Optera Structural Solutions

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Arboricultural method statement to install a root barrier at The Old Church, Ashington

Date

August 7, 2023

Services Performed For:

Crawford and Company
1st Floor, Cassiobury House
11-19 Station Road,
Watford,
WD17 1AP
Tel: 01923 471755

POLICYHOLDER ADDRESS: **The Old Church, Mereley Park Road, Ashington, Wimborne, BH21 3DF**

CLIENT REFERENCE: **SU2002228**

OUR REFERENCE: **OPT-7675**

PROJECT MANAGER: **Steve Wiseman**

Specifications of Barrier					
Barrier Type	**Length (m)**	**Max Root Depth from SI (m)**	**Minimum depth to be achieved with barrier (m)**	**Shortest distance between vegetation and barrier (m)**	**Shortest distance between barrier and foundation (m)**
Copper	21	1.7	2.7	6	2.5

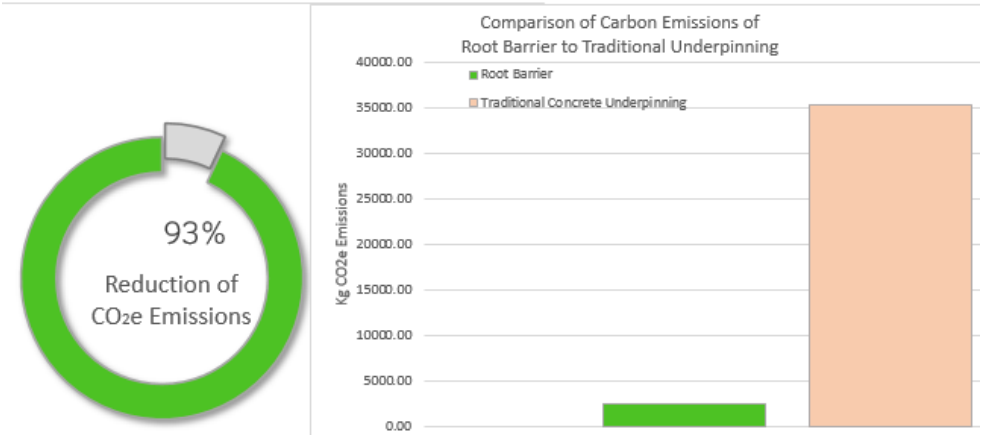

Figure 1 - Aerial plan indicating proposed 21m length and alignment of barrier

Report

This method statement covers the installation of a root barrier at the above property due to tree root induced subsidence caused by adjacent trees.

Property Details

The property is a detached building, comprising a converted Church/Chapel.

Figure 2 - Front elevation

The property has a projection at the rear-right corner and a lean-to garage at the right-hand side (front). It is understood that some underpinning has previously been installed, but to a relatively shallow depth and that further differential movement has been noted during the extended dry period in the summer of 2022.

Figure 3 – Site Plan (from Crawford's Technical Report)

Site Investigation Summary

Item	Metric
Investigation date	16/10/2020
Relevant Trial Hole foundation depth	1.70m
Indicated foundation type	Concrete – underpinned
Maximum root depth	1.7m
Maximum Plasticity of Clay (NHBC Class)	Medium VCP
Maximum depth achieved with borehole	3.0m
Water noted in borehole	None recorded
Drains surveyed/relevant	No

Level monitoring

Level monitoring data covers the period from 17/11/2020 to 08/12/2022. It shows a pattern of cyclical/ seasonal movement, which corroborates the diagnosis of tree-root induced, clay-shrinkage subsidence.

Arboricultural Recommendations

The arborist report recommended removal of a number of trees which have been identified as being implicated in the current damage, these are listed in the table below:

Tree ID	Type	Height	Distance to Building	TPO/CA?
T3	Ash (now removed)	7m	5.5m	No
T4	Oak	12m	7m	Yes
TG1	Oak	18m	6m/5m	Yes
G3	Pittosporum	7m	4m	No

