



CLIENT: LONDON UNDERGROUND LIMITED

CONTRACT REF: TLL 7917

NORTHERN LINE EXTENSION

MAIN WORKS CONTRACT

CODE OF CONSTRUCTION PRACTICE PART B KENNINGTON PARK



Issue and Revision Control

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GLOSSARY AND ABBREVIATIONS

Alluvium Soil - deposited by river processes

Ambient - Background levels

Aquifer - A below ground, water-bearing layer of soil or rock

BAP - Biodiversity Action Plan. A plan highlighting a species of concern within a specific geographical area

Baseline - Existing environmental conditions present on, or near a site, against which future changes may be measured or predicted

Bentonite – a type of absorbent clay formed by breakdown of volcanic ash, used especially as a filler.

Best Practicable Means (BPM) – A methodology having regard to the current state of technical knowledge, the local conditions and circumstances and the financial implications. It must also include consideration health and safety, design, installation, maintenance and manner and periods of operation, plant and machinery, and the design, construction and maintenance of buildings and structures.

BREEAM – BRE Environmental Assessment Method; an independently assessed scheme designed to improve the environmental performance of building projects.

CEEQUAL – Civil Engineering Environmental Quality assessment scheme, an independently verified assessment tool used to improve environmental performance of civil engineering projects.

CoCP - Code of Construction Practice. Document providing mitigation to reduce or eliminate adverse effects and enhance beneficial effects

Code of Construction Practice Part A – sets out the general principles and requirements to be applied during construction and are applicable project-wide.

Code of Construction Practice Part B – sets out the site-specific measures applied during construction, in addition to the general requirements indicated in Part A.

Contamination - Contamination is the addition, or the result of addition, or presence of a material or materials to, or in, another substance to such a degree as to render it unfit for its intended purpose

Crushers - Deconstruction plant used to reduce the size of demolition waste

Cumulative Impacts - Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions

dB - Decibel. The ratio of sound pressures, which we can hear, is a ratio of 106 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A) - The unit of noise measurement (measured on a logarithmic scale), which expresses the loudness in terms of decibel (dB) scale and the frequency factor (A)

Demolition - Deconstruction of buildings and other structures

Dewatering - The removal of water from the soil to enable work to be carried out below the groundwater level

Dust - Fine particles of solid materials ranging in size from 1 to 75 micron diameter (see British Standard 3405) capable of being re-suspended in air and settling only slowly under the influence of gravity where it may cause nuisance

Ecology - The study of living organisms in relation to their surroundings

Environmental Statement (ES) - The outcome of the Environmental Assessment presented in a formal document or documents in accordance with EC Directive 85/337. Includes such information that is reasonably required to assess the environmental effects of a development.

Environmental Impact - Positive or negative impact of a project component or activity on the surrounding environment

FLO – the contractor joint venture between Ferrovial Agroman UK and Laing O'Rourke appointed by Transport for London to carry out the Northern Line Extension Project.

Grade I Listed - A listed building of exceptional interest

Grade II* Listed - Particularly significant buildings of more than local interest

Grade II Listed - Buildings of special architectural or historic interest

Habitat - The living place of an organism characterised by its physical or biotic properties

Hazardous - A substance that is potentially damaging to the environment and harmful to humans and other living organisms

Head house - The above ground structure which is associated with and either directly above or off set from a below ground shaft

Heritage Structures - Buildings of historic significance

Hoarding - A temporary board fence set up on the perimeter of a building site

Hydrocarbon - An organic compound consisting entirely of hydrogen and carbon

In-situ - In the natural, original or appropriate position

Listed building - Buildings of special architectural or historic interest listed by the Secretary of State for Culture, Media and Sport on the advice of English Heritage - Buildings are graded to indicate their relative importance

LU – London Underground.

M&E - Mechanical and Electrical

Made Ground - Soils or other material that has been deposited by man rather than natural processes, for example to make up ground levels

Mitigation (measure) - The measures put forward to prevent, reduce and where possible, offset any adverse effects on the environment

NOx – Oxides of nitrogen

PAH - Poly Aromatic Hydrocarbon

Particulate matter - Discrete particles in ambient air, sizes ranging between nanometres (nm, billionths of a metre) to tens of micrometres (µm, millionths of a metre)

PM₁₀ – Particulate Matter of 10 microns or less

Passive Deposition Monitoring - is the collection of a representative sample of particulate matter over a known area without any active intervention e.g. dust slides or sticky pads.

pH - A measure of the acidity or basicity of a solution

Pre-cast - cast (an object or material, typically concrete) in its final shape before arriving on site and positioning.

Pile - A timber, steel or concrete post that is driven jacked or cast (bored) into the ground to carry vertical or horizontal loads

Plant - A building's generator, heating, ventilation, and/or electricity production system, or the machinery used in demolition and construction

PPV - Peak Particle Velocity in metres per second. The vibration measurement parameter that based on a form of acceleration that is frequency weighted to reflect human sensitivity to various frequencies

Receptor – something or someone that could be affected (beneficially or adversely) by changes caused as a result of a development of a scheme

Reinforced concrete - Concrete reinforced with steel bars to increase tensile strength

Running Tunnels - Basic sections of tunnels between stations, shafts and turnouts

Runoff - Rainwater flowing off the ground surface

Secant Pile – a way of constructing retaining walls and are formed by a series of interlocking bored concrete piles.

Section 61 Agreement - A Consent with the local authority issued under the Control of Pollution Act 1974 to agree 'best practicable means' associated with reducing the noise and vibration impacts for activities with the potential to cause nuisance from a worksite.

SCL - Sprayed Concrete Lining

Shaft - A vertical excavation used as a passage from the surface to the below ground works, used for ventilation, travelling, hoisting, or all three. Shafts are usually of limited cross section in relation to their depth

Stakeholder - A person, group, or organisation that affects or can be affected by an organisation's actions

Station Box - A deep cut and cover box below ground level which will contain the station concourse and relevant facilities

Step Plate Junction - A junction where two tunnels lined with plates of different diameters meet, and vertical plates are used to close the vertical faces, to form a step

TBM - Tunnel Boring Machine

TPH - Total Petrol Hydrocarbons

TWAO - Transport and Works Act Order. Can authorise railways, tramways, guided transport schemes and certain other types of infrastructure project in England and Wales

Threshold - A level of effect above which an assessment will be taken of whether any changes to procedures need to be made

Trial Pits - Intrusive investigation positions excavated by a mechanical Excavator

VNEB - Vauxhall Nine Elms and Battersea. This is identified as an 'Opportunity Area' in the London Plan for regeneration and redevelopment, as an integral part of the Central Activities Zone.

1.0 Introduction

This Code of Construction Practice (CoCP) Part B has been prepared by FLO (joint venture between two companies Ferrovial Agroman UK and Laing O'Rourke) for the construction of the Northern Line Extension (NLE) and covers the environmental impacts relating directly to the construction activity within Kennington Park site boundary, but also within the local area that may be affected by the construction works.

This document takes into account the nature of the works, the local environmental 'receptors' and the results of ongoing engagement with the London Boroughs of Lambeth and Southwark as well as with other stakeholders. Through the CoCP Part B, FLO aims to inform stakeholders of our proposed approach and mitigation to reducing adverse effects from the works.

