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

October 2020
Edition 185

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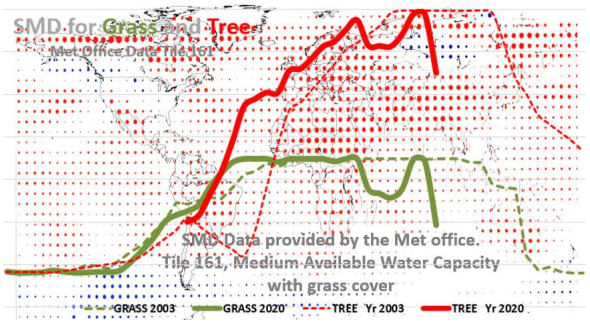
Issue 185, October 2020

SMD Update

Earlier concerns that the SMD data for both grass (green) and trees (red) were indicating a possible surge in claims have not materialised. Prior to 2006 the graphs had an 80% probability of predicting whether summer would deliver a surge or normal year towards the end of May but changing weather patterns have reduced their effectiveness. See page 2 for claim numbers.



'Risk by District' series

Hounslow is this month's 'Risk by District' area. Future editions will re-visit high risk districts that have been covered in previous editions, adding more detail.

BGS Rebrand

The new logo (below, right) updates the BGS brand.

BGS 1835

BGS British Geological Survey

Their web site explains the objectives:

- An updated logo derived from brand marks that were established in the 1900's.
- A refreshed colour palette inspired by rich earth tones to reflect BGS' work around the surface and subsurface.
- A clearer, more legible font to reflect the need for straightforward, easy-to-understand geoscientific information that is impartial and transparent.

Contributions Welcome

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

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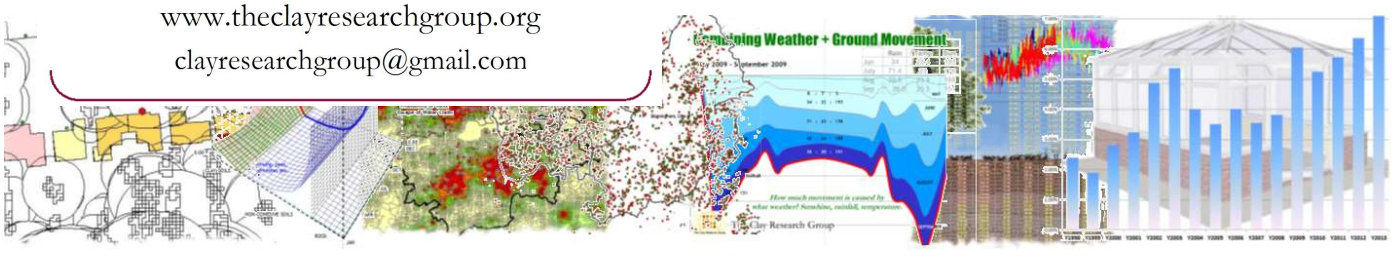

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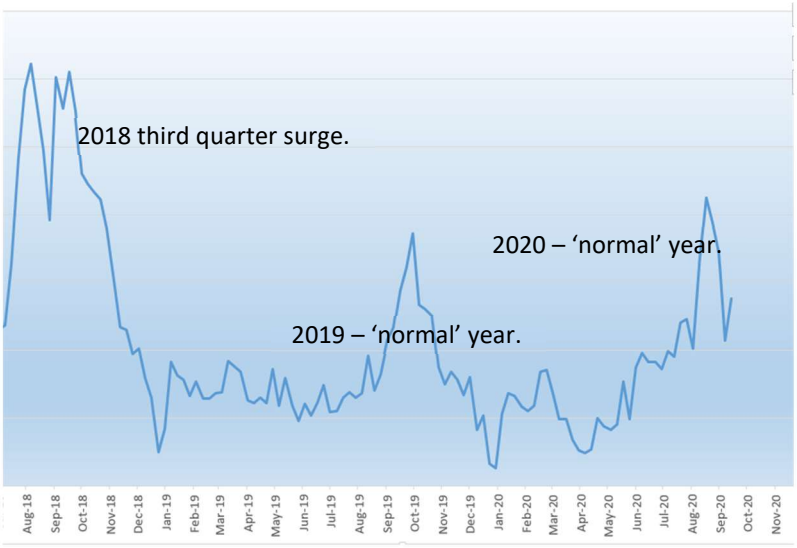


Claim Numbers

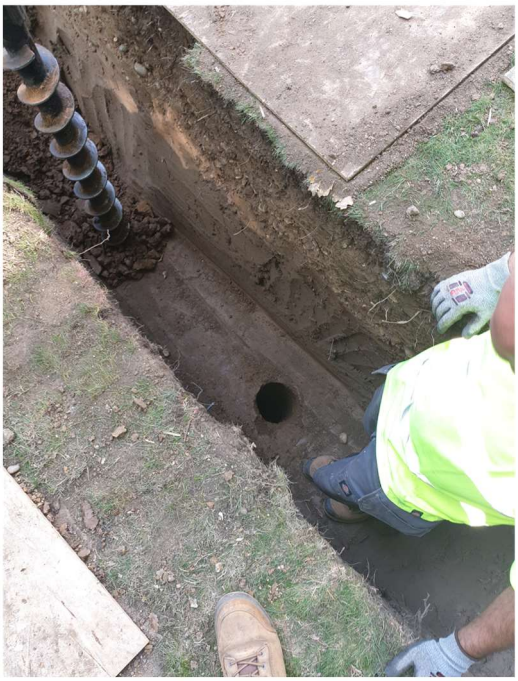
Claim numbers are following the 2019 profile and the threat earlier in the year of a surge based on the SMD profiles hasn't materialised.

