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

September 2018
Edition 160

The Clay Research Group

CONTENTS

Issue 160, September, 2018

The GeoBear Map

Thanks to Dr. Jon Heuch of Duramen Consulting for drawing our attention to the following site plotting subsidence risk from the company's claims experience across the UK.

https://www.geobear.co.uk

Geobear are the founders of Uretek, the soil injection company. They have accessed 10,000 claim records to build the map

Risk Modelling
- Basingstoke and Deane -

After concentrating on the London boroughs, this month's edition travels west and looks at Basingstoke and Deane to explore the risk of subsidence, the geology, house type by style and ownership and comparing the CRG soil model with the BGS small scale 1:625,000 series maps.

The borough is rated fairly low risk, placed 296th in the subsidence risk table.

Subsidence Forum Award

The annual £500 prize for the subsidence Dissertation Initiative is to be announced shortly by the Subsidence Forum.

Visit http://www.subsidenceforum.org.uk/ for details.

Climate Modelling and Subsidence

In next month's edition we review the work of the CRG in this area.

Risk changes with the shrink/swell potential of clay soils, and differs by year and by month – geology and time are linked. The model takes account of variability both spatially and temporally.

Re-visiting the model has been triggered following a review of both the BGS and Cranfield work in this area.

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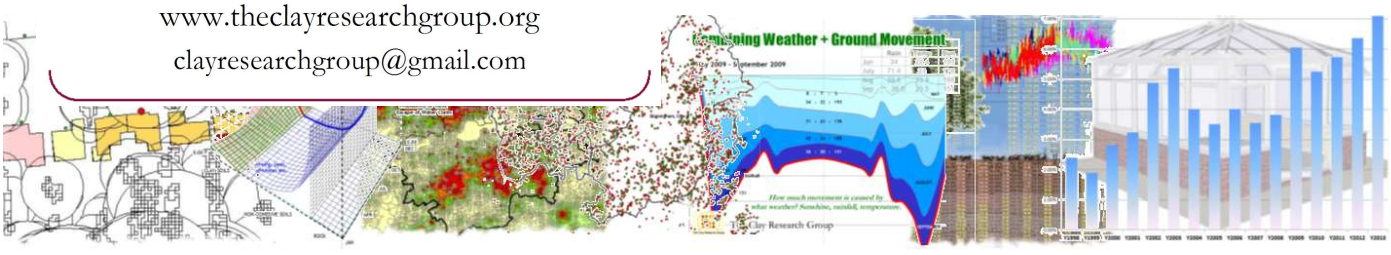

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Met Office Update – Extract from their Web Site

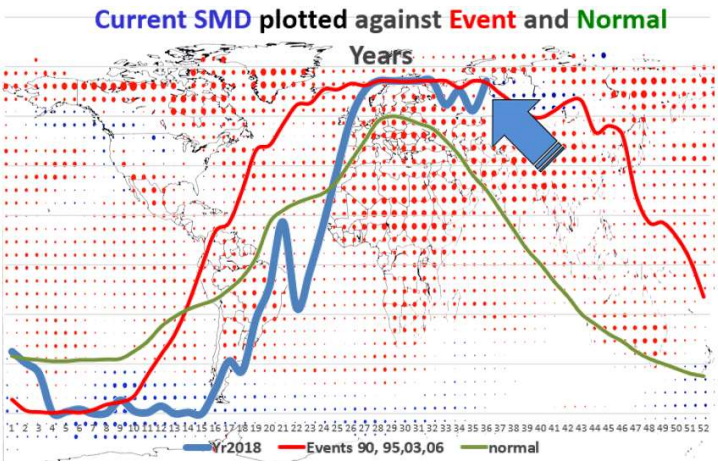
"Having further assessed the temperature data for the UK as a whole for summer 2018 the figures are so close that we are declaring it as the joint hottest on record together with 2006, 2003 and 1976."

"The margin between the mean temperatures at the top of the league tables (records dating back to 1910) is so small, at around 0.03 of a degree, that it is impossible to separate the years.

Usually we will only quote statistics to the nearest 0.1C as differences smaller than this could result from small numerical differences arising from the statistical calculations. The provisional temperature for the summer of 2018 is nominally 15.80C, for 2006 is 15.78C, for 2003 is 15.77C, and 1976 is 15.77C all of which are within 0.03C of each other, and will therefore be quoted as 15.8 °C."

