

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



May 2026
Issue 252

The Clay Research Group

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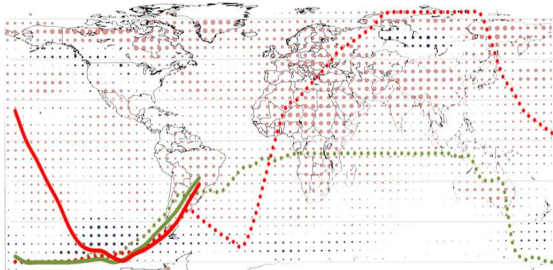
Subsidence Risk Analysis by District

Southend-on-Sea

SMD Graph

2003 -v- 2026 SMD for Grass and Trees

●●●●GRASS 2003 ●●●●TREES Yr 2003 — GRASS 2026 — TREES Yr 2026



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

SMD graph for Met Office tile 161 plotting the correlation between the SMD for a surge year (2003) and the current year in soils with medium water capacity.

Contributions Welcome

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

THE CLAY RESEARCH GROUP

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District and Sector Risk

Southend-on-Sea is situated in Essex, on the north coast of the Thames Estuary. It has an area of 41.76km² and a population of around 185,000.

It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises River Terrace deposits and silt overlying predominantly London clay – see Page 9.



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

TDAG Seminars

Visit the TDAG web site for a full list of conferences and seminars - <https://www.tdag.org.uk/>

On the 14th May, The seminar "Integrating Trees and Buildings – they don't have to be in conflict!" is to be held at FutureBuild, ExCel, London. <https://www.excel.london/>

The seminar commences at 13.30 and scheduled to last approximately three-quarters of an hour.



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ChatGPT



Question to ChatGPT

Can you identify the soil type in Southend-on-Sea?

Response

The soil in **Southend-on-Sea** isn't just one single type—it's a **mix shaped by coastal processes, rivers, and underlying clay geology**. But you can narrow it down to a few dominant soil types.

Main soil types in Southend-on-Sea

1. Clay-based soils (very common)



- The area sits largely on **London Clay**, a thick marine clay deposit.
- Soils derived from this are typically:
 - **Heavy clay or clay loam**
 - **Slow draining (can get waterlogged)**
 - Sticky when wet, hard when dry
- Common inland and along the cliffs.

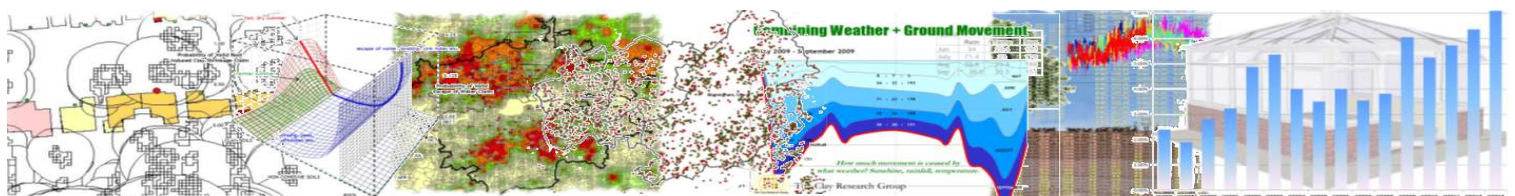
 This is probably the **most widespread "default" soil** in Southend.

2. Loamy and clay-loam soils



- Many areas have **loamy soils (mix of sand, silt, clay)**.

... continued



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ChatGPT



- Often described as:
 - **Fine loamy or silty clay loam**
 - Sometimes **slowly permeable clayey soils**
- These are more workable than pure clay and reasonably fertile.

