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

April 2022
Issue 203

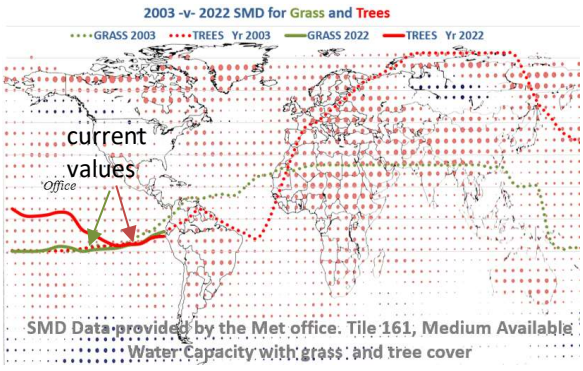
The Clay Research Group

CONTENTS

Issue 203, April 2022

Soil Moisture Deficit

Below, the SMD values provided by the Met Office for both grass and tree cover, comparing them with the 2003 event year.



Contributions Welcome

We welcome articles and comments from readers. If you have a contribution, please Email us at:

clayresearchgroup@gmail.com

THE CLAY RESEARCH GROUP
www.theclayresearchgroup.org
clayresearchgroup@gmail.com

BGS Launch GeoCoast

The British Geological Survey are launching a new product, GeoCoast, with a launch event scheduled for 1pm on Wednesday, 27th April.

To register for the 30 minute webinar, visit:

https://ukri.zoom.us/webinar/register/WN_HcXcZLkxQqKCCQ5OgTt4uQ

The product is a "GIS package of datasets designed to inform and support coastal management and adaptation. It provides information on the morphology, behaviour and vulnerability of the coastline, underpinned by its geology and its coastal context (shape, profile, height, etc.), and particularly coastal erosion, inundation and potential subsidence."

TDAG Diary Date

The next TDAG meeting explores "How can planning help us increase our urban trees?" and takes place between 2-4pm on the 8th June, 2022. For access go to:

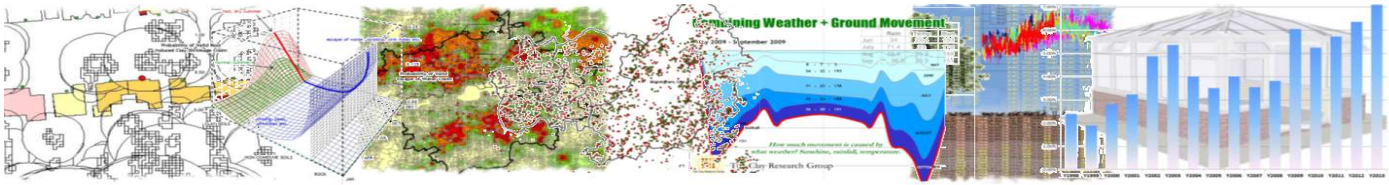
https://www.eventbrite.co.uk/e/how-can-planning-help-us-increase-our-urban-trees-tickets-317493801507

For information on this and other events etc., go to: https://www.tdag.org.uk/

TDAG produce a range of guides that can be accessed at: https://www.tdag.org.uk/our-guides.html

UKCRIC Diary Notes

Lots going on across the membership of UKCRIC. For details go to https://www.ukcric.com/



The Clay Research Group

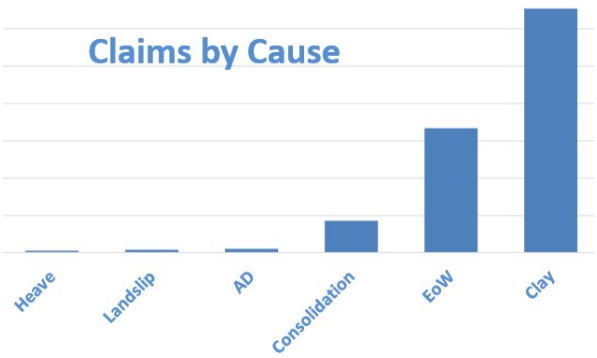
Changing Times - Reducing Risk?

A review of over 54,000 claims revealed how times have changed over the last 30 years.

For example, there were no claims listed resulting from sulphate damage. Not that this was a major contributor to the claim total 30 years ago, but it used to crop up on a fairly regular basis in the late 1980s and early 90s.

It was a peril related to the nature of fill beneath the concrete floors in houses built around the 1950s triggered by a chemical reaction between the sulphate contaminated fill on which a concrete floor has been cast, and the cement paste in the slab. An adjuster might have encountered a claim every few months.

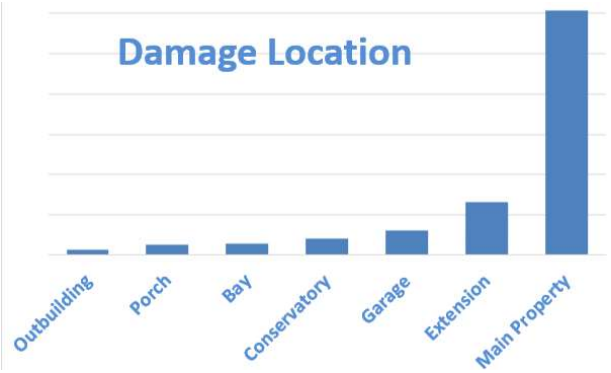
To meet policy criteria the damage had to be linked to an escape of water from a leaking drain or water service.



The other peril that is diminishing, but not disappeared just yet, is heave. The database contains 102 such cases.

