HANFORD ADVISORY BOARD

A Site Specific Advisory Board, Chartered under the Federal Advisory Committee Act

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Re: System Criteria to Guide Selection of Optimum Paths for Treating Hanford Wastes

Dear Ms. Olinger, Mr. Brockman, Mr. Manning and Ms. Miller,

Background

At its December 2008 meeting, the Hanford Advisory Board (Board) presented advice to the Tri-Party Agreement (TPA) Agencies to use a systems engineering approach for managing Hanford wastes (Advice #209). The focus is on examining the waste stream and ensuring that all risks are mitigated simultaneously. The Board recommended that criteria be developed and used to select the optimum path forward.

Recent U.S. Department of Energy – Office of River Protection (DOE-ORP) funded studies highlight issues with defining the proper path to deal with secondary

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wastes. As such, the Tank Waste Committee developed a set of criteria below to guide DOE-ORP as they work through the complex issues for treating these wastes. The Board expects that DOE-ORP will assess this recommendation together with their own perspectives, to develop a final set as an important tool for systematically selecting the best technical path forward.

Systems engineering focuses on understanding systems at several levels (constraints and requirements, criteria and performance, detailed layout in time and space, cost and manpower and other factors) to optimize the systems for best results. At the highest levels, systems engineering recognizes the constraints that dominate and control the possible solutions, next focuses thinking on potential alternatives, and then optimizes the best results.

The Board criteria are structured at three levels:

Top Level Criteria

The top level criteria are designed to be used by DOE-ORP, their contractors and the regulators as fundamental principles to guide decisions. In the Hanford historical terminology used in the mid-1990's, these are the "Capstone Level" criteria and are designed to input into "Level Zero" systems engineering assessments. The top level criteria are intended to serve as background guidance for brainstorming sessions on ways to provide quantum "out-of-the-box" alternatives to accelerate Hanford Site closure. The overarching top level criteria control or constrain the potential range of solutions and associated attributes (e.g. cost, schedule, priority and critical path).

Stakeholder and Legal Criteria

The stakeholder and legal criteria are to protect the workers and obey the law.

Guiding Criteria

The guiding criteria imply a degree of flexibility and an expectation that the criteria will be expanded and refined. The following top level, stakeholder and legal criteria are relevant and applicable to both DOE-ORP and DOE-Richland Operations Office (DOE-RL). The Board will follow with guiding criteria advice to DOE-RL as well as detailed discussions of each guiding criteria.

Explanations of the detailed thinking supporting the criteria are contained in the accompanying appendix.

Advice

Top Level Criteria

T1 - Remediate and protect the groundwater, soil, environment and Columbia River for long-term highest beneficial use.

T2 - Determine viable disposal paths for all waste streams so they meet environmental and human health risk requirements.

T3 - Mitigate multiple risks for preferred paths (e.g. simultaneously consider the final end state of the tanks and the surrounding and underlying soil).

T4 - Identify and select options that provide contingency paths where feasible (e.g. an alternate path if a geologic repository is not available). Clearly identify paths that lack contingencies as vulnerabilities.

T5 - Establish funding priorities that increase the probability of meeting or accelerating the end state. If feasible, mitigate the highest risks in the shortest time, provided that does not conflict with other criteria.

T6 - Favor proven technologies over unproven technologies while accelerating pilot scale demonstrations to determine credibility of promising options.

Stakeholder and Legal Criteria

S1 - Reduce risk to all workers by the thorough application of the Integrated Safety Management System.

S2 - Comply with all applicable National Environmental Policy Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation, and Liability Act, Atomic Energy Act, Clean Air Act, and Occupational Safety and Health Administration requirements, including early inclusion of Natural Resources Injury and Damage Assessment of impacts and costs to allow full comparison and analysis of potential alternatives and actions.

S3 - Honor Tribal rights and comply with treaty commitments and obligations.

S4 - Satisfy the current Hanford Federal Facilities and Agreement Consent Order (HFFACO, also known as the Tri-Party Agreement) or propose improved paths for risk mitigation with regulator approval.

