# NPL Site Narrative for Elizabeth Mine

## ELIZABETH MINE
## Strafford, Vermont

**Conditions at Proposal (December 1, 2000)**: The Elizabeth Mine is an abandoned copper mine located on Mine Road in the Village of South Strafford within the Town of Strafford, Orange County, Vermont. The Elizabeth Mine site is situated in a rural setting, on the east side of Copperas Hill. Topography of the area consists of north-south trending hills and valleys. Woodlands surround the mine property. Undeveloped and residential properties border the site's western margin. Site elevations range from approximately 1,000 feet to 1,300 feet above mean sea level. The property consists of three mine tailings piles, two open-cut mines, several adits (horizontal mine entrances), underground shafts and tunnels, ventilation shafts, and several former ore processing buildings. Other on-site structures include those previously used for office space, a shop, a solvent/oil storage shed, an air compressor building, and a garage. The majority of the buildings are in a dilapidated condition. However, one of the buildings and a trailer on the property are rented for residential purposes, and the garage is used to store equipment.

Deposits at the Elizabeth Mine were discovered in 1793. The mine operated from the early 1800s until its closure in 1958. The ore was initially valued for its iron content, and then its pyrrhotite content from which copperas (iron sulfate) was produced. Circa 1830, the deposit was primarily exploited for its copper content based upon the recognition that a significant amount of chalcopyrite (copper iron sulfide) was disseminated in the pyrrhotite. For nearly a century, intermittent production came from the open-cut mine as underground work did not begin until 1886. During the early mining operations, several copper smelters were built on the property. Between 1830 and 1930 approximately 250,000 tons of ore were mined from which approximately 10,500,000 pounds of copper were produced. From 1943 to 1958, 2,967,000 tons of ore were mined producing more than 90,000,000 pounds of copper. All mining operations ceased in February 1958. At the close of the mining operation, the mine property encompassed approximately 1,400 acres.

Past operations at the property consisted of mining, copper smelting, and ore processing. As a result, three mine tailings piles and two open-cut mines were generated on site. The processed tailings in Tailings Pile No. 1 were generated between 1943 and 1958, during the latter period of the mining operation. Ore was ground for flotation through an on-site mill. As copper and pyrrhotite were chemically separated from the ore, tailings sank to the bottom of a flotation separator and were removed. Tailings were dammed to form an impoundment and then were carried via open troughs to a tailings pond for sedimentation. As the valley filled with tailings, the pile's north face rose approximately 100 feet above the natural streambed of Copperas Brook. Tailings Pile No.1 is a flat-topped pile (plateau-like feature) on the lower portion of the property, and covers approximately 30 acres. This pile is comprised of a fine-grained material, uniformly reddish-brown in color at the surface and is the largest accumulation of tailings on site.

Tailings Pile No. 2 overlies Tailings Pile No. 1 at the southwest end of the massive pile. Like Tailings Pile No. 1, Tailings Pile No. 2 forms a raised plateau and covers approximately five acres. This pile rises approximately 30 feet above the surface of Tailings Pile No. 1. The north slope is bare and eroded. An erosion gully is present on the east side of Tailings Pile No.2 where a once buried conduit system has been undermined, exposed, and destroyed. Tailings in Pile No. 2 were also generated during the 1900s and deposited similarly to those in Tailings Pile No. 1.

Tailings Pile No. 3 is located farther southwest and upslope of Tailings Pile No. 2. This pile is immediately east of one of the two open-cut mines, and covers approximately 6 acres. Tailings Pile No. 3 is comprised of multiple piles of red and yellow-colored coarse-textured material and slag. Waste in these piles was generated from mining and copper smelting operations during the 1800s and early 1900s. Six copper smelters were built on the property between 1830 and 1916. Slag was observed in Tailings Pile No. 3; some pieces exhibited an iridescent surface.

When mining operations were abandoned, many of the underground areas flooded with ground water. An air shaft, once tunneled to provide ventilation for the underground work areas, currently discharges acid mine drainage to the ground surface. Drainage from this shaft flows overland and empties into an unnamed brook, which discharges to the West Branch Ompompanoosuc River.

The tailings on the property are rich in metals and sulfides. As water passes over and through the tailings, sulfuric acid is produced and the metals within the tailings are dissolved and mobilized. This results in acid mine drainage. Acid mine drainage contributes an elevated load of metals to Copperas Brook and the West Branch Ompompanoosuc River. The Elizabeth Mine has been previously investigated by State and Federal agencies, and private companies. As part of the various studies, one or more samples of mine tailings, surface water, sediment, fish tissues, ground water, and drinking water have been collected and analyzed for metals. The results indicated the presence of metals that exceeded background levels.

**Status (June 2001)**: EPA is considering various alternatives for this site.

For more information about the hazardous substances identified in this narrative summary, including general information regarding the effects of exposure to these substances on human health, please see the Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs. ATSDR ToxFAQs can be found on the Internet at ATSDR - ToxFAQs (http://www.atsdr.cdc.gov/toxfaqs/index.asp) or by telephone at 1-888-42-ATSDR or 1-888-422-8737.