Tacoma Smelter Plume Site
Soil Safety Program
Final Design Document

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Prepared for

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1.0 INTRODUCTION

ASARCO operated a primary copper smelter at Ruston, Washington for almost 100 years. That smelter, referred to as the Tacoma Smelter, specialized in the smelting of complex (e.g., high-arsenic) ores. It closed in 1986. For many years, the Tacoma Smelter was the sole domestic source of arsenic for the U.S. market.

The U.S. Environmental Protection Agency (EPA) is overseeing cleanup of residential properties in Ruston and north Tacoma, within approximately 1 mile of the former smelter, as part of Commencement Bay Superfund Site cleanup activities. The Washington State Department of Ecology (Ecology), in cooperation with local health departments, has been investigating widespread contamination from smelter emissions extending beyond the designated EPA Superfund site. This larger area of contamination has been designated the Tacoma Smelter Plume (TSP) Site under Washington's Model Toxics Control Act (MTCA).

A number of studies of residual soil contamination within the TSP Site have been completed including footprint studies of Thurston, Pierce, Kitsap, and King Counties, and Child Use Area (CUA) studies in King and Pierce Counties. Footprint studies defined the spatial pattern of smelter contamination and its likely maximum magnitudes by location. Child Use Areas - those locations where numbers of children are likely to spend significant time and have opportunities for contact with contaminated soil – have been sampled in King and Pierce Counties, on a limited basis as funding allowed. Young children are considered a population of special concern because of their propensity for soil contact, mouthing behaviors, and greater sensitivity (e.g., greater absorption) for smelter-related contaminants such as arsenic and lead.

1.1 PURPOSE

A new law, Chapter 70.140 RCW, was enacted in 2005 that requires Ecology to assess soil contamination at schools and childcares within the Tacoma Smelter Plume (TSP). The purpose of this document is to describe the activities that will be conducted and identify the roles and responsibilities of Ecology and other state and local agencies in implementing this law.

1.2 RECENT LEGISLATION (RCW 70.140)

A law (Chapter 70.140 RCW) was enacted in 2005 to assist state and local agencies in implementing actions to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law requires Ecology, in cooperation with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of the Superintendent of Public Instruction (OSPI), and local

health districts, to assist schools and childcares in western Washington to reduce the potential for children's exposure to area-wide soil contamination. The law (RCW 70.140.030) requires Ecology to:

(a) Identify schools and childcares that are located within the central Puget Sound smelter plume (Tacoma Smelter Plume) based on available information

(b) Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination;

(c) Conduct soil samples by December 31, 2009, if the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property; and

(d) Notify schools and childcares regarding the test results and the steps necessary for implementing best management practices, if soil sample results confirm the presence of area-wide soil contamination.

Ecology must also develop best management practice (BMP) guidelines [RCW 70.140.040(2)] and a grant program to assist schools and owners and operators of childcares with implementing BMPs [RCW 70.140.040(3)] and recognize schools and childcares that successfully implement BMPs [RCW 70.140.030(4)]. The law authorizes Ecology (within available funds) to provide grants to schools and childcares for implementation of BMPs [RCW 70.140.040(4)] and financial assistance to DSHS to implement required activities [RCW 70.140.040(5)]. It also authorizes Ecology to use an interagency agreement to authorize a local health department to implement any activity [RCW 70.140.040(6)].

In addition, the law requires schools and childcares to work with Ecology to provide site access for soil sampling. If schools or childcares with area-wide soil contamination do not implement BMPs within 6 months of receiving written notification of test results, they must notify parents and guardians in writing of the results, using a written notice prepared by Ecology.

Ecology has partnered with Public Health – Seattle & King County (PHSKC) and the Tacoma-Pierce County Health Department (TPCHD) to implement this law. The program has been titled the "Soil Safety Program." Ecology has provided grants to the health departments to conduct activities related to the Tacoma Smelter Plume, including soil sampling at the childcares and schools, and providing education and outreach.

1.3 PREVIOUS STUDIES

Footprint studies have been completed to determine the extent and magnitude of shallow soil contamination from the TSP. As a result of the footprint studies, CUA studies were conducted to determine the potential exposure to children in contaminated areas. The approaches and results of these studies are presented in the following sections.

1.3.1 RELATIONSHIP BETWEEN STATE CLEANUP LEVELS, INTERIM ACTION LEVELS, AND HIGH/MODERATE RANGES

Results from the Tacoma Smelter Plume studies are often compared to various concentration levels. Briefly described here are the relationships between these levels in order to better understand the comparisons.

State Cleanup Levels

State cleanup levels are established under the state cleanup law, the Model Toxics Control Act (MTCA). The 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; and
- Defining a level of performance ("how clean is clean?") that must be achieved when someone decides to clean up a specific property.

The state cleanup levels for arsenic and lead are listed in Table 1-1.

Interim Action Trigger Levels

For the first Child-Use Area studies, Ecology developed interim action trigger levels for arsenic and lead soil contamination to help Ecology prioritize interim cleanup decisions for child-use areas. 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 could be cleaned up right away. In order to identify the specific child-use areas which were most important to clean up first, Ecology developed interim action trigger levels – these are contaminant levels that "trigger" an interim action to occur. The Interim Action Trigger Levels are also listed in Table 1-1.

High/Moderate Ranges

Soils in large parts of Washington State contain elevated levels of arsenic and lead caused by past releases from metal smelters and historical application of agricultural pesticides. This low- to moderate-level soil contamination, dispersed over large geographic areas, is referred to as area-wide soil contamination. The Tacoma Smelter Plume is an example of an area-wide contaminated site. Ecology has developed a strategy for addressing area-wide contaminated sites. As part of this strategy, Ecology developed ranges to define low to moderate, and moderate to high. The basis for the interim action trigger levels was used to set the different ranges. The Area-wide Strategy sets out that the MTCA regulatory process may be used at properties found to have high levels of arsenic and lead. An alternative approach will be used at properties found to have moderate levels of arsenic and lead soil contamination, no related groundwater contamination, and no other contaminants. The ranges are also included in Table 1-1.

TABLE 1-1
STATE CLEANUP LEVELS, INTERIM ACTION TRIGGER LEVELS, AND MODERATE/HIGH RANGES

	Arsenic (ppm)				Lead (ppm)			
	MTCA Cleanup Level	Interim Action Trigger Level	Moderate	High	MTCA Cleanup Level	Interim Action Trigger Level	Moderate	High
Schools, childcares, residential properties	20	100	20 - 100	> 100	250	700	250 - 500	> 500
Parks, commercial properties	20	200	20 - 200	> 200	250	1000	250 - 700	> 700

* *Comparison statistics: averages above these levels; or a maximum above 2 times these levels (i.e., avg > 20 ppm, or max > 40 ppm)*

** *Basis for moderate and high concentrations – MTCA cleanup levels and Interim Action Trigger Levels. Moderate and high concentrations reviewed and supported by Science Advisory Board. Based on Science Advisory Board recommendations, the high range for lead was lowered.*

1.3.2 FOOTPRINT STUDIES: APPROACHES AND RESULTS

In 1999, Ecology and the local health departments in King and Pierce counties began a systematic and phased approach to soil investigations of smelter-impacted areas outside of the Ruston/north Tacoma area and ASARCO Superfund sites. A phased approach was used to allocate funding as it became available and to direct sampling efforts as more data became available. Footprint studies were conducted first on Vashon-Maury Island and the King County Mainland, followed by Pierce County, and later included parts of Thurston and Kitsap Counties. Footprint sampling focused on relatively undisturbed forested areas to develop information on the likely highest levels of soil contaminant concentrations. The studies were guided by a conceptual model of aerial deposition from the smelter stack influenced by wind direction and intensity, and topographic features. The conceptual model predicted higher concentrations in the surface soil in predominant downwind directions, higher soil concentrations closer to the smelter, and higher soil concentrations in undisturbed soil. Disturbance during development activities was assumed to dilute the surface soil concentrations. The footprint studies confirmed the conceptual model. Table 1-2 summarizes the results of the footprint studies.

TABLE 1-2
SUMMARY OF FOOTPRINT STUDY RESULTS

Study	Metals	Highest Found	State Standard
King County Mainland Footprint Studies	Arsenic	260 ppm	20 ppm
	Lead	790 ppm	250 ppm
Vashon-Maury Island Footprint Study	Arsenic	460 ppm	20 ppm
	Lead	1,300 ppm	250 ppm
Pierce County Footprint Studies	Arsenic	1,050 ppm	20 ppm
	Lead	6,670 ppm	250 ppm
Kitsap County Footprint Study	Arsenic	36.9 ppm	20 ppm
	Lead	198 ppm	250 ppm
Thurston County Footprint Study	Arsenic	159 ppm	20 ppm
	Lead	1,110 ppm	250 ppm

The results of the King County footprint studies showed arsenic contamination ranging as high as 460 ppm on Vashon-Maury Island and 260 ppm on the King County mainland, while lead ranged as high as 1,300 ppm on Vashon-Maury Island and 790 ppm on the King County mainland (Ecology 2000 and Ecology 2002). The Puget Sound background concentrations of arsenic and lead in soil are 7 ppm and 24 ppm, respectively (Ecology 1994). The Model Toxics Control Act Method A Soil Cleanup Levels for unrestricted land uses for arsenic and lead are 20 ppm and 250 ppm, respectively.

Pierce County Footprint Studies showed arsenic concentrations near the smelter as high as 1,050 ppm and lead concentrations as high as 6,670 ppm. A Final Extended Footprint Study included Kitsap and Thurston counties, as well as King and Pierce counties. Table 1-2 summarizes the results of all Footprint studies, and Figure 1 displays the results. Results in Kitsap and Thurston Counties showed lower levels of arsenic and lead, primarily due to their distance from the smelter; however, some results still exceeded the MTCA Method A Soil Cleanup Levels for unrestricted land uses.

1.3.3 CUA STUDIES: APPROACHES AND RESULTS

CUA studies were conducted in King County (including Vashon-Maury Island) and Pierce County between 2000 and 2005. Data from the footprint studies and statistical methods were used to define a geographic region called the CUA Study Zone. The study zone focused CUA sampling in areas that were most likely to have significant concentrations of arsenic and lead in the soil. Targeted CUAs included elementary schools, childcares, parks, and camps. Based on observing where the children played, the CUA was divided into "play areas." Average sample results for each play area were

compared to interim action trigger levels (for schools and childcares: 100 ppm arsenic, 700 ppm lead; for parks and camps: 200 ppm arsenic, 1,000 ppm lead) to determine if the play area needed immediate action to reduce children's exposure to arsenic and lead.

On Vashon-Maury Island, 34 out of 45 identified CUAs were sampled. Of the CUAs sampled, 13 were elementary schools, 4 were childcares, 11 were parks, 4 were camps, and 2 were beaches. On the King County mainland in 2003, 221 facilities were contacted; of those 97 were sampled. A total of 38 elementary schools, 30 parks, 1 garden and 28 childcares were sampled. And in 2005, 547 facilities were contacted; of those 91 were sampled. A total of 12 elementary schools, 30 parks, and 49 childcares were sampled. Of the facilities sampled in King County, none exceeded the interim action trigger levels. A total of 39 CUAs have play areas exceeding the MTCA cleanup level for arsenic, and 7 CUAs have play areas exceeding the cleanup level for lead.

In Pierce County in 2003, 194 CUAs were identified and 64 were sampled. A total of 18 schools, 16 parks, and 30 childcares were sampled. Of the facilities sampled, one school and one childcare exceeded the interim action trigger levels. At the school with a play area above the interim action trigger level, soil was removed from a dirt baseball field and replaced with clean soil and remaining areas of bare ground were covered with asphalt. At the childcare, the owners were provided with soil safety brochures, but no soil removal or encapsulation was undertaken because the contaminated area was wooded and children did not play in the area on a regular basis. In 2005, 10 Metro Parks facilities were sampled. Of the parks sampled, none exceeded the interim action trigger levels. A total of 30 CUAs have play areas exceeding the MTCA cleanup level for arsenic, and 6 CUAs have play areas exceeding the cleanup level for lead. Table 1-3 summarizes the numbers and types of CUAs studied in each county. Table 1-4 provides a summary of the CUA study results.

1.4 LESSONS LEARNED

This section focuses on evaluating processes and technical methods from past CUA studies to identify things that worked well and things that could or should be done differently. The lessons in this section were compiled through interviews with staff from Public Health-Seattle & King County, Tacoma-Pierce County Health Department, and Ecology. The following subsections describe general observations by agency staff regarding property access, community outreach, and sampling methods. Table 1-5 presents some specific lessons learned and changes that were recommended by agency staff for implementing the Soil Safety Program.

TABLE 1-3
CHILD USE AREA DATA SUMMARY

Study		# facilities identified	# facilities contacted	# access agreements	# sampled	# in moderate range	# in high range
King							
VMI (2001)							
	Public schools	4	4	4	4	2	0
	Private schools	6	6	6	6	3	0
	Childcare centers(1)						
	Home childcares	15	15	7	7	1	0
	Parks	13	13	11	11	3	0
	Camps	4	4	4	4	3	0
	Other	3	3	2	2	0	0
Main KC (2003)							
	Public elementary schools	48	41	38	35	10	0
	Private elementary schools	11	4	4	3	0	0
	Childcare centers (1)						
	Home childcares	432	74	35	28	3	0
	Parks	93	56	47	30	7	0
	Camps	0	0	0	0	0	0
	Other	2	1	1	1	0	0
Main KC (2005)							
	Public elementary schools	16	16		10	0	0
	Private elementary schools	10	10		2	0	0
	Childcare centers	85	85		9	1	0
	Home childcares	387	387		40	5	0
	Parks	41	41		30	7	0
	Camps	2	2		0	0	0
	Other	6	6		0	0	0
Pierce							
PC (2003)							
	Public elementary schools	19	19	19	18	5	**1**
	Private elementary schools	5	5	0	0	0	0
	Childcare centers (1)						
	Home childcares	131	131	33	30	12	**1**
	Parks	41	41	22	16	7	0
	Camps	0	0	0	0	0	0
	Other	0	0	0	0	0	0
PC (2005)							
	Public elementary schools	0	0	0	0	0	0
	Private elementary schools	0	0	0	0	0	0
	Childcare centers	0	0	0	0	0	0
	Home childcares	0	0	0	0	0	0
	Parks	12	12	12	10	6	0
	Camps	0	0	0	0	0	0
	Other	0	0	0	0	0	0

(1) Combined with "Home childcares"

TABLE 1-4
SUMMARY OF PREVIOUS CUA STUDY RESULTS

Study	Metals	Highest Individual Sample	Range of Averages	State Standard
Vashon-Maury Island CUA Study	Arsenic	130 ppm	4-50 ppm	20 ppm
	Lead	900 ppm	8-180 ppm	250 ppm
King County Mainland CUA Study (2003)	Arsenic	189 ppm	3-41 ppm	20 ppm
	Lead	699 ppm	4-134 ppm	250 ppm
King County Mainland CUA Study (2005)	Arsenic	223 ppm	2-173 ppm	20 ppm
	Lead	660 ppm	2-336 ppm	250 ppm
Pierce County CUA Study	Arsenic	691 ppm	1-114 ppm	20 ppm
	Lead	1,040 ppm	2-170 ppm	250 ppm
Pierce County Metro Parks CUA Study	Arsenic	214 ppm	3-85 ppm	20 ppm
	Lead	983 ppm	3-234 ppm	250 ppm

1.4.1 PROPERTY ACCESS

Obtaining property access at childcares was difficult and time consuming. Response rates from only sending letters were generally very poor. Response rates from follow-up telephone calls were much better, but were estimated to be below 50 percent. Several agency staff observed that childcare operators are generally very busy and do not have time to read mailed material, and often it is hard for them to even find time for a telephone call. In several cases, a visit to the childcare was effective in persuading the operator to proceed with sampling, although visits are costly and time consuming.

Several agency staff also found that distributing information to childcare operators through other avenues such as childcare organizations like Childcare Resource and Referral Network, or training programs like STARS, was effective. Agency staff obtained feedback from several childcare operators that receiving the information from trusted sources before they were contacted by the agencies was helpful. Childcare organizations were helpful in portraying a non-regulatory message that soil sampling and taking measures to reduce risk (i.e., BMPs) were a healthy choice rather than simply a government mandate. Once childcare operators understood the importance of soil sampling and BMPs for the health of the children, they were more receptive to the CUA study. Several agency staff suggested that a future approach might include disseminating materials through childcare organizations, followed by information from DSHS and the health departments.

TABLE 1-5
LESSONS LEARNED

Category	Lesson/Comment
Property Access	Success rate of achieving property access was greater when agency staff called the childcare directly than when request was mailed. The database of childcare providers did not include telephone numbers; obtaining telephone numbers required considerable effort. King County encountered a high rate of turnover of childcare facilities. Periodic updates to the list of childcares will be necessary to keep information current. Childcare owners and operators may not be the same person. This sometimes caused problems with access, but could be resolved by contacting and doing outreach to both owners and operators. Mailing requests was sometimes unreliable as letters were sent back because of incorrect addresses. The letters to childcare providers were too technical and not personal enough. Most providers ignored them. Agencies often used proper channels to make connections with childcares but could have used them in different ways to increase the success rate of getting access.. Getting the endorsement of childcare associations such as Child Resource and Referral, and DSHS prior to attempting property access increased the responsiveness of the childcares. Childcare providers that are already familiar with arsenic and lead issues have been very receptive to receiving more information. One approach may be to distribute information through childcare organizations then have health departments follow up with telephone calls to each childcares. Information sent to childcares should be clear and concise. Childcare providers do not have time to go through multiple brochures or read lengthy explanations.
Outreach	Many childcares were already doing BMPs such as hand washing and covering bare soil patches prior to learning about arsenic and lead issues in soil Providing outreach in advance of sending out letters requesting access is necessary to increase the positive response rate. Articles in newsletters, presentations at childcare organization meetings or conferences, and getting endorsement from childcare advocacy groups may be helpful. Agencies received a number of telephone calls after results letters were sent out. Generally, the telephone calls seemed helpful to the property owners in explaining the results. People are more receptive to implementing BMPs or Healthy Actions if they view it as a healthy choice they are making for themselves rather than as a government mandate. The childcare network is very interconnected. Many of the childcare providers became interested in the program through word of mouth. This can be problematic if a provider outside the CUA study area requests sampling, or if one childcare provider inside the CUA is required to implement BMPs while another outside the CUA is not, even though they may have similar levels of arsenic or lead. Call clients directly instead of asking them to call the agency if they have questions. Everyone whose property is sampled should get a follow-up telephone call to discuss their results and what they mean. Headstart and preschools are not under DSHSs jurisdiction unless they have an extended care program. These types of programs should be targeted in addition to licensed childcares. Secondary schools need different types of outreach materials and may have different types of BMPs. Provide outreach materials in several languages Focus groups have provided good qualitative information about the effectiveness of outreach materials, and have helped agencies tailor materials to better suit the target populations Surveys were useful in assessing how many people saw and remembered the outreach materials.
Sampling Methods and Design	Sample analysis results with a field, hand-held XRF unit had good correlation to laboratory splits above about 40 ppm, but not below. Some types of play areas were not sampled even though they may pose a potential exposure hazard; for example, wooded areas where children play or ride bikes. Some definition should be given to what constitutes a play area above and beyond areas with actual play structures.

TABLE 1-5
LESSONS LEARNED

Category	Lesson/Comment
	Some repetitive motion injuries were sustained by sample collection personnel from working with heavy coring devices and hammers. A section describing proper lifting and handling techniques should be added to the health and safety plan. Results indicate that collecting samples from the 0 to 6 inch interval rather than 0 to 2 inch and 2 to 6 inch intervals is adequate.
Providing Results	Some glitches were experienced in terms of the timing of data releases. A better approach may be to send results immediately so that owners/operators can implement BMPs as soon as possible. Withholding results letters until after press releases did not always work because some people were upset that they did not get it immediately, other people heard/read the press release before they received their letter and were alarmed.
Data Tracking	Data tracking worked reasonably well in previous footprint and CUA studies. However, better and more extensive data tracking will be needed for the next phase of the project because data tracking will become increasingly important for reporting to the legislature. Data tracking system should include some way to track if a facility changes hands or goes out of business. Also tracking should include whether a facility was sampled and if not provide a reason. Data needs to be associated with a property not just a facility.
BMP Implementation and cleanup	Using the term BMP when talking to childcares may not be effective because it sounds too regulatory. Note term that will be used is Soil Safety Actions. BMPs need to be defined. Will BMPs include behavior changes or only physical changes to the site? Time and frequency should be included in BMP definitions. For example, if a facility implements handwashing and taking off shoes, how often do children/adults have to do it to make it count as implementation? Or, if a facility puts down wood chips, how often do the chips have to be replaced or replenished? Long-term remedies such as paving play areas or putting in field turf are best incorporated when a facility is being redeveloped. Public Health – Seattle & King County staff have conducted follow-ups with STARS training participants to confirm whether providers implement soil safety measures. Staff often found that childcares didn't have a system of tracking things that had been done, and that some things were forgotten because of high staff turnover. Agencies should consider asking facilities to implement a simple tracking system when they implement BMPs. It could be tied into the certificate program. Follow-up is very important especially with BMPs that are behavior-oriented or require continued maintenance such as wood chips. Physical behavior prompts have been helpful in institutionalizing the messages about BMPs. Coordination with the DSHS licensers can help determine where specific activities take place (e.g., play areas).

Schools were generally receptive to having sampling conducted. Using existing contacts to get information to the schools was effective in sending a non-regulatory message.

1.4.2 OUTREACH

Outreach materials have been developed by Ecology, Public Health-Seattle & King County and Tacoma-Pierce County Health Department. The materials have the same basic messages about BMPs, although they use various names (BMPs, soil safety guidelines or healthy actions). Several staff

suggested that calling them BMPs sends a regulatory message that may not be well received by childcares.

Providing the outreach materials in several languages was helpful in reaching a larger audience. Childcare operators tended to be more receptive to materials disseminated through childcare organizations or existing contacts that they knew and trusted than local health departments, or a state agency such as Ecology. Staff noted that childcare operators are often extremely busy and do not have time to read a large packet of material with multiple brochures or lengthy explanations.

Health departments have assessed the effectiveness of outreach materials through focus groups, written surveys, and telephone surveys. Focus groups have been helpful in obtaining a qualitative assessment of how effectively the materials communicated the desired messages. Surveys were helpful in obtaining quantitative information about how many people and the types of people who had seen or received information. There has been positive feedback to fun, easy to use materials and the Dirt Alert characters created by Pierce County.

1.4.3 SAMPLING METHODS AND DESIGN

Generally agency health department staff thought that field sampling methods worked well. For play areas, agency staff said sampling a single depth (e.g., 0 to 6 inch depth) made more sense than doing a depth profile with 0 to 2 inch and 2 to 6 inch samples. Agency staff also thought that the coring devices were efficient and effective in most soil types, although backup techniques were needed at a few difficult sites. There were also some concerns about repetitive motion injuries from handling of the heavy coring devices and hammers. A suggestion was made that a section be added to the health and safety plans on proper handling techniques and stretching exercises to reduce repetitive motion injuries.

Ecology conducted a study comparing results from a hand-held XRF instrument to laboratory analysis results. The XRF data had good correlation to the laboratory data above about 40 ppm. However, the XRF was not accurate enough to determine if soil was above or below 20 ppm. This study indicates that use of a hand-held XRF instrument is probably not an acceptable analysis method for soil sampling at child use areas.

Some concerns were raised that certain types of informal play areas, such as wooded areas or dirt bike trails, were excluded from the sampling design although they may present an exposure hazard to children. Some agency staff wanted clearer definition of what qualifies as a play area, so that potential hazards are not missed.

1.4.4 PROVIDING RESULTS

In past studies results were collected and provided to property owners in groups periodically

throughout the study. Feedback from Health Department and Ecology staff indicated that sending results to facility owner/operators upon receiving results from the lab may be a good approach for this program. Several reasons were cited including glitches in previous data releases, unhappy or alarmed clients, and the need to provide results in a manner that would facilitate timely implementation of BMPs.

1.4.5 DATA TRACKING

Data tracking worked reasonably well in previous studies. However, the types of data being collected during the Soil Safety Program are more complex and the new databases will likely require a higher level of sophistication. For example, the implementation of BMPs, follow up visits, certification of BMP implementation, etc. will need to be recorded and tracked for reporting to the legislature. Ecology and the health departments will be conducting different parts of the program, so it will be necessary to coordinate data gathering and tracking efforts. Additionally, some concerns have been raised about having multiple database formats that are not easily compatible.

1.4.6 BMP IMPLEMENTATION AND CLEANUP

The CUA studies conducted to date did not include concerted efforts for implementing BMPs and cleanup. However, overall observations indicate that follow-up would be very important in ensuring BMPs are implemented and maintained. A simple tracking system could be combined with a certificate program to help schools and childcares track and maintain BMPs. This can be especially important at childcares where staff turnover is generally high.

2.0 SOIL SAFETY PROGRAM DESIGN

2.1 BACKGROUND

The goal of the Soil Safety Program is to identify play areas at schools and childcares (including Head Start programs and preschools) in the Tacoma Smelter Plume with elevated arsenic and lead in soils, and to assist schools and childcares to reduce the potential for child exposure to area-wide arsenic and lead contamination. The program is designed to encourage participation in the required sampling program by providing clear and concise information on why sampling is needed, and to encourage voluntary implementation of a Soil Safety Action Plan (i.e., BMPs) by providing useful information on what can be done, available funding assistance, and incentives for implementing a Soil Safety Action Plan.

Under the Soil Safety Program, Ecology, through the local health departments, will seek to analyze soil samples from all schools and childcares where children are at risk of exposure to area-wide arsenic and lead in soil and, for facilities with moderate or high levels of arsenic and lead, encourage schools and childcare operators to implement a Soil Safety Action Plan or notify the parents of children who attend the facility.

All agencies involved in the creation of the Soil Safety Program have expressed the view that the best way to accomplish the above goal is to create a positive incentive-based program. The new law does not provide reprimands if a school or childcare does not comply. The new law does require a school or childcare to notify parents and guardians about the soil testing results, if the facility chooses to not implement Best Management Practices (i.e. Soil Safety Actions). The conceptual design includes steps and practices to accomplish the objectives while conveying an overall positive message. The implementation steps are based on lessons learned by various agency staff from previous CUA sampling events and through meetings with representatives of childcares and schools.

Note: the design looks at schools and childcares. In most instances, schools include both public and private schools, and childcares include: licensed home childcares, childcare centers, corporate centers, preschools, Headstart programs, and ECEAP (Early Childhood Education and Assistance Program) programs. Each type of facility can require unique approaches for implementing the program. Some of the unique approaches are detailed in this design; some will be detailed in the health department's implementation plans.

2.2 IMPLEMENTATION

As described in Section 1.2, recent legislation (Chapter 70.140 RCW) states that all schools and childcares within the central Puget Sound smelter plume should be identified, and a qualitative assessment

conducted to determine if there is a potential for children's exposure to area-wide soil contamination. If the qualitative assessment determines that children may be routinely exposed to area-wide soil contamination, then soil sampling should be conducted. If the results of the soil sampling confirm the presence of area-wide contamination (see Section 2.2.8 for Evaluation of Results), then the facility must be notified and encouraged to implement a Soil Safety Action Plan. If the facility does not implement a Soil Safety Action Plan within 6 months, they are required to notify the parents and guardians of the children in their care of the results of the soil sampling.

Ecology and the local health departments are partnering to implement the Soil Safety Program. Specific responsibilities of the local health departments and Ecology are described in this document and will be further detailed in the individual agency implementation plans for the Soil Safety Program (appendices F and G).

The number of schools and childcares within the TSP is very large; to make effective use of available resources, prioritization and sequencing is necessary. The following sections provide a 12-step process for implementing the law. Table 2-1 below provides a summary of the 12-step process.

Note: many schools and childcares within the higher concentration area of the Tacoma Smelter Plume have already been sampled during previous CUA studies. The play areas at these facilities will not be re-sampled. The results from the previous sampling have been reevaluated against the criteria set for the Soil Safety Program, and those exceeding the criteria will be incorporated into the Soil Safety Action Plan implementation program. We have identified 44 schools and childcares from the earlier sampling program that will require Soil Safety Action Plans.

TABLE 2-1
SOIL SAFETY PROGRAM IMPLEMENTATION STEPS

	Task	Description	Responsible Agency(s)
1	Soil Safety Program Service Area	Define the geographic boundaries of the Soil Safety Program service area (SSP service area).	Ecology with input from Health Departments
2	Identification of Schools and Childcares	Identify schools and childcares within the SSP service area that need to be assessed, may include working with other agencies to obtain lists.	Health Departments with assistance from Ecology, DSHS and School Districts
3	Sequencing of Outreach, Assessment, and Sampling	Focus first on schools and childcares within the SSP service area with highest predicted levels of arsenic and lead based on the footprint studies, combined with administrative or geographical considerations.	Health Departments
4	Outreach/Messages	Work with school districts, private school associations and local childcare organizations to establish open communication with childcares, pre-schools, and schools. (detailed in Soil Safety Program Communication Strategy, Appendix C)	Health Departments and Ecology
5	Property Access	Request access to schools and childcares for qualitative assessment and soil sampling after appropriate outreach	. Ecology and Health Departments meet with public school districts. At the meeting, access forms will be ready for signature. Ecology contacts childcare corporations/centers. The corporate offices will define how to contact individual centers. Ecology contacts headquarter offices for Headstart, Early Headstart, and ECEAP. The headquarter offices will define how to contact the Headstarts and ECEAPs. Health Departments mail access information packets to family/home childcares, childcare centers and private schools.
6	Qualitative Assessment	Assess each school and childcare during a site visit to determine if there is a potential for children to be exposed to soil, if so, schedule soil sampling	Health Departments
7	Soil Sampling	Sample and analyze surface soil at schools and childcare facilities to determine the concentration of arsenic and lead.	Health Departments, TPCHD arrange for laboratory contracts for analysis of all samples
8	Evaluation of Results	Compare laboratory sample results to moderate and high concentration categories.	Health Departments evaluate results, calculate averages and identify maximum. Ecology makes the final determination if play areas are above or below criteria.
9	Property Owner/ Operator Notification	Notify the school districts and childcare or private school owner/ operator of the soil sample results; provide certificate of participation, and appropriate outreach materials. Explain Soil Safety Action Plan implementation, property access needs, and inspection process for those with levels above criteria.	Health Departments, via letter, provide results and certificate of participation to property owners with results below criteria. Ecology and Health Departments, in person and in writing, provide results and certificate of participation to property owners with levels above criteria.

TABLE 2-1
SOIL SAFETY PROGRAM IMPLEMENTATION STEPS

	Task	Description	Responsible Agency(s)
10	Soil Safety Action Plan	Provide school districts and childcare or private school owners/operators with technical and financial assistance as necessary to implement appropriate Soil Safety Actions (detailed in Funding Strategy, Appendix E). Provide a certificate of Soil Safety Action Plan completion upon completion of Soil Safety Action Plan. For those facilities not participating with the agencies in a Soil Safety Action Plan, contact owners 5 months after results are provided to them to determine if they have implemented Soil Safety Actions. If not, request they send notification to parents of the sampling results. Report those facilities that do not implement Soil Safety Actions and do not notify parents in legislative report. For those childcares participating with the agencies in a Soil Safety Action Plan, provide information on Soil Safety Actions conducted to local DSHS licensure for their records. Request local licensures to include follow-up on Soil Safety Actions in their routine inspections (centers every 12 months, home childcares every 18 months). For those schools participating with the agencies in a Soil Safety Action Plan, request they include follow-up inspections in their operation and maintenance.	Ecology, in coordination with the Health Departments, work with each facility to determine Soil Safety Action Plan and implementation schedule. Ecology documents recommended Soil Safety Action Plan; sends to facility for their agreement and access if necessary. Ecology provides funding or contracts to do soil actions (e.g., soil covers under playground equipment). Health Departments provide assistance with behavior actions (e.g., handwashing programs). Ecology provides a certificate upon completion of Soil Safety Action Plan. Ecology contact property owners not participating in Soil Safety Action Plan, ask if they have implemented Soil Safety Actions. Request they send notification letter to parents, if they have not implemented Soil Safety Actions. Ecology provide model notification letter. Ecology track those facilities that do not implement Soil Safety Actions and do not notify parents in database used for reporting to legislature. Ecology work with DSHS and local licensures to include Soil Safety Action Plan follow-up in routine inspections. DSHS licensure provide updated certificates.
11	Data Tracking	Use database to track information related to each step of the Soil Safety Program implementation process in order to provide information to Ecology and the Legislature.	Health Departments will track qualitative assessment, sample results, certificates of participation, outreach, and behavior actions. Ecology will track Soil Safety Action Plan recommendations, soil actions, certificates of Soil Safety Action Plan completion, facilities not participating in Soil Safety Action Plan.
12	Reports to the Legislature	Prepare progress reports to the legislature regarding the status of the Soil Safety Program.	Ecology using information provided by Health Departments (through the Soil Safety tracking database) and others.

2.2.1 SOIL SAFETY PROGRAM SERVICE AREA

The TSP is more than 1,000 square miles and funding is not currently available to identify and assess every school and childcare within the plume. For this reason, a focused service area for the Soil Safety Program of about 315 square miles was identified based on data compiled from the footprint studies (Figure 3). This service area approach allows limited resources to be focused initially in areas most likely to have significant impacts from the smelter plume. Assessment within the service area is the first step in the qualitative assessment of potential for exposure. At the end of 2008, the progress of the Soil Safety Program will be evaluated, and the program activities may be expanded to include areas with lower predicted levels of contamination outside of the initial focused service area.

The Soil Safety Program service area (SSP service area) was established in a two step process. First, reevaluation of previous CUA study zone boundaries incorporating new data; second, modifying the boundary based on local health department recommendations.

Initially, the SSP service area boundary was statistically defined, and covered geographic areas where there is potential for moderate or high levels of area-wide contamination. Table 2-2 defines moderate and high arsenic and lead soil concentrations. The study zone boundary for the original CUA studies was based on information from the first footprint studies in King and Pierce counties, including: distance and direction from smelter, and maximum predicted arsenic concentration (100 ppm).[1] In developing the SSP service area, the original boundary of predicted 100 ppm maximum arsenic was modified by including data from the final Extended Footprint Study, which covered King, Pierce, Kitsap, and Thurston counties. The addition of the extended footprint study results expanded the boundary in nearly all directions, including south into Thurston County. The 2002 and 2006 predicted maximum 100 ppm arsenic boundaries are shown on Figure 2.

TABLE 2-2
MODERATE AND HIGH SOIL CONCENTRATIONS
OF ARSENIC AND LEAD

	Arsenic (ppm)		Lead (ppm)	
	moderate	high	moderate	high
Schools and childcares	20 - 100	> 100	250 - 500	> 500

- MTCA Method A soil cleanup levels for unrestricted land uses: Arsenic = 20 ppm; lead = 250 ppm.
- Moderate and high concentration ranges will be used for comparison with play area concentrations:
  - Play area average concentration[2] compared to the ranges identified above (e.g., average arsenic compared to 20 ppm).
  - Play area maximum concentration[3] compared to two times the ranges identified above (e.g., maximum arsenic compared to 40 ppm).
- Moderate and high concentrations are based on MTCA Method A soil cleanup levels (moderate) and Interim Action Trigger Levels (high) previously used in TSP. The moderate and high concentrations have been reviewed by and are supported by the MTCA Science Advisory Board.

The initial SSP service area boundary was modified based on local health department recommendations. The initial SSP service area boundary in King County nearly doubled the area of the original CUA study zone. Due to the density of childcares and schools in King County and limited resources, Public Health-Seattle & King County recommends focusing sampling efforts on the area

1 The extended footprint sampling targeted undisturbed areas where concentrations of area-wide contaminants are likely to be highest. Concentrations at disturbed areas such as schools and childcares are likely to be significantly less as indicated by previous sampling results at schools and childcares. Therefore, use of a criterion value of 100 ppm soil arsenic (based on undisturbed soil, footprint data) is likely to produce a service area boundary that includes all schools and childcares with moderate or high concentrations.

2 Play area average concentration is determined by adding the concentrations in samples from a given play area together and dividing the sum by the number of samples.

3 Play area maximum concentration is the greatest concentration measured in samples from a given play area.

roughly inside the original CUA study boundary with minor variations based on geographic and political boundaries. The final SSP service area boundary reflects this recommendation in King County, and uses the expanded boundary in Pierce and Thurston counties. Sampling activities in King County may eventually extend further as time and funding allow. The SSP service area is shown on Figure 3. A more detailed description of how the service area was defined can be found in the Sampling Design in Appendix A.

As outlined in the overall Project Plan for the TSP (currently being finalized by Ecology, TPCHD, and PHSKC), geographic areas with high concentrations of arsenic and lead are a higher priority than areas with moderate concentrations of arsenic and lead. In King County, areas considered to have the potential for high levels of area-wide soil contamination generally include: Vashon-Maury Island, Normandy Park, Burien, Des Moines, SeaTac, Federal Way, and parts of West Seattle, Kent, and Tukwila. In Pierce County, areas considered to have the potential for high levels of area-wide soil contamination generally include: Tacoma, Fircrest, University Place, Lakewood, and Steilacoom. The final SSP service area includes these communities.

If childcares or schools outside the SSP service area request sampling, health departments will inform them that resources are not currently available to sample outside the service area and refer them to Ecology's website where posted materials describe how one can sample and reduce risk from arsenic and lead in soil. The health departments will refer them to Ecology for additional assistance if appropriate. Ecology and the health departments will keep a list of entities they provide materials to or assist. In instances where a facility is very close to the service area boundary, health departments may, at their discretion, sample the facility.

2.2.2 IDENTIFICATION OF SCHOOLS AND CHILDCARES

Schools and childcares requiring assessment will be identified in the SSP service area at the beginning of the program. As the childcare industry is dynamic, a re-identification of childcares (and schools) will take place every 6 months.

For past CUA studies, multiple sources were used to identify schools and childcares. Those sources often varied in their completeness and currency. Obtaining the lists of childcares was sometimes difficult. The following sections identify sources for information about schools and childcares and describe how agencies can work together to develop complete lists.

2.2.2.1 Schools (public and private)

Most public elementary schools within the SSP service area have already been sampled; therefore, school sampling will primarily focus on public middle and high schools, new elementary schools, elementary schools not previously sampled for various reasons, as well as private schools. The health departments will be responsible for identifying the schools within the service area in their jurisdiction. To determine the names and locations of specific schools within the SSP service area, health departments will contact the appropriate school districts, use geographic information system (GIS) data with the locations of schools, communicate with OSPI and Educational Service Districts, or use other means as needed to identify public and private schools. All identified schools will then be listed on the Soil Safety tracking database, including the schools which have already been sampled. Ecology is developing the Soil Safety tracking database which will be a web application – Ecology and the health departments will be able to access at any time, and it will always be up to date.

