



ARBORICULTURAL EXPERT REPORT

128 Haverstock Hill, London NW3 2AY

17 November 2021



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RECOMMENDATIONS

A summary of the recommendations is made below, justification and explanation can be found within the body of this report.

Current Damage

T1 Sycamore	Remove (fell) to near ground level and treat stump to prevent regrowth
T2 Lime	Remove (fell) to near ground level and treat stump to prevent regrowth
Insured	Conservation Area

Future Risk

Shrub S1 and small tree group TG1	Maintain at or below current dimensions by periodic pruning
Insured	Conservation Area



INTRODUCTION

We have been instructed by insurers to investigate a claim for subsidence at the above property. The area of damage, timescale and circumstances are outlined in our Technical Report dated 10/06/2021. This report should be read in conjunction with that report. To establish the cause of damage, investigations have been undertaken and these are described below.

INVESTIGATIONS

A Subsidence Consultant has diagnosed the damage to the front elevation of the property as being due to subsidence. There is internal and external cracking to the front bedroom and left elevation of the stairs to the upper ground floor. Site investigations were undertaken to determine the cause of subsidence on 14/10/2021.

SOILS

The soil type is confirmed by the British Geological Survey information as being clay soil such as London Clay or Oxford Clay. Site investigations confirm the presence of shrinkable clay soil. Such soil can significantly shrink and swell seasonally, particularly if tree roots are extracting moisture. These seasonal variations in moisture content can cause subsidence when soil beneath foundations is influenced by moisture extraction by tree roots.

DRAINS

Drain defects were reported but the condition of the soil indicates that soil softening due to an escape of water has not occurred.

ROOTS

At 7m and 8m distance respectively, roots from Sycamore T1 and Lime T2 would be capable of extending beneath the foundations of the damaged building and causing soil drying to occur, see below.

There are shrubs and a group of small trees closer to the building that would also be capable of extending roots beneath foundations, however due to their relatively small dimensions, it is most likely that T1 and T2 are the main causes of soil drying beneath foundations. Roots relating to Lime were formally identified.



DISCUSSION

The Subsidence Consultant's opinion is that damage has resulted from downward foundation movement beneath the main area of damage. There is shrinkable subsoil beneath foundations that will shrink and swell with changes in moisture content. If roots have extracted moisture below the depth of the footings, this can cause differential foundation movement to occur. This is supported by the following information and reference to the Technical Report and site investigation report:-

- **Subsoil** - Geological information indicates that the underlying soil is Clay and hence can significantly shrink and swell with seasonal changes in moisture content. Site investigations confirm characteristic brown silty Clay. There is high Vane strength (to 132kpa – 140kpa) therefore the soil has an adequate bearing capacity.
- **Movement** - Damage was first noticed in July 2021, at a time of year when soil moisture deficits due to tree root activity would be reaching their peak. The area and pattern of movement is consistent with the location of Sycamore T1 and Lime which are by far the most significant items of vegetation nearby.
- **Roots** – Roots were recovered from TP/BH1 and the roots sent for identification and were confirmed as emanating from Lime (3 samples), recently alive. Maple/Sycamore and Lime species can commonly root moderately deeply in clay soils and extend for considerable distances from the parent tree, see below. There do not appear to be any other likely sources of Lime roots nearby.
- **Vegetation influence** – There does not appear to have been any previous substantial pruning to the subject trees in the past.
- According to the standard published work on the subject (Cutler, D.F. and I.B.K. Richardson, (1989) further confirmed by Mercer, Reeves & O'Callaghan (2011) in shrinkable clay soils, Lime species are capable of causing subsidence damage at distances up to 20m, with 90% of cases occurring where the tree was within 11m. The subject Lime tree T2, at approximately 8m distance from the front elevation, is therefore well within its species' potential rooting and influencing distance of the building and would be capable of causing seasonal soil drying beneath foundations.
- Similarly, Maple/Sycamore species have been recorded as causing damage at distances up to 20m with 90% of cases where the tree was within 12m, therefore Sycamore T1, at a distance of only 7m is also capable of rooting and causing soil drying beneath foundations, despite the lack of root identification from the limited sampling exercise that is BH1.

Tree reduction option - Pruning is generally unreliable as a means of controlling water uptake. Whilst the tree remains, even if heavily pruned, damage is likely to continue or worsen, as the roots will continue to extract moisture from beneath foundations of the damaged building. In any event, the tree is sufficiently close to the structure that even heavy pruning is very unlikely to reduce root moisture uptake. There is no linear relationship between foliage volume and the amount of water lost. Being dynamic organisms, trees react to pruning by trying to restore the root to shoot ratio by producing as many leaves as they can. These new leaves are usually juvenile leaves with a larger surface area and generally more pores on the underside, these pores stay open for longer compared to an unpruned tree and increase the degree of water uptake by the roots. Research has shown that even a heavily pruned tree will quickly return to absorbing soil moisture and the seasonal movement and damage will continue. This is particularly the case with the subject Sycamore and Lime trees due to their size, age and species characteristics, these species grow back successfully and vigorously following pruning.

