ADDENDUM ARBORICULTURAL REPORT

SUBSIDENCE CLAIM

Crawford Reference: SU2207230

Insured:

26 Ashville Avenue

Eaglescliffe

Stockton-on-Tees

TS16 9AX

Insurer:
AXA Retail

PO Box 7073

Willenhall

WV1 9ZW

Claim Reference: 12583682J

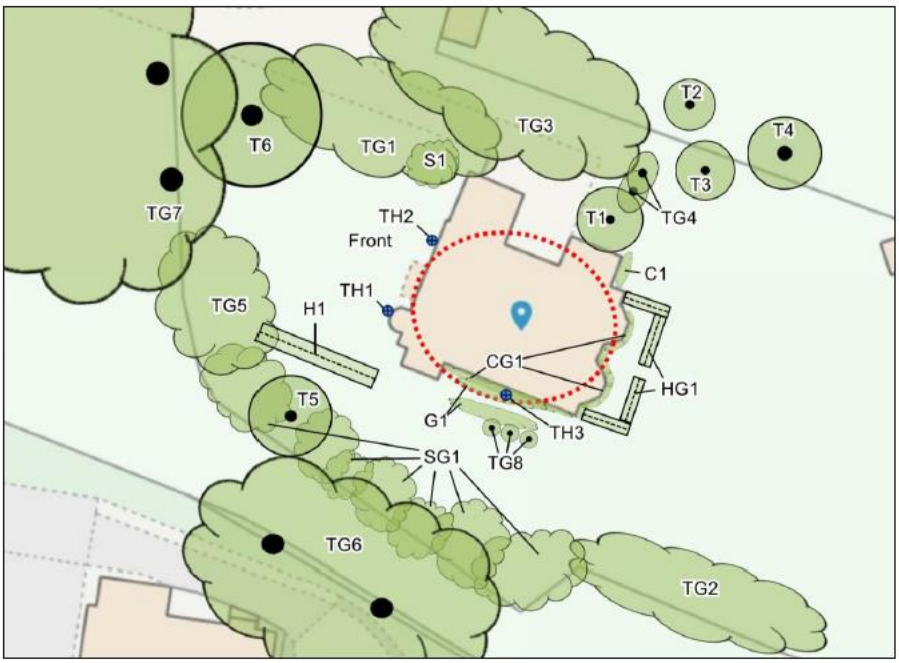
12 March 2024

Crawford Claims Solutions – Subsidence

Cartwright House,

Tottle Road,

Riverside Business Park, Nottingham, NG2 1RT



Plan not to scale – indicative only Approximate areas of damage

INTRODUCTION

We have been asked by insurers to comment on movement that has taken place to the above property. This report outlines the arboricultural issues and should be read in conjunction with the MWA Arboricultural Report and the site investigations including soil and root testing and level monitoring, which are summarised within this report.

TECHNICAL CIRCUMSTANCES

Damage is reported to be throughout the property - internal and external.

HISTORY & TIMESCALE

Date of Construction ..... House Circa 1880
Damage First Noticed ..... August 2022

TOPOGRAPHY

The property occupies a site sloping from front down to the rear and from the left down to the right.

PROPERTY

The risk address is an extended two storey large detached house of traditional construction with brick walls and rendered finish; surmounted by a hipped, slated roof.

The property has a two storey extension to the front, left-hand side. And a further single storey extension to the rear left-hand side and front right-hand side.

