



Questions & Answers

Tacoma Smelter Plume Site – Cleanup Levels and Interim Action Trigger Levels for Arsenic and Lead

Introduction

This question and answer sheet is intended to explain the state cleanup levels for arsenic and lead soil contamination under the state Model Toxics Control Act, and the Department of Ecology's interim action trigger levels for arsenic and lead at child-use areas within the Tacoma Smelter Plume site.

Under the Model Toxics Control Act, state cleanup levels serve two important purposes by:

- Establishing a dividing line between properties that require further investigation and cleanup, and those that do not.
- Defining a level of performance (“how clean is clean?”) that must be achieved when someone decides to clean up a specific property.

Within the Tacoma Smelter Plume site, the Department of Ecology has developed interim action trigger levels for arsenic and lead soil contamination to help Ecology prioritize interim cleanup decisions for child-use areas such as schools, daycare centers, parks, campgrounds and beaches. Areas used by children are Ecology's priority for investigations and cleanup because children tend to have greater exposure to contaminated soil, and may be more sensitive to the effects of arsenic and lead. However, the Tacoma Smelter Plume site covers more than 100 square miles where arsenic and lead may be found above state cleanup levels. Realistically, it will take many years for all the contamination in the plume area to be addressed. Therefore, Ecology developed interim action trigger levels to assist in identifying child-use sites that Ecology believes need early cleanup.

The questions that follow have been grouped into two categories: State Cleanup Levels, and Child-Use Area Interim Action Trigger Levels. The responses have been developed by the Washington State Department of Ecology in consultation with the State Department of Health.

State Cleanup Levels

Q: *What are the state cleanup levels for arsenic and lead in soil?*

A: The residential soil cleanup level for arsenic is 20 parts per million (ppm). The residential soil cleanup level for lead is 250 ppm. These cleanup levels are selected to be protective of human health and the environment.

Q: *How was the arsenic cleanup level of 20 ppm established?*

A: Under the state Model Toxics Control Act (MTCA), cleanup levels for cancer-causing chemicals such as arsenic are usually set to protect the population against increased cancer risk. For arsenic, the calculated risk-based number would be 0.67 ppm. However, arsenic occurs naturally in the environment at background levels that are higher than the risk-based level of 0.67 ppm. Therefore, the state arsenic cleanup level was set at the background level of 20 ppm.

Q: *What is a “risk-based” cleanup level?*

A: Typically, cleanup levels for cancer-causing chemicals like arsenic are set at a level where the risk that they could cause cancer is small. For residential properties, the goal is to reduce the lifetime risk of cancer from any one chemical to one-in-one million or less — that is one additional cancer above the background cancer rate for one million people. Lifetime cancer risk refers to the probability that an individual, over the course of a lifetime, will develop cancer.

The MTCA regulation provides a risk assessment formula for calculating cleanup levels for residential properties. As children are generally more vulnerable to the effects of pollutants than adults, the risk formula includes several assumptions about a child’s exposure. For example, it assumes that a child eats 200 milligrams of contaminated soil every day for the first six years of childhood. If the child grows up to be 75 years of age, their risk of cancer due to being exposed to the contaminated soil as a child should only be one-in-one million. Beyond the age of 6, an individual’s exposure to soil decreases, and by adulthood the estimated ingestion of soil is 50 milligrams per day. A risk-based cleanup level for arsenic that reduces the lifetime cancer risk to one-in-one million is 0.67 ppm.

Children are generally far more vulnerable to the effects of pollutants than adults because:

- Their bodies are still developing and thus are more susceptible to major damage, even from seemingly small exposures.
- They drink more water, eat more food, and breathe more air per pound of body weight.
- They have greater exposures because they are smaller and therefore closer to pollutants on and near the ground. They also play in the dirt more, and they put their hands and objects in their mouths more often than adults do.
- They absorb a greater proportion of many pollutants from the intestines and the lungs.

Q: *So why is the state’s arsenic cleanup level set higher than the risk level?*

A: Even though the risk-based level for arsenic is calculated to be 0.67 ppm, the state cleanup level is actually 20 ppm. This is because arsenic is a naturally occurring substance and is found in all soil throughout Washington. The upper end of the normal range of arsenic in soil is about 20 ppm. Even though a one-in-one million excess cancer risk is the maximum cancer risk allowed, state law provides an exception where natural background levels are higher. The Department of Ecology can not require cleanup to below what occurs naturally. The arsenic cleanup level of 20 ppm translates to a risk of 3 in one hundred thousand.

