

Health Consultation

PALMER LEAD COMPANY/HAZEL CREEK CAMPGROUND

PALMER, WASHINGTON COUNTY, MISSOURI

NOVEMBER 15, 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.

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HEALTH CONSULTATION

PALMER LEAD COMPANY/HAZEL CREEK CAMPGROUND

PALMER, WASHINGTON COUNTY, MISSOURI

Prepared By:

Missouri Department of Health and Senior Services
Division of Community and Public Health
Bureau of Environmental Epidemiology
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

STATEMENT OF ISSUES AND BACKGROUND

Statement of Issues

The Missouri Department of Health and Senior Services (DHSS) prepared this health consultation under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). This health consultation was requested by the Missouri Department of Natural Resources (MDNR) to evaluate the exposure potential and associated health effects to lead to visitors and campers of the former Palmer Lead Company lead smelter located in the US Forest Service (USFS) Hazel Creek Campground site. MDNR requested a health consultation from DHSS to determine if the site represented a health hazard, and DHSS replied with a letter to be used as guidance until this health consultation could be completed (1,2). This health consultation will address MDNR's original request and make recommendations to lessen potential exposure.

Background

The former Palmer Lead Company/Hazel Creek Campground site is the location of a historical lead smelter that was found to have high levels of lead contamination in the soil near the smelter remains. It is located approximately 17 miles southwest of Potosi in a rural area on the secluded USFS Hazel Creek Campground in the Mark Twain National Forest (See Figure 1). The Hazel Creek Campground is located near the former town of Palmer in Washington County, Missouri (3,4). Palmer no longer exists as a town, but currently consists of only a few residences, an old church and cemetery, and remnants of a few former-building foundations (5).

The smelter was built in the 1870s and operated until approximately the early 1920s. During the prime time of its operation from 1872 to 1891, it processed a total of over 10,350 tons of lead ore, making it one of the highest producing smelters in the area at that time (3). Lead ore was brought to the smelter from the surrounding area that is reported to have around 100 mines, or "diggings". It's also possible that mined lead ore from areas further away may have been smeltered as well (5).

Only the lower base stones remain of the former smelter. Trees have grown up in and around the actual smelter and it is practically hidden from view in the natural forest surroundings. However, access is unlimited (See Photographs 1 and 2). The smelter ruins with its remaining large elevated stones could be a physical hazard from trips, falls, or falling rocks. The mines or "diggings" in the area could also be a physical hazard, but are not as readily accessible as the smelter.

The former smelter ruins are located on the northern edge of the Hazel Creek Campground near the restroom facility and parking area (See Figure 2). The main campground area is over 300 feet to the south to southeast of the old smelter site and consists of approximately 12 primitive camping sites with picnic tables and campfire rings on a concrete pad. One isolated campsite,

which has since been removed, was located nearest the smelter area and the basic vault restroom facility and parking loop. Hazel Creek parallels the campgrounds to the west. Located at the edge of the parking lot, a marker erected by the USFS lists the park as part of the northern route of the "Trail of Tears" which marks the forced march of the southeastern Cherokee Indians to Indian Territory in Oklahoma in the late 1830s (6). The Ozark Trail, a primitive trail that transverses the Ozarks, presently passes through the park and is used by hikers, mountain bikers, and horse riders. All terrain vehicle (ATVs) use is also prevalent in the park area. Currently at the smelter ruins, no markers or warning signs are present denoting the smelter or potential health hazards of lead.

The Hazel Creek Campground is remotely located in the Mark Twain National Forest and provides only basic primitive camping facilities. Even with just the primitive facilities, the campground is popular during the summer, especially on weekends, and organized trail rides occasionally occur. The maximum number of visitors at any one time is expected to be around 100, but this number would only occur on special occasions (7). Visits by campers are expected to be short-term (3-4 days) and infrequent (1 to 2 times a year). Because of funding cutbacks, the US Forest Service, plans to remove the vault restroom facilities, picnic tables, and concrete pads with campfire rings, and convert the park into a trailhead that requires little or no maintenance (7,8). This action is expected to occur in the fall of 2007 and could considerably drop the number of visitors to the campground.