The site specific measures detailed within this CoCP Part B (in addition to the mitigation measures specified in the CoCP Part A which are denoted by the use of italics) will ensure that the environmental impacts resulting from the NLE construction at Kennington Park are effectively controlled and where possible eliminated. FLO will not only comply with all relevant environmental legislation and wider requirements but seek to exceed current industry best practice where possible. This will in part, be achieved, through our NLE environmental objectives below which will ensure continual improvement of our environmental and sustainability performance. We will seek to:

- reduce greenhouse gas emissions;
- reduce pollutant emissions to the air (NO_x and PM₁₀);
- reduce resource consumption and improve green procurement;
- reduce the waste generated by applying the principles of "reduce, reuse and recycle";
- BREEAM 'Very Good' score for the two stations
- CEEQUAL 'Excellent' score for civil engineering works (for more information on CEEQUAL visit: www.ceequal.co.uk)

The CoCP Part B will be submitted to the relevant local planning authorities for approval before starting works at Kennington Park worksite. This document should be read in conjunction with the following documents that describe aspects of the project environmental management in more detail.

Title of Document	Reference
Code of Construction Practice (CoCP) Part A	TfL 13E/1 20/12/13
CoCP Part B – Battersea	FLO_N205-2360000-HSE-PLN-00001
CoCP Part B - Kennington Green	FLO_N202-2360000-HSE-PLN-00002
CoCP Part B – Nine Elms	FLO-N203-2360000-HSE-PLN-00001
Noise and Vibration Management Plan	FLO-N001-2360000-HSE-PLN-00006

Resource Efficiency Plan	FLO-N001-2360000-HSE-PLN-00007
Air Quality Plan	FLO-N001-2360000-HSE-PLN-00008
Water Management Plan	FLO-N001-2360000-HSE-PLN-00009
Sustainable Travel Plan	FLO-N001-2360000-HSE-PLN-00010
Archaeology and Heritage Management Plan	FLO-N001-2360000-HSE-PLN-00013
Energy Management Plan	FLO-N001-2360000-HSE-PLN-00011
Ecology Management Plan (including reinstatement)	FLO-N001-2360000-HSE-PLN-00012
Traffic Management Plan	FLO-N001-2360000-CON-PLN-00004

2.0 Area and Scope

The Northern Line Extension (NLE) will create a new underground line as an extension to the existing Charing Cross branch of the Northern line between Kennington and a terminus station to the south of Battersea Power Station. The extension will consist of new twin bore running tunnels of 5.2m internal diameter and covering a distance of approximately 3.3km with new stations at Battersea and Nine Elms.

Two shafts of approx. 25m deep will be sunk at Kennington Green and Kennington Park respectively. These shafts will be used to remove the Tunnel Boring Machine's (TBM), service the Sprayed Concrete Lining (SCL) running tunnels up to the step plate junction (approx. 145m and 230m long respectively), build the step plate junction and build the four cross passages at Kennington Station. The current proposal to build the step plate junction includes two SCL gallery tunnels however this method is currently under review.

The Kennington Park works covered by the CoCP Part B includes site clearance, demolition, civil works including shaft construction, interface with tunneling, fit-out, services installations and head works.

This worksite is located at the junction of Kennington Park Road and St Agnes Place within Kennington Park which is registered for its special historic interest (Grade II) under the Historic Buildings and Ancient Monuments Act 1953 in the Register of Historic Parks and Gardens maintained by English Heritage. The north-eastern section of the proposed route (southbound) crosses Kennington Park and the southbound ventilation shaft and head house site is located in the northern edge of the park.

3.0 Temporary Work Sites

The illustrations contained within Appendix 1 identifies the construction worksite for the NLE activities at Kennington Park. Please refer to diagram III within Appendix 1 for the proposed initial layout of the worksite.

4.0 Summary of Main Works

A high level summary of the works at Kennington Park is included below. Detail of how site specific mitigation is to be applied for each environmental aspect on the Kennington Park scheme is included in the relevant section of this document.

4.1 Utilities Works

A range of utility investigations and diversions are required to facilitate the scheme which may include Gas, Electric, BT and Water. A majority of these utility works are located within the highway and footpaths.

4.2 Demolition Works

Demolition of existing Kennington Park Lodge.

4.3 Ground Treatment / Dredging Works

Not applicable

4.4 Tunneling Works

The general tunneling activities are covered within the Battersea CoCP Part B, however specific measures relating to settlement from the tunnel route passing underneath buildings and properties in the vicinity of the Kennington Park worksite is covered in Section 16.

Two SCL tunnels will be driven of length 230m and 145m at Kennington Green and Kennington Park respectively, from these tunnels two gallery tunnels will be driven in SCL (this method is currently being reviewed) prior to the construction of the Step Plate Junction works at both sites. Both Kennington Green and Kennington Park sites will be used to service the activities required for the construction of the four cross passages at Kennington Station.

4.5 Shaft Construction

- a) Sound attenuation works to Bishops House Nursery
- b) Site Clearance works, including:
 - i. Relocation of Bee Urban (to be undertaken by LB Lambeth)
 - ii. Relocation of dog walking area (to be undertaken by LB Lambeth)
 - iii. General site clearance (including some tree removal, erection of hoardings and traffic protection)
- c) Unexploded Ordnance Survey
- d) Piling works for new 13.5m diameter shaft approx. 26m deep
- e) Excavation of shafts
- f) Erection of acoustic shed and gantry crane to service the shaft
- g) SCL (Sprayed Concrete Lining) tunneling to the Step Plate Junction
- h) Reception of Tunnel Boring Machine (TBM) from Battersea
- i) TBM component removal by overhead and/or mobile cranes

- j) Fit out works to shaft
- k) Construction of head works
- l) Removal of worksite and reinstatement of the Park.

5.0 Public Access, Highways and River Transport

The Transport and Works Act Order (TWAO) authorises certain matters concerning highways as set out in the relevant articles and Schedules of the Order, the Deposited Plans and planning direction Drawings. The matters include the formation of accesses (temporary and permanent) as shown on the plans, temporary stopping up of streets as listed in Schedule 2 and temporary changes to traffic regulations as listed in Schedule 9. These do not therefore require the further approval of the highway authority, although in all cases FLO will consult with them on the timing and scope of any highway works (and conditions 12 and 18 of the deemed planning permission require approval of certain highway matters). Where works are not authorised by the TWAO, FLO will obtain approval of the highway authority for any highway works, including permits under the London Permit Scheme (LoPS), the need for which is not disapplied by the Order.

FLO will discuss with all relevant stakeholders, including local residents and businesses regarding the proposed traffic management arrangements required to facilitate the Kennington Park shaft construction. This will allow alternative arrangements (if necessary) to be agreed and implemented in a timely manner. All traffic management will have prior approval from the Local Authority before implementation and the arrangements will be clearly defined within the NLE Traffic Management Plan.

