## Optera Structural Solutions

The Barn, Oxburgh,
Fosse Way, Stretton on Dunsmore, Rugby, Warwickshire,
CV23 9JF


# Method statement for the installation of a traditional root barrier

| Date | Services Performed By: | Services Performed For: |
|---|---|---|
| November 24, 2022 | Optera Structural Solutions<br>The Barn, Oxburgh,<br>Fosse Way, Stretton on Dunsmore,<br>Rugby, Warwickshire,<br>CV23 9JF | Questgates<br>Benchmark House<br>Folds Point, Bolton, Greater Manchester.<br>BL1 2RZ |

**POLICY HOLDER ADDRESS:** **29 Elsworthy Road, London. NW3 3BT**

[redacted]

**ANTICIPATED START DATE:** **TBC**

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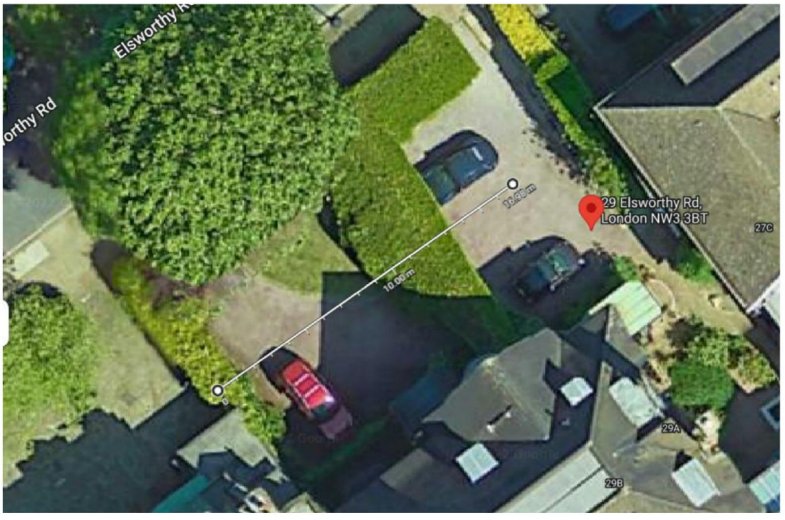
**PROJECT MANAGER:** **Spencer Caizley**




Aerial view of barrier position and location.

# Project details

This method statement describes the installation of a root barrier .

It is understood that the property was the subject of previous subsidence claims in 2016 (Front bay) and more recently 2018 (front bay and portico) following the prolonged hot summer. They investigated the claim and concluded that damage was the result of root induced clay shrinkage. The hedge was removed and the street tree was pollarded in line with the Arborists recommendation. It was also an obligation for the Council to re-pollard the tree every two year. This would suggest the tree should have been re-pollarded this summer.

# Property Details

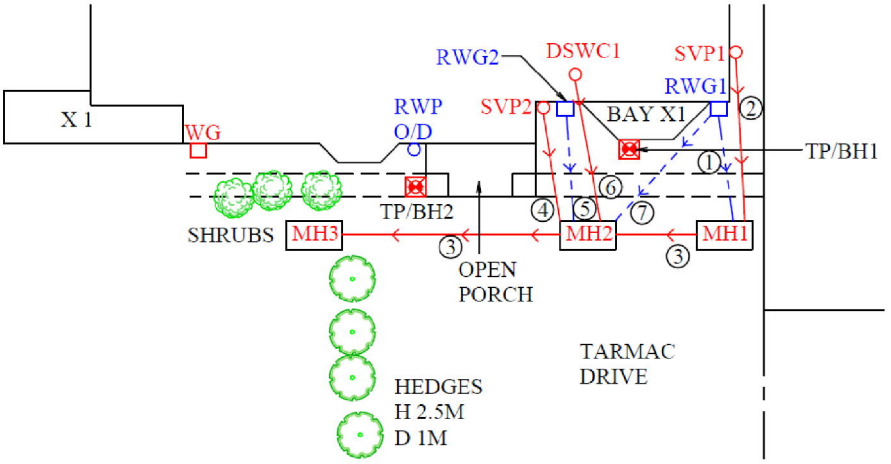
The property is large detached 2 storey plus attic house of traditional construction with solid external brick walls under a pitched and hipped tiled roof. No 29 occupies the ground floor of the building with a further 4 flats No 29 A-D that occupy the upper floors. Damage relating to the current claim is understood to affect the ground floor right bay and the entrance portico to No:29.

