

# 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 2025  
Issue 244

# The Clay Research Group

## CONTENTS

Issue 244, September 2025

### Page 2

ChatGPT – repairing heave damaged properties

### Page 3

Geology and Risk - London

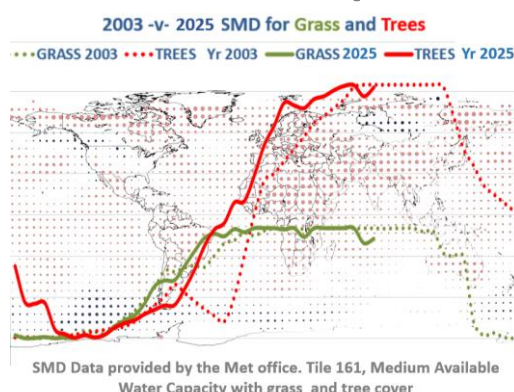
### Page 4

UK Met Office Anomaly Maps  
Weather – change by month comparing  
2003 with 2025

### Pages 5 - 11

Subsidence Risk Analysis by District  
**Norwich**

## SMD Graph



Plotting the correlation between the Soil Moisture Deficit for a surge year (2003) and the current year. 2025 has been particularly dry.

## Contributions Welcome

We welcome articles and comments from readers. If you have a contribution, please

Email us at: [clayresearchgroup@gmail.com](mailto:clayresearchgroup@gmail.com)

**THE CLAY RESEARCH GROUP**

[www.theclayresearchgroup.org](http://www.theclayresearchgroup.org)

[clayresearchgroup@gmail.com](mailto:clayresearchgroup@gmail.com)

## District and Sector Risk

Norwich is situated in Norfolk County, with a population of around 144,000 and an area of 38.7km<sup>2</sup>. 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 crag and chalk – see Page 7.



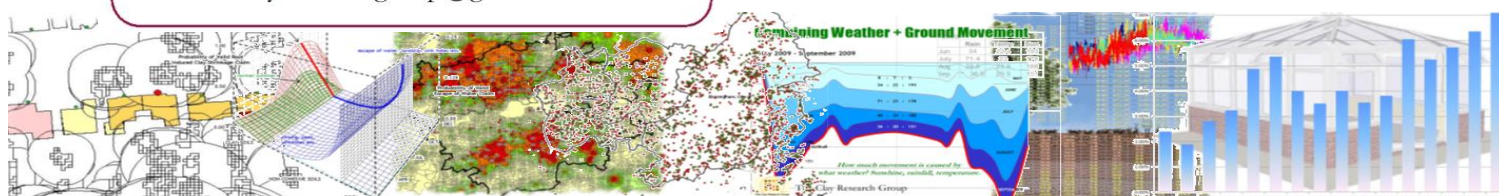
The risk maps are built from a data sample covering four claim years, including one surge and three 'normal' years.

## ChatGPT, AI and Claims

On page 2 we re-visit ChatGPT and ask for a structural solution to resolve heave claims. Homeowners making a claim may visit the ChatGPT web site at some stage and it is useful to understand the background to any queries they may raise.

On the topic of 'risk by geological series', we take a look at Norwich. In previous editions we have concentrated on clay soils, but Norwich tells a different story with non-cohesive soil dominating.

Both topics have links to the development of AI applications. In next month's edition we look at the benefits and drawbacks of this approach.



# The Clay Research Group

---

## ChatGPT – repairing heave damaged properties



### Question to ChatGPT

If your home is damaged by subsidence then underpinning is a possible solution but how do you deal with heave?

### Response

Great question — subsidence and heave are sort of opposites, so their solutions differ.

- Subsidence is when the ground beneath a property sinks, often due to things like tree roots removing moisture from clay soils, or leaking drains washing away fine material. Underpinning strengthens the foundation by extending it deeper to more stable ground.
- Heave is the opposite: the ground beneath a building expands and pushes upward. This often happens in clay soils when tree roots that had been drying the soil are removed (or a tree dies/gets felled), allowing the clay to rehydrate and swell.

👉 Dealing with heave is more complex than subsidence:

- You generally don't underpin against heave, because pushing forces are difficult to resist with just deeper foundations.
- Instead, possible measures include:
  - Heave protection when rebuilding or repairing (e.g., void formers or compressible materials under new foundations to absorb upward pressure).
  - Managing vegetation carefully (not over-removing trees/shrubs, staged felling, or replanting species with less water demand).
  - Foundation design in new builds/extensions (pile foundations with suspended floors rather than strip foundations).
  - Specialist structural interventions: in severe cases, parts of the structure may need rebuilding with heave-resistant techniques.

