Optera Structural Solutions
The Barn, Oxburgh, Stretton on Dunsmore
Warwickshire, CV23 9JF
[redacted]

Arboricultural method statement to install a tree root barrier at Flats 1-9, 8 Compayne Gardens

Date	Services Performed By:	Services Performed For:
January 20, 2023	Optera Structural Solutions	Crawford and Company

[redacted]

POLICY HOLDER ADDRESS: Flats 1 – 9, 8 Compayne Gardens, London, NW6 3DH

CLIENT REFERENCE: [redacted]

OUR REFERENCE:

ANTICIPATED START DATE: TBC

PROJECT MANAGER: Steve Wiseman

Introduction

This method statement describes methods to be used to install a tree root barrier as a result of building movement and associated damage that is the result of tree-root clay shrinkage subsidence

The front-left corner of the property is the area of damage. This proposal includes all activities relating to the installation of a copper impregnated bio-root barrier. The proposed barrier is intended to deal with the current vegetation. No specific allowance has been made to cater for future growth and items of vegetation not currently implicated in the damage under consideration.

Property Details

The property is a four-storey (including basement), semi-detached property, which is divided into 9 self-contained flats. The front of the property faces approximately south, and the occupied plot is relatively level, having no apparent adverse features.

Figure 1 – View of the property from the right-hand side

Site Investigation Results

Foundations in the area of damage to be concrete strip footing,are at a depth of approx. 0.68m below ground level onto shrinkable clay. Tree roots identified as originating from a Lime tree were noted to a depth of 2.17m below ground level.

Level Monitoring Results

Level monitoring data show a pattern of seasonal movement affecting the front and front-left sections of the structure, which corroborates a diagnosis of tree-root induced clay-shrinkage subsidence.

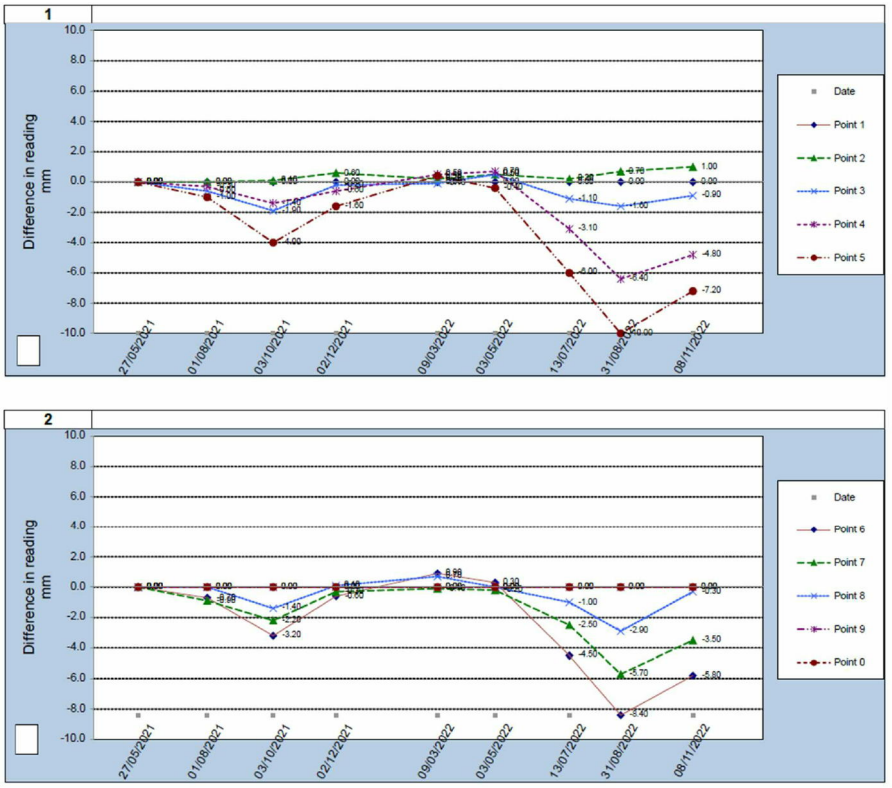


Figure 2 – Extract from level monitoring data (MHN)

Arboricultural Recommendations

Whilst removal of T4 was recommended and the council has permitted its removal, practical difficulties arising from the tree being owned by a third-party has prevented its removal. As a result, a root barrier is being considered to reduce the amplitude of property movement.