"2018 was clearly the warmest summer on record for England, with a provisional figure of 17.1C as of 31 August on the Met Office's mean temperature measure for the whole country, beating the 17.01C of 1976."

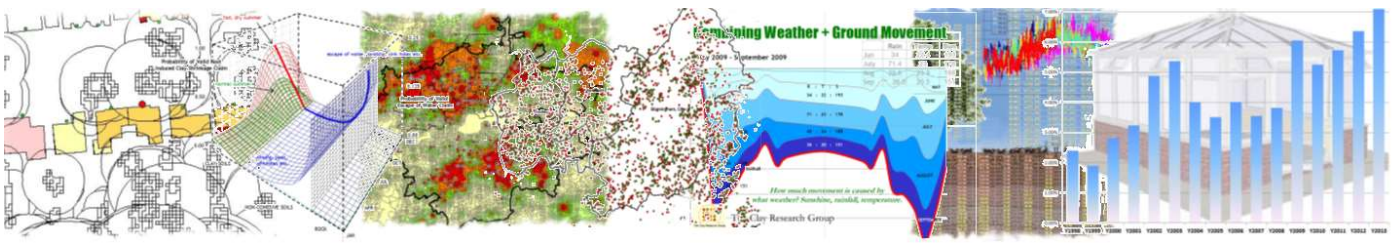
SMD Update



Soil Moisture Deficit (SMD) chart for tile 161, grass cover and Medium Available Water capacity. Data supplied by the Met Office.

Left, SMD profiles comparing 2018 (blue) with the averaged profiles for event (red) and normal (green) years. 2018 appears to be on target to deliver high claim numbers given the foregoing, but what would constitute a surge following 10 years of falling claim numbers?

Are we talking about numbers to match the surges in 2003 and 2006, or more modest increases from the 2017 figure of 12,000 claims? Will it be 20,000 claims, or 50,000? Our guess is fewer than 20,000.



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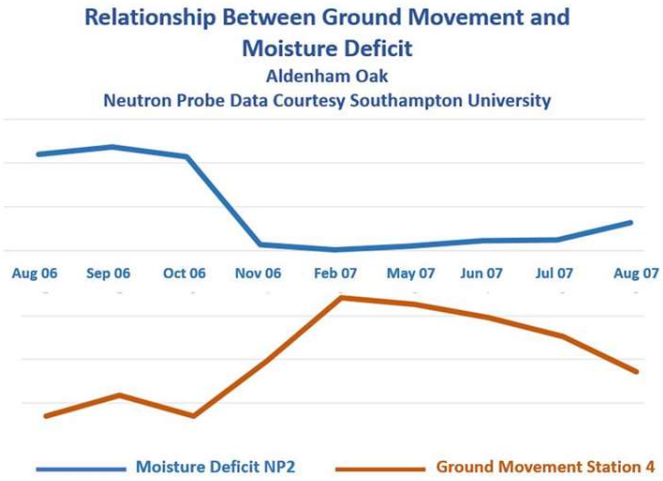
The Relationship between Mc and Ground Movement

The research team from Southampton University measured moisture change at the site of the Aldenham oak in 2006/07 using a neutron probe.

Plotting these alongside ground movement data from the GeoServ results reveals a close connection between the two.

The level stations are at shallow depth which no doubt explains the close correlation. Had the levelling stations been deeper, the ground movement profile would have been delayed, reflecting the time taken for water to percolate to depths of around 2mtrs or more.



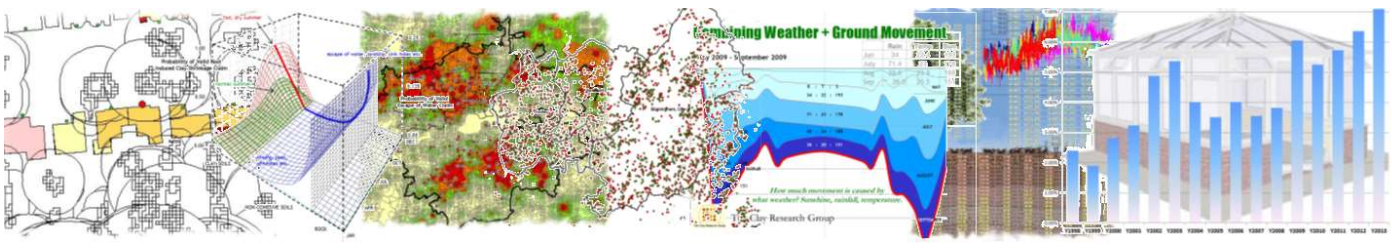
Plotting ground movement profiles and moisture change reveals a close correlation, mirroring the work done by the BRE at the Chattenden site. As the moisture deficit decreases, the ground rises.

