

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



March 2019

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The Clay Research Group

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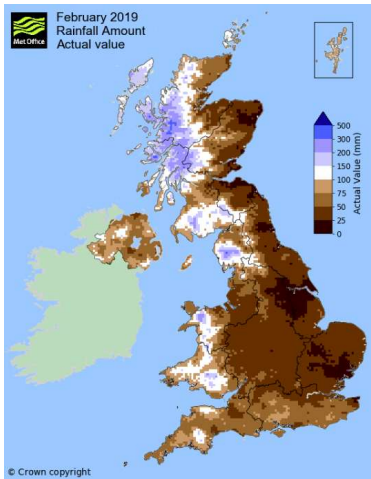
Hot Spot Study Continued.
Comparing Brent, Barnet, Harrow and
Welwyn & Hatfield.

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Continuing the Study of the London
Boroughs – Redbridge

Warmest February on Record

The Met Office report that last month was the warmest February since records began.



“Daily maximum temperatures have been the highest on record (dating back to 1910), averaging out at 10.0C, ahead of the 9.8C recorded in 1998.”

Hot Spot Research Project

This edition looks at the distribution of just over 2,700 subsidence claims involving LA trees across the UK from a sample provided by Subsidence Management Services.

The study reveals the issues engineers and tree officers face in locating so-called Hot Spots, and variations between districts.

Just how many claims are required to define a Hot Spot, and how do we account for variations in frequency between boroughs? Does the riskiest (in terms of root induced clay shrinkage claims involving street trees) set the standard, leaving all others free from potential liability, or should they be judged individually? Is a borough with a high number of evenly distributed claims (i.e. none in groups) free from liability?

Is the notion of a hot spot valid, or does risk relate to tree species and metrics? In this month’s edition we look at different situations and boroughs to explore whether rules can be formulated to assist those involved.

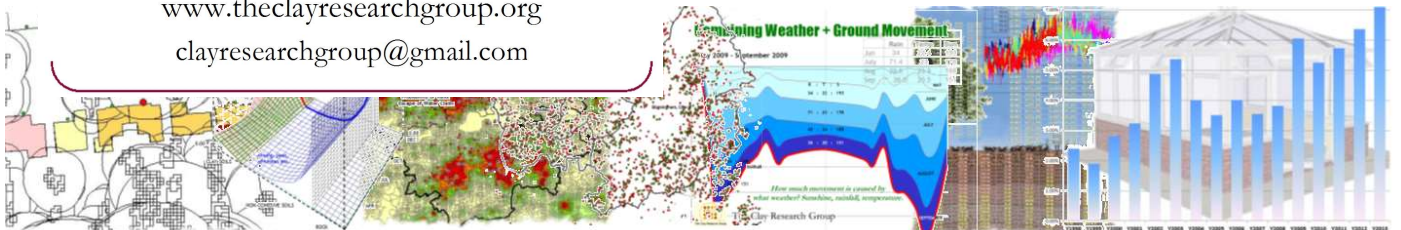
London Borough of Redbridge

Following a series of studies of individual London Boroughs, this edition looks at Redbridge to try to improve our understanding of the subsidence peril at postcode sector level.

Distribution by house type, geology, claims frequency and cost provide useful information for claims handlers, engineers, underwriters, LA risk departments and for developing triage applications.

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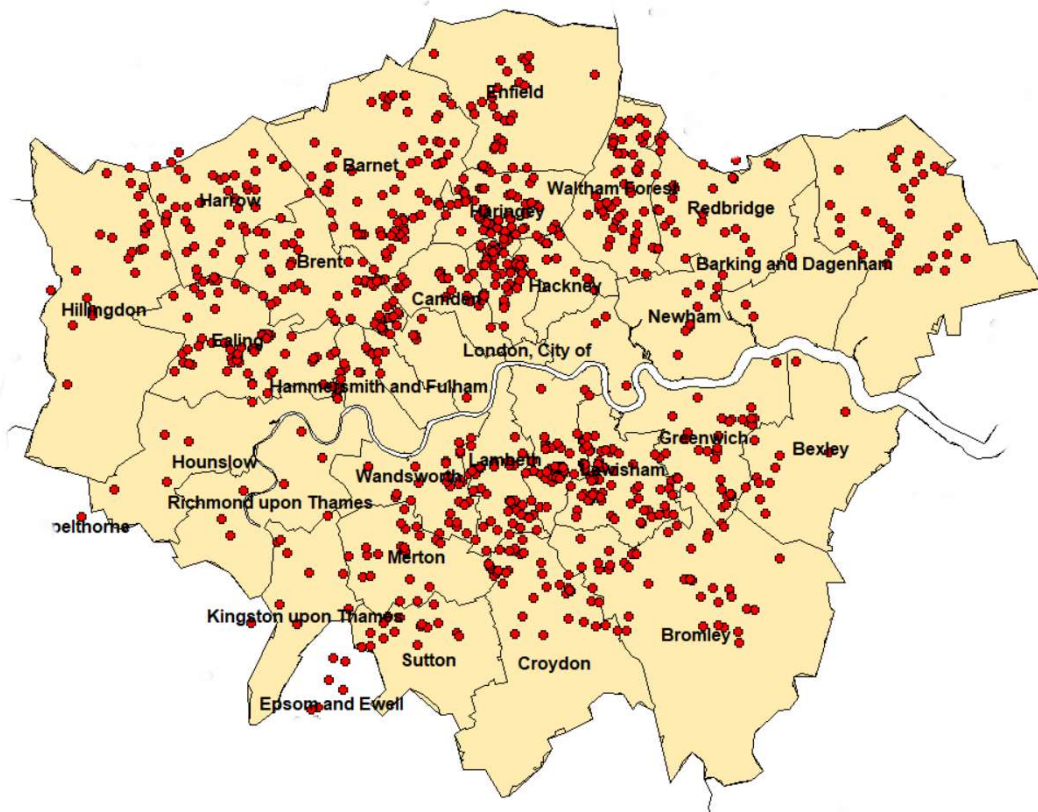


