



Camp Justice: Arsenic in Soil

The Preliminary Public Health Screening Risk Assessment Report, Camp Justice, describes the results of soil sample analyses for arsenic. As noted below, arsenic detected in the environment can be from human activities (e.g., application of pesticides/herbicides that contain arsenic) and/or from natural sources (e.g., rocks and other geologic material). To determine if the arsenic detected in soil at Camp Justice is man-made or from natural sources, 14 site-specific background soil samples (these are samples that are intended to represent natural concentrations of arsenic) were collected outside of Camp Justice near the lighthouse. Concentrations in these samples ranged from 1.1 mg/kg to 2.7 mg/kg and the mean concentration was 1.6 mg/kg. This fact sheet summarizes the soil sampling results for arsenic.

What is Arsenic?

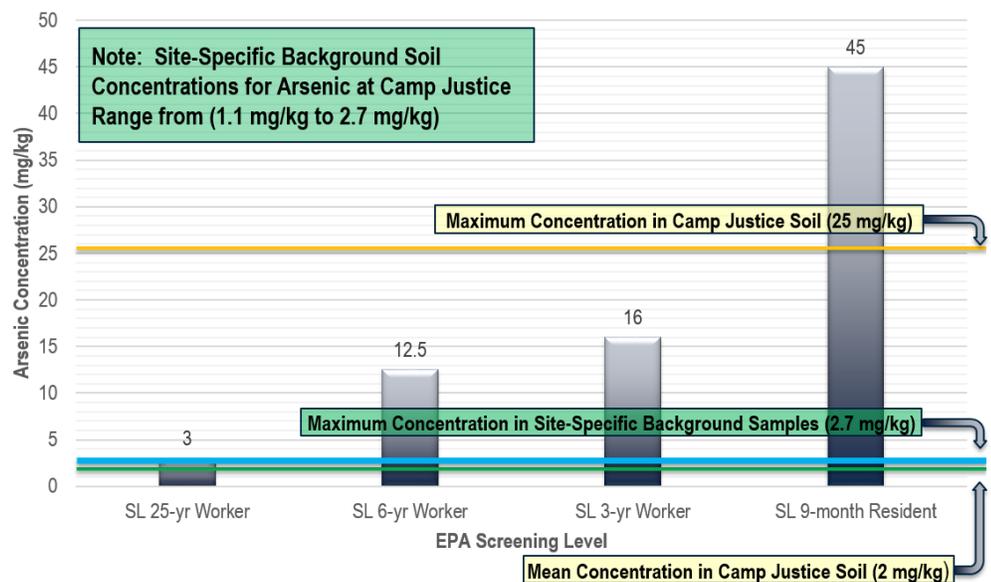
Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic can combine with other elements to form inorganic arsenic compounds. In animals and plants, arsenic can form organic arsenic compounds. Inorganic arsenic compounds were once widely used as pesticides, but such uses are no longer allowed. Copper chromated arsenate (CCA) was used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses, but is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

Arsenic Results

In October 2015, 60 soil samples were collected throughout the Camp. Thirty two of the 60 samples were non-detect. The highest concentration of arsenic detected in the samples was 25 mg/kg and the average concentration was 2 mg/kg. Soil data indicate that there are some sample locations on Camp Justice with arsenic concentrations that exceed Environmental Protection Agency screening levels (EPA SLs). The 25-year worker EPA SL was exceeded for 12 of 60 locations. Only one sample location exceeded the EPA SLs for the 6-year and 3-year worker and no sample locations exceeded the 9-month resident EPA SL. Forty seven of the 60 samples were similar to the site-specific maximum background concentration of 2.7 mg/kg. The comparison of Camp Justice soil concentrations to site-specific background concentrations indicate:

- The 25 mg/kg result is clearly elevated (one location).
- The 4 mg/kg to 7.1 mg/kg results are moderately elevated with respect to background (five locations)
- The 2.9 mg/kg to 3.9 mg/kg results are slightly elevated with respect to background (seven locations)

