The
Clay Research
Group

RESEARCH AREAS

Climate Change ◆ Data Analysis ◆ Electrical Resistivity Tomography
Time Domain Reflectometry ◆ BioSciences ◆ Ground Movement
Soil Testing Techniques ◆ Telemetry ◆ Numerical Modelling
Ground Remediation Techniques ◆ Risk Analysis
Mapping ◆ Software Analysis Tools
Artificial Intelligence

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Issue 165, February 2019

Hot Spot Resolution

Towards the end of the article on Hot Spots in this month's edition, we suggest how working together might provide a resolution to potential conflicts around tree root claims involving third parties. The major obstacle to councils sharing evidence to define the location of hot spots is that it would weaken their foreseeability defence. The answer might be working together – an extension of the JMP and the steering group within the Subsidence Forum.

Hot Spot Research Project

The study of what constitutes a so-call Hot Spot (see previous newsletters for background) continues in this edition, and possibly raises more issues than it resolves.

Plotting data provided by the London Borough of Brent for the period mid-November 1993 to the end of November, 2012 reveals the location of claims against the borough relating to subsidence damage caused by public trees, from which we can derive frequency. The data supplied is at full postcode level (i.e. not full address).

The dataset includes claims from the event years 1995, 2003 and 2006.

That said, there may be a bigger picture emerging revealing the trees most likely involved, and their metrics and environment. As someone from a local authority has noted, the definition of what constitutes a hot spot will vary in relation to the number of claims. If one borough has say 10 claims, two of which are in the same road, does that constitute a hot spot?

More inside.

Warmer and Wetter

The latest data from the Met Office records that 2015, 2016, 2017 and 2018 were the warmest years on record. In the last decade there has been 8% more rainfall and 6% more sunshine hours compared with 1961 – 1990 globally.

https://www.metoffice.gov.uk/climate-guide/climate-dashboard

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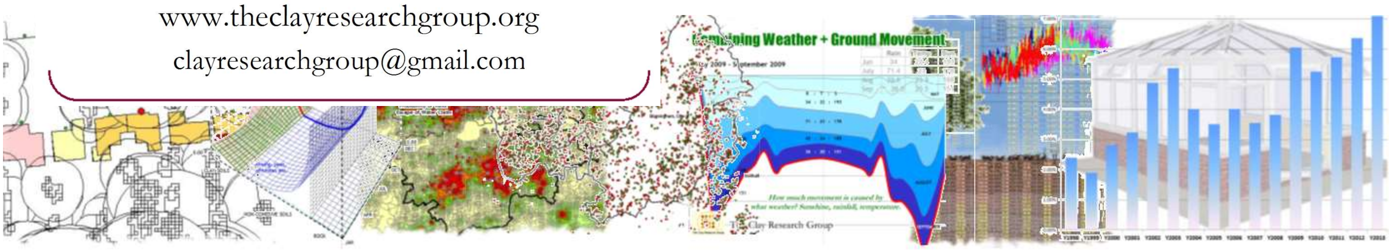

