills training and other initiatives to enable this.
- 14.2.16 Northumberland Park and the wider Upper Lee Valley are key strategic target areas for regeneration as identified in the adopted London Plan and other key strategic London-wide policy documents. The London Plan now projects significant population growth in Haringey, with a 29.5% increase over the period 2011-2036 making it the largest proportional increase of any London borough. As a result, new housing requirements have been estimated at 15,019 over the period 2015 to 2025.
- 14.2.17 The London Plan identifies the Upper Lee Valley (which covers the Tottenham area) as one of 38 Opportunity Areas (Policy 2.13). Opportunity Areas are described as representing 'the capital's major reservoir of brownfield land with significant capacity to accommodate new housing, commercial and other development linked to existing or potential improvements to existing or potential improvements to public transport accessibility' (para. 2.58). Annex 1 of the London Plan sets out the quantum of development anticipated to be accommodated by London's Opportunity Areas. The Upper Lee Valley is set an indicative employment capacity of 15,000 jobs and a minimum new homes target of 20,100. There is recognition that development in the Opportunity Area should provide stimulus for regeneration in existing