In short:

- Subsidence → underpinning is common.
- Heave → prevention and foundation design are key; repairs often mean reconstruction with heave protection rather than simple underpinning.

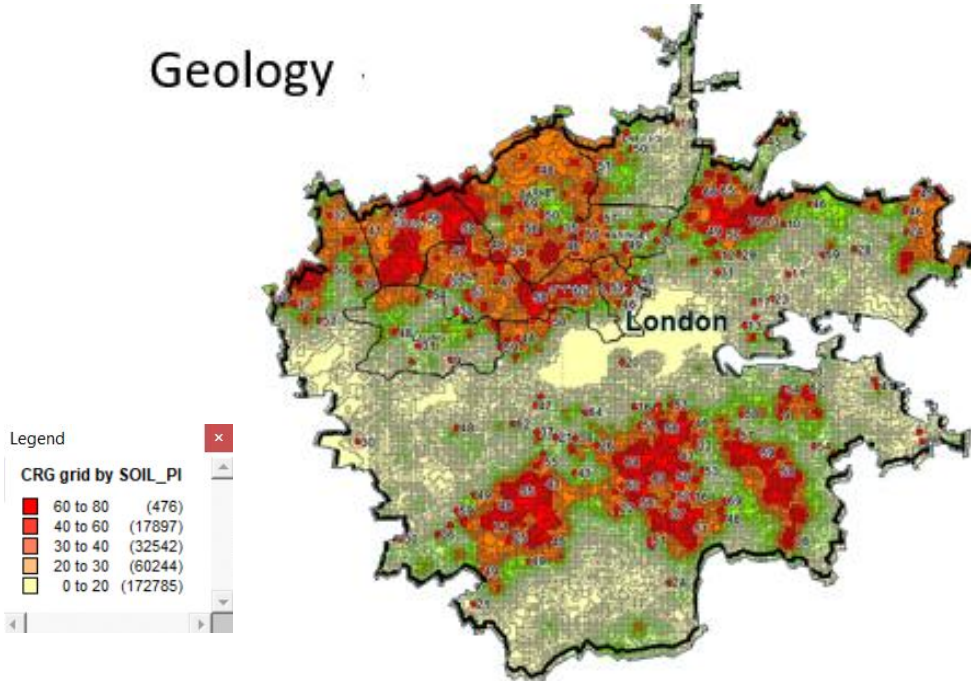




# The Clay Research Group

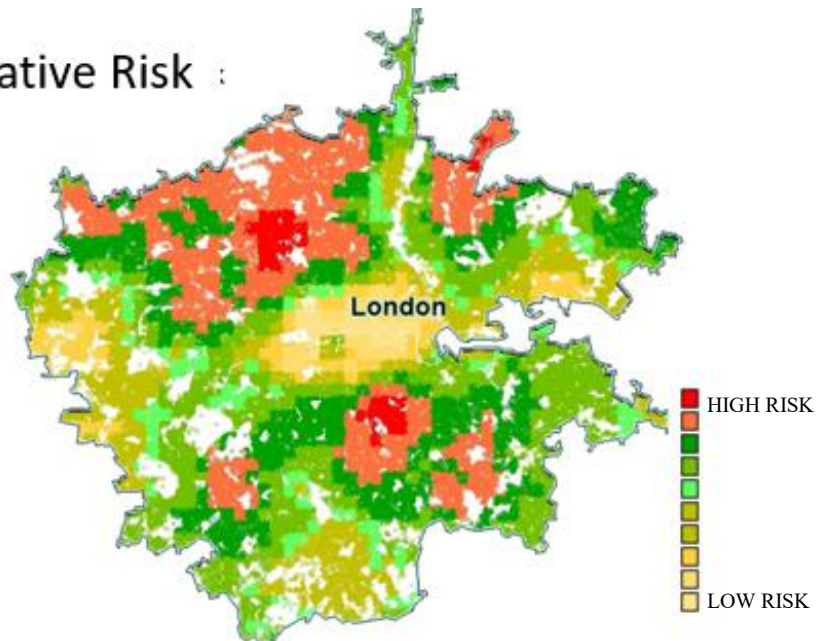
## Geology and Risk - London

### Geology



Above, CRG 250m tiled grid built from site investigation results associated with around 18,000 claims. Below, relative risk in terms of claim frequencies. Comparisons between the two confirm the high risk posed by clay soils.