2.2.2.2 Childcares

Lists of childcares from various organizations vary in their completeness and currency. Because the local DSHS licensing branches maintain the childcare licenses for their regional area, DSHS is likely to have the most complete and up-to-date list of licensed facilities. Due to limited funding, unlicensed facilities will not be targeted during this program. Ecology will obtain from DSHS a download from their database of licensed childcares. The data will be entered into the Soil Safety tracking database. Using address matching software, a latitude and longitude will be defined for each facility, and the facility mapped (a GIS layer will be created). The GIS layer is expected to contain information including the name, address, and number and age of children. Ecology will request updates of the DSHS database and create a new GIS layer approximately every 6 months to identify new licensees and those who are no longer providing childcare services.

2.2.2.3 Pre-schools and Headstart/ECEAP programs

Educational service districts, the Washington Association of Young Children, school districts, US Administration for Children and families – Region 10, and local municipality websites can be resources for locating pre-schools and Headstart/ECEAP programs. These facilities may be in DSHS databases if they include an extended care program. The health departments will identify and add to the Soil Safety tracking database.

2.2.3 SEQUENCING OF OUTREACH, ASSESSMENT, AND SAMPLING

The sequencing of outreach, assessment and sampling considers the timing between these activities, the levels of contamination (higher concentration areas first), and mobilization that reflects the most efficient use of resources. Ecology has estimated that approximately 573 schools and childcares in King County and approximately 183 schools and childcares in Pierce County are within the SSP service area and will need assessment by December 31, 2009. This estimate includes an estimate of new childcares that come into business prior to December 31, 2009.

As this is a new program, the first activity is outreach to schools and childcares, followed by assessment and sampling. Most of the public school districts in the SSP service area participated in the CUA studies, are aware of the TSP contamination, and may be aware of the law. This level of awareness should facilitate a quick outreach to public schools. Childcares and private schools are less likely to be aware of the law, let alone the TSP contamination. A larger and more time-consuming outreach will be needed for the childcares. Outreach to private schools may also take more time, but there are a limited number of private schools. (See section 2.2.4 for more details on Outreach).

In addition to the timing of activities, and to make the most efficient use of limited resources, areas within the SSP service area with the highest reported levels of arsenic from the footprint studies will be targeted first for outreach, qualitative assessments, and sampling. Those areas have been identified using a Theissen polygon analysis which statistically assigns a concentration to a geographic area based on nearby sampling results. Figure 3 shows concentration ranges assigned to areas using this method.

As there are a limited number of schools (public and private) remaining to be assessed (approximately 20 in each county) and the public school districts have participated in the previous CUA studies, Ecology and the local health departments will conduct soil safety program activities at public and private schools first. The sequencing will be based on the school district boundaries as overlaid on the concentration polygons (Figure 4). The school districts in the higher concentration areas of King County are Highline and Federal Way; and for Pierce County, the Tacoma School District. The sequencing of activities will then move to school districts in the lower concentrations areas (e.g., Seattle SD, Tukwila, Kent in King County; University Place in Pierce County).

Outreach to childcares, preschools, and Headstart/ECEAP programs regarding the Soil Safety Program will take some time (see Section 2.2.4). This outreach by Ecology and the local health departments will run concurrent with the outreach, assessment, and sampling of schools. As sampling at schools winds down, assessment and sampling at childcares, preschools, and Headstart/ECEAP programs will begin. Sequencing of childcare assessment and sampling is challenged by the dynamic nature of the industry. Thus the sequencing will need to be flexible – reflecting a preference to sample childcares in higher concentration areas first while maximizing use of staff resources. The health departments' Soil

Safety Program Implementation Plans are attached as appendices, and contain a more detailed explanation of the sequencing for each county.

2.2.4 OUTREACH/MESSAGES

During the previous CUA studies it was determined that outreach was a key component in successfully obtaining property access and helping schools and childcares understand sampling results. The Soil Safety Program Communication Strategy contains a detailed approach to be used when communicating with childcares and schools (Appendix C).

Ecology created the Communication Strategy with input from the health departments and stakeholders. The strategy reflects lessons learned (Section 1.4) from prior sampling and education and outreach efforts, and input from stakeholders who attended the Communications Strategy meeting in early March 2006, and stakeholder meetings in November and December 2005 and late March 2006.

The strategy contains a purpose and objectives, a proposal for modifying and updating the strategy, an audience and stakeholder profile with notes about communication, key messages, some tools for marketing the messages, a table of communication tools, a timeline for the first nine months of the program, and examples of materials created for the program.

The tools table includes both existing tools and new tools that Ecology and the health departments will use or have created specific for the Soil Safety Program.

The communication strategy objectives are:

- Create a cohesive, engaging and positive image of the Soil Safety Program and program partners, resulting in a high level of voluntary participation among target audiences.

- Coordinate messages and marketing among the program partners, especially among Ecology and the health departments, so that schools and childcares understand the program and can easily participate.

- Keep stakeholders well informed and involved throughout the life of the program, relying on their expertise and experience in the development and use of communication tools and in program evaluation.

An important part of the strategy is conducting intense outreach to childcares April – August 2006, prior to the health departments requesting access for soil testing. To provide intense outreach in such a short amount of time, Ecology is providing a $10,000 public participation grant to the Washington Child Care Resource and Referral Network (the Network). The grant will be for April 2006 through June 2007. The grant is for outreach to childcares and an independent survey of childcares in fall 2006. Outreach may include presentations, postcard mailings, articles in newsletters and other activities. Ecology will use the survey to modify and update the communication strategy and program design in

January 2007. The Network will be eligible to compete for additional funding for the July 2007-June 2009 biennium.

Major tools that Ecology and the health departments will use to communicate program content and messages are described below. For more details, please see Appendix C.

- Frequently Asked Questions – Soil Safety Program Overview

  This handout will be in a question and answer format, and will contain most of the key program messages and a simple service area map. Ecology will put this piece on a letterhead template that lists all the program partners and highlights the Dirt Alert logo. Schools and childcares will be the audiences for this piece.

- Property access cover letter and soil testing permission form

  The health departments will mail these to childcares and private schools not previously sampled. They will attach the Frequently Asked Questions piece. An important consideration with these tools is first impressions. For some childcares and private schools, the cover letter will be the first information they receive about the program.

- Service area map

  An important tool will be a simple service area map that shows the service area boundary, cities, county lines, major roads, and the smelter site. Listed on the back of the map will be zip codes, school districts and private schools that are located within the service area. Adding these elements to the map itself would make it too complicated, and a list will make it easy for schools and childcares to know if they are within the service area boundary.

- Certificates and Decal

  Ecology has contracted with Kick Spark Creative, LLC to create two certificates and a window decal. Ecology and the health departments will use the certificates and decal to acknowledge schools and childcares who participate in the program. Ecology will give the second certificate to schools and childcares that complete a Soil Safety Action Plan. This second certificate will list the actions the school or childcare has agreed to undertake and sustain. This will enable DSHS licensors, parents, and others who visit the school or childcare to know actions that should be in place, and support those actions.

- Language Translations

  Ecology will use in-house and contract services to provide Spanish, Russian and other translations as needed to serve non-English speaking schools and childcares. If necessary, Ecology and the health departments will use interpreters to communicate with schools and childcares.

An important part of the Communication Strategy is ongoing involvement of stakeholders who represent schools and childcares. To this end, several stakeholders who have already participated in design meetings have agreed to participate in an advisory capacity as needed. Ecology has already committed to reconvene stakeholders in November 2006 to review interim results and provide feedback

on program implementation. Their involvement has been invaluable throughout the design phase, and Ecology will seek their involvement throughout program implementation.

2.2.5 PROPERTY ACCESS

The law requires property owners to grant access for assessment and sampling. Ecology and the health departments will work with the property owners to gain access.

During past CUA studies, public schools were generally willing to allow access for soil sampling. There are a limited number of school districts within the SSP service area. Ecology will contact each school district to set up a meeting with Ecology and the health department. The school districts will determine if representatives of the schools requiring assessment (or Soil Safety Action Plans) should be involved in the meeting. The agencies will present information about the Soil Safety Program, request access to assess and sample schools, and begin discussions on implementing a Soil Safety Action Plan at those schools previously sampled that have arsenic and or lead above criteria. Each school district (and/or school) will be provided with an information packet that explains the program and includes a formal property access agreement form (Appendix D).

The approach for gaining access at private schools will be similar to childcares (as described below). Ecology will first provide outreach to private school associations – to get the word out. Then the health departments will mail letters with the information packet to the individual private schools. The information packet will include an access form to ensure there is a record of property access granted.

Outreach and education through childcare groups and DSHS licensors will be conducted prior to attempting access at childcares (see Section 2.2.4). Several methods of obtaining childcare access were used during the previous CUA studies. In general, calling each childcare to set up a sampling appointment achieved the best response rate, however was very time consuming. For the Soil Safety Program, the health departments will mail letters with the access form to family/home childcares and childcare centers. As with schools, an information packet will be included and a written access form will be used to ensure there is a record of property access granted. For those childcares that do not respond, the health departments will follow-up with a phone call within 1-2 months after mailing the letter. For those childcares that do not respond after a phone call, the health departments will consider a "knock & talk" to achieve access. If after 3 attempts (e.g., letter, phone call, knock & talk) there is still no response, the childcare will be listed in the Soil Safety tracking database as no response. In following up to get access, the health departments should work closely with their public health nurses and the DSHS licensure for the childcare that is not responding.

Corporate centers with multiple facilities will be treated like private schools in that Ecology will make personal contact with the corporate offices to explain the program and gain access for qualitative

assessments and sampling (if needed). Corporate offices will define how their individual childcare centers will be contacted to schedule the assessments and sampling.

Ecology will contact headquarter offices for Headstart, Early Headstart, and ECEAP to explain the Soil Safety Program. The health departments will then contact the individual Headstart facilities. An information packet will be provided and a written access form will be used to ensure there is a record of property access granted.

As some childcares routinely use play areas at nearby parks, Ecology and the health department will contact the park for access.

An example access agreement form is included in Appendix D. As noted in the example form, the form must make it clear that sample results are public information. The property access forms may be modified by the Counties as needed. Ecology will approve the language of access agreement forms before they are sent out.

The health departments will track access granted by schools and childcares, as well as access denied, and those that just don't respond in the Soil Safety tracking database.

Those schools and childcares that deny access will be tracked in the Soil Safety tracking database and included in the report to the legislature. Ecology may also include a list on their website. If the rate of denial is significant (e.g., >40%), then Ecology will report to the legislature (at any appropriate time) with recommendations for improving access approval rates.

2.2.6 QUALITATIVE ASSESSMENT

A qualitative assessment will be conducted at each childcare or school to determine if there is a potential for children to be exposed to contaminated soil. The results of the assessment will be recorded by the local health department field staff in field notebooks. Information collected, used and recorded by the local health department will be outlined in the Quality Assurance Project Plan (QAPP) and may include where children play, the condition of ground cover, the number and age of children at the facility, the type of play in different areas, and the facility and site history.

To provide some measure as to the effectiveness of the outreach in raising awareness of the program, field staff will ask the property owner/operator if they have heard of the Soil Safety Program. And if so, how did they hear of the program. This information will be recorded in the field notebook, and then tracked in the Soil Safety tracking database.

Based on the results of the assessment, the local health department will decide if soil sampling is necessary. Information about the results of qualitative assessments, whether sampling was needed, why or why not, and a record of the names and locations of the facilities that were evaluated will be

maintained in the Soil Safety tracking database. Since the qualitative assessments are a legislative requirement, the information will eventually be used to compile a report to the legislature.

2.2.7 SOIL SAMPLING

Once a school or childcare has been qualitatively assessed and it is determined that sampling is necessary, the local health department will schedule sampling in cooperation with the schools and childcares. The sampler may also schedule soil sampling at the same time as the qualitative assessment. In this case, the sampler can simply forgo sampling if it is determined to be unnecessary. Past sampling events have shown that most childcares will require some soil sampling.

Soil samples will be collected from all play areas within each property. Samples will be collected from surface soil between 0 and 6 inches below ground surface, the layer of soil that children are most likely to be exposed to. Samples will be collected by the local health departments, and analyzed by a contracted laboratory.

The sampling design is presented in Appendix A, and provides specific information on defining play areas, the number and locations of samples to be collected, sample depths, sample analysis, and data evaluation. The quality assurance project plan (QAPP) is presented in Appendix B. The QAPP establishes the quality assurance objectives and quality control procedures for the soil sampling and analysis for the Soil Safety Program. The county implementation plans are attached as appendices F and G. The implementation plans include basic field sampling activities such as procedures for identifying schools and childcares, prioritizing and scheduling assessment and sampling, collection of samples, record keeping, and other details of the sampling program.

2.2.8 EVALUATION OF RESULTS

Sample results will be reported by the laboratories directly to the health departments. As with past TSP studies, the health departments will be responsible for tracking analytical results in a database that is compatible with Ecology's EIM system.

The health departments will evaluate the results for each play area, calculating an average and identifying the maximum concentration for each play area. This may be an automated feature of the databases. The play area average and maximum will be compared to the concentration ranges in Table 2-2.

The screening statistics are an adaptation of the MTCA compliance statistics. MTCA compliance statistics include 3 tests to show compliance with MTCA cleanup standards: 1) the 95%UCL of site data should be below the cleanup level, 2) the maximum should be less than 2 times the cleanup level; and 3)

no more than 10% of results can exceed the cleanup level. The screening statistics include 2 of these 3 tests and are modified as follows: 1) the average of the play area data compared to the cleanup level or the moderate/high level; and 2) the maximum compared to 2 times the cleanup level or the moderate/high level.

Thus, play areas will be categorized as:

- **Below criteria** (average arsenic below 20 ppm and maximum arsenic below 40 ppm; average lead below 250 ppm and maximum lead below 500 ppm)

- **Moderate** (average arsenic between 20 ppm to 100 ppm; and/or maximum arsenic between 40 ppm to 200 ppm; and/or average lead between 250 ppm to 500 ppm); and/or maximum lead between 500 ppm to 100 ppm

- **High** (average arsenic above 100 ppm; and/or maximum arsenic above 200 ppm; and/or average lead above 500 ppm; and/or maximum lead above 1000 ppm).

As examples: a play area with average arsenic = 25 ppm is categorized moderate. A play area with average arsenic = 18 ppm and maximum arsenic = 45 ppm is categorized moderate. A play area with average arsenic = 105 ppm is categorized high.

The evaluation methods are described further in Appendix A.

Results of data evaluations will be provided to Ecology with data submittals for EIM every month. Ecology will then make a final determination of those facilities with results above criteria (moderate or high). Facilities with high levels will be considered to be a higher priority for personalized follow-up and for funding improvements than facilities with moderate levels. Follow-up with all facilities is described in the sections below.

Schools and childcares sampled during the previous CUA study have been evaluated according to the above criteria. Of 192 schools and childcares sampled, 21 schools and 23 childcares are in the moderate/high categories. These facilities will be included in the notification and Soil Safety Action Plan implementation described in the sections below.

2.2.9 PROPERTY OWNER/OPERATOR NOTIFICATION

Previously sampled schools and childcares with moderate or high results must be informed of the new law and any requirements for Soil Safety Actions based on previous sampling results. Ecology and the health departments will notify schools districts during the meeting about the Soil Safety Program and sampling of other schools in their district (Section 2.2.5). The 23 childcares will be notified in person by Ecology and the health departments. For the previously sampled properties with levels that are below the criteria, no action is necessary.

For newly sampled properties, the property owner will be notified within 1 month after results are reported to the health department. If arsenic and lead concentrations on the property are below criteria, notification will be in the form of a letter from the health department that conducted the sampling. A certificate of participation in the sampling program, which can be posted at the facility, will be mailed along with the notification letter.

If the property has moderate or high concentrations of soil contaminants, the owner/operator will be notified as follows:

- Ecology will contact the owner and operator by telephone to arrange a site visit to discuss sampling results and Soil Safety Action Plan options. This visit will be coordinated with the health departments.
- Ecology will provide a letter (results letter)[4] with the results, explanation of sample results, and summarizing the requirements of the law for parental notification, to the owner/operator in person at the time of the site visit, with copies provided to other appropriate parties (such as the property owner, corporate office, or school district office). All letters will encourage facilities to notify the parents regardless of the results or recommendations for a Soil Safety Action Plan. The letters will include a certificate of participation in the sampling program.
- Ecology will provide an information packet at the time of the visit. The packet will include information on the requirements of the law, information on Soil Safety Actions, a sample parental notification letter, information on Ecology funding of Soil Safety Actions, and information on how they may receive a certificate of successful participation in the Soil Safety Action Plan.
- The health departments will provide educational materials at the time of the visit.
- Ecology and the health department will then work with the owner and operator to develop a site specific Soil Safety Action Plan, as described in the sections below.

Appendix D includes model results letters to schools and childcares and a model letter to notify parents of results.

2.2.10 SOIL SAFETY ACTION PLAN

Schools and childcares with sampling results above criteria (moderate or high) will be encouraged to implement a Soil Safety Action Plan. Ecology and the health departments will work with the facility to identify a Soil Safety Action Plan appropriate for the facility. Ecology will assist with the implementation of the Soil Safety Action Plan, including financial assistance. Those facilities that successfully complete a Soil Safety Action Plan will receive a Certificate to post in their facility. Follow-

4 For schools, the results letter will be provided to both the school principal and the district superintendent, with copies to the facilities managers and/or public relations staff. For childcares, the results letter will be provided to the property owner, business owner, facility manager or operator, and DSHS licensure office covering that childcare.

up of Soil Safety Actions will be incorporated into routine maintenance activities (e.g., school maintenance programs) and licensure inspections (e.g., DSHS licensure inspections of childcares).

2.2.10.1 Soil Safety Action Plan Development

Ecology and the health department will meet with each school and childcare where sample results indicate arsenic and/or lead levels above criteria (Section 2.2.8) in the play areas, including the 44 facilities previously tested. The Department of Ecology and the facility will jointly develop a Soil Safety Action Plan.

A recommended Soil Safety Action Plan may vary depending on the level and location of contamination, the type of facility, and the age of the children. For example, a Soil Safety Action Plan appropriate for pre-schoolers at a childcare may not be appropriate for children at a public middle or high school. The Soil Safety Action Plan at a facility will likely include a range of actions. For example, the first step actions may be educational such as hand-washing and use of door mats; the second step actions may be structural such as building a containment structure under and around the play area.

Ecology has a preference for low-maintenance or permanent Soil Safety Actions. As an example, heavy-duty covers and a berm under and around playground equipment with wood chips for fall protection can reduce exposure to contaminated soil. This type of containment will require addition of wood chips overtime, but the liner continues to reduce exposure even if the wood chips have been kicked out. An example of a permanent Soil Safety Action might be removal of contaminated soils and replacement with clean soils.

Soil Safety Action information is being developed by Ecology with input from other participating agencies and stakeholders (Appendix E). The information will be provided to childcares and schools during the notification process after sampling results are known.

2.2.10.2 Soil Safety Action Plan Implementation

Ecology and the facility will determine the appropriate Soil Safety Action Plan for the facility and develop a timeline for implementing the program. For Soil Safety Actions requiring construction or structural changes, Ecology will work with the facility until the construction is complete, using Ecology funds as described below. For Soil Safety Actions that are educational (e.g., hand-washing, wiping feet at door), the health department will work with the facility.

2.2.10.3 Funding Strategy

Ecology is developing a strategy for funding Soil Safety Action Plans requiring construction or structural changes (see Appendix E). This may include direct funding through interagency agreements with school districts; public works contracts for implementing structural Soil Safety Actions at childcares or private schools; and utilizing Washington Conservation Corps (WCC) crews for smaller scale remediation projects. Funding for construction will be the Safe Soil Account which is a capital account (can be spent over several biennia). At the time of this design, it is anticipated that there will be adequate funds in the capital account to cover the costs of Soil Safety Actions at all facilities requiring Soil Safety Actions. If there is insufficient funds, Ecology will request additional funds from the Legislature.

The health departments are addressing Soil Safety Actions that are educational, and their funding is in the Site Hazard Assessment grants from Ecology to the health departments. Site Hazard Assessment grants are funded by the Local Toxics Control Account.

2.2.10.4 Sequencing

Ecology and the health departments will first approach the 18 schools (and their respective school districts) previously sampled that had results above criteria. The contact will be made at the same time as the outreach to the school districts for sampling of untested schools. The agencies will then approach the 26 childcares previously sampled that had results above criteria. These 44 facilities will serve as a pilot for implementing Soil Safety Action Plans, and provide an initial feedback on the effectiveness of the program. The agencies will learn about: the usefulness of the informational materials; common elements of a Soil Safety Action Plan (i.e., are there Soil Safety Actions we routinely recommend); typical costs; and ease of implementation (e.g., construction).

As new sampling results become available, the agencies will approach the newly identified schools and childcares. At the time of this design, we anticipate adequate funds to implement Soil Safety Action Plans, so prioritization of funding is not strictly necessary. Sequencing will be based on maximizing use of resources. To maximize use of resources, appointments and construction activities will be scheduled in geographic groups.

2.2.10.5 Parent Notification

Five months after notifying the school or childcare of their results, Ecology will determine whether a Soil Safety Action Plan has been successfully implemented (either by Ecology or the property owner). If not, Ecology will remind the facility of the legislative requirement to notify parents of the soil sampling results in writing within 6 months of receiving the results. Ecology can provide another copy of

the sample parental notification letter (Appendix D). At 6 months, Ecology will request a copy of the letter sent to parents and a list of parents that received the letter. Ecology can spot check by contacting some of the parents on the list to verify if they received a letter. Ecology will track in the Soil Safety tracking database those facilities that send letters, and those that do not. Ecology will include the information in their biennial report to the legislature.

For those facilities participating with Ecology in implementing a Soil Safety Action Plan, and where structural changes or construction are not yet complete, Ecology will work with the facility owner to draft language to provide to parents describing actions being taken to protect children from exposure to contaminated soils.

2.2.10.6 Soil Safety Action Plan Certification

A soil safety certification program is planned as a way to encourage implementation of Soil Safety Actions. Ecology will develop a Certificate of Soil Safety Action Plan implementation, describing what Soil Safety Actions were implemented and commending the facility for carrying them out. This will be in addition to the certificate of participation in the sampling program. Upon completion of the Soil Safety Action Plan, the facility will receive the Certificate of Soil Safety Action Plan Implementation to post in the facility. If new or additional Soil Safety Actions are implemented, the facilities may notify Ecology and have their certification updated. Renewal of certifications may eventually be part of the licensing program through DSHS.

2.2.10.7 Soil Safety Action Plan Follow-up

Ecology has a preference for permanent or low-maintenance Soil Safety Actions. However, some elements of a Soil Safety Action Plan will require on-going maintenance. For example, hand-washing programs must continue as long as there is a potential for exposure to contaminated soil. And, some containment remedies will require routine replacement of cover material that is kicked out of the play area.

For schools, Ecology will explore with the school and school district means of incorporating such elements into their day-to-day business and maintenance programs. For childcares, Ecology will work with DSHS licensures to incorporate inspection of Soil Safety Action Plan elements in their routine inspections (every 12 months for childcare centers, and 18 months for home childcares). To facilitate this, a copy of the Soil Safety Action Plan will be provided to the DSHS licensure.

Ecology will explore with the school districts and DSHS licensures how best to follow-up on Soil Safety Action Plan inspections, and how to track the results of inspections.

2.2.11 DATA TRACKING

Two types of data will be tracked by Ecology and the health departments: 1) environmental data (sample results), 2) additional information needed for reports to the legislature.

Results Database:

Ecology currently has a database for environmental results, the Environmental Information Management (EIM) database. Each health department will be responsible for maintaining a results database that is capable of extracting environmental data for EIM. The health departments will upload results data to EIM every month, and notify Ecology's Soil Safety coordinator via email that results have been uploaded to EIM. The following information, at a minimum, will be tracked for each childcare or school in the results database:

- Identification and contact information: facility name, type of facility, address, telephone number, contact name and position, and unique identifier (generated by Soil Safety tracking database).
- Location information – latitude and longitude of each play area
- Date of sampling. Number of play areas sampled. Number of samples. Field notes should include a sketch of play area(s) with sample locations.
- Date results were received by the health department from the lab.
- Sample results

Soil Safety Tracking Database:

Ecology will develop and maintain a second database (the Soil Safety tracking database) to manage the additional information needed for reports to the legislature. This database is a web application so will always be up to date – no need for uploading data. Each health department will be responsible for entering data into the Soil Safety tracking database on an on-going basis. The following information, at a minimum, will be tracked for each childcare or school in the Soil Safety tracking database:

- Identification and contact information: facility name, type of facility, address, telephone number, contact name and position, and a unique identifier.
- Was the facility sampled during a previous CUA event?
- Date(s) for attempts at access for assessment/sampling. Method(s) used to gain access (letter, phone call, knock & talk). Was access granted? (yes, no, no response). If not, why not?
- Date of qualitative assessment.

- Results of qualitative assessment. Does the property require sampling? If not, why not? Include in database if property owner/operator had heard of Soil Safety Program, and if so, how?
- Evaluation of concentration ranges for each play area (moderate or high).
- Outreach conducted specific to that facility.
- Date notification letter and certificate of participation sent to the facility owner or operator for sites with levels below the criteria.
- Date of visit by Ecology and the health department - when notification letter and certificate of participation was handed to the facility owner or operator for sites with levels above the criteria.
- Date Soil Safety Action Plan form sent to facility. Track basics of the recommended Soil Safety Action Plan.
- Date Soil Safety Action Plan form signed and returned to Ecology.
- Date when Soil Safety Action Plan initiated (e.g., Ecology contractor constructing remedy).
- Date Soil Safety Action Plan completed. Which Soil Safety Actions were implemented? Include amount of funds provided/spent.
- Date Certificate of Soil Safety Action Plan implementation mailed.
- Date contact made with follow-up agencies (e.g., DSHS licensures)
- Follow-up by Ecology with those facilities not working with Ecology in Soil Safety Action Plan. Did they implement Soil Safety Actions? Which Soil Safety Actions were implemented? If not, did they notify parents?

Consistency between Databases:

To ensure consistency between the health departments' results database, Ecology's EIM results database, and the Soil Safety tracking database, the agencies will follow the below naming/numbering convention.

1. User Study ID *{must be 8 or less characters}:*
   TSPPCSSP (Pierce County)
   TSPKCSSP (King County)
   TSPTCSSP (Thurston County)

2. User Location ID:
   This represents the study, facility and play area: *{must be 15 or less characters}*

   TSPPCSSPXXXX-1
   TSPKCSSPXXXX-2
   TSPTCSSPXXXX-1

XXXX = Sequential unique facility code assigned by Ecology's Soil Safety tracking database, numeric. To track facility type, the following range of numbers will be used for the specified facility type:

0001 to 1000 = schools
1001 to 8000 = childcares
8001 to 9999 = parks or camps (for those childcares with offsite play areas at nearby park or camp)

Example: TSPPCSSP0001-1 = play area 1 at school 0001 in Pierce County.
Example: TSPKCSSP1201-2 = play area 2 at childcare 1201 in King County.

Each play area within the facility will have its own GPS coordinates (latitude and longitude).

For schools and childcares, Ecology will use address matching software to identify a latitude/longitude for the facility – and enter this into the Soil Safety tracking database (not EIM). (If a school or childcare does not respond to access requests, or denies access, we will still be able to plot the facility.) For those facilities that grant access, the counties will use GPS during the qualitative assessment to verify the latitude/longitude of the facility. If the qualitative assessment determines that soil sampling is not necessary, then the GPS coordinates will be taken from the front door of the facility. If the qualitative assessment determines that soil sampling is necessary, then the GPS coordinates will be taken at each play area (for EIM). For the Soil Safety tracking database, the coordinates for the first play area will be used.

3. Location Name:
Name of facility
Examples: North Thurston High School PA2
KinderCare PA1

PA = play area

4. Study Location Name:
Name of facility
Examples: North Thurston High School PA2
KinderCare PA1

PA = play area

5. Location Description
Property address

6. Sample ID
1) County (Pierce = 27; King = 17; Thurston= 34) (numbers are standard county codes);
2) Facility Code: the sequential number assigned to each facility through Ecology's Soil Safety tracking database (format to be determined – numeric);
3) Play area number: 1,2, 3, 4, etc..
4) Boring number: 1, 2, 3, 4, etc.
5) Depth interval (required for KC database structure) 1 = 0-6"
6) Sample type 4= regular
5= duplicate

Example: 27-0001-1-1-1-4 = Pierce County, facility 0001, play area 1, boring 1, depth 1, regular sample.

Example: 17-0005-2-8-1-5 = King County, facility 0005, play area 2, boring 8, depth 1, duplicate sample.

2.2.12 REPORTS TO THE LEGISLATURE

Health departments will submit progress reports to Ecology by October 31, 2006 and October 31, 2008. Ecology will compile the submitted information and submit progress reports to the governor and legislature by December 31, 2006 and December 31, 2008. Reports will include information about the following items:

- The number of childcares and schools identified within the service area zone
- The number that were previously sampled
- The number of qualitative assessments conducted
- The number of facilities that did not need sampling and why
- The number of facilities where sampling was conducted
- The number of facilities that needed implementation of Soil Safety Actions
- Which Soil Safety Actions were implemented at what frequency
- The number of facilities that did not implement Soil Safety Actions when it was recommended
- Any instances where it was necessary to notify a regulatory agency because Soil Safety Actions were not implemented and parents were not notified by the facility.

2.3 EVALUATION OF SOIL SAFETY PROGRAM

The goal of the Soil Safety Program is to reduce exposure of children to soil with area-wide arsenic and lead at schools and childcares within the TSP. The steps to achieving this goal are:

- Identify the service area and schools and childcares within the zone
- Get access to identified schools and childcares
- Collect and analyze soil from child play areas if a qualitative evaluation indicates that children may be routinely exposed to area-wide soil contamination
- Notify schools and childcares of sample results and if results are in the moderate or high categories, encourage them to implement Soil Safety Actions by providing information on Soil Safety Actions, recommending implementation of specific Soil Safety Actions, and providing funding for implementation.

Ecology and the health departments will evaluate the effectiveness of the Soil Safety Program, by determining the effectiveness of the above steps, using the information included in the reports to the legislature described in Section 2.2.12.

2.3.1 IDENTIFY SOIL SAFETY PROGRAM SERVICE AREA AND SCHOOLS AND CHILDCARES WITHIN THE SERVICE AREA

In order to focus the efforts of Ecology and the county health departments on the area where soil is most likely to contain area-wide contamination, a Soil Safety Program service area was defined based on previous footprint sampling data and recommendation of the local health departments. Ecology, with the county health departments, will reevaluate the Soil Safety Program service area boundary at the end of 2008.

The re-evaluation will be qualitative. All schools and childcares sampled will be mapped – those below criteria will be colored blue, and those above criteria will be colored red. The locations of the facilities above criteria will be compared to the SSP service area boundary. If there are facilities above criteria that are close to the boundary, then the agencies will consider if the boundary should be expanded – as there may be facilities outside the boundary that are above criteria.

2.3.2 GET ACCESS TO IDENTIFIED SCHOOLS AND CHILDCARES

Ecology and the health departments will evaluate the effectiveness in getting access to identified schools and childcares in October of each year of the program. Performance is measured by the percentage of facilities granting access (i.e., number schools granting access/number schools contacted). The performance measures are:

	Schools	Childcares
October 2006	95%	60%
October 2007	100%	70%
October 2008	100%	80%
October 2009	100%	90%

If the rate for achieving property access is less than the performance measure, the outreach materials used and approach for gaining access will be reevaluated and may be revised. Additional evaluation of outreach materials will be performed as described in the Soil Safety Program Communications Strategy. If, based on this evaluation, Ecology concludes that voluntary participation in the program is not producing adequate results, Ecology will notify the Legislature in the progress reports (and at other times if appropriate) and suggest changes that would make the program more successful.

2.3.3 COLLECT AND ANALYZE SOIL

Ecology and the health departments will evaluate the effectiveness of the assessment and sampling elements of the program in October of each year of the program. Performance is measured by two percentages: 1) percentage of facilities assessed (i.e., number schools assessed/number schools granting access for assessment); 2) percentage of facilities sampled (i.e., number schools sampled/number schools requiring sampling based on qualitative assessment). The performance measures for both are:

	Schools	Childcares
October 2006	95%	75%
October 2007	100%	90%
October 2008	100%	90%
October 2009	100%	90%

If the rate of assessment or sampling is less than the performance measures, Ecology and the health departments will discuss how to increase the rates at which facilities are assessed and sampled. In addition, Ecology and the health departments will consider whether the health department is likely to complete sampling of schools and childcares within the SSP Service Area by the end of 2009.

2.3.4 ENCOURAGE SOIL SAFETY ACTION PLAN IMPLEMENTATION WHERE APPROPRIATE

Ecology and the health departments will evaluate the effectiveness of encouraging the implementation of Soil Safety Action Plans in October of each year of the program. Performance is measured by two percentages: 1) percentage of facilities initiating Soil Safety Actions (i.e. number schools initiating Soil Safety Actions/number schools above criteria); 2) percentage of facilities receiving Certificate of Soil Safety Action completion (i.e., number schools receiving certificate/number schools above criteria). The performance measures are:

	Schools		Childcares	
	Soil Safety Action Plan initiated	Soil Safety Action Plan complete	Soil Safety Action Plan initiated	Soil Safety Action Plan complete
October 2006	50%	25%	25%	10%
October 2007	100%	75%	50%	25%
October 2008	100%	100%	75%	50%
October 2009	100%	100%	75%	75%

If the rate of Soil Safety Action Plan implementation is less than the performance measures, Ecology and the health departments will discuss how to increase the rate. If, based on this evaluation, Ecology concludes that voluntary participation in the program is not producing adequate results, Ecology will notify the Legislature in the progress reports (and at other times if appropriate) and suggest changes that would make the program more successful.