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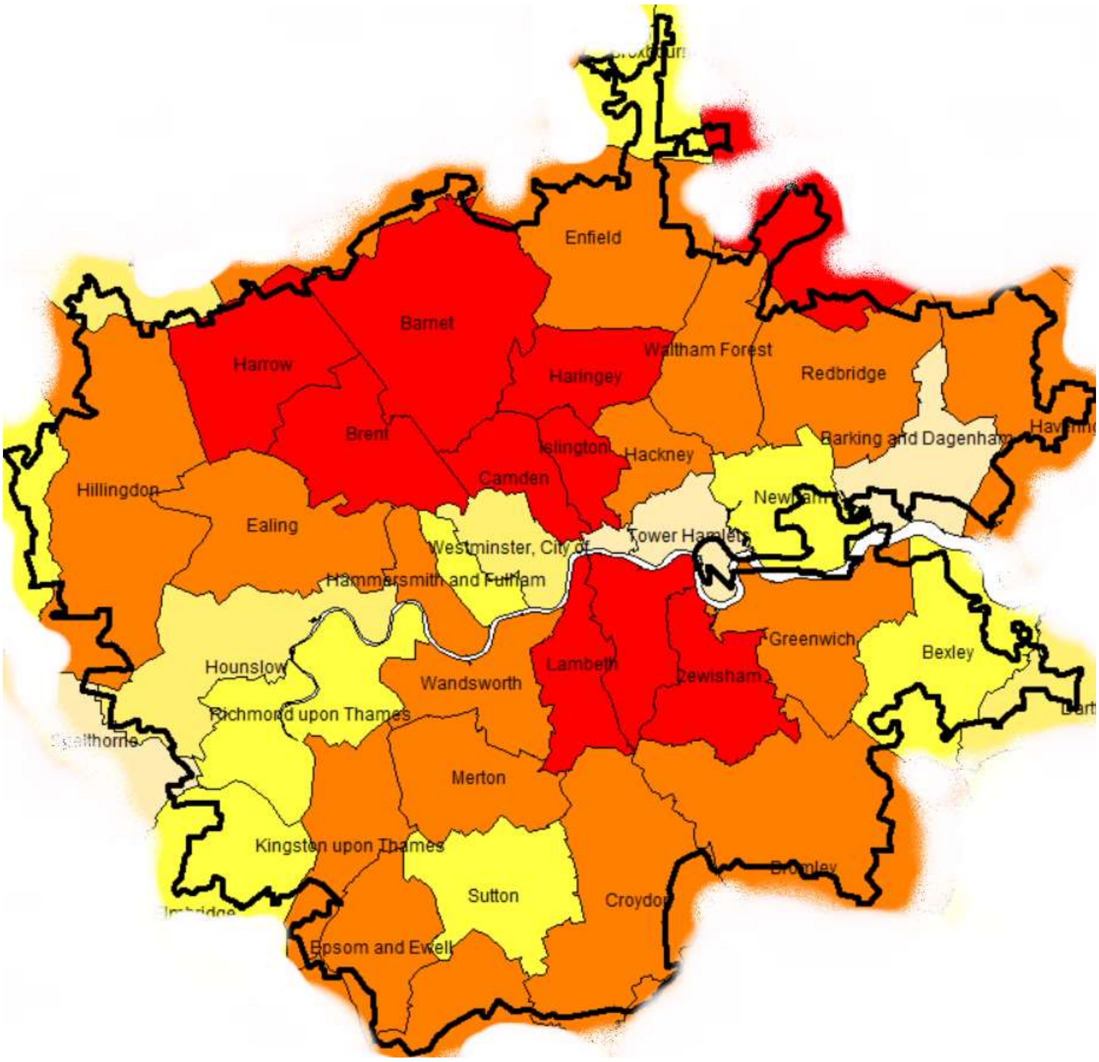
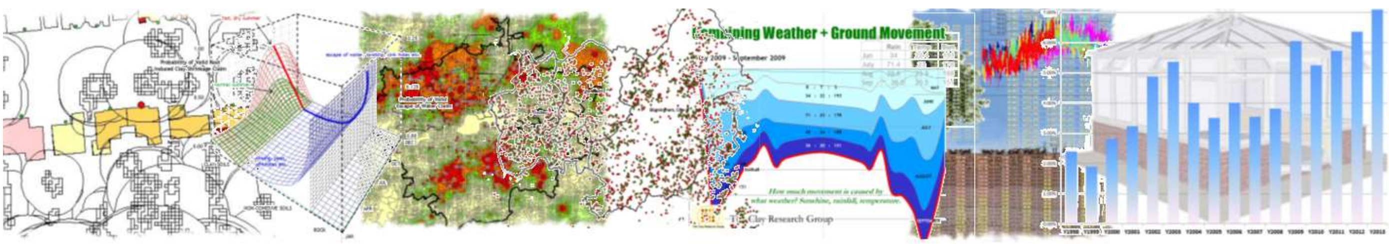
London Borough of Brent - Introduction

All claims, including both public and private vegetation and escape of water claims

Where does Brent stand in the table of subsidence risk across the UK when expressed as frequency? The map below reveals the importance of London generally and includes public and private tree related subsidence claims, and claims associated with escape of water.



Brent falls within the top 10 districts in terms of risk of subsidence in the UK.