Because of past mining and smelting activities, the Missouri Department of Natural Resources (MDNR) completed a Desk Top Review (DTR) of old records relating to past activities at the site along with limited on-site soil screening with an X-ray fluorescence (XRF) instrument. The maximum lead level detected in the sampling was 22,694 parts per million (ppm). Because of this elevated level of lead near the smelter, MDNR recommended that USFS remove the campsite nearest the smelter and to cover the soil with wood chips to minimize the chance of exposure. As a follow up to the DTR, MDNR conducted a pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site Screening (SS) investigation on April 13, 2006. The SS investigation was to determine if the USFS had followed up on recommendations made by the DTR and to collect soil samples and determine the extent of lead contamination. This more comprehensive investigation included 41 samples (with duplicates) of surface soil (0 to 2 inches) and subsurface soil (ranging from 6 to 12 inches deep) on transects up to 300 feet from the smelter in the four major directions (north, south, etc.). See Figure 2. Soil samples were then processed and analyzed by XRF following MDNR standard operating procedures. The lead level at the center of the smelter was 2,264 ppm in surface soil with the maximum levels of lead being detected in surface soil at 40,071 and 35,725 ppm at 50 feet from the smelter in the south and west directions. A lead level of 12,428 was reported in the parking area near the smelter ruins. Lead levels in surface soil declined to less than 250 ppm at 300 feet from the smelter in all four directions. Subsurface lead levels ranged from a maximum of 10,251 ppm near the smelter to 162 ppm 300 feet from the smelter. Four background soil samples taken in the area found lead levels to be less than 80 ppm (3). No mines or tailings are located around the smelter area, so the lead contamination is expected to be smelter related. Smelter waste and fumes are expected to be more bio-available than mine waste. During the April 13 sampling event, MDNR noticed a family collecting wild edible greens

around the smelter area. The MDNR sampling team advised the family of the possible exposure to lead that could occur and provided the family with information to lower that exposure.

The US Environmental Protection Agency (EPA) standard clean up level for lead contaminated soils is dependant on the usage of the soil. EPA considers areas used by sensitive populations (children less than 72 months of age or pregnant women) on a regular basis having lead soil level over 400 ppm to be a health concern (9).

On December 28, 2006, DHSS personnel conducted a site visit to inspect conditions at the site and determine the possibility that visitors could come into contact and be exposed to lead contamination. During this time of year the campground was deserted and there was little evidence of recent activity except for some ATV riders. Even with the leaves off the trees, the smelter ruins blended into its forest setting and was not readily noticeable from the parking area (See Photograph 1). The single isolated campsite that was closest to the smelter and in the area of maximum lead contamination had been removed (picnic table and grill) and only the concrete platform for the grill remained. Even with the picnic table and grill removed, this particular area is ideal for primitive camping, being mowed, flat, and near the restroom. The area around the smelter looked undisturbed and showed little signs of activity with the natural leaf cover intact. It is expected that during the times when campers are present, the smelter area would receive more activity, especially by children who would be exploring and climbing around on the remaining stones of the smelter.

DISCUSSION

This section addresses the pathways by which visitors to the former Palmer Lead Company/Hazel Creek Campground site may have been or are being exposed to the lead contamination at the site. When a chemical is released into the environment, the release does not always lead to exposure. Exposure only occurs when a chemical comes into contact with and enters the body. For a chemical to pose a health risk, a completed exposure pathway must exist. ATSDR has determined that an exposure pathway consists of five components. At the former Palmer Lead Company/Hazel Creek Campground site they consist of:

1. **Contaminant source** – lead contaminated soil.
2. **Environmental medium and transport** – soil, air, dust.
3. **Point of exposure** – areas where exposure to lead contamination is taking place.
4. **Route of exposure** – ingestion and inhalation.
5. **Receptor population** – those that ingest and/or inhale lead contamination.

Completed exposure pathways require that all five of the elements of exposure exist. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. Potential exposure pathways, however, have at least one of the five elements missing or uncertain, but could exist. Completed and potential exposure pathways could have occurred

in the past, could be occurring presently, or could occur in the future. To determine whether completed exposure pathways exist at the site, DHSS conducted an analysis of exposure pathways. Only ingestion and inhalation are considered pathways of concern since lead is not readily absorbed through the skin.