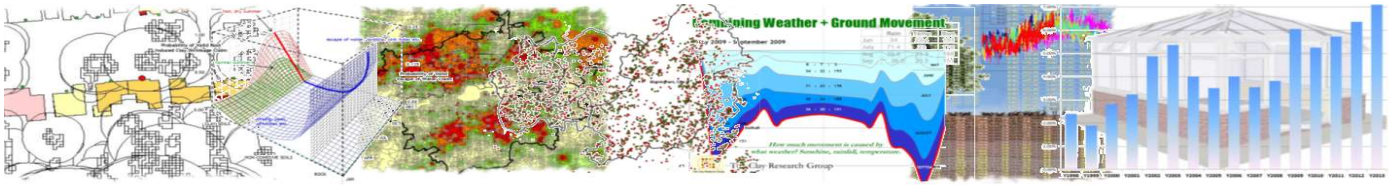
NHBC research relating to the risk posed by trees may have been a major factor in delivering this reduction as it (heave) was often associated with newer houses covered by their warranty.

Just over 50% of the claims in the sample were declinatures. Of the valid claims, there were twice as many attributed to clay shrinkage as escape of water. In terms of location, around 67% described damage to the main property, 14% to extensions, 7% to garages and 5% to conservatories – all figures have been rounded.



Claim numbers have been reducing since 2006 which may seem odd given the increased warming trend over recent years.

Is it the case that a large number of trees that posed a threat have now been dealt with and people are more aware and take precautions when planting and maintaining vegetation?



The Clay Research Group

Using Past Claims Data to infer Geology and Derive Probability of Cause and Liability

... cont. from previous editions

The District Risk series includes sector level data gained from past claims experience. The output is a useful indicator of (a) the geology and (b) the likelihood of a claim being valid as can be seen from the following graphs.

A large number of valid claims in the summer, declining significantly in the winter is indicative of a clay soils, and more often than not, the influence of vegetation. This is illustrated on the following page for sector NW6 7.

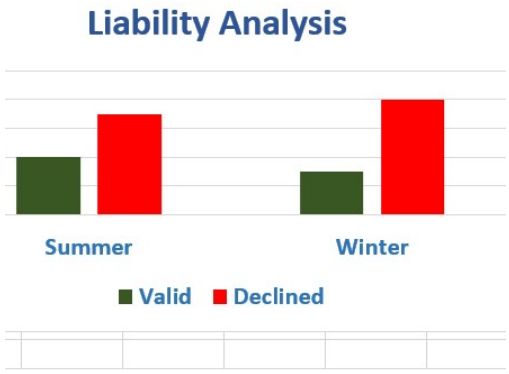
On the other hand, a more balanced (but smaller) count of claims between seasons, or an increase in the percentage of valid escape of water claims in the winter, usually reflects a non-cohesive soil – see data below for M21 9.

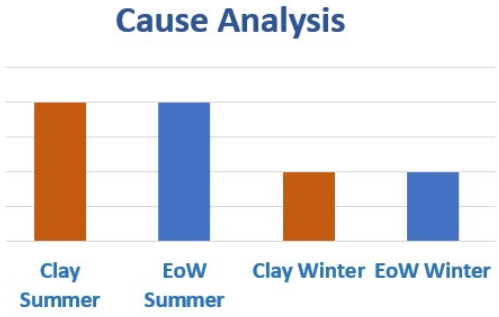
The output is useful in building a model of probable claim validity and likely cause both for underwriting and claim handling purposes.

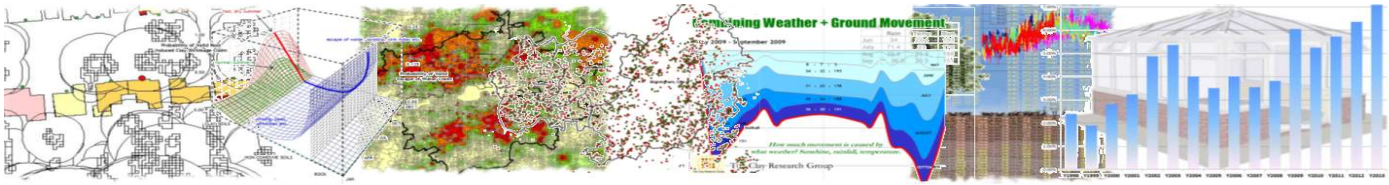
M21 9 – This is a relatively lower-risk sector with a balanced clay shrinkage/escape of water claim population as can be seen from the lower of the two graphs (right). There is a balanced probability of a claim being valid or declined in the summer, and in the winter the prospect of a claim being declined increases as a proportion of the total.

The chance of a valid claim being due to clay shrinkage matches that of the cause being due to escape of water. Referring to the BGS 1:50,000 series map reveals the solid geology to be sand and gravel overlying sandstone.

The average spend on valid claims from the sample in this postcode sector was £5,700.



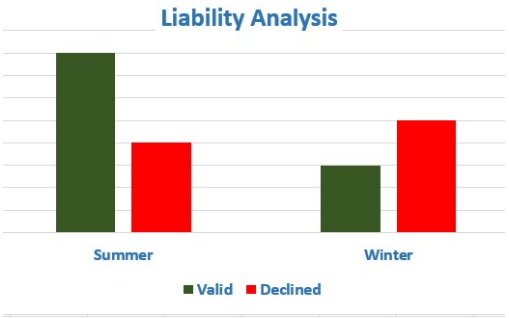


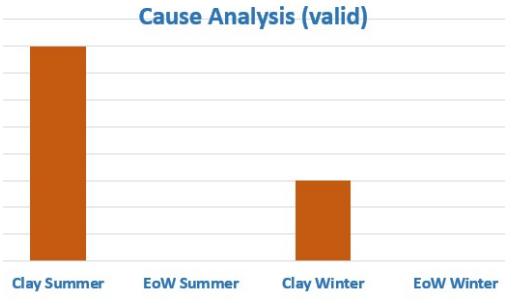


The Clay Research Group

Using Past Claims Data to infer Geology and Derive Probability of Cause and Liability