Traffic management

Traffic management arrangement drawings and overall traffic management detail such as the movement of materials by road, will be prepared as defined in the Traffic Management Plan. Designed Traffic Schemes will be submitted to the relevant Local Authority and Transport for London (TfL) for assessment and approval, discussions will be held with the appropriate parties during the design development. Traffic management schemes being designed for the construction phase will ensure that all the construction related traffic avoids the Vauxhall Gyratory (a requirement of the contract).

There will be suspension of 13 parking bays which will not be re-located but will be kept under review for the duration of the project, and suspension of 130 metres of pedestrian footway along Kennington Park Place. Pedestrians will be diverted to facilitate their safe movement. Coordination is required with both London Boroughs of Lambeth and Southwark, and TfL on the requirements of amended pedestrian routes. Changes to pedestrian routes will be communicated by FLO through signage, community liaison group, email bulletins and activity notifications (letter drops).

There will be no lorry movements in or out of Kennington Park at night. All excavated material from the 24/7 tunnelling activities will be stockpiled overnight and will only be collected during the day. All deliveries will be scheduled for core working hours.

The Kennington Park worksite access and egress points will be located separately along Kennington Park Place. Access for all FLO construction vehicles will be provided within the construction compound in order to ensure construction traffic impacts on local residents and businesses are minimised. Controls shall be put in place by FLO on roads adjoining the site if necessary to prevent parking by site workers. The Sustainable Travel Plan sets out FLO's strategy to encourage site workers to travel by public transport or to walk or cycle.

6.0 Water Resources

There are no surface watercourses within the immediate area of the Kennington Park site and the site drainage is connected to the existing combined sewers.

6.1 Site Drainage

Waste water is expected from site cabins, dewatering (if necessary) and the drainage arising from the SCL, as well as from other general construction operations. Appropriate licences will be obtained from Thames Water to permit the necessary discharge to the foul sewer and any offsite disposal will be managed by a licensed waste contractor.

Should storm events overwhelm the site drainage, FLO will implement the measures set out within Section 6.0 of the Water Management Plan.

6.2 Dewatering

Construction processes will minimise the requirement for dewatering, however investigations are ongoing to determine whether dewatering (or de-pressurisation) will be required during the construction of the shaft. Water from this process will be treated (if necessary) and discharged to the sewer with an appropriate permit, controls and monitoring regimes as required by the permit.

6.3 Surface Water Pollution control

The FLO team will ensure that the protection measures deployed (identified in section 7.5 of the CoCP Part A) to control the risk of pollution to surface water include:

- *securing fuel and oil containers in bunded areas*
- *careful management of refuelling activities*
- *preventative maintenance regimes and use of drip trays under static plant*
- *management of waters from any vehicle washing (PPG13 – Pollution Prevention Guidance on Vehicle washing and cleaning)*
- *use of biodegradable hydraulic oils when working near watercourses*
- *management of silty runoff from earthworks*

In addition the following steps will be implemented where appropriate and reasonably practicable:

- Any container with contaminative potential will be kept within a lockable and bunded store with the lid securely tightened. These measures will be checked and audited during site inspections
- Secondary bunding and plant nappies (or similar) will be used to minimise the risk of spillages from semi-static plant, temporary storage of fuels and during re-fuelling
- A wheel wash facility or localised jet washing of wheels on hard standing
- Road sweepers deployed as required within the site and on roads leaving the site
- Settlement tanks (e.g. silt busters), water filters and hessian matting to drains will be used to ensure that silt does not enter the surface water drainage network
- Temporary blocking of drains to prevent runoff entering the CSO
- Spill response including access to site drainage plans and regular spill response training.

6.4 Groundwater Pollution control

Due to the underlying hydrogeology Kennington Park is not considered to be a sensitive area in relation to groundwater. However any potentially contaminative materials (such as oils and lubricants) that may be used or stored on site during the construction will be controlled and managed in accordance with the CoCP Part A in order to minimise the risk to groundwater resources. *Measures to control the risk of pollution in the CoCP Part A include:*

- *Compliance with relevant legislation*
- *Avoidance of materials that can pollute groundwater where practicable*

Water containing silt will be minimised and intercepted as specified in the CoCP Part A in order to minimise the risk to surface and ground waters.

Discharge of water will be undertaken to sewer subject to the necessary approvals being obtained from Thames Water and in accordance with the CoCP Part A.

7.0 Noise and Vibration

The NLE Noise and Vibration Management Plan will ensure that the works are undertaken in accordance with the NLE requirements, that the Section 61 consent process is properly managed and that Best Practicable Means (BPM) is employed to control noise and vibration for all works undertaken.

FLO will comply with the commitment to achieving best practicable means (BPM) which includes the control of working hours, selection and use of quiet or low noise equipment, measures agreed with the London Boroughs of Lambeth and Southwark (as appropriate) for the Section 61 consent under the Control of the Pollution Act 1974 and monitoring.

Normal working hours will be 0800 to 1800 weekdays and 0800 to 1300 on Saturdays. Where practicable, operations with the potential for causing material disturbance and/or disruption will be limited to these hours. There is one hour either side of these hours for quiet preparatory start-up and shut down activities only.

Tunnelling

The tunnel between Battersea and Kennington Park will be constructed using a Tunnel Boring Machine (TBM). This tunnel boring method can give rise to groundborne noise and vibration that may affect properties above the route alignment, however the groundborne noise from the TBM would only be audible inside properties above the line for no more than one day, so no additional noise mitigation will be required.

Once the TBM arrives at Kennington Park its components will be removed through the shaft to the surface. The remainder of the tunnel will be mechanically excavated and sprayed concrete lined (SCL), these SCL works will be carried out on a 24/7 basis. The acoustic shed will provide effective mitigation during these hours minimising the impact on the local community as surface works overnight will also be contained within the acoustic shed. The SCL tunnel will be 145m in length and from this running tunnel a gallery tunnel will also be driven in SCL (this method is currently being reviewed).

The method usually employed for breaking out SCL can occasionally generate vibration that, when transmitted through the ground to the surface, may be emitted as audible sound within overlying buildings. This sound, called groundborne noise (GBN) will typically be a low frequency hum or rumble. BPM techniques will be used to minimise the risk of impacts from noise and vibration such as minimising the requirement to breakout SCL, selection of quiet/low noise equipment and controlling noise and vibration at source.

The SCL works will be followed by the construction of the Step Plate Junction works and the construction of the four cross passages at Kennington Station.

7.1 Noise and Vibration Receptors

The Kennington Park ventilation shaft will be constructed above the running tunnel and underneath Kennington Park. The top of the shaft head house will be located on the north eastern corner of Kennington Park. The worksite is in a generally residential area, with residential properties located overlooking the site. The location of these properties is summarised below and can be identified in Appendix 2:

- Residential properties and retail units on Kennington Park Road
- Residential properties on De Laune Street
- Residential properties on Kennington Park Place; and
- Residential properties on St Agnes Place.

FLO commissioned a noise monitoring exercise in October 2014 to validate the baseline ambient noise measurements within the Environmental Statement. FLO measured the noise levels at locations that are representative of the surrounding noise sensitive receptors which could be exposed to changes in ambient noise during the construction of the NLE.

