

# Health Consultation

---

MINERVA MINE # 1  
CAVE-IN-ROCK, HARDIN COUNTY, ILLINOIS

EPA FACILITY ID: ILN000508903

MAY 4, 2007

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.

You May Contact ATSDR TOLL FREE at  
1-800-CDC-INFO

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

HEALTH CONSULTATION

MINERVA MINE # 1  
CAVE-IN-ROCK, HARDIN COUNTY, ILLINOIS

EPA FACILITY ID: ILN000508903

Prepared By:

Illinois Department of Public Health  
Under cooperative agreement with the  
Agency for Toxic Substances and Disease Registry

## **Purpose**

The Illinois Department of Public Health (IDPH) reviewed information from the Illinois Environmental Protection Agency (Illinois EPA) to determine whether inorganic chemicals in soil, sediment and tailings at the Minerva Mine #1 site in Cave-in-Rock, Illinois, pose a public health hazard.

## **Background and Statement of Issues**

### **Site Description and History**

The inactive Minerva Mine #1 facility is on a 120-acre parcel of land in rural Hardin County. The property is approximately 5 miles north of the community of Cave-in-Rock and ¼ mile east of Illinois Highway Route 1 in a sparsely populated area of the county (Attachment 1).

The Minerva Mine #1 was one of the many fluorspar mines that were found throughout Hardin County. The mining of fluorspar in the Hardin County area was a major industry for the local economy dating back to the late 1800s [1]. The Minerva Mine #1 facility was built in 1941 and was the site of both mining and milling activities. During its operational years, the facility consisted of several buildings, a mineshaft and other structures related to mining and milling activities [2].

The fluorspar was mined from deep underground shafts. Ore containing fluorspar was brought to the surface and milled at the facility. The milling process involved crushing the ore into a fine material. This fine material was put into a solution to separate out the usable materials which were collected and sold to industries that made glass, aluminum, hydrofluoric acid, ceramic products, fluorine gas, and refrigeration gas. The unusable portions (tailings) of the milled ore containing limestone and other minerals such as lead and zinc, that were not extracted during the milling process, were disposed of as waste material. In the early years of operation, the waste material slurry was reportedly dumped directly into nearby creeks and streams. Beginning in the 1960s, the slurry was collected into tailing piles and ponds excavated on the mine property.

The mining and milling activities at the facility continued under various ownerships until 1984. The facility remained idle until 1988 when the Ozark Mahoning Company purchased only the mining operations. Fluorspar was still mined at the Minerva Mine #1 and the raw ore was transported to a milling facility in Rosiclare, Illinois. The mining operations continued until 1995. Between 1996 and 1997, Ozark Mahoning demolished all of the buildings at the facility and conducted limited remedial activities that included capping the mineshaft [2]. Atofina Chemicals, Incorporated eventually acquired the assets of Ozark Mahoning and is the current owner of the Minerva Mine #1 property.

The tailings pile and ponds are on separate parcels of land that were sold to a private individual in 1989. This property is approximately 1 mile north of the Minerva Mine #1 site. The tailings pile sits on a hilltop where gravity was used to dewater the slurry leaving only the tailings. The pile is

sparsely vegetated resulting in erosion and tailings material migrating from the hilltop in all directions. The estimated depth of the pile is at least 50 feet [2].

There are three additional tailings ponds that were used to collect the slurry of unused material. Two of the ponds each cover approximately 7 acres and the third pond is approximately 14 acres in size. The two smaller ponds are currently covered with thick vegetation and portions of their berms have eroded allowing tailings material to migrate into nearby creeks. Approximately 9 acres of the larger tailings pond is covered with water and is used for fishing. The remainder of the pond consists of tailings material up to 30 feet deep.

In May 2003, the Illinois EPA conducted a pre-Comprehensive Environmental Response, Compensation and Liability Act Information System (CERCLIS) screening assessment at the Minerva Mine #1 site and determined that fluorspar mine tailings were present throughout the area and had impacted nearby surface water bodies [3]. In December 2003, Illinois EPA continued this investigation with a more detailed Combined Assessment that included the collection of soil, sediment, and waste samples from the Minerva Mine property and its associated areas.

