Over 120 years worth of hydrocarbon exploration, an example of how legacy data can address todays challenges.

Mark W. Fellgett[1]*, Andrew Kingdon[1] and Anthony Myers[2]

[1]British Geological Survey, Environmental Science Centre, Nicker Hill, Keyworth, Nottingham, NG12

[2] Retired

Unconventional hydrocarbon exploration has been a contentious issue in the UK since tremors were associated with a hydraulic fracturing operation at the Preese Hall 1 well in Lancashire (Green et al., 2012). Following this a review of hydraulic fracturing concluded that more information was needed to characterise faults, fractures and stresses in UK shales (Mair et al., 2012).

One of the key requirements for planning a Shale Gas operation is an understanding of the in-situ stress field. The stress field is important as it predicts both the orientation and the plane in which hydraulic fractures propagate. However as of 2016 stress field information across the UK was limited with only 24 sites having information to characterise the stress field (Heidbach et al., 2016).

To investigate whether legacy data could be used to help characterise the stress field required an examination of the BGS archives. As a national data repository the British Geological survey holds records for over 2000 onshore oil and gas wells drilled across the UK landmass which date from 1896 to present day. The data types associated with these wells vary from formats such as TIFF, bitmaps, text files and pdfs to industry specific non binary formats such as LIS and DLIS. Effective use of this archive requires a mixture of data mining, expert interpretation and innovate techniques to convert the files to more accessible formats.

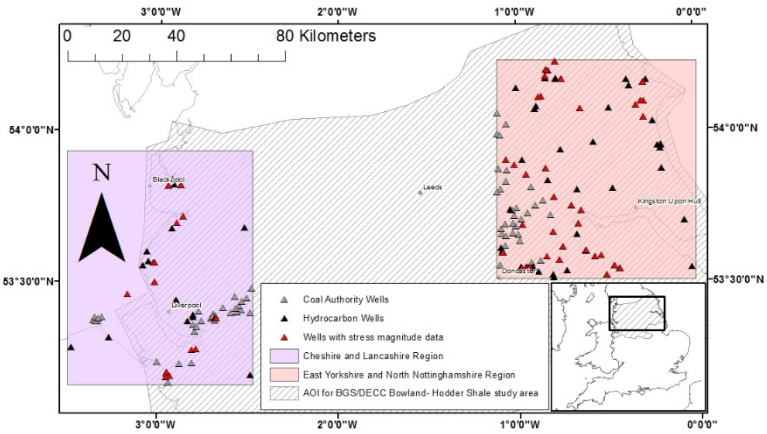

Figure 1:Map showing two UK regions where stress magnitudes have been investigated. Deep Boreholes are the most common source of stress field information and are shown as triangles. Boreholes in red have information to characterise stress magnitude data. Hatched zone corresponds to the area of interest from the BGS/DECC Bowland-Hodder Shale study, Andrews et al. (2013).

Much of the relevant information was contained in a series of scanned reports held as multi page files in TIFF format. Interrogating these files required the conversion to pdfs and then the use of optical character recognition which was performed on mass using FME and Adobe Acrobat Pro.

Currently there is active unconventional exploration interest in the UK, particularly in two areas underlain by the Bowland Shale Group (Figure 1). To identify relevant data to provide information to operators and regulators two areas were selected to see if any hydrocarbon boreholes had relevant information.

Utilising the legacy data found stress field information available for around 40% of the hydrocarbon boreholes across the regions. In total legacy information is now available for 75 sites across the UK and is now being used in the planning of well operations. However more work is needed to investigate theses issues and better techniques are required to automate the process of collecting stress field information.

References

1. Andrews, I.J. 2013. The Carboniferous Bowland Shale gas study: geology and resource estimation. British Geological Survey for Department of Energy and Climate Change, London, UK.
2. Green, C.A., Styles, P., and Baptie, B.J. 2012. Preese Hall Shale Gas Fracturing Review and Recommendations for Induced Seismic Mitigation. Report for DECC
3. Mair, R., Bickle, M., Goodman, D., Roberts, R., Selley, R.C., Shipton, Z., Thomas, H. & Younger, P. 2012. Shale gas extraction in the UK: a review of hydraulic fracturing. Royal Society & Royal Academy of Engineering 105pp.royalsociety.org/uploadedFiles/Royal_Society_Content/policy/projects/shale-gas/2012-06-28-Shale-gas.pdf