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Clyde Gateway Pilot 3D Geological Model, Version 2

Geology and Landscape Programme
Commissioned Report CR/12/010N

BRITISH GEOLOGICAL SURVEY

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Clyde Gateway Pilot 3D Geological Model, Version 2

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SW corner 255000, 660000
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FIGURES

Summary

This report describes the updates made to develop a new Version 2 of the Clyde Gateway Pilot Geological Model. For full details of the models please refer to the report accompanying version 1:

J E Merritt, A A Monaghan, S C Loughlin, M Mansour, B É Ó Dochartaigh and A G Hughes. 2009. Clyde Gateway Pilot 3D Geological and Groundwater Model BGS COMMISSIONED REPORT CR/09/005

1 Bedrock model version 2

A new model version was made to remove minor artefacts and to extend the model to include NS56NE to complete a 'Central Glasgow' square (Figure 1).

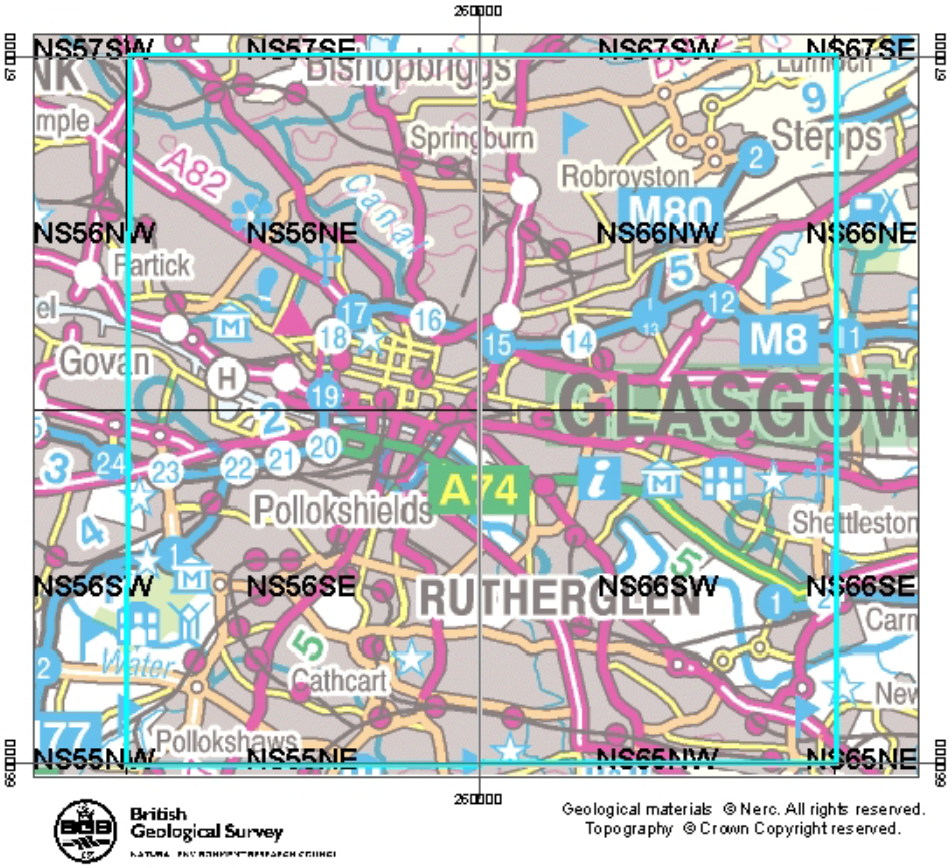

Figure 1 Area of the version 2 model

In detail the Version 2 model:

- Fits a revised rockhead model which in some places varies by 10m from the older version
- No new borehole data were entered into BGS.Borehole_Geology or collated from mining data since Version 1
- Faults were extended across NS56NE and also made more consistent with regional modelling work that had taken place since Version 1. The Great Dyke Fault is now called the Blythswood Fault and is taken to cut across the Dechmont Fault.