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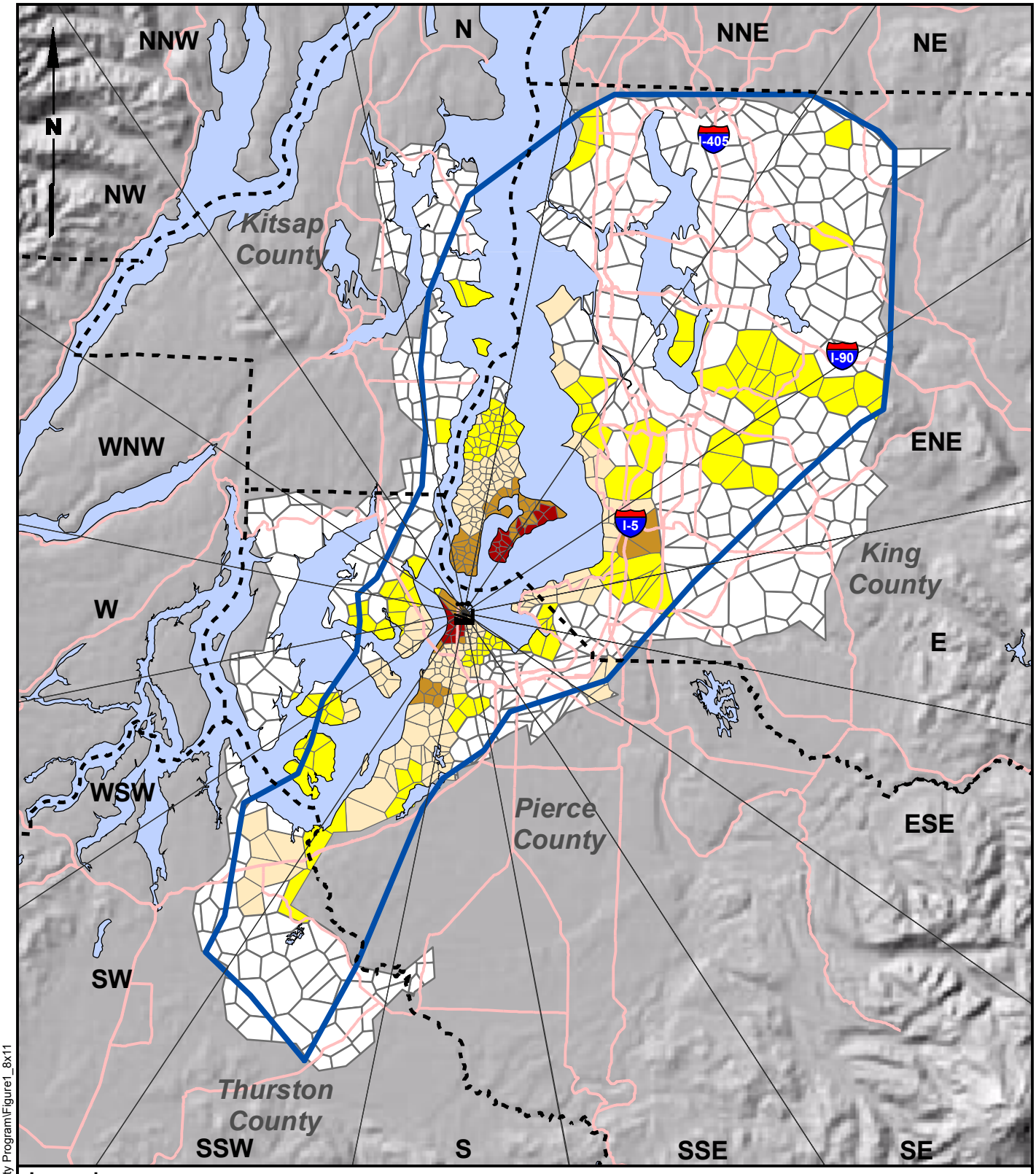

Legend

- Smelter Stack
- County Boundary
- Roads
- Wind Vectors
- 20ppm Boundary (PGG 2005)
- Water Bodies

Arsenic Concentration 0-6" 90th Percentile

- < 20 ppm
- 20 - 40 ppm
- 40 - 100 ppm
- 100 - 200 ppm
- >200 ppm

0 5 10
Miles

Data Source (Arsenic Concentrations): Pacific Groundwater Group 2005

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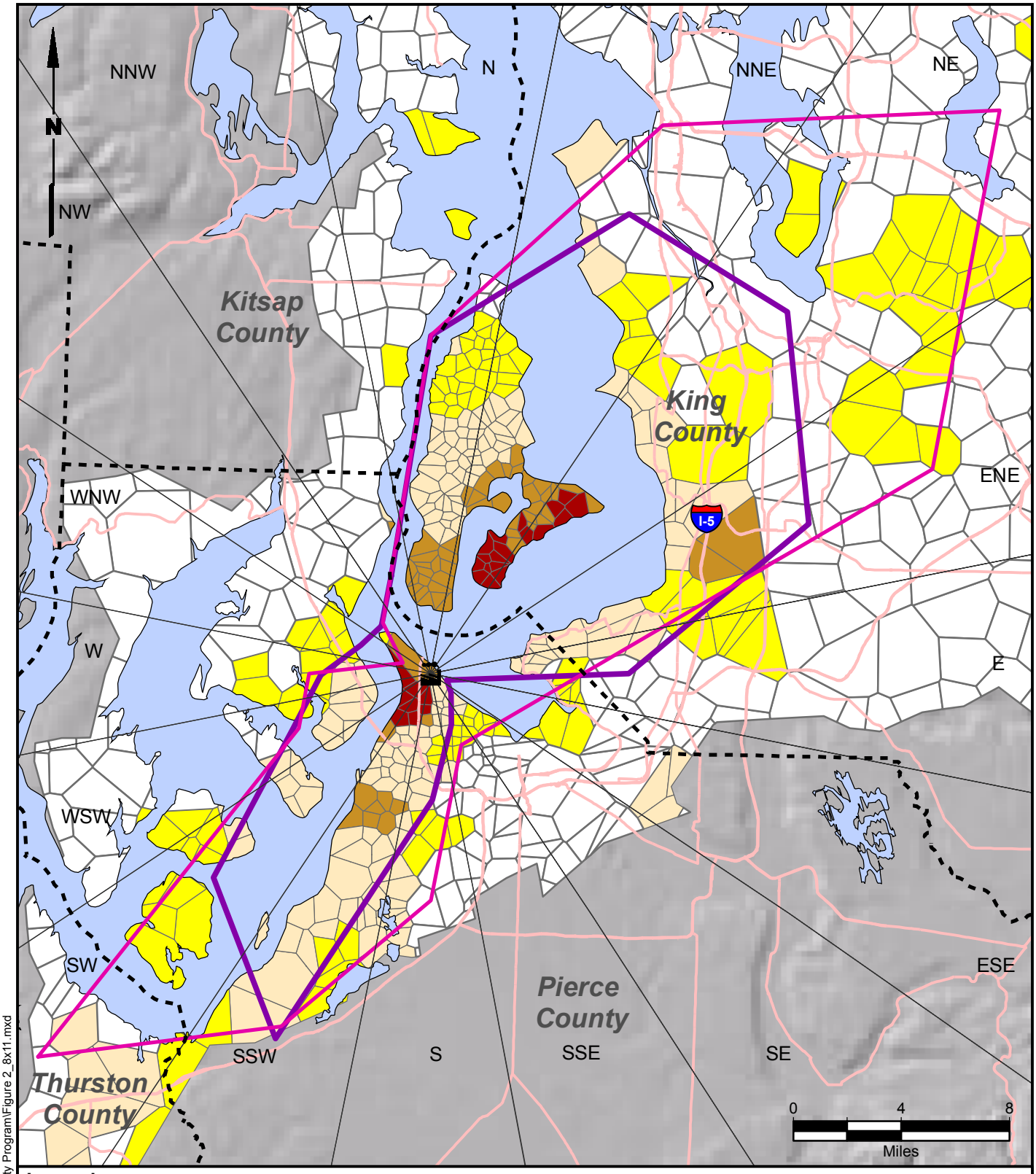
LANDAU ASSOCIATES

Tacoma Smelter Plume Soil Safety Program	**Extended Footprint Study Results**	Figure 1



Legend

- Smelter Stack
- County Boundary
- Roads
- Water Bodies
- Wind Vectors
- 2002 CUA Study Zone
- 2006 Predicted Zone of 100 ppm Max Arsenic

Arsenic Concentration 0-6" 90th Percentile

- < 20 ppm
- 20 - 40 ppm
- 40 - 100 ppm
- 100 - 200 ppm
- >200 ppm

Data Source (Arsenic Concentrations): Pacific Groundwater Group 2005

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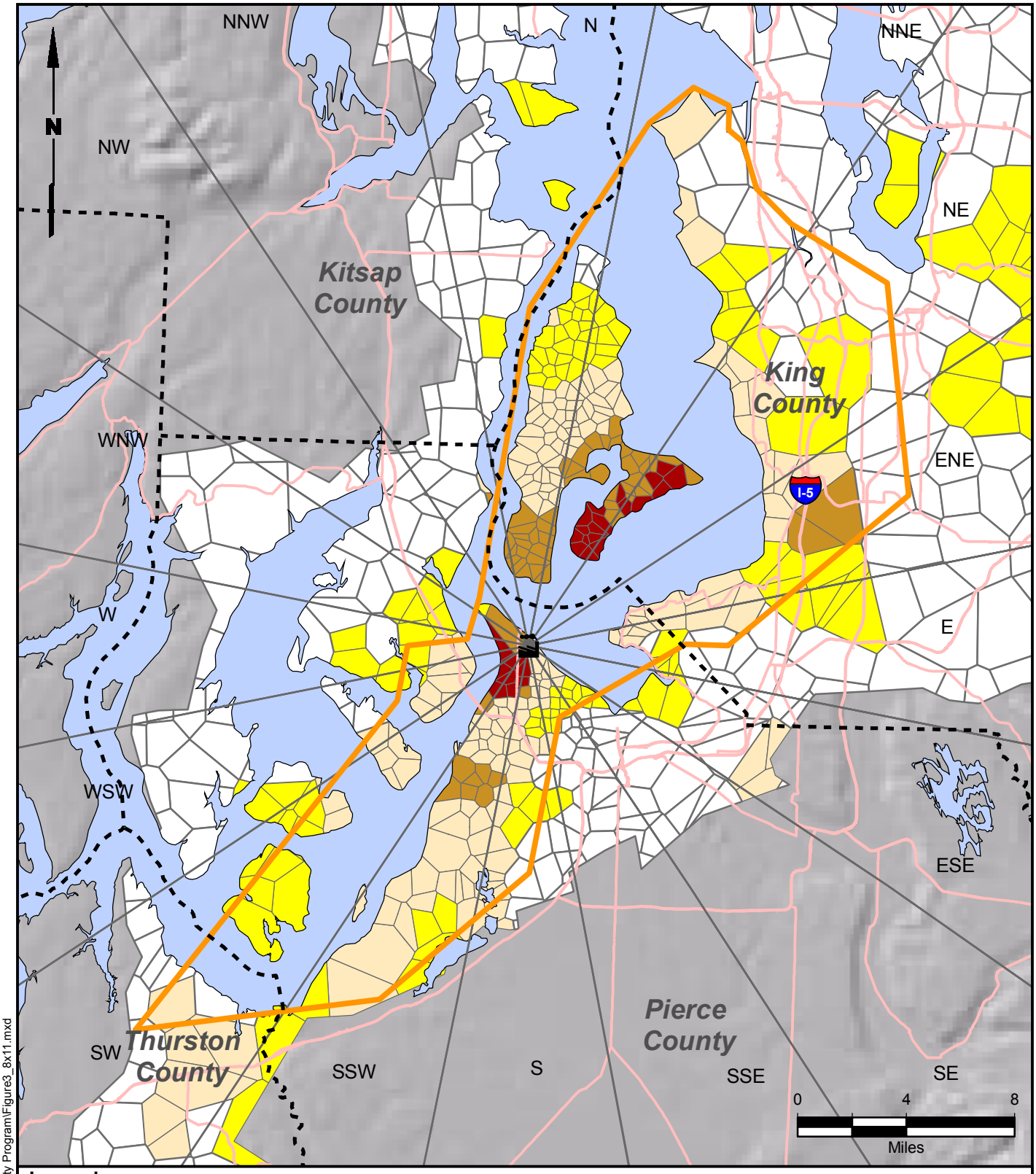
LANDAU ASSOCIATES

Tacoma Smelter Plume
Soil Safety Program

2002 and 2006 Predicted Zone of 100 ppm Maximum Arsenic

Figure
2



Legend

- Smelter Stack
- County Boundary
- Roads
- Water Bodies
- Wind Vectors
- SSP Service Area

Arsenic Concentration 0-6"
90th Percentile

- < 20 ppm
- 20 - 40 ppm
- 40 - 100 ppm
- 100 - 200 ppm
- >200 ppm

Data Source (Arsenic Concentrations): Pacific Groundwater Group 2005

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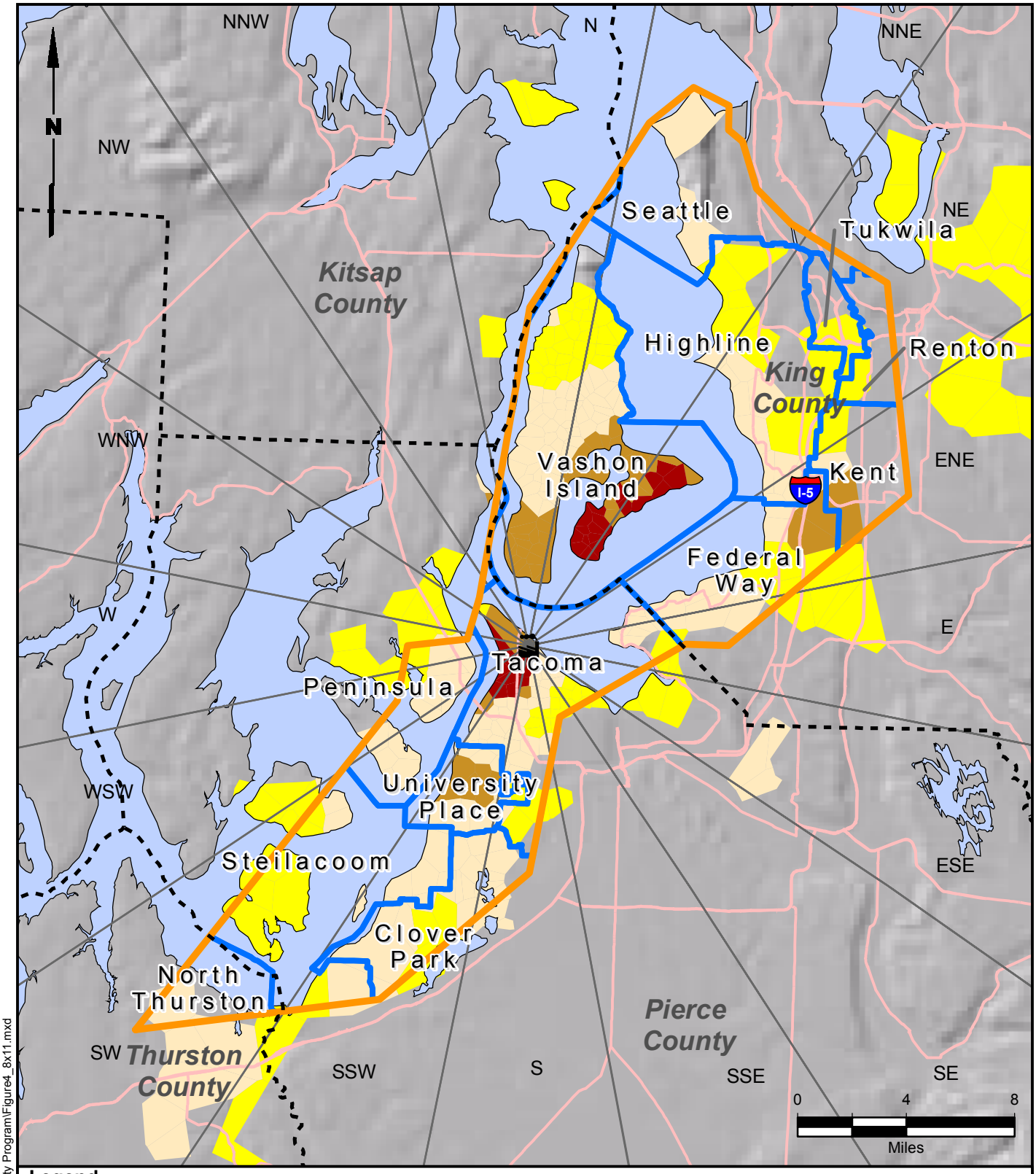
LANDAU ASSOCIATES

Tacoma Smelter Plume
Soil Safety Program

2006 Soil Safety Program Service Area

Figure 3



Legend

- Smelter Stack
- County Boundary
- Roads
- School District Boundary
- Water Bodies
- Wind Vectors
- SSP Service Area

Arsenic Concentration 0-6" 90th Percentile

- 20 - 40 ppm
- 40 - 100 ppm
- 100 - 200 ppm
- >200 ppm

Data Source (Arsenic Concentrations): Pacific Groundwater Group 2005

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LANDAU ASSOCIATES

Tacoma Smelter Plume
Soil Safety Program

Soil Safety Program Service Area and School Districts

Figure
4

APPENDIX A

Sampling Design

APPENDIX A
SAMPLING DESIGN FOR SCHOOLS AND CHILDCARES

DEFINITION OF SOIL SAFETY PROGRAM SERVICE AREA

This section describes the methodology used for defining the Soil Safety Program Service Area. The Soil Safety Program service area (SSP service area) was established in a two step process. First, reevaluation of previous CUA study zone boundaries incorporating new data; second, modifying the boundary based on local health department recommendations.

The SSP service area was developed by a work group comprised of Ecology, Public Health-Seattle & King County, and Tacoma-Pierce County Health Department. The methodology is based on the methodology used to define child use study zones in the 2002 King and Pierce County child-use area (CUA) studies (Glass 2002).

Four factors relevant to the issue of defining a service area were identified:

1. A recent law (Chapter 70.140 RCW) states that the Washington State Department of Ecology (Ecology) in cooperation with DSHS, OSPI, and the local health districts shall "Identify schools and childcares that are located within the central Puget Sound smelter plume based on available information; and Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination."

2. Funding for CUA sampling and BMP implementation is limited. As outlined in the TSP Project Plan, geographic areas with high levels of arsenic and/or lead in soil are a higher priority than geographic areas with moderate levels of arsenic and/or lead in the soil.

3. The footprint studies targeted relatively undisturbed forested locations; therefore, the sampling results are very likely to be an upper bound on soil contaminant concentrations at more developed and disturbed child use properties.

4. Data from the extended footprint studies has further refined the areas where area-wide contamination exists.

The CUA study zone boundary in 2002 was based on the first footprint studies in King and Pierce counties. For the SSP service area, data from all footprint studies including the extended footprint investigations was compiled into log-scaled graphs of arsenic concentration versus distance. The graphs can be used to determine the outer bounds of the TSP contamination for each wind direction. The Work Group decided to use a criterion value of 100 ppm soil arsenic - equal to the break between moderate and high concentration ranges identified by Ecology - for defining the SSP service area. All of the footprint studies targeted undisturbed areas where concentrations of area-wide contaminants are likely to be highest. Concentrations at disturbed areas such as schools and childcares are likely to be significantly

less as indicated by previous sampling results at schools and childcares. Therefore, use of a criterion value of 100 ppm soil arsenic is likely to produce a SSP service area boundary that includes all schools and childcares with high concentrations, and most with moderate concentrations.

The general methodology for defining the SSP service area boundary, based on the concentration versus distance graphs, was taken from the previous CUA study design (Glass, 2002) and includes the steps below. The data has already been partitioned into subsets by wind sectors (using the 16 sectors defined by typical wind roses), and plotted for maximum arsenic concentration versus distance for each wind sector.

1. Hand-draw the approximate bounding line for the plotted data.
2. Use the hand-drawn bounding line to estimate the intercept and slope values, and thereby establish the bounding curve equation.
3. Solve the equation for the bounding curve for each wind sector to calculate a distance to the 100 ppm soil arsenic criterion value.
4. Use the resulting distances for each wind sector to plot a child use study zone.

The initial SSP service are boundary (2006) is plotted with the old CUA study zone (2002) (Figure 2 of Design). The initial SSP service area boundary was modified based on local health department recommendations. The initial SSP service area boundary in King County nearly doubled the area of the original CUA study zone. Due to the density of childcares and schools in King County and limited resources, Public Health-Seattle & King County recommends focusing sampling efforts on the area roughly inside the original CUA study boundary with minor variations based on geographic and political boundaries. The final SSP service area boundary reflects this recommendation in King County, and uses the expanded boundary in Pierce and Thurston counties. Sampling activities in King County may eventually extend further as time and funding allow. The SSP service area is shown on Figure 3 of Design.

SAMPLING METHODOLOGY FOR SCHOOLS AND CHILDCARES

This sampling design addresses planned soil sampling of schools and childcares within the SSP service area. The sampling design includes approaches for sampling and analyzing soil, and methods for data evaluation.

SELECTING PLAY AREAS (DECISION UNITS)

Once the schools and childcares have been selected for sampling, a consistent design will be used to collect soil samples. This section discusses the concept of **Play Areas** (formerly identified as decision units) at the school or childcare.

A school or childcare property may be subdivided into multiple areas - reflecting various child activities, land uses, property histories, or other factors - at which soil is accessible by young children and exposures can occur. Only those areas where children play frequently will be selected for sampling. The data from soil sampling at these areas will be evaluated to characterize the exposure risks and assess appropriate response actions and their timing. Different parts of a child use property may therefore be treated as separate Play Areas, since the decisions on appropriate response actions may vary from one portion of the property to another based on the contaminant concentrations found.

Small childcares will often have only a single Play Area. For example, a childcare operated out of a private residence may have only a single fenced outdoor play area in the back yard of the property, perhaps 40 ft by 60 ft in size. An elementary school property tens of acres in size, on the other hand, may have a demonstration garden area, several areas with play equipment, various ball fields, and perhaps even a nature exploration area. Such an elementary school would best be classified into multiple Play Areas for sampling purposes.

Play Areas will be defined at the selected school or childcare by the field sampling teams, based on observations, discussions with property owners or operators, and the qualitative assessment questionnaire provided in Appendix C. Soil samples will be collected from all play areas within each property. The set of defined Play Areas at a school or childcare does not have to provide complete coverage of the entire property. Well-maintained grass lawns that are not used significantly by young children, for example, may not be included in any of the defined Play Areas. Some play areas may also already have a deep cover layer (e.g., 12 inches of wood chips) that minimizes contact with potentially contaminated soils, and so may not be included in the sampling. Play Areas should be at a minimum 100 ft^2 and at a maximum the size of a typical ball field (e.g., around 1 acre). To the extent practical, Play Areas should reflect fairly homogeneous activities and development histories.

SAMPLING WITHIN PLAY AREAS

The design for collecting soil samples within play areas is discussed in the following sections, including the number of boring locations, the selection of specific boring locations, the depth interval to be sampled, and the soil sample collection method.

NUMBER OF BORINGS

Samples will be collected from eight borings[1] at each Play Area. In unusual circumstances, the field sampling teams may modify that number somewhat; for example, additional samples could be required to include samples from all locations within a Play Area where soil contact was likely to occur, and subdividing the single Play Area into multiple Play Areas is not reasonable.

In choosing a number of sampling locations per Play Area, the Work Group considered the variability that can occur within areas the size of Play Areas. Information available from detailed sampling at Ruston/north Tacoma and Everett Smelter Site properties, and from previous TSP investigations, suggests that variability in soil contaminant concentrations can be substantial within sizes that may typify Play Areas. There is little to suggest that this variability is highly correlated with Play Area size. Therefore, the number of boring locations will not vary with Play Area size.

A smaller number of boring locations per Play Area would allow a larger number of schools and childcares to be sampled, within the available budgets. On the other hand, the larger the number of boring locations, the more representative the characterization of contamination within the Play Areas will be. Estimates of both the average and maximum contaminant concentrations will improve as the number of locations sampled increases. The decision to include eight boring locations per Play Area was informed by previous sampling design studies (including statistical evaluations of possible error rates as a function of the number of locations sampled, at Ruston/north Tacoma and the Everett Smelter Site). It is consistent with the sampling intensity for the completed CUA studies and the property-by-property sampling at the Everett Smelter Site. Recognizing that any number of samples per Play Area will still result in some non-zero error rates, it was the judgment of the Work Group that eight boring locations would provide reasonably accurate characterizations and allow for sampling at a significant number of schools and childcares.

BORING LOCATIONS

During the previous CUA study, boring locations were discussed in some detail, various ideas about how boring locations should be selected, and what the results of sampling should represent regarding "potential exposure risks from soil contact." The idea of an "average exposure concentration" serves to illustrate these discussions. Since exposures at CUAs are assumed to occur over an extended

[1]For this document, the term "boring" is used to denote a sampling location, regardless of the technique used to physically collect the sample. For shallow soil sampling, hand-sampling methods are likely to be used rather than equipment to advance true borings. The term "boring" has been used in previous TSP studies in this way and has also been used as a database field descriptive term.

period of time and, as a result, contact with more than a single specific location will occur, one relevant measure of exposure - particularly for chronic or cancer health risks - is the average exposure concentration over time. On close examination, the Work Group determined that different arrangements of boring locations could represent different types of average soil concentrations:

1. A random grid layout for sampling could reflect a spatial average over the entire Play Area. This would assure the best spatial representation of the Play Area as a whole. It would also reflect a simple assumption of equal probability for soil contact at any location within the Play Area.

2. Not all locations within a Play Area may be judged equally likely to result in soil contact. Child activities and behaviors may be focused at certain locations more than others - for example, areas with play equipment rather than lawn areas. Locations of bare soils, versus areas of well-maintained grass cover or wood chips, may also result in more potential exposure because they are attractive to young children and because direct soil contact is much more likely. Grid sampling could be restricted to only areas judged to have comparatively greater potential for soil exposures. This restricted spatial sampling would bias the average concentration toward those parts of a Play Area where exposure is judged most likely to occur. It includes an assumption of equal probability of soil contact in only designated parts of the Play Area. Some locations within the Play Area would not be represented at all by selected boring locations. Some reasonable estimates of areas of focused activity and most likely contact are often available from observations and short interviews at child use properties.

3. The potential for soil contact and contaminant exposure may vary in response to a number of factors: the types of child activities and their resulting intensity of soil contact; the frequency and duration of those activities by locations within the Play Area; and the presence or absence (a matter of degree) of cover materials between the child and soil. Instead of sampling with a single grid spacing to reflect equal probability soil contact over defined areas (see above), a weighted assignment of boring locations could be used to represent these factors (i.e., obtaining more samples from locations with more potential soil contact). Thus, different grid sampling densities could be used in different areas of focused activity, and some areas may not be sampled at all. If information on the factors contributing to soil contact was complete and accurate, this approach would move farthest away from simple spatial averaging toward averages reflecting actual exposures. Such information in practice is always incomplete and imprecise. Moreover, these patterns of soil contact usually vary significantly among children and over time.

The decision on how to select boring locations reflects choices about using bias and weighting factors, versus adopting the simpler equal-probability-of-sampling approach. The Work Group decided that the primary objective of evaluating exposure risks at CUAs makes it appropriate to bias samples toward locations where soil contact is more likely to occur. Information to apply a detailed weighting approach, with varying sampling intensities or estimates of varying soil contact, is considered too uncertain to be applied quantitatively. Therefore, field sampling teams will use their judgment in assigning sampling intensities to various areas of focused sampling within each decision unit.

The Work Group also decided that it would be appropriate in most instances to obtain some information in all parts of a Play Area where soil contact is possible, even if less likely.[2] As a result, a few boring locations may be assigned to areas - such as well-maintained lawns - which would not be identified as biased locations with higher probability soil contact. If no biased locations can be identified (a uniform, grassy playfield, for example), then simple spatial grid sampling will be used. Sampling to provide spatial coverage of a Play Area, even if some parts have less intense sampling, provides an opportunity to reveal highly variable conditions that could result from the usually poorly-documented history of soil disturbance from property development.

The Work Group recognized that a calculated arithmetic average using a mixed approach to sampling (biased plus spatial coverage locations) will represent neither a purely spatial average nor a purely exposure average, but something in-between. Nevertheless, this approach was chosen as best meeting the needs for CUA sampling.

The selection of boring locations will be made by the field sampling teams in the field at the time of sampling. They will identify areas of focused sampling, where soil contact is deemed most likely, through observations and discussions with owner/operators. (Initial requests for information may be made before going to the field to sample). The intensity of sampling in the selected areas of focused sampling, and in remaining areas, will be assigned using field team judgment. Overall, the selection of boring locations will reflect some degree of bias toward higher-probability contact areas wherever information to support the identification of such areas exists. The field sampling teams should document the rationales for their assignment of boring locations at each Play Area.

All boring locations will be restricted to areas of accessible soil. Thus, soil beneath buildings, paved driveways or patios, deep covers of gravel or other non-soil materials or otherwise inaccessible materials will not be sampled. Boring locations will also be restricted to locations with potentially contaminated soils; thus, imported sand in self-contained (lined) sandbox play areas, where no potential for digging to soils below the sand exists, will not be sampled.

The previous CUA studies included other exclusion criteria to preclude sampling in locations where other, non-smelter sources may significantly affect soil contaminant levels. These exclusion criteria provided setback distances from such other recognized potential sources as treated wood, leaded gasoline emissions from vehicle use, and painted surfaces. For this Soil Safety Program, the work group decided to <u>not</u> use the exclusion criteria. Defining the service area focuses sampling in areas most likely

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[2]Recall that not all parts of a child use property need to be included in one of the Play Areas that will be sampled. Sampling to provide spatial coverage is in relation to a Play Area, not to the child use property as a whole.

to have smelter plume related contamination. Once at the play area, we are interested in the amount of arsenic or lead present irregardless of the source as the legislation directs Ecology to reduce exposures to arsenic and lead. Sampling will not be targeted at other sources of arsenic or lead, unless children are playing nearby. For example, a shed in the backyard that may be painted with lead based paint – sampling will not take place next to the shed just because the shed is present. Sampling next to the shed will take place if children play near the shed.

SAMPLE COLLECTION

All samples collected and analyzed at schools and childcares will represent discrete samples, collected from a single depth interval from a single boring. Soils from multiple borings will not be composited for lab analyses. Discrete samples will provide the most detailed information on soil contamination in a Play Area. They will support direct rather than indirect evaluations of whether or not criteria for maximum concentrations are exceeded (see Data Analysis and Decision Criteria section). Information on the variations in concentrations within a Play Area will also be provided by the set of discrete sample results.

Note: While a spatial pattern for soil contamination may be suggested by the discrete results, considerable caution should be exercised in making spatial interpretations. The variability in results even on a very small spatial scale (e.g., within a few feet of a given boring) can be quite large, especially where development has disturbed native soils, and the suggested spatial pattern may not be reliable. It is for this reason that decisions on appropriate response actions are typically made for a Play Area as a whole.

Sample Depths

Samples will be collected from one depth interval in each boring: 0 to 6 inches. The "zero" depth from which depth measurements will be taken is defined to be the bottom of the root mass for grass cover, just below other types of cover (e.g., wood chips), or just below the duff layer if one exists. Clean sand will be treated the same as other cover materials, since previous sampling confirmed that clean sand materials (without admixed soil) have low arsenic and lead concentrations. Sample collection will therefore start just below any shallow cover layer (e.g., less than 4 inches of sand)

One depth interval will provide information to characterize the potential for children's exposure to surface soil from playing or shallow digging. Previous CUA investigations sampled from two depth intervals (0 to 2 inches and 2 to 6 inches). Two depth intervals allowed samplers to evaluate the vertical distribution of arsenic and lead and determine the types of behavior (i.e, digging or playing on surface soil) that may cause a child to come in contact with different soil concentrations. However, depth profile

results from the footprint studies show a strong 1:1 correlation between arsenic concentrations from 0 to 2 inches and from 2 to 6 inches. This suggests that collecting samples from a single depth would yield similar results. Collecting soil samples from 0 to 6-inch soil depth is consistent with the sampling depth recommended in the CUA sampling guidance (Ecology 2005) and is also consistent with the focus on characterizing possible exposure risks under current conditions - that is, not considering site redevelopment, utility construction projects, or other less frequent but possible activities that would disturb soils to a greater depth. Sampling one depth will allow sampling at more schools and childcares within the available budget. Ecology has developed and applied its moderate and high concentration ranges for the TSP Site for conditions in the top 6 inches of soil at CUAs

The proposed sampling design for the Play Areas addresses the specific objectives of the Soil Safety Program. It is not intended to provide complete characterization of soil contamination at a Play Area. Sampling at 0 to 6 inches may not include the maximum contaminant concentrations at a Play Area; about 30 percent of the non-beach Play Areas sampled in the Vashon-Maury Island CUAs study had maximum concentrations below 6 inches (see Public Health - Seattle & King County and Glass 2001). Soil disturbance at developed sites can result in much more complex contaminant depth profiles than in undisturbed soil. Sampling to only 6 inches will not fully define those contaminant depth profiles. In fact, the absence of any elevated concentrations within the top 6 inches is no assurance that contamination does not occur below 6 inches (as may result from the importation of a foot of clean fill soil during property development, for example). Therefore, the results from sampling of the top 6 inches will not be used to determine compliance with MTCA cleanup levels.

Collection Method

Sample collection will start just below any shallow cover layer (e.g., less than 4 inches of sand). The entire 6 inch depth of soil will be collected, placed in a stainless steel bowl, and thoroughly homogenized. An aliquot of soil will then be placed in a clean sampling jar, filled to the top of the jar. The sampled will be properly labeled and kept cool during transportation to the laboratory.

SAMPLE ANALYSIS

All CUA samples will be analyzed for total (unspeciated) arsenic and lead. No collected samples will be archived without analysis.

Information available from previous studies was reviewed to confirm that other smelter-related contaminants did not need to be analyzed for these studies. Based on the maximum soil concentrations found in previous studies of Tacoma Smelter impacts and direct soil contact exposures and risks as

calculated under MTCA[3], other elements known to be related to smelter emissions appear unlikely to pose significant risks, individually, at school and childcare play areas. This confirms earlier screening-level reviews, but with an expanded set of results on additional elements including more recent studies. Moreover, the other smelter-related contaminants are expected to show a high degree of correlation with arsenic and lead results. Arsenic and lead were judged to remain sufficient indicator contaminants for making decisions at school and childcare play areas.

Consistent with earlier TSP studies and with MTCA requirements, sample preparation will include homogenizing and sieving the samples prior to analysis. All analyses will be performed on subsamples from materials < 2mm in size.[4] Total arsenic and lead results will also be reported on a dry weight basis. Therefore, percent moisture (percent solids) will also be determined for each sample to support lab calculations of dry weight concentrations. Soil samples should be archived by the lab after analysis pending authorization for disposal by the contracting agency.

Analytical methods should be selected with detection limits low enough to reasonably limit the frequency of not-detected results, which will affect the calculation of average concentrations by depth within Play Areas to some degree. Most arsenic and lead results are expected to be above 5 ppm; essentially all are expected to be above 1 ppm. Evaluations of soil contamination at CUAs are not expected to be significantly affected by not-detected results as long as the detection limits are approximately 5 ppm or less. To this end, EPA Method 6020 will be used.

DATA ANALYSIS

The results from sample analyses will be evaluated using two numerical measures: average and maximum concentrations.

1. The maximum arsenic and lead concentrations in any single sample within a Play Area will be identified and recorded.

[3]The more complex risk evaluations associated with plant uptake and garden vegetable consumption were not included in this brief review, which was undertaken as only a screening-level evaluation.

[4]For the Soil Safety Program, the size fraction specified in the MTCA regulations - <2mm - will be analyzed.

2. The arithmetic average concentrations[5] for arsenic and lead, using results from all boring locations in the play area, will be calculated and recorded. The detection limit will be used (conservatively) for any not-detected results in making these calculations.

These data evaluation measures will support both comparative and absolute (numerical) assessments of the magnitude of soil contamination at the play areas at the schools and childcares, and the potential risks of exposures for young children. Response actions will follow as described in sections 2.2.8 through 2.2.10 of the main text of this report.

Ecology has established a set of numerical concentration ranges for the TSP Site to define levels of contamination that are below standards, moderate, or high (see Table 2-2 in the main text of this report). Ecology or the Health Departments will compare average results to the moderate and high concentration ranges to determine a below standards, moderate, or high contaminant level designation. Maximum sample results will also be compared to the moderate and high concentration ranges. If any sample is greater than 2 times the lower value for the contaminant level category, the Play Area will be assigned to that contaminant level category. BMPs will be recommended for play areas in the moderate or high categories. The BMPs recommended may reflect the level of contamination.

REFERENCES

Ecology. 2005. CUA Arsenic and Lead Soil Sampling Guidance. Washington State Department of Ecology. Ecology publication #03-09-037 (revised 5-05).

Glass, Gregory L. 2002b. Sampling Design for Tacoma Smelter Plume Site; Soil Sampling and Analysis at Child Use Areas in King County and Pierce County, Washington. November.)

Public Health - Seattle & King County and Glass 2001. *Vashon-Maury Island Child-Use Areas Study Final Report.* November.

[5]The Work Group decided not to use a calculated upper confidence limit on the average concentration as a formal data evaluation endpoint. Such upper confidence limits may be calculated, and the results made available on request, but they will not be directly used by the agencies in making decisions based on school and childcare sampling. The Work Group noted that the calculation of upper confidence limits is often itself uncertain for technical reasons, particularly for small data sets with variable results. Moreover, the purposes for the school and childcare sampling are distinct from final cleanup decisions under MTCA, and a different data evaluation approach was judged appropriate.

Appendix B

Quality Assurance Project Plan

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) establishes the quality assurance (QA) objectives and the quality control (QC) procedures for the soil sampling and analysis that will be carried out at schools, childcares, public parks, camps, and multifamily public housing play areas in the Soil Safety Program service area of the Tacoma Smelter Plume (TSP). This QAPP is based on the QAPP prepared for the 2002 CUA Study (SAIC 2002) and the QAPP for the Tacoma Smelter Plume Project Extended Footprint Sampling (Ecology, 2004). This QAPP is to be used in conjunction with the Soil Safety Program Design (main document), Sampling Design (Appendix A), Addendum (May 2010) and a field implementation plan and health and safety plan for each participating county and/or contractor.

The TSP is primarily contaminated by arsenic and lead. The sampling and analysis project governed by this QAPP will provide chemical data needed to support assessments of play areas at the various facilities listed above and decisions on best management practices (BMPs) based on potential risk determinations at those facilities.

2.0 PROJECT ORGANIZATION AND SCHEDULE

The project team, consisted of representatives of Ecology, Public Health-Seattle & King County (PHSKC), and Tacoma-Pierce County Health Department (TPCHD), jointly developed the Soil Safety Program Design, Sample Design, QAPP, and associated documents with Landau Associates as consultant and facilitator. Soil sampling will be conducted by PHSKC, TPCHD, Ecology contractors, and Ecology staff (jointly referred to in places within this document as "the samplers"). The samplers will be responsible for submitting samples to the laboratory, tracking samples, receiving electronic data reports from the laboratory, hard copies (electronic PDF format) and data verification. The samplers will transfer electronic and relevant field data to their internal databases and will provide electronic submittals of the data to Ecology in Ecology's Environmental Information Management System (EIM) format. Ecology will provide technical assistance for data submittals to EIM. At the end of the sampling effort, the counties will provide hard copies of data reports to Ecology, who will act as final repository for hard copy data. Ecology will provide project oversight and coordination.

Sampling in both counties was scheduled to begin in summer, 2006, and all the schools and childcares were completed by December 31, 2009. New schools and childcares will continue to be sampled as needed. In July 2010, public parks, camps and multifamily public housing play areas were added to the program.

3.0 SAMPLING PROCEDURES

The procedures that will be followed for collection, preservation, transportation, and storage of the soil samples and associated field QC samples will be described in the project implementation plans developed by each county. This includes procedures for sample custody and chain of custody documentation, sample management and tracking, and recording field and sample handling data in field notebooks and on field data forms. Specifications for identifying sampling locations, number of borings, and sample depth are included in the Sample Design (Appendix A) and Addendum (May 2010). Field methods for collecting the sample are similar for all samplers. Specifically, Pierce County obtains the samples with a stainless steel trowel, while King County obtains samples with a stainless steel hand auger. In both cases, the surface vegetation or humic layer is removed and soils are collected evenly across the 6 inch depth. The soils are homogenized in the field and a subsample is deposited into the sample jar.

3.1 SAMPLE NUMBERING SCHEME

A consistent scheme for sample numbering will be used by both counties. The sample identification scheme is described below:

1. County (Pierce = 27; King = 17; Thurston= 34) (numbers are standard county codes);
2. Facility Code: the sequential number assigned to each facility through Ecology's Soil Safety tracking system database. The facility code also signifies the type of play area –

   0001 to 1000 = schools

   1001 to 8000 = childcares

   8001 to 9999 = public parks, camps or multifamily public housing

3. Play area number: 1, 2, 3, 4, etc..
4. Boring number: 01, 02, 03, 04, etc.
5. Depth interval: 1 = 0-6", 2 = 6-12", 3=12-18"
6. Sample type 4 = regular, 5= duplicate

Example: 27-0001-1-01-1-4 = Pierce County, facility 0001, play area 1 (school), boring 1, depth 1, regular sample.

Example: 17-1005-2-08-1-5 = King County, facility 1005 (child care), play area 2, boring 8, depth 1, duplicate sample.

3.2 SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

The allowed holding time for all samples is 180 days after sample collection. No sample preservation is required. Containers will be glass jars provided by the laboratory. The sampler will homogenize the soil contents collected from the coring device and then subsample from that into a 4 ounce jar.

3.3 LOCATIONAL DATA

Ecology will use address matching software to identify the x and y coordinates for the facility – and enter this into the Soil Safety tracking database (not EIM). (If a school or childcare does not respond to access requests, or denies access, we will still be able to plot the facility.) For those facilities that grant access, the sampler will use GPS during the qualitative assessment to verify the x and y coordinates of the facility, or confirms the coordinates on orthophotos. The verified coordinates for that facility will then be input by the counties into EIM and the coordinates will be pulled from EIM to populate the Soil Safety tracking database. If the qualitative assessment determines that soil sampling is not necessary, then the coordinates will be taken from the front door of the facility, or centroid of the parcel if generated using orthophotos or other mapping system. If the qualitative assessment determines that soil sampling is necessary, then the coordinates will be identified for each play area (for EIM), either using GPS or orthophotos. For the Soil Safety tracking database, the coordinates for the first play area will be used.

4.0 ANALYTICAL PROCEDURES

Prior to digestion the entire soil sample will be removed from its container, sieved as is through a 2mm sieve, and then homogenized. This procedure is consistent with MTCA protocols [WAC 173-340-740(7) (d)]. The portion of the sieved homogenized material that is not needed for the primary analysis will be returned to the original container and returned to the sample storage area. The samples will then be prepared using a USEPA SW 846 Method 3050B. Total arsenic and lead in the soil samples will be analyzed by either ICP (USEPA method 6010) or ICP-mass spectrometry (ICP-MS) (USEPA method 6020). The reporting limits (RL) for this project will be the practical quantitation limits (PQL), of 6.25 mg/kg for arsenic and 5 mg/kg for lead. Percent moisture will be determined for each sample and sample results will be reported on a dry-weight basis. The percent moisture determination will be performed and reported for all soil samples using the EPA CLP ILMO4.0 method or equivalent.

5.0 QUALITY OBJECTIVES AND QUALITY CONTROL PROCEDURES

The analytical results from this project will be used to determine average and maximum arsenic and lead concentrations for soils in play areas. The average of all samples in a play area, and the maximum result of the play area, will be used to determine actions needed to provide protection against risks from exposure to the contaminated soil. The sample design is not meant to provide full MTCA characterization of soils at the play areas, and as such is considered to be 'screening level' sampling. However, it is important to ensure that the sample results are of sufficient quality to provide a high degree of confidence that no sites with contamination above acceptable risk levels are left behind, or that sites without contamination are mistakenly included in the program (with its associated costs to the Counties and Ecology). The measurement quality objectives and quality control procedures outlined below will be implemented to achieve this goal.

