October 7, 2004
Kleinfelder Project No.: 47755

Mr. Paul Manzer
Project Manager
PACLAND
1144 Eastlake Ave. East, Suite 601
Seattle, WA 98109-4450

Subject: **Limited Phase II Environmental Site Assessment**
Proposed Commercial Site
Former Isenhart Orchards Property
Northeast of State Route 97A and Isenhart Road
Chelan, Washington

Dear Mr. Manzer:

This letter presents the results of our Limited Phase II Environmental Site Assessment (ESA) performed at the above-referenced property located in Chelan, Washington (Figure 1) for PACLAND. This Limited Phase II ESA was performed to screen shallow soils for the potential presence of lead, arsenic, and pesticides prior to the planned purchase and subsequent redevelopment of the site for commercial use.

Our site assessment included collecting twelve discreet soil samples throughout the former apple orchard area of the subject property using a hand auger (see Figure 2 for sample locations). Each soil sample was collected a depths ranging between 6-inches to one foot below the ground surface. Following field activities, the soil samples were analyzed at a Washington Certified laboratory for the presence of lead, arsenic, organochlorinated pesticides, and organophosphorus pesticides.

In summary, the analytical results of the soil samples indicate that the concentrations of lead, arsenic, and one organochlorinated pesticide constituent (4,4' – DDT) exceeded the Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A soil cleanup levels. Other organochlorinated pesticides (i.e. aldrin and dieldrin) and the tested organophosphorus pesticide constituents were reported by the laboratory to be below the corresponding MTCA Method B soil cleanup levels. Details regarding our findings during this Limited Phase II ESA are summarized in the following sections of this report.

SITE DESCRIPTION

The subject site consists of one irregular shaped lot comprising a total of approximately 18-acres of land area (Figure 2). The site is currently part of a 198-acre parcel that (in addition to the subject site) also encompasses neighboring land areas located immediately west, south and southwest of the site.

The majority of the subject site is currently undeveloped and vegetated with wild grasses, weeds, shrubs, and remnants of an apple tree orchard that formerly existed on the property prior to 2000. A steep hill located along the southern end of the property extends approximately 60 feet above the site's surrounding terrain.

Other areas of the site are improved with two vacant apartment buildings located along the southeast end of the site, an occupied residential home located at the southwest corner of the site, four vacant studio cabins located immediately north and east of the occupied residence, and a small outhouse located immediately northeast of the hill. The residential home is currently being rented. The vacant apartment buildings and studio cabins were reportedly used as temporary housing for migrant workers associated with the former use of the site as an apple orchard.

This investigation did not include collecting soil samples from the steep sloped hill located along the southern end of the site or from areas near the residential home and cabins because, according to available historical records, these areas were apparently not planted with apple trees. In Kleinfelder's opinion, the potential for pesticides to have impacted the sloped areas of the hill (above the former tree top level of the apple orchard) is considered low. This opinion is based on the hill's vertical rocky terrain and our assumption that pesticide emissions will likely descend towards the ground (within the site's orchard area) immediately after being applied using a truck-mounted sprayer.

PREVIOUS SITE INVESTIGATION

Based on Kleinfelder's August 27, 2004 Phase I Environmental Site Assessment report, the subject site has been used as a "Red Delicious" apple orchard from at least the early 1900s until 1999. Reportedly, Mr. William Isenhart owned and operated the site as part of the "Isenhart Orchards" organization until the current site owner, Naumes Properties LLC (Naumes), purchased the site in 1980. According to Mr. Kile Peer (Manager with Naumes), Naumes discontinued apple orchard activities in 1999 and had the apple trees removed from the site between 1999-2000. Mr. Peer also stated that organophosphate pesticides, as well as the possible use of pesticides containing lead and arsenic, were used on the apple orchard in the past. Based

on Mr. Peer's statement, the Phase I ESA report concluded that the former use of pesticides in conjunction with apple orchard activities may have potentially impacted the subject site.

Recommendations contained in the Phase I ESA report included completing a limited Phase II ESA to assess the potential presence of lead, arsenic, and pesticides in the site's shallow soil prior to redevelopment activities.

SOIL LITHOLOGY AND DEPTH TO GROUNDWATER

According to Kleinfelder's geotechnical investigation report completed for the subject site (dated September 10, 2004), the subject property is underlain by loess deposits consisting of soft to medium stiff silt with varying amounts of sand, gravel, and cobbles to a depth of approximately 10 feet below the ground surface (bgs). Colluvium deposits underly the loess material to a depth of at least 30 feet bgs (the maximum depth explored during the geotechnical assessment). The colluvium material consists of medium dense to very dense silty gravel and gravel with silt and sand. One to two foot diameter cobbles and boulders were also encountered. Groundwater was not encountered in soil borings or test pits completed to depths ranging from 6.5 feet to 30 feet bgs during the geotechnical investigation.

LIMITED PHASE II ESA FIELD ACTIVITIES

On September 23, 2004, Kleinfelder collected 12 discreet soil samples (B-1 through B-12) throughout the former apple orchard area of the subject site (Figure 2). Each soil sample was collected at depths ranging between 6-inches to one-foot bgs using a steel hand auger with a standard collection head. The sampling equipment was decontaminated with soapy water and double rinsed after collecting each sample. The soil was transferred from the hand auger to pre-cleaned 4-oz glass sampling jars with Teflon-lined plastic lids. The jars containing the soil samples were sealed, labeled, stored on ice in a 5°C cooler, and delivered to ESN Laboratories, Inc. (a Washington Certified laboratory) located in Lacey, Washington, to be analyzed for the following constituents:

- Lead by EPA Method 7420.
- Arsenic by EPA Method 7061.
- Organochlorinated pesticides by EPA Method 8081.
- Organophosphorus pesticides by EPA Method 8141.

LIMITED PHASE II ESA RESULTS

Applicable Regulatory Standards – Soil

Analytical results of soil samples collected at the site during this limited Phase II ESA were compared to the current MTCA Method A soil cleanup levels. The applicable MTCA Method A soil cleanup levels are presented in Table 1 (see attached), alongside the soil sample analytical results, for comparison.

In cases where certain pesticide constituents do not have an established MTCA Method A soil cleanup level (i.e. Dieldrin), the corresponding MTCA Method B soil cleanup level was included for comparison purposes (provided that a Method B soil cleanup level for a particular pesticide constituent was established). MTCA Method B soil cleanup levels are enforceable by Ecology when MTCA Method A soil cleanup levels are absent.

Soil Sample Analytical Results

According to the soil sample analytical reports (see attached), lead concentrations in samples B-1, B-2, B-4, and B-5 exceed the MTCA Method A soil cleanup level for lead (250 mg/kg) and were reported to be 440 milligrams per kilogram (mg/kg), 710 mg/kg, 520 mg/kg, and 410 mg/kg, respectively. Lead analytical results for soil samples B-3 and B-6 through B-12 were reported to be less than the MTCA Method A soil cleanup level for lead. Additionally, concentrations of arsenic in the soil samples collected at the site (B-1 through B-12) reportedly ranged between 30 mg/kg to 140 mg/kg. The arsenic concentrations exceed the 20 mg/kg MTCA Method A soil cleanup level for arsenic.

Organochlorinated pesticides analysis results indicate elevated levels of 4,4'-DDT in one of the soil samples collected at the site (sample B-5). The concentration of 4,4'-DDT in sample B-5 was reported to be 11.0 mg/kg, which exceeds the 3.0 mg/kg MTCA Method A soil cleanup level for DDT. Other organochlorinated pesticide constituents (i.e. 4,4'-DDD and dieldrin) were reportedly below their corresponding MTCA Method B soil cleanup levels.

None of the organophosphorus pesticide analytical results exceeded the corresponding MTCA Method B soil cleanup levels in samples B-1 through B-12.

The soil sample analytical results are presented on Table 1. Laboratory soil sample analytical reports and chain-of-custody documentation are also included as an attachment to this report.

REGULATORY REVIEW

Area-Wide Arsenic and Lead Task Force Study

During this assessment, Kleinfelder obtained a copy of an Area-Wide Soil Contamination Task Force (AWSCTF) draft report from Ecology's website. The AWSCTF report (draft dated May 30, 2003) was prepared by a 17-person volunteer task force commissioned by the Departments of Agriculture, Ecology, Health, and Community, Trade and Economic Development. The purpose of the AWSCTF study (conducted between January and June 2003) was to develop findings and recommendations related to large areas of "low to moderate levels" of arsenic and lead soil contamination located throughout Chelan, Yakima, Okanogan, King, Pierce, Stevens, and Snohomish Counties. The AWSCTF report also included recommendations concerning land use scenarios where pesticides containing lead arsenate were used in conjunction with apple and pear orchard activities.

According to the AWSCTF report (see attached), area wide arsenic and lead soil contamination is suspected in Chelan County where apple and pear orchards existed prior to 1947. The task force relied on Ecology's views on what constitutes "low-to-moderate" levels of arsenic and lead in soil. For properties where arsenic and lead exposure to children from soil is considered less frequent, such as commercial properties, the AWSCTF report indicated that arsenic concentrations of up to 200 parts per million (ppm) and lead concentrations of 700 to 1,000 ppm are considered to be within the "low-to-moderate" range. As noted in the previous section of this report, the arsenic and lead concentrations discovered in the site's shallow soil during our Limited Phase II ESA would likely fall within this range should the site be developed into commercial use.

The AWSCTF report did not recommend response actions related to addressing area-wide arsenic and lead soil contamination for commercial properties that are covered with impervious surfaces such as buildings, parking lots, or other effective soil cover. However, recommendations concerning development of open land areas where agricultural activities are no longer in production (see Section 8d in the AWSCTF report) included the following:

1. A developer or property owner should complete soil testing in suspected area-wide arsenic and lead soil contamination areas prior to site development. If soil testing reveals the presence of arsenic and lead contamination, incorporate appropriate protection measures (i.e. covering impacted soil with impermeable surfaces) into site development

plans to reduce the potential for exposure to arsenic and lead during and following construction activities.

2. Construction workers engaged in development activities should implement individual protection measures to reduce potential exposure to arsenic and lead impacted soil.

3. Developers should implement appropriate protective measures to control dust emissions (i.e. use of water) and run-off during site development activities.

4. After the site is developed, the property owner is encouraged to use plat or other notices to record information on the status of properties where area-wide contamination is either known or likely to exist. Notices should, for example, record whether soil at a property has been tested and/or whether protection measures (i.e. asphalt covered parking lots) are in place.

Department of Ecology's Input

On September 30, 2004 Kleinfelder contacted Mr. Norman Hepner (Toxics Cleanup Program, Central Regional Office of Ecology in Yakima, Washington) to discuss Ecology's opinion concerning the lead, arsenic, and 4,4'-DDT levels in soils associated with prior orchard production in Chelan County and their requirements regarding proposed redevelopment for commercial use. Mr. Hepner stated that based on the lead, arsenic, and 4,4'-DDT levels in the site's soil and our intentions to redevelop the site for commercial use (verbally communicated to him by Kleinfelder), Ecology will likely not require additional soil sampling at the site, nor will they likely require that the lead, arsenic, and 4,4'-DDT impacted soil be excavated and removed from the site. In Mr. Hepner's opinion, lead/arsenic and 4,4'-DDT in soil (due to area-wide surface application of pesticides on orchards) typically do not migrate more than 3 to 4 feet bgs. Therefore, since groundwater at the site is located more than 30 feet bgs, and since there were no visual signs (either during the site reconnaissance or during our review of historical aerial photographs while conducting the Phase I ESA) indicating that a designated pesticide storage/mixing area existed at the site; lead, arsenic, and 4,4'-DDT impact to the site's groundwater seems unlikely.

Mr. Hepner stated that Ecology generally requires the following actions at sites where area-wide arsenic and lead soil contamination exists prior to issuing a No Further Action determination under the Voluntary Cleanup Program:

1. Copies of Kleinfelder's August 27, 2004 Phase I Environmental Site Assessment report, as well as a copy of this Limited Phase II ESA report, should be submitted to Ecology for review under the Voluntary Cleanup Program (VCP).

2. A restrictive covenant requiring the site owner to notify future purchasers of the presence of lead, arsenic, and 4,4'-DDT at the site would be required. The restrictive covenant would also require the site owner to notify Ecology prior to changing the site's intended commercial use into another use scenario (i.e. residential).

3. Off-site disposal of lead, arsenic, and 4,4'-DDT impacted soil would be allowed at a permitted municipal solid waste landfill.

4. Lead, arsenic, and 4,4'-DDT impacted soil remaining at the site (following development activities) must be covered with impervious surfaces such as asphalt parking lots and buildings.

Mr. Hepner summarized Ecology's requirements in an e-mail that was forwarded to Kleinfelder on September 30, 2004. A copy of Mr. Hepner's e-mail is included as an attachment to this report.

SUMMARY AND CONCLUSIONS

Per PACLAND's request, Kleinfelder completed a Limited Phase II ESA at the subject site. This investigation included: (1) collecting twelve discreet soil samples throughout the former apple orchard area of the subject property using a hand auger, and (2) submitting the soil samples to a Washington Certified laboratory to be analyzed for the presence of lead, arsenic, organochlorinated pesticides, and organophosphorus pesticides.

Analytical results of the soil samples (see Table 1 – attached) indicate the following:

1. Concentrations of lead in four of the twelve samples collected at the site (samples B-1, B-2, B-4, and B-5) exceed the MTCA Method A soil cleanup level for lead.

2. Concentrations of 4,4'-DDT in one of the samples collected at the site (sample B-5), exceed the MTCA Method A soil cleanup level for DDT.

3. Lead and 4-4'-DDT concentrations in other samples collected at the site were reported by the laboratory to be below the corresponding MTCA Method A soil cleanup levels.

4. Concentrations of arsenic in all twelve of the samples collected at the site (samples B-1 through B-12) exceed the MTCA Method A soil cleanup level for arsenic.

5. Excluding 4,4'-DDT, none of the other organochlorinated pesticide constituents were detected at concentrations exceeding the corresponding MTCA Method B soil cleanup levels.

6. None of the organophosphorus pesticide constituents were detected at concentrations exceeding the corresponding MTCA Method B soil cleanup levels in all twelve soil samples collected at the site.

Based on the analytical results and information obtained from interviewing Mr. Hepner, Kleinfelder recommends that a copy of this report, as well as a copy of our August 27, 2004 Phase I Environmental Site Assessment report completed for the site, be submitted to Ecology for a No Further Action Review determination under Ecology's Voluntary Cleanup Program. Additionally, Ecology's requirements for a restrictive covenant and proper off-site disposal of lead, arsenic, and 4,4'-DDT impacted soil generated during development activities should be adhered to. An option to reduce costs associated with waste profile sampling of contaminated soil and off-site disposal at a permitted solid waste landfill would be to incorporate the soil into the site grading plan.

Applicable recommendations contained in the May 30, 2003 Area-Wide Soil Contamination Task Force report concerning the need to control of airborne dust emissions, surface water discharges, construction worker protection procedures, as well as other recommendations pertaining to the development of former orchard properties should be followed during site development activities.

In Kleinfelder's opinion, the potential for pesticides to have impacted the sloped areas of the hill (above the former tree top level of the apple orchard) is considered low. This opinion is based on historical records indicating that the hill was apparently not planted with apple trees, the hill's vertical rocky terrain, and our assumption that pesticide emissions will likely descend towards the ground (within the site's orchard area) immediately after being applied using a truck-mounted sprayer.

LIMITATIONS

The work described herein was performed to assess the potential presence of lead, arsenic, and pesticides in the site's shallow soil prior to the planned purchase and subsequent redevelopment of the subject property for commercial use. The findings and recommendations in this report are made based upon the analytical results, field observations, and our best professional judgment. It is possible that unforeseen events could occur that may limit the effectiveness of the assessment. Although risk can never be eliminated, more detailed and extensive sampling and testing would yield better management of site risks. Since such extensive services involve greater expense, we ask our clients to participate in identifying the level of service that will provide them with an acceptable level of risk. Please contact the signatories of this report if you would like to discuss this issue of risk further.

The scope of work on this project was presented in our Contract Modification #1 (dated September 9, 2004) and subsequently approved by PACLAND as our client. Please be aware our scope of work was limited to those items specifically identified in the proposal. Other activities not specifically included in the presented scope of work (in the Contract Modification, correspondence, or this report) are excluded and should not be considered to be a part of our scope of services.

Land use, site conditions (both on-site and off-site) and other factors will change over time. Since site activities and regulations beyond our control could change at any time after the completion of this report, our observations, findings and opinions can be considered valid only as of the date of the site visit.

Any party other than PACLAND and its client (The Client) who would like to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report, Kleinfelder may require that additional work be performed and that a revised report be issued. Non-compliance with any of these requirements by PACLAND, The Client, or anyone else will release Kleinfelder from any liability resulting from the use of this letter report by any unauthorized party.

No warranty, either express, or implied is made.

CLOSING

We trust this report meets your needs at this time and appreciate the opportunity to provide our consulting services to PACLAND. Please contact the undersigned at (425) 562-4200, or John Mancini (Kleinfelder's Senior Client Service Manager to PACLAND) at (801) 261-3336, if you have any questions or require additional information.

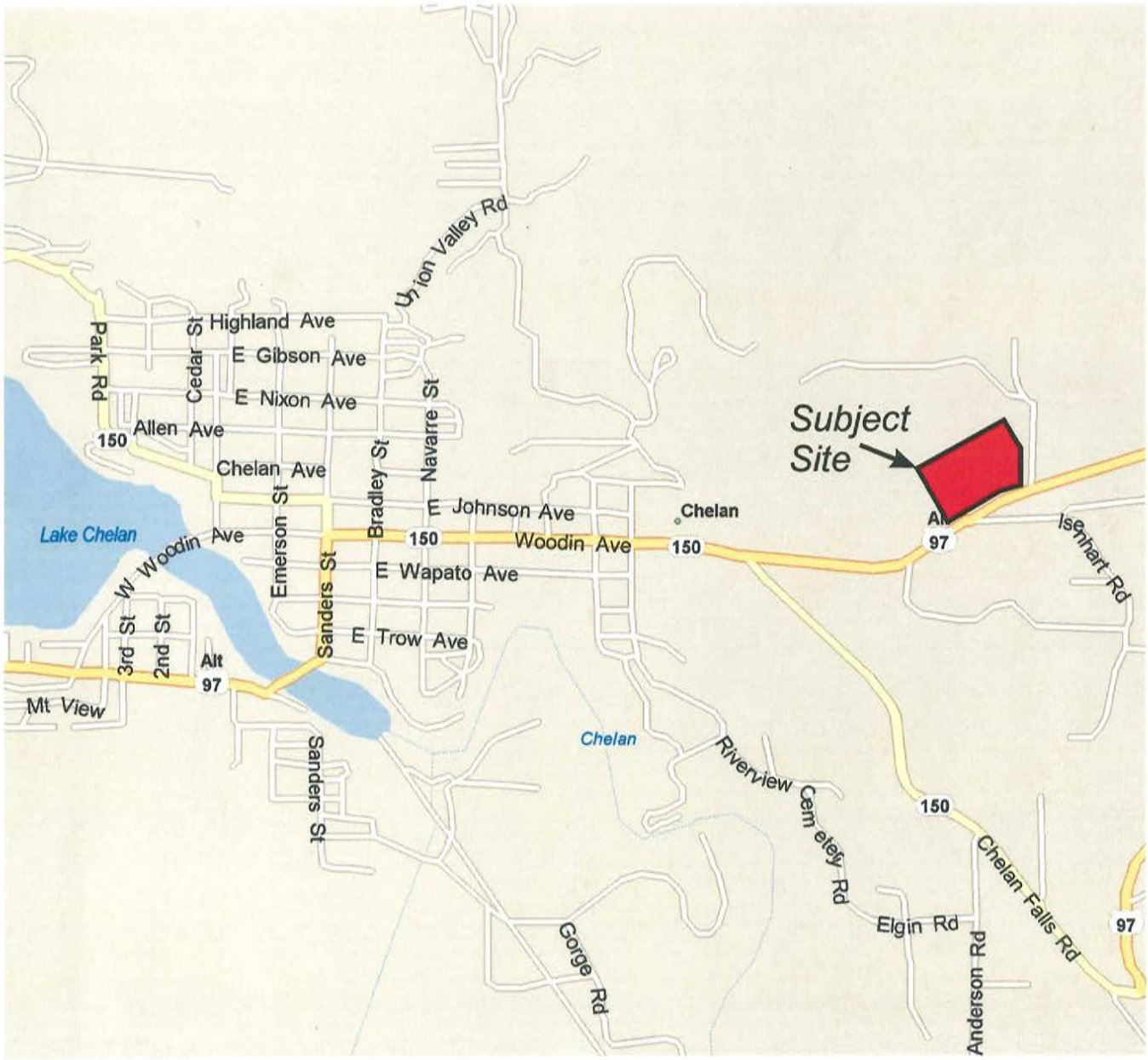
Sincerely,

KLEINFELDER, INC.

Ted W. Sykes
Project Manager

Kevin G. Lakey, PE, LHG
Environmental Services Manager

Attachments: Figure 1 – Site Vicinity Map
Figure 2 – Soil Sample Locations
Table 1 – Soil Sample Analytical Results: Lead, Arsenic, and Pesticides
Analytical Laboratory Reports and Chain-of-Custody
Copy of the May 30, 2003 Draft Area-Wide Soil Contamination Task Force Rpt
Copy of an e-mail concerning the subject site forwarded by Ecology



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Not to Scale

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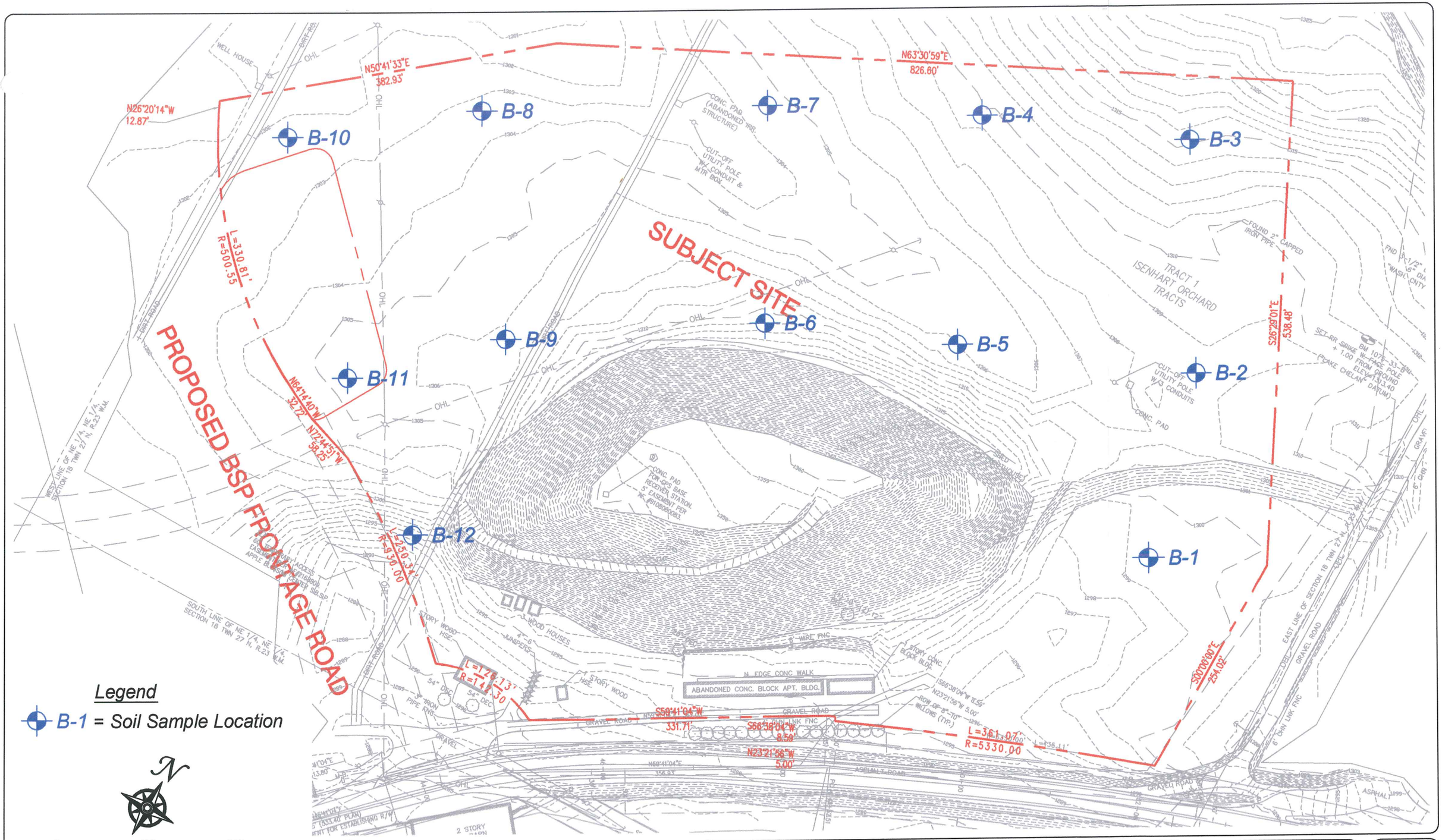
PROJECT NO. 47755 September 2004

Vicinity Map
Proposed Commercial Site
Former Isenhart Orchards Property
NE of SR 97A & Isenhart Road
Chelan, Washington

FIGURE 1



Source: Pacland, 2004.