1.1 SUMMARY MODEL DESCRIPTION

The same six stratigraphic surfaces as in version 1 were modelled (Figs 2 and 3)

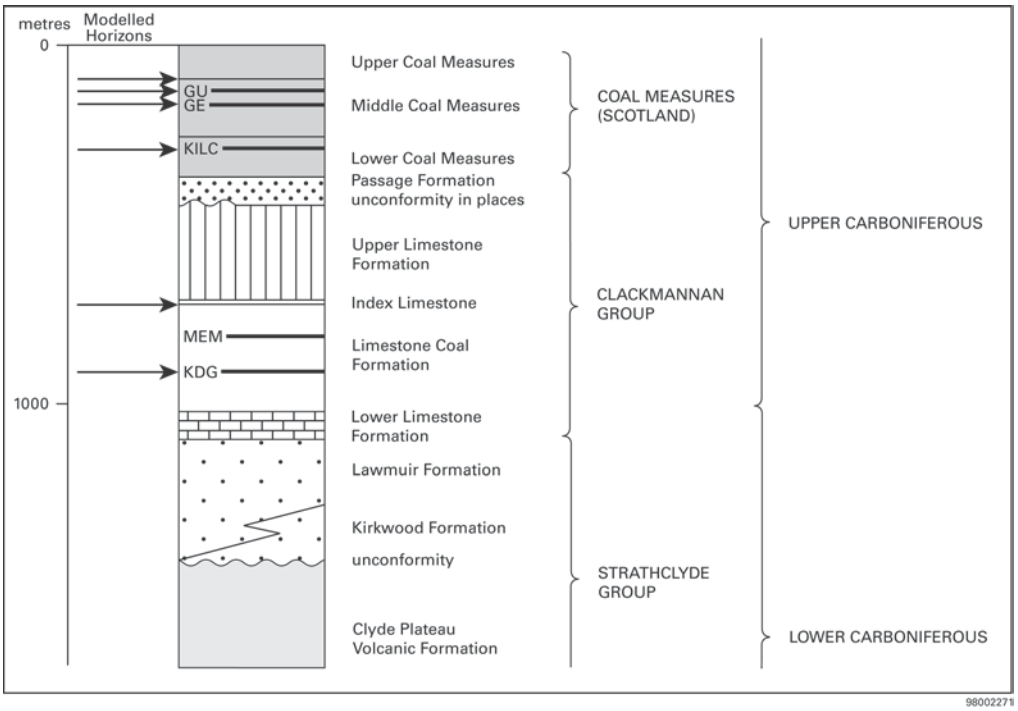

Figure 2: Summary stratigraphy of the modelled Carboniferous strata in the Glasgow area. Coal name codes Glasgow Upper coal (GU), Glasgow Ell Coal (GE), Kiltongue Coal (KILC), Knightswood Gas Coal (KDG)