Measurement quality objectives (MQOs) are qualitative or quantitative statements of the precision, accuracy (or bias), sensitivity, representativeness, completeness, and comparability necessary for the data to serve the objectives of the project. The MQOs and quality control procedures identified for this project are listed in the following subsections and are summarized in Table 1. In addition to the laboratory quality control procedures listed in Table 1, the laboratory shall follow all other quality control measures for instrument calibrations or lab performance that are specified in the chosen method (Method 6010 or 6020), and according to the laboratory's Standard Operating Procedures. If a sample batch does not contain 20 Soil Safety Program (SSP) samples, samples from other projects may be added to that batch but QC samples must be run on the SSP samples.

5.1 PRECISION

Precision is a measure of the reproducibility of an analytical result (i.e., the ability to obtain the same or similar results on replicate measurements of the same sample or of duplicate samples). Matrix variations, sample preparation procedures, and the analytical method affect reproducibility. Precision is measured by the variability in results between replicate analyses (e.g., the relative percent difference between duplicates).

5.1.1 FIELD PRECISION

Field precision will be assessed through the analysis of duplicate field samples collected from a particular sampling point. For these duplicates a single soil core will be homogenized in the field, then split into a primary and a duplicate sample and submitted to the laboratory to be analyzed as two separate

samples. A minimum of one duplicate per twenty samples will be collected. In the final data evaluation, only the results from the primary sample and not the duplicate sample will be considered. The MQO for the field duplicates will be a relative percent difference (RPD) no greater than ± 50 percent for each target element in the samples.

5.1.2 LABORATORY PRECISION

Laboratory precision will be evaluated by analysis of laboratory duplicates. Analysis and comparison of laboratory duplicates will evaluate laboratory precision within an analytical data group (batch). Laboratory duplicates will be analyzed for one sample in twenty (i.e., 5 percent) or one per batch of samples analyzed, whichever is more frequent. Target laboratory precision objectives for laboratory duplicates, expressed as RPD, are 35 percent for each sample and element.

For determining percent moisture, a duplicate moisture analysis must be performed at a frequency of at least one per batch or one per twenty samples, whichever is more frequent. The relative percent difference (RPD) shall not exceed 20 percent, or the percent moisture determination of the samples in that batch will need to be redone.

These objectives are consistent with levels of precision normally achievable by the standard EPA methods selected for this project. Duplicates with RPD values in excess of these control limits may indicate a lack of precision resulting from sampling or analysis techniques, and the results should be evaluated accordingly. In these cases, determination of the usability of the data for decision-making will include consideration of the difference between the concentrations in the samples and the corresponding decision criteria.

5.2 ACCURACY

Accuracy is defined as how close a measured parameter is to its true value. The accuracy of a measurement is affected by a combination of random error (precision, as discussed above) and systematic error (bias). Potential sources of bias include imperfect sample collection methods (such as equipment cleaning), chemical instability of the samples, and interferences (matrix effects).

TABLE 1
QUALITY CONTROL ELEMENTS – ARSENIC AND LEAD IN SOILS BY SW 846 METHOD 6020

	Quality Control Test	Minimum Frequency	Acceptance Criteria	Corrective Action
Precision	Field Duplicates	1 per 20 samples collected (5%)	50% Relative percent difference (RPD)	Qualitative review by County staff to gauge effect on overall project precision. Only result for primary sample will be used in data evaluations.
	Lab Duplicates	1 per 20 samples (5%), or 1 per extraction batch (whichever is more frequent)	35% RPD, if concentrations of both are > 5 x reporting limit (RL). If either the sample or duplicate result is < 5 X the RL, the difference in the concentrations must be less than 2 X the RL.	If sample or duplicate is > 5x RL, and if results are >20% RPD, then reanalyze batch. If similar results, flag samples accordingly. If sample or duplicate is <5x RL, and difference is >2x RL, flag associated samples accordingly.
Accuracy	Matrix Spike	1 per 20 samples (5%), or 1 per extraction batch (whichever is more frequent)	Where the native sample concentration is less than 4 X the amount spiked, the %R must be 75% to 125%. For analytes where the native sample concentration is greater than 4 X the amount spiked, no evaluation will be made	If MS is outside of control limits, will report blank spike results (if w/in acceptable limits) and flag samples accordingly. If blank spike is out of limits, then reanalyze entire batch.
	Standard Reference Materials	1 per 20 samples (5%), or 1 per extraction batch (whichever is more frequent)	Analyte results must be within manufacturers certified acceptance limits	Redigest and reanalyze associated samples
	Lab Control Sample/Blank Spike	1 per 20 samples (5%) or 1 per extraction batch (whichever is more frequent) (May be done in addition to SRM, but not replace SRM)	% Recovery of 80 - 120%	If out of control limits, reanalyze associated batch. If still out of limits, flag samples accordingly.
	ICP Serial Dilution	1 per 20 samples (5%), or 1 per extraction batch (whichever is more frequent)	When original sample result is > 50 x mdl, then Rpd between undiluted & diluted <10% or suspect matrix interference.	Redigest & reanalyze associated samples. If fails, then evaluate results post digestion spike. Flag if RPD > 10%
	Method Blanks	1 per 20 samples (5%), or 1 per extraction batch (whichever is more frequent)	Absolute value of blank result < RL, or associated sample results must be > 10 times blank concentration.	Reanalyze batch.

TABLE 1 QUALITY CONTROL ELEMENTS – ARSENIC AND LEAD IN SOILS BY SW 846 METHOD 6020				
	Quality Control Test	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Representativeness	Qualitative measure. Sample design plan has considered representativeness in sample layout and allocation and in identifying the boundaries of a play area. A qualitative review of each facility will determine which areas to sample to be representative of the area children are playing in. Sampling from the top 0-6" of soils represent the soils children are most likely to come into contact with on a regular basis. Sampling from the 6-12" of soils shows if contamination extends below the top six inches of soils.			
Comparability	Sample methods, sample design, analytical procedures match that of past projects, except that this project will not include sampling at two depth horizons (0-2" and 2-6"). Instead will obtain sample from 0-6". Evaluation of previous data for two horizons indicates very small difference between two horizons, so only one will be sampled in this study. This study will also evaluate the 6-12" soil layer. Some facilities will only have one quarter of the 6-12" borings analyzed, while other facilities will have all 6-12" borings analyzed.			
Completeness	Valid samples taken from 100% of facilities where qualitative evaluation indicates sampling is warranted. Valid measurements obtained for at least 90% of all samples submitted to lab.			
Sensitivity	Practical quantitation limits of 6.25mg/kg for arsenic and 5 mg/kg for lead will be appropriate for comparing sample results to MTCA Method A cleanup levels of 20 and 250 ppm.			

5.2.1 FIELD PROCEDURES

The potential for introducing bias will be minimized by adherence to established procedures for collection, preservation, transportation, and storage of samples (per each county Implementation Plan).

5.2.2 LABORATORY PROCEDURES

Bias due to sample matrix effects will be assessed by spiking a sample with target elements of known concentration and calculating the percent recovery (matrix spikes). In addition, analytical bias will be assessed by analyzing a standard reference material (SRM) and calculating the percent difference between the measured value and the known value of the standard. SRMs are purchased samples of a similar matrix as the field samples with certified, known concentrations. The use of SRM samples will be as follows:

> *The SRM will be prepared and analyzed with each analytical batch of samples, and the results of the analysis must be within the performance acceptance limits, as published by the supplier of the SRM, that correspond to the digestion procedure used by the laboratory. If SRM results are outside the acceptance limits, the entire analytical batch, including a new aliquot of the SRM, all associated samples, and all QC samples, will be redigested and reanalyzed. In cases where an analytical batch of samples must be redigested and reanalyzed, the laboratory must notify the designated project QA officer at the appropriate agency within 24 hours.*

Matrix spike samples and SRMs will be analyzed for no less than one sample in twenty (i.e., 5 percent) samples or one per batch analyzed, whichever is more frequent. Target laboratory accuracy objectives for matrix spike recoveries, expressed as percent recovery of the known spike amount, are 75 percent to 125 percent for each sample and element, except that, for analytes where the native sample concentration is more than four times the amount spiked, no evaluation will be made. For the SRMs, the measured concentration must be within the manufacturer's certified acceptance range.

Laboratory accuracy (as bias) will also be assessed by analysis of procedure (method) blank samples. A method blank sample is an aliquot of a known clean soil, sand, or deionized water sample that is prepared, digested, and analyzed along with an analytical batch of samples. The method blanks are analyzed to indicate potential sample contamination from contaminated laboratory equipment. Positive contamination from laboratory equipment would indicate a potential high bias to associated data. At least one method blank sample will be prepared and analyzed along with each analytical data group (batch).

5.3 REPRESENTATIVENESS

Representativeness expresses the degree to which sample data accurately represent the environmental conditions and variations within the sampling area. Representativeness is a qualitative parameter that is most affected by proper design of the sampling program. The representativeness criterion is best satisfied by making certain that sampling locations are selected properly and a sufficient number of samples are collected. The samples for this project will be collected in accordance with the sampling strategy specified in the main text and Appendix A of this document. The strategy has been developed to identify priority sites and provide data that are representative of the conditions within a site.

5.4 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Sample data should be comparable with other measurement data for similar samples and sample conditions. Comparability within this project and to past projects will be maintained by employing an Ecology-accredited laboratory, use of the same EPA-approved analytical methods, consistent reporting limits, consistent units, and consistent sampling methodologies. Comparability is affected by the other DQO parameters because only when precision and accuracy are known can data sets be compared with confidence. One aspect where data from this program will not be directly comparable with prior studies is in that prior studies evaluated soils from two depth horizons, 0-2", and 2-6". During the design process for the Soil Safety Program, the project team determined that the results from the two horizons were not significantly different, so that testing from one, combined, soil horizon was appropriate for this program. In 2010, the depth between 6 and 12" was added to the sampling protocol. This is to establish if contamination extends below the top six inches.

5.5 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a sampling and analysis program, expressed as a percentage of the number of valid measurements that should have been obtained. In general, completeness can be impacted by the number of field samples collected as opposed to the number planned, as well as by the number of valid analytical measurements obtained as compared to the number requested. For field sampling, the goal will be to obtain valid samples from 100% of facilities where the qualitative evaluation indicates sampling is needed. For analytical measurements, the target overall completeness objective for this project is 90 percent.

6.0 DATA REDUCTION, REVIEW, AND REPORTING

The process of data reduction, review, and reporting is applicable to all aspects of the project (field activities, laboratory analyses, analytical data validation) and is required for both project information and technical data. Project information (e.g., field logbooks, storage records, project tracking records) will be maintained to verify adherence to both field and laboratory protocols.

Technical data from field and laboratory analyses will be combined to characterize the contamination at the properties. Documented verification of these data is crucial. Consistent, documented data reduction techniques, for both hand calculations and computer analyses, and standardized technical data review are equally important in the verification of the technical data.

The following sections describe the process of handling field and laboratory data in terms of data reduction, review, and reporting.

6.1 DATA REDUCTION

Data reported by the laboratory and data collected in the field will be reduced by manual and computerized calculations. Procedures for ensuring the correctness of the data reduction process will include the following:

- Data will be reduced either manually on calculation sheets and field logbooks or by computer in spreadsheets or databases.
- Technical personnel will document and review their own work and are responsible for the correctness of the work.
- Calculations will be checked for methodology and accuracy, prior to use in reports, by an engineer or scientist of a professional level equal to or higher than that of the person who performed the calculation.
- The Project Manager at the laboratory will be responsible for ensuring that lab data reduction is performed in accordance with this QAPP.
- The field staff and project managers at the county health departments will be responsible for ensuring that field data are recorded and documented appropriately.

6.2 LABORATORY DATA REVIEW

Data generated by the laboratory will be reviewed prior to their release. In-laboratory data reduction and review will be conducted by the laboratory in accordance with the review processes documented in its Quality Assurance Manual. At a minimum, the laboratory will perform the following levels of data review:

- Analytical level (bench level chemist)
- Data section level (laboratory section supervisor)
- Final quality review (laboratory project manager or laboratory QA officer).

This review shall include the following procedures and elements:

- Primary review documented on data review worksheets.
- Secondary review performed by peer reviewer; documented on a secondary review checklist.
- Review of the data validation report by a qualified data review specialist or the laboratory QA officer; documented on a Report QC and approval checklist.

Review and approval for release by the laboratory project manager; documented by signature on transmittal memo.

6.3 LABORATORY REPORTING

The laboratory will submit an electronic data delivery (EDD), in a format mutually agreed upon, to the respective county health department staff within 30 days of sample receipt, followed by hard copy of the report package (this can be digital in PDF format). The laboratory shall perform quality control assessment of its Electronic Data Deliverable before transmitting to the counties.

The hard copy report of analytical data deliverables from the laboratory will include items listed in Attachment 1 (Laboratory Data Package Deliverables). All data packages must be complete, legible and of sufficient quality to undergo evaluation by an independent, third party validator, if it is later determined to be necessary. Incomplete, illegible or unusable data packages will not be accepted, and will be returned to the laboratory for correction. Minor clarification and corrections to the data package, which are requested by the county project managers, will be provided by the laboratory within three (3) calendar days of the request.

Completed data packages from the laboratory will include a list of sample numbers covered in the data package, a narrative outlining any problem, corrections, anomalies, description and discussion of data qualifiers and conclusions, as well as chain-of-custody documentation. The narrative will describe results of quality control samples and compare them to quality control limits. Each hard copy data package will clearly state which electronic data delivery it is associated with. All data package pages will be sequentially numbered.

7.0 DATA MANAGEMENT

This section describes the procedures to be used to document and track chemical data. The objective of these procedures is to assure that all data collected during the project are processed and archived in a manner that assures data quality, security, and retrievability, thereby assuring information integrity.

Maintaining data integrity involves all aspects of the project beginning with the collection of the first sample and continuing through archiving the electronic and hard copy results. Three primary tasks will be carried out to ensure data integrity throughout the duration of the project: sample management, management of hardcopy forms of data, and electronic data management.

7.1 SAMPLE MANAGEMENT

Sample management will involve monitoring and tracking of samples through the chain-of-custody process, from the time they are collected, through final disposal of samples after data have been reviewed and determined to be adequate. Each sampler will specify its procedures for storing, delivering, and tracking samples in their Field Implementation Plans. It will be the responsibility of every individual who handles the samples to ensure that chain-of-custody forms are filled out accurately and completely. **Attention to detail when transcribing sample numbers is of the utmost importance.** In addition to chain-of-custody forms, the laboratory will send confirmation e-mails to the client indicating which samples have arrived at the lab and the dates of their arrivals. Each sampler's project coordinator will assure the following sample management tasks are conducted:

- Ensuring that samples are stored in a secure environment at the proper temperature until delivery to the lab.
- Accurately tracking the transport of field samples to the laboratory through chain-of-custody documentation and confirmation e-mails.
- Reviewing sample confirmation e-mails and comparing them to field logbooks and sample numbers and dates entered into the database for that week.
- Confirming that all requested procedures, analysis, and re-analysis are performed.

Samples will be analyzed within 20 days of delivery and electronic results will be provided to the samplers within 30 days of receipt at the lab. The lab may hold small groups of samples for short periods of time to combine with other samples to complete the sample batch. The lab will store the samples after analysis until notified by the sampler that the electronic and hard copy deliverables have been reviewed and are acceptable.

7.2 MANAGEMENT OF HARD COPY DATA

Field data will be recorded in field log books and on standard forms. Relevant portions of the field data will be transferred manually to the Counties' databases. Copies or originals of the field data will be sent to Ecology at the end of the project, or on a mutually agreed-upon schedule, for appropriate long-term storage.

Hard copy report packages (accepted as digital PDF files), according to the list in Attachment 1, will be submitted to the sampler by the laboratory following the electronic data delivery. Each sampler's project coordinator will review the report packages data for completeness upon receipt and obtain complete information from the lab if needed. These laboratory deliverables and other hard copies will be stored and maintained in organized files until data reporting to Ecology is completed, at which time all hardcopy materials will be sent to Ecology for appropriate storage pertinent to the Administrative Record for the TSP Site.

7.3 ELECTRONIC DATA MANAGEMENT SYSTEM

Computer-based data management systems using relational database software at Pierce and at King Counties' health departments will be used for this project to store the results of the laboratory chemical analyses and associated field information when sampling is performed by the counties. An electronic version of the laboratory chemistry data will be supplied by the laboratory to the Counties in a format which is compatible with the counties relational databases, to be agreed upon prior to project commencement. The information compiled in the database for the field locations and chemical analysis results will include, at a minimum, the fields necessary to populate Ecology's Environmental Information Management (EIM) database. Ecology will provide technical assistance to the samplers to ensure the appropriate fields and formats are included in the databases for transfer to EIM. Data will be transferred to EIM by each county's data manager using the internet data submittal function of EIM, with assistance from Ecology if needed. Data transfer will occur on a schedule mutually agreed to by Ecology and each Health Department or contractor.

The master copy of the electronic databases from each county will reside on a secure network through the duration of the project. The database will be backed up regularly.

7.3.1 DATABASE ENTRY AND VALIDATION

Only the data manager or personnel authorized by the data manager at each health department will be permitted to update or edit the database. Other personnel who need to use the computerized data will be prohibited from altering the data and structure of the database; user entry restrictions will be built into the database software and will be set to grant read-only privileges to such users.

Information will be loaded into the database promptly following the receipt of the data from the field or laboratory. Some data entry will be accomplished manually, but the majority will be downloaded into the database from the laboratory electronic data deliverables. Data entered manually from documents and field forms will be checked to assure that correct data transcription has occurred. After the entries are complete, a person other than the data entry person will verify 100 percent of all hand-entered data against hardcopy.

Electronically loaded data will be compared to hardcopy forms of the data as well as the source EDD to confirm correct transfer. It is the responsibility of each party who handles samples or data to ensure that all data transmissions and transcriptions are correct and accurate. It is especially important to compare EDDs to hardcopies or their original files that have not been through an electronic transfer. This ensures that any errors created during the electronic transfer are corrected.

Additional data QC checks to be performed by the health departments include:

- Comparing sample numbers and dates indicated in confirmation e-mails from the laboratory with those entered into the database from field logbooks and chain-of custody forms.
- Review of hand-entered data by at least one other project staff member.

8.0 PERFORMANCE AND SYSTEM AUDITS

The designated project manager at each county health department will monitor the performance of the field and information management activities. This will be achieved through review of field logs, internal coordination meetings to ensure practices are consistent, and review of data quality narratives and results from the laboratory.

Since the laboratory used for this project must be certified by the State of Washington (either directly or through reciprocity), and is audited by the certifying agency at least annually, a project audit is not anticipated. On-going project performance will be determined through laboratory quality assurance and quality control measures.

9.0 DATA ASSESSMENT PROCEDURES

9.1 PROJECT STAFF DATA REVIEW

All data deliverables generated for this project will be reviewed by the health department project staff for completeness and accuracy. The hard copy and electronic data packages will be evaluated for completeness and for consistency with the project quality control requirements described in Section 3 and in Table 1. Mistakes or inconsistencies discovered will be reported to the laboratory by the county project staff by email, specifically noting what problem was identified and requesting correction by the laboratory. Ecology will be copied on all requests for correction, and their resolution.

Each data package will be reviewed for:

- Completeness (according to Attachment 1, for hard copies)
- Analytical holding times from summary forms (met or not met)
- Chain of custody (COC), sample handling, and ensuring that all samples have been analyzed for the requested analytes.
- Analytical accuracy [i.e. matrix spike compounds and standard reference materials, expressed as percent recovery (%R)] from summary forms. (Review of lab calculations and spot check calculations, compare to acceptance limits).
- Analytical precision (i.e. comparison of duplicate sample results) expressed as relative percent difference (RPD) from summary forms. (Review of lab calculations and spot check calculations, compare to acceptance limits).
- Relative percent difference calculations for field duplicate samples.
- Reporting limits (RL's) – (identify range and compare to acceptance limits.)

Each sampler will develop a review checklist with the above elements for data quality assessment and will attach it, either electronically or physically, to each hard copy data package. It is recommended that the samplers perform a summary review of data quality and completeness when the electronic deliverable is provided from the lab to catch problems early on.

A summary of the quality control reviews, consisting of copies of the completed checklists and a short narrative describing any quality control issues and their resolution, will be submitted to Ecology by each county or contractor with their quarterly reports.

Calculation of quantitative measures of data quality is reviewed below.

9.1.1 PRECISION

The results from field duplicate analyses and laboratory duplicate analyses will be used to determine the relative percent difference (RPD) between the pair of analyses. The RPD for field duplicates will be used as a measure of field precision and the RPD for laboratory duplicates will be used as a measure of analytical precision. The RPDs will be calculated as follows:

$$RPD\ (\%) = \frac{100\ (C1 - C2)}{[(C1 + C2) / 2]}$$

Where:

RPD	=	relative percent difference
C1	=	the higher concentration measured for the duplicate samples
C2	=	the lower concentration measured for the duplicate samples

Only the results from the primary sample will be used for project decisions.

9.1.2 ACCURACY

For spiked samples (matrix spikes and lab control samples), the percent recovery (% R) will be used as the measure of accuracy and is calculated as follows:

$$\%\ R = [100\ (Cs - Cn)] / Csa$$

Where:

% R	=	percent recovery
Cs	=	measured concentration in spiked aliquot
Cn	=	measured concentration in non-spiked aliquot
Csa	=	actual concentration due to spike added

The percent difference (% D) for analysis of SRM samples will be used as an additional measure of accuracy and is calculated as follows:

$$\%\ D = [100\ (Csrm - Cm\ )] / Csrm$$

Where:

% D	=	percent difference
Cm	=	measured concentration in SRM aliquot
Csrm	=	certified SRM concentration

9.1.3 COMPLETENESS

The measure of completeness will be based on the number of environmental soil samples submitted to the laboratory for analysis, and will be calculated as follows:

$$C\ (\%) = \frac{100\ (\text{Number of acceptable measurements})}{(\text{Number of samples submitted})}$$

10.0 CORRECTIVE ACTION

It is the intent of the quality assurance process to minimize the need for corrective action through the development and implementation of effective internal controls. To accomplish this goal, corrective action procedures will be implemented, as described in this section, for each measurement system. The corrective action procedures will involve the following steps:

1. Discovery of a nonconformance
2. Identification of the cause or responsible party.
3. Plan and schedule corrective measures.
4. Confirmation that the corrective measures achieved the desired results.
5. If nonconformance is discovered after initial submission, resubmission of corrected data will be required.

Activities subject to quality control and quality assurance will be evaluated for compliance with established procedures and acceptance criteria described in the FSP, this QAPP, and the laboratory quality assurance manual. A lack of compliance with these procedures will constitute nonconformance. Any project team member who discovers or suspects a nonconformance is responsible for requesting a corrective action. The County Health Department Project Coordinator or the contracted project coordinator will ensure that no additional work that is dependent on the non-conforming activity is performed until corrective action is implemented.

10.1 FIELD CORRECTIVE ACTION

The initial responsibility for monitoring the quality of field measurements and procedures lies with the field personnel. Each technical staff member is responsible for verifying that all QC procedures are followed. The technical staff member will assess the correctness of the field methods and the ability to meet QA objectives while conducting the work. If a problem occurs which might jeopardize the integrity of the project or cause a quality assurance objective not to be met, the technical staff member will notify the project manager. Corrective measures will be determined and implemented as appropriate. The technical staff member along with the project manager will document the problem, the corrective measures, and the results. Documentation will be through use of a corrective action form, unless the problem is determined to be minor, in which case documentation in a field logbook may be done instead.

10.2 LABORATORY CORRECTIVE ACTIONS

The need for corrective actions in the analytical laboratory may come from several sources: equipment malfunction, failure of internal QA/QC checks, method blank contamination, failure of performance or system audits, and/or noncompliance with QA requirements. When measurement equipment or analytical methods fail QC checks, the problem will immediately be brought to the attention of the appropriate laboratory project manager and other persons in the laboratory in accordance with the laboratory's quality assurance manual. If failure is due to equipment malfunction, the equipment will be repaired, precision and accuracy will be reassessed, and the analysis will be rerun. Attempts will be made to reanalyze all affected parts of the analysis so that, in the end, the product is not affected by failure to meet QC checks. The laboratory project coordinator will ensure that no additional work that is dependent on the non-conforming activity is performed until corrective action is implemented.

In the following situations, reanalysis will automatically occur:

- Linear range exceeded; sample dilution required.
- Method blank contamination (blank concentration is greater than the reporting limit and sample concentrations are less than 10 times the blank concentration).
- Percent recovery of SRM is not within the acceptable performance limits.
- Calibration verification samples not within control limits.

All incidents of QC failure and the corrective actions will be documented, and reports will be placed in the project file and sent to the County Health Departments along with the data hardcopies. If, at any time, the QA/QC criteria outlined in this QAPP are not met and the laboratory corrective action does not resolve the problem, the County Health Department project manager will be notified and a corrective action report initiated.

11.0 REFERENCES

Ecology, April 2004, Quality Assurance Project Plan, Tacoma Smelter Plume Project, Extended Footprint Sampling. Prepared in conjunction with Tacoma-Pierce County Health Department, Kitsap County Health Department, Public Health- Seattle & King County, and Thurston County Health Department.

SAIC, 2002. Final Quality Assurance Project Plan for Work Assignment No. SAI28, Contract No. C9800045, Child Use Area Sampling Program, Tacoma Smelter Plume Investigation, Pierce and King Counties, Washington. October.

EPA. 1994. USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review. EPA 540/R-94/013. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. Washington DC. February.

ATTACHMENT 1

LABORATORY DATA PACKAGE DELIVERABLES

Deliverables on Report
Case narrative
Cross reference of the field sample ID number, laboratory sample number, and analytical batch
Chain-of-custody forms
Sample results
Blank results preparation
Matrix spike results
Duplicate sample results
Laboratory Control Sample (LCS) results
All pages must be numbered sequentially
On Record at Laboratory
Internal standard results (ICP-MS only)
Interference Check Sample results
SRM results and manufacturer's Certification of Analysis
Serial dilution results
Blank Results: Initial, continuing and prepartion
Initial calibration data
Instrument Detection Limits (yearly)
Linear ranges (yearly)
Preparation log (including percent solids)
Analysis run log
Standards preparation sheet/logs
ICV, CCV, and ICSAB True Values
Raw data and instrument printouts
Continuing calibration verification data

APPENDIX C

Communication Strategy

APPENDIX C
COMMUNICATION STRATEGY

PURPOSE

The purpose of this communication strategy is to summarize how the Tacoma Smelter Plume project team intends to manage and communicate Soil Safety Program content and key messages to audiences and stakeholders. To increase success, representatives of key audiences and stakeholders have provided input on this strategy and will continue to provide feedback during program implementation.

The project team will evaluate and modify this strategy as the program evolves, and use this strategy as a touchstone to ensure cohesive and clear communication when developing new materials or making program changes.

BACKGROUND

The legislature passed a law (Chapter 70.140 RCW) in 2005 to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law directs Washington Department of Ecology (Ecology) to:

- Work with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of the Superintendent of Public Instruction (OSPI), and local health departments;
- Test soils at schools and childcares within the Tacoma Smelter Plume; and
- Encourage actions that reduce exposure of children to smelter arsenic and lead.

Ecology is working with Public Health – Seattle & King County (PHSKC) and the Tacoma-Pierce County Health Department (TPCHD) to implement this law. Ecology provides grants to the health departments to conduct activities related to the Tacoma Smelter Plume, including sampling soil at schools and childcares, providing education and outreach, and assisting in the implementation of actions that reduce contact with arsenic and lead.

The health departments, DSHS, DOH, OSPI, public and private schools, childcare advocacy groups and support organizations, childcare provider union, and individual childcare providers have provided input to this communication strategy. Ecology solicited input primarily through four meetings.

Ecology convened two meetings of stakeholders in November (schools) and December (childcares) 2005 to review soil contamination materials for both statewide distribution and the Tacoma Smelter Plume. Based on these meetings, Ecology determined there was a high level of stakeholder interest in the Soil Safety Program design, and periodically convening an ad hoc stakeholders' review group would be advantageous for designing and implementing a program that met the audiences' needs. Ecology also determined that they should develop materials specific for the program – separate from statewide materials.

Ecology convened a communication strategy team meeting on March 8, 2006 and another stakeholders' meeting on March 29, 2006 to get feedback on the draft program design and materials, including a general communication approach.

The input received at these four meetings greatly influenced the program's design and this communication strategy.

OBJECTIVES

This communication strategy is designed to meet three key objectives:

- Create a cohesive, engaging and positive image of the Soil Safety Program and program partners, resulting in a high level of voluntary participation among target audiences.

- Coordinate messages and marketing among the program partners and stakeholders, especially among Ecology and the health departments, so that schools and childcares understand the program and can easily participate.

- Keep stakeholders well informed and involved throughout the life of the program, relying on their expertise and experience in the development and use of communication tools and in program evaluation.

MODIFICATIONS AND UPDATES

Ecology will need to update this communication strategy to reflect lessons learned through program implementation. During program implementation, it will be important for the project team to keep each other and stakeholders informed of changes prior to changes taking effect.

An important role of stakeholders is to provide feedback to Ecology about how well the program is accepted and implemented by schools and childcares – and how to improve the program. Ecology will invite stakeholders to periodically review and comment on new program elements or materials, and to hear program results tracked through the database.

Specifically, Ecology will convene a meeting of stakeholders in November 2006 to review program results to that point, and to advise Ecology on any beneficial modifications to the program

prior to Ecology's December 2006 report to the legislature. Ecology will update the communication strategy in January 2007 to reflect lessons learned and input from stakeholders and the legislature.

AUDIENCE AND STAKEHOLDER PROFILE

There are many audiences and stakeholders with an interest in the health and safety of children. The Soil Safety Program's two main audience categories are schools and childcares – including children and their families. Key program stakeholders are those agencies, groups, organizations, and associations responsible or concerned for children's health and safety at schools and childcares. Table 1 contains the Soil Safety Program's audiences and stakeholders.

TABLE 1
SOIL SAFETY PROGRAM AUDIENCES AND STAKEHOLDERS

Audiences

Schools

Primary

- School district superintendents
- School facility managers
- School risk managers
- School operations and maintenance staff
- Private school owners
- Private school board of trustees or regents
- Private school headmasters
- Public school principals

Secondary

- School Boards
- PTAs
- Teachers
- School Staff
- School Nurses
- Students
- Parents and families of students

Childcares

Primary

- Multi-location childcare owners
- Multi-location childcare operators
- Multi-location childcare facility managers
- Multi-location maintenance providers
- Single location center owners
- Single location center operators
- Home childcare owners
- Home childcare operators
- Licensed pre-schools

- Unlicensed pre-schools we know of
- Head Starts
- Early Childhood Education and Assistance Program (ECEAP) facilities
- Property owners

Secondary
- Childcare staff
- Head Start offices (Educational Service Districts, etc.)
- Customers – parents and families, children

Stakeholders

Primary
- Our partners (DSHS/DCCEL, DOH, OSPI, Child Care Resource and Referral Network) and each other
- Agency management
- Legislature general
- Legislation sponsors
- Media – especially early childhood publications
- Supporters:
    - Public health nurses
    - Key Childcare organizations
        - The Collaborative on Health and Environment members
        - WAEYC
        - Washington Parents for Safe Childcare
    - Washington Toxics Coalition school program

Secondary
- Other childcare organizations as appropriate
- Local governments other than Health Departments
- State Agencies other than partners – CTED, L&I
- Other environmental groups as appropriate
- Parent groups

The following paragraphs contain communication considerations stakeholders shared with the project team during the four meetings held in 2005 and 2006. Ecology will convene additional stakeholder meetings throughout the life of the program to help ensure cohesive and effective communication of program content and messages.

Program Design Communication Considerations

During the meetings described above, attendees identified several issues to consider when working with schools and childcares. Most of these considerations are more about program timing and sequencing than communication, but are listed here to ensure they are recorded and available for reference.

Schools

- *Seasonal maintenance schedule is predominately summer*

Childcares

- *On-site visits by the health departments and Ecology should be convenient for the school or childcare.*
- *Be careful about creating unfair business advantage or disadvantage for childcares.*
- *Go through corporate childcare offices with notification to local operator.*
- *Ensure maintenance is low cost and minimized so soil safety actions succeed long-term.*

Schools – Communication Considerations

Public school stakeholders have urged the project team to initiate communication directly with school district superintendents. Given each district is different, this allows a superintendent to delegate responsibility as they chose; manage the communication and messages to facilities or operations managers, school boards, principals, staff, parents, school boards and students; and take a coordinated approach for multiple schools. Working through the superintendent also honors the fact that school principals are busy with academic issues and need the support of their superintendents to institute soil safety actions.

The public school stakeholders have been especially clear that working with the district superintendent on an action plan that meshes with budgets and construction plans is important to successful on-the-ground implementation of soil safety actions. Having an action plan in place or at least underway before fully engaging the school board or parents is also important, so the superintendent can present the problem and solution in tandem.

The Office of the Superintendent of Public Instruction (OSPI) plays a pivotal supportive role in communicating with public schools and is an official partner in the Soil Safety Program. OSPI provides guidance on school health and safety, oversees regulatory compliance, and facilitates communication among schools and school administrators. OSPI uses publications, a website, and other tools to communicate with public schools. In addition to direct communication to public school district superintendents, Ecology will work through OPSI to communicate key messages and program content to public school audiences.

Private (or independent) school stakeholders have described private schools as more individualized than public school districts. Some private schools are not part of a larger organization and the school headmaster makes decisions independently or in cooperation with a board of trustees. Some private organizations manage more than one school, and the board of trustees or regents of these organizations will likely want to have a coordinated multi-school approach and manage the communication and messages to headmasters, staff, parents, and students.

Private schools are not eligible for services provided by OSPI and have formed their own associations to serve their needs. The Pacific Northwest Independent Schools Association is the largest of these and Ecology will contact them to discuss outreach to private schools. Other associations may exist and Ecology will contact them to facilitate communication of Soil Safety Program content and messages.

Childcares – Communication Considerations

Childcares are the most diverse and complex audience category. For the purpose of the Soil Safety Program, childcares include Head Start programs, Early Childhood Education and Assistance Program (ECEAP) childcares, pre-schools, and licensed childcares.

Given this diversity, communication tools need to be flexible. Materials and information need to be appropriate for multi-location and single location childcares, large and small childcares, and a broad range of owner and operator education and cultural backgrounds. Language translations will be essential to communicate with some childcares and their customers. Ecology will translate certain materials into Spanish and Russian initially, and into other languages as appropriate. Ecology has a translation team in-house that can provide Spanish and Asian language translations, and Ecology will contract for Russian and other services as needed.

Many agencies and organizations provide support to and communicate with childcares. These agencies and organizations attended the stakeholder meetings in significant numbers. Childcare stakeholders have strongly urged the project team to use existing agencies and organizations, and existing trainings, publications, list serves, and other tools to communicate with childcares. They also strongly urged the team to work with existing agencies and organizations to publicize the program requirements and services for a few months prior to requesting access for soil sampling – as a way to gain more voluntary participation. By introducing the program through known and trusted agencies and organizations, childcares should welcome the program more than without such an introduction.

Working closely with DSHS licensors, childcare owner and operator trainers, the childcare union, and advocacy groups on overall program design and implementation should increase the long-term sustainability of soil safety actions. Soil Safety Program funding will eventually run out. Once soil safety actions are in place, childcare agencies and organizations will play a major role in ensuring soil safety actions continue into the future.

KEY MESSAGES

Summarized below are the key messages we want audiences and stakeholders to act upon and understand. These key messages reflect existing messages used for the Tacoma Smelter Plume project

during 1999 – 2006, and input from stakeholders and project team members at the Communication Strategy meeting of March 8, 2006. A question and answer piece containing most of the key messages was presented to stakeholders by Ecology on March 29. The current wording reflects feedback from these stakeholders.

1. Ecology and the health departments are partners with you in caring about the health and safety of children.
2. State agencies and organizations that care about children support the program.
3. The program provides free technical and financial assistance.
4. You are encouraged to use this free program while funding and assistance is available.
5. Ecology based the program on a new state law. The state law requires schools and childcares to provide access for soil testing.
6. If you choose not to take actions to protect children in your care, you are required to notify parents of soil sampling results. (Note: Deliver this message only to those with soil results above state standards.)
7. Ecology and the health departments will provide services at a time that is convenient for you.
8. We appreciate your participation. Ecology will acknowledge you for your participation.
9. We want to celebrate your participation with your permission. However, regardless of your permission, some information is still part of the public record.
10. We will serve areas of potential higher levels of arsenic and/or lead first, based on proximity to the Tacoma Smelter, wind patterns, and previous test results.
11. Although there are health concerns with arsenic and lead in even low amounts, the higher the amount the greater the health concern.

MARKETING THE MESSAGES

The project team and stakeholders are from a variety of agencies and organizations, and operate under various mandates and directives. This means we all have our own terminology, writing styles, logos and publication formats. To accomplish our objectives (see above), the project team will use consistent graphics, terms and taglines that invites the audiences' attention and participation in program services.

Graphics

Ecology has developed a letterhead template with the Dirt Alert logo and list of program partners (see Attachment C1). Tacoma-Pierce County Health Department (TPCHD) originally developed the logo for the Pierce County portion of the Tacoma Smelter Plume project. TPCHD has tested the logo in focus groups and used it successfully for several years. TPCHD has graciously

agreed to use of the logo plume-wide. Ecology will highlight the logo in all Soil Safety Program materials.

The program partners include Ecology, PHSKC, TPCHD, DSHS, DOH, OSPI, and the Washington Child Care Resource and Referral Network. These partners have agreed to be included on the letterhead template, which underscores the broad-based support for the program.

Ecology has retained Kick Spark Creative, LLC for Soil Safety Program graphics support. Kick Spark Creative, LLC did the original Dirt Alert logo and created the letterhead template, certificates and decal for the program. This ensures a consistent look throughout the program materials and was cost-effective, given they had already developed materials for TPCHD. Please see Appendices F2a F2b and F2c for the program's certificates and decal. Ecology will personalize certificates for each school or childcare. The health departments or Ecology will give the first certificate to all childcares that go through the site assessment, regardless if they need soil testing or not. Ecology will give the second certificate to schools and childcares once soil safety actions are in place. Ecology will prepare the certificates and decal in the appropriate language for the audience.

Glossary of Terms

Since the beginning of the Tacoma Smelter Plume project, Ecology, PHSKC, and TPCHD have operated somewhat independently regarding terminology. Ecology terminology tends to stem from state law (the Model Toxics Control Act, etc.) and recommendations of the interagency Area-wide Soil Contamination Task Force. The health departments have each developed their own terminology consistent with their own mandates and directives as they developed public outreach and education materials for their specific audiences.

In order to present an image for the Soil Safety Program that is cohesive, simple and easily understood by key audiences, we have developed a glossary of terms for program materials. All program partners will use these terms in written or verbal communication with audiences and stakeholders. These terms contribute to an easier comprehension level, and help meet the Governor's Plain Talk directive for state agencies.