It is important to remember that state cleanup levels are intended to prevent cancer effects from a chemical. It is not a measure of what effects have actually occurred. Ecology is often asked what the medical outcomes are when people have been exposed to a specific level of contamination. Determining those effects is very difficult due to variations in individual sensitivities to health risks and separating out the effects of the arsenic from other environmental effects.

Q: *How was the lead cleanup level of 250 ppm established?*

A: The lead cleanup level of 250 ppm was developed in 1991 and is based on protecting children against the toxic effects of lead. Infants and small children are particularly vulnerable to the effects of lead poisoning because lead adversely affects the developing brain and other parts of the nervous system. Also, children usually have greater exposure to lead than adults do because they tend to swallow more lead-contaminated material and absorb a much greater fraction of the lead that has been swallowed. A child’s risk is evaluated by levels of lead in their blood. The state

cleanup level was developed using a mathematical model to determine concentrations of lead in soils that would have less than a 1 percent chance of causing blood lead levels above 15 micrograms of lead per deciliter of blood.

State cleanup regulations also provide the flexibility to take into account new scientific information and site-specific data when establishing cleanup levels for individual sites. Since 1991, there have been two main developments that impact how Ecology establishes cleanup levels for lead for some individual sites. First, the federal Centers for Disease Control and Prevention (CDC) published blood lead guidelines (see Table 1) and currently considers children to have an elevated level of lead if the amount of lead in the blood is equal to or greater than 10 micrograms of lead per deciliter of blood. The Centers for Disease Control also recommends environmental investigation and intervention if blood lead levels remain at or above 15 micrograms of lead per deciliter of blood. Second, the EPA developed a newer child blood lead model (Integrated Exposure Uptake Blood Kinetic (IEUBK) Model) which is now used by state and federal agencies to establish site-specific cleanup levels.

Ecology still believes that the 250 ppm level protects children’s health even though the level was set before the current CDC guidelines and EPA Child Lead Model were developed. In fact, most of the site-specific levels established in Washington over the last several years are higher than 250 ppm. For example, Ecology used the newer EPA lead model to establish a lead cleanup level of 353 ppm for residential properties at the Everett Asarco Smelter Site.

**Table 1: Interpretation of blood lead test results and follow-up activities:
Class of child based on blood lead concentrations**

Class	Blood lead concentration (µg/dl)	Comment
I	= or < 9	A child in Class I is not considered to be lead- poisoned
IIA	10-14	Many children (or a large proportion of children) with blood lead levels in this range should trigger community-wide childhood lead poisoning prevention activities. Children in this range may need to be screened more frequently.
IIB	15-19	A child in Class IIB should receive nutritional and educational interventions and more frequent screening. If the blood lead levels persist in this range, environmental investigation and intervention should be done.
III	20-44	A child in Class III should receive environmental evaluation and remediation and a medical evaluation. Such a child may need pharmacological treatment of lead poisoning.
IV	45-69	A child in Class IV will need both medical and environmental interventions, including chelation therapy.
V	= or > 70	A child in Class V lead poisoning is a medical emergency . Medical and environmental management must begin immediately .

(Adapted from CDC, Preventing Lead Poisoning in Young Children. A Statement by the Centers for Disease Control, October, 1991. U.S. Department of Health and Human Services/Public Health Service)

Q: *Why is the federal residential arsenic action level 230 ppm at the Asarco Tacoma Smelter Superfund Site in Ruston, but the state residential level is 20 ppm?*

A: The Asarco Tacoma Smelter site in Ruston near Tacoma is a federal Superfund site managed by the EPA. At the Ruston site, EPA established a cleanup level of 20 ppm (based on the MTCA cleanup level) with an action level of 230 ppm. What this means is:

- No action is required for properties with levels below 20 ppm;
- Institutional controls such as community education are required for properties with levels between 20 and 230 ppm; and
- Soil removal is required for properties with levels above 230 ppm.

Ecology and EPA utilize similar risk assessment methodology. However, Ecology and EPA employ different acceptable risk levels, which explains the difference between Ecology's cleanup levels and EPA's action levels.

