



CLIENT: LONDON UNDERGROUND LIMITED

CONTRACT REF: TLL 7917

NORTHERN LINE EXTENSION

MAIN WORKS CONTRACT

CODE OF CONSTRUCTION PRACTICE PART B KENNINGTON GREEN



Issue and Revision Control

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Revision History			
Rev No	Date	Summary of Changes	Section Number
1.	04.12.2014	Review and approval.	All
2.	11.12.2014	Updated for review and approval.	All
3.	23.01.2015	Updated from review comments.	All

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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 Green 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 Borough of Lambeth 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 Green 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 station
- 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 authority for approval before starting works at the Kennington Green 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 Park	FLO_N202-2360000-HSE-PLN-00001
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 but this method is currently being reviewed.

The Kennington Green 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 Kennington Green, on the western side of Kennington Road within the London Borough of Lambeth. There are residential properties on the northern and western sides of the Green and to the east on the other side of Kennington Road. The Chivas Beefeater Gin Distillery is situated in the north-western corner of the Green, bounded by Montford Place and Kennington Road, with an access gate and boundary wall facing the Green. The worksite is within the Kennington Conservation Area.

3.0 Temporary Work Sites

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

The FLO site compound, temporary office and welfare cabins will be located at Montford Place, which is situated behind the Chivas Distillery. This is covered under a separate planning application but where relevant FLO will comply with the CoCP Part A and any site specific requirements.

4.0 Summary of Main Works

A high level summary of the works at Kennington Green is included below. Detail of how site specific mitigation is to be applied for each environmental aspect on the Kennington Green 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 wall at Chivas Distillery site.

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 Green 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) Site Clearance (including some tree removal, erection of hoardings and traffic protection)
- b) Unexploded Ordnance Survey
- c) Piling works for the new 13.5m diameter shaft approximately 26m deep
- d) Excavation of shafts
- e) Erection of acoustic shed and gantry crane to service the shaft.
- f) Sprayed Concrete Lining (SCL) Tunnelling to the Step Plate Junction
- g) Reception of Tunnel Boring Machine (TBM) from Battersea
- h) TBM component removal by overhead and/or mobile cranes
- i) Fit out works to shaft
- j) Construction of head works
- k) Removal of worksite and reinstatement of the Green.

5.0 Public Access and Highways

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 Green 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 Traffic Management Plan.

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. Pertinent discussions will be held with the appropriate parties as further information is developed. All of the traffic management schemes being developed for the construction phase ensure that all the construction related traffic avoids the Vauxhall Gyratory.

It is anticipated that around mid-2015, there will be suspension of 4 parking bays and 8 parking bays along Kennington Road as well as 80 metres of bus lane in Kennington Road (A23). FLO will create 2 parking bays for the Car Club opposite No 362 Kennington Road. This will be followed by the closure of a further 18 metres of footpath and road on the corner of Montford place.

The signalised pedestrian crossing across Kennington Road (A23) to Kennington Green will be closed and all pedestrian walkways around the green will be closed. Pedestrians will be diverted along an existing footpath to facilitate their safe movement. Coordination is required with both the London Borough of Lambeth and Transport for London on the requirements of amended pedestrian routes. Changes to pedestrian routes will be communicated by FLO through signage, the community liaison group, email bulletins and activity notifications (letter drops).

The worksite access and exit points will vary depending on the phase of the works. At the initial site set up an interim temporary access will be enabled at the corner adjacent to Montford place and the Chivas distillery vehicle access. During construction, access to the site will be on the south side of Kennington Green, off Kennington Road (A23), with the site egress point along the east end of Kennington Green back onto Kennington Road (A23).

There will be no lorry movements in or out of Kennington Green 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 the core working hours.

