

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



January 2019
Edition 164

The Clay Research Group

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London Borough of Brent – Locating the Hot Spots.

Next Month

The 'HOT SPOT' STUDY continues, proposing a suggested resolution and exploring the use of GIS systems to deliver most value.

NEURAL NETWORKS. Returning to the topic of Ai, exploring the benefits and drawbacks of neural networks and looking at some examples.

APPLE iPhone MEASURING APP: The recent upgrade incorporating a measuring application looks interesting and from our limited trial seems reasonably accurate, given the nature of its potential use in measuring room sizes.

FEEDBACK. An opportunity for discussion. We welcome thoughts about the topics covered, and how we might progress them to benefit all parties involved with subsidence claims.

Looking back and going forward.

According to the Met Office web site, "2018 is likely to be the second sunniest in records dating back almost 90 years." They go on to say "global temperature forecasts suggest that 2019 will be close to record warmth due to climate change and the added effect of El Niño-related warming in the Pacific".

Whether this will lead to an increase in claim numbers remains to be seen. The UK is not as badly affected as many parts of the world in terms of warming of course, and over recent years we have had spells of heavy rainfall that mitigate the effect of root induced clay shrinkage claims – the driver behind surge.

There is no doubt that 2018 delivered a substantial increase in claims compared with previous years, and the increase was sharp enough to be regarded as a surge.

LiDAR Data

Thanks to Tony Bracegirdle of GCG and Jon Heuch of Duramen Consulting for notifying us that free LiDAR data is available which can be downloaded from the DEFRA web site at:

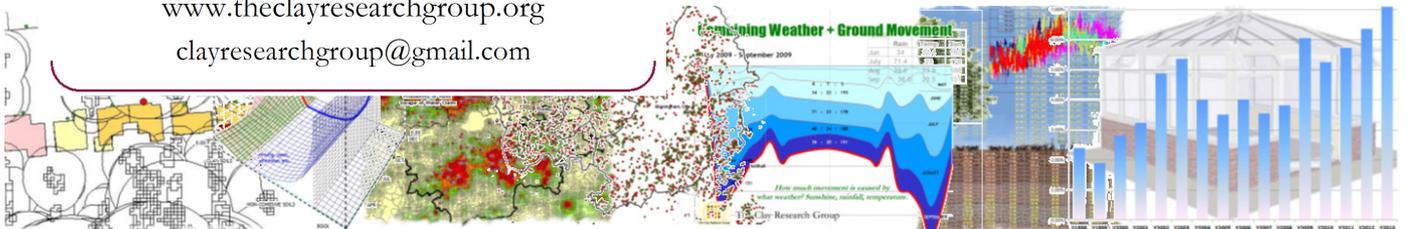
<https://data.gov.uk/>

The data are updated regularly and although not in a format that is as easy to use as a traditional GIS, the site provides access to a valuable resource at no cost.

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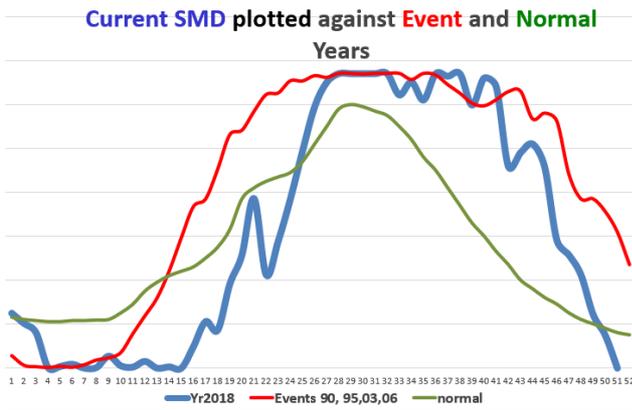
clayresearchgroup@gmail.com



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SMD Update

Equilibrium has been restored to clay soils in the south-east of the UK as can be seen from the Soil Moisture Deficit graph below.



Data supplied by the Met Office for Tile 161, grass cover and medium available water capacity.

DoE Tree Consultation

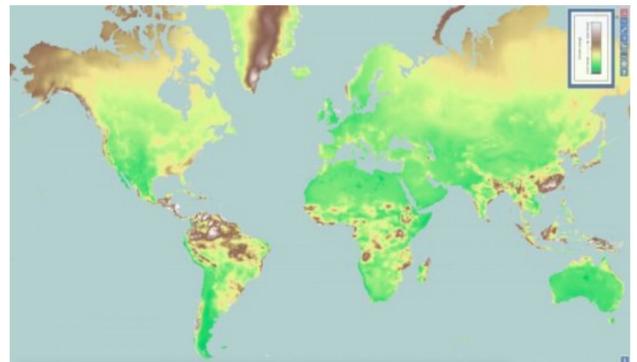
The Department of the Environment issued a consultation document on the 30th December, enquiring whether councils should be required to (a) consult residents prior to tree felling and (b) report on tree felling and planting.

