TRANSPORT AND WORKS ACT 1992

TOWN AND COUNTRY PLANNING ACT 1990

PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) ACT 1990

PROPOSED LONDON UNDERGROUND (NORTHERN LINE EXTENSION) ORDER

APPENDICES TO PROOF OF EVIDENCE

OF

Rupert Thornely-Taylor
Noise and Vibration

FOR

TRANSPORT FOR LONDON (TfL)

DOCUMENT TFL3/B

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FIGURES REFERRED TO IN THE PROOF

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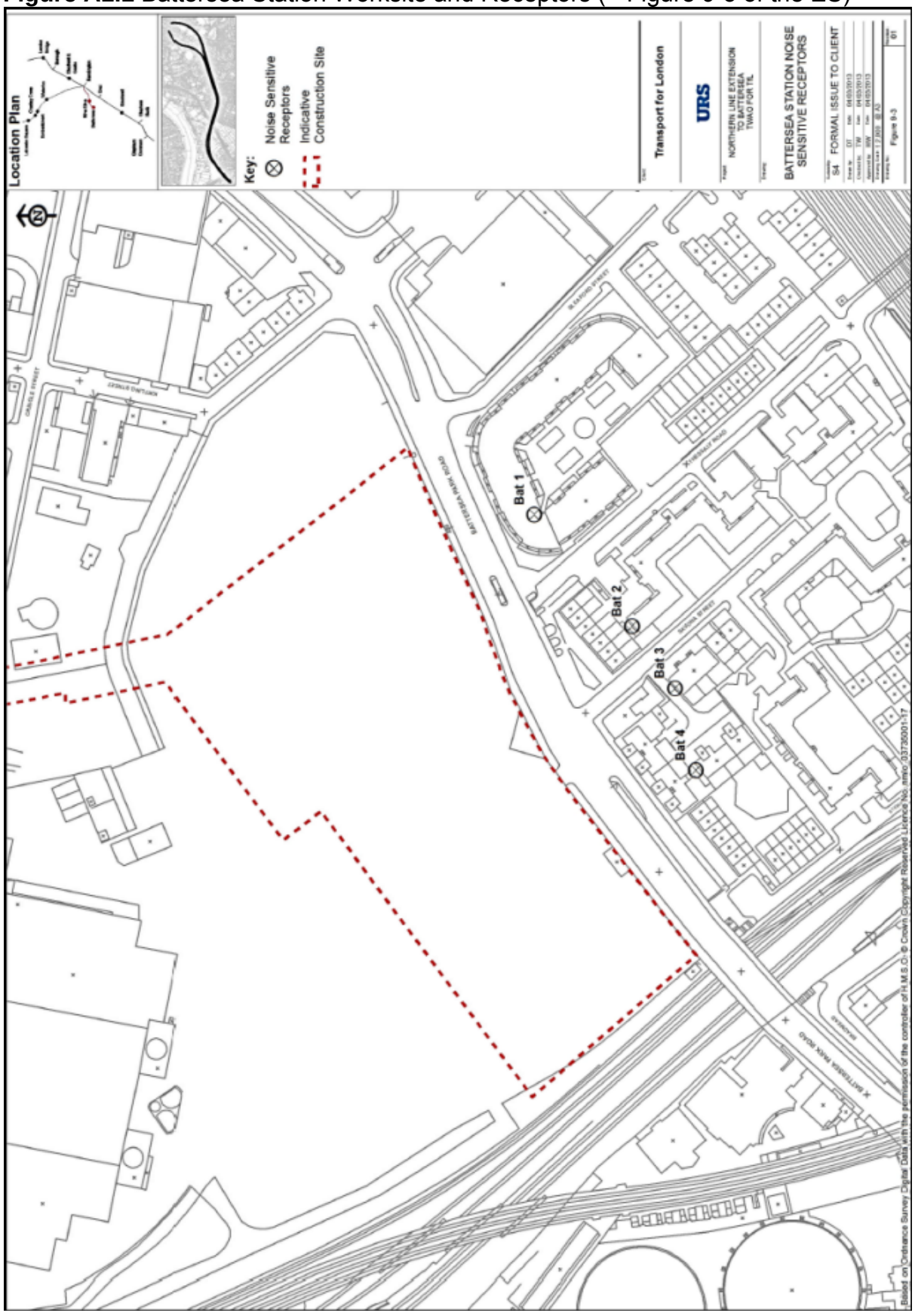
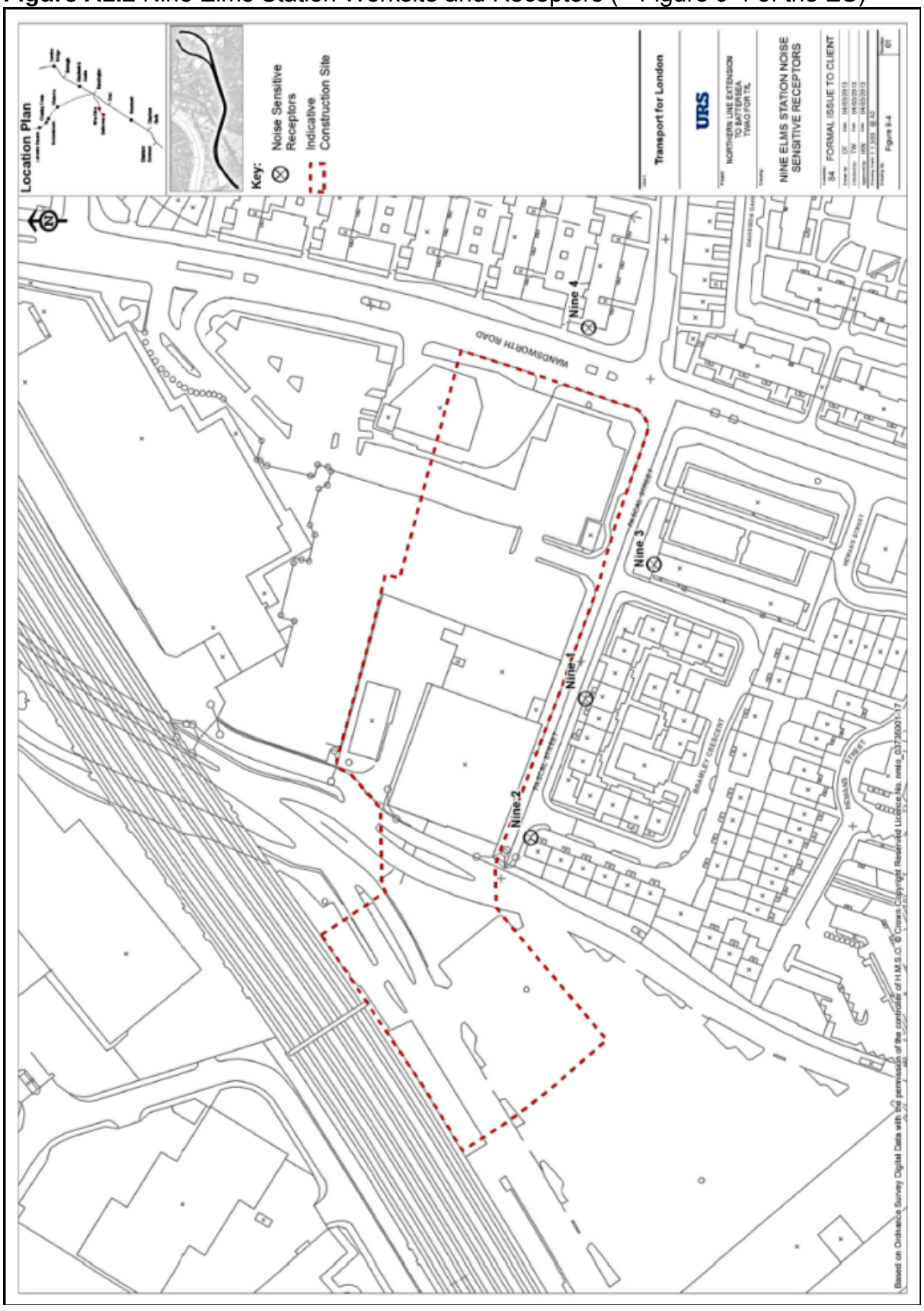


Figure A1.2 Nine Elms Station Worksite and Receptors (= Figure 9-4 of the ES)



