



Confederated Tribes and Bands
of the Yakama Indian Nation

Established by the
Treaty of June 9, 1855

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September 23, 1997

Mr. John D. Wagoner, Manager
U. S. Department of Energy
Richland Operations Office
P. O. Box 550
Richland, Washington 99352

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DOE-RL/DIS

94-2 COMPOSITE ANALYSIS SUGGESTIONS

Dear Mr. Wagoner

On September 16th, Doug Hildebrand of your staff and Battelle scientists provided our technical staff and the Columbia River Comprehensive Impact Assessment (CRCIA) Team an informal work-in-progress presentation of the Composite Analysis effort. We are very appreciative of the opportunity to become familiar with this extremely important analysis and the valuable time spent in preparing and presenting this material. Throughout the afternoon the exchange was cordial and constructive with many questions but very little contention. While we have some suggestions we would like to forward to your staff via this letter, we hope they are received in the constructive spirit in which they are offered.

As you know, members of our technical staff have reflected deeply in recent months about how to conduct major, difficult analyses like the CRCIA and the Composite Analysis. We are aware of the guidelines and limitations established for the Composite Analysis by the Defense Nuclear Facility Safety Board (DNFSB); it is not our intent to question those, even though we feel strongly they leave crucial factors out of the analysis (e.g., potential chemical contaminants). We hope DOE finds some usefulness in our suggestions.

With respect to the CRCIA, we await DOE's response to the virtually unanimous call at the Salt Lake City Workout for full funding of this analysis (\$23.8M across FY 98, 99, and 00). It is important to note that the policy level speakers at the table who were insisting that the CRCIA be funded did so with full awareness of the funding shortfall and of DOE's response to the TPA milestone regarding the CRCIA. The reasoning in that milestone letter simply is not valid in suggesting that DOE is funding cumulative risk assessment work which is equivalent to the CRCIA. While we plan to address this TPA milestone letter more fully in separate correspondence, it must be understood neither the Yakama nor, apparently, the other organizations at Salt Lake City accept that letter as satisfactory justification for failing to fund the CRCIA.

Sincerely,

Russell Jim, Manager
Environmental Restoration and
Waste Management Program

**RL COMMITMENT
CONTROL**

SEP 25 1997

**RICHLAND
OPERATIONS OFFICE**

cc:
CRCIA Team members
DNFSB
EPA Doug Sherwood
Ecology Mike Wilson
HAB Marilyn Reeves
DOE-RL Kevin Clarke

1 attachment:
Suggestions on the Composite Analysis

YAKAMA NATION SUGGESTIONS ON THE COMPOSITE ANALYSIS

Based upon an informal work-in-process presentation of the state of the 94-2 Composite Analysis made to the Columbia River Comprehensive Impact Assessment (CRCIA) Team on September 16, 1997, the following observations and suggestions are offered for consideration.

GENERAL

- Although the CRCIA Team has been intensively active for over two years in defining an acceptably comprehensive assessment in the same technical field as the Composite Analysis, the presentation received on September 16 was the first discussion of the content and technical approach of the Composite Analysis. Consequently DOE has, in the last year and a half of work on the Composite Analysis, missed months of opportunities for collaboration and potential improvement of both analysis efforts. Therefore, at this advanced stage it may no longer be practical to implement a number of the suggestions addressed below. Without many of these changes the results of the Composite Analysis may be meaningless and unusable.
- The purpose of the analysis states, in part, "[the analysis shall] estimate the potential cumulative impacts ..." It appears that the present work scope does not fulfill this purpose. At least at this stage of the analysis, impacts are not being estimated; only dose calculations are being made. It is not clear that impact estimates are planned, or if so, that impacts other than cancer are to be estimated. There are many other very serious potential impacts other than cancer and many other potential impacts than those directly affecting human health (e.g., impacts to ecosystems, cultural lifestyles, and regional economies).
- The purpose also includes a statement that the analysis is intended to be a decision aid. The work scope also falls seriously short of this purpose for the reasons discussed in the next four points: time of assessment, estimates and control of analysis uncertainty, definition and control of pivotal factors contributing most to the analysis results, and development of a responsive architecture for the analysis before significant resources were spent on disappointing intuitive approaches.
- If the time period assessed in the analysis must be held to such a small fraction of the hazardous life of the potential contaminants, then the analysis should at least estimate the trends in quantity, concentration, and migration rate of the potential contaminants at the conclusion of the time period studied. As we presently understand the analysis, potentially large and inaccessible inventories of dangerous contaminants (possibly accumulated in the vadose zone at the end of the study period) will not be assessed for their significance.
- Among the most elementary engineering principles applied in virtually every technological discipline in, at least, the last 200 years is that of design margin. Successful technical decisions, recognizing that uncertainty exists in all estimates, always includes conservatism in proportion to uncertainty. However, this practice requires knowledge of the extent of uncertainty prevailing in the matter. The Composite Analysis has no provision for tracking uncertainty. In fact, calculations are deterministic; there is presently no capability for stochastic work, nor are there any estimates for the extent of uncertainty introduced by assumptions, models, or field data quality (it is interesting to note that none of the Hanford cleanup technical solutions contains any recognizable design margin). Without the availability of reasonable estimates of uncertainty, it seems doubtful the results of the Composite

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Analysis will be able to be used as a decision aid as required by the project's purpose. Additionally, identification of the major contributors of uncertainty is a powerful tool in allocating resources, both Composite Analysis resources as well as actual cleanup field project resources.

