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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 2018
Edition 154

The Clay Research Group

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Issue 154, March, 2018

Falling Claim Numbers

The latest figures from the ABI record around 12,000 claim notifications in 2017, a figure last seen in 1988. There has been a steady decline over recent years and the figure is around one-third of the UK average since 1990.

This is in part at least due to heavy bouts of intermittent rainfall reducing the contribution from root induced clay shrinkage claims. The Met Office weather station at Heathrow recorded 3 times the amount of rainfall in July 2017 compared to July 2003 (a surge year), and over five times the amount of rainfall in August.

The Role of Analytics - Taking Advantage of the Pause

Tony Boobier is a well-known figure in the world of subsidence. He has a career that spans in excess of 30 years, most recently as World Wide Executive, IBM Analytics.

He is the author of "Analytics for Insurers: the Real Business of Big Data", and is working on a follow-up book entitled "Advanced Analytics and AI: Impact, Implementation and the Future of Work", due for release in May 2018.

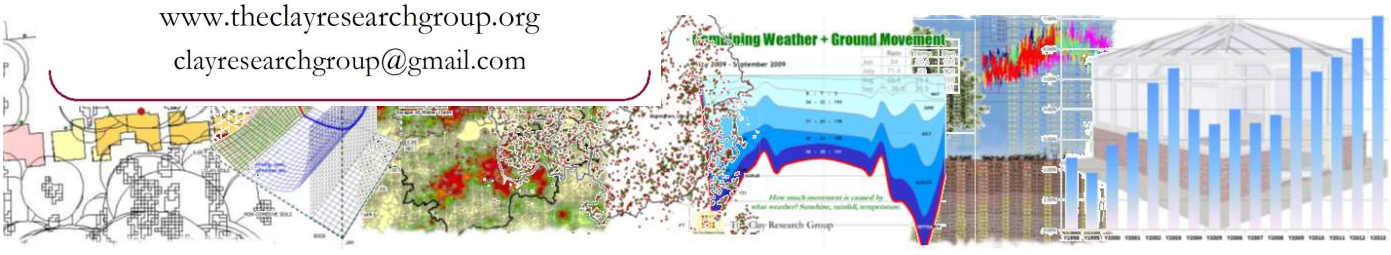
We are grateful that he has taken the time to provide an article suggesting that the industry might take advantage of the 'claims pause' over recent years (and the possibility that 2018 might follow this trend) to re-think process.

Laser Scanning Survey of Tree Canopy

Keiron Hart of Tamla Trees has alerted us to research undertaken by Dr. Mat Disney, University College London involving measuring the tree canopy using laser scanning technology. Apparently, the total length of branches of a sycamore tree near Oxford amounted to nearly 7 miles. Using this information they have been able to determine the weight of the canopy and assess environmental benefits. See:

http://home.bt.com/news/science-news/researchers-use-new-laser-scanning-tech-to-weigh-trees-11364250833803#.WooN5ZyN4UA

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



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A Window of Opportunity?

Tony Boobier, BEng, CEng, FICE, FCIM. MCIPS.

This newsletter is essentially about prediction, so I'm going to make one of my own, which is that 2018 is not going to be a subsidence event year. There, I've said it.

If I'm right, which I think is likely, then I'll look back sometime in 2019 and remind you of my predictive powers. If I'm wrong, and who really knows what the wider impact of El Nino might be, then I'll quietly brush my prediction under the proverbial carpet.

I think insurers and intermediaries will now almost certainly have a clear 20 month run before any significant number of subsidence claims, which provides them with a real opportunity to think about the topic and re-engineer the process. (This could also include redefining the cover under the policy.) It doesn't make sense to make changes if there are likely to be relatively large volumes of claims - who wants to be caught with their pants down whilst claims transformation takes place?

Having a window of opportunity becomes a critical success factor. In this 'window', what are the options? Has the industry tried everything and ran out of innovation? I don't think so. Subsidence as a product has at least one or two great transformations to go through, maybe more.

In my forthcoming second book (due for release on May 4th) about analytics and the future of work, I anticipate the impact of widespread changes to almost all industries and professions which will increasingly become infused with data, and analytically driven. One consequence is that new skills and behaviours by subsidence professionals will inevitably be required. The flip-side is that some traditional skills such as engineering or surveying might no longer be needed.

On the question of predictability and risk assessment, in the short term, will the impact of trees on property simply be too difficult to predict with certainty? In the UK isn't there simply too much variation in property shape, tree performance and ground conditions to model damage with absolute certainty?

All we can be sure of is a propensity to cause damage, and no more than that. But it's not a lost cause, as insurance has never been about absolute certainty, rather it is the science of probability.