The Problem with (some) Data

Surely, risk is risk, and all maps should correspond – approximately of course. The reasons for variations are as follows. First, what period does the sample relate to? Some relate to a surge year, whilst others use normal year data. Some may compare spend, count of claims, frequency or perhaps soil type. Differences are sometimes due to inconsistent gradations of the frequency/count intervals, or variations in thematic colour schemes. Please don't mention averages.

What do we mean when we say account has been taken of demographics? Are we really linking subsidence risk to religion, gender, ethnicity, age of occupiers and number of cars per household? Or is it the case that risk is related to age of house, geology and vegetation and whilst we may not have the measure of each, the data does reflect their combined influence. Sometimes.

We also have to recognise that it's a changing world. A borough receiving high numbers of subsidence claims in a warm, dry year may instigate a policy of heavy tree pruning or felling, reducing the risk significantly going forward. Apart from the foregoing, all of the data we see is accurate, infallible and simply amazing. Occasionally.



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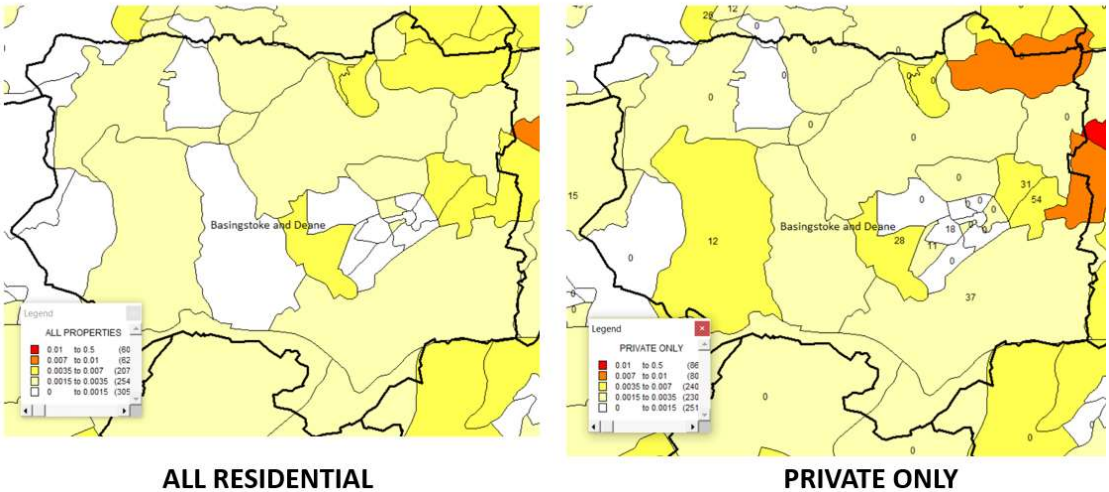
Basingstoke & Deane – Risk of Subsidence

Basingstoke & Deane has a population of just over 87,000, a housing stock of around 70,000 and an area of 634km^2.

Private housing comprises just under 67%, social housing 21% and private rented accommodation 12%.

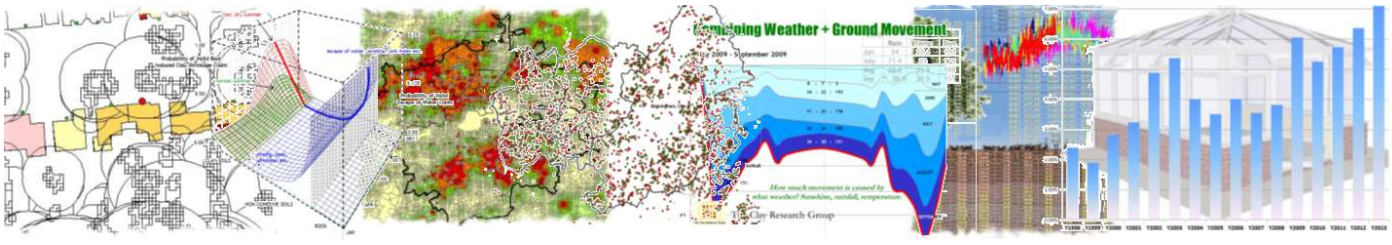
All figures are approximate and taken from past Census data.