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Proposed Commercial Site
Former Isenhart Orchards Property
NE of SR 97A & Isenhart Road
Chelan, Washington

Project: 47755 September 2004

Soil Sample Locations

FIGURE
2

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TABLE 1

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
LEAD, ARSENIC, ORGANOCHORINATED AND ORGANOPHOSPHORUS PESTICIDES
PROPOSED COMMERCIAL SITE
CHELAN, WASHINGTON

Sample Number			B-1	B-2	B-3	B-4	B-5	B-6
Sample Depth (feet)			1	1	1	1	1	1
Sample Date			9/23/2004	9/23/2004	9/23/2004	9/23/2004	9/23/2004	9/23/2004
(UNITS: mg/kg = milligrams/kilogram, dry weight)								
Compound	**MTCA Method A**	**MTCA Method B**						
Metals (mg/kg)								
Lead	250	NA	**440**	**710**	230	**520**	**410**	110
Arsenic	20	NA	**86**	**140**	**74**	**40**	**73**	**62**
Organochlorinated Pesticides (mg/kg)								
a-BHC	--	0.159	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
b-BHC	--	0.556	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
d-BHC	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
g-BHC (Lindane)	--	0.769	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aldrin	--	0.0588	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4,4'-DDD	--	4.17	0.15	0.12	0.38	0.44	1.4	0.038
4,4'-DDE	--	2.94	0.47	0.33	0.4	1.2	2.3	0.34
4,4'-DDT	3.0	NA	0.21	1.6	1.6	2.3	11	0.96
Dieldrin	--	0.0625	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan I	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan II	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan Sulfate	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin	--	24	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin Aldehyde	--	0.0625	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor	--	0.222	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor Epoxide	--	0.11	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Organophosphorus Pesticides (mg/kg)								
Dichlorvos	--	3.44	<0.0044	<0.00489	<0.00448	<0.00475	<0.00499	<0.00466
Mevinphos	--	20	<0.00298	<0.00331	<0.00303	<0.00322	<0.00338	<0.00315
Demeton, O-S	--	3.2	<0.00363	<0.00403	<0.0037	<0.00392	<0.00412	<0.00384
Ethoprop	--	--	<0.00448	<0.00498	<0.00457	<0.0044	<0.00508	<0.00474
Naled	--	160	<0.00579	<0.00643	<0.0059	<0.00625	<0.00657	<0.00612
Sulfotepp	--	--	<0.00412	<0.00458	<0.0042	<0.00445	<0.00467	<0.00436
Monocrotophos	--	--	<0.00535	<0.00594	<0.00545	<0.00578	<0.00607	<0.00586
Phorate	--	16	<0.00365	<0.00406	<0.00372	<0.00394	<0.00414	<0.00386
Dimethoate	--	16	<0.00495	<0.0055	<0.00505	<0.00535	<0.00562	<0.00524
Diazinon	--	72	<0.0069	<0.00767	<0.00703	<0.00746	<0.00783	<0.00731
Disulfoton	--	3.2	<0.00335	<0.00372	<0.00341	<0.00361	<0.0038	<0.00354
Parathion, methyl	--	20	<0.00354	<0.00393	<0.0036	<0.00382	<0.00401	<0.00374
Ronnel	--	4000	<0.00128	<0.00142	<0.0013	<0.00138	<0.00145	<0.00135
Malathion	--	1600	<0.0149	<0.0165	<0.0151	<0.0161	<0.0169	<0.0157
Chlorpyrifos	--	240	<0.00361	<0.00401	<0.00367	<0.00389	<0.00409	<0.00382
Fenthion	--	--	<0.0054	<0.00801	<0.00551	<0.00584	<0.00613	<0.00572
Parathion	--	480	<0.00395	<0.00438	<0.00402	<0.00426	<0.00448	<0.00418
Trichloronate	--	--	<0.00503	<0.00559	<0.00513	<0.00544	<0.00571	<0.00533
Tetrachlorvinphos	--	41.7	<0.00208	<0.00231	<0.00212	<0.00225	<0.00236	<0.0022
Fensulfothion	--	20	<0.0123	<0.0136	<0.0125	<0.0132	<0.0139	<0.013
Tokuthion	--	--	<0.00753	<0.00837	<0.00767	<0.00813	<0.00854	<0.00797
Merphos	--	2.4	<0.00683	<0.00758	<0.00695	<0.00737	<0.00775	<0.00722
Bolstar	--	--	<0.00503	<0.00559	<0.00513	<0.00543	<0.00571	<0.00532
EPN	--	--	<0.00438	<0.00487	<0.00447	<0.00473	<0.00497	<0.00464
Azinphos, methyl	--	--	<0.00477	<0.0053	<0.00486	<0.00515	<0.00541	<0.00504
Coumaphos	--	--	<0.0114	<0.0127	<0.0117	<0.0124	<0.013	<0.0121

NOTES :
Refer to site diagram for sampling locations.
MTCA - Model Toxics Control Act Cleanup Criteria
Concentrations are in milligrams per kilogram (mg/kg) or parts per million (ppm)
-- Indicates applicable standard not established
NA = Not Applicable
Bold - Indicates concentration above MTCA Method A or B Standard
< - Less than the reported laboratory analysis method detection limit

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SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS
LEAD, ARSENIC, ORGANOCHORINATED AND ORGANOPHOSPHORUS PESTICIDES
PROPOSED COMMERCIAL SITE
CHELAN, WASHINGTON

Sample Number			B-7	B-8	B-9	B-10	B-11	B-12
Sample Depth (feet)			1	1	1	1	1	1
Sample Date			9/23/2004	9/23/2004	9/23/2004	9/23/2004	9/23/2004	9/23/2004
(UNITS: mg/kg = milligrams/kilogram, dry weight)								
Compound	**MTCA Method A**	**MTCA Method B**						
Metals (mg/kg)								
Lead	250	NA	120	97	< 5	220	6.1	< 5
Arsenic	20	NA	**81**	67	97	46	**38**	**30**
Organochlorinated Pesticides (mg/kg)								
a-BHC	--	0.159	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
b-BHC	--	0.556	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
d-BHC	--	--	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
g-BHC (Lindane)	--	0.769	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aldrin	--	0.0588	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4,4'-DDD	--	4.17	0.064	0.097	0.042	0.078	0.027	0.0086
4,4'-DDE	--	2.94	0.14	0.34	0.1	0.18	0.071	0.036
4,4'-DDT	3.0	NA	0.115	0.54	0.078	0.28	0.095	0.034
Dieldrin	--	0.0625	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan I	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan II	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan Sulfate	--	480	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin	--	24	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin Aldehyde	--	0.0625	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor	--	0.222	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor Epoxide	--	0.11	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Organophosphorus Pesticides (mg/kg)								
Dichlorvos	--	3.44	<0.00415	<0.00399	<0.00536	<0.0042	<0.00492	<0.00502
Mevinphos	--	20	<0.00281	<0.0027	<0.00363	<0.00284	<0.00333	<0.0034
Demeton, O-S	--	3.2	<0.00342	<0.00329	<0.00442	<0.00346	<0.00406	<0.00414
Ethoprop	--	--	<0.00423	<0.00407	<0.00546	<0.00428	<0.00501	<0.00511
Naled	--	160	<0.00546	<0.00525	<0.00705	<0.00552	<0.00647	<0.0066
Sulfotepp	--	--	<0.00389	<0.00374	<0.00502	<0.00393	<0.00461	<0.0047
Monocrotophos	--	--	<0.00505	<0.00486	<0.00651	<0.0051	<0.00598	<0.0061
Phorate	--	16	<0.00344	<0.00331	<0.00444	<0.00348	<0.00408	<0.00416
Dimethoate	--	16	<0.00467	<0.0045	<0.00603	<0.00473	<0.00554	<0.00565
Diazinon	--	72	<0.00651	<0.00627	<0.00841	<0.00659	<0.00772	<0.00787
Disulfoton	--	3.2	<0.00316	<0.00304	<0.00407	<0.00319	<0.00374	<0.00381
Parathion, methyl	--	20	<0.00334	<0.00321	<0.00431	<0.00338	<0.00396	<0.00403
Ronnel	--	4000	<0.00121	<0.00116	<0.00156	<0.00122	<0.00143	<0.00146
Malathion	--	1600	<0.014	<0.0135	<0.0181	<0.0142	<0.0166	<0.0169
Chlorpyrifos	--	240	<0.0034	<0.00327	<0.00439	<0.00344	<0.00403	<0.00411
Fenthion	--	--	<0.0051	<0.00491	<0.00658	<0.00516	<0.00604	<0.00616
Parathion	--	480	<0.00372	<0.00358	<0.00481	<0.00377	<0.00441	<0.0045
Trichloronate	--	--	<0.00475	<0.00457	<0.00613	<0.0048	<0.00563	<0.00574
Tetrachlrovinphos	--	41.7	<0.00196	<0.00189	<0.00253	<0.00199	<0.00233	<0.00237
Fensufothion	--	20	<0.0116	<0.0111	<0.0149	<0.0117	<0.0137	<0.014
Tokuthion	--	--	<0.0071	<0.00683	<0.00917	<0.00719	<0.00842	<0.00859
Merphos	--	2.4	<0.00644	<0.0062	<0.00831	<0.00651	<0.00763	<0.00778
Bolstar	--	--	<0.00475	<0.00457	<0.00613	<0.0048	<0.00562	<0.00574
EPN	--	--	<0.00414	<0.00398	<0.00534	<0.00418	<0.0049	<0.005
Azinphos, methyl	--	--	<0.0045	<0.00433	<0.0058	<0.00455	<0.00533	<0.00543
Coumaphos	--	--	<0.0108	<0.0104	<0.0139	<0.0109	<0.0128	<0.013

NOTES :
Refer to site diagram for sampling locations.
MTCA - Model Toxics Control Act Cleanup Criteria
Concentrations are in milligrams per kilogram (mg/kg) or parts per million (ppm) .
-- Indicates applicable standard not established
NA = Not Applicable
Bold - Indicates concentration above MTCA Method A or B Standard
< - Less than the reported laboratory analysis method detection limit

ESN NORTHWEST
Environmental Services Network

October 7, 2004

Ted Sykes
Kleinfelder
2405 140th Avenue NE
Suite A101
Bellevue, WA 98005-1877

Dear Mr. Sykes:

Please find enclosed the analytical data report from the Pacland Chelan Project site in Chelan, Washington. Soil samples were analyzed for Pesticides by Methods 8081 and 8141 and Pb & As by Method 7000 series on September 27 – October 1, 2004.

The results of these analyses are summarized in the attached tables. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to Kleinfelder for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A Korosec

Michael A. Korosec
President

677 Woodland Square Lp. SE, Suite D ▪ Lacey, Washington 98503 ▪ 360.459.4670 ▪ FAX 360.459.3432
Web Site: *www.esnnw.com* E-Mail: *info@esnnw.com*

ESN NORTHWEST CHEMISTRY LABORATORY

PACLAND CHELAN PROJECT
Chelan, Washington
Kleinfelder, Inc.
Client Project #47755

Heavy Metals in Soil by EPA-7000 Series

Sample Number	Date Analyzed	Lead (Pb) EPA 7420 (mg/kg)	Arsenic (As) EPA 7061 (mg/kg)
Method Blank	9/27/04	nd	nd
B-1	9/27/04	440	86
B-1 Dup.	9/27/04	440	81
B-2	9/27/04	710	140
B-3	9/27/04	230	74
B-4	9/27/04	520	40
B-5	9/27/04	410	73
B-6	9/27/04	110	62
B-7	9/27/04	120	81
B-8	9/27/04	97	67
B-9	9/27/04	nd	97
B-10	9/27/04	220	46
B-11	9/27/04	6.1	38
B-12	9/27/04	nd	30
Method Detection Limits		5	5

"nd" Indicates not detected at listed detection limits.

ANALYSES PERFORMED BY: T. McCall

ESN NORTHWEST CHEMISTRY LABORATORY

PACLAND CHELAN PROJECT
Chelan, Washington
Kleinfelder, Inc.
Client Project #47755

QA/QC Data - Total Metals EPA-7000 Series Analyses

Sample Number: B1

	Matrix Spike			Matrix Spike Duplicate			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	(%)
Lead	250	332	133	250	337	135	1.49
Cadmium	25	23	92	25	23	92	0.00
Chromium	250	257	103	250	259	104	0.78
Arsenic	250	215	86	250	218	87	1.39

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
Lead	250	241	96
Cadmium	25	23	92
Chromium	250	249	100
Arsenic	250	214	86

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: T. McCall

ESN NORTHWEST CHEMISTRY LABORATORY

PACLAND CHELAN PROJECT
Chelan, Washington
Kleinfelder, Inc.
Client Project #47755

Pesticide Analyses of Soil (EPA Method 8081)

Sample Description		Method Blank	B-1	B-2	B-3	B-4	B-5	B-6	B-7
Date Sampled			9/23/04	9/23/04	9/23/04	9/23/04	9/23/04	9/23/04	9/23/04
Date Analyzed		9/27/04	9/27/04	9/27/04	9/27/04	9/27/04	9/27/04	9/27/04	9/27/04
	MDL (ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
a-BHC	1.0	nd	nd	nd	nd	nd	nd	nd	nd
b-BHC	1.0	nd	nd	nd	nd	nd	nd	nd	nd
g-BHC	1.0	nd	nd	nd	nd	nd	nd	nd	nd
d-BHC	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Aldrin	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor epoxide	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan I	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Dieldrin	1.0	nd	nd	nd	nd	nd	nd	nd	nd
4,4'-DDE	1.0	nd	470	330	400	1200	2300	340	140
Endrin	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan II	1.0	nd	nd	nd	nd	nd	nd	nd	nd
4,4'-DDD	1.0	nd	150	120	380	440	1400	38	64
Endrin aldehyde	1.0	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan sulfate	1.0	nd	nd	nd	nd	nd	nd	nd	nd
4,4'-DDT	1.0	nd	210	1600	1600	2300	11000	960	115
Surrogate Recovery (TCMX) (%)		117	100	111	106	107	77	95	91
Surrogate Recovery (DCBP) (%)		101	109	108	125	135	65	135	87

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (TCMX) AND (DCBP): 65% - 135%

ANALYSES PERFORMED BY: Marilyn Farmer & Tim McCall

ESN NORTHWEST CHEMISTRY LABORATORY

PACLAND CHELAN PROJECT
Chelan, Washington
Kleinfelder, Inc.
Client Project #47755

Pesticide Analyses of Soil (EPA Method 8081)

Sample Description		B-7 Dup.	B-8	B-8 Dup.	B-9	B-10	B-11	B-12
Date Sampled		9/23/04	9/23/04	9/23/04	9/23/04	9/23/04	9/23/04	9/23/04
Date Analyzed		9/27/04	9/28/04	9/28/04	9/28/04	9/28/04	9/28/04	9/28/04
	MDL (ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
a-BHC	1.0	nd	nd	nd	nd	nd	nd	nd
b-BHC	1.0	nd	nd	nd	nd	nd	nd	nd
g-BHC	1.0	nd	nd	nd	nd	nd	nd	nd
d-BHC	1.0	nd	nd	nd	nd	nd	nd	nd
Heptachlor	1.0	nd	nd	nd	nd	nd	nd	nd
Aldrin	1.0	nd	nd	nd	nd	nd	nd	nd
Heptachlor epoxide	1.0	nd	nd	nd	nd	nd	nd	nd
Endosulfan I	1.0	nd	nd	nd	nd	nd	nd	nd
Dieldrin	1.0	nd	nd	nd	nd	nd	nd	nd
4,4'-DDE	1.0	150	340	250	100	180	71	36
Endrin	1.0	nd	nd	nd	nd	nd	nd	nd
Endosulfan II	1.0	nd	nd	nd	nd	nd	nd	nd
4,4'-DDD	1.0	63	97	65	42	78	27	8.6
Endrin aldehyde	1.0	nd	nd	nd	nd	nd	nd	nd
Endosulfan sulfate	1.0	nd	nd	nd	nd	nd	nd	nd
4,4'-DDT	1.0	125	540	430	78	280	95	34
Surrogate Recovery (TCMX) (%)		127	int.	76	98	131	135	80
Surrogate Recovery (DCBP) (%)		116	117	101	92	118	135	98

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (TCMX) AND (DCBP): 65% - 135%

ANALYSES PERFORMED BY: Marilyn Farmer & Tim McCall

QA/QC Data - Pesticide Analyses - Soils

Sample Description: L-1							
	Matrix Spike			Matrix Spike Duplicate			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	(%)
g-BHC	0.40	0.37	93	0.40	0.38	95	2.67
Heptachlor	0.40	0.40	100	0.40	0.42	105	4.88
Dieldrin	0.40	0.45	113	0.40	0.39	98	14.29
Endrin	1.00	0.66	66	1.00	0.86	86	26.32
4,4'-DDT	1.00	1.04	104	1.00	1.40	140	29.51
TCMX			135			93	36.84
DCBP			119			96	21.40

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
g-BHC	0.20	0.24	120
Heptachlor	0.20	0.26	130
Dieldrin	0.40	0.55	138
Endrin	0.40	0.44	110
4,4'-DDT	0.40	0.32	80
TCMX			77
DCBP			82

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-145%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Marilyn Farmer & Tim McCall

STL Seattle

Sample Identification:

Lab. No.	Client ID	Date/Time Sampled	Matrix
123852-1	B-1	09-23-04 08:20	solid
123852-2	B-2	09-23-04 08:30	solid
123852-3	B-3	09-23-04 08:40	solid
123852-4	B-4	09-23-04 08:53	solid
123852-5	B-5	09-23-04 09:05	solid
123852-6	B-6	09-23-04 09:25	solid
123852-7	B-7	09-23-04 09:33	solid
123852-8	B-8	09-23-04 09:42	solid
123852-9	B-9	09-23-04 09:52	solid
123852-10	B-10	09-23-04 10:03	solid
123852-11	B-11	09-23-04 10:10	solid
123852-12	B-12	09-23-04 10:30	solid

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-1
Lab ID:	123852-01
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	95.67
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	104		55	128
Triphenyl Phosphate	92.8		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	11.2	4.4	
Mevinphos	ND	8.42	2.98	
Demeton,O-S	ND	11.2	3.63	
Ethoprop	ND	11.2	4.48	
Naled	ND	16.8	5.79	
Sulfotepp	ND	11.2	4.12	
Monocrotophos	ND	16.8	5.35	
Phorate	ND	11.2	3.65	
Dimethoate	ND	16.8	4.95	
Diazinon	ND	16.8	6.9	
Disulfoton	ND	11.2	3.35	
Parathion,methyl	ND	11.2	3.54	
Ronnel	ND	11.2	1.28	
Malathion	ND	22.5	14.9	
Chlorpyrifos	ND	44.9	3.61	
Fenthion	ND	16.8	5.4	
Parathion	ND	11.2	3.95	
Trichloronate	ND	16.8	5.03	
Tetrachlorvinphos	ND	5.61	2.08	
Fensulfothion	ND	33.7	12.3	
Tokuthion	ND	16.8	7.53	
Merphos	ND	16.8	6.83	
Bolstar	ND	16.8	5.03	
EPN	ND	11.2	4.38	
Azinphos,methyl	ND	16.8	4.77	
Coumaphos	ND	44.9	11.4	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-2
Lab ID:	123852-02
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	94.5
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	99.2		55	128
Triphenyl Phosphate	98		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	12.5	4.89	
Mevinphos	ND	9.36	3.31	
Demeton,O-S	ND	12.5	4.03	
Ethoprop	ND	12.5	4.98	
Naled	ND	18.7	6.43	
Sulfotepp	ND	12.5	4.58	
Monocrotophos	ND	18.7	5.94	
Phorate	ND	12.5	4.06	
Dimethoate	ND	18.7	5.5	
Diazinon	ND	18.7	7.67	
Disulfoton	ND	12.5	3.72	
Parathion,methyl	ND	12.5	3.93	
Ronnel	ND	12.5	1.42	
Malathion	ND	24.9	16.5	
Chlorpyrifos	ND	49.9	4.01	
Fenthion	ND	18.7	6.01	
Parathion	ND	12.5	4.38	
Trichloronate	ND	18.7	5.59	
Tetrachlorvinphos	ND	6.24	2.31	
Fensulfothion	ND	37.4	13.6	
Tokuthion	ND	18.7	8.37	
Merphos	ND	18.7	7.58	
Bolstar	ND	18.7	5.59	
EPN	ND	12.5	4.87	
Azinphos,methyl	ND	18.7	5.3	
Coumaphos	ND	49.9	12.7	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-3
Lab ID:	123852-03
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	95.94
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	98.1		55	128
Triphenyl Phosphate	93.4		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	11.4	4.48	
Mevinphos	ND	8.58	3.03	
Demeton,O-S	ND	11.4	3.7	
Ethoprop	ND	11.4	4.57	
Naled	ND	17.2	5.9	
Sulfotepp	ND	11.4	4.2	
Monocrotophos	ND	17.2	5.45	
Phorate	ND	11.4	3.72	
Dimethoate	ND	17.2	5.05	
Diazinon	ND	17.2	7.03	
Disulfoton	ND	11.4	3.41	
Parathion,methyl	ND	11.4	3.6	
Ronnel	ND	11.4	1.3	
Malathion	ND	22.9	15.1	
Chlorpyrifos	ND	45.8	3.67	
Fenthion	ND	17.2	5.51	
Parathion	ND	11.4	4.02	
Trichloronate	ND	17.2	5.13	
Tetrachlorvinphos	ND	5.72	2.12	
Fensulfothion	ND	34.3	12.5	
Tokuthion	ND	17.2	7.67	
Merphos	ND	17.2	6.95	
Bolstar	ND	17.2	5.13	
EPN	ND	11.4	4.47	
Azinphos,methyl	ND	17.2	4.86	
Coumaphos	ND	45.8	11.7	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-4
Lab ID:	123852-04
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	97.09
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	97.7		55	128
Triphenyl Phosphate	89.5		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	12.1	4.75	
Mevinphos	ND	9.09	3.22	
Demeton,O-S	ND	12.1	3.92	
Ethoprop	ND	12.1	4.84	
Naled	ND	18.2	6.25	
Sulfotepp	ND	12.1	4.45	
Monocrotophos	ND	18.2	5.78	
Phorate	ND	12.1	3.94	
Dimethoate	ND	18.2	5.35	
Diazinon	ND	18.2	7.46	
Disulfoton	ND	12.1	3.61	
Parathion,methyl	ND	12.1	3.82	
Ronnel	ND	12.1	1.38	
Malathion	ND	24.2	16.1	
Chlorpyrifos	ND	48.5	3.89	
Fenthion	ND	18.2	5.84	
Parathion	ND	12.1	4.26	
Trichloronate	ND	18.2	5.44	
Tetrachlorvinphos	ND	6.06	2.25	
Fensulfothion	ND	36.4	13.2	
Tokuthion	ND	18.2	8.13	
Merphos	ND	18.2	7.37	
Bolstar	ND	18.2	5.43	
EPN	ND	12.1	4.73	
Azinphos,methyl	ND	18.2	5.15	
Coumaphos	ND	48.5	12.4	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-5
Lab ID:	123852-05
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	95.44
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	96.4		55	128
Triphenyl Phosphate	91.5		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	12.7	4.99	
Mevinphos	ND	9.55	3.38	
Demeton,O-S	ND	12.7	4.12	
Ethoprop	ND	12.7	5.08	
Naled	ND	19.1	6.57	
Sulfotepp	ND	12.7	4.67	
Monocrotophos	ND	19.1	6.07	
Phorate	ND	12.7	4.14	
Dimethoate	ND	19.1	5.62	
Diazinon	ND	19.1	7.83	
Disulfoton	ND	12.7	3.8	
Parathion,methyl	ND	12.7	4.01	
Ronnel	ND	12.7	1.45	
Malathion	ND	25.5	16.9	
Chlorpyrifos	ND	51	4.09	
Fenthion	ND	19.1	6.13	
Parathion	ND	12.7	4.48	
Trichloronate	ND	19.1	5.71	
Tetrachlorvinphos	ND	6.37	2.36	
Fensulfothion	ND	38.2	13.9	
Tokuthion	ND	19.1	8.54	
Merphos	ND	19.1	7.75	
Bolstar	ND	19.1	5.71	
EPN	ND	12.7	4.97	
Azinphos,methyl	ND	19.1	5.41	
Coumaphos	ND	51	13	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-6
Lab ID:	123852-06
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	97.36
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	80.4		55	128
Triphenyl Phosphate	76.4		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	11.9	4.66	
Mevinphos	ND	8.91	3.15	
Demeton,O-S	ND	11.9	3.84	
Ethoprop	ND	11.9	4.74	
Naled	ND	17.8	6.12	
Sulfotepp	ND	11.9	4.36	
Monocrotophos	ND	17.8	5.66	
Phorate	ND	11.9	3.86	
Dimethoate	ND	17.8	5.24	
Diazinon	ND	17.8	7.31	
Disulfoton	ND	11.9	3.54	
Parathion,methyl	ND	11.9	3.74	
Ronnel	ND	11.9	1.35	
Malathion	ND	23.8	15.7	
Chlorpyrifos	ND	47.5	3.82	
Fenthion	ND	17.8	5.72	
Parathion	ND	11.9	4.18	
Trichloronate	ND	17.8	5.33	
Tetrachlorvinphos	ND	5.94	2.2	
Fensulfothion	ND	35.6	13	
Tokuthion	ND	17.8	7.97	
Merphos	ND	17.8	7.22	
Bolstar	ND	17.8	5.32	
EPN	ND	11.9	4.64	
Azinphos,methyl	ND	17.8	5.04	
Coumaphos	ND	47.5	12.1	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-7
Lab ID:	123852-07
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	96.02
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	91.9		55	128
Triphenyl Phosphate	82.6		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	10.6	4.15	
Mevinphos	ND	7.94	2.81	
Demeton,O-S	ND	10.6	3.42	
Ethoprop	ND	10.6	4.23	
Naled	ND	15.9	5.46	
Sulfotepp	ND	10.6	3.89	
Monocrotophos	ND	15.9	5.05	
Phorate	ND	10.6	3.44	
Dimethoate	ND	15.9	4.67	
Diazinon	ND	15.9	6.51	
Disulfoton	ND	10.6	3.16	
Parathion,methyl	ND	10.6	3.34	
Ronnel	ND	10.6	1.21	
Malathion	ND	21.2	14	
Chlorpyrifos	ND	42.4	3.4	
Fenthion	ND	15.9	5.1	
Parathion	ND	10.6	3.72	
Trichloronate	ND	15.9	4.75	
Tetrachlorvinphos	ND	5.3	1.96	
Fensulfothion	ND	31.8	11.6	
Tokuthion	ND	15.9	7.1	
Merphos	ND	15.9	6.44	
Bolstar	ND	15.9	4.75	
EPN	ND	10.6	4.14	
Azinphos,methyl	ND	15.9	4.5	
Coumaphos	ND	42.4	10.8	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-8
Lab ID:	123852-08
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	97.07
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	102		55	128
Triphenyl Phosphate	90.6		47	138