Exposure to lead contamination at the site could occur if lead contaminated dust is stirred up and then inhaled or the soil is played with and inadvertently ingested. An exposed child (especially under 72 months of age) is of the greatest concern because of their high hand to mouth activity and because they are more affected by exposure to lead. Children who are exposed to lead from other sources and have an existing elevated blood-lead level, or who exhibit pica behavior, could be more affected by the additional exposure to lead from the site.

A completed exposure pathway could potentially exist for a child playing in the contaminated soil, because children have a high hand to mouth activity. High levels of lead contamination have been found around the historical lead smelter ruins and in an area that may be used by the public on an infrequent and short-term basis. The majority of the contaminated soils are found in the wooded area around the smelter ruins and below several inches of leaf litter and vegetation. A child could play in the wooded area around the smelter ruins without coming into significant contact with the lead contaminated soils.

Lead contamination in the parking lot is more accessible and exposure would only require someone to contact the contaminated soil and inadvertently ingest it or stir up dust from the site and breath it in. Activities that disturb the lead contaminated soil, whether from humans, ATVs, horse riders, or the wind, could stir up dust at the site, particularly in the parking area. However, the parking area is not an attractive play area, and use of the parking area is expected to be primarily limited to vehicle parking and occasional foot traffic by campers on the way to the vault restroom, which is soon to be removed.

Consumption of the wild edible greens could also be a route of exposure to lead because some plants uptake lead in roots, shoots, and leaves and lead contaminated soil sticks to edible portions of plants. The amount of lead exposure from the plants would depend on how well they were washed, how much lead the plants had up-taken and how often they were eaten. The area of contamination around the smelter ruins is relatively small; therefore, it is not likely that a significant amount of plants could be gathered from this area.

There is little specific information about the use of the park campground in order to determine who may be exposed to lead contamination at the site. The site is situated away from large populations in a rural secluded area in the Mark Twain National Forest. The campground is popular during summer weekends, but all of the designated campsites are well away from the lead contaminated area near the smelter ruins. The US Forest Service plans to remove even the basic amenities from the campground, which will likely reduce its popularity. Given all these factors, visits by campers are expected to be short-term and infrequent, and contact with the lead contaminated area of the site is expected to be rare. Therefore, potential exposure to the high levels of lead are expected to be minimal.

TOXICOLOGICAL EVALUATION

This section will discuss the health effects of exposure to specific contaminants found at the site. A discussion of non-cancerous health effects and the possibility of the contaminants causing cancer are evaluated in this section.

Health assessors typically use media-specific comparison values (CVs) developed by ATSDR or EPA to select environmental contaminants of concern. However, ATSDR and EPA have not developed a CV for ingestion of lead through soil. Therefore, the usual approach of estimating human exposure to an environmental contaminant and then comparing this dose to a health guideline, or CV, cannot be used. Instead, exposure to lead is evaluated by using a biological model that predicts a blood lead concentration that would result from exposure to environmental lead contamination. The modeled blood lead concentration is then compared to the level of concern for blood lead concentrations in children as recommended by the Centers for Disease Control and Prevention (CDC). CDC's current level of concern is 10 microgram of lead per deciliter of blood (10 $\mu\text{g}/\text{dL}$) (10). Using this model, EPA has established a standard clean up value of 400 ppm for lead in soil using the default parameters in this model (9). The default parameters in the model include estimated soil ingestion and time spent outdoors. If the default parameters are found to not be accurate in an area being investigated, the clean up value used at that site may be different than what is listed above.

Lead is a naturally occurring metal found in the earth's crust. It has no characteristic taste or smell. It is mined and processed for use in various industries. It is used in some types of batteries, ammunition, ceramic glazes, medical equipment, scientific equipment, and military equipment. Lead contamination can also be found in lead mine tailings and lead smelter waste where contact and exposure can easily occur. At one time, lead was used as an additive in gasoline and paint (10). Paint containing lead may still be present in older homes and becomes more available for uptake into the body, especially for children, if it is deteriorated or flaking.

The pathways of concern for lead exposure are inhalation and ingestion. Lead is not readily absorbed through the skin, so dermal contact is not an important route of exposure. The correlation between lead-contaminated soil and blood lead level are influenced by many factors, including access to soil, behavior patterns (especially of children), presence of ground cover, seasonal variation of exposure conditions, particle size and composition of lead compounds found at various sites, and the exposure pathway (10).