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Identifying the Hot Spots

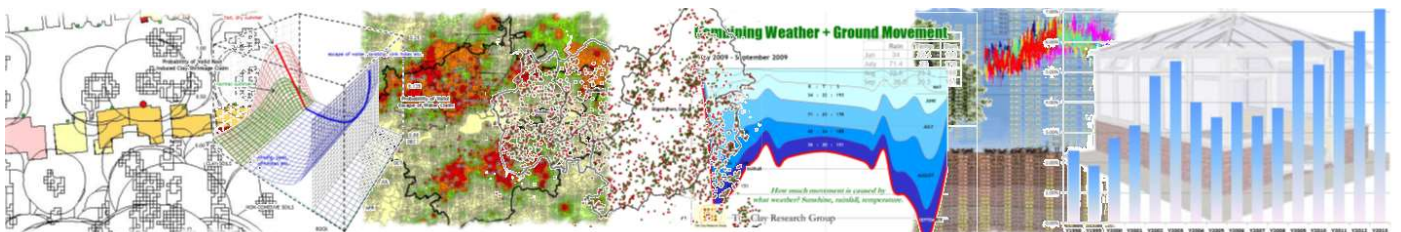
Continuing the theme from last month’s edition, we have received location details of over 2,700 claims made against local authorities across the UK where a valid claim has been determined relating to root induced clay shrinkage subsidence damage to domestic properties where a council tree has been involved.

Below, an extract showing the claim locations at full postcode level (some dots may represent more than one claim) in the London area, by borough.



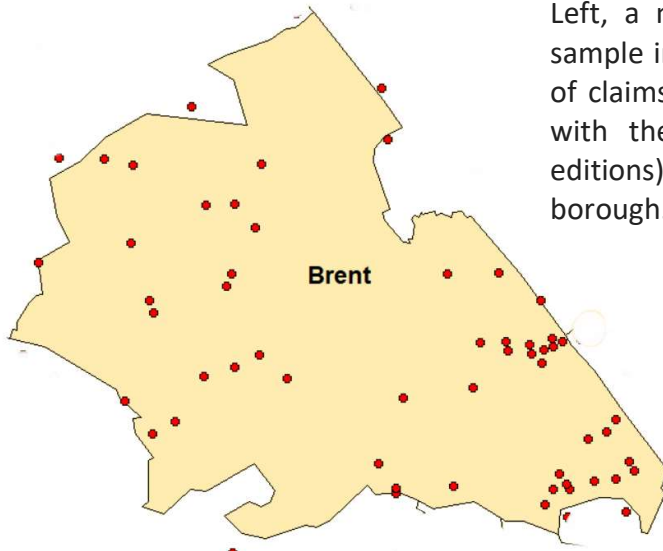
We don’t have details of the tree species or metrics, but the map may be useful to understand where Hot Spots are located, and assist council tree officers arrange their maintenance program to reduce claims in nuisance relating to subsidence where council trees are involved.

The following pages consider how we might define a hot spot – by count of trees, frequency, species – and ask how we account for density variations between boroughs. Is a Hot Spot two or three claims within a defined distance, or five or ten? Do we use the higher risk boroughs to refine our definition, or a median range borough?



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Identifying the Hot Spots



Left, a map plotting the claims from the smaller sample in Brent. There do appear to be ‘collections’ of claims in at least two areas which agree broadly with the data supplied by Brent (see last few editions), particularly to the southeast of the borough.

The data is more meaningful if delivered as frequency to avoid the situation where we see more claims simply because there are more houses.

Frequency estimates also take account of situations where a single postcode might contain several claims.

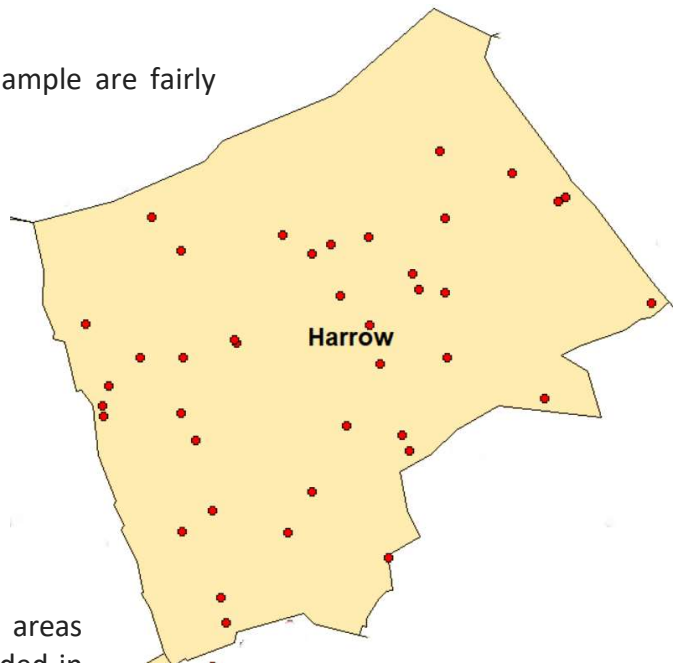
The claim distribution from the SMS sample follows that of the Brent data in last months edition.

In Harrow (image, right) claims from the sample are fairly evenly distributed across the borough.

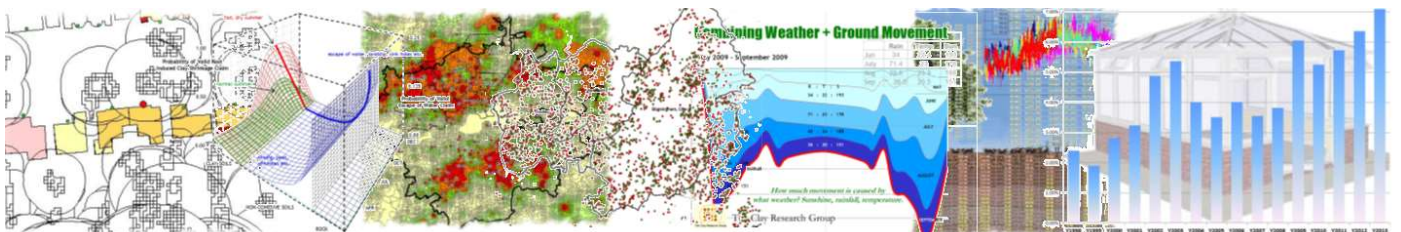
Again, it is possible that a single red dot could contain more than one claim and a detailed analysis would need to be undertaken to understand where the risk lies.