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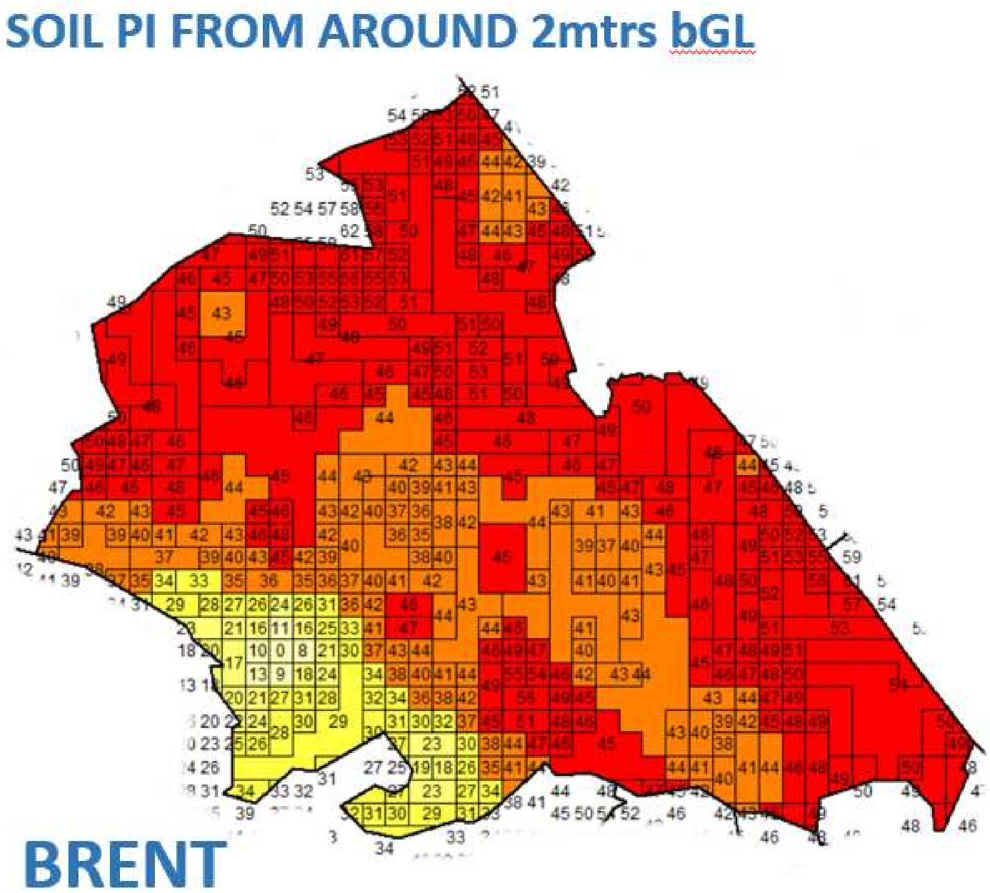
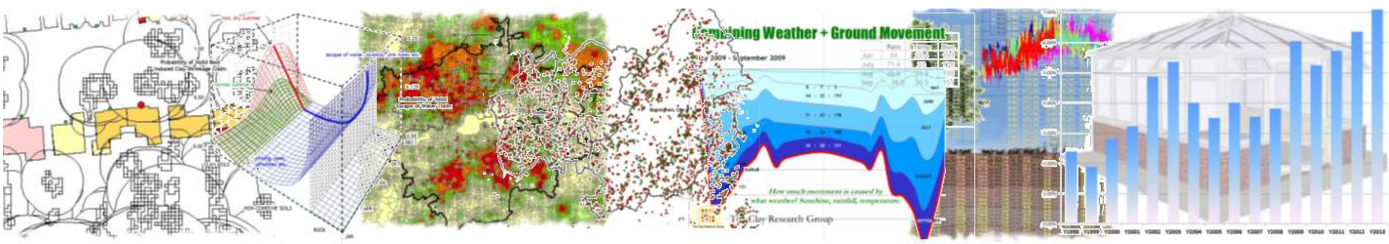
Brent – Soil Plasticity Index

Below, a map showing the Plasticity Index of soils plotted on a 250m grid, with values interpolated where no data is available. Values for Liquid Limit, Plastic Limit and % passing can also be plotted on the grid.



The PI has been taken from a depth of around 2mtrs, a depth often coincident with root activity of mature trees in the high risk category. The values reveal the presence of a highly shrinkable clay soil which extend into adjoining high risk boroughs of Barnet, Harrow and the northern sectors of Camden.



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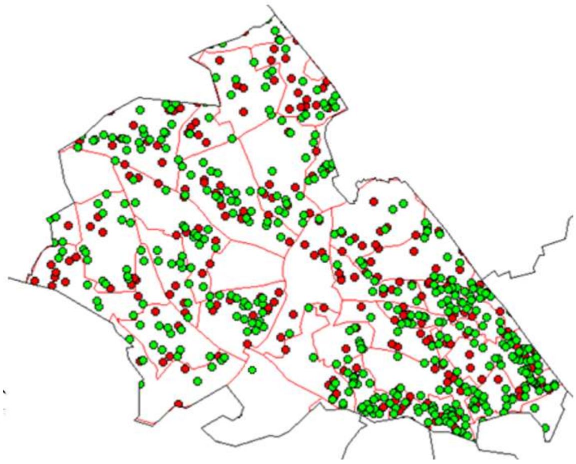
Brent Study – Valid or Declined by Postcode

