

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



January - March 2008

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In the Press

Water: A long dry summer

In parts of the world already facing unreliable food supplies, an uncertain climate adds to the future stress for soils, plants and people. Quirin Schiermeier (Nature) reports on water strategies for a drier world.

The record-breaking European heatwave of 2003 did not come out of the blue. It was preceded by an unusually dry spring during which soils dried up across the continent.

Water: More crop per drop

Farmers' yields in the developing world are often limited by unreliable rains. Improving their harvests will require plant breeders, agronomists and geneticists to pull together – but can these experts work out their differences? Emma Marris reports in Nature.

The International Assessment of Agricultural Science and Technology was to be to agriculture what the Intergovernmental Panel on Climate Change is to climate: the definitive statement of the scientific art. Hundreds of researchers have worked on the report for five years.

A stomatal ion channel

The stomata on the undersides of leaves control the exchange of carbon dioxide and water between plants and the atmosphere. Now two groups working independently have identified a protein that is an essential component for S-type anion channel function and is required for stomatal closure in response to a variety of physiological and stress stimuli. Termed SLAC1, it is a distant homologue of fungal and bacterial dicarboxylate/malic acid transport proteins.

HOT AIR - AND CLIMATE CHANGE

A recent paper published by Peter Cox from Exeter University reports that natural rises in temperature have caused increased levels of CO₂, and not the other way around. It isn't the case that our industrial processes have caused global warming. Rather, global warming has caused a build up of CO₂.

Good news? Not really.

CO₂ still presents the same problem - with increasing temperatures, it is harder to remove and as it accumulates, it making matters worse.

Joint Mitigation Protocols (JMP)

Richard Rollit attended the JMP meeting and reports as follows - this is his personal recollection of the key points.

The JMP is a framework for handling subsidence claims involving Local Authority trees in London. The intention of the Protocol is to reduce the cost and duration of subsidence claims, whilst still considering the value that urban trees provide to the environment and the community.

It is perhaps unsurprising that given the high aims of the Protocol it has taken a number of years to reach a workable framework, but following a meeting, involving a number of people associated with the Clay Research Group, an agreement has finally been reached.

At the heart of the agreement is a financial assessment of the tree value, which is a radically new way of looking at subsidence claims. The tree value is derived from a number of factors including the replacement costs, social benefit and amenity value. The tree value then links to the level of evidence necessary to facilitate tree mitigation works. In this way, the investigations are proportionate to the tree value, which enables the Local Authority and Insurers to demonstrate that proper consideration has been given to any tree works. Hopefully this will help to counter some of the recent poor press. Integral to the Protocol is an undertaking that the Local Authority will act promptly to reduce trees, even if removal may be subject to more detailed monitoring results.

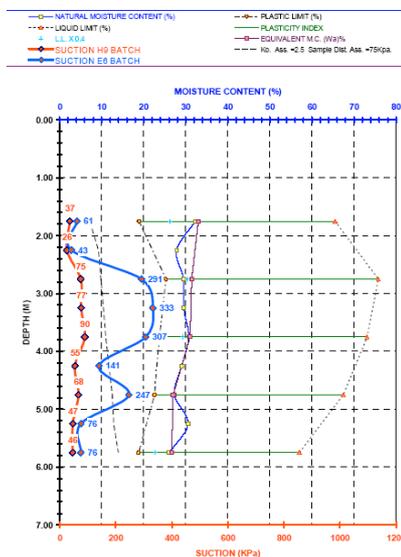
The next stage is for the Protocols to be adopted more widely by the London Boroughs and Insurers to see whether they can really make a difference.

Assuming the Protocols reach a wider audience no doubt they will develop and evolve and perhaps linking claim and tree value is the next step. Anything, however, that builds upon an open dialogue, between all the parties involved, has to be encouraged and hopefully we will see costs and duration reduced whilst still retaining mature urban trees.