The monitoring locations identified in 7.5 were selected to ensure that a “realistic worst case” assessment of noise and vibration impacts can be undertaken. This will facilitate an accurate prediction of the impact on receptors is maintained throughout the works and appropriate mitigation measures (discussed in 7.4) can be implemented to minimise the likelihood that the thresholds, as agreed with the local authorities, are not exceeded.

7.2 Construction Activities

The Kennington Park works (described in section 4) include construction activities that have the potential to cause a noise and/or vibration nuisance unless appropriately mitigated.

The noisiest activities for the construction of the ventilation shaft at Kennington Park are predicted to occur during the site preparation, piling and shaft excavation phases of the construction programme (approximate duration 10 weeks).

7.3 Noise and Vibration Mitigation Measures

Civil engineering works in the Kennington Park area have the potential to impact upon nearby residents, however FLO will strive to minimise these impacts. All relevant and practicable measures outlined within the CoCP Part A will be employed. At Kennington Park the following site specific measures will be implemented:

- Temporary super silent generators during the initial site setup for use during daytime only with additional acoustic screening if necessary, the orientation and location will be selected to minimise impacts to local sensitive receptors.
- Acoustic shed to mitigate noise from the tunnelling and/or shaft activities
- During utility works we will use acoustic blankets where necessary
- Hoarding of 2.4m
- Top down construction will provide more attenuation from construction noise due to the work activity being below ground and therefore providing a shielding effect
- Sound attenuated equipment where practicable

Specific provisions as per the CoCP Part A (section 5.3) to minimise noise and vibration during construction are summarised below:

- *Each item of plant used on the project will comply with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701 The Noise Emission in the Environment by Equipment for Use Outdoors Regulations (as amended).*
- *FLO will adopt the recommendations for the control of noise, as set out in BS 5228-1:2009 section 8, and for the control of vibration, as set out in BS 5228-2:2009 section 8 or alternative industry guidelines.*
- *Plant and equipment liable to create noise and/or vibration whilst in operation will, as far as reasonably practicable, be located away from sensitive receptors. The use of barriers to absorb and/or deflect noise away from noise sensitive areas will be employed where required and reasonably practicable.*
- *All plant, equipment, and noise control measures applied, shall be maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable. Any plant, equipment, or items fitted with noise control equipment found to be defective will not be operated until repaired.*
- *Where reasonably practicable, fixed items of construction plant shall be electrically powered in preference to being diesel or petrol driven.*

- *Vehicles and mechanical plant utilised on site for any activity associated with the construction works will be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable.*
- *Machines in intermittent use will be shut down or throttled down to a minimum during periods when not in use. Static noise-emitting equipment operating continuously will be housed within suitable acoustic enclosure, where appropriate.*

7.4 Pre-construction Ambient Noise and Vibration Survey

A pre-construction ambient noise and vibration survey has been undertaken by FLO's noise and vibration specialists during November 2014. An ambient noise and vibration survey measures the back ground levels of noise and vibration that occurs over a period of time. This is done to establish the 'normal' level of noise and vibration occurring in the surrounding area, which informs the strategy for managing noise and vibration arising from FLO's activities within the worksite.

Attended noise and vibration measurements were taken at four survey locations (refer to Appendix 2 for a location plan of the survey locations) over a period of six separate days and nights. The measurement locations were chosen to be representative of sensitive receptors around the Kennington Park worksite. The table below summarises the measurement locations.

Kennington Park		
ID	Location	Co-ordinates
KP1	Kennington Park Road (A3)	531451/178025
KP2	De Laune Street	531543/178044
KP3	Kennington Park Place	531568/177943
KP4	St Agnes Place	531/588/177898

Attended monitoring was taken during the following time periods:

- Monday to Friday 07:00- 19:00;
- Monday to Friday 19:00- 23:00; and
- Monday to Friday 23:00- 07:00.

The attended noise measurements comprised a sequence of 10min duration periods at each location over three consecutive hours during the daytime and two each during the evening and night time periods. Vibration measurements were undertaken simultaneously with the noise monitoring.

The table below compares the 2014 FLO baseline survey data with the 2008 data reported in the Environmental Statement (ES).

ID (2008/2014)	Time Period	2014 Survey Data			2008 Survey Data		
		Typical L _{Aeq T}	Typical L _{A90 T}	Typical L _{AFmax T}	Typical L _{Aeq T}	Typical L _{A90 T}	Typical L _{AFmax T}

		dB	dB	dB	dB	dB	dB
S14/KP1	Daytime	72.2	58.2	81.6	71.0	58.0	-
	Evening	69.7	59.0	80.1	-	-	-
	Night-time	67.5	58.1	74.4	66.0	47.0	-
S9/KP2	Daytime	56.6	50.8	68.4	66.0	54.0	-
	Evening	54.6	45.9	69.4	-	-	-
	Night-time	47.9	42.8	58.8	56.0	43.0	-
L4/KP3	Daytime	65.3	53.8	78.9	58.0	49.0	-
	Evening	59.1	50.8	73.3	55.0	-	-
	Night-time	52.3	46.9	59.6	52.0	44.0	-
S8/KP4	Daytime	57.5	51.2	67.3	61.0	39.0	-
	Evening	58.2	47.3	68.5	50.0	-	-
	Night-time	49.3	46.0	58.8	52.0	38.0	-

Comparison of the measured noise levels reported in the ES against our new survey data shows that the baseline conditions measured are broadly consistent. However the FLO survey did identify a significant increase in the daytime noise levels at Kennington Park Place (KP3), than stated within the ES. Therefore for this location the ambient noise level is higher than predicted by the ES therefore the effect of noise from our works may be less.

The reported baseline levels at monitoring location KP2 (De Laune Street) is lower than those reported in the ES. However, this location has been chosen to be indicative of the baseline levels set back away from the works. As such, this reduction would not have increased the impacts arising from the ventilation shaft construction.

Levels of vibration during the vibration survey were below a perceptible level to the technician at the measurement locations.

7.4.1 Provision of Noise Insulation

In accordance with the CoCP Part A sensitive receptors likely to be subject to noise levels above the trigger levels identified in the NLE Construction Noise and Vibration Mitigation Scheme will be identified prior to works commencing on site and the appropriate action taken.

Noise insulation in the form of secondary glazing has been provided by FLO for the Willow Room in Bishops House Nursery which is located opposite the worksite along Kennington Park Place and was completed at the end of December 2014.

7.5 Noise and Vibration Monitoring

Noise

Monitoring locations have been selected on Kennington Park Place and St Agnes Place to facilitate an accurate assessment of the likely effects experienced by residents in those areas, their location is illustrated in Appendix 2.

There are two types of noise monitoring – attended and unattended. Attended measurements, facilitate the collation of data associated with specific construction activities,

and allow detailed observations to be made concurrently regarding other (non-related) noise sources. Unattended measurements, also called continuous measurements, enable long term, 24/7 data to be collated for use in reporting, analysis of incidents, and to assist proactive management of BPM.

Unattended noise monitors shall be positioned at locations agreed with the local authorities to represent sensitive receptors for the duration of the potentially noisy construction activities. These receptors have been selected due to their close proximity to the construction activities that may generate noise and vibration.