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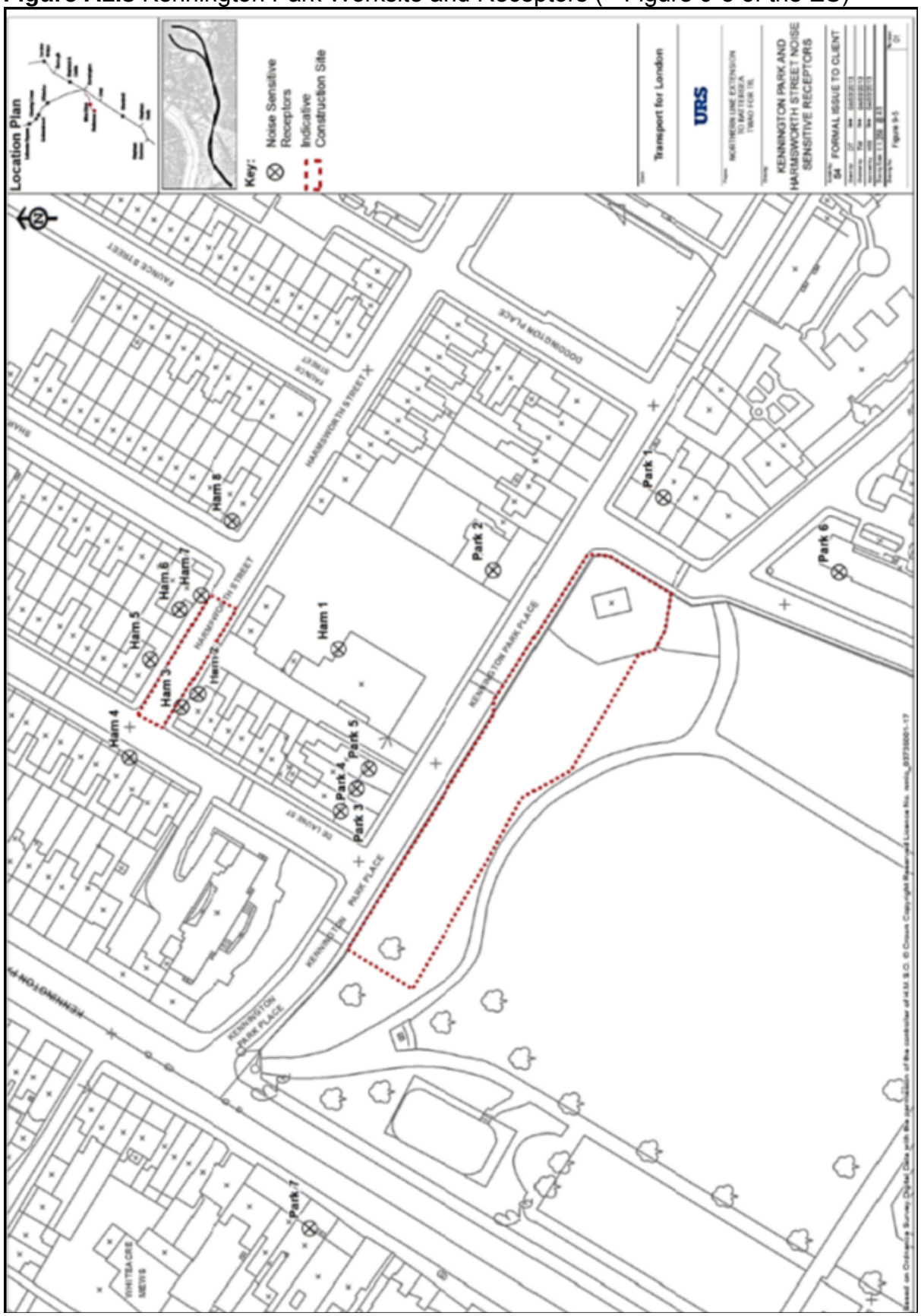

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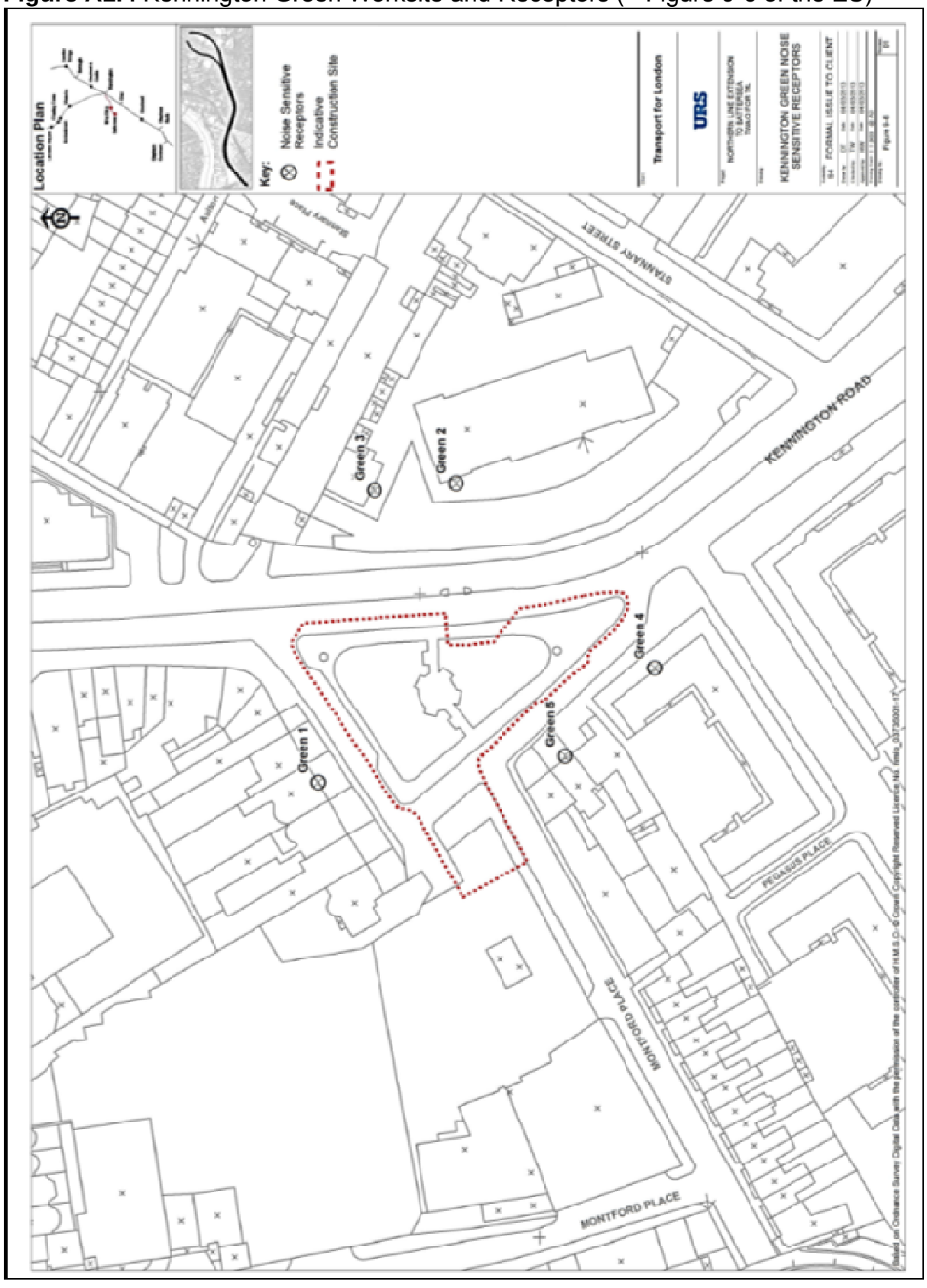

Figure A1.5 Groundborne Noise and Vibration Receptors(= Figure E4-1 of Appendix E, Part E4 of the ES)

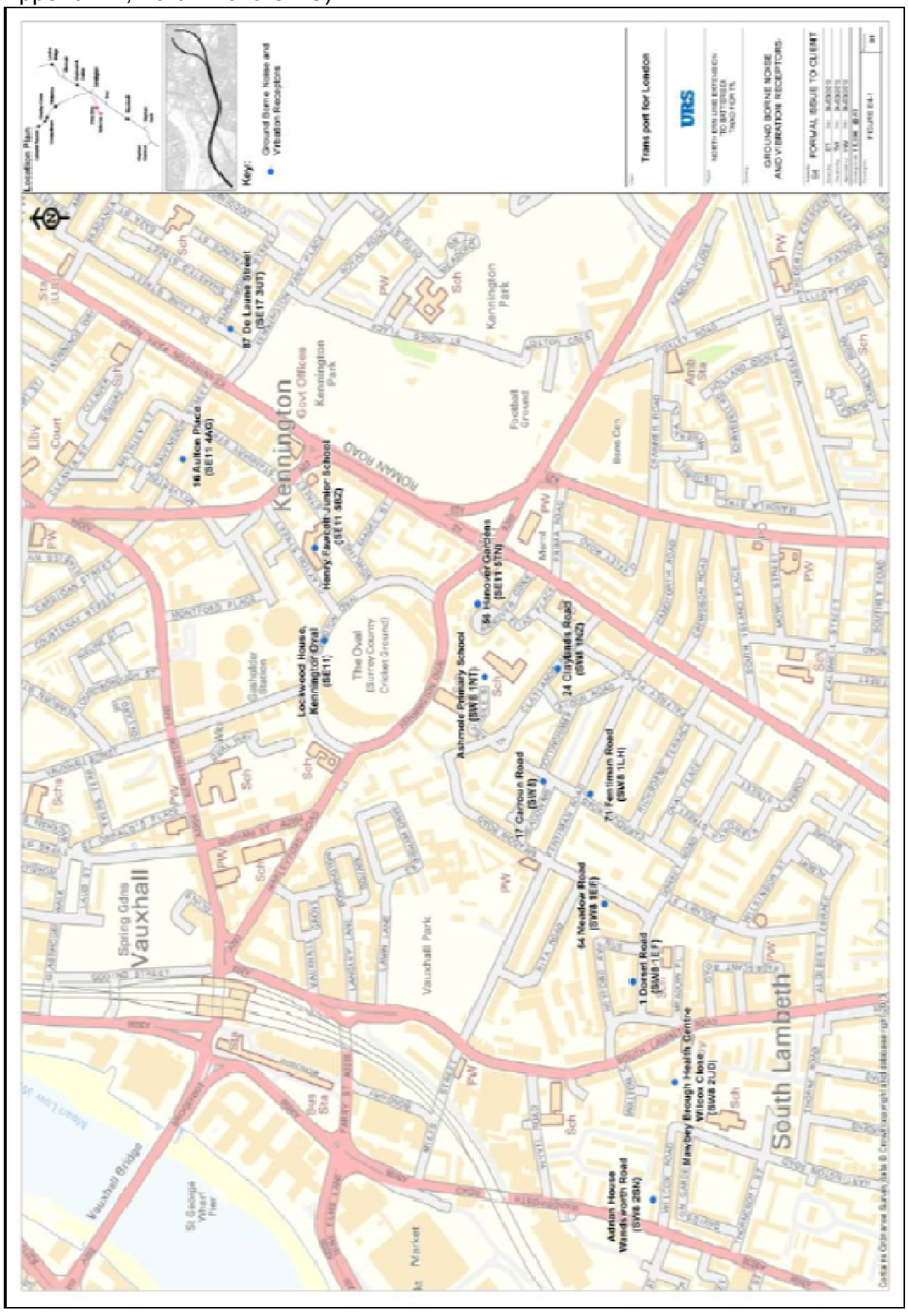

Figure A1.6 Baseline Monitoring Locations (= Figure 9-2 of the ES)

