Sedgwick International UK

[redacted]

Policyholder: [redacted]

Subject Property Address:

6, Hollycroft Avenue
London
NW3 7QL

INSURANCE CLAIM

CONCERNING SUBSIDENCE DAMAGE

ENGINEERING APPRAISAL REPORT

This report is prepared on behalf of [redacted] for the purpose of investigating a claim for subsidence. It is not intended to cover any other aspect of structural inadequacy or building defect that may otherwise have been in existence at the time of inspection.

Date: 05/04/2019

Cunningham Lindsey Ref: [redacted]

INTRODUCTION

This report has been prepared by our Chartered Engineer, Nigel Barnes BEng CEng MICE DipCII, regarding a claim for subsidence damage, which is being investigated in accordance with our Project Managed Service.

Unless stated otherwise all directions are referred to as looking towards the front door from the outside the property.

DESCRIPTION OF BUILDING

The subject property is a semi-detached house in a suburban location on a plot that is sloping down towards the rear. The overall layout is recorded on our site plan.

The general layout of the site is shown on the attached sketch plan.

There are trees within influencing distance of the front of the property as follows:-

2No. 4m tall Japanese cherry trees in the front garden 4m from the building
A currently 9m tall highway ash tree in the pavement to the front 7m from the building
A 2m tall privet boundary hedge on the right-hand boundary 0.1m from the building
A 2m tall climbing hydrangea attached to the front bay window
A 1m tall dogwood hedge on the front boundary 4m from the building
A 1m tall box hedge 4.5m from the building

The were 2 further 4m tall Japanese cherry trees in the front garden 0.5m and 1.0m from the building but these were felled in 2015 on the advice of OCA arboricultural consultants to reduce the risk of damage due to these trees in the future. The ash street tree was originally 15m tall in January 2015 when OCA carried out their site survey but was pollarded by Camden Borough Council in 2017 after we requested that they fell the tree.

There is also a 15.5m tall private third party ash tree located 10m from the rear elevation in the rear garden of 34 Platts Lane, NW3 7NS.
The drainage system is a combined system which is shown on the attached plan.

CIRCUMSTANCES OF DISCOVERY OF DAMAGE

The policyholder and homeowner, [redacted], first discovered the damage in Summer 2013.**NATURE AND EXTENT OF DAMAGE**

Plans and photographs showing the layout of the site and the damage are attached.

Description and Mechanism

The principal damage takes the form of internal and external diagonal cracking to 3mm wide to both storeys of the 2 storey front bay window, and the front elevation and adjoining walls local to the front bay window.

The indicated mechanism of movement is downwards towards the front.

There is also cracking to 2mm wide to internal walls local to the rear elevation.

The indicated mechanism of movement is downwards to the rear.

Significance

The most significant damage is to the front 2 storey bay window because this is the closest part of the building to the ash street tree implicated in the damage to the front. The damage falls under category 2 (slight) of BRE Digest 251 – assessment of damage in low rise buildings.

The damage towards the rear also falls under category 2 (slight).

Onset and Progression

[redacted] has advised that damage first commenced in summer 2013.

The timing of the occurrence of the damage is consistent with damage due to clay shrinkage subsidence, as is the significant progression of the movement last year which proved to be the longest hot dry period over the 4years that we have been monitoring the property.

SITE INVESTIGATIONS

Reference to the solid and drift geological survey map shows the anticipated subsoil as clay, silt and sand based on the bedrock geology known as Claygate Member.

Two ground investigations have been carried out by CET Structures Ltd on 12th December 2014 and 30th November 2018. For details of the trial pit and borehole locations, together with test results, please refer to the attached CET factual report.

Trial Pit 1/Borehole 1 12th December 2014

This was located to the middle of the front elevation to the front 2 storey bay window.

The underside of the foundation is at 1.2m below ground level with the foundation comprising a 150mm thick concrete strip footing beneath corbelled brickwork with an overall projection from the face of the wall of 390mm. The soil beneath the property foundations has been identified as shrinkable sandy, silty clay with a modified plasticity index ranging from 18-37% classifying the clay as low to medium shrinkage potential. This is consistent with the predicted soil type. At the time of sampling the moisture content ranged from 21-30%, and the lowest moisture reading was at underside of the foundation. The shear vane reading at underside was 41kPa classifying the clay as firm, gradually increasing with depth to 140kPa+ at 4m deep. The liquid limit of the clay at underside was 32%, increasing to 56% at 2m deep. Comparison of the moisture and liquid limit (LL) results suggest the clay beneath foundation level was not desiccated at the time of sampling in December 2014 due to winter re-hydration. There were no suction tests done at that time.

