innovation group
subsidence management services

Subsidence Claim
Addendum Report

Our Reference: IFS-AVI-SUB-14-0052426
Insurer Reference: 14C600002
Prepared for: Aviva

Claim Details:

Report Date:

Claim address: Haverstock Hill, London, NW3 2BD

This report has been prepared to support an application to remove statutory protection on implicated vegetation and removal of the same in order to stabilise the garden flat.

The key documents considered in the report are listed as follows:

- Engineer's report, produced by SMS, dated 15/08/2014
- Site investigation report, produced by SMS, dated 03/11/2014
- Site investigation report, produced by SMS, dated 27/03/2015
- Drainage report, produced by SMS, dated 18/12/2014
- Arboricultural report, produced by SMS, dated 20/10/2014

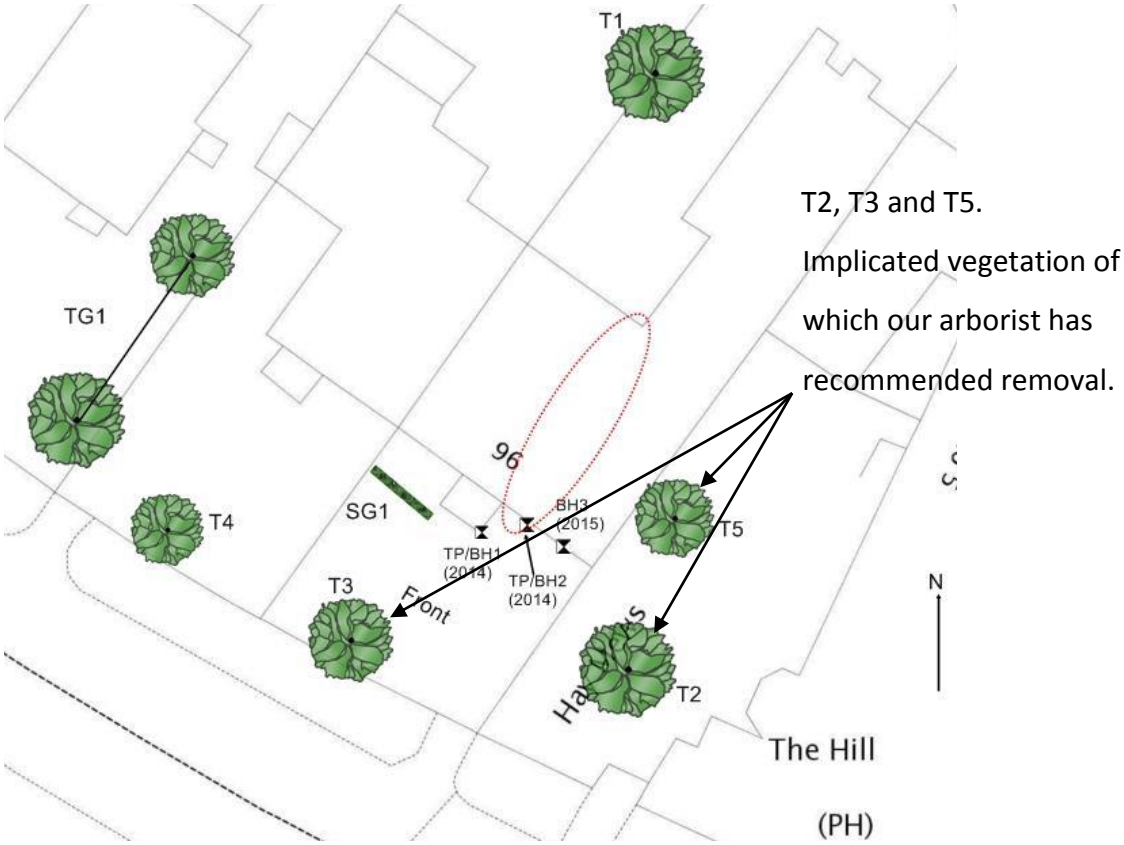


Figure 1 – site plan showing the location of the principal vegetation in relation to the property

Summary of claim

We have advised in our Engineers Report that following the appearance of cracking, being concerned that the damage may be due to subsidence a claim for subsidence damage was submitted to insurers.
The policyholder advised that the building damage to the Garden Flat commenced suddenly over July 2014. The policyholder also advised that the Garden Flat of the property had been extensively renovated at the time of purchase in 2011.
Finally, the policyholder advised that the property had been the subject of a past subsidence claim for the front right entrance steps and portico in 2003.