SOIL SAFETY PROGRAM GLOSSARY OF TERMS

Terms used in existing materials	Soil Safety Program terms	Example sentences
Best management practices, soil safety guidelines/tips, community protection/protective measures, soil management practices, common sense actions, healthy actions	Soil safety actions	There are soil safety actions you can take to protect children in your care.
Ecology, PHSKC, TPCHD, DSHS, DOH, OSPI, and Child Care Resource and Referral Network	Program partners	The program partners are working together to make…
Ecology, PHSKC, TPCHD	Project staff, project team	The project team will work with you to make your childcare a safer place for children.
PHSKC, TPCHD	Health department(s)	The health departments will test your soil.
Reduce risk of exposure	Reduce contact	Soil safety actions can help reduce contact with arsenic and lead.
Contamination, contaminated	Pollution, polluted	Soil testing shows your soil is polluted with arsenic and lead.
Remediation, to remediate	Make safer, make healthier	Covering or reducing the amount of bare soil creates a safer play area.
Modified Expanded Footprint CUA Study Zone	Soil Safety Program service area	Your school is in the Soil Safety Program service area.
Children you are responsible for	Children in your care	Soil safety actions help provide a safer and healthier environment for children in your care.
Elevated levels	Higher levels, raised levels	The program will start in areas where higher levels of arsenic and lead are most likely.
Child use area interim action trigger levels	State standards	If the amount of lead in your soil is above state standards, Ecology will work with you to create a Soil Safety Action Plan for your school.
Institutional frameworks, institutional capabilities	Long-term solutions	The project team is working on long-term solutions to the soil pollution,
Soil concentration	Amount	If the amount of arsenic in your soil is over 20 parts per million, we will work with you to….
Area-wide soil contamination from smelters	Smelter arsenic and lead in soil	There may be smelter arsenic and lead in your soil.
Airborne emissions, smelter emissions	Air pollution	Air pollution from the smelter settled onto Vashon Island soil.
Analytical results	Soil test results	Ecology will meet with you to talk about your soil test results.
Implementation, implement	Do, carry out, put in place	Ecology can provide design help for putting soil safety actions in place.

Taglines

Taglines are catchy phrases that succinctly convey an image, idea or message. Taglines should be memorable, and repeated throughout materials to be effective.

Listed below are taglines that will be used in Soil Safety Program materials.

- Be soil smart (e.g. Be a soil smart school)
- Be alert about dirt (e.g. This childcare is alert about dirt)
- Protecting children from smelter arsenic and lead
- Protecting children – our most important resource

- Working together toward a safer and healthier environment
- Know your soil.

Soil Safety Program taglines are designed to compliment taglines in existing Tacoma Smelter Plume materials:

- Dirt Alert: Take a closer look
- Be alert in the dirt
- Dirt can hurt
- Healthy actions: Simple things to keep you safe
- Dirt Alert healthy school
- Helping families make informed choices to reduce contact with contaminated dirt and soil.

COMMUNICATION TOOLS

A strategy is generally less detailed and more flexible than a communication plan – a plan contains specific dates, times, locations, presenters, etc. associated with each communication tool. This strategy provides some details on tools and associated audiences, purpose, distribution, and timing – but is more general than a plan and can be added to as the program is implemented.

Flexible communication tools are essential to communicating with such a diverse and complex array of audiences and stakeholders. To this end, this strategy includes a letterhead template that can be used to overlay text, and a certificate template. Using templates is cost effective because you can create materials as you need them, and use current information relevant to the specific audience – yet create a cohesive image for the program.

The letterhead template will be used as the framework for question and answer sheets, fact sheets, letters, and other information. The certificate template will be personalized with each school's or childcare's name and a specific set of soil safety actions, and translated into various languages as needed.

A key element of this strategy is outreach to childcares during April – August 2006. Ecology has a created a resource notebook with relevant information about childcare organizations and groups that have newsletters and other communication tools available to inform childcares. In April 2006, Ecology will begin submitting newsletter articles to childcare groups for publication. Ecology staff will do additional outreach through childcare organizations as they learn more about available venues and opportunities.

To complement Ecology's outreach to childcares, Ecology is providing a $10,000 public participation grant to the Washington Child Care Resource and Referral Network (the Network). Stakeholders have repeatedly mentioned the Network as a highly trusted and visible organization among childcares. Given this, Ecology will fund the Network to reach out to childcares, especially during the period April – August 2006. The Network also will independently assess the program. Ecology will use the results to improve program services, modify the program design, and inform the legislature in December 2006. The Network will also be eligible to compete for July 2007 – June 2009 biennium funding to continue childcare outreach and assessment.

Please see Attachment C3, Soil Safety Program Communication Tools, for details on templates and other tools. As the program progresses, Ecology will update the communication tools table periodically to reflect lessons learned. An important update will occur in fall 2006, after the childcare outreach has been underway for a few months and the first round of Soil Safety Action Plans are implemented.

TIMELINE

Please see the communications tools table for an approximate timeframe and circumstances for each tool. Please see Figure 1: Communication Strategy Timeline, for a general timeline of the first nine months of the program (April through December 2006). Ecology will update the timeline along with the rest of the strategy in January 2006.

ATTACHMENTS

Attachment C1
Frequently Asked Questions about the Soil Safety Program

Attachment C2
Certificates and Decal
C2a – Soil Testing Certificate
C2b – Soil Safety Action Plan Certificate
C2c – Soil Safety Decal

Attachment C3
Soil Safety Program Communication Tools Table

Frequently Asked Questions about Tacoma Smelter Plume

New state law – Free Soil Safety Program for schools & childcares

Working together to protect children from area-wide soil contamination

Please see the last page of this handout for where you can learn more about the Soil Safety Program.

Para obtener información acerca del proyecto del *Tacoma Smelter Plume*, visite al sitio Web: http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm. Si necesita más información en español, favor de comunicarse con el Sr. Gus Ordonez al (360) 407-6619.

За информацией о Проекте ликвидации выбросов медеплавильного завода Такомы посетите вебсайт: http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm. Если вам нужна дополнительная информация на русском языке, пожалуйста, звоните Александру Клементьеву в отдел здравоохранения Такомы и округа Пиэрс по телефону (253) 798-3528.

Q: What is the Soil Safety Program?

A: For almost 100 years, the Asarco company had a copper smelter in Tacoma. Air pollution from the smelter settled on parts of King, Pierce, Kitsap, and Thurston counties. Arsenic and lead are still in the soil. Some child play areas may have arsenic and lead in amounts that are a health concern.

In 2005, the legislature passed a law to keep children safe from polluted soil. The Soil Safety Program is one result of this new law. If you would like to know more about the law, see the last page of this handout.

The Soil Safety Program:

- Assists schools and childcares in providing a safer and healthier setting for children.
- Reduces children's contact with smelter arsenic and lead – especially young children.
- Identifies child play areas where children come in contact with polluted soil.
- Provides:
  - ✓ Free soil testing at all schools and childcares in the Soil Safety Program service area (please see map on page 3).
  - ✓ Free design assistance, labor and materials to put soil safety actions in place – at schools and childcares with arsenic and lead above state standards.

The Soil Safety Program partners are:

- ***Washington Department of Ecology, Toxics Cleanup Program***
- ***Public Health - Seattle & King County***
- ***Tacoma-Pierce County Health Department***
- ***Washington Department of Social and Health Services***
- ***Washington Department of Health***
- ***Washington Office of the Superintendent of Public Instruction***
- ***Washington Childcare Resource & Referral Network***

The Washington Department of Ecology (Ecology) pays for and manages the program as part of the Tacoma Smelter Plume project. Public Health – Seattle & King County and the Tacoma – Pierce County Health Department (your local health departments) are key partners in carrying out the program because of their expertise and knowledge of the local community. Another important partner in protecting children is you – a school or childcare where children learn and play.

Q: Is my school or childcare in the Soil Safety Program service area?

A: **If you received this handout from Ecology or your local health department, you are probably in the service area**. (Please see page 3 for a service area map.)

Schools and childcares in the service area generally have a greater potential for smelter arsenic or lead above state standards. Although arsenic and lead are health concerns in even low amounts, the higher the amount the greater the health concern.

Q: Why should I care about arsenic and lead?

A: Arsenic and lead cause several health problems in people. Whether someone is affected depends on the amount of arsenic and lead taken into his or her body over time. Young children are more vulnerable because they tend to put dirty fingers and toys into their mouths. Their hands and toys may have arsenic and lead on them.

Scientists have linked arsenic to a variety of health problems including heart disease, diabetes, and cancer of the bladder, lung, skin, kidney, liver, and prostate. Lead can cause behavioral problems, permanent learning difficulties, and reduced physical growth.

For more information on health effects of arsenic and lead, please contact:

Jim White, Washington Department of Health Toxicologist

Phone	*360-236-3192*
E-mail	*Jim.W.White@doh.wa.gov*
Website	*http://www.doh.wa.gov/ehp/dw/*

Please visit Ecology's Tacoma Smelter Plume website for an arsenic and lead information sheet developed just for the Soil Safety Program:

http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm

You may order a copy of the arsenic and lead information sheet by calling 360-407-6262.

You can also find arsenic and lead information on your local health department websites:

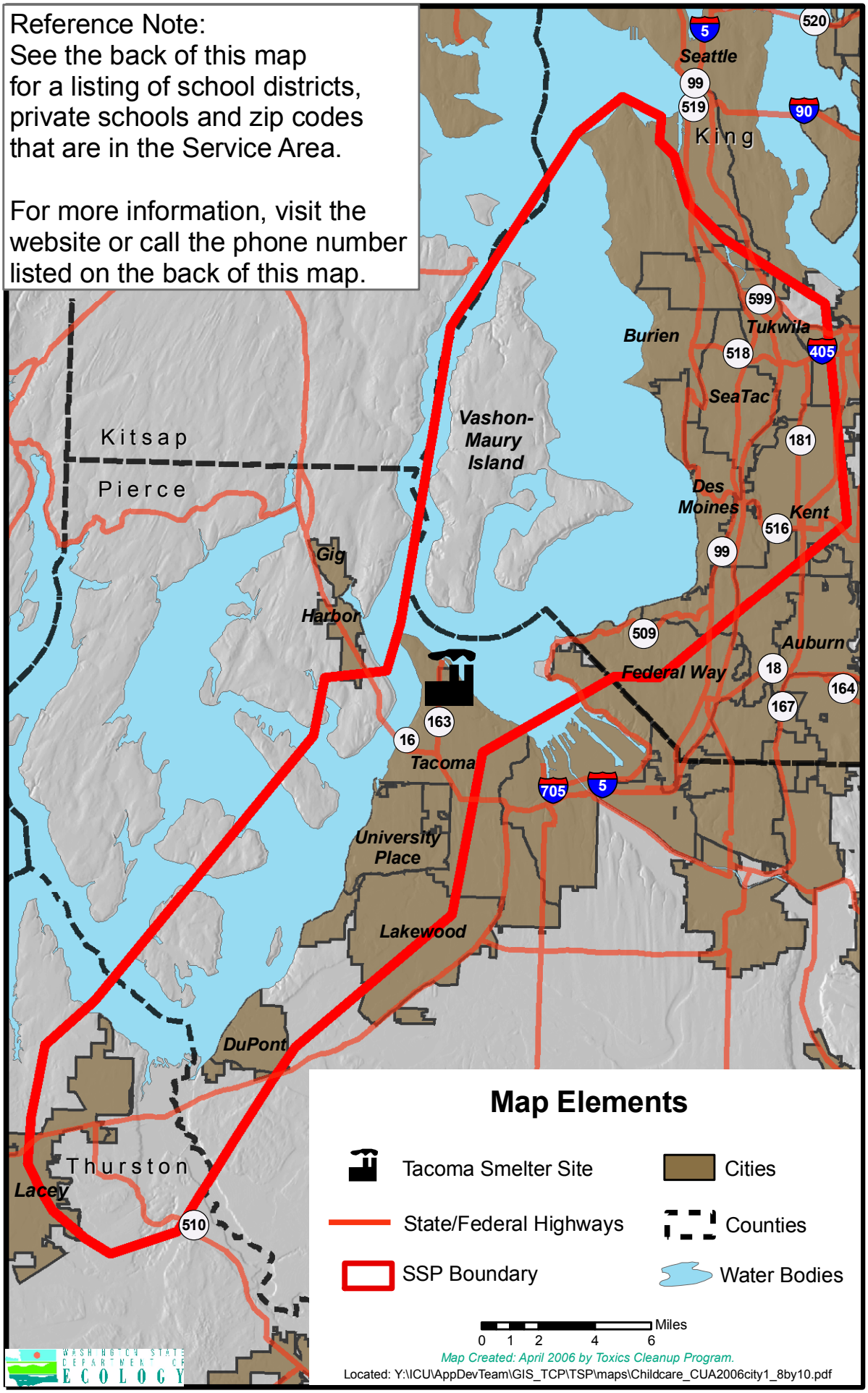
Public Health – Seattle & King County:
http://www.metrokc.gov/health/tsp/arseniclead.htm

Tacoma-Pierce County Health Department:
http://tpchd.org/dirtalert

Soil Safety Program Service Area

Reference Note:
See the back of this map
for a listing of school districts,
private schools and zip codes
that are in the Service Area.

For more information, visit the
website or call the phone number
listed on the back of this map.



Zip Code	Post Office
98001	Auburn
98003	Federal Way
98023	Federal Way
98031	Kent
98032	Kent
98055	Renton
98070	Vashon
98106	Seattle
98108	Seattle
98116	Seattle
98118	Seattle
98126	Seattle
98134	Seattle
98136	Seattle
98168	Seattle
98178	Seattle
98303	Anderson Island
98327	Dupont
98332	Gig Harbor
98333	Fox Island
98335	Gig Harbor
98359	Olalla
98366	Port Orchard
98367	Port Orchard
98388	Steilacoom
98402	Tacoma
98403	Tacoma
98405	Tacoma
98406	Tacoma
98407	Tacoma
98409	Tacoma
98416	Tacoma
98421	Tacoma
98422	Tacoma
98433	Tacoma
98498	Lakewood
98499	Lakewood
98503	Lacey
98513	Olympia
98516	Olympia
98032*	Kent
98146*	Seattle
98148*	Seattle
98158*	SeaTac
98166*	Seattle
98188*	Seattle
98198*	Seattle
98465*	Tacoma
98466*	Tacoma
98467*	University Place

Private Schools	
Annie Wright School	Tacoma
Burien SDA School	Seattle
Charles Wright Academy	Tacoma
Covenant High School	Tacoma
Des Moines Creek School	Des Moines
Earlington Elementary School	Seattle
Evergreen Lutheran High School	Des Moines
Explorer West	Seattle
Faith Lutheran School	Lacey
Family Academy/Academy NW	Seattle
Federal Way Christian Academy	Federal Way
Freedom School	Seattle
Glendale Lutheran School	Burien
Hamlin Robinson School	Seattle
Harbor Christian High School	Gig Harbor
Heritage Christian School	Tacoma
Holy Family School	Lacey
Holy Rosary Elementary	Seattle
Holy Trinity Lutheran School	Des Moines
Hope Lutheran School	Seattle
JF Kennedy Memorial High School	Seattle
Kent View Christian School	Kent
Lakewood Lutheran School	Lakewood
Learning Way School	Seattle
Lighthouse Christian School	Gig Harbor
Normandy Park Academy	Seattle
Our Lady of Guadalupe School	Seattle
Seabury School	Tacoma
SeaTac Christian Academy	SeaTac
Seattle Christian School	Seattle
Seattle Lutheran High School	Seattle
Shorewood Christian School	Seattle
St. Charles Borromeo School	Tacoma
St. Christopher Academy	Seattle
St. Patrick School	Tacoma
St. Vincent De Paul School	Federal Way
Steilacoom Classical Academy	Steilacoom
West Seattle Christian School	Seattle
West Seattle Montessori School	Seattle
Westside School	Seattle

Public School Districts	
Clover Park	Seattle
Federal Way	Steilacoom
Highline*	Tacoma
Kent	Tukwila*
North Thurston	University Place*
Peninsula	Vashon Island*
Renton	

A * indicates completely in service area; others partially overlap service area.

Website: http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm

Please contact Ecology's Soil Safety Program Coordinator: Mark Kastenbaum
Phone: 360-407-6262 E-mail: MKAS461@ecy.wa.gov

Q: Am I required to participate in the Soil Safety Program?

A: Yes. Schools and childcares within the Soil Safety Program service area are required to participate. Schools and childcares within the service area have a greater potential for polluted soil than those outside the service area. Schools include both public and private schools. Childcares include both childcare centers and home childcares. The program also includes preschools and Head Start programs, and Early Childhood Education and Assistance Program (ECEAP) facilities.

By law, schools and childcares within the service area must provide property access for soil testing. If test results are above state standards, Ecology will offer free design assistance, labor and materials for soil safety actions. See page 8 for more about soil safety actions and test results.

This is a free program to assist you in creating a safer and healthier setting for children in your care. You are encouraged to use this free program while funding and assistance are available.

Q: What funding and resources are available?

A: We believe we have enough funding for soil testing and soil safety actions at schools and childcares in the service area. We expect to offer free testing and soil safety actions at least through December 2009.

For more details about funding and resources set aside for the program, please read *Soil Safety Program – Facts about Funding and Resources*. See the last page of this handout for where to get a copy of the fact sheet.

Q: Who will test my soil?

A: Your local health department will evaluate your child play areas and, if needed, test your soil. These services will be free.

This handout should have arrived with a letter from your local health department asking permission to come and test soil in your play areas. Your letter should include a soil testing permission form. To receive a free evaluation and soil testing, you must complete and return the form to your local health department. Once the health department receives your form, they will call you to set up a convenient time to test your play area soils.

Q: What if the health department already tested my soil for smelter arsenic and lead?

A: If the health department or Ecology's contractor has already sampled your soil for smelter arsenic and lead, please call the health department and let them know you received the cover letter and form by mistake. If the health department or Ecology's contractor has already tested your soil and the levels are of concern, Ecology will contact you in late spring or early summer 2006 to assist you with soil safety actions.

Q: When will the health department test my soil?

A: The Soil Safety Program service area is big – almost 315 square miles. We estimate it will take four years to serve all the schools and childcares in the area. Described below are the local health departments' timelines for testing soil at schools and childcares.

King County Service Area

The King County part of the service area currently has 123 public and private schools, and over 380 childcares.

Schools: Public Health – Seattle & King County will offer soil testing to all public and private schools in the King County service area in April – May 2006. Soil testing will take several months, lasting through the summer.

Childcares: In late summer 2006, Public Health – Seattle & King County will begin offering soil testing to childcares. The table below lists where and when the health department will generally offer soil testing.

General Location of Childcares	General Start Time for Childcares
Vashon-Maury Island	Summer 2006
Federal Way/Auburn	Fall 2006
DesMoines/Kent	Spring 2007
Normandy Park/Burien/SeaTac/Tukwila	Fall 2007
Seattle	Spring 2008

Pierce County Service Area

The Pierce County part of the service area currently has 65 public and private schools, and over 170 childcares.

Schools: The Tacoma-Pierce County Health Department will offer soil testing to all public and private schools in the Pierce County service area in April – May 2006. Soil testing will take several months, lasting through the summer.

Childcares: In late winter 2007, the Tacoma-Pierce County Health Department will begin offering soil testing to childcares. The table below shows general locations and start times for soil testing.

General Location of Childcares	General Start Time for Childcares
North Tacoma, N.E. Tacoma	Winter 2007 – Spring 2007
West Tacoma	Summer 2007
University Place	Fall 2007
Lakewood, Steilacoom	Winter 2008
Gig Harbor	Spring 2008
Fort Lewis	Summer 2008

Q: What can I do to create a healthier environment for children while I am waiting to get my play area soil tested?

A: Please contact your local health department for information about what you can do while waiting to get your soil tested. See contact information for Public Health – Seattle & King County and Tacoma – Pierce County Health Department on the last page of this handout.

Q: How will Ecology help me with soil safety actions?

A: As soon as we have your test results, Ecology will see if they meet state standards. If your soil test results don't meet state standards (see page 10), Ecology will contact you to set up a meeting. Not meeting the arsenic and/or lead standards means there is a problem that needs attention. Ecology will explain the test results, and talk about different soil safety actions that will help protect you and the children in your care. Together, we will make a Soil Safety Action Plan for you. Ecology and the health departments will then provide the funding, labor and/or educational resources to carry out these actions.

Q: What are soil safety actions?

A: Soil safety actions are actions we can take to protect children from soil arsenic and lead. These actions also help protect adults working at schools and childcares. You are probably already taking actions that are positive and helpful. Many soil safety actions are common sense and easy to do – and have health benefits beyond reducing contact with arsenic and lead.

Some simple soil safety actions you can take now include:

- Keep children from putting dirt in their mouths
- Wash hands and faces after playing outside and before eating
- Keep dirt outside by using a door mat
- Wash children's toys and pacifiers often

Other soil safety actions, which take time to design and plan, include:

- Cover soil with sod or wood chips, or other material approved for child play areas
- Mix the soil
- Remove the soil and take to a landfill

Ecology will work with you to select the actions best suited for your school or childcare.

Q: What will my test results show?

A: Soil testing will provide a general picture of soil arsenic and lead in your play areas. The health department will take about eight samples of soil from each play area at your school or childcare. Ecology will average the results, and look at the maximum amount of arsenic and lead. Ecology will then compare the results with state standards. The table below lists the arsenic and lead amounts Ecology will use to determine if a school or childcare needs a Soil Safety Action Plan.

Amounts of arsenic and lead and when Soil Safety Action Plan is needed

Measure	Arsenic in parts per million (ppm)		Lead in parts per million (ppm)	
Average of Soil Test Results	20 ppm or less	Over 20 ppm	250 ppm or less	Over 250 ppm
Maximum Amount Found	40 ppm or less	Over 40 ppm	500 ppm or less	Over 500 ppm
Will schools and childcares need a Soil Safety Action Plan?	No – Some limited resources and advice on actions will be provided upon request	Yes – Ecology and your local health department will provide resources for a Soil Safety Action Plan	No – Some limited resources and advice on actions will be provided upon request	Yes – Ecology and your local health department will provide resources for a Soil Safety Action Plan

Once you have the test results, you can make an informed decision on what to do next. If the average or maximum amounts of arsenic or lead in your soil don't meet state standards, Ecology will work with you to develop a Soil Safety Action Plan for your school or childcare.

The Soil Safety Program Design report describes the reasoning behind the state standards and amounts chosen for the program. You can get a copy of the report from Ecology's Tacoma Smelter Plume website or by calling Ecology's Soil Safety Program Coordinator listed on the last page of this handout.

Q: What must schools and childcares do?

A: Here is what you have to do as an important partner in the Soil Safety Program:

Soil Testing – All schools and childcares must have their soil tested.

- ☐ **Give permission for local health department staff to take soil from your play areas by signing a property access form.**
- ☐ **Provide a simple drawing of your property and buildings, if you have one.**
- ☐ **Answer questions about the history and use of your property, including where children play.**
- ☐ **Receive your soil test results and learn what they mean.** If the soil test results show low amounts of arsenic and lead in your play areas, you will receive a letter describing your test results and what they mean, and a certificate of appreciation and window decal for taking part in the program. No other action is required of schools and childcares with low amounts of arsenic and lead.

  Your local health department and Ecology staff will be available to answer your questions about soil test results. Ecology and your local health department can also provide advice if you want to use your own funding to put actions in place.

Soil Safety Action Plan – Schools and childcares with arsenic and lead above state standards will be highly encouraged to put a Soil Safety Action Plan in place. The state law requires schools and childcares with arsenic and lead above state standards to put a Soil Safety Action Plan in place, or notify parents and families in writing of the test results. To take advantage of free soil safety action design assistance, labor and materials, you will need to:

- ☐ **Work with Ecology to create a Soil Safety Action Plan for your school or childcare.** You will need to sign a Soil Safety Action Plan agreement to reserve free resources. The plan will be designed just for your setting and situation, and will generally have two parts:

- Actions such as hand washing, using doormats, and other steps to make a safer and healthier setting for children. A local health department expert will offer fun and creative tools you can use to engage children in healthy behaviors.
- Actions that require design and planning such as covering or removing polluted soil, or redesigning play areas. Ecology will work with administrators, owners, and/or operators to identify the best approach - recognizing the need to coordinate work with other priorities at your school or childcare.

☐ **Maintain the soil safety actions**. Ecology and your local health department can help get soil safety actions started – but you will need to make sure they continue into the future. Upkeep of soil safety actions such as hand washing, landscaping, and play area groundcovers will be your responsibility. Ecology will work with you to estimate maintenance costs before asking for your signature on the Soil Safety Action Plan agreement.

☐ **Post a certificate that praises your participation in the program and describes your Soil Safety Action Plan**.

☐ **Allow Ecology staff to visit your school or childcare occasionally, to ensure soil safety actions are still working well for your school or childcare.**

In addition to the above items, we hope schools and childcares will be willing to give us feedback on program services and materials. We have provided a grant to the Washington Child Care Resource and Referral Network to survey childcares occasionally to learn how we can improve the program.

We also invite you to call or email the Soil Safety Program Coordinator with any questions, ideas or suggestions you may have. Please see the next page for how to reach the coordinator and where to learn more about the Soil Safety Program.

Thank you!
We look forward to working with you to make schools and childcares a healthier and safer place for children.

Where to Learn More about the Soil Safety Program

Please contact Washington State Department of Ecology for general program information.

Ecology's website contains program details:
http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm

Ecology's Safety Program Coordinator is ready to answer your questions:

Mark Kastenbaum
Washington Department of Ecology, Toxics Cleanup Program
PO Box 47775
Olympia, WA 98504-7775
Phone *360-407-6262*
E-mail *Mkas461@ecy.wa.gov*
TTY *711, or 1-800-833-6388*

You are encouraged to contact your local health department for soil testing information.

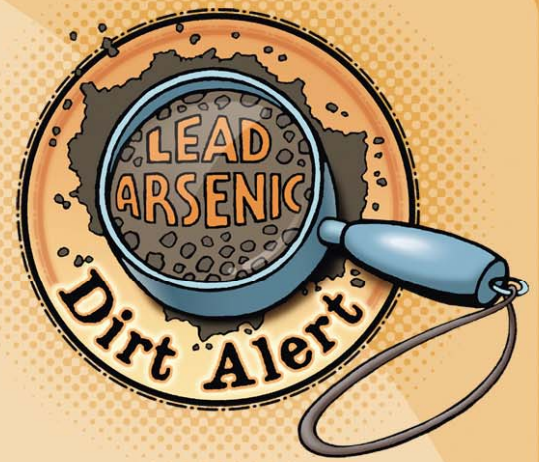
Sid Forman
Public Health – Seattle & King County
999 3rd Avenue, Suite 1200, Seattle, WA 98104
Phone *206-205-8070*
E-mail *Sid.Forman@METROK.GOV*
TTY *711*

Glenn Rollins
Tacoma – Pierce County Health Department
3629 South D Street, Tacoma, WA 98148-6813
Phone *253-798-3503*
E-mail *GRollins@tpchd.org*
TDD *253-798-6050*

The Washington State Childcare Resource and Referral Network has a state public participation grant to assist childcares in understanding and participating in the Soil Safety Program. Childcares are encouraged to contact them with questions.

Ryan Pricco
Washington State Child Care Resource and Referral Network
917 Pacific Avenue South, Suite 600
Tacoma, WA 98402
Phone *253-383-1735, ext. 26*
E-mail *ryan@childcarenet.org*
Website *http://www.childcarenet.org/*

ABC Childcare



…is a **Soil Smart** childcare!

The Washington Department of Ecology certifies this childcare:

- Tested its soil for arsenic & lead in May 2006
- Soil tested at this childcare meets state standards

Name XXX, Childcare Director
ABC Childcare

Jay Manning, Director
Washington Department of Ecology

Soil Safety Program, Washington Department of Ecology: 360.407.6300
http://www.ecy.wa.gov/programs/sites/tacoma_smelter/ts_hp.htm

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ABC Childcare

…is a Soil Smart childcare!

The Washington Department of Ecology certifies this childcare tested its soil, and is taking the following actions to protect children and staff from arsenic and lead.

- ✓ Informing employees, children and parents.
- ✓ Keeping children from eating dirt.
- ✓ Washing hands/face with soap and water after playing in soil, and before eating.
- ✓ Using scrub brushes to clean nails.
- ✓ Using doormats at every door.
- ✓ Washing children's toys, bedding, and pacifiers frequently.
- ✓ Damp mopping floors and dusting with damp cloth to control dust.
- ✓ Washing outside toys and play equipment.
- ✓ Covered contaminated soil.
- ✓ Maintaining soil cover material.

Name Xxx, Childcare Director
ABC Childcare

Jay Manning, Director
Washington Department of Ecology

Soil Safety Program, Washington Department of Ecology: 360.407.6300
http://www.ecy.wa.gov/programs/sites/tacoma_smelter/ts_hp.htm

This Childcare is

SOIL SMART

Washington Department of Ecology, **Soil Safety Program 360.407.6000**
http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Note: In this document, "schools" refers to both School Districts and private schools. The term "schools districts" is used as needed. "Individual schools" are referred to as such. "Childcares" refers to licensed childcare centers and home childcares, pre-schools and Head Starts.					
Template for FAQ, Fact Sheets, etc. *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Audiences listed below for specific documents	Create image that fits with existing materials	Ecology (Cedar)	Use as base for printed materials	*All steps*
Timeline(s) of Soil Safety Program *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Schools and childcares, stakeholders	Graphically communicate program implementation	Ecology (Cedar)	Use in presentations, reports, and a very simplified version in Soil Safety Program FAQ	*All steps*
Generalized service area map with school districts, county lines, and cities *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Schools and childcares, stakeholders	Inform schools and childcares why they need to participate Illustrate where Soil Safety Program occurs	Ecology (Mark) with input from HDs	Distribute as part of Soil Safety Program information, with FAQ, on website, etc. Distribute as part of press or management updates, etc.	*All steps*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Map with sampling results	Schools and childcares	Inform school districts of existing sampling results in their district; inform private schools and childcares of results in surrounding area	Ecology (Mark)	Provide during initial presentation, and as appropriate. Use in PowerPoint presentations and as printout.	*Step 5: Property Access*
Newsletter articles and information on websites of childcare and school organizations, STARs trainings, etc. *Translations as needed.	Schools and childcares – with emphasis on childcares	Set stage for program launch; encourage participation in program along the way	Ecology (Cedar and Mark) PHSKC (New person) - STARs Trainings, health specific articles	Ecology writes and submits articles. Works with individual organizations. Ecology and HDs notify each other before posting articles, presentations, etc. If Child Care Resource and Referral Network has grant – make sure coordinated effort. PHSKC for KC STARs trainings.	*All steps – with emphasis on April/May/June 2006*
Public Participation Grant with Child Care Resource and Referral Network	Childcares – with emphasis on home childcares	Set stage for program launch; support along the way	Ecology (Cedar and Marian)	Use current funds available ($10,000) Long-term grant for 2007-09	*Prep Mode (March-April)*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Ad Hoc Advisory Group of Stakeholders	Schools and Childcares, Stakeholders	Provide advice on program design and implementation	Ecology (Cedar and Mark)	Ask for input at key times. Make sure there is a decision to be made before convening.	*Prep Mode (Late March)* *March 2006 – review design and communication materials* *July 2006 – update them and get feedback on how things are going* *Nov 2006 – update them and get feedback prior to legislature* *Other key times to be defined later.*
Press Releases	Schools, childcares, stakeholders, general public	Provide support as needed for program, etc.	Ecology PIOs (SWRO and NWRO) and health department PIOs depending on issue	Postpone to summer so media does not get out front of childcare outreach.	*Late summer before school convenes*
Web updates *Translated Spanish and Russian. Asian languages as appropriate.	Schools, childcares, stakeholders, general public Provide downloadable information	Provide support as needed for program, etc.	Ecology (Cedar/Mark) and/or TSP health departments depending on issue		*Program launch, then aligned with program progress*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Health affects fact sheet from DOH *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Schools and childcares	Provide specific piece of information about health affects along with FAQ, etc.	Ecology (Cedar, DOH creates)	Use when meeting with School Districts and childcares, both initial meetings and when sharing sampling results	*Step 4: Outreach/Messages* *Step 5: Property Access* *Step 9: Property Owner/Operator Notification* *Step 10: BMP Program*
Photos of healthy actions School and childcare photo albums	Schools and childcares	Provide visual about what healthy actions look like on the ground	Ecology (Mark)	Use when meeting with schools and childcares, both initial meetings and when sharing sampling results	*Step 4: Outreach/Messages* *Step 5: Property Access (school districts)* *Step 9: Property Owner/Operator Notification* *Step 10: BMP Program* *Step 12: Reports to Legislature*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Frequently Asked Questions with simplified timeline – Soil Safety Program Overview Write one for schools and childcares – one for mailing and one for non-mailing *Note: Make available in WORD on website so others can cut and paste.* *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Schools and childcares Others as needed (See Use & Distribution Notes)	Provide overview of Soil Safety Program - clear messages and answer anticipated questions Provide written text we can use for other materials Provide written text that schools, childcares and stakeholders can use for communicating to others	Ecology (Cedar)	Hand-deliver at initial presentations to schools and childcares. Hand-delivered by Ecology and Health Department staff to elected officials, management, etc. Hand-delivered by public health nurses at select STARS trainings, and at other trainings as appropriate Provided at childcare orientations and trainings by DSHS/DCCEL (new dept.) Provided to childcares through Childcare Resource and Referral Network and other stakeholders	*Step 4: Outreach/Messages* *Step 5: Property Access (school districts)* *Step 9: Property Owner/Operator Notification*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Checklist of Actions for Schools - Steps to take now, Steps to plan for, and cost examples	Schools	List services Ecology and HDs will provide and fund, and what schools will need to do.	Ecology (Mark)	Provide a copy during initial school and childcare center presentations. Once completed by Ecology, attach to Ecology's Property Access and Service Agreement	*Step 4: Outreach/Messages* *Step 5: Property Access (school districts)* *Step 9: Property Owner/Operator Notification*
Cover Letter requesting Property Access	Childcares Note: Schools are given information in person.	Explain need for and encourage access	HDs with approval from Ecology (Ecology writes model)	This letter is mailed with Property Access Form (below)	*Step 5: Property Access*
Property Access Form – Childcares and Schools *Translations as needed for home childcares.	Childcares	Acquire legal authorization for sampling	PHSKC and TPCHD with approval from Ecology (Ecology writes model letter)	Mailed with cover letter to private schools and childcares when requesting access Hand-delivered when access is requested of public schools	*Step 5: Property Access*
Fact Sheet - Funding and Technical Assistance *Translated Spanish and Russian. Asian languages as needed for individual home childcares.	Schools and childcares	Describe funding and technical assistance that is available	Ecology (Mark and Marian)	Provide during initial school and childcare center presentations Provide directly to home childcares with results, if over criteria	*Step 5: Property Access* *Step 9: Property Owner/Operator Notification*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Decorated Van (existing)	Individual schools and childcares	Marketing Dirt Alert and Soil Safety Program	TPCHD	Drive it during sampling and presentations	*Step 7: Soil Sampling*
General brochures, nailbrushes, door mats, healthy action posters, door hangers, videos, etc. (existing) *Translations already exist	Individual schools and childcares	Encourage Healthy Actions	PHSKC and TPCHD	Provided by HDs in cooperation with Ecology regarding timing and recipients	*PHSKC –* *Step 7: Soil Sampling and* *Step 9: Property Owner/Operator Notification* *Step 10: BMP Program* *TPCHD –* *Step 9: Property Owner/Operator Notification and beyond* *Step 10: BMP Program*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Notification of DSHS licensors about childcares being contacted, and test results	King County and Pierce County DSHS licensors	Enable licensors to support program during site visits and other communications with childcares	Ecology (Mark)	Ecology provides information to licensors on a frequent (at least monthly) basis regarding who is being contacted, test results, and follow-up actions	*Step 5: Property Access* *Step 9: Property Owner/Operator Notification* *Step 10: BMP Program*
Classroom curriculum and presentations (existing and being developed)	Individual schools and childcares	Encourage Healthy Actions	PHSKC and TPCHD	Provided by HDs in cooperation with Ecology regarding timing and recipients	*PHSKC –* *Step 7: Soil Sampling and* *Step 9: Property Owner/Operator Notification* *Step 10: BMP Program* *TPCHD –* *Step 9: Property Owner/Operator Notification and beyond* *Step 10: BMP Program*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Laboratory results of sampling	Schools and childcares	Use to decide which schools and childcares need healthy actions. Inform management, legislature	Health Departments and Ecology (Mark)	HDs evaluate results. Ecology makes determination. Ecology does press releases, reports to legislature, makes available as appropriate. This information is part of public record – so anyone will be able to access.	*Step 8: Evaluation of Results*
Results Letters o Below criteria o Above criteria *Translated as needed for home childcares.	Schools and childcares	Clearly share sampling results and next steps to take	Ecology creates model letters (Mark)	Mailed to school districts, private schools and childcares with low levels (no actions required), with certificate and window decal. PHSKC and TPCHD mail or hand-deliver. Hand-delivered to school districts, private schools and childcares that need to take actions. Ecology and Health Depts. hand-deliver to those with results above criteria.	*Step 9: Property Owner/Operator Notification*
Tip Sheet for Talking with Parents and Media	Private schools and childcares	Provide support on sharing results, answering tough questions	Ecology (Cedar and Sandy)	Delivered with results to those with results above criteria	*Step 9: Property Owner/Operator Notification*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Certificate and Window Decal *Translated as needed for home childcares.	Individual schools and childcares	Reward their completion of sampling	Ecology (Cedar creates, Mark and HDs deliver)	See above. Only for those below criteria (at this step in process)	*Step 9: Property Owner/Operator Notification*
Sampling Guidance brochure – Large scale child use area *Translated Spanish and Russian.	Schools and childcare centers that want to do additional sampling	Encourage voluntary sampling	Ecology (Dawn Hooper)	Make available to schools and childcare centers with their sampling results	*Step 9: Property Owner/Operator Notification*
Display ad *Translated into languages as needed for certain publications.	School and childcare "customers"	Provide kudos to schools and childcares that have been sampled and want such recognition.	Ecology (Cedar)	Published in major newspapers and parent-oriented publications	*Step 9: Property Owner/Operator Notification*
Property Access and Service Agreement *No translations for schools and corporate childcares. *Translations as needed for home childcares.	Schools and childcares that agree to implement Healthy Actions	Legal commitment to take action. States services and resources Ecology and HDs will provide.	Ecology (Mark)	Provide draft in person with results Provide final after negotiations completed	*Step 9: Property Owner/Operator Notification* *Step 10: BMP Program*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Checklist of Actions for Childcares – Steps to take now, Steps to plan for, and cost examples *Translations as needed for home childcares.	Childcares	Provide list of actions Ecology and HDs will provide, and what the childcare must do. Provide cost examples relevant to large and small childcares.	Ecology (Mark)	Provide to sampled childcares with results Once completed, attach to Ecology's property access and service agreement	*Step 9: Property Owner/Operator Notification*
Sample parent notification letter *Translations as needed for home childcares.	Schools and childcares who haven't completed healthy actions within 6 months of results	Provide sample letter to make expectations clear and encourage notification regardless of results	Ecology (Mark)	Provide to schools and childcares with sampling results if over criteria. Also encourage positive letter announcing their participation and taking actions as they do them. Resend/remind at 5 months if Healthy Actions are not implemented	*Step 9: Property Owner/Operator Notification* *Step 10: BMP Program*
Certificate and Window Decal *Translations as needed for home childcares.	Individual schools and childcares who complete Healthy Actions	Acknowledge schools and childcares	Ecology (Cedar creates, Mark delivers)	Same as those noted above, except extra language on certificate about actions required. Mailed or hand-delivered once healthy actions are in place.	*Step 10: BMP Program*

ATTACHMENT C3: SOIL SAFETY PROGRAM COMMUNICATION TOOLS

April 7, 2006

Communication Tool	***Audience***	***Purpose(s)***	***Lead***	**Use & Distribution Notes** **(many materials will be posted on Ecology website)**	***Timeframe (Program Design Steps)***
Evaluation and assessment	Program staff and partners, Ad Hoc Advisory Group, agency management, legislature	Feedback for adapting program	Ecology (Mark with data provided by HDs in some cases)	HD sampling teams and outreach staff provides input to database for tracking (e.g. have childcares already heard about program, access rates, etc.) Ecology oversees student project and/or The Network survey of childcares that evaluates services by November 2006.	*Ongoing* *Ad Hoc Advisory Group meetings (see above)* *Step 12: Reports to Legislature December 2006 December 2008*
Updates and summary reports	Legislature; agency management, Childcare orgs	Provide results	Ecology (Marian and Mark)	Deliver when directed by Ecology management or legislation deadlines	*Step 12: Reports to Legislature December 2006 December 2008*

Appendix D

Model Letters & Forms

Model Permission to Sample Cover Letter

[HEALTH DEPARTMENT LETTERHEAD]

Date

Dear MAIL MERGE

New state law – Free Soil Safety Program for your [childcare or school]

I am writing you about a new program intended to protect children from the harmful effects of arsenic and lead. Called the Soil Safety program, the program is part of a new state law (Chapter 70.140 Revised Code of Washington). The law requires all childcares and schools with soil possibly polluted by the Tacoma Asarco smelter to have their soil tested for arsenic and lead.
Washington Department of Ecology (Ecology) funds the program and works in partnership with the [HEALTH DEPT NAME] (health department). The health department provides free soil sampling, education and assistance. (Please read the enclosed *Soil Safety Program* handout for details.)
Please sign up for free soil testing by filling out and returning the enclosed permission form. Once I receive your signed form, I will call you and set up a soil testing day and time that is convenient for you.