The Sunday Times reports that 110,000 trees in public ownership have been felled over the last three years, and of course, the loss of trees following Sheffield Council’s tree clearance program has left the city’s previously leafy streets looking like a concrete jungle.

From a domestic subsidence point of view, we imagine this will result in further delays when resolving claims involving trees.

ClimateEx Model

Professor Tomasz Stepinski from University of Cincinnati has produced a map showing areas that are predicted to suffer most as a result of climate change. The area’s most at risk are shaded brown, and those least at risk are shaded green

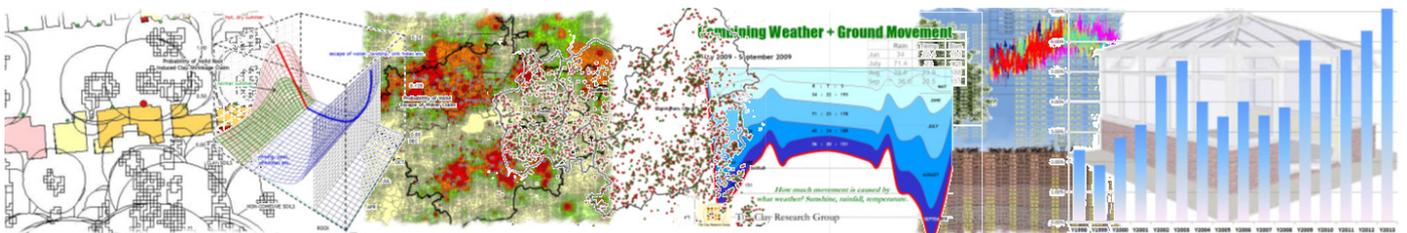


TDAG Update

The Tree Design Action Group continues to be one of the more active organisations exploring the topic of how trees interact with the environment and its web site provides details of future conferences together with details of the research being conducted by members and associates. Visit their site at:

<http://www.tdag.org.uk/>

Their latest bulletin contains a report from Martin Kelly covering items in the news over the last 12 months. This includes the GLAs proposal to increase the London street canopy by 10% by 2020 and Philip Hammond’s proposal to increase spending on tree planting across England, with £10m allocated to street trees.



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London Borough of Brent – Locating the ‘Hot Spots’

The previous newsletter outlined the background to the study, referencing the Berent judgement in 2012 around foreseeability. In this edition, we look at how an assessment might be made, and consider the benefits of a Geographic Information System (GIS) compared with a database.

What criteria do we use to define a hot spot? Postcode sectors are too crude, containing on average around 2,000 houses. The full postcode delivers a higher resolution, and is perhaps a good starting point, provided account is taken of specific circumstances.

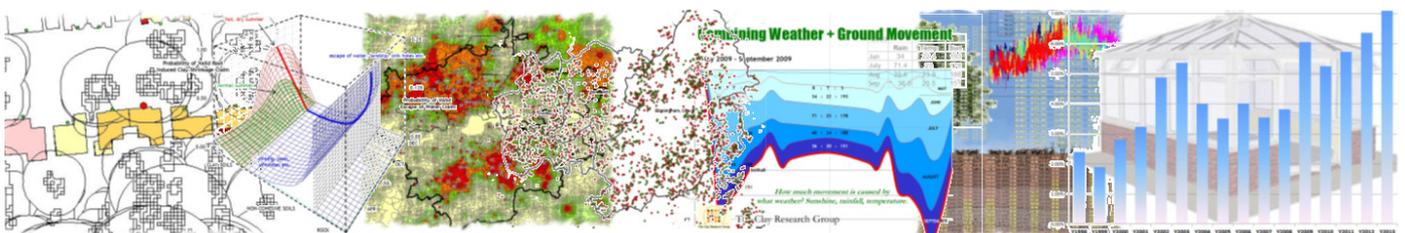
Following our study, we came to the conclusion that it is a case of taking each case on its merits. Groups of claims do not always follow pre-defined patterns, and a visual assessment is far more useful. Jon Heuch explains “Will postcodes work for trees? It seems unlikely as trees aren’t managed by postcodes and tree officers are unlikely to use postcode data. Street name, proximity with other similar streets with the same trees size and species may work. If there are two parallel streets – one with large trees and one with small trees - with similar architecture and geology, does the street with small trees constitute a hot spot if the street with large trees is a hot spot?”