... cont. from previous editions



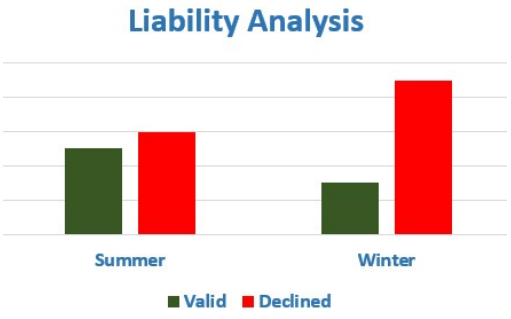


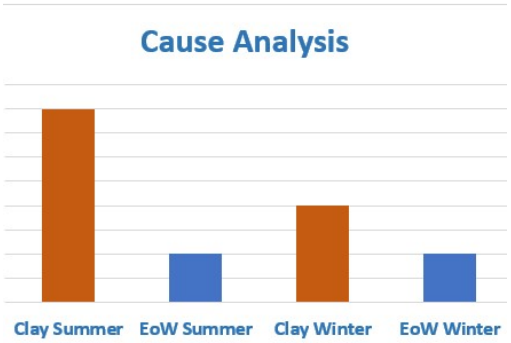
NW6 7 – This is a high-risk sector with a predominantly clay shrinkage claim population as can be seen from the lower of the two graphs (left). Claims are more likely to be valid in the summer, and in the winter the prospect of a claim being declined increases as a proportion of the total.

The chance of a valid claim being due to clay shrinkage is nearly four times that of escape of water. Referring to the BGS 1:50,000 series map reveals the solid geology to be predominantly outcropping London clay.

The average spend on valid claims from the sample in this postcode sector was £9,000.

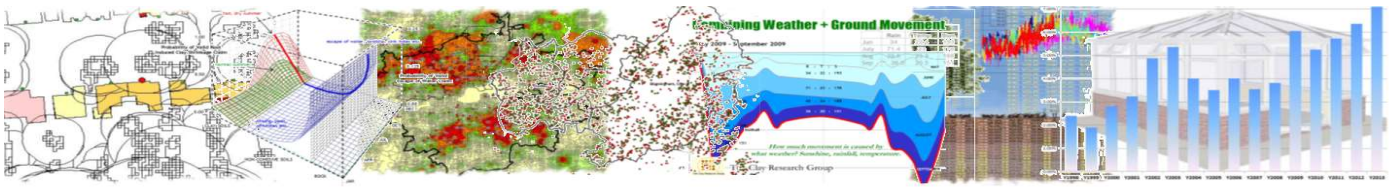
LE10 0 – This is a lower-risk sector with a predominantly clay shrinkage claim population as can be seen from the lower of the two graphs (right). There is a balanced probability of a claim being valid or declined in the summer, and in the winter the prospect of a claim being declined increases as a proportion of the total.





The chance of a valid claim being due to clay shrinkage is nearly four times that of escape of water. Referring to the BGS 1:50,000 series map reveals the solid geology to be predominantly clay and silt overlying the Mercia mudstone series.

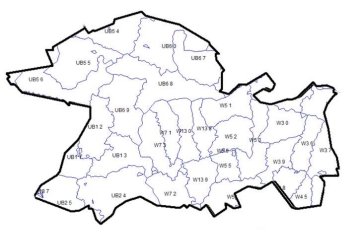
The average spend on valid claims from the sample in this postcode sector was £8,800.



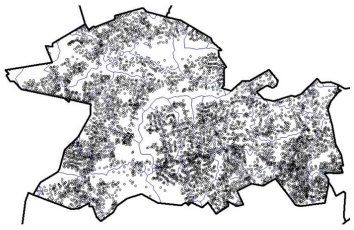
The Clay Research Group

Subsidence Risk Analysis – EALING

The Ealing district is situated in the north of London and occupies an area of 55km^2 with a population of around 85,000.



Postcode Sectors



Housing Distribution by Postcode

Distribution of housing stock using full postcode as a proxy. Each sector covers around 2,000 houses and full postcodes include around 15 – 20 houses on average, although there are large variations.

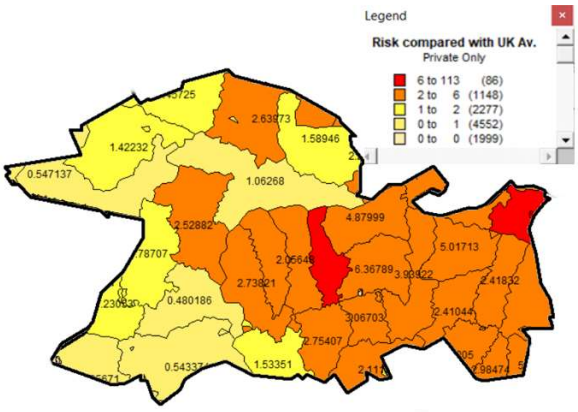
Housing distribution across the district (left, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there simply more claims in a sector because there are more houses?

Using a frequency calculation (number of claims divided by private housing population) the relative risk across the borough at postcode sector level is revealed, rather than a 'claim count' value.

From the sample we have, sectors are rated for the risk of domestic subsidence compared with the UK average – see map, right.