Results of site investigations and cause of damage

An initial site investigation has been carried out to the front of the property and a copy of the factual site investigation report dated 3rd November 2014 provides some further information.

The building foundations within the area of damage were found to be at a depth of between 500 - 1500 mm below ground level (bgl) comprising of a brickwork steeped footing bearing onto a subsoil comprising of a stiff brown clay with the presence of tree roots to a depth of between 1500 - 1900 mm bgl.
The tree roots identified from Ulmus spp. are elms.

A further site investigation was carried out to the front right of the building to provide additional evidence concerning the nearby trees. The site investigation report dated 27 March 2015 provides some further details.

The root identification confirmed tree roots encountered to 3.00m bgl in BH3.
Roots were not encountered from 3.00m bgl to 4.00m bgl in BH3. The tree roots identified as Ulmus spp. are elms and Acer spp. are maples, including sycamore, Norway maple, and Japanese maples.

The cause of the building damage has now been confirmed as clay shrinkage subsidence due to the moisture extracting influence of the nearby trees in both the front garden of the property and the adjoining neighbour's gardens.

Soils

Soil samples were taken from the boreholes for testing during the initial site investigations and a copy of the factual site investigation report dated 3rd November 2014 provides some further information.

The soil analysis has identified the underlying substrata to be of brown slightly sandy clay with medium to high shrinkage potential (atterberg testing showed the plasticity index to be between 36% and 41% across the 3 boreholes taken) to a depth of 3.70m below ground level (BH3).

The results indicate that the clay at a shallower depth has a lower than expected moisture content, the moisture content increases with depth down to 1.80m in boreholes 1 and 2 but decreases with depth in borehole 3 after reaching 1.20m. The moisture contents of between 23% and 33% (across the 3 boreholes) are low for the time of the year that they were taken.

Lab Ref	Depth (m)	MC (%)	Corr MC (%)	LL (%)	PL (%)	PI (%)	% Passing .425mm
Samples from BH1							
001	0.50	24	24	62	26	36	100
002	1.00	23					
003	1.50	26	26	65	27	38	100
004	1.80	26	26	68	28	40	100
Samples from BH2							
005	1.20	25	25	69	28	41	100
006	1.70	28	28	71	30	41	100

Lab Ref	Depth (m)	MC (%)	Corr MC (%)	LL (%)	PL (%)	PI (%)	% Passing .425mm
Samples from BH3							
001	1.20	33	33	71	30	41	100
002	1.70	32					
003	2.20	31	31	68	30	38	100
004	2.70	30					
005	3.20	30	30	68	30	38	100
006	3.70	30					