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Whatman's Filter Papers - concerns over reliability -

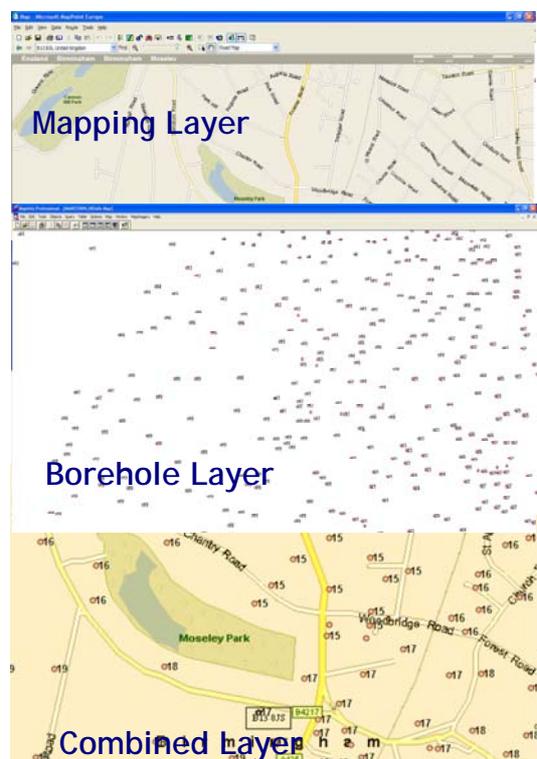
Research at the Aldenham site has raised queries regarding the reliability and repeatability of the soil suction test using the filter paper technique. MatLab report that differing batches of Whatman's No. 42 filter paper produce widely differing results and their research is ongoing. Below we see the results from the same samples, one plotted as a blue line, and the other as a red line, giving entirely different outcomes.



Initial results from the bentonite test are very encouraging, and further work is being carried out on disturbed samples using the oedometer, which continues to deliver good results.

Virtual Boreholes

Details of the shrink/swell characteristics for every postcode in the UK have been plotted as 'virtual boreholes' onto a map as we see below. Analysis reveals that non-shrinkable soils exist beneath 776,161 postcodes, and of the remainder a PI of between 0 - 20 beneath 703,615, 20 - 40 beneath 183,752, 40 - 60 beneath 87,553 and a PI greater than 60 beneath 922.



Annual Subsidence Conference

This year promises to be quite an event with some excellent speakers. The British Geological Survey will be explaining the basis of their risk model, Peter Osborne will be putting the case for the tree entitled "Oh no, there's a Council tree involved!".

Plexus Law will explain the current thinking on levels of evidence, Case Law, mitigation and protocols etc. Glenda Jones (Keele University) will reveal the outcome of her research at Aldenham over the last two years, comparing the ERT data with precise levels.

Richard Rollit will handle the introductions in his usual affable but firm way and will be asking whether investigations actually add anything. It should be a good day!



Domestic Subsidence & Trees
The Real Risk

12th June 2008

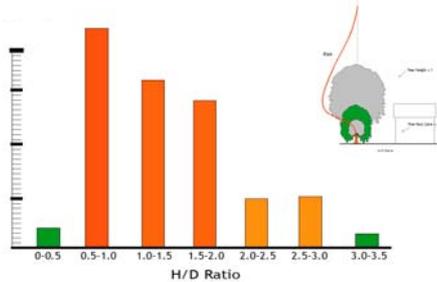
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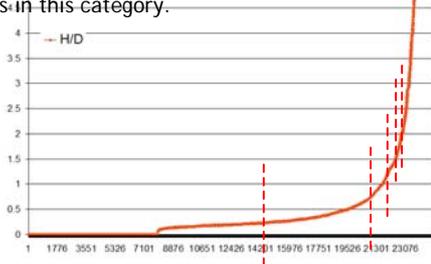
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H/D Ratio

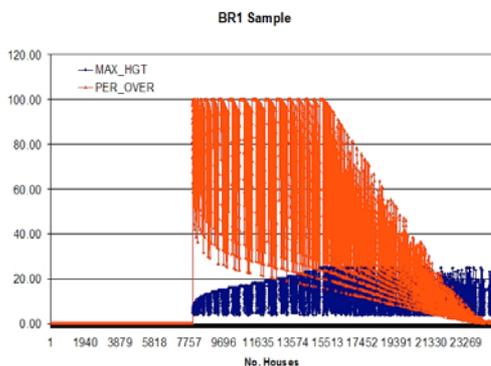
Below is the Height:Distance relationship from our database of 35,000 trees thought to be implicated with claims. The highest risk zone is in the 0.5 - 1 band.



To determine the influence of frequency, Innovation have provided data from their LIDAR survey and we have the heights and 'distances to building' of all trees within the M25. Taking BR1 as an example (see graph below) we can see that the count in each category diminishes with higher H/D ratio as a percentage of the population, which clarifies the claim risk graph above. The higher H/D ratio is less risky because there are fewer trees in this category.