CLAIM FREQUENCY



ALL RESIDENTIAL **PRIVATE ONLY**

Claim distribution by ownership. Figures in sectors on 'private only' map (right) record soil plasticity index. The orange shaded sectors coincide with the presence of outcropping London clay – see following page. The CRG soils map does not have a record of clay to the top, right sector (RG7 2) of the 'private only' map although clay is correctly recorded in the BGS series. Reference to a recent site investigation revealed an average PI of 32%.



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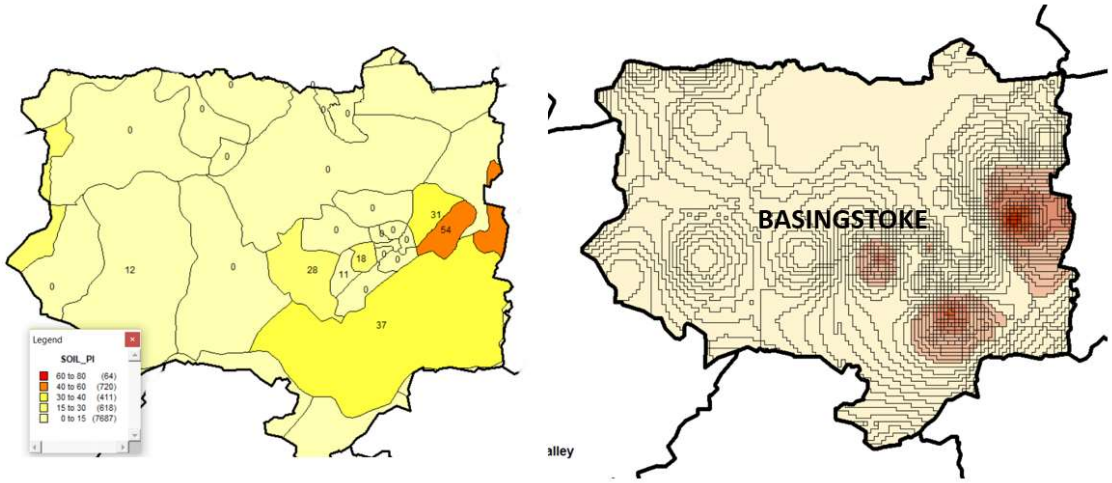
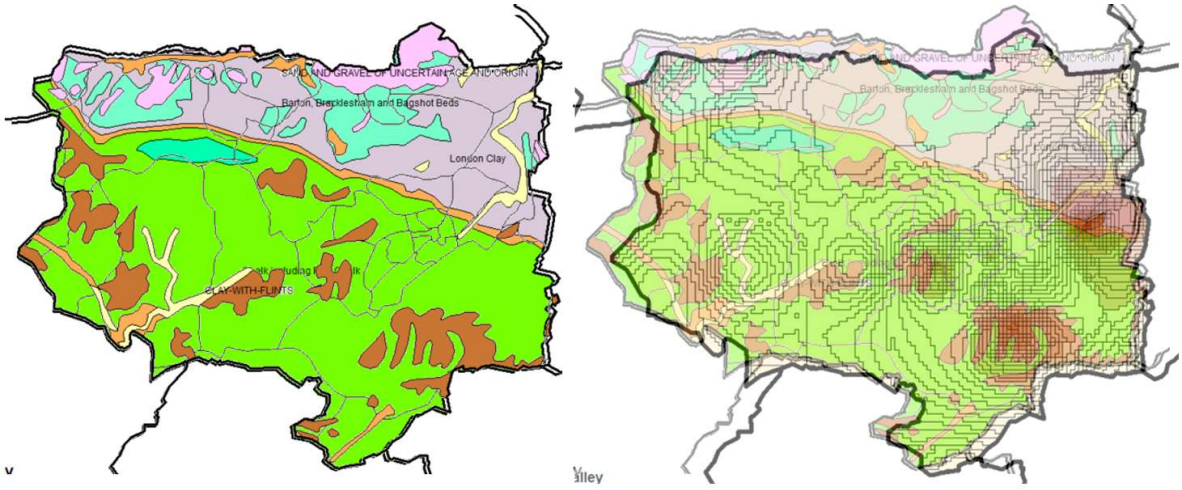
Basingstoke and Deane – Geology