APPENDIX 2

MEASURED AMBIENT NOISE LEVELS

Table A 2.1 Summary of measured ambient noise levels

	Average Ambient Free-Field dB $L_{Aeq,T}$			Lowest Hourly Recorded Background Noise dB $L_{A90,T}$	
Location	**Daytime (07:00 – 19:00) and Saturdays (07:00– 13:00)**	**Evenings (1900 – 2300) and Weekends**	**Night (2300– 0700)**	**Daytime 07:00 – 23:00 (T = 16hr)**	**Night-time 23:00 – 07:00 (T = 8hr)**
Battersea Station [1]					
L1	62	61	59	51*	45*
L2	61	58	55	48*	43*
S1	74	-	68	62	48
S2	72	-	68	61	41
S3	74	-	70	64	44
Nine Elms Station					
L3	59	59	52	47*	44*
S4	55	53	50	43	38
S5	58	-	-	44	-
S6	65	-	-	53	-
Kennington Park					
L4	58	55	52	49*	44*
S7	63	-	50	52	41
S8	61	50	52	39	38
S14	71	-	66	58	47
Kennington Green					
L5	71	63	61	51*	39*
S12	71	-	65	57	43
S13	73	-	66	61	46
Harmsworth Street					
S9	66	-	56	54	43
Radcot Street					
S10	56	46	48	41	36
S11	65	-	53	49	36

* Represents lowest hourly average L_{A90} for each day and each night period

Note 1
The measured day and night time levels captured by the long-term measurements differ from the short-term measurements by 10 – 14 dB this is a direct result of the location of the measurement positions. All short-term positions were in close proximity to Battersea Park Road while the long-term monitors are set back into the site away from the road.

This table has been compiled from Tables 9-11 to 9-16 of the ES.

APPENDIX 3

EVALUATION CRITERIA

EVALUATION CRITERIA ARE SHOWN FOR THE FOLLOWING:

CONSTRUCTION PHASE

Airborne Noise from Construction Sites	**Table A 3.1**
Road Traffic Noise (Including Construction Traffic)	**Table A 3.2**
Effects of Vibration on Buildings	**Table A 3.3**
Effects of 'Feelable' Vibration on People in Buildings	**Table A 3.4**

OPERATING PHASE

Airborne Noise from Ventilation Shafts and Stations	**Table A 3.5**
Effects of Vibration on People in Buildings	**Table A 3.6**
Effects of Groundborne Noise on People In Buildings	**Table A 3.7**

INTERPRETATION OF THE SIGNIFICANCE OF EFFECTS	**Table A 3.8**

AIRBORNE NOISE FROM CONSTRUCTION SITES

Table A 3.1 Construction Noise Assessment Threshold Values

	Construction noise Threshold Values $L_{Aeq,T}$		
Location	**Daytime (07:00 – 19:00) and Saturdays (07:00– 13:00)**	**Evenings (1900 – 2300) and Weekends**	**Night (2300– 0700)**
Battersea Station	75	73	71
(S1, S2, S3)			
Nine Elms Station –	65	65	55
Wandsworth Road (L3, S6)			
Nine Elms Station –	65	60	55
Pascal Street (S4,S5)			
Kennington Park –	75	65	64
Kennington Park Place (L4)			
Kennington Park –	65	60	55
St Agnes Place (S8)			
Kennington Green	65	55	55
(L5, S12, S13)			
Harmsworth Street*(S9)*	70	60	59
Radcot Street *(S10)*	65	55	55
Battersea Park **Phase 1** [1]	65	55	45
Note 1: The nearest sensitive receptor is the proposed residential building which forms phase 1 of the Battersea park redevelopment. It is not possible to determine representative ambient noise levels for this position as the proposed building will screen the nearest receptors from the existing ambient noise sources. Therefore, for the purpose of this assessment the lower limits set out in Table 9-2 have been assumed.			

This table corresponds to Table 9-17 of the ES

ROAD TRAFFIC NOISE (INCLUDING CONSTRUCTION TRAFFIC)

Table A 3.2 Road Traffic Noise Assessment Criteria

Noise Change Band (dB(A)	Magnitude of Impact as Given in DMRB	Significance of Effect for the NLE
0	No change	No change
0.1 – 0.9	Negligible	Negligible
1 – 2.9	Minor	Minor
3 – 4.9	Moderate	Moderate
5	Major	Major

This table corresponds to Table 9-3 of the ES

EFFECTS OF VIBRATION ON BUILDINGS (DURING CONSTRUCTION)

Where the vibration excitation is continuous, the values in Table 9-5 are required to be halved.

Vibration exceeding the values shown the table below would be considered a significant adverse effect. It should be noted that the criteria used in this assessment relate to the potential for cosmetic damage rather than damage to structural elements of buildings.

Table A 3.3 Peak Particle Velocity Limits for Cosmetic Damage

	Peak Component Particle Velocity [1]	
Type of Building	**Vibration in Frequency Range of 4 Hz to 15 Hz**	**Vibration in Frequency Range of 15 Hz and above**
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz [2]	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Notes	1 - Values referred to are at the base of the building	
	2 - At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded; mm/s – millimetres per second.	

This table corresponds to Table 9-5 of the ES.

EFFECTS OF 'FEELABLE' VIBRATION ON PEOPLE IN BUILDINGS DURING CONSTRUCTION

Table A 3.4 Guidance On Human Effects Of Construction Vibration Levels [1]

Vibration Level	Response	Significance of Effect
<0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3 – 1mm/s	Vibration might be just perceptible in residential environments.	Minor Adverse
1 – 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Moderate Adverse
>10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major Adverse
Note 1	Levels are in terms of peak particle velocity (ppv) in mm/s	

This table corresponds to Table 9-4 of the ES which has been adapted from Table B.1 in BS 5228-2:2009

AIRBORNE NOISE FROM VENTILATION SHAFTS AND STATIONS

Table A 3.5 Significance Criteria For Ventilation Shaft and Station Noise

Rating Level minus Background Level	Significance of Effect
Rating noise is 5 dB(A) or more below background level	Negligible
Rating Level is between 5 dB(A) below and 5 dB(A) above background	Minor Adverse
Rating Level is between 5 dB(A) and 10 dB(A) above background	Moderate Adverse
Rating noise is more than 10 dB(A) above the background level	Major Adverse

This table corresponds to Table 9-8 of the ES.

EFFECTS OF VIBRATION ON PEOPLE IN BUILDINGS

Table A 3.6 Criteria for Assessing Human Response to Vibration in Buildings

Period	Adverse Comment Not Expected	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable	Adverse Comment very likely
Residential 16 Hour Daytime	< 0.2	0.2 - 0.4	0.4 – 0.8	0.8 – 1.6	> 1.6
Residential 8 Hour Night-time	< 0.1	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8	> 0.8
Significance of Effect	Negligible	Minor Adverse	Moderate Adverse	Major Adverse	Major Adverse

The values shown in the table above relate to residential accommodation and are also used for hotels and places of worship. Where the assessment concerns the effects on commercial premises, the values shown in the table need to be doubled, as advised by BS 6472-1:2008.

This table corresponds to Table 9-8 of the ES.

EFFECTS OF GROUNDBORNE NOISE ON PEOPLE IN BUILDINGS

Table A 3.7 Significance of Groundborne Noise Effects

Internal* Noise Level Due to a Train Passby (dB L_{AFmax})	Significance of Effect
≤ 35	Negligible
36 – 40	Minor Adverse
41 – 45	Moderate Adverse
≥ 46	Major Adverse
*internal refers to noise levels which are experienced in a ground floor living room or bedroom of any lawfully occupied residential property above the line.	

This table corresponds to Table 9-7 of the ES.

INTERPRETATION OF THE SIGNIFICANCE OF EFFECTS

The significance of the effect has been considered based on the magnitude of the impact and the sensitivity of the receptor, as shown in Table A2-8 (ES, para9.43).

Adverse or beneficial impacts have been assessed against the following scale (ES, para 9.42) :

Low slight, very short or highly localised effect of no significant consequence;
Medium limited effect (by extent, duration or magnitude), which may be considered significant; or
High considerable effect (by extent, duration or magnitude) of more than a local impact or in breach of recognised acceptability, legislation, policy or standards.

Table A 3.8 Significance of Effects

	Sensitivity of Receptor		
	High	**Medium**	**Low**
Magnitude of Impacts			
High	Major	Moderate	Minor
Medium	Moderate	Minor	Minor
Low	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible
Notes	High sensitivity receptors are considered to be residential buildings, hospitals, and places of worship. Medium sensitivity receptors are considered to be offices and commercial buildings. Low sensitivity receptors are considered to be buildings of an industrial nature. (ES, para 9.44). Due to the nature of the buildings that surround the locations affected by the construction and operation of the NLE, , the significance criteria for each section of the assessment will be based on high sensitivity receptors. (ES, para 9.45).		

This table corresponds to Table 9-1 of the ES.

APPENDIX 4

DRAFT PLANNING CONDITIONS

CODE OF CONSTRUCTION PRACTICE

5. The Development shall be carried out in accordance with the provisions of the Northern line extension (NLE) Code of Construction Practice Part A, unless otherwise agreed by the Local Planning Authority.

Reason: In the interests of amenity.

CODE OF CONSTRUCTION PRACTICE PART B

6. No Stage of the Development shall be commenced until a Northern line extension (NLE) Code of Construction Practice Part B, relating to that Stage, has been submitted to, and approved by, the Local Planning Authority. The contents of the Code of Construction Practice Part B shall be in accordance with the specification set out in Part A, unless otherwise agreed by the Local Planning Authority.

Reason: To protect the environment and amenity of the locality.

CONSTRUCTION NOISE AND VIBRATION MITIGATION SCHEME

7. No Stage of the Development that is predicted to trigger the criteria for noise insulation or temporary rehousing as identified in the London Underground Northern line extension Construction Noise and Vibration Mitigation Scheme shall be commenced unless and until:

- TfL or its nominated contractor has written to owners / occupiers of properties that are eligible for noise insulation to offer such provision or, where relevant, has written to occupiers to offer temporary re-housing; and
- in the case of noise insulation, if the owners / occupiers have accepted this offer in a timely manner and allowed reasonable access, TfL or its nominated contractor has installed the noise insulation works.