The relationships across the postcode are complex as can be seen below. It would appear using our estimated root zone that smaller trees are closer to the buildings than taller trees. There is a greater overlap in the lower tree heights - broadly.



Around 30% of the properties in this postcode do not have any trees nearby.

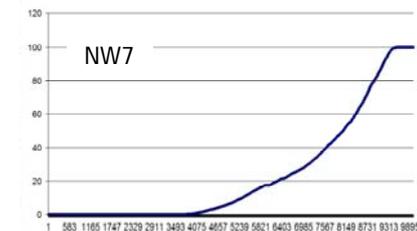
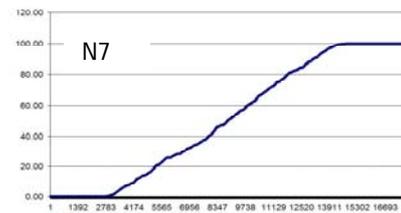
Frequency of tree planting by species is outside the scope of our research although we would welcome hearing from anyone with this level of information.

Trees and London Boroughs

Using the LiDAR data gathered by Innovation and our modelled root zone we have plotted the count of trees whose roots may extend beneath the building footprint for a selection of districts within the M25. See below.

The measurements have been derived using OS Master Map and a GIS. The 'x' axis is the number of individual houses, and these vary between Boroughs although we have maintained the aspect ratio of the graphs to show the pattern that emerges.

The 'y' axis is the estimated percentage overlap of the root zone beneath the building.



To the left of each graph we see the number of houses with no trees in influencing distance.

N7 has fewer houses with no trees in influencing distance than NW7 for example, but twice as many where the root overlap beneath a building might be 100%.

A high level view of the tree/house relationship between London Boroughs/postcode sectors etc.

Mapping

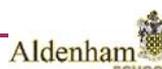
Tony Boobier is now heading up the location intelligence division of Pitney Bowes and has an international role developing their mapping solutions following the purchase of MapInfo.

If you have an interest in mapping and risk, come along to the conference in Birmingham on the 29 - 30th of April.



BIRMINGHAM 29 - 30 APRIL

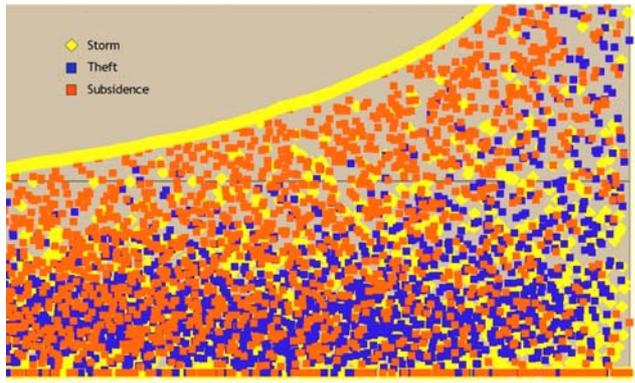
www.interact08.co.uk



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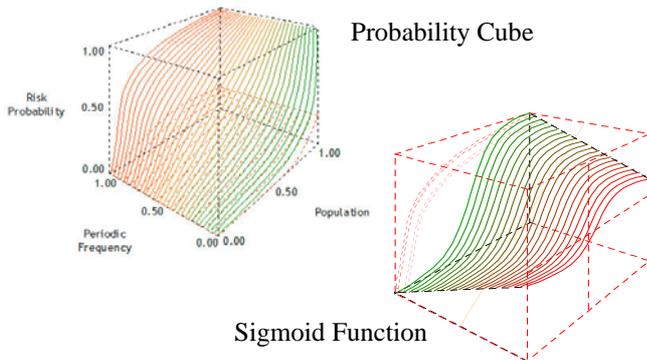
Risk

The first quarter of the year is always quiet and we have used our time to complete the various industry risk models for Innovation. Below is an extract from the graph of the aggregated risk posed by the combination of subsidence, flood, theft and storm in a unified table – see extract from graph below.



Understanding where subsidence lies in relation to other perils requires further modelling and has to take account of frequency and cost. Theft has lots of small, low value claims but the total cost to the industry exceeds that of subsidence, which has fewer claims that cost more individually, but the total industry spend is less.

Flood can be catastrophic with 100% frequency. The relationship is complex as we see from the small extract above.



A probability cube (left) resolves these complex interactions, taking into account cost, count and return periods all within the constraints of the risk parameters devised.