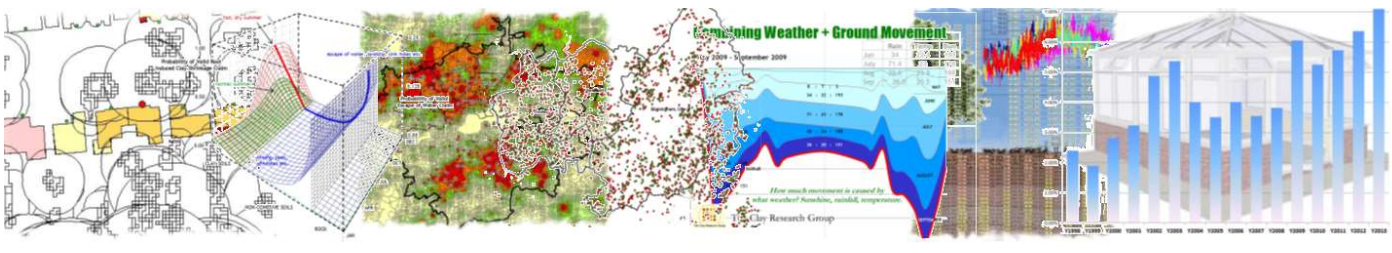
SOIL PI **CRG SOIL MAP**

CRG geological maps showing max. soil PI by postcode sector from investigations undertaken following notification of claim (left) and interpolated data on a 250m grid (right).



BGS DRIFT AND SOLID **CRG OVERLAY**

Above extracts from the small scale (1:650,000) British Geological Survey map showing drift deposits and solid geology (left). Right, overlaying the CRG model onto the BGS map reveals an interesting match. The highly shrinkable clays highlighted on the CRG map correspond with outcropping London clay and areas of clay with flints.



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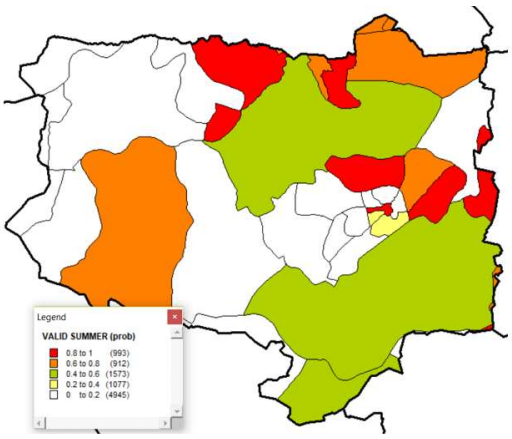
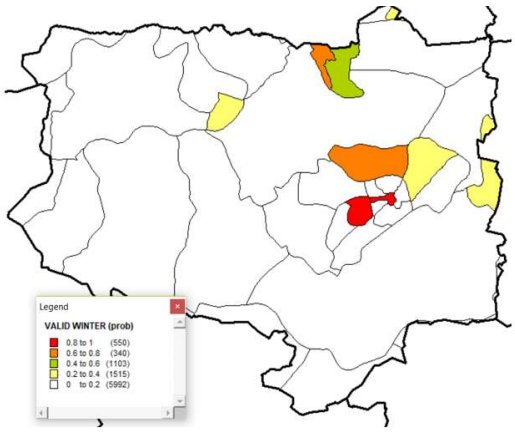
Basingstoke and Deane – by Season

