Implementation of Chapter 70.140 RCW – Area-wide Soil Contamination

Soil Safety Program
Tacoma Smelter Plume

A Report to the Legislature

DEPARTMENT OF ECOLOGY
State of Washington

June 2009
Publication no. 09-09-127

Publication and Contact Information

This report is available on the Department of Ecology's Web site at www.ecy.wa.gov/biblio/0909127.html

For more information contact:

Toxics Cleanup Program
P.O. Box 47775
Olympia, WA 98504-7775

Phone: (360) 407-6300

Washington State Department of Ecology - www.ecy.wa.gov/

Headquarters, Olympia	(360) 407-6000
Northwest Regional Office, Bellevue	(425) 649-7000
Southwest Regional Office, Olympia	(360) 407-6300
Central Regional Office, Yakima	(509) 575-2490
Eastern Regional Office, Spokane	(509) 329-3400

If you need this publication in an alternate format, please contact the Toxics Cleanup Program at (360) 407-6300. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Cover photo: Star Lake Elementary School- Federal Way Public Schools-After Soil Safety Actions. Photo by Amy Hargrove Summer 2008

Implementation of Chapter 70.140 RCW – Area-wide Soil Contamination

Soil Safety Program – Tacoma Smelter Plume

A Report to the Legislature

by
Amy Hargrove
Valerie Bound
Marian Abbett
Hannah Aoyagi
Cynthia Walker

Toxics Cleanup Program
Washington State Department of Ecology
Olympia, Washington 98504-7775

This page is purposely left blank

Table of Contents

Figures

List of Figures, Tables and Images

Page

Tables

Images

Figures

Executive Summary

Washington State Legislature Engrossed Second Substitute House Bill 1605 was approved by the Governor on May 6, 2005. This bill added a new chapter to Title 70 of the Revised Code of Washington (RCW) – Chapter 70.140– Area-wide soil contamination. The law directs the Washington Department of Ecology (Ecology), in cooperation with the Department of Social and Health Services, the Department of Health, the Office of the Superintendent of Public Instruction, and local health departments, to assist schools and childcares west of the crest of the Cascade mountains to reduce the potential for children's exposure to area-wide soil contamination. Area-wide soil contamination is low to moderate level contamination, dispersed over large geographic areas.

The law requires Ecology to:

1. *Identify schools and childcares* that are located within the central Puget Sound smelter plume (Tacoma Smelter Plume) based on available information.
2. *Conduct qualitative evaluations* to determine the potential for children's exposure to area-wide soil contamination.
3. *Conduct soil sampling* by December 31, 2009, if the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property.
4. *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.
5. *Recognize schools and childcares* that successfully implement best management practices with a voluntary certification letter.
6. *Develop best management practice guidelines* for schools and childcares with area-wide soil contamination.
7. *Develop a grant program* to assist schools and childcares with implementing best management practices.
8. *Evaluate actions to reduce child exposure to contaminated soils* and submit progress reports to the governor and to the appropriate committees of the legislature by December 31, 2006, and December 31, 2008.

In addition, the law requires schools and childcares to work with Ecology to provide site access for soil sampling. If schools or childcares with contaminated soil do not implement best management practices within six months of receiving written notification of test results, they must notify parents and guardians of the results in writing.

To implement the law, Ecology, Public Health – Seattle & King County, and the Tacoma-Pierce County Health Department (the agencies) designed the Soil Safety Program. The agencies created a positive, incentive-based program that meets the requirements of the law while conveying positive messages to the school and childcare communities. The agencies based their approach to implementing the law and designing the Soil Safety Program on input from school and childcare stakeholders, and state agencies with responsibility for child health and safety. The final design document was published in April 2006.

Based on the advice of school and childcare stakeholders and state agency partners, Ecology is providing the Soil Safety Program free to schools and childcares. Soil testing is paid for through grants to the local health departments, who are conducting qualitative evaluations and soil sampling. Ecology manages the design and labor costs of soil safety actions for schools and childcares with arsenic or lead levels above the Model Toxics Control Act (MTCA) cleanup criteria (20 mg/kg for arsenic, and 250 mg/kg for lead).

Soil safety actions are best management practices that range from hand washing to soil removal and replacement. There is an option for public schools to manage the work themselves through an interagency agreement. The agencies selected this approach to: 1) reduce the paperwork that would be required of a grant program; 2) speed up getting actions in place; and 3) encourage voluntary participation in the program.

The Tacoma Smelter Plume 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, the agencies identified a focused service area for the program of about 315 square miles. This focused area encompasses the highest concentrations, which are closest to the former smelter site. Ecology is providing technical assistance to schools and childcares outside of this area, including guidance for sampling and best management practices. Ecology would reevaluate the service area boundary map if the Soil Safety Program were to continue past 2009. A re-evaluation would consider locations of plume related elevations of arsenic and lead. It could shrink the boundary lines to exclude Thurston County and parts of King County. It could also widen the boundary line to the southeast around Lakewood in Pierce County.

Under grants from Ecology, the local health departments in King and Pierce counties are conducting the qualitative evaluations and soil sampling of the schools and childcares within the service area. The agencies began with communities closest to the smelter where there is an increased potential for higher levels of contamination, then moved outward. Ecology meets with schools and childcares with soil contamination above MTCA cleanup criteria, to discuss the sampling results and actions needed to reduce exposure. Ecology has developed best management practice guidelines, termed "soil safety actions." The range of soil safety actions reflects concentration, extent, and location of contamination, and how children use the area. Ecology uses these soil safety actions to help put together a soil safety action plan for each school or childcare.

In 2007 and 2008, Ecology planned soil safety actions for 31 schools and 78 childcares with arsenic or lead above criteria. Ecology completed soil safety actions at 19 schools and 24 childcares. Ecology will contract to do soil safety actions at eight additional childcares in early spring of 2009. An interagency agreement is in process for four elementary schools located in the Tacoma School District. The agreement will have soil safety actions completed before June 30, 2009. In 2009, Ecology will continue to implement soil safety action plans at schools and childcares by priority, as funding is available. Table 1 lists activities completed to date.

As the Soil Safety Program is scheduled to sunset in 2009, Ecology and the Department of Early Learning are exploring the opportunities and challenges to making Tacoma Smelter Plume soil sampling remediation a condition of childcare licensure.

Ecology has also undertaken sampling and remediation at schools in central and eastern Washington impacted by lead-arsenate pesticides. In eastern Washington, one school was found with elevated levels of arsenic and lead, cleanup was completed in 2007. In central Washington, sampling showed approximately 35 schools required cleanup activities. To date, Ecology has implemented successful cleanups at 14 schools - eight in 2006, two in 2007, and four in 2008. More information is available on page 37 under Sampling and Cleanup in Central Washington.

Ecology is requesting an additional $4 million from the State Toxics Control Account for the 2009-2011 biennium to continue to address lead and arsenic contamination at schools and childcares in Washington State.

Table 1. Soil Safety Program activities completed as of September 30, 2008

**Percentages are the number of completed qualitative evaluations over the number of active facilities.*

Legislative Directive	Status	Comment
Identify schools and childcares in the central Puget Sound Smelter Plume	Identified 215 schools and 718 childcares in the Soil Safety Program service area *Task completed*	Childcare list will be updated with new childcares, as they become licensed, through 2008.
Conduct qualitative evaluations	Completed at 215 (100%)* schools and 595 (83%)* childcares	Based on evaluations, some facilities do not need sampling, generally because play areas are paved.
Conduct soil sampling	Completed at 180 schools and 522 childcares	Soil sampling was done concurrently with evaluations.
Notify schools and childcares of sampling results	All sampled facilities were notified	Of facilities sampled, 31 schools and 82 childcares tested above MTCA criteria.
Recognize schools and childcares that participate	Certificates of participation were sent to 149 schools and 440 childcares	All facilities not requiring soil safety actions have received a certificate.
Develop best management practice guidelines	*Task completed*	Published “Soil Safety Guidance” for small and large properties where children play (January 2007).
Develop grant program	Completed soil safety action plans at 19 schools and 24 childcares	Grants were given to local health departments for evaluations and sampling. Ecology contracts out soil cleanup work. Some public schools manage soil safety actions under inter-agency agreements.
Evaluation of actions and report to the Legislature	Reports submitted for 2006 and 2008 *Evaluation ongoing*	Legislation sunsets in 2009.

Introduction

Purpose of the Report

This report builds on the information provided in the 2006 legislative report and summarizes on-going accomplishments of the Soil Safety Program in implementing the requirements of Chapter 70.140 Revised Code of Washington (RCW) - Area-wide soil contamination (Appendix A). This report also provides a summary of accomplishments in soil remediation at schools in central Washington.

Area-wide Soil Contamination

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.

As Washington's population grows, many areas with elevated levels of arsenic and lead continue to be developed into residential neighborhoods, schools, childcares, and parks. These development activities raise a variety of health, environmental, and marketplace concerns, and create pressures for cleanup.

In early 2000, the Washington State Departments of Agriculture, Ecology, Health, and Community, Trade & Economic Development decided that effective, long-term solutions to area-wide soil contamination problems would require looking beyond traditional cleanup processes and agency boundaries. In 2001, the Washington Legislature appropriated $1.2 million to form and support a stakeholder Task Force to consider these issues. The agencies chartered a 17-member Task Force to offer advice about a state-wide strategy to respond to area-wide arsenic and lead soil contamination in Washington State. The Task Force submitted their recommendations to the agencies in June 2003.

Based on these recommendations, Ecology worked with other state and local agencies to develop and implement strategies for addressing area-wide soil contamination. These strategies focus on:

- Reducing exposures, especially to young children, at schools and childcares.
- Improving public awareness of area-wide soil contamination concerns and solutions.
- Integrating means of addressing area-wide soil contamination with local land use planning and permitting processes.
- Exploring other (local and state) institutional changes to improve responses to area-wide soil contamination problems.

Ecology's efforts are currently focused on areas with the highest potential for elevated arsenic and lead (King, Pierce, Thurston, Chelan, Douglas, Okanogan, Yakima, and Spokane counties)

and properties where young children are likely to be present on a regular basis (schools, child-cares, residential neighborhoods, and parks). Area-wide activities in King, Pierce, and Thurston counties are captured under the Tacoma Smelter Plume project. Area-wide activities in Chelan, Douglas, Okanogan, Yakima, and Spokane counties include soil sampling and remediation at public schools (see page 28).

Tacoma Smelter Plume

The Tacoma Smelter Plume is an example of a very large area-wide contamination site. Air emissions from the former Asarco Ruston Smelter impacted over 1000 square miles of primarily urbanized land in portions of King, Pierce, Kitsap, and Thurston Counties (see Figure 1). The plume impacted tens of thousands of residential, commercial, and industrial properties, leaving behind elevated arsenic and lead in the surface soils. The sheer size of the impacted area, and the number of diverse communities within the impacted area, calls for a unique approach to cleanup.

Ecology's management plan for the Tacoma Smelter Plume identifies three objectives:

- *Improve Public Awareness* and understanding of soil contamination and protective measures to reduce risk from exposure.
- *Characterize Soil And Implement Protective Measures* - collect and evaluate information to support decisions on implementing measures to reduce risk from exposure to arsenic and lead in soil.
- *Improve Institutional Capabilities* for responding to arsenic and lead in soil.

To meet these objectives, Ecology is partnering with Public Health–Seattle & King County, the Tacoma - Pierce County Health Department, and the Thurston County Health & Social Services Department. Under Ecology grants, the local health departments are working to improve public awareness with education and outreach to local communities, particularly schools, childcares, and households with small children. The health departments characterize soil for the Soil Safety Program by conducting soil sampling at schools and childcares. Ecology is working with other local governments (planning departments, for example) to improve their institutional capabilities –to find ways to address arsenic and lead pollution as part of day-to-day business.

The Soil Safety Program

Ecology, Public Health–Seattle & King County, and the Tacoma-Pierce County Health Department designed the Soil Safety Program to implement Chapter 70.140 RCW. The program is a positive, incentive-based program that meets the requirements of the law while providing education and resources to the school and childcare communities.

The goal of the Soil Safety Program is to implement Chapter 70.140 RCW by identifying play areas at schools and childcares in the Tacoma Smelter Plume with elevated arsenic and lead in soil, and assisting these schools and childcares in reducing the potential for children's exposure to the soil pollution. The Soil Safety Program design addresses the law through the following implementation steps:

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

   The agencies identified a Soil Safety Program service area. The Tacoma Smelter Plume is more than 1000 square miles and funding is not currently available to identify and assess every school and childcare within the plume. For this reason, the agencies identified a focused service area for the Soil Safety Program of about 315 square miles. This focused service area encompasses the highest concentrations found which are closest to the former smelter site (see Figure 2). Ecology provides technical assistance to schools and childcares outside of the service area, mainly through the guidance for sampling and best management practices (see Appendix B).

   Due to high turnover in licensed childcares, Ecology works with the Department of Early Learning (DEL) to update the active childcare list every six months, in July and January.

2. *Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination.*

   The agencies define a qualitative evaluation as a visit by experienced local health department staff, who can determine if children may be exposed to contaminated soil. The local health departments in King and Pierce counties are doing qualitative evaluations under their grants from Ecology. These evaluations consist of interviewing owners or operators and staff, and visually inspecting child play areas to determine if soil sampling is needed.