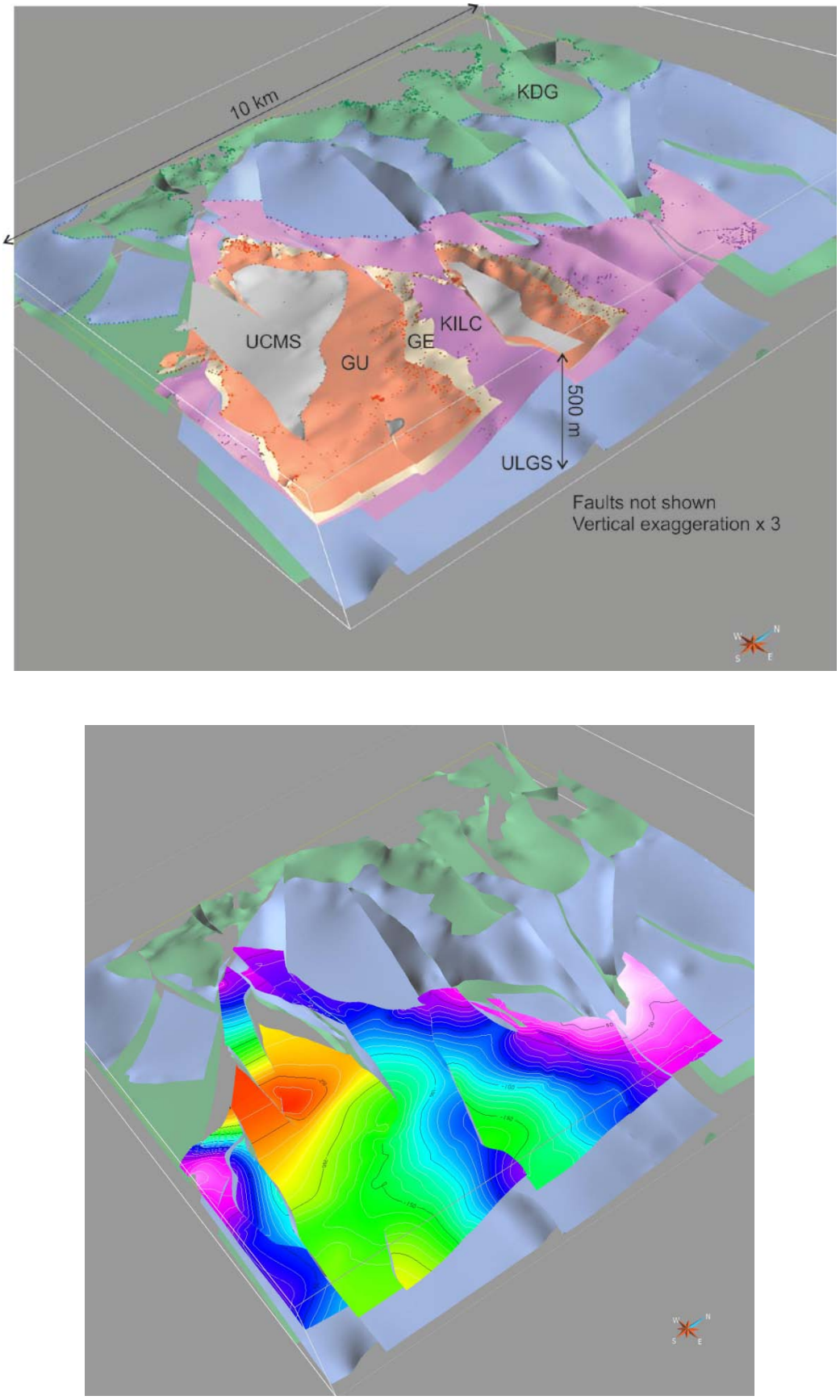

Figure 3a: Overview of surfaces modelled with data points from boreholes, mine plans and mapped outcrop shown. Figure 3 b): Contours on KILC

34 dipping faults were modelled (Figure 4).