An unborn child can also be exposed to lead if their mothers have lead in their bodies. This exposure can cause problems such as premature births, low birth weight, decreased mental ability, learning difficulties, and reduced growth as young children (10).

Cancer

While the EPA considers lead to be a probable human carcinogen and the National Toxicology Program (NTP) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens based on limited studies (10,11), there has been no studies linking residential ingestion or inhalation of lead contaminated soil or drinking water to increased cancer risks. While the American Cancer Society estimates that in the United States, slightly less than half of all men and slightly more than one-third of all women will develop some form of cancer in their lifetime (12), the primary health concern for lead at the Palmer Lead Co./Hazel Creek Campground site is not cancer, but lead's effect on the nervous system, especially for children less than 72 months of age.

Children's Health

In general, children are more susceptible to lead poisoning than adults and are more likely to be exposed to lead contaminated materials. In their daily activities, children have a tendency for frequent hand-to-mouth contact and often introduce non-food items into their mouths. Because children are smaller, their bodies are still developing, and they typically retain more of the contaminants, it usually takes less of a contaminant to cause adverse health effects in children than adults.

Babies and children can swallow and breathe lead in dust and dirt while they play on the floor or ground. Also, compared to adults, a larger proportion of the amount of lead swallowed will enter the blood in children. While about 99% of the amount of lead taken into the body of an adult will leave as waste within a few weeks, only about 32% of lead taken into the body of a child will leave as waste. This allows for the greater accumulation of lead in the child's system. When children are exposed to lead contaminated materials, a variety of adverse health effects can occur depending on the level of lead to which they are exposed and the duration of exposure. These effects include learning disabilities, slowed growth, hyperactivity, impaired hearing, and at very high exposure levels, even brain damage. Unborn children can also be exposed to lead through their mothers if their bodies contain lead and are at risk of premature birth, low birth weight, decreased mental ability, learning difficulties, and reduced growth as young children (10).

Children who exhibit pica behavior may be at an even greater risk of exposure to lead in soil than other children. Individuals who exhibit pica behaviors have a craving to put non-food items in their mouths or eat non-food items, such as dirt, paint chips, etc.

CDC's current level of concern is 10 microgram of lead per deciliter of blood (10 µg/dL) in children. Blood lead levels of 10 µg/dL are associated with learning difficulties in children. Yearly blood-lead testing before a child is 72 months of age is key to determining if the child has been exposed. Eliminating exposure pathways by controlling contamination sources, practicing good personal hygiene, and eating a proper diet high in calcium can lessen the risk of lead poisoning in children.

CONCLUSIONS

High levels of lead contamination are present in surface soils in a limited area near the historical lead smelter ruins at the Palmer Lead Co./Hazel Creek Campground site; however, the site/park is located in a secluded rural area. The campground is visited by many people each year, especially during the summer, but visits are expected to be short-term and infrequent. Much of the area of elevated lead contamination is present in a natural forest setting below several inches of leaf litter and vegetation, and the adjoining parking lot is not an area that individuals, and especially children, are likely to spend a significant amount of time. While there are no warning signs to warn visitors of the possible hazard of exposure to lead contamination, the planned removal of campground facilities will likely further reduce the potential exposure of visitors. Limited consumption of wild edible greens found around the smelter ruins could be a potential route of exposure to lead, but this exposure is expected to be very minimal.

The actual amount of exposure to the lead contamination at the site is unknown. However, based on the available information, and our expectations about likely site usage, DHSS concludes that although some exposure might be occurring, exposures are not at levels likely to cause adverse health effects. Because exposure is still possible, DHSS has categorized this site as *No Apparent Public Health Hazard*. The category of no apparent public health hazard is given to sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health concern. If further information were to show that exposure is greater than assumed here, this conclusion would not necessarily apply.

Although minimal, the potential of physical hazards exist at the smelter with its large elevated rocks from trips, falls, or falling rocks and in the surrounding area where open mine diggings may be present.