OBSERVATIONS

INTERNAL
Drawing Room - Rear RHS:
Cracking to walls around the French doors and right hand window - up to 5mm wide.
Landing:
Multiple cracks to the original moulded cornice - up to 2mm wide.
These are considered to be non-progressive thermal/aged deterioration cracks.
Rear RHS Bedroom:
Several cracks to right hand wall - around wash basin area - up to 3mm wide.
Several cracks within the bay window area side walls - up to 3mm wide.
First Floor Front RHS Bedroom:
The room is presently being used for storage of family belongings.
The glazed French door to Balcony is jamming and not being used at present.
Several cracks across the original lath & plaster ceiling - up to 1mm wide.
Several cracks across the chimney breast wall - up to 3mm wide.
Kitchen, Kitchen Extension, Remaining Internal Rooms:
All other rooms and areas were inspected and assessed and found to be unaffected at this time .
EXTERNAL
Front Elevation:
Below the Kitchen window is a vertical crack within proximity of th Kitchen waste gully.
Below the curved Bay window to the right hand side the render is observed to be cracked - up to 5mm wide.
RHS Elevation:
Were scaffold had been erected during the initial inspection of May 2022; the accessible render finishes present multiple hairline cracks. These areas are a replacement render and the cracks are more consistent with thermal shrinkage as opposed to subsidence.
Working along the elevation toward the rear right corner , scaffold remains in situ whilst aged Ivy is removed. Beneath the Ivy is evident cracking to the render finishes; whether this is subsidence or typical penetration of the Ivy is unclear. There are several mature root balls against the elevation.
Retaining Wall with access to Cellar:
This wall runs parallel to the right hand elevation and presents aged and recent cracking.
There are several young and aged trees within influencing distance of this area.
Rear Elevation:
Whilst internal cracks are evident to this area, no external cracks could be observed at the time of our visit.
LHS Elevation:
Whilst internal cracks are evident to this area, no external cracks could be observed at the time of our visit.

CATEGORY

In structural terms the damage falls into Category 2 of Table 1, Building Research Establishment[1] Digest 251, which describes it as “slight”.

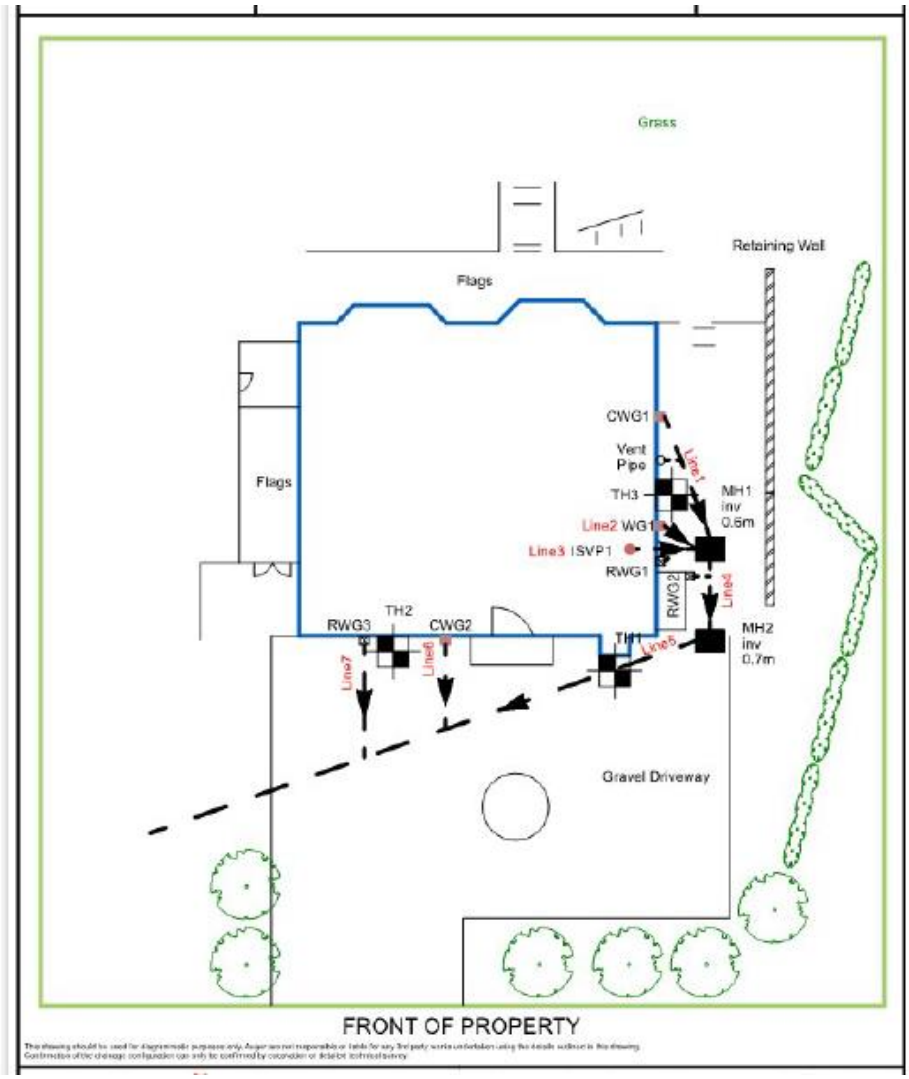
GEOLOGY & SOIL

Site investigations confirm clay soil of very high plasticity, meaning it can significantly change in volume due to seasonal variations in moisture content, particularly if influenced by tree roots extracting moisture.

