

MTCA Science Advisory Board Meeting Summary

March 18, 2004
9:00 am – 3:30 pm

EPA Region X
1200 6th Avenue
Nisqually-Pend Orielle Rooms
Seattle WA

Key Agenda Item: Defining Moderate Levels of Lead in Soils.

Agenda Items:

- Introductory Remarks
- Discussion: Defining Moderate Levels – Lead
- Public Comment
- Agency Update (Working Lunch)
- Discussion: Defining Moderate Levels – Lead (Continuation of Morning Discussion)
- Overview – Defining Moderate Levels – Arsenic
- Public Comment
- Next Steps

Attendees:

SAB Members: Dr. Hank Landau; Dr. Bruce Duncan; Dr. Elaine Faustman; Dr. Marjorie Norman
Agency Staff: Dave Bradley; Curtis Dahlgren; Michael Feldcamp; Dawn Hooper; Pete Kmet; Norm Peck
Public: Jim W. White; Warren Hanson; Karen Pickett.

Introductory Remarks and Review of January 12th Meeting Summary

Dr. Landau expressed his gratitude for the plaque presented at the January meeting and thanked the other Board members for their participation and contributions over the last 15 years. Dr. Landau noted that the Board is organized to address scientific issues. However, many scientific issues are intertwined with policy considerations and that the Board may also choose to comment on the policy aspects of an issue. He also urged the Department to consider new scientific information as it becomes available and make appropriate adjustments (either tightening or relaxing rule requirements) based on that information.

Defining Moderate Levels of Lead in Soils – Review and Discussion of Background Materials

Dave Bradley provided a brief summary of the January 12 meeting and the additional information provided to the Board in response to questions at that meeting. The Board proceeded to discuss some of those materials.

- Distribution of Elevated Soil Lead Concentrations: At the January meeting, the Board requested additional information on the nature and extent of lead soil contamination in Washington. In response to that request, Ecology provided (1) a summary of a review of available information on arsenic and lead soil contamination prepared by Landau Associates, (2) maps displaying the range of arsenic and lead soil concentrations in the Tacoma Smelter Plume and (3) a summary of data collected in soil surveys in Washington State. This information was designed to provide context for the Board's review of Ecology's working definition for lead-contaminated soils. The Board identified several limitations associated with available data:
- Robustness of Available Data: Dr. Faustman stated that her level of comfort/discomfort with the proposed action levels is influenced by the level of certainty that areas have been adequately characterized. She expressed concerns about whether available data was robust enough to detect elevated levels at particular properties given the potentially large variations in soils concentrations. Ecology indicated that the Department had similar concerns and that determinations on the level of contamination are being made based on property-specific sampling information. The sampling designs for individual properties take into account what is known about variability in soil concentrations. Ecology explained that the need for property-specific sampling was due to the fact that soil concentrations are highly variable which makes it difficult to estimate the concentrations on a particular property based on results from adjacent properties. Dr. Duncan recommended that Ecology use the results from ongoing sampling studies to periodically reassess the variability of sampling results in order to inform future sampling efforts. [NOTE: Ecology will provide the Board with additional information on the variability in soil concentrations prior to the next meeting.]
 - Use of Available Soil Data: Dr. Norman observed that conclusions regarding the utility of available soils data are related to the uses proposed for that data. She indicated that it was her understanding that the soil data had been collected in several studies for several different purposes and had been provided to the Board to provide general indication on the range and variability of soil concentrations found in those studies. Ecology agreed that was the intent behind providing the summary tables and stated that the data are not necessarily representative of the distribution of concentrations that might be found on statewide or regional basis (i.e. the distribution of concentrations will vary from place and place and property to property). Ecology stated that the Task Force had recommended a tiered approach to sampling areas and properties that reflect the multiple sampling purposes and data uses. This prompted a discussion on the various elements of the Task Force recommendations
 - Flowchart: The Task Force recommended that property owners conduct qualitative assessment using the flowchart included in the Task Force report. The Board expressed general support for the use of such a tool. However, Dr. Landau identified several flowchart provisions that might lead to erroneously concluding a particular property did or did not have the potential for elevated concentrations. In particular, he noted that lack of information may lead a person to conclude there was a low probability of elevated levels (as opposed to an unknown probability). Board members observed that it would be difficult for the average person to answer some of these questions. Dr. Norman stated that making soil information similar to that

presented in the maps available to people might assist in applying the flowchart to individual properties (i.e. answering questions like “Is the property within an area affected by historical smelter emissions?”).