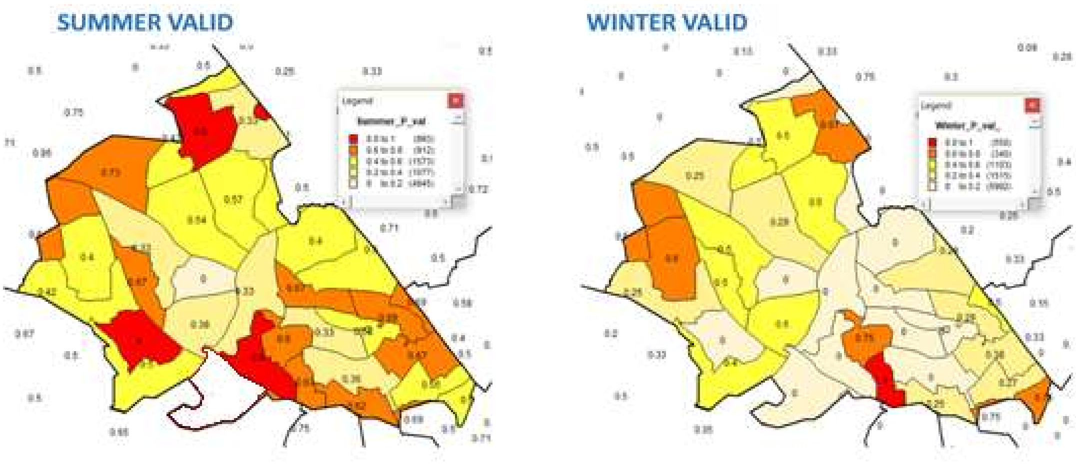
The sample of all claims (including both public and private vegetation, escape of water etc) is shown below. Green dots represent valid claims, and red dots, declinatures.



At the bottom of the page, the probability of a claim falling into either category (i.e. valid or declined) is plotted by season.

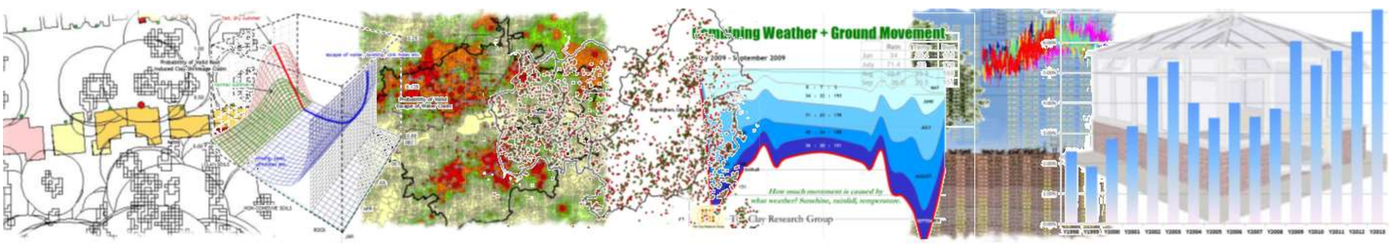
The data are on a scale of 0 – 1, with ‘0’ representing a high likelihood of a declinature, and ‘1’ representing a high likelihood of the claims received being accepted as valid.

The map above doesn’t always coincide with the sector plot below due to the level at which the data is stored. Some records are at full unit postcode and others at sector level.



BRENT – by probability of valid by season

It is also the case that one claim in a sector can determine the output. For example, in an otherwise low risk sector, one notification – either valid or declined – will determine the classification. To cater for this, the underlying table has a confidence value reflecting the number of claims. Low claim numbers deliver a lower confidence level score, and high claim numbers, a higher confidence level.



