3D Model developments – Mapping lithology stochastic modelling

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Glacial sediments in the real world

Grey, fine to coarse grained sand with some silt, clay and locally gravels
Stratigraphic models
Boreholes in Central Glasgow

- Logs of 4391 geotechnical boreholes
- Described in accordance with British Standard BS930:1990
- With this amount of data we can use to investigate lithological variation
Lithological variation in glacial units

Superficial stratigraphic units

- Made Ground
  - Law Sand and Gravel Member
  - Stathkelvin Clay and Silt Member
  - Gourock Sand Member
  - Kilearn Sand and Gravel Member
  - Paisley Clay Member
  - Bridgeton Sand Member
  - Ross Sand Member
  - Broomhouse Sand and Gravel Member
  - Widerness Till
  - Cadder Sand and Gravel Member
  - Pre-Quaternary bedrock
What is stochastic modelling?

Stratigraphic models don’t show variability in the unit.

We can apply a the value randomly using a standard distribution.

If we have boreholes showing how the property varies in the unit we can apply stochastic techniques.
How stochastic modelling works
Run model 500 times and find the most frequently occurring lithology at any one locality.
Probability maps

- Probability of Soft Clay
- Probability of Organic
- Probability of Sand
- Probability of Silt and Gravel
- Probability of Silt
- Probability of Stiff Clay Diamicton

Clay Diamicton

D& Gravel
Summary

1. Stochastic models show lithology rather than stratigraphy

2. Can produce probability maps of different lithologies which indicate uncertainty in data

3. Are dependant on large amounts of data >1000 boreholes and affected by clustering

Is this of interest?