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 2025
Issue 245

The Clay Research Group

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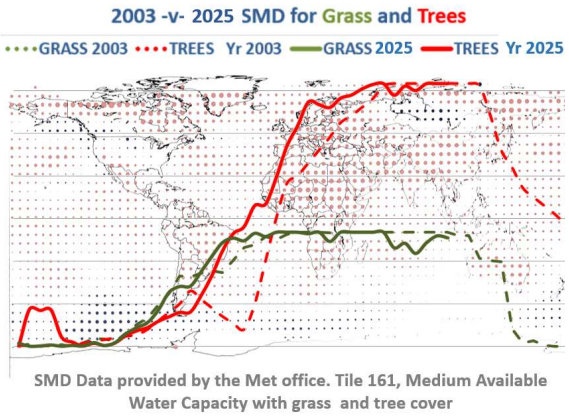
Issue 245, October 2025

SMD Graph



SMD Data provided by the Met office. Tile 161, Medium Available Water Capacity with grass and tree cover

Plotting the correlation between the Soil Moisture Deficit for a surge year (2003) and the current year. Analysis on page 4.

Contributions Welcome

We welcome articles and comments from readers. If you have a contribution, please Email us at: *clayresearchgroup@gmail.com*

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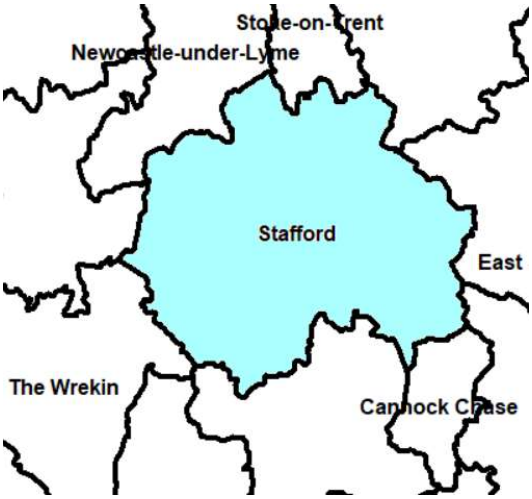
District and Sector Risk

Stafford is a market town in the County of Staffordshire, with a population of around 71,700 and an area of 2,713km^2. It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises a mixture of non-cohesive soils (alluvium, till, sand and gravel) overlying mudstone and sandstone – see Page 7.

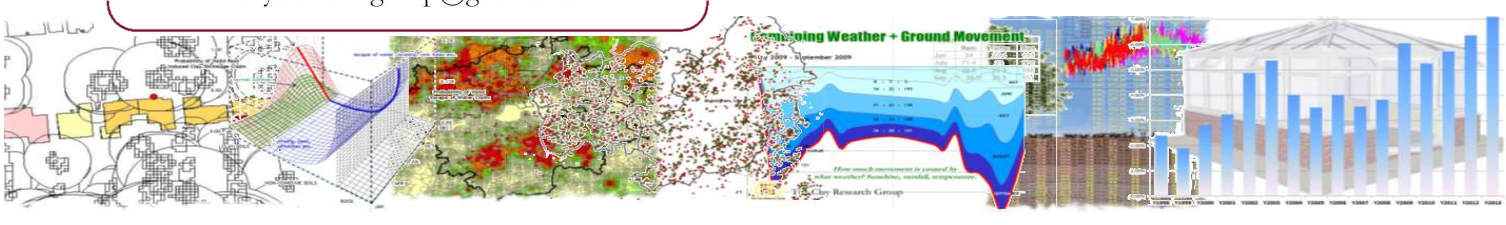


The risk maps are built from a data sample covering four claim years, including one surge and three 'normal' years.

Research Award

Congratulations also to Dr Allan Tew, Chief Engineer, Innovation Group for being awarded the Insurance Times Technical and Innovation Awards earlier in September for his research into Electro Kinetic Stabilisation (EKS). This complements the award to Innovation Group of Claims Service Provider of the Year for their support of his research.

Allan has also been appointed an Honorary Research Fellow at the University of Birmingham. This provides access to their team of experts and laboratory facilities etc.



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ChatGPT – repairing heave damaged properties

Question to ChatGPT

Which district in the UK has the highest risk of domestic subsidence?

Response

What drives high subsidence risk?

- **Clay-rich soils**: soils that shrink when dry and swell when wet are much more prone to ground movement.
- **Young clay formations / shallow foundations**: Many older houses in London and the South East were built on London Clay with relatively shallow foundations.
- **Climate change effects**: hotter, drier summers lead to soil losing moisture; then wetter periods lead to swelling. Projections show increased risk in many clay-rich areas, especially in south-east England.
-

Areas / Districts particularly at high risk

From the sources I've found, some specific places stand out as having especially high subsidence or shrink-swell risk:

- Greater London, especially many of the inner and outer London boroughs. Because much of London is built on London Clay, which is highly shrinkable. Boroughs like Camden, Islington, Brent, Barnet, Harrow, Haringey, Waltham Forest, Lambeth, Lewisham are frequently cited.
- South East England more broadly (Kent, Essex, etc.) due to clay soils.
- Postcode / local area level:
    - East Dulwich (SE London) is repeatedly identified as one of the worst postcodes for subsidence.
    - Ruislip (London Borough of Hillingdon)
    - Chingford (near Epping Forest, London)

Tentative "top" district

If pressed to pick a single district that is likely among the highest risk, London seems to dominate, particularly some of the inner or more clay-rich boroughs. So, something like **Camden or Islington** or another North / Central London borough built over London Clay would be strong candidates.

