Optera Structural Solutions

[redacted]

Arboricultural method statement to install a traditional root barrier.

Date	Services Performed By:	Services Performed For:
January 17, 2023	Optera Structural Solutions	Crawford & Company
	[redacted]	

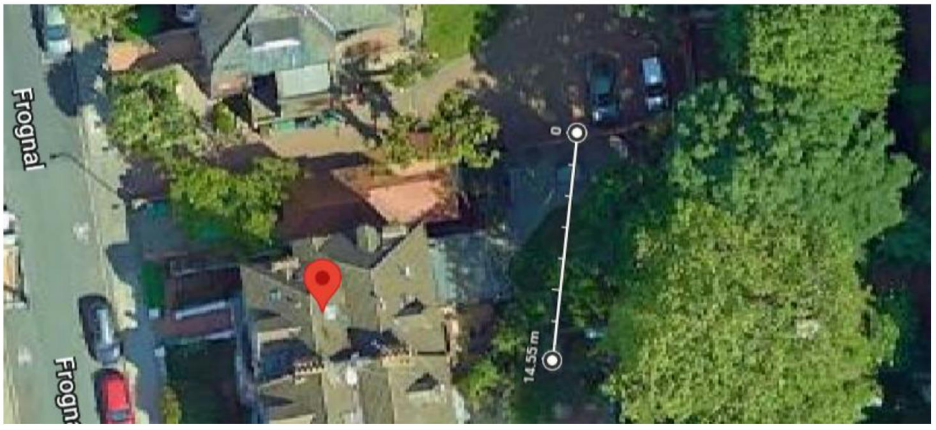
POLICY HOLDER ADDRESS: Flat 2, 34 Frognall, London. NW3 6AG

CLIENT REFERENCE:

OUR REFERENCE: [redacted]

ANTICIPATED START DATE: TBC

PROJECT MANAGER: Paul Milliam



Aerial plan indicating proposed 14.5m length and alignment of barrier

Discussion

This method statement covers operations to install a copper impregnated bio-barrier.

The subsidence movement affects the rear projecting contemporary conservatory extension.

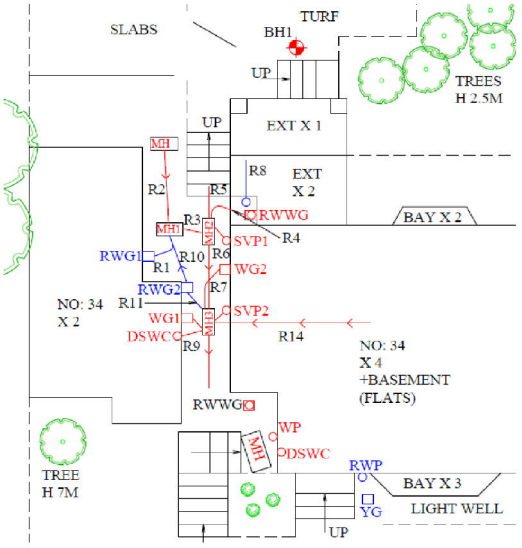
Property Details

The property is large semi-detached period property of traditional construction with solid brick walls under a pitched tiled roof. The property has been converted in 5 self-contained flats. Flat two occupies the upper ground floor flat that has an original rear projection supported with steel columns. Added to this is a modern contemporary conservatory extension supported by a steel framework upon steel column supports, with steps leading down into the garden. It is understood that extension support columns utilise a pad foundation understood to be 2.5-3m below ground.

Front and rear elevations of property

Site Investigation Results

Site investigations in January 2020 included a single borehole within the rear garden adjacent to the rear access steps leading from the extension into the garden. The soil was firm mid brown/orange sandy and silty clay with occasional gravel with the soil makeup remaining consistent to the termination of the borehole. The soil at 1.2m progressed from firm to very stiff to the base of the borehole at 4m. No roots where observed below 3m and water seen to be entering the borehole and standing at 3.7m. Soil samples showed peak soil suctions at 2m. Moisture contents dropped lowest at 3m. The clay was determined as having an intermediate plasticity at upper level becoming highly plastic at 2m. The roots retrieved were identified as Platanus (plane) and Tilia (lime) consistent with trees located in the rear garden. All drainage is shown to extend down the flank wall of the property.