Numbers will probably be around 20,000.

Intervention Technique

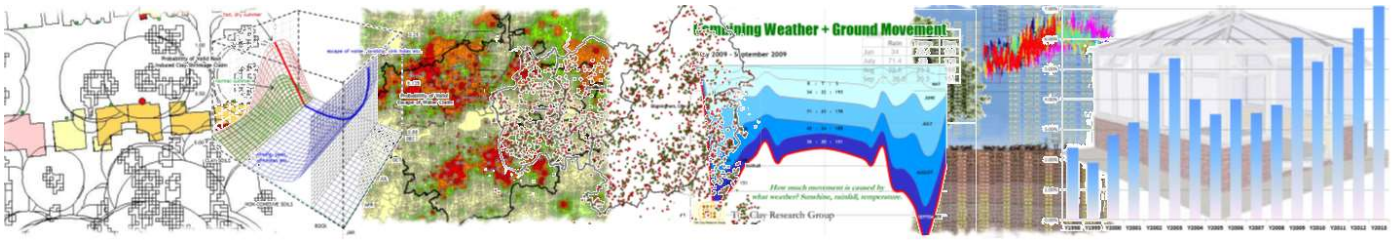
Update Provided by Dr. Allan Tew of the Innovation Group

We understand that Innovation Group have installed the Intervention Technique on over 500 claims.



The patented system involves excavation of a trench to contain water and minerals. Holes are then drilled into the base of the excavation and filled with sand. Water percolates into the bores to service roots at depth.

The objective is to provide sufficient water to (a) reduce ground shrinkage by rehydration and (b) transport the hormone, abscisic acid produced by the roots growing in the desiccated soil on the side opposite to the treatment area, to the leaves, leading to closure of the stomata.



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The Changing World of Domestic Subsidence

The Part Played by The Building Research Establishment

The contribution of the BRE towards understanding domestic subsidence is well known. Over a relatively short period of time, the team at Garston produced a range of Digests, Information Papers and published research papers providing a resource that engineers and surveyors were able to refer to when making decisions, leading to changes in the way claims were handled.

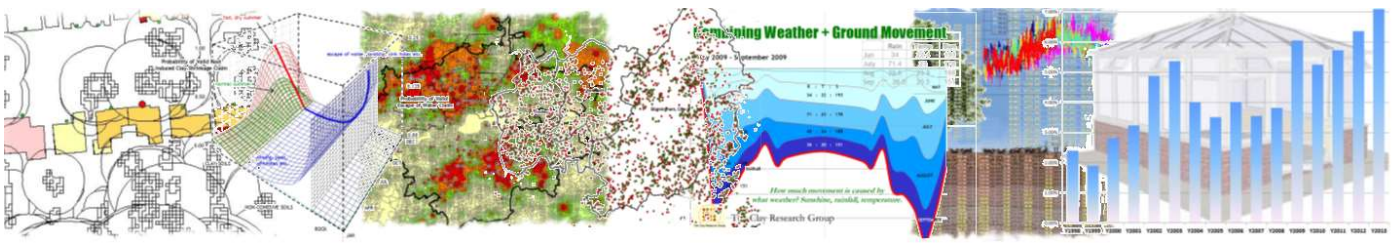
Up until their involvement, there was little by way of advice and engineers often specified underpinning to protect their PI cover. After all, if they didn't specify underpinning and the cracks returned, who would be liable?

The BRE led the way by providing authoritative advice which led to engineers being able to specify repairing drains, removing or reducing vegetation and monitoring to avoid costly underpinning schemes. Cost savings resulting from their research amounts to many millions of pounds. In the surge year of 1990, around 50% of all valid claims were underpinned. Now the figure is closer to 5%.

Richard Driscoll headed up the research unit (see Edition 118 of the CRG newsletter for background), working with Tim Freeman and Mike Crilly. Tim took a particular interest in the value of precise levels to diagnose causation, measure the amplitude of movement and arrive at the appropriate repair. He is the author of 'Has your house got cracks?', a best-selling book from publishers Thomas Telford. Tim has participated in several technical audits on behalf of major insurers and provides Expert Witness services to solicitors and the Insurance Ombudsman.

Mike is an expert in the field of geotechnics and, in conjunction with Prof. Chandler from Imperial College, developed the widely used suction test to improve the diagnosis of desiccation in clay soils. He is the author of many published research papers.

Both Tim and Mike continue in roles related to their field of interest. Tim is the MD of GeoServ Ltd., who undertake precise levelling and Mike is an Associate Director with Geotechnical Consulting Group. Richard maintains a role as an expert witness and provides advice on claims.