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AI and Claims Handling

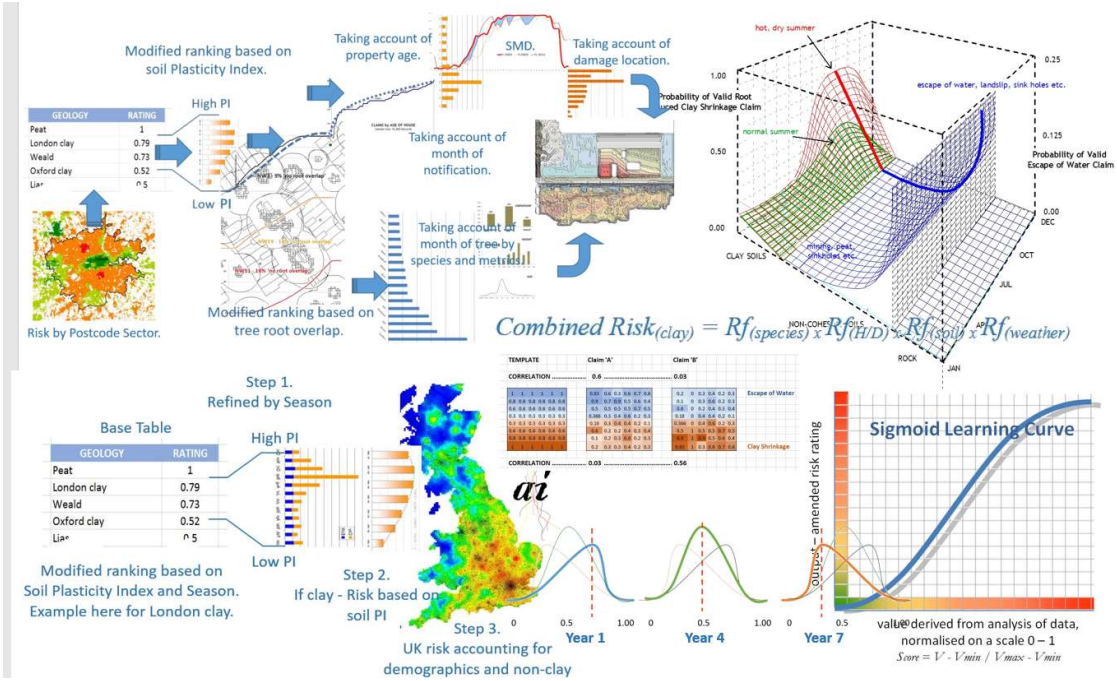
AI is a consuming topic just now, directed to improving the financial efficiency of companies and improve service. We have spent many years looking at the subsidence process in terms of triage, diagnosis and resolution. For example, the 'Risk by District' maps use claims data to provide an indication of the likely peril, the risk by season and the probability of whether the claim is likely to be valid or not.

In 1996 we had London overflown and built a digital model of tree location, height and proximity to housing, followed by an update in 2006 using LiDAR.

This is fine and certainly helps the claim handler make an educated assessment of the situation, but what about the homeowner?

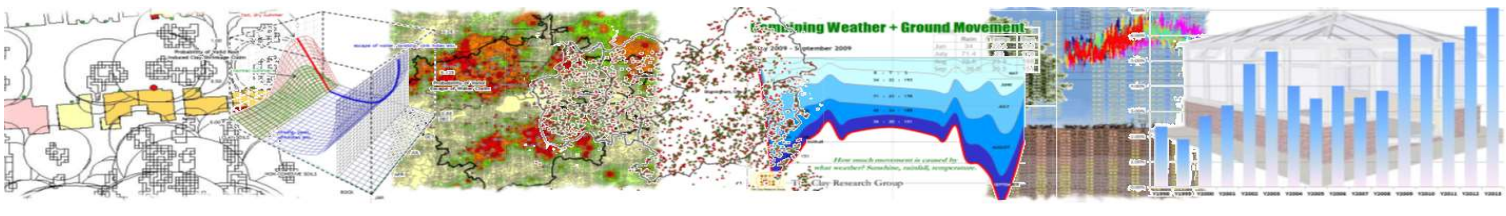
AI has a role, but the human element is central to resolving such claims bearing in mind the stress a declinature can induce.

In next month's edition we look at the method of assessing claims from the time of notification and shortening their duration using AI, but as an assistant to staff, rather than a replacement.



