Tunnelling and Ground Movement Factsheet 4

Introduction

London Underground has extensive experience of constructing tunnels, shafts and station boxes. This includes minimising any associated ground movement and effects on nearby buildings.

What is settlement?

Settlement is a term given to the way the ground moves around an excavation, such as a tunnel.

Construction of tunnels, shafts and basements causes movements in the ground. An initial assessment of the buildings and utilities in the vicinity of the proposed Camden Town station capacity upgrade has identified that the predicted settlement is unlikely to have any major detrimental effects. There may however be minor effects in some buildings, which could include surface cracking or doors sticking.

Assessment process

We use established assessment methods to understand the risk of damage to nearby buildings and utilities, and determine the need for mitigation works. These assessments are carried out in accordance with industry best practice and London Underground’s established standards. The process takes place in three stages:

- **Stage 1: Scoping**
  Calculations are undertaken to identify the extent of the area where settlement may occur due to the proposed works. The results are presented as plan drawings setting out the 1mm surface movement contour with contours of worst case surface ground movement overlaid on the existing infrastructure. This is a conservative assessment which represents the worst case because the effect of buildings on the pattern of ground movement is ignored and parameters are chosen which tend to overestimate ground movements.
Stage 2: Initial assessment
Buildings and other infrastructure such as utilities within the area identified as being within the 1mm contour in Stage 1 are analysed using simple engineering models to determine the degree of damage that could reasonably be anticipated. Listed buildings are also assessed for their structural and heritage sensitivity.

Stage 3: Detailed assessment
We carry out detailed analysis of any buildings, or other infrastructure, identified as being at risk of at least moderate damage in Stage 2.

Mitigation measures
Depending on the findings of the assessment process, the following types of mitigation may take place during construction to protect buildings from the effects of ground movement:

- Minimisation of ground movement at source
  A range of measures will be used during tunnelling and excavation works to reduce the magnitude of ground movements generated. It is accepted industry practice that all reasonable measures are employed as a matter of course when undertaking works in an urban environment.

- Ground treatment measures
  These comprise methods of reducing or modifying the ground movements generated by tunnelling, or excavation, by improving or changing the engineering response of the ground during works.

  Categories of potential ground treatment include:
  - compensation grouting, which is injecting grout into the ground above the tunnel to counteract the settlement, maintaining the building position;
  - permeation or jet grouting, which involves creating a stiffer ground to reduce movement

- Structural measures
  Structural measures involve modifying or strengthening a building to better resist or accommodate ground movements. It is not expected that structural mitigation measures will be necessary for this project, except in isolated cases. Discussions will be held with stakeholders on an individual basis.
Listed buildings

Specific consideration will be given to buildings that are listed as being of special architectural or historic interest.

The specific mitigation measures to be used for each building will be determined during the detailed design and construction phases, and will be tailored to the building and the risk presented to it.

The closest listed buildings to the site on Buck Street are the grade II listed Elephant House and the Grade II* listed Church of St Michael, located 50m north and southeast of the site boundary respectively.

Pre-construction defect surveys

Defect surveys will be undertaken prior to any work taking place so that the effects of any settlement to buildings can be monitored and addressed. A defect survey would usually be undertaken on any property predicted to experience 10mm or more of settlement before tunnelling works begin. This is a written and photographic record of the existing condition of finishes and structures, and is carried out by a qualified engineer or surveyor working jointly for us and the owner of the building. Owners of properties where defect surveys are required are contacted in advance to arrange access. The survey will not be undertaken until shortly before the start of construction activities that could affect the building.

Monitoring

We will establish monitoring across the area potentially affected by the station capacity upgrade, to make sure that construction effects fall within predicted levels. The need for specific building monitoring would be determined on a case-by-case basis as part of the assessment process. Monitoring would begin before the start of the works and continue until movement attributable due to the works has ceased to be measurable.

Consultation and commitments

Consent to construct the station capacity upgrade will be provided through a Transport and Works Act Order (TWAO) application. This process requires formal consultation and an Environmental Statement must be produced.
The TWAO will include a general power to undertake protective works to affected properties. If a building has been identified as requiring protective works there will be a formal notification of the proposal. This is the formal notice required under the TWAO. There will also be a period of consultation with the landowner to provide information on the reasoning for and nature of any protective works.

**Settlement deed**

We are prepared, at a landowner's request, to enter into our standard form of settlement deed with any landowner within the predicted 10mm contour who is concerned about settlement at their property. This will provide a binding commitment from us addressing settlement issues. However, those landowners who do not want to enter into a settlement deed with us will continue to benefit from our policy as detailed above.

**Find out more**

Visit [tfl.gov.uk/camden-town-upgrade](http://tfl.gov.uk/camden-town-upgrade) where you can view and download a range of factsheets and other information about the scheme.

Alternatively, come along to our exhibition where you will have the opportunity to view our proposals and speak to members of the project team

Trinity United Reform Church, Buck Street, London, NW1 8NJ
Thursday 13 July and Thursday 14 July 12:00 until 20:00
Saturday 15 July 11:00 until 16:00

To request a paper version of this factsheet, or a copy of any of the consultation materials in Braille, large-text or another language please contact us using the details below.

**Contact us**

Website: [tfl.gov.uk/camden-town-upgrade](http://tfl.gov.uk/camden-town-upgrade)
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* Service and network charges may apply