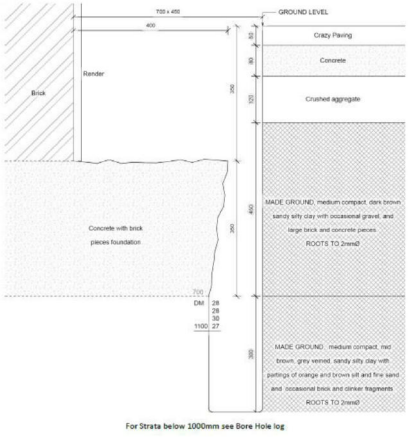
**Front elevation of property, Plane tree within footpath.**

## Site Investigation Results

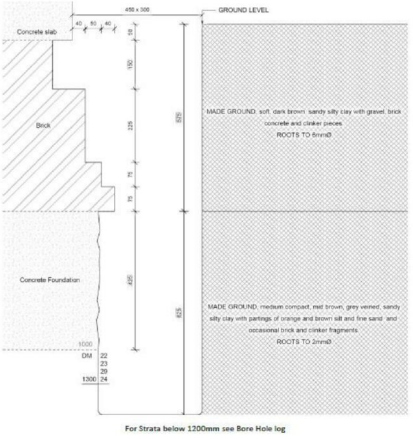
Site Investigations were undertaken by CET 15/05/2019 and included the excavation of two trial pits and the hand augering of two boreholes shown on the plan below. A drainage survey was also undertaken. The foundation to the front bay was established as being a concrete strip footing 350mm thick and extending to a depth of 700mm below ground level. The soil to the underside was recorded as made ground extending into a very stiff brown clay at 2.5m to the termination the borehole at 3m. Roots were found to the underside and down to 2.4m, these were tested and identified as being Platanus more commonly known as Plane and being consistent with the street tree growing in the pavement. TP2 to the to the left of the portico recorded the footing as brick corbelled to 575mm supported by a concrete strip 425mm thick giving an overall foundation depth of 1000mm. Roots found to the underside were identified as being Plane roots, with roots retrieved to a depth of 2.2m established as being Cupressaceae (Cypress)

these related to a hedge that run centrally within the front garden up to the house, but has since been removed.




TP 1- Front Bay




TP 2 - Portico

| | | |
|---|---|---|
| ***EPSL***<br>***European Plant Science Laboratory*** | Sheet: 1 of 1<br>[redacted] | Site: **29 Elsworthy Road,**<br>Work carried out for: **Crawford Claims MGMT SUS** |

***Certificate of Analysis***

The following work was commissioned by CET on behalf of their client. Root samples were obtained in sealed packets from the above site with no reference given as to the types of tree or shrub from which they may have originated.
The results were as follows -

| Trial pit/ Borehole number | Root diameter (mm) | Tree, shrub or climber from which root originates | Result of starch test |
|---|---|---|---|
| TP1 (USF) | 2 mm | Platanus spp.<br>2 roots | Positive |
| BH1 (to 2.4m) | 1.5 mm | Platanus spp.<br>3 roots | Positive |
| TP2 (USF) | 1.5 mm | Platanus spp. | Positive |
| TP2 (USF) | <1 mm | Cupressaceae spp. | Positive |
| BH2 (to 2.2m) | 2 mm | Cupressaceae spp.<br>4 roots | Positive |

Platanus spp. include London plane and Oriental plane.
Cupressaceae spp. include Lawson cypress, western red cedar, Monterey cypress, Leyland cypress and junipers.