Past editions of the newsletter include numerous examples of combining data from various sources - tree metrics, species, season, geology, pattern of distress etc. - to deliver the most likely outcome.

The graphics above outline a few of the 'behind the scenes' elements. The completed product allows the claim handler to have a more meaningful discussion with the homeowner. More next month.



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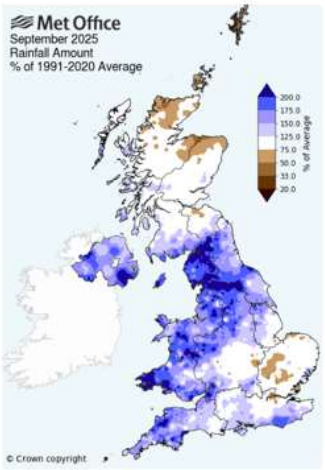
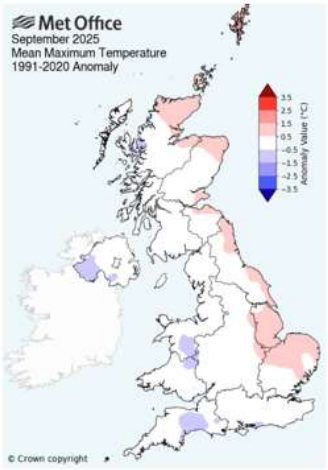
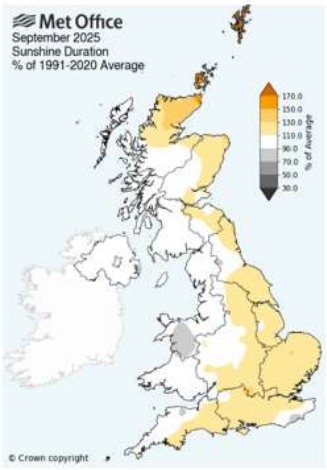
Met Office Anomaly Maps for September 2025

Anomaly maps from the Met Office web site for the month of September 2025 comparing data with the 1991 – 2020 average, reproduced below.







The maps reveal greater rainfall across parts of the UK and increased temperature and sunshine duration towards the east compared with 1991 – 2020 averages.

https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-actual-and-anomaly-maps

Weather - Change by Month Comparing 2003 – v - 2025

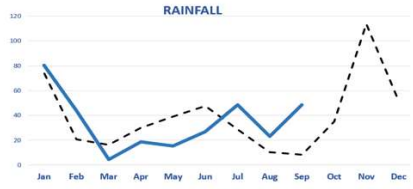
The charts plotting data from the Met Office web site reveal rainfall, sunshine and temperature in 2025 compared with 2003, a surge year.

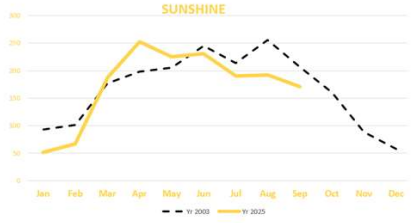
Rainfall was significantly lower in 2025 from March until June/July and hours of sunshine higher over the same period. Temperature was also higher over this period.

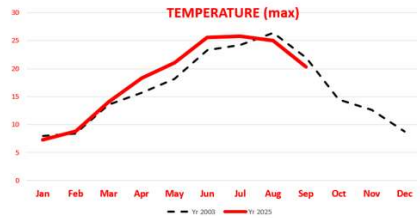
2025 rainfall increased and sunshine decreased compared with the 2003 levels in July and August.

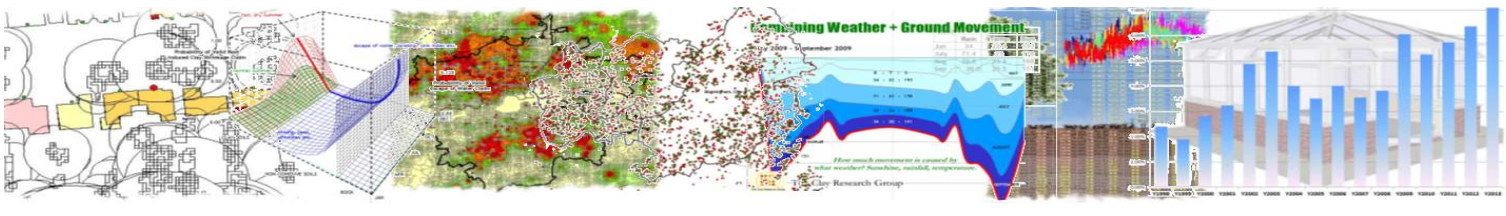
We don't have the latest ABI claims data yet, but suggestions from colleagues indicate high numbers.

It will be interesting to relate the two years to improve our understanding of the influence of weather and particularly the months of July/August.