Federal law does not have standardized cleanup levels per se. Under Superfund, risks are managed within an acceptable risk range for each individual site. Federal regulations specify this range as between a one-in-one million (same as the MTCA standard) to one-in-ten thousand increased risk of cancer. EPA guidance also provides that the one-in-ten thousand risk can include estimated risks slightly above one-in-ten thousand if justified based on site-specific information. At Ruston, the allowable cancer risk was set at one-in-two thousand, resulting in an action level of 230 ppm.

The *action level* is the level at which active cleanup (soil removal for example) is required. The MTCA cleanup level of 20 ppm still applies at the Ruston site as an "applicable" state law. Thus, for levels between 20 ppm and 230 ppm, safety measures other than active cleanup (such as community education about health protective measures individuals can take) are required to reduce exposure to soils contaminated above the MTCA cleanup level.

A recent review of cleanup levels set for arsenic at other federal cleanup sites found that 84 percent of the sites had cleanup levels based on risk, and 16 percent were based on background levels. The cleanup levels based on risk ranged from 2 to 305 ppm, while the background levels ranged from 8 to 21 ppm.

Q: *What is required when a property has soil levels that exceed the state cleanup levels?*

A: If arsenic or lead concentrations on a property are above the state cleanup levels, the property is considered contaminated. Ecology normally ranks and prioritizes sites requiring cleanup. Ecology does not conduct the cleanup itself unless there is an immediate public health threat, or in some circumstances where properties are abandoned. Ecology requires site owners and other liable parties to conduct cleanups at high priority sites. Many cleanups are also conducted voluntarily, often driven by the sale or development of a property.

However, the Tacoma Smelter Plume site is an unusual situation — it covers a very large area, contains many properties, and involves a huge number of property owners. When more information about the extent of the contamination is available (through studies now being conducted by local health departments), Ecology intends to develop an overall cleanup strategy for the whole Tacoma Smelter Plume site. Meanwhile, Ecology does not plan to require cleanup of private residential yards, unless there is an imminent threat to human health or the environment.

Q: *What if I discover my property is contaminated?*

A: Under state law, the discovery of contamination must be reported to the Department of Ecology. Contamination reports can be made by calling Joyce Mercuri (Pierce County) at 360-407-6260 (e-mail: jmer461@ecy.wa.gov), or Norm Peck (King County) at 425-649-7047 (e-mail: nope461@ecy.wa.gov).

Q: *What actions can a property owner take?*

A: An overall cleanup strategy for the Tacoma Smelter Plume site will include active soil remediation and will also likely include other measures such as community education, use restrictions, or local permit requirements. The public will have an opportunity for input to the long-term strategy. Ecology and health agencies urge persons living in the Tacoma Smelter Plume site to follow common-sense measures to reduce exposure to arsenic and lead such as keeping children from playing in bare soil. Property owners may also want to consider covering areas of bare soil with grass or wood chips, washing hands and faces after playing outdoors or gardening. For more information on protective measures, refer to http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm.

Child-Use Area Interim Action Trigger Levels

Q: *What is an Interim Action?*

A: It can take many years to clean up a contaminated site. Sometimes, however, the hazard at part of a site is great enough that Ecology finds it necessary to act more quickly to ensure people's safety or to protect the environment. An Interim Action is a measure that is done quickly to reduce the potential effects of contamination, before a final cleanup action occurs. An interim action may only partially or temporarily address the cleanup of a site or reduce exposure to the contaminants while a final cleanup action is being developed.

Interim actions can include:

- fencing areas to prevent entry and exposure
- digging up "hot spots" and legally disposing of the soil
- placing a clean soil cap over the contaminated soil to prevent routine contact
- educating people about ways they can protect themselves from exposure

Q: *Is Ecology considering interim actions for the Tacoma Smelter Plume Site?*

A: For any cleanup site, Ecology considers conducting early cleanup actions (interim actions) to reduce potential threats to human health and the environment, or to control a problem that may get worse before the final cleanup decision is made. In fall 2000, Ecology began considering interim actions to reduce exposure to contaminants in areas used by children in parts of the Tacoma Smelter Plume site. Child-use areas include: schools, daycare centers, parks, campgrounds and beaches.