Reason: To protect the amenity of occupiers of premises close to construction sites

GROUNDBORNE NOISE FROM THE OPERATION OF TRAINS

11. (a) Work Nos. 1, 2 and 3 shall be designed and constructed such that their permanent track support system is a consistent system and is predicted by the person or body responsible for carrying out the Development to give rise in all reasonably foreseeable circumstances to a level of groundborne noise arising from the passage of a train in service on Work Nos. 1, 2 and 3 not exceeding 35dB L_{AFmax} near the centre of any habitable room within a residential property.

(b) The groundborne noise prediction model utilised for the purposes of Condition 11(a) must be fully compliant with the

guidance provided in ISO 14837-1:2005, Mechanical Vibration – Groundborne noise and vibration arising from rail systems – Part 1: General Guidance.

(c) Before installing any part of the permanent track support system the following details shall be submitted to the Local Planning Authority:

i) details of the groundborne noise prediction model utilised for the purposes of Condition 11(a), including details of the model development, calibration, validation and verification procedures undertaken to comply with the guidance mentioned in condition 11(b), and the identified model accuracy;
ii) the modelling results for the design identified for the purposes of Condition 11(a); and
iii) the details of the type of permanent track support system proposed.

(d) Before Work Nos 1, 2 and 3 are brought into public use, groundborne noise measurements carried out by or on behalf of the person or body mentioned in Condition 11(a) and taken in a representative sample of habitable rooms in residential properties (subject to reasonable access being given) shall be submitted to the Local Planning Authority.

(e) In maintaining the permanent track support system designed and constructed pursuant to Condition 11(a), reasonable endeavours shall be used to achieve the performance level mentioned in Condition 11(a), with reference to best practicable means.

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APPENDIX 5

TABLES RELATING TO RESPONSES TO OBJECTIONS

LOCATIONS OF OBJECTORS TO NOISE AND VIBRATION ISSUES

Table A 5.1 Table of Objectors: Locations and Issues

Ref	Name	Address	Construction	Operation	Construction Traffic
1	Karen Crawcour	Flat 3, 16 Kennington Park Road, London, SE11 4AS	X		Note 1
3	Jonathan Cox (and Amanda Cox and Jonny Cox)	15, Montford Place, London, SE11 5DE	X	X	Note 2
6	Rebecca Grist	41A De Laune St, Kennington, London, SE17 3UR	X		X
7	Niron Noel	30 Ravensdon Street, London, SE11 4AR			X
12	Tomas Sasko	Flat 28, Tyler House, Rumsey Road, SW9 0UA	X		X
14	Louise Holden	116, Camberwell New Road, SE5 0RS	X		X
17	Christine Everitt	17 Coney Way, Ashmole Estate, Meadow Mews, Oval, SW8 1LN	X	X	
20	Paul Becha	79 Liverpool Grove, Walworth, London SE17 2HP	X		X
22	Michael Rourke and Mark Cubon	37 Hanover Gardens, London	X	X	X

Table A 5.1 Table of Objectors: Locations and Issues

Ref	Name	Address	Construction	Operation	Construction Traffic
		SE11 5TN			
23	Vicky Bowman	13 Palfrey Place, London, SW8 1PB		X	
27	Eric Guibert & Robin Pembrooke	Aircon House, 377 Kennington Road, London, SE11 4PT		X	
30	Heart of Kennington Residents' Association [2]	Priscilla Baines, Chairman 11 Ravensdon Street, London, SE11 4AQ	X	X	
31	Dr AA Khakoo	44 Claylands Road SW8 1NZ		X	
32	Mel Cullinan	6 Faunce Street, Walworth, London, SE17 3TR	X		
38	Lynda Haddock	20 Faunce Street SE17 3TR	Endorses Obj 60		
40	David Harkness & Tristan Sandish	352 Kennington Rd	X	X	
43	Adrian and Victoria Bartlett	132 Kennington Park Road SE11 4DJ		X	
46	Battersea Dogs and Cats Home	4 Battersea Park Rd SW8 4AA	X	X	
48	Councillor Patrick Diamond	Kennington Park area	X	X	

Table A 5.1 Table of Objectors: Locations and Issues

Ref	Name	Address	Construction	Operation	Construction Traffic
59	Suzanne Jansen	90 De Laune St	X		
60	Kennington and Walworth Neighbourhood Action Group		X	X	
66	Alexandra Norrish Kenbiggan Management Company				
67	Henry Cobbe	61 Fentiman Rd and others		X	
73	Ballymore Group	Embassy Gardens	X	X	
75	Aiden Conlon and Gail Sixsmith	9 Sherwin Hs Kennington Rd	X	X	
123	VNEB Development and Action Transport Group			X	
131	IMPACT			X	
132	Richard Clayton	58 Fentiman Road		X	
138	Edward and Emma Docx	65 Fentiman Road		X	
146	G Bradic-Nelson	27D Westcott Road SE17 3QY	X	X	X
157	Vauxhall Liberal Democrats		X	X	
158	Kennington Green Supporters Group		X		
186	BPS Owning Group	Battersea Power	X		

Table A 5.1 Table of Objectors: Locations and Issues

Ref	Name	Address	Construction	Operation	Construction Traffic
		Station			
190	Coalition of Lambeth and Walworth Residents (now known as NLE Community Action)		X	X	
206	Kennington Association Planning Forum				
214	Cory Environmental Limited				
241	Fentiman Road NLE Affected Properties Group			X	
250	Simon Hughes MP		X		
251	Gerald Bowden	130 Kennington Park Rd	X	X	
253	Athiqur Meah	168 Old South Lambeth Road	X		
254	Claylands Green NLE Action Group			X	

CONSTRUCTION TRAFFIC NOISE ASSESSMENT

Table A 5.2 Significance of Noise from Construction Traffic – Kennington

Road	Baseline 18 Hour Traffic Flow		Baseline + Construction 18-Hour Traffic Flow		Predicted Change in Traffic Noise Level, dB $L_{A10,18hr}$	Significance of Effect
	Total Vehicles	Total HGV (%)	Total Vehicles	Total HGV (%)		
Kennington	21584	6%	21790	7%	0.5	Negligible

Table A 5.2 Significance of Noise from Construction Traffic – Kennington

Road	Baseline 18 Hour Traffic Flow		Baseline + Construction 18-Hour Traffic Flow		Predicted Change in Traffic Noise Level, dB $L_{A10,18hr}$	Significance of Effect
	Total Vehicles	Total HGV (%)	Total Vehicles	Total HGV (%)		
Park Road, south of Camberwell North Road						
Kennington Park Road, south of Kennington Road	35678	9%	35884	10%	0.3	Negligible
Kennington Park Road, south of Kennington Park Place	29750	6%	29956	7%	0.4	Negligible
Kennington Park Road, south of Braganza Street	29750	6%	29956	7%	0.4	Negligible
Kennington Road, west of Kennington Park Road	21190	7%	21396	8%	0.5	Negligible
Harleyford Road, west of Kennington Park Road	20444	9%	20650	9%	0.5	Negligible
Camberwell North Road, east of Kennington Park Road	22026	9%	22232	10%	0.4	Negligible

Extracted from Table 9-24 of the ES

LOCATIONS OF RECEPTORS USED FOR GROUNDBORNE NOISE AND VIBRATION ASSESSMENT SHOWING CONSTRUCTION PHASE AND MITIGATED OPERATION PHASE GROUNDBORNE NOISE LEVELS

Table A 5.3 Estimated Groundborne Noise Levels from Trains

ID	Receptor	Groundborne Noise Level, dB L_{AFmax}	
		Construction Phase	**Operating Phase**
G1	Adrian House, Wandsworth Road	38	27
G2	Mawbey Brough Health Centre, Wilcox Close, Vauxhall	38	27
G3	1 Dorset Road	38	27
G4	64 Meadows Road	37	26
G5	71 Fentiman Road	32	21
G6	17 Carroun Road	31	20
G7	24 Claylands Road	33	22
G8	Ashmole Primary School	38	27
G9	56 Hanover Gardens	38	27
G10	Lockwood House, Kennington Oval	38	27
G11	Henry Fawcett Junior School	38	27
G12	16 Aulton Place	40	30
G13	87 De Laune Street	45	35

Adapted from Tables 9-28 and 9-31 of the ES

Table A 5.4 Predicted Groundborne Noise and Vibration Levels from TBM without mitigation.

ID	Receptor		
		Predicted ppv, mm/s	**Predicted Groundborne noise level, dB L_{pA}**
G1	Adrian House, Wandsworth Road	3.55	56
G2	Mawbey Brough Health Centre, Wilcox Close, Vauxhall	3.24	55
G3	1 Dorset Road	2.89	52
G4	64 Meadows Road	2.54	50
G5	71 Fentiman Road	2.42	49
G6	17 Carroun Road	2.37	49
G7	24 Claylands Road	2.54	50
G8	Ashmole Primary School	2.60	51
G9	56 Hanover Gardens	2.74	52
G10	Lockwood House, Kennington Oval	2.81	52
G11	Henry Fawcett Junior School	2.97	53
G12	16 Aulton Place	3.44	56
G13	87 De Laune Street	3.66	57

Note: This table corrects erroneous entries in the column headed “Predicted ppv, mm/s” in table 9-26 in Chapter 9 of the ES and table 22 in Appendix E-2 of the ES.

APPENDIX 6

RESPONSES TO OBJECTIONS

Introduction

A6.1 This section of the proof considers the objections made on the grounds of noise and/or vibration.

A6.2 The premises associated with objectors can usually be identified from their address, where the objector is one or more individuals. The addresses provided by the objectors are shown in Appendix A5, Table A5.1, which also indicates whether their objections relate to the construction phase, the operating phase, or construction traffic. In the case of the residents' association, the streets in which their members are said to reside are shown.