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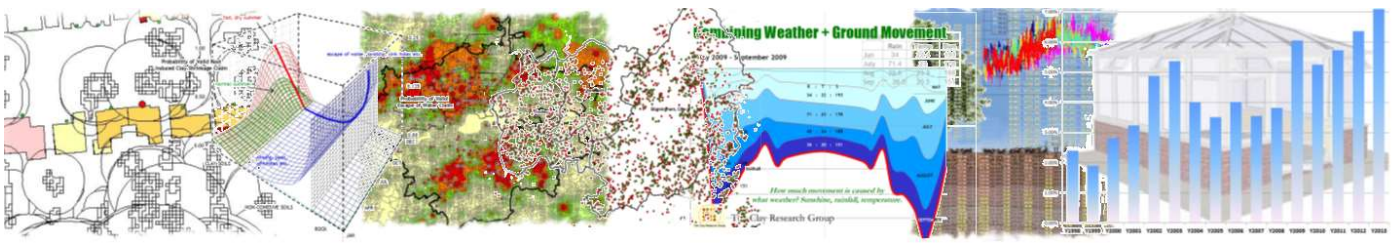

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A Window of Opportunity?

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In the meantime we may be able to create some predictive models, but overall are thin on the ground (in every sense) for data points. Compare what exists in subsidence modelling data to that of vehicle telematics which boast databases of 8 billion miles of information.

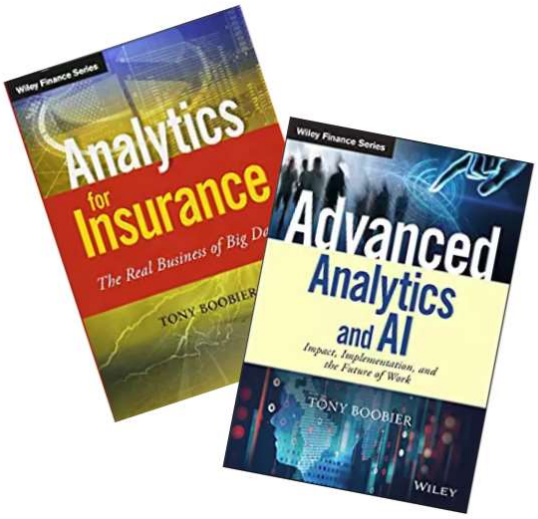
And the absence of a burning platform, that of major insurance expenditure, might simply mean that insurers are unwilling to invest in this peril for the moment. Why should they, when there are other higher priorities such as GDPR?

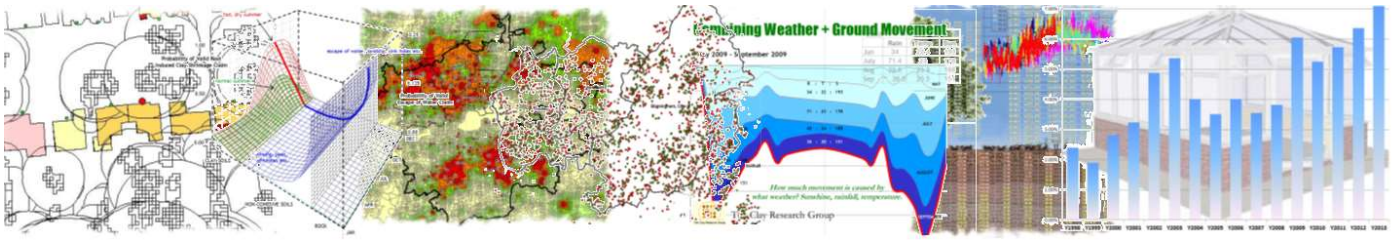
Beyond this, shouldn't we resist the temptation to simply digitize existing linear processes? Analytics will allow quicker decisions to be made and the effect of those outcomes to be monitored more effectively, creating closed-loop decision engines. Much of the new types of analysis currently emerging will leave traditionalists nervous, but won't old dogs increasingly need to learn new tricks?

But it does feel to me that a potential 20-month window of opportunity allows somebody to grasp the nettle, and shake up what seems to me to be currently a rather passive subject area.

To purchase Tony's books, visit:

https://www.amazon.co.uk/Books-Tony-Boobier/s?ie=UTF8&page=1&rh=n%3A266239%2Cp_27%3ATony%20Boobier





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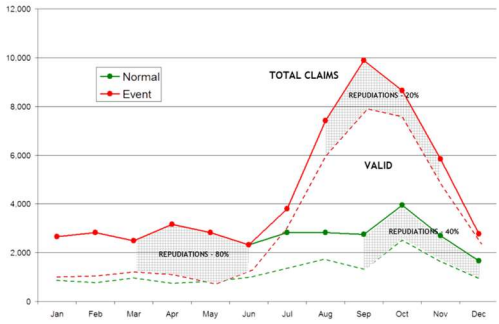
Cause and Liability by Postcode Sector

The current study (see issues 152 & 153 for details) reviews historical claims data at postcode sector level and seeks to interpret the risk of subsidence categorised by (a) date of first notification of loss and (b) causation, to enable a numeric value to be derived that can be used in triage, diagnosis and claims handling.