Unattended monitoring will be undertaken using type 1 class real time noise monitors and data downloaded a minimum of once a week, but also after any complaints have been received to aid investigation and resolution of the complaint. Noise monitors that detect an elevated noise reading (averaged over the appropriate timescale) will send an automated alert to the Kennington Park site manager and environmental manager so that they can take appropriate action to mitigate impact. This enables an instant response to a potential problem. Noise monitors are fitted with alarms to enable monitoring against trigger levels. The trigger levels are defined in the Section 61 agreement with the Local Authority.

FLO shall also measure construction noise levels using a hand-held meter (attended) where works require it (for instance when starting new potentially noisy activities), to both verify the unattended results and also to provide supplemental measurement data at additional locations. The frequency and location of these surveys will be dependent upon the nature and sensitivity of the works being undertaken.

Vibration

FLO will undertake attended vibration monitoring should it be discerned by the environment team that vibration associated with certain activities extends beyond site boundaries, and/or complaints are received.

Vibration monitors will have their alarms set at a trigger level defined by the agreement with the building owner / occupier or best practice. These will also be enabled to provide real-time alerts of breaches so that action can be taken to rectify the problem.

All noise and vibration monitoring will be made available to the Local Borough as per arrangements outlined within the Section 61 consents. The data shall be presented in a format which shall be agreed with the London Borough of Lambeth and London Borough of Southwark.

The railway tunnels between the existing Northern Line loop at Kennington Station and Battersea Power Station and the Kennington shaft will be constructed using Tunnel Boring Machines. Tunnels between the Kennington Park shaft and the existing London Underground tunnels of the Northern Line loop at Kennington station will be constructed using a Sprayed Concrete Lining (SCL) technique. This method of tunnelling can give rise to groundborne noise and vibration that may affect properties along the route alignment. The

level of groundborne noise and vibration from tunnelling and any mitigations required will be assessed by applying the NLE Noise and Vibration Mitigation scheme.

8.0 Dust and Air Quality

FLO will comply with the general measures to control air quality impacts as detailed within the CoCP Part A section 6 and the Air Quality Management Plan which details the general controls to limit dust emissions, such as the use of water suppression and regular cleaning and hard standing areas. FLO will use the Supplementary Planning Guidance (SPG) document on 'the control of dust and emissions during construction and demolition' as the basis of site specific controls to manage dust.

The FLO Air Quality specialists have completed an assessment of the potential dust generating activities at Kennington Park and have assessed the Kennington Park worksite as a Tier 2 category (Tier 1 = Low risk, Tier 2 = Medium risk, Tier 3 = High risk). This corresponds with the tiered mitigation measures specified in the CoCP Part A section 6.3. If the works methodology assumptions (on which the air quality assessment was based upon) changes sufficiently to render the assessment unreliable, then FLO will arrange for a reassessment.

8.1 Sensitive Dust Receptors

Considering their proximity to the works, the following properties have been identified by FLO's Air Quality specialists as potentially the most sensitive receptors in the proximity of the Kennington Park worksite: residents of Kennington Park Place and St Agnes Place.

8.2 Activities Requiring Specific Dust Mitigation Measures

The following activities at Kennington Park have been identified as requiring specific dust mitigation measures:

Demolition

After implementation of a hazardous material survey the controlled demolition of Kennington Park Lodge will be undertaken in accordance with the control measures described in the CoCP Part A. Such measures include, but are not limited to, appropriate hoarding of the worksite, stripping interior fixtures prior to dismantling the structure, sheeting/screening, the use of water suppression and the consideration of material storage locations.

The nearest sensitive receptors to the Kennington Park demolition works are residential properties located approximately 26m away on Kennington Park Place to the north and St Agnes Place to the east. Implementation of measures listed in the CoCP Part A will reduce the potential impacts of this demolition work.

Earthworks and Tunnelling

Early phases of the works at Kennington Park are likely to involve excavations and earthworks, followed by construction and trackout of material and the movement of construction related road vehicles. These activities are likely to be the principal sources of dust during the construction phase. The principal activities that may generate emissions of

particulate material during the earthworks will be the site clearance works, excavations, foundation works, the laying of utilities and the temporary stockpiling of material. If temporary stockpiles are required, FLO will locate them away from receptors where practicable, however FLO will at all times endeavour to remove surplus material from site as soon as possible to mitigate any dust and run off impacts from stockpiles.

The nearest sensitive receptors to the Kennington Park ventilation shaft earthworks are the residential properties on Kennington Park Place and Bishop's House Day Nursery, 30m to the north.

During all excavating and trial trenches a debris netting will be provided for the perimeter of the work area. FLO will also erect an acoustic shed over the top of the shaft, this will help to further reduce any dust emissions from the tunnelling activities.

8.3 Category Tier 2 Dust Mitigation Measures for Kennington Park

The CoCP Part A (section 6.3) provides a range of mitigation measures corresponding to the relevant tier number (1-3) / dust raising potential of the works. Kennington Park has been allocated a Tier 2 (medium risk category), in addition to the Tier 1 standard dust control procedures, the site specific dust control procedures for a Tier 2 worksite (applicable to Kennington Park worksite) as described in the CoCP A are outlined below:

- 1) *strip insides of buildings, as far as reasonably practicable, before demolition;*
- 2) *bag and remove biological debris (such as birds' nests and droppings) or damp down such material prior to demolition;*
- 3) *wherever reasonably practicable, retain walls and windows while the rest of the building is demolished to provide a screen against dust;*
- 4) *screen buildings, where dust producing activities are taking place, with debris screens or sheeting;*
- 5) *ensure slopes on stockpiles are no steeper than the natural angle of the material and maintain a smooth profile;*
- 6) *ensure appropriate equipment is readily available on site and clean up any spillages as soon as reasonably practicable after the event using wet cleaning methods;*
- 7) *ensure mixing of cement, bentonite, grout and other similar materials takes place in enclosed areas remote from site boundaries and potential receptors;*

8.4 Dust Monitoring

Kennington Park has been allocated a Tier 2 (medium risk category) therefore passive deposition monitoring techniques (passive systems collect and measure deposited dust and are best suited for measuring over days weeks and months) will be adopted at appropriate locations (site boundaries/local receptors).

For such Tier 2 sites, and in addition to the monitoring outlined above, a comprehensive site survey will be undertaken to determine the prevailing wind direction (using available meteorological data) and a minimum of two permanent PM10 monitoring stations will be

installed along the line of the average wind direction and to make data readily available to the local authority.

With the provisions specified in the CoCP Part A (section 6.3) coupled with the mitigation and monitoring measures specified above it is not expected that significant dust deposition will occur as a direct result of the works. However should dust deposition occur as a direct result of the works, FLO will make ensure appropriate mitigation is implemented. Section 10 of the NLE Air Quality Management Plan details FLO response should dust levels exceed agreed thresholds, cause obvious visual impacts and/or complaints.

