

# Creating a digital landslide

“Prevention is better than cure” is an old adage that rings especially true when it comes to advance warning of potential land subsidence. The cost of the cure far outweighs the cost of prevention, if the potential disaster has not been anticipated as has happened several times in Britain, often with spectacular results.

Prominent among these was the Holbeck Hall Hotel incident of June 1993, when a landslide near Scarborough took an entire hotel to an unexpected demise on the seashore below (see Figure 1).



Fig 1 Holbeck Hall Landslide 1993

Old mine shafts can be similarly dangerous, as was witnessed in November 1994 when a drilling rig carrying out site investigation work in Glasgow suddenly toppled into a long disused mine shaft (Figure 2). Fortunately, not all the incidences are as dramatic as these and loss of life from such incidents is extremely rare. However the costs and inconvenience caused when these hazards are not considered can be considerable. At the British Geological Survey (BGS) we have been working hard at identifying many of these hazards and hence help to prevent similar occurrences in the future. As part of this work we have been creating a digital archive of more than a million and a half irreplaceable documents, including deep mine records and original geologist’s maps and field

slips that are up to 140 years old. This has two purposes; firstly for the security of the data and secondly to make it more readily accessible

The intention is to make these documents quickly and easily accessible to all enquirers, via our GeoSure ground stability information service, whether they are geoscientists, property developers, consultants or the general public. Soon, the days of geologists or researchers having to pore over large numbers of paper documents should be in the past. Instead, they will be able to access this information rapidly from their own desktop computer, using software that allows them to zoom to specific areas of interest at the click of a mouse.

The availability of this information digitally also means that BGS’s own geologists will be able to access the data when they are re-surveying areas or carrying out revisions. The geologists will be able to download the data at their field stations and take this and other information out with them into the field on digital field data capture hardware. This will improve the speed and accuracy of the mapping process.



Fig 2 Collapsed mineshaft Garsgadden Mine.

Clearly, creating this digital archive is a massive task. Funding was provided by the Natural Environment Research Council and the Coal Authority. Due to the need to complete the work both quickly and to a technically high standard BGS decided to call in some outside expertise. Consequently, a team of about 20 staff from Océ Business Services, (<http://www.oce.com/uk/>) which is the outsourcing and document management division of global digital document company Océ, has been scanning and archiving the documents in-house at BGS's premises at the National Geological Records Centre at Keyworth, near Nottingham, and in Edinburgh.

The documents themselves being digitised by Océ are very varied in both type and format. There are 40,000 colour geological maps at 1:10,000 and 1:10560 scales from across England, Scotland and Wales, and over 77,000 geological field slips. These documents are vital in the drawing of accurate maps and are also of great historic value. They contain an incredible amount of very fine, handwritten information, recorded by geologists in the field (Figure 3) as they walked the land. Apart from detailed recording of the geology they contain geological data that is no longer visible and often record the land use at the time. They also recorded information about hazards from mine shafts through to swallow holes and made ground.

Here the digitisation project has already produced unforeseen benefits, as these minute handwritten notes, some of which are now very fine and worn after decades of use, can now be easily viewed using the computerised zoom facility and potentially enhanced by the use of image software.

More than a million and half documents that make up the Deep Mine Primary Geological Record deep mine records that belong to and were previously held by The Coal Authority, are also being scanned. These records contain over 20,000 borehole records related to site exploration and also additional analyses. These records illustrate the geology, coal deposits and related information at past or present mine sites as well as prospective sites. These records are currently under used because information about the content of the records is not readily available. Once the records