Soil testing crews will:

- Evaluate the property to see if children may come in contact with polluted soil.
- Take soil samples from child play areas, if needed (samples will be taken from top 6 inches of soil).
- Refill sampling holes.
- Have soil samples tested by a certified laboratory.

If the amount of arsenic and/or lead in your soil is above state standards, the health department and Ecology will work with you and provide free assistance to make your childcare a safer and healthier place for children.
Please sign and return the enclosed permission form within two weeks to ensure you receive the soil sampling and related free services in a timely way. If you have any questions, please call me at XXX-XXX-XXXX or send an email to [STAFF EMAIL]. For TTY, please call XXX or 1-800-XXX-XXXX.

You may also log on to Ecology's website at [WEBSITE ADDRESS] for more information about the Soil Safety Program, the state law (RCW 70.140), arsenic and lead, and other soil safety resources. You can also find information about the program on our website at [WEBSITE ADDRESS].

Thank you for your time. I look forward to hearing from you.

Sincerely,

[NAME]
[TITLE]
[HEALTH DEPARTMENT NAME]

DIRT
ALERT LOGO

Model Permission to Sample Form

Health Dept Logo

Soil Safety Program
Permission to Sample Play Area Soils Form

State law (Chapter 70.140.030 RCW) requires schools and childcares to provide access for soil testing.

Under the law, the Washington Department of Ecology (Ecology) is to evaluate schools and childcares for soil polluted by the former Asarco smelter in Tacoma, and test soils as needed. Under a grant from Ecology, [Health Department name] will evaluate play areas, collect soil samples, and deliver soil to a certified lab for testing of arsenic and lead. [Health Department name] will provide soil test results to the property Owner or Tenant named on page 2 of this form. Test results will be part of the public record and subject to public disclosure.

The undersigned Owner or Tenant gives permission to [Health Department name] to enter the property at the location(s) listed on the back of this form. [Health Department name] will enter the property for the purpose of evaluating and testing for polluted soil in children's play areas. [Health Department name] will only enter the property at a time pre-arranged with the Owner or Tenant.

If the Owner or Tenant does not provide access for evaluating and testing soils, Ecology will list the school or childcare as non-compliant with state law and provide the list to the state legislature. Ecology will also list non-compliant schools and childcares in public records that are subject to public disclosure.

Signature	Date

Name of Owner or Tenant:(please print)	Phone:
Mailing Address:	Email Address:
Facility (1) Address:	Facility (2) Address:
Facility (3) Address:	Facility (4) Address:
Name of Property Owner:(if applicable)	Phone:
Mailing Address:	Email Address:

Is there anything the sampling crew should be aware of when taking soil samples (dogs, gates or fences, buried pipes or cables, etc.)?

Has there been any work on the property, such as landscaping or digging? If yes, please describe the work and when it happened.

Model Soil Safety Action Plan Agreement Form

AGREEMENT FOR
SOIL SAFETY ACTION PLAN

This is an agreement between the Department of Ecology (Ecology),
_____ (Property Owner), and
_____ (Tenant, if applicable).

The purpose of this agreement is to:

- Document the recommended Soil Safety Action Plan for your Property (the Work)
- Define the conditions of the Work

State law (Chapter 70.140.030 RCW) requires the Department of Ecology (Ecology) to notify schools and childcares of test results indicating the presence of soil contamination and steps necessary to implement soil safety actions. Ecology will provide financial assistance to implement the soil safety actions. Ecology and {local health department name} will provide technical assistance. If soil safety actions are not addressed within six months, the law requires you to notify parents or guardians of test results.

The attached checklist documents the recommended Soil Safety Action Plan for your Property. The Work detailed in the checklist will be performed by Ecology, its agents, employees, contractors and subcontractors, the health department and you.

The conditions of the Work are as follows:

(1) Duration of Agreement:
This Agreement is effective when all parties have signed below, and will remain in effect until certification by Ecology that all Work relating to the Property has been satisfactorily completed.

(2) Conducting the Work:
The health department will provide education for soil safety actions. Ecology will perform the construction elements of the Work.

(3) Compliance with Applicable Laws and Regulations:
Ecology agrees to perform the Work in a professional manner and in compliance with any federal, state, or local laws, ordinances, or regulations which may be applicable.

(4) Expense:
Ecology will pay the expense of the Work.

(5) Grant of Access:
Property Owner/Tenant grants Ecology, its agents, employees, contractors and subcontractors, access to enter the Property for the purpose of performing the Work.

(6) Availability of Access:
Ecology shall have access to the Property at all reasonable times for the duration of this Agreement. Access to the property shall be solely for the purpose of carrying out the terms of this Agreement.

(7) Responsibilities of Property Owner/Tenant:
Property Owner/Tenant responsibilities include:

1. Implementing soil safety actions with children.
2. Removing obstructions from the Work site, including: boats, trailers, vehicles, swing sets, wood piles.
3. Removing flower bulbs or plants an occupant may wish to save.
4. Providing water for dust control and watering plants during the Work.
5. Watering and maintaining replacement sod.
6. Maintaining cover material placed in play areas.

If the Property is rented, the Tenant shall assist in obtaining approval from the Property Owner for access to the Property necessary for Ecology to perform the terms of this Agreement if Ecology is unable to obtain such access.

Property Owner/Tenant shall have the opportunity to review and approve of the plan for the Work and re-landscaping of the Property prior to the initiation of the Work.

(8) Responsibilities of Ecology:
Ecology responsibilities include:

1. At completion of the Work, maintain or replace landscape features affected by the Work to approximate original condition.
2. Work in a safe manner in accordance with health and safety plans to prevent damage to site features or hazards to property tenants.
3. Provide visual safety barriers (e.g. caution tape) around Work site.
4. Reduce dust and noise impacts as much as possible. Dust will be kept at a minimum by spraying water on Work site.
5. Provide instructions on care of sod, new vegetation, etc., upon completion of Work.
6. Provide documentation of the Work performed on the property including a copy of the access agreement and attachments and a summary of the Work performed.

(9) Indemnification:
Property Owner/Tenant agrees to indemnify and save and hold Ecology, its employees, and agents harmless from any and all claims or causes of action for death or injuries to persons or for loss or damage to property arising from or on account of acts or omissions of Property Owner/Tenant, its employees, agents, or contractors in implementing this agreement. However, the Property Owner/Tenant shall not indemnify Ecology nor save nor hold its employees and agents harmless from any claims or causes of action arising out of the negligent acts of Ecology, its employees, consultants, and contractors, in implementing the activities pursuant to this Agreement.

(10) Miscellaneous:
This agreement is the entire agreement between the parties. Changes to this agreement are only valid if they are put in writing and signed by the parties. This Agreement shall be interpreted in accordance with the laws of the State of Washington. This Agreement shall be effective as of the date signed.

We approve of the recommended Soil Safety Action Plan as attached, and agree to implement the plan in accordance with the conditions in this agreement.

Property Owner Signature:	Date:

Department of Ecology Signature:	Date:

Tenant Signature (if applicable):	Date:

Name of Owner or Tenant:(please print)	Phone:
Mailing Address:	Email Address:
Property Address:	
Name of Property Owner:(if applicable)	Phone:
Mailing Address:	Email Address:

[Date]

[Name of childcare]
3808 North 27th Street
Tacoma, WA 98407

Dear Sir or Madam:

I am writing to inform you of the arsenic and lead levels found in soil samples collected at [Name of childcare]. Tacoma-Pierce County Health Department staff collected soil samples at designated play areas. Enclosed are tables that provide the arsenic and lead concentration found in each sample collected from [Name of childcare], along with a photo that indicates the approximate spots where samples were taken.

Test results indicate that low levels of arsenic and lead were found at [Name of childcare]. As a result, removal or replacement of the soil with "clean" soil is not required. However, we recommend that you practice the "Healthy Actions," enclosed with this letter, in order to reduce the potential for long-term health effects to children.

The Health Department appreciates your cooperation and help to protect the health of children in Pierce County. Enclosed is a soil testing certificate and window decal. We hope you will post the certificate and decal as a way to let others in your school community know about your participation in the Soil Safety Program.

If you have any questions, please contact me by phone or email. You may also contact Amy Hargrove at the Washington State Department of Ecology by calling (360) 407-6262 or visit Ecology's website at ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm.

Sincerely,

Glenn D. Rollins
Environmental Health Specialist II
253 798-3503
tpchd.org/dirtalert

Enclosures

Model Results Above Letter

[ECOLOGY LETTER HEAD]

[DATE]

Name
Address
City, State, Zip

RE: Soil Test Results from Your Property(s)

Dear [XXXX]:

Thank you for participating in the Soil Safety Program with [HEALTH DEPARTMENT NAME], in conjunction with the Washington State Department of Ecology (Ecology). The Soil Safety Program is part of a new state law (Chapter 70.140 Revised Code of Washington). The law requires all childcares and schools with soil possibly polluted by the Tacoma Asarco smelter to have their soil tested for arsenic and lead. The purpose of this letter is to share with you the soil test results for your property(s).

Your Soil Test Results
In [DATE OF TESTING] sampling was performed by [HEALTH DEPARTMENT NAME] at play areas on your property(s). The sampling tested for the amounts of arsenic and lead in the soil. Each play area had 8-10 samples taken. From those samples, the average and maximum were determined.

The table below lists the arsenic and lead amounts Ecology uses to determine if a school or childcare needs a Soil Safety Action Plan.

Amounts of arsenic and lead and when Soil Safety Action Plan is needed

Measure	Arsenic in parts per million (ppm)		Lead in parts per million (ppm)	
Average of Soil Test Results	20 ppm or less	Over 20 ppm	250 ppm or less	Over 250 ppm
Maximum Amount Found	40 ppm or less	Over 40 ppm	500 ppm or less	Over 500 ppm
Will schools and childcares need a Soil Safety Action Plan?	No – Some limited resources and advice on actions will be provided upon request	Yes – Ecology and your local health department will provide resources for a Soil Safety Action Plan	No – Some limited resources and advice on actions will be provided upon request	Yes – Ecology and your local health department will provide resources for a Soil Safety Action Plan

[CHOOSE A SCENARIO]

[ARSENIC ABOVE, LEAD BELOW]
Arsenic was found **above** the criteria in the play areas at the following property(s). However, **lead** was found **below** the criteria.

Property(s): [LIST PROPERTIES]

[ADD IF APPROPRIATE]
In addition, arsenic and lead were found below the state standards in the play areas at the following property(s).

Property(s): [LIST PROPERTIES]

A copy of the test results and a map of the sample locations from your property(s) are enclosed.

[ARSENIC BELOW, LEAD ABOVE]
Arsenic was found **below** the criteria in the play areas at the following property(s). However, **lead** was found **above** the criteria.

Property(s): [LIST PROPERTIES]
[ADD IF APPROPRIATE]
In addition, arsenic and lead were found below the state standards in the play areas at the following property(s).

Property(s): [LIST PROPERTIES]

A copy of the test results and a map of the sample locations from your property(s) are enclosed.

[ARSENIC ABOVE, LEAD ABOVE]
Arsenic and **Lead** were found **above** the criteria in the play areas at the following property(s).

Property(s): [LIST PROPERTIES]

[ADD IF APPROPRIATE]
In addition, arsenic and lead were found below the state standards in the play areas at the following property(s).

Property(s): [LIST PROPERTIES]

A copy of the test results and a map of the sample locations from your property(s) are enclosed.

State Standard

The Washington State soil cleanup standard for arsenic is 20 parts per million (ppm), and lead is 250 ppm. Background or natural levels of arsenic in the soil in the Puget Sound region are about 7-10 ppm, while background lead is 24 ppm.

Health Effects
Both the [HEALTH DEPARTMENT NAME] and Ecology reviewed your soil test results and found the amount of arsenic and lead are low enough that it is not a health emergency, but is a long-term health concern.

Arsenic and lead cause several health problems in people. Whether someone is affected depends on the amount of arsenic and lead taken into his or her body over time. Young children are more vulnerable because they tend to put dirty fingers and toys into their mouths. Their hands and toys may have arsenic and lead on them.

Scientists have linked arsenic to a variety of health problems including heart disease, diabetes, and cancer of the bladder, lung, skin, kidney, lever, and prostate. Lead can cause behavioral problems, permanent learning difficulties, and reduced physical growth.

Soil Safety Actions
Soil safety actions are actions you can take to protect children and others from soil arsenic and lead. You are probably already taking actions that are positive and helpful. Some simple soil safety actions you can take now include:

- Keep children from putting dirt in their mouths
- Wash hands and faces with soap and water after playing outside and before eating
- Keep dirt outside by using a door mat
- Wash children's toys and pacifiers often
- Damp dust and damp mop indoors

[HEALTH DEPARTMENT] can provide additional information about the health effects of arsenic and lead, and can suggest additional ways to reduce contact with polluted soil. For more information, please visit the health department's website at: [health department website]

Free Soil Safety Program
Ecology offers a free soil safety program for schools and childcares with soil test results above state standards. We would like to work with you to develop a Soil Safety Action Plan for addressing the polluted soils. Ecology will provide the funding, labor and/or education resources to carry out the soil safety action plan.

I will contact you soon to set up a meeting at your convenience to discuss your concerns, test results, and to discuss actions that you can take to protect children from polluted soils. A representative from your local health department will accompany me to provide additional assistance.

[INCLUDE IF APPROPRIATE]

Soil Testing Certificate

Enclosed is a Soil Testing certificate and window decal for those properties with arsenic and lead below state standards. We hope you will post the certificate and decal at these properties as recognition for your participation in the Soil Safety Program.

For more information on the Soil Safety Program, contact me at XXX-XXX-XXXX, or visit Ecology's website at:
http://www.ecy.wa.gov/programs/tcp/sites/tacoma_smelter/ts_hp.htm

Again, thank you for participating in the Soil Safety Program, and I look forward to meeting with you.

Sincerely,

[NAME]
Soil Safety Program Coordinator
Department of Ecology

Enclosures

Model Parent Notification Letter

[DATE]

Parent and/or Legal Guardian
Address
City, State, Zip

Dear Parent or Legal Guardian:

We want to inform you that [Name of Childcare] participated in the Soil Safety Program. The Soil Safety Program is part of a new state law (Chapter 70.140 Revised Code of Washington). The law requires all childcares and schools with soil possibly polluted by the Tacoma Asarco smelter to have their soil tested for arsenic and lead.

The [HEALTH DEPARTMENT NAME] took soil samples from our play areas to determine the amount of lead and arsenic in the soil. Arsenic and/or lead were found above the state standards.

Both the health department and the Washington State Department of Ecology (Ecology) reviewed your soil test results and found the amount of arsenic and lead are low enough that it is not a health emergency, but is a long-term health concern.

Arsenic and lead cause several health problems in people. Whether someone is affected depends on the amount of arsenic and lead taken into his or her body over time. Young children are more vulnerable because they tend to put dirty fingers and toys into their mouths. Their hands and toys may have arsenic and lead on them.

The health department and Ecology have asked that we follow some simple soil safety actions, such as:

- Keep children from putting dirt in their mouths
- Wash hands and faces with soap and water after playing outside and before eating
- Keep dirt outside by using a door mat
- Wash children's toys and pacifiers often
- Damp dust and damp mop indoors

In addition, Ecology has offered to take action in our play areas at no cost to [Name of Childcare].

Your child's safety is our highest priority. Our staff will follow the soil safety actions recommended above. [add anything else the childcare plans to do…]

If you have any questions or would like more information, please contact Amy Hargrove at the Department of Ecology, (360)407-6262, send an email to ahar461@ecy.wa.gov or visit Ecology's website, http://www.ecy.wa.gov/programs/tcp/sites/dirt_alert/soilSafety/soilsafety.htm.

Sincerely,

[Name]
[Name of Childcare]
[Phone number]

Model Soil Safety Action Plan

Recommended Plan

Date of initial visit_____

Protective Steps to Take Now

- ☐ Inform employees, children and parents.
- ☐ Keep children away from contaminated soil. Fence off contaminated area(s).
- ☐ Keep children from eating dirt.

Soil Safety Actions: (health department can provide educational assistance)

- ☐ Wash hands/face with soap and water after playing in soil, and before eating.
- ☐ Use scrub brushes to clean nails.

- ☐ Remove shoes before entering the building.
- ☐ Use doormats at every door.

- ☐ Wash children's toys, bedding, and pacifiers frequently.
- ☐ Wash soil laden cloths separately.
- ☐ Damp mop floors and dust with damp cloth to control dust.
- ☐ Vacuum several times a week (recommend using a HEPA filter).
- ☐ Keep pets clean. Brush and bathe them regularly.

- ☐ Sweep, pressure wash, or hose off paved areas to remove dirt and minimize dust.
- ☐ Wash outside toys and play equipment.

- ☐ Wash fruits and vegetables grown on your property prior to eating.
- ☐ Peel carrots and potatoes grown on your property prior to eating.
- ☐ Eat a healthy diet of foods that contain iron and calcium.

Protective Steps to Plan For

Construction Actions: (Ecology can provide labor and funding)

- ☐ Cover bare soil with bark, sod, gravel, wood/mulch product or other material.

- ☐ Construct containment cover over contaminated soil.

- ☐ Pave contaminated soil with asphalt or concrete.

- ☐ Mix contaminated surface soil with clean soil.

- ☐ Remove all contaminated soil and transport to approved landfill.

- ☐ Replace sand boxes or play boxes with new boxes on landscape fabric.

- ☐ Gardens
  - ☐ Mix contaminated soil with clean soil.
  - ☐ Replace with raised garden beds.

Maintenance Actions: (responsibility of owner/tenant)

- ☐ Maintain cover material.
- ☐ Water sod or landscaping.
- ☐ Maintain painted surfaces.

Check condition and surfacing of play equipment. If play equipment is arsenic treated wood, recommend replacing or painting.

Sketch play area with recommended actions

Completed Plan

Date of final visit_____

Protective Steps to Take Now

- ☐ Inform employees, children and parents.
- ☐ Keep children away from contaminated soil. Fence off contaminated area(s).
- ☐ Keep children from eating dirt.

Soil Safety Actions: (health department can provide educational assistance)

- ☐ Wash hands/face with soap and water after playing in soil, and before eating.
- ☐ Use scrub brushes to clean nails.

- ☐ Remove shoes before entering the building.
- ☐ Use doormats at every door.

- ☐ Wash children's toys, bedding, and pacifiers frequently.
- ☐ Wash soil laden cloths separately.
- ☐ Damp mop floors and dust with damp cloth to control dust.
- ☐ Vacuum several times a week (recommend using a HEPA filter).
- ☐ Keep pets clean. Brush and bathe them regularly.

- ☐ Sweep, pressure wash, or hose off paved areas to remove dirt and minimize dust.
- ☐ Wash outside toys and play equipment.

- ☐ Wash fruits and vegetables grown on your property prior to eating.
- ☐ Peel carrots and potatoes grown on your property prior to eating.
- ☐ Eat a healthy diet of foods that contain iron and calcium.

Protective Steps to Plan For

Construction Actions: (Ecology can provide labor and funding)

- ☐ Cover bare soil with bark, sod, gravel, wood/mulch product or other material.

- ☐ Construct containment cover over contaminated soil.

- ☐ Pave contaminated soil with asphalt or concrete.

- ☐ Mix contaminated surface soil with clean soil.

- ☐ Remove all contaminated soil and transport to approved landfill.

- ☐ Replace sand boxes or play boxes with new boxes on landscape fabric.

- ☐ Gardens
    - ☐ Mix contaminated soil with clean soil.
    - ☐ Replace with raised garden beds.

Maintenance Actions: (responsibility of owner/tenant)

- ☐ Maintain cover material.
- ☐ Water sod or landscaping.
- ☐ Maintain painted surfaces.
- ☐ Check condition and surfacing of play equipment. If play equipment is arsenic treated wood, recommend replacing or painting.

Sketch play area with completed actions

Appendix E

Funding Strategy
[Not completed]

Appendix F

Public Health – Seattle & King County

Soil Safety Program Implementation Plan

SOIL SAFETY
IMPLEMENTATION PLAN

Tacoma Smelter Plume Project
for
King County

Public Health – Seattle & King County
Environmental Health Division
For
Washington Department of Ecology
Revised December 21, 2009

Table of Contents

APPENDICES

1.0 SOIL SAFETY PROGRAM BACKGROUND

ASARCO operated a primary copper smelter at Ruston, Washington for almost 100 years. That smelter, referred to as the Tacoma Smelter, specialized in the smelting of complex (e.g., high-arsenic) ores. It closed in 1986. For many years, the Tacoma Smelter was the sole domestic source of copper for the U.S. market.

The U.S. Environmental Protection Agency is overseeing cleanup of residential properties in Ruston and North Tacoma, within approximately one mile of the former smelter, as part of Commencement Bay Superfund Site cleanup activities. The Washington State Department of Ecology (Ecology), in cooperation with local health departments, is investigating widespread contamination from smelter emissions extending beyond the designated EPA Superfund site. This larger area of contamination has been designated the Tacoma Smelter Plume (TSP) Site under Washington's Model Toxics Control Act (MTCA).

A number of studies of residual soil contamination within the TSP Site have been completed. Sampling in relatively undisturbed forested areas and at older residences was conducted to define the spatial pattern of smelter contamination and its likely maximum magnitude by location. These studies are referred to as Footprint studies. Four footprint studies have been completed: Vashon-Maury Island Initial Footprint Study (1999); King County Mainland Initial Footprint Study (2002); Pierce County Initial Footprint Study (2002) and a final Extended Footprint Study including sampling in King, Kitsap, Thurston and Pierce counties (2005).

In addition to the Footprint Studies, Child-Use Area studies were undertaken in King and Pierce Counties. Young children are considered a population of special concern because of their propensity for soil contact and ingestion and greater sensitivity for smelter-related contaminants such as lead. Five child-use area studies have been completed: Vashon-Maury Island Child-Use Areas Study (2000); King County Mainland Child-Use Area Study (2003); Pierce County Child-Use Area Study (2004); King County Child-Use Area Phase 2 (2005); and Tacoma/Metro Parks supplemental Child-Use Area Study in Pierce County (2006). These child-use area studies focused sampling at schools, childcares, parks, and camps.

As part of the King County Mainland Child-Use Area Study (2003), Public Health – Seattle & King County (PHSKC) identified 586 child-use areas for sampling. With limited resources, Ecology's contractor SAIC investigated 194 child-use areas in 2003. PHSKC completed investigation of the remaining child-use areas (approximately 392) previously identified plus additional CUA properties from current DSHS list, thus totaling 583 child-use areas (Phase 2, 2005).

1.1 Recent Legislation

A law (Chapter 70.140 RCW) was enacted in 2005 to assist state and local agencies in implementing actions to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law requires Ecology, in cooperation with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of Superintendent of Public Instruction (OSPI), and local health districts, to assist schools and childcares in western

Washington to reduce the potential for children's exposure to area-wide soil contamination. The agencies involved have named the program developed to implement the law the "Soil Safety Program." The law (RCW 70.140.030) requires Ecology to:

(a) Identify schools and childcares that are located within the central Puget Sound smelter plume based on available information;

(b) Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination;

(c) Conduct soil samples by December 31, 2009, if the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property; and

(d) Notify schools and childcares regarding the test results and the steps necessary for implementing best management practices, if soil sample results confirm the presence of area-wide soil contamination.

The law also requires Ecology to develop best management practice (BMP) guidelines (RCW 70.140.040(2)) and a grant program to assist schools and owners and operators of childcares with implementing BMPs (RCW 70.140.040(3)) and recognize schools and childcares that successfully implement BMPs (RCW 70.140.030(4). The law requires schools or childcares with area-wide soil contamination that do not implement BMPs within 6 months of receiving written notification of test results, to notify parents and guardians in writing of the results, using a written notice prepared by Ecology.

The law authorizes Ecology to use an interagency agreement to authorize a local health department to implement any activity [RCW 70.140.040(6)]. PHSKC, Ecology and the Tacoma-Pierce County Health Department (TPCHD) developed a Soil Safety Program Design, Sampling Design, and Quality Assurance Project Plan (QAPP). Under the Soil Safety Program Design, some of the terminology has changed from previous Child Use Area studies. The term "Child-Use Areas" has been replaced with "schools and childcares" or "facilities." The "Child-Use Area Study Zone" has been slightly modified from earlier studies and is now referred to as the "Soil Safety Program Service Area," and "decision units" are now referred to as "play areas."

This Implementation Plan provides specific procedures that PHSKC will use to carry out the Soil Safety Program, and is to be used in conjunction with the design documents and QAPP. The Field Sampling Plan that PHSKC will refer to in the field is included as Appendix C.

1.2 Contaminants of Concern

Based on the studies performed to date, arsenic and lead are the primary contaminants of concern.

2.0 SOIL SAFETY PROGRAM ORGANIZATION AND RESPONSIBILITIES

The design of the soil safety program components (selecting the schools and childcares to be sampled, sample locations, sample depths, and analyses performed) has been a collaborative effort between the Washington Department of Ecology (Ecology), Public Health – Seattle & King County (PHSKC), Tacoma Pierce County Health Department (TPCHD), and Landau Associates. TPCHD will be responsible for contracting the analytical chemistry portion of the work on behalf of PHSKC. The current contract has been let to King County Environmental Laboratory (KCEL) in Tacoma, Washington. PHSKC, in conjunction with Ecology, will review the list of schools and childcares still untested from the CUA Phase 2 study, and identify the most current list of schools and childcares for sampling and testing in 2006. We will add middle and high schools as required by the legislation.

Ecology will update the list of childcares every 6 months based on the DSHS list. PHSKC will review the list after each update and contact new child cares that did not previously appear on the list. Ecology will maintain contact and tracking information on child cares and schools in an electronic database. PHSKC will update Ecology's database with King County information. Soil sample, field notebook and test data will be maintained in the existing PHSKC Tacoma Smelter Plume database.

3.0 SCOPE AND OBJECTIVES

3.1 Scope

The schools and childcares covered under this program include several different property types and uses where children are likely to be present with some frequency, and where their activities are likely to put them in contact with potentially contaminated soils. RCW 70.140 requires sampling of play areas at the following:

(1) Public and private elementary, middle, and high schools

(2) Childcares (the agencies have defined this to mean licensed childcares as well as preschools, Head Start programs, and ECEAP programs.)

3.2 Objectives

The primary objective for sampling soils at identified schools and childcares in King County within the TSP Site is to identify those locations where smelter-related contamination is present, so that facility operators can implement Soil Safety Actions to reduce risk to children from exposure to the contaminated soil.

Several aspects of this primary objective are notable:

- These investigations focus on characterizing soil contamination resulting from Tacoma Smelter emissions. It is not the objective of sampling to completely characterize impacts from other sources of arsenic or lead, such as treated wood, paint residues, or emissions from leaded gasoline use, though impacts from those sources may be identified by the program.

- The depth profiles of soil contamination where soils have been disturbed by development activities can be complex, with contamination extending well below depths affected in undisturbed soils. Sampling at schools and childcares is not intended to fully characterize soil contamination at selected properties, or to necessarily identify the maximum concentrations occurring at any depth. The emphasis on potential soil exposures under current conditions serves to limit sampling to near-surface soils where soil contact is most likely to occur.

3.3 Definition Of Soil Safety Program Service Area

This section describes the methodology used for defining the Soil Safety Program Service Area. The Soil Safety Program service area (SSP service area) was established in a two step process. First, reevaluation of previous CUA study zone boundaries incorporating new data; second, modifying the boundary based on local health department recommendations.
The SSP service area was developed by a work group comprised of Ecology, Public Health-Seattle & King County, and Tacoma-Pierce County Health Department. The methodology is based on the methodology used to define child use study zones in the 2002 King and Pierce County child-use area (CUA) studies (Glass 2002).
Four factors relevant to the issue of defining a service area were identified:

1) A recent law (Chapter 70.140 RCW) states that the Washington State Department of Ecology (Ecology) in cooperation with DSHS, OSPI, and the local health districts shall "Identify schools and childcares that are located within the central Puget Sound smelter plume based on available information; and Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination."

2) Funding for CUA sampling and BMP implementation is limited. As outlined in the TSP Project Plan, geographic areas with high levels of arsenic and/or lead in soil are a higher priority than geographic areas with moderate levels of arsenic and/or lead in the soil.

3) The footprint studies targeted relatively undisturbed forested locations; therefore, the sampling results are very likely to be an upper bound on soil contaminant concentrations at more developed and disturbed child use properties.

4) Data from the extended footprint studies has further refined the areas where area-wide contamination exists.

The CUA study zone boundary in 2002 was based on the first footprint studies in King and Pierce counties. For the SSP service area, data from all footprint studies was compiled into log-scaled graphs of arsenic concentration versus distance. The graphs can be used to determine the

outer bounds of the TSP contamination for each wind direction. The Work Group decided to use a criterion value of 100 ppm soil arsenic - equal to the break between moderate and high concentration ranges identified by Ecology - for defining the SSP service area. All of the footprint studies targeted undisturbed areas where concentrations of area-wide contaminants are likely to be highest. Concentrations at disturbed areas such as schools and childcares are likely to be significantly less as indicated by previous sampling results at schools and childcares. Therefore, use of a criterion value of 100 ppm soil arsenic is likely to produce a SSP service area boundary that includes all schools and childcares with high concentrations, and most with moderate concentrations.
The general methodology for defining the SSP service area boundary, based on the concentration versus distance graphs, was taken from the previous CUA study design (Glass, 2002) and includes the steps below. The data has already been partitioned into subsets by wind sectors (using the 16 sectors defined by typical wind roses), and plotted for maximum arsenic concentration versus distance for each wind sector.

1) Hand-draw the approximate bounding line for the plotted data.
2) Use the hand-drawn bounding line to estimate the intercept and slope values, and thereby establish the bounding curve equation.
3) Solve the equation for the bounding curve for each wind sector to calculate a distance to the 100 ppm soil arsenic criterion value.
4) Use the resulting distances for each wind sector to plot a child use study zone.

The proposed SSP service area boundary (2006) is plotted with the old CUA study zone (2002) (Figure 1)**.** The proposed SSP service area boundary was modified based on local health department recommendations. The proposed SSP service area boundary in King County nearly doubled the area of the original CUA study zone. Due to the density of childcares and schools in King County and limited resources, Public Health-Seattle & King County recommends focusing sampling efforts on the area roughly inside the original CUA study boundary with minor variations based on geographic and political boundaries. The final SSP service area boundary reflects this recommendation in King County, and uses the expanded boundary in Pierce and Thurston counties. Sampling activities in King County may eventually extend further as time and funding allow. The SSP service area is shown on Figure 2.

3.4 Sampling Methodology For Schools And Childcares

This sampling design addresses planned soil sampling of schools and childcares within the SSP service area. The sampling design includes approaches for sampling and analyzing soil, and methods for data evaluation.

3.4.1 King County Sampling and Selection Priorities

The manner in which Public Health Seattle & King County (Public Health) will prioritize the work of obtaining access agreements and conducting qualitative assessments and sampling

within the Soil Safety Program Service Area is outlined in detail in Appendix A. The methods draw upon Public Health's experience gained in previous Child-Use Areas studies and the agency's expertise in engaging communities within King County.

3.4.2 Selecting Play Areas (Decision Units)

A consistent design will be used to collect soil samples. This section discusses the concept of **Play Areas** (formerly identified as decision units) at the school or childcare.
A school or childcare property may be subdivided into multiple areas - reflecting various child activities, land uses, property histories, or other factors - at which soil is accessible by young children and exposures can occur. Only those areas where children play frequently will be selected for sampling. The data from soil sampling at these areas will be evaluated to characterize the exposure risks and assess appropriate response actions and their timing. Different parts of a child use property may therefore be treated as separate Play Areas, since the decisions on appropriate response actions may vary from one portion of the property to another based on the contaminant concentrations found.

Small childcares will often have only a single Play Area. For example, a childcare operated out of a private residence may have only a single fenced outdoor play area in the back yard of the property, perhaps 40 ft by 60 ft in size. An elementary school property tens of acres in size, on the other hand, may have a demonstration garden area, several areas with play equipment, various ball fields, and perhaps even a nature exploration area. Such an elementary school would best be classified into multiple Play Areas for sampling purposes.

Play Areas will be defined at the selected school or childcare by the field sampling teams, based on observations, discussions with property owners or operators, and the qualitative assessment questionnaire provided in Appendix B. Soil samples will be collected from all play areas within each property. The set of defined Play Areas at a school or childcare does not have to provide complete coverage of the entire property. Well-maintained grass lawns that are not used significantly by young children, for example, may not be included in any of the defined Play Areas. Some play areas may also already have a deep cover layer (e.g., 12 inches of wood chips) that minimizes contact with potentially contaminated soils, and so may not be included in the sampling. Play Areas should be at a minimum 100 ft^2 and at a maximum the size of a typical ball field (e.g., around 1 acre). To the extent practical, Play Areas should reflect fairly homogeneous activities and development histories.

3.4.3 Sampling within Play Areas

The design for collecting soil samples within play areas is discussed in the following sections, including the number of boring locations, the selection of specific boring locations, the depth interval to be sampled, and the soil sample collection method.
All sample locations will be restricted to areas of accessible soils. Thus, soils beneath buildings, paved driveways or patios, deep covers of gravel or other non-soil materials, or otherwise inaccessible will not be sampled. Specific exclusion criteria include:

- Areas with at least one-foot of cover (sand, sawdust, beauty bark, tire chips, etc) will not be sampled.

- Areas will not be sampled if they have an intact barrier, i.e., geotextile fabric used as a weed guard, 12" of wood chips, gravel, tire chips, etc.

3.4.4 Number Of Borings

If a qualitative assessment determines the need for sampling, all play areas with the potential for exposure at each facility will be sampled. Eight borings will be obtained from each play area. On the occasion a play area may need more borings to acquire information about potential points of exposure, up to 10 borings can be collected instead of eight. For example, additional samples could be required to include samples from all locations within a play area where soil contact was likely to occur, and subdividing the single play area into multiple play areas is not reasonable. On the occasion a play area may need additional after the initial sampling to acquire information about potential points of exposure.

For extremely small play areas (<500 square feet) six borings may be collected instead of eight. All samples will be collected from the depth of 0-6" at each boring.

3.4.5 Boring Locations

As determined in the Sampling Design, different arrangements of boring locations could represent different types of average soil concentrations. Below are the different patterns that PHSKC has historically used in previous Child Use Areas studies and will use for sampling play areas in the Soil Safety Program:

1) **Random grid layout** – This would assure the best spatial representation of the Play Area as a whole. It would also reflect a simple assumption of equal probability for soil contact at any location within the Play Area. Random grids are typically employed in Play Areas where the likelihood of exposure appears vague or homogenous.

2) **Biased sampling** - Not all locations within a Play Area may be judged equally likely to result in soil contact. Child activities and behaviors may be focused at certain locations more than others - for example, areas with play equipment rather than lawn areas. Locations of bare soils, versus areas of well-maintained grass cover or wood chips, may also result in more potential exposure because they are attractive to young children and because direct soil contact is much more likely. Grid sampling could be restricted to only areas judged to have comparatively greater potential for soil exposures. This restricted spatial sampling would bias the average concentration toward those parts of a Play Area where exposure is judged most likely to occur. It includes an assumption of equal probability of soil contact in only designated parts of the Play Area. Some locations within the Play Area would not be represented at all by selected boring locations. Some reasonable estimates of areas of focused activity and most likely contact are often available from observations and short interviews at child use properties.

Field sampling teams will use their judgment in assigning sampling intensities to various areas of Focused sampling within each play area and record how and why the decisions were reached.

All boring locations will be restricted to areas of accessible soil. Soil beneath buildings, paved driveways or patios, deep covers of gravel or other non-soil materials or otherwise inaccessible materials will not be sampled. Boring locations will also be restricted to locations with potentially contaminated soils; thus, imported sand in self-contained (lined) sandbox play areas, where no potential for digging to soils below the sand exists, will not be sampled.

The previous CUA studies included other exclusion criteria to preclude sampling in locations where other, non-smelter sources may significantly affect soil contaminant levels. These exclusion criteria provided setback distances from such other recognized potential sources as treated wood, leaded gasoline emissions from vehicle use, and painted surfaces. For this Soil Safety Program, the exclusion criteria will not be used. The legislation upon which the Soil Safety Program is based directs Ecology to reduce exposures to arsenic and lead, regardless of source. Sampling will not be targeted at other sources of arsenic or lead, unless children are playing nearby. For example, a shed in the backyard that may be painted with lead based paint – sampling will not take place next to the shed just because the shed is present. Sampling next to the shed will take place if children play near the shed.