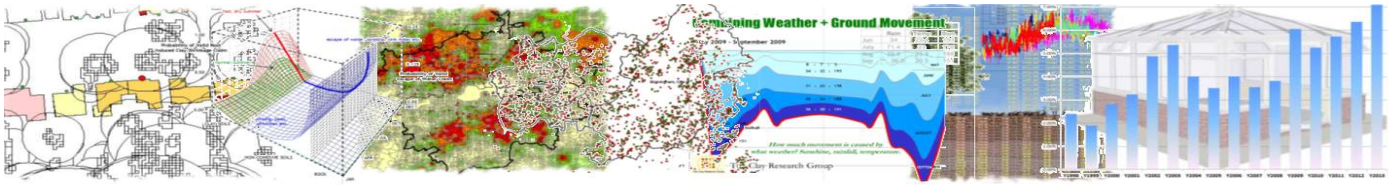
Ealing is rated 25th out of 413 districts in the UK from the sample analysed and is around 2.13x the risk of the UK average, or 0.55 on a normalised scale.

The distribution varies considerably across the borough as can be seen from the sector map.



Sector Risk Compared with UK Average

Risk compared with UK Average.
Ealing district is rated around 2.13 times the UK average risk for domestic subsidence claims from the sample analysed. Above, risk by sector.

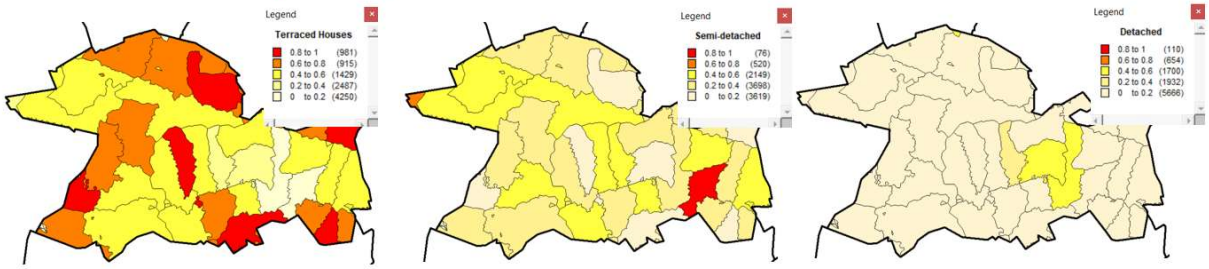


The Clay Research Group

EALING - Properties by Style and Ownership

Below, the general distribution of properties by style of construction, distinguishing between terraced, semi-detached and detached. Unfortunately, the more useful data is missing at sector level – property age. Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of application.

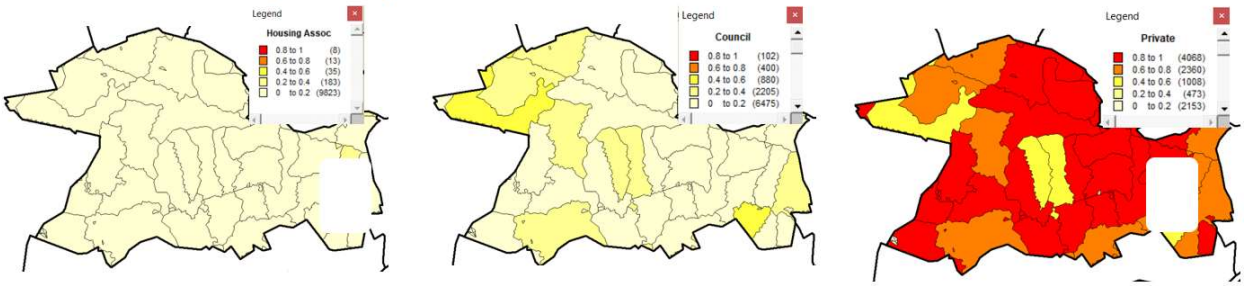
EALING - Distribution by House Type



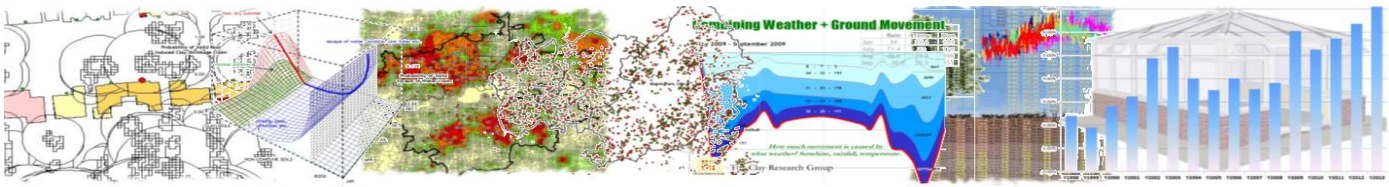
Terraced | Semi-Detached | Detached

Distribution by ownership is shown below. Privately owned properties are the dominant class and are spread across the borough.

EALING - Distribution by Ownership



Housing Association | Council Ownership | Private Ownership



The Clay Research Group

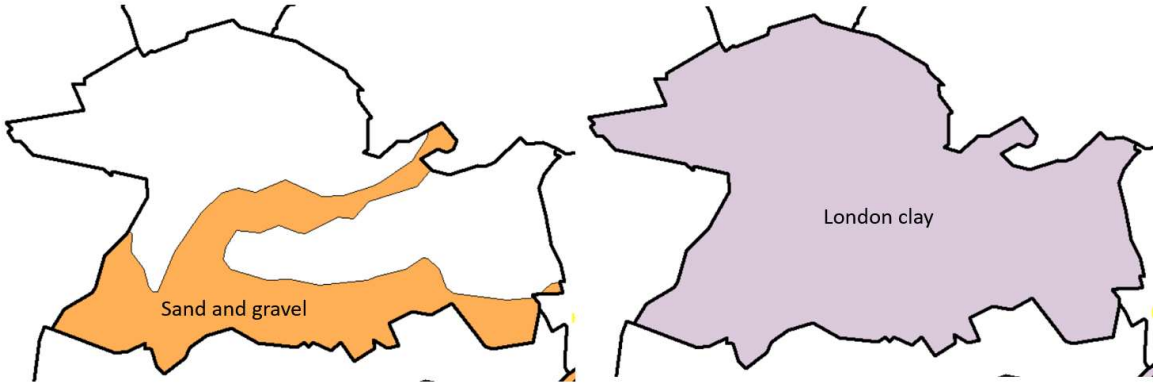
Subsidence Risk Analysis – EALING

Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html for more detail.