As an example, of the 2,700 or so claims plotted by postcode in our sample across the UK, 116 had two claims in the same postcode, and 13 had three.

The Harrow map identifies at least three areas where two or more claims have been recorded in reasonably close proximity, but whether these would be classified as hot spots when compared with Brent is at issue.



In contrast to the Brent distribution, claims involving council trees are more widely distributed in Harrow.

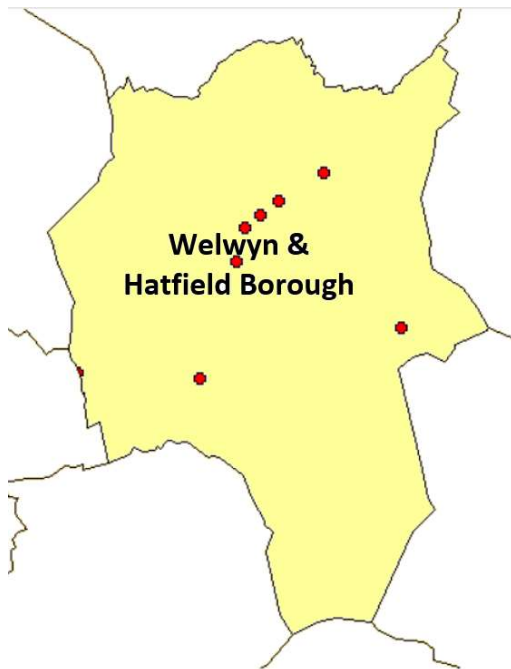


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Hot Spots – Agreeing the Criteria

We are getting closer to understanding how a Hot Spot might be identified. The first step is to carry out a frequency calculation to determine areas with higher risk by full postcode (effectively ‘by road’), and then add tree data to see why the selected area poses a higher risk.

Is it simply because there are more trees, or more trees of a particular species and/or height and proximity etc?



*Wellingborough – do two or three trees in adjoining roads constitute a hot spot?
Is it fair to use the same criteria for Brent and Welwyn?*

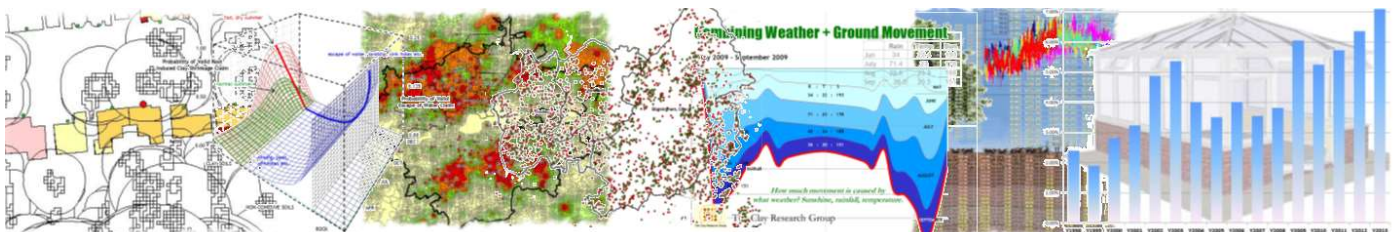
Another piece of the jigsaw involves a point raised by Andrea Plucknett, the Treasury, Insurance & Controls Lead Officer from Welwyn & Hatfield Borough when she queried how we can compare one borough with another.

Taking Brent and Harrow as examples, would the onus fall on Brent, leaving Harrow with no identifiable hot spots on account of the more widespread distribution? How would Welwyn fare (see left), with fewer claims spread over a larger area?

Would the table compare boroughs, using one league table, or would each be looked at individually?

Using the ‘one league table of risk’ wouldn’t help reduce claim numbers in the remaining boroughs, and places an undue onus on one or two of the higher risk boroughs. A ‘borough by borough’ approach, with each judged individually may seem unfair as it applies different criteria to each.

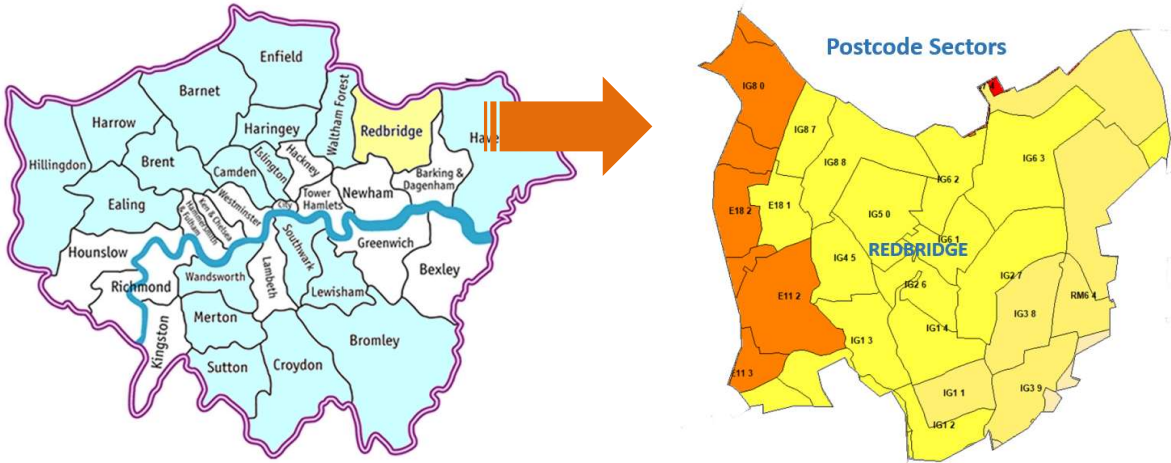
Next month’s edition extends the study to other areas of the UK. Whilst the boroughs within Greater London receive the highest number of claims, how would other districts compare? Are there identifiable Hot Spots in each and are there any criteria that would help Tree Officers identify potentially troublesome trees? If not, where does this leave the foreseeability issue?