If causation is a function of the geology (which of course it is) then we anticipate there will be a link that adds value to an Ai application.

There are issues. For example, the risk may be associated with the age of the property (older houses present higher risk), tree population, species and metrics, maintenance programs, paving etc., on a road by road basis, or even house-by-house.

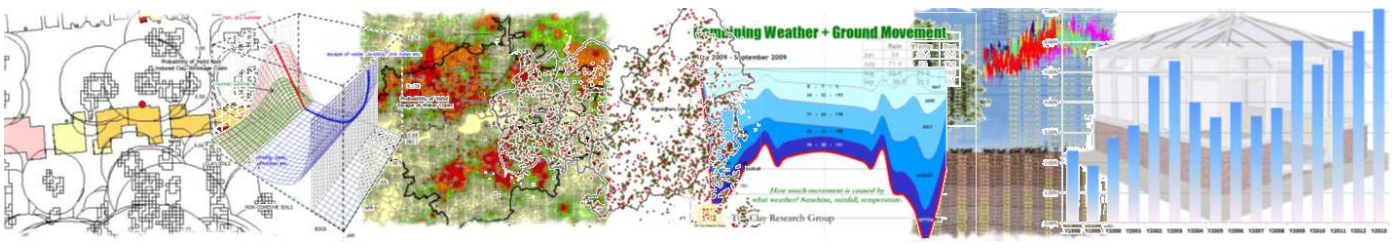
Regarding the season of notification, analysis reveals this is a powerful indicator of both liability and causation in some sectors. From a subsidence point of view, the 'summer period' (i.e. more likely to be root induced clay shrinkage) extends from mid-July to mid-November. See notification graph, right.



In edition 152, NW11 6 was shown to be a high-risk postcode with a high probability that a claim would be valid. It consists of outcropping London clay and the primary peril was root induced clay shrinkage. What would we find if we travelled north to the Midlands, and looked at a sector with more variable soils? B13 9 has been identified as a high-risk sector, but with a high number of declinatures. Is this a function of the geology, some demographic characteristic or perhaps a vulnerability factor in the house style?

What is the difference, expressed numerically? Is NW11 6 one, two or ten times riskier than B13 9? Are claims notified in the 'winter' (mid-November through to mid-July for the purposes of our analysis) on a gravel formation more likely to be valid, or declined?

The output delivers probability values relating to likelihood of validity and causation but most importantly in the longer term, a route map through the technical claims maze on the nature of investigations that might be needed to conclude the claim as efficiently as possible. What degree of confidence can we have in the output? Does the output vary – is there a difference between 'normal' and surge years?



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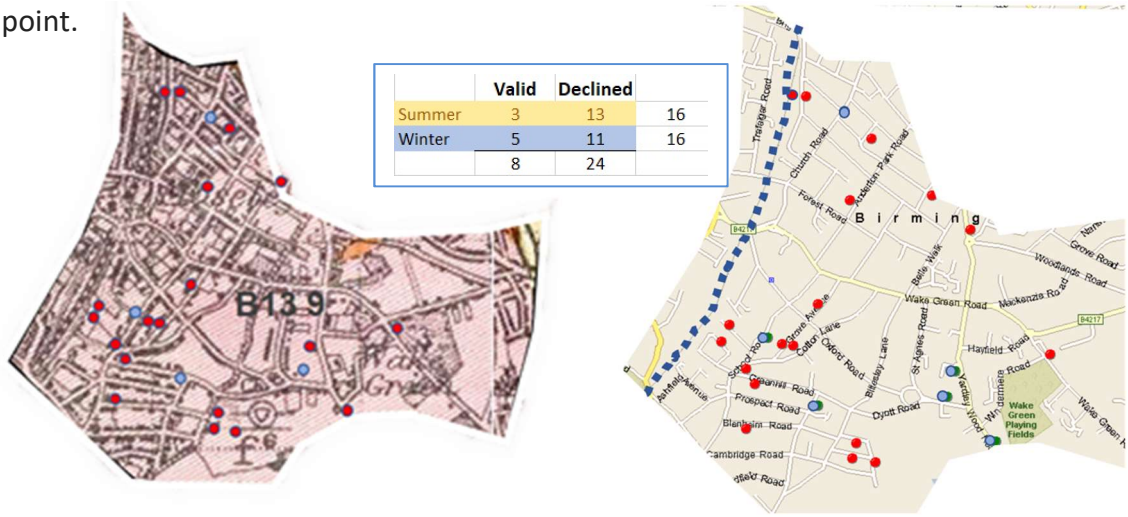
Postcode Sector B13 9 – Why the high number of declined claims?

Postcode B13 9 lies to the south of Birmingham and has a rather unusual claim distribution, with high count, but few valid. In summary, and from the sample of 54,000 claims, 8 were valid and 24 declined. Of the valid claims, 3 were notified in the summer, 5 in the winter.