Immediate access for all FLO construction vehicles will be provided within the construction site in order to ensure construction traffic impacts on local residents and businesses are minimised. If necessary, controls shall be put in place by FLO on roads adjoining the site 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 Green 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 Sprayed Concrete Lining (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)*
- *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

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:*

- *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 Borough of Lambeth 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 Green 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 Green 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 230m 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 Green ventilation shaft will be constructed above the running tunnel and underneath the green space bound by the A23 and Kennington Road. The shaft head house will be located on the south eastern corner of the Beefeater distillery site at the junction between Montford Road and Kennington Road. The area comprises a number of sensitive receptors including:

- Residential properties, offices, industrial units and a distillery on Montford Place;
- Residential properties, offices and retail units on Kennington Road; and
- Residential properties on Milverton Street.

FLO commissioned a noise monitoring exercise to validate the Environmental Statement predictions for the existing baseline ambient noise environment by measuring noise levels at locations that are considered to be representative of the surrounding noise sensitive receptors which may be exposed to changes in ambient noise due to the construction of the scheme.

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

At Kennington Green the piling for the shaft is scheduled for Autumn 2015 with the shaft excavation currently scheduled for early 2016. The noisiest activities for the construction of the ventilation shaft at Kennington Green 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 Green area have the potential to impact upon nearby residents, however, FLO will strive to minimise these impacts. All relevant and practicable measures as outlined within the CoCP Part A will be employed. At Kennington Green 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 three 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 Green worksite. The table below summarises the measurement locations.

Kennington Green		
ID	Location	Co-ordinates
KG1	Kennington Road (A23)	531194/178026
KG2	Milverton Street	531243/178090
KG3	Montford Place	531243/178090

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 dB	Typical L _{A90} T dB	Typical L _{AFmax} T dB	Typical L _{Aeq} T dB	Typical L _{A90} T dB	Typical L _{AFmax} T dB
S13/KG1	Daytime	71.5	53.9	79.5	73.0	61.0	-
	Evening	60.2	48.1	71.3	-	-	-
	Night-time	55.7	47.6	60.6	66.0	46.0	-

S12/KG2	Daytime	70.7	60.1	82.8	71.0	57.0	-
	Evening	69.6	58.1	81.2	-	-	-
	Night-time	65.9	47.6	76.0	65.0	43.0	-
-/KG3	Daytime	59.1	52.8	70.6	-	-	-
	Evening	57.6	46.7	75.0	-	-	-
	Night-time	46.6	43.5	55.2	-	-	-

Comparison of the measured noise levels reported in the ES against our new survey data shows that the baseline conditions measured are broadly consistent. The measurement locations for the 2014 survey have been chosen to be representative of sensitive receptors around the Kennington Green worksite.

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.

7.5 Noise and Vibration Monitoring

Noise

As described previously, monitoring locations have been selected on Kennington Road east and west 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 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 Green 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 unattended vibration monitoring should it be discerned by the environment team that vibration associated with certain activities extends beyond site boundaries, 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.

The railway tunnel between Battersea Power Station and the Kennington Green shaft will be constructed using a Tunnel Boring Machine. The tunnel between Kennington Green shaft and the existing 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 Green and have assessed the Kennington Green 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 Green worksite: the residential properties on Kennington Road to the north, south and west.

8.2 Activities Requiring Specific Dust Mitigation Measures

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

Demolition

The controlled demolition works activity (a stretch of wall and railings at the Beefeater Gin Distillery) at Kennington Green will be undertaken in accordance with the control measures described in the CoCP Part A. The nearest sensitive receptors to the Kennington Green demolition works are the residential properties on Kennington Road, 11m to the south and 16m to the north. Control measures such as additional acoustic screening will reduce the impact of these activities.

Earthworks and Tunnelling

Early phases of the works at Kennington Green 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 potential sources of dust during the construction phase. These 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 Green ventilation shaft earthworks are the residential properties on Kennington Road, 12m to the southwest.

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 Green

The CoCP Part A (section 6.3) provides a range of mitigation measure corresponding to the relevant tier number (1-3) / dust raising potential of the works. Kennington Green 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 Green worksite) *as described in the CoCP A are outlined below:*

- 1) *screen buildings, where dust producing activities are taking place, with debris screens or sheeting;*

- 2) *ensure slopes on stockpiles are no steeper than the natural angle of the material and maintain smooth profile;*
- 3) *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;*
- 4) *ensure mixing of cement, bentonite, grout and other similar materials takes place in enclosed areas remote from site boundaries and potential receptors; and*

8.4 Dust Monitoring

Kennington Green 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 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

Kennington Green 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 Green. 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 Green worksite are detailed below:

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

The material generated by the demolition of the brick wall at the Chivas Distillery will where practicable be used onsite, for example within piling mats. This is preferable to re-using the material off site.