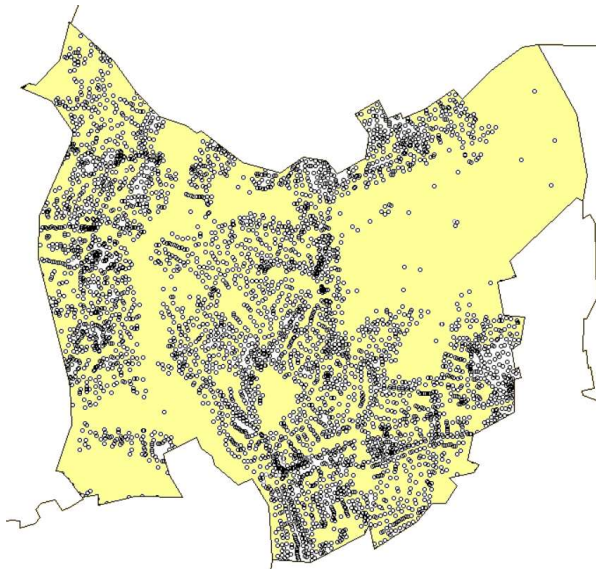
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London Borough of Redbridge

Continuing the study of London Boroughs (see table below for those already covered), the following pages look at the London Borough of Redbridge, situated to the northern border of greater London. Below, right, a map of the postcode sectors.



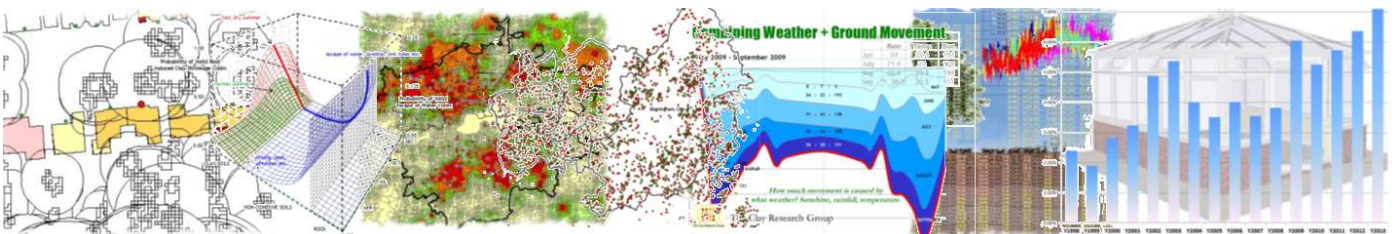
Redbridge has an area of 56km², a population of around 300,000 and around 105,000 households. The distribution of postcodes across the borough is shown on the map, below, left.



Borough	Edition	Date
Islington	Issue 47	Apr-09
Camden	Issue 69	Feb-11
Brent	Issue 71	Apr-11
Haringey	Issue 72	May-11
Barnet	Issue 77	Oct-11
Waltham Forest	Issue 79	Dec-11
Welwyn and Hatfield	Issue 80	Jan-12
Ealing	Issue 84	May-12
Sutton	Issue 91	Dec-12
Hillingdon	Issue 106	Mar-14
Havering	Issue 149	Oct-17
Harrow	Issue 150	Nov-17
Enfield	Issue 155	Apr-18
Southwark	Issue 156	May-18
Lewisham	Issue 157	Jun-18
Bromley	Issue 158	Jul-18
Croydon	Issue 159	Aug-18
Basingstoke & Deane	Issue 160	Sep-18
Merton	Issue 161	Oct-18
Wandsworth	Issue 162	Nov-18
Basildon	Issue 163	Dec-18
Redbridge	Issue 166	Mar-19

Housing distribution shown by full postcode. Sometimes sectors appear low risk simply due to the absence of homes, and risk may be biased if, for example, there is one claim in a sector with a low housing density.

Table of previous studies listing issue and date.

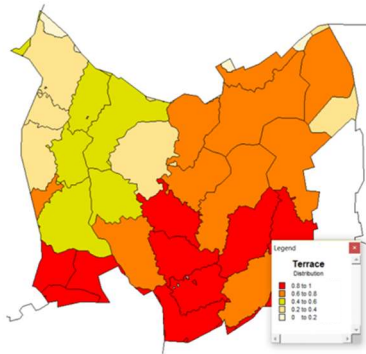


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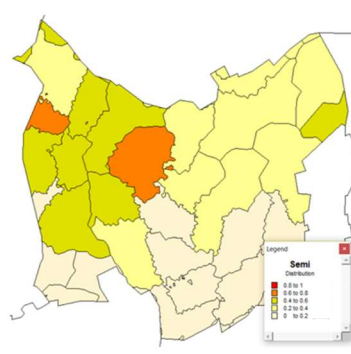
Redbridge Borough – House Style & Ownership

It is useful to have some idea of house style and ownership across the borough, as shown below and as discussed on the following page. Is there a link between house style and/or ownership? Is a semi-detached, terraced or detached house riskier and if so, is there a reason?

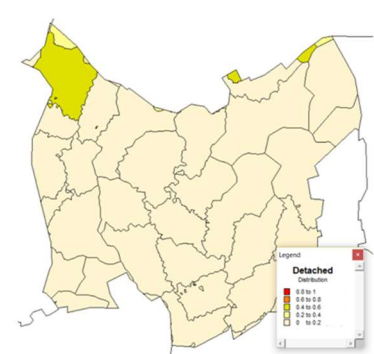
Terrace



Semi-Detached



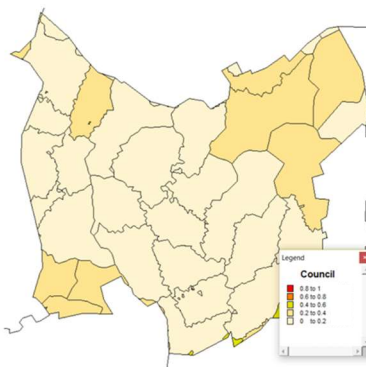
Detached



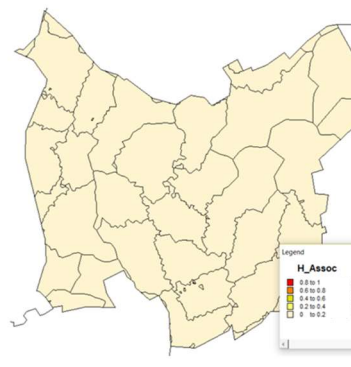
REDBRIDGE

These are questions best resolved by analysing the underlying data and taking into account age of property and details of any vegetation, where implicated.