Sample results are on a dry weight basis.

Analyte		**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND		10.2	3.99	
Mevinphos	ND		7.64	2.7	
Demeton,O-S	ND		10.2	3.29	
Ethoprop	ND		10.2	4.07	
Naled	ND		15.3	5.25	
Sulfotepp	ND		10.2	3.74	
Monocrotophos	ND		15.3	4.86	
Phorate	ND		10.2	3.31	
Dimethoate	ND		15.3	4.5	
Diazinon	ND		15.3	6.27	
Disulfoton	ND		10.2	3.04	
Parathion,methyl	ND		10.2	3.21	
Ronnel	ND		10.2	1.16	
Malathion	ND		20.4	13.5	
Chlorpyrifos	ND		40.8	3.27	
Fenthion	ND		15.3	4.91	
Parathion	ND		10.2	3.58	
Trichloronate	ND		15.3	4.57	
Tetrachlorvinphos	ND		5.09	1.89	
Fensulfothion	ND		30.6	11.1	
Tokuthion	ND		15.3	6.83	
Merphos	ND		15.3	6.2	
Bolstar	ND		15.3	4.57	
EPN	ND		10.2	3.98	
Azinphos,methyl	ND		15.3	4.33	
Coumaphos	ND		40.8	10.4	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-9
Lab ID:	123852-09
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	93.34
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	101		55	128
Triphenyl Phosphate	90.9		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	13.7	5.36	
Mevinphos	ND	10.3	3.63	
Demeton,O-S	ND	13.7	4.42	
Ethoprop	ND	13.7	5.46	
Naled	ND	20.5	7.05	
Sulfotepp	ND	13.7	5.02	
Monocrotophos	ND	20.5	6.51	
Phorate	ND	13.7	4.44	
Dimethoate	ND	20.5	6.03	
Diazinon	ND	20.5	8.41	
Disulfoton	ND	13.7	4.07	
Parathion,methyl	ND	13.7	4.31	
Ronnel	ND	13.7	1.56	
Malathion	ND	27.3	18.1	
Chlorpyrifos	ND	54.7	4.39	
Fenthion	ND	20.5	6.58	
Parathion	ND	13.7	4.81	
Trichloronate	ND	20.5	6.13	
Tetrachlorvinphos	ND	6.84	2.53	
Fensulfothion	ND	41	14.9	
Tokuthion	ND	20.5	9.17	
Merphos	ND	20.5	8.31	
Bolstar	ND	20.5	6.13	
EPN	ND	13.7	5.34	
Azinphos,methyl	ND	20.5	5.8	
Coumaphos	ND	54.7	13.9	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-10
Lab ID:	123852-10
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	97.53
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	95.2		55	128
Triphenyl Phosphate	87.3		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	10.7	4.2	
Mevinphos	ND	8.04	2.84	
Demeton,O-S	ND	10.7	3.46	
Ethoprop	ND	10.7	4.28	
Naled	ND	16.1	5.52	
Sulfotepp	ND	10.7	3.93	
Monocrotophos	ND	16.1	5.1	
Phorate	ND	10.7	3.48	
Dimethoate	ND	16.1	4.73	
Diazinon	ND	16.1	6.59	
Disulfoton	ND	10.7	3.19	
Parathion,methyl	ND	10.7	3.38	
Ronnel	ND	10.7	1.22	
Malathion	ND	21.4	14.2	
Chlorpyrifos	ND	42.9	3.44	
Fenthion	ND	16.1	5.16	
Parathion	ND	10.7	3.77	
Trichloronate	ND	16.1	4.8	
Tetrachlorvinphos	ND	5.36	1.99	
Fensulfothion	ND	32.1	11.7	
Tokuthion	ND	16.1	7.19	
Merphos	ND	16.1	6.51	
Bolstar	ND	16.1	4.8	
EPN	ND	10.7	4.18	
Azinphos,methyl	ND	16.1	4.55	
Coumaphos	ND	42.9	10.9	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-11
Lab ID:	123852-11
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	97.16
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	94.8		55	128
Triphenyl Phosphate	89.1		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	12.6	4.92	
Mevinphos	ND	9.41	3.33	
Demeton,O-S	ND	12.6	4.06	
Ethoprop	ND	12.6	5.01	
Naled	ND	18.8	6.47	
Sulfotepp	ND	12.6	4.61	
Monocrotophos	ND	18.8	5.98	
Phorate	ND	12.6	4.08	
Dimethoate	ND	18.8	5.54	
Diazinon	ND	18.8	7.72	
Disulfoton	ND	12.6	3.74	
Parathion,methyl	ND	12.6	3.96	
Ronnel	ND	12.6	1.43	
Malathion	ND	25.1	16.6	
Chlorpyrifos	ND	50.2	4.03	
Fenthion	ND	18.8	6.04	
Parathion	ND	12.6	4.41	
Trichloronate	ND	18.8	5.63	
Tetrachlorvinphos	ND	6.28	2.33	
Fensulfothion	ND	37.7	13.7	
Tokuthion	ND	18.8	8.42	
Merphos	ND	18.8	7.63	
Bolstar	ND	18.8	5.62	
EPN	ND	12.6	4.9	
Azinphos,methyl	ND	18.8	5.33	
Coumaphos	ND	50.2	12.8	

STL Seattle

Client Name	ESN Northwest, Inc.
Client ID:	B-12
Lab ID:	123852-12
Date Received:	9/26/2004
Date Prepared:	9/27/2004
Date Analyzed:	10/1/2004
% Solids	95.13
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	87.6		55	128
Triphenyl Phosphate	93.1		47	138

Sample results are on a dry weight basis.

Analyte	**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND	12.8	5.02	
Mevinphos	ND	9.6	3.4	
Demeton,O-S	ND	12.8	4.14	
Ethoprop	ND	12.8	5.11	
Naled	ND	19.2	6.6	
Sulfotepp	ND	12.8	4.7	
Monocrotophos	ND	19.2	6.1	
Phorate	ND	12.8	4.16	
Dimethoate	ND	19.2	5.65	
Diazinon	ND	19.2	7.87	
Disulfoton	ND	12.8	3.81	
Parathion,methyl	ND	12.8	4.03	
Ronnel	ND	12.8	1.46	
Malathion	ND	25.6	16.9	
Chlorpyrifos	ND	51.2	4.11	
Fenthion	ND	19.2	6.16	
Parathion	ND	12.8	4.5	
Trichloronate	ND	19.2	5.74	
Tetrachlorvinphos	ND	6.4	2.37	
Fensulfothion	ND	38.4	14	
Tokuthion	ND	19.2	8.59	
Merphos	ND	19.2	7.78	
Bolstar	ND	19.2	5.74	
EPN	ND	12.8	5	
Azinphos,methyl	ND	19.2	5.43	
Coumaphos	ND	51.2	13	

STL Seattle

Lab ID:	Method Blank - OS0160
Date Received:	-
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
% Solids	
Dilution Factor	10

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Tributyl Phosphate	81.4		55	128
Triphenyl Phosphate	92.5		47	138

Sample results are on an as received basis.

Analyte		**Result (ug/kg)**	**PQL**	**MDL**	**Flags**
Dichlorvos	ND		13.3	5.22	
Mevinphos	ND		10	3.54	
Demeton,O-S	ND		13.3	4.31	
Ethoprop	ND		13.3	5.32	
Naled	ND		20	6.87	
Sulfotepp	ND		13.3	4.89	
Monocrotophos	ND		20	6.35	
Phorate	ND		13.3	4.33	
Dimethoate	ND		20	5.88	
Diazinon	ND		20	8.2	
Disulfoton	ND		13.3	3.97	
Parathion,methyl	ND		13.3	4.2	
Ronnel	ND		13.3	1.52	
Malathion	ND		26.7	17.7	
Chlorpyrifos	ND		53.3	4.28	
Fenthion	ND		20	6.42	
Parathion	ND		13.3	4.69	
Trichloronate	ND		20	5.98	
Tetrachlorvinphos	ND		6.67	2.47	
Fensulfothion	ND		40	14.6	
Tokuthion	ND		20	8.94	
Merphos	ND		20	8.11	
Bolstar	ND		20	5.97	
EPN	ND		13.3	5.21	
Azinphos,methyl	ND		20	5.66	
Coumaphos	ND		53.3	13.6	

STL Seattle

Blank Spike/Blank Spike Duplicate Report

Lab ID:	OS0160
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
QC Batch ID:	OS0160

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

Compound Name	Blank Result (ug/kg)	Spike Amount (ug/kg)	BS Result (ug/kg)	BS % Rec.	BSD Result (ug/kg)	BSD % Rec.	RPD	Flag
Diazinon	0	333	273	82	287	86.2	5	
Malathion	0	333	293	88	301	90.4	2.7	
Chlorpyrifos	0	333	276	82.9	305	91.5	9.9	
Azinphos,methyl	0	333	315	94.6	301	90.4	-4.5	

STL Seattle

Matrix Spike/Matrix Spike Duplicate Report

Client Sample ID:	B-1
Lab ID:	123852-01
Date Prepared:	9/27/2004
Date Analyzed:	9/30/2004
QC Batch ID:	OS0160

Organophosphorus Pesticides by USEPA Method 8141 GC/MS Modified

Compound Name	Sample Result (ug/kg)	Spike Amount (ug/kg)	MS Result (ug/kg)	MS % Rec.	MSD Result (ug/kg)	MSD % Rec.	RPD	Flag
Diazinon	0	286	225	78.8	250	80	1.5	
Malathion	0	286	248	86.6	282	90.3	4.2	
Chlorpyrifos	0	286	245	85.7	277	88.6	3.3	
Azinphos,methyl	0	286	319	112	372	119	6.1	

STL Seattle
5755 8th Street East
Tacoma, WA 98424

Tel: 253 922 2310
Fax: 253 922 5047
www.stl-inc.com

DATA QUALIFIERS AND ABBREVIATIONS

B1: This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).

B2: This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).

C1: Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be < 40%.

C2: Second column confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be > 40%. The higher result was reported unless anomalies were noted.

C3: Second analysis confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be ≤ 30%.

C4: Second analysis confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be > 30%. The original analysis was reported unless anomalies were noted.

I: GC/MS confirmation was performed. The result derived from the original analysis was reported.

D: The reported result for this analyte was calculated based on a secondary dilution factor.

E: The concentration of this analyte exceeded the instrument calibration range.and should be considered an estimated quantity.

J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.

MCL: Maximum Contaminant Level

MDL: Method Detection Limit

RL: Reporting Limit

SEE: See analytical narrative

ND: Not Detected

X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.

X2: Contaminant does not appear to be "typical" product.

X3: Identification and quantitation of the analyte or surrogate was complicated by matrix interference.

X4: RPD for duplicates was outside advisory QC limits. The sample was re-analyzed with similar results. The sample matrix may be nonhomogeneous.

X4a: RPD for duplicates outside advisory QC limits due to analyte concentration near the method practical quantitation limit/detection limit.

X5: Matrix spike recovery was not determined due to the required dilution.

X6: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Sample was re-analyzed with similar results.

X7: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Matrix interference may be indicated based on acceptable blank spike recovery and/or RPD.

X7a: Recovery and/or RPD values for this spiked analyte outside advisory QC limits due to high concentration of the analyte in the original sample.

X8: Surrogate recovery was not determined due to the required dilution.

X9: Surrogate recovery outside advisory QC limits due to matrix interference.

ESN NORTHWEST Environmental Services Network

CHAIN-OF-CUSTODY RECORD

CLIENT: KLEINFELDER, INC.

ADDRESS: 24005 - 140TH AVENUE N.E., SUITE A-101 BELLEVUE, WA 98005

PHONE: (425) 562-4200 FAX: (425) 562-4201

CLIENT PROJECT #: 47755 PROJECT MANAGER: TED SYKES

DATE: 9/23/04 PAGE 1 OF 1

PROJECT NAME: PARKLAND CHEVRON

LOCATION: S.R. 7TH, CHEHALIS, WA

COLLECTOR: TED SYKES DATE OF COLLECTION 9/23/04

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8021B	VOA 8021B BTEX Only	VOA 8260	SEMI VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PAH 8270	PCBs 8082	Pesticides 8081	EPH	VPH	Methamphetamine	Pb	Hex Chrome	RCRA 8 Metals	NOTES	Total Number of Containers	Laboratory Note Number
1. B-1	5'-1'	0820	SOIL	4oz JARS											X				X		X	X		2	
2. B-2	"	0830	"	"											X				X		X	X		2	
3. B-3	"	0840	"	"											X				X		X	X	STL-SEATTLE	2	
4. B-4	"	0853	"	"											X				X		X	X		2	
5. B-5	"	0905	"	"											X				X		X	X		2	
6. B-6	"	0925	"	"											X				X		X	X		2	
7. B-7	"	0933	"	"											X				X		X	X		2	
8. B-8	"	0942	"	"											X				X		X	X		2	
9. B-9	"	0952	"	"											X				X		X	X		2	
10. B-10	"	1003	"	"											X				X		X	X		2	
11. B-11	"	1010	"	"											X				X		X	X		2	
12. B-12	"	1030	"	"											X				X		X	X		2	
13.																									
14.																									
15.																									
16.																									
17.																									
18.																									

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	9/23/04	[signature]	9/23/04 1415
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ ESN DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	24
CHAIN OF CUSTODY SEALS Y/N/NA	NA
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time: 24 HR 48 HR (5 DAY)

Area-Wide Soil Contamination Task Force Report

Draft of May 30, 2003

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1. Introduction

This report is the product of a 17-person Task Force chartered by the Departments of Agriculture; Ecology; Health; and Community, Trade and Economic Development (the Agencies) charged with developing findings and recommendations related to large areas of low to moderate level arsenic and lead soil contamination (so called "area-wide soil contamination") in Washington State. The Task Force process was carried out over 18 months, from January 2002 to June 2003.

As used in this report, "area-wide soil contamination" means low-to-moderate level soil contamination that is dispersed over a large geographic area, ranging in size from several hundred acres to many square miles. Area-wide soil contamination is different from most cleanup sites, which are typically smaller and have higher levels of contamination.

Concentrations of arsenic and lead within areas affected by area-wide soil contamination are highly variable. The Task Force relied on Ecology's current views about what constitutes "low-to-moderate" levels of arsenic and lead in soil. For schools, childcare centers, and residential land uses, in general, Ecology considers arsenic concentrations of up to 100 parts per million (ppm) and lead concentrations of 500 – 700 ppm to be within the low to moderate range. For properties where exposure of children is less likely or less frequent, such as commercial properties, parks, and camps, Ecology considers arsenic concentrations of up to 200 ppm and lead concentrations of 700 – 1,000 ppm to be within the low to moderate range. Ecology plans to ask the Science Advisory Board to review these values and their use in implementing the Task Force recommendations. For comparison, the unrestricted site use cleanup levels for arsenic and lead are 20 ppm and 250 ppm, respectively. Arsenic occurs naturally in Washington State soils at approximately 5 - 9 ppm; lead at 11 - 24 ppm.

Task Force deliberations focused on understanding and mapping the nature and extent of low-to-moderate level arsenic and lead soil contamination from three historical sources, emissions from metal smelters, use of pesticides containing lead arsenate, and combustion of leaded gasoline, and on developing recommendations about effective, practical, and affordable steps organizations and individuals can take to reduce the potential for exposure to low to moderate levels of arsenic and lead soil contamination.

The foundation of the Task Force recommendations calls for the Agencies to initiate a broad-based education and awareness building campaign about low to moderate level arsenic and lead soil contamination, and to support and encourage actions individuals can take to reduce the likelihood that they will be exposed to arsenic and lead in soil. To complement broad-based education and awareness building, the Task Force also recommends specific activities for a number of land-use situations, with an emphasis on child-use areas. Finally, the Task Force recommends creation of a special process under the Model Toxics Control Act (MTCA) that is tailored for properties affected by area-wide soil contamination.

In making these recommendations, the Task Force was guided by six principles: which are listed here and described more fully later in the report:

- A balanced approach is needed.
- Lower adverse health risk than more traditional cleanup situations.
- Focus on controlling exposure.
- Focus on children.
- Responses increase as exposure increases.
- Decisions should be made locally.

2. Project Background and Task Force Charge

In 1994, the Washington Legislature established the Model Toxics Control Act (MTCA) Policy Advisory Committee (PAC) to review implementation of MTCA. In their final report, the MTCA PAC recommended that the Department of Ecology (Ecology) take steps to more effectively address area-wide soil contamination. In early 2000, the Departments of Agriculture; Ecology; Health; and Community, Trade and Economic Development concluded that effective, long-term solutions to area-wide soil contamination problems would require looking beyond traditional cleanup processes and agency boundaries. The agencies identified several interconnected challenges posed by widespread low-to-moderate level soil contamination.

- Potential for exposure: Over the past 50 years, Washington's population growth has resulted in many agricultural and forested areas and other open space being converted to residential uses. Population has also increased in areas affected by emissions from metal smelters. This growth can bring more people into contact with area-wide soil contamination.

- Scale: The geographic scale of area-wide soil contamination is significantly greater than contamination typically addressed by state and federal cleanup programs and encompasses many individual parcels of land.

- Financial Impacts: Citizens and land developers have purchased or built homes in areas with contaminated soils. This creates the potential for financial problems that may include payment for cleanup, reduction in property values, and difficulties in financing or selling homes.

- Lack of Information and Awareness: The Agencies lack key information needed to effectively address area-wide soil contamination, for example, information on the full scope of the problem and on stakeholder views. Similarly, many residents are unaware that soil at their homes, future homes, and/or children's schools may contain low-to-moderate levels of arsenic and lead. Consequently, they are unable to take steps to control exposures.

In June 2001, the Washington Legislature appropriated $1.2 million to form and support a stakeholder Task Force to consider these issues, and the Agencies initiated the process of hiring a project support contractor and identifying potential Task Force members. The Agencies chartered the Area-Wide Soil Contamination Task Force (Task Force) in January 2002 to consider the special challenges posed by area-wide soil contamination and recommend a statewide strategy for meeting these challenges. In particular, the Agencies asked the Task Force to provide findings and recommendations on four sets of questions:

- What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State? What steps should be taken to improve our understanding of the location and magnitude of arsenic and lead soil contamination?

- What are technically feasible measures for addressing widespread low-to-moderate soil contamination problems? What is the full range of actions that might be considered to address widespread low-to-moderate levels of soil contamination?

- What changes are needed to eliminate barriers in addressing area-wide soil contamination problems? How can agencies facilitate cleanup of area-wide soil contamination problems under the current legal system?

- What agencies need to play a role in addressing area-wide soil contamination problems and what are possible funding sources?

Even though other contaminants may pose area-wide soil contamination problems, the Agencies asked the Task Force to focus on problems associated with arsenic and lead because of the potential widespread distribution of these contaminants and their persistence in the environment. The Agencies also identified three areas as beyond the scope of the Task Force process: (1) MTCA cleanup standards for arsenic and lead and the policies and technical methods upon which the cleanup standards are based, (2) ongoing site-specific cleanup actions, and (3) current agricultural practices. In this context, the Task Force began deliberations at its first meeting in February 2002, with the goal of completing deliberations and issuing findings and recommendations to the Agencies in June 2003.