Guiding Criteria

G1 - Ensure that the highest risk contaminants (e.g. technetium, uranium, iodine, neptunium, plutonium, cesium and strontium) have solid and realistic risk mitigation options. Place a priority on dealing with mobile contaminants that drive long-term risks (e.g. uranium and technetium).

G2 - Dispose of the highest and longest lived hazards in deep geologic disposal, not in near surface disposal at Hanford.

G3 - Favor concentration and isolation/destruction options over dilution and on-site storage.

G4 - Optimize waste stream blending to maximize uniform isotope concentration in the vitrified glass, thereby maximizing the performance of the vitrified glass waste form.

G5 - Factor in the increasing costs of inaction on risks (e.g. expanding soil and groundwater plumes or ongoing "hotel costs").

G6 - Give priority to retrieval and treatment of tank wastes, close sections of the site and/or of the tank farms to reduce the overall cost of operations.

G7 - Favor extracting the materials that represent a minimal potential risk (e.g. sodium, aluminum, zirconium, sulfates, etc.) to reduce the time the Waste Treatment Plant (WTP) is in operation. Such efforts should not adversely effect the initiation of WTP operations.

G8 - Reduce the risks the waste forms pose due to release of mobile or volatile components (e.g. ionic salts that bring isotopes to the glass surface) through selection of more durable waste forms or by process selections that minimize these effects from occurring.

G9 - Do not rely solely on risk assessment models for making cleanup decisions. Overreliance on models increases the chance that safety may be compromised and cleanup may either fail or be derailed as new information becomes available.

The Board recommends that DOE-ORP and DOE-RL sponsor a joint Strategic System Engineering Task Force to meet and brainstorm possible alternatives to rapidly accelerate tank removal and soil remediation under the suspected leaking tanks as soon as practicable. Membership should include the most strategic thinkers.

Sincerely,

Susan Leckband

Susan Leckband, Chair
Hanford Advisory Board

This advice represents HAB consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Doug Shoop, Co-Deputy Designated Federal Official, U.S. Department of Energy, Richland Operations Office

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Appendix

Below is a detailed discussion of each criterion.

Top Level Criteria

T1 is a restatement of the DOE-ORP mission.

T2 is to ensure DOE-ORP addresses the secondary waste issue in the near term. A systems engineering approach requires that solutions for secondary wastes/processes are available and likely to succeed before committing to building treatment, pre-treatment, and other facilities that process the waste. The decision to eliminate technetium removal from the pre-treatment facility is now a major risk driver in the burial grounds and is a major issue that needs to be mitigated in the secondary waste stream. Technetium is one of the dominant risk drivers in the long-term for wastes at Hanford. How the waste forms release technetium to the environment controls the risks posed, and ultimately whether DOE-ORP can succeed in the mission to clean up and process the wastes. As a result, emphasis should be on dealing with technetium and ensuring that it is strongly retained in whatever waste form(s) is selected.

T3 focuses on one of the fundamental advantages of using a systems engineering approach. Examining the end states and selecting options that achieve all end states simultaneously could accelerate schedules and lower costs. For example, currently DOE-ORP is focused on the end state at the conclusion of the 10-year tank farm operations contract (with extension). If instead there was a system level examination of the ultimate end state for final closure of the tanks and the surrounding soil, other alternatives would be examined; as an example, clean closure via utilization of mining equipment to extract the tanks and putting the soil through a Superfund-type soil washing system. This is just one potential alternative and not meant as the proposed solution. Early closure of the SSTs alone could save $100 million a year and would accelerate the final Hanford Site closure. However, the focus must remain on the requirements and criteria so as not to substitute a step (tank farm closure) for criteria requirements (risks under the regulations). It is important to engage in this thinking process prior to selecting the Tank Closure and Waste Management Environment Impact Statement alternatives. This process was a part of how the Rocky Flats Site was able to achieve historical breakthroughs on accelerating site closure. It is also an example of "capstone" level brainstorm thinking that should occur at DOE-ORP.