See page 10 for a seasonal analysis of the sample we hold which reveals that in the summer there is a greater than 75% probability of a claim being valid, and of the valid claims, there is a high probability (nearly 85% in the sample) that the cause will be clay shrinkage.

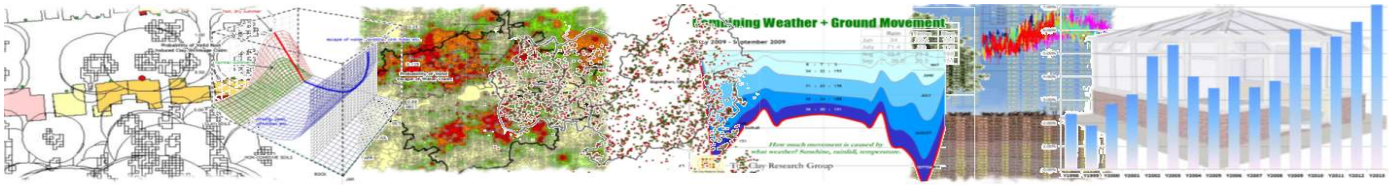
In the winter the likelihood of a claim being valid is much lower at around 30% and if valid, there is greater than 90% probability the cause will be due to an escape of water. Maps at the foot of the following page plot the seasonal distribution.

EALING : BGS Geology – 1:625,000 scale



DRIFT DEPOSITS **SOLID GEOLOGY**

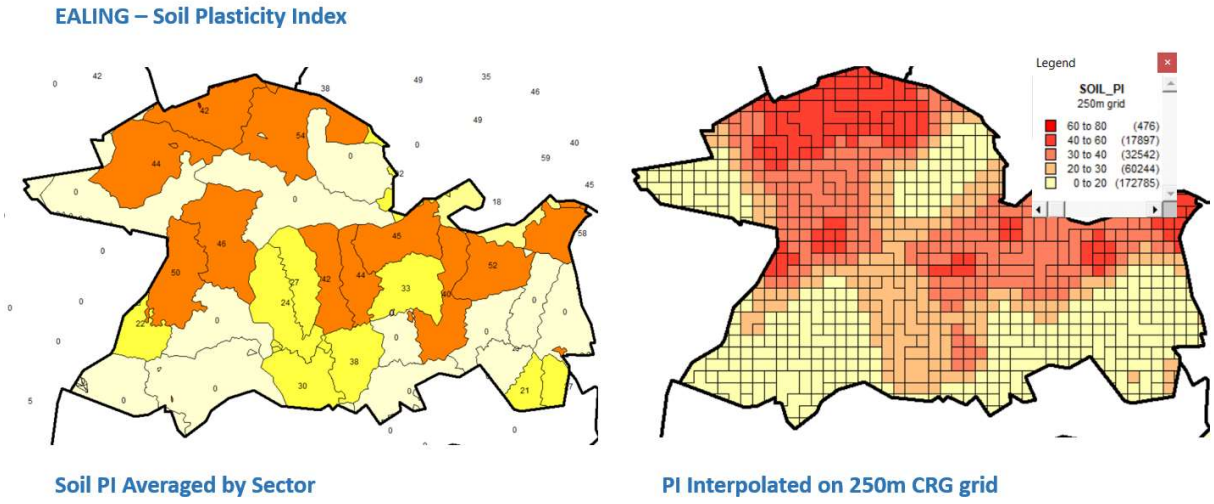
1:625,000 series British Geological Survey maps. Working at postcode sector level and referring to the 1:50,000 series maps deliver far greater benefit when assessing risk. The geology delivers a fairly equal distribution in terms of causation with clay shrinkage being the dominant cause in the summer, and escape of water in the winter.



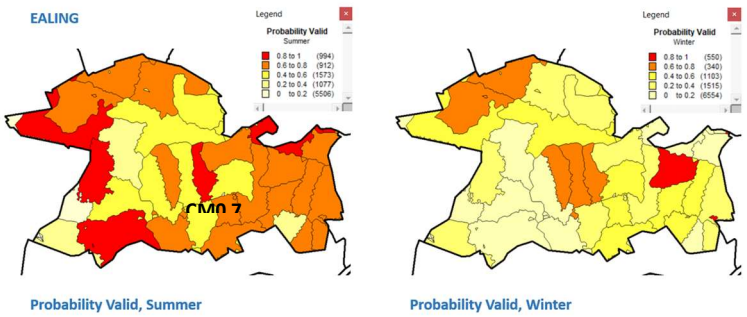
The Clay Research Group

Liability by Geology and Season

Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right). The higher the PI values, the darker red the CRG grid. The general pattern agrees with the BGS maps on the previous page.