Declined claims consisted in the main of damage resulting from historic movement or shrinkage. The picture below, left, shows the claims on an extract of the BGS 1:50,000 scale solid and drift map. Borehole results reveal a mixture of sands, gravels and marl. See the BGS web site at http://mapapps.bgs.ac.uk/geologyofbritain/home.html?

Right, a street map showing the same claims by full postcode. The dots represent the full postcode (i.e. B13 9XX – not individual houses) and there may be more than 1 claim at any point.

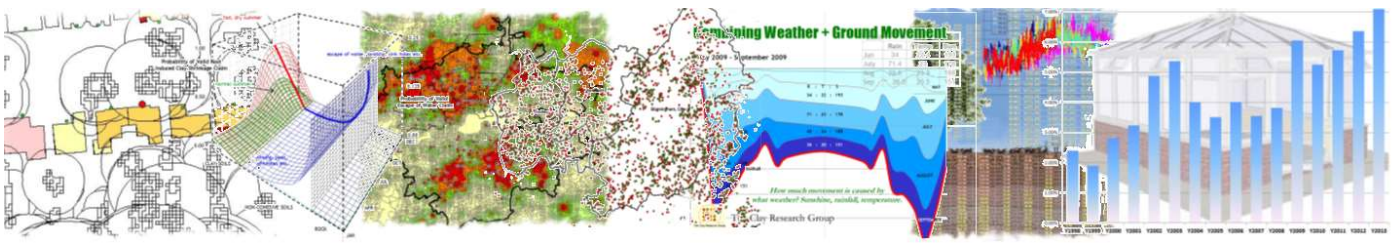


	Valid	Declined	
Summer	3	13	16
Winter	5	11	16
	8	24	

Blue dots indicate valid, escape-of-water claims, as might be expected with the gravel deposits indicated. Red dots indicate declined claims.

A short length of underground railway line passes beneath St. Mary's Row – could this be a contributory cause of the minor damage reported on declined claims, exploiting inherent weaknesses in the buildings, perhaps due to vibration passing through the gravel? The railway line is superimposed as a blue dotted line on the right-hand plan.

The analysis suggests NW11 6 is around 4.25 times riskier than B13 9 in terms of frequency (claims/private house population), taking into account valid claims only.



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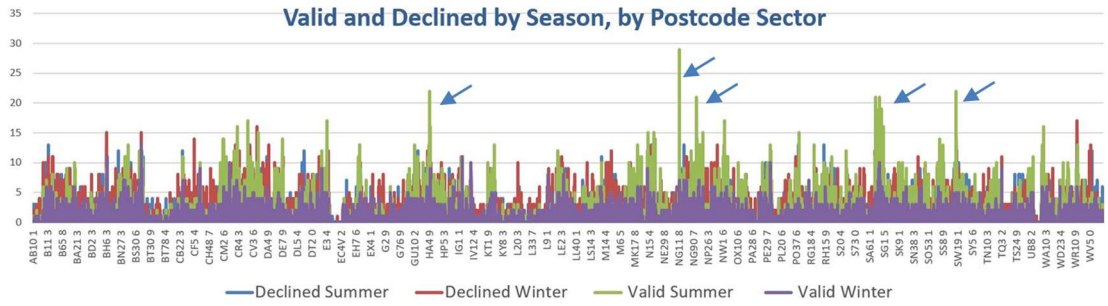
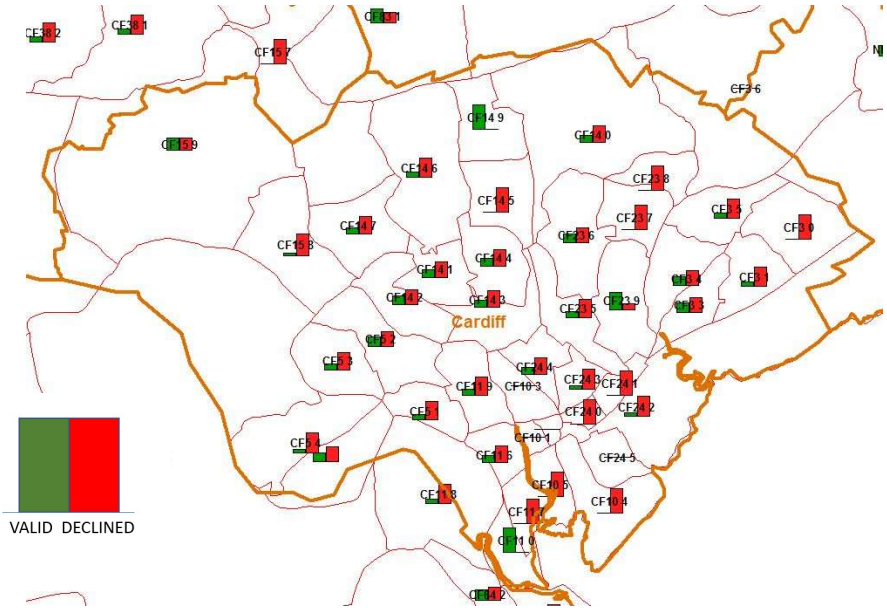
Spotting the Outliers