- Identifying Areas of Concern/Mapping: The Task Force recommended that the chartering agencies work with local governments to develop maps or other mechanisms to give the public a general sense of where elevated levels of arsenic and lead might be present. The Board appeared to believe this was a sound approach. However, Dr. Faustman stated it was not clear that available data provided a reasonable basis for identifying areas of concern given the limited number of samples and the large amount of variability in soil concentrations. In particular, she expressed concerns that properties with high concentrations might be missed if determinations were made based on average concentrations found on a regional basis. Dave Bradley indicated that Ecology shared some of those concerns and that maps are viewed as screening tools that are one part of the overall evaluation process (including property-specific sampling). Dr. Faustman also suggested that maps include information on the number of soil samples used to estimate soil concentrations.
- Sampling individual properties to determine soil concentrations: The Board agreed with the Task Force conclusions about concentrations present at a particular property must be based on adequate sampling for that property. However, Dr. Faustman noted that property-specific sampling with a small number of sample locations may have a high probability of missing high levels of arsenic or lead. Dave Bradley stated that the Department has developed soil sampling guidance for residential and school properties. The guidance materials address the process of identifying sampling areas (e.g exposure units), designing a sampling strategy and collecting and analyzing soil samples. The materials discuss the tradeoffs (costs vs certainty) associated with deciding on the number of samples (but do not identify a recommended number for various exposure situations).
- Roadside Lead: Dr. Landau noted that the Task Force recommended that additional evaluation of roadside lead contamination in Washington State. He expressed concerns about the lack of information on lead concentrations in roadside soil and dust and suggested that the Board may want to recommend additional data collection. Pete Kmet provided some perspective on roadside dust and noted that it did not appear to be a widespread problem except at properties immediately adjacent heavy traffic areas. Dr. Norman observed that roadside lead was one of several sources that contributed to lead exposure problems in highly urbanized areas. Dr. Faustman noted that the State of California recently passed a law regarding the location of schools near highways. Although much of the discussion on this issue dealt with traffic safety concerns, environmental factors such as roadside lead were also important considerations. Dr. Duncan noted that automobile emissions/use also resulted in the release of other hazardous substances (e.g. PAHs) and that it was important to consider lead releases within this broader context.
- Blood Lead Test Results from Washington Children: At the January meeting, the Board requested additional information on blood lead testing in Washington. In response to that request, Ecology provided (1) the most recent summary of the blood testing results prepared

by the Department of Health (March 2003); (2) a summary of 2002 testing results (by county) with information on the percentage of children with blood concentrations greater than 10 ug/dL and between 5 and 9 ug/dL; and (3) a copy of the document "Washington State Childhood Blood Lead Screening Recommendations" which provides the recommendations and rationale for current blood testing programs in Washington. This information was designed to provide context for the Board's review of Ecology's working definition for lead-contaminated soils. Dr. Faustman stated that it is difficult to interpret the available data because blood lead testing performed in Washington is non-random (children are tested only if parent requests testing or the physician recommends testing). She suggested that Ecology examine the NHANES III data for Washington State (which included a random sampling design) separately from the blood lead testing results that are collected from clinics where children are tested only upon request. Dr. Landau noted that the county data indicates that the majority of elevated blood lead levels (5-9 and > 10 ug/dL) were reported in nine contiguous counties in Central Washington. He questioned DOH's conclusions and recommendations regarding identification of risk factors. The Board concluded that available data was sufficient to demonstrate that lead exposure issues in Washington did not appear to be as large as lead problems observed in urban areas like New York City and Boston. However, it would be difficult to conclude (from available data) that lead exposure is not a problem in particular areas.