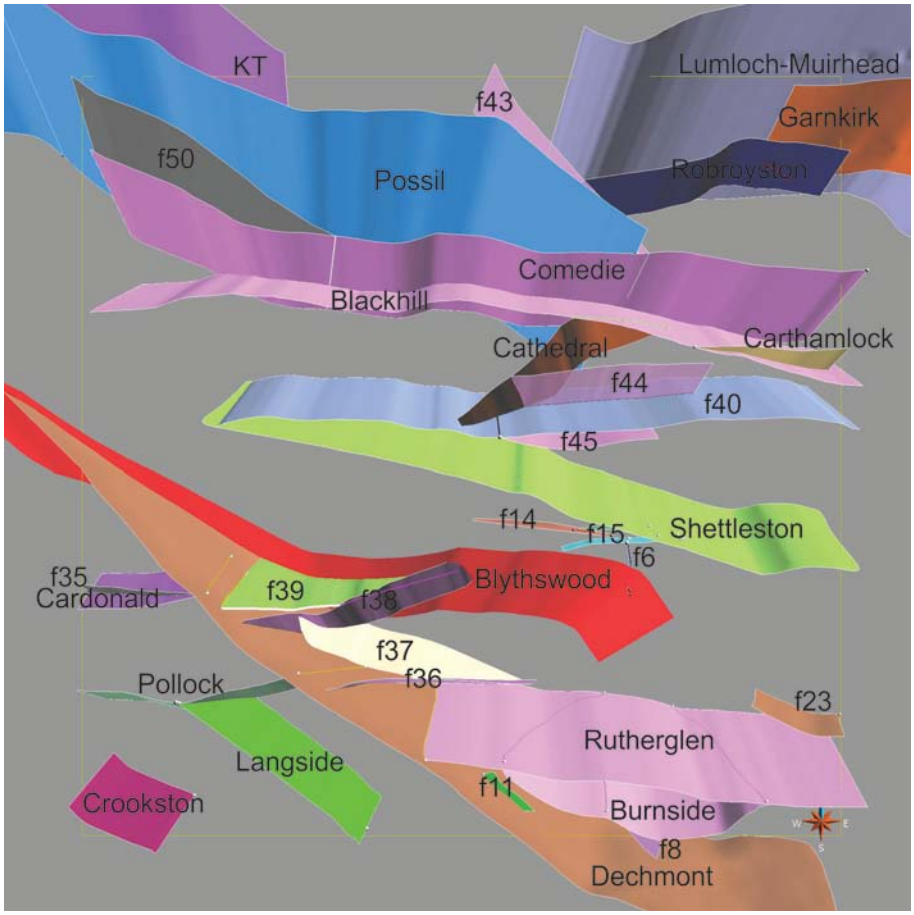

Figure 4: Overview of faults modelled, looking from above.

1.2 MODEL LIMITATIONS AND INCONSISTENCIES

Fault geometries which terminate against each other at low angles result in numerous thin 'slivers'. These are difficult to model satisfactorily and are often poorly constrained by data (e.g. at junction of Blythswood, f38 and f39). There is a small sliver of the Kiltongue Coal surface that penetrates through f38, and should not. Thus thin slivers should be treated as parts of the model with high uncertainty.

Isopach maps and cross-sections through the stacked surfaces and faults highlight inconsistencies caused by lack of data particularly on the more deeply buried parts of KDG and Base ULGS/ILS, or by patchy data coverage on one particular surface (e.g. circular inconsistencies caused by data on a particular coal seam from a particular, localised set of boreholes between GU and GE). For example, variation in general dip between faults 37 and 38 on KILC-ILS-KDG surfaces. Generally the KDG and ILS modelled surfaces are much more uncertain away from their outcrop than the other modelled surfaces, due to lack of data.

f40 reverses throw along its length, as on the 10,000 scale map, but the fault dip has consistently been modelled at 60° to the north along the whole structure.

The scale of faults modelled is inconsistent. Some smaller faults have been included (f14,15,6) where they constrain the outcrop of the modelled coals on NS66SW. In other areas of the model, only much larger fault structures have been included. Known, smaller faults have been excluded.

Very small areas of bedrock surfaces lie up to 2 metres higher than the rockhead model causing a local crossover. This happens in areas where there are local low points in the higher resolution mesh of the rockhead surface, and there are no TIN points within that area from the lower resolution bedrock mesh (crossovers at TIN points should have been removed).

1.3 EXPORT TO ESRI RASTER GRIDS

The bedrock model is not included within the Lithoframe Viewer file. The surface grids and a combined fault grid were exported from the modelled TIN's using a grid spacing of 25m, for loading to ArcGIS.

2 Version 2 superficial model

The main edits to the superficial deposits model were:

- Node density was increased on cross-sections to improve the interpolation of geological units across the area
- The 2D distribution of the units was improved by adding additional holes to the envelopes where the unit was not correlated and using newer functionality in GSI3D v3 for snapping the correlations in section against the surface outcrop and subcrop
- Water was removed as a modelled unit from the area.

The modelled surfaces were exported as ESRI grids and are also in the Lithoframe Viewer.

3 Model uncertainty

The Version 1 model was supplied with uncertainty layers. Revised layers are not supplied with version 2 since no new data were included in the model. Note that there are no uncertainty maps for NS56NE, the newly modelled NW corner of the model.