Sediment samples also were collected from the Saline River. Surface water drainage routes from the Minerva Mine and associated areas flow toward the Saline River. The Saline River is a small river that flows through Hardin, Saline, and Hamilton Counties [2]. The Saline River flows east and eventually empties into the Ohio River.

No soil samples were collected from residential areas. The mine is in a remote and sparsely populated area. The nearest permanent residence is approximately 200 feet east of the mine property. The population within a 1-mile radius is estimated to be about 23 people [2].

## **Discussion**

### **Chemicals of Interest**

In preparing this health consultation, IDPH relied on the sampling information provided by Illinois EPA and assumed that adequate quality assurance and quality control measures were followed during the laboratory analysis and data reporting.

IDPH compared the level of each chemical with appropriate screening comparison values developed by the Agency for Toxic Substances and Disease Registry (ATSDR) and other sources, to select contaminants for further evaluation [4, 5, 6, 7]. A description of each of the comparison values used is presented in Attachment 2. Chemicals exceeding comparison values or chemicals for which no comparison values were available were further evaluated for carcinogenic and non-carcinogenic health effects considering exposure to children and adults.

Chemicals of interest found at levels greater than the comparison values in on-site soil, tailings waste areas, and sediment samples were the inorganic chemicals barium, cadmium, and lead. The soil samples collected on the mine site were described as sandy silt mixed with tailings material and

gravel. The maximum concentrations detected in this material were barium at 15,800 parts per million (ppm) (average concentration of 6,900 ppm), cadmium at 350 ppm (average concentration of 142 ppm), and lead at 12,000 ppm (average concentration of 2,842 ppm) [2].

The sediment samples were collected from surface water drainage routes throughout the investigative area. All of the drainage routes had water flowing in them. The maximum level of contaminants detected included barium at 10,000 ppm (average 1,834 ppm), cadmium at 94.7 ppm (average 13 ppm), and lead at 652 ppm (average 87 ppm). The surface water collects down gradient in the Saline River. Sediment samples were collected from the Saline River; however, no contaminants were found greater than typical background levels.

Maximum levels of contaminants found in associated tailings waste areas included barium at 14,300 ppm (average 9,518 ppm), cadmium at 171 ppm (average 68 ppm), and lead at 4,300 ppm (average 1,468 ppm).

### **Exposure Evaluation**

An exposure pathway consists of a source of contamination, environmental media and transport mechanisms, a point of exposure, and a receptor population. The potential for persons to experience adverse health effects from exposure to a chemical depends on the age of the person when exposure occurs, how much of it a person contacts, how long the exposure lasts, and the health condition of the person exposed.

The Minerva Mine #1 site and associated tailings waste areas are located in a remote, sparsely populated area of Hardin County. Although the site soil and drainage routes have been contaminated with inorganic chemicals associated with past mining and milling activities and there is no fence to restrict access to the affected areas, exposure to site soils and ponds would be minimal due to the remoteness of the area. The area might be appealing to trespassers on off-road vehicles. Shotgun shells found on the site suggest the area is also occasionally used by hunters [2].

For trespassers, IDPH assumed that middle aged children (40 kg) to adults (70 kg) would come onto the site 20 times per year for 10 years of their lifetime. IDPH assumed that trespassers would incidentally ingest 150 milligrams of soil daily from activities including stirring up dust from off-road vehicles, hiking and digging, and would be exposed to the maximum level of contaminants detected in the soil. Based on these scenarios; however, exposure by an occasional trespasser to the contaminants detected in soil and sediment are not expected to cause adverse health effects.