A6.3 The topics raised in relation to noise/vibration objections are:

Construction Noise

Construction Vibration

Operational Noise

Operational Vibration

Traffic Noise

A6.4 Preceding sections of this proof have described the approach taken in considering noise and vibration effects including evaluative criteria, mitigation and findings. Further information relevant to specific objectors is now provided below – the objectors' reference number is given in each case followed by the premises in respect of which the objection is made.

A6.5 The proposals initially included an option for temporary shafts and associated worksites in Harmsworth Street and Radcot Street and some of the objectors concerns relate to the works at those locations. However, as noted in paragraph 2.2, the option that would have required those works (Method A) is no longer being taken forward and only Method B is being proposed. Consequently, this project decision has removed the basis on which some objections were made and in those cases they are no longer affected.

A6.6 Responses to particular objections follow:

1 Karen Crawcour Flat 3, 16 Kennington Park Road

Objections are raised in relation to the construction phase, specifically the impact of heavy excavation and construction work on surrounding residential buildings (item 2), and the impact on the quality of life of people in the Kennington area given the proposed and potential site working hours (item 3).

The objector's location is much further from the nearest worksites than the receptors assessed in the ES are, and the residual effects from construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES (**NLE/A19**), Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of 16 Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table A5.2).

3 Jonathan Cox 15 Montford Place

Objections are raised in relation to the construction phase, specifically traffic disruption etc and a general expression of concern regard that the premises (a listed building) will be affected.

The objector's location is about 200m north-west of Kennington Park Road and approximately opposite the centre of Kennington Park. The nearest worksite is for the construction of the Kennington Green shaft.

The objector's location is further from that worksite than the receptors assessed in the ES are, and the residual effects of airborne construction noise at those locations were predicted to be not significant.

The ES reports (Paragraph 9.160) that the likelihood of any cosmetic damage to buildings surrounding any of the worksites owing to vibration from surface construction works is negligible.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200 – 300m north-east of Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5, Table A5.2).

The premises are in the vicinity of the northern limb of the new line and there is therefore the potential for groundborne noise and vibration to affect them during both the construction and operating phases.

These effects have been assessed for both phases at 13 locations in the Kennington area and they are shown on Figure E4-1 in *ES Volume IIb: Appendix* E4 (**NLE/A20**). They are also listed in Appendix A5, Table A5.3 of this proof. That table allocates identification numbers (form G1 to G13) for ease of reference in this section of the Proof.

The address for this objector is located midway between receptor locations G11 and G12. Those locations lie above the line of the new tunnel; this objector's premises are to one side of the new tunnel, by about the same distance from centre line as is receptor G10.

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Based on the assumptions in the ES (para 9.171) the levels of groundborne noise from the temporary construction railway at receptors G10, G11, and G12 are not considered to be a significant effect.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

6 Rebecca Grist 41A De Laune Street

Objections are raised in relation to "noise pollution and traffic'' (no further details are given).

The premises are located about 50 – 100m from the site where the Harmsworth Street Shaft would have been but that temporary shaft will not be constructed. Consequently there can be no noise or vibration effects from the site itself or from any local construction traffic that would have served the worksite.

The nearest location to this objector's premises at which groundborne noise and vibration has been predicted is G13 (87 De Laune Street, shown on Figure A1.6 in Appendix 1 of this proof).

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Based on the assumptions in the ES (para 9.171) the level of groundborne noise from the temporary construction railway at receptor G13 is a moderate adverse effect which would be significant.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

7 Niron Noel 30 Ravensdon Street

Objections are raised in relation to the impact of the works on the park and the noise and pollution from construction traffic.

The objector's premises are about 200m from the Kennington Park worksite on the opposite (ie, west) side of Kennington Park Road. The nearest worksite is for the construction of the Kennington Green shaft.

The objector's location is much further from the nearest worksites than the receptors assessed in the ES are, and the residual effects of airborne construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table 5.2).

12 Tomas Sasko Flat 28, Tyler House, Rumsey Road

Objections are raised in relation to (construction) noise levels rising for Kensington residents, especially during the 'night and day works' and noise from traffic during construction. There is also objection to locating the shaft in the park and a concern about effects on the peace there.

The objector acknowledges that he does not live in the area but says that he cycles through it on the way to work, and that he spends a lot of time in the park.

The objector's location is much further from the worksites than the receptors assessed in the ES are, and the residual effects from construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table 5.2).

14 Louise Holden 116 Camberwell New Road

Objections are raised in relation to Kennington Park becoming a worksite and to avoid 40-50 lorries a day passing schools and nurseries. These have been interpreted as objections re airborne noise from construction sites and construction traffic.

This objector's premises are located about 400 – 500 m south-east of Kennington Park Road on a line opposite Oval underground station.

The objector's location is much further from the nearest worksites than the receptors assessed in the ES are, and the residual effects from construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of 16 Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table 5.2).

17 Christine Everitt 17 Coney Way, Meadow Mews

Objections are raised in relation to 'shafts' being located at the rear of the property.

The property is located about 200m south-east of the Oval cricket ground near the line of the northern tunnel. The nearest receptor at which groundborne noise and vibration has been predicted is G6 (17 Carroun Road, shown on Figure A1.6 in Appendix 1 of this proof).

It is not clear what shafts are being referred to in the objector's submission, but the new tunnels run (underground) near the objector's premises.

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Based on the assumptions in the ES (para 9.171) the level of groundborne noise from the temporary construction railway at receptor G6 is not significant.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

20 Paul Becha 79 Liverpool Grove

Objections are raised in relation to noise during the works. Traffic during construction is also raised as an issue but this appears to be related to safety concerns, not noise.

The objector's property more than 800m east of the Kennington Park worksite.

The objector's location is much further from the nearest worksites than the receptors assessed in the ES are, and the residual effects from construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table 5.2).

22 Michael Rourke and Mark Cubon **37 Hanover Gardens**

Objections are raised in relation to noise during and after the works. An undertaking to use floating track slab (or better if available) is sought, together with requirement for noise monitoring in the property during both the construction and operating phases. The expectation is that there should be no noise audible during the operating phase.

The premises are located to the west of Kennington Park Road near Oval underground station and so the objections are assumed to relate to underground activities. The nearest groundborne noise prediction location is G9 (56 Hanover Gardens, see Figure A1.6 of Appendix 1 to this proof).

The groundborne noise level during construction (from the use of the temporary railway) is not considered to be a significant effect. During the operating phase the mitigated groundborne noise level is estimated to be 27 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect.

23 Vicky Bowman **13 Palfrey Place**

The objector requests that the noise level (at her premises) from the operating railway is no higher than 27 dB (time-weighting not specified).

These premises are located about 100 – 200m south-west of Oval underground station on the west side of Kennington Park Road. The nearest groundborne noise prediction location is G7 (24 Claylands Road, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 22 dB L_{AFMax} (Appendix A5, Table 5.3, 'Operating Phase' column) which is not a significant effect and is below the objector's preferred level.

27 Eric Guibert & Robin Pembrooke — **Aircon House, 377 Kennington Rd**

The objector requests that the noise level from the operating railway should be no higher than 30 [sic] for the whole length of the NLE line (time-weighting not specified).

These premises are located about 150 – 200m north-west of Kennington Park Road on a line opposite Kennington Park Place. The nearest groundborne noise prediction location is G12 (16 Aulton Place, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 30 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect and does not exceed the value that the objectors request as a maximum at their location.

The objector cites Norwegian Research "Annoyance and self-reported sleep disturbances due to structurally radiated noise from railway tunnels". This research is not capable of comparison with the normal kind of noise and social survey studies on which guidance and policy making is based, because the survey, being a postal survey about self-reported effects, immediately asks leading questions about whether railway tunnel noise annoys the subject. The correct approach is to begin by asking non-specific questions about the respondent's environment and only to ask specific questions about a stated source if it has been identified as a topic in the general response about the environment. THIs requires a structured survey which is administered in a face-to-face interview by survey personnel.

That said, the survey found that for structureborne noise in the 32-37 dB L_{AFmax} range of 313 respondents 4 had problems falling asleep and 8 reported awakenings. At 35 dB L_{AFmax} fewer than 2% reported they were moderately, very or extremely annoyed. Only by adding in "slightly" annoyed does the figure go up to 24%.

30 Heart of Kennington Residents' Association — **Ravensdon Street**

Now that the Radcot Street worksite is not part of the proposals, this objector concern is with the level of groundborne noise in its members' properties once the new line is operational.

The Heart of Kennington Residents' Association represents the residents of Aulton Place, Cumberland Mews, Methley, Milverton, Radcot, Ravensdon and Stannary Streets and Wigton Place. These streets are located in the triangle between Kennington Road, Kennington Park Road and Kennington Lane. Several properties in our streets are directly above the existing Kennington Loop; they, and others, will be directly above either the step plate junction where the new more northerly east-bound line joins the Kennington Loop, or the new line.

The Association's concern with operational groundborne noise is this. The ES shows predicted levels of 30 dB L_{AFmax} for most of the line except near the step plate junction where it is predicted to be 35 dB L_{AFmax}. However, TfL is only committed to designing to meet a noise level of 35 dB L_{AFmax}, including round the step plate junction and there is no reference to the predicted level of 30 dB L_{AFmax}. The Association states that studies show that levels of 35 dB L_{AFmax} wake people up and that 32 dB L_{AFmax} disturbs sleep. The best available technology should therefore be used so that the levels of 30 dB L_{AFmax} are certain to be achieved, particularly because remedial action if the levels were higher than predicted would be unrealistic.

As explained in paragraph 6.4 of my proof of evidence, the modern approach to designing and constructing an underground railway is to select a system-wide track support design which is predicted to achieve, in the locations likely to receive the highest levels of groundborne noise and vibration (colloquially referred to as "pinch-points"), a noise level which is below known complaint thresholds in London. The approach means that at locations other than the 'pinch-points' the levels predicted for groundborne noise will be lower.

It is therefore to be expected that TfL's stated design aim for the line of 35 dB leads to the values reported in the ES of 35 dB L_{AFmax} at most and lower values elsewhere. Around the step plate junction, because of the presence of switches which require a more complex form of rail support than plain line, special provisions are likely to be required to achieve the level of 35 dB L_{AFmax}.