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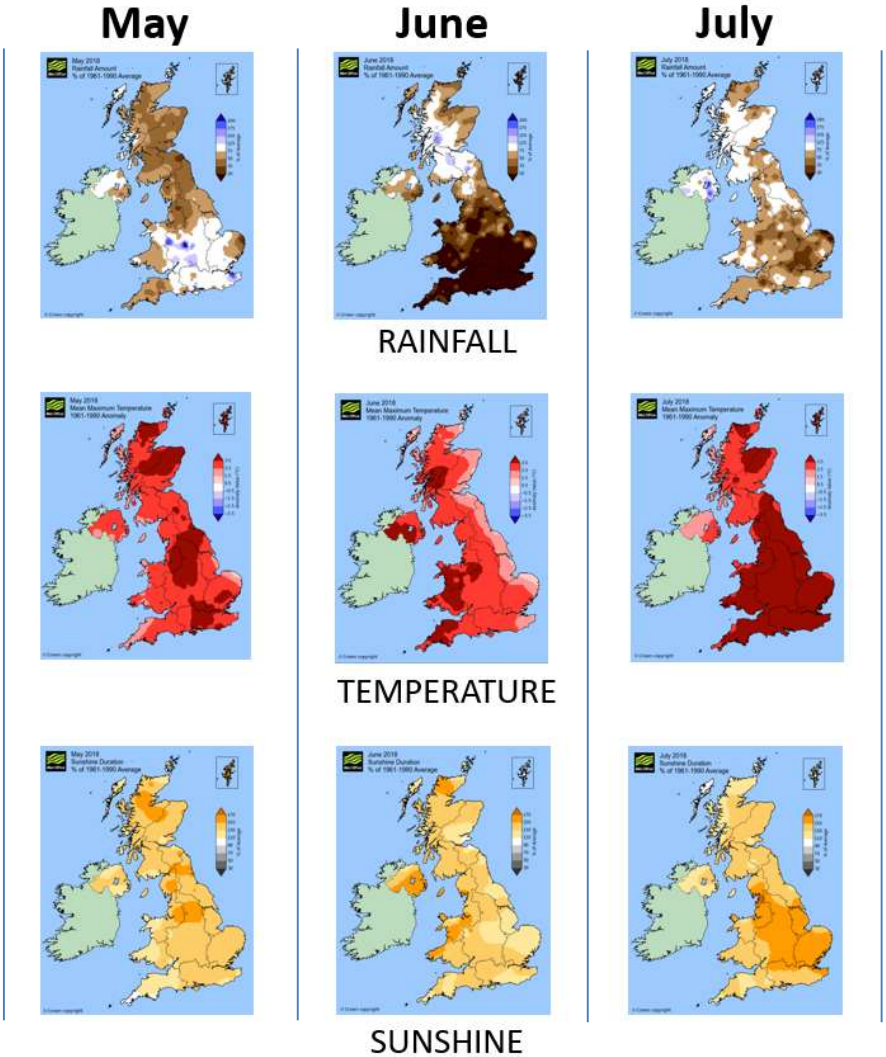
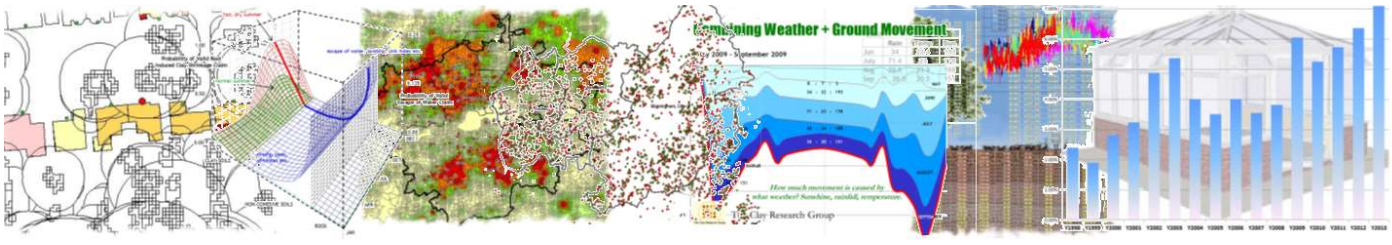
2018 – Third Quarter Surge. Anomaly Data

Below, maps provided by the Met Office showing rainfall, temperature and sunshine anomaly data comparing 2018 with the 1961-1990 average. 2018 delivered a third-quarter surge and the Met Office data helps to understand the cause.

Top row, June 2018 was far dryer than the average for the period 1961-90, and this continued into July. The temperature maps reveal it was warmer, increasing into July and finally, the hours of sunshine were also higher, again increasing in July.

The drier, warmer weather with longer hours of sunshine in 2018 almost certainly explain the third quarter surge.





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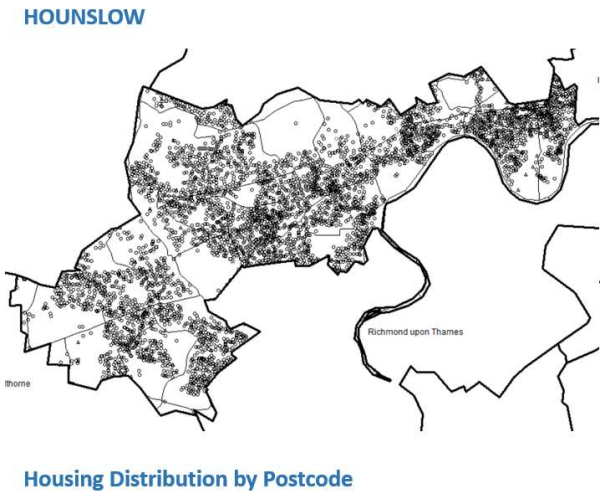
Subsidence Risk Analysis – HOUNSLOW

Hounslow occupies an area of around 56km^2 with a population of over 270,000.



Distribution of housing stock using full postcode as a proxy. Each postcode in the UK covers on average 15 – 20 houses, although there are large variations.