Ecology decided to implement the interim action concept because the Tacoma Smelter Plume site is extraordinarily large, potentially encompassing hundreds of square miles. It will take several years to investigate, and to develop and implement cleanup solutions for the whole plume area. Meanwhile, children would continue to be exposed to contaminated soils.

Because of the vast size of the Tacoma Smelter Plume site, not all child-use areas with arsenic and lead concentrations above state cleanup levels (20 ppm and 250 ppm respectively) can be cleaned up right away. In order to identify the specific child-use areas which are most important to clean up first, Ecology developed interim action trigger levels – these are contaminant levels that “trigger” an interim action to occur.

Q: *What are the interim action trigger levels for the child-use areas within the Tacoma Smelter Plume Site?*

A: For schools and daycare facilities, the interim action trigger level for arsenic is 100 ppm and for lead is 700 ppm. For parks and children’s camps, the interim action trigger level for arsenic is 200 ppm and for lead is 1000 ppm. The interim action trigger levels for schools and daycare facilities were set at lower levels because children tend to play more often at these locations. Soil investigations by local health departments in King and Pierce Counties will help to identify the child-use areas, if any, needing interim actions.

Q: *What are Interim Action Trigger Levels NOT to be used for?*

A: It is important to understand some of the things for which interim action trigger levels are not designed to be used. First, they are not to be used to identify properties that require no further action. Interim action trigger levels are only being used to distinguish between properties requiring early action and those requiring further investigation/cleanup in the longer term. Second, interim action trigger levels do not establish performance standards for cleanup measures at individual properties. Once a decision is made to clean up a specific property, the cleanup standard defines the level of performance (“how clean is clean”) that must be achieved. Finally, interim action trigger levels are not intended to identify properties requiring some type of emergency action. In general, emergency actions would only be initiated if concentrations were much higher than the cleanup standards and the interim action trigger levels.

Q: *What does it mean when a property exceeds the interim action trigger level?*

A: For public child-use areas, Ecology plans to make sure that interim cleanup actions are conducted at properties that have average soil concentrations exceeding the interim action trigger levels in the top six inches of soil. Ecology will work with the owner of the property to remove or cover the contaminated soil.

Ecology has provided grant funds to Public Health-Seattle & King County and Tacoma Pierce County Health Department to conduct testing of public child-use areas to identify and prioritize those needing early cleanup action. Because of the large number of child-use areas, it may take several years to sample the child-use areas in the suspected Tacoma Smelter Plume vicinity. The local health departments will be developing criteria to decide which child-use areas to sample first, focusing on the more highly contaminated parts of the plume where arsenic or lead concentrations might exceed interim action trigger levels. Child-use areas in some parts of the plume may not be sampled at all if concentrations in the surrounding areas are below the interim action trigger levels.

Q: *What about child-use areas with contamination below the interim action trigger levels...won’t children continue to be exposed to contaminated soil?*

A: Ecology and the health agencies continue to urge persons living in the Tacoma Smelter Plume site to follow common-sense measures to reduce exposure to arsenic and lead, such as keeping

children from playing in bare soil. Staff from the agencies are available to consult with operators of child-use facilities. Property owners of child-use areas may want to consider covering areas of bare soil with grass or wood chips. Operators of a child-use facility should encourage the children to wash hands and faces after playing outdoors or gardening. For more information on protective measures, refer to http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm.

Q: *How were the interim action trigger levels for arsenic established?*

A: Ecology established interim action trigger levels for arsenic to prevent children from getting sick (toxic effects) and/or experiencing unacceptable cancer risks. The interim action trigger levels for arsenic were developed using the risk assessment methods included under state law. However, a target cancer risk level of one-in-ten thousand was used, compared to the target cancer risk level of one-in-one-million that is used in setting cleanup levels. Ecology also assumed the exposure to the contaminants would be less frequent than the exposure used for establishing cleanup levels.

The MTCA risk formula used to calculate cleanup levels for residential properties was modified to develop the interim action trigger levels based on the following considerations.

- **Acceptable cancer risk level:** Nationally, acceptable cancer risks are usually set somewhere between one-in-one million (e.g. one person from among a million people exposed to the risk factor is expected to develop cancer from it), and one-in-ten thousand (e.g. one person from among ten thousand people exposed to the risk factor is expected to develop cancer). Regulatory action has almost always been required when cancer risks exceed one-in-ten-thousand and regulatory actions are rarely required when cancer risks were less than one-in-one-million.