3. Sandy & gravelly soils (localised)



- Found especially:
 - Near the coast and estuary
 - On old river terraces
- Made up of sand, gravel, and alluvium (river deposits)
- Typically:
 - Free-draining
 - Less nutrient-rich unless improved

4. Alluvial / estuarine soils (coastal flats)

- Around tidal areas:
 - Soft clays and silty soils
 - Sometimes with peat layers
- These are:
 - Moist or waterlogged
 - Found near mudflats and marshy edges

Simple summary

If you had to generalise:

- Most typical: heavy clay or clay-loam soil
- Also common: loamy soils (better for gardening)
- Near coast/estuary: sandy, silty, or alluvial soils

What that means in practice (abbreviated)

- **Building: clay can shrink/swell, so foundations matter**



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Accurate Predictions – or Crying Wolf?

Tony Boobier

There's an interesting connection between the Greek writer Aesop, and the prediction of subsidence claims. The story of 'The Boy Who Cried Wolf' was written in Classical times, and tells the story of a boy who tricks villagers into thinking that a wolf is approaching. When the real wolf approaches, the villagers ignore his calls, and their sheep are lost.

It seems to me that we have been 'crying wolf' about the likelihood of a subsidence event year for a while now. The alarms bells start to ring the moment that we have a dry spring and the authorities start to threaten water shortages. But what's the reality? Can we really predict a subsidence event with any degree of certainty?

A recent article, reported in the April edition of CRG, seems to think so. It says 'Analysis from PwC suggests extreme temperatures could lead to increased subsidence insurance payouts of up to £1.9bn (US\$2.48bn) by 2030'. I recall that the industry spoke about the £1.0 billion event year over 40 years ago, at a time industry costs were running in excess of £300m pa.. Adjusting for inflation, £1.bn would equate to £4.0 bn in today's money, so maybe PwC's £1.9bn prediction isn't quite so bad?

We've come a long way since then. We've learned a lot but had to unlearn some things as well. For example, once there seemed to be much greater certainty regarding the impact of trees on buildings but now we seem to be less sure. Beyond this, the world has also changed. We've become submerged in data which collectively should help provide us with better insight into the causes of subsidence, and our ability to forecast it. So why should prediction be so difficult?

Is it because there are so many contributory factors? Practitioners will be well aware of the key facts – trees, ground conditions, weather, distance, drains – but recognise other key factors such as the shape and vulnerability of buildings, the risk appetite of the property owner to the acceptance of damage, and even the impact of the housing market. Media attention also has its part to play.

The laws of big numbers should make the industry increasingly able to create broader-based models and give a better indication of the likelihood of a surge year with more confidence. Part of the analytical process is that of validation, where algorithmic models are created and then validated – or 'tested' – against what actually happened. Can't we use the past to help predict the future by retrofitting calculations?

A combination of time-based, deep learning methods and satellite-based remote monitoring certainly gives greater insight but aren't these solutions proffered by technologists rather than practitioners? Despite the apparent wizardry of technology, until we can effectively model homeowner attitudes or the fluctuations of housing market conditions, won't we only be able to predict a partial picture?

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It seems like, at least for the moment, we'll probably just have to rely on intuition and how much the seaweed has dried out, which seems (at least, to me) to still be a bit 'hit and miss'. And as a result, won't the industry inevitably just have to 'cry wolf' until a surge event actually happens? By then, won't it be too late to act in terms of effective claims management and proactive customer service?

British Geological Survey Updates

More news on the BGS updates to three of their databases and of particular interest is **GeoClimate** which is aimed at identifying the risk posed by clay shrink-swell related subsidence under multiple climate scenarios.

“Shrink-swell subsidence presents a significant growing economic cost – In 2025, the UK experienced the warmest Spring on record, and the driest in more than 50 years. As a result, in the first six months of 2025, subsidence-related insurance claims in the UK totalled £153 million (ABI, 2025). Climate change projections indicate that hotter, drier conditions are likely to become increasingly frequent over the coming century, exacerbating subsidence susceptibility.”

Register on line for a 'virtual launch' on the 2 June 2026 - 2 to 3 pm:

<https://www.eventbrite.co.uk/e/bgs-geoclimate-dataset-launch-webinar-tickets-1988463865951?aff=oddtcreator>

To refine the risk model still further, a dataset entitled 'Property Risk Assessment' is to be released on the 8th June, 2026. An outline of the content can be found using the following link:

<https://www.bgs.ac.uk/download/information-note-property-subsidence-assessment/>

“The BGS Property Subsidence Assessment (PSA) dataset displays a calculated subsidence hazard score that identifies areas of potential shrink-swell hazard. This score is derived via the weighted integration of geology, tree location and building characteristics. Building level information is then further scaled to obtain a hazard score at postcode level.”