* - estimated

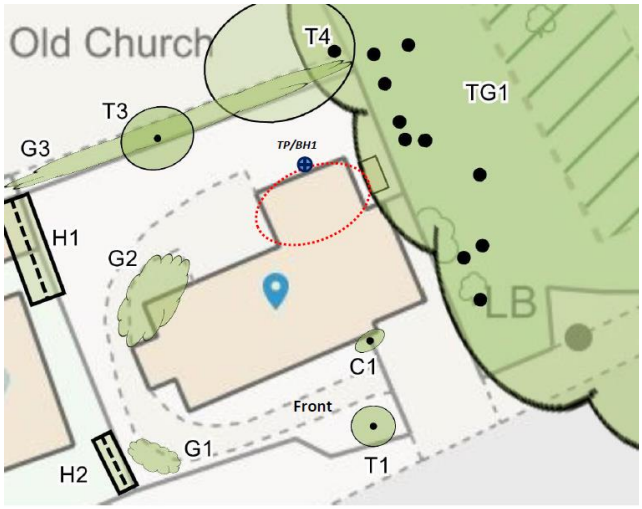

Figure 3 – Tree Plan (extract from MWA report)

The arborist report indicates that T4 and TG1 are protected by Tree Preservation Order (TPO).

We are informed by Crawford & Company that "*T3 Ash has been removed, T4 Oak TPO (consent has been given council ref: TP/22/00199/X). G3 Pittosporum - Reduce height to 4m. TG1 Oak - Remove within 10m of garage/dwelling (TPO consent TP/22/00758/X 22/11/22)*".

Barrier Design

The plan is to install a conventional tree-root barrier, dependent on suitable access down the right-hand side of the property and into the rear garden with a mechanical excavator.

The barrier would be approximately 21m in length and achieve a target depth of 2.7m below ground level. The line of the barrier is illustrated at Figure 1 above.

Subject to completion of tree works agreed, it is considered that that the distance between the affected trees and the barrier is sufficient that the trees will not be destabilised by the barrier installation process.

Method Statement

The proposed works will comprise the following:

1) Set up site, including compound area agreed with the Customer; the work and compound areas will be boarded, protected and secured with suitable site fencing

4) The line of the barrier will be marked out on the ground and the area scanned with a CAT[1] prior to mechanical excavation
5) Any services detected within 1.0m are to be hand excavated and exposed prior to machine excavation. Excavation within the top metre of soil near trees will be under supervision. Any significant roots (with diameter >25mm) will be cut with a clean sharp saw on the side of the trench closest to the trees)
6) A trench of approximately 300mm wide will be formed to the design depth
7) Typically, once the first 5m of trench has been formed, we will bund the leading edge of the excavation with a trench sheet and line the trench with the copper impregnated bio-barrier
8) The trench will be backfilled with free-draining stone, or where appropriate with as dug arisings (where as dug material is re-used, this will be compacted in layers using a vibrating plate compactor attached on the excavator)
9) The next section of trench will then be formed and the process repeated until all of the barrier has been excavated and installed
10) Once the barrier installation has been completed, we will top up the excavations with topsoil to the surface in order that the site is left tidy and without trip hazards
11) All site fencing, welfare, protections and plant will be removed from site, along with all residual waste. The work and access areas will be left tidy on completion

Proposed Plan of Works for OPT-7675

START DATE: Within 4-6 weeks of approval

COMPLETION DATE: Within 2 weeks of starting the works

Alternative scheme and reserve estimate

Should the proposed root barrier be deemed unacceptable or otherwise be unable to be installed, then any alternative option would likely involve an engineer designed, foundation augmentation scheme.

In this case, we envisage that this would likely take the form of a traditional underpin, although the depth of roots may necessitate a piled solution. No engineering feasibility or design has been prepared, and no formal cost estimates have been calculated at this time. However, for indicative purposed only, we would suggest that costs in the region of £100,000.00 + VAT may be incurred for the installation of such a scheme.

[1] *CAT – Cable Avoidance Tool*

Intervention Explained

Clay-shrinkage subsidence is typically related to the encroachment of tree roots into the clay soils beneath the foundations of the property.

To ameliorate tree-root induced clay-shrinkage subsidence, the first option is generally removal of the implicated tree(s). However, where the tree(s) cannot be felled, for whatever reason, the next option would be to sever the roots between the tree and the property and form a barrier to prevent reestablishment of the roots.

