

The space beneath your feet

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A re we sufficiently concerned about the ground we live on? For centuries our ancestors extracted the mineral wealth of the British Isles in a haphazard manner resulting in a bewildering legacy of mining relics. Some of these are considered to be part of our national heritage, because of their scientific or historical value. However, abandoned mines, shafts, old workings and natural solution hollows are frequently responsible for disruption to land, damage to structures and underground conveyances and some of the most notorious disasters in the British Isles.

Two main types of underground voids occur in the British Isles: those of a natural origin and those created by the activities of man. Natural voids occur due to the dissolution of carbonate rich and other soluble formations such as gypsum, limestone, chalk and halite by acidic rain, surface run-off and underground water courses. Man-made cavities are almost entirely due to extraction of metalliferous minerals such as the ores of copper, gold, iron, tin, lead and zinc and of industrial minerals including coal, flint, sandstones and limestones. Many urban and rural areas are underlain by thousands of



Above The dramatic effect of the collapse of old workings for flint in the chalk in Norwich. Right A subsidence depression in the front garden of a house in Ripon caused by dissolution of gypsum (see also front cover).

kilometres of hidden levels, mine workings and natural solution hollows. Over 70,000 abandoned mine workings have been recorded, and it is estimated that at least 30,000 remain undiscovered. In addition the location of an estimated 80,000 shafts are unmarked in the British Isles and the extent of natural solution galleries is unknown. A large number of these workings are flooded and inaccessible, others contain noxious or explosive gases or liquids contaminated by heavy metals.

Mining has been practised in the British Isles over a period spanning many centuries. The earliest mine workings in the British Isles date from pre-Roman times but the vast majority of abandoned metalliferous and coal mines which can be seen today date from the seventeenth to twentieth centuries. The first statutory obligation to keep coal mine records only dates from 1850 and it was not until 1872 that legislation required the production, retention and the submission of mine plans, to a governing body, immediately following abandonment of a coal mine. Despite this attempt to regulate the mining industry, the metalliferous mining companies did not follow suit, and there

Hidden workings



Above A drilling rig being recovered from a collapsed shaft in Glasgow associated with 19th century ironstone workings.



is an even worse situation than in the coal industry. There is no systematic record of natural solution cavities. Each site is unique and must be assessed individually. Even where the position of mine workings has been recorded on plans, their precise outline is often difficult to determine. This can be due to poor understanding of the geophysical techniques employed, poor communication between geologist and engineer, misinterpretation of the data and inaccuracies in the early surveying and cartographic techniques. Bogus mining activities and deliberate falsification or omission of mining records also have to be considered.

When mine workings and natural solution voids are suspected near to the surface, it is essential that they are detected prior to surface or underground development. Conventional, direct techniques such as trial pitting, trenching and drilling and indirect geophysical investigations are an essential part of a ground investigation survey. The BGS has extensive archives and experience of all the relevant techniques and is therefore frequently commissioned to advise a variety of public and private bodies.