   Thurston County Department on Health and Social Services has a grant with Ecology for Tacoma Smelter Plume outreach and education. Their grant does not include conducting qualitative evaluations or soil sampling, as the number of schools and childcares is small. Ecology contracted with Science Applications International Corporation and GeoEngineers to conduct soil sampling at childcares in Thurston County in May of 2007. In 2009, soil samples will be collected at the remaining childcares in Thurston County by Ecology.

3. *Conduct soil sampling by December 31, 2009, if the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property.*

   If a qualitative evaluation shows that children may come into contact with contaminated soil, the local health departments then sample soil in the areas where children play. Qualitative evaluations and soil sampling began with public schools and private schools, followed by childcares. Soil sampling started in communities closest to the smelter where there is an increased potential for higher levels of contamination, then moved outward.

4. *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 compares each school or childcare's soil results with the Model Toxics Control Act (MTCA) cleanup criteria—20 milligrams per kilogram (mg/kg) for arsenic and 250 mg/kg for lead.

   A. For arsenic and lead levels *below* MTCA criteria, the health department provides a letter explaining the test results.

   B. For levels *above* MTCA criteria, Ecology meets with the school district representative or childcare provider to discuss the results, and actions needed to reduce exposure. Ecology helps the facility develop a soil safety action plan. Soil safety actions range from handwashing and using doormats, to removing or covering contaminated soils in play areas. Ecology fully funds the soil safety actions, but schools and childcares must maintain them. An example of a soil safety action plan is provided in Appendix C.

5. *Recognize schools and childcares that successfully implement best management practices with a voluntary certification letter.*

   Ecology provides certificates and window decals to schools and childcares that complete the program. This includes facilities that were sampled but did not have arsenic or lead above criteria. Examples of certificates are provided in Appendix B.

6. *Develop best management practice guidelines for schools and childcares with area-wide soil contamination.*

   Ecology developed best management practice guidelines, or "soil safety actions." The range of soil safety actions reflects concentration, extent, and location of contamination, and how much children use the area. Ecology provides the guidelines to schools or childcares wishing to put actions in place without Ecology's assistance. Ecology is using the guidelines to create a healthier and safer environment for children.

7. *Develop a grant program to assist schools and childcares with implementing best management practices.*

Based on the strong advice of school and childcare stakeholders and state agency partners, Ecology provides the Soil Safety Program free to schools and childcares. Soil testing is paid for through grants to the local health departments, who conduct the soil testing. Ecology is managing the design and labor costs for soil safety actions at schools and childcares with arsenic or lead levels above MTCA criteria. There is an option for public schools to manage the work themselves through an interagency agreement. This reduces the paperwork required of a grant program, speeds up getting actions in place, and encourages voluntary participation in the program.

8. *Evaluate actions to reduce child exposure to contaminated soils and submit progress reports to the governor and to the appropriate committees of the legislature by December 31, 2006, and December 31, 2008.*

   This report represents the second progress report to be submitted.

9. *In addition, the law requires schools and childcares to work with Ecology to provide site access for soil sampling.*

   Schools and childcares must provide written permission to the health departments for property access to conduct qualitative evaluations and soil sampling. The health departments provide a permission form to the schools and childcares for signature. At least three attempts are made to gain access to the schools and childcares through letters and phone calls. If after three or more attempts a school or childcare does not provide access, the information is noted in Ecology's database (the Soil Safety Tracking System). Each October, Ecology evaluates the success of gaining access. If the access rate is lower than performance measures then Ecology re-evaluates the effectiveness of outreach to target audiences, such as childcares.

10. *And the law states, if schools or childcares with contaminated soil do not implement best management practices within six months of receiving written notification of test results, they must notify parents and guardians of the results in writing.*

    Ecology offers free design assistance, labor and funding for soil safety actions. A school or childcare can use Ecology's assistance, or use its own resources to put actions in place. If a school or childcare does *not* take action, either with Ecology's assistance or on their own, the facility must notify parents and families in writing about the test results. Ecology will provide an example letter that the school or childcare may use to notify parents. If a school or childcare does not take action within six months, Ecology will request a copy of the letter sent by the facility to the parents and a list of the parents that received the letter.

Implementation of the Soil Safety Program

Data for the summary of accomplishments are from activities completed by September 30, 2008.

Qualitative Evaluation and Sampling

After the agencies obtain signed access agreements, an appointment is made for a qualitative evaluation. If children may be exposed to contaminated soil then the facility is usually sampled at that time. This is the first opportunity the health departments have to reach out to facilities and prepare them for the next steps in the process.

Schools

The public schools in the Soil Safety Program service area fall within thirteen school districts– seven districts in King County; five districts in Pierce County; one district in Thurston County. There are also private schools located in all three counties within the service area. See Figure 3 for a map of schools in the service area.

The agencies identified 219 public and private schools within the service area. Currently, 215 of these schools are open at the location where the qualitative evaluation was performed. This report includes only schools that were in operation at the time of the report. By the end of 2007, qualitative evaluations were complete at all 215 schools—100% of identified schools have been evaluated. One hundred eighty (84%) of those assessed required sampling. The health departments sampled all of the schools requiring sampling. Thirty five schools did not need sampling because there were no play areas, or the play areas were paved. Thirty one schools (17%) tested above the criteria for the Soil Safety Program. Of these, five took action on their own, leaving 26 that require actions by Ecology. See Table 2 and Figures 4 and 5 for a summary of the results for each county.

Table 2. Summary of Soil Sampling at Schools

County	Schools identified	Qualitative evaluations	Required sampling	Sampled	Required soil safety actions
King	135	135 (100%)	113 (84%)	113 (100%)	15 (13%)
Pierce	70	70 (100%)	57 (81%)	57 (100%)	16 (28%)
Thurston	10	10 (100%)	10 (100%)	10 (100%)	0
Total	215	215 (100%)	180 (84%)	180 (100%)	31 (17%)

King County
In the King County portion of the service area, Public Health—Seattle & King County assessed 135 schools, and 113 (84%) required sampling. All schools requiring sampling were sampled. Ninety eight schools tested below the criteria and 15 tested (13%) above the criteria.

Pierce County
In the Pierce County portion of the service area, Tacoma-Pierce County Health Department assessed 70 schools, and 57 (81%) required sampling. All schools requiring sampling were sampled. Forty one schools tested below the criteria and 16 tested (28%) above the criteria.

Thurston County
In the Thurston County portion of the service area, Ecology's contractor assessed and sampled 10 schools. All of the schools tested below the criteria.

Childcares

Childcares have high turnover. They open and close, change ownership and operators, and change location frequently. Over the course of the Soil Safety Program, the agencies identified 952 childcares in the service area. Currently only 718 childcares are still in operation with active licenses. Childcares are updated in Ecology's database every six months, in July and January. The last entry of new childcares, before the end of the Soil Safety Program, will be in January of 2009. This report includes childcares that were operational as of September 30, 2008.

The agencies have contacted all active childcares in the service area. Five hundred ninety five childcares have been evaluated (83%) with 522 (88%) requiring sampling. Of those sampled, 440 have tested below criteria, while 82 (16%) have tested above criteria. Seventy-three did not require sampling because there were no play areas, areas were paved, or adequate cover was installed over the play area. Fifty childcares have signed access agreements and are awaiting evaluation. Sixty-six childcares are in need of signed access agreements. See Table 3 and Figures 7 and 8 for a summary of the results for each county.

Table 3. Summary of Soil Sampling at Childcares

County	Childcares identified	Qualitative evaluations	Required sampling	Sampled	Required soil safety actions
King	488	381 (78%)	326 (86%)	326 (100%)	22 (7%)
Pierce	198	192 (97%)	176 (92%)	176 (100%)	60 (34%)
Thurston	32	22 (69%)	20 (91%)	20 (100%)	0
Total	718	595 (83%)	522 (88%)	522 (100%)	82 (16%)

The act of gaining access can take multiple methods of contact. Local health departments try to contact childcares at least three times through letters, phone calls, and home visits. Once all three methods are used, the agencies can mark a childcare as unresponsive. Eight of the 66 childcares waiting for signed access agreements were marked as unresponsive. Seven childcares have denied access for evaluation. See Figure 6 for a map of the childcares in the service area.

King County

In the King County portion of the service area, 650 childcares were identified, 488 childcares are operational. Qualitative evaluations are complete at 381 operational childcares (78%). Based on the results of the qualitative evaluation, sampling was required at 326 of the childcares (86%). One hundred percent of childcares requiring sampling have been sampled. Of the 326 childcares sampled in King County, 22 (7%) require soil safety actions. Three hundred and four tested below criteria and received certificates and window clings for their participation. Fifty-five childcares did not require soil sampling because there are no play areas, areas were paved, or adequate cover was installed over the play area. In King County, 107 childcares remain to be assessed and sampled. Of these, 50 have signed access agreements and await an evaluation. One childcare has denied access for a qualitative evaluation.

Pierce County

In the Pierce County portion of the service area, 255 childcares were identified, 198 of these are operational. Qualitative evaluations are complete at 192 operational childcares (97%). Based on the results of the qualitative evaluation, sampling was required at 176 of the childcares (92%). One hundred percent of childcares requiring sampling have been sampled. Of the 176 childcares sampled in Pierce County, 60 childcares (34%) require soil safety actions. One hundred sixteen tested below criteria and received certificates and window clings for their participation. Sixteen childcares did not require soil sampling because the play areas were paved or adequate cover was installed over the play area. Five childcares have denied access for qualitative evaluations. One childcare remains as access in progress but has been marked as unresponsive. Currently, no childcares remain to be sampled in Pierce County, except those that have refused. New childcares will be uploaded into the database in January 2009.

Thurston County

In the Thurston County portion of the service area, Ecology identified 47 childcares, 32 of these are operational. Ecology's contractor completed qualitative evaluations at 22 childcares (69%). Based on the results of the qualitative evaluation, sampling was required at 20 of the childcares (91%). One hundred percent of childcares requiring sampling have been sampled. Two childcares did not require soil sampling because the play areas were paved or adequate cover was installed over the play area. Of the 20 childcares sampled, none require soil safety actions. Ten childcares still need qualitative evaluations. One childcare has denied access for sampling.

All qualitative evaluations and sampling will be completed by June 2009, for all schools and childcares in the service area.

Soil Safety Actions

If a facility is found to have soil contamination above Model Toxics Control Act (MTCA) criteria (see Table 4), Ecology and the health departments encourage the school or childcare to use Soil Safety Action Plans. Ecology develops site specific Soil Safety Action Plans since a wide range of variables need to be taken into consideration. The action plan may vary depending on the level and location of contamination, the type of facility and the age of the children. See Appendix C for an example of a soil safety action plan.

Table 4. Arsenic and lead soil concentrations requiring a Soil Safety Action Plan

	Arsenic in parts per million (ppm)		**Lead in ppm**	
Average of all samples	≤20	>20	≤250	>250
Maximum of all samples	≤40	>40	≤500	>500
Soil Safety Action Plan needed?	No*	Yes.	No*	Yes

**Ecology can provide advice to facilities planning to take their own soil safety actions.*

Soil safety actions are actions taken to protect children and others from soil arsenic and lead. These actions can vary from simple temporary solutions to more permanent construction based actions. The simple actions can give a childcare or school a temporary solution, while waiting for construction activities. They can be put in place during the first outreach event to schools and childcares. Some simple soil safety actions include:

- Keeping children from putting dirt in their mouths.
- Washing hands and faces with soap and water after playing outside and before eating.
- Keeping dirt outside by using a door mat and taking shoes off at the door.
- Washing children's toys and pacifiers often.
- Damp dusting and damp mopping indoors.

Ecology also offers construction based soil safety actions. These actions require more planning and funding to implement. These actions are also more permanent and require less oversight by schools and childcares. Some soil safety actions Ecology uses are shown in Images 1 through 5.

Ecology offers free design assistance, labor and funding to put actions in place. A school or childcare can use Ecology's assistance, or use its own resources to put actions in place. If a school or childcare refuses to take action, either with Ecology's assistance or on their own, the facility must notify parents and families in writing about the test results. Ecology will provide an example letter that the school or childcare may use to notify parents. If a school or childcare does not take action within six months, Ecology will request a copy of the letter sent by the facility to the parents and a list of the parents that received the letter.

Image 1. Removal of the top six inches of contaminated soil

Images 2a and 2b. Covering soil with geotextile fabric and rubber matting or play chips

Image 3. Covering contaminated soil with concrete

Image 4. Mixing contaminated soil with clean soil

Image 5. Fencing off area with contaminated soil

Schools

As of September 30, 2008, 31 schools had sampling results above criteria. Ecology has done field visits at all the schools with results above criteria. Five of the schools implemented actions on their own since sampling occurred. Ecology developed soil safety action plans for the remaining 26 schools. Ecology worked with the school districts and private schools to create site specific soil safety action plans that met their needs, while protecting children at play.

Ecology has completed construction activities identified in the soil safety action plans at 19 schools. The 19 completed schools consist of seven different districts and five private facilities. Another five schools have had major remodeling of the play areas since sampling took place. This may eliminate the need for soil safety actions. Three of these schools will be re-sampled after construction is complete. Seven schools will receive soil safety action plans as funding becomes available. See Figure 9 for a summary of the above criteria schools.

Ecology worked with each district and private school to develop unique soil safety action plans. The Vashon Island School District did the work themselves through an interagency agreement; for all other completed schools, Ecology contracted out the work. Ecology and Tacoma Public Schools have been working on an interagency agreement since June 2008. The agreement is finalized but awaiting school board approval. The school district will complete soil safety actions at four elementary schools before June 30, 2009. The remaining three schools will have soil safety action plans completed during the 2009-2011 biennium, as funding becomes available.