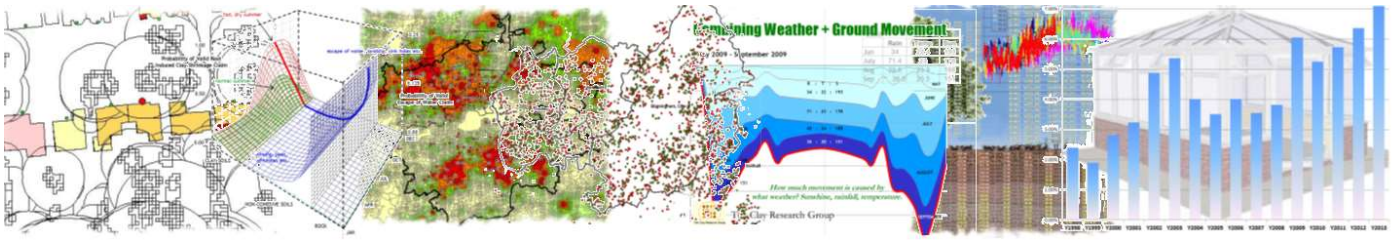
Housing distribution across the district (left, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there concentrations of claims simply because there are more houses?

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.

Districts are rated for the risk of domestic subsidence compared with the UK average – see map, right.

The highest risk rating is a value of 4 and Hounslow is rated as being 1.03 times the UK average risk, putting it in 152nd place.

Hounslow is ranked 152nd in the UK in terms of 'risk by district' and rated 1.03 x the UK average risk for domestic subsidence claims from the sample analysed. Above, values at postcode sector level.



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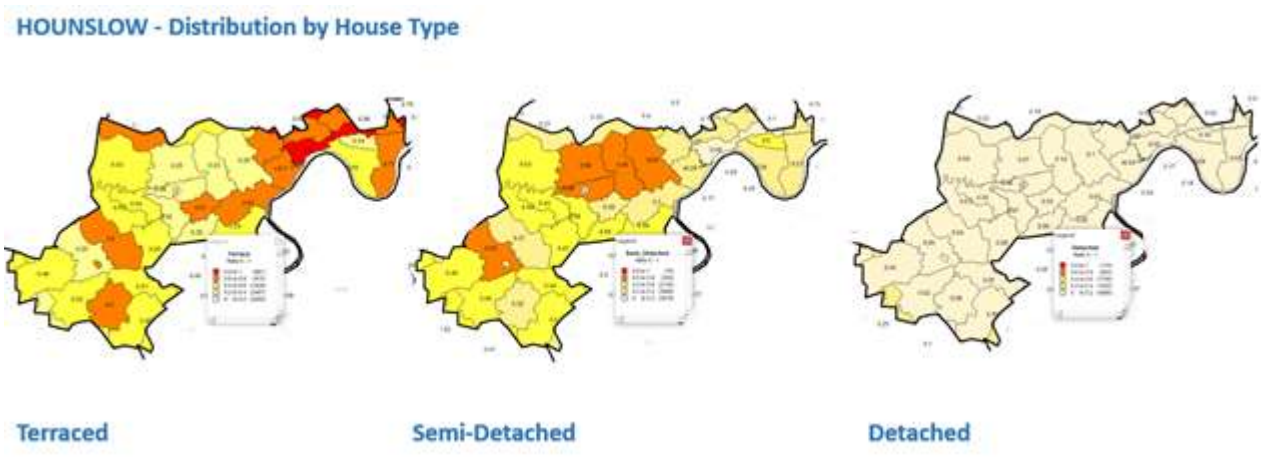
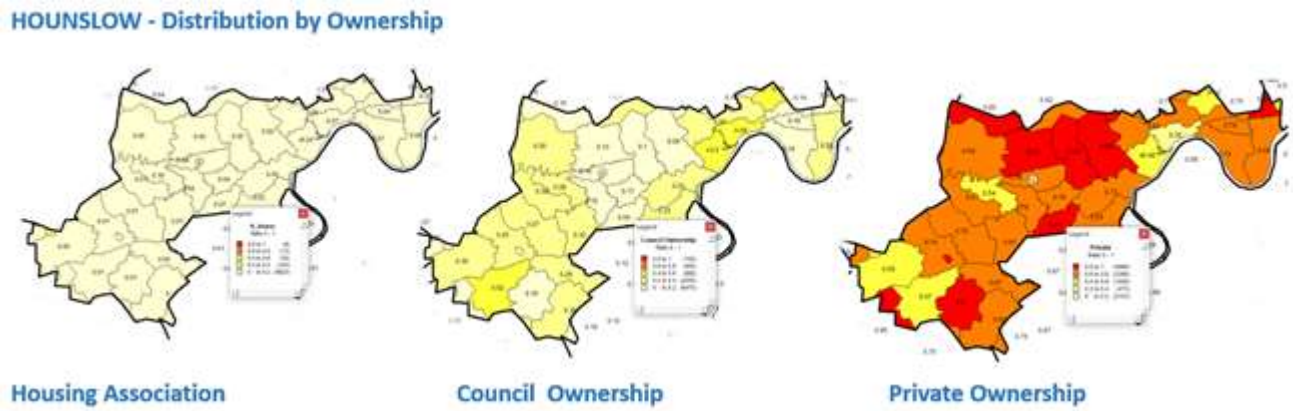
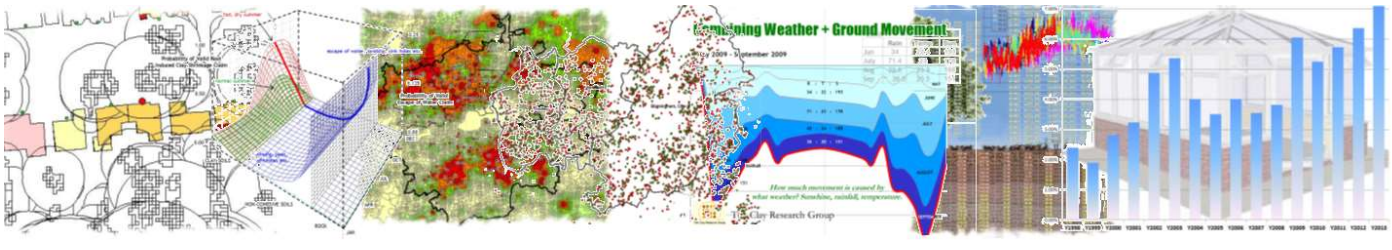
HOUNSLOW - Properties by Style and Ownership