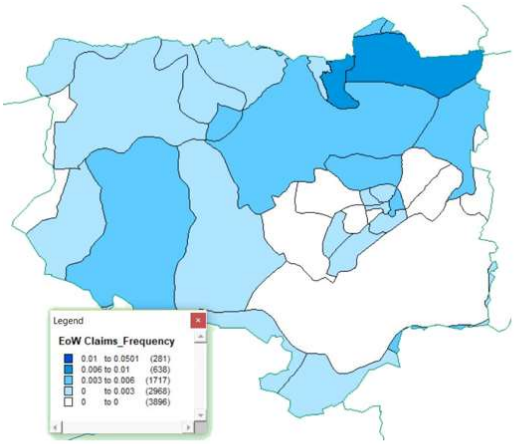


Prob Valid Claim - Summer

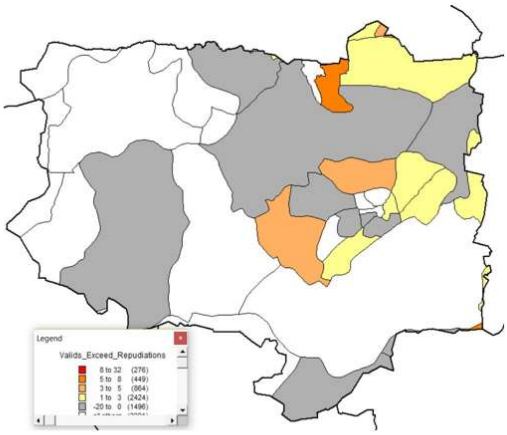


Prob Valid Claim - Winter

Probability of valid claim by season. The value is not related to claim frequency, but to the likelihood that, when a claim is notified it has 'x' probability of being valid based on analysis of historic data. Again, the legend provides breakdown in 20% bands covering the UK, not just Basingstoke and Deane.

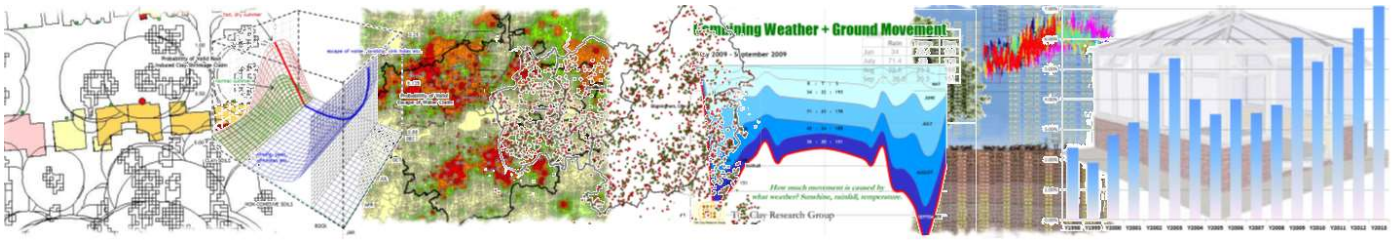


Distribution of EoW Claims



Declinatures and Valid Claims

Left, distribution of primarily water related claims correlating to the outcropping chalk and superficial Barton, Bracklesham and Bagshot beds. Right, grey shaded sectors reflect higher rates of declinatures than valids – other shaded sectors (yellow, orange etc) illustrate higher numbers of valid claims than declinatures. Sample of just over 44,000 claims, not seasonally adjusted.



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TERRACED SEMI-DETACHED DETACHED

Distribution by house type. Legend provides breakdown in 20% bands covering the UK, not just Basingstoke and Deane.

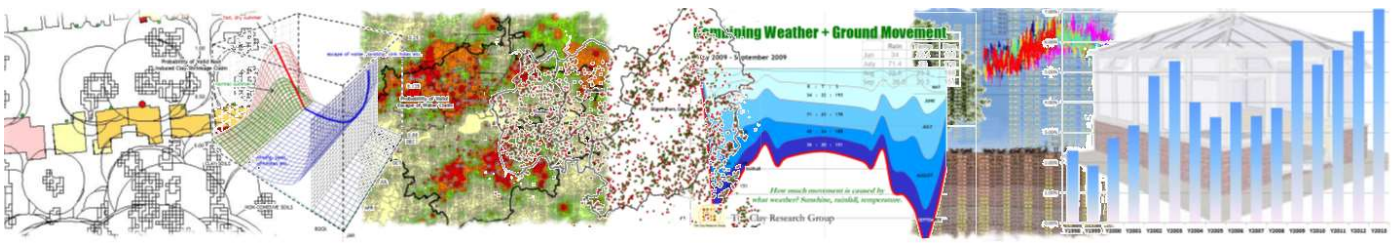
Basingstoke and Deane – by District

District	summer clay	summer EoW	Repudiation Rate (summer)	winter clay	winter EoW	Repudiation Rate (winter)
Basingstoke and Deane	0.506	0.192	0.302	0.16	0.43	0.401

Extract from the coarser, 'by District' table listing probabilities of a claim being valid, by season. This has been built from a smaller sample than the sector database.