4.0 DATA COLLECTION ACTIVITIES

4.1 Access Agreements

To ensure that PHSKC accesses properties legally and with the consent of the owner / operator, a signed access agreement form will be obtained before PHSKC begins sampling. Access will be obtained according to the priorities outlined in the preceding Section 3.4.1. Methods for obtaining access are described in Appendix A. All activities associated with obtaining signed access agreements will be collected by PHSKC and entered in Ecology's Soil Safety Program database via a secure internet connection. The information will be updated at least monthly by PHSKC to allow Ecology to track progress.

4.2 Sampling Within Play Areas

All samples collected and analyzed at schools and childcares will represent discrete samples, collected from the depth interval 0 to 6 inches at each boring location, and from the depth interval 6 to 12 inches at approximately 25 percent of the boring locations. Soils from multiple borings will not be composited for lab analyses. The design for collecting soil samples is discussed in the following sections, including the number of sample locations, the depth intervals to be sampled, and the selection of specific boring locations

4.2.1 Number of Sample Locations

See Section 3.4.5 regarding sample locations.

4.2.2 Sampling Depths

Samples will be collected from two depth intervals: 0-6 inches and 6-12 inches. The "zero" depth from which depth measurements will be taken is defined to be the bottom of the root mass for grass cover, just below other types of cover (e.g., wood chips), or just below the duff layer if one exists. The defined depth intervals will provide information to characterize near-surface soils in areas where children are most likely to come into contact with soils.

4.2.3 Sample Locations

The field sampling teams will document the rationales for their assignment of sample locations at each play area in field notebooks. The rationale for deciding where to sample and whether or not to sample will be based upon the series of questions outlined in Appendix B.

4.2.4 Sampling Procedure

Soil sampling will be performed using one or more samplers. Samples will be collected using stainless steel "bucket augers" and placed into certified sealed and sterile 4-oz plastic containers supplied by King County Environmental Laboratory (KCEL).

The entire recovered sample of the soil core will be placed in the 4 oz. container. The soil core will be homogenized according to the procedure outlined for field duplicate samples in Section 5.0 of this document (below). The plastic containers will be capped and labeled, with a pen with the name of the project, the date, the time sample taken and sample number. The sample numbering scheme as follows:

Sample ID

1) County (Pierce = 27; King = 17; Thurston= 34) (numbers are standard county codes);
2) Facility Code: the sequential number assigned to each facility through Ecology's Safe Soil tracking database
3) Play area number: 1, 2, 3, 4, etc.
4) Boring number: 1, 2, 3, 4, etc.
5) Depth interval (required for KC database structure) 1 = 0-6" , 4 = 6-12"
6) Sample type 4= regular
   5= duplicate

Example: 27-0001-1-1-1-4 = Pierce County, facility 0001, play area 1, boring 1, depth 1, regular sample.

Example: 17-0005-2-8-1-5 = King County, facility 0005, play area 2, boring 8, depth 1, duplicate sample.

This format fits the PHSKC database numbering scheme for Child Use Areas, as follows:

Zone – Facility ID – Play Area – Boring – Depth – Sample Type

When the sample has been placed in sample jar, the hole will be restored to as close to the original condition as possible. Extra soil from the site may be added to replace the removed soil, and the grass plug will be placed firmly over the exposed soil and tamped into position.

The sample jars will be packaged to prevent breakage If samples are required to be held overnight or longer by PHSKC they will be kept in a secured refrigerator or on blue ice at the appropriate temperature (4°C) until such time that they can be delivered to KCEL.

Samples will be transferred to KCEL as soon as possible after collection and according to a mutually agreed upon procedure by PHSKC and KCEL using appropriate chain of custody documentation.

All sampling equipment will be decontaminated after each use. Decontamination includes a wash and scrub with a dilute Alconox© solution and tap water, and a triple rinse with deionized water. This work will be completed at the sampling location with de-con solutions discarded on the ground away from the sampling site, bodies of water and/or drainage ditches. Waste decontamination solutions may also be discarded in the sanitary sewer system of the satellite office. The wastewater generated from washing and rinsing the sampling tools will be discarded on the site, away from the sampling area. Decontaminated equipment will be stored in a Ziploc bag or aluminum foil between sampling events.

4.2.5 Other Data Collection Activities

Other non-sampling data activities are described in the following subsections.

Mapping of sample locations. The locations of all samples will be mapped using King County GIS. PHSKC will be using a Garmin GPS to mark each boring location. The datum is WGS 1984. This information is in PHSKC's database. The maps are in NAD 1983 WSP North. For sites that receive a qualitative assessment, but no sampling is required, the GPS, orthophotos, or other method will be used to confirm latitude and longitude location for the facility, and the confirmed coordinates will be entered into the Soil Safety Tracking database for that facility. The field-checked coordinates will replace the coordinates in the Soil Safety Tracking database that were generated with address-matching software.

Mapping of physical features. The locations of important physical features will be noted in the PHSKC field notebooks as well as the parcel number, boring locations and boring location conditions at the time of sampling.

Qualitative analysis. The team will record the observations of the play area(s) and the determination as to why or why not the play area is suitable for sampling. The evaluation will include the type of play area, type of ground cover, and other information as outlined in Appendix B.

Safety information. PHSKC sample team members hold safety meetings and record the topics of the meetings in the field notebook. Examples of topics include avoiding back and joint injuries, wearing appropriate protective clothing, avoiding hazards on the job site, noting the locations of nearby medical facilities, etc.

Database. Field notebook information (excluding sketches), chain of custody information, soil test data and associated Quality Assurance data will be maintained in the existing PHSKC Tacoma Smelter Plume database by PHSKC staff. The information will be kept current on a monthly basis. In addition, PHSKC will keep database information current in both the TSP database and Ecology's database by the following dates, to allow for reporting to the Washington State Legislature:
October 31, 2006
October 31, 2007
October 31, 2008
September 31, 2009

5.0 Field Quality Assurance Procedures

Field duplicate samples will be collected for quality control purposes. No field rinsate blank samples will be collected for this program. Field precision will be assessed through the analysis of duplicate field samples collected from a particular sampling point. A volume of soil from a single boring, roughly equal to the volume of one sample jar will be collected in a new plastic bag. The contents of the bag will be mixed for at least thirty seconds to homogenize the contents. The contents of the bag will be split equally between two sample jars. A minimum of one duplicate per twenty boring samples will be collected. The data quality objectives for the field duplicates will be relative percent difference (RPD) of no greater than ±50% for each target element in the samples.

Field notebooks will contain a record of each day's activities and all relevant observations, criteria for selecting play area(s) and boring locations, a sketch of the play area with boring locations noted, measurements, and data not recorded elsewhere. Copies of the field notebook pages will be made at the end of each field event and maintained in the project file.

Sample collection data sheets will be completed for each sample collected. Field staff will be responsible for recording pertinent information regarding site description and conditions during the sampling process. The following information will be recorded on the sample data sheet or in the field notebook for each play area at the child-use facility:

- Parcel number and address
- Geographic Positioning System (GPS) coordinates (Latitude and Longitude)
- Accuracy of GPS reading (in feet)
- Field locate points using bearings and distances to property corners, if known
- Sampling team members
- Boring number
- Sampling depth interval
- Sample type (Primary, Primary Duplicate)
- Date and time of sampling
- Sampling location – address
- Approximate age of building(s)
- Any unusual circumstances

Sample labels will be attached to each sample jar collected. Labels will contain the sample number, date and time of sample collection, analyses requested, and sampler initials. The sample numbering scheme is described in the QAPP, and in Sec. 4.2.4, above.

Chain of custody forms will accompany all samples shipped to the analytical laboratory. In addition to containing a record of sample information, chain of custody forms will contain the signature of the sample shipper and will document the date and time the samples were shipped and the airbill number of the carrier (if not hand delivered). Upon receipt at the laboratory, the chain of custody record will be compared with the samples received, any discrepancies will be noted, and the form will be signed and dated by an authorized laboratory representative and a copy returned to the sender. Figure 1 provides an example of a sample label and a chain of custody form.

At the completion of the soil safety program, Ecology will be provided copies of the sketches, field notebooks, access agreements and lab reports for their files.

5.0 DATA MANAGEMENT

This section describes the procedures to be used to document and track chemical and field data. The objective of these procedures is to assure that all data collected during the Program are processed and archived in a manner that assures data quality, security, and irretrievability and thereby assures information integrity.

Technical data from field notebooks and laboratory analyses will continue to be combined in the existing database. Therefore the data can be analyzed and utilized to characterize the environmental conditions at the sample locations.

Maintaining data integrity involves all aspects of the program beginning with the collection of the first soil sample and continuing through data reporting of valid results. Three primary actions will be carried out to ensure data integrity throughout the duration of the program: sample management, management of hard copy forms of data, and management of electronic data.

5.1 Sample Management

Sample management will be monitored by tracking field samples through the chain-of-custody process. It will be the responsibility of every individual who handles the samples to ensure that chain-of-custody forms are filled out accurately and completely. Attention to detail when transcribing sample numbers is of the utmost importance. The project manager will assure the following sample management tasks are conducted by:

- Accurately tracking the transport of field samples from the point of collection to the selected laboratory through chain-of-custody documentation and confirmation e-mails.

- Keeping the selected laboratory informed of pending sample shipments to achieve the required turnaround times and avoid missing sample holding times.

- Confirming that all requested procedures and analyses had been performed, and coordinating with the selected laboratory for any additional analyses.

- Coordinating with the lab for disposal of samples once data have been reviewed and verified as acceptable.

5.2 Management of Hard Copy Data

The hardcopy forms of data that will be utilized throughout this program include:

- Field notebooks. Field data will be recorded in field notebooks containing Rite-in-the-Rain paper. Field data that is pertinent for characterizing the contaminants will be entered into the database along with sample numbers, date, locations, and names of samplers.

- Laboratory data sent to PHSKC from the laboratory

These selected hardcopy laboratory deliverables will be stored and maintained in organized locked files until the data verification and reporting process is complete, at which time copies of all hardcopy materials will be sent to Ecology for appropriate storage. This will include copies or originals of the field notebooks and the hard copies of laboratory reports.

5.3 Management of Electronic Data

Laboratory data will be provided from the laboratory to PHSKC in an electronic data deliverable (EDD). EDD's will be uploaded to the PHSKC Tacoma Smelter Plume database developed by PHSKC and maintained on king County Servers. The database will be used to assist with QC activities, to query data, to assist in producing reports and to assist in transferring data to Ecology's Environmental Information Management (EIM) database. Relevant field data will also be entered into and maintained in the PHSKC Tacoma Smelter Plume database by PHSKC staff.

Ecology's EIM database will be utilized by Ecology to store soil analytical results from the Soil Safety Program. Sample location and result data will be uploaded from the PHSKC Tacoma smelter plume database to EIM.

Ecology's Soil Safety Tracking System (SSTS) database will be utilized to track information about schools and childcares, facility contact and location information, access attempts, results of the qualitative assessment, outreach efforts, soil results, actions needed, actions taken, and other information. PHSKC will provide ongoing updates to the SSTS database as outlined below.

Ecology will maintain the EIM database and the Soil Safety Tracking (SST) database.

5.4 Responsibilities

5.4.1 King County Environmental Laboratory (KCEL)

KCEL will be responsible for sample transport to the laboratory, preparation and analysis of soil samples, and reporting the data to PHSKC as specified in the QAPP and contract with TPCHD. Results from sample analysis will be sent by EDD from KCEL to PHSKC and followed by hardcopies of data as specified in the QAPP. KCEL will be responsible for verifying and reviewing the quality and accuracy of all data deliverables to PHSKC.

5.4.2 PHSKC

PHSKC will be responsible for accumulating and managing data in the existing PHSKC TSP Project database. The following tasks will be performed:

- Entering all pertinent data from field notebooks into the project database.
- Uploading data from EDD's into the project database

- QC checking all data that is entered into the database. This task will be completed by comparing sample numbers and dates to those in the confirmation e-mails received from the selected laboratory, comparing data which has been uploaded into the database from EDDs to the files received from the selected laboratory, and any data that was entered from field notebooks.

- Reviewing data quality.

- Providing data transfer of sample results to Ecology's EIM system.

- Maintaining appropriate fields in the SSTS database.

5.4.3 Ecology

Ecology will be responsible for long-term storage of both electronic and hardcopy data. Electronic data will be maintained in the EIM system and the Soil Safety Tracking Database and hardcopy data will be properly archived. Ecology will be responsible for reporting the results of the program to the legislature.

5.4.4 Data Entry

Information from each sampling event will be entered into the *PHSKC Tacoma Smelter Plume* database within two weeks of receipt of the data from the field or the selected laboratory. Field data will be entered manually by the designated and trained PHSKC staff. EDDs containing analysis results will be uploaded electronically into the project database. Only the data manager will be permitted to update or edit the database. Other personnel who need to use the data will be prohibited from altering the data and structure of the file.

5.4.5 Data Retrieval

The PHSKC project manager will be responsible for processing requests for the transfer of analytical data files and summaries In addition, the project manager will be in charge of coordinating data transfers to the Ecology EIM system.

5.4.3 Data QC

It is the responsibility of each party who handles samples or data to ensure that all data transmissions and transcriptions are correct and accurate. It is especially important to compare EDDs to hardcopies or their original files that have not been through an electronic transfer. This ensures that any errors created during the electronic transfer are corrected. Additionally, PHSKC will perform data QC checks, compare sample numbers and dates with those entered into the database from field notebooks and the chain-of-custody forms.

The lab will provide electronic data deliverables to PHSKC via email. The EDD will be in a mutually agreed-upon format that is compatible with the databases used by Ecology, PHSKC and TPCHD to store and manage soil test data. The contents of the EDD will be checked by a qualified staff member selected by the PHSKC project manager, and if complete will be uploaded into the PHSKC database by a qualified PHSKC staff member. All database entries will be checked by a second qualified PHSKC staff member. Errors will be reported to the lab. The lab must correct the errors as requested and send corrected versions of the EDDs and, if necessary, corrected hardcopies of the lab data to PHSKC. A list of the parameters that will be used to check for accuracy, completeness and precision is provided in the QAPP (Appendix 1). A summary of the quality assurance reviews will be provided to Ecology with the quarterly reports for PHSKC's Site Hazard Assessment grant for the Tacoma Smelter Plume.

6.0 DATA EVALUATION AND NOTIFICATION OF RESULTS

When EDD's arrive from the laboratory, the PHSKC project staff will review the results for each facility sampled and will determine the average level of arsenic and lead as well as the maximum arsenic and lead result for each play area. PHSKC will coordinate with Ecology's SSP project manager whenever all results from a facility are available, to determine how to notify facilities of their results. The Soil Safety Program Design requires that property owners and operators be notified of their results within one month of the health departments receiving results from the laboratory. For all facilities that fall under the action criteria from the Soil Safety Program Design, PHSKC will provide a letter to the facility owner and operator, based on the template from the SSP Design, along with a certificate of participation in the program.

7.0 REFERENCES

Landau Associates, 2003. *Sampling Design for the Tacoma Smelter Plume 2003-2005 Extended Footprint Study.* Tacoma, WA 2003

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APPENDIX A

KING COUNTY SAMPLING AND SELECTION PRIORITIES

This section outlines the manner in which Public Health - Seattle & King County (Public Health) will prioritize the work of obtaining access agreements and sampling within the Soil Safety Program Service Area. The methods draw upon Public Health's experience gained in previous Child-Use Areas studies and the agency's expertise in engaging communities within King County.

Obtaining Access

Public Health must obtain a signed access agreement from the property owner or tenant prior to sampling the soil. Public Health will attempt to obtain access agreements by a number of different methods, as indicated below.

1. **Mailings** – Public Health will mail a cover letter with a blank access agreement (utilizing the template from the Soil Safety Program Design) and self-addressed, stamped envelope to each facility within the SSP Service Area that has not been previously sampled in past King County Child-Use Area studies. In the case of child cares, Public Health will obtain lists of facilities from the Ecology SSP database, which will be refreshed at a minimum of every six months. . All mailings will be documented and entered in the SSP database. Ecology expects that all mailings be from lists generated from the Ecology SSTS database, not other lists generated or obtained directly from DSHS or other sources. Ecology will work directly with the DSHS licensures to check over the lists and make sure there aren't any oddballs such as places that are temporarily on vacation or something. Preschools will be identified by PHSKC through various local resources. PHSKC will add to the SSTS database any facilities identified that are not already in the SSTS database.
2. **Phone calls** – Public Health will follow up with facilities that have not responded to mailings within three weeks by calling the facility as many as three times, when a phone number is available. A maximum of three phone call attempts will be made to each facility for the purposes of contacting them about the access agreement. All calling activities will be documented and entered in the SSP database.
3. **Field visits** – Public Health will research all businesses that have not responded to mailings, phone calls or other attempts at contact to ensure that the business is still in operation. If Public Health cannot determine conclusively that the business is out of operation, Public Health will visit the facility in the course of other sampling activities. If the facility is closed or does not appear to be operating, Public Health will document this in the database. If the facility is operating, Public Health staff will contact the facility in person and attempt to obtain an access agreement. All field visits will be documented and entered in the SSP database.
4. **Partnerships** –
   School districts in the SSP Service Area will be contacted by representatives form Public Health and the Department of Ecology (Ecology). Public Health and Ecology will meet with representatives from each school district. For schools which have already been

sampled, Ecology will attempt to enter into agreements with the school districts to address contamination in those properties that rank as "medium" or "high" as defined in RCW 70.140. Public Health and Ecology will work with the school districts to obtain access agreements for school play areas that have not been previously sampled by Public Health.

Child care facilities in the SSP Service Area may concurrently be contacted through Public Health partner organizations. Such organizations might include the Public Health Child Care team, the Local Hazardous Waste Management Program (LHWMP), Head Start and others.

5. **Private Schools**
6. **Outreach activities** – Concurrent with sampling activities, Public Health will conduct outreach activities with schools, pre-schools, and child cares to educate audiences, encourage safe soil activities and promote the Soil Safety service. Public Health May promote the soil sampling service during outreach activities. Outreach activities might include curriculum offerings (schools and pre-schools), STARS trainings, TSP information and educational materials provided at health fairs and other methods.

Sequence of Work

Public Health believes that all child use areas in King County that are affected by the Plume should be sampled and staff and families should be educated on methods to reduce exposure to contaminated soil. However, given resource constraints, the TSP Team at Public Health will attempt to concentrate efforts at obtaining access agreements and sampling in stages based on the type of facility, whether or not Public Health has previously contacted the facility, and the geographic location relative to the former Asarco smelter. In order to perform the work in the most efficient manner possible, Public Health will prioritize it in a number of interdependent ways, including the following:

1. **Proximity to the former Asarco smelter** - Beginning at the areas closest to and most affected by the former Asarco smelter (as determined by previous sampling data), Public Health will move northward and eastward in the Soil Safety Program (SSP) Service Area. Within the SSP Service Area, Public Health will attempt to conduct mailings and sampling activities in three geographical groupings, based upon School District boundaries. The groupings are as follows:
   Phase I: Vashon School District, Federal Way School District
   Phase II: Highline School District, Kent School District
   Phase III: Renton School District, Tukwila School District, Seattle School District
2. **Efficiency** – Access agreements for facilities in proximity to each other will be sampled at the same time to reduce commute time and energy consumption, and to increase the number of facilities that can be sampled on the same day. Field visits to facilities to obtain access agreements will be conducted as close as possible to the sampling locations to maximize efficiencies in time and energy.
3. **Availability** – Past experience indicates that signed access agreements are often received in a random pattern of location and time. Public Health will always endeavor to conduct the sampling activities in the most efficient manner, and recognizes that this may require sampling facilities as signed access agreements are obtained if the response rate is low.

APPENDIX B

- QUALITATIVE ANALYSIS OF DECISION UNITS

- The following is a list of questions samplers will ask in evaluating play areas and determining whether or where to sample. Each play area will be unique, so not all questions may apply. The decisions will be documented as notes in the field notebooks. In addition to the usual questions related to the need for sampling, the SSTS database also has a place for noting how the facility heard about the program. These questions should be asked at the qualitative assessment so the SSTS database can be filled in for that issue.

  - Sampling Criteria Questions

  - Where is exposed dirt?

  - Where do children usually play?

  - Where do children spend the most time?

  - What are the ages of children in the facility?

  - How many of the children are under the age of 6?

  - How many children are under the age of 3?

  - How many play areas / structures are there?

  - How deep is the covering (chips, bark, gravel, etc) under and surrounding the play structure(s)?
    [If the covering is more than 12" deep throughout, the area is not sampled]

  - Is there a lining separating the covering from the soil?
    [If there is a continuous, well-maintained plastic or Geotech™-type barrier under the covering material, the area is not sampled]

  - Is there an impervious surface (asphalt, texturized rubber, concrete, etc.) over the play area?
    [If so, the area is not sampled]

  - Do the children dig or play in the dirt? If so, where?

  - The following questions are asked on a case-by-case basis to help samplers determine exclusion zones and/or interpret results: (they have not been systematically recorded)

  - When was the property developed?

- Has soil been moved / removed / added?
- Has there been any remodeling or landscaping?
- Do any of the structures (play structures, fences, decks, etc) have painted or treated wood?
- How old are the structures?
- Have any play structures been added / removed / moved, particularly treated wood or old painted structures?

Appendix G

Tacoma-Pierce County Health Department

Soil Safety Implementation Plan

SOIL SAFETY IMPLEMENTATION PLAN
Tacoma Smelter Plume Project
for
Pierce County

Tacoma Pierce County Health Department
Environmental Health Program
for
Washington Department of Ecology
February 7, 2007

Field Sampling Plan

Table of Contents

1.0 INTRODUCTION

ASARCO operated a primary copper smelter at Ruston, Washington for almost 100 years. That smelter, referred to as the Tacoma Smelter, specialized in the smelting of complex (e.g., high-arsenic) ores. It closed in 1986. For many years, the Tacoma Smelter was the sole domestic source of arsenic for the U.S. market.

The U.S. Environmental Protection Agency (EPA) is overseeing cleanup of residential properties in Ruston and north Tacoma, within approximately 1 mile of the former smelter, as part of Commencement Bay Superfund Site cleanup activities. The Washington State Department of Ecology (Ecology), in cooperation with local health departments, has been investigating widespread contamination from smelter emissions extending beyond the designated EPA Superfund site. This larger area of contamination has been designated the Tacoma Smelter Plume (TSP) Site under Washington's Model Toxics Control Act (MTCA).

A number of studies of residual soil contamination within the TSP Site have been completed including footprint studies of Thurston, Pierce, Kitsap, and King Counties, and Child Use Area (CUA) studies in King and Pierce Counties. Footprint studies defined the spatial pattern of smelter contamination and its likely maximum magnitudes by location. Child Use Areas - those locations where numbers of children are likely to spend significant time and have opportunities for contact with contaminated soil – have been sampled in King and Pierce Counties, on a limited basis. Young children are considered a population of special concern because of their propensity for soil contact, mouthing behaviors, and greater sensitivity (e.g., greater absorption) for smelter-related contaminants such as arsenic and lead.

The work described in this Field Sampling Plan (FSP) is being performed by the Tacoma – Pierce County Health Department (TPCHD) on behalf of the Washington State Department of Ecology (Ecology). It is part of a Site Hazard Assessment of Pierce County areas surrounding the former ASARCO Tacoma Smelter, located in Ruston, Washington. It includes part of the City of Tacoma, part of southwest Pierce County, Gig Harbor and Fox Island. The project includes cities such as Fircrest, University Place, Lakewood, and Steilacoom. Parts or all of these areas fall within the Soil Safety Service Area where schools, preschools, and childcare facilities will be contacted and assessed for soil sampling.

2.0 PROJECT DESCRIPTION

2.1 Overview

A law (Chapter 70.140 RCW) was enacted in 2005 to assist state and local agencies in implementing actions to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law requires Ecology, in cooperation with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of the

Superintendent of Public Instruction (OSPI), and local health districts, to assist schools and childcares in western Washington to reduce the potential for children's exposure to area-wide soil contamination.

The TPCHD will collect and analyze soil samples from play areas at public and private schools, preschools, and child cares within the defined Soil Safety Service Area on mainland Pierce County, Gig Harbor, Fox Island, and Anderson Island. Some parks may also be sampled if they are frequently used by childcare or preschool facilities for a primary playground. The samples will be analyzed for arsenic and lead content.

2.2 Definition of the Soil Safety Service Area

The Pierce County Footprint Study, completed in November 2002, and the Extended Footprint Study completed in August 2004 provides soil arsenic results for 278 locations. Data from these studies were analyzed by Pacific Groundwater Group (PgG), an environmental consulting firm under contract with Ecology, to estimate the arsenic concentrations in soil at the 90th percentile for 0-6 inches. The boundaries for the Soil Safety service area were defined based on this set of analyzed data, and include those parts of the county where soil arsenic levels could exceed 100 ppm. See "Arsenic Concentrations Within Soil Safety Area" Map. A more detailed explanation of the process for defining the Soil Safety Service area is found in the Soil Safety Program Sampling Design document. The service area includes the Asarco Study Area.

Properties within the service area that are excluded from sampling are the Point Defiance Zoo, South Tacoma Field, and a portion of the Ft. Lewis army base. However, if Ecology were able to obtain access to Ft. Lewis, the TPCHD would include in the Safe Soil Project.

2.3 Identification of Child Use Areas

Public and private schools (Kindergarten through 12th grade), were identified from a database lists provided through the Pierce County GIS system. Ecology will work with DSHS to generate a list of current licensed childcare facilities in the service area and provide that information to TPCHD initially, with updates provided approximately every six months. Preschools and private schools that are not captured by Ecology's database will be provided and entered by the Health Department.

2.4 Prioritization of Schools and Childcares

Priority is given to facilities that are closest to the smelter site and in a downwind direction. Maps provided by the PgG Report will be used to guide resources to the sites most likely to have elevated levels of arsenic and lead. The schools within the Tacoma School District will be sampled first, followed by University Place, Clover Park, Steilacoom, and Peninsula District Schools. At the same time, private schools within those school districts will be addressed. Following the school district sampling phase, childcare facilities and preschools within zip codes 98407, 98406, and 98466 will be prioritized in the order of their proximity to the old Asarco site and, prevailing wind patterns, and arsenic concentration levels. These sites include the communities of North

Tacoma, West Tacoma, and University Place. The remaining zip codes will be prioritized accordingly: 98467, 98498, 98499, 98388, 98422, 98335, 98327, 98303, 98403, and 98333.

2.5 Sampling Strategy

If a qualitative assessment determines the need for sampling, all play areas with the potential for exposure at each facility will be sampled. Eight borings will be obtained from each play area. On the occasion the Play Area may need more borings to acquire information about all potential points of exposure, up to 10 borings can be collected instead of eight. For extremely small play areas (<about 500 square feet), six borings may be collected instead of eight. All samples will be collected from the depth of 0-6" at each boring.

The number of Play Areas per property is dependent on the number of different areas on the property used by children. For example, one area of a school property may be a sports field, another the playground and a third could be a garden. This would potentially result in three Play Areas for the property. The field sampler will make the final decisions on the number of Play Areas based on the development history of the property, input from property owners or operators, and observing where children play. Historical information will be collected from questions on the access agreement and from meetings and discussions with the property owners or school administrators.

The field sampler will use his best judgment to select the borings. If the play area has non-uniform features, such as the back yard of a daycare center, the locations of the borings within the play area will be chosen based on children's potential exposure to soil. If the play area has uniform features, such as a soccer field, borings will be laid out in a grid pattern that covers the entire play area.

3.0 TASK DESCRIPTIONS

3.1 Access

Each private property owner (primarily preschools, child care operators and private schools) will be sent a cover letter explaining the project and an access agreement to be signed by the property owner to allow the TPCHD to conduct qualitative assessments and collect soil samples. The cover letter and access agreement will be based on the templates from the Soil Safety Program design document. Private facilities will be notified in groups, with the first mailing reaching those located in the 98407 zip code. The following groups will be mailed according to the prioritizing scheme in section 2.4 of this plan. As the facilities are completed in one zip code, the next group in the proceeding zip code will be mailed. All sampling sites will be provided the specific parcel numbers of the property/properties the TPCHD is interested in sampling. If the access agreement is not returned within two to four weeks, a call to remind the facility will be given. After another two to four weeks, and if no signed agreement is received, a planned visit by the Health Department will take place. The local Department of Social

and Health Services (DSHS) child care licensures will also be contacted for their assistance in encouraging child care facilities that do not respond to the letter. For corporate childcares, Ecology will contact and find out how the corporation wants to deal with individual facilities, then TPCHD will contact accordingly. When signed access agreements are received, the private schools and childcares will be contacted to arrange a site visit for qualitative assessment and sampling.

For school access, Ecology and the TPCHD will meet with each public school district to explain the current scope of the project and request access to their appropriate schools. After the signed access agreement is received, the sampling of public schools will begin as explained in section 2.3.1. The point of contact with each school district will be contacted before each school is sampled, unless the school district gives permission to the TPCHD to contact the individual schools. The TPCHD will use the template access agreement provided by Ecology on the TPCHD letterhead.

The access agreement addresses the legality of entering private and public property. Where appropriate, the Property Access Agreement will list the selected facilities to be sampled, such as public schools within a district, and corporate child care facilities. All sites that are sampled will receive their results within one month after the TPCHD receives the data from the laboratory. TPCHD staff will review the results and identify which properties fall below the criteria for action. Recipients that fall below the criteria will receive a cover letter and certificate of participation, based on the templates in the SSP design document, with an enclosure of their results. TPCHD will coordinate with Ecology's SSP project manager about the data evaluations and notification of property owners prior to sending any notification letters. Facilities that are above criteria will be contacted by Ecology.

All pertinent information from each property will be provided to Ecology's Soil Safety Tracking Database. The Field Lead person will update the SSP database on a regular basis. After each facility is sampled, the sample ID's with comments will be entered into the SSP database within the week. Reports will be drawn from this database by Ecology and provided to the Washington State Legislators by December 2006 and 2009, as cited by RCW 70.140.

3.2 Qualitative Assessment

TPCHD will conduct a qualitative assessment at each site where access is gained. The following questions will be asked to determine if sampling is needed at a site, and to help choose the sample locations.

Sampling Criteria Questions

- Where is exposed dirt?
- Where do children usually play?

- Where do children spend the most time?
- What are the ages of children in the facility?
- How many of the children are under the age of 6?
- How many children are under the age of 3?
- How many play areas / structures are there?
- How deep is the covering (chips, bark, gravel, etc) under and surrounding the play structure(s)?
  [If the covering is more than 12" deep throughout, the area is not sampled]
- Is there a lining separating the covering from the soil?
  [If there is a continuous, well-maintained plastic or Geotech™-type barrier under the covering material, the area is not sampled]
- Is there an impervious surface (asphalt, texturized rubber, concrete, etc.) over the play area?
  [If so, the area is not sampled]
- Do the children dig or play in the dirt? If so, where?

The following questions are asked on a case-by-case basis to help samplers determine exclusion zones and/or interpret results: (they have not been systematically recorded)

- When was the property developed?
- Has soil been moved / removed / added?
- Has there been any remodeling or landscaping?
- Do any of the structures (play structures, fences, decks, etc) have painted or treated wood?
- How old are the structures?
- Have any play structures been added / removed / moved, particularly treated wood or old painted structures?

Areas that will be excluded from sampling include:

- Inaccessible soils, such as those beneath buildings, paved driveways or patios, deep covers of gravel or other non-soil material
- Areas with one foot deep cover, such as gravel, wood chips, bark or sand
- Areas with a barrier, such as a rubber mat or a geotech liner covered with non-soil material

At the time of the qualitative assessment, staff will also ask the facility contact about how they learned of the Soil Safety Program, and for other information needed for the Soil Safety Tracking database, and will input that information into the database for each facility.

3.3 Sample Numbering Scheme

The sample numbering scheme was designed to incorporate all the essential information about the property and the specific boring.

Example of sample numbers are: Ex. (#1) 27-X021-3-6-1-4
Ex. (#2) 27-X522-1-4-1-5

Where fields are:
County ID – Facility Type & Code – Play Area ID - Boring ID – Boring Depth - Type of Sample

1) County Code (Pierce = 27);
2) Facility Type will be incorporated into the facility code. The following ranges will apply; schools = 0001 to 1000, childcares = 1001 to 8000, parks/others = 8001 to 9999;
3) Facility Code: the sequential number assigned to each facility through Ecology's safe soil tracking system database
4) Play area number: 1,2, 3, 4, etc…
5) Boring number: 1, 2, 3, 4, etc.
6) Depth interval (required for KC database structure) 1 = 0-6"
7) Sample type 4 = regular, 5 = field duplicate

3.4 Field Log Information

Field staff is responsible for recording pertinent information regarding site description and conditions during the sampling process. Field notes will be recorded on data sheets generated by an Access database report (containing property and ownership information) and printed on Rite in the Rain paper. The following information will be recorded in the field notebook for each sampling property:

- Property ID number
- Address and parcel number
- Sampler
- Date and time of sampling event
- Play area number
- Description of the property at that particular location and any known soil disturbances, such as tilling, sprinkler systems, excavation, etc.
- The number of children using the facility or property
- Sample number, which incorporates the County ID, property ID, type of child use area, Play areas, boring number, and sample type
- Ground cover
- Any unusual circumstances, such as a distinctly different soil type, as well as any observations about the play areas and their use by children
- Map of the sample locations on an orthophoto for each property (with notes about the Play areas if they are not self-explanatory)
- An explanation of the number of sampling locations per Play area

The information recorded in the field logs will be entered in to the Pierce County TSP database. These entries will be validated by a second person.

Orthophotos of each property will be printed from the Pierce County GIS and the locations of each of the borings will be recorded on the pictures. The sampler will pace the distance from one boring to another. Each Play area will be outlined on the orthophoto as well. This will provide TPCHD with a map of all sample locations. Additionally the printouts should include the parcel number, address, and the property ID number. These photos will become part of the archive for this project. The lat/long coordinates for each play area will be entered in the result database, provided by the Pierce County GIS Department orthophotos.

As each site is visited, the latitude and longitude coordinates that were generated from the address-matching software for the Soils Safety Program Tracking Database will be confirmed using the orthophotos, and the SSP database will be updated with the correct latitude and longitude. The lat/long for the first play area will be used to represent the site in the SSP database. If it is possible for Ecology to automatically input the correct latitude and longitude coordinates to the SSP database from the EIM database, that will be done for sites that have been sampled. For sites that receive a qualitative assessment but are not sampled, TPCHD will identify the latitude and longitude and update the SSP database as described above.

3.5 Equipment

The majority of the field equipment will be the same as in the footprint study, with a few items that need to be replenished periodically.

Daily Equipment

- Backpack
- 1 stainless steel coring device at 6 inch length
- Four pound sledgehammer and/or deadblow mallet
- Shovel
- Latex gloves
- Earplugs
- Aluminum foil
- Field logs and indelible pens
- Labels (provided by lab) and stickers for the sample jars
- Topsoil or sand
- Liqui-Nox® detergent and deionized water
- Bottlebrushes
- Hand sanitizer wipes
- 4 oz. Sampling jars (provided by lab)
- 5 gallon buckets
- 2 gallon water sprayer
- De-ionized water (provided by the lab)
- Kneeling pads
- Garbage bags
- Cooler and ice packs for sample storage in the field

The stainless steel soil collection equipment was designed by Ecology and modified for this project. The devices were produced at Zeigler's Welding in Olympia, Washington. This is a stainless steel tube at a 6" length with a 2" diameter, and 3/8" thick stainless steel plate on the top (see drawings in appendix A).

3.6 Field Preparation

Most field equipment and supplies will be kept in storage bins in the project vehicle, with the exception of the field notebooks, coolers, and ice packs. Orthophotos for a given property will be prepared at least one day prior to sampling. Sample labels and a Chain of Custody will be prepared daily in the field. The sample labels will be placed on the sample jars, along with bright stickers to easily identify the sample as a TPCHD sample after it is received by the contract analytical laboratory.

3.7 Sample Protocol

Property owners will be notified prior to sampling. While sampling, the residents/owners of the property will be able to observe the sampling procedure outside the 10-foot radius of the sampling location. Each coring device will collect between 4 and 10 ounces of soil. This volume will be sufficient since the contracted laboratory will use 0.5 grams (~1/50 of an ounce) of soil for analysis. A four-pound sledgehammer or rubber mallet will be used to pound the coring device into the soil and then remove the soil by tapping the coring device so the soil falls into the stainless steel bowl or on to aluminum foil. Stainless steel spoons will help remove any large rocks or roots that cannot be sampled for arsenic and lead and transfer the remaining soil into sample jars. If the soil from the hole is not retained in the coring device, a clean stainless steel spoon may be used to remove the soil from the hole. The field sampler will always wear latex gloves while collecting the soil samples. The holes that are created by the coring devices will be backfilled with clean topsoil or sand. After the sample or samples are collected the equipment must be decontaminated using deionized water and Liqui-Nox® critical cleaning liquid detergent.
Below is the description of sample protocol while samplers are on site.

Sampling Details

1. Note location of Play area(s) and each boring on ortho photos and note current site conditions and other pertinent information in field log
2. Create work area
3. Record sampling data; see list in section 3.4
4. Sample collection
    a. Any large amount of fallen leaves or pine needles or other non-soil material on the ground will be removed, but this does not include tufts of grass.
    b. Place the 6" coring device on the ground and drive it down with the four-pound dead blow mallet into the ground. The result is a 0-6" sample. This device has a 2" inner diameter stainless steel pipe. If the whole sample

does not come out in the coring device the rest of the soil can be dug out using a clean stainless steel spoon. Making sure that the whole sample is removed.

c. Remove the pipe from the ground.
d. Remove the soil from the pipe onto aluminum foil or into a stainless steel bowl. This can be done by tapping lightly on the outside of the pipe with the sledgehammer. Keep the sample out of the wind to prevent fines from blowing away.
e. The base of the root mass is considered the beginning of the soil sample, therefore the tuft of grass and roots are removed from the sample. Shake the soils from the roots onto the foil. Remove any large rocks or organic matter such as sticks or roots. (Leave clay particles and soil particles in place. Lab will process these when sieving.)
f. If the amount of soil is more than the size of the jar, the soil will be homogenized before filling the jar in order to get a representative sample.
g. If the soil does not remain in the coring device when it is removed, the sampler may need to dig the sample out using a clean stainless steel spoon. In this case the sampler must be careful to remove the entire sample that has been dislodged by the coring device.
h. Transfer enough of the homogenized collected soil sample to fill a sterile glass jar provided by the laboratory using the stainless steel spoons. The jars, which do not contain preservatives, will have a label with the date and time, sampler name or initials, sample number and location, and a bright sticker to easily identify the sample as a TPCHD sample.
i. If there is sample refusal, such as the coring device cannot be driven into the ground due to an obstruction such as a large rock or root, the boring will either be abandoned and a second adjacent boring will be collected starting over, or the obstruction will be removed and sampling will continue. Any soil samples that were collected in an abandoned boring will be discarded and the hole will be returned to its original state.
j. Decontaminate sample core equipment, spoons and bowls using diluted Liqui-Nox® detergent and rinsing twice with deionized water (this can also be done at the end of the sampling for each boring).
k. Return site as close to original conditions as possible, backfilling the borings with clean topsoil or sand. Replace grass plug.
l. Make sure all information is collected and recorded in field log, sample's label and chain of custody.
m. Place samples in a cooler with blue ice packs. Samples will be kept cool until received by the contract analytical laboratory. When delivered to the laboratory, samples will be placed in a locked refrigerator and maintained at 4°C until analyzed. If the samples cannot be delivered to the laboratory on the day they are collected they can be held up to three days in a 4^0C refrigerator at TPCHD.