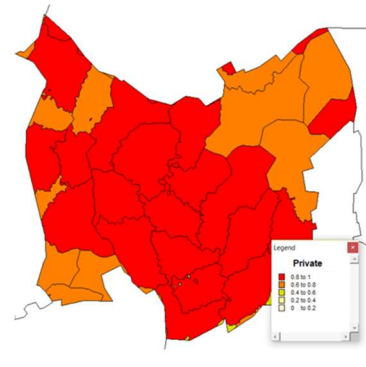
Council



Housing Association

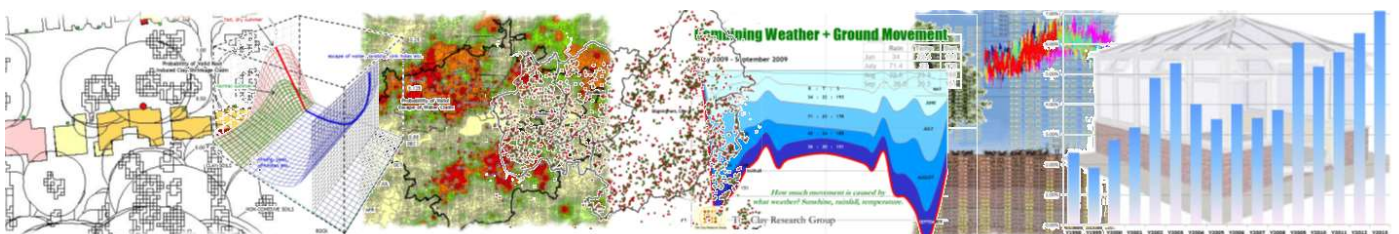


Private



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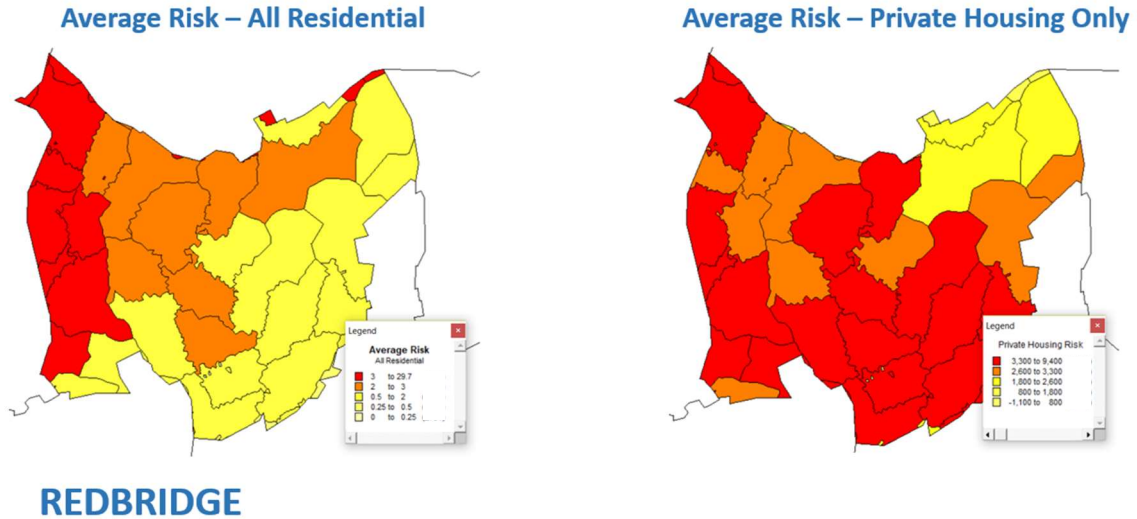
Ownership is relevant as some social council housing self-insure, which can alter the risk profiles as can be seen on the following page.



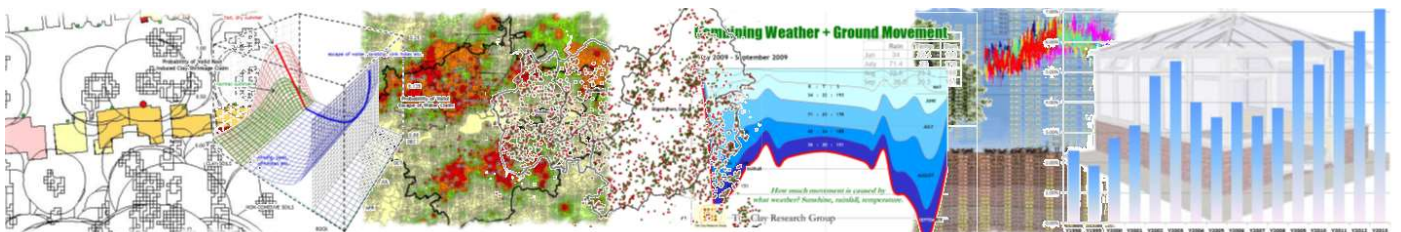
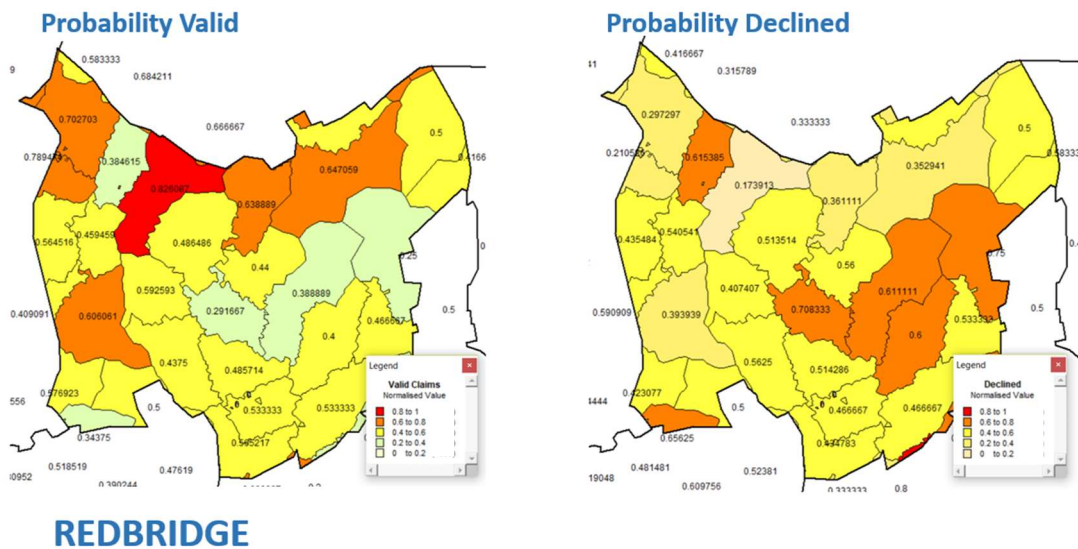
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Claim Distribution – Redbridge

Below, postcode sector maps showing distribution by ownership, bearing in mind some social housing organisations and councils self-insure.