There is a 9 acre tailing pond on the site that may be used for fishing. Although no fish, surface water or sediment samples were collected from the pond, soil samples collected from tailings material adjacent to the pond did reveal elevated levels of cadmium and lead in the material. Cadmium accumulates mainly in the liver and kidney of vertebrates, not in the muscle which is the portion of the fish consumed. Aquatic organisms may bioconcentrate lead; however, lead is not biomagnified in aquatic food chains. Lead levels are generally highest in benthic organisms and algae, and lowest in predator fish [7]. An occasional fish meal from this pond would not be expected to result in adverse health effects. The remoteness of the pond would further reduce the potential for exposure.

IDPH maintains a registry of children in Illinois identified with elevated blood lead levels. A review of this data and conversations with a representative of the Southern Seven Health Department in Hardin County did not identify any children in the area with elevated blood lead levels that would be associated with the Minerva Mine #1 site.

### **Child Health Considerations**

IDPH recognizes that children are more susceptible to chemicals because their developing systems are more vulnerable, and because they consume more food, drink more water, and breathe more air than adults do on a per weight basis. They also spend much more time at ground level than adults and explore their environment with their hands and mouths, so they may contact and ingest more chemicals in surface soil.

The Minerva Mine site is in a very remote location with sparse population in the surrounding area. This is not an area that would be easily accessed by children, particularly young children.

### **Conclusions**

IDPH concludes that under current conditions, exposures to inorganic chemicals in soil and sediment on the Minerva Mine #1 site and associated tailing waste areas are not expected to cause adverse health effects. This site poses no apparent public health hazard.

### **Public Health Action Plan**

IDPH will continue to monitor this site. Should future sampling activities suggest contaminants are affecting populated areas, IDPH will reevaluate potential exposure to the surrounding population and respond accordingly.

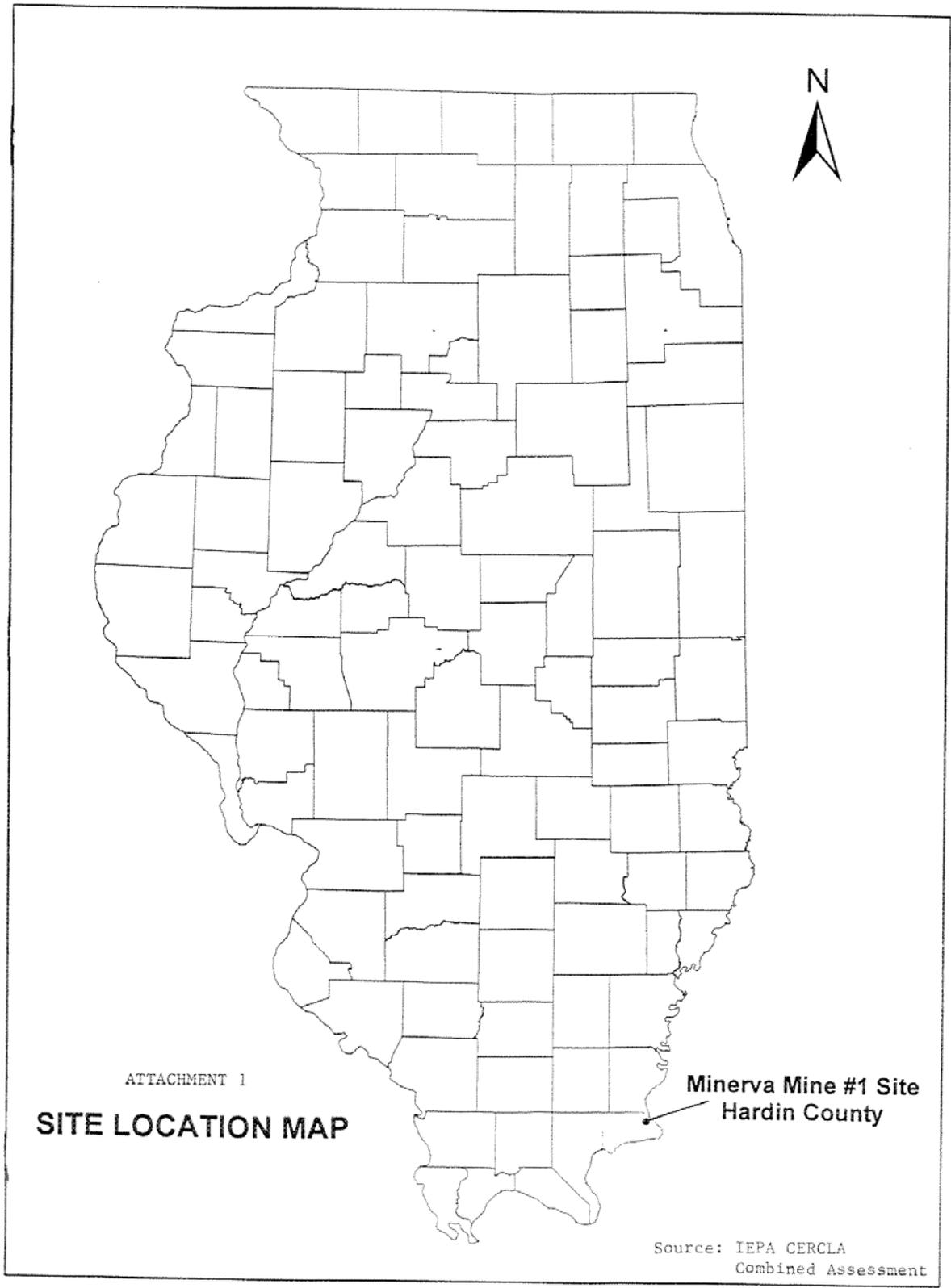
IDPH maintains a registry of children in Illinois identified with elevated blood lead levels. A review of this data and conversations with a representative of the Southern Seven Health Department in Hardin County did not identify any children in the area with elevated blood lead levels that would be associated with the Minerva Mine #1 site.