The database covers Great Britain and postcode and building level and includes the Blue Sky national tree database and latest OS data, both updated in October 2025. House data from Office for National Statistics.

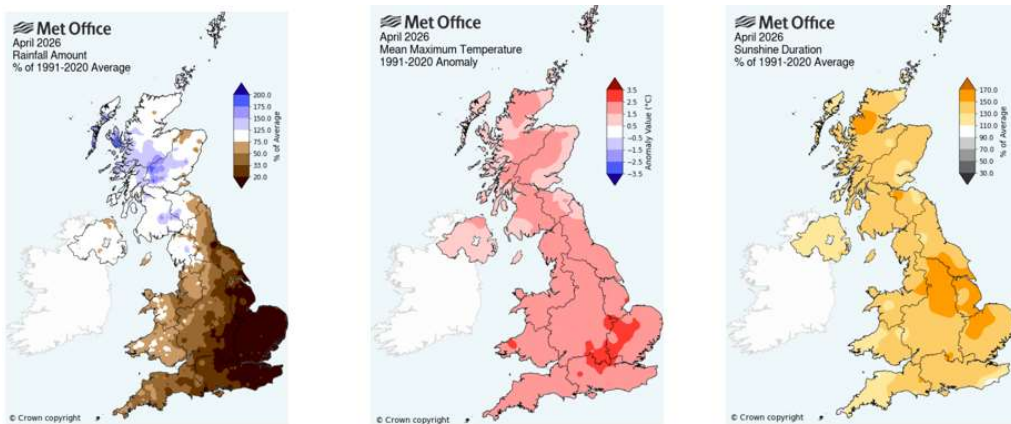
<https://www.ons.gov.uk/census/maps/choropleth/housing/accommodation-type/accommodation-type/terraced/?oa=E00080204>



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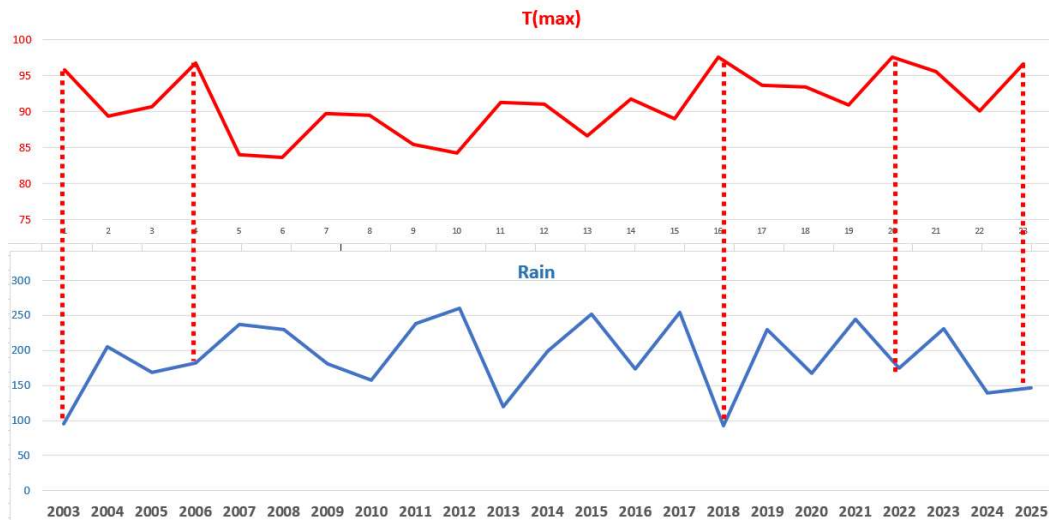
Met Office Anomaly Maps for April 2026

Anomaly maps from the Met Office web site for the month of April 2026 comparing data with the 1991 – 2020 average, reproduced below. The weather has been drier to the SE and warmer with longer sunshine duration across the UK.