RECOMMENDATIONS

Although this site is categorized as *No Apparent Public Health Hazard*, prudent public health practice calls for reducing exposures to lead even when the assessment does not indicate that exposures are likely to cause adverse health effects. Because a child may be exposed to lead from multiple sources, it is possible that exposure to lead contaminated soils at this site could contribute to a child's existing elevated blood-lead level. Although exposure is expected to be infrequent and short term and would not continue on a regular basis, the actual amount of exposure a child could accumulate is unknown.

To further reduce the possibility of lead exposure at this site causing adverse health effects, DHSS recommends actions should be taken to reduce the potential for exposure to the high concentration of lead in soils. Actions could include:

1. Covering the parking area near the smelter ruins with at least six inches of clean base rock or paving the parking area with asphalt or concrete to minimize exposure of visitors to the lead contamination found there.
2. Posting signs informing visitors of the presence of lead contamination around the historical smelter furnace with information on how to minimize lead exposures from the site. These signs could also warn of the physical hazards.
3. Removing contaminated soils from around the smelter ruins and replacing with clean soil, or covering the contaminated soil with several inches of wood chips or mulch.

PUBLIC HEALTH ACTION PLAN

This Public Health Action Plan (PHAP) for Palmer Lead Company/Hazel Creek Campground site contains an explanation of the actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), and other stakeholders. The purpose of the PHAP is to ensure that this public health consultation not only identifies public health hazards, but provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazardous substances at or near the site. Below is a list of commitments of public health actions to be implemented by DHSS, ATSDR, or other stakeholders at the site:

1. DHSS/ATSDR offers their assistance to the stakeholders to alleviate the potential for lead exposure at this site.
2. DHSS/ATSDR will provide health education on exposure to lead and the health effects of that exposure as needed.
3. DHSS/ATSDR will review additional exposure information if it becomes available and provide guidance regarding possible health risk if necessary.

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Appendices

Figure 1 - Site Location Map

Figure 2 – Sample Location Map

Photograph 1 – Former Smelter in Natural Winter Wooded Setting

Photograph 2 – Former Palmer Lead Company Smelter

REFERENCES

1. Missouri Department of Natural Resources. Letter requesting a Health Consultation, Palmer Lead Company – Hazel Creek Campground. 2006 December 11.
2. Missouri Department of Health and Senior Services. Letter to Dennis Stinson, Chief, Superfund Section, stating health concerns about the Palmer Lead Company – Hazel Creek Campground site. 2007 January 19.
3. Missouri Department of Natural Resources. Pre-CERCLIS Site Screening Report, Palmer Lead Company/ Hazel Creek Campground Site, Washington County, Missouri. 2007 January 29.
4. Lead Mining Companies, Washington County, Missouri, Records, 1809-1954 (3893). Found at <http://www.umsystem.edu/whmc/invent/3893.html> on 2006 December 27.
5. Mining & More. Found at <http://www.orgsites.com/mo/ghostsofharmony/pgg2.php3> on 2007 March 20.
6. The Cherokee Trail of Tears – Map of the Trail of Tears. Found at <http://www.rosecity.net/tears/trail/map.html> on 2007 March 19.
7. Personal conversation with Joe Walker, Assistant Ranger – TM/REC, concerning Hazel Creek Campground, US Forest Service, Potosi, Missouri. 2007 January 23.
8. Smith D. Forestry Service looking to close campground. Democrat News Online. Found at <http://www.dailyjournalonline.com/articles/2007/03/21/fredericktown/news18.txt> on 2007 March 22.
9. US Environmental Protection Agency. Superfund Lead-Contaminated Residential Sites Handbook. 2003 Aug.
10. Agency for Toxic Substances and Disease Registry. Toxicological profile for lead, update. Atlanta: US Department of Health and Human Services. 1999 July.
11. National Toxicology Program. Lead (CAS No. 7439-92-1) and Lead Compounds Substance Profiles. Report on Carcinogens, Eleventh Edition; 2004.
12. American Cancer Society. Cancer facts and figures, 2007. Atlanta: American Cancer Society, Inc; 2007.

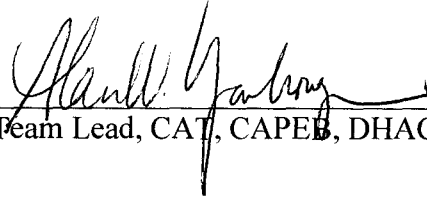
CERTIFICATION

This Palmer Lead Company/Hazel Creek Campground Site Health Consultation was prepared by the Missouri Department of Health and Senior Services 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.