It became evident in the course of the study that whilst species and metrics play a significant role, the setting was perhaps as important. How does the tree get its water? Many are planted on narrow pavements, close to houses with concrete drives. In such situations, the trees offer the only significant form of diversity, softening an otherwise hard landscape.

In essence, this study is directed at trying to establish (a) where the risk lies and (b) its characteristics.

We could find no geological feature that would explain a difference in claim frequencies across the borough. Brent is predominantly underlain by outcropping, highly shrinkable London clay, apart from a narrow band of alluvial soil and pockets of gravel – see page 8. This means we have what may be termed a ‘level playing field’, allowing the risk of the tree and its environment to be determined, without geological variation confusing the outcome.

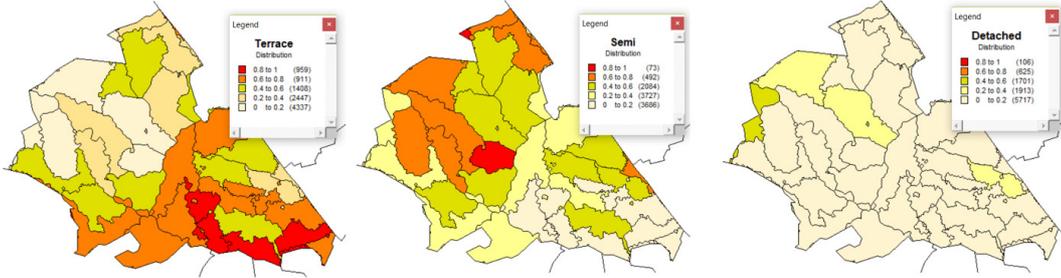
What the study has revealed is a difference between certain areas and the potential benefit of using Google Street View to survey large areas and perhaps identify those roads that might require a site inspection.



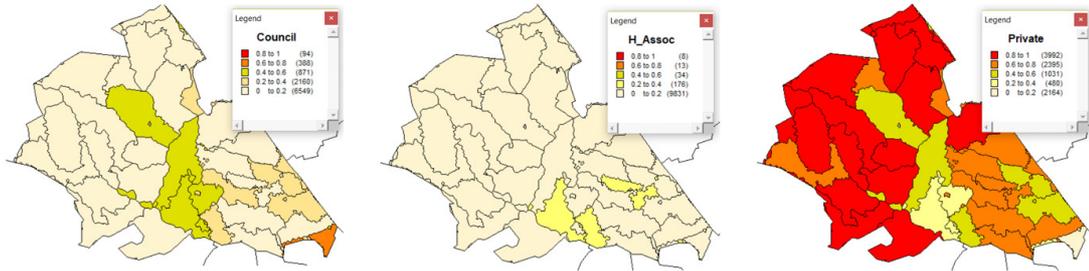
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Hot Spots – Brent Overview

Brent has around 115,450 houses and a population of around 325,000. Around 45% of properties are in private ownership. Data from GLA Intelligence and Analysis web site.



Above, housing distribution by style of construction. Large terraced houses dominate, followed by semi-detached and finally detached.

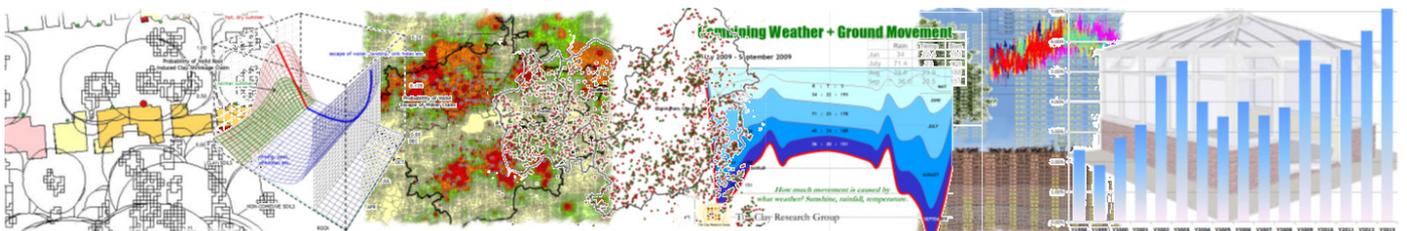


House ownership is shown in the above images. Private ownership dominates, with a background of council and Housing Association properties.

PROBABILITY TABLE

| District | SUMMER | | | WINTER | | |
|----------|-------------------|------------------|---------------------------|-------------------|------------------|---------------------------|
| | valid summer clay | valid summer EoW | Repudiation Rate (summer) | valid winter clay | valid winter EoW | Repudiation Rate (winter) |
| Brent | 0.760 | 0.026 | 0.214 | 0.01 | 0.16 | 0.83 |

An extract from the probability table reveals the likelihood of a claim being valid by season, together with the declinature rate. The high probability of a claim being accepted as valid in the summer and the low rate in the winter is a function of the underlying geology – predominantly outcropping London clay.