Surge Causation

The difference between high temperature coincident with low rainfall is a good indicator of surge causation. The graph below uses the sum of the month's June, July, August, September and October from the Met Office weather station in Heathrow. Unfortunately, it doesn't have a predictive element. Surge years are indicated by vertical dotted lines.



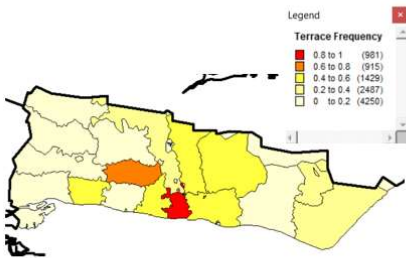
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Southend-on-Sea - Properties by Style and Ownership

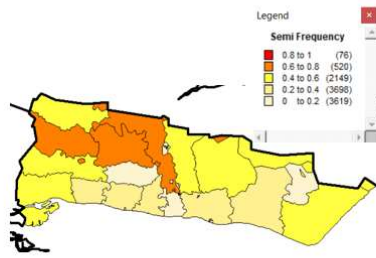
Below, the general distribution of properties by style of construction, distinguishing between terraced, semi-detached and detached. Unfortunately, the more useful data is missing at sector level – property age.

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.

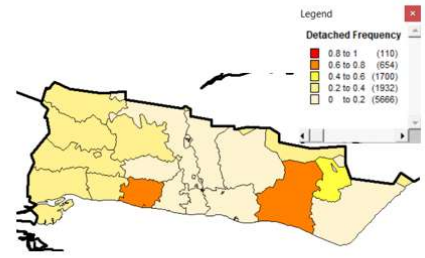
Southend-on-Sea - Distribution by House Type



Terraced



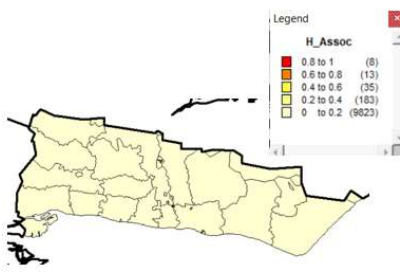
Semi-Detached



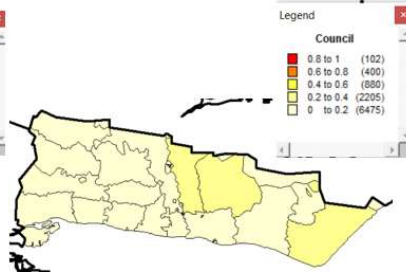
Detached

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

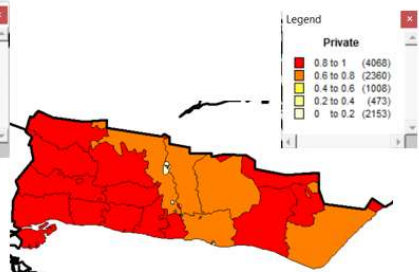
Southend-on-Sea - Distribution by Ownership



Housing Association



Council Ownership



Private Ownership



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Subsidence Risk Analysis – Southend-on-Sea

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

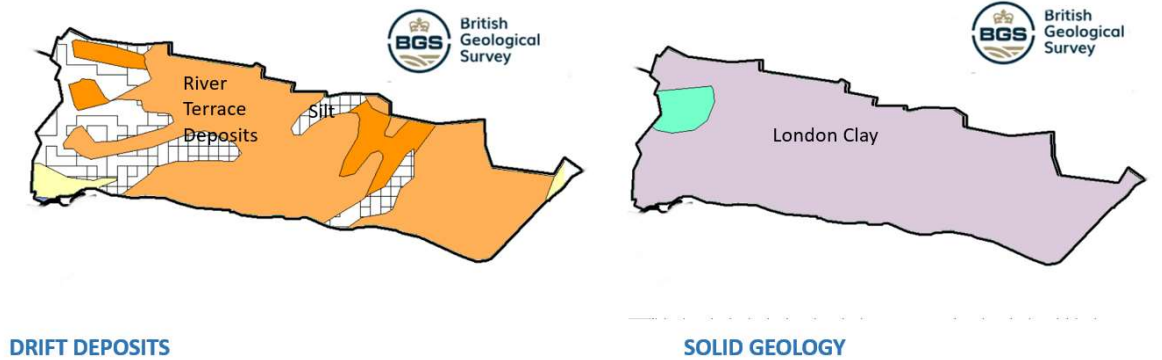
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