- CDC Review of Blood Lead Guidelines: At the January meeting, the Board requested additional information on the health effects associated with blood lead concentrations below 10 ug/dL. In response to that request, Ecology provided copies of materials from the October 2003 meeting of the CDCP Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP). These materials included (1) a summary of the evidence of health effects at blood lead concentrations below 10 ug/dL prepared for the committee's review; and (2) the minutes from the ACCLPP's October 2003 meeting which include summarize the discussion of the draft evaluation. Drs. Norman and Faustman agreed that it was important for Ecology to consider the new scientific information on the effects of low levels of lead exposure when defining moderate levels of soil concentrations. They noted there are two aspects of current studies that are particularly important when evaluating approaches for responding to lead-contaminated soils.
 - No Identified Threshold for Health Effects: Scientists have not been able to identify a level of exposure (as measured by blood lead concentrations) where there are no adverse health effects.
 - Larger Incremental Response at Low Levels of Exposure: Available information indicates that there is an inverse relationship between blood lead concentrations and IQ scores. This relationship has been observed at blood lead concentrations above and below 10 ug/dL. However, one of the important differences observed in more recent studies is that there appears to be a greater reduction in IQ scores per increase in blood lead concentrations when blood lead concentrations are below 10 ug/dL. In other words, an increase in blood lead concentrations from 4 to 5 ug/dL appears to have a greater incremental effect on IQ scores than increasing blood lead concentrations from 14 to 15 ug/dL.

The Board also noted that several figures were missing from the materials downloaded from the CDC website. [NOTE: The Centers for Disease Control and Prevention (CDCP) has

added a revised version of the work group report (dated February 2004) to the CDCP website. The revised report (attached to this meeting summary) includes the missing figures.]

Defining Moderate Levels of Lead in Soils – Review and Discussion of Questions Associated with Characterizing Exposure to Lead-Contaminated Soils

The Board discussed several of the Ecology questions related to characterizing exposure to lead-contaminated soils. The following section identifies each question and summarizes the Board's discussions and conclusions related to that question.

- *Is there sufficient scientific information to conclude that incidental ingestion of soil and dust represents an important exposure pathway for young children and adults?* The Board concluded there is sufficient scientific evidence to support Ecology's conclusion that incidental ingestion of soil and dust is an important pathway of exposure for young children.
- *Is the conclusion "dermal contact with lead-contaminated soils does not represent a significant contributor to overall lead exposure" consistent with current scientific information? If not, what approach should Ecology use to evaluate potential lead exposure resulting from dermal contact with lead-contaminated soils?* Ecology noted that the IEUBK child lead model does not consider exposure resulting from dermal contact and that a screening level evaluation indicates that estimated lead uptake via dermal contact would generally be much less than the estimated lead uptake via soil/dust ingestion. The Board was not comfortable with this statement given that (1) the large amount of uncertainty regarding the dermal absorption factor, (2) the range of dermal-to-ingestion ratios (< 1% to 15%) do not take into account higher potential dermal exposures that might occur when children play in mud or moist soils, and (3) the information materials provided by Ecology indicate that dermal exposure could be as high as 10-15% of estimated exposures resulting from incidental ingestion of soil and dust. Dr. Faustman recommended that Ecology contact Dr. John Kissel (University of Washington) in order to obtain (1) information on dermal absorption of lead and (2) his opinion on the significance of dermal exposure to lead-contaminated soils. Dr. Norman indicated she would be comfortable with the approach reflected in the discussion materials if a dermal absorption factor of 0.001 is appropriate and the relative contribution from this pathway is 1-2% (relative to the soil ingestion pathway). If there is a reasonable likelihood that the contribution is greater than 1-2% of overall exposure, the Board recommended that Ecology run the IEUBK model with estimated dermal exposures included as an alternate source of exposure. At a minimum, the Board recommended that Ecology provide a qualitative discussion of this pathway when discussing uncertainty and variability in exposure estimates.
- *Is the conclusion "inhalation of wind-blown dust does not represent a significant contributor to overall lead exposure" consistent with current scientific information? If not, what approach(s) should Ecology use to estimate potential exposure levels? Are there situations where inhalation of wind-blown dust is a particular concern?* The Board reviewed the technical memorandum prepared by Landau Associates. The discussion revolved around two main issues: (1) Should Ecology consider inhalation of wind-blown dust when evaluating exposure to lead-contaminated soils? and (2) Has Ecology used appropriate methods and assumptions to characterize exposure via this pathway. On the first issue, the Board concluded that Ecology should consider this pathway when estimating overall lead exposure. However, the Board did not reach a conclusion on the second issue due to questions