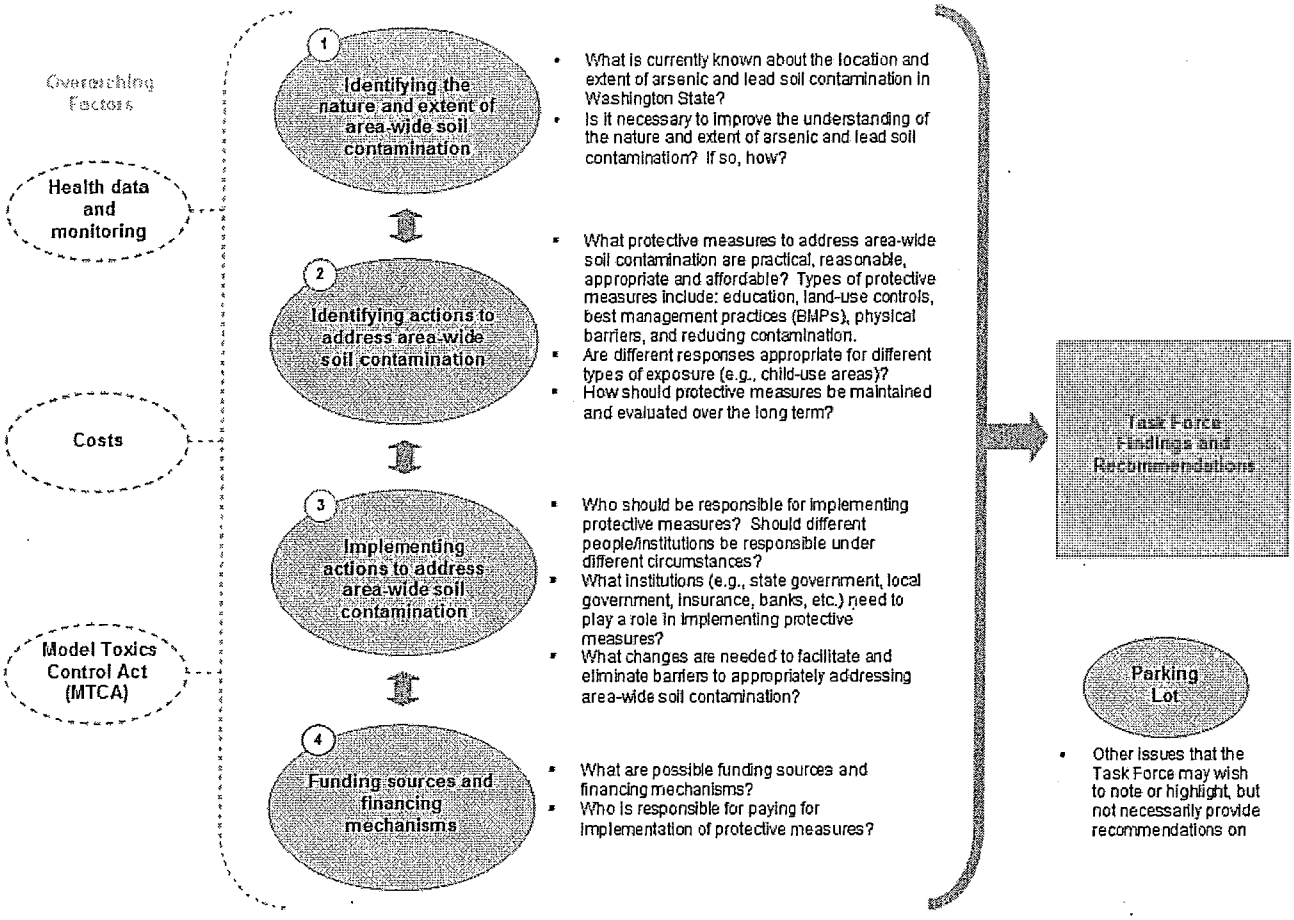
3. Task Force Composition, Process, and Information Gathering

The Task Force is made up of 17 individuals who represent diverse interests including business, environment, agriculture, local government, and schools. The Agencies identified Task Force members based on areas of expertise, ability to represent potentially affected stakeholder groups, and a desire to ensure geographic representation across the state. Task Force members served the project as volunteers—they were not compensated for their time or expertise. Most Task Force members served for the entire process. Two Task Force members left the process relatively early because of changes in their professional circumstances. They were replaced by other representatives in their area of expertise. The Task Force met 12 times between January 2002 and June 2003. All meetings were advertised and were open to the public, with opportunities for public comment provided at each meeting.

The Task Force began by reviewing and accepting the Task Force charter, which includes the questions posed by the Agencies and the areas identified as outside the scope of the Task Force deliberations discussed in the section above. They also accepted two co-chairs recommended by the Agencies—a representative of environmental interests from Western Washington and a representative of business interests from Eastern Washington. The Task Force co-chairs served as liaisons to the facilitation team and helped to guide and manage the Task Force process. A list of Task Force members, meeting locations and dates, and a copy of the Task Force charter are included in Appendix B.

There was a wide range of views on the Task Force, and at their first meetings Task Force members struggled to develop a common language and information base from which to discuss area-wide soil contamination issues and to understand one another's concerns and interests. At their fourth meeting, the Task Force developed a Project Map (see Figure 1 below) as a way to organize their deliberations. The Project Map organizes Task Force deliberations into four issue areas: (1) identifying the nature and extent of area-wide soil contamination, (2) identifying actions to address area-wide soil contamination, (3) implementing actions to address area-wide soil contamination, and (4) funding sources and financing mechanisms. It lists questions that the Task Force considered under each issue area and shows the issue areas as interrelated and affected by three overarching factors: cost, health exposure data, and MTCA. In between full Task Force meetings, small groups of Task Force members met to evaluate specific issues identified on the Project Map and develop options and recommendations for the full Task Force to consider. These discussions formed the basis for the recommendations described in this report.

Figure 1: Area-Wide Soil Contamination Project Map



The Task Force completed preliminary findings and recommendations for the majority of the questions on the Project Map in April 2003. Preliminary Task Force findings and recommendations were widely publicized and made available for public review and comment in May 2003. In addition, five focus group meetings were organized. Task Force members attended the focus group meetings to hear first hand the reactions to the preliminary findings and recommendations. The public review and comment process is summarized in Appendix C. The Task Force then met twice in June 2003 to evaluate public comments and refine their findings and recommendations, and issued their final report at the end of June 2003.

The Agencies served as *ex officio* members of the Task Force, attending both Task Force and small group meetings. They provided background information and support for Task Force deliberations and offered agency perspectives during the Task Force's development of findings and recommendations, but did not participate in final decision-making with respect to the Task Force report. In addition, the Task Force was supported by a contractor project team hired by Ecology and, early in their process, by two workgroups made up of technical experts and advisors. The workgroups carried out research and analysis to support Task Force deliberations and reviewed technical documents prepared for the project. The contractor project team carried out research and analysis to support Task Force deliberations and facilitated the Task Force and small group meetings.

Task Force deliberations were supported by an information gathering effort that had three primary components:

- Interviews with Task Force members and stakeholders to identify key issues and concerns.

- Survey of research to identify and learn from other approaches to area-wide soil contamination and similar challenges.

- Case studies of several relevant cleanup or land-use development projects to evaluate their legal, funding, and institutional arrangements for addressing soil contamination and responding to public concerns.

Each of these information gathering efforts is described in appendices to this report.

4. Consideration of Health Risks and Guiding Principles for Making Recommendations

As described earlier in this report, the Task Force charter specifically excluded evaluation of the MTCA soil cleanup standards for arsenic and lead, the risk policies underlying the cleanup standards, and the technical methods used to establish the standards. Nonetheless, to develop appropriate recommendations, the Task Force discussed the potential risks posed by arsenic and lead, and reviewed some of the available information on potential health effects from exposure to low to moderate levels of arsenic and lead in soil and heard presentations from experts. From this evaluation, the Task Force reached a number of conclusions.

What is Low to Moderate?

The Task Force relied on Ecology's current views about what constitutes "low to moderate" levels of arsenic and lead in soil. For schools, childcare centers, and residential land uses, in general, Ecology considers arsenic concentrations of up to 100 parts per million (ppm) and lead concentrations of 500 – 700 ppm to be within the low to moderate range. For properties where exposure of children is less likely or less frequent, such as commercial properties, parks, and camps, Ecology considers arsenic concentrations of up to 200 ppm and lead concentrations of 700 – 1,000 ppm to be within the low to moderate range.

- As described earlier in this report, concentrations of arsenic and lead in soil are above cleanup levels in some areas of Washington State.

- The risk of developing health problems from arsenic or lead depends on the amount of exposure and the concentrations to which a person is exposed. The greater the exposure or the greater the concentrations, the greater the risk. Most information about the health effects of arsenic and lead comes from studies where exposures were greater than those expected from living and working in places with low to moderate levels of arsenic and lead in soil.

- The Task Force was presented with little or no evidence showing that exposure to low to moderate levels of arsenic and lead contamination in soil has caused or is causing acute health effects in Washington residents. Health monitoring and research studies have not been carried out to the extent necessary to understand and document whether exposure to low to moderate level soil contamination is causing or contributing to long-term health problems.

- Evaluating health effects at lower levels of exposure is difficult, and it is unlikely that conclusive scientific information to determine the health risks from exposure to area-wide soil contamination will be available in the foreseeable future. In light of this uncertainty, there is disagreement among scientists about how the information that is available should be interpreted and used to assess the risks of exposure

to low to moderate level soil contamination. Some members of the scientific community argue that federal and state efforts to address low to moderate level soil contamination are not scientifically justified because there is no information demonstrating that health problems are being caused by exposure to such contamination. Other members of the scientific community argue that arsenic and lead in soil have the potential to cause health problems at low levels of exposure—especially for people who are particularly sensitive to the effects of these contaminants. Task Force members mirrored this diversity of views. In recent years, the majority of scientific review committees formed to evaluate the available scientific information on arsenic and lead have concluded that there is a sufficient scientific basis to justify efforts to reduce exposure to these contaminants.

- Exposure to high levels of arsenic and lead can cause health problems in people. Arsenic can cause more than 30 distinct health effects, including nervous system damage, increased blood pressure, heart attack, stroke, and cancer of the bladder, lung, skin, and other organs. Lead can affect many parts of the body, causing health effects that include increased blood pressure, kidney damage, and brain damage. Although both children and adults can be adversely affected by lead poisoning, it is a particular concern for young children. Arsenic and lead are both considered persistent contaminants. This means that they bind strongly to soil and usually remain in the environment without breaking down or losing their toxicity, and thus can be a source of exposure for many decades.

In light of this information, the Task Force developed a six guiding principles for its deliberations. These principles guided the Task Force's recommendations and should guide the Agencies and other organizations' implementation of Task Force recommendations:

- A balanced approach is needed: the Task Force believes that responses to area-wide soil contamination should be effective, practical and affordable.

- Lower adverse health risk: Despite the fact that concentrations of arsenic and lead in soil may be above state soil cleanup levels, the Task Force believes that the level of risk associated with exposures to low-to-moderate arsenic and lead soil contamination appears to be relatively low when compared to risks at sites where smelters operated or where lead arsenate pesticides were mixed (i.e., sites with higher concentrations of contaminants). Resources to address contaminated sites in Washington State are limited, and addressing area-wide soil contamination sites will compete with addressing more traditional cleanup situations for resources. Beyond the broad-based education and awareness building discussed below, the Task Force does not recommend that additional remediation responses are needed at every individual property with low-to-moderate arsenic and lead soil contamination, unless exposure potential exists for children and/or the likelihood for exposure potential exists for adults through activities such as gardening.

- Focus on controlling exposure: given the potential for exposure to arsenic and lead to cause adverse health effects in people, it is prudent to take effective, practical and affordable steps to minimize the potential for exposure to arsenic and lead in soil.

- Focus on children: While adults are also vulnerable to adverse health effects from arsenic and lead and should not be ignored, the Task Force felt a special responsibility to address protection of children. Resources devoted to assessing and responding to area-wide soil contamination should be focused on locations where there is the highest risk of exposure and should be targeted at protecting children. The vulnerability of the population, likelihood of exposure, and the duration or frequency of exposures are the most important factors in informing whether response actions are necessary and, where actions are needed, in informing the specific actions selected.

- Responses increase as exposure increases: Responses to area-wide soil contamination should be commensurate with the level of risk associated with potential exposure. In general, the intensity and effectiveness of responses to area-wide soil contamination should increase as exposures become more likely (because of likelihood of extent of contact), more prevalent (because of more individuals exposed), or more intense (because of longer duration or more frequent exposures). In some situations, higher concentrations of arsenic or lead may be found in areas affected by area-wide soil contamination; in these cases, more aggressive response actions may be warranted.

- Decisions should be made locally: The Task Force recommends what it believes are effective, practical, and low-cost methods to respond to area-wide soil contamination. However, the Task Force recommendations are only guidelines. Each person or community affected by area-wide soil contamination should implement a response that meets their priorities, objectives, and tolerance for risk, even if those responses differ from those recommended by the Task Force. For example, some individuals or communities might choose to remove contaminated soil, even though less costly measures would also be effective, because they do not want to maintain other protection measures over time.

Using these guiding principles, the Task Force considered a wide range of protection measures and developed the recommendations in the remainder of this report.

5. Nature and Extent of Area-Wide Soil Contamination

The Task Force considered what is known and not known about the location and magnitude of elevated levels of arsenic and lead in soil from historical smelter emissions, use of pesticides containing arsenic and lead, and combustion of leaded gasoline. Much of the Task Force's deliberations focused on how to communicate this information in a way that would present information accurately without causing undue alarm. As discussed below, the Task Force decided that a tiered series of maps, along with accompanying information and tools, should be used to communicate information on area-wide soil contamination in a balanced and useful way. The Task Force also recommended updating the maps regularly to improve their precision and developing local maps of area-wide soil contamination where such maps do not exist (primarily for areas affected by lead arsenate pesticides). (Recommendations for additional research on contamination from combustion of leaded gasoline are discussed in Section 11.)

The Task Force's findings and recommendations in this section are organized according to three questions the Task Force considered:

- *What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State?*

- *How should information on the nature and extent of area-wide soil contamination be communicated?*

- *What steps should be taken to improve our understanding of the nature and extent of arsenic and lead soil contamination?*

What is Known about the Nature and Extent of Area-Wide Arsenic and Lead Soil Contamination

Elevated levels of arsenic and lead are present in soil in some areas of Washington State from three historical sources: air emissions from metal smelters, lead arsenate pesticides, and combustion of leaded gasoline. In areas affected by off-site deposition of smelter emissions and areas where lead arsenate pesticides were applied to crops, concentrations of arsenic and lead in soil generally are higher than concentrations that occur naturally in Washington soils and higher than state soil cleanup levels established under the Model Toxics Control Act; however, concentrations generally are lower than those found at smelter operation sites and at sites where lead arsenate pesticides were mixed in preparation for application. Low-to-moderate arsenic and lead soil contamination associated with areas affected by off-site deposition of smelter emissions, lead arsenate pesticide application, and combustion of leaded gasoline is referred to as "area-wide soil contamination" to distinguish it from the higher concentrations and smaller geographic extent of contamination at more traditional cleanup sites.

What is Area-Wide Soil Contamination?

Area-wide soil contamination is low-to-moderate level contamination that is dispersed over a large geographic area, ranging in size from several hundred acres to many square miles.

The precise boundaries of land affected by area-wide soil contamination are not known; however, certain places have a higher likelihood of arsenic and lead soil contamination based on the locations of metal smelters or the probable use of lead arsenate pesticides from approximately 1905 to 1947. To support Task Force deliberations, the contractor project team conducted a detailed study of available data on the nature and extent of area-wide soil contamination. Based on this study, areas affected by smelter emissions in King, Pierce, Snohomish, and Stevens counties have a higher likelihood of arsenic and lead soil contamination than other areas of the State due to historical emissions from metal smelters located in Tacoma, Harbor Island, Everett, Northport, and Trail, BC. Areas where apples and pears were historically grown have a higher likelihood of arsenic and lead soil contamination than other areas of the State because of past use of lead arsenate pesticides. Chelan, Spokane, Yakima, and Okanogan counties have a higher likelihood than other counties for elevated levels of lead and arsenic in soil based on the greater numbers of apple and pear trees in production there between 1905 and 1947. Combustion of leaded gasoline produces lead-enriched particulates and aerosols that are emitted from exhaust pipes and deposited onto nearby soils. The full extent of area-wide soil contamination from past use of leaded gasoline in Washington is not known; however, in general, land adjacent to any road constructed prior to 1995 and land in the center of highly populated urban areas has some likelihood of elevated levels of lead in soil from leaded gasoline. The following table describes the number of acres potentially affected by area wide arsenic and lead soil contamination based on information currently available.

What Are Other Sources of Arsenic and Lead Contamination?

Other sources of arsenic contamination include wood treated with chromated copper arsenic (often called "pressure-treated" wood), emissions from coal-fired power plants and incinerators, and other industrial processes. Other sources of lead contamination include lead-based paint, lead-soldered water pipes, home remedies or health-care products that contain lead, hobbies that use lead (e.g., staining glass or sculpturing), foods and beverages, combustion of coal or oil, waste incinerators, and mining and industrial processes (such as battery and ammunitions manufacturing). Both arsenic and lead also occur naturally in the environment at varying concentrations.

According to the study prepared to support Task Force deliberations, the range of concentrations of arsenic and lead in soil in area-wide soil contamination areas is quite broad. Arsenic concentrations range from natural background levels (7 – 9 ppm statewide) to over 3,000 ppm in smelter areas. Average concentrations of arsenic in soil at developed properties are generally less than 100 ppm. Lead concentrations range from natural background levels (11 – 24 ppm statewide), to over 4,000 ppm in orchard top soils. Average concentrations of lead in soil at developed properties are generally less than 700 ppm. The higher concentrations were observed in smelter areas and in areas where lead arsenate pesticides likely were mixed in preparation for application. By comparison, the MTCA soil cleanup levels for unrestricted land use for arsenic and lead are 20 mg/kg and 250 mg/kg, respectively. Soil concentrations tend to be greater around the Tacoma smelter than in the other smelter areas, because the Tacoma smelter operated for a longer period and specialized in the processing of high-arsenic ore.

Where found, arsenic and lead soil contamination tends to be relatively shallow. In undisturbed soils, most of the arsenic and essentially all of the lead from historical smelter emissions and historical use of lead-arsenate pesticides typically are concentrated in the upper 6 to 18 inches of soil.[1] While some downward movement of arsenic occurs in most soils, substantial downward movement has been observed on occasion and appears to be restricted to heavily leached sandy soils and medium-textured soils with very uniform soil profile characteristics. There are a few anecdotal reports of elevated arsenic concentrations in shallow drainage water derived from heavily irrigated land containing lead arsenate pesticide residues; however, currently there does not appear to be evidence of ground water contamination. The long-term consequences of the very slow downward movement of arsenic in soil require further evaluation.

Concentrations of arsenic and lead at properties affected by area-wide soil contamination are highly variable and depend on the historical use and development of the property. For example, during development of a property, surface soils are often mixed with underlying soils and redistributed; this disturbance tends to dilute the concentrations of arsenic and lead in soil and distribute them in unpredictable patterns. Contaminant concentrations on one property cannot reliably be used to predict concentrations on neighboring properties.

Information on the nature and extent of arsenic and lead soil contamination provided the basis for Task Force deliberations on what actions should be taken to respond to area-wide soil contamination in important ways. For example, the knowledge that most added arsenic and almost all added lead remains in surface and near-surface soils, coupled with lack of evidence for ground water contamination suggests that ground water contamination is not likely a substantive issue for properties with area-wide soil contamination. Similarly, the understanding that arsenic and lead contamination tends to be highest in undisturbed soils led to the Task Force's recommendations on additional steps that should be taken when converting open land into developed properties.

Preliminary Estimates of Area-Wide Soil Contamination in Washington

Area-Wide Contamination Source	Estimated Land Area Affected [3]
Smelters	
Tacoma	329,600 acres [1]
Everett	8,320 acres [1] [2]
Harbor Island	640 acres [1]
Northport and Trail	150,400 acres [1] [2]
Orchard Land	187,590 acres [1]
Roadsides	Unknown at present
All Area-Wide Sources	>676,550 acres

[1] Extent of affected area has not been fully characterized.
[2] Based on air modeling for the Everett smelter and maps of sulfur dioxide injury to vegetation for the Northport and Trail smelters.
[3] The total area of land in Washington is 66,544 square miles, or about 42.6 million acres.

[1] Data in this paragraph from Landau Associates, *Preliminary Estimates Report, Area-Wide Soil Contamination Strategy, Washington State,* prepared for the Washington State Department of Ecology, Olympia, WA, 2003 (pending).

Recommendations on How Information on the Nature and Extent of Area-Wide Soil Contamination Should be Communicated

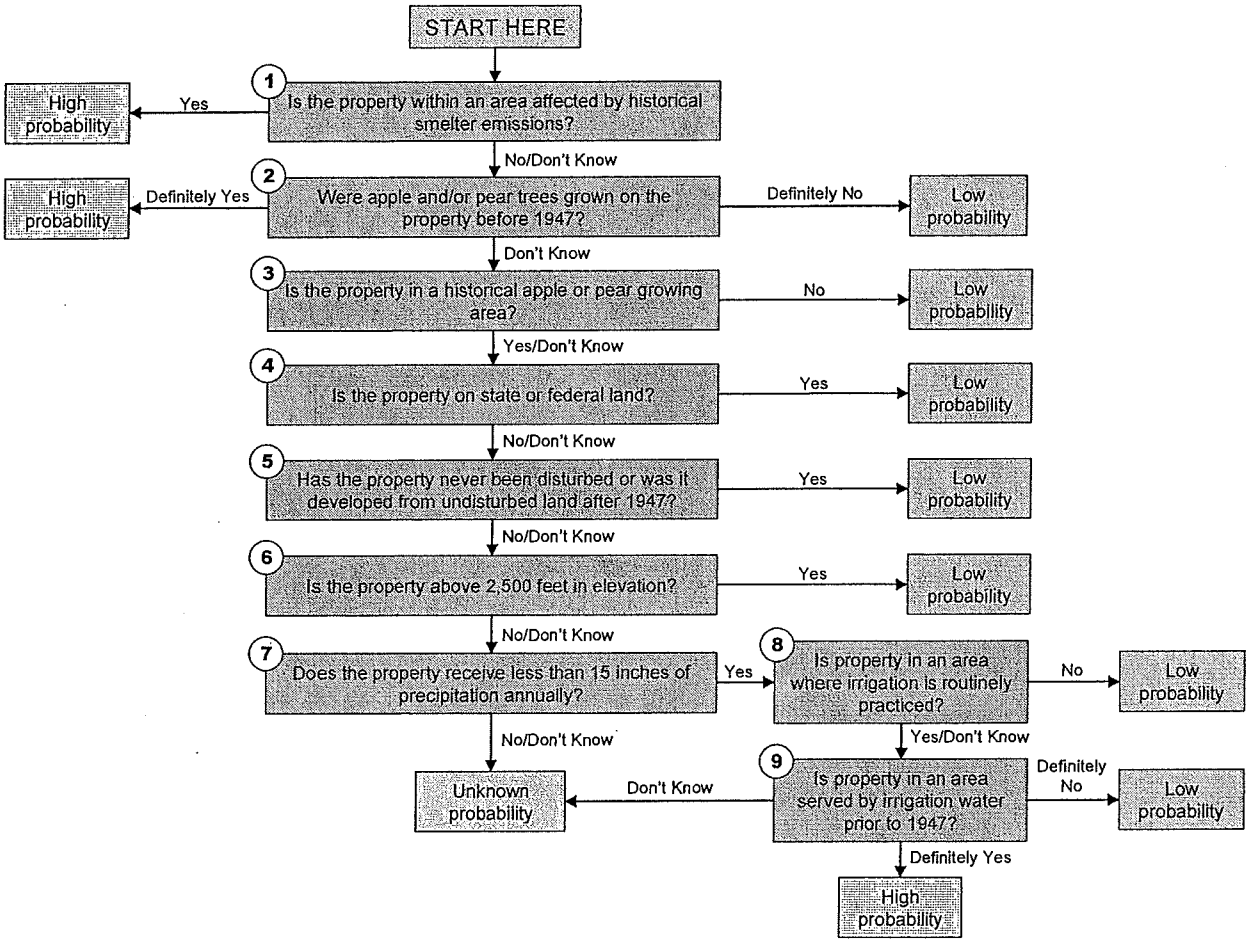
The Task Force recommends that information on the nature and extent of area-wide soil contamination be communicated using a combination of maps and accompanying narrative information. Maps can be a highly effective way to communicate available information about potential locations of area-wide soil contamination to the public. In addition to communicating information about potential locations of area-wide soil contamination to the public, the maps recommended by the Task Force serve a variety of purposes, including helping the Agencies to identify areas where an alternate approach under MTCA might apply (see Section 10 below) and helping the Agencies and local jurisdictions prioritize and focus efforts to address area-wide soil contamination in areas of probable soil contamination. For both the Tacoma and Everett smelters, Ecology, several local jurisdictions, and other organizations have collected and continue to collect data on where arsenic and lead soil contamination is likely to be present based on emissions, wind deposition, and results from a number of soil sampling events, and have developed maps to communicate this information. These maps were an important factor in the Task Force deliberations.