See page 12 for a seasonal analysis of the sample which reveals that, at district level, from the sample held, there was around a 76% probability of a claim being valid in the summer and, of the valid claims, there is a 80% probability that the damage will have been caused by clay shrinkage.

In the winter, the likelihood of a claim being valid is around 45% and of the valid claims, around 80% were attributable to an escape of water.

drift deposits of River Terrace overlying a solid geology of London clay. Site investigations undertaken relating to claims confirms the presence of clay soils with a PI of around 40 – 50%. Many bores describe a sandy clay.

Southend-on-Sea : BGS Geology – 1:625,000 scale



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.

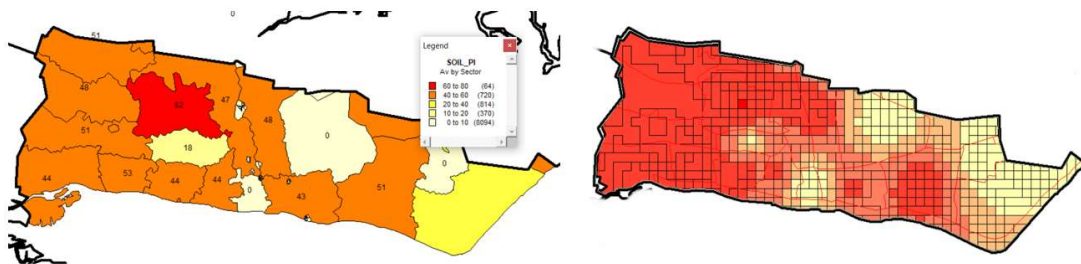


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Liability by Geology and Season

Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right).

Southend-on-Sea – Soil Plasticity Index



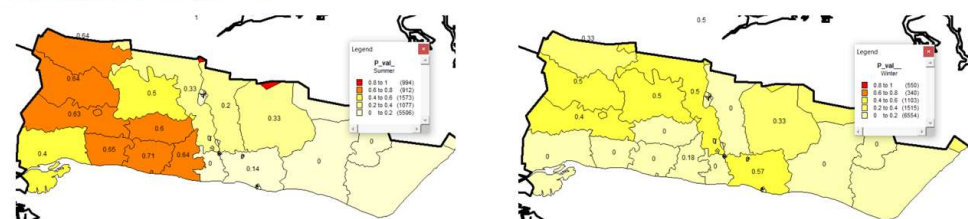
Soil PI Averaged by Sector

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 12 is perhaps the most useful way of assessing the potential liability, likely cause and geology using the values listed.

Southend-on-Sea – by season



Probability Valid, Summer

Probability Valid, Winter

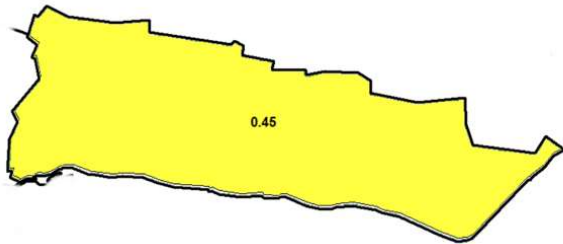
A high frequency risk can be the product of just a few claims in an area with a low housing density of course and claim count should be used to identify such anomalies.