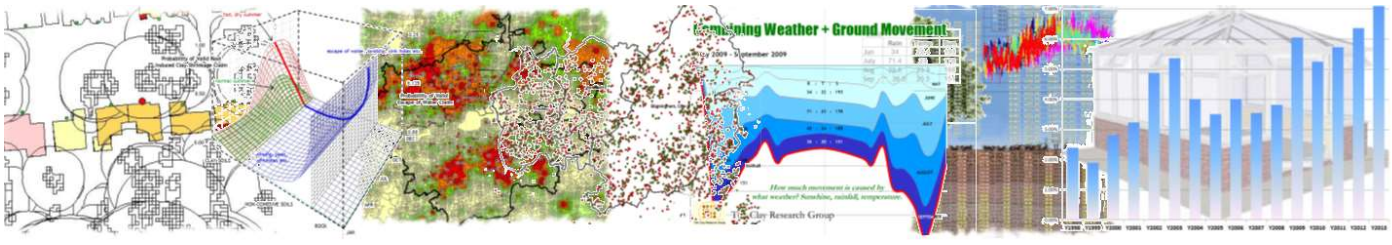
Picking up on Tony Boobier's article relating to the value of analytics, the graph below plots subsidence claims by validity and season, at postcode sector level across the UK.



Certain postcodes show exceptional activity (see arrows), and particularly so in the case of the 'valid summer' profile. There are in excess of 10,000 postcode sectors, and a graphical plot provides a quick, visual indicator of areas that might benefit from further study.



Plotting the data spatially, using a GIS, can reveal associations that may explain the variations - usually linked to the underlying geology. Above, a postcode map of Cardiff showing the wide variation between sectors. Next month, valid/declined maps of postcode sectors from the recent study, with seasonal data added.



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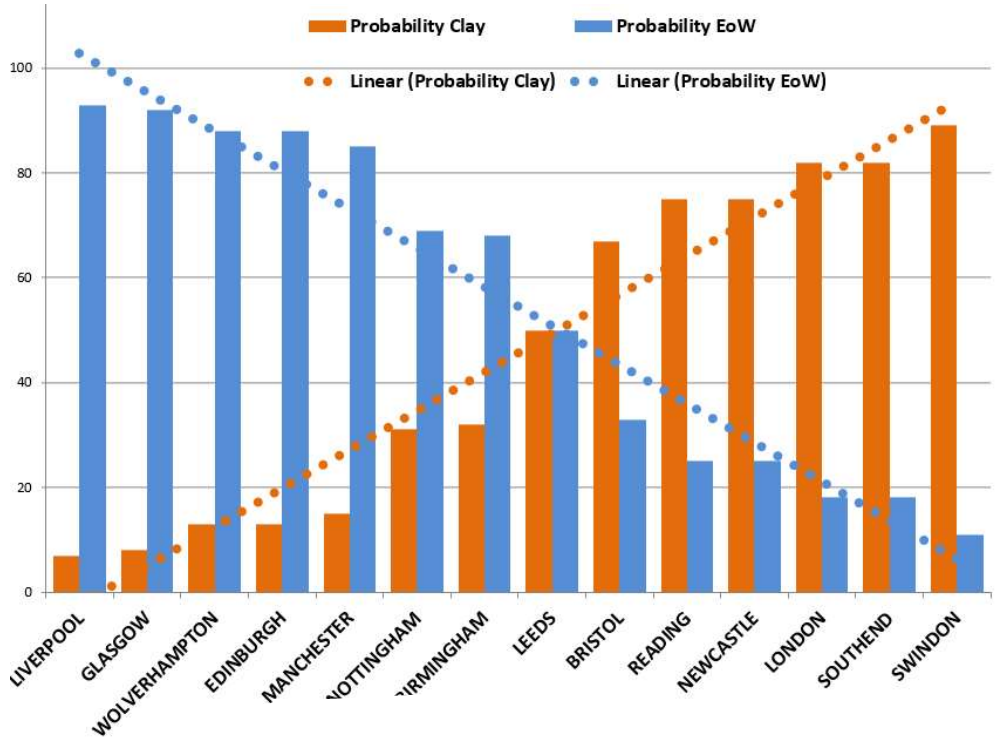
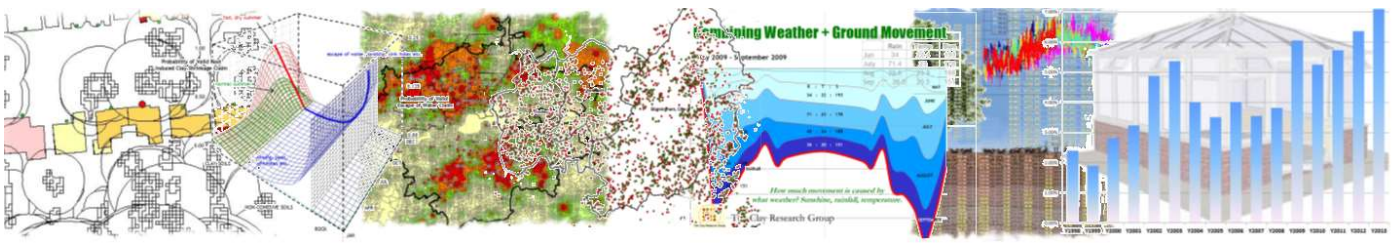
Triage – Cause by City