Below, annual claim distribution for the larger of the samples held (over 100,000), containing valid and declined at postcode sector. The number of notifications varies by year and by cause, with clay shrinkage claims increasing in dry, warm years and escape of water claims rising in particularly wet years. The seasonal influence is illustrated on the following page.



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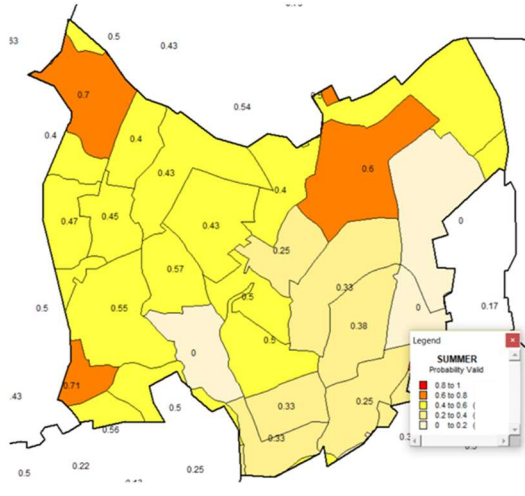
Probability of Valid Claim, by Season, Sector and District

Below, a table showing the probability of a claim being valid (together with probable cause) or declined, by season and by district. In a particular summer (see caveat at bottom of page), around 73% of claims in Redbridge might be classified as valid, and root induced clay shrinkage is three times more likely to be the cause than escape of water, variable by location and geology. In the winter, the likelihood of a claim being valid drops to around 60%, with escape of water being the most likely cause, accounting for 75% of the accepted claims.

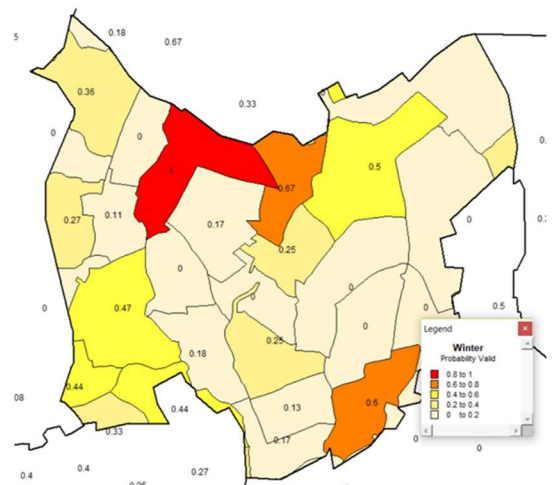
Probability Valid Claim by Season

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Redbridge	0.553	0.180	0.267	0.15	0.45	0.401

Probability Valid – Summer



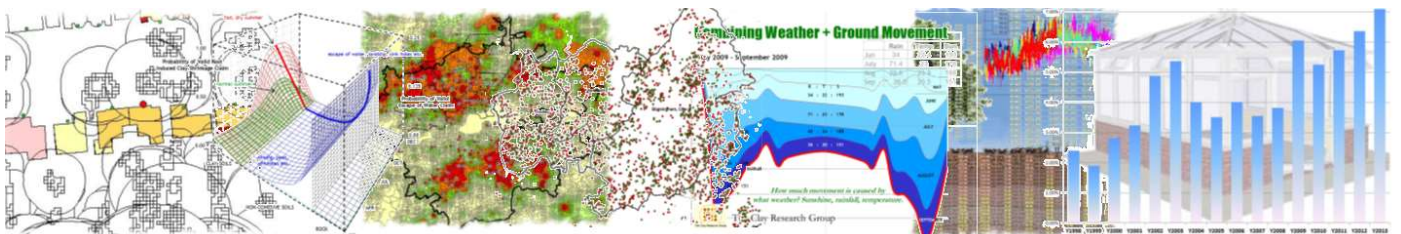
Probability Valid - Winter



REDBRIDGE

Mapping the distribution by postcode sector, above. The estimates are based on the prevailing weather for years corresponding to the sample, and will vary annually. For example, the likelihood of a claim being valid and the cause attributed to root induced clay shrinkage will be far higher in the summer of 2003 than say 2017.

The model should be linked to some measure of soil dryness in the clay belt, and temperature, to estimate probabilities.

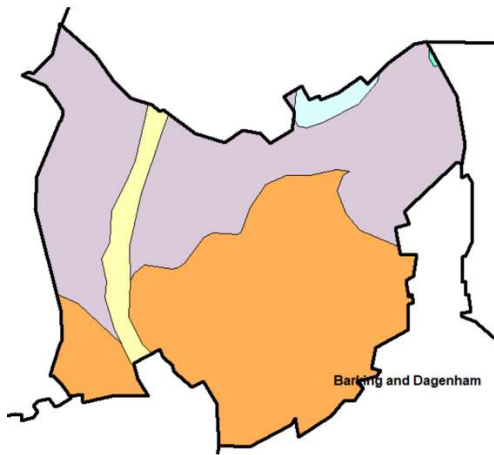


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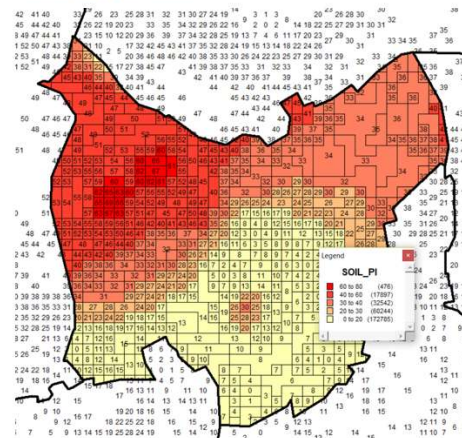
London Borough of Redbridge

The figures for the 'Probability of Valid Claim by Season' mentioned on the previous page varies with the underlying geology. Below comparison mapping from the large scale BGS and 250m CRG grid showing broadly similar profiles.