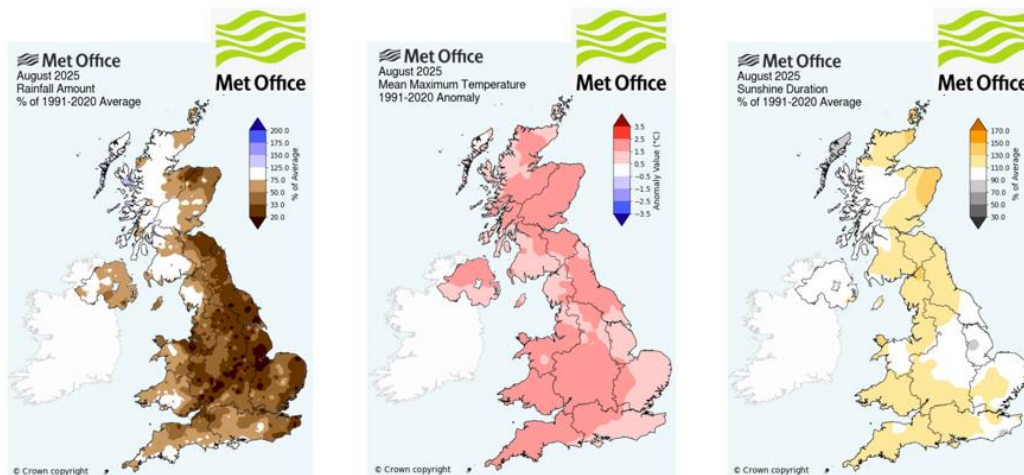
### Relative Risk :



# The Clay Research Group

## Met Office Anomaly Maps for August 2025

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



The maps indicate far less rainfall; significantly higher and longer sunshine duration 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

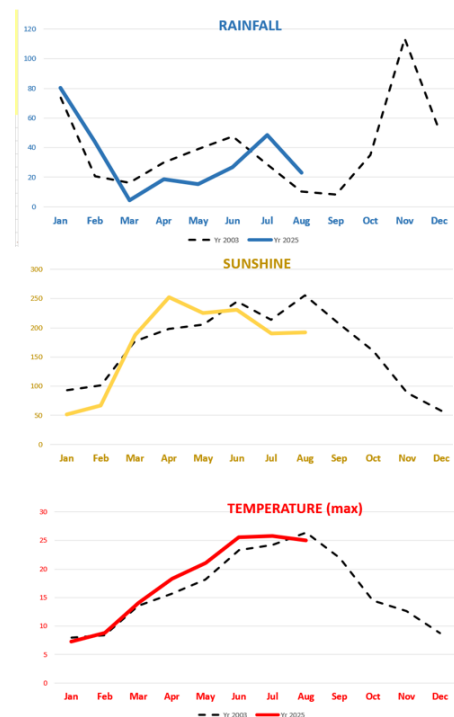
The charts plotting data from the Met Office web site reveal rainfall, sunshine and temperature in 2025 compared with 2003, a surge year.

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.

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.