In the summer (for our purposes defined as mid-July to mid-November), the chance of a claim being valid and due to root induced clay shrinkage is 0.506, and due to an escape of water, 0.192. The chances of a claim being declined are around 0.302.

In the winter, the odds reverse, favouring escape of water followed by a likely declinature over clay shrinkage. The table provides an aggregated view and the distribution varies, following the geology. Above analysis based on a sample of just over 44,000 claims.



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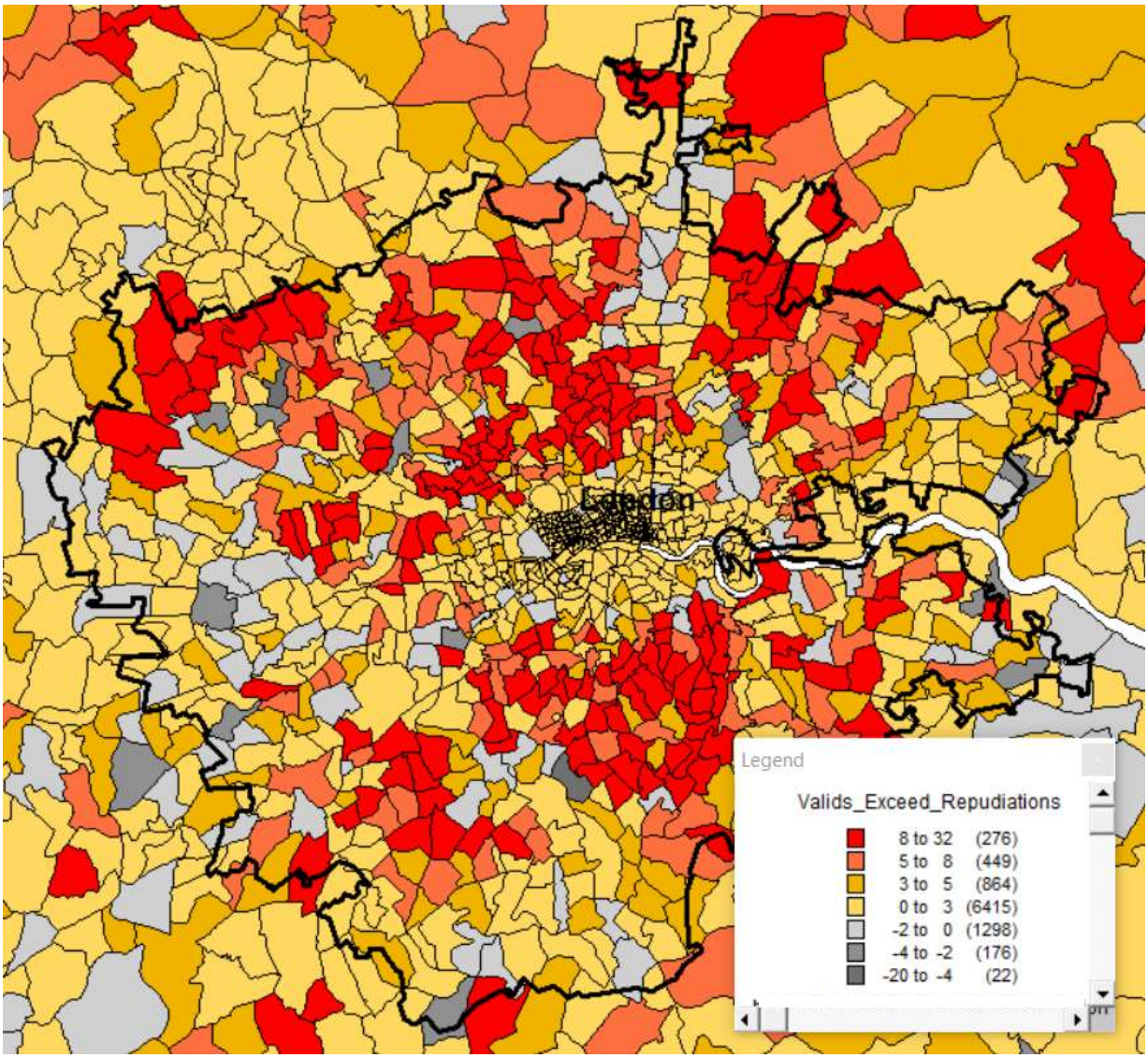
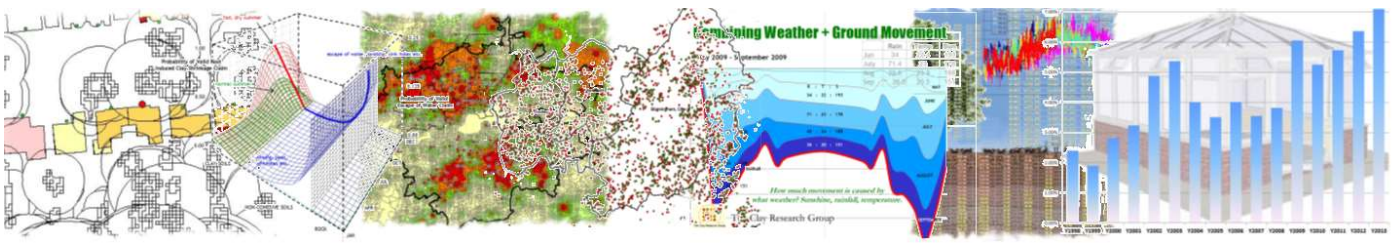
Is the claim likely to be valid? Or declined?

