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Richland Operations Office
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OCT 17 1995

Mr. Steve Alexander
Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 West Fourth Avenue, MSIN B5-18
Kennewick, Washington 99336-6018

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Dear Messrs. Alexander and Sherwood:

TRANSMITTAL OF HANFORD SITE BACKGROUND: PART 1, SOIL BACKGROUND FOR NONRADIOACTIVE ANALYTES, REVISION 3, AND RESPONSE TO COMMENTS ON REVISION 2

Attached are copies of Revision 3 of DOE/RL-92-24, Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, and response to comments on Revision 2. Based on extensive discussions with regulators and reviewers of Revision 2 of DOE/RL-92-24, only a few changes are required for final approval of the document. Revision 3 is attached in the form of page changes for your review and approval.

The primary change to Revision 2 is a recalculation of the summary statistics, and associated changes to charts, tables, and text references. These changes result from excluding 15 collocated samples from the systematic random sample set (the Hanford Site background reference set), as recommended by the reviewers and discussed in the attachment. No additional revisions are needed based on an evaluation of the comments and conclusions provided by reviewers. These reviews indicate that the conceptual model describing the distribution of chemical components is valid, as is the chemical characterization of the unsaturated zone. Thus, the information provided in this document is appropriate for use as sitewide background for various applications at the Hanford Site.

The second attachment addresses general and specific comments submitted to the U.S. Department of Energy, Richland Operations Office from the State of Washington Department of Ecology, as provided to them by their consultants. A number of the issues raised by the reviewers concerning the adequacy of samples and data have been previously discussed and resolved in reviews of previous background documents (e.g., WHC-MR-024 (1991), Sampling and Analysis Plan (1992), and two previous revisions of DOE/RL-92-24). However, responses to many of these issues are restated to clarify the use of these data as sitewide background, and to justify the extent to which these samples are appropriate for the characterization of radiological background for the

naturally occurring isotopes. These responses are also provided to correct any misunderstandings concerning the technical basis for the manner in which the soil background characterization activities were carried out, and the robustness and validity of the data set to serve as sitewide background for environmental activities at the Hanford Site.

If you have any questions, please contact Mr. R. F. Brich at 376-9031 or Mr. R. W. Ovink at 372-9631.

Sincerely,

for P. F. X. Dunigan, Jr.
Hanford Project Manager

RPS:RFB

Attachments (as stated)

cc w/attachs:
C. Cline, Ecology
L. Gadbois, EPA
J. Hoover, WHC
T. LeFrancois, BHI
S. Liedle, BHI
R. Ovink, BHI
S. Petersen, BHI

Responses to Comments on Revision 2 of DOE/RL-92-24

Responses to Comments on Revision 2 of DOE/RL-92-24 as Presented in Section 6.0 of PTI Environmental Services Review of Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes:

Comment: Additional information should have been provided regarding the geological facies where the individual systematic random soil samples were collected.

Response: The geological support staff that accompanied the sampling team could have provided more detailed information on the geologic facies at the systematic sampling locations. More detailed descriptions would have been included if the regulatory agencies had requested it in the comment and review of Revision 1. However, this issue is far less important than the information provided indicating that extensive vertical variability is an intrinsic characteristic of the soils in the vadose zone, and is a contributing factor to the chemical variability of the soils within the region.

Comment: The sampling scheme was not necessarily either systematic or random because of the focus on borrow pits and natural outcrops, which may have biased the samples toward specific grain size distributions not representative of the vadose zone materials as a whole. A stratified random sampling scheme (e.g., randomly collected samples from within identified strata representing the predominant geological facies) would have made more sense.

Response: The sampling scheme in the Sampling and Analysis Plan was approved by the regulatory agencies in 1992. As described in the soil background conceptual model, the focus on borrow pits and natural outcrops was neither narrow nor biased toward specific grain-size distributions, but rather just the opposite. The decision to use selected borrow pits and natural outcrops not only provided an improved basis to obtain representative samples throughout the stratigraphic sequence, but also enabled the sampling effort to include the complete range of dominant lithologies, size fractions, and modes that occur throughout the stratigraphic sequence laterally and vertically. Thus, this scheme provided a highly representative and efficient approach to sampling. It is doubtful that a better sampling scheme could be developed for this purpose without significantly greater costs. Moreover, the results of evaluations on grain-size analysis, modal distribution, and compositional distribution abundantly corroborate the representativeness of the approach used and the validity of the conceptual model.

Comment: The site background conceptual model may nevertheless be appropriate, in that the chemistry of the soils within the various geological facies is related by having common source materials.

Response: The validity of the site background conceptual model cannot be justified by the lone assertion that the various geological facies have common source materials. The validity of the conceptual model is based on data indicating that both grain size and modal composition contribute to the range and distribution of digestate chemistry of the soils. The reported data corroborate the prediction that a single distribution exists for each analyte because a largely

common suite of component minerals and rock types (having common origins and source material) occur in all samples in varying proportions and size distributions.