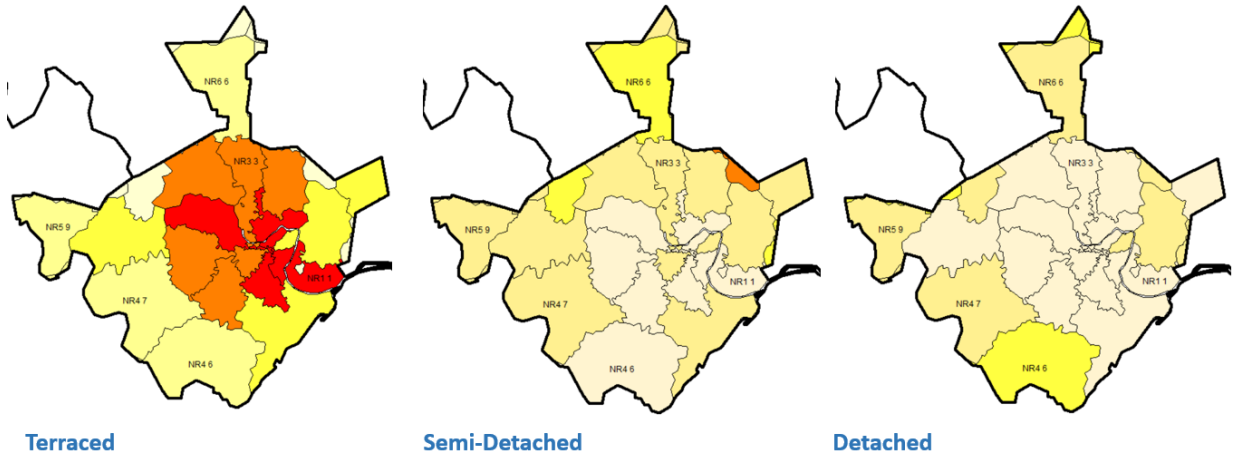
# The Clay Research Group

## Norwich - 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.

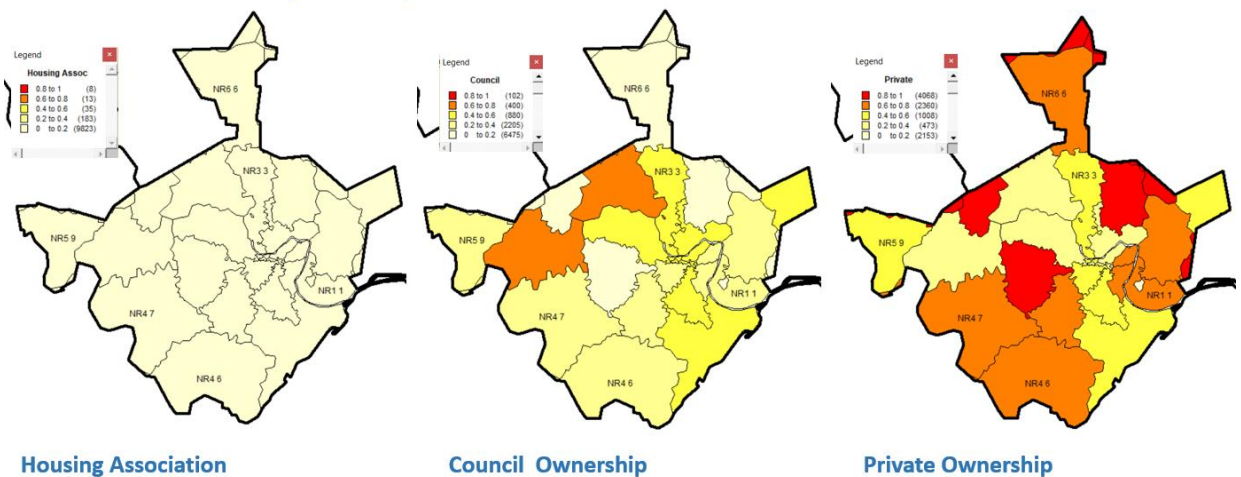
Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of taking out the policy.

### NORWICH - Distribution by House Type



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

### NORWICH - Distribution by Ownership



# The Clay Research Group

## Subsidence Risk Analysis – Norwich

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

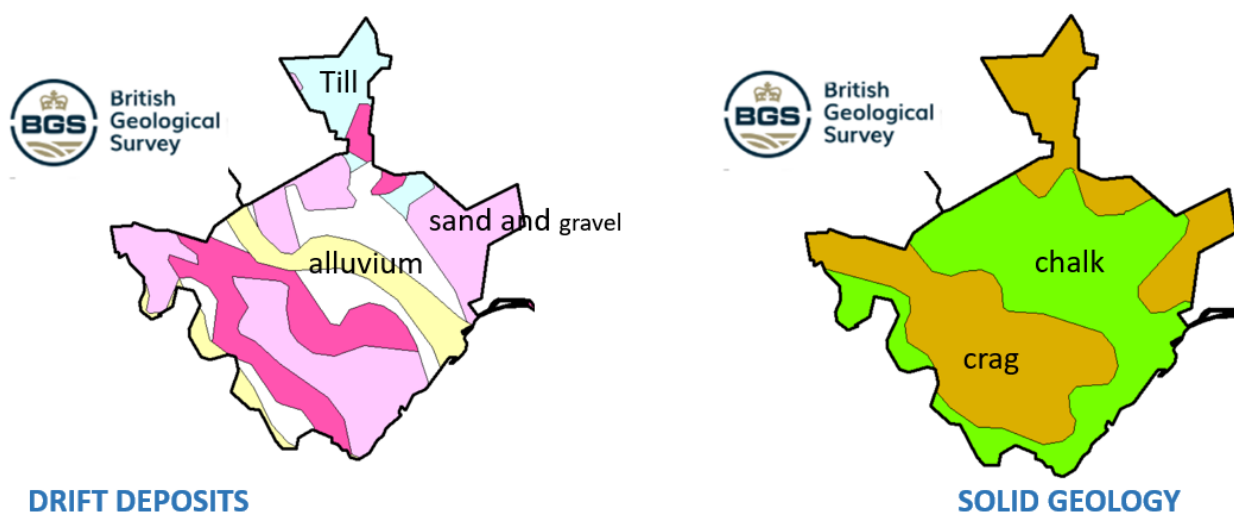
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