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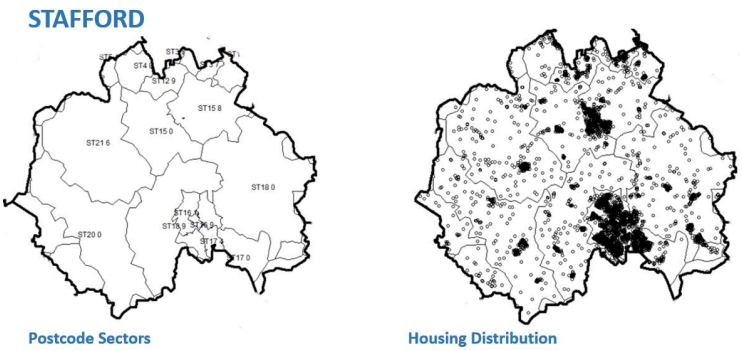
Subsidence Risk Analysis – Stafford

Stafford is situated in Staffordshire County and occupies an area of around 2,713km2 with a population approaching 71,700.



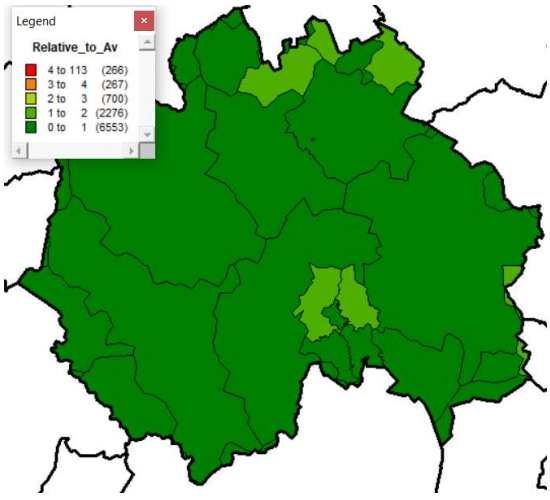
Distribution of housing stock using full postcode as a proxy. Each sector covers around 3,000 houses on average across the UK and full postcodes include around 15 – 20 houses on average, although there are large variations.

Sector and 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?

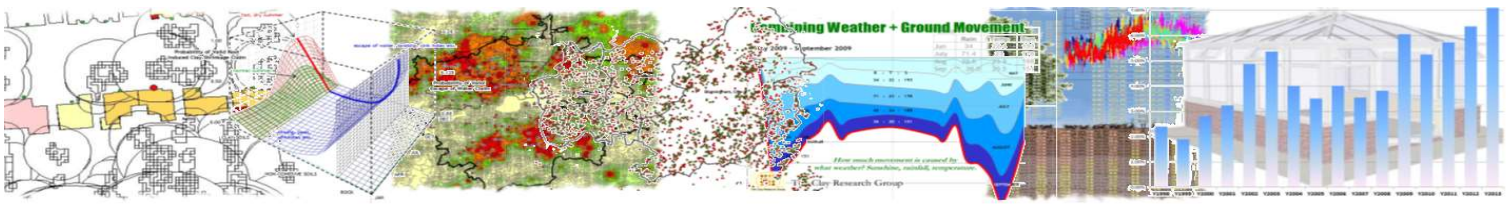
Using a frequency calculation (number of claims divided by private housing population) the relative risk across the borough at postcode sector level is revealed, rather than a 'claim count' value.

Stafford is rated 242nd out of 413 districts in the UK from the sample analysed and is around 0.764x the risk of the UK average, or 0.198 on a normalised 0 - 1 scale.

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



Sector risk compared to UK average from the sample analysed.



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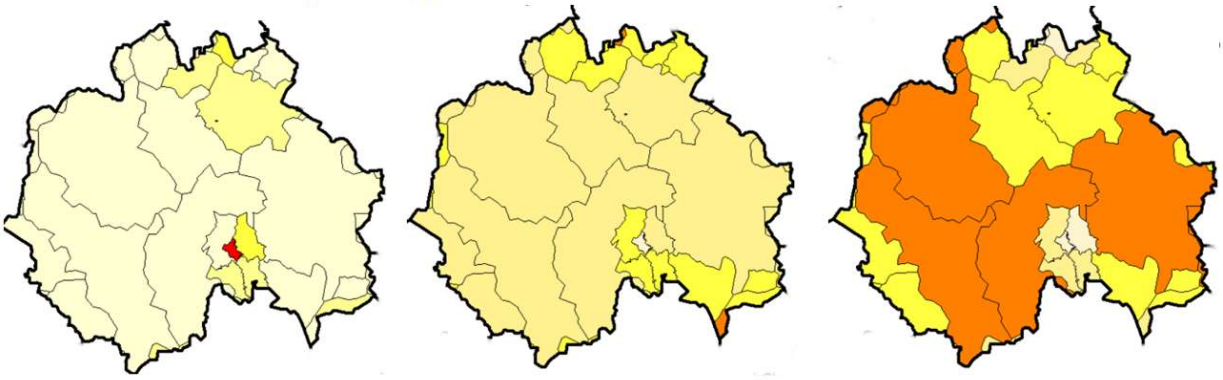
Stafford - Properties by Style and Ownership

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 taking out the policy.