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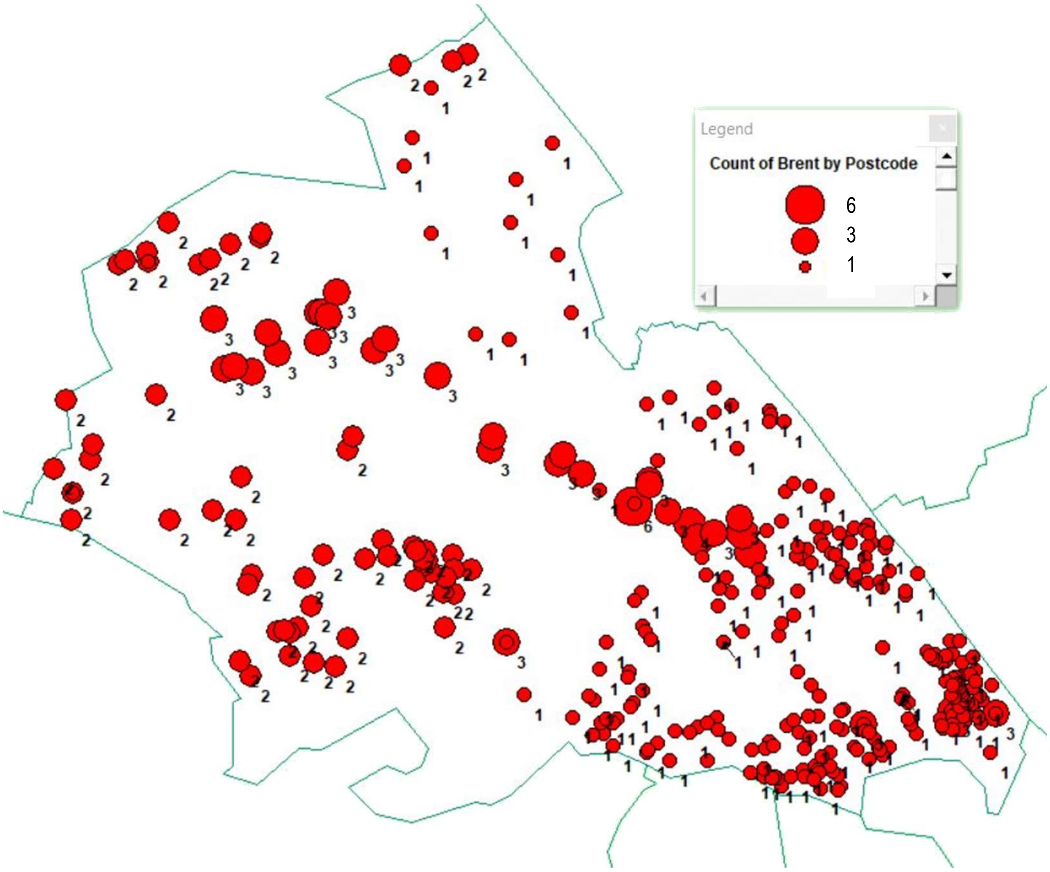
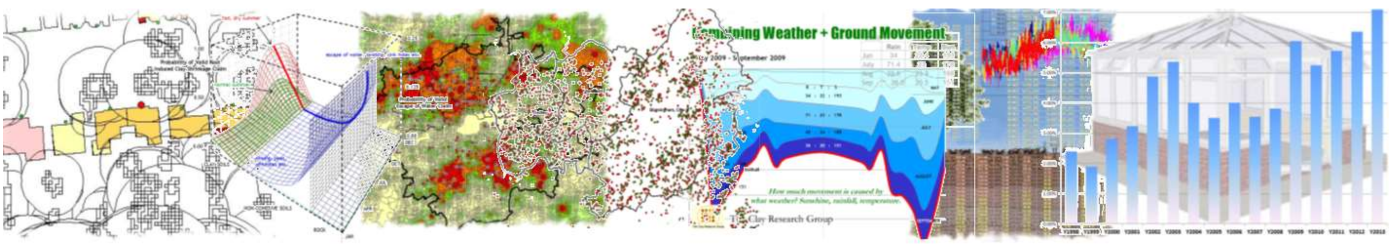
Brent Public Tree Claim Notifications - Distribution

The diameter of the dots below indicates the count of tree related subsidence claims against the London Borough of Brent for the period defined on page 1, by full postcode (postcode is usually a proxy for a road, depending on house count). The dot diameter in the image leads to a slightly over-emphasised view of risk due to the default settings in the GIS system. The south east of the borough remains riskier in terms of distribution, but there are several streets towards the north west of the borough with two or three claims in each postcode.



The highest count of claims in any single postcode is 6. That is situated just south east of the centre and represents a particularly interesting aspect of this exercise in trying to determine what constitutes a hot spot.

Looking at the example on the following page, we might well conclude that a road-by-road assessment delivers most value, but that a thread running across the borough links a particular tree species and its metrics to the risk of subsidence.



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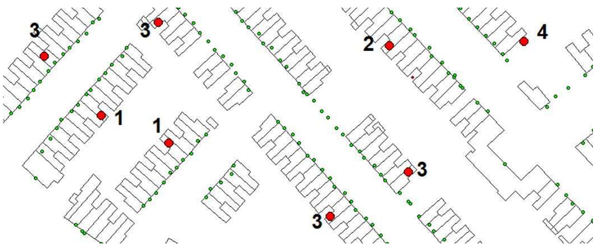
Brent Borough Claim Distribution – Study Method

Below, an example of the approach adopted, plotting the number of claims from the data supplied, by postcode. This provides access to the location in Google Street View to explore differences and similarities between low and high-risk roads.



The unit postcode with the most claims relating to street trees for the period supplied is in the NW6 area with a count of 6 claims.

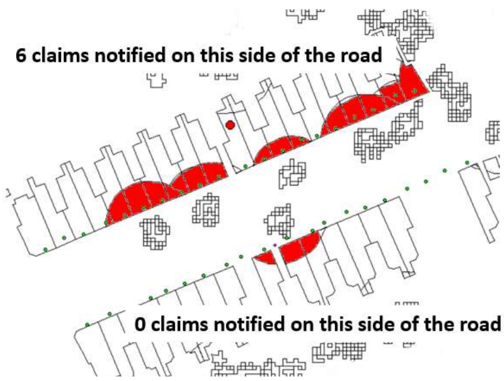
The total expenditure by Brent to resolve these six claims amounted to £110,000, with individual claim costs in the range £3,200 to £28,138.

Perhaps the most interesting point about the road in question is the fact it only had eight (see page 5) trees, two of which are remote from private housing. In short, it seems that every tree in the road may have caused damage.