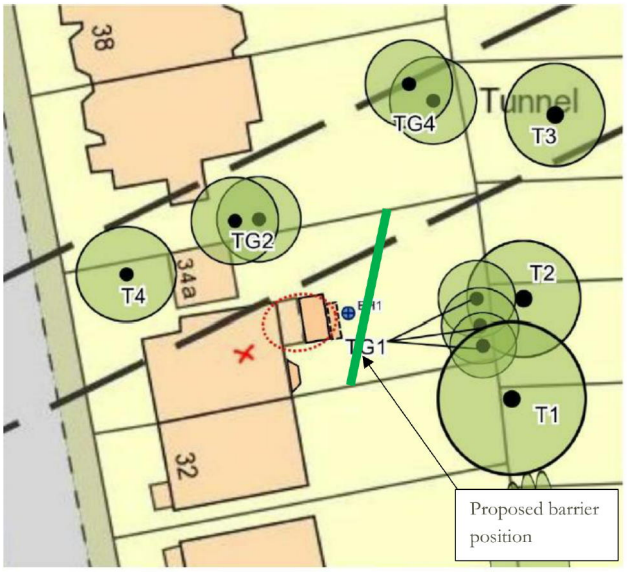


Level monitoring Results

The level monitoring provided shows cyclical movement to the rear extension typical of root induced clay shrinkage subsidence. Additional monitoring will assess the buildings movement following the installation of a root barrier and will ultimately determine when stability has been regained and superstructure repairs can be completed.

Arboricultural Recommendations

The arborist's report assessed the vegetation around the site and proposed removal of the several nearby trees detailed under the heading current claim. Others vegetation has been listed as future risk and this includes the lime trees referenced as TG2. TG2 has previously been pollarded and the arborist states that these should be maintain only. A root barrier would not be able to be installed to design against any nuisance from these trees. TG1 Limes have been removed with the stumps still evident within the ground. The Arborist considered T1 and T2 to be primary causes and recommends removal/felling.



Tree Root barriers Explained in Brief

The current issues arise from the presence of tree roots which have grown into the clay soils directly below the foundations of the property. To abate the nuisance, it is prudent to either fell the tree in question or sever the roots between the tree and the property and provide protection against further growth.

Optera can install a copper impregnated geotextile barrier. This is typically installed with a small excavator measuring no more than 2m in width. A trench is formed with the excavator and the arisings stored to one side of the trench. The barrier is typically formed in 5m lengths. Once the first 5m of the trench is excavated, we will bund the leading edge with sheet piles and line the trench with the copper impregnated bio-barrier, before backfilling with 20mm imported granular fill. In certain instances the trench can be backed with as dug soil providing this is suitable.

The process is then repeated until all the designated barrier is installed. Where the barrier is below hard landscaping the top 200mm will be filled with MOT Type 1 well compacted before laying the finish layer. Where the barrier sits below soft landscaping the top 200mm of the trench will be filled with topsoil and grass seeded.

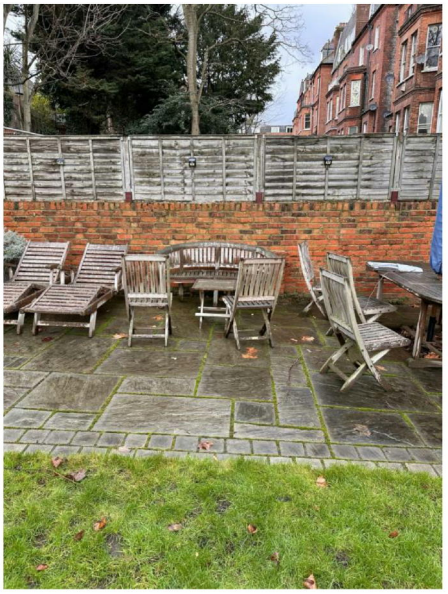
Any excavated spoil will be cleared from site along with the plant, welfare, and protections. The area will be left tidy on completion.

The location of the barrier is targeted at the roots between the tree and the foundations, and the act of excavation will sever them, causing the roots under the foundation to wither and die. The absence of water demand from the clay below the footings will allow the clay to rehydrate and recover. Whilst a period of recovery is anticipated, repairs can be typically undertaken 3-6 months after the installation is complete.