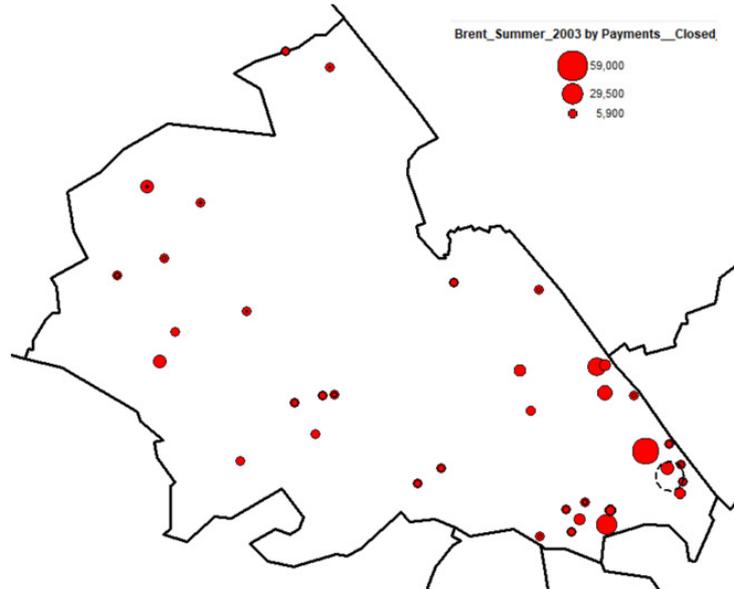


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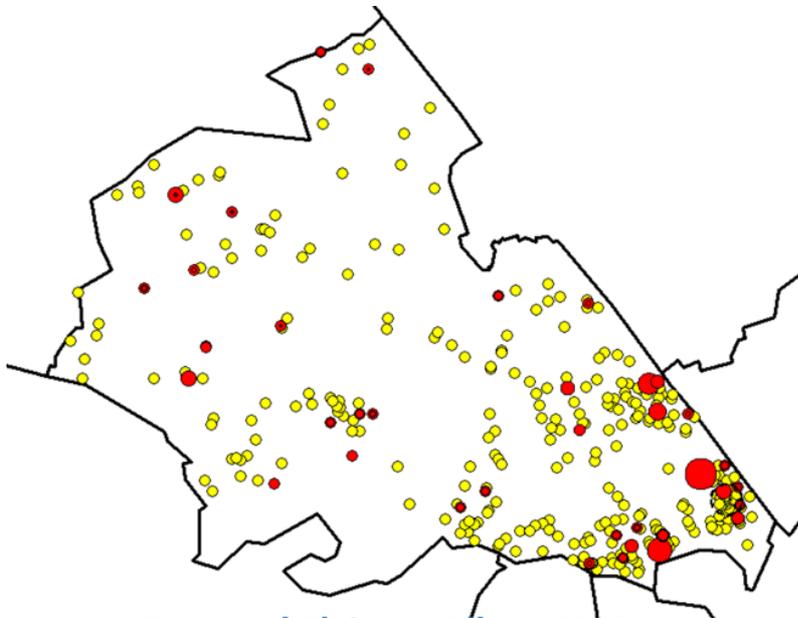
‘Hot Spot’ Locator – London Borough of Brent

The red dots indicate claims notified to Brent in 2003 - a surge year with a high number of root-induced clay shrinkage claims. This reveals an increased risk towards the south east of the borough, both in terms of numbers and frequency.

The diameter is related to settled costs, with a maximum value of £59,000 from the sample. There are claims in other years that far exceed this value.