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 Management Plan. However site specific information is detailed below.

The Kennington Green worksite is an area of amenity grassland, with scattered mature trees. The habitat types at Kennington Green are 5 scattered trees on the grassland and 6 within the pavement (species include cherry *Prunus cerasus*, London plane *Platanus x hispanica*, black acacia *Acacia melanoxylon* and Ginko *Ginkgo biloba*), and an area of short mown grassland (comprising perennial rye grass *Lolium perenne* and common forbs).

12.1 Terrestrial

There is potential breeding bird habitat at Kennington Green, 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 Green 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 Green has the potential to support common mammal species such as hedgehog and red fox, foraging or seeking shelter within the bounds of the Kennington Green 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.

12.2 Aquatic

Not applicable

12.3 Protection of Habitats

Not applicable

12.4 Protection of Trees

This site lies within a Kennington Conservation Area, which is an area of special architectural or historical interest where it is desirable to preserve or enhance its character or appearance. This includes the protection of trees in this area and therefore on site.

An Arboriculture assessment of site has identified that there are 11 trees within the Kennington Green site boundary, based on the current construction approach FLO anticipate that eight of the eleven 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. Trees to be retained will be protected in accordance with BS 5837:2012.

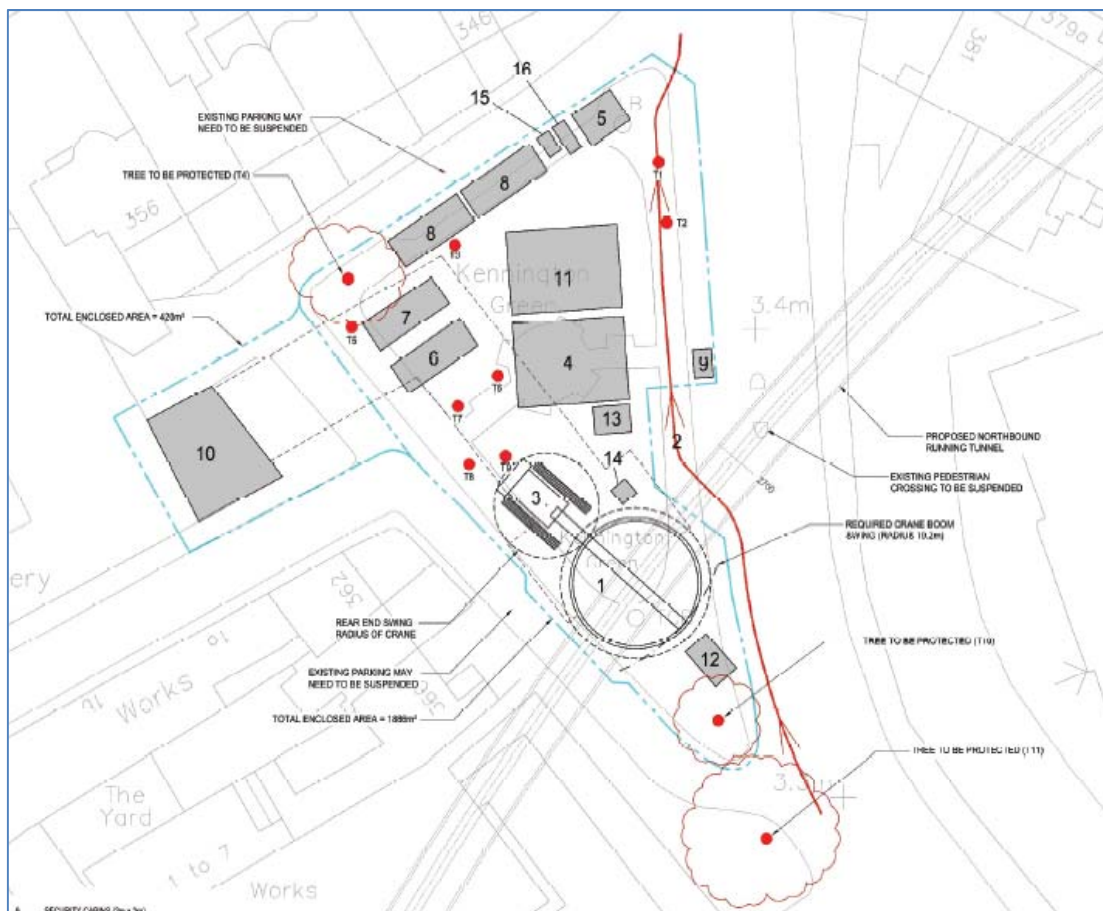


Fig. 1 - Arboriculture survey plan identifying trees to be removed
(trees to be protected are surrounded by a red bubble, trees designated for removal are red dots).

13.0 Lighting

Site lighting and signage will be provided to ensure the safety and security of the construction sites 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 Green 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 Green worksite is within the Kennington Conservation Area which is an area of special architectural or historical interest where it is desirable to preserve or enhance its character or appearance.