BGS Superficial Geology (1:625,000 scale)



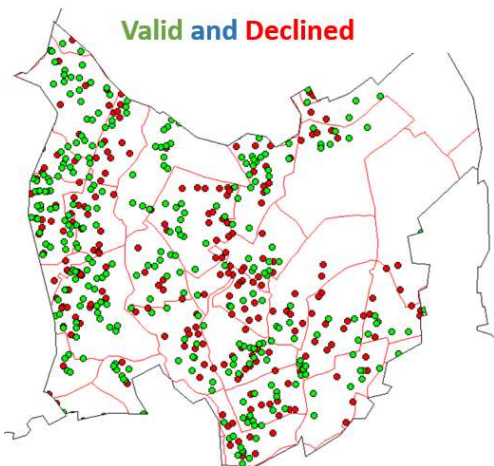
CRG 250m Grid



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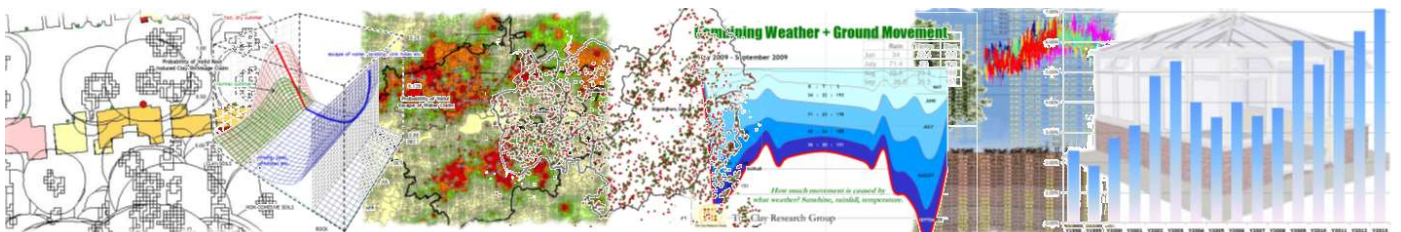
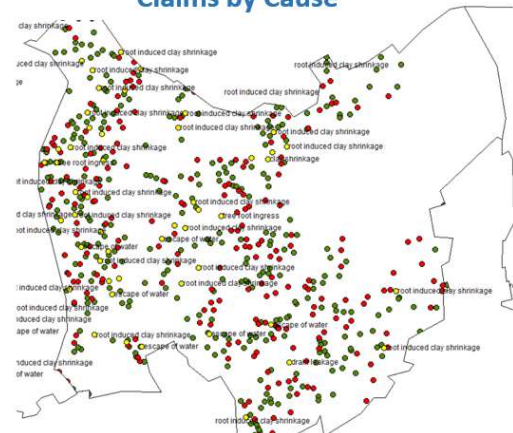
The shrinkable clay deposits can be found to the north of the borough, and Barking and Dagenham beds to the south. The latter are described by the BGS as a mixture of clay, silts and gravel, suggesting a higher percentage of clay shrinkage claims to the north, and escape of water claims to the south of the borough, although the latter will be dependent on the thickness of the superficial deposits and clay content. Population densities skew the results to the west of the borough.

Valid and Declined



REDBRIDGE

Claims by Cause

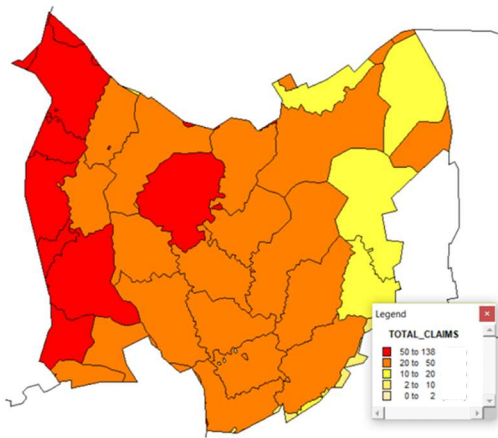


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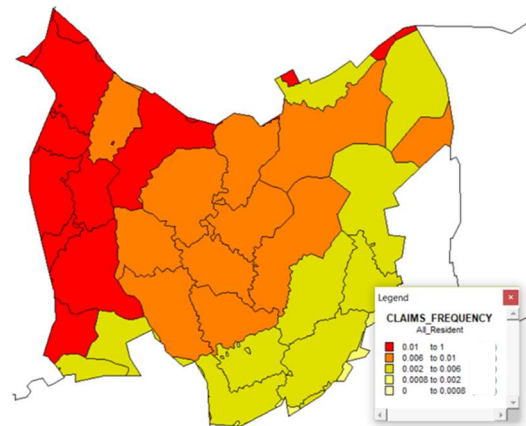
Redbridge – Claim Count & Frequency

The following thematic maps have been derived using the larger sample of over 100,000 claims. The western side of the borough is the riskiest in terms of subsidence by both count and frequency. See housing distribution on page 5.