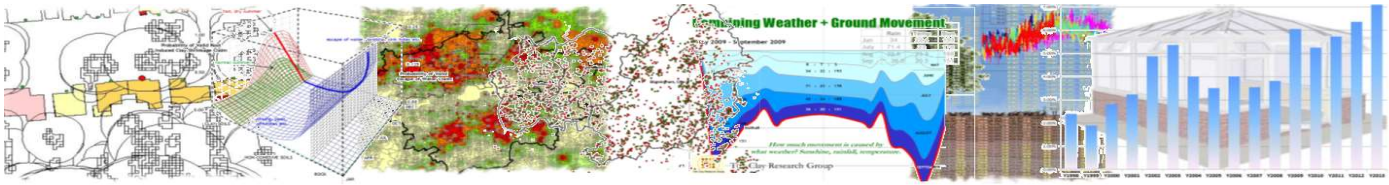
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. A single claim in an area with low population can raise the risk as a result of using frequency estimates.



The maps, left, show the seasonal difference from the sample used.

Combining the risk maps by season combined with the table on page 10 is perhaps the most useful way of assessing the likely cause, potential liability and geology using the values listed.

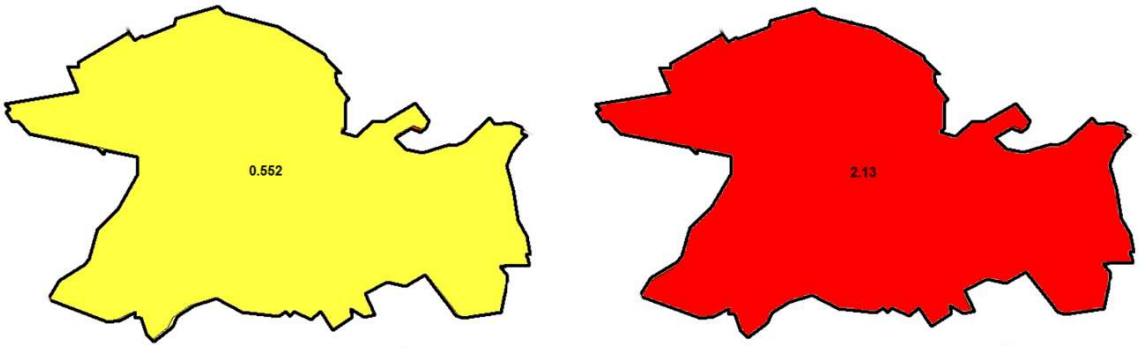
The claim distribution and the risk posed by the soil types is illustrated at the foot of the following page. Escape of water related claims are associated with the river terrace deposits and clay shrinkage claim, the outcropping shrinkable London clay. A high frequency risk can be the product of just a few claims in an area with a low housing density of course and claim count should be used to identify such anomalies.



The Clay Research Group

District Risk -v- UK Average. EoW and Council Tree Risk.

EALING - Subsidence Risk

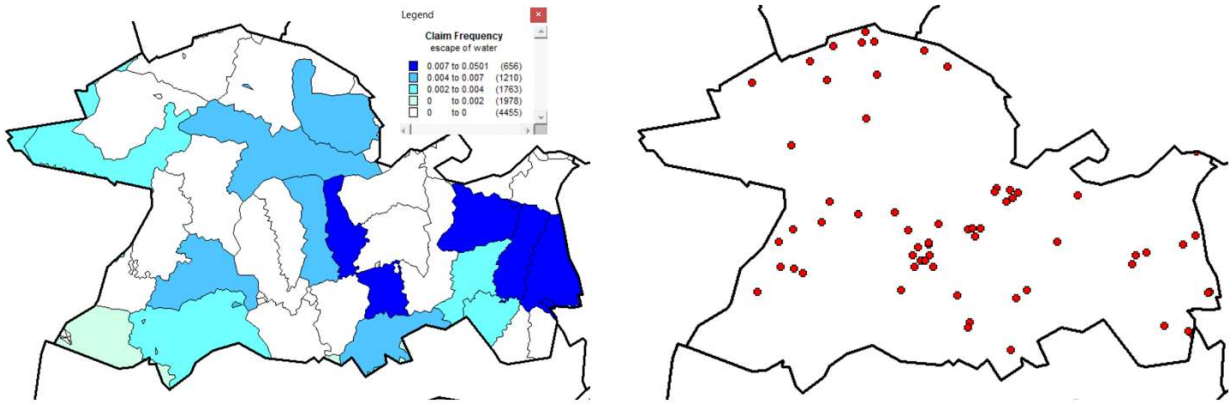


Normalised (0 – 1) Scale **Relative to UK Average**

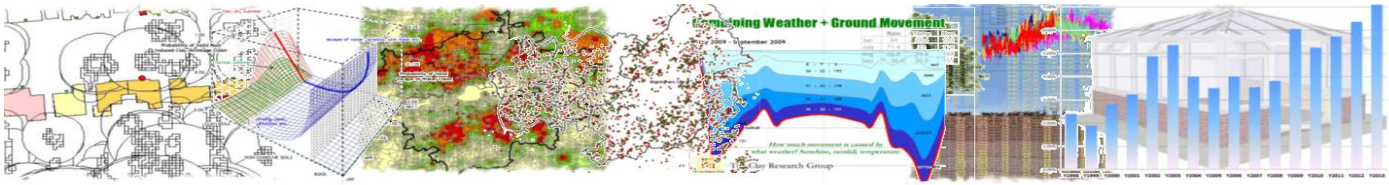
Below, left, mapping the frequency of escape of water claims reflects the presence of, non-cohesive soils – alluvium, sands and gravels etc. The absence of shading can indicate a low frequency rather than the absence of claims.

