

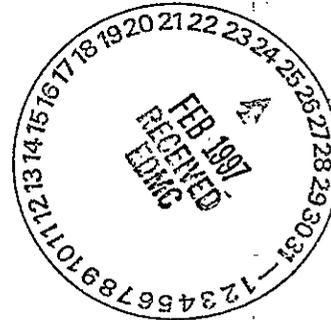
[6450-01-P]

DEPARTMENT OF ENERGY

Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington.

AGENCY: Department of Energy

ACTION: Record of Decision



SUMMARY: This Record of Decision addresses actions by the U.S. Department of Energy (DOE) to manage and dispose of radioactive, hazardous, and mixed waste within the Tank Waste Remediation System (TWRS) program at the Hanford Site in southeastern Washington State. DOE, in cooperation with the Washington State Department of Ecology (Ecology), issued a Final Environmental Impact Statement (EIS) entitled "Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement" (TWRS EIS) (DOE/EIS-0189, August 1996). The Final EIS evaluates alternatives for the management and disposal of mixed, radioactive, and hazardous waste currently stored or projected to be stored in 177 underground storage tanks and approximately 60 active and inactive miscellaneous underground storage tanks associated with the Hanford Site's tank farm operations, as well as the management and disposal of approximately 1,930 cesium and strontium capsules currently stored at the Hanford Site.

Based on the environmental impact analysis of the Final EIS and after evaluating costs, regulatory compliance requirements, technical uncertainties, worker and public health and safety, and public, agency, National Research Council, and Tribal Nation comments, DOE has decided to implement the preferred alternative identified in the Final EIS for retrieval, treatment, and disposal of tank waste the, "Phased Implementation alternative" and to defer the decision on disposition of cesium and strontium capsules.

The Phased Implementation alternative was selected because it provides a balance among short-and long-term environmental impacts, meets all regulatory requirements, addresses the technical uncertainties associated with remediation, and provides the flexibility necessary to accommodate future changes in the remediation plans in response to new information and technology development.

While carrying out this decision, DOE will continually evaluate new information relative to the tank waste remediation program. DOE will also conduct periodic independent scientific and technical expert reviews, which DOE believes are essential to the success of the TWRS program. Further, DOE intends to conduct formal evaluations of new information relevant to the tank waste remediation program at three key points over the next eight years under its National Environmental Policy Act (NEPA) regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE stays on a correct course for managing and remediating the tank waste. Various informal reviews also will be conducted during this period.

DOE has decided to defer action on the cesium and strontium capsules to further evaluate potential beneficial uses of the capsules and study potential long-term environmental impacts. The capsules will continue to be managed in the Hanford Site Waste Encapsulation and Storage Facility. DOE will complete an evaluation for potential future uses of the capsules within two years and will issue a Cesium and Strontium Management Plan that will address alternatives for beneficial uses. If no future uses are found and DOE determines that the capsules should be disposed of, DOE will select an alternative for disposal of the capsules and supplement this Record of Decision.

ADDRESSES: Addresses of DOE Public Reading Rooms and Information Repositories where the Final EIS, Record of Decision, and other relevant information are available for public review are listed at the end of this Record of Decision. The Final EIS and Record of Decision are also available for review on the Internet at www.hanford.gov/eis/twrseis.htm and on the DOE NEPA Web page (<http://tis-nt.eh.doe.gov/nepa>).

FOR FURTHER INFORMATION: Requests for copies of the Record of Decision or further information on the Final EIS or Record of Decision should be directed to Carolyn Haass, DOE Tank Waste Remediation System EIS NEPA Document Manager, U.S. Department of Energy, Richland Operations Office, P.O. Box 1249, Richland, WA 99352. Ms. Haass may be contacted by telephone at (509) 372-2731. Information on the DOE NEPA process may be requested from Carol M. Borgstrom, Director, Office of NEPA Policy and Assistance (EH-42), U.S. Department of Energy, 1000 Independence Avenue S.W., Washington, D.C. 20585. Ms. Borgstrom may be contacted by telephone at (202) 586-4600, or by leaving a message at (800) 472-2756.

SUPPLEMENTARY AGENCY INFORMATION:

Purpose and Need for Action: This Record of Decision addresses actions by DOE to manage and dispose of radioactive, hazardous, and mixed waste within the Tank Waste Remediation System (TWRS) program at the Hanford Site in southeastern Washington State. The waste includes approximately 212 million liters (56 million gallons) of waste stored or to be stored in underground storage tanks at the Hanford Site. DOE also will manage the cesium and strontium salts contained in approximately 1,930 capsules currently stored at the Site and, if they are determined to be waste, will dispose of the capsules. The tank waste and cesium and strontium capsules currently pose a low short-term risk to human health and the environment; however, storage costs are high, and the potential for an accident resulting in large releases of radioactive and chemical contaminants will increase as the facilities age.

DOE must implement long-term actions to safely manage and dispose of the tank waste, associated miscellaneous underground storage tanks, and the cesium and strontium capsules (if the cesium and strontium are determined to be waste) to permanently reduce potential risk to human health and the environment. These actions also are needed to ensure compliance with all applicable Federal and Washington State requirements regarding the management and disposal of radioactive, hazardous, and mixed waste.