[1] Building Research Establishment, Garston, Watford. Tel: 01923.674040

SITE INVESTIGATIONS

Site investigations confirm 400mm to 1200mm deep foundations bearing on clay that has very high plasticity.



Laboratory tests confirm significant desiccation has occurred where roots were observed in TH2 & TH3, the moisture contents being at or significantly less than 0.5x the Liquid Limit, this indicates abnormal soil drying in the presence of tree roots.

It is notable that the sampling was undertaken at a time of year (March) when soil moisture deficits due to root activity would be at their lowest and we would expect significantly drier soil during summer months when roots are active.

TH Trial Hole	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing .425mm %	NHBC Chapter 4.2	Remarks
TH1	D	0.80	61	81	40	41	92	HIGH VCP	MV Very High Plasticity
TH1	D	1.30	35						
TH1	D	1.80	33	63	23	40	93	MEDIUM VCP	CH High Plasticity
TH1	D	2.30	26						
TH1	D	2.80	30	57	21	36	90	MEDIUM VCP	CH High Plasticity
TH2	D	0.40	22	56	22	34	90	MEDIUM VCP	CH High Plasticity
TH2	D	0.90	24						
TH2	D	1.40	23	51	22	29	94	MEDIUM VCP	CH High Plasticity
TH2	D	1.90	22						
TH2	D	2.40	23	50	22	28	94	MEDIUM VCP	CI/H Inter/High Plasticity
TH2	D	2.90	25	53	22	31	90	MEDIUM VCP	CH High Plasticity
TH3	D	1.20	22	51	20	31	86	MEDIUM VCP	CH High Plasticity
TH3	D	1.70	23						
TH3	D	2.20	20	53	19	34	82	MEDIUM VCP	CH High Plasticity
TH3	D	2.70	21	50	19	31	82	MEDIUM VCP	CI/H Inter/High Plasticity

Roots were recovered from depths of up to 1.4m

ROOTS

The recovered roots were sent for laboratory testing and the results are as follows:

TH1, 0.8m		
4 no.	Examined root: AESCULUS (Horse Chestnut and related Buckeyes).	Alive, recently*.
1 no.	A piece of BARK only, insufficient material for identification.	
TH1, 1.3m		
3 no.	Examined root: AESCULUS (Horse Chestnut and related Buckeyes).	Alive, recently*.
2 no.	Both samples revealed too few cells for microscopic identification.	
TH2, 0.4m		
1 no.	Examined root: very THIN (under 0.08mm in diameter). We cannot rule out AESCULUS (Horse Chestnut and related Buckeyes).	Alive, recently*.
5 no.	Examined root: a conifer, could well be the family CUPRESSACEAE (cypresses ('macrocarpa', 'Leylandii' etc.), Thuja (Western Red Cedar), Junipers). Very immature.	Dead*.
3 no.	Unfortunately all with insufficient cells for identification.	
TH2, 0.9m		
1 no.	Examined root: could also be the family CUPRESSACEAE (as listed above). Less than 0.08mm in diameter.	Alive, recently*.
1 no.	Microscopic examination showed insufficient cells for recognition.	
TH2, 1.4m		
2 no.	Examined root: ACER (Maples, Sycamores).	Alive, recently*.
1 no.	Microscopic examination showed insufficient cells for recognition.	
TH3, 1.2m		
1 no.	Examined root: most referable to the family VITACEAE (includes Vitis (Grape-Vine) and Parthenocissus (Virginia Creeper etc.)). POOR in condition.	Very decayed*.
1 no.	Examined root: similar in many ways to CLEMATIS. Tentative.	Alive, recently*.

Click here for more information: ACER AESCULUS CUPRESSACEAE

Roots were observed to a depth of 1.3m bgl in TH1, 1.4m bgl in TH2 & 1.2m bgl in TH3. Recovered samples have been positively identified (using anatomical analysis) as *Aesculus*, *Cupressaceae, Acer, Vitaceae & Clematis.* The origin of these roots will be the associated vegetation recorded in Table 1 (see below) confirming their influence on the soils below the foundations. This includes T6 horse chestnut, TG1 cypress, TG7 sycamore, CG1 Virginia creeper & the clematis in G1.