The chart below plots valid claims by peril and city. The probability of the cause of a valid claim being due to an escape of water is high in Liverpool, Glasgow and Wolverhampton, and clay shrinkage in London, Southend and Swindon, with diminishing differences as we approach Leeds.



The distribution will vary by season with escape of water claims dominating in the winter, and clay shrinkage in the summer, but the annual figures provide a useful general guide when planning a triage application.

This background knowledge also helps the engineer when assessing the damage and particularly when visiting areas beyond their usual remit. It can also be useful when making assessments remotely, matching crack patterns from photographs uploaded to the web interface with the geology and claims history. Used appropriately, it is a useful interface for the homeowner, exploring how engineering decisions are made with accompanying explanations and illustrations.



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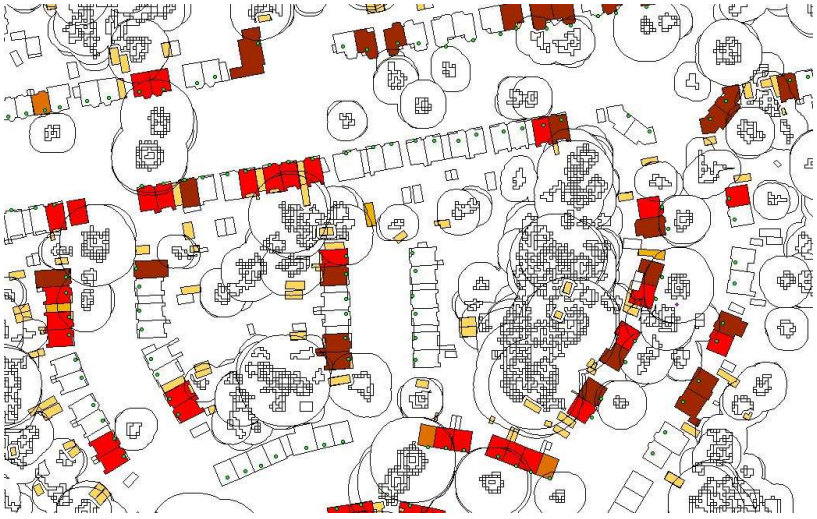
Dynamic Risk Model Accounting for Change in Weather Patterns by Week

When bringing the various threads together associated with risk and changes by season etc., it's not difficult to see how a future system might anticipate risk and, to a degree, have the various factors combined ready to deal with a claim following notification.

Modelling the street scene in an area with a clay soil, plotting the location of trees and modelled root zones in a 'normal' summer. The model would include tree metrics and soil shrink/swell potentials, together with a 'live' feed from a local weather station.

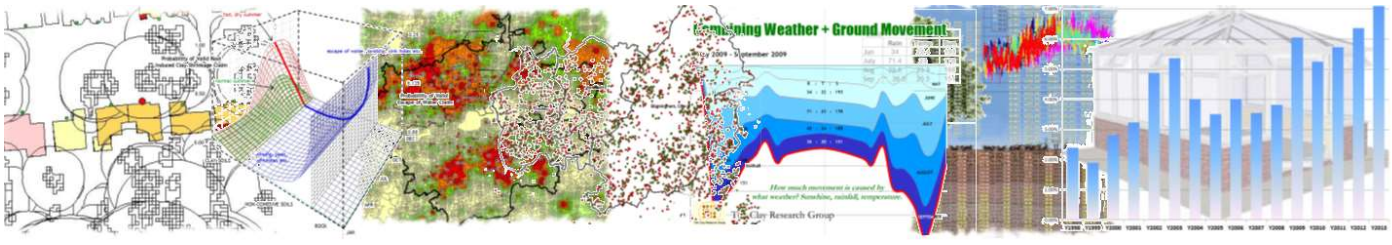
The image above reflects the risk in the summer months of a normal year. Below, the same area reflecting the increased risk in an event year, with values changing in relation to the weather. How would this benefit the homeowner? The likelihood of claim validity would be assigned, and on coincidence of a root zone with the area of reported damage, a schedule of actions instigated in seconds, not days or weeks.



The risk would dynamically update with changes in the weather and taking account of past and current claim notifications by postcode sector.

By referring to the results of the analysis discussed on previous page and past editions, the system would 'recognise' the likelihood of a claim being valid, and if so, the most likely cause and method of progression.