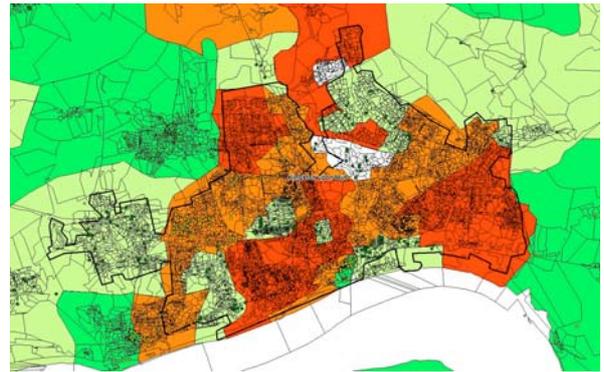
The final piece of the jigsaw is price optimisation. Flexing prices to match risk. The Sigmoid function (right) is used to achieve this.

The function moderates the output to influence insurers rates by increasing the cost where there is a high risk, lowering them where there is not, whilst ensuring this happens in a constrained framework.

Other Perils

We are sometimes asked to undertake analysis of data for other perils, and this has occupied us throughout December.

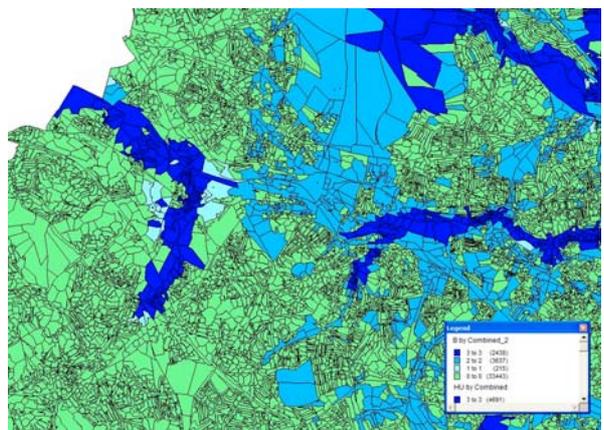
Below we see extracts from various maps that have been produced from the data, and the interesting thing is how quickly patterns emerge even when dealing with topics that we know little about.



Above is the map of data for Crime using several sources, including Census and deprivation tables. This is a little unusual because we have merged crime patterns with highly granular, house by house, information.

Below we have mapped flood data (provided by JBA Consulting) and mapped it against policy and loss data. The objective has been to understand exposure for a major insurer. The work has been funded entirely by Innovation.

Innovation are building a suite of risk models and risk rating engines to serve this data out in real time from a web based application and are using the Triage and OSCAR algorithms to power some of them.



Insurers require increasingly sophisticated information on which to build their rating structures and hopefully the above models will help.

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Aston University

Aston University, School of Engineering & Applied Science, presents a One-day Conference
in the Main Building on Thursday 12 June 2008

DOMESTIC SUBSIDENCE & TREES: THE REAL RISK

09.00 – 10.00	Registration and coffee
10.00 – 10.15	Opening by Chairman: Richard Rollit , The Clay Research Group
10.15 – 10.50	<i>Oh No! There's a Council Tree Involved</i> PETER OSBORNE , TreeSubs Limited
10.50 – 11.25	<i>The Rise & Fall of Tree-Related Ground Movement – The Story from Non-Invasive Date Correlation</i> GLEND A JONES , Keele University
11.25 – 11.40	----- COMFORT BREAK -----
11.40 – 12.15	<i>Do Investigations Help in the Diagnosis of Subsidence Claims?</i> RICHARD ROLLIT , Crawford & Co
12.15 – 12.45	Discussion
12.45 – 14.00	----- LUNCH -----
14.00 – 14.35	<i>Did the Ground Move for You?</i> MALCOLM BROWN , British Geological Survey
14.35 – 15.10	<i>Integrated Tree Risk Management & Corporate Social Responsibility.</i> KIERON HART Head of Insurance Services, Marishal Thompson Ltd
15.10 – 15.25	----- COMFORT BREAK -----
15.25 – 16.00	<i>Tree Root Nuisance – The Legal Position</i> TONY GREENFIELD . Plexus Law
16.00 – 16.30	Discussion
16.30 – 17.00	Tea & Disperse

For Conference Availability

Helen Mallinson 0121 204 3593 or Claire Wallis 0121 204 3624 Fax: 0121 204 3684.