# Arboricultural Recommendations

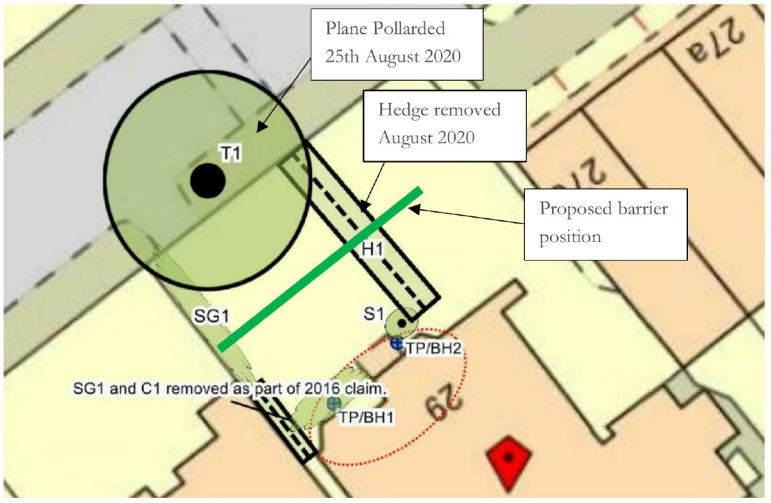
The arborist's report assessed the vegetation around the site and proposed removal of the Cypress hedge (H1) back 4m from the house. This was subsequently removed back to the front boundary August 2020. The Arborist whilst implicating the Plane tree (T1) in the subsidence movement they only recommended pollarding and for this to be repeated bi-annually. It was confirmed within an e-mail from the Local Authority that pollarding of the Plane was last undertaken 25th August 2020. We have not been advised if further reduction has taken place this year.

**Table 1** **Current Claim** - Tree Details & Recommendations

| Tree No. | Species | Ht (m) | Dia (mm) | Crown Spread (m) | Dist. to building (m) | Age Classification | Ownership |
|---|---|---|---|---|---|---|---|
| T1 | Plane (London) | 16 | 900 | 13 | 15.5 | Younger than Property | Local Authority |
| Management history | | Past pollard management | | | | | |
| Recommendation | | Re pollard. Repeat every 2 years. | | | | | |
| H1 | Cypress | 3 | 100 Ms | 11 | 1 | Younger than Property | Policy Holder |
| Management history | | No recent management noted. | | | | | |
| Recommendation | | Remove section to provide 4m clearance from insured property. | | | | | |

Ms: multi-stemmed * Estimated value

**Site Plan**




**Arborists Site plan of implicated trees and suggested position of root barrier**


## 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 be agreed with the customer (Front Drive). This will be boarded, protected and secured with site fencing. If a street work license is required, then this would be at an additional cost.
- 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 Bamboo fence to be taken down and set aside. Grass verge edging to be lifted and set aside.
- Disc cut clean lines through the tarmac with floor saw to allow the sub-base to be broken out.
- A trench, 300mm wide will be formed to a depth of 3.7m which is 1.3m past the last root recorded in the investigations.
- 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..
- 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 left at the front of the drive for periodic collection by grab lorry.
- 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.
- Tarmac will be re-laid along the trench line to blend with existing surfaces with.
- We will re-erect the bamboo fence and re-set the verge edging stones
- 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.

# Proposed Plan of Works for 6844

START DATE: 4 weeks following the formal approval of the costed scheme

COMPLETION DATE: Within 2 weeks of starting the works.

# Assumptions

- 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.
- A communication cable runs along the central bamboo fence. This will be worked around providing suitable flex is in the cable. Should a service engineer be required this will be chargeable.
- It is assumed that the trench will be formed through clay soil which is readily excavated with the plant prescribed and no additional mechanical breaking is necessary.
- No dewatering of the trench has been allowed.
- The tarmac drive is in poor condition. Reinstatement of the tarmac along the barrier line will leave scaring. The tarmac will also need to be coloured to match best possible with existing. Given the age and condition of the tarmac we cannot take responsibility for any damage arising where reasonable protection has been provided.

| 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** | **17m** | **2.4m** | **3.7m** | **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 SOW
- 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 SOW or a Variation of works is required:

- 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 other party.
- 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.
- Upon completion of the variation works, these will be invoiced separately to the initial authorized project.

# 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.

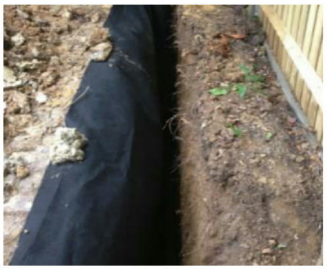
The water content of a shrinkable clay soil will vary with depth, remote from and near to a large tree. Near the ground surface there can be relatively large changes in soil water content between summer and winter as a result of evaporation from the ground surface and transpiration by the grass. Such 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.