OR/19/052 Appendix 2 - Core scanning facilities

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Kingdon, A, Fellgett, M W, and Spence, M J. 2019. UKGEOS Cheshire Energy Research Field Site - Science infrastructure. *British Geological Survey Internal Report*, OR/19/052. *Contributors:* Midgley, J, Elsome, J W, Dearden, R A, Chapman, C, Burke, S P, Hough, E, Luckett, R R, and Bianchi, M.

A new, state-of the art, core scanning facility funded by the UK Geoenergy Observatories programme is available as part of the National Geological Repository (NGR) at Keyworth, Nottingham, UK. The NGR Core Scanning Facility hosts several high-resolution core scanners that allow whole, split, or slabbed rock and sediment cores to be, continuously and non-destructively, scanned before being further processed.

Core scanning provides detailed information on the geophysical, mineralogical, and geochemical characteristics of the core, records core quality and fundamental variations along the core, and allows multiple imaging techniques including high-definition optical, near-infrared (NIR), ultraviolet (UV), and X-radiographic images to be taken.

The following core scanning facilities are available:

X-ray tomography — X-ray computed tomography visualises and records internal structures present within the core to determine core quality, structural features, heterogeneity and fracture networks. The rotating source-detector assembly scans in multiple orientation, producing both 2D radiographic core images (‘slices’) and 3D reconstructions. A digital rock software package will help users to visualize, process, and rapidly interpret the digital core imagery.

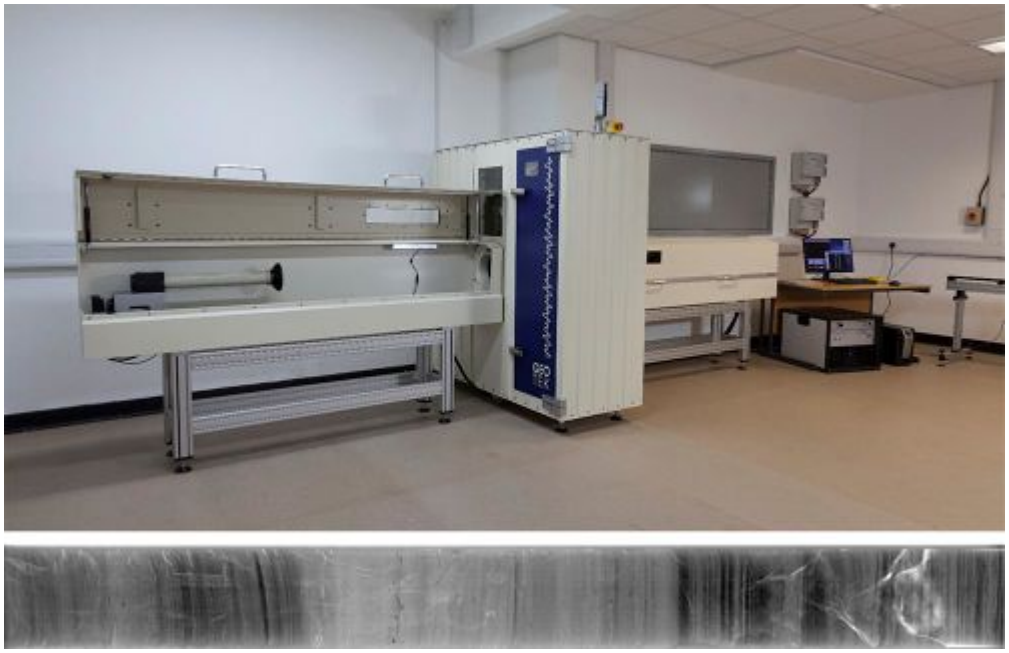

Figure 16 MSCL-RXCT core scanner and example 2D X-ray radiograph (Geotek MSCL — RXCT).

Geophysics and core imaging — Multi-sensor core logging providing ultra-high definition optical

core images and geophysical analyses, including:

- bulk density, porosity, and/or P-wave velocity profiles
- core quality, heterogeneity, identification of sedimentary features and lithological variations (e.g., grain-size, texture, colour) and changes in composition
- core-log integration & correlation between boreholes

Figure 17 Multi-sensor core logging scanner (Geotek MSCL-S).

Two X-ray fluorescence scanners — These acquire elemental abundances and variations along core, and can produce 2D XRF maps. Additional colour linescan and UV imaging capabilities provide records of down-core textural/compositional variation. Both XRF core scanners are able to detect a wide range of elements (Mg to U at % and ppm levels) and allow high-spatial resolution scans, down to 0.1 mm. XRF scanning is a well-established, non-destructive method that allows:

- Characterisation of rock and sediment provenances
- Interpretation of mineralogy and matrix properties
- Identification and analysis of fundamental horizons (e.g., bed boundaries)
- Identification of potential element ratio proxies
- Core-to-core and/or core-to-log correlations.

Figure 18 X-ray fluorescence scanner (Geotek, MSCL-XYZ XRF).

Other Laboratory facilities
The British Geological Survey at Keyworth have the following facilities:

- Geochemistry labs
- Mineralogy, petrology and biostratigraphy
- Physical property labs

Methodology and eligibility for access to these facilities is still to be determined.

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