surrounding the level of conservatism built into the fugitive dust models. Dr. Faustman noted that work at the University of Washington indicate that EPA models can underestimate ambient air concentrations. Dr. Landau noted the results in the technical memorandum raised question on the level of conservatism because the predicted concentrations using the EPA model were much lower than estimated levels based on observed particulate matter (PM₁₀) data (Dr. Landau noted these results were the opposite of what one would expect when using a screening model). Consequently, while the IEUBK default assumption appears to provide an upper-bound estimate, the Board noted that there was some uncertainty associated with that conclusion. The Board recommended that Ecology work with Landau Associates, the EPA Air Program or the Ecology Air Quality Program to expand this evaluation to address the Board's concerns. Dave Bradley noted that even if the predicted dust concentrations are increased by one-or-two orders of magnitude, the inhalation pathway still appears to contribute a small percentage of predicted lead exposure.

- *Is the following assumption consistent with current scientific information: lead concentrations resulting from the uptake of lead into homegrown fruits and vegetables are not significantly different than the lead concentrations present in the national food supply.* Ecology stated that additional lead exposure resulting from the consumption of homegrown fruits and vegetables was not considered in this evaluation (the underlying assumption being that exposure via this pathway is similar to dietary lead exposure from the national food supply). Ecology noted this in area where there is a large amount of uncertainty. Efforts to characterize exposure are complicated by uncertainties on plant uptake factors and variability in factors between plants and cultivars. Drs. Faustman and Dr. Landau stated that they believe this pathway could be significant and that assumption exposures are equivalent to lead exposure via the national food supply may underestimate exposure. Pete Kmet noted that frozen vegetables containing carrots grown in a former orchard near Quincy, WA had been recalled in early 1999 following the discovery of elevated levels of lead during routine sampling by the Department of Agriculture. However, those measures do not address homegrown fruits and vegetables. Ecology agreed to provide additional information on this incident to the SAB. The Board recommended that Ecology evaluate this pathway further and suggested that Dr. John Kissel may have information on (1) plant uptake of lead and (2) information on the consumption of homegrown fruits and vegetables in Washington.
- *Is Ecology's use of the IEUBK model to predict child blood lead concentrations associated lead-contaminated soils consistent with available scientific information?* The Board agreed that the IEUBK model is appropriate for use in estimating blood lead levels in children that might result from exposure to lead-contaminated soils. However, the Board also indicated that further evaluation was needed to determine whether the default model parameters were appropriate for use in characterizing child lead exposure in Washington State.
- *Is Ecology's use of the Adult Lead Model to predict fetal blood lead concentrations associated lead-contaminated soils consistent with available scientific information?* The Board focused their discussion on child exposure issues and did not discuss this question at the March 18th meeting.
- *Are there other models and/or approaches that the SAB believes Ecology should consider when attempting to predict child or fetal blood lead concentrations resulting from exposure to lead-contaminated soils?* Dr. Faustman observed that EPA is currently developing a new

model to evaluate lead exposure (the EPA “all ages” model). Ecology stated that the new EPA model was not scheduled to be available for widespread use until 2005.