See page 10 for a seasonal analysis of the sample which reveals that, at district level, there is around a 30% probability of a claim being valid in the summer and, of the valid claims, there is a 90% probability that the damage will have been caused by escape of water.

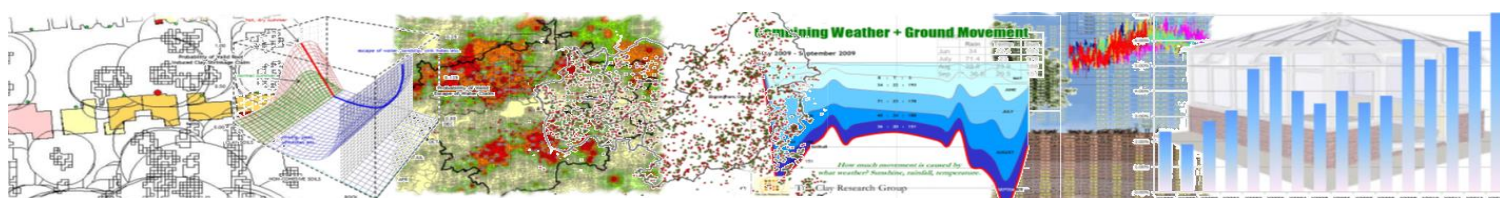
In the winter, the likelihood of a claim being valid is around 90% and of the valid claims, escape of water remains the most likely cause – around 90%, reflecting the geology.

A postcode sector map on the following page records the PI of soils retrieved following site investigations from actual claims.