Comment: The procedure for modifying detected concentrations of certain analytes that were reported by the analytical laboratory is unjustified. The concentrations of analytes reported as detected should remain unchanged, regardless of whether they were below a detection limit assigned for the data set as a whole. The effect of this inappropriate modification of data on the overall interpretation of soil background concentrations is difficult to predict without reanalyzing all of the data. It is likely that the effect would be most pronounced for analytes with a large number of values at or near the detection limit (e.g., silver), while there would likely be relatively little effect for analytes with few values at or near the detection limit (e.g., nickel), and no effect for analytes with all values well above the detection limit (e.g., lead).

Response: The censoring of the data at the low end was done strictly for the purpose of producing a data set for which distribution estimates could be made. Detection limits were only used to establish rankings, and not for computing summary statistics. Sections D2-3 and D2-12-3 contain detailed descriptions of how detection limits were handled.

Comment: There are apparently significant differences in the concentrations of certain analytes with depth. The effect of such variations should be taken into account in any future uses of the data.

Response: Systematic variations in analyte concentrations with depth (e.g., pedogenic profiles) are not observed or expected for most analytes. The reviewers have mistakenly drawn conclusions from the plots presented in Figures 2 and 3 of their report. These plots are artifacts of the sampling scheme designed for opportunistic sampling of various parts of the stratigraphic sequence from surface or near-surface exposures (i.e., upper, middle, and lower parts of the stratigraphic section occurring near the present ground surface).

The plots generated by the reviewers show that most of the variability in chemical composition is, in fact, represented by samples in the upper 30 to 50 ft (9 to 15 m) from the sites selected to represent the stratigraphic sequence. However, these plots are also misleading because the only data plotted as occurring at deeper levels are from borehole samples. The comments regarding depth-composition relationships on the basis of these plots are not compelling because (1) compositional variability due to stratigraphy and variations attributable to depth (e.g., pedogenic) cannot be distinguished from these plots and (2) systematic vertical variations in the data were specifically evaluated, but were not observed at any of the sampling localities except for certain analytes in a few of the rare subordinate topsoils (e.g., playa or alkaline soils). The only other notable exception is the chloride profile for soils in the region, attributable to the semiarid climate and evaporative enrichment.

Comment: Insufficient justification was provided for use of the Weibull distribution over the lognormal distribution, given that the fit of the data to the latter distribution was not statistically rejected. Under MTCA guidance (Ecology 1992), use of the lognormal distribution is recommended, unless statistically rejected. Nevertheless, the differences in the 90th percentile values estimated from the two distributions are relatively inconsequential. Also, the procedures for fitting distributions to the data (e.g., how outliers were deleted and multiple distributions were identified) appeared subjective and should be substantiated.

Response: This issue is moot since DOE has proposed an alternative statistical method to Ecology's guidance (DOE/RL-94-72). This method is based on nonparametric methods and is currently under review by Ecology.

Comment: Treatment of the field split samples as independent samples is likely inappropriate. The preferred approach would be to use the average of the two split sample values as the concentration for that parent sample. The effect of U.S. DOE's treatment of the field split samples as independent samples on the statistical analyses of the data is difficult to discern, but may be relatively minor; the effect on the estimated percentile values does appear to be relatively minor.

Response: The reviewers have interpreted the field duplicates as field splits; however, the field duplicates were colocated samples rather than splits, as identified in Appendix D (page D-10). Although these duplicates can be treated as independent samples rather than splits, it has been agreed that the inclusion of the data from these samples in the systematic random data set would be a source of concern to some. Therefore, the colocated duplicate samples have not been included in the systematic random data set, and the summary statistics have been recalculated on the basis of 104 samples rather than the 119 reported in Revision 2 of the document. In addition, all tables, charts, and text references to the previous calculated parameters have been revised as necessary.

Comment: The representativeness of the systematic random data set was not adequately demonstrated by the various statistical treatments of the data. Use of the judgment samples to test the representativeness of the systematic random samples is questionable; it might have been more appropriate to collect additional systematic random samples instead.

Response: The representativeness of the data set should be evaluated primarily in terms of the conceptual model. In this context, the representativeness of the systematic random data set not only appears to be justified in terms of the statistical distribution characteristics of the soil chemistry for all of the analytes, but also by the companion data on modal and grain-size distributions.

In their conclusion, the reviewers state that "despite apparent deficiencies in both the approach to the characterization of Hanford Site soil background concentrations and in the statistical evaluation of the data, it may still be possible to use the data set for its intended purpose" (pg. 25). Most of the alleged deficiencies identified by the reviewers appear to result from misinterpretation or misunderstanding. The above responses to the primary issues raised by the reviewers are intended to clarify these misconceptions.