Alternatives Considered in the Final EIS: The following describes the alternatives considered in the Final EIS and a discussion of their advantages and disadvantages.

In order to compare the alternatives for both the high- and low-activity fractions of the waste, vitrification was used as a representative technology to conduct the EIS analysis. DOE currently plans to implement parts of the Phased Implementation alternative through a privatization initiative whereby private companies will perform certain aspects of the remediation in an effort to use competition within the marketplace to bring new ideas and concepts to waste remediation and reduce project costs. Under current plans, the selected private companies will have the responsibility to treat the high-level waste using vitrification, and will have the option to immobilize the low-activity waste by either vitrification or other similar immobilization methods provided that the final waste form meets regulatory requirements. (DOE has issued contracts to two companies to design tank waste treatment facilities - both companies had proposed vitrifying low-activity waste.)

Tank Waste Alternatives Considered

Phased Implementation (Preferred Alternative): The Phased Implementation alternative was identified in the Final EIS as the Preferred Alternative. Under the Phased Implementation alternative, the tank waste would continue to be safely stored until the waste is retrieved from the tanks for treatment and disposal by implementing a demonstration phase (Phase I) to verify that the treatment processes will function effectively and then by implementing a full-scale production phase (Phase II).

During Phases I and II, continued operations of the tank farm system and actions to address safety and regulatory compliance issues would be performed and would include:

- Upgrading tank farm infrastructure, including waste transfer, instrumentation, ventilation, and electrical systems;
- Monitoring tanks and equipment to support waste management and regulatory compliance requirements;
- Combining compatible waste types, interim stabilization of single-shell tank waste, continuing waste characterization, removing pumpable liquid from single-shell tanks, transferring newly generated waste from ongoing Site activities to double-shell tanks, operating the 242-A Evaporator and the Effluent Treatment Facility, and performing mitigative actions to resolve tank safety issues;
- Using rail or tanker truck systems to transport waste to the tank farms;
- Completing construction of and operating the new replacement cross-site transfer system to facilitate regulatory compliant waste transfers from 200 West to 200 East Area and continue operating the existing transfer pipeline system until the replacement system is operational; and
- Installing and operating an initial tank waste retrieval system to improve the capacity to consolidate double-shell tank waste and support mitigation of safety issues.

Phase I activities (Part A, development activities; Part B demonstration) activities would last for approximately 10 years and would include:

- Constructing demonstration-scale facilities to produce vitrified low-activity waste and vitrified high-level waste for future disposal;
- Installing and operating tank retrieval systems to retrieve selected waste (primarily liquid waste) for separations and immobilization, and selected tank waste for high-level waste vitrification;
- Transferring liquid waste to receiver tanks and transferring selected waste for high-level waste processing directly to the high-level waste facility;
- Performing separations to remove selected radionuclides (e.g., cesium) from the low-activity waste stream;
- Storing separated high-level waste at the treatment facilities or in the Canister Storage Building pending future high-level waste treatment;
- Returning a portion of the sludge, strontium, and transuranic waste from separations processes to the double-shell tanks for future retrieval and treatment during Phase II;
- Vitrifying the low-activity waste and high-level waste; and
- Transporting the low and high activity wastes to onsite interim storage facilities.

Phase II (full-scale production) activities would begin after completion of Phase I, last for approximately 30 years and would include:

- Constructing full-scale facilities to vitrify low-activity waste and vitrify high-level waste;
- Installing and operating tank retrieval systems to retrieve waste from all single-shell tanks, double-shell tanks, and miscellaneous underground storage tanks;
- Pretreating the waste by sludge washing and enhanced sludge washing followed by separations of the liquid and solids;
- Performing separations to remove selected radionuclides from the low-activity waste feed stream and transferring the waste to the high-level waste vitrification facility;
- Vitrifying the high-level waste stream and the low-activity waste stream;
- Packaging the high-level waste in canisters for onsite interim storage and future shipment to a national geologic repository; and
- Placing the immobilized low-activity waste in containers and placing the containers in onsite near-surface disposal facilities.

DOE also would continue to characterize the tank waste and perform technology development activities to reduce uncertainties associated with remediation, evaluate emerging technologies, and resolve regulatory compliance issues.

The principal advantages of the Phased Implementation alternative are that it provides for retrieval of the waste, separation of the high- and low-activity waste constituents and immobilization of the waste. Separations processes would reduce the volume of high-level waste and eliminate the bulk of the contaminants in the low-activity waste stream. This alternative would permanently isolate the wastes from humans and the environment to the greatest extent practicable and provide for protection of public health and the environment by disposing of the bulk of the radionuclides offsite in a national geologic repository and isolating the low-activity waste through immobilization and disposal in onsite facilities. By using a phased approach, DOE will obtain additional information concerning the uncertainties associated with waste characteristics and the effectiveness of the retrieval, separations, and treatment technologies prior to constructing and operating full-scale facilities. Lessons learned from the demonstration phase, ongoing waste characterization, and technology development activities would be applied to Phase II, which may substantially improve the operating efficiency of the second phase and reduce construction and operating costs.