VEGETATION

There are trees and shrubs nearby, some with roots that may extend beneath the foundations. The following are of particular interest and recommendations have been made to provide a remedy to the damage:-

NOTE: TG1 Cypress, S1 Viburnum, G1 shrub and climber were removed during February 2024 and H1 Yew was reduced in height. CG1 Virginia Creeper ids to be substantially reduced in size.

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

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T6	Horse Chestnut	18	680 *	14	18	Older than extension(s)	Policy Holder
Management history		No past management noted.					
Recommendation		Reduce height to 12m and crown radius to 5m leaving balanced crown. Prune on a biennial cycle to maintain at broadly reduced dimensions. Subject to review if movement persists.					
TG1	Cypress	17	300 Ms	8	2.3	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) all stems that are within the 8m of the property to near ground level.					
S1	Viburnum	6	130 Ms *	4	4	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) to near ground level and treat stump to inhibit regrowth.					
CG1	Virginia Creeper	5 *	160 Ms *	15	0	Younger than Property	Policy Holder
Management history		Subject to past management/pruning.					
Recommendation		Remove (fell) all elements of climbing group to near ground level and treat stumps to inhibit regrowth.					
G1	Ornamental shrub & climber group	0.8 *	20 Ms *	1.5 *	0.5 *	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) all elements in group that are growing in the shrub boarder adjacent to the house walls. Maintain remaining elements broadly at no more than current dimensions by periodic pruning.					
H1	Yew	3.6	120 Ms *	1.5	2.8	Younger than Property	Policy Holder
Management history		Regularly trimmed.					
Recommendation		Remove (fell) all stems within 6m of building to near ground level and treat stump to inhibit regrowth.					

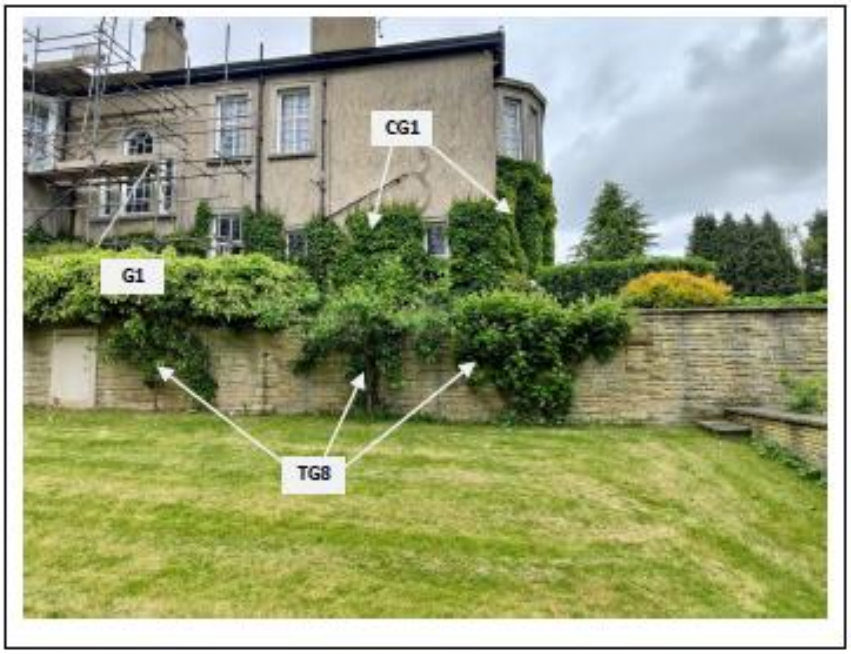
Ms: multi-stemmed * Estimated value

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

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
TG7	Including sycamore, horse chestnut	18	700 *	16	21	Older than extension(s)	Policy Holder
Management history		No recent management noted.					
Recommendation		Reduce sycamore to 12m and crown radius to 5m. Prune on a biennial cycle to maintain at broadly reduced dimensions. Subject to review if movement persists.					

Ms: multi-stemmed * Estimated value

PHOTOGRAPHS


CG1
G1
TG8


CG1
HG1

VEGETATION INFLUENCE

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, Horse Chestnut (Aesculus) species are capable of causing subsidence damage at distances up to 23m, with 75% of cases occurring where the tree was within 10m and 90% of cases occurring where the tree was within 15m.