The nearest groundborne noise prediction location to the streets covered by the Association is G12 (16 Aulton Place, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 30 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect and does not exceed the value that the objectors request as a maximum at their location.

31 Dr AA Khakoo **44 Claylands Road**

The objector states that the noise (assumed to be groundborne) should not exceed 25 dB (time-weighting not specified) and 'anything above this will significantly impact on the quality of our lives'.

These premises are located about 150 – 200m south-west of Oval underground station and about 100m north-west of Kennington Park Road. The nearest groundborne noise prediction location is G7 (24 Claylands Road, see Figure A1.6 of Appendix 1 to this proof).

The groundborne noise level during construction (from the use of the temporary railway) is estimated to be of the order 33 dB L_{AFmax} (Appendix A5, Table A5.3, 'Construction Phase' column) which is not considered to be a significant effect. During the operating phase the mitigated groundborne noise level is estimated to be 22 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect and is below the level specified by this objector.

32 Mel Cullinan **6 Faunce Street, Walworth**

The objector is concerned about the 'impact of heavy excavation and construction work on surrounding residential buildings'.

These premises are located close to the north-east side of the site where the Harmsworth Street Shaft would have been but that temporary shaft will not be constructed. Consequently there can be no noise or vibration effects from the site itself or from any local construction traffic that would have served the worksite.

The nearest groundborne noise prediction location is G13 (87 De Laune Street, see Figure A1.6 of Appendix 1 to this proof).

The effects of construction vibration on buildings and humans is not predicted to be significant.

The groundborne noise level during construction (from the use of the temporary railway) might just be significant. During the operating phase the mitigated groundborne noise level is estimated to be 35 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect.

38 Lynda Haddock **20 Faunce Street**

This objector wishes to endorse the Statement of Case submitted by Kennington and Walworth Neighbourhood Action Group (KWNAG) – Objector 60.

40 David Harkness/Tristan Standish 352 Kennington Rd

The objector is concerned about noise from Kennington Green Shaft/Head House during construction and operation.

The objector's premises are approximately 100m north of the Kennington Green worksite and screened from it by intervening buildings.

The objector's location is much further from this worksite than the receptors assessed for effects in the in the ES are, and the residual effects from construction noise at those locations were predicted to be not significant.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200m south of 16 Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table 5.2).

The nearest groundborne noise prediction location is G12 (16 Aulton Place, see Figure A1.6 of Appendix 1 to this proof).

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Based on the assumptions in the ES (para 9.171) the levels of groundborne noise from the temporary construction railway at receptor G12 is not considered to be a significant effect.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

43 Adrian and Victoria Bartlett 132 Kennington Park Road

The objectors' concern is that the increased frequency of trains once the NLE is operational will lead to increased frequency of existing vibration effects on properties above the current Northern Line which will not have the benefit of the track mitigation measures proposed for the new extension to the railway.

The objectors' premises lie just beyond the step plate junction at the end of the northbound branch of the new extension, above the existing Northern Line.

The existing groundborne noise levels at this address are primarily due to trains on the Morden branch and as explained in the ES Appendix E paragraph 5.2 are likely to be 42 dB L_{AFmax}. In paragraph 9.19 in my proof of evidence it is explained that there is a potential increase in speed on the short length of the Kennington Loop between the step plate junctions. Measures will be taken to ensure that the noise level from trains using the loop will not be increased..

46 Battersea Dogs and Cats Home 4 Battersea Park Road

The objector is concerned about noise and vibration during both construction and operating phases, especially because of the particular sensitivity of dogs and cats and the importance of a stress-free environment. There is also concern about adverse physical impacts such as settlement or other damage to buildings.

The objector's premises are to the west of the Battersea Station worksite from which it is separated by several railway lines.

Unmitigated noise levels from surface worksite activity are within the threshold for significant effects at the nearest noise-sensitive receptors to the worksite which are at a similar distance from it as the objector's premises are. It is not therefore expected that these thresholds will be exceeded at the objector's premises.

The ES reports (Paragraph 9.160) that the likelihood of any cosmetic damage to buildings surrounding any of the worksites owing to vibration from surface construction works is negligible.

In the case of vibration from the TBM the ES reports (paragraph 9.165) that the significance of this source of vibration is negligible for both buildings and humans.

Groundborne noise from the use of the temporary construction railway is not predicted to give rise to significant effects in this part of the NLE.

However, in the course of constructing the underground tunnel, which it is intended to construct using sprayed concrete lining (SCL), it will be necessary to construct a temporary rib across the middle of the tunnel, to be broken out when enlarging the tunnel to its full diameter. If the breaking out were to be done using conventional percussive methods, there would be potential for a significant groundborne noise effect in the buildings above. Mitigation will be required in the form of non-percussive breaking methods which will avoid a significant effect.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

48 Councillor Patrick Diamond

The objector is concerned about the construction and operational phases of the work and installation at Kennington Park. He assumes that vibration from machinery will cause at least some damage to properties, disruption from noise during construction and operation in the surrounding areas and in the Park itself. Furthermore, TfL has informed him that they believe working at night and at weekends will be necessary.

The ES reports (Paragraph 9.160) that the likelihood of any cosmetic damage to buildings surrounding any of the worksites owing to vibration from surface construction works is negligible.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

Airborne noise from surface activities during construction is predicted to generate levels at the noise sensitive receptors in Kennington Road, Kennington Park Place, and St Agnes' Place overlooking the worksite above the threshold for significant effects at this location but the application of the mitigation measures described in the ES and in this Proof will result in there being no residual significant effects. That assessment is for the worst-case activity – shaft excavation – which is expected to last about 10 weeks.

59 Suzanne Jansen 90 De Laune St

Point 5 of this objector's submission is concerned with the effect of the Harmsworth Street worksite on her premises, particularly as she works from home.

The premises are opposite where the Harmsworth Street Shaft worksite would have been located but that temporary shaft will not now be constructed and there will be no worksite there. Consequently there can be no noise or vibration effects from the site itself or from any local construction traffic that would have served the worksite.

The next nearest worksite to these premises is the one at Kennington Park. Airborne noise levels from surface activity at that worksite have been predicted for receptors that overlook the site including locations nearer to it that the objector's premises are. The application of the mitigation measures described in the ES and in this Proof will result in there being no residual significant effects at those locations from surface activity at the Kennington Park worksite. Consequently, there will be no residual significant effects at the objector's premises from that source either.

60 Kennington and Walworth Neighbourhood Action Group (KWANAG)

The Association is concerned about operational noise from Kennington Park Head House/Shaft on houses in the adjacent streets and on Bishop House Early Years Centre (at 5 Kennington Park Place), noise during construction and operation, and groundborne noise during operation.

Kennington and Walworth Neighbourhood Action group KWANAG, is a group of local residents from the Kennington and Walworth areas whose homes are in the vicinity of the proposed tunnel and the proposed access shaft on the site of Kennington Park Lodge.

As regards construction noise KWANAG is concerned at TfL's indication that overnight and weekend working might be necessary and KWANAG are seeking guarantees that the project's normal working hours will be adhered to though KWANAG realises that some tunnel cementing work might require 24-hour working with the agreement of local residents.

Operational noise levels from the shaft and the railway are addressed in KWANAG's Statement of Case which proposes that TfL provides the following 3 guarantees.

First, noise levels from the vent should be no more than 25 dB (no noise scale specified but reference is made to WHO Guidance from 1999 to support this).

Secondly, final levels from 'the tunnels should not exceed 30 decibels (outside noise levels)' (a further reference to the 1999 WHO Guidance is made here).

Finally, that ' ... noise levels in the De Laune Street area , in close proximity to the step plate junction, should also be brought down to 30 dB in line with the rest of the scheme'.

This response deals with the issues raised in the order – airborne noise during construction, operational noise from the vent shaft, and operational groundborne noise.

Airborne noise from surface activities during construction is predicted to generate levels at the noise sensitive receptors in Kennington Road, Kennington Park Place, and St Agnes' Place overlooking the worksite that are above the threshold for significant effects at this location but the application of the mitigation measures described in the ES and in this Proof will result in there being no residual significant effects. That assessment is for the worst-case activity – shaft excavation – which is expected to last about 10 weeks.

The design aim for operational noise from the shafts is to ensure that the noise from them does not cause a significant effect. To that end the rating level that at the nearest dwelling will be 10 dBA below the existing noise level in the area at night with the noise from the shaft defined as a rating level (and using the L_{Aeq} index) and the existing noise defined using the L_{A90} index. In the area round Kennington Park the typical lowest night-time noise level is 44 dB $L_{A90,1hr}$ and so the shaft would be designed not to exceed a rating level of 34 dB outside the nearest dwelling. During the daytime the existing noise levels in the area are higher than at night but the noise level from the shaft would not increase and consequently shaft noise levels would be even further below the existing noise level.

Thus at night the noise levels outside the nearest dwelling would be below the existing levels and there would be no significant effect and during the daytime, when the Bishop House Early Years Centre would be operating, the existing noise levels would be higher than it is at night and so the effect of noise from the shaft would be less.

KWANAG refers to 1999 guidance from WHO in support of the noise level of 30 dB it has put forward for groundborne noise.

In 2009 WHO published the Night Noise Guidelines for Europe which states in its and the Abstract that:

> ”These guidelines are applicable to the Member States of the European Region, and may be considered as an extension to, as well as an update of, the previous WHO Guidelines for community noise (1999).”

Section 6 of this proof considers the 2009 WHO guidance (in paragraphs 6.22 to 6.25) with regard to L_{Amax} (and L_{night}). That review concludes that for transportation noise in general the NOAEL level in the 2009 WHO guidance is not as strict as the design guidance for NLE. Consequently, the ES concludes that even in the area close to the step plate junction where the predicted level of groundborne noise is 5 dB or more above that for other locations, there will be no residual significant effect with the proposed mitigation measures in place.