- *Are the exposure parameters and assumptions used in the evaluation consistent with current scientific information?* The Board reviewed and discussed the exposure parameters and assumptions summarized on page 21 of the January discussion materials. Dr. Norman noted that the parameters could be divided into two groups (1) parameters that are not expected to vary between areas (e.g. parameters used to estimate the amount of lead absorbed from the gastrointestinal tract) and (2) exposure factors where Washington-specific values might be different than the national default values. The Board appeared to agree that the national default values were consistent with current scientific information. However, the Board recommended that Ecology give further consideration to the applicability of certain parameters to Washington State. The Board identified several parameters that were of particular interest:
- Soil ingestion rate: The Board suggested that Ecology evaluated the default soil ingestion rate in light of more recent re-analyses of soil ingestion data and the characteristics of Washington exposure scenarios (e.g. amount of bare vs grass-covered soils).
 - Exposure frequency/activity patterns: Dr. Norman and Dr. Faustman observed that activity patterns for children in Washington may differ from the activity patterns assumed in the IEUBK model.
 - Lead concentrations in household dust: Norm Peck (Ecology) noted that insulation materials used in many homes in Washington contain rock wool made from Asarco slag. The Board recommended that Ecology consider this and other information to determine whether the default relationships between lead concentrations in soil and household dust are appropriate for Washington. It was noted that Metro had funded several dust studies by John Roberts that might be source of Washington-specific information.
 - Consumption of homegrown fruits and vegetables: As discussed above, the Board recommended that Ecology consider this pathway further using available information on soil uptake factors and food consumption patterns in Washington State (i.e. percentage of households with gardens, consumption rates, etc).
 - Geometric Standard Deviation: Ecology stated that the evaluations were run using the default GSD value of 1.6. This parameter has a significant impact on the P₅, P₁₀ and P₁₅ values estimated by the IEUBK model (e.g a higher assumed GSD results in a higher predictions on the number of children with blood lead concentrations above 5, 10 and 15 ug/dL following exposure to specific levels of lead in soils). The Board recommended that Ecology use a GSD value based on Washington-specific information.
- *Are there particular population groups where the exposure parameters and assumptions used in this evaluation do not provide an appropriate characterization of potential exposure?* The discussion surrounding this question was integrated with the general discussion on exposure parameters and assumptions. The Board identified three population groups where the exposure parameters and assumptions used in the evaluation may not provide an appropriate characterization of potential exposure:

- Children Playing in Current Orchards: Dr. Landau raised concerns about children playing beneath the trees in current orchards where lead-arsenate pesticides had been applied in the past. He noted that the uneven distribution of soil concentrations and the potential for less ground cover might lead to exposure levels higher than those predicted by standard exposure models.
 - Older Children: Dr. Faustman recommended that Ecology consider potential exposure levels for children ages 36 – 48 months of age (in addition to children ages 12 - 36 months and 6 – 84 months). She noted that while the IEUBK model predicts the highest blood lead concentrations for the 12-36 month age interval (given equal exposures), different activity patterns among age groups might actually lead to greater potential exposure in slightly older children may be playing outside on a more frequent basis.
 - Adults Engaged in Activities with Higher Potential for Contact with Soils: The Board noted that certain occupations and activities have a higher potential than others for soil contact. The Board recommended that Ecology consider these situations when evaluating adult exposure.
- *Is the approach used to evaluate uncertainty and variability consistent with current scientific information? Does the approach appropriately identify important sources of uncertainty and variability? Does the SAB believe there is sufficient information on the distribution of various input parameters to allow the preparation of a meaningful probabilistic risk assessment?* The Board emphasized the importance of evaluating potential sources of uncertainty and variability in lead exposure and health risks. Drs. Norman and Faustman noted that this evaluation would necessarily include qualitative and quantitative components. They recommended that Ecology perform additional analyses:
- Variability in estimated exposures and relative contributions to variability: Dave Bradley noted that exposure estimates were based on a wide range of assumptions and parameters. He indicated that screening level analysis for the soil ingestion pathway indicates that variability in exposure estimates for the soil/dust ingestion pathway is primarily explained by variability in the soil/dust ingestion rates and GI absorption factors. On the other hand, variability in the soil/housedust concentration ratio and the percentage of time spent outdoors appear to be minor contributors (< 2%) to overall variability in the estimated exposure from this pathway. The Board recommended that Ecology conduct additional evaluations to characterize the variability in exposure estimates and the relative contributions to variability by the various input factors. Ecology agreed to provide additional analyses that provide information on the distribution of estimated exposures and the sensitivity of those estimates to variations in various input parameters.
 - Identify and (where possible) characterize the sources of uncertainty: The Board recommended that Ecology identify important sources of uncertainty and (where possible) characterize that uncertainty. Source of uncertainty identified during the meeting include (1) dermal absorption fraction; (2) levels of lead in the ambient air; (3) uptake factors for various fruits and vegetables; (4) food consumption patterns in Washington State. Ecology agreed to review the qualitative discussions of various sources of uncertainty and variability and the sensitivity analyses included in Section 3 and, where appropriate, to incorporate additional information on these and other sources of uncertainty.