The Task Force believes strongly that maps should always be accompanied by information that describes what the maps show and the limitations of data on which the maps were based. As discussed earlier in this report, the precise boundaries of area-wide soil contamination are not, and likely will not be, identified using maps. Even where area-wide soil contamination is likely, the actual distribution and concentrations of arsenic and lead in soil vary greatly over short distances. Because of this limitation, the Task Force emphasizes that maps can be used only to communicate where elevated levels of arsenic and lead in soil are more likely to be present relative to other areas in Washington State. Maps do not show where elevated levels of arsenic and lead have actually been found, and many properties within identified area-wide soil contamination locations may, if sampled, be shown to have concentrations of arsenic and lead that are below MTCA cleanup levels.

Individual Property Evaluations

The Task Force believes that individual property evaluations are an important step in residents understanding the potential for area-wide soil contamination where they live. The Task Force emphasizes that these assessments are more important than locating a property on one of the maps discussed later in this report, because of the variability in the distribution of arsenic and lead. To support these evaluations, the Task Force has created the following flowchart.

Figure 2: Individual Property Evaluation Flowchart



Maps of Potential Area-Wide Soil Contamination

To supplement individual property evaluations, the Task Force recommends use of maps. Care should be taken to avoid misinterpretation of the maps. The Task Force emphasizes that the maps do not show where properties have been sampled and area-wide soil contamination found. Many properties within areas identified on the maps may, if sampled, be shown to have concentrations of arsenic and lead that are below MTCA cleanup levels. The maps only communicate where elevated levels of arsenic and lead in soil are more likely relative to other areas in Washington State. The Task Force recommends two tiers of maps and accompanying information.

- Tier 1: The first tier of maps and accompanying information should identify the general areas in the state where elevated levels of arsenic and lead soil contamination are more likely to be present based on historical smelter emissions and historical use of lead arsenate pesticides. Information accompanying Tier 1 maps should emphasize that maps do not show areas that have been found to be contaminated, but simply show where contamination is more likely relative to other places. Tier 1 information should be designed to raise general awareness about area-wide soil contamination in the widest possible audience and to help users decide whether to look at the second tier of more detailed maps and informational tools for more information.

- Tier 2: The second tier of maps and accompanying information should identify where area-wide soil contamination is likely to be present on more detailed, smaller scale maps of smelter plumes and historical orchard areas, where these areas are known. Information accompanying Tier 2 maps should include flowcharts and/or other informational tools to help individuals determine whether arsenic and lead soil contamination is likely to be present based on the location and land use history of individual properties (see Figure 2, Area-Wide Soil Contamination Flowchart) and whether to implement individual protection measures or other responses, including soil sampling.

It is important to reiterate that while maps show a greater or lesser probability of encountering elevated levels of arsenic and lead soil contamination based on proximity to historical sources, individual property evaluations are needed to confirm if elevated levels of arsenic and lead are actually present. Due to the variability of the nature and distribution of area-wide soil contamination, properties outside of areas identified on maps may contain elevated levels of arsenic and lead, while properties inside areas identified on maps may not, in fact, have elevated levels of arsenic and lead. The maps in this report include disclaimers to explain these limitations so that individuals are not given a false sense of assurance or concern about whether their property likely is affected by area-wide soil contamination.

Smelter Maps

The Task Force recommends that the Agencies rely on the following maps showing areas affected by historical smelter emissions.

- Tier 1: Figure 3 shows the general locations of areas affected by historical smelter emissions in Washington, based on information currently available.

- Tier 2: Figures 4–7 are smaller scale maps of areas affected by historical emissions form individual metal smelters.

Figure 3: Areas Potentially Affected by Historical Smelter Emissions, Based on Data Available as of January 2003

Figure 4: Map of the Area Affected by Emissions from the Tacoma Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003

Figure 5: Map of the Area Affected by Emissions from the Everett Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003

Figure 6: Map of the Area Affected by Emissions from the Harbor Island Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003

Figure 7: Map of the Area Affected by Emissions from the Northport and Trail, BC Smelters, Based on Data Available as of January 2003

Lead Arsenate Pesticide Maps

The location of areas affected by historical use of arsenical pesticides are not as well known or as extensively studied as areas affected by historical smelter emissions in Washington. Because of this difference, the Task Force recommends a slightly different mapping strategy.

- First, the Task Force recommends that the Agencies use Figure 8, which shows the total acreage of land potentially affected by lead arsenate pesticide use on apple and pear trees in each county, as the Tier 1 map for lead arsenate pesticide contamination. The Task Force considered many options for this map and attempted to develop a map that more closely resembles the state map of historical smelter emissions; however, the Task Force has concluded that at this time data are not available to develop a state lead arsenate pesticide map comparable to the state smelter map.

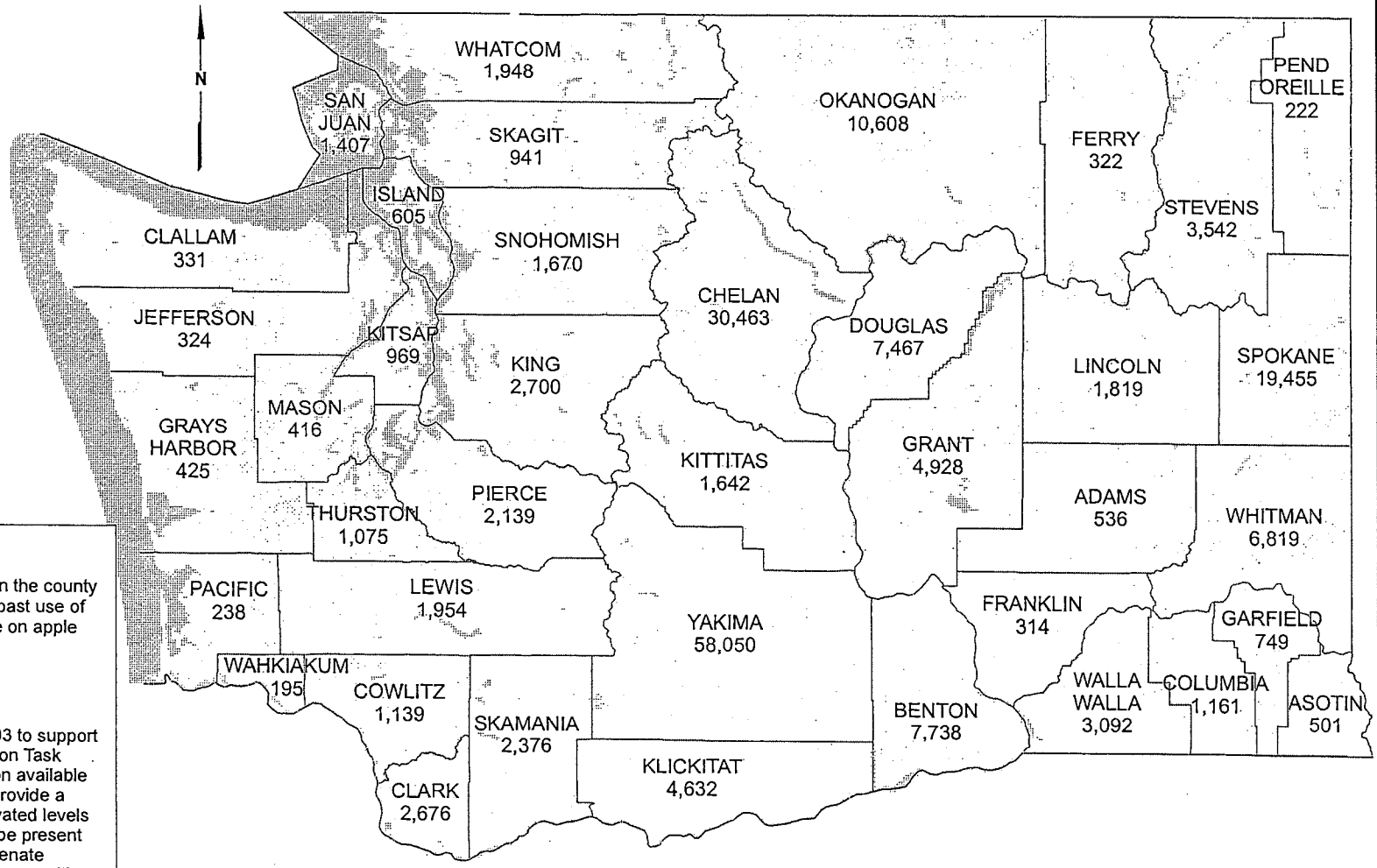
- Second, the Task Force recommends that the state map be supplemented by two types of smaller scale Tier 2 maps:

    - Maps of the general locations of areas potentially affected by lead arsenate contamination within individual counties, based on readily available land use information. The Task Force developed examples of these maps for Chelan, Okanogan, and Yakima counties (see Figures 9–11). These maps show areas that are below 2,500 feet in elevation (2,000 feet for Yakima County) and that are not state, Federal, or tribal lands. With a few exceptions, fruit trees are not likely to have been grown on state and Federal public lands, or at elevations greater than 2,000 or 2,500 feet (based the highest elevation of historical orchard locations in Yakima and Chelan counties). On the Yakima County map (Figure 11), an area west of Wapato where apple and pear trees were historically grown is shown as potentially affected, even though it is the property of the Yakima Indian Nation.

    - Maps showing the locations of historical orchards based on aerial photographs. Maps of historical orchards in Yakima county and in the Manson area near Lake Chelan are included in this report (see Figures 12–13) as examples of Tier 2 lead arsenate maps. These maps were developed by analyzing 1947 aerial photographs to identify the locations of historical orchards, entering this information into a geographic information system (GIS) database, and overlaying the locations of the historical orchards onto aerial photographs or other geographic data, such city and county boundaries and highways. Because apple and pear acreage was lower in these counties in 1947 than in previous years, these maps may fail to show lands that may be impacted by lead arsenate use.

Figure 8: County Acreage Potentially Affected by Historical Use of Lead Arsenate Pesticide

Figure 4: County Acreage Potentially Affected by Historical Use of Lead Arsenate Pesticide on Apple and Pear Orchards



Legend

1,948 Number of total acres in the county potentially affected by past use of lead arsenate pesticide on apple and pear orchards

Disclaimer

This map was developed in 2003 to support the Area-Wide Soil Contamination Task Force. It is based on information available at that time and is intended to provide a general indication of where elevated levels of arsenic and lead in soil may be present due to historical use of lead arsenate pesticides, so individuals and communities can assess whether to look in to additional information on area-wide soil contamination.

Figure 9: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Chelan County

Figure I-5: Potential Historical Orchard Areas in Chelan County (Based on Use of the Individual Property Evaluation Flowchart)

Legend

- Areas where historical orchards may have been located
- Areas where historical orchards are not likely
- Cities
- Lakes
- Roads
- County line

Disclaimer

This map should not substitute for a site-specific assessment. Not all of the areas identified on the map will actually have elevated levels of arsenic and lead in soil. Some properties outside of the identified areas may have elevated levels of arsenic and lead in soil.

The areas potentially affected by historical use of lead arsenate pesticides shown in this map were determined by excluding State, Federal and Tribal land and areas with elevations greater than 2,500 feet from the area of the county because these areas are unlikely to have had apple or pear trees grown on them.

This map was developed in 2003 to support the Area-Wide Soil Contamination Task Force. It is based on information available at that time and is intended to provide a general indication of where elevated levels of arsenic and lead in soil may be present due to historical use of lead arsenate pesticides, so individuals and communities can assess whether to look in to additional information on area-wide soil contamination.

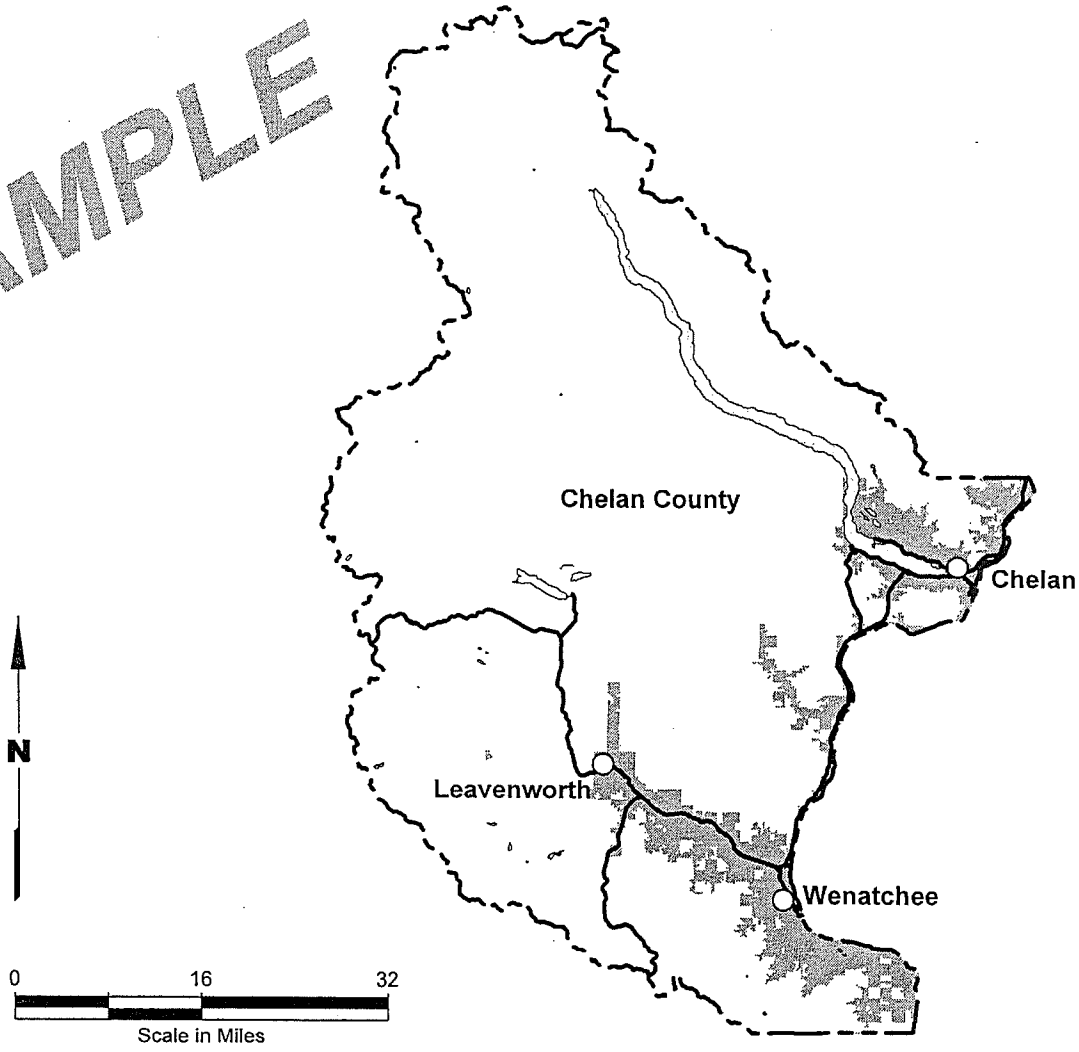


Figure 10: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Okanogan County

Figure 11: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Yakima County

Figure 12: Example Map of Historical Orchards in Yakima County

Figure 13: Example Map of Historical Orchards in the Lake Chelan/Manson Area of Chelan County

Recommendations for Improving Our Understanding of the Nature and Extent of Area-Wide Soil Contamination in Washington

The Task Force has two types of recommendations for improving understanding of the nature and extent of area-wide soil contamination: (1) recommendations that address developing and updating maps; and (2) recommendations for additional study of roadside lead contamination (discussed in Section 11).

Developing and Updating Maps

The Task Force has four recommendations for developing and updating maps of area-wide soil contamination areas:

- The maps produced to support Task Force deliberations (many of which were based on preexisting maps developed to support ongoing cleanup efforts associated with the Tacoma and Everett smelters) represent an important investment and should be used as the starting point for further mapping efforts, including efforts to identify areas that may be eligible for the alternative approach under MTCA discussed in Section 10 of this Report.

- The Agencies should use their statewide GIS capability to maintain state maps of area-wide soil contamination areas and to update the maps based on newly available data from sampling on public properties, including public schools and parks, and other public data sources.

- The Agencies should encourage, support, and provide financial assistance to local governments that want to identify historical orchard locations and, if appropriate, develop smaller scale maps of areas potentially affected by lead arsenate pesticide contamination. Depending on available data sources and local needs, these smaller scale maps may show areas potentially affected by lead arsenate based on land use information and/or may more specifically show historical orchard locations.

- The Agencies should coordinate with local governments to maintain and update smaller scale maps of areas potentially affected by historical smelter emissions and areas potentially affected by lead arsenate pesticides. These maps should be updated regularly based on newly available information from sampling on public properties, including public schools and parks, and other public data sources. Data from sampling on private properties may also be used to update maps, provided that the Agencies ensure that data from sampling at residences is not recorded at the level of individual properties, except in certain circumstances (see Section 8b).

Because the areas potentially affected by historical smelter emissions are already relatively well defined, the highest priority for funding efforts to refine understanding of the nature and extent of area-wide soil contamination should be to encourage, support, and provide financial assistance to local governments to identify historical orchard locations. In order to use financial resources most effectively, the Agencies should consider first providing "seed" money to local jurisdictions to research available data sources to determine the most appropriate means of identifying and mapping areas potentially affected by lead arsenate pesticide before providing full funding for map development. Financial resources should be made uniformly available to local governments that choose to develop maps.

6. Range of Protection Measures Considered and Evaluation of Protection Measures

Part of the charge to the Task Force was to consider the full range of protection measures that might be used to respond to area-wide soil contamination and to make recommendations about the most appropriate responses. To organize their discussions, the Task Force identified six categories of protection measures:

- **Education programs** refer to broad-based, community-wide efforts to inform individuals and businesses of the presence of contamination and changes in behavior that can be taken to limit or reduce exposure to the contamination. Such programs use a wide range of techniques to distribute information and increase public awareness.

- **Public health programs** generally involve activities designed to identify and focus protection measures on specific populations within a community considered to be at high risk. They often include health monitoring activities (e.g., blood lead testing or urinary arsenic screening), one-on-one education on steps to reduce exposure, and intervention activities to address sources contributing to elevated exposures.

- **Individual protection measures** are simple, day-to-day things that individuals can do to limit or reduce exposure to soil contaminants. Examples include washing hands with soap and water, removing shoes before entering homes, using gloves while gardening, scrubbing fruits and vegetables before eating them, wet mopping to clean surfaces indoors, and frequently bathing pets and washing toddler toys.

- **Land-use controls** are actions by government or private agreements that provide information on the presence of contamination on a property and/or that limit or prohibit activities that could result in exposure to contaminants. Examples include zoning, permits and licenses, covenants, easements, deed and plat notices, and real-estate disclosure.

- **Physical barriers** prevent or limit exposure to contaminated soil or unauthorized access to a property. Examples include fences, grass cover, wood chips, clean soil cover, geotextile fabric barriers (used under wood chips or clean soil cover), and pavement. Contaminated soil might be consolidated into a smaller area of a property and then covered with a physical barrier such as a parking lot, building or landscape berm.

Protection Measures Considered

- **Education Programs**: Public Meetings, Brochures and Newsletters, School-Based Programs, Posting No Trespassing Signs
- **Public Health Programs**: Health Monitoring and Home Visits or One-on-One Intervention
- **Individual Protection Measures**: Personal Hygiene Practices, Washing Garden Vegetables and Fruit, Reduce Dirt and Dust Inside the Home
- **Land Use Controls**: Permits and Licenses, Deed Notices, Real Estate Disclosure Forms and Practices
- **Physical Barriers**: Fencing, Vegetative Cover, Wood Chip Cover, Clean Soil Cover, Pavement
- **Contamination Reduction**: Soil Blending/Tilling, Soil Removal and Replacement, Phytoremediation

- **Contamination reduction** involves reducing the concentration of contaminants in soil through activities such as soil blending or tilling or phytoremediation, or removing contaminated soil for disposal at another location.

The Task Force identified four criteria for evaluation of protection measures: effectiveness at protecting humans, effectiveness at protecting ecological receptors (plants, wildlife), cost, and practicality. To support Task Force deliberations, the contractor project team researched specific protection measures within each category and rated each protection measure according to the Task Force's criteria. Each protection measures considered was rated for three land-use scenarios: a 0.2-acre residential property, a 2-acre residential property, and a 20-acre undeveloped property. The results of this evaluation are summarized below. The full evaluations are included in Appendix F.

Rating Methodology

Each protection measure was rated for each land-use scenario on a scale from "no effect" to "very effective," on a scale from "not practical" to "very practical," and, for cost, on a scale from $0 to $200,000 total (very low) to over $200,000,000 total (very high).

For protection measures in the categories education programs, public health programs, individual protection measures, and land-use controls, the rating of human health effectiveness was based on the level of participation these measures attract and the ability of these measures to influence participants to change behaviors or implement recommended actions. Human health effectiveness for physical barriers and reducing contamination was rated based on the ability of these measures to reduce the potential for exposure to contamination.

For ecological effectiveness, ratings for physical barriers and reducing contamination were based on the ability of the protection measure to reduce exposure to terrestrial plants, invertebrates, and wildlife. Protection measures in the education programs, public health programs, individual protection measures, and land-use controls categories do not reach ecological receptors such as birds, rodents, and reptiles and were therefore all rated as having "no effect."

Cost for the two residential scenarios was based on applying the protection measure to a population of 10,000 residents and 4,000 properties. Accessible contaminated soil was assumed to be present at a depth of 0.5 to 1.5 ft. over one-half of the 0.2-acre property and 90 percent of the 2-acre property. Cost for the 20-acre undeveloped property was based on applying the protection measure to a single 20-acre undeveloped property. Accessible contaminated soil was assumed to be present over the entire 20 acres at a depth ranging from 0.5 to 1.5 ft. Costs for application of the pavement cover protection measure to the 20-acre undeveloped property assume that contaminated soil is excavated, consolidated to 20 percent of the original property size, and that an asphalt pavement cover is placed over the contaminated soil. A 30-year project life is assumed for protection measures with recurring annual costs (e.g., education programs, public health programs).

Practicality ratings were based on evaluation of the technical, social, and administrative barriers to implementing a protection measure. For example, there are few social or technical barriers to holding meetings or sending brochures, but excavating soil from yards on developed residential lots is technically challenging and socially disruptive. Practicality ratings do not consider the ability to obtain funding. They are expressed on a range from "not practical" to "very practical."

Ratings

The Task Force worked on the protection measures ratings during summer of 2002 and finalized the ratings in the fall. The following table summarizes average ratings of all protective measures by category. Full ratings for each protective measure are included in Appendix F. Ratings for protection measures (e.g. vegetative cover or handwashing) were averaged to develop the summary ratings for protection measure categories. In many cases, ratings of protection measures varied within the categories, but the average rankings hide these variations. For example, ecological effectiveness for physical barriers ranges from "no effect" (for fencing and vegetation) to "effective (for pavement cover).

