The potential for surface subsidence related to crown pillar failure in abandoned mines at Goldenville, Nova Scotia

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Gold mining has been an integral part of the history of Nova Scotia since 1862, resulting in the creation of numerous near-surface underground openings in more than 60 abandoned mining districts in the Meguma Terrane. Very little is known about the problem of long-term stability of the surface crown pillars which cap these openings. Time domain reflectometry was used to investigate this problem in the Goldenville mining district between February 1991 and March 1993.

The Goldenville site lies on the southern limb of a major anticline. Abandoned near-surface stopes excavated in stratiform gold-bearing quartz veins are tabular in shape, strike east-west and generally dip steeply to the south. Surface crown pillars overlying these stopes are typically 1 to 2 m wide and as little as 1 to 3 m thick. Although recent surface subsidence is evident in several places, a direct causal relationship between crown pillar failure and subsidence has not been established.

The bedrock is characterized by tabular to wedge-shaped decimetre-scale blocks bounded mainly by cleavage planes, bedding planes and joints. Time domain reflectometry measurements indicate that the rock mass is deforming by pervasive shear and extension along numerous discrete discontinuities. These data imply that the wallrocks and crown pillars associated with near-surface openings in the Goldenville district are undergoing progressive gravity-controlled degradation. Continuation of this process will lead to eventual failure and surface caving.