Case Studies

Sunset Primary School in the University Place School District had low level contamination on a slope outside of the play structure area. The playground staff did not want children playing on the slope as they were out of visual range. Talking with school staff, Ecology found that installing a low fence would provide a barrier to better define the play area and keep the children from playing in contaminated soil. The soil safety action plan also included soil removal and replacement with a covering of sod in an additional area with elevated levels (see Images 5 and 6).

Image 6. Construction activities at Sunset Primary in the University Place School District

Property owners at two private schools on Vashon Island did not want major soil removal. Ecology worked with these schools to develop soil safety action plans that gave the children clean areas to play around play equipment, while leaving some soil contamination on the property (see Images 7a-c). At both sites, hand washing and shoe removal are routine since some contamination remains in the play areas.

Image 7a. Vashon Island private school yard before soil safety actions

Image 7b. After soil safety actions

Image 7c. Wood chips added under play structures

Custer Elementary, in the Clover Park School District, had low levels of arsenic over the entire play area. Ecology worked with the school district to remove the top six inches of soil over the entire play area. This project began in the summer and completed before the start of school. Clean soil was brought in and covered with sod and hydroseed. The school district then planned a watering schedule that would maintain the sod and start the seed. (See Images 8a-c)

Image 8a. Custer Elementary before soil safety actions

Image 8b. Soil removal and watering to control dust

Image 8c. After soil safety actions

Star Lake Elementary, in the Federal Way Public School District, had high and moderate levels of arsenic in the play field and areas surrounding the play equipment. Ecology worked with the district to remove the top six inches of soil over the portion of the play area with contamination. Clean soil was laid in the field and covered in hydroseed. In the areas with play equipment, geo-textile fabric was laid and covered in twelve inches of play chips (see Images 2 and 9a-b).

Image 9a. Star Lake Elementary before soil safety actions

Image 9b. After soil safety actions

Childcares

As of September 30, 2008, 96 childcares had sampling results above criteria. Only childcares operational as of September 30, 2008 will be counted in this report. High turnover has lead to 14 childcare closures at the locations that were sampled. Two of these childcares were closed after soil safety actions were taken, leaving 82 childcares requiring soil safety actions. Ecology has developed soil safety action plans for 70 of these childcares. Ecology worked in cooperation with the childcares to come up with soil safety action plans that meet their needs and at the same time protect children at play.

Five of the remaining 12 childcares have had a change in the play area since sampling, such as installation of new cover material. Two of the childcares have refused soil safety action plans. One refused a field visit to implement a plan and one refused to complete a soil safety action plan. Ecology is still working with these childcares to take the necessary soil safety actions. Five childcares are waiting for field visits to develop soil safety action plans.

Ecology has completed soil safety actions at 24 childcares. This leaves 53 childcares waiting for soil safety action plans to be completed. See Figure 10 for a summary of the actions at above criteria childcares.

Site specific soil safety action plans are also developed for childcares. The 24 childcares with completed actions consist of two preschools, five childcare centers, and 17 family home childcares. Each of these has a unique play area, with varying contamination levels and facility needs. Ecology has contracted for work to be performed at eight more childcares before June 30, 2009. If funds remain, more childcares may be completed before the end of the 07-09 biennium. The remaining childcares will be completed in the 2009-2011 biennium, as funding becomes available.

Case Studies

Ecology has not named the childcares in this report, as they are private businesses.

A preschool in Tacoma had low levels of arsenic and lead. The preschool had a play area remodeling project planned and needed soil safety work to be completed before the beginning of the school year. At this time, Ecology did not have a contractor. Instead, the agency tried a new approach and worked in cooperation with the preschool to complete the project. The preschool provided the labor and Ecology provided technical and safety advice, geotextile fabric, and play chips. This cooperation saved the Soil Safety Program approximately $10,000 and saved the preschool approximately $3,500.

Ecology used a similar approach at a childcare on Fort Lewis, with low levels of arsenic and lead. Ecology provided technical assistance and made sure that the disposed soil went to an appropriate location. The Army provided the funding and labor to complete the project.

A family home childcare in Lakewood had high levels of lead. This play area became a priority due to the levels of lead in the soil. Tacoma-Pierce County Health Department and Ecology

started outreach within days of receiving the results. Ecology completed construction activities 36 days after receiving the sampling results. This property had soil removal, geotextile fabric and play chips throughout the play area (see Images 10a and 10b).

Image 10a. Geotextile barrier placed over soil

Image 10b. Play chips in the finished play area

Most childcares, due to the structure of their play areas, require more than one method of construction. Three childcares in Tacoma, needed different approaches for each different play areas. All three childcares required soil removal and replacement covered with sod. Childcares A and B required geotextile fabric and play chips around play structures while childcare C preferred pea gravel (Image 11a). Childcare C needed a raised garden box to enable the children to garden (Image 11b) Childcare A also needed a fence to keep toddlers out of the soil around the bushes (Image 11c).

Image 11a. Pea gravel bed at childcare C

Image 11b. Raised garden bed at childcare C

Image 11c. Fencing at childcare A

Education and Outreach

Education and outreach is the most critical part of the Soil Safety Program. The local health departments are able to deliver outreach as soon as soil results are available, whereas Ecology may need months to plan cleanup. Outreach helps schools and childcares limit children's' exposure to contaminated soil immediately. The Soil Safety Program not only reaches children where they play but also provides materials and lessons they can take home. Education and outreach is intertwined in every step of the soil safety program including:

- Promoting awareness of soil safety and gaining access to schools and childcares.
- Conducting qualitative evaluations and sampling
- Encouraging soil safety action plans.

Promoting awareness and gaining access

Promoting awareness of the Soil Safety Program and soil contamination has helped the agencies gain access to schools and childcares. In 2006, the agencies contacted public schools and one hundred percent granted access for sampling. In 2007, the agencies contacted private schools for access and one hundred percent granted access.

In 2007 and 2008, Ecology, and the health departments sent access request packets to childcares; these packets included an endorsement letter from the Childcare Resource & Referral Network. In 2007, the Childcare Resource & Referral Network provided this endorsement letter, presented at childcare association meetings in King and Pierce counties and included information about the Soil Safety Program on its Web site. Sixty nine percent of childcares granted access in 2007 with the rate rising to 90% by the end of September 2008.

Each year, the King and Pierce County health departments offer several Washington State Training and Registry System (STARS) trainings to childcare providers. These trainings boost awareness of soil contamination, promote the Soil Safety Program, and train providers how to reduce exposure to soil contamination. Ecology and the health departments have attended many local and statewide events to promote the Soil Safety Program and soil safety messages. These events target teachers, childcare providers, and parents, and include:

- Environmental education events;
- Local fairs and festivals; and
- Washington Association for the Education of Young Children annual conferences.

The Tacoma-Pierce County Health Department also promotes soil safety awareness through billboards, bus placards, and television advertising. Through surveys of local residents, they have seen an increase in awareness during and after these promotions.

Ecology works with the Department of Early Learning to educate childcare licensors about the Soil Safety Program, and gather feedback and advice. The Department of Early Learning has incorporated soil safety training in provider education during licensing. Ecology provides quarterly updates on the Soil Safety Program's progress as well as copies of soil safety action plans

for childcares with results above the state criteria. The Department of Early Learning provides lists of licensed childcares in Washington State and closure dates for childcares that have left the system during the Soil Safety Program period. Ecology is working with the Department of Early Learning to identify how soil contamination from TSP can be best addressed in new childcares in the long-term (see p. 27 for Next Steps).

Conducting Qualitative Evaluations/Sampling

Once the health departments have a signed access agreement, they have an opportunity to meet with childcare providers and school district personnel to explain the Soil Safety Program. They speak with school staff or childcare providers to find out where children play. This information helps them plan where to sample. They also have the chance to answer questions. The health departments have met with over eight hundred schools and childcares and provided outreach and educational information.

This first contact is a vital part of the Soil Safety Program—it prepares schools and childcares for the next steps in the process. For most facilities, whose results are below criteria, this is the only contact they have with the Soil Safety Program. These facilities receive their results, certificate, and window cling in the mail after sampling. For facilities with results above criteria, the samplers prepare them for a call from Ecology about creating a soil safety action plan. This has helped Ecology staff reach schools and childcares to set up an initial appointment.

Encouraging Soil Safety Action Plans

Ecology and the health departments try to meet at the same time with schools and childcares above criteria. At these meetings, Ecology offers an explanation of the sampling results and possible soil safety actions that can be taken. The health departments provide outreach and education materials that help the childcare or school teach children about soil safety. The agencies work as a team to answer questions about lead, arsenic, and the Soil Safety Program, and to encourage the facility to take soil safety actions. Educational materials provided include:

- Dirt Alert Kits (nailbrush, cleaning cloth, activity sheet, and informational brochure).
- Curriculum.
- Posters.
- Educational DVDs.
- Door mats.

Facilities with results above criteria are also offered follow up visits from local health department staff. These follow up visits offer additional education opportunities and a more in depth look at soil safety. Some examples of follow up visit topics include:

- Hand washing presentations.
- Visits from Digger the Dog.
- Vacuum Loan Program.
- Curriculum demonstration.

Together, the agencies have met with 106 facilities with levels above criteria, thus reaching thousands of children. Ecology estimates it has protected over 7400 children from arsenic and lead soil contamination by implementing action plans at facilities with levels above criteria.

See Appendix B for examples of education and outreach materials available from the health departments and Ecology.

Resources

Local Toxics Control Account

Ecology used 2005-2007 Local Toxics Control Account funds to provide $1,045,297 in grants to Public Health Seattle & King County and $980,000 to Tacoma-Pierce County Health Department. The grants covered soil sampling and education and outreach. Ecology provided $5000 to the Thurston County Health & Social Services Department to provide education and outreach.

In the 2007-2009 biennium Ecology provided grants of $1,568,521 to Public Health Seattle & King County and $948,930 to Tacoma-Pierce County Health Department to conduct soil sampling and provide education and outreach. Ecology provided $12,000 to the Thurston County Health & Social Services Department for education and outreach.

Ecology expects less funding will be needed for 2009-2011 grants, since sampling will be completed. Funding will still be needed for outreach and education activities to the local communities to continue to raise and maintain awareness about Tacoma Smelter Plume contamination.

State Toxics Control Account – Capital

Over the last two biennia, $8.8 million has been appropriated for the cleanup of schools and childcares. The funding has been divided between three of Ecology's regions to cover cleanups at schools and childcares in western , eastern, and central Washington. See Figure 11 for a budget summary for the area-wide soil contamination cleanup work.

In the 2005-2007 biennium, Ecology reserved $250,000 of the $4.3 million appropriation for cleanup of schools and childcares within the Tacoma Smelter Plume Soil Safety Program service area. The Soil Safety Program spent $277,765 to perform soil safety actions at 8 schools and one childcare. The remainder of the appropriation was used to remediate soils at schools in central Washington (see pages 37-39).

In 2007, Ecology spent $97,707 to contract with Science Applications International Corporation to perform soil sampling at schools and childcares in Thurston County. Ten schools and 22 childcares were evaluated by the contractor.

In the 2007-2009 biennium, Ecology reserved $1,625,000 of the $4.5 million appropriation (established to cleanup schools and childcares) for the Soil Safety Program. The Soil Safety Program spent $899,563 to perform soil safety actions at eleven schools and 25 childcares. The Soil Safety Program encumbered $607,000, which will be used to perform soil safety actions at eight

childcares and four schools before June 30, 2009. If additional funds remain, it is possible that more childcares may be completed before the end of the 07-09 biennium. The Eastern Regional Office has used a portion of the funds and the central regional office will use the remainder of the account to remediate schools in central Washington.

The remaining schools and childcares in the Soil Safety Program will be completed in the 2009-2011 biennium if funding allows. Ecology estimates an additional $1.6 million will be needed for soil safety actions at the remaining three schools and 45 childcares in the service area. This is a conservative estimate, as soil testing is not complete, and the actual number of facilities requiring soil safety actions is not known.

Ecology is requesting an additional $4 million from the State Toxics Control Account for the 2009-2011 biennium to continue to address lead and arsenic contamination at schools and childcares in Washington State.

The State of Washington has a claim in the Asarco bankruptcy. If Asarco settlement dollars become available during the 2009-2011 biennium, Ecology will request use of the settlement funds for Soil Safety Program work rather than the State Toxics Control Account.

Evaluation of the Soil Safety Program

Performance Measures

The agencies identified four performance measures for evaluating the Soil Safety Program, pertaining to gaining access, conducting evaluations and sampling, and encouraging soil safety actions where appropriate.

Gaining Access

Ecology and the health departments evaluate the success of gaining access to identified schools and childcares in October of each year. Performance is measured by the percentage of facilities granting access (see Table 5). For all public and private schools in the soil service area, the health departments and Ecology achieved 100% access rate by October 2007. In October 2006, the agencies had not yet started to gain access to childcares and we did not include data from the previous footprint studies. In October 2007, the agencies nearly met the performance measure for gaining access to childcares, gaining access to 69% of the childcares in the service area. The health departments have made great strides in their efforts for gaining access. The health departments by October 2008 have contacted 100% of the childcares and surpassed the target and gained access to 90% of the childcares in the service area.