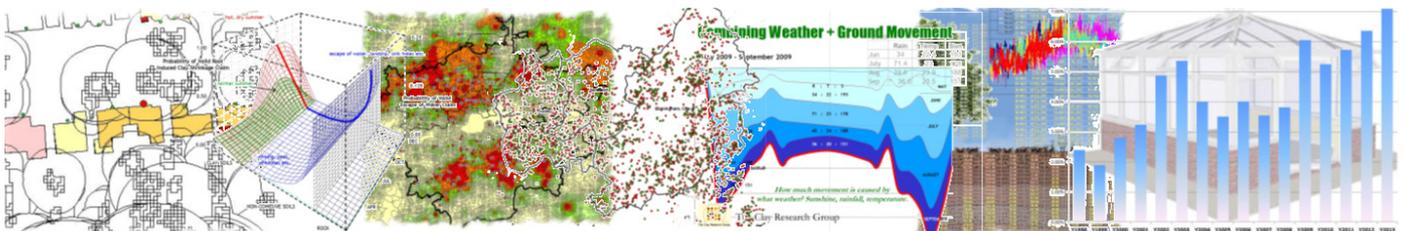


Settled Cost – 2003 Valid Claims



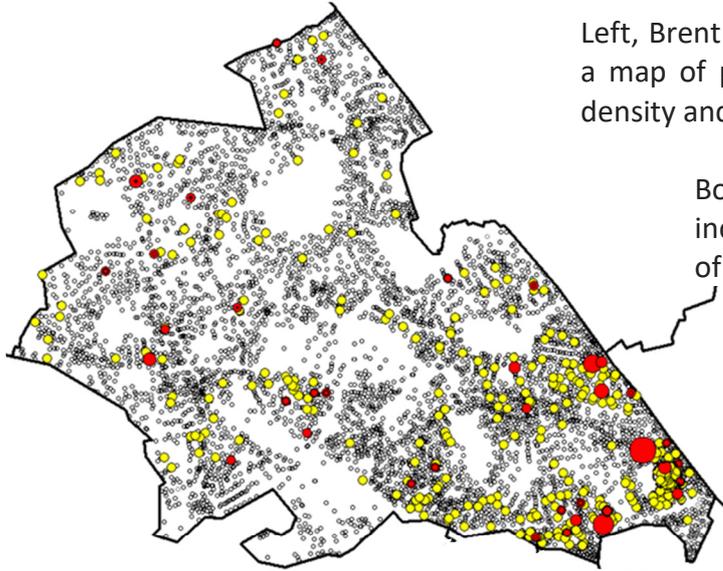
Accepted Claims – All –v- 2003

Left, a map combining all claims notified to Brent in the stated period (yellow), including those from 2003 (red), again confirming the increased risk to the south east corner of the borough.



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‘Hot Spot’ Locator – London Borough of Brent



Left, Brent public tree claims superimposed onto a map of postcodes in the borough to visualise density and distribution.

Both claims and housing densities increase towards the south east quarter of the borough.

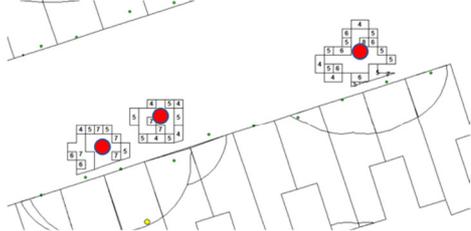
Frequency calculations (rather than count) have been used to determine risk more accurately, avoiding the outcome that an area with a high claim count is classed as high risk simply because there are more houses.

Brent Claims Superimposed onto the Full Postcode Map

The image, right, plots individual houses with addresses (green dots), tree outlines and roads that have had claims related to public trees (yellow dots).

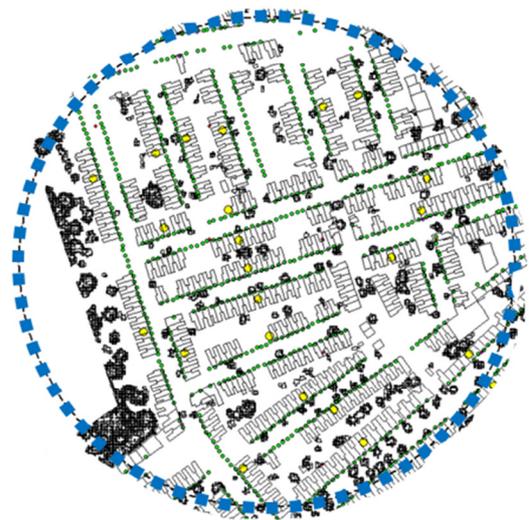
Below, enlarged image showing the detail derived from LiDAR imagery.

Referring back to the LiDAR model

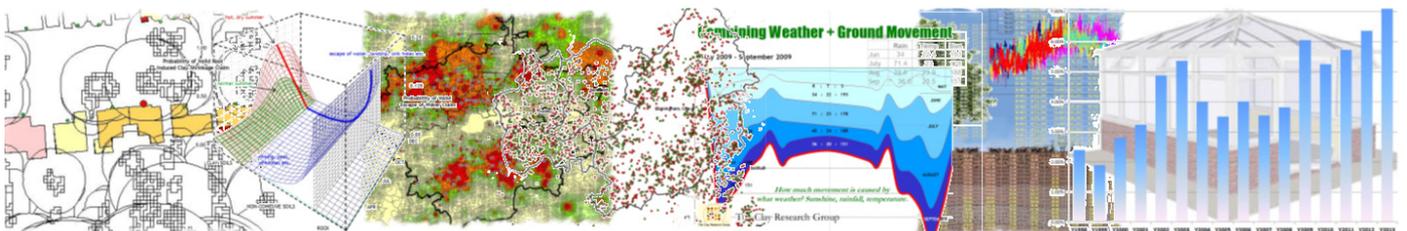


Canopy height is indicated in each canopy grid, and modelled root zones are indicated where they may extend beneath buildings.