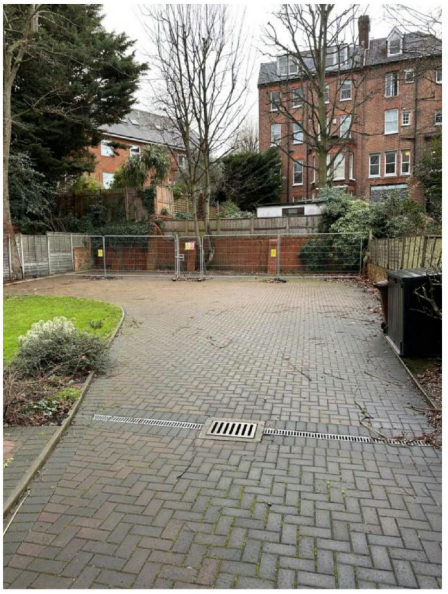
Proposed Works

The proposed works will comprise the following:

- Set up site, including compound area to left side neighbours rear car park. This will be boarded, protected and secured with site fencing.
- The barrier will be marked out on the ground and the area CAT scanned prior to mechanical excavation. Any detected services are to be hand excavated and exposed prior to machine excavation.
- The left boundary fence will be taken down and c2m section of the boundary wall will be taken down to facilitate plant access. Due to the 0.5m drop in level ramped access will need to be constructed. A 6t long reach excavator will then be brought to site.
- A section of the patio and brick edging will be lifted and set aside for re-use. Where re-use is not possible then new near match slabs and edging will be sourced . The sub-base will then be broken out and the virgin soil exposed.
- A trench, 300mm wide will be formed to a depth of 4m which is 1m past the last root recorded in the investigations.Excavation in the top metre of soil will be under supervision in order to identify any significant roots (diameter > 25mm). Any such roots will be cut with a clean saw on the side of the trench nearest the trees.
- Once the first 5m of trench has been formed, we will bund the leading edge of the excavation with sheet piles and line the trench with the copper impregnated bio-barrier.
- The trench will be backfilled with 20 angular stone 200mm short of the surface, with the barrier folded back across the trench where this is cut through hard landscaping. Where the barrier is excavated across the lawn an element of as dug soil will be used as backfill to economise costs.
- The next section of trench will be formed, and the process repeated, until all of the barrier has been excavated and installed.
- The excavated arising will be tracked to the compound area and placed into 8 yard skips. Grab trucks cannot be utilised due to restricted width.
- Once the barrier is installed and complete, we will top up any excavations to the surface with MOT type 1, or topsoil and grass seed along the barrier line.
- The ramp access will be deconstructed.
- The patio lifted with be reinstated to correspond with existing levels. Brick edging will be relayed to blend with existing surfaces.
- The left boundary wall will be rebuilt with best matching brick.
- Fencing will be reinstated utilising the original materials.
- All security fencing, welfare and plant will be off hired and cleared from site and the area left tidy on completion, allowing the hard landscaping and reinstatement to be completed by others.



Walling and paving to be removed to facilitate woks



Rear car park to 36 Frognal to be used for compound

Proposed Plan of Works for 6926

START DATE: 2 weeks following the formal approval of the costed scheme

COMPLETION DATE: Within 2 weeks of starting the works.

Assumptions

- **Quote allows for full use of the neighbours rear car park. Access and use of the rear car park 36 Frognal to be arranged and agreed by others. No payment or allowance has been included within the quote for its use.**
- **Parking permits, bay suspensions, hoarding licences as may be required will be arranged through our sister company William Hunt Consulting and will be charged at cost plus 20%**
- **No drainage has been identified as being present within the designated area of installation, and hence no drainage works have been allowed for in the costs.**
- **No dewatering of the trench has been allowed. The site investigation where undertaken during the wet month of January. It is assumed no water will be encountered at 3.7m**
- **The paving and walling will be reinstated to best existing.**

Specification of front Barrier					
Barrier Type	**length**	**Max Root Depth**	**Minimum depth to be achieved with barrier**	**Distance between tree / Vegetation and barrier**	**shortest distance between barrier and foundation**
Copper	**14.5m**	**3m**	**4m**	**9m+**	**6m+**

Carbon savings and green credentials

The installation of a copper impregnated geotextile fabric is the most carbon neutral option available to the insurance repair marketplace. The average tree absorbs 21 kg of CO_2 per annum based upon a mature species. Felling trees releases carbon and replanting saplings takes many tens if not hundreds of years to offset the effect of felling the original species.

Traditional engineering solutions consume vast quantities of carbon, both in their execution with plant, spoil to landfill and the vehicle movements to and from site. In addition, the manufacture of concrete generates in the region of 72kg of CO_2 per ton and contributes 8% of all man-made carbon output in the world today.

From Optera's own investigations and research, we estimate:

- The average underpinning scheme omits 12 tons of CO_2
- The average piled raft scheme omits 44 tons of CO_2
- PU injection treatment omits 3 tons of CO_2
- By contrast, a 10m root barrier omits just 1 ton of CO_2

Not only is the root barrier installation both less disruptive and much quicker to install then traditional engineered techniques, but it offers carbon savings of between 88 and 97%. And is still 66.667% more carbon friendly than the closest innovative competitor.