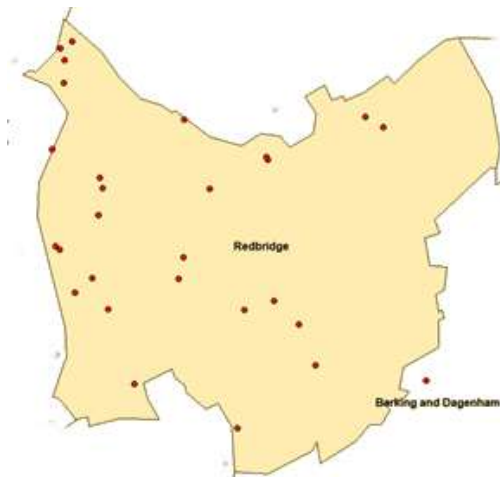
Total Claims by Count



Claim Frequency



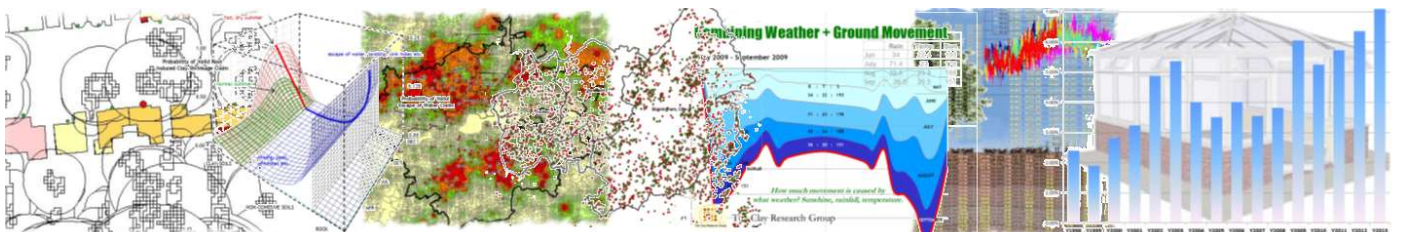
REDBRIDGE



Finally, picking up on the theme regarding subsidence damage caused by street trees and 'hot spots', the image left shows the claims against Redbridge from the sample of just over 2,700 claims covering the UK provided by Subsidence Management Service.

There are 30 claims in total, spanning a 15 year term - two claims a year on average. This may not seem high risk but the sample is a small proportion of industry notifications.

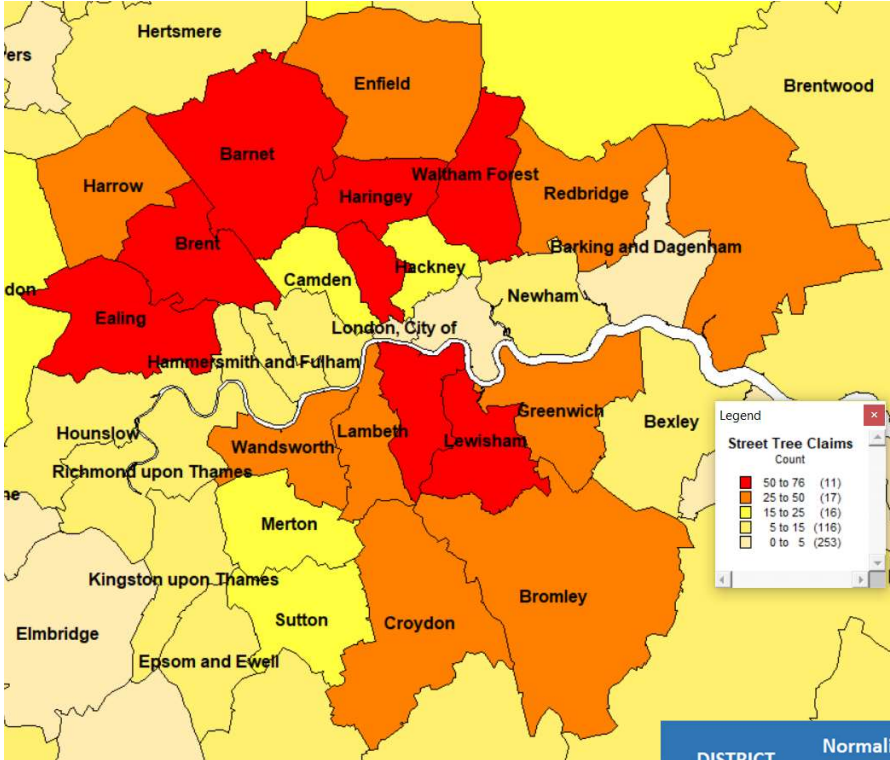
For the same sample period, Brent has 55 claims, Haringey 63, Barnet 76 and Harrow, 39. Are there any Hot Spots? If so, how do they compare with Brent? There are two locations where two claims can be seen close to one another. Does this make these locations Hot Spots?



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Street Trees - Frequency by Borough

Although Brent provides a clearer picture of how we might identify a hot spot, how does it rate with other London boroughs in terms of frequency of claims relating to street trees? From the limited sample of just over 2,700 claims across the UK, the boroughs rate as follows:



A district map of London and surrounding areas showing the relative risk in terms of recorded street tree claims from the sample, relative to private housing stock.

The calculation lacks the refinement of recording those areas on clay only, and boroughs with say half their area with non-shrinkable soil will have an increased risk factor.

The tables, right, derive frequency rates and then normalise the output to build a 'Top 20 league table of risk' related to street tree claims for the relatively small sample held. The table to the left uses 'count of claims/all houses' and the table to the right uses 'count of claims/houses on clay soil only' to deliver an amended Top 20. The figures are approximate estimates only as we have no data that distinguishes the distribution of private/social housing by geology and the output will be further confounded by the variable depths of drift deposits overlying shrinkable clay series. The exercise illustrates how the underlying data can deliver very different results dependant on the approach adopted.

DISTRICT	Normalised Rank Order
Islington	1
Haringey	0.885
Southwark	0.867
Waltham Forest	0.793
Lewisham	0.758
Brent	0.641
Ealing	0.632
Barnet	0.535
Lambeth	0.508
Harrow	0.424
Camden	0.418
Hackney	0.343
Havering	0.336
Enfield	0.303
Redbridge	0.282
Bromley	0.279
Croydon	0.275
Merton	0.260
Hillingdon	0.204
Kingston upon Tl	0.149

DISTRICT	Amended Normalised Risk
Bromley	1.000
Southwark	0.966
Richmond upon	0.696
Enfield	0.478
Hammersmith ar	0.476
Lewisham	0.471
Waltham Forest	0.469
Merton	0.446
Ealing	0.400
Islington	0.393
Hackney	0.370
Brent	0.348
Barking and Dage	0.341
Haringey	0.311
Croydon	0.301
Redbridge	0.283
Lambeth	0.263
Havering	0.244
Barnet	0.235
Hillingdon	0.186