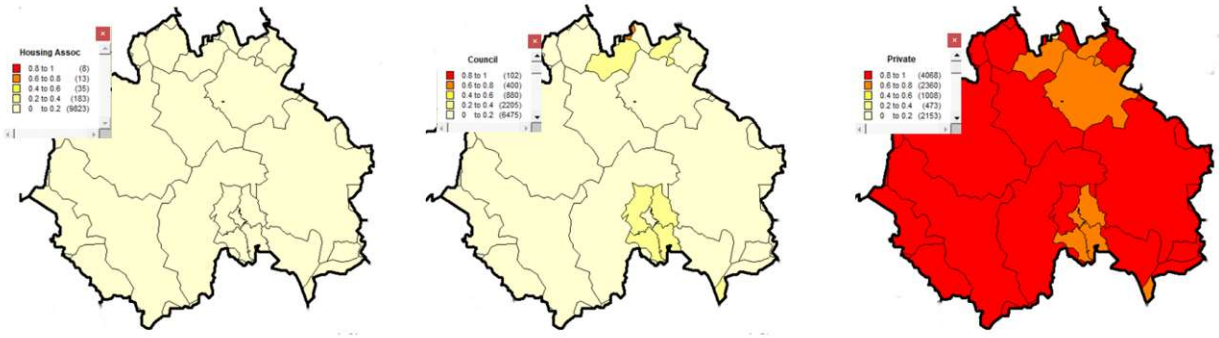
STAFFORD - Distribution by House Type



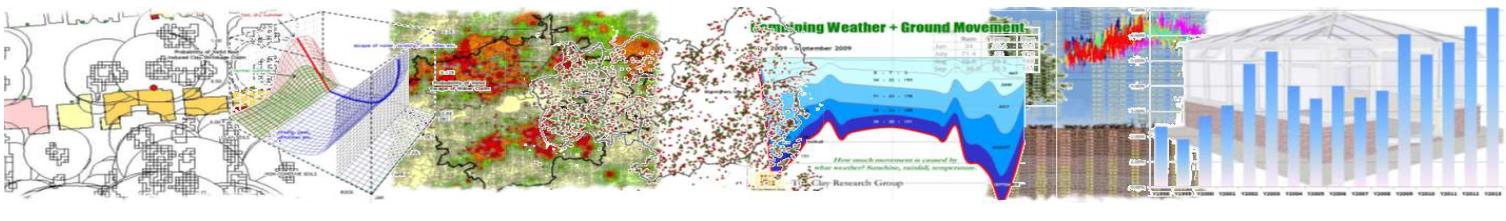
Terraced | Semi-Detached | Detached

Distribution by ownership is shown below. Detached, private properties are the dominant class across the district.

STAFFORD - Distribution by Ownership



Housing Association | Council Ownership | Private Ownership



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Subsidence Risk Analysis – Stafford

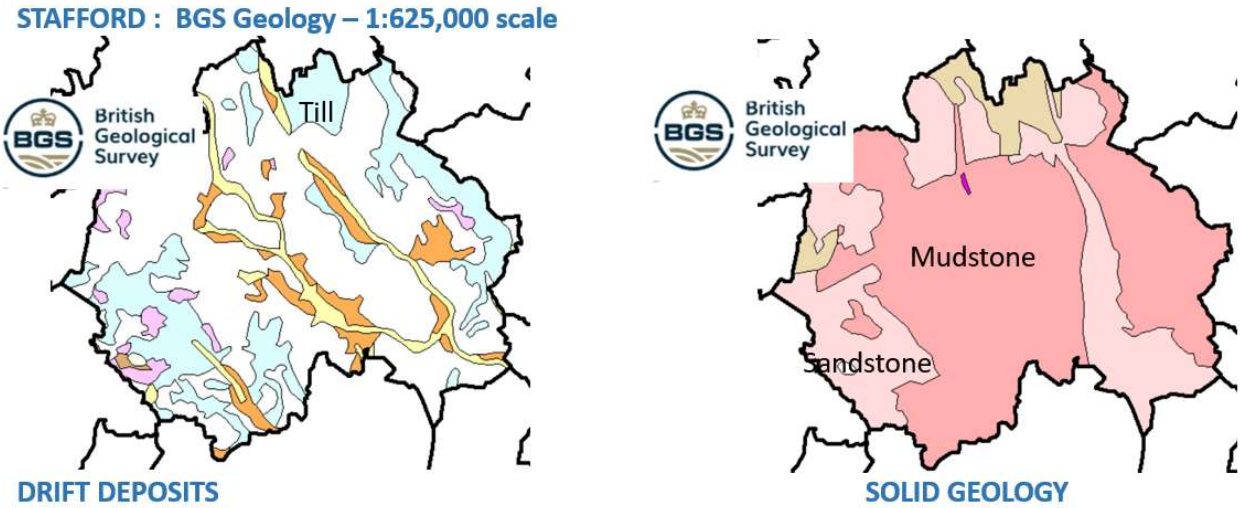
Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at:

http://mapapps.bgs.ac.uk/geologyofbritain/home.html

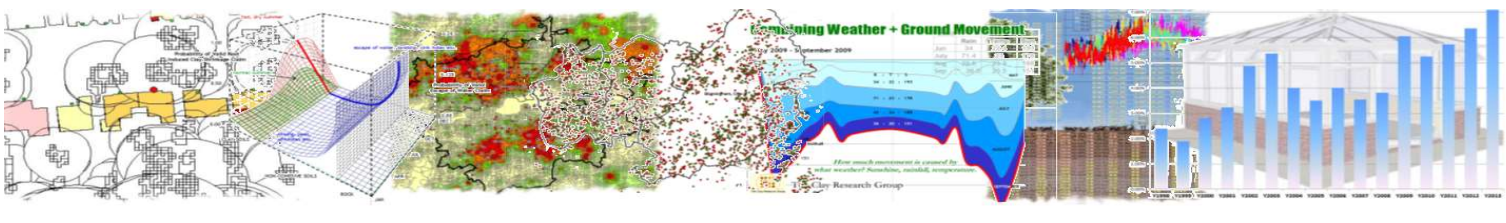
See page 10 for a seasonal analysis of the sample which reveals that, at district level, there is around a 60% probability of a claim being valid in the summer and, of the valid claims, there is a 50% probability that the damage will have been caused by escape of water.

In the winter, the likelihood of a claim being valid is around 70% and of the valid claims, escape of water accounts for around 50%.

A postcode sector map on the following page records the PI of soils retrieved following site investigations from actual claims. The most likely cause of the clay shrinkage claims is the presence of the Mercia Mudstone series and the low distribution of drift deposits.



Above, extracts from the 1:625,000 series British Geological Survey maps. Working at postcode sector level and referring to the 1:50,000 series delivers far greater benefit when assessing risk.



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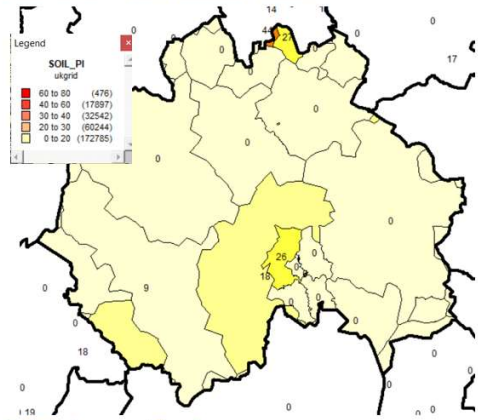
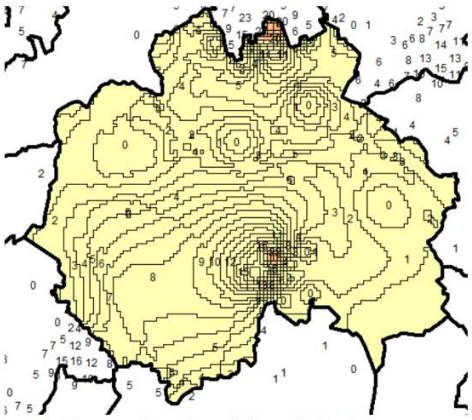
Liability by Geology and Season

Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right), both indicating a low to zero PI across the district.

STAFFORD – Soil Plasticity Index



Soil PI Averaged by Sector

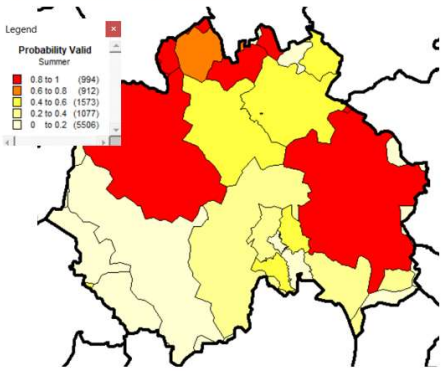


PI Interpolated on 250m CRG grid

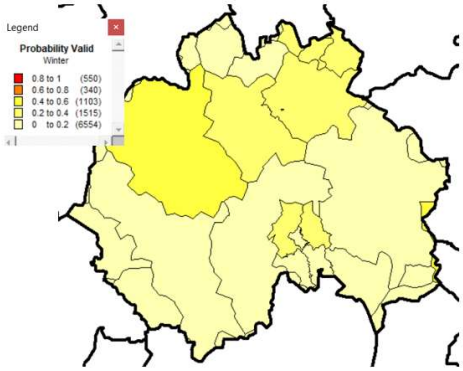
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. A single claim in an area with low population can raise the risk as a result of using frequency estimates.

The maps below show the seasonal difference from the sample used. Combining the risk maps by season and reviewing the table on page 10 is perhaps the most useful way of assessing the potential liability, likely cause and geology using the values listed.