Table 5. Performance Measures—Gaining access

	Schools		Childcares	
	Target	**Actual**	**Target**	**Actual**
October 2006	95%	100%	60%	---
October 2007	100%	100%	70%	69%
October 2008	---	---	80%	90%
October 2009	---	---	90%	---

Conducting Qualitative Evaluations/Sampling

Ecology and the health departments evaluate the effectiveness of the qualitative evaluation and sampling elements of the program in October of each year of the program. Performance is measured by two percentages:

- Percentage of facilities evaluated (number of facilities evaluated/number of facilities granting access).
- Percentage of facilities sampled (number of facilities sampled/number of facilities requiring sampling based on qualitative evaluation).

The performance measures for conducting qualitative evaluations and the actual measures for 2006-2008 are shown in Table 6. The performance and actual measures for conducting sampling are shown in Table 7. As of October 2007, the county health departments met the target for conducting qualitative evaluations and sampling of schools. One hundred percent of the schools have had qualitative evaluations and all of those requiring sampling have been sampled. The county health departments have exceeded the target by performing evaluations at 84% of the childcares in October 2007 and 92% in October 2008. In both 2007 and 2008, the health departments exceeded the sampling target by sampling one hundred percent of childcares that required sampling after qualitative evaluation.

Table 6. Performance Measures - Conducting qualitative evaluations

	Schools		Childcares	
	Target	**Actual**	**Target**	**Actual**
October 2006	95%	85%	60%	---
October 2007	100%	100%	70%	84%
October 2008	---	---	80%	92%
October 2009	---	---	90%	---

Table 7. Performance Measures - Conducting sampling

	Schools		Childcares	
	Target	**Actual**	**Target**	**Actual**
October 2006	95%	100%	60%	100%
October 2007	100%	100%	70%	100%
October 2008	---	---	80%	100%
October 2009	---	---	90%	---

Encouraging Soil Safety Actions

Ecology and the health departments also evaluate the implementation of soil safety action plans in October of each year of the program. Performance is measured by two indicators:

- Percentage of facilities initiating soil safety actions (number of facilities initiating soil safety actions/number of facilities above state criteria)
- Percentage of facilities receiving certificates of soil safety action completion (number of facilities receiving certificate/number of facilities above state criteria)

The performance measures for encouraging soil safety actions and the actual measures for 2006-2008 are shown in Table 8. One-hundred percent of the schools requiring soil safety actions have had soil safety action plans initiated. Soil safety action plans are complete at 77% of the schools. Ninety-one percent of the childcares requiring soil safety actions have had soil safety action plans initiated. Soil safety action plans are complete at 35% of the childcares, compared to the target of 50%.

Table 8. Performance Measures - Encouraging soil safety actions with Soil Safety Action Plans

	Schools				**Childcares**			
	Plan initiated		**Plan complete**		**Plan initiated**		**Plan complete**	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
October 2006	50%	69%	25%	0%	25%	4%	10%	0%
October 2007	100%	100%	75%	37%	50%	64%	25%	2%
October 2008	---	---	100%	77%	75%	91%	50%	35%
October 2009	---	---	100%	---	75%	---	75%	---

Challenges to Implementation

Much of the first year—July 2005 to April 2006—was spent designing the program and coordinating with stakeholders. The agencies had a goal to create an effective, incentive-based program. The final program design meets the requirements of the law while conveying an overall positive message to the school and childcare communities. The program design was finalized in April 2006, and field work began at that time. Due to staff turnover, the Soil Safety Program Coordinator position was not filled until October 2006. This left Ecology and the health departments a year behind on targets in 2006.

In 2008, Ecology and the local health departments have met and exceeded all targets, except the completion of soil safety action plans. For schools, actual completion of soil safety action plans (77%) (Table 8) is less than the targeted completion rate of 100%. For childcares, actual completion (35%) is less than the targeted completion rate of 50%. Funding, contracting processes, working around school breaks and weather have all delayed the completion of soil safety action plans at both schools and childcares. Overall, Ecology feels that the program has been successful and is on target to meet most goals and deadlines.

Program Successes

Outreach to the childcare community has been successful, particularly with the help of the Childcare Resource and Referral Network (CCRRN), and State Training and Registry System (STARS) trainings. CCRRN provided Web site space and presentation time at meetings for publicizing the Soil Safety Program. They also provided a letter of endorsement that is sent to all

childcares when they are first contacted. The STARS trainings are a way to reach childcares that have not yet participated in the program, while reinforcing soil safety messages for childcares who have already been sampled. Ecology has been positively received on field visits and most providers have heard about at least one other childcare that has had soil safety actions. Ecology has received many letters and notes from providers and children, thanking the agency for their new play areas.

Construction activities have gone smoothly and stayed on budget for all completed projects. Most childcares with an average sized play area can expect contractors to work for about one week. A few childcare projects have lasted a little longer due to difficult access, requiring more manual labor and less equipment operation. Out of 45 projects, only one complaint has been made—a leak in sprinkler line that resulted in dead sod. The line was quickly repaired and the sod was replaced by the Ecology contractor, resulting in a satisfied childcare operator.

Modifications to Program

King County had to add a second sampling team due to the size of the service area and over 400 childcares to qualitatively evaluate. King County has greater distances to travel, coupled with traffic congestion, which has slowed sampling. In the 2007-2009 grant, funds were added for a part time additional sampling team and a full time intern. This increased productivity and helped in meeting performance measures. As of May 2008, King County returned to one sampling team.

Soil Service Area Map Changes

The soil service area boundary map would need to be re-evaluated by Ecology and the county health departments, if the Soil Safety Program continues past 2009. This evaluation could lead to a smaller service area.

In King County, seven percent of childcares sampled were above criteria. Of the twenty-two childcares above criteria, five were due to lead, likely unrelated to the Tacoma Smelter Plume. Six had lower levels of arsenic—average arsenic below 23 milligrams per kilogram (mg/kg) and a maximum below 40 mg/kg. This means that 50% of the childcares above criteria appear to be more impacted by the Tacoma Smelter. If the service area boundary was changed, areas in north and east King County might be removed. This would better focus the program on facilities with a higher likelihood of having Tacoma Smelter Plume contamination.

The greatest number of impacted schools and childcares are seen in Pierce County. As a result of the number of above criteria childcares, Ecology has sampled outside of the service area, to the south and east around Lakewood. Several childcares in this area have results above criteria. Ecology would look into a slight expansion of the service area around Lakewood, if the Soil Safety Program was to continue.

In Thurston County, Ecology evaluated 69% of childcares and 100% of schools, and did not find a facility above criteria. If the Soil Safety Program is extended past 2009, Ecology would consider eliminating Thurston County from the service area.

Next Steps with Soil Safety Program

In January 2009, the last upload of new childcares will be added to the database. These childcares will be evaluated and sampled by the end of April 2009. In 2009, Ecology will continue to implement soil safety action plans at schools and childcares requiring action. Ecology anticipates a productive year, with the completion of soil safety action plans at the remaining public schools and many childcares.

Ecology and the Department of Early Learning are exploring the opportunities and challenges to making Tacoma Smelter Plume soil sampling remediation a condition of childcare licensure. This option will continue to be evaluated as the Department of Early Learning undergoes a negotiated rule review process and as Ecology plans for the next stages of Tacoma Smelter Plume Management with anticipated Asarco Settlement funds.

Sampling and Cleanup in Central Washington

While Chapter 70.140 RCW is specific to areas in western Washington affected by the Tacoma Smelter Plume, Ecology's Yakima office has been working with schools in central Washington affected by lead arsenate. This section summarizes those efforts.

Background

In the central Washington region, lead and arsenic contamination is a result of past pesticide use. Apple and pear orchards in the early 1900's commonly used lead-arsenate to control the codling moth. Ecology used historical maps and aerial photography to determine the potential for contamination. The counties of Okanogan, Chelan, Douglas, and Yakima were targeted based on their high orchard production (in terms of acres). Ecology focused initial sampling efforts in the Wenatchee School District. Because of the high contamination levels discovered, Ecology continued sampling throughout the four counties.

Sampling and Remediation

By 2005, over 100 central Washington public schools had been tested for lead and arsenic contamination. About 35 schools had contamination above state cleanup levels, and Ecology began reaching out to these schools to offer assistance. To date, Ecology has completed successful cleanups at 14 schools, eight in 2006, two in 2007, and four in 2008. Specific schools are listed in Table 9.

Table 9. Central Washington schools successfully cleaned up

County	School	Year
Chelan	Lewis & Clark Elementary	2006
Chelan	Lincoln Elementary	2006
Chelan	Manson Elementary	2006
Chelan	Orchard Middle School	2008
Chelan	Peshastin-Dryden Elementary	2008
Chelan	Sunnyslope Elementary	2008
Chelan	Washington Elementary	2006
Chelan	Westside High School	2006
Douglas	Bridgeport Elementary	2007
Douglas	Lee Elementary	2008
Douglas	Orondo School District	2007
Okanagan	Brewster Elementary	2006
Okanagan	Brewster High School	2006
Yakima	Naches Intermediate	2006

Ecology used a variety of cleanup methods to address the lead and arsenic contamination. These included widespread soil excavation, limited soil excavation, soil capping, and deep mixing. The cleanup method was determined after assessing the geology of the site and the distribution of contamination throughout the soil profile (depths of soil). In 2006, many of the cleanups utilized innovative deep mixing technology. This technology allowed for the clean, deep soil to be mixed with the contaminated soil near the surface (see Image 12). While deep mixing allowed for a permanent cleanup of contamination, it was generally not useful at schools with arsenic levels above 100 mg/kg.

Image 12. Deep mixing at Naches Intermediate School, Yakima County

In 2007 and 2008, most schools used soil capping as the cleanup method (see Image 13). This involves placing a geo-textile membrane (essentially landscaping fabric), in overlapping sheets, on the existing soil surface. Then, between six and eight inches of clean topsoil is placed on top. The existing irrigation system is raised to the new soil level. Seed or sod is then imported to maintain the grass cover necessary. This cleanup method requires a restrictive covenant to be placed on the property because contamination is not actually removed, just covered over and separated with a barrier. Most schools were not opposed to having a restrictive covenant.

Image 13. Soil capping at Orondo School District, Douglas County

Limited soil excavation was used for several schools prior to deep mixing. Widespread soil excavation down to the depth of contamination (typically, between one and one and a half feet below grade) was only used at one school—Manson Elementary.

Education and Outreach

Ecology used various education and outreach methods depending on the needs of the particular school district. The agency worked with a wide variety of partners to ensure a consistent message and address parent and community concerns, including school administrators, maintenance personnel, local health districts and the state Department of Health. Outreach materials were distributed upon request. These included letters to parents, brochures, and fact sheets.

Future Efforts

Ecology is committed to completing additional cleanups at schools where contamination is in excess of state cleanup levels. The agency has contacted all schools where cleanups are necessary and is working with them to determine the best schedule.

Figures

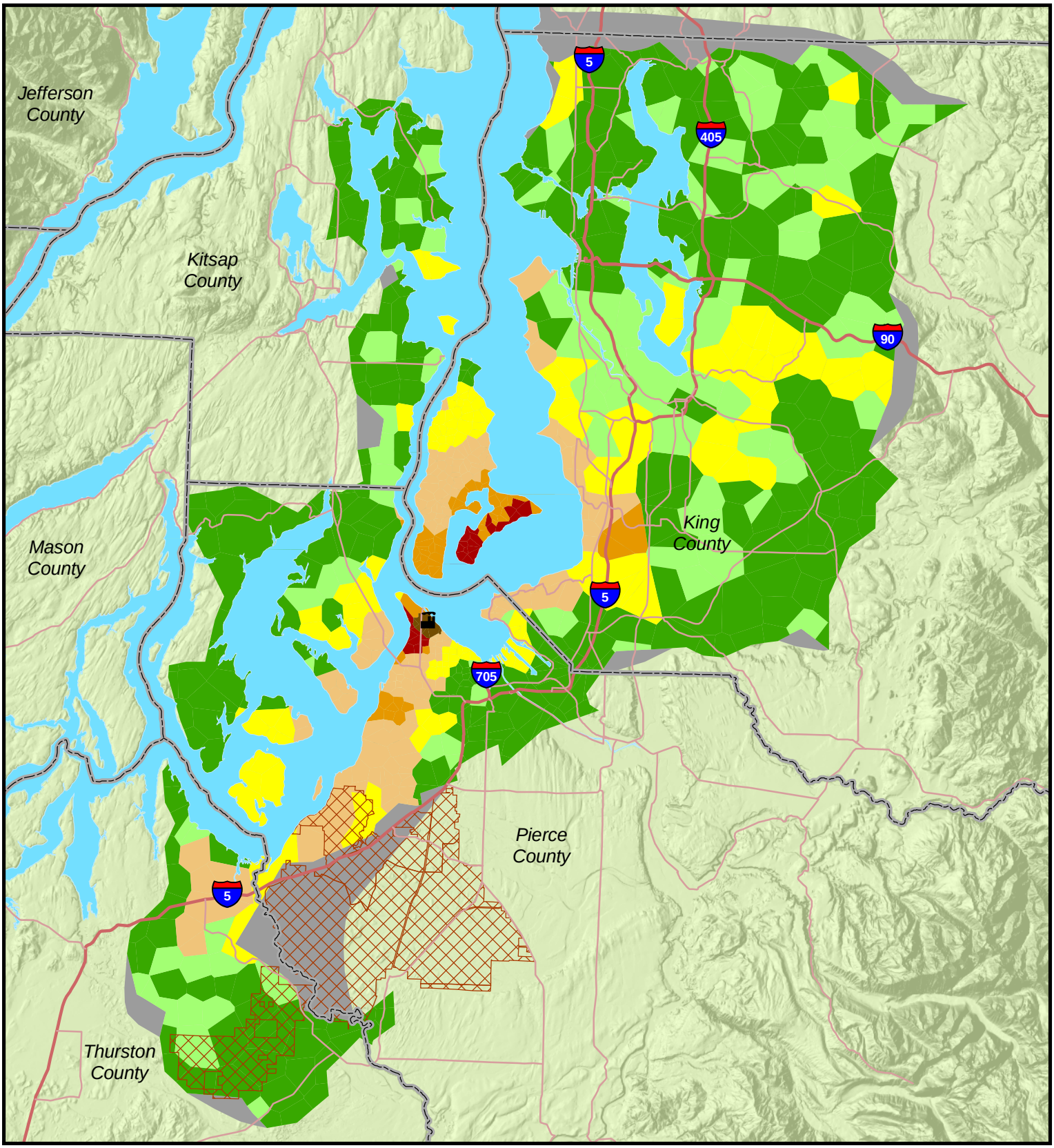


Figure 1 - Tacoma Smelter Plume FootPrint

Map Features

Arsenic Concentrations in Soil, 0-6 inches, 90th Percentile (ppm) in the TSP Study Area