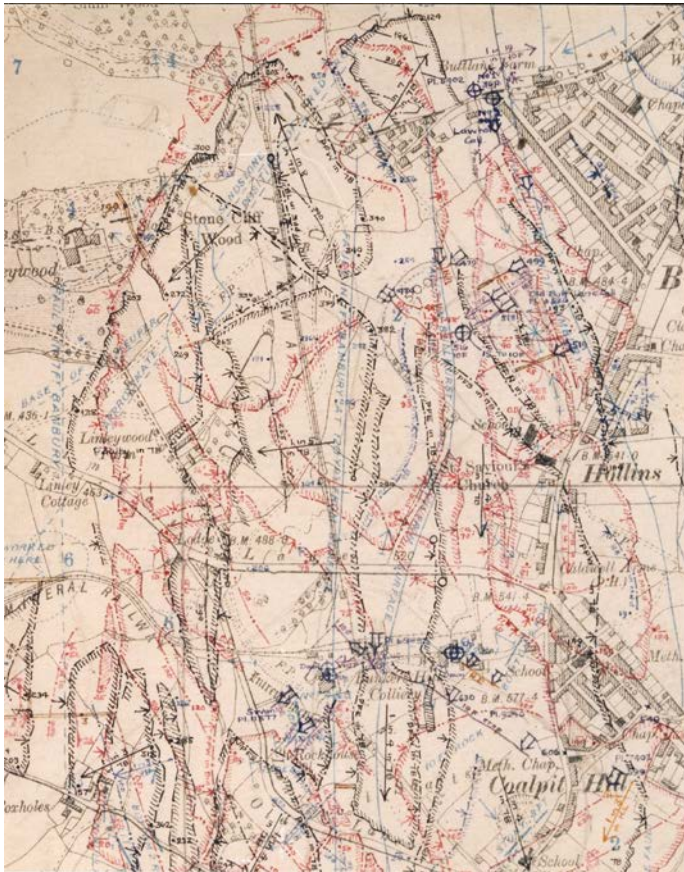


Fig 3 Field map showing mining activity by FW Cope 1940

have been scanned BGS staff will be entering basic index information to allow details to be made available over the Internet via a GIS system. It is expected that far more use will be made of the data by developers to check on subsidence and potential ground contamination at these sites. The information has also been used to examine alternative methods of extracting the energy from coal other than mining

“This project benefits the nation as a whole,” says Ian Jackson, Director of Information and Management Services at BGS. “Some of these documents are over 140 years old, many are unique and some are showing signs of accumulated wear and tear, so it’s absolutely crucial for us

capture the information in a secure form before it’s too late.”

“We receive enquiries and requests for maps (often held in different locations) at a rate of about 80 per day, so the work that Océ is currently undertaking will save us a great deal of time in our day-to-day work. We also implement stringent quality controls, but it’s working well, and we look forward to making regular use of the output from the in-house Océ team.”

Scanning the map holdings has enabled BGS to update its databases and ensure that not only is the latest version of map for any area available but also all previous versions. The BGS will benefit from being able to pull the digital data straight into its GIS systems on screen. This will greatly assist the National Geoscience Information Service, geologists working to produce reports for the GeoReports Service (<http://www.bgs.ac.uk/georeports/home.cfm>) will have easy access to all versions of the maps and the original field slips along with scans of borehole and mining records. The days of geologists wrestling with reams of paper documents on their desks will soon be gone

BGS has an experienced project team covering three areas, the map scanning, the Deep Mine Scanning and the third area, which is the geographic rectification of the scans. The first major use of the map scans will be for the capture of the information that BGS holds on non-coal mine shafts, originally gathered by its surveyors and recorded on the field slips

The scanning process has presented considerable logistical and technical challenges especially with quality control. Océ has a team of 20 staff working on the BGS

project at the two sites. The work is carried out using five Océ wide format scanners, allowing capture of documents up to A0 size. The digital data is uploaded to the BGS's bespoke Electronic Document Management System in TIFF or JPEG2000 format. Eventually it is hoped that the information will all be available online.

Phil Earles of Océ UK, who is responsible for the management of the Océ team at BGS said: "It's certainly a challenging undertaking, but we have the people and expertise in place to deliver a successful project. There is a huge volume of paper documentation that needs digitising in a short time frame, and we keep a daily tally of our scanning output. At the moment the record is over 26,000 documents per day, but we try to improve on that every day."

In addition, Océ Business Services has identified opportunities to assist BGS with its document conversion programmes and add further value to our data holdings. Whilst on site Océ Business Services has provided helpful advice on streamlining our routine scanning operations

It is hoped that organisations donating information to the National Geological Data Centre and users of the National Geoscience Information Service will see the benefits of this move into the digital environment. As Mr Chris Eaton, Managing Director of Geotechnical Developments (UK) Ltd (<http://www.geotechnical.co.uk/>) says "We have provided the BGS with borehole records over the past 15 years and in turn utilised the BGS borehole record archive over the same period for our clients benefit. More recently the introduction by the BGS of scanned boreholes records has allowed a much improved and rapid service to be provided, allowing us to obtain easily transferable and stored records for clients and our own in-house needs. We look forward to being able to incorporate the Coal Authority borehole records currently being scanned at BGS. In providing our own borehole records to the BGS in AGS format this also allows the BGS to store the data electronically and removes the need for copying and scanning of paper copy logs; perhaps saving a few trees in the process".

Rod Bowie  
Records Manager and Deep Mine  
National Geological Records Centre  
British Geological Survey  
Keyworth  
Nottingham NG12 5GG

**Telephone:**

+44(0)115 9363106 Direct/Pager

+44(0)115 9363100 Switchboard

**e-mail:**

[rcb@bgs.ac.uk](mailto:rcb@bgs.ac.uk)

**web site:**

<http://www.bgs.ac.uk/programmes/infoserv/im/home.html>