Adding Properties (high risk area as example)



BRENT



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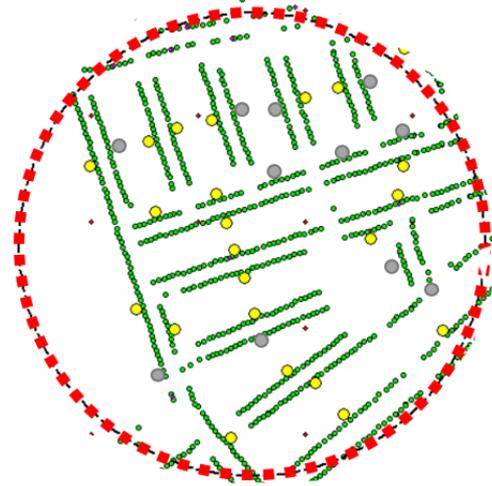
‘Hot Spot’ Locator – London Borough of Brent

The claims data provided by Brent is at full postcode level – i.e. “NW6 6TJ” – rather than individual addresses. Nationally, a postcode includes around 15 – 20 houses on average, but variable by street length.

Postcodes with recorded claims (shown right by yellow dots) might include one, or several, claims. For example, “NW6 6NE” contains 3 claims, “NW6 7LG”, 2 claims and “NW6 7UY” one claim which explains the caption, “22 yellow dots = 37 claims”.

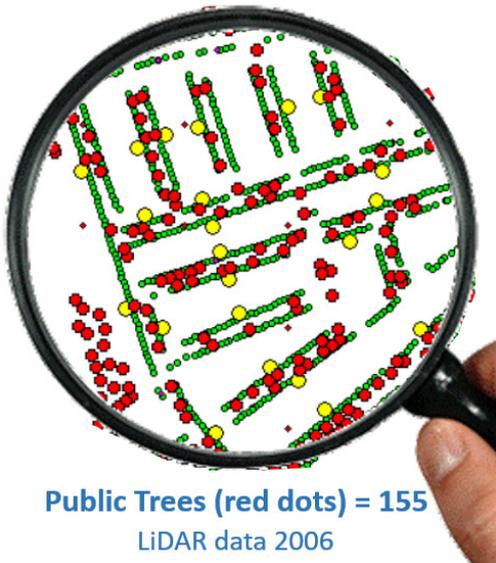
It can be seen that the majority of roads (66%) in the study area have had claims. Grey dots indicate roads with no claim records (33%).

22 yellow dots = 37 claims
grey dots = no claims in sample



Green Dots = Individual Properties

Yellow dots represent full postcodes (“NW6 6NE”) with claims from the Brent sample, green dots individual houses and grey dots postcodes with no claims recorded.

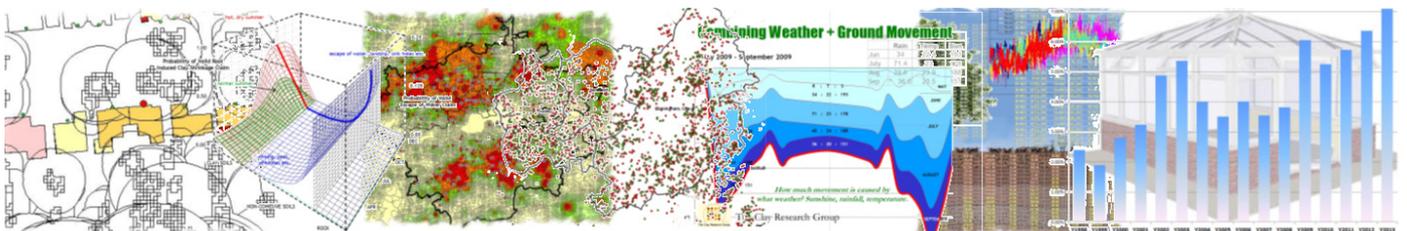


Red dots indicate public (street) trees present in the 2006 LiDAR survey.

Left, the distribution of street trees (red dots, taken from the LiDAR survey in 2006) added to the houses (green dots) and postcodes map.

Whilst not coincident in terms of the date of notification for the Brent claims dataset, it is a guide to tree location and height at the time of the survey, but unfortunately, does not indicate species.