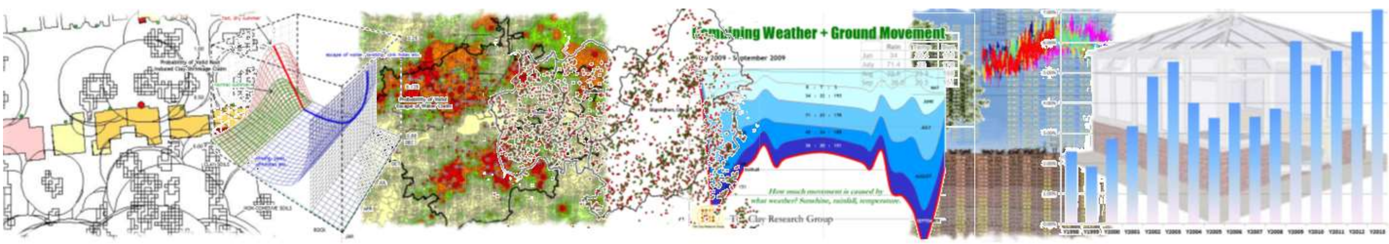
Most of the claims relate to the dry summers of 2003 and 2006. Some of the claims relating to the 2003 summer were notified in early 2004, no doubt reflecting the delay associated with undertaking investigations and gathering evidence.

Now, how would we view this in terms of foreseeability? This is a question for lawyers to consider of course, but the fact that the majority of recorded claims occurred in one year means that they couldn't have been foreseen on the basis of historic performance, leaving just one out of the 6 as arguably foreseeable. We have no data for previous years and this defence would we assume fail if there was a history of damage due to tree root nuisance in earlier years.

So, looking at the map of the borough with the benefit of hindsight and plotting claims doesn't clarify the issue of foreseeability without taking into account the timing of the events, the tree species and metrics. Perhaps all of the trees that caused damage were London Plane, in which case damage by say an ash tree somewhere along the road presumably remains 'unforeseeable', whilst damage by another London plane say 5 years later, might have been foreseeable.



An extract showing a high risk road with the 2006 LiDAR data superimposed. There are probably around 16 houses notionally at risk using the modelled root zones for trees present at that time.



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Brent Claim Distribution – Findings

Below, aerial imagery, courtesy of Google Earth, taken over time (commencing September 1999 with latest image from July 2018) relating to one of the higher-risk streets. It appears that Brent have responded to the challenge of root induced clay shrinkage claims by severe crown reduction of some street trees – particularly those to the right side of the road in the pictures below for July 2018.

Below, two images taken from Google Street View of one of the higher risk areas. The trees have undergone severe crown reduction and one might take the view that they have outgrown their location.

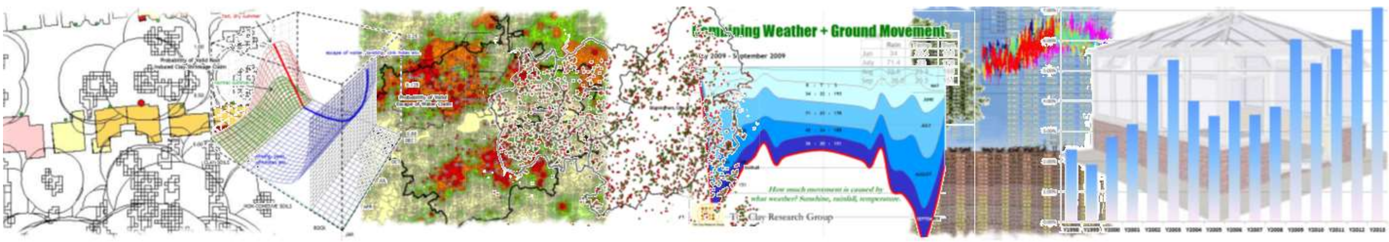
The pictures also show the different types of construction and perhaps variations in vulnerability between differing house styles.

Right, Figure (a), shows a row of terraced houses with what we assume to be traditional foundation depths, and Figure (b), three storey houses with a basement, and deeper foundations as a result.

To make most use of the limited resources available, it would be worth comparing claims experience for the two house styles, which may account for the differing treatments either side of the road in the images at the top of the page.