- The information available on the status of the Composite Analysis indicates sensitivity analyses can yet be done to identify those parameters contributing most to the findings. However, it is equally apparent that the technical approach was not conceived with this need in mind. Consequently, it is difficult to determine which segments of the very lengthy calculations really are worth the analytical burden they represent and which potentially more significant factors have been excluded entirely or treated at an inappropriately coarse level of fidelity. An important example of this problem is discussed below in the analysis of vadose transport calculations. Definition and control of these considerations is generally achieved only during careful and insightful planning of analysis architecture.
- As discussed above as a part of the suggestions regarding uncertainty and dominant factors, early attention to analysis architecture is often where success or failure is decided, and it appears the next iteration of the Composite Analysis could benefit greatly if this subject area were to be revisited. For example, major benefits should be possible if analysis resources were allocated to segments of the problem in proportion to the extent of uncertainty and significance of contribution to results. There are likely to be other benefits as well such as selection of appropriate calculational tools (it appears that this problem exceeds the practical capability of spreadsheet methods).

SOURCE TERM

- An assumption has been made that all radiological sources on the Site will be removed to the 200 Area. Consequently, all transport calculations are being made only from the 200 Area. Although, as noted above, the extent of uncertainty introduced by this assumption and its significance is unknown, intuitively this seems to be a major biasing assumption indeed. Currently, contaminants in the soil column are being excavated only to a depth of 15 feet. Therefore, known groundwater plumes in the 100, 300, and 400 Areas are excluded from the Composite Analysis. In addition, vadose contamination below 15 feet is excluded.
- While the low level wastes from the U. S. Ecology landfill are being included, the soil/groundwater burden from the Supply System's power reactor operations and from Seimen's fuel fabrication facility are excluded. Again, the significance of these exclusions is unknown.
- Source term contributions from cleanup operations have been excluded as have contaminant accumulations from past reactor and processing production operations. These exclusions together with the commercial operations mentioned above leaves the Composite Analysis results without a frame of reference as to the significance of any Hanford contribution to the present and future contaminant burden in the environment.
- Another assumption which is very troubling is that if the analysts found there is no radiological characterization data on a facility or site, it is excluded. The canyon buildings and PUREX tunnels have been excluded by this assumption, at least for the first iteration of the Composite Analysis. This appears to be unwise and could be overcome by including estimates of reasonable bounding conditions (with associated estimates of uncertainty).

- In terms of impacts to human health, the environment, cultural lifestyles, and regional economics, it is highly likely that chemical contaminants are as significant as radionuclides. Reconsideration of this exclusion for the next iteration of the Composite Analysis is strongly suggested.

CONTAINMENT

- The Composite Analysis assumes 1000 years of certain cap integrity with only 0.5 mm of infiltration per year. This appears to assume a remarkable engineering accomplishment rivaling the performance of the deep geologic repository at Yucca Mountain. However, without estimates of uncertainty any suggestion that some other infiltration number should be used would not be very constructive. Perhaps in the next iteration a range of infiltration values should be explored to determine the infiltration threshold of unacceptable performance. Comparison of that threshold with the probabilities for climate change or cap deterioration would appear to be very useful information.

VADOSE TRANSPORT

- Analysts have included a very attractive method to treat variation in K_d . However, the significance of including this sophistication in the calculations is unclear, especially when the dominant parameter is, by all accounts, infiltration rate. With no insight into the uncertainty of the infiltration rate used, the reduction in uncertainty afforded by the analysts' treatment of K_d is of unknown importance.
- The infiltration rate appears to so dominate the results as to render the study's findings a highly questionable artifact of this key assumption.
- The present idealized treatment of moisture flow under caps considers only vertical flow originating through the caps. The current model assumes no lateral flow either into the soil column vertically under the cap or out of that soil column. As we understand it, a common geologic feature called a lens frequently causes such lateral flow to occur. The effect of the present vertical flow assumption appears to overly bias the study's results toward increased transport times, higher concentrations, and slower onset rates of contamination.
- Infiltration is used as an annual average. This is very conservative in that it disregards pulses which may occur with rapid snow melt, for instance.
- It is also assumed that future farming irrigation has no effect because of a postulation that in the future, irrigation water will be used with such a high efficiency that no surplus water remains to influence infiltration rate. This assumption appears to be both highly uncertain and very significant.

EXPOSURE

- The exposure lifestyle scenarios used exclude many of the present day cultural lifestyles indigenous to the area, for example, migrant Hispanic farm workers and Native Americans, both of which are more closely in contact with the environment and, therefore, potentially more at risk.

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- Native American lifestyles should be included in the Composite Analysis to comply with Treaties and Federal Trust responsibilities.
- The groundrule that causes exposure to be calculated only up to the Site boundary unfortunately excludes the distribution of contaminants by the Columbia River, potentially to many more receptors.
- In view of the exposure suggestions above, the analysis appears to ignore the interests of many Hanford stakeholders. The value of the Analysis would be enhanced if this condition could be corrected.