Completion Criteria

Optera shall have fulfilled its obligations when:

- Contractor accomplishes the Contractor activities described within this method statement
- The Policy Holder is in agreement that works have been carried out as per the agreed specification to an acceptable standard.
- Agreement that works have been carried out as per the agreed specification to an acceptable standard by the appropriate Engineer
- Site has been vacated and all plant and materials removed.

Project Variation Procedure

The following process will be followed if a change to this method statement:

- A project variation request will be submitted to the handling adjustor. The variation must describe the change, the rationale for the change, and the effect the change will have on the project.
- The designated Technical Manager for OPTERA will review the proposed change and determine whether to submit the request to the project arboriculturist.
- If variation works are agreed, works will be booked in at the request of the handling Adjustor/Engineer and OPTERA will seek formal approval via the adjusting company.

Intervention Explained

How do Copper Root Barriers work ?

In the UK the shrinkage and swelling of clay soils, particularly when influenced by trees, is the single most common cause of foundation movement that damages domestic buildings.

Trees are known to cause clay soils to shrink by drawing water through their roots, predominantly during spring and summer. This shrinkage results in both vertical and horizontal ground movements that, when transmitted to a building's foundations, cause damage to the building structure. The amount of shrinkage depends on the type of clay soil, the type and size of vegetation, and on climate. Trees growing under grass cover are forced to compete for their water and to extract water from greater depths than they might otherwise do, as is the case in this instance.

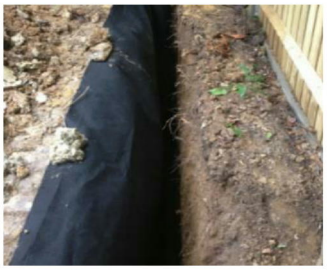
The water content of a shrinkable clay soil will vary with depth, remote from and near to a large tree. Near the ground surface there can be relatively large changes in soil water content between summer and winter as a result of evaporation from the ground surface and transpiration by the grass. Such variations are normally confined to the top 1-1.5m of the ground, possibly less adjacent to buildings. Where mature trees grow at the same location, then the water-content profiles will vary and the seasonal fluctuations in soil water content are both larger and extend to a greater depth. Soil volume changes and hence ground movements will be greater.

A crack due to differential foundation movement occurring after a tree has reached maturity, there being no cracks up to that time, means it is probable that an exceptionally long dry spell has also had an influence. But cracks will recover when ground moisture contents recover and will not recur to any greater width in future. BRE Cracking in Buildings. The intention of the Bio-root shield is to mitigate against this periodically damaging effect. The solution adopted in this case seeks to decrease water uptake by the trees thereby lessening subsidence risk by conserving soil

moisture and reducing clay subsoil shrinkage. This aim is to achieve an impairment to root growth by the focused introduction of a proprietary Bio-root-shield that offers all the benefits of being both flexible and permeable. In addition it works as a biological repellent.

The Copper signal barrier details a cooper foil securely bonded between porous geotextile, releasing copper ions and forming copper carbonate (verdigris) that signals an adverse reaction to roots deflecting them away from the barrier. The presence of copper does not constitute an eco-system burden or impact on groundwater

This solution is multipurpose and ideally suited to the current application. Traditional impervious barriers divert rather stop roots and may block moisture movement. Also, roots getting under such barriers can grow back to the surface. Therefore, the use of this permeable barrier stops roots either by engaging and constricting them or by chemically inhibiting them.



The benefits of such a shield are its dual protection both physical and biological. The multi layered sheets can be welded together whilst retaining its flexible qualities, i.e. can be cut and effectively resealed to fit round services and foundations, inert with a 60 year service life expectancy. Equally the solution inhibits root growth on the barrier face which is often problematic with conventional barriers where increased moisture levels can cause root growth to become more prolific on the face of a traditional barrier. Research has shown that the use of the recommended style of copper based screening has greatly reduced the effects of root growth when compared to other traditional physical barrier installations

Following the installation of the shield the trench will be backfilled and compacted mechanically with 20mm single sized stone. Alternatively, dependent upon site conditions backfill using lean mix concrete will utilised on the structure side of the shield. On occasions some natural settlement is anticipated following completion. In all instances the project envisages a return visit to the property to affect any required maintenance of the surface of the reinstatement routinely programmed within 6 months following completion of the installation.