INTRODUCTION

Concerns about arsenic-bearing groundwater in New England, coupled with inconsistencies in published literature identifying primary arsenic belts, prompted us to consider a careful examination of possible mineralogical sources of significant arsenic in local bedrock. We employed x-ray diffraction, scanning electron microscopy, and electron microprobe analyses of iron-sulfides and calc-silicate minerals collected from 50 location sites in coastal and midcoast Maine, a region that has been shown to contain high arsenic-bearing sites.

MATERIALS AND METHODS

Sample collection from sites in Maine and New Hampshire was guided by the presence of significant arsenic anomalies, as determined using a Scintag X1 Advanced Diffractometer system and the ICDD database (2000) and Jade 5.0 software program.

MINERALOGY

Primary arsenic-bearing minerals include pyrite (up to 7% As in PyS2), pyrrhotite (max. 0.5% S in FeS0.5), kolligite, nickel-oxide carbides, cobaltiferous arsenopyrite, cobalt arsenian pyrite, and pyrite. Secondary arsenic minerals can occur in shales and their metamorphosed equivalents. Each type and generation can have a characteristic mineralogy that can be used to predict hydrothermal alteration products and environmental impacts. Mineralogical factors that contribute to natural acid rock drainage can be useful in developing predictive models for mineral deposits.

SULFIDE WEATHERING

Weathering of pyrite and pyrrhotite in the Penobscot Fm. results in (1) complex mixtures of pyrite, arsenic, and low to moderate arsenopyrite, (2) iron oxide minerals and secondary salts such as ferric iron oxides and hydrous ferric oxide, (3) secondary arsenopyrite, particularly where Cu and/or Au sulfide minerals occur, and (4) iron oxide minerals and secondary salts that can precipitate from solution. Mineralogical factors that contribute to natural acid rock drainage can be used to predict hydrothermal alteration products and environmental impacts. Mineralogical factors that contribute to natural acid rock drainage can be useful in developing predictive models for mineral deposits.