The homeowner would log on to the insurer's web site and select "I would like to notify a possible subsidence claim" and if the area of damage coincided with the area of root activity, a few photographs would suffice to progress investigations in many instances.



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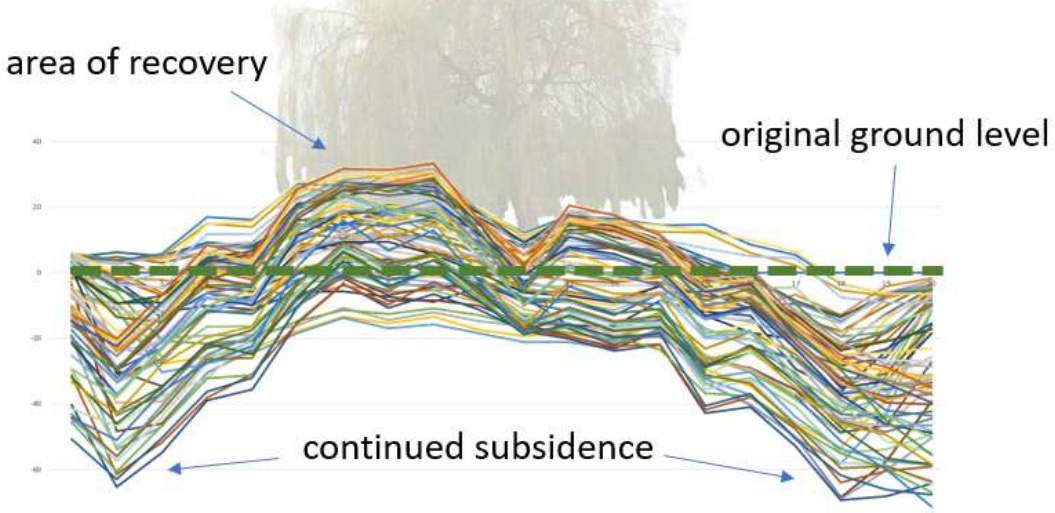
Ground Movement in the Vicinity of the Aldenham Willow

Plots of level profiles from the two arrays at the site of the Aldenham willow, within influencing distance of the root system over a period of 11 years – over 75 readings in total. The data has been collected by GeoServ Limited and funded by Crawford & Co.

There has been significant recovery close to the tree where the ground has risen above the starting point in 2006. This is indicative of gradual recovery of a persistent deficit, although it isn't known whether full rehydration has taken place.

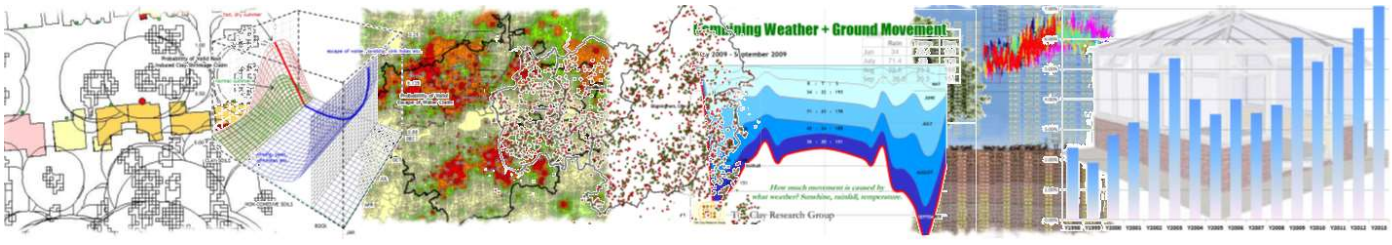


The unusual profile of ground movement beneath the Aldenham willow, with recovery beneath the tree, and ongoing subsidence towards the root periphery.

The profile is the inverse of what might normally be expected (i.e. a 'saucer' profile with maximum subsidence beneath the tree, diminishing towards the root periphery) due to the recovery of the persistent deficit.

Is it the case that roots close to the tree have died back due to the deficit over the growth of the tree, and peripheral roots from an extended system have been driven to explore further afield?

Any thoughts from experts in the field are welcome. The exercise does illustrate the variability that can be encountered and particularly so when considering mature trees.