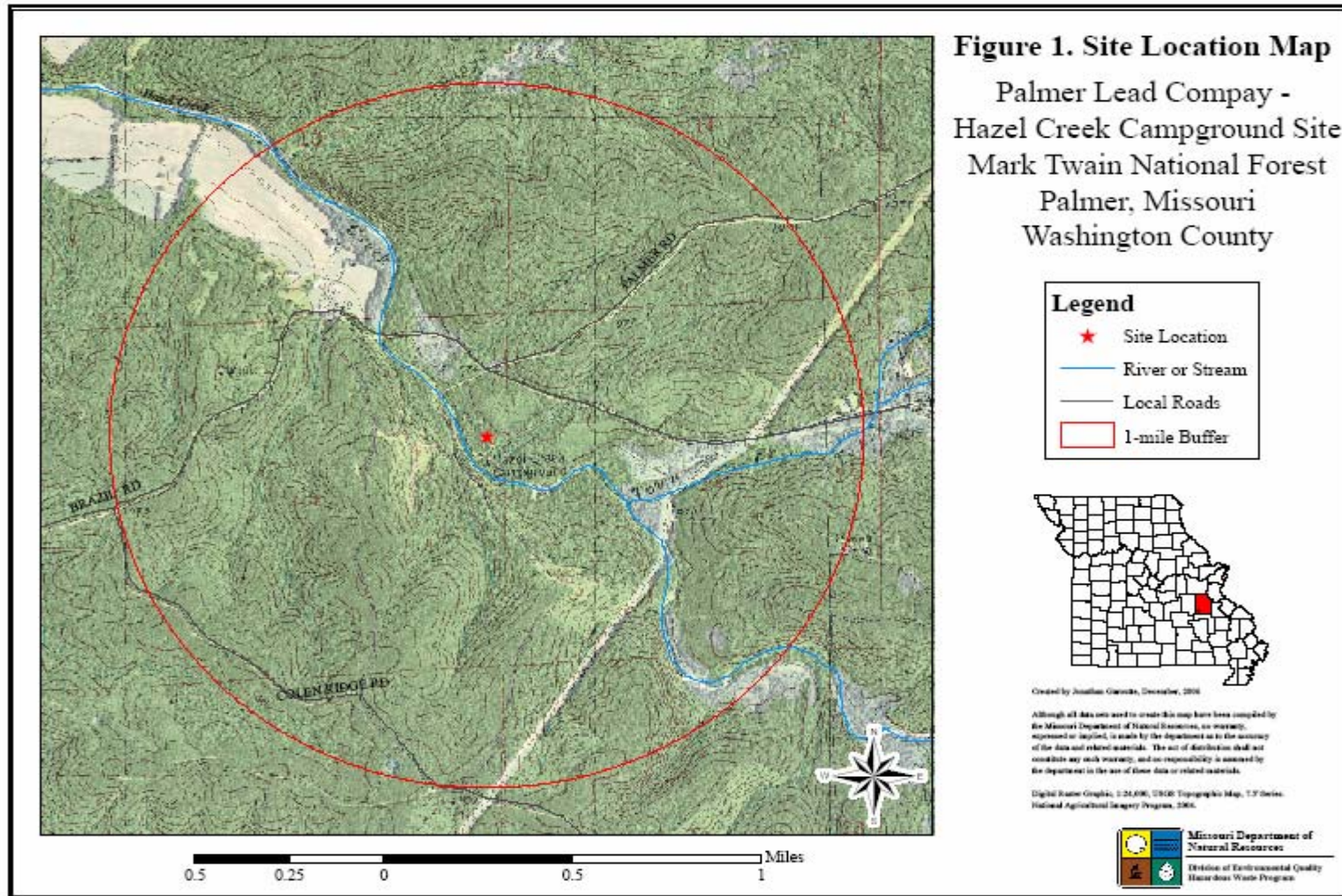
Technical Project Officer, CAT, CAPEB, DHAC

