

Health Consultation

Lead in Clams Data Review

CALLAHAN MINE SUPERFUND SITE

BROOKSVILLE, HANCOCK COUNTY, MAINE

JULY 8, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Statement of Issues

On May 29, 2008, the U.S. Environmental Protection Agency (EPA) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate the potential future pathway for ingestion of clams at the Callahan Mine Super fund Site in Brooksville, Hancock County, Maine.

Background

The Callahan Mine site is located approximately 1,000 feet east-southeast of Harborside Village in the Town of Brooksville, Hancock County, Maine. The site is the former location of a zinc/copper open-pit mine. The mining operations were conducted adjacent to and beneath Goose Pond, a tidal estuary. The Callahan Mine was reputedly the only intertidal heavy metal mine in the world at the time of its operation. The property comprises 150 acres and is located in a coastal, rural setting on the Cape Rosier peninsula. The property abuts Goose Pond to the east, and private properties to the west, south, and north. Facility features include large waste piles (waste rock piles), a tailings pond, and mine operations buildings and structures. The open pit mine ceased operations in 1972 and was flooded by opening a dam at Goose Falls. The mine is currently under water and is subject to daily tidal exchange in Goose Pond. Goose Pond is connected to Goose Cove to the north by a reversing falls known as Goose Falls. Goose Cove is located on the southern part of Penobscot Bay.

The zinc/copper sulfide deposit was discovered in 1880 at low tide by a clam digger. The main components of this deposit were sphalerite and chalcopyrite, accompanied by abundant pyrite and lesser amounts of pyrrhotite. The first mine operated until 1887. Ore was mined from three shafts. Efforts were made to mine the ore sporadically through 1964. Callahan Mining Corporation geologists became interested in the potential of the property in 1964 and subsequently open pit mining operations commenced in 1968. Two dams were constructed at the saltwater inlet and freshwater inlet of Goose Pond. Fresh water that normally flowed into Goose Pond was diverted south to Wier Cove via a drainage ditch. Goose Pond was subsequently drained to allow for the excavation of the mine.

The open-pit mine was approximately 600 to 1,000 feet in diameter and 320 feet deep. Approximately 5 million tons of non-ore-bearing waste rock and 798,000 to 800,000 tons of ore-bearing rock were removed from the mine. Waste rock was removed and piled throughout the property, but predominantly in an area south of Dyer Cove. This area has been referred to as "Callahan Mountain," due to the large volume of waste rock located in this area. In addition, a large amount of marine clay (200,000 to 225,000 tons) was dumped on the lower portions of "Callahan Mountain" after a mudslide occurred at the open-pit mine. Dyer Cove, currently a small part of the Goose Pond estuary, was a fully enclosed area used to temporarily store water pumped from the open pit mine. Particulates were allowed to settle out prior to pumping the water from this cove to Goose Cove. Sediment-laden water from the mine was also pumped through a 16-inch pipeline, discharging directly into Goose Cove, north of Goose Pond.

Ore was trucked from the mine to an ore storage area. From here, the ore was loaded into a series of crushers and mills that reduced the rock to the consistency of fine sand and silt. The small particles containing zinc and copper were then recovered by a process called "flotation." The ore was passed through flotation cells into which chemicals were introduced that caused the minerals to float on bubbles. Chemicals that were used in the flotation process included dithiophosphate

salts, aryl phosphorodithioate, cyclohexanol, and cresol. The flotation process creates a "froth" which lifts (through surface tension) the mineral particles and depresses or allows the remaining rock to sink. The mineral rich froth was collected, washed, dried, and stockpiled in a portion of the mill where it awaited transportation to a smelter. The average ore grade was 1.30% copper, 4.91% zinc, 0.35% lead, and 0.50 ounces per ton of silver.

The remaining non-mineral particles and residues of the chemical reagents were discharged to the tailings pond. The approximately 11-acre tailings pond is located in the southern portion of the property, adjacent to Goose Pond. A series of dams were constructed as material was added to the tailings pond. The final height of the dam is 82 feet. Mining operations ceased in June 1972 due to the depletion of the mineral reserve. Milling ceased in July 1972.

(http://yosemite.epa.gov/r1/npl_pad.nsf/f52fa5c31fa8f5c885256adc0050b631/1CDD147450089BB585256ACA005551E9?OpenDocument)

A study completed by the Maine Department of Marine Resources in 1975 examined bioaccumulation of trace elements in selected marine organisms located in Goose Cove. Levels of cadmium, copper, lead, and zinc were detected at several times to several orders of magnitude higher, in Goose Cove biota and sediments than in samples collected from other Maine midcoastal and river locations. The most recent sampling event was conducted by the Maine Department of Environmental Protection in October 1999. Soil samples, tailings pond samples, tailings pile samples, waste rock pile samples, sediment samples, and surface water samples were collected. Soil samples were collected from the mine entrance and the mine operations areas. Sediment samples were collected from Goose Pond, Dyer Cove, and Horseshoe Cove. Samples were submitted to the State of Maine Health and Environmental Testing Laboratory for metals analysis. The analytical results for these samples are used to associate hazardous substances with the sources and attribute hazardous substances to the site. The sediment samples document actually contaminated sensitive environments and an actually contaminated fishery in Goose Pond. (<http://www.epa.gov/superfund/sites/npl/nar1646.htm>)

Discussion

The mission of ATSDR is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and disease related to toxic substances. In general, ATSDR considers reducing or minimizing exposures to hazardous chemical contaminants a prudent public health measure. For further information regarding the agency, please visit ATSDR's web site at <http://www.atsdr.cdc.gov/>. ATSDR provides site-specific public health recommendations based on available toxicological literature, levels of environmental contaminants detected at a site compared to accepted comparison values, an evaluation of potential exposure pathways, and the characteristics of the exposed population. Whether a person will be harmed by exposure to hazardous substances depends upon several factors, including the type and amount of the contaminant, the manner in which the person was exposed, the duration of the exposure, the amount of the contaminant absorbed by the body, genetic factors, and individual lifestyle factors.

