



CONTAMINANTS IN ALASKA

Contaminated Sites Program Fact Sheet Series

Becoming familiar with common contaminants in the environment is important to prevent further spread and exposure of contaminants in your area. These contaminants have the potential to affect the health of the environment, as well as your personal health and the health of those around you.

What is a Contaminant?

The contaminants most commonly found in Alaska are among those commonly found elsewhere in the United States. A contaminant is defined as any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil. These contaminants include petroleum, polychlorinated biphenyls (PCBs), solvents, and metals.

Where Do They Come From?

Soil, water, and air contamination occur from a variety of sources and activities. Government, public, industrial, or commercial facilities, as well as households, can generate or use chemicals that cause contamination when improperly used. Some chemicals considered contaminants occur naturally in the environment. Many metals, for example, are commonly found in soil. Naturally-occurring contaminants can become a concern when exposed and distributed, such as when excavation or natural processes expose minerals to erosion or get washed into a stream. Contamination discovered today is often from activities that occurred before there were laws and regulations to protect soil, water, air, and human health from the impacts of contamination.

How Does a Contaminant Cause Harm?

Exposure to a contaminant may cause harm to plants, aquatic life, animals, and people. The amount of harm depends on several factors, including the toxicity of the contaminant, the exposure route, the dose, and the length of exposure. Depending on the combination of these factors, exposure to a contaminant may result in no effects, a minor effect such as skin irritation, or a serious effect such as liver damage, brain damage, or even death. People and animals are usually exposed to contaminants through inhalation, ingestion, or dermal exposure.

Plants can be exposed by absorbing contaminants from the air, soil, or water or by coming into direct contact with contaminants. Even if the plant lives, the contamination may potentially be passed on to creatures that eat the plant.



Common Contaminants in Alaska

petroleum

Alaskans use a wide variety of petroleum products, including gasoline, diesel fuel, heating oil, jet fuel, lubricating oil, bunker oil, and tar - all of which are refined from crude oil. Each of these products contains many petroleum compounds and, sometimes, other additives that also can be of concern as contaminants. Petroleum is the most common contaminant in Alaska.

Depending on the petroleum product and how it is released into the environment, it may evaporate, attach to soil or sediment particles, move through surface waters, or seep into groundwater. Lighter products such as gasoline are more toxic and mobile in the environment but also degrade faster than heavier ones, such as tar. Petroleum products naturally decompose when exposed to oxygen, sunlight, and soil bacteria. In Alaska, petroleum-contaminated soil decomposes slowly, taking many years or even decades to complete. Cold Alaskan air and soil temperatures and winter snow cover slow natural breakdown. Petroleum-contaminated groundwater can remain contaminated far longer because of cold temperatures and lack of oxygen in the groundwater.

The **two primary categories** of petroleum products are:

- Gasoline and aviation fuel - These contain high levels of the most harmful "aromatic" constituents such as benzene. Benzene is a known cancer-causing agent (carcinogen). Aromatic compounds also tend to be the most easily dissolved in water and can make drinking water sources unfit for human use.
- Diesel fuels and the heavier petroleum products - Although hazardous, these products have a much lower content of the most harmful constituents.

Most Likely Sources

Most petroleum contamination in Alaska comes from leaking storage tanks, containers, pipes, and equipment; transportation accidents; and improper handling/disposal practices that lead to spills. Most of the sites handled by the Contaminated Sites Program come from past spills.

Even small leaks can add up. A leak of just one drop per second from a tank or pipe can amount to more than 10 gallons per day and nearly 4,400 gallons per year!

Because many storage tanks and piping systems are underground, a tank can leak for years before it is discovered. In recent years, state and federal regulations have required certain types of tanks to be tested and monitored in an attempt to prevent this sort of contamination.

Environmental & Health Risks

The primary concern with petroleum contamination is its chronic toxicity when ingested through contaminated soil, water, foods, or air (vapor intrusion) over long periods of time. Different types of petroleum cause different kinds of health effects, including headaches, nausea, skin irritation, and cancer. For instance, gasoline contains benzene, a known carcinogen to people and animals.

solvents



Solvents are commonly used as degreasers, paint strippers, paint/lacquer thinners, and in dry cleaning by a wide variety of commercial facilities and households. Common solvents include acetone, toluene, xylene, kerosene, methylene chloride, tetrachloroethylene, ethanol, and methanol.

Some solvents chemically break down when exposed to oxygen, soil bacteria, or sunlight. Other solvents are more difficult to breakdown and therefore more persistent in the environment. Also, many solvents can dissolve in water and easily transport through water. Some solvents have chemical properties that make them denser than water and can exist as nonaqueous phase liquids in the environment that persist for a very long time. A small amount of solvent contamination in groundwater can cause a very large problem. When solvents are found in the groundwater, they are difficult to remove. Many solvents evaporate readily to become air pollutants. In the air, they can be easily absorbed through skin, inhaled, or transported in the atmosphere.

