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**Background concentrations of arsenic and mercury  
in soils from the Montague and Goldenville  
gold districts, Nova Scotia**

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Recent studies of 15 historical gold districts in Nova Scotia have identified several areas where exposure to mine wastes may represent a potential risk to human health. Arsenopyrite (FeAsS) occurs naturally in the ore and surrounding bedrock in these gold deposits, and was concentrated in the tailings during historical milling operations. The concentration of arsenic (As) in tailings at these sites is generally two to four orders of magnitude higher than the 12 mg/kg Canadian Soil Quality Guideline for As in residential and parkland soils. Two sites, Montague and Goldenville, are of particular concern, as the tailings are located close to residential properties and are occasionally used for racing off-road vehicles. Environmental Site Assessments are ongoing at both of these sites to clarify the spatial extent of mine tailings, and to investigate the fate of windblown tailings dusts. Delineation of the area impacted by tailings requires an understanding of the naturally occurring concentrations of As and mercury (Hg) in soils overlying the variably mineralized bedrock within these gold districts. In 2007, Natural Resources

Canada collected samples of the top 0–5 cm of surface soil (the Public Health layer) from 46 sites near Montague, and 39 sites near Goldenville. Samples of individual soil horizons (H, Ae, B, and C) were also collected from 10 sites in Montague, and 6 sites in Goldenville, to evaluate the vertical distribution of elements in the soil profile. All samples were air dried, sieved to various grain size fractions (< 2 mm, < 150 µm, < 63 µm), and digested and analyzed for metal(loids) and organic carbon using protocols commonly employed during environmental assessments (e.g. EPA Method 3050B). Preliminary results from these surveys show that the concentrations of As and Hg in all soil horizons are generally higher down-ice (south) of the ore zones in both districts, reflecting glacial erosion and transport of mineralized bedrock containing arsenopyrite and other sulfides. Analysis of the top 0-5 cm of soils shows the following ranges in As and Hg concentrations (< 2 mm, HNO<sub>3</sub>-H<sub>2</sub>O<sub>2</sub> digestion): Montague: As, 2–273 mg/kg (median 40 mg/kg); Hg, 72–490 µg/kg (median 164 µg/kg); Goldenville: As, 2–140 mg/kg (median 13 mg/kg); Hg, 60–312 µg/kg (median 123 µg/kg). In general, the concentrations of As are highest in the B and C horizon soils, whereas Hg concentrations are highest in the organic-rich humus (H) layer. Data for As and Hg in soils from Montague are in close agreement with results from previous soil surveys in 9 gold districts conducted by the Nova Scotia Department of Natural Resources in 2003–2005. However, the concentrations of both As and Hg are significantly lower in most soil horizons at Goldenville. Results from this study will be used by the Nova Scotia Historic Gold Mines Advisory Committee to assess the distribution of tailings at these sites, and to help guide risk-management decisions.