Roots to 2mm diameter were confirmed beneath the foundations to a depth of 2.7m. All of the root samples were identified using microscopy techniques as Fraxinus (ash) and to have been alive in the recent past.

Trial Pit 2/Borehole 2 12th December 2014

This was located to the middle of the rear elevation.

The underside of the foundation is at 1.25m below ground level with the foundation comprising an 850mm thick concrete trench fill footing with a projection from the face of the wall of 210mm. The soil beneath the property foundations has been identified as shrinkable very silty clay with partings of silt and fine sand with a modified plasticity index ranging from 27-45% classifying the clay as medium to high shrinkage potential. The highest plasticity readings and hence the clay with most volume change potential was at underside of foundation. This is consistent with the predicted soil type. At the time of sampling the moisture content ranged from 26-30%. The shear vane reading at underside was 58kPa classifying the clay as firm, gradually increasing with depth to 140kPa+ at 3m deep. The liquid limit of the clay at underside was 66%, decreasing to 50% at 2m deep. Comparison of the moisture and liquid limit (LL) results suggest the clay beneath foundation level was approaching desiccation from underside to almost 2m deep at the time of sampling. There were no suction tests done at that time.

Roots to 2mm diameter were confirmed within the trial pit beneath the foundations to a depth of 1.4m. All of the root samples were identified using microscopy techniques as Fraxinus (ash) and to have been alive in the recent past.

The 2nd trial pit/borehole to the front was excavated to the left-hand corner of the front elevation to the front 2 storey bay window on 30th November 2018.

As expected based on the results of the earlier investigation the underside of the foundation is at 1.2m below ground level with the foundation comprising a 150mm thick concrete strip footing beneath corbelled brickwork with an overall projection from the face of the wall of 340mm. Again this investigation confirmed the soil beneath the property foundations is shrinkable sandy, silty clay with a modified plasticity index ranging from 25-39% classifying the clay as medium shrinkage potential. At the time of sampling the moisture content ranged from 15-33%, and the lowest moisture reading was at underside of the foundation. The shear vane reading at underside was 140kPa+ classifying the clay as very stiff to 2.5m deep, below which shear vane readings ranged from 88-96 (stiff). The liquid limit of the clay at underside was 50%, increasing to 58% at 1.5m deep. Comparison of the moisture and liquid limit results confirm that on this occasion the clay beneath foundation level was desiccated to a depth of between 2.0-2.5m at the time of sampling based on moisture readings of less than 0.4xLL. The clay at underside was too stiff for suction testing, but at 1.5m deep the suction reading was 339kPa reducing to 78.3kPa at 2.5m deep, and 39.8kPa at 3.5m. Water seepage was identified at 3.0m deep and the base of the borehole at 3.8m deep was wet but the borehole remained open.

Again roots of up to 2mm diameter were confirmed beneath foundation level to a depth of 2.5m and again these were all identified as Fraxinus (ash) and to have been alive in the recent past.

The exceptionally low moisture content of the clay subsoil beneath the foundations within the zone of influence of the ash tree roots positively identified beneath the foundations confirms that the past pollarding of the ash street tree has not been successful in reducing its influence on the stability of the foundations to the front of the property. The fact that both site investigations did not identify any other roots beneath the bay window foundations other than those from the ash street tree supports the conclusion that no other vegetation is implicated in the damage to the front of the property.

Whilst the December 2014 site investigation did not identify desiccated clay due to winter re-hydration, the November 2018 site investigation results have confirmed desiccated clay beneath foundations within the zone of influence of the ash street tree roots.

Camera surveying of the drains located to the front of the property was undertaken in December 2014 and revealed a blocked yard gully in the path to the front door. This was replaced along with a section of the pipe-work in 2015.

Further investigations were considered and discounted. There was nowhere sufficiently remote within the site for a control borehole and DNA testing is not justified as there are no other similar species belonging to any other party in close proximity to the area of damage. In addition the site investigation results are consistent with the anticipated geology.

MONITORING

Crack width and level monitoring has been underway since December 2014.

In summary, the results to date show seasonal cyclic movement every year at a maximum to the front elevation and bay window local to the ash street tree. The maximum amplitude of downwards foundation movement doubled to 12mm last year relative to previous years despite the pollarding of the ash street tree, and the maximum crack opening of any year has also been recorded to the front bay window of the order of 2mm. It is no coincidence that last year saw the longest hot dry summer over the 4 years that the property has been monitored, when ground moisture levels can be expected to be at their lowest and hence water demand of adjacent vegetation is likely to have the greatest influence on already depleted soil moisture levels within the zone of influence of the roots from the ash trees.

Results of the crack width and level monitoring carried out over the last 4years are attached in table/graphical format together with a plan showing the location of the monitoring points.