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 from a visual assessment using Google Street View, we rate Hounslow at around 0.48 (variable across the district) on a scale of 0 – 1. Policies allow insurers to assign a rating to individual properties.



Distribution by ownership is shown below. The maps reveal predominantly privately-owned properties across the borough.





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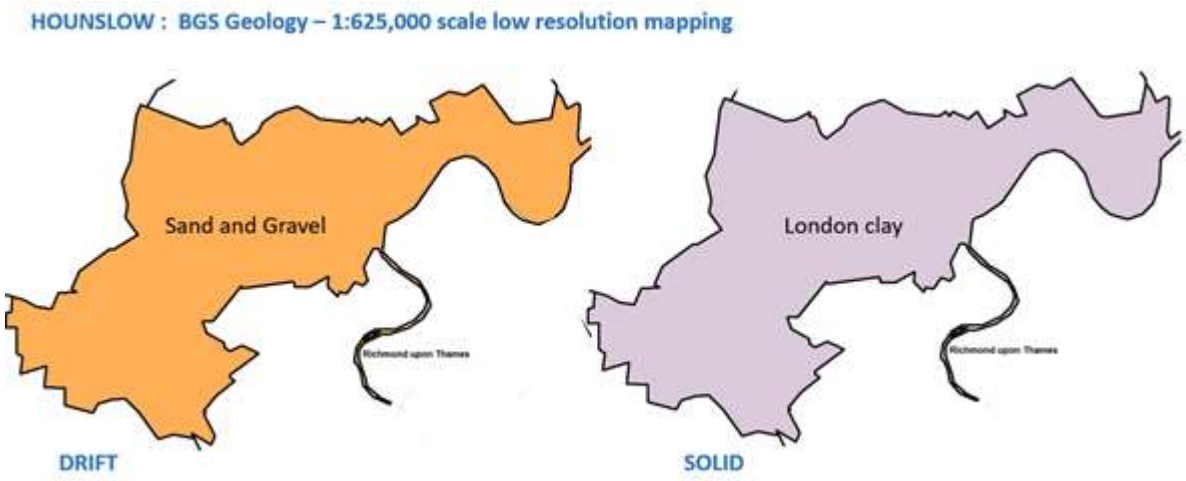
Subsidence Risk Analysis – HOUNSLOW

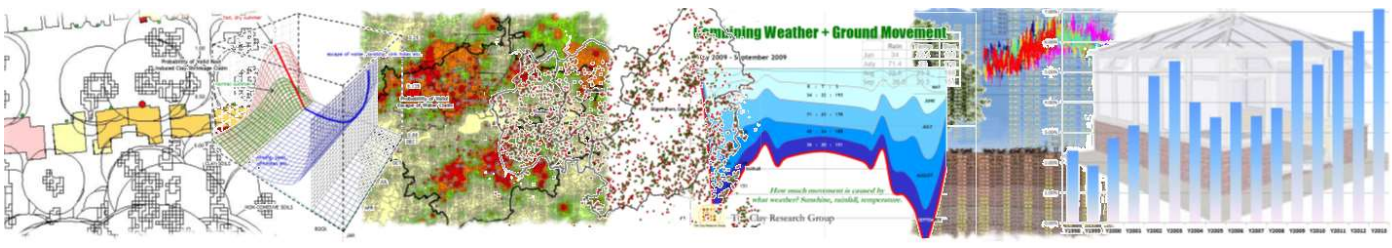
Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html for more detail.



See page 10 for a seasonal analysis which reveals that in the summer there is a 62% probability of a claim being valid, and of the valid claims, there is a 55% probability that the cause will be due to clay shrinkage.

In the winter the situation is similar in terms of the number of claims declined or accepted as valid. The most likely cause of a valid claim (by a narrow margin) is an escape of water – a leaking drain most likely or water service.

The analysis reflects the influence of the underlying clay series and the apparent shallow thickness of the superficial deposits in some locations.



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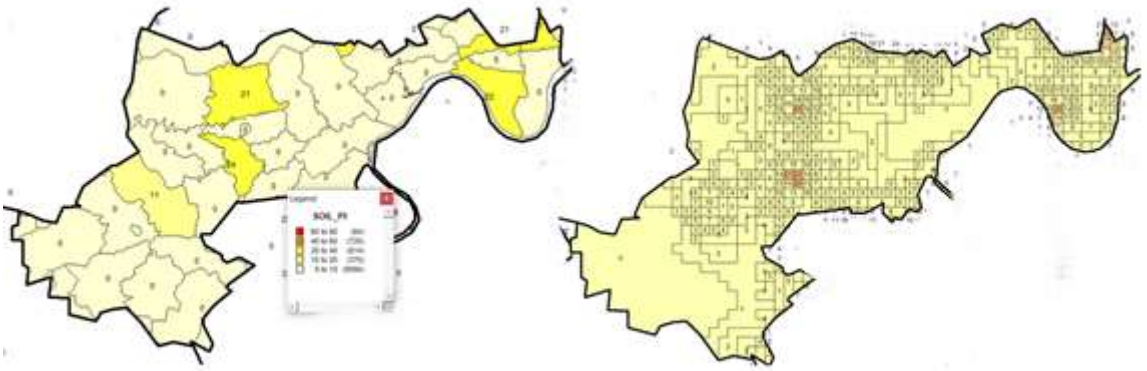
Liability by Season and Geology

Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right). The presence of a gravel deposits on the BGS maps (previous page) is reflected by the zero values on the CRG map.