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

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

- remains of late 18th-century and 19th-century houses;
- remains of 20th-century manufacturing works; and
- remains of the prehistoric to medieval periods.

It is expected that no buried archaeological remains, of sufficient significance to merit preservation in-situ, will be discovered within the Kennington Green 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 Borough 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 Green worksite are discussed below:

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

- The site lies within the Kennington Conservation Area and under/adjacent Kennington Green which is protected by the London Squares Preservation Act 1931;
- The site is within the setting of No's 3 and 7-25 Montford Place, 362, 364 and 366 Kennington Road, 356 Kennington Road, 354 Kennington Road, 350 and 352 Kennington Road, 348 Kennington Road, 346 Kennington Road, The former Vauxhall Manor School now The Lycee, Stannary Street, Old Town Hall, 367 Kennington Road, 328 Kennington Road, 324A and 326 Kennington Road, 320 and 322 Kennington Road, 318 Kennington Road – all listed at Grade II and of high sensitivity. (NB – No's 350 & 352 are Grade II* listed);
- The site is within the setting of a locally listed building of moderate sensitivity, 377 Kennington Road, and other undesignated buildings of low sensitivity;
- The 'screen' forming the distillery boundary wall is of very low sensitivity.

Prior to the demolition of the c.2002 screen structure forming part of the boundary wall at Kennington Green, FLO will ensure that an Archaeological standing building recording is carried out in consultation with English Heritage.

FLO will also 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 interested parties 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 London Borough of Lambeth.

The Kennington Green Community NLE Liaison Group 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 Borough of Lambeth, the Kennington Green Supporters Group and local businesses, and aims to meet a minimum of four times per year and more frequently if necessary. Pertinent issues raised within the Kennington Green Community NLE Liaison Group meeting 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.