T4 is intended to institutionalize the systems engineering and project management practice of looking at possible credible future risks and analyzing alternative paths. This approach is a requirement in DOE project management and is a part of systems engineering best practices. An example is addressed in other Board advice on the implications of not having a repository to receive Hanford waste.

T5 recognizes the importance of setting a path focused on accelerating achievement of the ultimate end state. If possible, select near term steps that place priority on eliminating the highest risk as quickly as possible (e.g. focus on zone closure rather than individual higher risk tanks). Tanks cannot be completely closed and the costs cannot be significantly reduced on a tank-by-tank basis. To the degree possible, closures must include any inter-related areas or actions (e.g. other tanks, adjacent cribs or sites, pipelines, vadose zone and groundwater).

T6 reflects a frustration that some of the most promising technical alternatives are not considered viable because they have not been demonstrated at a pilot-plant scale. The "Catch 22" result is to select poorer alternatives that are more costly and less effective to reduce risks since the funding to verify a much more cost effective solution was not a priority. This result is short-sighted thinking reflecting the reality of dealing with budget constraints.

Stakeholder and Legal Criteria

S1 is to ensure that alternatives to reduce the ultimate end-state risk do not create near-term risks to the workers.

S2 restates the obvious legal directives that are considered "constraints" or "requirements" in the systems engineering terminology.

S3 recognizes that tribes are sovereign nations and the United States has made legal treaty commitments to them that must be honored.

S4 recognizes the legal status of HFFACO. This criterion presumes that the regulators will be receptive to options that accelerate site closure.

Guiding Criteria

G1 represents the concerns of the Secondary Waste Issue Task Force of the Tank Waste Committee (TWC). Technetium is a long-lived isotope that is highly mobile through the soil and in groundwater. The resin column extraction pretreatment option for tank wastes was eliminated by a prior decision. Current planning will result in a large amount of technetium being sent to land disposal in undefined waste forms and ultimately affecting the groundwater. It is a principal issue in the secondary waste stream and is a difficult actor to control. This was demonstrated in the bulk vitrification experiments, where the technetium surrogate was swept to the surface of the glass logs by sulphate.

G2 emphasizes caution not to select options that leave long-term risks at Hanford. The general guidance from the various laws is to place the highest and longest lived hazards in deep geologic disposal, not in near-surface disposal.

G3 reflects the forgotten wisdom that "dilution is not the solution." At one time, this practice was legally discouraged. New technologies should be considered; recent data demonstrates that it is possible to transmute radioactive technetium into nonradioactive ruthenium. This criterion suggests that these and other alternatives should be considered.

G4 supports an objective that is currently being used to emphasize alternatives that maximize the homogeneity of the radioactive content in the vitrified glass logs. This approach may both improve the quality of the waste form and minimize the amount and costs.

G5 augments the top level criterion T5 by emphasizing those resources necessary to eliminate certain risks increase with time if the risks are not eliminated. Expanding plumes with time are one such example. This late application of resources both increases the risks and costs and decrease the quality and likelihood of cleanup being a success.

G6 restates the objective of reducing entire sections of the site to eliminate the "hotel operation costs" that can be redirected to other cleanup activities.

G7 reflects a major concern of the TWC and an appeal to find alternative paths for extracting such non-radioactive materials as sodium and aluminum from the waste streams. As an example, the idea of adding 60,000 metric tons of sodium to balance the aluminum seems to be a costly current path. The long-term cost of increased numbers of glass logs should be balanced against spending near-term funding to develop alternatives to reduce or eliminate adding all the sodium.

The amount of sodium in the wastes is a major controlling parameter in how much glass must be made. In turn, the glass volume determines, in large part, the size of the treatment plants, their operational life time, and the date of the site closure end state. Any process that either reduces the addition of sodium (caustic) to the wastes (e.g. to dissolve aluminum wastes) or removes it from the waste stream in the first place, has the potential to dramatically improve all aspects of the cleanup by (1) reducing the required capacity of the treatment plants, (2) shortening the time they must operate, (3) minimizing the number of glass logs created, (4) improving the quality of the resulting glass by reducing the waste density in the glass, and 5) reducing the amount of radioactive materials that end up in secondary waste forms that can be released to the environment.