According to the above, Sycamore/Maple (Acer) species are capable of causing subsidence damage at distances up to 20m, with 75% of cases occurring where the tree was within 9m and 90% of cases occurring where the tree was within 12m.

The subject trees are therefore well within their species' potential rooting and influencing distance of the building and would be capable of causing seasonal soil drying beneath foundations. The site investigations confirm significant rooting of Horse Chestnut and Sycamore/Maple beneath foundations in any event.

Whilst roots relating to a climber were recovered from beneath foundations and from a depth of 1200mm, we do not consider this to be capable of significant degrees of moisture extraction from soil, however there is to be a significant degree of reduction to the dimensions of CG1 and other nearby vegetation has been removed.

PATTERN OF MOVEMENT

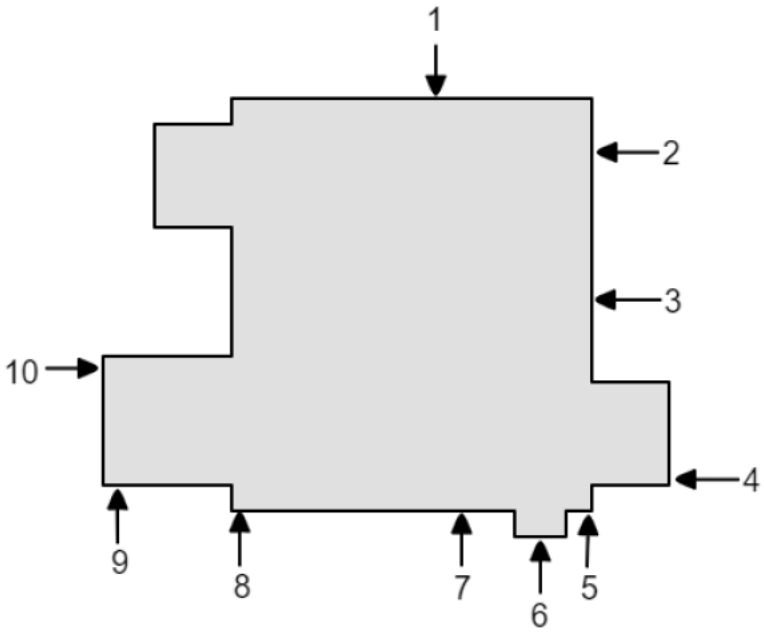
Damage was observed to worsen during summer 2022 during a time of year when soil moisture deficits due to tree root activity would be reaching their peak.

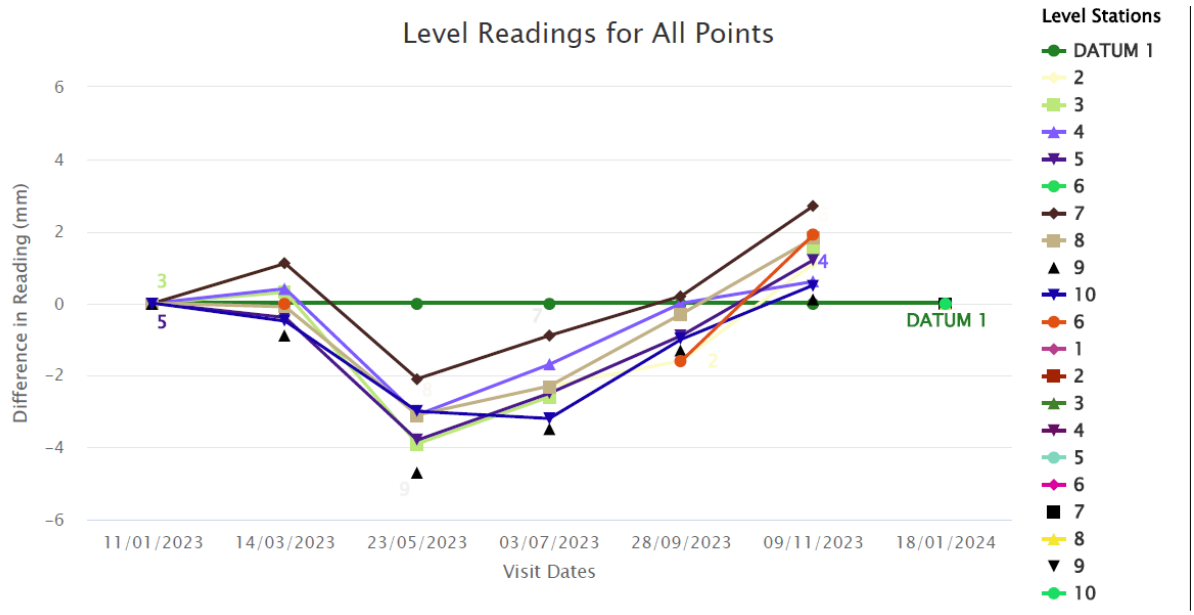
The area of movement and damage is consistent with the locations of the subject trees.