66 Alexandra Norrish
Kenbiggan Management Co 13 Kennington Pk Place

The objector is asking that noise levels and working hours during construction should be guaranteed and Lambeth Council should have powers to oversee and enforce these. Long term noise levels from the development should be guaranteed at no more than 30 decibels, including at the step plate junction.

Noise levels and working hours will be controlled by Lambeth through the procedures in Sections 60 and 61 of the Control of Pollution Act. Noise from the operating railway will be controlled through the planning conditions which are given in draft in Appendix 4.

The nearest groundborne noise prediction location is G13 (87 de Laune Street, see Figure A1.6 of Appendix 1 to this proof).

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Based on the assumptions in the ES (para 9.171) the unmitigated levels of groundborne noise from the temporary construction railway at receptor G13 have the potential to have a significant effect. The temporary construction railway will be subject to the requirement to use best practicable means to reduce noise and vibration.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

67	**Henry Cobbe**	**61 Fentiman Rd**
	also representing	
	Ceri Morgan	**54 Fentiman Road**
	Peter & Laura Carew	**58 Fentiman Road**
	Peter & Laura Carew	**60 Fentiman Road**
	Stephen Bayley	
	Nick Bence-Trower	**59 Fentiman Road**
	David Glass	**67 Fentiman Road**
	Simon Ricketts	**69 Fentiman Road**
	Andrew Weller,	
	Michael Thomas &	
	Alison Forbes	**71 Fentiman Road**
	Martyn Thomas &	
	Ann Rogers	**72 Fentiman Road**

The objectors are concerned about the following aspects of groundborne noise during operation.

Factsheet F sets out TfL's firm commitment to achieving 40 dB L_{AFmax} but only to use 'reasonable endeavours' to achieve 35 dB L_{AFmax} and so TfL has no obligation to achieve 35 dB L_{AFmax} even though it will be designed to do so.

The objectors therefore request first, that there should be a firm commitment or undertaking made by, or imposed on TfL, to use all mitigation measures possible to meet < 35 dB L_{AFmax} for receptors adjacent to the step plate junctions and points and crossings; and < 27 dB L_{AFmax} for receptors along the rest of the route. Secondly, they request that there to be a firm commitment or undertaking made by, or imposed on TfL, to ensure that the mitigation measures assumed in Rupert Taylor's analysis to deliver the lower predicted noise levels in the Environmental Statement (IIa Appendix E4:Groundborne Noise and Vibration Prediction Report, Table 7, p.20) are implemented in full.

Thirdly, that in the interests of equity with the Crossrail Bill floating slab track is installed in all tunnels which are routed under residential property at a depth of 15 metres or less. Finally, they request that floating slab track is also installed in all tunnels which run through schools and conservation areas, detailed in map they provide.

The main objector's premises are south-west of the Oval Underground Station and adjacent to the limits of deviation of the proposed route; the premises of some of those who represents are closer to the tunnels than his own property is.

The nearest groundborne noise prediction location is G5 (71 Fentiman Road, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 21 dB L_{AFmax} (Appendix A5, Table A5.3, 'Operating Phase' column) which is not a significant effect and is substantially below the objectors' preferred level.

73 Ballymore Group Nine Elms.

The objector is concerned about the effect of groundborne noise during operation on their new development which includes a multi-storey block of flats supported on piled foundations.

The objector's site is at Embassy Gardens in the Nine Elms Area near Battersea Park Station and the objector requests the use of floating slab track to provide additional noise mitigation in order to allow for uncertainty in the noise predictions.

Because the NLE is a project in which existing train types will operate in tunnels constructed in ground conditions which are well understood, and the rail support system will be of a well-established kind an example of which is already in successful use on the Jubilee Line Extension, the uncertainty associated with the predictions of groundborne noise and vibration is low.

123 VNEB Development and Action Transport Group – DATA **Vauxhall Area**

This objector believes that TfL has provided misleading information on groundborne noise and is concerned as to whether the degree of mitigation ultimately employed to control vibration from the use of the running tunnels will be sufficient to avoid disturbance to residents and damage to properties along the line of the NLE.

DATA refers to the WHO document NNGE in support of its belief that the guidance therein has not been used appropriately in relation to the NLE's design aims.

Section 6 of this proof considers the WHO NNGE document (in paragraphs 6.22 to 6.25) with regard to L_{Amax} (and L_{night}). That review concludes that for transportation noise in general the NOAEL level in the WHO guidance is higher than the design guidance for NLE.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects on occupiers or buildings.

131 IMPACT Residents' Association **Meadow Road, Palfrey Place Ashmole Street, Claylands Road Claylands Place, and Trigon Road**

IMPACT (a Residents' Association for the roads listed above) is concerned about groundborne noise from the operation of the NLE and that the NLE design aims to take proper account of WHO guidance.

Specifically IMPACT states that "TfL is aiming for operational noise levels of 35 dB L(A) max, fast, but World Health Organisation guidelines indicate that a target of 30 dB L(A) max fast should be the optimum target (preferably less), if long term impacts on health (especially amongst vulnerable young and elderly residents) are to be avoided. TfL's design standards should ensure that operational noise does not exceed 30 dB L(A) max and that their design and build criteria are incorporated in the contractual terms and conditions for the NLE construction."

Section 6 of this proof considers the most recent (2009) WHO guidance (in paragraphs 6.22 to 6.25) with regard to L_{Amax} (and L_{night}). That review concludes that for transportation noise in general the NOAEL level in the 2009 WHO guidance is higher than the design guidance for NLE. Consequently, the ES concludes that even in the area close to the step plate junction where the predicted level of groundborne noise is 5 dB or more above that for other locations, there will be no residual SE with the proposed mitigation measures in place.

The area represented by IMPACT lies about 100m south west of the Oval Cricket Ground and groundborne noise prediction locations G5 to G8 are within it or nearby (Appendix A5,Table A5.3).

During the operating phase the typical mitigated groundborne noise levels are estimated to be 20 – 22 dB L_{AFmax} with a maximum of 27 dB L_{AFmax} at G8. (Appendix A5, Table A5.3, 'Operating Phase' column). These levels do not give rise to a significant effect and are below the objectors' preferred level.

132 Richard Clayton and Laura Forman 58 Fentiman Road

The objectors submit that the best possible mitigation should be used to control noise and vibration from the daily operation of the NLE. This is because of their concerns about noise blight (if groundborne noise levels are above their preferred level of 30 dB L_{AFmax}) and for the structural integrity of their property.

The objector's premises are south-west of the Oval Underground Station and the nearest groundborne noise prediction location is G7 (24 Claylands Road, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 22 dB L_{AFmax} (Appendix A5, Table A5.3, 'mitigated' column) which is not a significant effect and is below the objector's preferred level.

In the operating phase, groundborne vibration from the underground trains is not predicted to give rise to any significant residual effects on occupiers or buildings.

138 Edward and Emma Docx 65 Fentiman Road

The objectors are concerned about the environmental impact (noise and vibration) of the NLE as further explained below.

Factsheet F sets out TfL's firm commitment to achieving 40 dB L_{AFmax} but only to use 'reasonable endeavours' to achieve 35 dB L_{AFmax} and so TfL has no obligation to achieve 35 dB L_{AFmax} even though it will be designed to do so.

The objector would therefore like there to be a firm commitment or undertaking made by, or imposed on TfL, to use all mitigation measures possible to meet the < 35 dB L_{AFmax} for receptors adjacent to the step plate junctions and points and crossings; and < 27 dB L_{AFmax} for receptors along the rest of the route

The objectors' property is south-west of Oval Underground station and is to be included in the limit of deviation from the proposed tunnel. The nearest groundborne noise prediction location is G7 (24 Claylands Road, see Figure A1.6 of Appendix 1 to this proof).

During the operating phase the mitigated groundborne noise level is estimated to be 22 dB L_{AFmax} (Appendix A5, Table A5.3, 'mitigated' column) which is not a significant effect and is below the objector's preferred level.

In the operating phase, groundborne vibration from the underground trains is not predicted to give rise to any significant residual effects on occupiers or buildings.

146 G Bradic-Nelson 27 Westcott Road

The objector is concerned about noise from construction, excavation, tunnelling and lorries.

In particular she is concerned at TfL's indication that overnight and weekend working might be necessary and is seeking guarantees that the project's normal working hours will be adhered to; she also considers that night working is only carried out after a notice period of 2 weeks.

She suggests that TfL provides the following three guarantees in respect of operational noise levels from the shaft and the railway.

First, noise levels from the vent should be no more than 25 dB (no noise scale specified but reference is made to WHO Guidance from 1999 to support this).

Secondly, final levels from 'the tunnels should not exceed 30 decibels (outside noise levels)' (a further reference to the 1999 WHO Guidance is made here).

Finally, that ' ... noise levels in the De Laune Street area, in close proximity to the step plate junction, should also be brought down to 30 dB in line with the rest of the scheme'.

The objector's premises in Westcott Road lies on the north side of Cook's Road which is a continuation of Kennington Park Place. The entrance to Westcott Road is approximately 200m from the easternmost part of Kennington Park.

This response deals with the issues raised in the order – airborne noise during construction, operational noise from the vent shaft, and operational groundborne noise.

Airborne noise from surface activities during construction is predicted to generate levels at the noise sensitive receptors in Kennington Road, Kennington Park Place, and St Agnes' Place overlooking the worksite that are above the threshold for significant effects at this location but the application of the mitigation measures described in the ES and in this Proof will result in there being no residual significant effects. That assessment is for the worst-case activity – shaft excavation – which is expected to last about 10 weeks. The objector's premises are more remote from the worksite and so there will be no significant effects there from this source of noise.

The design aim for operational noise from the shafts is to ensure that the noise from them does not cause a significant effect. To that end the rating level that at the nearest dwelling will be 10 dBA below the existing noise level in the area at night with the noise from the shaft defined as a rating level (and using the L_{Aeq} index) and the existing noise defined using the L_{A90} index. In the area round Kennington Park the typical lowest night-time noise level is 44 dB $L_{A90,1hr}$ and so the shaft would be designed not to exceed a rating level of 39 dB outside the nearest dwelling.