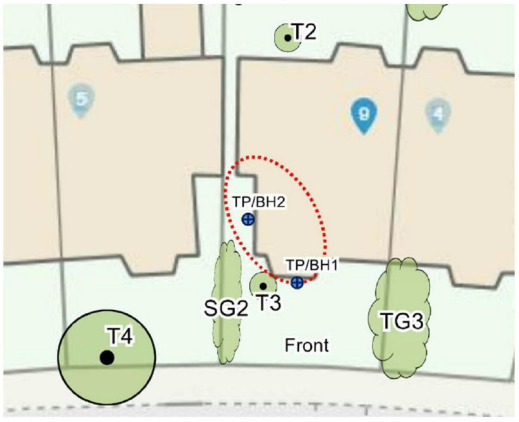


Figure 3 – Extract from MWA Arboricultural report

Proposal

The proposed tree-root barrier is to be installed as shown in figure 2 below.

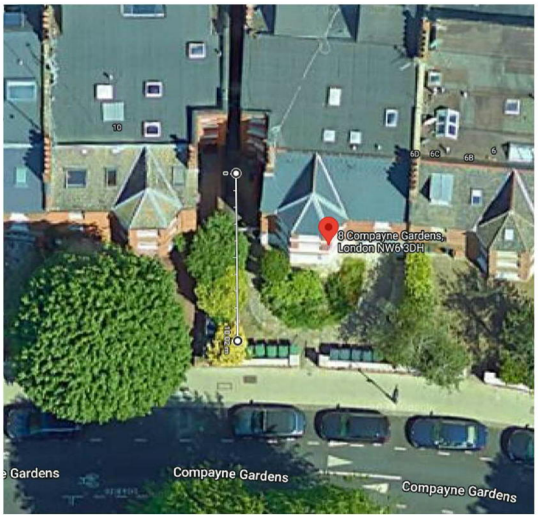


Figure 2 – Site Plan, showing the line and location of the proposed barrier

The root barrier will be approximately 10m in length and to a depth of 3.0m. Due to access constraints, a 'compact root barrier' will be installed as this will minimize the enabling and reinstatement works necessary to facilitate the works. A 'compact root barrier', is installed by drilling a series of linked, vertical holes, which are then lined to form the barrier which would sever roots originating from the offending tree and prevent re-growth. With this method it is not possible to gain direct access to the roots & cut them with a saw.

A contiguously drilled trench of approximately 150mm wide and a nominal depth of 3.0m would be formed on the line indicated at figure 5, using specialist drilling equipment and lined with a copper impregnated Bioroot-barrier before backfilling with 20mm clean stone.

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 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 excavated arisings. The backfilled spoil will be placed in layers and consolidated with a compactor attachment on the excavator.

The process is then repeated until all the designated barrier is installed. The spoil will be filled to the surface as a temporary measure to allow consolidation and until permanent reinstatement is completed. We have assumed that permanent reinstatement will occur shortly afterwards by Others.

Any excess 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 implicated tree(s) and the foundations, and the process of excavation will sever all of the main roots, 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 normally required, repairs can typically be undertaken shortly after the installation is complete.

Method Statement

It is assumed for the purpose of the quote that the site will be secured by others and any hard landscaping lifted and set aside for reinstatement on conclusion of our works. The quote is based on soft ground excavation and any additional hard break out or hard landscaping will be charged over and above the works proposed.

The proposed works will comprise the following:

- Obtain Parking Bay suspension for parking and skip placement
- Obtain Hoarding License if required
- Any enabling works will be attended to prior to Optera's start
- Set up site, including compound area to be agreed with the customer. 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.
- A contiguously drilled trench, 150mm wide will be formed to a depth of 3.0m which is more than 0.50m past the last detected root in the information we have been supplied.
- Once the barrier material has been installed, the trench will be filled with gravel
- Once the barrier is installed and complete, we will top up any excavations to the surface in order that the site is left temporarily with trip hazards and the area left tidy.
- All fencing, welfare and plant will be off hired and cleared from site and the area left tidy on completion.