Ecology is using a similar decision framework within the Tacoma Smelter Plume site. Under MTCA, the risk-based formula for calculating cleanup levels uses a cancer risk of one-in-one-million (the “lower” or “more protective” end of the cancer risk range). The interim action trigger levels for arsenic were established using a cancer risk of one-in-ten-thousand in the MTCA risk-based formula (the “upper” or “less protective” end of the cancer risk range).

- **Potential exposure situations:** When setting cleanup levels for residential properties, the standard exposure situation in MTCA assumes that a child is exposed to contaminated soils every day for six years. For interim action trigger levels, the exposure situation was changed to reflect how frequently a child might be exposed at a child-use property. For the interim action trigger levels, it was assumed that a child would be exposed every day that he/she attended school/daycare (180 – 250 days/year for six years) or played at parks or children’s camps (50 – 100 days/year for six years).

Q: *How were the interim action trigger levels for lead established?*

A: Ecology established the interim action trigger levels for lead by using EPA’s child blood lead model. The model was used to estimate soil concentrations that would have less than a 5 percent chance of causing blood lead concentrations that exceed 15 micrograms of lead per deciliter of blood. This guideline is used by the federal Centers for Disease Control and Prevention. This is the same model currently used by Ecology when setting cleanup levels for some individual sites. However, for the interim action trigger levels, some of the assumptions and inputs to the model are different than the ones Ecology uses when setting cleanup levels. This is because the interim

action trigger levels are for identifying properties for early actions, and are not intended as a cleanup level.

The major differences in the assumptions used in the model for setting the interim action trigger levels versus the use of the model to set site-specific cleanup levels are described below:

- First, the interim action trigger levels are based on preventing blood lead concentrations greater than 15 micrograms of lead per deciliter of blood. For comparison, Ecology currently establishes site-specific cleanup levels intended to prevent blood lead concentration greater than 10 micrograms of lead per deciliter of blood. Ecology chose the higher level for setting interim action trigger levels because the Centers for Disease Control recommends that environmental investigation and remediation be done if a child's blood lead levels stay in the 15 – 19 micrograms of lead per deciliter of blood range after nutritional and educational intervention (see Table 1). As Ecology and the health agencies are providing information on community protection measures and health education, Ecology believes that the 15 micrograms of lead per deciliter of blood guideline value is an appropriate basis for identifying areas that require early action.
- Second, Ecology modified the assumptions about how frequently children play at schools, daycare facilities, parks, and children's camps. When establishing cleanup levels, Ecology generally assumes that children will be playing at a particular location for 350 days/year. When setting interim action trigger levels, Ecology assumed that a child would be exposed 180 days/year at schools and daycare facilities, and 100 days/year for parks and children's camps. The lower frequencies used for setting interim action trigger levels were selected after considering the length of the school year, and seasonal uses of children's camps.
- Third, Ecology took into account that children are exposed to many other sources of lead on a daily basis. Specifically, Ecology assumed that, in addition to lead exposures at child-use areas, children would be exposed to lead on a daily basis because lead is also present in the soils/dust at their homes, drinking water and food.

Q: *Do the interim action trigger levels apply to other properties besides child-use properties?*

A: Ecology is using the interim action trigger levels only for prioritizing early cleanup of child-use properties. Until more information is available about the extent of the Tacoma Smelter Plume site, Ecology does not intend to sample or mandate cleanup of non-child use areas (for example residential yards), unless a situation arises where there are very high levels which could have immediate impacts to life or health. Therefore, the interim action trigger levels would not trigger early cleanup at non-child use properties.

Q: *Do the interim action trigger levels translate to safe short-term contaminant levels for the yard at my home?*

A: While the basis for the interim action trigger levels were not specifically created to evaluate potential home exposures, the exposure and risk values for homes, schools and daycare facilities are similar. Property owners may use the interim action trigger levels as a means of evaluating their relative risk, and deciding on a course of action. Residential properties with concentrations below the interim action trigger levels, but exceeding the state cleanup levels are still of concern, and will need to be addressed as part of the long-term cleanup plan.