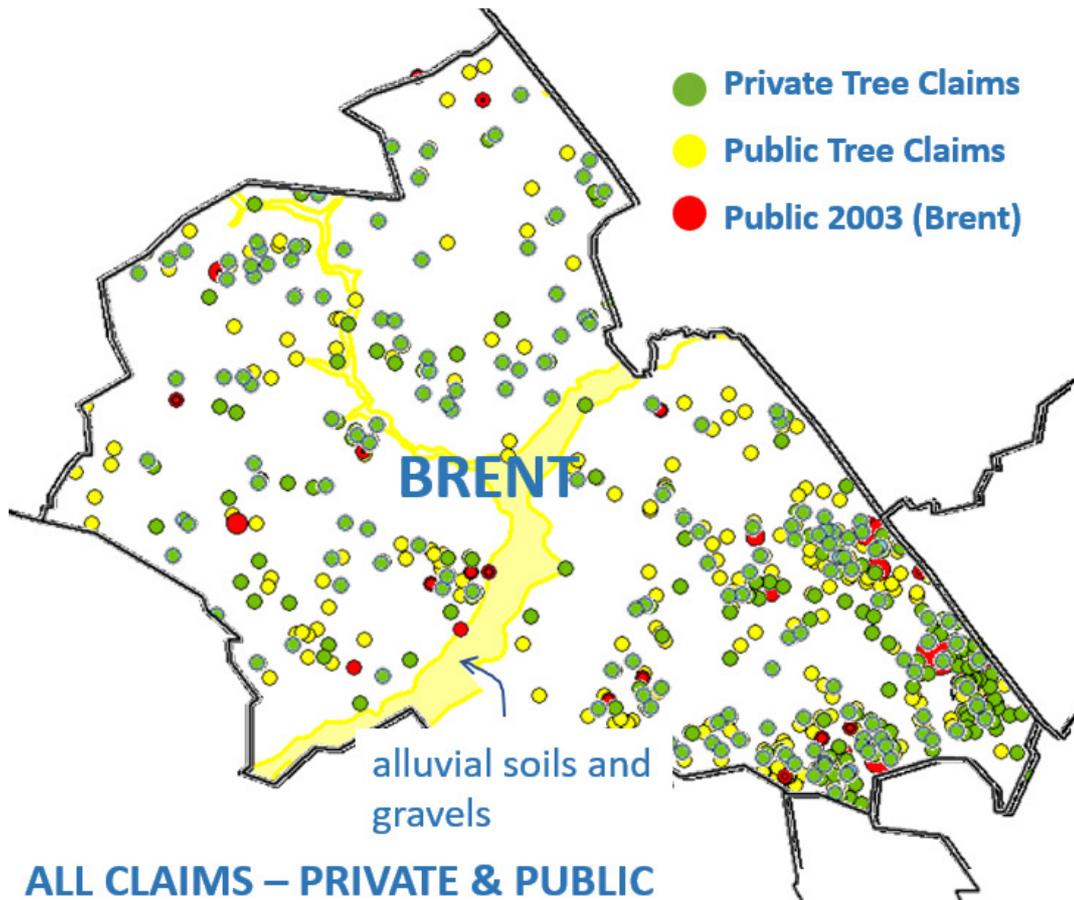
Looking at the iTree survey on the London Government web site it appears that Brent has not supplied data relating to tree species and location at the time of our study.



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‘Hot Spot’ Study – London Borough of Brent

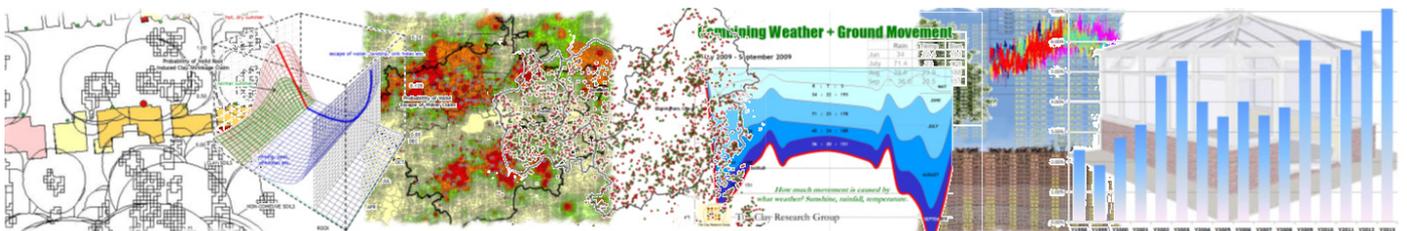
How does the Brent claims experience (public trees only) compare with insurers? The map below superimposes private tree-related claims onto the Brent claims experience.