During the daytime the existing noise levels in the area are higher than at night but the noise level from the shaft would not increase and consequently shaft noise levels would be even further below the existing noise level.

Thus at night the noise levels outside the nearest dwelling would be below the existing levels and there would be no significant effect and during the daytime.

The objector refers to 1999 guidance from WHO in support of the noise level of 30 dB he has put forward for groundborne noise.

In 2009 WHO published the Night Noise Guidelines for Europe which states in its and the Abstract that:

> "These guidelines are applicable to the Member States of the European Region, and may be considered as an extension to, as well as an update of, the previous WHO Guidelines for community noise (1999)."

Section 6 of this proof considers the 2009 WHO guidance (in paragraphs 6.22 to 6.25) with regard to L_{Amax} (and L_{night}). That review concludes that for transportation noise in general the NOAEL level in the 2009 WHO guidance is higher than the design guidance for NLE. Consequently, the ES concludes that even in the area close to the step plate junction where the predicted level of groundborne noise is 5 dB or more above that for other locations, there will be no residual SE with the proposed mitigation measures in place.

157 Vauxhall Liberal Democrats

The objector is concerned that the tunnelling and operation of the extension will have a noise impact for residents in the area. This will be a significant cost to residents and needs to be minimised. TfL could go further than they are currently committing to in terms of noise mitigation and this should be a condition on the TWAO.

It is not clear exactly what further mitigation is being sought. This is likely to include improvements in mitigation of operational groundborne noise which I have addressed in several places in this evidence.

158 Kennington Green Supporters Group

The proposals would results in great noise disturbance during construction to residents whose main windows look on to the Green.

The noise levels predicted for Kennington Green are given in section 9.142 of the ES. The unmitigated predictions show a significant effect, but with the application of mitigation measures the effect will not be significant.

190 Coalition of Lambeth and Walworth Residents (now known as NLE Community Action)

The objectors believe that TfL is capable of delivering a system which reduces operational noise levels to below its suggested 35 dB L(A) max, fast and that a target of 30 dB L(A) max, fast is suitable for TfL to aim for in designing the Northern Line Extension, and would be better for health than the standard which TfL is currently aiming to deliver. They need further answers as to how TfL intends to procure contractors who are able to operate at the cutting edge of noise mitigation technology. TfL should explain what standards it intends to hold its contractors to on noise issues, as part of a wider requirement on TfL to demonstrate that it is using best practical means to reduce operational noise levels.TfL does not offer any remedies for residents if it turns out at a later date that noise levels are above those predicted in the Environmental Statement included in the TWAO application. The TWAO application does not set out what standards will be in place to reduce construction noise to a minimum, nor is there evidence of the role local authorities intend to play to enforce the standards.

The health position regarding operational noise levels is addressed in the consideration of the Night Noise Guidelines for Europe which I refer to in paragraph 6.24 above. The noise mitigation required is well established and in use in many other railways so that all major contractors bidding for the NLE work will be familiar with the required design and procurement processes. If operational noise levels turn out to be higher than those predicted, the provisions of Part I of the Land Compensation Act will apply. TfL have made clear commitments through the Code of Construction Practice and the use of the prior consent provisions of Section 61 of the Control of Pollution Act to apply best practicable means to reduce construction noise.

206 Kennington Association Planning Forum

Their concerns are stated to be fully explored by the Coalition of Lambeth and Walworth Residents.

214 Cory Environmental Limited

The objector has concerns regarding noise and dust control measures included within the design the conveyor, and the associated impact that this would have on the proposed developments within the Vauxhall Nine Elms Battersea Opportunity Area and requests that if the Order is granted, it is conditional on the conveyor being acoustically enclosed along the route.

The conveyor will come within the ambit of the Control of Pollution Act Section 61 provisions through which best practicable means for noise control are required, which if practicable will require it to be acoustically enclosed.

241 Fentiman Road NLE Affected Properties Group

The objector contends that achievement of TfL's maximum operational ground-borne noise commitment of 35dBLAfmax is insufficient for locations such as Fentiman Road where the line passes under Victorian residential listed buildings with shallow foundations and basements that include bedrooms. Lower levels than this were specified at particular points on the Crossrail route. The objector agrees with the independent consultants acting for Lambeth Council (Ramboll), which found that a general maximum of 30dBLAmax would be more suitable. It appears likely to the objectors that 30dBLAmax will in fact be comfortably achieved under their properties but likelihood is not enough and the objector seeks certainty. TfL fails to specify the technology that will be used, leaving the final trackform the responsibility of the design and build contractor in collaboration with London Underground. The objector requests that

1. That the stated intention by TfL to use a consistent trackform and incorporated mitigation along the whole length of the NLE is made a legally binding condition for the building of the NLE; and
2. That the mitigation method of resilient base pads as outlined to us on 21 February 2013 or, failing that, an alternative method which is modelled to deliver at least the same reduction in dBLAFmax, is made a legally binding condition for the building of the NLE.

The legal status of TfL's commitments are outside the scope of my evidence.

250 Simon Hughes MP

The objector is concerned about the proximity of the Kennington Park shaft to residential facades and about a lack of TfL guarantees on maximum construction noise levels until contractors appointed which is unacceptable to residents who need comfort that impact will be minimised to the greatest extent possible. There is also uncertainty regarding site working hours and whether heavy construction work will take place outside normal working hours/weekends.

The noise levels predicted for Kennington Park shaft are given in section 9.140 of the ES. The unmitigated predictions show a significant effect, but with the application of mitigation measures the effect will not be significant. The application of the Code of Construction Practice and use of the prior consent provisions of Section 61 of the Control of Pollution Act will provide strong control of construction noise levels.

251 Gerald Bowden 130 Kennington Park Rd

The objector is concerned about noise from heavy earth-moving plant and lorries during construction and lasting damage to foundations and fabric particularly above properties above or adjacent to the area of tunnelling operations.

The objector states that tunnelling is planned to go directly beneath his premises which are about 200 - 300 m south-west of Kennington Underground station.

The nearest worksite to the objector's premises is at Kennington Park. Kennington Park is about 100m south-west of his premises along Kennington Park Road and the worksite is set back from the frontage of the park with Kennington Park Road.

Airborne noise from surface activities during construction at the Kennington Park worksite is predicted to generate levels at the noise sensitive receptors overlooking it in Kennington Road, Kennington Park Place, and St Agnes' Place that are above the threshold for significant effects at this location but the application of the mitigation measures described in the ES and in this Proof will result in there being no residual significant effects. That assessment is for the worst-case activity – shaft excavation – which is expected to last about 10 weeks. The objector's premises are more remote from the worksite and so there will be no significant effects there from this source of noise.

The effects of construction traffic have been assessed for sections of Kennington Park Road from south of Camberwell New Road [NB this is printed as Camberwell North Road in the ES, Table 9-24] to south of Braganza Street. Braganza Street is about 200 - 300 m north-east of Kennington Park Road. For all these sections of Kennington Park Road the effect was negligible and not significant (See Appendix A5,Table A5.2).

Construction vibration has been predicted at locations G1 to G13 for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

Groundborne noise levels have also been predicted at locations G1 to G13. The objector's premises lie between G12 and G13 being slightly nearer to G13. The assumption is made in the ES (para 9.171) that the level of groundborne noise from the temporary construction railway will be similar to the unmitigated noise levels predicted for the operating railway. However, this location is at the end of the tunnel drive, and the unmitigated noise levels for the operating railway include the effect of trains passing over the turnout at the step plate junction, and there will be no similar effect for the temporary railway. No more than minor adverse effect is likely.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

253 Athiqur Meah 168 Old South Lambeth Road

The objector believes that high intensity drilling during construction of the tunnels and shafts will inevitably cause structural damage to the property (ie, cracks, minor movement of building, door frames). He also believes that groundborne noise and possible vibration during operation will render the ground floor of his property uninhabitable. He therefore proposes that moving the line within the limits of deviation away from his premises is considered.

The objector's premises are south-west of the Oval cricket ground near the alignment of the northbound running tunnel.

Construction vibration has been predicted at locations G1 to G13 in the Kennington area for tunnel boring activities and the effects are not predicted to be significant for their effects on humans or structures.

In the operating phase, groundborne noise and vibration from the underground trains are not predicted to give rise to any significant residual effects.

254 Claylands Green NLE Action Group

The group expresses concern that through much of its length the 2 tunnels are aligned so that many residents will be subject to noise from 2 trains passing in opposite directions, simultaneously. They believe the number of properties potentially affected by noise from 2 trains is extensive. It is essential that TfL set out in a single, legally binding document for the public, what the assumptions are behind their noise predictions, what those predictions are [based on 2 trains passing each other] and how these will be incorporated in any main or sub-contract. It is also unclear what affordable remedies could be available to residents at a later date, if it becomes clear that noise levels are above those predicted in the ES. It is of vital importance that full noise mitigation measures are part of the design and build criteria for the NLE and are properly incorporated into the contractual terms and conditions for the NLE construction. It appears that Lambeth Council chose to disregard the advice of their own independent consultants Ramboll to require a maximum noise level of 30 dB L(AF)max along the length of the NLE. TfL should be obliged to incorporate measures that will result in the noise levels not exceeding 30 dB L(AF)max along the full length of the NLE including the Kennington Loop.

I have explained the effect of two trains passing in paragraph 8.15 above and the effect of taking two simultaneous trains into account is not as great as the group fears. It will not result in significant effects. All previous policies regarding groundborne noise design aims in new underground railways have been expressed in similar terms.

With regard to the choice of design level for groundborne noise, which the group request to be 30 dB L_{AFmax}, the position is that for major infrastructure projects the correct approach is to take into account government guidance which in the case of noise is expressed in terms of SOAEL which I have explained in paragraph 6.21 above. While it is technically possible to employ more elaborate track support systems to achieve lower noise levels, these would increase the cost of the project and cannot be justified in terms of planning policy. While the cost is significant even for the relatively short length of the NLE, the precedent set would have escalating cost consequences when, for example the future proposed Crossrail Line 2 is taken into consideration.