ATSDR's approach to evaluating a potential health concern has two components. The first component involves a screening process that could indicate the need for further analysis of selected contaminants. The second component involves a weight-of-evidence approach that

integrates estimates of likely exposure with information about the toxicology and epidemiology of the substances of interest.

Screening is a process of comparing appropriate environmental concentrations and doses to ATSDR or EPA comparison values. These comparison values (CVs) include but are not limited to:

- ATSDR's Environmental Media Evaluation Guides (EMEGs),
- ATSDR's Reference Dose Media Evaluation Guides (RMEGs),
- ATSDR's Minimum Risk Levels (MRLs),
- ATSDR's Cancer Risk Evaluation Guidelines (CREGs), and
- EPA's Maximum Contaminant Levels (MCLs).

These CVs and health guidelines, as well as all other health-based screening criteria, represent conservative levels of safety; they are not thresholds of toxicity. Although concentrations at or below a CV may reasonably be considered safe, concentrations above a CV will not necessarily be harmful. To ensure that they will protect even the most sensitive populations (such as children or the elderly), CVs are lower by as much as two to three orders of magnitude than the corresponding no-observed-adverse-effect-levels (NOAELs) or lowest-observed-adverse-effect-levels (LOAELs) on which the CVs were based. When a level is above a comparison value, it does not mean that health effects will occur—it does, however, represent a point at which further evaluation is warranted. After identifying potential chemicals of concern through the screening process, ATSDR evaluates the potential for health effects to occur depending on the contaminant and site-specific exposure conditions.

For this site, ATSDR reviewed the data provided by EPA to determine if people should not eat clams because of the lead levels in clams. Since ATSDR has not derived MRLs for lead, the U.S Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition (CFSAN) safety tolerance and the FDA's Total Diet Study results for element levels in market basket surveys were used for comparison. The safety tolerance level represents a point at or above which the agency will take action to remove products from the market. The Total Diet Study Statistics on Element Results represent the levels of lead found in the food we consumed.

The levels of lead in 13 clam samples from the site ranged from 0.71- 43 mg/kg. ATSDR determined current levels of lead found in sampled clams exceed FDA's CFSAN safety tolerance level of 1.7 mg/kg (<http://www.cfsan.fda.gov/~comm/haccp4x5.html>), and FDA's Total Diet Study of 0.026 mg/kg lead as Maximum value (FDA, 2006).

Child Health Considerations

Children could be at greater risk than adults are after certain kinds of exposure to hazardous substances. A child's lower body weight results in a greater dose of hazardous substance per unit of body weight. Children also are more active and have higher heart and respiratory rates, causing them to have higher peak and mean exposures. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Based on Callahan Mine site sampling data, ATSDR considers that exposures to lead contaminated clams could result in harmful health effects in children if current fishing restrictions are lifted in the area.

Conclusions

ATSDR reviewed the limited data available from the data provided by EPA and determined current levels of lead found in sampled clams exceed the FDA's safety tolerance level of 1.7 mg/kg (<http://www.cfsan.fda.gov/~comm/haccp4x5.html>), and FDA's Total Diet Study of .026 mg/kg as a maximum value (FDA, 2006).

Only 13 clam samples were analyzed for lead contamination. ATSDR believes that collecting additional samples for lead analyses will increase the overall confidence in the public health evaluation of the biota pathway.

At the current time, ATSDR recommends that individuals continue to adhere to the fish and shellfish consumption restrictions and advisories that already exist in the area.

Recommendations

ATSDR concludes that future pathway for ingestion of clams at the Callahan Mine Super fund Site is a potential public health hazard for consumption of clams if current fishing restrictions are lifted. Our evaluation is based on the limited amount of data available (too few samples). ATSDR considers that it would be prudent public health practice to follow the current fishing restrictions until further sampling is conducted.

Public Health Action Plan

The purpose of the public health action plan is to ensure that this evaluation not only identifies potential and ongoing public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. ATSDR will mail this health consultation to the appropriate personnel at EPA to ensure that they are aware of ATSDR's public health conclusions and recommendations.

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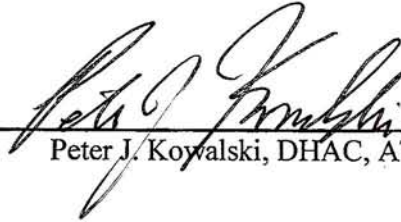
The U.S Food and Drug Administration Center for Food Safety and Applied Nutrition. Total Diet Study Statistics on Element Revision 4, Market Baskets 1991-3 Through 2004-4. College Park, Maryland. August 21, 2006.

Technical Notes: on Water Quality Analysis, EPA 600/R94-173. October 1994

Certification

This Callahan Mine Superfund Site Health Consultation was prepared by the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated.

The Division of Health Assessment and Consultation (DHAC) and Division of Regional Operations (DRO), ATSDR, have reviewed this health consultation and concur with its findings.



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