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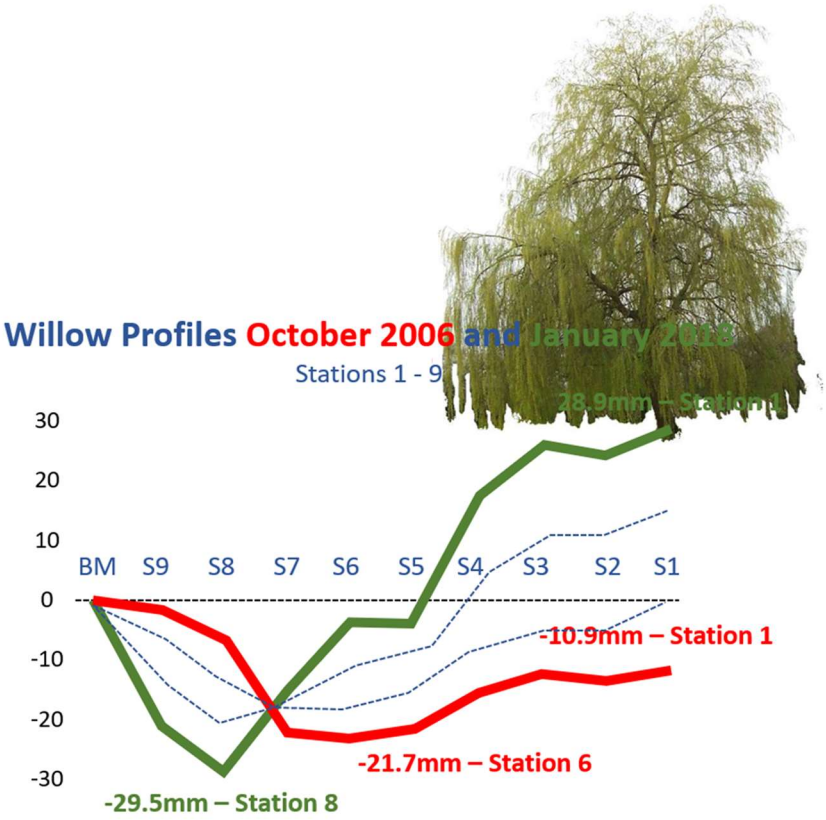
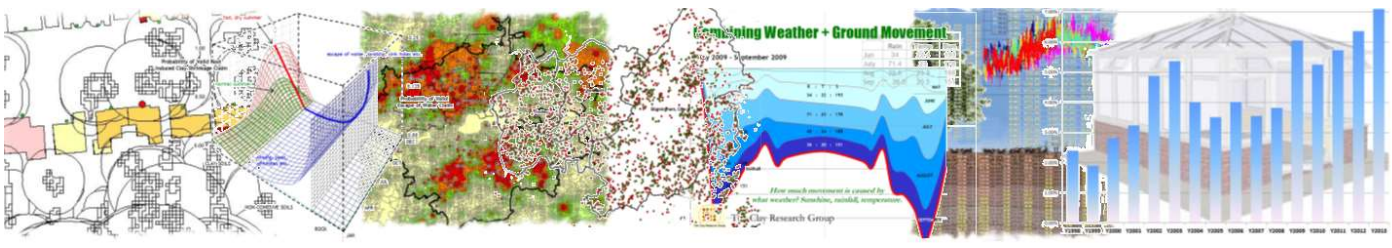
Willow Precise Levels – Difference between October 2006 and January 2018 readings.

The difference between the numbered stations over time is illustrated below. The red profile represents movement in October 2006, and the green profile shows movement in January 2018, both relative to the original datum established in in June 2006.



Station 8 subsided by 29.5mm relative to its starting point over 11 years ago, whereas station 1 (the station nearest to the tree) rose by a similar amount – 28.9mm.

2006 was a busy year with just under 50,000 claim notifications. This compares with a period of low claim numbers (around 12,000 claims notified in 2017) over recent years.



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Soil Moisture Deficits and Surge

The relevance of soil drying at depth in determining the likelihood of surge.

Tim Freeman MA, CEng, MICE, is the former Head of Foundation Research at the Building Research Establishment and currently the Director of GeoServ Limited, a company specialising in monitoring buildings using precise levels and electronic monitoring equipment.

Tim is the joint author of the guide, “Does your house have cracks” published by the ICE and delivered a paper entitled “Climatic Changes in Clay Soils - an explanation for the recent boom in subsidence claims” to the Fifth Conference on Changing Weather Patterns back in 1992, describing the work of the BRE at the Chattenden research site in Kent.

His paper explained that one reason for the increasing number of subsidence claims was public awareness following the introduction of subsidence cover to the building policy in the early 1970s. From his study he goes on to explain that whilst the exceptional claim numbers in 1989-90 were of course due to warm, dry summers, they were not substantially hotter or drier than 1976.

Two measures of SMD in common use (i.e. grass cover and deciduous trees) returned to zero in the intervening winter, so what had caused the increase in numbers?

The BRE study at Chattenden involved sinking rods to various depths and distances from the tree and measuring vertical movement and moisture change over a period of years, revealing the difference between seasonal movement at shallow depth with the reduced movement with increasing depth. The shallow rods were set 1m bGL and the deepest rod, 3.5mtrs bGL.

Tim compared the ground movement with the Soil Moisture Deficit coincident with the event year of 1990 and came to the conclusion that it is the deficit at depth that determined the risk the following year, rather than the moisture deficit just below ground level.

The logic was clear. Rainfall would replenish any shallow deficit whilst desiccation at depth took longer to rehydrate, and consequently ‘lay in wait’ to exacerbate a dry period in an ensuing year.