Figure 2 – summary of soil test results

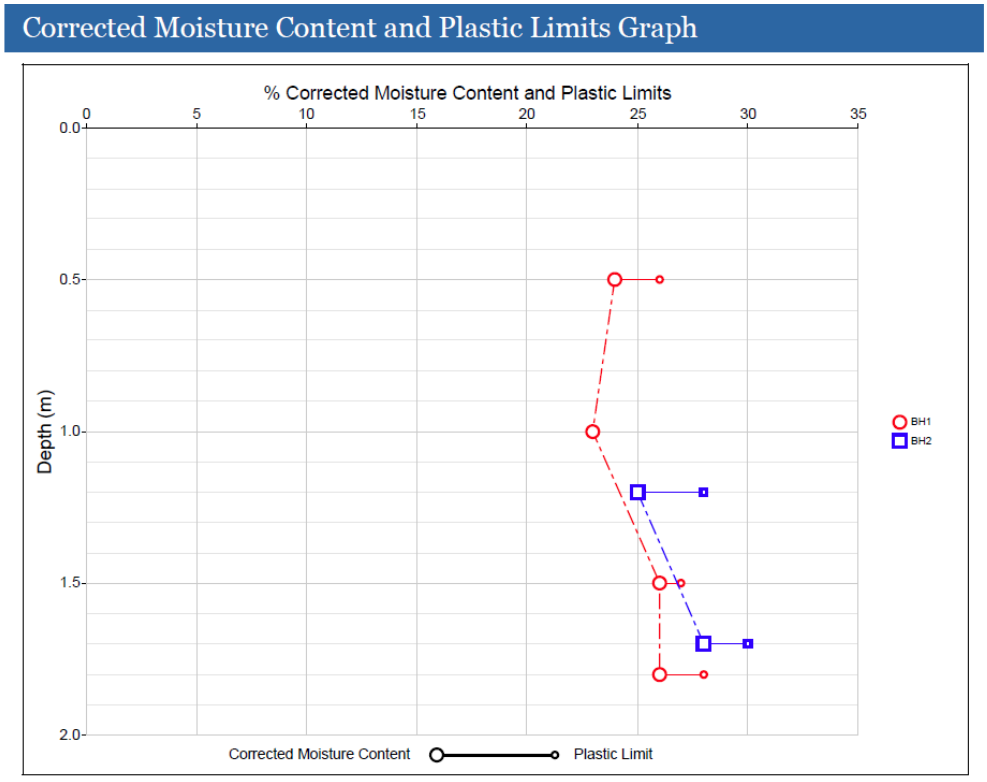


Figure 3 – moisture content and plastic limits graph

Drains

A drainage survey was carried out to the right side of the building and within the area of subsidence damage and the drainage investigation report dated 18 December 2014 provides some further details.

The drainage investigation contractor carried out a CCTV survey of the drainage system. All runs were cleaned by high pressure water jetting prior to the CCTV survey.
All drainage runs surveyed were found to be in a serviceable condition and did not require any repair.

Damage to the property

The following is a summary of the damage relating to the Insurance claim, including any unrelated damage in the same vicinity:

INTERIOR

FRONT LEFT SIDE BEDROOM:

Diagonal tapering cracks in the region of 10 - 15 mm in width were recorded to the right side and rear walls of the bedroom around the ensuite bathroom and hallway doors.
A further vertical tapering crack in the region of 1 - 2 mm in width was recorded to the front right of the room underside of the window.

FRONT RIGHT SIDE BEDROOM:

Diagonal tapering cracks in the region of 2 - 3 mm in width were recorded to the right side wall of the bedroom to underside of the window. Diagonal tapering cracks in the region of 20 – 25 mm in width were recorded to the front wall above the hallway door. A crack was recorded to the ceiling close to the hallway door. An area of dampness was also recorded to the front bay and is the subject of further investigation.
The bedroom floor was also recorded to have dropped along the right side kitchen wall in the region of 20 mm.

ENSUITE:

A crack in the region of 1 – 2 mm in width was recorded to the ensuite tiled flooring.

FRONT RIGHT STUDY:

The study timber flooring was recorded with downwards movement resulting in a gap with the skirting.

HALLWAY:

The hallway timber flooring was recorded with downwards movement of approximately 25 – 75 mm resulting in a gap with the skirting. Diagonal tapering cracks in the region of 1 – 15 mm in width were recorded to the left side wall of the hallway to above both the bedroom and bathroom doors.

BATHROOM:

A horizontal and vertical tapering crack in the region of 1 - 2 mm in width was recorded to above the hallway door. A vertical crack in the region of 1 mm in width was recorded to the rear tiled surface to the rear of the bathroom.

REAR LEFT LOUNGE:

A number of both horizontal and diagonal cracks in the region of 2 - 3 mm in width were recorded to the front right of the lounge to above the hallway and kitchen doors. A further diagonal crack in the region of 2 - 3 mm in width was recorded to the front wall of the lounge.

The lounge floor was also recorded to have dropped along the right side kitchen wall in the region of 20 mm.

REAR RIGHT KITCHEN:

A number of both horizontal and diagonal cracks in the region of 5 - 10 mm in width were recorded to the front right of the lounge to above the hallway and kitchen doors.

The kitchen floor was also recorded to have dropped along the right side kitchen wall in the region of 20 mm.

GROUND FLOOR FLAT

RIGHT SIDE KITCHEN:

A number of both horizontal and diagonal cracks in the region of 1 - 3 mm in width were recorded to the front left of the kitchen to above the hallway and lounge doors.

FRONT LEFT SIDE LOUNGE:

A diagonal tapering crack in the region of 2 -3 mm in width was recorded to the left side of the rear lounge wall.

EXTERNALLY

FRONT ELEVATION, ENTRANCE STEPS AND PORTICO:

Crack damage was recorded in the form of render deterioration to both the front entrance steps, portico and boundary walls to the property.

RIGHT SIDE ELEVATION:

No crack damage was recorded.

REAR ELEVATION:

No crack damage was recorded.