- Stack
- County_Boundaries
- Interstates
- Highways

Tacoma Smelter Plume

Arsenic Concentration

- Non-Detect to 20.0 ppm
- Non-Detect to 20.0 ppm; Max > 20.0
- 20.1 ppm to 40.0 ppm
- 40.1 ppm to 100.0 ppm
- 100.1 ppm to 200.0 ppm
- Greater than 200.0 ppm
- Ruston Superfund Site
- Not Tested - Possibly Contaminated
- Miltary Base

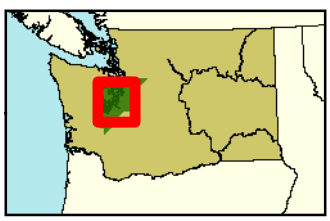
0 2 4 6 8 10

Miles

DEPARTMENT OF ECOLOGY
State of Washington

Map Created: December, 2008 by Toxics Cleanup Program

\\ecylcyfsvrxfile\tcp\ICU\AppDevTeam\GIS_TCP\Projects\07043_TSP_web_Hannah\mxd\TSP_Plume_fp_rev1.mxd



Tacoma Smelter Plume Project

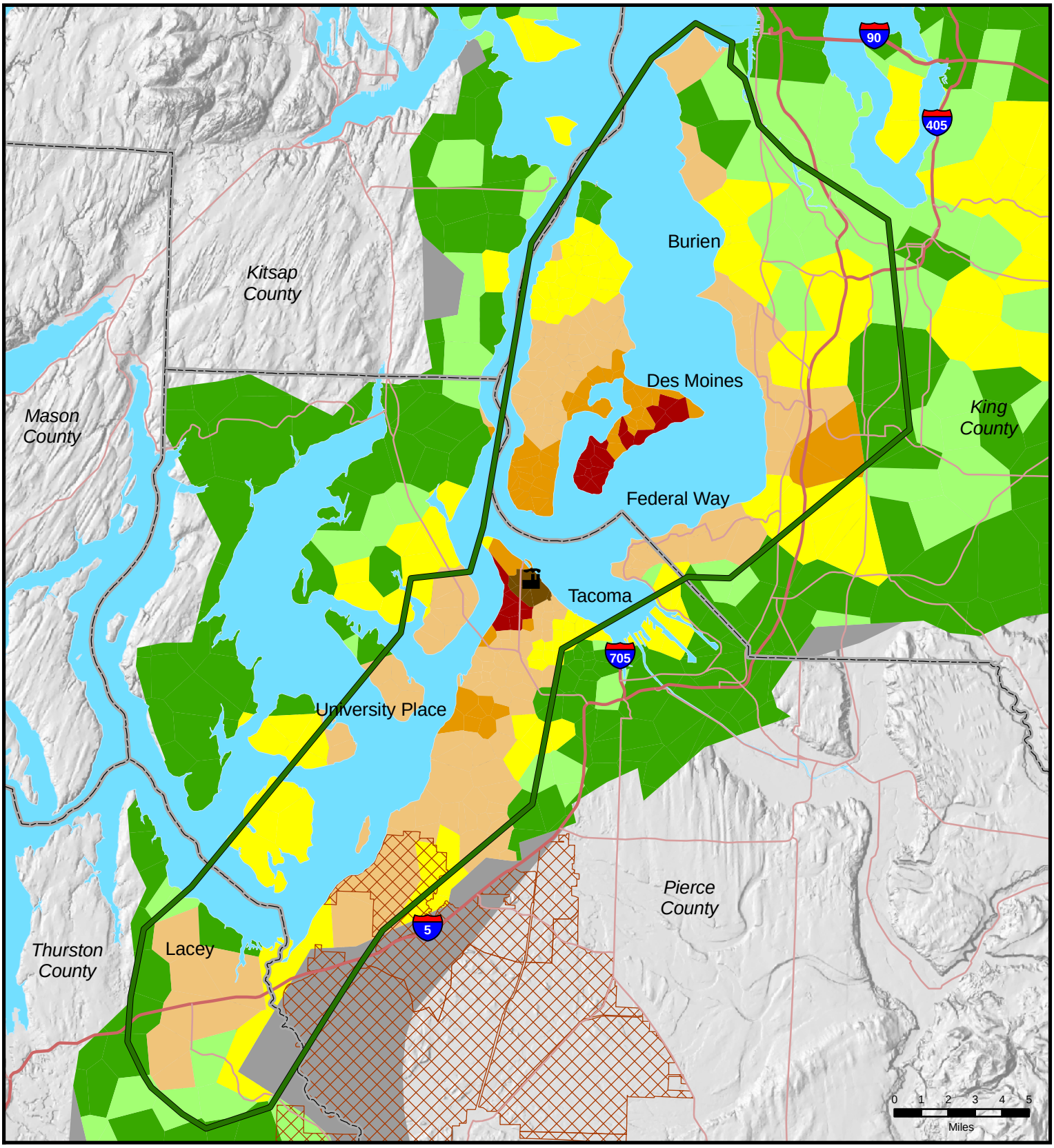


Figure 2 - Soil Safety Program Service Area

Map Features

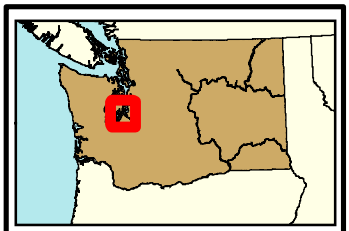
Arsenic Concentrations in Soil, 0-6 inches, 90th Percentile (mg/kg) in the Soil Safety Program Service Area

- Stack
- Soil Safety Program Service Area
- Non-Detect to 20.0 ppm
- Non-Detect to 20.0 ppm; Max > 20.0
- 20.1 ppm to 40.0 ppm
- 40.1 ppm to 100.0 ppm
- 100.1 ppm to 200.0 ppm
- Greater than 200.0 ppm
- Ruston Superfund Site
- Not Tested - Possibly Contaminated
- Miltary Base

DEPARTMENT OF ECOLOGY
State of Washington

Map Created: November, 2008 by Toxics Cleanup Program

\\ecylcyfsvrxfile\tcp\ICU\AppDevTeam\GIS_TCP\Projects\08072_TSP_SchoolsChildcares_Amy\mxd\Soil_safety.mxd



Tacoma Smelter Plume Project

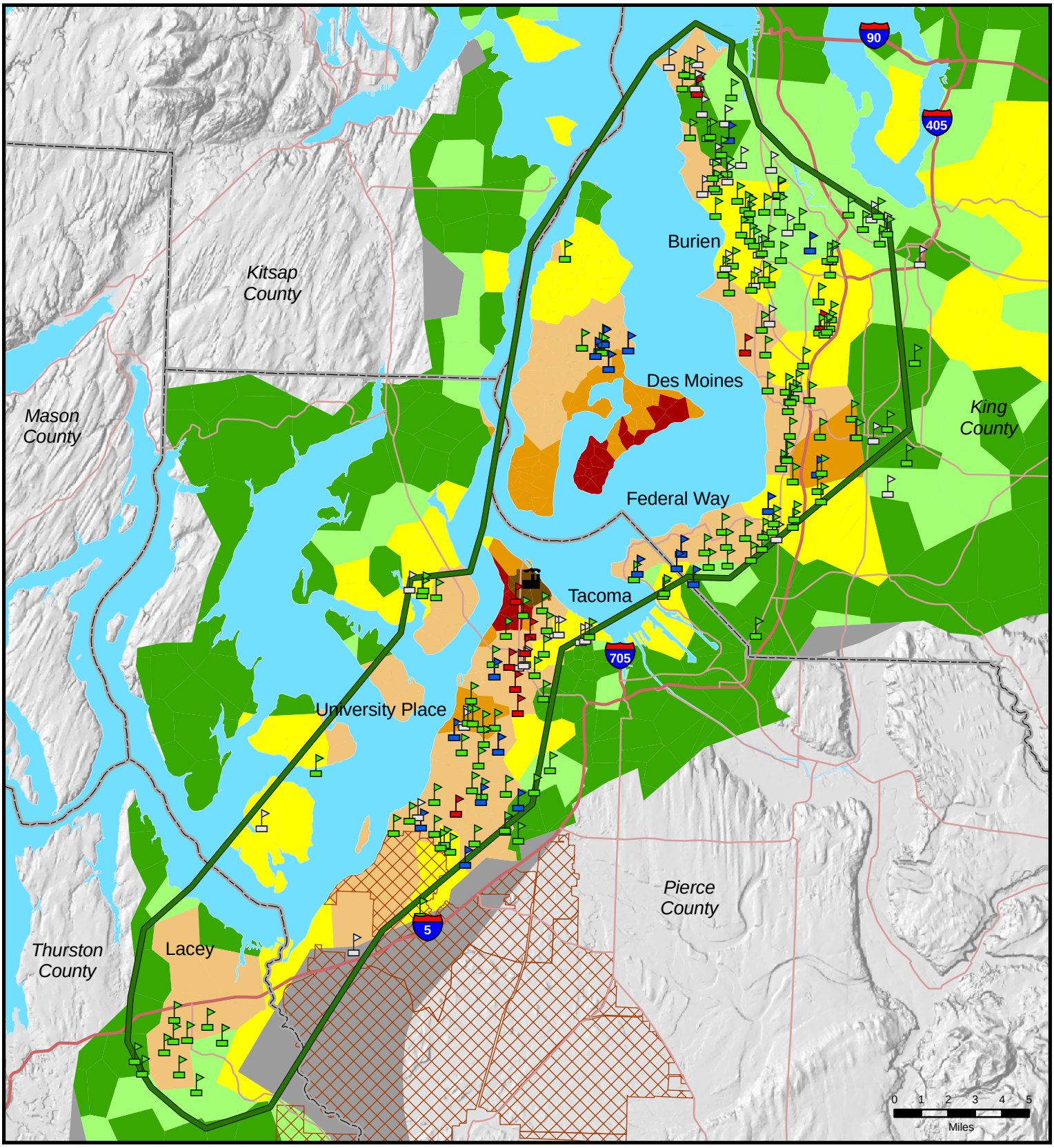


Figure 3 - Soil Safety Program Service Area and Schools

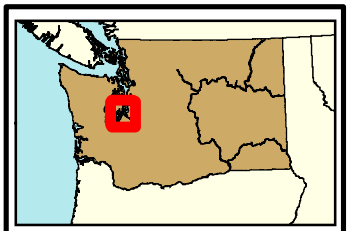
Map Features

Arsenic Concentrations in Soil, 0-6 inches, 90th Percentile (mg/kg) in the Soil Safety Program Service Area

- Sampling not required
- Completed
- Above
- Below
- Stack
- Soil Safety Program Service Area
- Non-Detect to 20.0 ppm
- Non-Detect to 20.0 ppm; Max > 20.0
- 20.1 ppm to 40.0 ppm
- 40.1 ppm to 100.0 ppm
- 100.1 ppm to 200.0 ppm
- Greater than 200.0 ppm
- Ruston Superfund Site
- Not Tested - Possibly Contaminated
- Miltary Base

DEPARTMENT OF ECOLOGY
State of Washington

Map Created: November, 2008 by Toxics Cleanup Program
\\ecylcyfsvrxfile\tcp\ICU\AppDevTeam\GIS_TCP\Projects\08072_TSP_SchoolsChildcares_Amy\mxd\TSP_schools.mxd