Figure (a)

Figure (b)



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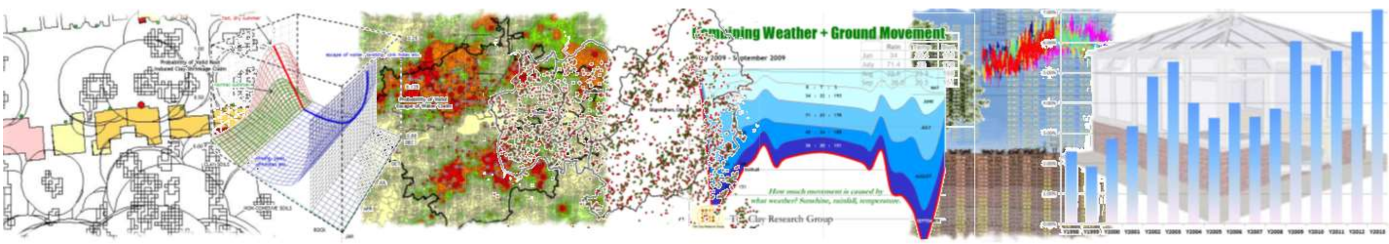
'Hot Spot' Imagery – London Borough of Brent

In another example, Google imagery dated 1999 shows 11 trees on the north side of the road, prior to the high number of claims in that location in the Brent dataset in 2003 and 2004.

2018 imagery (below) reveals a reduction in the number of trees on the north side of the road (the side with the highest number of claims from the Brent database), and an apparent increase in the number of trees on the south side of the road. The trees on the south side are (with two exceptions) of a smaller variety with a less vigorous crown than the Plane trees.



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‘Hot Spot’ Locator – London Borough of Brent

From a study of the aerial photographs from different years it seems that Brent took action following the event years of 2003 and 2006 to reduce the number of trees in some high-risk locations and there appears to have been some re-planting, perhaps with a species regarded as posing less of a risk. We draw this conclusion from the apparent difference in the count of trees and the appearance of younger trees that appear relatively recent additions judging by the gravel beds in the pavement surrounding them from a Street View survey. Clearly an element of conjecture and any background information from the Tree Officer would be of great value.

In Chainsaw Massacre, published in May 2007 (a period relevant to the Brent survey data) by the Environment Committee of the London Assembly, it was recorded that Brent felled an estimated 1,500 trees out of a population of around 18,000 over a period of a few years (exact term undefined). The period likely includes the 2006 event year.

Of the 1,500 trees felled, 250 were removed due to their involvement in subsidence claims.

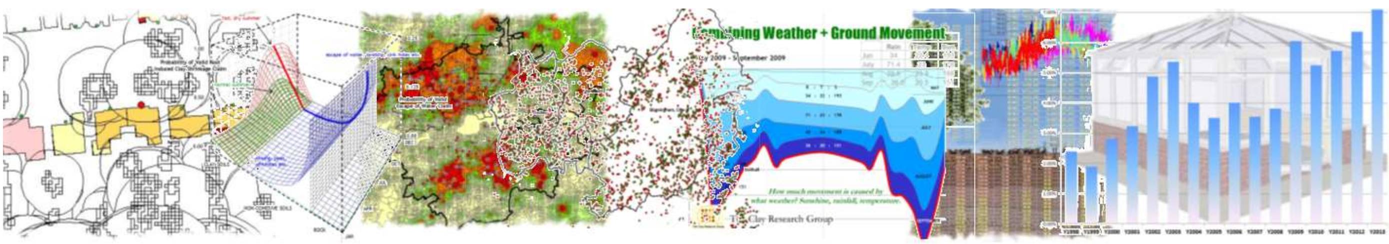
According to “Branching Out”, another publication from the Environment Committee dated 2011, Brent had 20,000 street trees in 2011, equating to 463 tree/km^2. This was an increase from the 18,000 trees recorded in 2007.

Are we any nearer understanding what a Hot Spot is? Possibly not. We have little information relating to species where there have been high claim numbers and, in any event, some offending trees may have been removed.

Regarding foreseeability, a percentage of large trees with a high water demand (as defined in published tables provided by Biddle, Cutler & Richardson and the NHBC) pose a risk, but which will cause damage to a nearby house and when, is unknown and unforeseeable.

Yes, the actual number of trees that cause damage may be regarded as trivial when compared with the total tree stock, but it is a cumulative count and causes significant distress to homeowners. The acknowledgement that some trees cause damage can be seen from the heavy crown reductions that have been undertaken across many boroughs.

In summary, determining the location of so-called Hot Spots is a challenge perhaps best resolved by learning from claims experience. The FoI data supplied by Brent has been useful, but limited. Providing the species of tree and its metrics would have added value.



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‘Hot Spot’ Locator – London Borough of Brent - Conclusions

On the borough web site we see *"...Council will keep its records and management system up to date, and will store and maintain an inventory of its street tree stock, to enable accurate analysis of the tree population for future planning purposes.".* The obstacle to any council publishing such information is that it would provide claimants with evidence that could be used against them in the event of future claims matching an acknowledged risk profile.