The pattern of movement is entirely consistent with the seasonal, cyclical influence of tree roots on soil moisture, foundations moving down during summer months when roots are active and extracting soil moisture, then returning to recovery and uplift as soil moisture increases during winter when tree roots are inactive.

Precise Level Monitoring

The results are as follows:





The level monitoring indicates a clear seasonal and cyclical pattern of movement consistent with root induced clay shrinkage with the greatest amplitude of movement being consistent with the locations of the subject trees. Summer 2023 was considerably wetter than summer 2022 when

damage occurred, and we would expect a greater degree of seasonal foundation movement during a normal or a dry summer.

DISCUSSION

The pattern and nature of the cracks is indicative of an episode of subsidence. The cause of movement is clearly attributable clay shrinkage exacerbated by tree root activity.

The timing of the event, at a time of year when soil moisture deficits due to tree root activity would be reaching their peak.

The presence of shrinkable clay beneath the foundations and the proximity of vegetation where there is damage indicates the shrinkage to be root induced. This is a commonly encountered problem and probably accounts for around 70% of subsidence claims notified to insurers.

Root identification implicates Horse Chestnut and Sycamore/Maple species as the main cause of the damage.

MITIGATION OPTIONS

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 trees due to their size, age and species characteristics, and this species grows back successfully following pruning. These trees are so close to the area of damage that root activity would continue even if the trees were to be heavily pruned.

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 (further published in BRE IP7/06) 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.

Therefore, taking all reasonable tests the insured property is within the likely zone of influence of the subject trees. This is further verified by the fact that roots were recovered from the underside of foundations, with further roots being noted to a maximum depth of 1.4 metres.

If the subject trees are not reduced in size in accordance with BRE IP7/06 “Pruning trees to reduce water use”, then damage will almost certainly continue and worsen. Roots from these trees have encroached beneath foundations and caused seasonal soil drying that has led to the damage.

Root pruning 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.

Root barrier option – We have considered the feasibility of installing a root barrier within a deep trench. The excavations sever all roots, and a geotextile membrane provides a physical barrier to root growth and incorporates a repellent which diverts and inhibits roots. The severed roots then die and no longer absorb soil moisture and the clay will then rehydrate, causing foundations to become stable again.

As crown reduction pruning is recommended, there is no requirement at present for a root barrier to be considered.

Underpinning – if the trees remain without being pruned then the only appropriate solution would be a scheme to stabilise foundations, the cost of which is currently estimated at £150,000

Drains - There are no apparent issues in relation to drains, and soil softening/washing by an escape of water is not considered to be a factor in the damage.

Heave Potential – Our investigations confirm that the risk of adverse heave is deemed to be minimal. However, the trees are not proposed for removal therefore there would be no risk of adverse heave occurring following pruning.

RECOMMENDATIONS

T6 Horse Chestnut – Reduce height from 18m to 12m and reduce crawn radius from 7m to 5m leaving a well balanced crown (subject to consent being granted under the TPO)

TG7 Sycamore & Horse Chestnut – Reduce height from 18m to 12m and reduce crawn radius from 8m to 5m leaving a well balanced crown (subject to consent being granted under the TPO)

Statutory Controls – The trees are covered by a Tree Preservation Order administered by Stockton on Tees Borough Council, therefore an application is required and consent needs to be granted prior to any tree works occurring.

The trees are located within the insured address.

RESERVES

Superstructure repairs - **£7,500**
Estimated Engineering solutions and superstructure repairs - **£150,000**

Yours faithfully

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

Arboricultural Consultant - Subsidence Team
Crawford & Company

Standard References:

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