Tacoma Smelter Plume Project

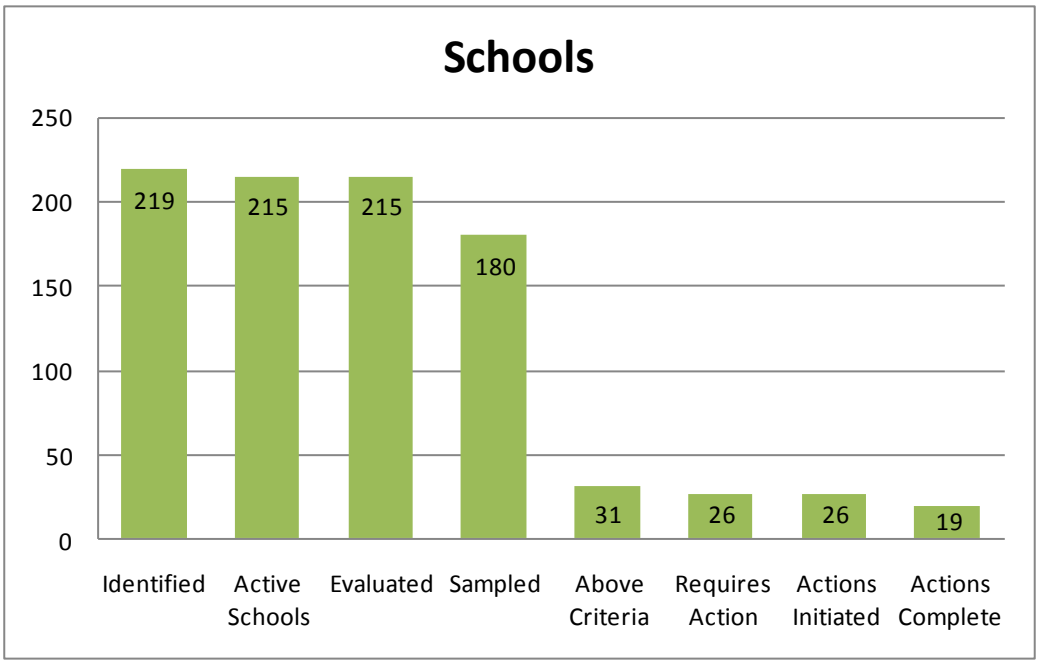


Figure 4 Summary of Soil Safety Program and schools

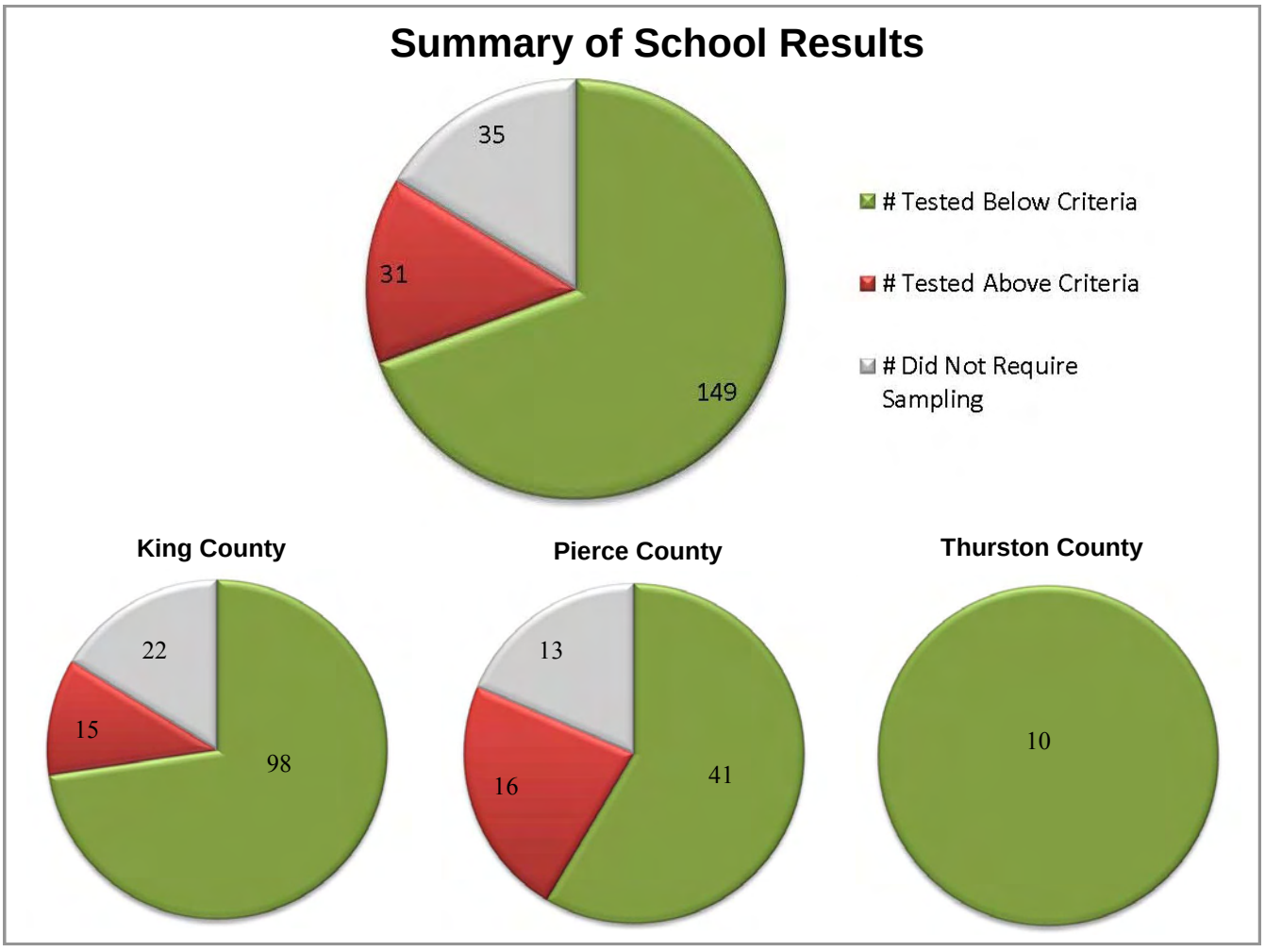


Figure 5 Summary of school results, broken out by county

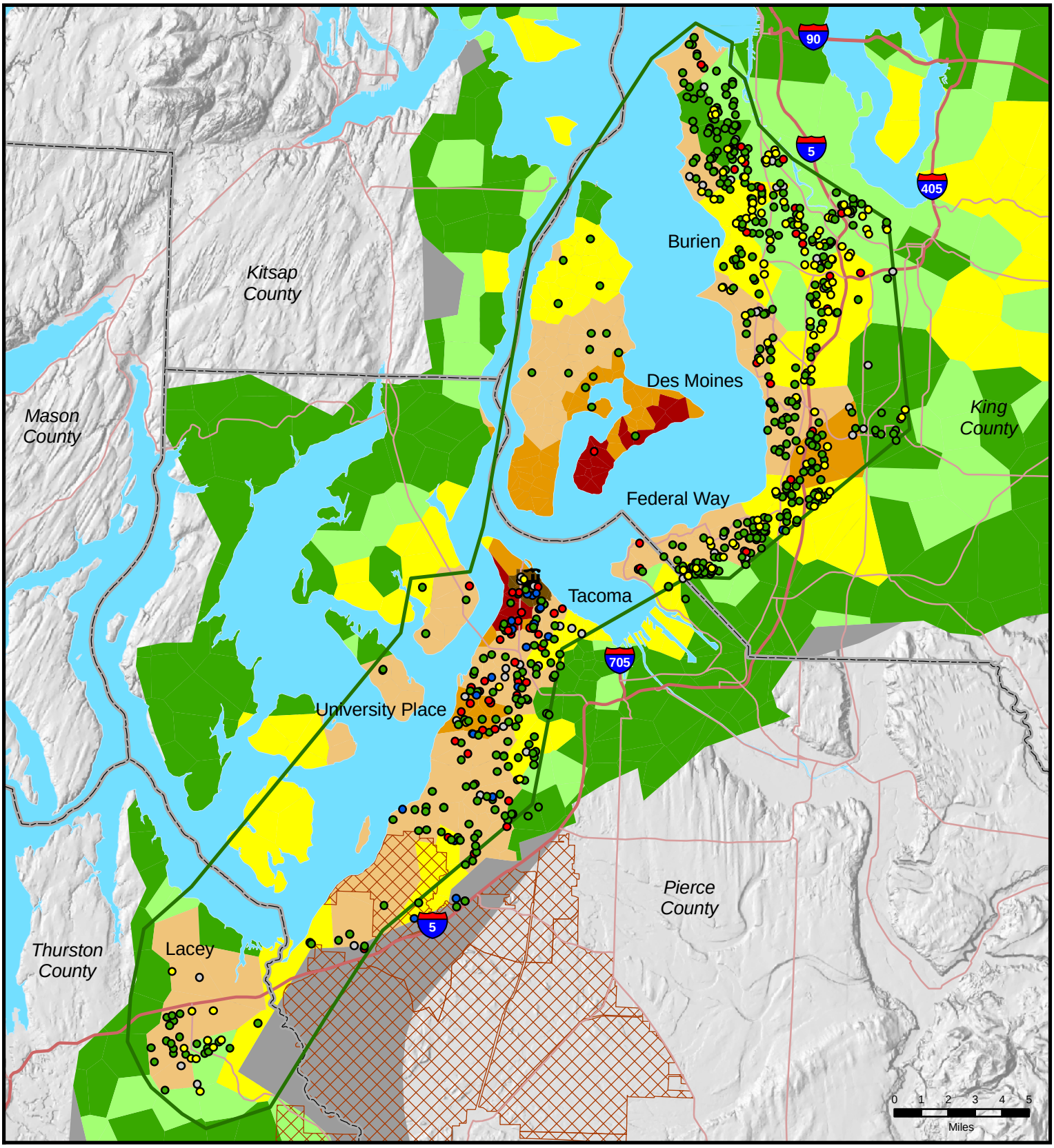


Figure 6 - Soil Safety Program Service Area and Childcares

Map Features

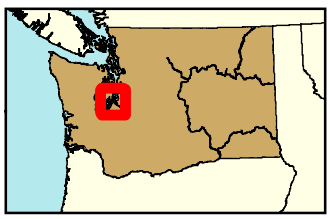
Arsenic Concentrations in Soil, 0-6 inches, 90th Percentile (mg/kg) in the Soil Safety Program Service Area

- Completed
- Tested above
- Tested below
- Not tested
- Sampling Not Required
- Stack
- Soil Safety Program Service Area
- Non-Detect to 20.0 ppm
- Non-Detect to 20.0 ppm; Max > 20.0
- 20.1 ppm to 40.0 ppm
- 40.1 ppm to 100.0 ppm
- 100.1 ppm to 200.0 ppm
- Greater than 200.0 ppm
- Ruston Superfund Site
- Not Tested - Possibly Contaminated
- Miltary Base

DEPARTMENT OF ECOLOGY
State of Washington

Map Created: November, 2008 - Toxics Cleanup Program

Y:\ICU\AppDevTeam\GIS_TCP\Projects\08072_TSP_SchoolsChildcares_Amy\mxd\childcare.mxd