### **Preparer of Report**

Lynn M. Stone  
Environmental Health Specialist  
Illinois Department of Public Health

## References

1. Agency for Toxic Substances and Disease Registry. Health Consultation/Exposure Investigation for Rosiclare Mines, Rosiclare, Hardin County, Illinois. Atlanta: US Department of Health and Human Services; February 2002.
2. Illinois Environmental Protection Agency. CERCLA Combined Assessment Report for Minerva Mine #1, Cave In Rock, Hardin County, Illinois. Springfield, Illinois. March 2004.
3. Illinois Environmental Protection Agency. CERCLA Pre-Cerclis Screening Action Report for Minerva Mine #1, Cave In Rock, Hardin County, Illinois. Springfield, Illinois. July 2003.
4. Agency for Toxic Substances and Disease Registry. Soil Comparison Values. April 2005.
5. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Barium (Draft for Public Comment). September 2005.
6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Cadmium (Update). July 1999.
7. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead (Draft for Public Comment). September 2005.



ATTACHMENT 1  
**SITE LOCATION MAP**

**Minerva Mine #1 Site**  
**Hardin County**

Source: IEPA CERCLA  
Combined Assessment

### **Comparison Values Used In Screening Contaminants For Further Evaluation**

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are not action levels but are comparison values. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. They are very conservative concentration values designed to protect sensitive members of the population.

Reference Dose Media Evaluation Guides (RMEGs) are another type of comparison value. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. They are very conservative concentration values designed to protect sensitive members of the population.

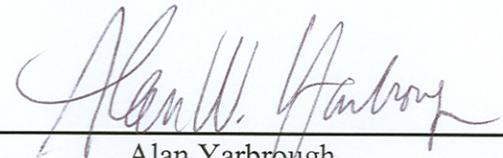
Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a probability of one excess cancer in a million persons exposed to a chemical over a lifetime.

## Certification

This Minerva Mine public health consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with 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. Editorial review was completed by the Cooperative Agreement partner.

  
\_\_\_\_\_  
Charisse J. Walcott  
Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

  
\_\_\_\_\_  
Alan Yarbrough  
Team Lead, CAT, CAPEB, DHAC, ATSDR