9.0 Energy

General procedures to reduce energy consumption across the whole NLE scheme is detailed within the Energy Management Plan however FLO is committed to being as energy efficient and responsible as possible through specific methods that will include but not be limited to; purchasing/hiring energy efficient equipment and lighting, avoiding unnecessary lighting, provision of energy efficient and well insulated site accommodation, metering and sub-metering for data collection, regular communication and reporting and exploring options to procure energy from renewable sources.

10.0 Contaminated Land

This area of Kennington Park has changed very little in land use and has comprised open space from at least the late 1800s to present day. In view of the non-contaminative activities onsite and the distance of off-site contaminative industries, there is considered to be a low potential for contamination of soils at Kennington Park. However any contaminated land issues will be addressed in a separate site specific Contaminated Land Management Plan which will be produced once all the ground investigation data has been assessed.

In accordance with the CoCP Part A where construction activities reveals suspected presence of contaminated land, the works in this area will be halted immediately and further investigation carried out. A separate Resource Efficiency Plan has been produced to set out the management process to reduce the risks associated with any contaminated material identified at the site, and how to deal with any previously unidentified contaminants.

11.0 Materials and Waste Management

The general material resource management and reduction of waste is detailed within the NLE Resource Efficiency Plan. However the specific measures FLO are implementing on the Kennington Park worksite are detailed below.

Clean' excavated material will arise from the excavation of the shaft at Kennington Park, this will be loaded onto lorries during the day and transported offsite for beneficial reuse.

The material generated by the demolition of the Kennington Park Lodge, if uncontaminated, will be sent offsite for beneficial reuse.

12.0 Ecology and Nature Conservation

General procedures to control and limit disturbance to areas of nature conservation interest, protected species and habitats, and measures to be adopted in the event of the discovery of protected species across the whole NLE scheme are detailed within the Ecology and Ecological Reinstatement Management Plan. However site specific information is detailed below.

Kennington Park lies within Kennington Park Site of Local Importance (SLINC). The Kennington Park worksite is an area of amenity grassland, with scattered mature trees. The habitat types at Kennington Park include London plane, oak *Quercus sp.*, silver birch *Betula pendula* and ash *Fraxinus excelsior* and an area of short mown grassland comprising perennial rye grass and common forbs. Also within the worksite is Kennington Park Lodge which is a building with mature garden surrounding which contains a number of artificial bee hives.

Demolition and construction works will result in the loss of approximately 250m² of land within the designated site. The majority of the loss will be temporary and will include the loss of trees, amenity grassland, Kennington Park Lodge and associated garden area. A small area (approximately 100m²) of amenity grassland will be lost permanently as the head-house associated with maintenance of the NLE will be located within this area. The loss of habitat will not affect the integrity of this SLINC and it will continue to function as a haven for wildlife and amenity resource for the community.

12.1 Terrestrial

There is potential breeding bird habitat at Kennington Park as the scattered trees provide some opportunity for birds to nest during the breeding season. Therefore there is potential for small numbers of breeding birds to be present within or in close proximity to the Kennington Park site. FLO will ensure that the timing of the tree removal occurs outside the bird breeding season (approximately 1st March to the 31st July) to avoid impacting on nesting birds.

Kennington Park has the potential to support common mammal species such as hedgehog and red fox, foraging or seeking shelter within the bounds of the Kennington Park site. FLO will reduce this risk by the covering of all deep holes and trenches overnight and/or the provision of planked escape routes for any trapped wildlife.

Bee Urban occupy land/buildings on the site of the old lodge in a corner of Kennington Park, it is a facility used primarily to breed and keep bees. The bee hives will be relocated by the London Borough of Lambeth.

The existing dog walking area within Kennington Park is to be relocated next to the Tennis Courts. (This works will be completed by the London Borough of Lambeth.)

12.2 Aquatic

Not applicable

12.3 Protection of Habitats

Not applicable

12.4 Protection of Trees

An Arboriculture assessment of the site has identified that there are 22 trees within the Kennington Park site boundary. Based on the current construction approach FLO anticipate that 19 of the 22 trees are required to be removed to facilitate the development, the intention is to complete these works prior to the 2015 bird nesting season (March-July). All tree removals are to be mitigated by an post-construction re-planting programme with the intention of restoring the landscape to a higher standard that currently exists.

Three trees require protection but may be subject to some minor pruning to facilitate the installation of the site hoarding to be agreed with the London Borough of Lambeth tree officer. Seven trees outside of the worksite boundary are to be protected during construction, FLO will ensure that measures to ensure tree protection are in line with BS 5837.

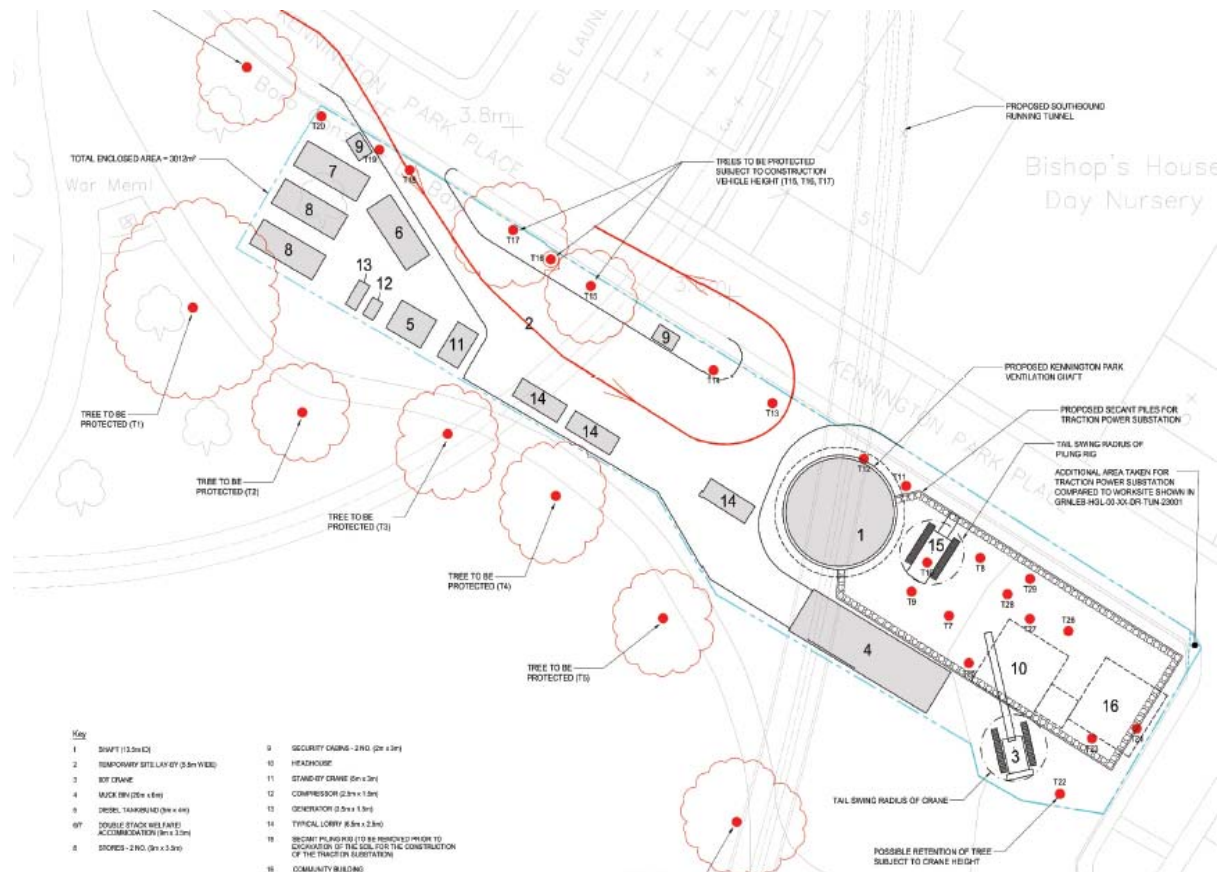


Fig. 1 - Arboriculture survey plan identifying trees to be removed
(trees to be protected are surrounded by a red bubble, trees designated for removal are red dots).