STAFFORD – by season

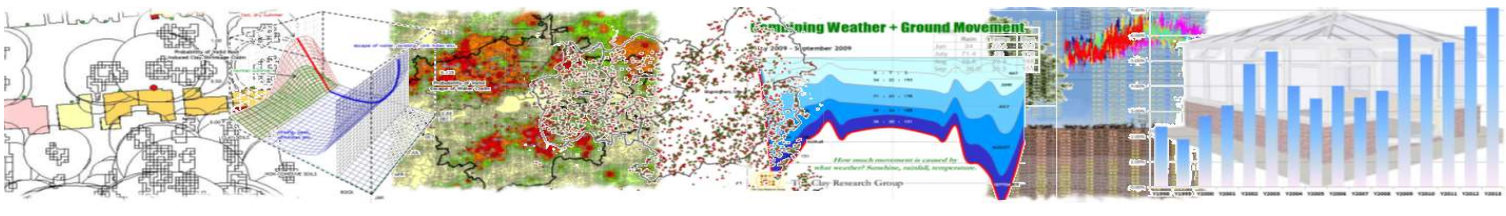


Probability Valid, Summer



Probability Valid, Winter

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.



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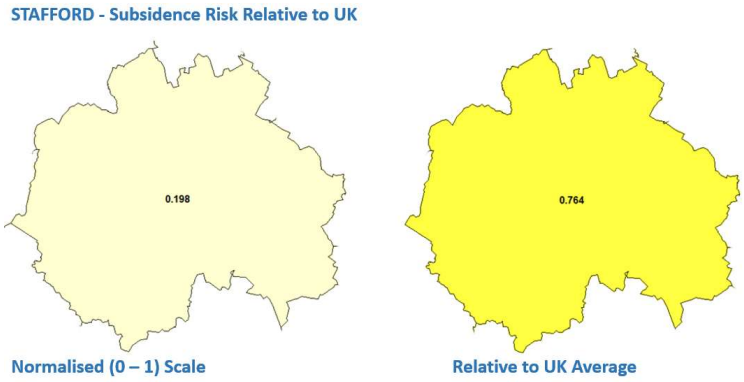
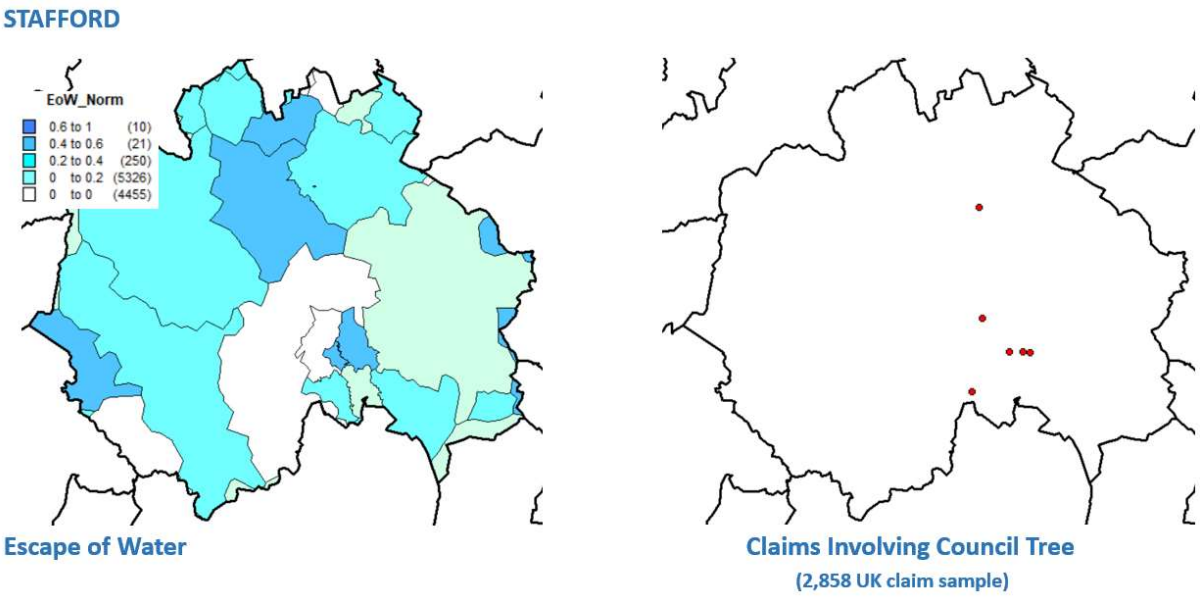
District Risk. EoW and Council Tree Risk.



Below, left, mapping the frequency of escape of water claims reflecting the presence of drift deposits of non-cohesive soils underlain by chalk and crag.

As we would expect, the 1:50,000 scale BGS map provides a more detailed picture. The CRG 1:250 grid reflects claims experience.

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 presence of claims coincides with the outcropping Mercia Mudstone series.