Tacoma Smelter Plume Project

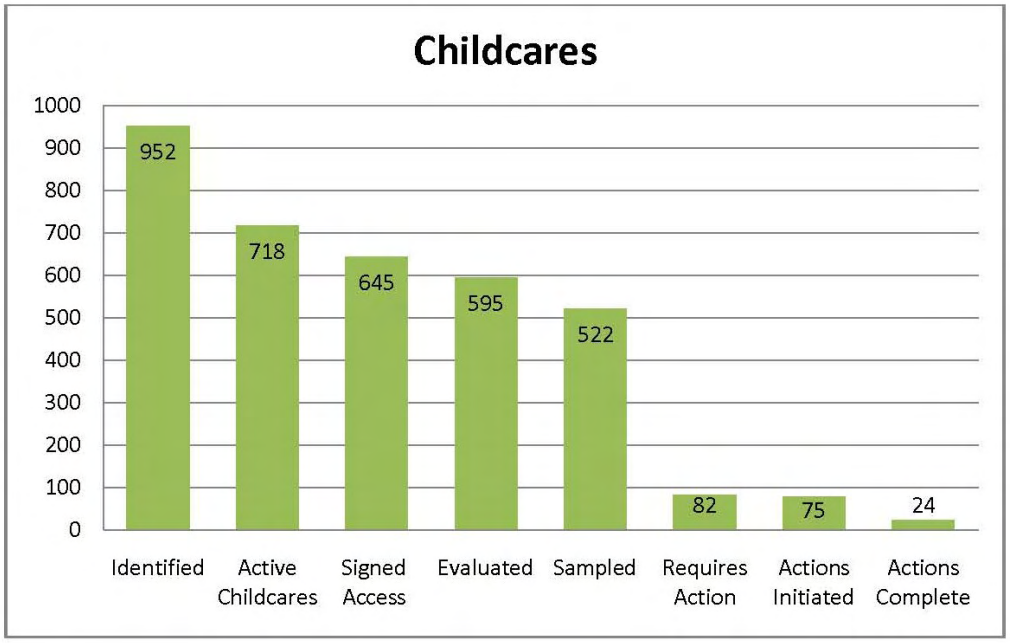


Figure 7 Summary of Soil Safety Program and childcares

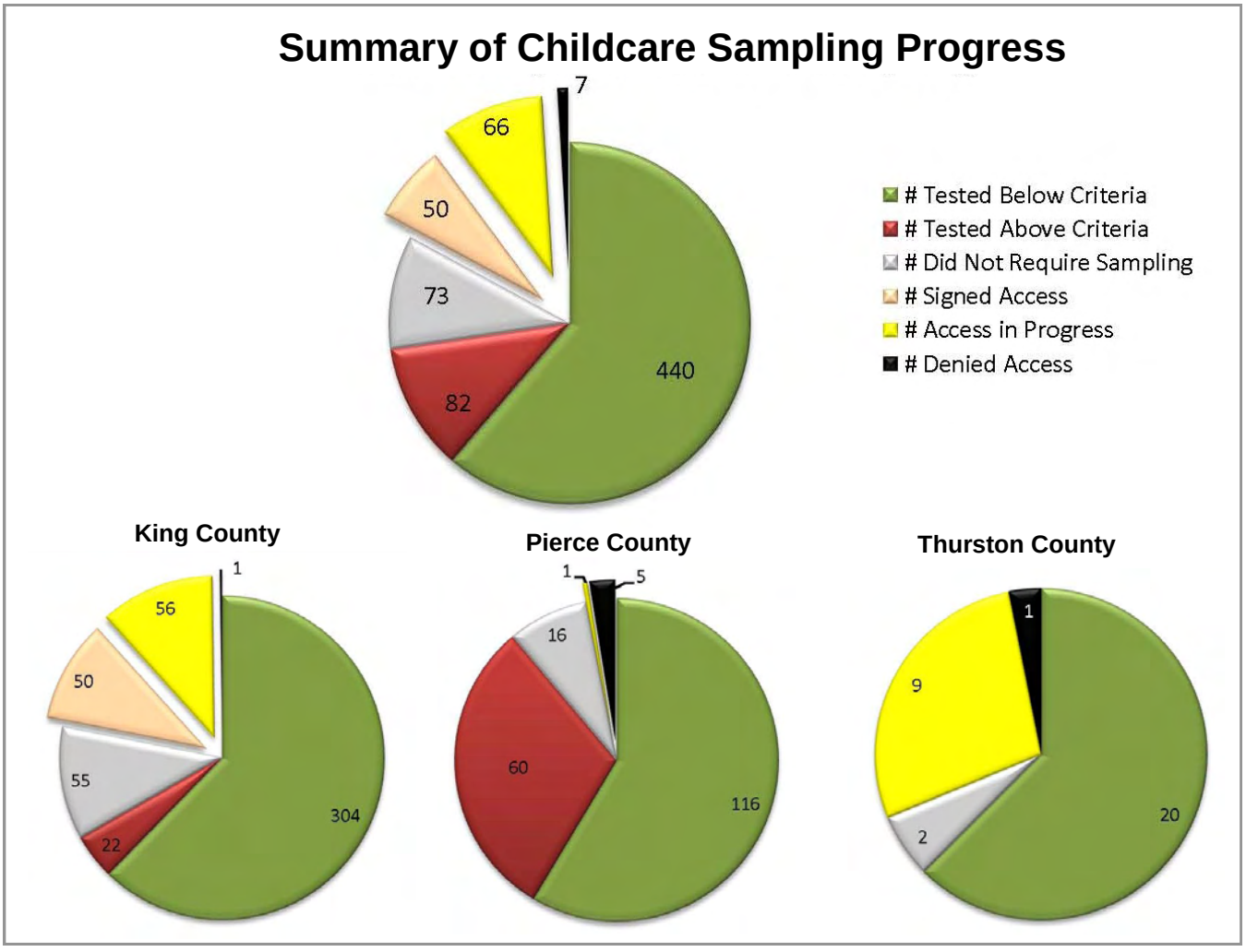


Figure 8 Summary of childcare sampling progress, broken out by county

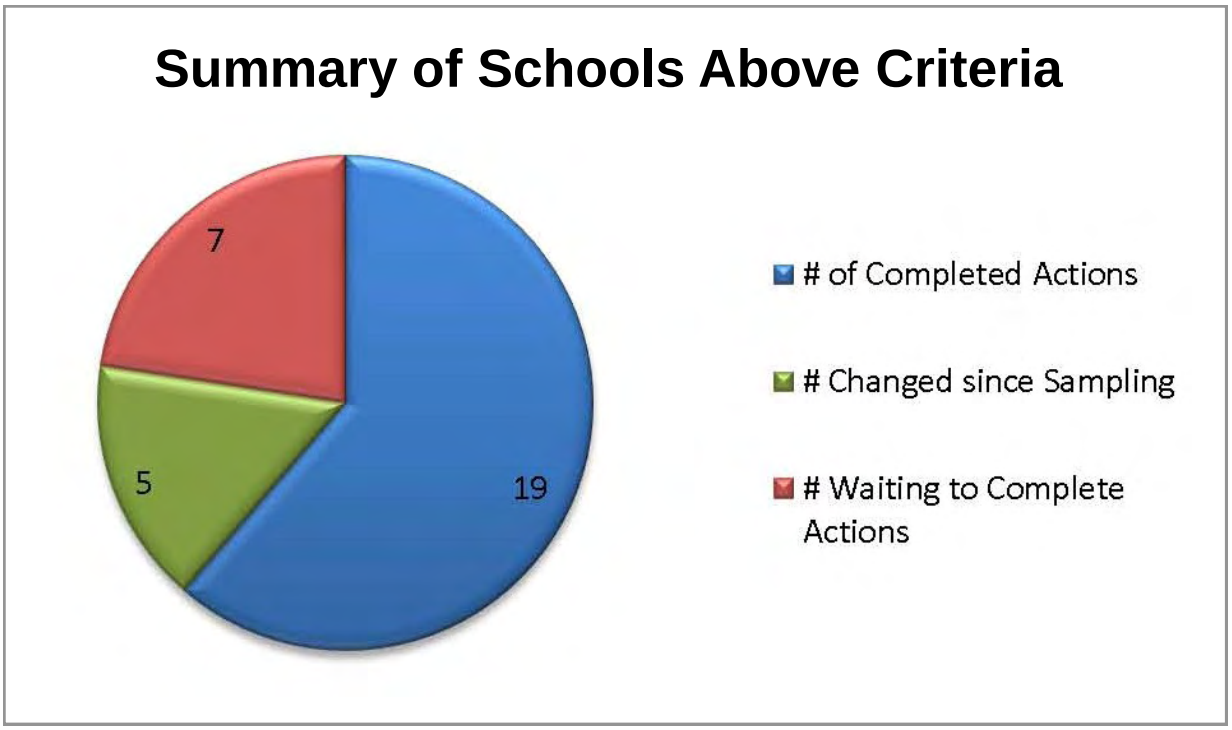


Figure 9 Summary of schools above criteria

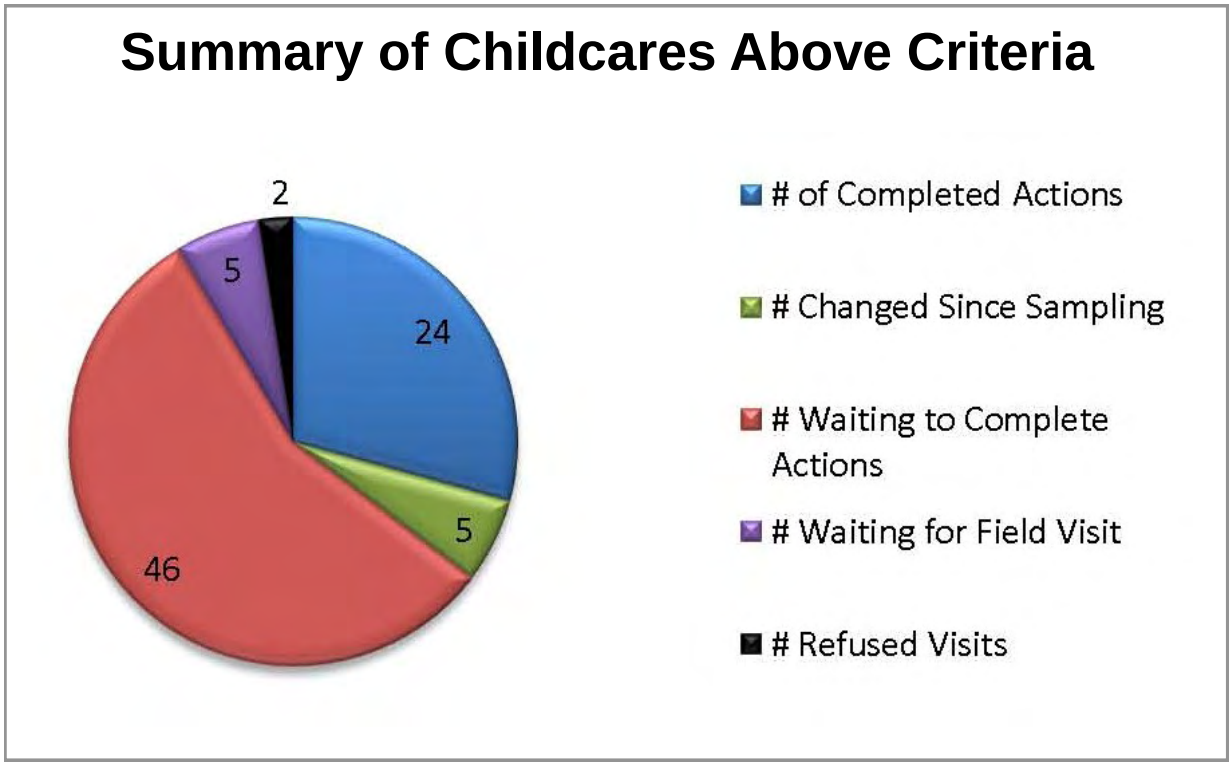


Figure 10 Summary of childcares above criteria

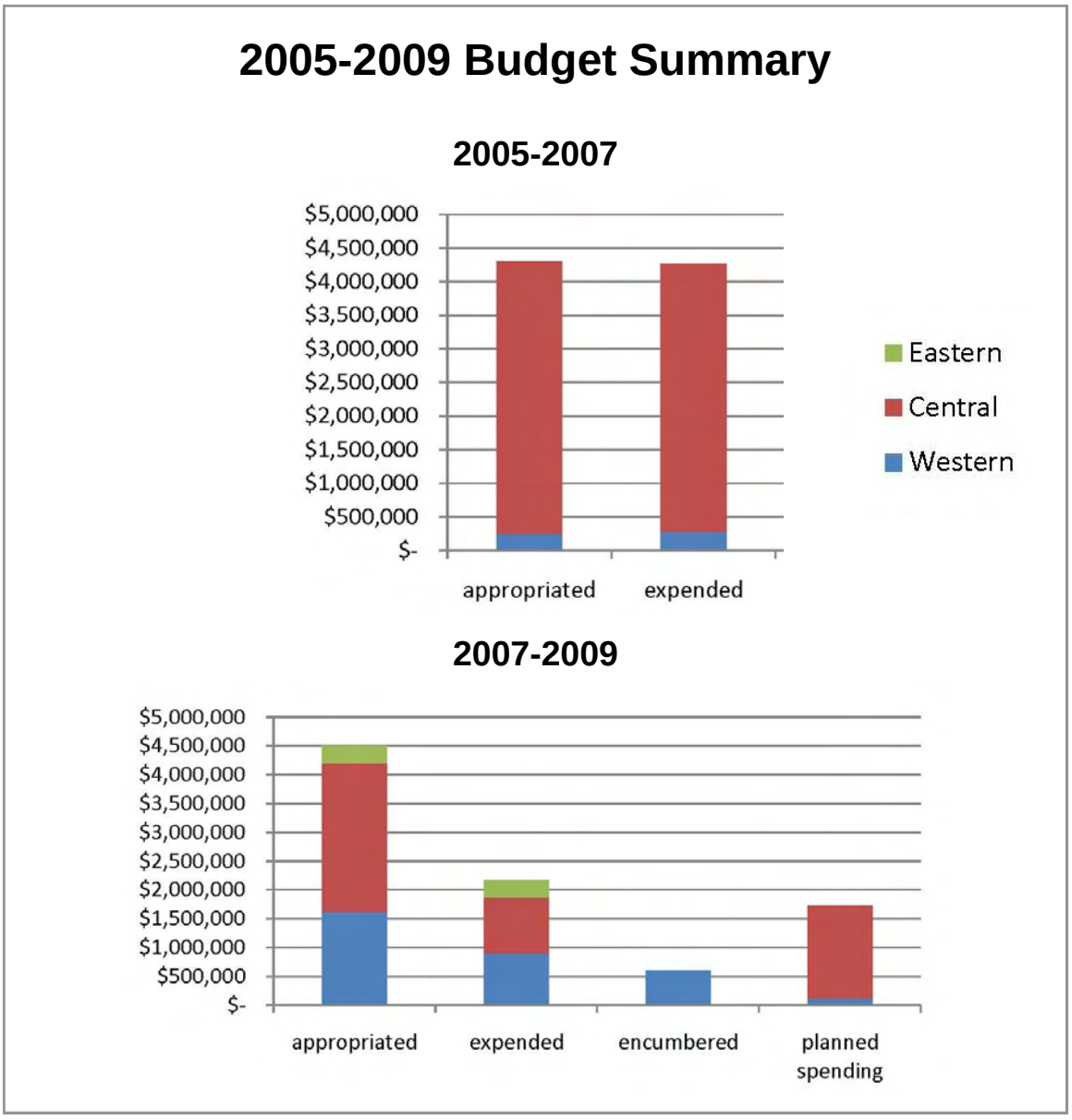


Figure 11 Area-wide soil contamination budget summary from 2005 through 2009

Appendices

Appendix A

Chapter 70.140 RCW
Area – Wide Soil Contamination

70.140.010
Findings.

The legislature finds that state and local agencies are currently implementing actions to reduce children's exposure to soils that contain hazardous substances. The legislature further finds that it is in the public interest to enhance those efforts in western Washington in areas located within the central Puget Sound smelter plume.

[2005 c 306 § 1.]

70.140.020
Definitions.

The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Area-wide soil contamination" means low to moderate arsenic and lead soil contamination dispersed over a large geographic area.

(2) "Child care facility" means a child day-care center or a family day-care provider as those terms are defined under *RCW 74.15.020.

(3) "Department" means the department of ecology.

(4) "Director" means the director of the department of ecology.