13.0 Lighting

Site lighting and signage will be provided to ensure the safety and security of the construction site and will be at the minimum luminosity necessary. Where appropriate, lighting to site boundaries will be provided and illumination will be sufficient to provide a safe

route for the passing public and the lux levels on footways shall be at least equal to those provided by the existing street lighting. In particular, precautions will be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas.

Site specific lighting measures to minimise the adverse impacts on adjacent buildings, wildlife sites and land uses at Kennington Park will be taken from the 'Guidance Notes for the Reduction of Obtrusive Light GN01:2011' (published by the Institution of Lighting Professionals) and from the Bat Conservation Trust – 'Interim Guidance: Artificial lighting and wildlife - Recommendations to help minimise the impact of artificial lighting'.

14.0 Archaeology

Where possible, FLO will minimise all potential impacts to archaeology and will take a proactive approach to handling both buried and above ground archaeology should it arise. The Kennington Park worksite is within Kennington Park which is registered for its special historic interest (Grade II) under the Historic Buildings and Ancient Monuments Act 1953 in the Register of Historic Parks and Gardens maintained by English Heritage.

General procedures to control and limit disturbance to Archaeology across the whole NLE scheme is detailed within the Archaeology and Built Heritage Management Plan, however pertinent archaeological considerations relating to the Kennington Park worksite are detailed below.

At Kennington Park there is potential to discover the following archaeological remains:

- Potential for agricultural remains dating to the medieval to post-medieval periods; and
- Potential for unrecorded prehistoric and Roman remains.

During site preparation no archaeological measures are required where works are undertaken within the levels of made ground identified by ground investigations. Where works require ground reduction that will exceed the levels of made ground identified by ground investigations, a scheme of archaeological monitoring will be required. The Heritage Specialist will provide a specification in the form of a WSI for an appropriate programme of archaeological work to be approved by the local planning authority.

It is anticipated that no buried archaeological remains, of sufficient significance to merit preservation in-situ, will be discovered within the Kennington Park area. However FLO will engage with an archaeological contractor to provide a Written Scheme of Investigation which will detail our strategy should we make a discovery. This will be submitted to the London Boroughs of Lambeth prior to material ground break within the site.

15.0 Listed Building and Conservation Areas

General procedures to control and limit disturbance to built heritage across the whole NLE scheme is detailed within the Archaeology and Built Heritage management plan. However

site specific buildings of historical or architectural significance that could be impacted by the activities at the Kennington Park worksite are discussed below:

No listed buildings are predicted to be materially affected by the NLE works at Kennington Park although there are a number of listed buildings or built heritage potential close to the Kennington Park worksite:

- The site contains one unlisted building, a lodge built in 1938 (referred to as Kennington Park Lodge), that is of low sensitivity;
- The site lies within the London Borough of Lambeth's St Marks Conservation Area and immediately adjacent to London Borough of Southwark's Kennington Park Road Conservation Area, both of high sensitivity;
- The site is within the medium distance setting of Prince Consort Lodge (erected on the western edge of the park in 1852), which is Grade II* listed and an asset of very high sensitivity;
- The site is within the setting of The Bishops House, the gate piers to The Bishops House, 10 Kennington Place, 11 – 12 Kennington Place and 1 – 7 Agnes Place and railings all Grade II listed buildings of high sensitivity;
- The site is within the setting of a number of undesignated buildings of low sensitivity;
- The site lies within Kennington Park which is protected by a Grade II listing on the Register of Historic Parks & Gardens.

Prior to the demolition of the 1938 Kennington Park Lodge and adjacent railings, FLO will ensure that an Archaeological standing building recording is carried out in consultation with English Heritage.

FLO will be carrying out condition/structural surveys on the above buildings where necessary. All proposals for works directly affecting any of the above buildings will be in accordance with Listed Building or Conservation Area Consent and attached conditions.

16.0 Settlement

Robust control of ground movement is essential on the NLE due to the critical infrastructure and residential areas above, below and adjacent to the works. FLO will carry out a comprehensive regime of settlement monitoring prior to, during and after tunnel boring. This will provide real time alerts if any significant movement is detected.

FLO will further develop its response to sensitive buildings and infrastructure and will liaise directly with any potentially affected parties.

17.0 Community and Stakeholder Liaison

FLO will provide a dedicated stakeholder management team and resources to enable the successful delivery of the NLE project. FLO will achieve this by establishing and maintaining positive relationships with the project stakeholders and contributing to maintaining and improving the reputation of the FLO JV and London Underground. This will create a lasting legacy after the works have been completed. FLO shall provide the local community (including Community Liaison Groups, business and residential properties, schools,

churches, park users and other organisations) around the Kennington Park worksite with information relating to construction activities that are likely to affect them. As the project progresses additional stakeholders may emerge and they will be included in works notifications and other project communications as appropriate.

These communications would typically be to inform parties of any proposed works, the nature, timing and planned disruption, measures to reduce the impact of these works, the helpline telephone number and address to which any enquiries should be directed. Advance notice of works will be sent out at least two weeks prior to their commencement where possible (exceptions may occur such as short-notice utility works).

FLO will maintain regular communication to ensure that the wider community and other stakeholders and affected parties are kept well informed. Regular newsletters providing information on the works will be distributed to local residents and businesses and other key stakeholders. The works update page on the NLE website will be updated on a monthly basis or as appropriate. FLO will also provide on a regular basis an update of the schedule of work to the London Borough of Lambeth.

The Kennington Park and Newington NLE Community Liaison Group, chaired on a rotating basis by councillors from the London Boroughs of Southwark and Lambeth, is an established forum through which a timely and informed discussion of the works can take place. This Community Liaison Group aims to keep representatives of local residents and businesses informed about the work and provide an opportunity to raise matters of interest or concern. It is comprised of representatives from FLO, London Underground (LU), London Boroughs of Lambeth and Southwark, Friends of Kennington Park, the Kennington and Walworth Neighbourhood Action Group, Bee Urban and a representative of the Dog Walking Community, and aims to meet a minimum of four times per year and more frequently if necessary. Pertinent issues raised within the Kennington Park and Newington NLE Community Liaison Group meetings will be escalated to the Core Liaison Group meeting.