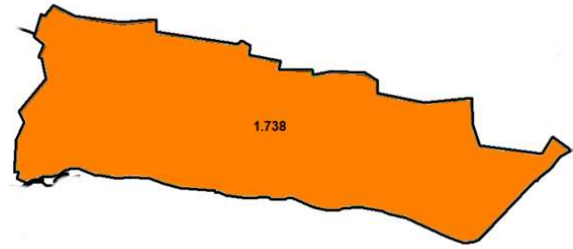
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District Risk. EoW and Council Tree Risk.

Southend-on-Sea - Subsidence Risk Relative to UK



Normalised (0 – 1) Scale



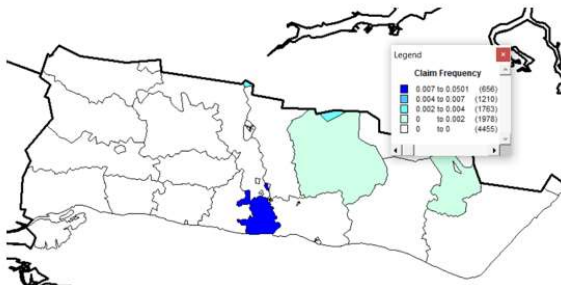
Relative to UK Average

Below, left, mapping the frequency of escape of water claims reflecting the presence of drift deposits.

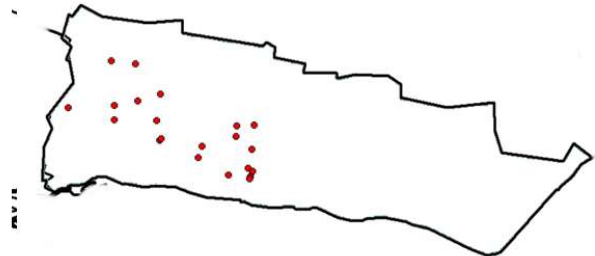
As we would expect, the 1:50,000 scale BGS map provides a more detailed picture. The CRG 1:250 grid reflects claims experience.

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. In this case their location identifies the presence of shrinkable clay soils.

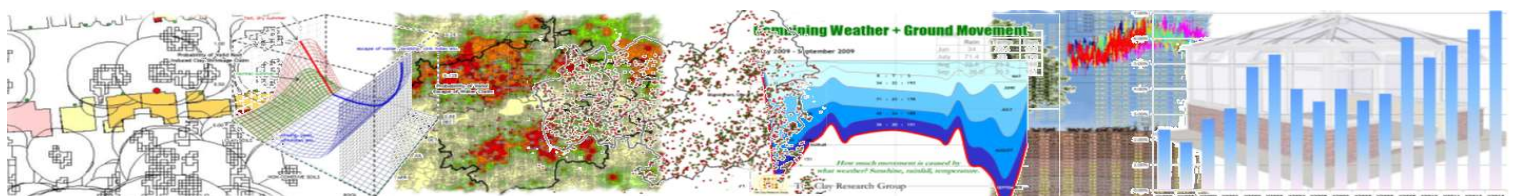
Southend-on-Sea



Escape of Water



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

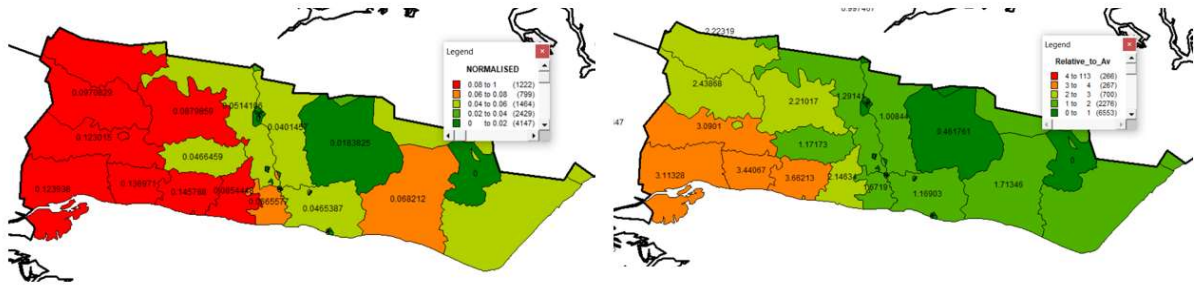


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Southend-on-Sea - Frequencies & Probabilities

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.