The indicated mechanism of movement is downwards internally to the right side of the property**.**

Mitigation

An arboricultural assessment report has been obtained concerning the vegetation to the front of the property. The arboricultural consultant's report dated 20th October 2014 provides some further information.

The arboricultural consultant has advised that they have implicated T2 (Acer), T3 (Elm) and T5 (Pear), also based on their assessment, the footings of the subject property fall within the anticipated rooting zone of this vegetation.

The implicated vegetation is therefore deemed to retain the capacity to be causal to the current movement and building damage. In assessing the potential drying influence of the vegetation on site, T2 (Acer) and T3 (Elm) are considered the dominant features and accordingly the aboriculturist has identified them as the principal cause of subsidence.

T5 (Pear) cannot be discounted as contributing to the overall level of soil drying proximate to the area of damage and is therefore also considered to retain a contributory influence, albeit in a limited or secondary capacity .

The arboricultural consultant has recommended the removal of T2 (Acer), T3 (Elm) and T5 (Pear).

Summary and interpretation of Monitoring

Level monitoring involved fixing pins around the perimeter of the building from which levels were taken to determine where the external walls and hence by implication the foundations are moving and by how much.

Level monitoring was set up in October 2014 and readings have been taken at approximately 8 week intervals.

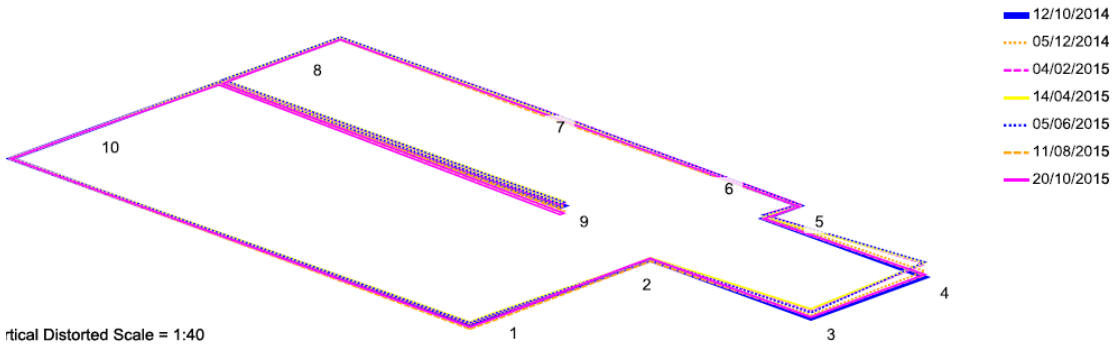
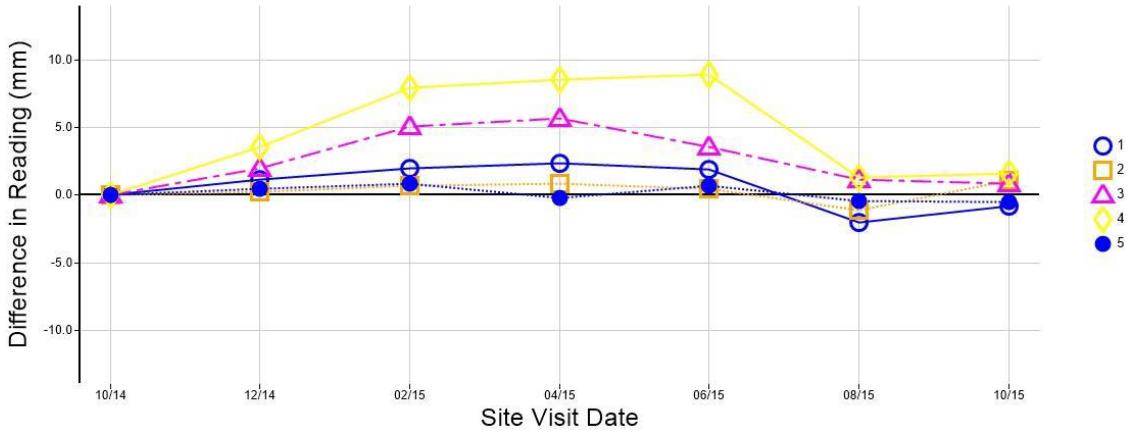


Figure 4 – areas of fixed pins.

The level monitoring has shown that the property is affected by seasonal downward movement to the front elevation/steps with the maximum degree of seasonal downward movement occurring to point 4 in the region of 10 mm overall.