The map of London isn't showing the subsidence risk – or at least not directly. It plots the count of valid claims in excess of declinatures. The red shaded areas indicate sectors where claims are most likely to be valid and coincide with the high risk of root induced clay shrinkage.



The grey shaded sectors indicate areas where declinatures exceed valids. The problem using such data in Triage is the prejudice it can introduce. Looking at the postcode and concluding "this one is likely to be a declinature", and introducing a script to match is counterproductive to achieving a correct diagnosis. It probably has less value in Triage than other risk maps, but can be useful if seasonal analysis is added.



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Tree Updates

Supplied by Keiron Hart, Tamla Trees Limited
www.tamlatrees.com

Loss of Life

Hinckley Golf Club was fined £75,000 and had to pay £75,000 in costs when one of its managers was killed when using a chainsaw to remove a branch. The branch fell on him, causing brain injuries that proved fatal. The club hadn't carried out checks when the manager, Mr Johnstone, claimed he had the required experience.

Hinckley Golf Club is run by volunteers, but Councillor Kevin Morrell, executive member for environmental services at Hinckley and Bosworth Borough Council, explained: "This case serves as a reminder to any organisation run by volunteers that they have the same health and safety responsibilities to their employees as any other business."

Apparently, Johnstone was not trained to operate a chainsaw, was not wearing a safety helmet and had been working alone at night. The club explained that they believed Johnstone was qualified to use the saw based on information he had provided in his job application. Judge Martin Hurst reportedly criticised the club for failing to carry out pre-employment checks with the worker's two referees at Wentworth and Pinner golf courses.

Felling Protected Trees

Royal Borough of Windsor and Maidenhead officers caught employees of Landmark Tree Surgery felling protected trees in a historic woodland around St Leonard's Hill on the edge of Windsor, following a tip-off from a member of the public. The workers had already felled 11 protected trees included ash, willow and sycamore.

Landmark Tree Surgery was fined £11,045.30, Mark Knight (owner of Landmark Tree Surgery) was fined £4,545.30, and Geoffrey Try (landowner), £2,045.30. Each party was further ordered to pay costs of £1,821.40 and a victim surcharge of £170.

The council's planning enforcement team then launched a criminal investigation against the company and the landowner. All parties admitted to cutting down protected trees contrary to tree preservation regulations at Reading Magistrates' Court on Friday 20 July, and were ordered to repay all the council's legal fees alongside their own fines.