Normalised Risk by Sector – Southend-on-Sea



Normalised Subsidence Risk – scale 0 – 1

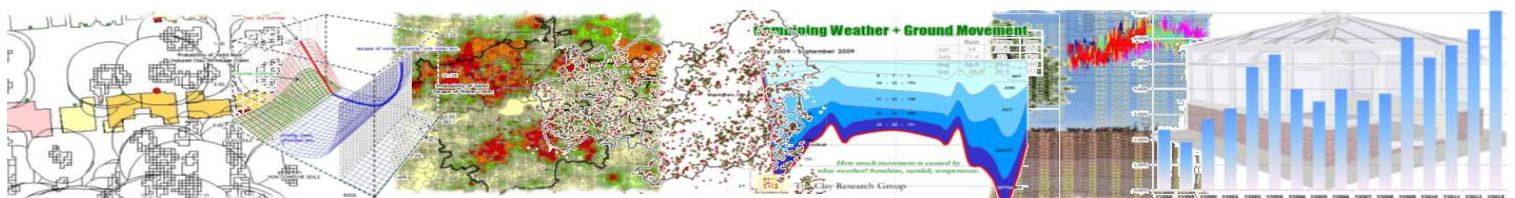
Subsidence Risk Compared to UK Average

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 values reflect the presence and influence of the underlying geology with non-shrinkable soils accounting for a higher proportion of Escape of Water claims throughout the year.

Liability by Season - Southend-on-Sea

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Southend-on-Sea	0.622	0.140	0.238	0.08	0.37	0.55

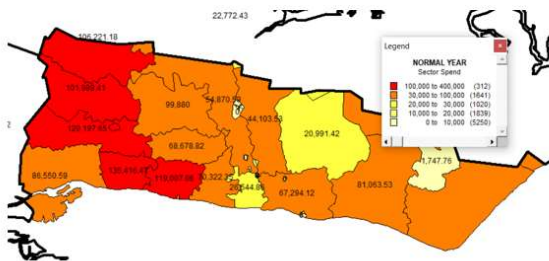


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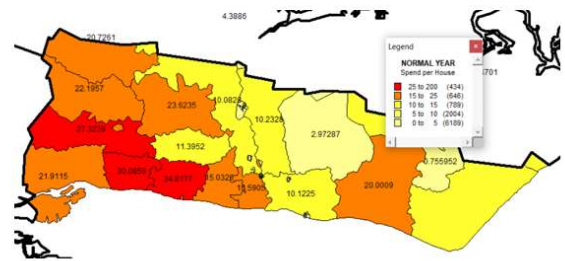
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

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.

NORMAL YEAR SPEND – Southend-on-Sea



Spend by Sector

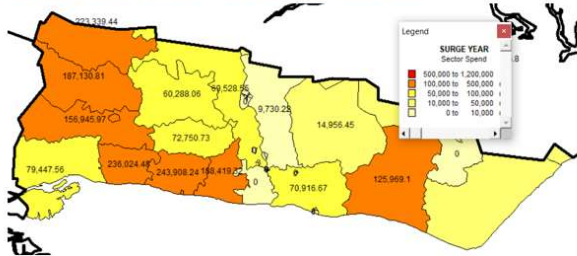


Spend Averaged Over Private Housing Population

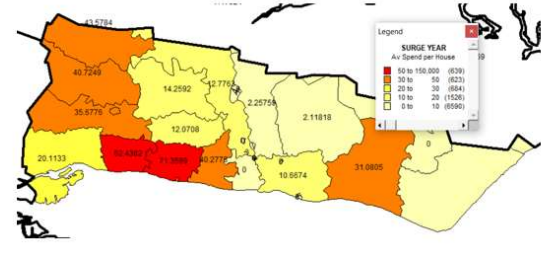
The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

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

SPEND in SURGE – Southend-on-Sea



Spend by Sector



Spend Averaged over Private Housing Population