HOUNSLOW – Soil Plasticity Index

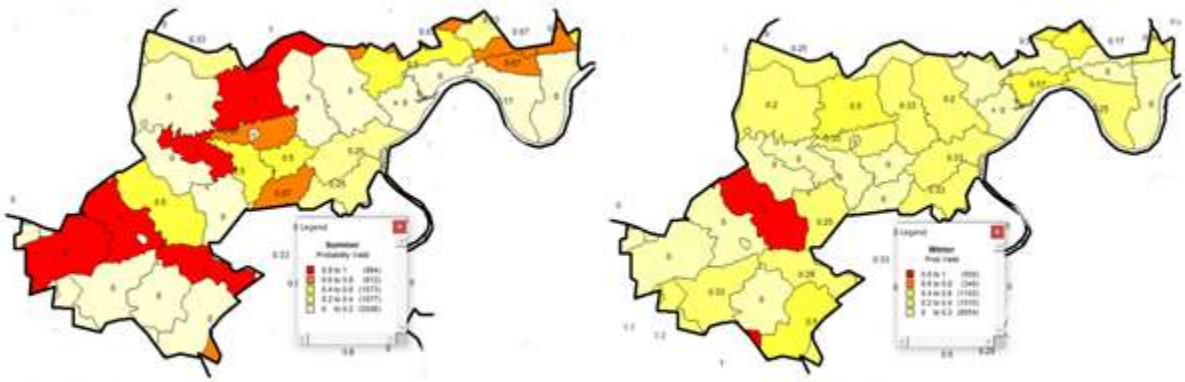


Soil PI Averaged by Sector

PI Interpolated on 250m CRG grid

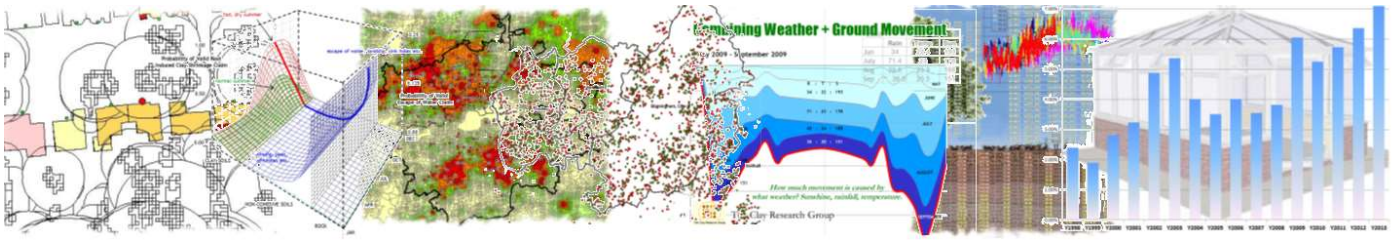
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. The widespread influence of the shrinkable clay plays an important role in determining whether a claim is likely to be valid or declined by season. A single claim in an area with low population can raise the risk as a result of using frequency estimates.

HOUNSLOW – probability of valid claim by season



Probability Valid, Summer

Probability Valid, Winter



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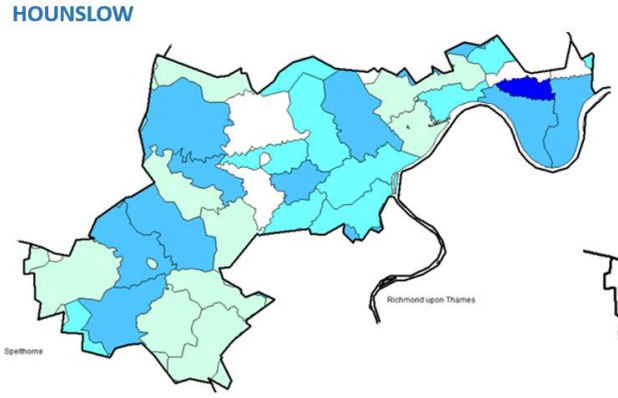
District Layout. EoW and Council Tree Risk.

Roads and Postcode Sectors

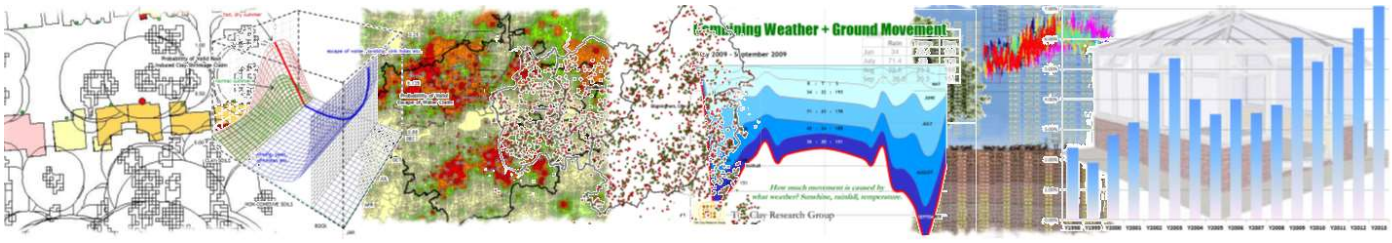
A review using Google Earth's Street View (above) is useful in providing context and exploring the differences in property ages and styles of construction across the district.