CAUSE OF DAMAGE

Taking an overview of all the site investigation and monitoring results referred to above, it is my opinion that the cause of damage to the front and towards the rear of the property results from clay shrinkage subsidence brought about by the action of roots from the ash street tree located in the pavement to the front of the property, and the ash tree to the rear located in the rear garden of 34 Platts Lane.

I base this view on the fact that the foundations of the property in the area of damage have been built at a relatively shallow depth, bearing onto shrinkable clay subsoil. The soil is susceptible to movement as a result of changes in volume of the clay with variations in moisture content and analysis of the site investigation results indicates that the soil has been affected by shrinkage. Ash

tree roots are present in the clay subsoil beneath the foundations. In this case, I am satisfied that the damage has therefore been caused by clay shrinkage subsidence following moisture extraction by the ash street tree in the pavement to the front of the property, and the ash tree in the rear garden of 34 Platts Lane.

I have also considered whether there could be any other influencing factors such as leaking drains or water supply pipes but the pattern of cyclic movement is not consistent with an escape of water and the clay immediately beneath foundation level is exceptionally dry. The water seepage at 3m deep to the front and 4.5m to the rear is consistent with the expected ground water table level. The crack damage is not typical of normal cracking to the building fabric that may be expected due to thermal movement or age related wear and tear. The vegetation within the front garden is of a size and species whereby the rooting depth is unlikely to extend down to the 1.2m foundation depth and this is supported by the site investigation results which confirmed the root samples taken from beneath foundation level were exclusively ash tree roots.
I am satisfied that there is no factor, other than the ash street tree that is causing the damage to the front, and the ash tree in the rear garden of 34 Platts Lane that is causing the damage to the rear.

It is recommended that the ash street tree located in the pavement to the front of the property is removed as well as the ash tree in the rear garden of 34 Platts Lane to mitigate against further movement as the previous pollarding has proved to be ineffective and may well have encouraged accelerated growth thus increasing the water demand of the tree. BLM Law continues to liaise with the Local Authority and the private third party ash tree owner in this regard and a copy of OCA UK Limited's original January 2015 report is attached herewith.

HEAVE ASSESSMENT

I have assessed whether significant heave will occur to the risk address should the vegetation as referred to above be removed.

I conclude that this is not the case as no desiccation was found in the soil samples taken in December 2014. The reason for the lack of desiccation at that time is that the clay subsoil has rehydrated over the wetter late autumn/ early winter months in 2014 such that the moisture deficit that would have existed that summer had been replenished, and equilibrium moisture content had returned. Consequently, as there is no persistent soil moisture deficit then there cannot possibly be any heave of the clay subsoil as a result of removal of the ash tree.

The site investigation last year was undertaken when there had still not been sufficient rainfall to re-hydrate the desiccated clay sub-soil. The amount of desiccation is minor and, in my opinion, represents purely seasonal desiccation rather than a persistent soil moisture deficit. I believe any upwards foundation movement will equate to ground recovery of the subsidence that has taken place this summer, rather than being true heave, and consequently I am not of the opinion that long term heave will result should the ash street tree be removed.

The clay subsoil is generally of low to medium plasticity rather than being of high plasticity and hence this significantly reduces the risk of heave.
There is no evidence of significant tilt towards the ash trees having occurred to the house, or distortion within the property, as would be expected if a significant persistent soil moisture deficit had been set up, and where the tree was planted after the house was built.

I am not of the opinion that heave of the clay subsoil is a threat to adjacent property on the street which was constructed at the same time and of the same original design and hence is expected to have similar foundations, and is further from the ash street tree. I am not of the opinion that heave of the clay subsoil is a threat to 34 Platts Lane. The original building is of a similar distance from the tree to the risk address and also of a similar age. It is therefore likely the foundation depth will be similar. The conservatory of the rear of 34 Platts Lane is relatively new and though nearer to the tree the foundations would be expected to have been designed to take account of the risk of heave in the event that the ash tree was removed.

In summary, based on the site investigation results, the timing of the investigation and the nature and extent of damage within the property, I have concluded that significant heave will not occur to the risk address or adjacent buildings should the vegetation management described above be undertaken.
If the ash trees are removed then I consider that works including structural crack repair and redecoration to the damage to the property at an approximate cost of [redacted] will be appropriate in order to repair the damage in this case. Alternative accommodation may also be required for the occupants and due to the rental cost in this area for a comparable property this is likely to be a similar sum.

If the ash trees are not removed then it may be necessary to consider underpinning of the foundations of the property in the area of damage, in addition to structural crack repair and redecoration needed to repair the damage. The total cost of this option is estimated at [redacted]

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Building Consultant
[redacted]