Data reveals a similar distribution of risk between private and public trees, with the focus to the south east of the borough where both density and frequency are highest.

The claim sample spans several – not always coincident - years.

The predominant geology is outcropping London clay. The yellow shaded areas indicate alluvial soil.



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Brent Study – variable risk in two areas

We have selected a medium risk and a high risk area, to determine the difference between them. The areas are shown below, described by a circle with a diameter = 435mtrs.

There are twice as many houses in the high risk area, but 8 times number of claims. Pro-rata with low risk area, the high risk should deliver 10 claims. In fact, it receives 41. Four times riskier, and yet the low risk area has a higher trees/houses frequency. In the higher risk area, the tree/house frequency = 0.16 and in the low risk area, = 0.218. Interestingly, there are fewer trees per claim in the higher risk area. There are 3.8 trees/claim in the higher risk area, and 23 in the lower risk.



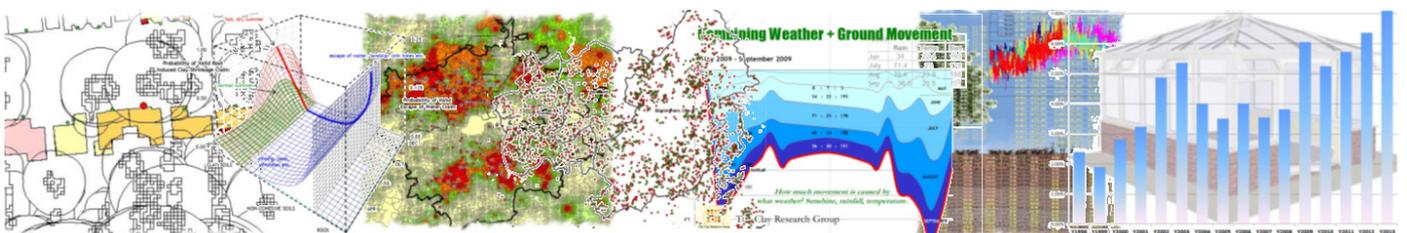
Lower Risk Area

The two areas used in the study show the distribution of Brent claims by full postcode for the full sample alongside the Brent claims experience in 2003 (red dots).

The claims/houses ratio = 0.042 in the higher risk area, and 0.0094 in the low risk area.

Clearly the species and/or metrics (height and distance from properties) are risk indicators – it isn't simply a case of 'more trees = more claims'.

Next month, a street level analysis will reveal the issues faced by local authority tree officers and will provide examples using images from Google Street View. Is it possible, plotting data from their claims experience, for local authority tree officers to identify high risk areas from a desk-top study? What is the difference between high and low risk roads in terms of species, pruning regime and metrics?



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Hot Spot Study - Summary

Local Authority Tree Officers may benefit by being able to direct valuable (and diminishing) resources to reduce the nuisance posed by a small number of trees using the findings. Identifying the species in the areas described may increase awareness of risk and the metrics involved – is there a particular height at which any given species becomes more likely to cause damage, and at what distance from the property? Is there a particular style and/or age of property, or ‘street scene’ that makes houses particularly vulnerable? The objective is a reduced strain on the council budgets, hopefully resulting in fewer claims.

Homeowners will benefit both in terms of reduced pressure on household budgets associated with increasing council rates and insurance premiums, as well as reducing the stress associated with subsidence damage when it does occur.

Insurers will benefit with fewer technically complex, long duration, high cost claims, often leading to litigation.

If the CRG can help by plotting claims experience and tree data for individual boroughs, it is likely insurers would be willing to fund further studies. The understanding would be that such a service would result in publication of the output for shared benefit of the domestic subsidence community.

On the downside, there is clearly a problem managing some of the older tree stock in the higher risk areas. They are often higher risk because of the tree species – see next month’s edition. We have seen examples of tall, mature, heavily pollarded trees, planted on narrow pavements adjoining houses with small front gardens and roots with little access to water.

In theory, the answer may appear to be to simply remove the trees identified as being high risk, and re-plant with a smaller species; something that is already happening across London when the opportunity arises and in suitable locations. In practice there are significant issues at every level.

There are environmental and political concerns, and objections from the public relating to downgrading of the amenity trees provide. Imagine the response if a tree officer produced a report suggesting many tens or even hundreds of trees are to be felled and replaced because of the relatively small potential risk of subsidence. The plans outlined by Michael Gove (Page 1) will no doubt add to the complexity of resolving claims when they occur.

More on the topic of Hot Spots next month and contributions/thoughts welcome.

