Soil Sampling for Lead Cadmium and Arsenic

The equipment you will need:

- A plastic or stainless steel spoon or scoop
- Cleaning detergent and water for cleaning your sampling implements between samples.
- Clean sample containers, either glass jars with plastic lids or zip lock bags
- Labels
- Marking pen
- Paper and pen or pencil to make a map of your sample locations

Where and how you sample depends on what question you want to answer.

Children are the most sensitive population for heavy metal contamination, because they often play in the dirt, they often eat dirt (about 10 percent of children actually eat dirt by the handful), their stomachs are more acid than adults' (thus absorbing more heavy metal, proportionately), and their growing bodies and nervous systems are more sensitive to metals. ***If you have small children, you should sample in the areas in which they play***.

Use a clean plastic or stainless steel spoon or scoop and collect soil from areas where children play. Remove any sticks or other debris from the area, and combine soil from several spots in each play area. Gather a small, approximately equivalent amount of dirt from four to 8 spots, sampling only the top two inches of soil. This is called a composite sample. In total, you should have at least one-half cup of soil. Store the soil in a container such a zip lock bag or small clean glass jar. Label the container, and draw a rough map of the property, noting where the sample was taken. Create a numbering system that makes sense to you and put those numbers on the map and on your samples.

Clean you sampling equipment by scrubbing with mild detergent (such as dish detergent or trisodium phosphate), and rinsing at least three times in clean water. Repeat the sampling process in other child play areas.

Gardens are a concern because we are often eating the produce from them. However, be aware that different gardening methods can lead to greater or lesser uptake by plants. Furthermore, different vegetables take up different metals differently. Arsenic appears to be mostly in roots and stems, and less in leaves and fruits, while cadmium appears to be mostly concentrated in leaves. There is no hard and fast connection between the heavy metals in garden soil and the heavy metals in vegetables.

Gardens can be sampled in much the same way as child use areas, but you should be sampling the first six to 8 inches of the soil (the root zone) instead of the top two inches. A stainless steel bulb planter can be used for this kind of sample. Make sure it is REALLY clean before you start and after every composite sample.

Take a composite sample by removing the plant debris on the surface, then sampling the top 6 to 8 inches of soil. Combine at least three samples from each garden. Then label the sample and mark your map as to its location. Another way to sample gardens is to composite several gardens—but be aware that metal contamination varies a great deal over small distances. You may have one garden that is very high in metals while others are very low in metals. Mixing them together may conceal the high metals garden.

Property/Real estate assessments are asking whether the property as a whole is contaminated. To determine this, you should take a random sampling over the entire property of at least ten separate, non-composited samples. They will give you a statistical assessment of the property. Don't forget to use the map to note where samples are taken.

Worst-case assessments are based on picking the few places on the property where the highest concentrations are expected. On Vashon-Maury Island, the heavy metals derived from the Tacoma Smelter plume, and the highest concentrations are found on upper, southward-facing slopes. Samples should be taken at the foot of the largest trees, where the soil appears to be undisturbed on the south side, and preferably at elevations of at least 100 feet. If the property is at low elevation, try to get as high as possible for the sampling. No compositing is required. Two or at most three samples will give you a reliable worst-case sampling.

The advantage to doing a worst-case assessment, is that if your numbers are relatively low, you know that there is not likely to be a problem on the property. Worst-case assessments can be most useful for those seeking to purchase property or those who suspect that their overall levels of contamination are low.

Storage and Analysis

Once you have your samples, you should store them in a refrigerator.

All your work sampling will be worthless if your laboratory is not good at analyzing these kinds of samples. You need to tell them to:

- Follow the SW846 methods (these are EPA's standard methods)
- Screen the samples to 2 mm (this removes rocks and other debris from the sample)
- Measure the dry weight of the sample and express results in dry weight
- For arsenic, measure using either Furnace AA (Graphite Furnace Atomic Absorption Spectrometry) or ICP-MS (Inductively Coupled Plasma Mass Spectrometry)

Call your laboratory ahead of time to assure that they can do this kind of analysis. Also ask what their turnaround time is—how long it will take to get your results. Find out how they want the samples delivered. Usually you should pack them with ice packs or ice, and send them via courier to the lab in a cooler. Make sure that you include your name and contact information inside the cooler, along with a description of the samples and what tests you want done.

Caveat Emptor. Relatively few laboratories can do a good job with these kinds of samples. King County uses Onsite Environmental Inc. 14648 NE 95th St. Redmond, WA 98052. Phone: 425-883-3881, Fax 425-885-4603. They appear to do a good job in producing accurate (though not always rapid) results.

If you have any questions, feel free to call the Institute for Environmental Research and Education (206-463-7430) or email to staff@iere.org, or you can call the Heavy Metal Remediation Committee (HMRC) of the Vashon-Maury Island Community Council. May Gerstle chairs this committee, and her phone number is 206-463-0974.