

## Tumbledown cottages

## Mining subsidence in Ferniehill, Edinburgh

by Mike Browne, Edinburgh

ost people living in the Lothian area of Scotland are probably aware of the **Tumbledown Cottages** incident in south-east Edinburgh. It started on 9 November 2000 when an elderly resident reported jamming doors and windows, and cracks in her bungalow walls. At first explained as the subsidence of landfill in an old limestone quarry, it was quickly realised that collapsing old limestone mineworkings were responsible for what became catastrophic damage to many properties. By March 2001, 34 properties had been evacuated at Ferniehill, of which 33

have since been demolished. Several other homes were monitored as new cracks appeared. The 31 demolished bungalows were each worth about £40 000 and the two demolished stonebuilt semi-detached houses were valued at about £150 000 each. Apart from the stress and aggravation that all the occupants have had to endure, homeowners (as distinct from council tenants) also faced demolition and safety costs of £11 000 and land cost losses of about £8000 on each property. These are not covered by insurance policies. There were also major site investigation and emergency services costs — several



Ferniehill Street, Gilmerton. Open fissures near the southern limit of the subsidence of mineworkings in the Gilmerton Limestone, 2000.

hundred boreholes have now been drilled and new flexible gas pipes laid throughout the surrounding area. Subsequently, the ripples of this mining incident spread to the adjacent Moredun Park area. Here, as a safety precaution on the 24 February, the evacuation took place of 52 families from three blocks of flats and four pensioners' cottages. This was because the City's consultant engineers had assessed that a similar mining subsidence situation potentially existed in relation to the Ferniehill limestone mines. Apart from the cottages, these properties have also now been demolished. The concern about subsidence also affected the Hyvots area where the demolition of multi-storey flats is under way, having started in July 2001. As a result 141 households have been moved out, even though no actual subsidence has taken place. The Hyvot properties are located over a different group of old limestone mines. On the site of the former Hyvot's Bank Primary School, closed in the 1980s because crownholes formed in the playground, completion warrants for new housing are being withheld whilst site safety is reassessed.

The Ferniehill limestone quarries in the Gilmerton Limestone were last worked in 1829 and infilled by about 1955. The Gilmerton Limestone is up to 18 metres thick, of which the basal two and a half metres of pure limestone were extracted underground. The limestone mines descend generally southwards at about 20 degrees, from entrances located in at least three of the five quarries at about 20 to 25 metres below the original ground level. The limestone was worked by the pillar and stall method of extraction. From photographs of the mine in The Scotsman of November 1940, the roof-supporting pillars appear to be narrow (no more than 1.5 metres across) and the rooms four to five metres across. suggesting 80-90% extraction rates near the mine mouths. These figures are supported by archived BGS field notes.

The BGS were part of the city council's emergency response team from the outset until consultants were appointed. BGS geologists have knowledge of both the local geology and mining subsidence and at the first emergency meeting gave an illustrated presentation on the likely cause of the incident. Relevant BGS data holdings included:





Ferniehill Terrace, Gilmerton. A bungalow and its raft foundation rotated by the subsidence of mineworkings in the Gilmerton Limestone, 2000.

- Geological maps at a scale of 1:10 000 dating from about 1860 to 1951 (published and unpublished); with notes on mining and site geology.
- Borehole records and digital metadata; BGS borehole logs note cavities near the base of the Gilmerton Limestone.
- Non-coal mine abandonment plans (a negative search on this occasion).
- Field geologists' notes; the BGS inspected the abandoned mine in 1940, 1941, and 1948. Notes from the 1940 visit provide an insight into conditions underground and the extent of the workings.
- Memoirs: The Midlothian Coalfield and Limestone Resources in Scotland.
- Paper archive of relevant site enquiries. 1940: BGS geologist's notes on extent of workings, pillar size etc. passed to the City Architect relating to Air Raid Shelters.1962: The City Architect advised about the existence of mines at Ferniehill prior to construction of the bungalows.

BGS library: e.g. pamphlet on the history of limestone mining in the Lothians.

Mining legacies of this type exist

widely throughout the Central Belt of

Scotland. There are abandoned workings in limestone, sandstone, ironstone and other metalliferous ores, fireclay, and coal, some of the last extending back to the thirteenth century when medieval monks followed coal seams into the ground from their outcrops at surface. The BGS are in discussion with the City of Edinburgh Council with the intention of establishing a long-term working relationship to help address the urgent social

and economic consequences of former mining or other geological hazards, should they arise. A similar relationship is also being pursued with City of Glasgow Council. Such arrangements will be in line with the recently published BGS Strategy Report of the

Programme Development Group for Onshore Geological Surveys (Walton and Lee 2001) and the report on *Quaternary Geology* — towards meeting user needs (Foster et al. 1999) to further align its scientific research programme with the user community on environmental, geohazard, and resource aspects.

The BGS has maintained a centre in Scotland for the pursuit of geoscientific research over the past 140 years. Its extensive archives, databases, and expertise are of particular importance in understanding impacts such as the mining-related subsidence described above, as well as identifying economic resources and protecting or developing water resources.

For more information, contact:

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Ferniehill Street, Gilmerton. Compressive damage caused by the subsidence of mineworkings in the Gilmerton Limestone,