Most Likely Sources

Leaking tanks or containers, and improper disposal of solvents cause environmental contamination. Sources of contamination can include dry cleaners, paint shops, industrial plants, and auto and equipment repair shops. People can become exposed to solvents while working with them and not wearing personal protection, such as respirators and gloves.

Environmental & Health Risks

Solvents can be toxic to plants, animals, and people. Some solvents are known or suspected to cause cancer and birth defects in animals and people. Other solvents may degrade into more toxic contaminants. In people, overexposure to solvents frequently results in dizziness and lightheadedness in the short-term and may result in memory loss, liver damage, coma, or even death if exposure is severe.

polychlorinated biphenyls (PCBs)



PCBs are a group of man-made chemicals made up of numerous chemical compounds that contain two or more chlorine atoms. Manufacturing of PCBs in the U.S. has been prohibited since 1977. Prior to that time, PCBs were commonly found in oils used in electrical equipment and hydraulic fluids. PCBs also were used in heat transfer liquids, hydraulic fluids, plasticizers, and caulking materials.

PCBs strongly attach to plants, soils, and sediments. PCBs found in soil can very slowly migrate to groundwater or surface water. Some forms of PCBs are easily evaporated into the air and may return to land or water by settling or washout by rain or snow miles from their origins. PCBs can be spread through windborne dust that contains the contaminant.

Most Likely Sources

From about 1930 until 1977, the largest use of PCBs was in electrical transformers, switches, and capacitors (including fluorescent light ballasts). PCB contamination in Alaska mainly occurred from leaky transformers or the improper disposal of PCB oil before 1977. Since then, transformers and other equipment containing PCBs must be marked with special labels, checked regularly for leaks, managed according to specific rules, and sent to special incinerators or landfills (all located out-of-state) for disposal.

Environmental & Health Risks

PCBs are very persistent in the environment because sunlight, oxygen or bacteria may not easily break them down. Small amounts of PCBs can be found in almost all outdoor and indoor air, soil surfaces, and surface water. People and animals become exposed to PCBs mainly when they ingest PCB contaminated water, sediment, soil, plants, or other animals that already contain PCBs. When exposed to elevated levels of PCBs over a long period of time, some animals develop cancer. PCBs are suspected of causing cancer, endocrine disruption, and reproductive harm in people.

metals

Metals occur naturally in the environment in many different forms. In very small amounts, certain metals are necessary to sustain life. However, too much of some metals can cause human health and environmental contamination problems.

Metals can be found dissolved in liquid (soluble) or a solid form in the environment. Naturally occurring metals can also be found at levels that are dangerous to human health and the environment. For example, naturally occurring arsenic can be found in drinking water or soils in some parts of Alaska at levels above what is considered safe by state or federal standards.

Most Likely Sources

Metals may be present as environmental contaminants in soil or water, as naturally occurring compounds or because of human activity. Common sources of metal contamination from human activities include: lead from batteries, gasoline and paint; mercury from batteries and historical mining operations/tailings; and silver from photographic processing.

Environmental & Health Risks

Health effects of overexposure to metals vary depending on the metal itself. Symptoms can include nervous system disorders, brain damage (this was the problem with lead in paint), kidney damage, blindness, and death. Some of the symptoms are reversible if detected soon enough. Any metal can be harmful to plants, animals, and people if the organism's exposure to the metal is high enough and if the metal is in a form that can be absorbed.

Other Types of Contamination

Hazardous Substances

Volatile Organic Compounds

- Solvents, dry cleaning fluids
- Benzene (a common component of petroleum)
- Toluene

Bioaccumulative compounds

- Per- and polyfluoroalkyl substances (PFAS)
- Polychlorinated biphenyls (PCBs)
- Some pesticides and herbicides
- Some petroleum compounds, such as polycyclic aromatic hydrocarbons (PAHs)
- Metals, such as lead, zinc, various forms of mercury, chromium, arsenic and tin, etc
- Some solvents, such as trichlorobenzene



Explosives

- Royal Demolition Explosive (RDX)
- High Melting Explosive (HMX)
- Nitroglycerin

GLOSSARY

acute toxicity

health problems caused shortly after exposure

chronic toxicity

health problems caused over a long period of time, usually as the result of repeated exposures to a substance

dose

a measure of exposure to a contaminant

exposure route

a way in which a contaminant enters the body; for example, ingestion (eating or drinking a contaminated substance)

inhalation

breathing

ingestion

eating

dermal exposure

absorption through the skin

Reference List

- Agency for Toxic Substances and Disease Registry
- U.S. Environmental Protection Agency: Office of Emergency and Remedial Response, "Contaminants at Superfund Sites".
- U.S. Environmental Protection Agency, "Exposure Assessment Tools by Routes."

This fact sheet is one of a series of free publications prepared by DEC to help people understand contaminated site cleanup issues. The others can be found at <https://dec.alaska.gov/spar/csp/faq>.