The monitoring shows the affected parts of the property moving downward during the summer months when the trees are in leaf demanding larger amounts of water, the rainfall is lower and the net moisture content within the clay soil below the property decreases.

Recovery or upward movement is then witnessed during the winter months when the tree loses leaf, demands less moisture and the rainfall events increase, allowing the soil to rehydrate to some degree and swell, causing upward movement and consequential closing of cracks within the property.



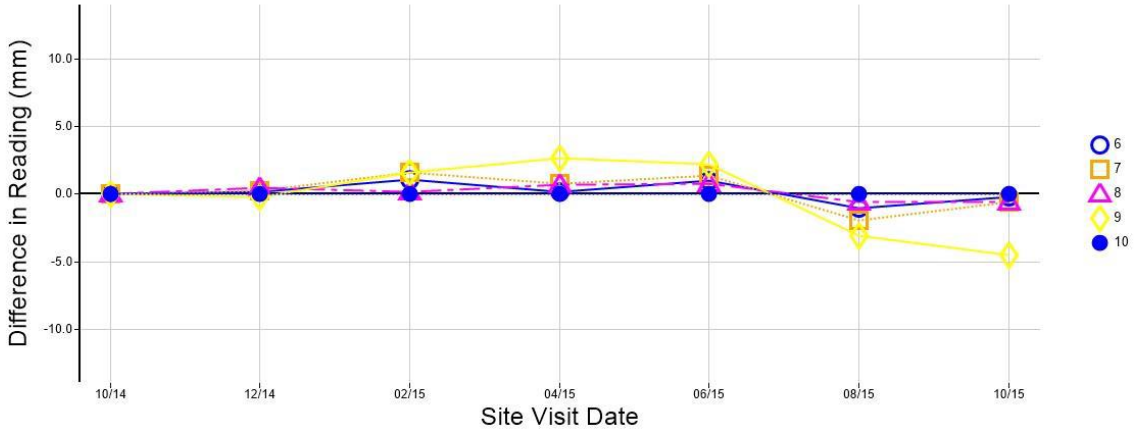


Figure 5 – level monitoring 10/14 – 10/15

While it was not possible to identify a suitable remote datum, the readings have been made relative to Level Station 10 with an assumed value of 10.000m at the time of each reading.

The level monitoring program to date clearly indicates downward movement through summer 2014 with recovery becoming evident with the onset of the wetter winter months.

This demonstrates that the identified offending trees are the cause.

While climate alone can cause some small changes in the surface soil (to a depth of 500 mm or so), the foundations of the house, being some 3000mm below ground level are beyond this zone and seasonal movement of this scale shown are indicative of root-induced shrinkage associated with a large tree.

In this instance, the only significant vegetation within influencing distance of the front and right side of the property are the Acer, Elm and Pear.

Remedial Works

The building damage is generally considered to be Category 3 (Moderate) in structural terms. It will be expensive to rectify because of the size of the rooms and the extensive decorations that will be required.

Even if there was any doubt as to the extent of the damage that can be reasonably attributed to the influence of the nearby trees, the current recorded seasonal foundation movements are unacceptable.

If the influence of the implicated trees are not eliminated, an engineering solution will most likely be needed to stabilise the property.

A range of underpinning solutions are available depending on the area that requires stabilisation and the depth required. Traditional, mass concrete, underpinning is generally the most economical solution where the required depth is relatively shallow. It has the added advantage that the underpinning also acts as a root barrier. However, it tends to become uneconomical, and the Health & Safety considerations become increasingly onerous, where the required depth exceeds 2.5m.
Most underpinning is extended to a metre below the last discovered root and this is 3.0 m making this an unacceptable risk from a health and safety perspective and should be discounted.

A pile-based underpinning solution tends to be more economical where (i) the required depth exceeds 2.5 m and (ii) it is necessary to stabilise internal walls as well as external walls. A common variant is the piled-raft which consists of a reinforced concrete slab under the entire footprint of the property supported on driven or bored piles.
It is very difficult to partially underpin a property with a piled raft as the transition between stabilised and un-stabilised parts of the property is very vulnerable to cracking as a consequence of the minor seasonal fluctuations which might be expected in the traditionally founded part relative to the very stable piled section.

The advised cost should the tree be removed is £11,205. Should the tree remain in situ a further £50,000 would be required for stabilisation work.

Ray Borrow
Subsidence Engineer
Subsidence Management Services