### NORWICH : BGS Geology – 1:625,000 scale



*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.*



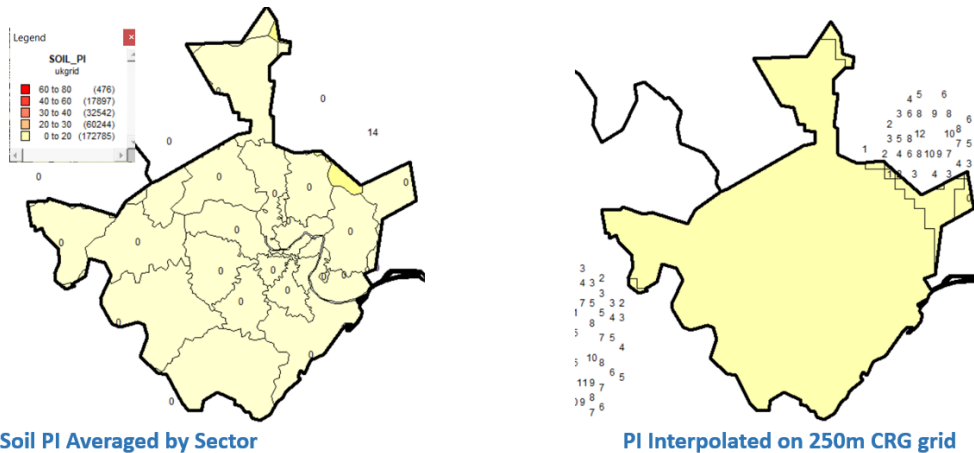


# The Clay Research Group

## 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 zero PI across the district.

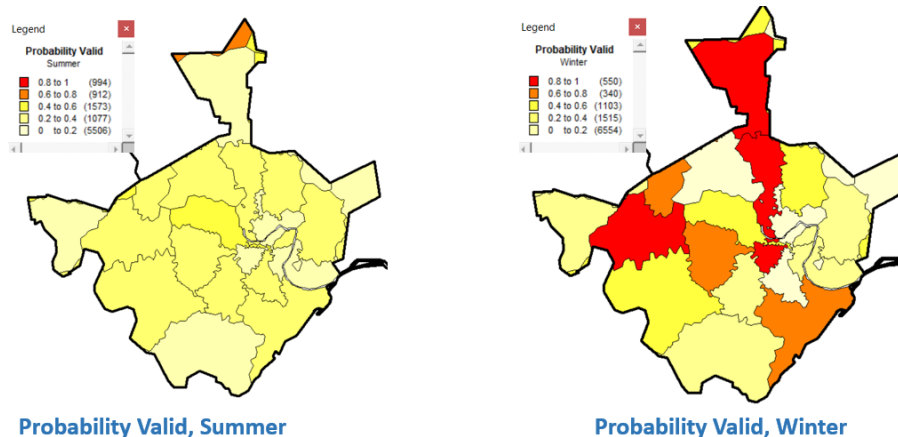
### NORWICH – Soil Plasticity Index



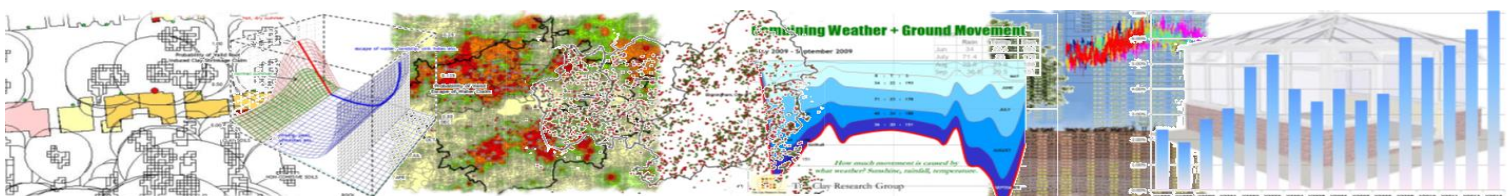
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. A single claim in an area with low population can raise the risk as a result of using frequency estimates.

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. In this instance, the dominant cause of damage is escape of water throughout the year.

### NORWICH – by season



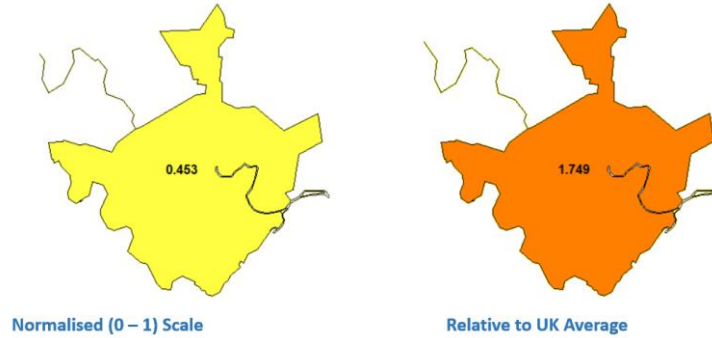
A high frequency risk can be the product of just a few claims in an area with a low housing density of course and claim count should be used to identify such anomalies.



# The Clay Research Group

## District Risk. EoW and Council Tree Risk.

NORWICH - Subsidence Risk Relative to UK

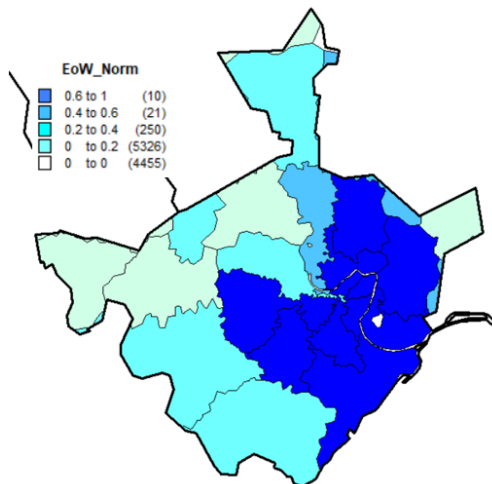


Below, left, mapping the frequency of escape of water claims reflecting the presence of drift deposits of non-cohesive soils underlain by chalk and crag.