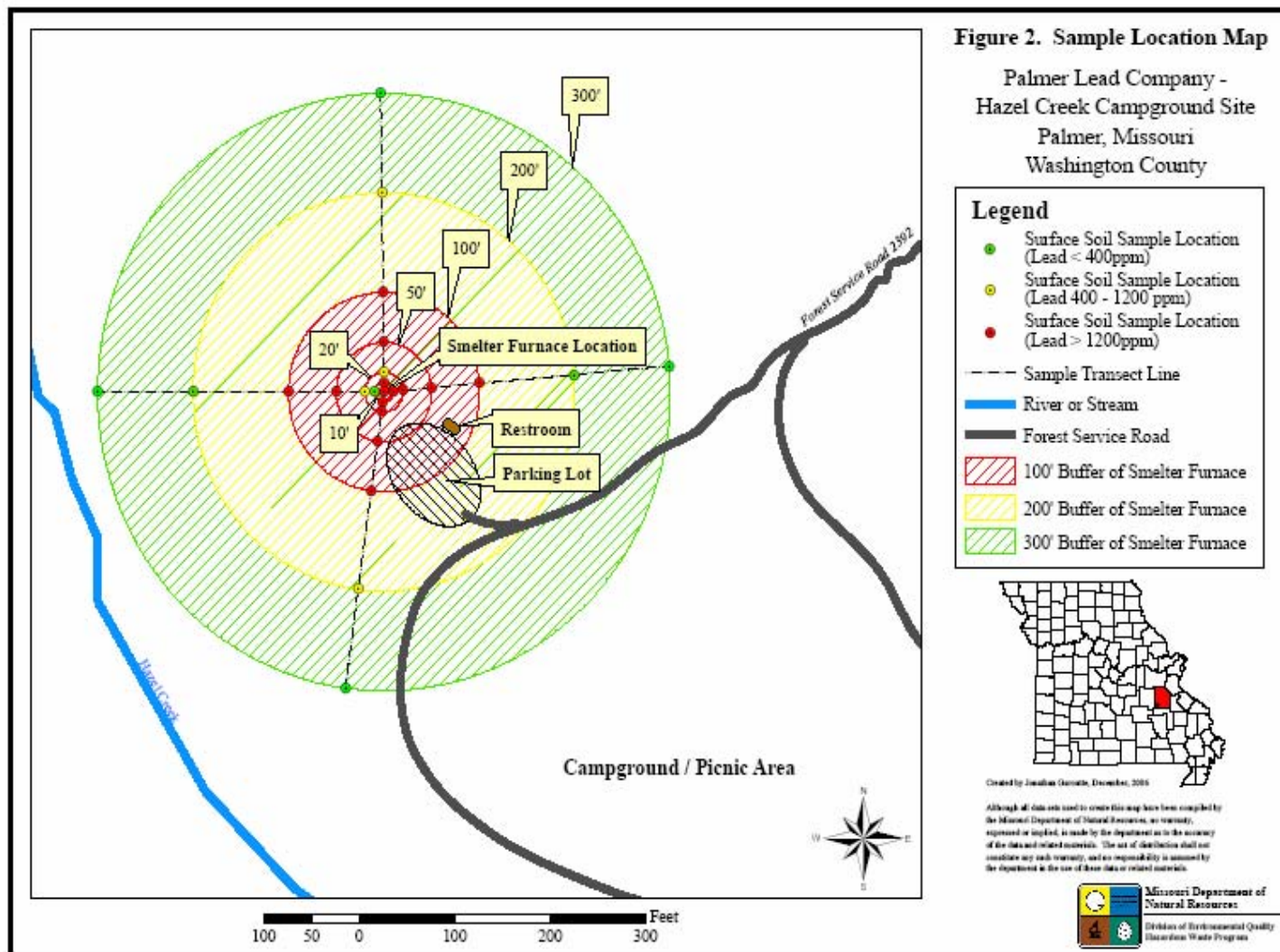
The Division of Health Assessment and Consultation (DHAC), has reviewed this health consultation and concurs with its findings.



Team Lead, CAT, CAPEB, DHAC, ATSDR

APPENDICES





Photograph 1
Palmer Lead Co./Hazel Creek Campground
Palmer, Missouri
Trail of Tears Sign with Historical Smelter barely visible in trees



Photograph 2
Palmer Lead Co./Hazel Creek Campground
Palmer, Missouri
Historical Palmer Lead Co. Smelter