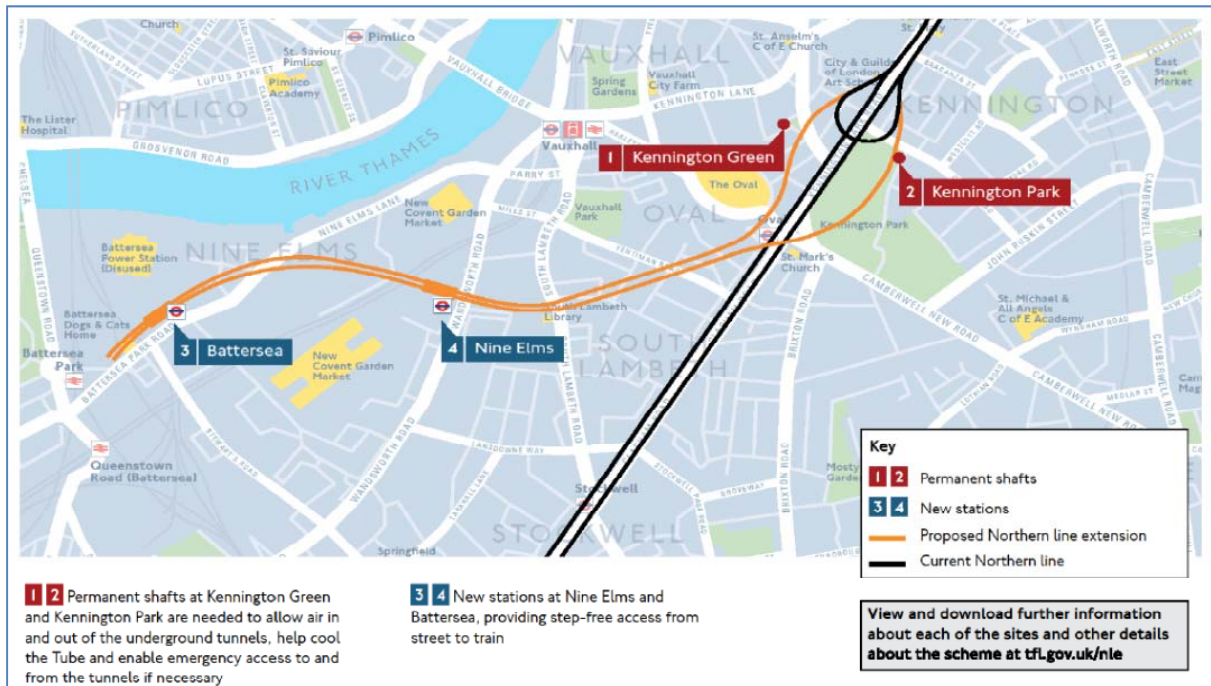
FLO recognises the importance of enquiries and complaints as a valuable form of feedback and we are committed to using this information to help drive forward improvements. FLO is responsible for maintaining a complaints register up to date and available for review at internal and external meetings.

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 Green Community NLE Liaison Group meetings and contact details.

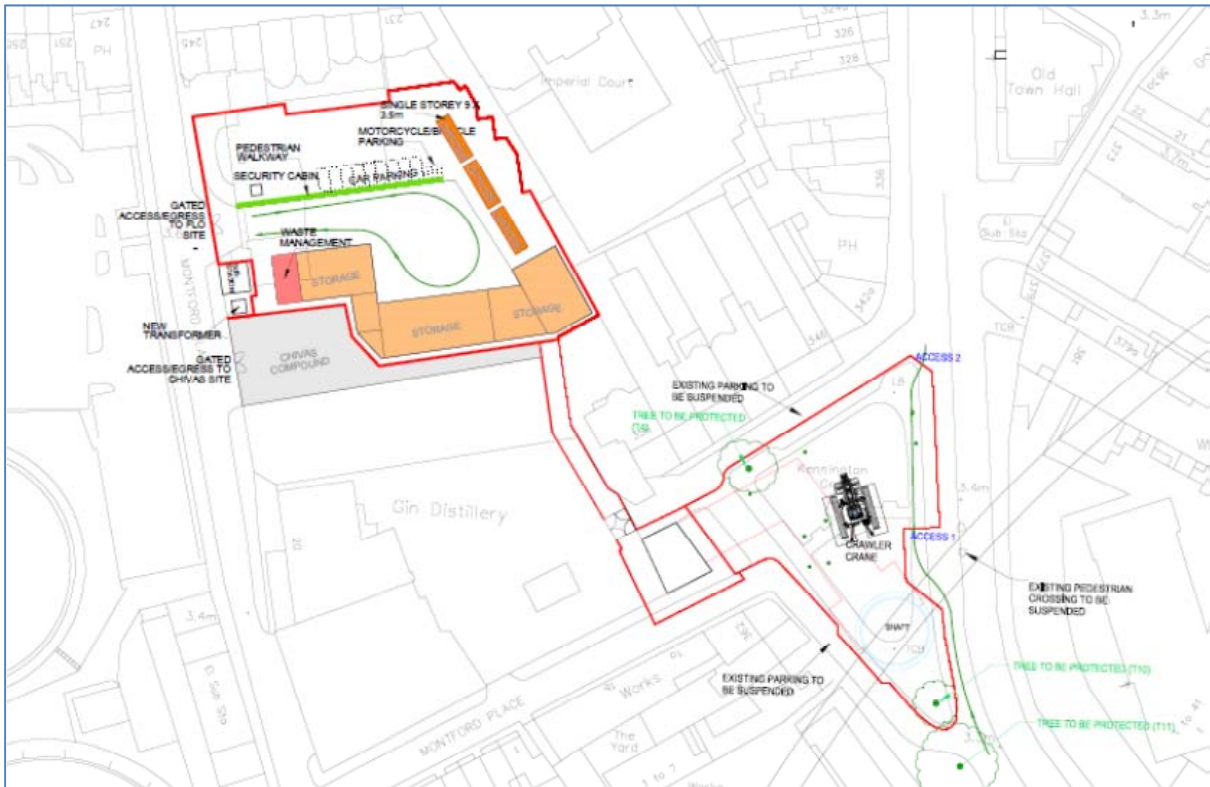
Appendix 1 – Kennington Green Worksite Location