- The publication "CONTROLLING WATER USE OF TREES TO ALLEVIATE SUBSIDENCE RISK" © 2004 BRE on behalf of the Link Consortium for Horticulture Link Project No. 212 concluded that:



- For practical soil moisture conservation, severe crown-reduction 70-90% of crown volume would have to be applied. Reduction of up to 50% crown volume is not consistently effective for decreasing soil drying.
- To ensure a continued decrease in canopy leaf area and maximise the period of soil moisture conservation, crown reductions should be repeated on a regular managed cycle with an interval based on monitoring re-growth.
- For Lime trees of the age and proximity of the subject Lime T2, and for Sycamore trees such as T1 that have a high future growth potential, repeated regular pruning (bi-annually) would be an expensive but not necessarily effective means of controlling above ground growth of the tree that would not be guaranteed to negate root activity beneath foundations. Heavy pruning or pollarding will stimulate fresh growth and the influence of these trees on soil moisture beneath foundations would continue
- Therefore, if the trees remain (even in a heavily pruned state) roots beneath foundations will remain active and seasonal subsidence damage is likely to continue to the damaged part of the property (and possibly more extensively in future).
- Neither tree pre-dates the risk address therefore there should be no risk of adverse soil heave occurring if the trees are removed.
- **Root barrier option** - Root pruning as a form of mitigation is inherently unreliable as the level of excavation required could include many cubic meters of soil to be guaranteed to have removed all roots causing a nuisance, to effect such a remedy might materially make the tree unsafe or so biologically damaged as to destroy the amenity being the subject of the attempted remedy. Also, new roots will immediately seek to colonise the soil subject to the root cutting and the nuisance will recur. Due to the juxtaposition of the trees and their surroundings, it would not be possible to install a root barrier.
- **Tree removal** – The removal of any trees that are causal or contributory will allow the soil beneath foundations to rehydrate and to recover its original moisture content. Once trees are removed the activity of roots is negated and foundations will stabilize and repairs can be undertaken. If appropriate tree removal is not undertaken then the damage is likely to continue and worsen.
- **Drains** - The condition of the soil, with adequate load bearing capacity (up to 140kPa) indicates that soil softening is not a factor for consideration in relation to the damage.
- **Statutory Controls** – The trees are located within the Parkhill Conservation Area.

RECOMMENDATIONS

Current Damage

The cause of the movement needs to be dealt with first. From the results of the Subsidence Consultant's diagnosis of the damage and the geological factors, we recommend removal of Sycamore T1 and Lime T2. The resulting stumps treated with a herbicide (e.g. Glyphosate Eco-Plugs") to prevent regrowth occurring. Based on our analysis, we are satisfied there is no adverse heave risk to the risk address.

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Yours faithfully,

Chris Davies Dip.Arb.(RFS), F.Arbor.A

Arboricultural Consultant

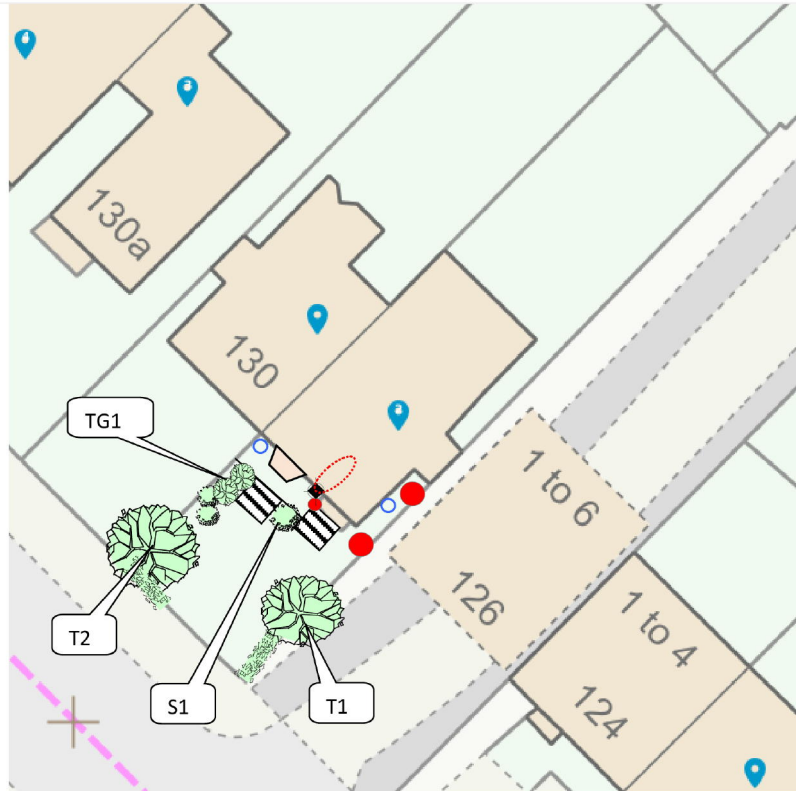
17 November 2021



Site Plan

This plan is Not to Scale

This plan is diagrammatic only and has been prepared to illustrate the general position of the property and its relationship to nearby trees etc. The boundaries are not accurate, and do not infer or confer any rights of ownership or right of way. Position of utilities is only indicative and contractors must satisfy themselves regarding actual location before commencing works.



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Key:

	Tree: Deciduous		Tree: Conifer		Shrub
	Hedge		Area of Damage		Bore Hole
	Trial Hole		Trial & Bore Hole		Level Monitoring
	Rain Water Manhole		Rain Water Gulley		Rain Water Pipe
	Waste Water Manhole		Waste Water Gulley		Toilet Pipe
	Rain Water Drain		Waste Water Drain		Electricity Cable

Photographs



Lime T2

Sycamore T1



Standard References:

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