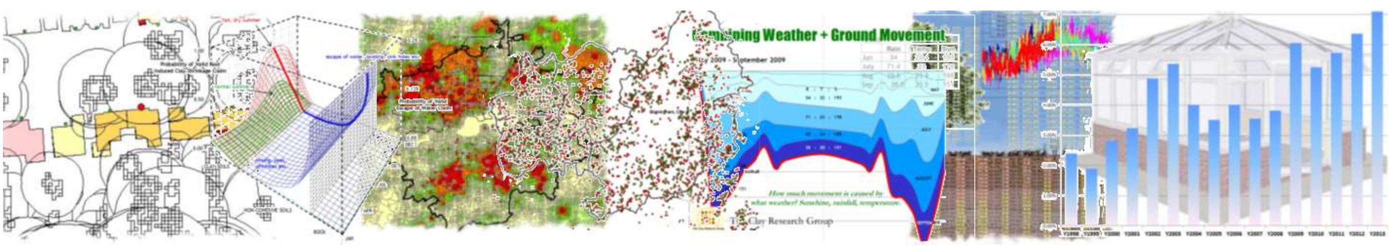
So, do we leave trees that pose a recognised risk in place, seeing them cause damage over a period of time, or seek their removal, losing a valuable amenity? What percentage of trees would be lost? Who would meet the cost? Environmentally we have major issues to resolve. Do we want to see streets of concrete paving, and lose the often quoted benefits of vegetation in urban environments? Are we expecting councils to fund the removal of perhaps hundreds of street trees to cater for the relatively small number that cause damage?

An objective analysis would benefit all parties. We need to know which trees pose the greatest threat, when and where, to address the problem. Council’s could better direct their limited resources and avoid prosecution if they could identify trees that posed a risk statistically and agree a method of abatement (crown reduction, felling etc). After all, if analysis can’t identify trees that pose a risk, what hope for a successful prosecution?

Perhaps adjusters and engineers handling subsidence claims should pool their data for analysis? Most hold data listing species, height, distance, ownership, date of notification, loss value and soils type by full postcode. Our study suggests that a road by road appraisal is the most appropriate way forward and with the granular detail listed, a rank order of risk by species/value/count might be derived and released to councils.

Insurer’s might consider setting up a ‘Save the Tree’ fund, making a contribution to local authorities covering high risk areas that would be a percentage of their annual subsidence claim spend (a figure to be determined), which would benefit all parties. Insurers would reduce their losses, gain favourable publicity and promote their environmental credentials. The fund would provide additional cash for the hard pressed London Tree Officers in higher risk boroughs (perhaps selecting the ‘top ten’ boroughs as beneficiaries) to implement the results of the analysis undertaken.

Projects like iTree and the GLA tree database make a significant contribution towards resolving the issues LTO face if funding was available to meet the cost of data gathering and analysis utilising GIS and the output shared.



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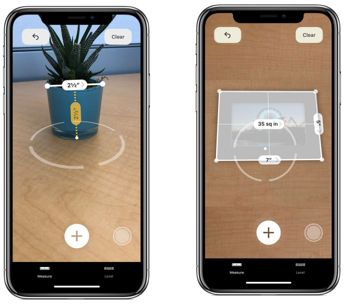
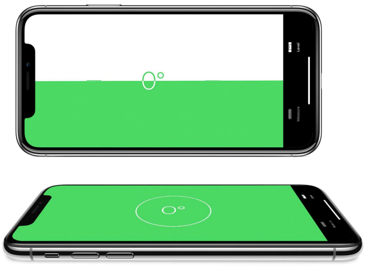
iPhone Measuring App.

Apple introduced a measuring application in their last release and we have carried out very limited tests measuring furniture, rooms etc., - to establish the accuracy and ease of use.



Their web site provides the following screens to illustrate the uses. Right, measuring is a simple, 'point and click' affair and the app can take several dimensions sequentially. Simply set the pointer on the side of the pot (in the example shown), click, and then move the pointer to the other reference point and click again to reveal the diameter.

The app also measures rectangles - screen on far right.



Set the phone on its side, end or lie it flat on a surface to measure levels – see left. Probably best to remove any flexible casing when using the device on its edge, and obviously, the measurement only applies to the length (or width) of the phone, but it might be useful for window cills and door jambs etc.

Turning now to the measurement of rooms and the accuracy of the output.

Internally, measuring a table top, the accuracy varied. The table was actually 650mm wide and 1,200mm long. We took three measurements with the phone which gave widths of 590, 615 and 630mm and lengths of 1,150, 1,170 and 2,050mm.

Measuring room sizes proved more difficult and delivered variable accuracy due to obstructions (furniture) and variable light conditions. That said, results would no doubt improve with experience and some means of steadying the handset.

Access Free LiDAR and Detecting Tree Canopy Volume

Thanks to Jon Heuch to Duramen Consulting Limited for drawing our attention to the publication below, relating to tree measuring using LiDAR technology in the London Boroughs:

https://cbmjournal.biomedcentral.com/track/pdf/10.1186/s13021-018-0098-0

The reference section at the end of the paper includes "Camden Council. About Camden's trees" (item 46) and a source of free LiDAR data – see "UK Environment Agency" (item 50).