The barrier will be positioned between the offending tree(s) and the affected part of the building, and will be installed to a depth designed to cut the tree(s) roots between the tree and the foundations; the act of excavation severs the roots, causing any roots beneath the foundations to wither and die. This prevents the tree(s) from extracting moisture from the clay supporting the foundations, allowing the clay to rehydrate and recover their natural moisture levels. Naturally, there is a period of time required for the recovery process to take place, but repairs can typically be undertaken shortly after the installation is complete.

The root barrier material favoured by Optera is a tough, copper impregnated geotextile membrane. This is normally installed using an excavator measuring no more than 2m in width. A trench is formed with the excavator and the arisings are either disposed of off site, or are stored on-site for use as backfill material.

The barrier is typically formed in 5m sections. Once the first 5m of the trench is excavated, the leading edge is bunded with a trench-sheet and the copper impregnated bio-barrier is installed, before backfilling with free-draining stone, or excavated arisings as appropriate to the site. Where 'as-dug' material is used, the backfill is placed in layers and consolidated with a compactor plate attached to the excavator. The process is then repeated until all of the designated barrier has been installed. If reinstatement works are to be undertaken by another contractor, Optera will fill the trench to the surrounding surface as a temporary measure to allow consolidation, and avoid a trip-hazard until the permanent reinstatement can be completed. Any excess spoil will be cleared from site along with the plant, welfare, and protections.

How do Copper Root Barriers work?

In the UK the shrinking 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 the Spring and Summer months. The shrinkage results in both vertical and horizontal ground movement that, when transmitted to a building's foundations, cause damage to the building's structure. The amount of shrinkage depends on the type of clay soil, the type and size of vegetation, and on weather patterns.

The moisture content of a clay soil tends to vary with depth. Closer to the surface there can be relatively large changes in soil moisture content between summer and winter as a result of evaporation from the ground surface, the drying effect of the Sun and general vegetation, including grasses. Such variations are normally confined to the upper 1m of the ground. However, where trees are growing within influencing distance of a building, then the soil moisture profiles will fluctuate much more widely through the seasons and to a much greater depth; in response, soil volume changes are amplified, and consequential building movements will be far greater.

It is quite possible that a building will coexist with nearby trees for many years without any noticeable damage, so what is the trigger for the onset of damaging levels of movement? The answer is usually a combination of the tree(s) getting bigger and developing larger leaf areas, but very often it is linked with a particularly hot, dry period of weather.

The process of clay-shrinkage subsidence is a reversable one and buildings experiencing damage in response to a period of hot, dry weather will typically see an improvement (crack widths will reduce) following a corresponding period of cooler, wetter weather when the clay is able to recover its moisture levels and swell back to its former volume.

The intention of the Bio-root barrier is to divorce the building (or more specifically the clay soils supporting the building's foundations) from the influence of the trees and thereby stop the seasonal soil moisture fluctuations, allowing the building to remain stable throughout the year.

The bio-root barrier is strong and flexible, with very high tear resistance, as well as being water-permeable, thus allowing the natural movement of water through the ground without impediment. The Copper contained within the core of the membrane also acts as a chemical repellent to the roots without constituting a hazard to plants or animals. The Copper foil securely bonded within the porous geotextile membrane, releases Copper ions into the adjacent soil by forming Copper Carbonate (verdigris); this signals adverse conditions to any roots growing towards the barrier, preventing a proliferation of roots close to the barrier. The levels of Copper generated do not constitute a burden on the eco-system or impact groundwater quality.

Outdated, impervious barriers divert rather stop roots and may prevent the movement of groundwater causing unintended consequences. The use of Optera's permeable barrier stops roots both by forming a physical impenetrable obstacle and by acting as a chemical inhibitor to the reestablishment of roots.

The multi layered membrane is welded together, retaining its flexible qualities, allowing it to be cut and effectively resealed to fit round buried services. The barrier material itself has a 60 year service life expectancy.

The chemical inhibitor effect prevents the proliferation of root against the barrier face, which was often a problem associated with conventional barriers, where increased moisture levels could encourage root growth.

Following installation of the root barrier, the trench may be backfilled with 20mm single sized stone, alternatively, and dependent upon site conditions, backfilling could be done with as-dug material, which would be placed and compacted with a plate-compactor mounted on the excavator arm. In specific circumstances, we may also use no-fines concrete on the structure side of the shield.

Some degree of surface settlement can be experienced following completion, where this happens, Optera will return to top-up the trench; typically this occurs within the first six months of installation.