Defining Moderate Levels of Lead in Soils – Review and Discussion of Questions Related to Human Health Risks Associated with Lead-Contaminated Soils

- *The CDCP guidelines are primarily based on adverse impacts on the central nervous systems of young children. In preparing this evaluation, Ecology made the assumption that responses based on this health endpoint will be protective of other health impacts/toxicological endpoints. Does the Board believe this assumption is consistent with current scientific information?* The Board stated it was appropriate to base decisions on central nervous system effects. However, the Board observed that (1) scientists have not been able to identify a threshold below which there is no health risk and (2) scientists have also identified a wide range of other health effects associated with low levels of lead exposure.
- *In preparing this evaluation, Ecology characterized health risks in terms of the probability that blood lead concentrations would exceed CDCP guideline values. Based on current scientific information, are there other methods and/or benchmarks that Ecology should consider when characterizing the health risks (either on an individual or population basis) associated with exposure to lead-contaminated soils?* The Board reviewed Sections 3 and 5 of the January discussion materials and provided several recommendations and observations related to this question. Dr. Faustman recommended that Ecology estimate soil concentrations associated with target blood lead concentrations of 5 ug/dL and 10 ug/dL. She noted this was particularly important given the current scientific studies and the emerging consensus on the adverse impacts of blood lead concentrations less than 10 ug/dL. Dr. Faustman also stated that using a target blood lead concentration of 15 ug/dL to distinguish between soils requiring no further action and soils requiring some type of action was inconsistent with current scientific studies.
- *Based on current scientific information, does the SAB believe that the CDCP guidelines provide a risk management goal that is comparable (in terms of the level of protection) to the risk management goals under the Model Toxics Control Act for other hazardous substances?* Due to time constraints, the Board did not discuss this issue.

Defining Moderate Levels of Lead in Soils - Information Collection

- *Given the evaluation results, where does the SAB recommend that Ecology focus additional information collection efforts?* The Board did not explicitly address this question. However, several potential information needs were identified throughout the day. These include:
 - Information on the concentrations of arsenic and lead in soils and the variability in those concentrations.
 - Information on the blood lead concentrations in kids in different parts of Washington State.
 - Roadside lead

Agency Update

The Board discussed several issues surrounding future meetings, membership and review topics.

- **Meeting Schedule:** The Board decided to reschedule the May Board meeting which will now be held on May 28, 2004 from 9:00 to 3:30 at the EPA offices. The Board also decided to schedule a meeting for June 22nd.
- **Recruitment for New Board Member:** Pete Kmet provided an update on efforts to fill the Board vacancy created by Dr. Richelle Allen-King resignation. He explained that Ecology had identified a list of potential candidates and asked the Board whether they would like to participate in the selection process. Pete explained that, based on earlier discussions with the Board, Ecology intended to fill that position with someone with hydrogeology experience. Drs. Landau and Norman said they would be willing to work with Ecology in filling that position.
- **Future Topics:** Pete Kmet informed the Board that Ecology planned to request their review of proposed fish consumption rates being developed to evaluate health risks in the Duwamish Waterway/Elliot Bay. He noted, however, that the timing of that review was uncertain.

Defining Moderate Levels of Arsenic in Soils - Overview

Due to time constraints, the Board did not discuss this topic.