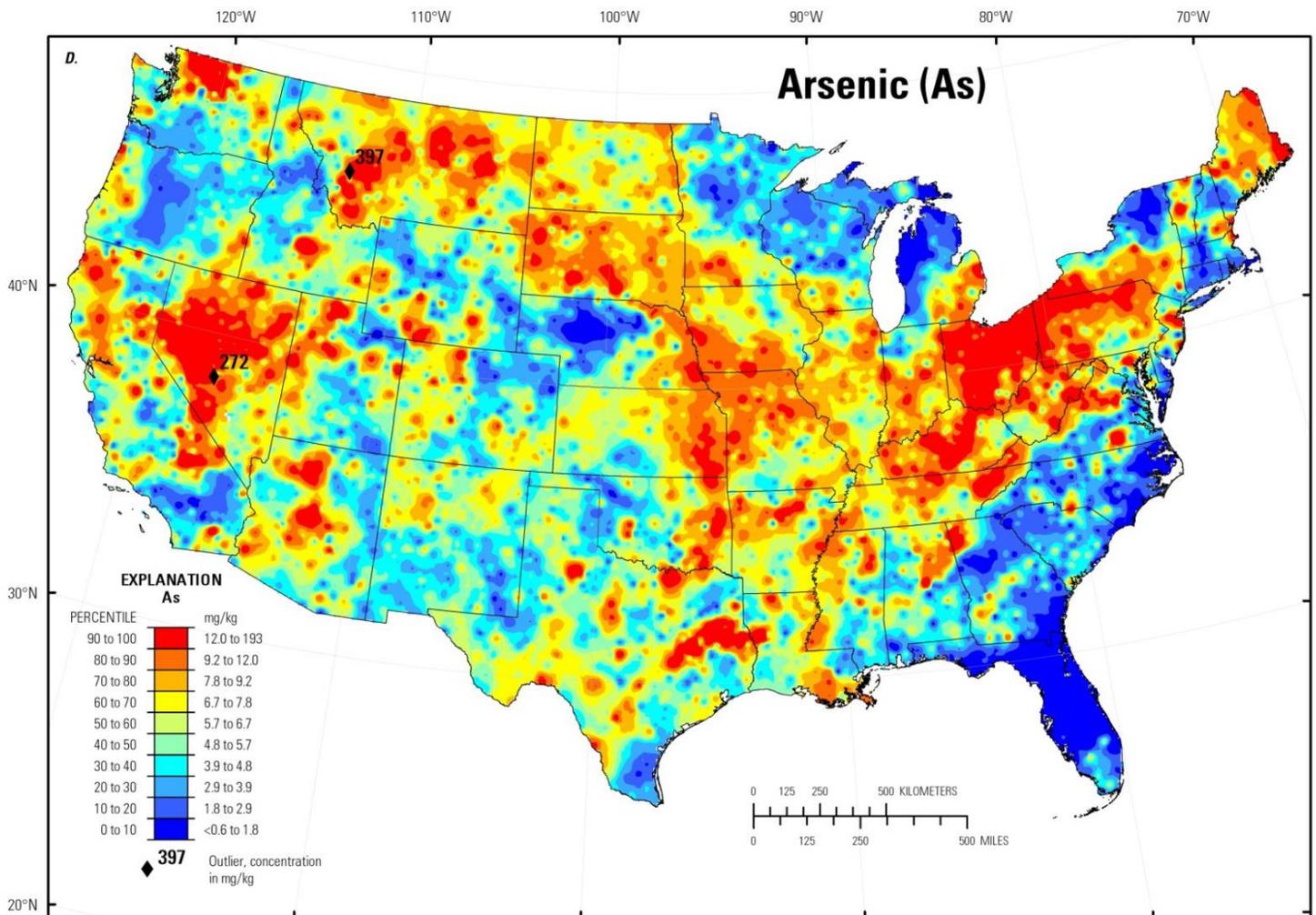
Comparison of Arsenic Concentrations to EPA SLs and Site-Specific Background Concentrations



Forty seven of the 60 samples were similar to the site-specific maximum background concentration of 2.7 mg/kg. The comparison of Camp Justice soil concentrations to site-specific background concentrations indicate:

For more context, in 1994 the Agency for Toxic Substances and Disease Registry (ATSDR) reported a range of background levels of arsenic in soil of 1 – 40 ppm (mg/kg) with an average of 3-4 ppm (mg/kg). A more recent 2014 study conducted by the U.S. Geological Survey (USGS) reported background levels ranging from 0.6 to 193 ppm (mg/kg).

USGS Geochemical and Mineralogical Maps for Soils of the Conterminous U.S. 2014



What Happens to Arsenic When it Enters the Environment?

- Inorganic arsenic occurs naturally in soil and groundwater, but may also be present as a result of human activities.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Arsenic may move within the environment as a component of wind-blown dust and in waters from runoff and leaching. Rain and snow can remove arsenic dust particles from the air.
- Inorganic arsenic compounds may dissolve in water and will ultimately end up in soil or sediment where it can become bound.
- Fish and shellfish can accumulate arsenic in an organic form called arsenobetaine that is much less toxic.

How Might I Be Exposed to Arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or smoke from burning wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in soils.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How Can Arsenic Affect My Health?

- Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.
- Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins and needles” in hands and feet.
- Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small “corns” or “warts” on the palms, soles, and torso.
- Skin contact with inorganic arsenic may cause redness and swelling.
- Arsenic can cross the placenta and has been found in fetal tissues. Although not definitive, some studies suggest that inhaled or ingested arsenic can injure pregnant women or their unborn babies. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic has been found at low levels in breast milk.
- Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that organic arsenic compounds are generally less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How Likely is Arsenic to Cause Cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer of the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The U.S. Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

Is There a Medical Test to Determine Whether I've Been Exposed to Arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within a few days of exposure. Tests on hair and fingernails can measure exposure to high levels of arsenic that have occurred over the previous 6 to 12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot be used to predict whether the arsenic levels in your body will affect your health.

For more information, contact **Navy and Marine Corps Public Health Center**
620 John Paul Jones Circle, Suite 1100 Portsmouth, VA 23708 | 757-953-0700 | www.nmcphc.med.navy.mil
For ATSDR ToxFAQs™, visit www.atsdr.cdc.gov/toxFAQs