Below right, map plotting claims where damage has been attributable to vegetation in the ownership of the local authority from a sample of around 2,858 UK claims. The location coincides the presence of shrinkable clay soils – see both BGS (page 7) and CRG (page 8).

EALING



Higher Risk Escape of Water **Claims Involving Council Tree**
(2,858 UK claim sample)

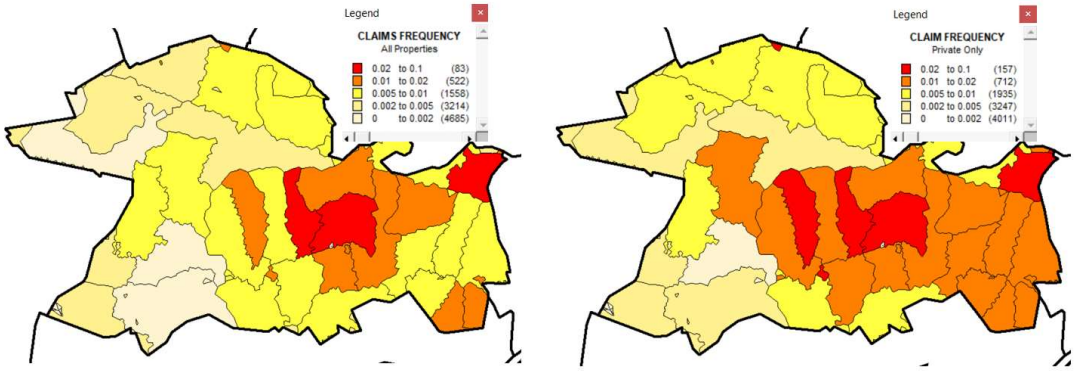


The Clay Research Group

EALING - Frequencies & Probabilities

Mapping claims frequency against the total housing stock by ownership (left, private, council and housing association combined and right, private ownership only), reveals the importance of understanding properties at risk by portfolio. There are a several sectors in the 'private only' map with an increased risk.

EALING - Postcode Sector Subsidence Risk (frequency) by Ownership

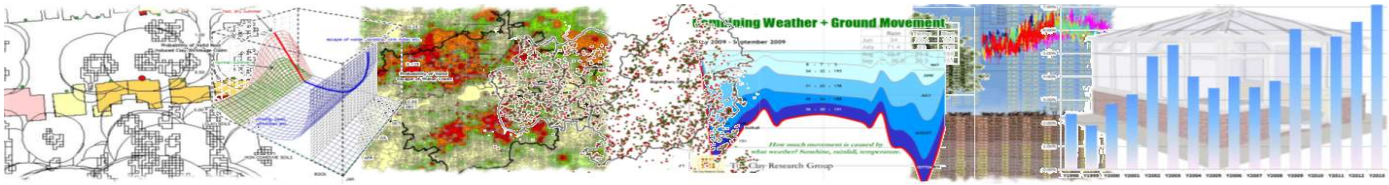


Combined Public and Private Frequency **Private Only**

On a general note, the reversal of rates for valid-v-declined by season is a characteristic of the underlying geology. For clay soils, the probability of a claim being declined in the summer is low, and in the winter, it is high. Valid claims in the summer are likely to be due to clay shrinkage, and in the winter, escape of water. For non-cohesive soils, sands gravels etc., the numbers tend to be lower throughout the year.

Liability by Season - EALING

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Ealing	0.675	0.100	0.225	0.04	0.27	0.69

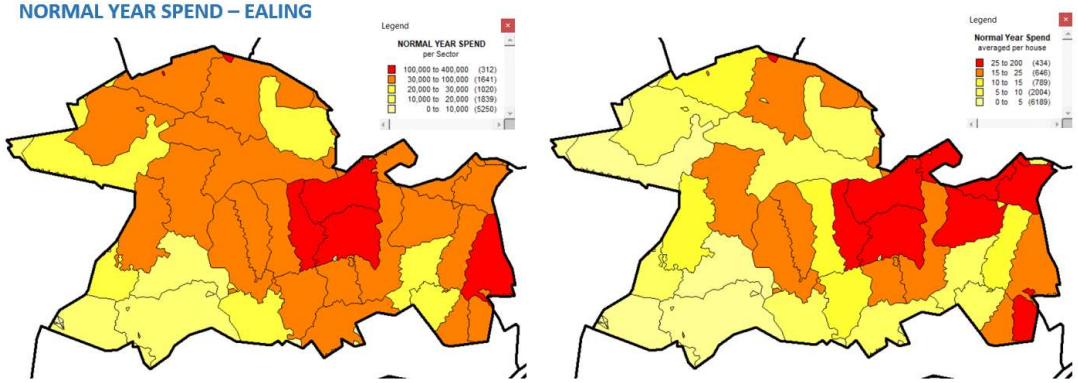


The Clay Research Group

Aggregate Subsidence Claim Spend by Postcode Sector and Household in Surge & Normal Years

The maps below show the aggregated claim cost from the sample per postcode sector for both normal (top) and surge (bottom) years. The figures will vary by the insurer's exposure, claim sample and distribution.