Proposed Plan of Work

START DATE: TBC

COMPLETION DATE. Optera's works are estimated to take two weeks to complete.

Root Barrier Specification

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	10m	TBC	3.0m	10m	1.5m

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.

Appendix B - 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 movements that damage domestic buildings.

Trees are known to cause clay soils to shrink by extracting moisture from the clay 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, can cause distortion and damage to the building's structure.

The amount of shrinkage depends on the type of clay, the type and size of vegetation, and on climatic conditions. Trees growing adjacent to other trees or vegetation will compete for water and may, therefore extract water from greater depths, or further afield than they might otherwise do so.

The moisture 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 moisture content between summer and winter as a result of evaporation from the ground surface and transpiration by grasses, or other low-growing vegetation. Such variations are normally confined to the top 1-1.5m of the ground, possibly less adjacent to buildings. However, where mature trees grow at the same location, then the moisture-content profiles will vary significantly and the seasonal fluctuations in soil moisture content are both larger and extend to a greater depth; this amplifies volumetric changes in the clays beneath the foundations and hence ground and building movements will be greater.

Where tree-root induced clay-shrinkage is the cause of foundation movement in buildings, we see a seasonal, or cyclical pattern of movement, with the building moving down as the clay dries, and back up as the clay recovers moisture during the wetter months – we tend to see cracks open towards the end of the summer and to close, or 'recover', during the winter months when soil moisture levels increase. Without the influence of the tree roots, the building will, in all probability, remain stable year-round.

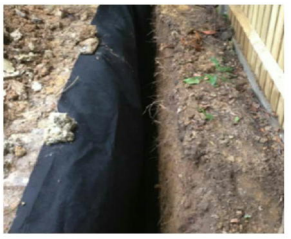
The intention of the Bioroot barrier is to divorce the building from the influence of the tree roots, thereby acting to mitigate against this seasonal damaging effect. This aim is to initially prune the roots and then impair future root growth by the introduction of a proprietary Bioroot-shield that offers the benefits of being both flexible and permeable.

In addition it works as a biological repellent. The Copper-foil, which is securely bonded within the porous geotextile barrier, releases copper ions and forms copper carbonate (verdigris) which acts to 'signal' adverse soil conditions to the tree roots, deflecting them away from the barrier and inhibiting the proliferation of roots against the barrier. The presence of copper does not constitute an eco-system burden or impact on groundwater or soil microbial life.

This solution is ideally suited to the amelioration of tree-root subsidence cases. More traditional, and now out dated impermeable barriers, divert rather stop roots and may prevent established ground water pathways.

Also, with less innovative barrier types, severed roots tend to grow back in time and circumnavigate the barrier. The use of this permeable barrier, with its 'signaling effect' stops roots both by engaging and constricting them or by chemically inhibiting their growth.

The benefits of such a shield are, therefore its dual protection both physical and biological.



The multi layered sheets are welded together so as to retain its flexible qualities, i.e. it can be cut and effectively resealed to fit round services and foundations.

The material is has a 50 year service life expectancy.

As indicated above, this material inhibits root growth on the face of the barrier, which was historically a problem with conventional, impermeable barriers where increased moisture levels on the surface of the barrier tended to promote root growth leading to a proliferation of root growth on the face of the barrier; the massing of roots against the face of conventional barriers would eventually lead to puncturing, fracturing and eventual failure of the barrier.

Research has shown that the use of the recommended style of copper-based barrier has greatly reduced the effects of root growth when compared to other traditional physical barrier installations

Following the installation of the barrier the trench is backfilled with 20mm single sized stone.

Alternatively, and dependent upon site conditions backfill using lean mix, or no-fines concrete is substituted on the structure side of the shield.

On occasions some natural surface settlement can develop following installation. Where such settlement is excessive, the project envisages a return visit to the property to effect any required maintenance of the surface reinstatement within 6 months following completion of the installation.