Below, left, mapping the frequency of escape of water claims from the sample reflects the presence of the non-cohesive drift deposits or shallow foundations on backfill given the age of some of the housing stock. Below, right, dots on the 'Council Tree Claims' map represent properties where damage has been attributable to vegetation in the ownership of the local authority and coinciding with a clay formation.



Escape of Water Frequency Distribution

Local Authority Street Tree Claims



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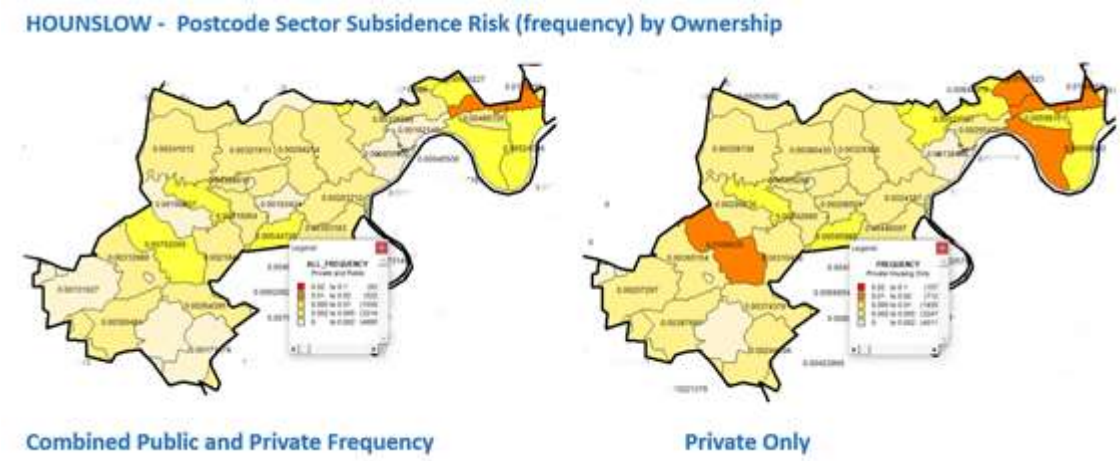
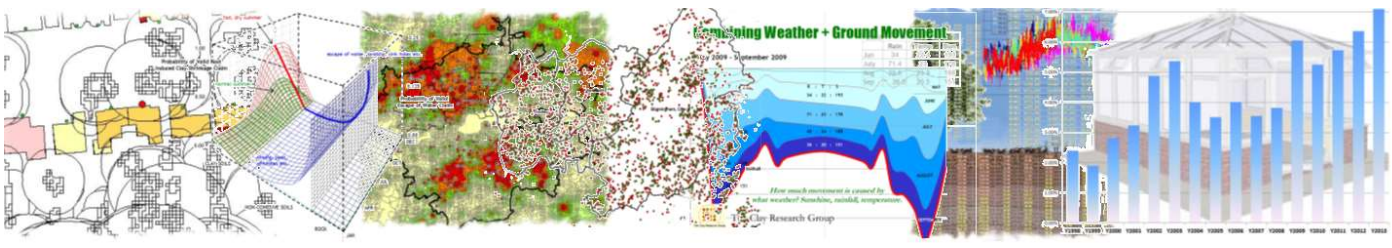
HOUNSLOW - Frequencies & Probabilities



The figures in the table below suggest a fairly even distribution between the three categories listed by season, indicative of a variable geology. Hounslow is around the average risk in the UK in terms of domestic subsidence, ranked 152nd.

Liability by Season - HOUNSLOW

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Hounslow	0.348	0.270	0.382	0.28	0.35	0.37