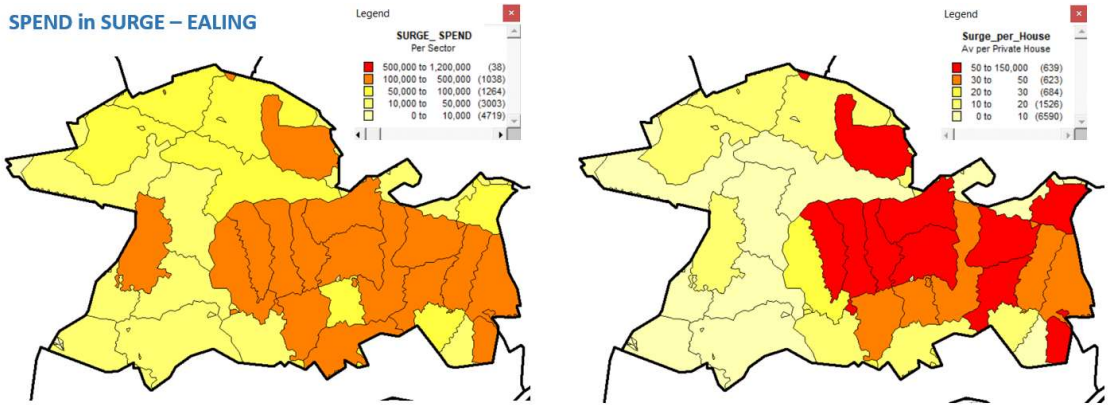
NORMAL YEAR SPEND – EALING



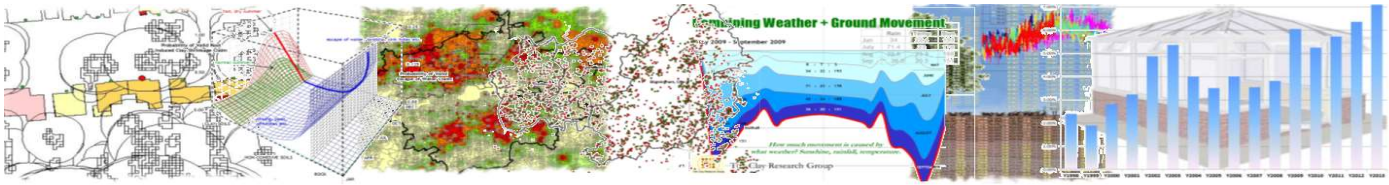
Spend by Sector **Spend Averaged over Housing Population**

It will also be a function of the distribution of vegetation and age and style of construction of the housing stock. The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across housing population to derive a notional premium per house for the subsidence peril. The figures can be distorted by a small number of high value claims.

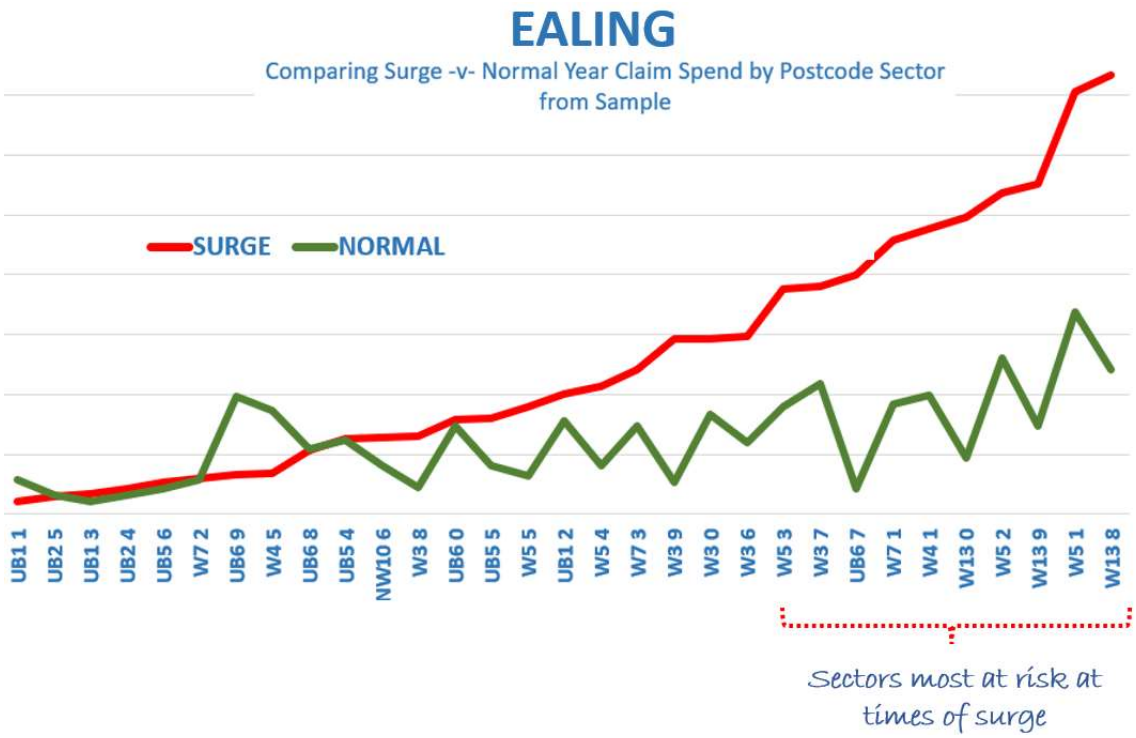
SPEND in SURGE – EALING



Spend by Sector **Spend Averaged over Housing Population**



The Clay Research Group



The above graph identifies the variable risk across the district at postcode sector level from the sample, distinguishing between normal and surge years. Divergence between the plots indicates those sectors most at risk at times of surge (red line).

It is of course the case that a single expensive claim (a sinkhole for example) can distort the outcome using the above approach. With sufficient data it would be possible to build a street level model.

In making an assessment of risk, housing distribution and count by postcode sector play a significant role. One sector may appear to be a higher risk than another based on frequency, whereas basing the assessment on count may deliver a different outcome. This can also skew the assessment of risk related to the geology, making what appears to be a high-risk series less or more of a threat than it actually is.

The models comparing the cost of surge and normal years is based on losses for surge of just over £400m, and for normal years, £200m.