Table 2: Summary Ratings of Protection Measure Categories

	Residential Property				Undeveloped/Open Land			
Protection Measure Category	Human Health Effectiveness	Ecological Effectiveness	Cost	Practicality	Human Health Effectiveness	Ecological Effectiveness	Cost	Practicality
Education Programs	●○○○	○○○○	●●●○	●●●○	●○○○	○○○○	●●●○	●●●●
Public Health Programs	●●○○	○○○○	●●●○	●●●○	●●○○	○○○○	●●●○	●●●○
Individual Protection Measures	●○○○	○○○○	●●●●	●●●●	NA	NA	NA	NA
Land-use Controls	●○○○	○○○○	●●●●	●●●○	●●○○	○○○○	●●●●	●●●○
Physical Barriers	●●●○	●○○○	●○○○	●●○○	●●●○	●○○○	●●●○	●●●○
Reducing Contamination	●●●●	●●●●	●○○○	●●○○	●●●●	●●●●	●●●○	●●●○

Explanation of Ratings

Effectiveness ratings are based on the following scale:

○○○○ = No Effect
●○○○ = Minimal Effect
●●○○ = Some Effect
●●●○ = Effective
●●●● = Very Effective

Cost ratings are based on the following scale:

○○○○ = over $200,000,000 (very high cost)
●○○○ = $20,000,000 to $200,000,000 (high cost)
●●○○ = $2,000,000 to $20,000,000 (moderate cost)
●●●○ = $200,000 to $2,000,000 (low cost)
●●●● = $0 to $200,000 (very low cost)

Practicality is rated on the following scale:

○○○○ = Not Practical
●○○○ = Minimally Practical
●●○○ = Somewhat Practical
●●●○ = Practical
●●●● = Very Practical

Ratings for reducing contamination do not include ratings for phytoremediation, which tends to be less effective than soil blending or removal.

There was not much change in the rankings of protective measures between the land-use scenarios—most measures were ranked the same for a 0.2-acre or a 2-acre residential property and for a 20 acre undeveloped property. However, protective measures that rely on physical barriers or involve reducing contamination are slightly more practical and less costly at larger, undeveloped properties. Furthermore land-use controls such as zoning, permits, and licenses are more effective and more practical at undeveloped properties.

7. Broad-Based Education and Awareness Building

The Task Force believes that in most cases decisions about responses to area-wide soil contamination should be made by the individuals who may be exposed to the contamination or, in the case of children, by parents or other caretakers. Broad-based education and awareness building will give residents the information they need to make responsible choices about managing their potential exposure to arsenic and lead. These recommendations support and underlie the recommendations on responses in specific land-use scenarios discussed later in this Report.

Recommendations

The Task Force has 4 recommendations with respect to broad-based education and awareness building:

- The Agencies should work with and through local governments, particularly local health jurisdictions, to increase knowledge of area-wide soil contamination through a broad-based education and awareness building campaign. The goal of broad-based education and awareness building should be to provide individuals, organizations, and communities with the information and materials they need to make knowledgeable and responsible choices about responding to area-wide soil contamination.

- Education and awareness building materials and activities should be carefully balanced to provide accurate information while, at the same time, avoid creating unnecessary concerns or other unintended consequences. To meet various needs and to target resources, a toolbox of information and materials is needed, and a step-wise approach to outreach should be taken.

- Education and awareness building should focus on risks associated with exposure of children and of adults who have frequent contact with soil. The most important audiences for education and awareness building are people and organizations that care for children, including parents, educators, health care providers and childcare providers, and gardeners and other adults who frequently work in soil.

- The success of education and awareness building efforts should be monitored.

The Task Force believes that broad-based education and awareness building is an appropriate foundation recommendation for a number of reasons. First, this approach will give individuals the information necessary for them to make prudent and informed choices about the use of their property and what measures they might take to understand and respond to the potential for area-wide soil contamination. Second, an information based approach creates the possibility for Ecology to use intrusive methods for promoting protection of human health. Given the limited State resources that could be developed in the

short- and mid-term to more expensive, resource intensive approaches to addressing area-wide soil contamination, the Task Force concluded that it may be more feasible for Ecology to focus now on promoting voluntary efforts by property owners. Finally, the Task Force emphasizes that, as recognized by the Agencies in initiating this project, currently there is no systematic statewide effort to address area-wide soil contamination, the majority of potentially affected properties are not being addressed, and there is no plan to address them. In this context any approach that systematically encourages individuals to understand area-wide soil contamination problems and provides them with the support and information necessary to make responsible choices about limiting exposure to arsenic and lead in soil is a marked improvement over the current climate.

A "Toolbox" of Information is Needed

The Agencies should develop a toolbox of information and materials to help individuals (e.g., parents) and organizations (e.g., schools) understand the potential for arsenic and lead contamination at specific properties and identify actions they can use to reduce their potential for exposure to arsenic and lead. At a minimum, this toolbox should include the following:

- Maps showing where area-wide soil contamination is most likely to be found. The Task Force recommends a specific approach to mapping discussed in detail in Section 5 of this report.
- Materials that provide context for the maps and describe the variability of the nature and extent of area-wide soil contamination, so individuals outside of areas identified on maps are not given a false sense of assurance that they cannot encounter elevated levels of arsenic and lead in soil and individuals inside areas identified on maps are not given a false sense of concern.
- Materials, including flow charts and checklists, that describe how residents can use easily observable features of a property and readily available factual information to evaluate whether elevated levels of arsenic and lead in soil are likely to

Individual Protection Measures to Minimize Potential Exposure to Arsenic and Lead in Soil
(Based on Guidelines Developed by the Public Health–Seattle & King County, Tacoma-Pierce County Health Department, and Snohomish County Health District)

Inside Your Home:

- Take off your shoes before entering your home.
- Wash hands and face thoroughly after working or playing in the soil, especially before eating or preparing food. Use water and soap to wash - avoid "waterless" soaps.
- Wash hands your hands after handling your pet, and bathe pets frequently.
- Wash toddler toys and pacifiers often.
- Wash clothes dirtied by contaminated soil separately from other clothes.
- Clean surfaces by wet mopping, spraying with water, or vacuuming with a HEPA filter. Don't sweep or blow the surface.
- Change air filters regularly and properly maintain your heating, ventilation, and air conditioning system.
- Maintain painted surfaces in homes. Homes built before 1978 may contain lead-based paint. When older paint flakes it may become a source of lead.
- Minimize children's exposure to hobbies that use lead (e.g., in lead solder or paint).
- Eat a balanced diet. Iron and calcium help keep lead from becoming a problem in the body.

Outside Your Home:

- Keep children from playing in contaminated dirt.
- Do not eat or drink while working or playing in contaminated areas.
- Keep pets off of exposed dirt so they don't track it into the house.
- Fill any holes where dogs may be digging as soon they are noticed.

be present and whether exposure to soil is likely (see Figure 2 above and Table 2 below). This process is referred to as a "qualitative evaluation" and is discussed further in the child-use areas section of this report, which includes a specific qualitative evaluation checklist.

- Materials providing guidance on how to collect and analyze soil samples at typical types of properties (e.g., a residential yard) to determine if elevated levels of arsenic and lead in soil are present. Note that the Task Force does not assume or recommend that soil testing is necessary at each property potentially affected by area-wide soil contamination.

- Information on the health risks associated with exposure to low-to-moderate level arsenic and lead soil contamination, particularly the health risks associated with exposures of children and information on how parents can obtain blood lead level tests for their children.

- Materials, such as those developed by Public Health-Seattle & King County, that encourage good personal hygiene practices and other individual protection measures, such as frequent hand washing with soap and water to reduce exposure to arsenic and lead in soil.

What Does it Mean to Maintain Good Soil Cover?

The Task Force often recommends that individual protection measures be supplemented by actions that "maintain good soil cover." The intention of maintaining good soil cover is to further reduce the potential for people to come into contact with contaminated soil. Good soil cover can be maintained in a variety of ways, such as:

- Thoroughly cover bare patches of dirt with bark, woodchips, mulch, pea gravel, or other material
- Maintain good grass or other vegetative cover
- Install a geotextile fabric barrier (such as weed cloth) between dirt and cover materials

- Materials, such as those developed by the Washington State University Cooperative Extension, that describe individual protection measures, such as thorough washing of vegetables to remove dirt particles before eating, where soil has elevated levels of arsenic and lead.

- Materials, such as those developed by the Snohomish Health District, that describe individual protection measures such as wearing gloves and not eating or drinking in contaminated areas for utility and other workers, who may frequently come into contact with contaminated soil through their work.

- Materials describing the range of additional protection measures that might be taken to respond to area-wide soil contamination to complement use of individual protection measures, in particular materials that describe actions that can be taken to maintain good soil cover. This information should include guidance on how individuals or organizations may locate clean soil for use in gardens.

- Materials that identify organizations—such as local health jurisdictions, land-use planning offices, the National Lead Information Center, and regional offices of the Department of Ecology, the U.S. Department of Housing and Urban Development (HUD), and the Environmental Protection Agency (EPA)—and individuals that are available to answer questions and provide additional help in understanding and responding to area-wide soil contamination.

The Task Force has developed a toolbox on area-wide soil contamination for the Agencies to consider. This is attached as Appendix G.

In addition to materials for general use, targeted materials should be developed for individuals who care for children (e.g., parents, teachers, and child and healthcare providers), for adults who have a higher potential to come into contact with contaminated soil (e.g., gardeners and construction and utility workers), and for others who may play a role in implementing the Task Force's recommendations (e.g., real estate professionals). In particular, targeted materials for people who care for children should explain the health risks associated with exposures of children to arsenic and lead, how to use qualitative evaluations to determine the potential for children to be exposed to arsenic and lead in soil at a specific property, and, if potential exposures exist, how to mitigate exposures through good personal hygiene practices, other individual protection measures, and maintenance of good soil cover. Parents and others should be encouraged to consider not only the potential for exposure on their properties, but also the potential for exposure in other places where children play, including open land, and at construction and work sites in area-wide soil contamination areas.

Targeted Audiences for Education and Outreach

Targeted materials should be developed for the following specific audiences:

- Parents of young children
- Childcare providers and preschool operators
- School officials and operations, maintenance and grounds keeping staff
- Park officials and operations, maintenance and grounds keeping staff
- Gardeners
- Real estate professionals
- Construction, utility and other workers who have routine contact with soil
- Healthcare providers
- Homebuilders associations
- Local planning and zoning officials
- Agricultural workers and landlords with farm unit rentals and picker camps

The Task Force emphasizes that it is important for education and outreach materials to be written in a way that makes the information easily understandable for people who may not be accustomed to evaluating issues associated with exposure to hazardous substances in soil and that is balanced. Materials should be made available in appropriate languages for the range of potentially affected communities. To be effective, materials must be targeted for specific audiences and must be accompanied by outreach and follow up. Ongoing outreach is particularly important because it is likely that elevated levels of arsenic and lead in soil will remain at many properties for many years. Outreach will encourage people to remain attentive to area-wide soil

What Are Additional Protection Measures?

Additional protection measures are actions that individuals or organizations can take to physically alter properties in a way that reduces the potential for people to come into contact with contaminated soil. Additional protection measures might include:

- Contain contaminated soil under paved surfaces, structures, or in landscaping berms.
- Remove and replace small amounts of contaminated soil, especially in children's play areas and gardens.
- Till or blend soils to reduce surface concentrations of arsenic and lead.

contamination issues over time, and remind them to continue their practice of individual protection measures and maintaining good soil cover.

A Step-Wise Approach is Appropriate

To use resources effectively, the Agencies should take a step-wise approach to providing information about area-wide soil contamination, as follows:

Step 1: The Agencies should make basic, overview educational materials about area-wide soil contamination available to all residents. At a minimum, materials should be made available using the following means:

- Development and maintenance of an area-wide soil contamination website.
- Distribution to libraries and other public information repositories.
- Distribution to Ecology regional and field offices, local health departments, and to other locations where residents may go to seek information on environmental and health conditions.

Step 2: Where area-wide soil contamination is likely, the Agencies should supplement educational materials with outreach. Outreach should include routine briefings, trainings, and workshops for local health jurisdictions, planning and zoning agencies, operators of child-use areas, and other appropriate organizations to facilitate informed distribution of educational materials and ensure a solid understanding of health risks and exposure reduction measures. The Agencies should work with local governments and other organizations such as parent teacher associations to develop strategies designed to ensure that educational materials reach target audiences. For example, a county planning department could distribute a fact sheet on minimizing exposure to arsenic and lead in soil as part of the building permitting process.

Where is Area-Wide Soil Contamination Likely?

Based on available data, area-wide contamination is likely to be found in portions of counties potentially affected by off-site smelter emissions, such as portions of King, Pierce, Snohomish, and Stevens counties, and areas where apple and pear trees historically were grown, such as portions of Chelan, Okanogan, Spokane, and Yakima counties.

Step 3: Where area-wide soil contamination is known to exist because of soil testing, the Agencies should provide additional outreach, education, and resources as described below in the discussions of specific land-use scenarios.

Monitoring and Evaluating Effectiveness

Finally, the Agencies should monitor and evaluate whether the area-wide soil contamination education program effectively changes behavior and encourages greater adoption of individual protection measures and other measures recommended by the Task Force to reduce the potential for exposure to arsenic and lead in soil. Information gathered during this monitoring and evaluation should be used to improve and update education and awareness building materials and activities. Recent efforts to evaluate the effectiveness of area-wide soil contamination education programs in Pierce and King Counties have focused primarily on improving the content and format of educational materials such as posters and brochures, based on feedback from focus groups and written surveys. These studies have also gathered data on the extent to which residents report that they implement or would implement specific individual protection measures, such as taking off shoes before entering one's home. The Agencies should consider

the lessons learned from these and other evaluation efforts as they design a statewide evaluation and develop the toolbox and other broad-based and targeted educational materials about area-wide soil contamination.

8. Recommendations for Specific Land-use Scenarios

This section contains Task Force recommendations for specific actions that should be taken in specific land-use scenarios in places where area-wide soil contamination is likely. Additional actions are recommended in situations where the Task Force was particularly concerned about a specific population, such as children, or to take advantage of opportunities to leverage ongoing activities to implement more aggressive measures to reduce the potential for exposure to arsenic and lead in soil. The Task Force emphasizes that these activities are meant to build upon and complement—not replace—broad-based education and awareness building.

8a. Child-Use Areas

The Task Force is particularly concerned about exposure of young children to arsenic and lead in soil. Children tend to have greater exposure than adults to soil and dust because they often play on the ground, and tend to put things in their mouths, such as hands, pacifiers, and toys, which may have soil on them. Children are at greater risk than adults from lead because, when exposed, they absorb more lead than adults, and their rapidly developing nervous systems are more sensitive to lead damage. Parents already may be aware of the need to protect children from lead poisoning as a result of long-standing programs established to prevent children from exposure to residues from lead-based paints. Actions in other states or countries to address widespread soil contamination, as well as ongoing efforts to address area-wide soil contamination in Washington State, tend to prioritize activities that protect children. The Task Force felt a special responsibility to recommend actions that address even the potential for children to be exposed to arsenic and lead in soil, and spent much of its time considering recommendations for child-use areas.

What Are Current Approaches for Child-use Areas?

There are a number of projects to address area-wide soil contamination at child-use areas across Washington state, including projects associated with the ongoing cleanups of the Tacoma and Everett smelter sites and other affected properties, and projects at a number of schools and parks built on properties affected by past use of lead arsenate pesticides, including schools in Chelan and Okanogan Counties and parks in the City of Yakima. Current approaches often involve outreach to school officials to provide information and support for implementation of individual protection measures and maintenance of good soil cover, and systematic soil sampling at the child-use area under consideration, followed by selection and implementation of additional protection measures. The Agencies typically provide both technical and financial assistance for ongoing responses in child-use areas.

Types of Child-use Areas and Prioritizing Activities at Publicly Maintained Areas

The Task Force considered a number of types of child-use areas: primary schools and their associated playgrounds and playfields; public playgrounds and playfields (such as those at public parks); day- and childcare facilities, including preschools and family home childcare facilities; and camps. The Task

Force also distinguished between publicly maintained child-use areas, such as public schools and parks, and privately maintained areas, such as private schools, playgrounds, and childcare facilities.

In general, the Task Force believes that the same responses are appropriate at both public and private child-use areas and that over time potential exposure should be addressed at all child-use areas where area-wide soil contamination is likely. However, the Task Force also recognized that it may not be practical to address all child-use areas immediately. Accordingly, the Task Force recommends that publicly maintained child-use areas should be prioritized and responses in these areas should set the standard for protection of children.

Recommendations

In addition to the education and awareness building discussed earlier in this report, the Task Force recommends five responses for child-use areas where area-wide soil contamination is likely:

- Individual protection measures and maintenance of good soil cover in areas where children play to reduce the potential for children to be exposed to contaminated soil.
- Qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
- Soil testing where qualitative evaluations indicate the potential for exposure to contaminated soil and implementation of additional protection measures if contamination is found.
- Mandatory soil testing at new public child-use area construction sites and implementation of additional protection measures if contamination is found.
- Special approaches, including targeted outreach and a voluntary certification program, for family home childcares and childcare centers.

Individual protection measures and good soil cover

The first step to minimize the potential for children to be exposed to elevated levels of arsenic and lead in soil should be implementation of individual protection measures and maintenance of good soil cover in areas where children play. The Task Force emphasizes that it is not necessary to confirm that elevated levels of arsenic and lead are present in soil before implementing individual protection measures and providing for good soil cover. Rather, where area-wide soil contamination is likely, the Task Force strongly recommends that these measures be instituted immediately unless 1) qualitative screening indicates that elevated soil levels of arsenic and lead are not likely or it is unlikely children could be exposed to soil or 2) quantitative soil testing shows that elevated levels of arsenic and lead in soil are not present.

The Task Force believes this is a reasonable approach primarily for two reasons. First, as discussed above, children are the population most vulnerable to adverse health effects from soil contamination, particularly from exposure to lead. Second, implementing individual protection measures and providing for good soil cover in play areas are, to a great extent, consistent with the types of good personal hygiene practices and routine maintenance activities that should already be in place at schools, parks, childcares, and other child-use areas.

The Task Force recommends that the Agencies work with local health jurisdictions to support, encourage, and assist with implementation of individual protection measures. This may include providing training, briefings, or other assistance or materials to local health jurisdictions. In addition, the Agencies should work with local jurisdictions and other organizations, such as the Washington Association of Maintenance and Operations Administrators, to support, encourage, and assist with activities that maintain good soil cover and to integrate these activities into ongoing landscaping and maintenance. This may include providing training or information on the relative effectiveness of various soil covers and methods to maintain effective soil cover. Grass, for example, may not be an effective cover for contaminated soil on an athletic field or other child-use area if it is not properly maintained.

Qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures

The Task Force strongly encourages property owners/managers of other child-use areas to carry out qualitative evaluations of the potential for exposure to arsenic and lead in soil in places routinely used by children. Qualitative evaluations should use easily identifiable factors (such as elevation at properties potentially affected by historical use of lead arsenate pesticides) to determine if elevated levels of arsenic and lead in soil are likely, and easily observable features (such as the presence or absence of bare dirt) to identify situations when there is the greatest potential for exposure. Qualitative evaluations should help identify situations where there is or could be direct, frequent contact with contaminated soil over a period of months or direct contact with particularly high concentrations of arsenic or lead. The Task Force recommends that the following checklist be used to carry out qualitative evaluations.

What Does It Mean for the Agencies to Provide Support, Encouragement, and Assistance to Local Jurisdictions?

Local governments, such as health departments and school districts, often will play a key part in implementing Task Force recommendations. In many places in this report the Task Force advises the Agencies to provide "support, encouragement, and assistance" to local jurisdictions. Besides financial support, the need for which the Task Force expects will be universal, the Task Force has not attempted to precisely define what this support, encouragement, or assistance might involve. The Task Force emphasizes that the first step is for the Agencies to reach out to local jurisdictions in areas where area-wide soil contamination is likely to provide information on the issue and the Task Force recommendations, and to ask what types of assistance and support the local jurisdiction might need.

Table 3: Qualitative Evaluation Checklist for Understanding Potential Exposures to Arsenic and Lead in Soil

Please visit and walk around the site, preferably during daylight hours, before answering these questions.	
Q1. ***Is the property near a historical smelter location in Pierce, King, Snohomish, or Stevens counties?***	If YES or UNSURE, go to Q4. If NO, go to Q2.
Q2. ***Were lead arsenate pesticides used on the property historically (e.g., on apple or pear trees)?***	If YES or LIKELY, go to Q4. If NO, go to Q3.
Q3. ***Are portions of the property within 25 feet of a road built before 1995?***	If YES or UNSURE, go to Q4. If NO, elevated levels of arsenic and lead are not likely to be present in soil.
Q4. ***Do children routinely play in this area?***	If YES or UNSURE, go to Q7. If NO, go to Q5.
Q5: ***Do people spend a lot of time in this area (e.g., while gardening)?***	If YES or UNSURE, go to Q7. If NO, go to Q6.
Q6: ***Are there frequently used, unpaved paths or trails through this area?***	If YES or UNSURE, go to Q7. If NO, potential exposure to elevated levels of lead and arsenic in soil is less likely.
Q7: ***Is there any exposed dirt in play and high use/traffic areas (e.g., swing sets, gardens, sports fields, lawns, and paths)?*** Note: Asphalt, wood chips, grass cover, or other natural/synthetic barrier may help limit potential exposure to contaminated soil. The Consumer Product Safety Commission recommends that surfaces around playground equipment have at least 5-12 inches of wood chips, mulch, sand, or pea gravel, or are covered with mats made of safety-tested rubber or rubber-like materials.	If YES or UNSURE, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils. If NO, go to Q8.
Q8: ***Would you expect soils to be exposed at any time during the year (e.g., due to seasonal sports or other activities)?***	If YES, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils. If UNSURE, check with the landowner or organization responsible for maintaining the property to see whether a maintenance program is in place to ensure that play and high use/traffic areas remain thoroughly covered year round. If NO, the potential for exposure to contaminated soils is less likely.

Soil Testing and Implementation of Additional Protection Measures

Where qualitative evaluations indicate that children may be routinely exposed to contaminated soil, the Task Force recommends that property owners/managers of child-use areas conduct soil sampling to determine if elevated levels of arsenic and lead are actually present in soil. Guidance on how to carry out soil sampling is part of the "toolbox" of information discussed in Section 7 of this report and included in Appendix G.

Where soil sampling results indicate that elevated levels of arsenic or lead are present, property owners/managers of child-use areas should implement additional protection measures to reduce the potential for children to come into contact with contaminated soil. Additional protection measures to reduce potential exposure could include installing protective barriers such as geotextile fabric between contaminated soil and the overlying protective cover, removing and replacing small amounts of

contaminated soil, or consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms.

The Agencies should assist local jurisdictions, other organizations, and individuals select and implement additional appropriate protection measures where soil contamination is found. In addition, where physical barriers are used to reduce the potential for contact with contaminated soil are used, the Agencies should work with local jurisdictions and other organizations, such as the Washington Association of Maintenance and Operations Administrators, to integrate protection measures into ongoing landscaping and maintenance activities, and to ensure that these barriers are maintained.

In addition, the Agencies should work with school districts, park agencies, and other appropriate organizations to facilitate understanding of area-wide soil contamination and to prioritize response actions at schools, parks, and other child-use areas. In particular, parents of young children should be kept informed during all stages of assessment and cleanup processes through Parent Teacher Association meetings, school newsletters, community events, and other appropriate means. As with the broad-based education and awareness-building materials described earlier in this report, outreach activities where elevated soil levels of arsenic and lead are found should balance the need for accurate and complete information with the need to avoid unnecessarily frightening parents and other audiences, or creating unintended consequences or overreactions.

Finally, the Agencies should work together and with local jurisdictions to continue collection of soil data at public child-use areas where area-wide soil contamination is likely to better understand the extent of area-wide soil contamination and the potential for children to be exposed.

Special Considerations for Playgrounds and Playfields

The Task Force believes children have a high potential to come into contact with contaminated soil at playgrounds and playfields. By the nature of their use, playgrounds and playfields often have areas of bare dirt to which children could be exposed. Because these areas are typically publicly owned and operated, the Task Force believes there is a special responsibility to ensure that children who use these areas are protected.

The *Handbook for Public Playground Safety* published by the U.S. Consumer Product Safety Commission (CPSC) contains guidelines for maintaining children's safety in public playgrounds. It recommend that woodchips, mulch, sand, gravel, or shredded tires be installed and maintained to a depth of at least 5-12 inches (depending on the surfacing material selected) under playground equipment. The *Health and Safety Guide for K-12 Schools in Washington*, published by the Office of the Superintendent of Public Instruction (OSPI) and the Department of Health, recommends that all playground equipment at primary and secondary schools in Washington conform to CPSC's playground safety standards.

