
1 Introduction

The British Geological Survey (BGS) was commissioned by the Scottish Mines Restoration Trust (SMRT) to carry out a geodiversity audit of sections of particular geological significance within the abandoned surface coal mines of Spireslack and Mainhill Wood, in East Ayrshire and South Lanarkshire respectively. Both surface coal mines (SCM) have revealed spectacular sections through coal-bearing Carboniferous strata (Patterson et al, 1998) worthy of preservation and/or stewardship for future generations. Mainhill Wood SCM, situated just off the M74 near Happendon Services, reveals outstanding structural geology linked to the major Kennox Fault within the Clackmannan Group (BGS 1: 50 000, 23E (Lanark) published geological map), whilst Spireslack SCM, located north of the A70 at Glenbuck, has exposed a world class 1.5 km long section through the whole of the Limestone Coal Formation (BGS 1: 50 000, 23W (Hamilton) geological map). The geology revealed at both sites exposes structures and strata not typically seen on anything approaching the same scale or completeness/continuity within natural sections across Scotland, or further afield in the UK. They thus provide unique and important insights into the character of key Carboniferous strata. They also preserve important examples of Scotland's coal mining legacy: for example, Spireslack SCM reveals sections cut through an earlier generation of underground workings allowing an appreciation of the ways and respect for the conditions under which, those early coal miners worked.

This study has taken the form of a systematic geodiversity audit within each site to assist in future planning, development and conservation of the two sites. The audits were carried out using well established assessment procedures based on other regional BGS geodiversity audits (e.g. Arkley, 2011; Barron et al., 2005; Whitbread and Arkley, 2013; Whitbread et al, 2015). The audits are placed in the regional geological context of the area to aid wider development opportunities, such as potentially Geopark status for the Coalfields across East Ayrshire and South Lanarkshire.

This work was undertaken in August and September 2015 with a desktop-review of BGS records and published literature followed by field visits to gather new geodiversity information. This report describes, illustrates and evaluates key geological sites within the Spireslack and Mainhill Wood SCM voids that are considered to best represent the geological diversity of the sites. The audit of Spireslack and Mainhill Wood SCMs is intended to form the basis for recognition and protection of local geodiversity sections within the surface mines. The audit will also provide SMRT with information that may be used to enhance the quality of the geological assets at the two sites and to develop public engagement and education initiatives.

Recommended boundary lines defining the site areas have also been supplied separately to SMRT in GIS format (ESRI Shapefile) to supplement the information provided in this report.

1.1 Aims and objectives

The principal aim of the study is to identify and formally assess the key geodiversity sections within the Spireslack and Mainhill Wood surface coal mines (based on methodologies developed in Arkley, 2011; Barron et al., 2005; Whitbread and Arkley, 2013; Whitbread et al, 2015). These sections are selected to represent the diverse geology of the site. The objectives of the study are:

1. to evaluate the geodiversity of each surface coal mine based on criteria that consider the scientific, educational, and cultural merits;
2. to delineate section boundaries that encompass the key geological features of the surface coal mines and sufficient area to allow them to be viewed;
3. to review the condition of the sections and, where appropriate, to make suggestions for potential improvements in the management, access and educational potential of the section.

1.2 Structure of the report

An overview of the geology of, and surrounding Spireslack and Mainhill Wood is presented in Chapter 2, including the bedrock (solid) geology and briefly, the overlying Quaternary (superficial) deposits. Chapter 3 describes the methods used to identify potential geodiversity sections, the criteria used in their evaluation, and the procedures used in the field assessments. Chapter 4 provides detailed site assessments for each of the geodiversity sections within Spireslack SCM, followed by a description of the geodiversity site at Mainhill Wood SCM: this chapter forms the main part of the report. The results of the audit are summarised and discussed in Chapter 5.

1.3 What is geodiversity?

Geodiversity has many definitions (e.g. Gray 2005; Crofts 2014), but essentially describes the variety of rocks, minerals and fossils, landforms and landscapes, active geological processes and soils and subsoils (Quaternary deposits) of an area. These elements interlink and together determine not only our natural environment, but also the character of local wildlife habitats and ecosystems.

Geodiversity underpins the social, cultural and economic heritage of an area. The locations of settlements, abstraction of coal and other resources give a distinct character to the region and typify the close links between our human heritage and our geodiversity.

1.4 Why conserve geological features

Despite wide preservation and protection of biodiversity sites, the geodiversity that underpins the stability of ecosystems and contributes to our economic, social and cultural heritage has only limited protection within the planning system in Scotland. Current protection for geological sites in Scotland is restricted to the sites that are designated as 'Sites of Special Scientific Interest' (SSSIs) by Scottish Natural Heritage (SNH).

Awareness of other important geological sites was formally initiated in 1977 with the launch of the Geological Conservation Review (GCR). The GCR was developed to identify sites of national and international importance which underpinned the key scientific elements of Earth heritage in the UK (<http://jncc.defra.gov.uk>). The aim of the review was to provide a publically available record of these sites, which were already notified or being considered as SSSIs. The chosen GCR sites form 'the basis of statutory geological and geomorphological site conservation in Britain' (<http://jncc.defra.gov.uk>), and were picked with the view to their long-term conservation. GCR sites which did not achieve SSSI status, or indeed, SSSI sites which lost their status, may form part of Regionally Important Geological/Geomorphological Sites (RIGS) schemes, part of GeoConservationUK. GeoConservationUK formed 'to promote local 'geo' sites for education and public benefit' (<http://wiki.geoconservationuk.org.uk>). Whilst these sites do not benefit from national statutory protection, they are recognised by the local authority and listed in their development plans (<http://wiki.geoconservationuk.org.uk>). In Scotland these sites are called 'Local Geodiversity Sites'.

Scotland also has its own dedicated charter — the first of its type in the world — to raise awareness of geodiversity and integrate it into policy and decision making — 'Scotland's Geodiversity Charter'. This Charter is supported by the Scottish Government, The British Geological Survey and SNH, along with a large number of other stakeholders (<http://scottishgeodiversityforum.org/charter>).

Geodiversity is an integral part of nature. It has intrinsic (geoheritage), scientific, educational, cultural, ecological and ecosystem service values. These values are vulnerable to a wide range of threats; quarries can be infilled, natural overgrowth by vegetation can obscure exposures, and features within an urban environment may be built over. Our understanding of the geological processes and landscape history of Scotland, and the wider UK, depends on access to key sites from which the diverse nature of rocks can be directly observed. These sites preserve our geological heritage. They are fundamental not only for scientific research and education, but often have cultural and aesthetic values that provide connections between people and place. Many also support highly valued ecosystems, habitats and species, while others are assets for recreation and tourism. Hence, it is vital that geodiversity sites are protected so that our geoheritage can be maintained and appreciated by future generations.

References