3.8 Quality Control Samples for Field Collection

The following field QC samples will be collected for this project:

Field Duplicates

Field precision will be assessed through the analysis of duplicate field samples collected from a particular sampling point. A minimum of one duplicate per twenty samples, or 5% of the total samples, will be collected. Every twentieth boring will be collected as a duplicate, while making sure the duplicates are spatially located throughout the study boundaries. Duplicates will be collected for the 0-6" depth from the same boring. A single sample will be placed onto aluminum foil, any large rocks or sticks will be removed, the sample will be homogenized using a stainless steel spoon, split in half and analyzed as two separate samples. TPCHD will not collect any duplicates for owners or residents of properties sampled. The location of field duplicate samples will not be pre-selected because they are a test of field variability and sample collection competence. The locations will be positioned throughout the study area and mapped to show where the duplicates were collected. The map will be periodically reviewed to ensure adequate geographic coverage. The Relative Percent Difference (RPD) will be calculated when the data is received. RPD = $\{(R1 - R2)/R\} \times 100$

3.9 Decontamination and Waste Handling

To prevent the cross-contamination of samples, sampling devices will be cleaned of adhering soil after each sample is collected. The sampling devices will be cleaned using Liqui-nox® detergent, deionized water and a bottlebrush. Liqui-nox® detergent is made by Alconox, Inc. and does not contain any phosphates that could affect sample results. The detergent must be diluted, 10 ml Liqui-nox® per one liter of deionized water. The coring devices will be washed and rinsed twice using a spray bottle of deionized water. The wastewater generated from washing and rinsing digging tools will be discarded on the site, away from the sample collection area.

3.10 Sample Shipping & Chain of Custody

Samples will be placed in a cooler with "blue ice" packs and kept in the field until transferred tothe contract lab for analysis. The Chain-of-Custody form will be included in each sample shipment (Appendix B). The chain of custody forms indicate the date the samples were collected and the date they were delivered tothe contract analytical laboratory.

3.11 Data Management

This section describes the procedures to be used to document and track chemical data. The objective of these procedures is to assure that all data collected during the project are processed and archived in a manner that assures data quality, security, and retrievability, thereby assuring information integrity. Maintaining data integrity involves all aspects of the project beginning with the collection of the first sample and continuing through archiving the electronic and hard copy results. Three primary tasks will be carried out to

ensure data integrity throughout the duration of the project: sample management, management of hardcopy forms of data, and electronic data management.

3.11.1 Sample Management

The Field Lead person will be responsible for sample management, and will involve monitoring and tracking of samples through the chain-of-custody process, from the time they are collected, through final disposal of samples after data have been reviewed and determined to be adequate. The TPCHD will begin by using the assigned number for each facility found on Ecology's Safe Soil Tracking System database. The field identification numbers will be the primary means to track the sample from the field to the final data result entry into the TPCHD field database. The field identification numbers will be recorded in the field log, and on the chain-of-custody form. The field numbers will be hand entered into the TPCHD database. It will be the responsibility of every individual who handles the samples to ensure that chain-of-custody forms are filled out accurately and completely. **Attention to detail when transcribing sample numbers is of the utmost importance.** In addition to chain-of-custody forms, the laboratory will send confirmation e-mails to the TPCHD indicating which samples have arrived at the lab and the dates of their arrivals. The TPCHD Field Lead person will assure the following sample management tasks are conducted:

- Ensuring that samples are stored in a secure environment at the proper temperature until delivery to the lab.
- Accurately tracking the transport of field samples to the laboratory through chain-of-custody documentation and confirmation e-mails.
- Reviewing sample confirmation e-mails and comparing them to field logbooks and sample numbers and dates entered into the database for that week.
- Confirming that all requested procedures, analysis, and re-analysis are performed.

Samples will be analyzed within 20 days of delivery and electronic results will be provided to the Health Department within 30 days of receipt at the lab. The lab will store the samples after analysis until notified by the TPCHD that the electronic and hard copy deliverables have been reviewed and are acceptable.

3.11.2 Management of Hardcopy Data

Field data will be recorded in field log books and on standard forms. Relevant portions of the field data will be transferred manually to the Counties' databases. Copies or originals of the field data will be sent to Ecology for appropriate long-term storage.

Hard copies of laboratory data, according to the list in Attachment 1 of the SSP QAPP, will be submitted to the TPCHD by the laboratory following the electronic data delivery. The Field Lead person will review the hard copy data for

completeness upon receipt and obtain complete information from the lab if needed. These laboratory deliverables and other hard copies will be stored and maintained in organized files until data reporting to Ecology is completed, at which time all hardcopy materials will be sent to Ecology for appropriate storage pertinent to the Administrative Record for the TSP Site.

3.11.3 Electronic Data Management System

Computer-based data management systems using relational database software at TPCHD will be used for this project to store the results of the laboratory chemical analyses and associated field information. An electronic version of the laboratory chemistry data will be supplied by the laboratory to the TPCHD in a format which is compatible with the TPCHD database. The information compiled in the database for the field locations and chemical analysis results will include, at a minimum, the fields necessary to populate Ecology's Environmental Information Management database. Ecology will provide technical assistance to the TPCHD to ensure the appropriate fields and formats are included in the databases for transfer to EIM. Data will be transferred to EIM by the data manager using the internet data submittal function of EIM, with assistance from Ecology if needed. Data transfer will occur monthly, or on a schedule mutually agreed to by Ecology and the TPCHD. The Ecology Soil Safety Program coordinator will be notified when each new batch of data is uploaded into EIM.
The master copy of the electronic database from the TPCHD will reside on a secure network through the duration of the project. The database will be backed up regularly.

3.11.4 Database Entry and Validation

Only the data manager or personnel authorized by the data manager will be permitted to update or edit the database. Other personnel who need to use the computerized data will be prohibited from altering the data and structure of the database; user entry restrictions will be built into the database software and will be set to grant read-only privileges to such users.

Information will be loaded into the database promptly following the receipt of the data from the field or laboratory. Some data entry will be accomplished manually, but the majority will be downloaded into the database from the laboratory electronic data deliverables. Data entered manually from documents and field forms will be checked to assure that correct data transcription has occurred. After the entries are complete, a person other than the data entry person will verify 100 percent of all hand-entered data against hardcopy.

Electronically loaded data will be compared to hardcopy forms of the data as well as the source Electronic Data Deliverable (EDD) to confirm correct transfer. It is the responsibility of each party who handles samples or data to ensure that all data transmissions and transcriptions are correct and accurate. It is especially important to compare EDDs to hardcopies or their original files that have not been through an electronic transfer. This ensures that any errors created during the electronic transfer are corrected.

Additional data QC checks to be performed by the TPCHD will include:

- Comparing sample numbers and dates indicated in confirmation e-mails from the laboratory with those entered into the database from field logbooks and chain-of custody forms.
- Review of hand-entered data by at least one other project staff member.

3.11.5 Staff Data Quality Review

The TPCHD Field Lead person will review the Electronic Data Deliverables when received from the lab to determine if all expected results are present (i.e., compare to sample numbers sent to the lab); and will review reporting limits, results from matrix spikes, duplicates, and SRMs, and compare field duplicates results. TPCHD will notify the lab immediately if problems are noted, with a copy to Ecology, and request corrective action.

When hard copies arrive from lab, the TPCHD Field Lead staff will complete a data quality review checklist and attach it to hard copy package. A summary of the quality review process, including copies of the review checklists, will be submitted with the TPCHD Tacoma Smelter Plume grant quarterly report.

3.12 Property Contact and Outreach Data

Outreach elements such as access follow up, presentations, and persons of contact will be entered into Ecology's "Safe Soil Tracking System" (SSTS) database. The Outreach staff will provide updates to the SSTS at a time interval that is mutually agreed upon with Ecology. Updates will consist of access attempts, outreach efforts, and populate other necessary fields required for the legislative reports. Outreach elements will be entered into the SSTS database by the outreach staff. The Field Lead person will enter all other updates.

4.0 REFERENCES

Ecology, 1995. *Guidance on Sampling and Data Analysis Methods*. Washington State Department of Ecology, Toxics Cleanup Program. Olympia, WA. January 1995.

PHSKC, 1999. *Field Sampling Plan – Vashon/Maury/Mainland Soil Sampling.* Washington State Department of Ecology, WA. August 1999.

SAIC, 1999. *Field Sampling Plan for Homesite Sampling and Analysis, Everett Smelter Site, Everett, Washington.*

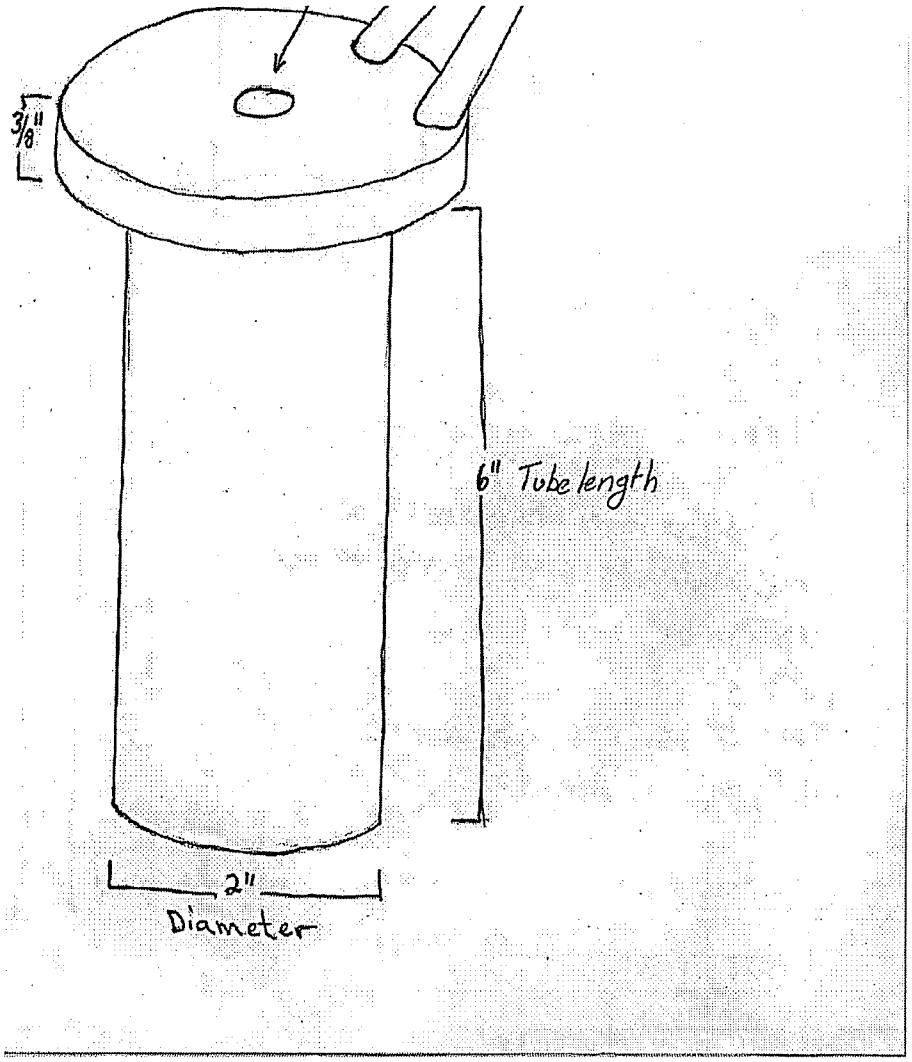
TPCHD, 2002. *Tacoma Smelter Plume Project, Pierce County Sampling Health and Safety Plan.* Tacoma, WA.

TPCHD, 2002. *Quality Assurance Project Plan, Tacoma Smelter Plume Project, Pierce County Site Soil Sampling.* Tacoma, WA.

TPCHD, 2002. *Field Sampling Project Plan, Tacoma Smelter Plume Project, Pierce County Site Soil Sampling.* Tacoma, WA.

Appendix A

Design of Sample Coring Device



SAMPLE

APPENDIX B

CHAIN OF CUSTODY FORM

Severn Trent Laboratories, Inc.
5755 8th Street East
Tacoma, WA 98424
Phone: 253.922.2310 Fax: 253.922.5047

CHAIN OF CUSTODY
Request for Laboratory Services

SAS Lab No. _____

Turnaround Request (business days)

10	5	3	1,2
X			

Client:	Tacoma Pierce County Health Department
Project:	Arsenic Project
Contact:	Glenn Rollins
Phone No.:	(253) 798-3503
Fax No.:	(253) 798-6496
Email:	grollins@tpchd.org

Lab #	Sample ID	Date	Time	Matrix	# of containers	Arsenic and Lead: ICP-MS	Analyses Requested
1					1		
2					1		
3					1		
4					1		
5					1		
6					1		
7					1		
8					1		
9					1		
10					1		
11					1		
12					1		
13					1		
14					1		
15					1		
16					1		
17					1		
18					1		
19					1		
20					1		

	Printed Name	Signature
Relinquished By		
Received By		
Relinquished By		
Received By		
Relinquished By		
Received By		

Cooler: 4 degrees C; Archive for 6 months

Appendix H

Department of Ecology
Soil Safety Program Implementation Plan (2010)

Soil Safety Program Design
Appendix H

SOIL SAFETY IMPLEMENTATION PLAN
Tacoma Smelter Plume Project

Department of Ecology
Soil Safety Program
October 2010

Contents

1.0 Introduction

ASARCO operated a primary copper smelter at Ruston, Washington for almost 100 years. That smelter, referred to as the Tacoma Smelter, specialized in the smelting of complex (e.g., high-arsenic) ores. It closed in 1986. For many years, the Tacoma Smelter was the sole domestic source of arsenic for the U.S. market.

The U.S. Environmental Protection Agency (EPA) is overseeing cleanup of residential properties in Ruston and north Tacoma, within approximately 1 mile of the former smelter, as part of Commencement Bay Superfund Site cleanup activities. The Washington State Department of Ecology (Ecology), in cooperation with local health departments, has been investigating widespread contamination from smelter emissions extending beyond the designated EPA Superfund site. This larger area of contamination has been designated the Tacoma Smelter Plume (TSP) Site under Washington's Model Toxics Control Act (MTCA).

A number of studies of residual soil contamination within the TSP Site have been completed including footprint studies of Thurston, Pierce, Kitsap, and King Counties, and Child Use Area (CUA) studies in King and Pierce Counties. Footprint studies defined the spatial pattern of smelter contamination and its likely maximum magnitudes by location. Child Use Areas - those locations where numbers of children are likely to spend significant time and have opportunities for contact with contaminated soil – have been sampled in King and Pierce Counties, on a limited basis. Young children are considered a population of special concern because of their propensity for soil contact, mouthing behaviors, and greater sensitivity (e.g., greater absorption) for smelter-related contaminants such as arsenic and lead.

The work being described in this implementation plan covers the entire Soil Safety service area and describes sampling of new sites and confirmation samples taken by Ecology.

2.0 Project Description

2.1 Overview

A law (Chapter 70.140 RCW) was enacted in 2005 to assist state and local agencies in implementing actions to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law requires Ecology, in cooperation with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of the Superintendent of Public Instruction (OSPI), and local health districts, to assist schools and childcares in western Washington to reduce the potential for children's exposure to area-wide soil contamination.

Over the course of the Soil Safety Program most of the samples taken at schools, childcares, parks, camps and multifamily public housing play areas have been assessed and sampled by either TPCHD, PHSKC or a contractor hired by Ecology. There are times at which Ecology takes the lead in sampling. These times include; when the number of new childcares in Thurston County did not warrant hiring a contractor, when a previously sampled facility required additional sampling in order to design a soil safety action plan or conformation sampling during soil safety actions.

2.2 Definition of the Soil Safety Service Area

The original Soil Safety Program service area was approximately 315 sq miles and extended north to West Seattle and south to Thurston County (Figure 1, May 2010 Soil Safety Program Design Addendum) After three years of sampling schools and childcares, the data was evaluated and mapped. The service area has been made smaller in order to better focus the program on facilities with a higher likelihood of having Tacoma Smelter Plume contamination. The light blue line on Figure 1 shows the new boundary of the Soil Safety Program Service Area which covers approximately 253 sq miles.

Thurston County has been removed from the focused service area, since no childcares or schools have been found with elevations of arsenic or lead.

Pierce County has the greatest number of impacted schools and childcares and as a result Ecology did sample outside of the service area, to the south and east around Lakewood. Childcares with results above criteria were found in that area, thus the service area has been expanded in this one section. No elevations were seen on Anderson Island or Fox Island so these areas have also been removed from the focused service area to the Pierce County mainland border.

King County's service area boundary has also been made smaller to the north and east. The few childcares that were found with elevations in these areas had either lead only contamination, most likely not from the Tacoma Smelter Plume; or they had low levels of arsenic with an average below 23 parts per million (ppm) and a maximum below 40 ppm. This shrinking allows the program to better focus in on facilities with a higher likelihood of having Tacoma Smelter Plume contamination.

The new service area boundary has not eliminated the original boundary but has focused our main sampling within the new border. The original boundary lines still exist and, if needed, facilities may still be sampled or have contamination addressed within the original boundary lines.

2.3 Identification of Child Use Areas

The Soil Safety Program covered under this program includes several different property types and uses where children are likely to be present with some frequency and where activities are likely to put them in contact with potentially contaminated soils. The following are the types of play areas covered under the Soil Safety Program:

Schools: public and private schools educating kindergarten through 12th grade

Childcares: licensed childcares, Head Start and ECEAP programs as well as some unlicensed childcares and preschools that were sampled under previous studies or happen to be found during sampling.

Parks: Play areas at public parks (includes play structures, fields, and other areas Ecology determines to be high use).

Camps: Play areas at public and private camps (including high use gathering areas).

Multifamily public housing: Play areas at multifamily housing facilities owned by a public housing authority. Ecology may address subsidized housing in highly contaminated areas on a case-by-case basis.

2.5 Sampling Strategy

New Facilities: If the qualitative assessment indicates that sampling is necessary and it is determined that Ecology is the sampling lead then Ecology will schedule sampling in cooperation with the facility manager. The sampler may also schedule soil sampling at the same time as the qualitative assessment.

Soil samples will be collected from all play areas within each property that require additional sampling. Samples will be collected from surface soil between 0 and 6 inches below ground surface and between 6 and 12 inches below the ground surface. One quarter of the 6 to 12 inch samples will be analyzed with the 0 to 6 inch samples. The remaining 6 to 12 inch samples will be archived until the initial results are determined by the laboratory. If the initial samples have an average arsenic above 20 ppm or a maximum arsenic above 40 ppm or an average lead above 250 ppm or a maximum lead above 500 ppm then the remaining samples will be analyzed.

The number of samples taken at a facility will be determined using the size of the play area and whether it is located in Zone 1 where arsenic may be found greater than 100 ppm or in Zones 2 and 3 where arsenic levels are predicted to between 20 and 100 ppm (see Table 1 below and Figure 3 for map zones in the May 2010 Soil Safety Program Design Addendum).

Table 1: Number of sample locations per play area for characterization.

Sampling area size	**Residential, parks, commercial Samples needed**	
Acres	**Zone 1 arsenic >100 ppm**	**Zones -2 and 3 arsenic < 100 ppm**
0.25*	10	8
1	20	16
5	40	32
10	60	48
20	80	64
100	120	90
>100	120 + 1 per 5 acres	90 + 1 per 5 acres

*0.25 acres ~ 11,000 square feet

Previously sampled facilities: If the qualitative assessment indicates that additional sampling is necessary in order to better characterize the site for cleanup activities and it is determined that Ecology is the sampling lead then Ecology will schedule sampling in cooperation with the facility manager. Parks and camps with previous sampling data will have old boring locations

and new boring locations placed on the same aerial photograph so that all data points can be evaluated together. The number of borings taken will depend on the number previously taken and the amount of information that is required in order to better characterize the site for cleanup activities. The additional sampling may require higher depth samples than were previously taken to determine the depth that is needed for cleanup activities.

Confirmation Sampling: Since the start of cleanup activities on sites the confirmation sampling has undergone a transformation. During the initial cleanup activities from August 2006 through August 2008 the only confirmation samples taken were of the imported soil to determine that the imported soil was clean. The samples of import soil were provided by the contractor at the start of each contract or during the construction if the soil provider changed during the project. One childcare also had confirmation samples taken after mixing occurred on the site. These confirmation samples were taken by dividing the area into 5 sections and taking composite samples from 0-6 inches, each composite sample was made up by homogenizing 5 sample locations from each section.

After March 2009 confirmation sampling was added to Ecology's tasks during construction activities. The import soil was still sampled by the construction contractor and the results were provided to Ecology at the start of each project. Confirmation samples are taken during construction activities after all the contaminated soil has been stockpiled or removed from the property. The number of confirmation samples taken on each property is determined by the number of original samples taken in the excavated area. Most confirmation samples are taken at a depth of 6-12 inches (from below the original ground surface area); however, some confirmation samples are taken from 12-18 inches.

3.0 TASK DESCRIPTIONS

3.1 Access

Each property owner of a new facility will be sent a cover letter explaining the program and an access agreement to be signed by the property owner to allow Ecology to conduct qualitative assessments and collect soil samples. If the property has been previously sampled or the samples are confirmation samples the original access agreement or the soil safety action agreement will be used for data collection.

All pertinent information from each property will be provided to Ecology's Soil Safety Tracking System Database.

3.2 Qualitative Assessment

Ecology will conduct a qualitative assessment at each site where Ecology is the sampling lead and access is gained. The following questions will be asked to determine if sampling is needed at a site, and to help choose the sample locations.

Sampling Criteria Questions

- Where is exposed dirt?
- Where do children usually play?
- Where do children spend the most time?
- What are the ages of children in the facility?
- How many of the children are under the age of 6?

- How many children are under the age of 3?
- How many play areas/structures are there?
- How deep is the covering (chips, bark, gravel, etc) under and surrounding the play structure(s)?
  [If the covering is more than 12" deep throughout, the area is not sampled]
- Is there a lining separating the covering from the soil?
  [If there is a continuous, well-maintained plastic or Geotech™-type barrier under the covering material, the area is not sampled]
- Is there an impervious surface (asphalt, texturized rubber, concrete, etc.) over the play area?
  [If so, the area is not sampled]
- Do the children dig or play in the dirt? If so, where?

Areas that will be excluded from sampling include:

- Inaccessible soils, such as those beneath buildings, paved driveways or patios, deep covers of gravel or other non-soil material
- Areas with one foot deep cover, such as gravel, wood chips, bark or sand
- Areas with a barrier, such as a rubber mat or a geotech liner covered with non-soil material

At the time of the qualitative assessment, staff will also ask the facility contact about how they learned of the Soil Safety Program, and for other information needed for the Soil Safety Tracking database, and will input that information into the database for each facility.

3.3 Sample Numbering Scheme

Initial Sampling Number Scheme: The sample numbering scheme was designed to incorporate all the essential information about the property and the specific boring.

Example of sample numbers are: Ex. (#1) 27-X021-3-6-1-4
Ex. (#2) 27-X522-1-4-1-5
Ex. (#3) 27-X123-1-4-2-4

Where fields are:
County ID – Facility Type & Code – Play Area ID - Boring ID – Boring Depth - Type of Sample

1) County Code: Pierce = 27; King = 17, and Thurston = 34
2) Facility Code: the sequential number assigned to each facility through Ecology's Soil Safety Tracking System database. The facility code also signifies the type of play area.
   0001 to 1000 = schools
   1001 to 8000 = childcares
   8001 to 9999 = parks, camps or multifamily public housing
3) Play area number: 1, 2, 3, 4, etc…
4) Boring number: 1, 2, 3, 4, etc.
5) Depth interval (required for KC database structure) 1 = 0-6" 2 = 6-12" 3 = 12-18"
6) Sample type 4 = regular, 5 = field duplicate

Confirmation Sampling Number Scheme:

Example of sample numbers are: Ex. (#1) 27-X021-3-C1-1-4
Ex. (#2) 27-X522-1-C1-1-5
Ex. (#3) 27-X123-1-C1-2-4

Where fields are:
County ID – Facility Type & Code – Play Area ID - Boring ID – Boring Depth - Type of Sample

1) County Code: Pierce = 27; King = 17, and Thurston = 34
2) Facility Type will be incorporated into the facility code. The following ranges will apply; schools = 0001 to 1000, childcares = 1001 to 8000, parks/others = 8001 to 9999;
3) Facility Code: the sequential number assigned to each facility through Ecology's safe soil tracking system database
4) Play area number: 1, 2, 3, 4, etc…
5) Boring number: C1, C2, C3, C4, etc.
6) Depth interval (required for KC database structure) 1 = 0-6", 2 = 6-12", 3 = 12-18"
7) Sample type 4 = regular, 5 = field duplicate

3.4 Field Log Information

Field staff are responsible for recording pertinent information regarding site description and conditions during the sampling process. Field notes will be recorded Rite in the Rain field notebook. The following information will be recorded in the field notebook for each sampling property:

- Property ID number
- Address and parcel number
- Sampler
- Date and time of sampling event
- Play area number
- Description of the property at that particular location and any known soil disturbances, such as tilling, sprinkler systems, excavation, etc.
- The number of children using the facility or property(if known)
- Sample number, which incorporates the County ID, property ID, type of child use area, Play areas, boring number, and sample type
- Ground cover
- Any unusual circumstances, such as a distinctly different soil type, as well as any observations about the play areas and their use by children
- Map of the sample locations on an aerial photograph for each property (with notes about the Play areas if they are not self-explanatory)
- An explanation of the number of sampling locations per Play area

Aerial photographs of each property will be used during sampling. The photographs will come from the county that initially sampled the property or from a website with the best aerial photograph of the associated play area. During sampling the boring locations will be marked on the aerial photograph and appropriately labeled.

3.5 Equipment

The majority of the field equipment is listed below.

Daily Equipment

- Trowels and stainless steel spoons
- 1 12 inch flat screw driver for using as a digging bar to break up compact soil
- Latex gloves
- Earplugs
- Aluminum foil
- Zip lock bags
- Field logs and indelible pens and pencils
- 4 oz. Sampling jars (provided by lab)
- Labels for the sample jars (provided by lab)
- Liqui-Nox® detergent and deionized water
- Bottlebrushes
- Hand sanitizer wipes
- De-ionized water
- Kneeling pads
- Garbage bags
- Cooler and ice packs for sample storage in the field
- Measuring wheel or tape measure
- Camera

3.6 Field Preparation

Most field equipment and supplies will be kept in a storage bin in the Toxic Cleanup Program cage in the basement. Aerial photographs for a given property will be prepared prior to sampling. Sample labels and a Chain of Custody will be prepared daily in the field or before the sampling event. The sample labels will be placed on the sample jars.

3.7 Sample Protocol

Property owners will be notified prior to sampling. While sampling, the residents/owners of the property will be able to observe the sampling procedure outside the 10-foot radius of the sampling location. Below is the description of sample protocol while samplers are on site.

Sampling Details

1. Note location of Play area(s) and each boring on aerial photos and note current site conditions and other pertinent information in field log
2. Create work area and lay out sampling plan. Photograph sample locations before, during or after sampling. Photograph in order the samples are taken, more than one boring may be included in each photograph.
3. Record sampling data; see list in section 3.4
4. Sample collection
    a. Any large amount of fallen leaves or pine needles or other non-soil material on the ground will be removed.
    b. The 12 inch screw driver will be used to break up the ground as needed and the stainless steel spoons will be used to dig out a six inch deep hole.

c. The sidewalls of the hole will be scrapped from either top to bottom or bottom to top to insure that the entire six inch profile is included in the sample. These scrapings will be placed on aluminum foil or inside a stainless steel bowl or zip lock bag.
d. The base of the root mass is considered the beginning of the soil sample, therefore the tuft of grass and roots are removed from the sample. Shake the soils from the roots onto the foil. Remove any large rocks or organic matter such as sticks or roots. (Leave clay particles and soil particles in place. Lab will process these when sieving.)
e. The soil will be homogenized before filling the jar in order to get a representative sample.
f. Transfer enough of the homogenized collected soil sample to fill a sterile glass jar provided by the laboratory using the stainless steel spoons. The jars, which do not contain preservatives, will have a label with the date and time, sampler name or initials, sample number and location.
g. If there is sample refusal, such as the coring device cannot be driven into the ground due to an obstruction such as a large rock or root, the boring will either be abandoned and a second adjacent boring will be collected starting over, or the obstruction will be removed and sampling will continue. Any soil samples that were collected in an abandoned boring will be discarded and the hole will be returned to its original state.
h. Decontaminate sample equipment that will be reused in the field, by spraying with Liqui-Nox detergent and rinsing three times with deionized water. Reusable sampling equipment may also be place in a bag to be brought back to Ecology and cleaned in the cleaning room, using the same procedure.
i. Return site as close to original conditions as possible, backfilling the borings with the remaining soil and replacing the grass plug if applicable.
j. Make sure all information is collected and recorded in field log, sample's label and chain of custody.
k. Place samples in a cooler with ice. Samples will be kept cool until received by the contract analytical laboratory. When delivered to the laboratory, samples will be placed in a locked refrigerator and maintained at $4^{o}C$ until analyzed. If the samples cannot be delivered to the laboratory on the day they are collected they can be held up to three days in a $4^{0}C$ refrigerator at Ecology.

3.8 Quality Control Samples for Field Collection

The following field QC samples will be collected for this project:

Field Duplicates

Field precision will be assessed through the analysis of duplicate field samples collected from a particular sampling point. A minimum of one duplicate per twenty samples, or 5% of the total samples, will be collected. Every twentieth boring will be collected as a duplicate, while making sure the duplicates are spatially located throughout the study boundaries. Duplicates will be collected from the same depth as the sample boring. A single sample will be placed onto aluminum foil, any large rocks or sticks will be removed, the sample will be homogenized using a stainless steel spoon, split in half and analyzed as two separate samples. Ecology will not collect any duplicates for owners or residents of properties sampled. The Relative Percent Difference (RPD) will be calculated when the data is received. RPD = {(R1 – R2)/R} x 100

3.9 Decontamination and Waste Handling

To prevent the cross-contamination of samples, sampling devices will be cleaned of adhering soil after each sample is collected. The sampling devices will be cleaned using Liqui-nox® detergent, deionized water and a bottlebrush. Liqui-nox® detergent is made by Alconox, Inc. and does not contain any phosphates that could affect sample results. The detergent must be diluted, 10 ml Liqui-nox® per one liter of deionized water. The coring devices will be washed and rinsed twice using a spray bottle of deionized water. The wastewater generated from washing and rinsing digging tools will be discarded on the site, away from the sample collection area.

3.10 Sample Shipping & Chain of Custody

Samples will be placed in a cooler with ice and kept in the field until transferred to the contract lab for analysis. The Chain-of-Custody form will be included in each sample shipment. The chain of custody forms indicate the date the samples were collected and the date they were delivered to the contract analytical laboratory.

3.11 Data Management

This section describes the procedures to be used to document and track chemical data. The objective of these procedures is to assure that all data collected during the project are processed and archived in a manner that assures data quality, security, and retrievability, thereby assuring information integrity. Maintaining data integrity involves all aspects of the project beginning with the collection of the first sample and continuing through archiving the electronic and hard copy results. Three primary tasks will be carried out to ensure data integrity throughout the duration of the project: sample management, management of hardcopy forms of data, and electronic data management.

3.11.1 Sample Management

The sampler will be responsible for sample management. Monitoring and tracking of samples through the chain-of-custody process, from the time they are collected, through final disposal of samples after data have been reviewed and determined to be adequate. The sampler will begin by using the assigned number for each facility found on Ecology's Safe Soil Tracking System database. The field identification numbers will be the primary means to track the sample from the field to the final data result entry into the EIM database. The field identification numbers will be recorded in the field log, and on the chain-of-custody form. It will be the responsibility of every individual who handles the samples to ensure that chain-of-custody forms are filled out accurately and completely. **Attention to detail when transcribing sample numbers is of the utmost importance.** In addition to chain-of-custody forms, the laboratory will send confirmation e-mails to the sampler indicating which samples have arrived at the lab and the dates of their arrivals. The sampler will assure the following sample management tasks are conducted:

- Ensuring that samples are stored in a secure environment at the proper temperature until delivery to the lab.
- Accurately tracking the transport of field samples to the laboratory through chain-of-custody documentation and confirmation e-mails.
- Reviewing sample confirmation e-mails and comparing them to field logbooks and sample numbers and dates entered into the database for that week.

- Confirming that all requested procedures, analysis, and re-analysis are performed.

Samples will be analyzed within 20 days of delivery and electronic results will be provided to the sampler within 30 days of receipt at the lab. The lab will store the samples after analysis until notified that the electronic and hard copy deliverables have been reviewed and are acceptable.

3.11.2 Management of Hardcopy Data

Field data will be recorded in field log books and on standard forms. Relevant portions of the field data will be transferred manually to the appropriate database.

Hard copies of laboratory data, according to the list in Attachment 1 of the SSP QAPP, will be submitted to the sampler by the laboratory following the electronic data delivery. The sampler will review the hard copy data for completeness upon receipt and obtain complete information from the lab if needed. These laboratory deliverables and other hard copies will be stored and maintained in organized files.

3.11.3 Electronic Data Management System

An electronic version of the laboratory chemistry data will be supplied by the laboratory to the sampler in a format which is compatible with Ecology's Environmental Information Management (EIM) database and will include at a minimum the fields necessary to populate EIM. The sampler or database manager will populate the EIM spreadsheets and submit the data to EIM. The EIM data before submittal should be verified for accuracy by a second party. EIM data should be updated quarterly or at the end of a project.

3.11.4 Staff Data Quality Review

The sampler will review the Electronic Data Deliverables when received from the lab to determine if all expected results are present (i.e., compare to sample numbers sent to the lab); and will review reporting limits, results from matrix spikes, duplicates, and SRMs, and compare field duplicates results. The sampler will notify the lab immediately if problems are noted and request corrective action.

A hard copy of the report will be printed out upon receipt and the front sheet will be labeled with the sampling location name(s) contained in the report. The sampler will complete a data quality review checklist and attach it to hard copy package.

3.11.5 Soil Safety Tracking System

New Facilities: If Ecology is the lead for obtaining access and sampling new facilities then the appropriate fields in the SSTS will be filled out. These fields are located under the Property Access tab and the Qualitative Assessment Tab.

- Property Access – date of access attempts and agreement and associated comments
- Qualitative Assessment – date of assessment, box for sampling, and associated comments

Facilities Above Criteria: Ecology will fill out the fields under the Play Area and Soil Safety Actions tabs after the visit to notify the facility of the results. If outreach is provided only by Ecology at that initial visit, then the Out Reach tab fields will also be completed.

- Play Area: Notification of results – date and type and comments
- Soil Safety Actions – box if required, dates of letters and agreement and boxes checked for recommended actions
- Outreach: date and event description, items given and comments

After soil safety action plans are completed Ecology will update the Play Areas and Soil Safety Actions tabs.

- Play Areas: Construction actions fields will be updated with the contract type, dates and funds spent. Any construction problems will be noted in comments section.
- Soil Safety Actions: Certificate and completion dates along with the actions implemented will be updated. A brief description of the actions may be included in the SSA comments field.

3.12 Soil Safety Action Plans

If a facility is above criteria, Ecology will meet with that facility along with the county's outreach staff to go over the results and discuss the Soil Safety Program.

Outline of visit

- Introductions and explanation of results, the program and the timing and answering of questions.
- Going into the play area with the property owner and asking them some property specific questions (see list below).
- Photographing the play area including play equipment, odd things in the excavation area and access points (which may include alley, front yard, side yard or adjacent roadways) and excluding children.
- Taking measurements and sketching the play area. Important measurements include: width of access points, pads of concrete or impervious surfaces, play chip or gravel play area dimensions, and square footage of area to excavate
- After the play area has been measured and photographed the Ecology employee might want to discuss some options for the play area with the property owner. Ecology might also want to make a note as to if additional sampling might be necessary to better define the area of contamination.
- Thanking the property owner and explaining to them what they should expect from Ecology next and what they need to send back in order to proceed with the program, any outreach items that may be dropped off in the future, and an explanation of a timeline for activities.

Daily Equipment

- Camera
- Measuring Wheel
- Notebook
- Field Log Book
- Pencil or Pen
- Results Table and Map
- Sample Soil Safety Action Plan and Agreement

- Sample Parent Notification Letter
- Ecology's FAQ
- Outreach Staff handouts – dirt alert bags, curriculum

Questions to Ask Property Owner

- Does the property have a septic system? If so where is it located
- Is there anything buried on the property that Ecology should know about? (i.e. Deceased pets, phone or electrical lines, sprinkler system)
- Would the property owner be interested in a play chip area if they don't have one and have large play toys?
- Are there any changes that they would like to see if work was going to be done in the play area?
- Where is the best entrance/exit to the play area?

3.12 Soil Safety Actions

If Soil Safety Actions are necessary, Ecology will put out a bid proposal for the work. While the contractor is working onsite the Soil Safety Program Coordinator will check in on work progress on a daily basis. During these site visits it is important to record the daily activities that are happening on the site through photography and note taking.

Outline of Site Visit

- Check in with property owner and make sure that they don't have any concerns, complaints or questions about the progress of the work.
- Check in with contractor to make sure that they know exactly what is expected of them onsite. Make sure that they don't have any questions, concerns or complaints. Ask about the schedule and make sure they are on track. If there is more than one site being worked on during the contract, ask about progress and when to let the next customer know about the progress to their residence.
- Photograph work and make notes of what is being done. Check on excavation depths, where fabric is laid, depth of chips, and any other tasks that are important to the project. Make notes of questions and any decisions that have been made.
- Make note of any change that was made to the original scope of work. If contractor is working on a change order keep records of start time, end time, amount of trucks leaving the site and the times and any other tasks and times that may be important to the project.
- If there are concerns on the site that are not addressed call construction project manager or contracts manager. Use clear communication to the contractor onsite to see if concern can be addressed. If necessary stay and watch or leave for a short amount of time and return to make sure that concerns are being addressed.
- Communication between the contractor, Ecology and the property owner are key to a smooth running project.

Daily Equipment

- Camera
- Measuring Wheel
- Notebook
- Field Log Book
- Pencil or Pen

- Results Table and Map
- Scope of Work for Contract
- List of phone numbers for staff at Ecology, health departments, and contractors
- Cell phone

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