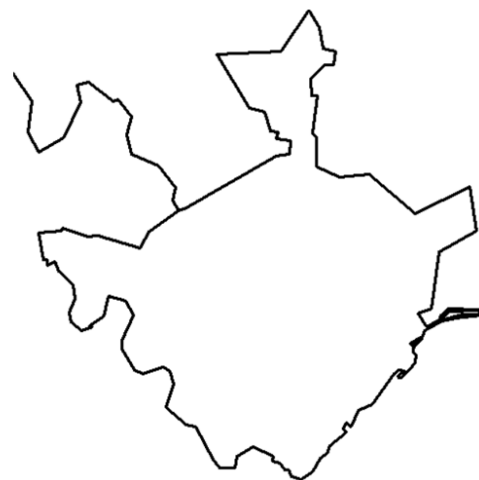
As we would expect, the 1:50,000 scale BGS map provides a more detailed picture. The CRG 1:250 grid reflects claims experience.

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 absence of claims from the sample held reflects the non-cohesive nature of the geology.

NORWICH

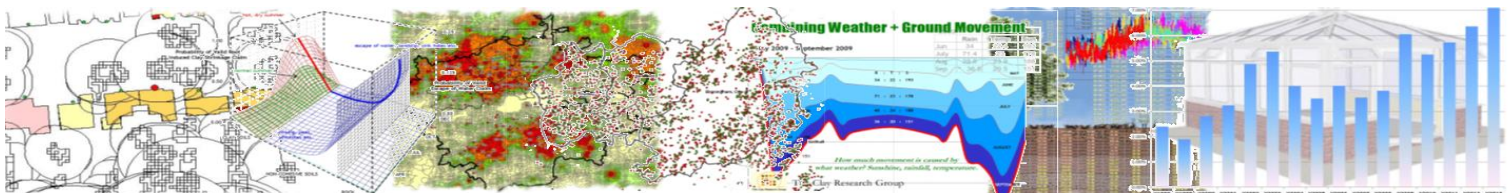


Escape of Water



Claims Involving Council Tree  
(2,858 UK claim sample)





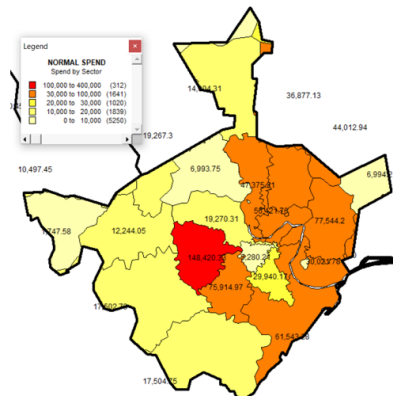


# The Clay Research Group

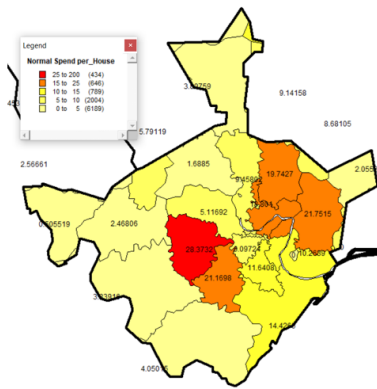
## Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

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.

### NORMAL YEAR SPEND – NORWICH



Spend by Sector

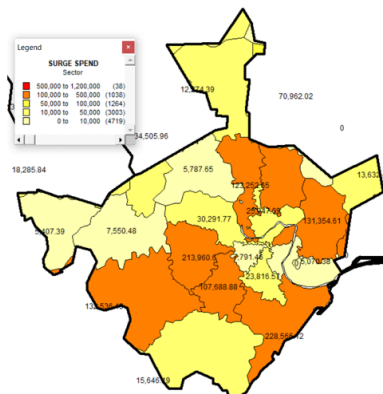


Spend Averaged Over Private Housing Population

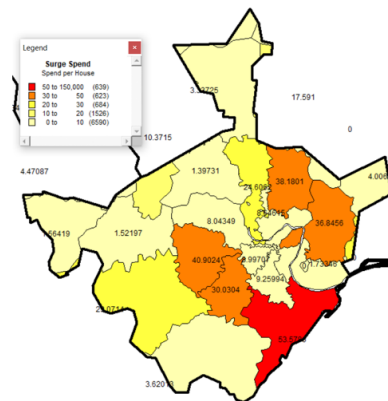
The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

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

### SPEND in SURGE – NORWICH



Spend by Sector



Spend Averaged over Private Housing Population