The Task Force recommends that the CPSC surface material guidelines be fully implemented at existing playgrounds at parks, schools, private camps, and childcare facilities. In areas where area-wide soil contamination is likely, the Task Force recommends that a geotextile fabric barrier (such as landscaping fabric or weed block) be incorporated below the surfacing material under play equipment to further limit the potential for contact with soil. For other play areas, such as sports fields, the Task Force recommends that efforts be made to minimize the potential for children to come into contact with contaminated soil, by maintaining good year-around grass cover and ensuring clean soil in areas of bare dirt, such as baseball field baselines. Sports fields primarily used by adults and older children may not need the same types of actions to reduce exposure because, in general, exposure is expected to decrease with age.

Soil Testing and Additional Protection Measures at New Child-Use Areas

Construction of new child-use areas, such as schools and playgrounds commonly involves earth-moving activities. These activities create important opportunities to address area-wide soil contamination. Incorporating soil sampling into the site selection and design process for new construction allows officials to modify construction plans to incorporate cost-effective, practical, and effective measures to reduce the potential for exposure of children, which may be more efficient than retrofitting existing child-use areas.

Where area-wide soil contamination is likely, the Task Force recommends that officials (e.g., school district superintendents or park managers) be required to test soils at proposed child-use sites during the site selection and design process. This is especially relevant at publicly funded child-use areas. Where soil sampling shows that elevated soil levels of arsenic and lead are present, officials should incorporate protection measures into construction plans and budgets Protection measures might include installing a geotextile fabric barrier below surfacing material such as woodchips, mulch, or grass cover in play areas; removing and replacing small amounts of contaminated soil; consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms; or other activities.

At school sites, the Agencies should work with local health jurisdictions and with the Office of the Superintendent of Public Instruction to assist school officials interpret sampling results and select of protection measures. Local health inspectors should confirm during regular site visits that sampling has occurred at school playground construction sites and that appropriate responses have been implemented. The Agencies should assist local health jurisdictions with these inspections.

Targeted Outreach and Voluntary Certification Programs for Childcare Providers

Many children spend significant amounts of time in commercial or family home childcare settings. This is particularly true for children who have not yet reached school age and who may be particularly vulnerable to exposures to arsenic and lead. Where area-wide soil contamination is likely, the Agencies should collaborate with the Department of Social and Health Services (DSHS) and local health districts to work with childcare providers to give them information about area-wide soil contamination and encourage them to take actions to reduce the potential for children to be exposed to arsenic and lead in soil. The Agencies should also collaborate with DSHS to establish a voluntary certification process that childcare providers can use to communicate that they have taken precautions to reduce the potential for children to be exposed to area-wide soil contamination or have verified through sampling that elevated soil levels of arsenic and lead are not present.

The Task Force recommends that targeted outreach to childcare centers and family homes should be integrated into and build upon existing processes that provide for the health and safety of childcare facilities, including regular inspections of childcare facilities by DSHS and local health jurisdictions and the DSHS licensing process. In particular, the Task Force recommends that training on how to identify and minimize potential exposure to area-wide soil contamination using individual protection measures, good soil cover, and other protection measures be incorporated into the existing STARS childcare training program and/or other annual training requirements for childcare providers.

The goals of the voluntary childcare certification program should be to (1) create a mechanism to raise awareness of area-wide soil contamination issues among childcare providers, (2) provide parents and other caretakers with information about how individual businesses have chosen to address area-wide soil contamination issues, and (3) assist parents to make informed choices about where to place their children. The Task Force recommends a three-step education and certification process:

- Step 1: Childcare center operators receive and review information prepared by the Agencies and/or complete training (through the existing STARS childcare training program and/or other annual training requirements) on how to identify and minimize potential exposure using individual protection measures, good soil cover, and other protection measures.

- Step 2: Childcare operators conduct qualitative assessments and/or contact local health districts to help them identify and take steps to minimize children's potential exposure to arsenic and lead in soil.

- Step 3: Childcare operators certify that soils have been tested using approved soil sampling protocols and have been found not to contain elevated levels of arsenic and lead or that the recommended protection measures have been implemented.

Upon completion of Step 3, the childcare center operator can request that DSHS issue a letter recognizing that the childcare operator has certified the steps that have been taken at the facility to minimize children's potential exposure to lead and arsenic. To encourage further adoption (and maintenance) of the actions and measures the Task Force is recommending, DSHS childcare inspectors and local health jurisdictions should review information about which childcare centers have self-certified to tailor outreach, education, and other discussions during their regular facility inspections. DSHS should also function as a clearinghouse for information on which childcare centers have participated in the voluntary certification program and should make this information publicly available.

The Task Force emphasizes that education and the opportunity for voluntary certification should be made available to all childcare providers, not just those who are covered by current licensing requirements. To minimize disruption at licensed facilities, certifications should be timed to renew and expire in conjunction with the childcare licensing cycle (i.e., every three years). If the soil at a childcare facility has been tested and found not to contain elevated levels of arsenic and lead, the certification should be permanent and need not be renewed.

The Task Force acknowledges that many childcare facilities, particularly those not covered by current licensing requirements, may have significant resource limitations and may be difficult to locate and reach. One potential benefit of broad-based education and awareness building is that it can create momentum for evaluating and responding to area-wide soil contamination issues within the childcare market, by creating increased demand on the part of parents for childcare facilities that have taken steps to understand and, when necessary, respond to area-wide soil contamination. The Agencies should consider the differences between types of childcare facilities in collaborating with DSHS and local health jurisdictions to develop education and outreach strategies, and should make financial resources available to childcare facility owners to support responses to area-wide soil contamination.

8b. Residential Properties

The Task Force is very concerned about the number of properties potentially affected by area-wide soil contamination and the practicality and cost of implementing protection measures at residential properties. At the same time, the Task Force recognizes that most residential properties are, essentially, child-use areas and that both children and adults are most likely to come into regular contact with soil at home, either through play, gardening, and other activities. However, the Task Force also recognizes that residents can choose whether and how to implement protection measures at their properties to address low-to-moderate levels of soil contamination. Therefore, the Task Force emphasizes that the Agencies should focus on supporting residents understand the potential for elevated levels of arsenic and lead in

soil at individual properties and take appropriate response actions. With these considerations in mind, the Task Force decided that responses to area-wide soil contamination at residential properties should be similar to, and no more stringent than, the approaches described above for child-use areas and that particular attention should be paid to three populations: children, gardeners, and other adults who frequently work in soil.

Recommendations

In addition to broad-based education and awareness building to increase residents' knowledge about area-wide soil contamination, the Task Force recommends that the Agencies encourage and support residents potentially affected by area-wide soil contamination in taking three actions:

- Implement individual protection measures and maintenance of good soil cover in areas where children play to reduce the potential for exposure to contaminated soil.
- Conduct qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
- Conduct soil testing where qualitative evaluations indicate the potential for exposure to contaminated soil and implementation of additional protection measures if contamination is found.

The Task Force emphasizes that these are activities recommended to residents, not recommendations for creating new regulatory requirements. The Agencies should focus on supporting residents through education and outreach and with financial assistance.

Individual Protection Measures and Maintenance of Good Soil Cover

As with child-use areas, at residential properties the first step in taking action to minimize the potential for children and adults to come into contact with contaminated soil is to practice individual protection measures and to maintain good soil cover. It is not necessary to confirm that elevated levels of arsenic and lead are present in soil before taking these actions. Rather, where area-wide soil contamination is likely, the Task Force recommends that all residents follow individual protection measures and maintain good soil cover unless 1) qualitative screening indicates elevated levels of lead and arsenic in soil or exposure to soil are not likely, or 2) quantitative soil testing shows that elevated soil levels of arsenic and lead are not present.

Qualitative Evaluations

Residents within areas of area-wide soil contamination should carry out qualitative evaluations to determine the potential for their property to have elevated levels of arsenic and lead in soil and the potential for exposures to contaminated soil. Qualitative evaluations should use easily identifiable features (such as property elevation in areas potentially affected by historical use of lead arsenate pesticides) to determine if elevated soil levels of arsenic and lead are likely and easily observable features (such as the presence or absence of bare dirt) to determine if exposure to contaminated soil is likely. A qualitative evaluation checklist is included in Section 8a above.

Soil Testing and Additional Protection Measures

Where qualitative evaluations show that elevated levels of arsenic and lead in soil and/or exposures to contaminated soil are likely, residents should consider soil sampling. Soil sampling will provide a basis for residents' decisions about what steps, if any, beyond implementation of individual protection

measures and maintenance of good soil cover should be taken to reduce potential exposures. It may also help confirm the absence of elevated levels of arsenic and lead, thereby obviating the need for individual protection measures or other responses. Guidance on how to carry out soil sampling is included in the "toolbox" of information discussed in Section 7 of this report and included in Appendix G.

The Agencies should provide incentives and opportunities for individuals who choose to sample soils on their properties. Specifically, the Agencies should work with local health jurisdictions to provide do-it-yourself sampling kits to residents upon request. These kits should include instructions on how to collect soil samples, tools for collecting samples, clear explanations of why the sampling procedures should be followed, and instructions on how to have soil samples analyzed. Furthermore, the Agencies should establish a mechanism to subsidize the costs of sampling at residential properties in area-wide soil contamination areas so that residents only need to pay at most nominal fees for soil analysis. Fees should be comparable to the costs to residents of other environmental monitoring programs, such as water quality testing. The Agencies could, for example, make X-ray fluorescence (XRF) machines available routinely throughout the year at easily accessible locations and charge residents only minimal fees for the on-site soil analysis. If XRF machines cannot be made available, the Agencies could provide vouchers to residents for reduced or low-cost analysis of soil samples at independent laboratories.

Finally, the Agencies should work with local health jurisdictions to assist property owners interpret soil testing results and select any appropriate protection measures. The Agencies should provide the appropriate context for sampling results so that residents understand the potential health risks from exposure to contaminated soils without becoming unduly alarmed.

Confidentiality and Reporting of Sampling Results

To protect the privacy of residents who choose to take advantage of soil sampling opportunities, data from soil testing conducted by individuals for their own use should be kept confidential and should not be associated with specific property locations in Agencies' records (i.e., residents' names and addresses should not be recorded in writing), unless (1) individuals volunteer/request to have the data used to update maps of area-wide soil contamination, (2) they request a No Further Action letter for the property from Ecology, or (3) the sampling results reflect concentrations that are not associated with area-wide soil contamination (i.e., that are not low-to–moderate). The Agencies' assistance with the interpretation of sampling results should be provided in ways that prevent property-specific data from becoming public. This is not the case for public properties such as public child-use areas, where the Agencies have the responsibility to educate parents and others about any contamination that is present.

If it is necessary for the Agencies to include information on sampling results from private residences in their records to provide financial and technical assistance, or as a way to provide for information that might be used to make maps of locations of potential area-wide soil contamination more precise, these data should be recorded only at the section, township, and range level. This level of detail should allow the Agencies to update area-wide soil contamination maps and help further target outreach activities and financial resources, while protecting the privacy of residents who choose to test soil on their properties. The Task Force recognizes that regardless of how the Agencies track and record sampling data, individual property owners who have information about the presence of elevated levels of arsenic, lead, or other contaminants on a property are required under existing real estate disclosure laws to disclose this information to buyers during real estate transactions.

Support for Additional Protection Measures Individuals Choose to Implement

Where soil sampling results indicate that elevated levels of arsenic or lead are present, residents should be encouraged to consider implementing additional protection measures to further reduce the potential for

exposure to contaminated soil. In some instances, individuals may choose to take additional actions to further contain or remove contaminated soil. Additional protection measures might include installing protective barriers such as geotextile fabric (e.g. weed cloth) between soil and landscaping materials or other soil covers, particularly in areas where children play. Alternatively, additional protection measures might include replacing small amounts of contaminated soil with clean soil in gardening areas or filling raised garden beds with clean soil.

The Agencies should support individuals who choose to implement additional protection measures by providing guidance on low-cost, effective, and practical solutions for covering contaminated soils, removing and replacing small quantities of soil, and other appropriate activities. The Agencies should also provide information on where and how to dispose of contaminated soil that individuals choose to remove from their properties.

To support individuals who choose to replace small quantities of contaminated soil with clean soil, the Agencies should look for ways to help residents locate sources of soil that meets the MTCA cleanup standards for arsenic and lead, e.g., by identifying soil suppliers or other means.

8c. Commercial Areas

As discussed above, the Task Force is most concerned about exposure of children to arsenic and lead in soil. In general, commercial areas are not frequently used for play by young children and tend to be covered with impervious surfaces such as buildings, parking lots, or other man-made and maintained cover, such as landscaping bark or gravel.

Recommendations

- Where commercial areas are covered with surfaces such as buildings, parking lots, or other effective soil cover, the Task Force recommends that no further response actions are necessary to address area-wide soil contamination.
- However, for mixed use areas, such as a childcare facility located in a shopping center, the Task Force believes that its recommendations for the non-commercial use should be considered for the non-commercial operation. In other words, in this example, the child-use area recommendations should be considered for a childcare facility located in a shopping center or other largely commercial area.

8d. Open Land

Open land includes undeveloped properties, agricultural land that is no longer in production, and other developed properties that are currently vacant or abandoned. Agricultural land that is being fallowed is not considered open land and is not addressed by these recommendations. The Task Force considered two categories of open land: open land that is being developed and open land that is not proposed for development. Although there is the potential for both human health and ecological impacts from area-wide soil contamination at open land, this section only addresses risks from human exposure. Ecological concerns are discussed in Section 8e below.

Recommendations

In addition to broad-based education and awareness building, the Task Force recommends that the Agencies support and encourage the following activities for open land in areas where area-wide soil contamination is likely.

- Amending the State Environmental Policy Act (SEPA) checklist to include a question designed to prompt consideration of the potential for area-wide soil contamination during new development.

- For open land being developed, qualitative evaluations to increase understanding of whether area-wide soil contamination is likely and, where area-wide soil contamination is likely, soil testing before construction, implementing additional protection measures if contamination is found, and using plat or other notices to record information on property status.

- For open land being developed, implementation of existing requirements and policies governing worker protection and safety, and control of fugitive dust and surface water, to minimize the potential for exposure to area-wide soil contamination at and near construction sites.

- For open land not being developed that is in or near residential areas, use of practical cost effective measures to limit trespassing and the potential for soil exposure and wind blown dust.

Open Land Being Developed into Other Land Uses

In general, the Task Force believes that responses to area-wide soil contamination at open land being developed should be consistent with the responses the Task Force recommends for the end land use, since the end land use most affects the potential for exposure. For example, the recommended responses described in Section 8a above for child-use areas are appropriate to consider when open land is being developed into schools, parks, childcare facilities, or other child-use areas. Because development activities generally include manipulation of the soil and grade at a site, new development also may offer opportunities to implement certain protection measures more easily and for less cost than at developed properties. Additional precautions are also warranted to prevent or reduce exposure of people who live near or work at construction sites and may be exposed to contaminated soil (including wind-blown dust) during construction activities.

The Task Force believes that the most appropriate way to address potential exposures during and after development is to integrate responses to area-wide soil contamination into the land-use review and development process. The Task Force recommendations include a series of actions that developers, construction workers, and property owners should take to reduce potential exposure and recommendations for how to work with existing land use planning and permitting processes to encourage implementation of the recommendations.

Recommended Activities for Developers, Construction Workers, and Property Owners

The Task Force recommends that developers conduct qualitative evaluations of properties and, where warranted, carry out soil testing at open properties prior to construction. Depending on the results of these evaluations developers should incorporate appropriate additional protection measures into site development and construction plans to reduce the potential for exposure to area-wide soil contamination on the properties after they are developed. Developers, for example, could take advantage the opportunities construction activities provide to contain and cap contaminated soil under roads, structures, or landscaping berms. Other options that might be considered include tilling or blending soils to reduce surface concentrations of arsenic and lead, installing protective barriers and good soil cover, and removing and replacing small quantities of soil, all of which are more cost effective if implemented

during rather than after properties have been developed. In general, as indicated in the Task Force's principles, the level of effectiveness and permanence of the responses should be greatest for proposed land uses where there is the greatest potential for exposure of children, gardeners, and other adults who have frequent contact with soil. The Agencies should set an example for private developers by adopting these practices for their construction projects.

Large Construction Sites

The Task Force received a number of comments from individuals concerned about proper transportation and disposal of contaminated soil during construction projects, particularly at large construction sites. There was a diversity of views about this issue on the Task Force. Some Task Force members thought that existing regulations governing management of construction sites and disposal of contaminated soil were adequate to address the issue. Other Task Force members supported developing additional guidance for management of soils with low to moderate levels of arsenic and lead.

During construction, the Task Force recommends that construction workers implement individual protection measures to reduce their potential for exposure to contaminated soil, consistent with U.S. Occupational Safety & Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements. Moreover, as a precautionary measure, the heightened awareness and safety precautions required for construction at properties where hazardous substances are known to be present should also be applied at properties where area-wide soil contamination is likely, unless soil sampling shows that elevated levels of contaminants are not present. Finally, since clearing areas for development exposes soils that could generate a lot of dust and erosion, the Agencies should work with state and local air and other authorities to ensure that appropriate precautions consistent with existing requirements are used to control dust and run-off during construction.

After development, the Task Force encourages property owners to use plat or other notices to record information on the status of properties where area-wide soil contamination is likely. Notices should, for example, record whether a property has been sampled and/or whether protection measures are in place.

Encouraging Implementation of the Task Force Recommendations for New Development

To encourage implementation of the Task Force recommendations, the Task Force recommends that the Agencies educate people who work on State Environmental Policy Act (SEPA) issues in local government, as well as other local planning and permitting officials, about area-wide soil contamination and how to respond appropriately to it. The Task Force believes that local land use planning and permitting processes represent an important opportunity to educate developers about the Task Force recommendations and assist developers with implementation of recommended activities. Local planning and permitting officials should be provided with educational materials to distribute to developers, property owners, and others early in the site development process. Materials should provide guidance on qualitative evaluations, soil sampling, and how to select and implement protection measures.

Furthermore, the Task Force recommends that the State Environmental Policy Act (SEPA) checklist, which is used to determine whether government actions require an environmental impact statement, be modified to incorporate a question about whether the property is located in an area where area-wide soil contamination is likely. For construction activities that are exempt from SEPA requirements, such as the construction of fewer than four single-family homes, the Agencies should work with local governments to leverage appropriate land-use or building processes to reach these development activities.

Open Land Not Proposed for Development

At open land not proposed for development and *not* in or near residential areas, the potential for exposure to area-wide soil contamination is generally low, since these areas are not likely to be frequented by children or other sensitive populations. The Task Force believes that broad-based education and awareness building activities should be sufficient to address potential health risks from human exposure to area-wide soil contamination in these areas.

For open land not proposed for development that *is* in or near residential areas, children could be exposed to area-wide soil contamination if they play or trespass on this land. The Task Force recommends that the Agencies encourage property owners to take practical steps to limit trespassing on their property, such as posting signs at vacant lots in residential areas. Concerned parents should take steps to ensure that their children do not trespass on open lands. Where appropriate, property owners might also consider taking practical, cost-effective steps to limit the potential for soil exposure and wind-blown dust, such as keeping open land covered with grass, hay, or other vegetation.

8e. Ecological Risks

There is a significant body of scientific information demonstrating that high levels of arsenic and lead in soils can adversely impact plants and animals. However, the ecological risks associated with the range of concentrations associated with area-wide soil contamination are less well understood. In general, low-to-moderate arsenic and lead soil contamination has been found to adversely impact several plant species in laboratory and field studies. At the same time, other field studies have documented healthy and thriving plant communities in areas with soil arsenic and lead concentrations of similar magnitudes. Ecological receptors such as plants and animals exhibit differing sensitivities and tolerances to soil arsenic and lead, which may over longer periods of time effect some changes in the distribution and thriftiness of the ecological community relative to an uncontaminated site.

Assessments of and responses to ecological risks are further complicated by site-specific circumstances. In general, ecological concerns at developed commercial and residential properties do not trigger response actions beyond those actions that would be necessary to protect human health. Cleanups of larger properties, such as open land, raise more

Specific Protocols for Addressing Area-Wide Soil Contamination

During the focus group meetings on the draft Task Force recommendations, a number of officials from local building and planning departments emphasized their need for clear, standard protocols for addressing area-wide soil contamination. The officials agreed that they were often in the best position to work with land developers and builders to address area-wide soil contamination, but explained that they were not, and were not likely to become, experts on qualitative evaluations, soil testing, or protective measures. Officials mentioned general permits under the Clean Water Act as an example of a successful standard protocol. Standard protocols (guidance) for qualitative evaluations and soil testing are included in the Task Force's recommended tool box. The Task Force finds the idea of additional standard protocols intriguing, but recognizes that in many cases it will be difficult to standardize selection and implementation of protective measures, due to the site-specific nature of these decisions. The Task Force recommends that Ecology work with local building and planning departments to continue to explore the concept of standard protocols, with a view towards providing as much certainty and predictability as possible to local planning officials, builders, and developers.

complicated concerns. The Task Force recommendations for response actions for open lands focus on reducing the potential for human exposure to arsenic and lead in soil through education and awareness building, but do not address protection of ecological receptors. Given the lack of definitive evidence for substantive impacts on ecological systems and the complexity of these issues, the Task Force recommends that Ecology conduct or support studies that evaluate the potential ecological impacts associated with low-to-moderate level arsenic and lead soil contamination. The results of these studies might suggest circumstances where measures beyond those recommended by the Task Force to limit human exposure are needed to protect plants and animals. Individual Task Force members expressed varying degrees of support for this recommendation. In particular, some Task Force members viewed studies of ecological impacts of area-wide soil contamination to be a lower priority than recommendations that address protection of human health. Other Task Force members considered these studies to be a critical step in appropriately responding to area-wide soil contamination.

[Placeholder for Root Vegetables section, being worked on by small group identified at April Task Force meeting.]

9. Real Estate Disclosure Recommendations

Over the course of its deliberations, the Task Force discussed Washington State real estate disclosure practices related to lead-based paint (in part as a response to the Residential Lead Based Paint Reduction Act of 1992-Title X) as well as similar types of environmental disclosure forms used elsewhere around the country. Current Washington state disclosure practices are centered around the mandatory use of the Real Property Transfer Disclosure Statement (WAR Form D-5 & NWMLS Form 17) for one to four single-family properties and the Disclosure of Information on Lead-Based Paint and Lead-Based Paint Hazards for homes built prior to 1978. The Real Property Transfer Disclosure Statement requires sellers to disclosure any knowledge of the presence of hazardous substances (including soils with concentrations of hazardous substances above cleanup levels). Although it is not typical for sellers and real estate professionals to use the Lead-Based Paint and Lead-Based Paint Hazards booklet to address elevated levels of lead in soil, the definition of "lead-based paint hazard" in the Residential Lead based Paint Reduction Act of 1992 – Title X includes "any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, and lead-contaminated point that is deteriorated or present in accessible surfaces. . .that would result in adverse human health effects as established by the appropriate Federal agency."

Recommendations

- Real estate transactions create another important opportunity to educate Washington state residents about low-to-moderate arsenic and lead soil contamination and ways to protect themselves and their families, employees, and others from potential exposure to such contamination. The Task Force supports the use of real estate disclosure practices to raise Washington state residents' awareness of potential lead and arsenic contamination on properties. To help enact these practices, the Task Force recommends that chartering agencies take the following specific steps.

- Encourage the Washington Association of Realtors to work with interested legislators to take steps to enact legislation requiring a real property transfer disclosure statement for vacant lands (in addition to the existing requirements for residential properties) and encourage the voluntary

use of the existing seller's property condition report for vacant land until such legislation is adopted.

- Work with and through the Washington Association of Realtors to strongly encourage real estate agents to use the lead-based paint disclosure form and the EPA lead pamphlet for all transactions (not only sales of homes built before 1978) or use similar disclosure documentation for the potential presence of contaminated soils where area-wide soil contamination is likely.

- Support the Washington Association of Realtors to create an education course for real estate agents about area-wide soil contamination or to incorporate relevant Task Force findings and recommendations (such as those contained in the Area-wide Soil Contamination Toolbox [Appendix G]) into realtors' existing course materials.