The FLO complaints procedure will be approved by LU (as required by the CoCP Part A) and has been developed to ensure that all complaints received, relating to the construction of the project, are dealt with efficiently and in an appropriate timeframe. FLO recognises the importance of enquiries and complaints as a valuable form of feedback and we are committed to using this information to help drive forward improvements. FLO is responsible for maintaining a complaints register, up to date and available for review at internal and external meetings.

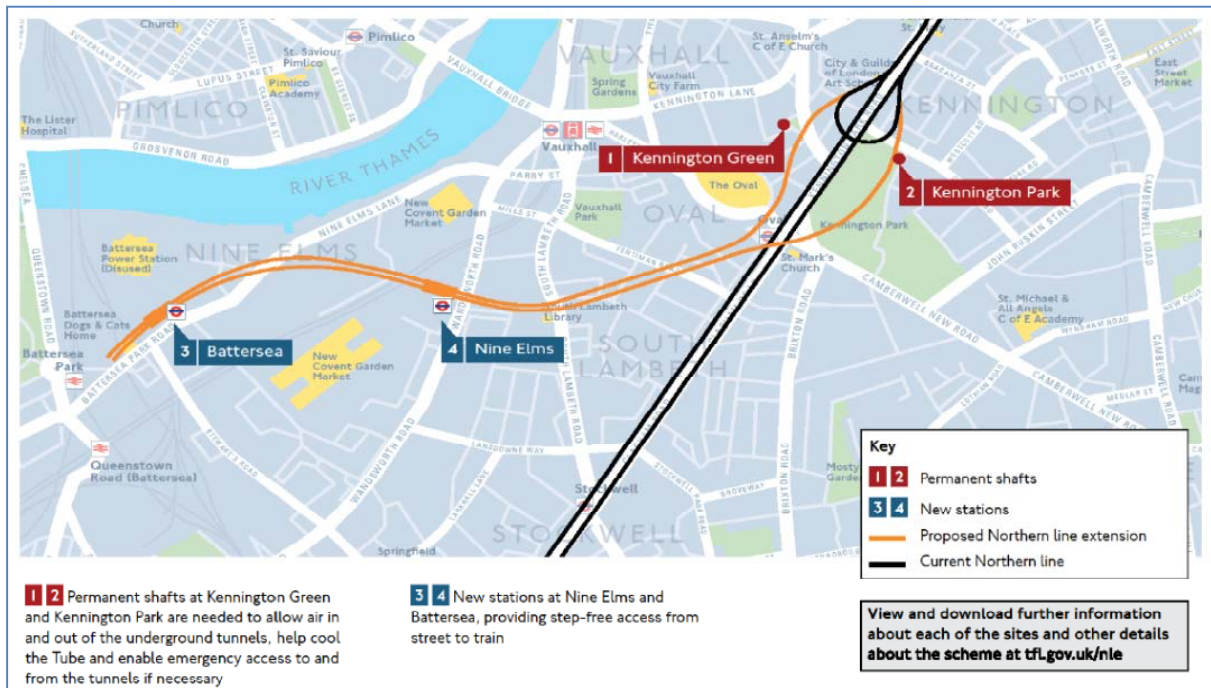
There is a 24 hour helpline for enquiries and complaints (0343 222 2424) and an email account (nle@tfl.gov.uk) to receive complaints and enquiries from the public which is monitored on a daily basis.

- All calls to be logged and complaints tracked through to resolution
- Every complaint to be acknowledged within 24 hours of being received
- The complaint will be forwarded to the relevant person to action within 24 hours
- FLO will endeavor to resolve all issues within 10 days

- Weekly reports to be provided to the LU Stakeholder Manager and the LU Project Manager.
- Quarterly reports to be shared at Community Liaison Groups.

Project web pages can be found at www.tfl.gov.uk/northern-line-extension providing general information on the project, regular progress updates, details of forthcoming works, any impacts on travel arrangements, relevant publications including minutes of the Kennington Park and Newington NLE Community Liaison Group meetings and contact details.

Appendix 1 – Kennington Park Worksite Location

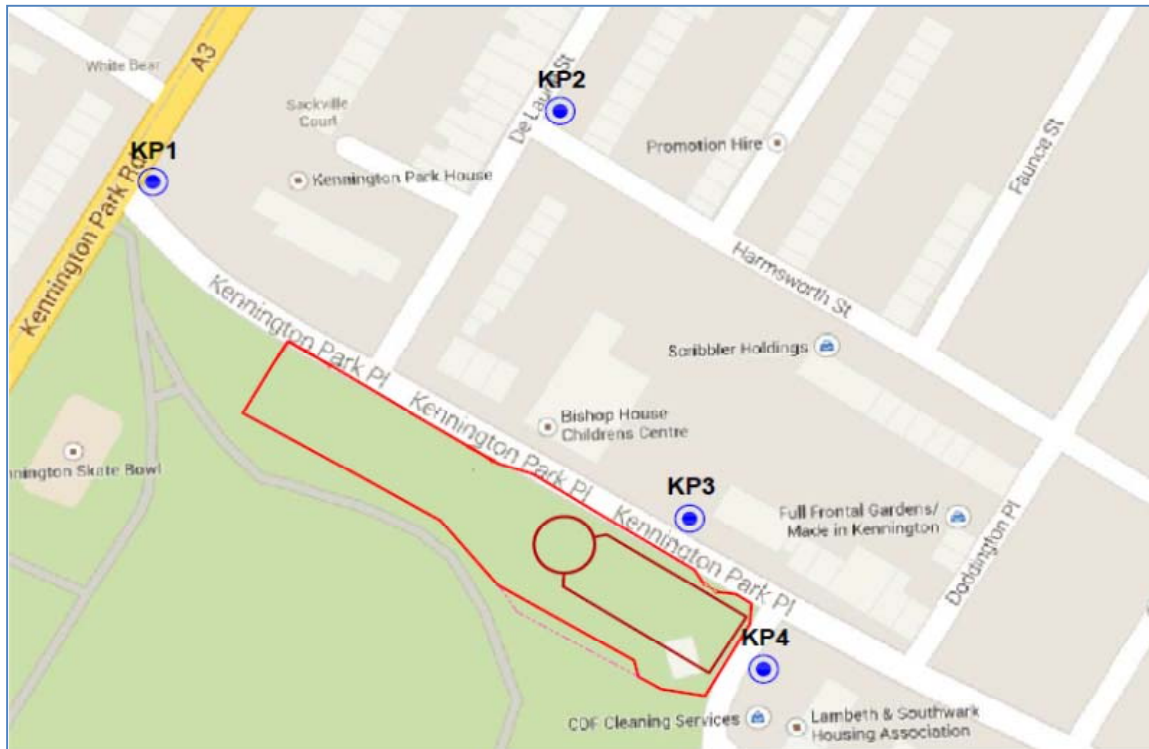


I. Northern Line Route Alignment



II. Kennington Park Site Location

Appendix 2 – Figures



I. Location of four noise and vibration baseline survey locations (KP 1, 2, 3, 4)



II. Location of proposed unmanned noise monitoring locations

The noise monitors will be located at points within the two areas shaded pale green. The exact locations will be determined following consultation with the local authority.