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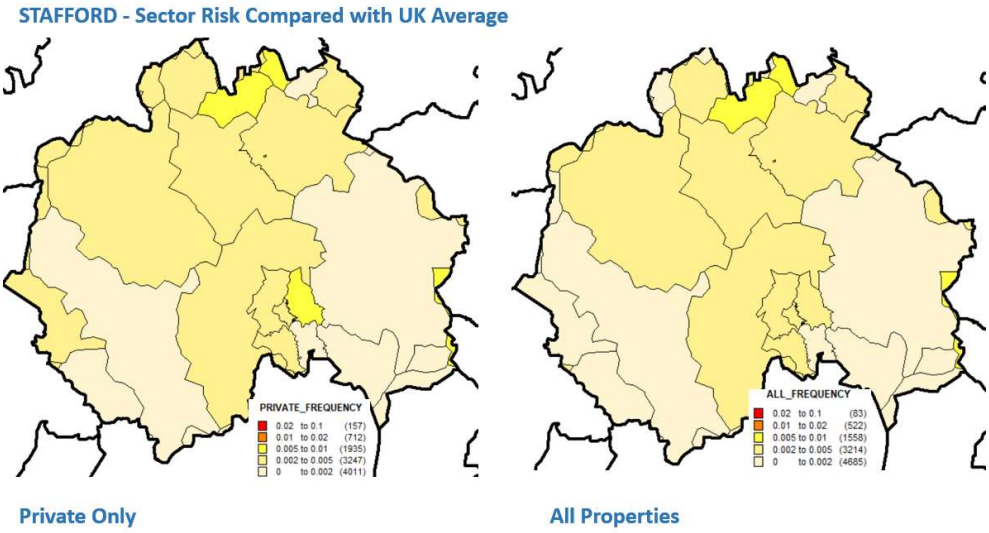
Stafford - Frequencies & Probabilities

Below, mapping the risk of subsidence by ownership. Claims frequency that includes council and housing association properties delivers a misleading value of risk as they self-insure. The following show the normalised risk, taking account of the private housing population – that is, the rating compared with the average value for each category.

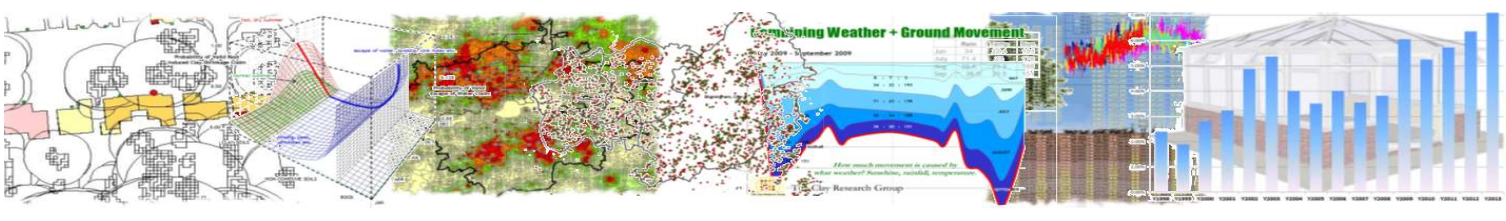


To reiterate, a reversal of rates for valid-v-declined by season is a characteristic of the underlying geology. For clay soils, the probability of a claim being declined in the summer is usually low, and in the winter, it is high.

In this case, the numbers are equally distributed between the causes – escape of water and clay shrinkage, reflecting the geology.

Liability by Season - STAFFORD

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Stafford	0.300	0.300	0.401	0.35	0.35	0.302



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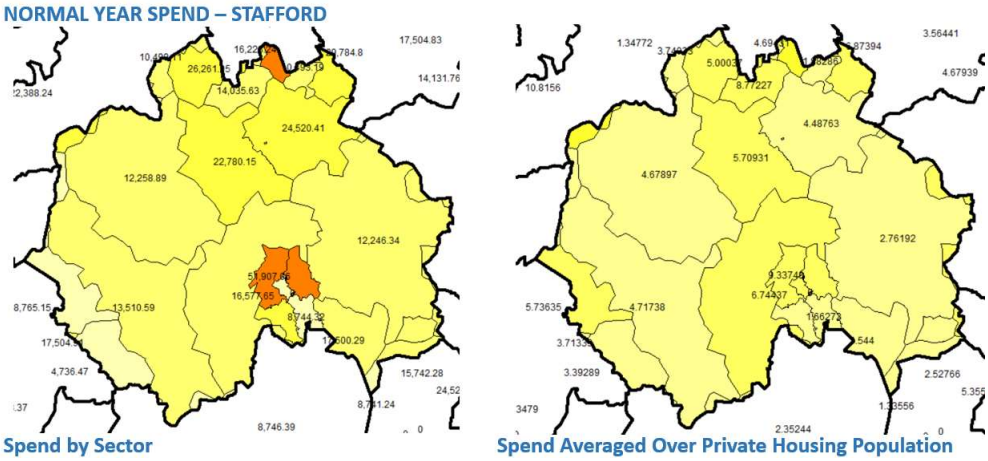
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

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 of course.



The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

In this case, the absence of any distinct difference between surge and normal years reflects the geology.