- Encourage the Washington Association of Realtors to draft an article highlighting the Task Force's findings and recommendations, including key elements of individual protection measures, for the *Washington Realtor*.

10. Application of the Model Toxics Control Act

[Placeholder: MTCA text being worked on by MTCA subgroup in an effort to reach consensus on conditions for enforcement forbearance and self-certification.]

11. Recommendations for Additional Information Needed

Recommendations for Data Gathering on Arsenic and Lead Exposure

To develop recommendations for responding to area-wide soil contamination, the Task Force had repeated discussions about the implications that elevated levels of arsenic and lead in soil may have for the health of Washington State residents. Based on these discussions, the Task Force understands there is only limited information available on the actual health of Washington residents who, because of where they live, work, or go to school, may be exposed to elevated levels of arsenic and lead in soil. The Task Force is concerned about this lack of health data for Washington residents, particularly with respect to children, who may be at greatest risk.

The Task Force encourages the Washington Department of Health, in partnership with other agencies as appropriate, to expand its use of blood-lead testing, fluoroscopy, or any other appropriate techniques to gather additional information on the health of Washington residents, particularly children, who may be exposed to arsenic and lead. The Task Force believes it is important for the Department of Health to look at both arsenic and lead, even though the test methods for arsenic have limitations. Furthermore, any studies should not be directed only at voluntary subpopulations, but should be representative of all of Washington residents who might be exposed to lead or arsenic in the soil. Appropriate use of random testing and finding ways to eliminate or minimize the effects of confounding factors, such as smoking and home remedies, are also needed to give a better picture of how the health of Washington residents might be affected by lead and arsenic in the soil.

The Task Force felt so strongly that additional information on the health of Washington residents who may be exposed to elevated levels of arsenic and lead in soil is needed that it offered this recommendation to the Department of Health approximately mid-way through the Task Force process. The Task Force acknowledges and appreciates the Department of Health's concern about the practicality of implementing this recommendation and about the need to apply the precautionary principle to potentially exposed populations. Nonetheless, the Task Force continues to feel strongly that gathering additional information on the health of Washington residents is important to continuing to refine an understanding of the effects of area-wide soil contamination and thereby focus response actions over time.

Additional Research on Roadside Lead Contamination

According to the study prepared by the contractor project team to support Task Force deliberations, little is known about the distribution of roadside lead in Washington or the concentrations of lead that are likely to be present in roadside soils. Analogous circumstances of other states and countries suggest that roadside lead contamination may be extensive and may occur in many areas routinely used by people, such as adjacent to driveways and residential streets. The Task Force recommends that the Agencies conduct further research to characterize the location and extent of elevated levels of lead in soil from past use of leaded gasoline in Washington. Research should be focused in areas where there is the greatest potential for exposure of children and where concentrations are likely to be the greatest, such as areas adjacent to older, more heavily used roads. If the results of this research warrant such action, the Agencies should extend implementation of the Task Force's recommendations the recommendations to areas that are most likely to be affected by combustion of leaded gasoline.

12. Funding Recommendations

The Task Force was asked by the Agencies to recommend possible funding sources for agency activities to address area-wide soil contamination. As part of this charge, the Task Force discussed which agencies, organizations, or individuals should pay for the activities the Task Force recommends to respond to area-wide soil contamination. A central theme in these discussions was that the state government, and in particular the Agencies, should provide financial assistance for local government efforts to address area-wide soil contamination, particularly the activities of local health jurisdictions, to avoid establishing unfunded mandates. Moreover, individual residents, childcare providers, and others who choose to take actions to address area-wide soil contamination should not bear the full burden of the costs to conduct property evaluations, implement individual protection measures, maintain good soil cover, and implement any other appropriate protective measures. The Task Force recognizes that state agencies do not have limitless resources and that there are competing demands for the use of available resources. This creates a need to target available resources effectively and seek additional funding from a broad array of potential sources.

To provide information for the Task Force's deliberations on possible funding sources and funding strategies, the project support contractor developed rough estimates of the costs to implement the Task Force's recommendations and researched potential funding sources for those recommendations. These cost estimates and the Task Force's recommendations on potential funding sources are described below.

Cost Estimates

The project support contractor developed the following estimates of costs to implement the Task Force's recommendations. These rough estimates were developed based on available information using a variety of assumptions. The estimates are intended to provide a general sense of the level of financial resources

that might be needed to implement the Task Force recommendations. They are not detailed, accurate estimates for budgeting purposes. Actual costs will vary according to the type and number of the activities implemented, where the activities are implemented, the level of effort and operating expenses of the implementing entities, the ability to leverage funding for existing programs, and many other factors. *Actual costs, therefore, may be considerably higher or lower than these estimates suggest.*

It is important to see these estimates in the full context of the Task Force recommendations. The estimates are designed to give information on activity costs; however, the implementing entity will not necessarily bear the full costs of the activity. For example, residents who choose to test soils on their properties will not likely bear the full cost given Task Force recommendations to subsidize sampling activities. Similarly, because most of the Task Force recommendations rely on individuals to make choices about how to live with area-wide soil contamination, not all of the activities for which cost estimates have been prepared will be carried out at every property affected by area-wide soil contamination. The following table provides unit cost estimates for some of the activities individuals and institutions may choose to implement to address area-wide soil contamination at developed residential properties (on an estimated 0.1 acre of land per residence) and during new construction of child-use areas, residences, or commercial or other developments on open land. Ranges of costs are provided to illustrate in a general sense how actual costs may vary.

Table 4: Cost Estimates for Activities in Residential Areas and New Development

Activity	Developed Residential Properties		Open Land Being Developed	
	Cost Range (per residence)[1]	Mid-Range Costs (per residence)[1]	Cost Range	Mid-Range Costs
Sampling[2]	$100-$300	$200	$1K-$3K/acre	$2K/acre
Individual Protection Measures[3]	low, primarily non-monetary costs	low, primarily non-monetary costs	low, primarily non-monetary costs	low, primarily non-monetary costs
Grass Cover (Using Hydroseed)[4]	$200-$750	$300 ($500 with surface preparation)	$3K- $7K/acre	$5K/acre
6" Woodchips + Barrier[4]	$2.1K-$4.5K	$3K	$21K- $45K/acre	$30K/acre
Clean Soil Cover (with Barrier & Hydroseed)[4]	$4.5K-$9.6K	$6.4K	$34K- $74K/acre	$49K/acre
Soil for Raised Garden Bed[5]	$200-$800	$500	$200-$800/garden	$500/garden
Soil Blending/Tilling (6" deep contamination)	$3.5K-$14K	$9K($5K w/o mobilization charge for equipment)	$56K- $120K/acre	$80K/acre
Soil Blending/Tilling (12" deep contamination)	$7K-$20K	$13K($10K w/o mobilization charge for equipment)	$106K- $227K/acre	$151K/acre
Soil Blending/Tilling (18" deep contamination)	$9K-$24K	$16K($13K w/o mobilization charge for equipment)	$155K- $332K/acre	$221K/acre
Consolidate Surface Soils & Cap with Asphalt (6" deep contamination)[6]	N/A	N/A	$55K- $120K/acre	$78K/acre
Consolidate Surface Soils & Cap w/ Asphalt (12" deep contamination)[6]	N/A	N/A	$67K - $143K/acre	$95K/acre
Consolidate Surface Soils & Cap with Asphalt (18" deep contamination)[6]	N/A	N/A	$78K- $168K/acre	$112K/acre
Soil Removal/ Replacement (top 6")	$11K-$23K	$15K	$56K - $120K/acre	$80K/acre
Soil Removal/ Replacement (top 12")	$18K-$39K	$26K	$106K- $227K/acre	$151K/acre
Soil Removal/ Replacement (top 18")	$26K-$56K	$37K	$155K- $332K/acre	$221K/acre
Dust Suppression During Construction[7]	N/A	N/A	$700-$1.5K/acre	$1K/acre
Plat Notices[8]	minimal	minimal	minimal	Minimal

Notes:
[1] It is assumed that 0.1 acres are treated (e.g., 0.1 acres are newly covered with woodchips) at each residence.
[2] These low estimates of sampling costs assume 4 samples are taken per residence (or 40 per acre at open land) and an average cost of laboratory analysis of $50 per sample. Actual costs will be greater if additional samples are analyzed (e.g., in the case of a new child-use area development).
[3] Costs include materials (dust masks, HEPA vacuum filters, etc.) as well as time and inconvenience.
[4] Actual costs for caps (e.g. grass cover, wood chips, or clean soil cover) will be lower if soil is already well covered.
[5] This estimate assumes that 18" of soil is spread over a 10'x10' garden bed; topsoil costs are based on average costs for soil at Seattle-area nurseries.
[6] Estimates assume that the consolidated and capped soil occupies an area that is one-third the size of the original contaminated surface area.
[7] This includes costs for a water truck and sprayer. Costs for dust suppression are included in the estimates for consolidation, removal, and tilling of soil.
[8] This assumes low administrative costs per property.

Where it was possible to develop rough estimates of funding needs for implementing the Task Force recommendations statewide, the project team developed two sets of estimates: (a) unit costs for each activity (e.g., the cost of sampling at one school) and (b) costs for the first 10 years of implementation of the recommendations (e.g., the cost of sampling 400 schools over 10 years). These estimates, as summarized in Tables 5 and 6 below, include potential costs for State and local efforts to develop and maintain maps, conduct outreach, investigate and address contamination at child-use areas, develop and adopt new policies, and conduct additional research and monitoring. Statewide costs are highly dependent on the number of places the activities are implemented (e.g., the number of local health jurisdictions implementing education and awareness building on area-wide soil contamination issues), which will depend on the choices of numerous individuals, organizations, and agencies as well as local needs and site-specific conditions, so these estimates have the greatest amount of uncertainty associated with them.

Table 5: Cost Estimates for Task Force Recommendations on Maps, Education, Technical Assistance, Policy Development, Research, and Monitoring

Activity	Unit Cost Range	Mid-Range Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Maps of Area-Wide Soil Contamination				
Initial Scoping Studies for Lead Arsenate Maps	$5K-$15K	$10K	$100K	If 10 counties decide to develop maps
Tier 1 Lead Arsenate Maps (by County)	$2.5K-$7.5K	$5K	$50K	Based on costs for existing Tier 1 county maps, assumes 10 other counties develop similar maps
Tier 2 Lead Arsenate Maps (Identifying Orchards)	$20K-$50K	$35K ($25K + $10K scoping study)	$350K	Based on costs for Yakima County Tier 2 orchards map, assumes 10 other counties develop similar maps
Defining Area-Wide Zones	$20K-$60K/yr	$40K/yr	$160K	Assumes 0.5 FTE is needed for 4 of 10 years
Data Management, Maintaining/Updating Maps	$23K-$68K/yr	$45K/yr	$180K	Assumes 0.5 FTE needed
Subtotal for Maps			*$740,000*	
Broad-Based Education and Awareness Building				
Developing Educational Materials, Providing Training and Support	$75K-$225K/yr	$150K/yr	$900K	Assumes 1 FTE and $50K/yr in materials & contract support for 6 of 10 years
Education Program Implementation (by Local Health Districts)	$65K-$360K/yr	$240K/yr (large populations), $130K/yr (small populations)	$12.6 million	Assumes King & Pierce County health districts use 2 FTE and $80K/yr for materials; the other 6 high-likelihood counties[1] use 1 FTE and $50K/yr for materials
Evaluate Effectiveness of Education in Increasing Implementation of Individual Protection Measures	$200K-$600K	$400K	$400K	Assumes baseline + follow-up survey; 0.25 FTE per high-likelihood county over 2 separate years
Subtotal for Education			*$14 million*	

Activity	Unit Cost Range	Mid-Range Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Support for Sampling and Selection of Protection Measures				
Assisting with Interpretation of Sampling Data, Selection of Protection Measures	$50K-$100K/yr	$75K/yr	$750K	Assumes 0.75 FTE needed every year
Review Land-Use/Building Permit Applications	$10K-$50K/yr	$30K/yr	$9.9 million	Assumes 0.25 FTE + $10K/yr in materials for 8 counties, 25 cities
Mobile XRF Analysis, Onsite Education to Support Residential Sampling	$60K-$200K/yr (8 counties); $15K-$45K per XRF machine	$130K/yr staffing & maintenance (8 counties) + $30K per XRF machine	$1.4 million[2]	XRF analysis & education provided 4 times per year (3-days each) in 8 high-likelihood counties, with 3 XRF machines, based on King Co. Wastemobile costs
Total Support Costs (in addition to education)			*$12 million*	
Commercial Areas				
Maintain Paved Surfaces, Landscaping, Other Soil Cover	minimal additional costs	minimal additional costs	Not estimated	
Rulemaking/Policy Development				
Changes to Real Estate Disclosure Requirements	$50K-$150K	$100K	$100K	$80K for salaries/benefits, $20K other costs
Add Question to SEPA Checklist	$50K-$150K	$100K	$100K	$80K for salaries/benefits, $20K other costs
Adopt New Enforcement Forbearance Policy	$40K-$120K	$80K	$80K	$60K for salaries/benefits, $20K other costs
Establish Self-Implementing System for Recognition that a Site is Clean	$25K-$75K (setup); $5K-$15K per year (maintain)	$50K setup; $10K/yr	$150K	0.3 FTE + $20K in materials to establish web-based, self-certification system; 0.1 FTE to maintain/update
Total Rulemaking/Policy Development Costs			*$430K*	
Research and Monitoring				
Research on Contamination from Leaded Gasoline	$75K-$225K	$150K	$150K	For initial study only; assumes ~8-10 acres total area sampled around different types of roads
Research on Ecological Risks	$50K-$150K	$100K	$100K	Assumes 0.5 FTE for 2 years for literature review and field research
Health Monitoring	$60K-$190K per year per health dist. ($25K-$75K startup)	$125K/yr per health district, $50K for startup statewide	$10 million	For 8 health districts; assumes existing State infrastructure can be used for startup; ~6,000 additional children tested per year
Total Research and Monitoring Costs			*$10 million*	
Total Estimated Costs *(does not include costs for*			***$37 million***	

Activity	Unit Cost Range	Mid-Range Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
residential, child-use, and open land scenarios)				

Notes:

[1] For the purposes of these estimates, "high-likelihood counties" are those counties that have the greatest numbers of acres potentially affected by smelter emissions and/or use of lead arsenate pesticides. These counties are King, Pierce, Snohomish, Stevens, Chelan, Okanogan, Spokane, and Yakima counties.

[2] Costs are largely independent of the number of residents participating. If 5,000 residents participate per year (50,000 over 10 years), providing this service will cost $28 per resident.

Table 6: Cost Estimates for the Task Force Recommendations at Child-Use Areas

Activity	Unit Cost Range	Mid-Range Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Qualitative Evaluations (Child-Use Areas)	$30-$80	$50	$105K	$50 for 1 hour assistance/education, if 100% of an estimated 2,100 child-use areas affected by area-wide contamination in 8 high-likelihood counties conduct evaluations[1]
Sampling – Schools	$2K-$6K	$4K	$1.6 million	Assumes sampling at 400 schools (100% participation)
Sampling – Parks	$1K-$5K	$3K	$1.5 million	Assumes sampling at 500 parks (100% participation)
Sampling – Childcare Centers & Family Home Daycares	$800-$3K	$2K/center, $1.6K/family home	$2 million	Assumes sampling at 300 childcare centers, 900 family homes (100% participation)
Subtotal: Property Evaluations			*$5.2 million*	
Individual Protection Measures	low, mainly non-monetary costs	low, mainly non-monetary costs	Not estimated	Costs include time, inconvenience, and some materials (e.g., HEPA filters for ventilation systems, vacuums)
6" Woodchips + Barrier in Play Areas – Schools	$10K-$23K	$15K	$4.5 million	0.5 acre treated at 300 schools (75% of total) – actual costs lower if some cover is in place
6" Woodchips + Barrier in Play Areas – Parks	$21K-$45K	$30K	$11 million	Assumes 1 acre treated at 375 parks (75% of total) – actual costs lower if some cover is in place
6" Woodchips + Barrier in Play Areas – Childcare Centers & Family Home Daycares	$4K-$18K	$12K/center, $6K/family home	$6.8 million	Assumes 0.4 acre treated at 225 centers, 0.2 acre treated at 675 family homes (75% of total) – actual costs lower if some cover is in place
Clean Soil Cover – Sports Fields	$13K-$29K	$19K	$9.5 million	Assumes 0.5 acres treated at 500 sports fields (e.g., baseball field lines)
Maintenance of Grass Cover – Schools[2]	$4.7K-$20K	$6.7K elementary school, $13K high/middle school	$2.7 million	Assumes in addition to regular maintenance: 3 acres seeded @200 elementary schools, 6 ac. @100 high/ middle schools, every 5 yrs
Maintenance of Grass Cover – Parks[2]	$7.7K-$17K	$11K	$4.2 million	Assumes in addition to regular maintenance: 5 acres seeded at 375 parks, every 5 years

Activity	Unit Cost Range	Mid-Range Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Subtotal: Protection Measures			*$39 million*	
Addressing Soil Contamination at New Child-Use Areas	See unit cost estimates for open land	See unit cost estimates for open land	Not estimated	
Development & Administration of Childcare Certification Program	$20K-$60K/yr ($25K-$75K to establish program)	$50Ksetup, $40K/yr administration	$450K	Assumes 0.25 FTE and $20K/yr for materials in addition to broad-based education costs above
***Total Child-Use Areas** (not including education, maps)*			***$45 million***	

Notes:

[1] Child-use area numbers (2,100 total child-use areas: 400 schools, 500 parks, 300 childcare centers, 900 family homes) represent the project team's estimates (+/- 50%) of the number of child-use areas in areas affected by lead arsenate and/or smelter emissions in 8 high-likelihood counties; they are based on information from local health departments, OSPI, and DSHS. These numbers represent about 15% of all schools statewide and about 13% of all licensed childcare facilities statewide.

[2] Estimates are for costs in addition to regular maintenance costs.

The Task Force recognizes that these estimates are based on information available at the time and do not represent the actual costs that will be incurred. As the Task Force recommendations are implemented, however, the Agencies may gain a greater understanding of the extent of potential exposure to area-wide soil contamination and the expected costs of preventing and reducing this exposure. The Task Force recommends that the Agencies work with local agencies and other appropriate organizations to refine and more precisely estimate costs for responding to area-wide soil contamination in individual localities. Furthermore, the Task Force recommends that the Agencies regularly update information on costs of sampling and protection measures described in the area-wide soil contamination toolbox to help individuals make informed decisions about actions to reduce potential exposure to arsenic and lead in soil.

Recommendations on Possible Funding Sources

In developing funding recommendations, the Task Force was motivated by several guiding principles:

- Wherever possible, individuals and institutions should minimize costs by integrating activities into existing processes and activities.
- State and local government agencies should provide information, technical assistance, financial support, and other incentives to residents and property owners to evaluate the potential for exposure to arsenic and lead in soil and to take effective, practical, and affordable steps to minimize exposure.
- State and Federal agencies should provide local agencies with the financial resources needed to implement any new obligations, in order to avoid establishing unfunded mandates.
- Resources to address area-wide soil contamination should be fairly allocated across the State.

- Persons or institutions responsible for the contamination under existing legal authorities should pay for actions to address it.

The Task Force recommends that the Agencies seek funding from a broad array of Federal, State, and private sources to implement the Task Force recommendations and proposes the following general funding strategy:

1. *The Agencies should expand the use of the State and Local Toxics Accounts to support actions to address area-wide soil contamination.* The State Toxics Account supports state agency efforts, including the hazardous sites cleanup program, while the Local Toxics Account provides funding to local governments and non-profit organizations for public education and outreach, individual property evaluations, cleanup actions, and other activities.

2. *The Agencies should seek funding from potentially liable parties such as pesticide manufacturers and smelter operators.* The Task Force recognizes that MTCA is based on the "polluter pays" model for financing cleanup of contamination, and that Ecology has a statutory obligation to seek to recover its costs in administering the MTCA program from potentially responsible parties. The Task Force believes that Ecology should discharge its legal duties wherever possible; at the same time, the Task Force recognizes that Ecology may face unusual challenges in trying to recover its costs for addressing area-wide soil contamination, and that, in some instances, it may not be feasible to recover some or all costs. Because of these potential difficult circumstances, the Task Force also recommends that Ecology look to other possible sources of supplementary funding, as discussed below.

3. *The Agencies should work with the Office of the Superintendent of Public Instruction to continue its efforts to identify and address contamination during new school construction and to explore opportunities to leverage school construction funds to provide priority for activities that address area-wide soil contamination issues.* The Task Force also encourages the Agencies to look for other opportunities to use existing funding programs to support local efforts to respond to area-wide soil contamination. Individual Task Force members had varying degrees of support for the recommendation to prioritize funds for new school construction to implement the Task Force recommendations. Some Task Force members believed that prioritizing school construction funds would provide additional incentives and necessary financial support to school districts to implement the Task Force recommendations and would be an important way to make use of existing processes to respond to area-wide soil contamination. Other Task Force members believed that school construction funds should continue to be prioritized based on current systems, but could be used to address area-wide soil contamination as part of construction of new schools.

4. *Finally, the Task Force recommends that the Agencies seek supplementary funding from private foundations, federal grant programs, and other federal, state, and private sources.* Specific examples of potential funding sources include federal grant programs, such as Environmental Protection Agency (EPA) Environmental Education Grants and the Department of Housing and Urban Development (HUD) Community Development Block Grants, and grants from private sources such as the Bullitt Foundation and the DuPont *Lead-Safe...for Kids' Sake* grant program. (See Appendix H for a more complete summary of applicable grant programs and other potential funding sources.) Many of these grant programs are available to local jurisdictions, non-profit organizations, and other entities. The Task Force recognizes that it will be difficult to obtain significant amounts of money from many of these sources, including the competitive and formula-based grant programs. Thus, it may be necessary to seek additional funding directly from Federal and State agencies or legislatures.

13. Appendices

- Appendix A: Glossary of Terms and Uses
- Appendix B: Task Force Charter, Task Force Membership, and List of Meeting Locations and Dates
- Appendix C: Summary of Public Review and Comment Process
- Appendix D: Summary of the Information Survey
- Appendix E: Institutional Frameworks Case Studies and Institutional Approaches in Other States
- Appendix F: Protection Measures Evaluation Tables
- Appendix G: Area-Wide Soil Contamination Toolbox
- Appendix H: Summary of Potential Funding Sources
- Appendix I: Summary of Task Force Recommendations
- Appendix J: Supporting Materials and Research for Institutional Frameworks

Ted Sykes

From: **"Hepner, Norm" <NHEP461@ECY.WA.GOV>**
To: **"'tsykes@kleinfelder.com'" <tsykes@kleinfelder.com>**
Date sent: **Thu, 30 Sep 2004 09:09:54 -0700**
Subject: **Commercial Property from Old Orchard**

Ted,

It was enjoyable talking with you this morning. This email is to provide some guidance and direction on Ecology's Voluntary Cleanup Program. My understanding based on your site description is that lead/arsenic contamination and some DDT is present above MTCA limits. Further, it is intended that the property be converted to commercial use with a significant portion of the property in building and asphalt. Ecology generally requires the following actions at these sites prior to issuing a No Further Action under the Voluntary Cleanup Program:

1. A restrictive covenant placed on the property. See boilerplate restrictive covenant at http://www.ecy.wa.gov/programs/tcp/vcp/modl_rc.pdf <http://www.ecy.wa.gov/programs/tcp/vcp/modl_rc.pdf>
2. Offsite disposal of lead/arsenic contaminated soil is allowed at a permitted Municipal Solid Waste Landfill.
3. All lead/arsenic contaminated soil remaining onsite must be covered. Asphalt parking lot and building is an adequate cover system.

I hope this information helps and provides sufficient direction and understanding. We look forward to providing you additional services through Ecology's Voluntary Cleanup Program [http://www.ecy.wa.gov/programs/tcp/vcp/Vcpmain.htm <http://www.ecy.wa.gov/programs/tcp/vcp/Vcpmain.htm>]

Norman T. Hepner, P.E.

Toxics Cleanup Program

15 W. Yakima Ave, Suite 200

Yakima, WA 98902

Phone: 509 457-7127

Fax: 509 575-2809