I. Northern Line Extension Scheme – Route

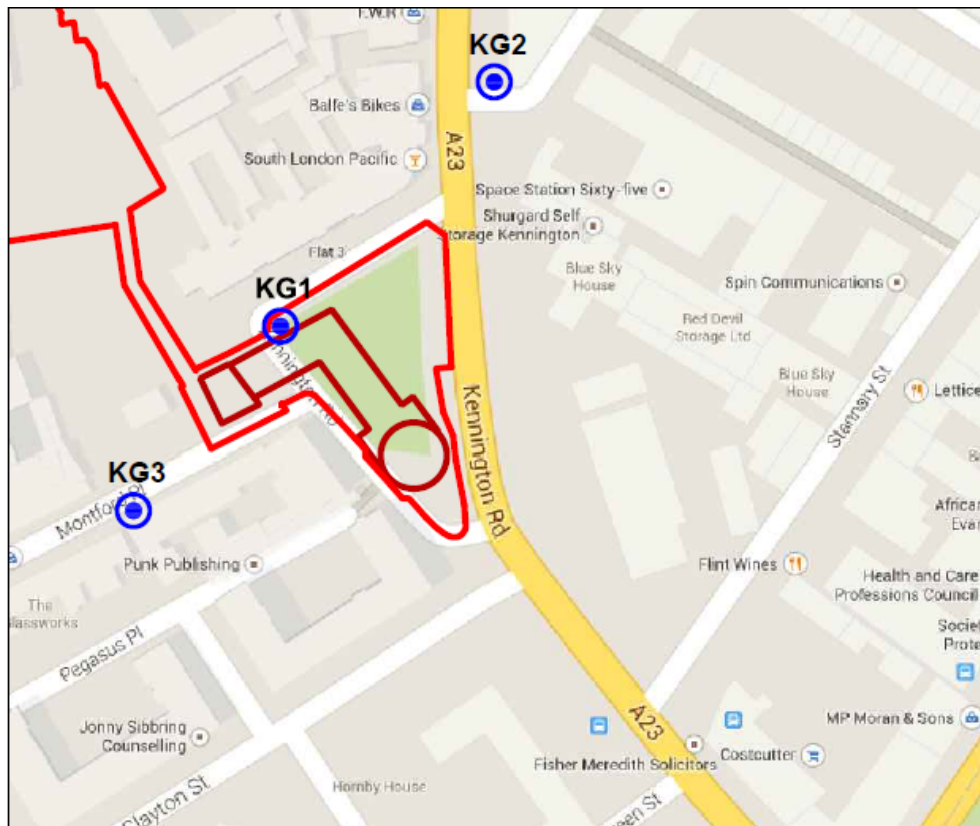


II. Kennington Green and Montford Place worksites



III. Site Layout Drawing

Appendix 2 – Figures



I. Location of three noise and vibration baseline survey locations (KG 1,2,3)



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.