(5) "Low to moderate soil contamination" means low level arsenic or lead concentrations where a child's exposure to soil contamination at a school or a child care facility may be reduced through best management practices.

(6) "School" means a public or private kindergarten, elementary, or secondary school.

[2005 c 306 § 2.]

Notes:

***Reviser's note:** RCW 74.15.020 was amended by 2006 c 265 § 401, removing the definitions for "child day-care center" and "family day-care provider."

70.140.030
Children in schools and child care facilities – Department duties – School and child care facility duties.

(1) The department, in cooperation with the department of social and health services, the department of health, the office of the superintendent of public instruction, and local health districts, shall assist schools and child care facilities west of the crest of the Cascade mountains to reduce the potential for children's exposure to area-wide soil contamination.

(2) The department shall:

(a) Identify schools and child care facilities 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) If the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property, conduct soil samples at that property by December 31, 2009; and

(d) If soil sample results confirm the presence of area-wide soil contamination, notify schools and child care facilities regarding the test results and the steps necessary for implementing best management practices.

(3) If a school or a child care facility with area-wide soil contamination does not implement best management practices within six months of receiving written notification from the department, the superintendent or board of directors of a school or the owner or operator of a child care facility must notify parents and guardians in writing of the results of soil tests. The written notice shall be prepared by the department.

(4) The department shall recognize schools and child care facilities that successfully implement best management practices with a voluntary certification letter confirming that the facility has successfully implemented best management practices.

(5) Schools and child care facilities must work with the department to provide the department with site access for soil sampling at times that are the most convenient for all parties.

[2005 c 306 § 3.]

70.140.040
Department assistance – Best management practice guidelines – Grants – Interagency agreements authorized – Reports.

(1) The department shall assist schools and owners and operators of child care facilities located within the central Puget Sound smelter plume. Such assistance may include the following:

(a) Technical assistance in conducting qualitative evaluations to determine where area-wide soil contamination exposures could occur;

(b) Technical and financial assistance in testing soils where evaluations indicate potential for contamination; and

(c) Technical and financial assistance to implement best management practices.

(2) The department shall develop best management practice guidelines for schools and day care facilities with area-wide soil contamination. The guidelines shall recommend a range of methods for reducing exposure to contaminated soil, considering the concentration, extent, and location of contamination and the nature and frequency of child use of the area.

(3) The department shall develop a grant program to assist schools and child care facilities with implementing best management practices.

(4) The department, within available funds, may provide grants to schools and child care facilities for the purpose of implementing best management practices.

(5) The department, within available funds, may provide financial assistance to the department of health and the department of social and health services to implement this chapter.

(6) The department may, through an interagency agreement, authorize a local health jurisdiction to administer any activity in this chapter that is otherwise not assigned to a local health jurisdiction by this chapter.

(7) The department shall evaluate actions to reduce child exposure to contaminated soils and submit progress reports to the governor and to the appropriate committees of the legislature by December 31, 2006, and December 31, 2008.

[2005 c 306 § 4.]

70.140.050
Department of health to provide assistance.

The department of health shall assist the department in implementing this chapter, including but not limited to developing best management practices and guidelines.

[2005 c 306 § 5.]

70.140.060
Department of social and health services to provide assistance.

The department of social and health services shall assist the department by providing information on the location of child care facilities and contacts for these facilities.

[2005 c 306 § 6.]

70.140.070
Livestock, agricultural land exempt from chapter.

This chapter does not apply to land devoted primarily to the commercial production of livestock or agricultural commodities.

[2005 c 306 § 7.]

70.140.080
Existing authority of department not affected.

Nothing in this chapter is intended to change ongoing actions or the authority of the department or other agencies to require actions to address soil contamination under existing laws.

[2005 c 306 § 8.]

Appendix B

Outreach Materials

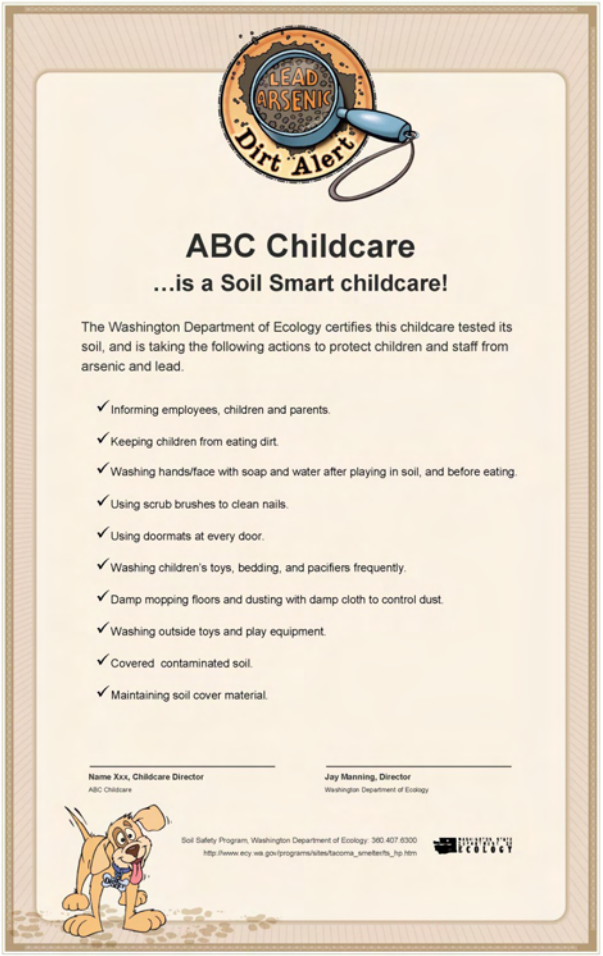
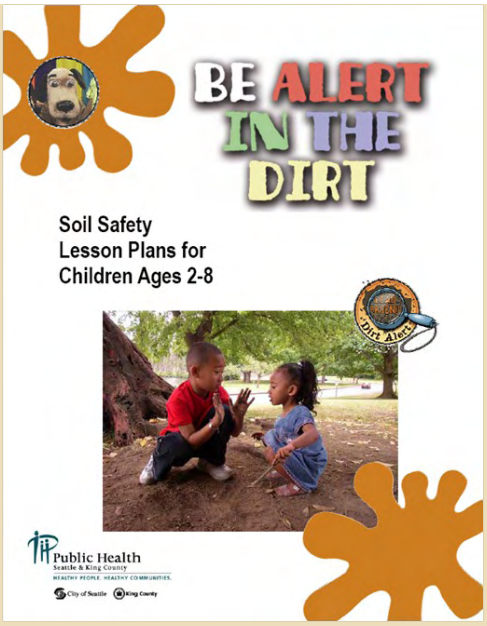
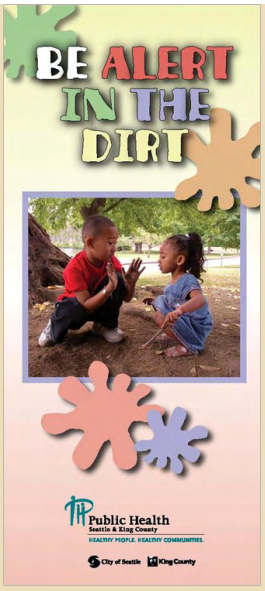
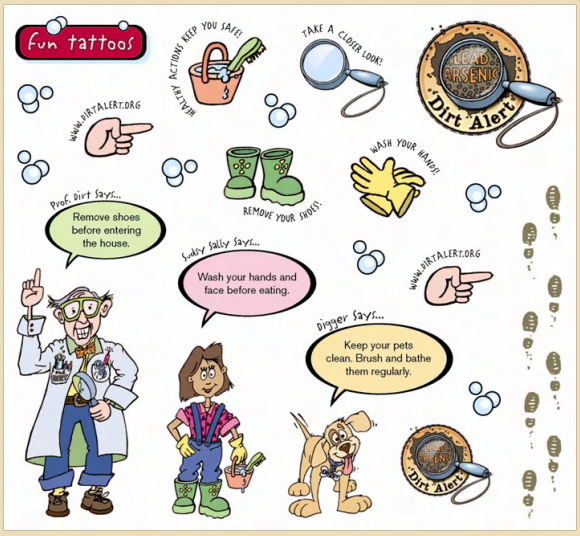
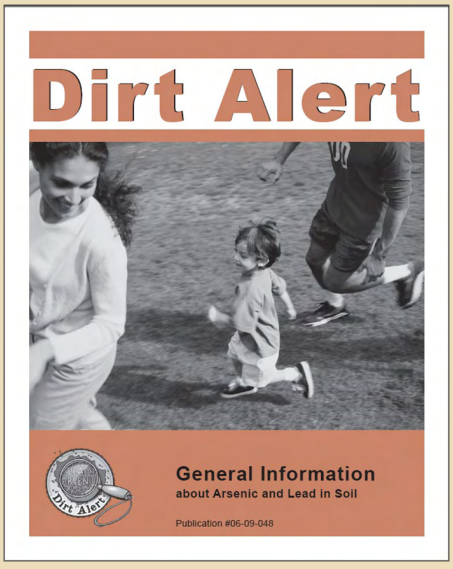


Figure B-1 Certificates and window cling given to schools and childcares that tested below criteria or after successful completion of soil safety actions.









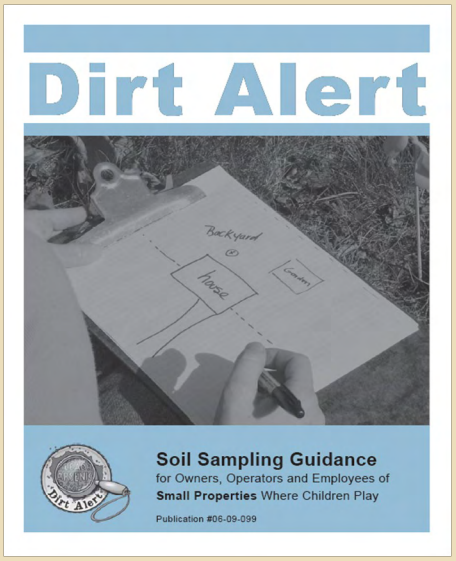


Figure B-2 Outreach materials developed by Public Health Seattle & King County, Tacoma-Pierce County Health Department and Ecology

Appendix C

Soil Safety Action Plan

Soil Safety Action Plan

Recommended Plan

Date of initial visit 8-29-08

Protective Steps to Take Now

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

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

- [x] 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.
- [x] 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.

- [x] Remove all contaminated soil and transport to approved landfill.

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

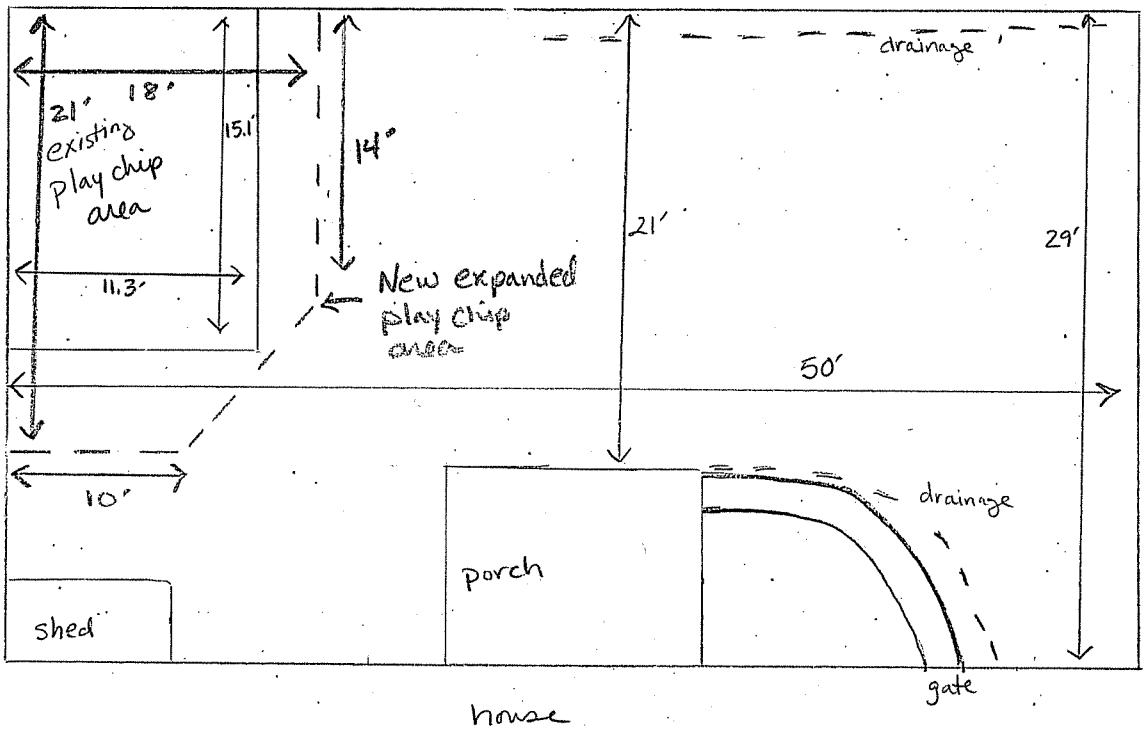
- [ ] Gardens
  - [ ] Mix contaminated soil with clean soil.
  - [ ] Replace with raised garden beds.

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 of play area with recommended actions



- Remove contaminated soil down 6 inches
- Replace with clean soil and sod
- Remove play chip area, lay geotextile fabric, new borders, and expand the area. Replace with 8 inches of play chips