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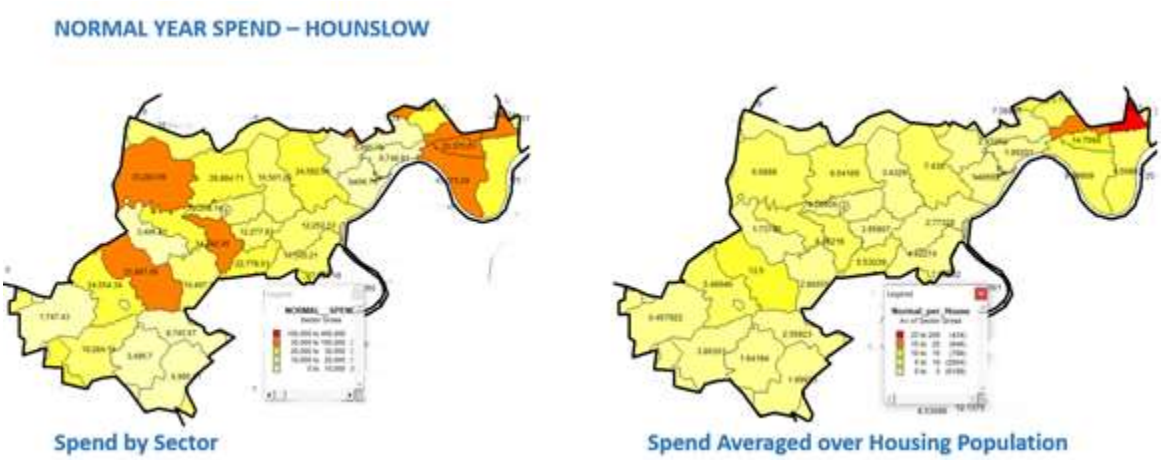
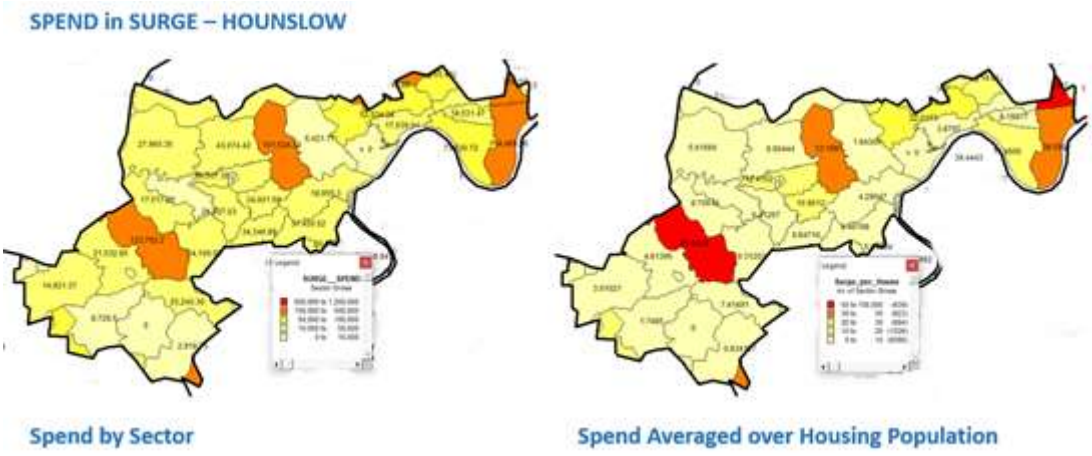
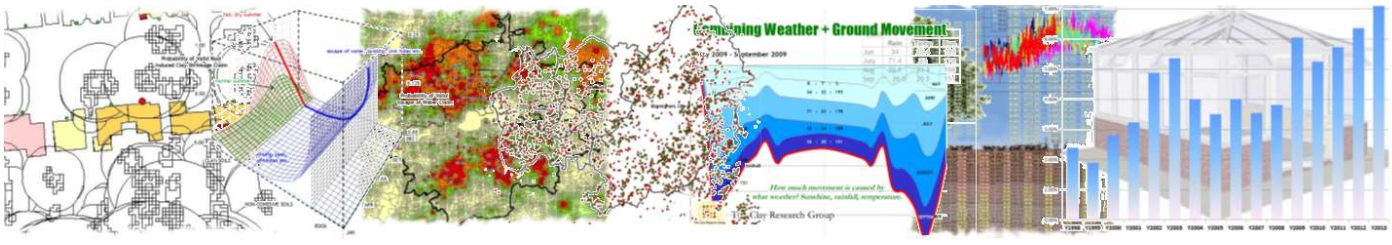
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Surge & Normal Years

The maps below show the aggregated claim cost from the claim 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.



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.





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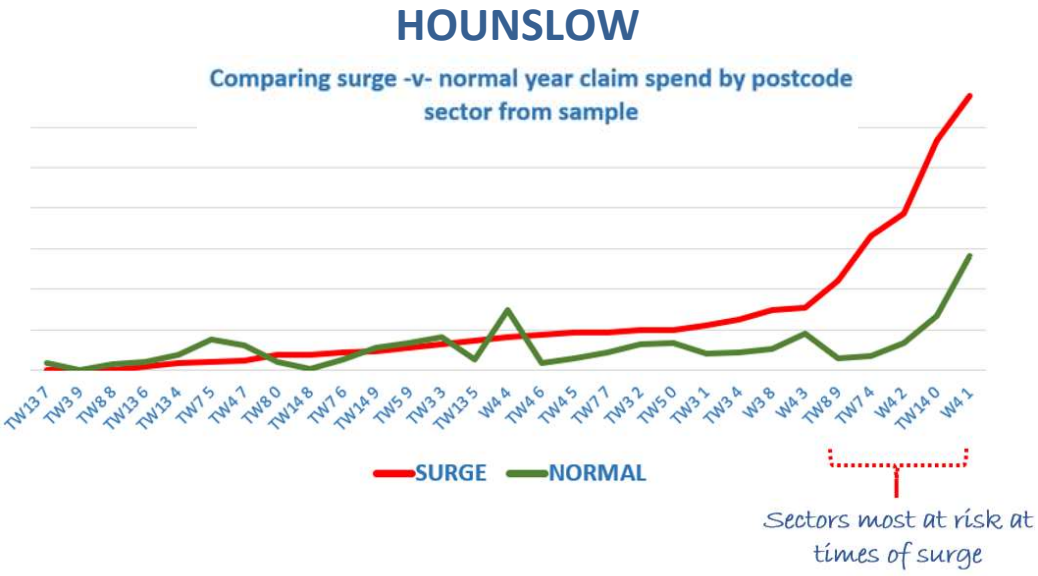

The above graph identifies the variable risk across the district based on house by house spend, distinguishing between normal and surge years by postcode sector. Divergence between the plots indicates those sectors most at risk at times of surge (red line).

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 can 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.

From an underwriter's point of view, the values would vary by sum insured and both overheads and profit need to be added.