The principal disadvantage of this alternative is that it would involve slightly higher short-term impacts than the in situ and combination alternatives, though lower than the continued management alternatives. Short-term impacts include potential health impacts during Phases I and II from occupational, operational, and transportation accidents and radiation exposures to workers during normal operations. In addition, this alternative would disturb shrub-steppe habitat and may cause a short-term strain on public services during construction activities. This alternative would also cost more than the in situ alternatives.

Other Tank Waste Alternatives Considered: The Final EIS analyzed nine other alternatives for the tank waste. All of the alternatives considered include continuing the current tank farm operations to maintain the tanks and associated facilities until they are no longer needed for waste management. All of the alternatives (except No Action) include upgrading tank farm systems as identified for the Phased Implementation alternative. The following are the other alternatives addressed.

1. No Action -- Perform minimum activities required for safe and secure management of the Hanford Site's tank waste with the current tank farm configuration during a 100-year period. This alternative would provide for continued storage and monitoring of tank waste. No construction or remediation activities would be performed under the No Action alternative.

The principal advantage of this alternative is that the short-term environmental impacts would be lower than other alternatives analyzed (except operational accidents which would be high due to the assumed 100-year operating period). The cost estimated for this alternative would be lower than most other alternatives. The degree of technical uncertainty associated with this alternative is low because it is a continuation of ongoing activities. Selection of this alternative would also allow time to develop new waste remediation technologies.

The principal disadvantage of this alternative is that it would result in the highest long-term environmental impacts. Because no action would be taken to immobilize or isolate the waste, the contaminants in the waste would migrate to the groundwater in a relatively short period of time, resulting in contamination of the groundwater far above accepted safe levels and drinking water standards. Persons consuming this contaminated groundwater would have a significant risk of contracting cancer. In addition, this alternative would not meet waste disposal laws, regulations, and policies. This alternative eventually would result in continued deterioration of the structural integrity of the tanks and an increased risk that an earthquake would cause a catastrophic release of tank contents to the environment and the potential for a large number of fatalities. Because all of the waste would remain in the tanks in an unstabilized form, there would be a significant human health risk to inadvertent intruders into the waste after any loss of administrative control of the Site.

2. *Long-Term Management* -- Perform minimum activities required for safe and secure management of the Hanford Site's tank waste during the 100-year administrative control period. This alternative is similar to the No Action alternative, except that the waste transfer system would be upgraded and the double-shell tanks would be replaced twice during the assumed 100-year administrative control period to prevent the potential leakage of large volumes of liquid to the environment from the double-shell tanks. No waste remediation would be performed under this alternative.

The principal advantage of this alternative is the same as for the No Action alternative except that leaching of contaminants into the groundwater from the double-shell tanks would be delayed by 100 years due to the tank replacement program.

The principal disadvantages of this alternative are the same as for the No Action alternative except that the long-term impacts to the groundwater would be slightly lower than the No Action alternative.

3. *In Situ Fill and Cap* -- Retrieve and evaporate liquid waste from the double-shell tanks, fill single- and double-shell tanks with gravel, fill miscellaneous tanks and ancillary equipment with grout, and cover the tank farms with a low permeability earthen surface barrier, disposing of all tank waste onsite.

The principal advantages of this alternative are that the short-term environmental impacts (accident fatalities, radiation exposures, and shrub-steppe habitat disturbance) would be low and the estimated cost would be lower than for all other alternatives. The degree of technical uncertainty associated with this alternative is low because it involves applying common technology, which has a high probability of achieving its projected level of effectiveness for most tanks.

The principal disadvantages of this alternative are that it would have relatively high long-term environmental impacts due to contaminants leaching into the groundwater where they could expose persons who might consume the groundwater, and it would not meet waste disposal laws, regulations, or policies. Because the actions taken for this alternative involve isolation but not immobilization of the waste, the contaminants would migrate to the groundwater over a long period of time and result in significant long-term impacts on public health and the environment. In addition, this alternative may not be feasible for those tanks that generate high levels of flammable gases because of the potential for sparks causing a fire in the tanks while filling with gravel. Other types of fill material may be necessary for these tanks. Because all of the waste except the liquid waste in the double-shell tanks would remain in the tanks in an unstabilized form, there would be a significant human health risk to inadvertent intruders into the waste after any loss of administrative control of the Site.

4. *In Situ Vitrification* -- Retrieve and evaporate liquid waste from the double-shell tanks, fill the tanks with sand, vitrify (melt to form glass) all of the tanks in place, and cover all of the tank farms with an earthen surface barrier to dispose of all tank waste onsite. This alternative would involve constructing tank farm confinement facilities to contain and collect the off-gasses generated during the vitrification process. The waste, tanks, and soil surrounding the tanks (including miscellaneous underground storage tanks) would be vitrified by using electricity to melt the soil and waste, which would solidify into a glass when cooled.

The principal advantages of this alternative are that the short- and long-term impacts would be relatively low. The short-term impacts such as occupational, operational, and transportation accidents would be lower because fewer personnel would be required to construct and operate the in situ vitrification systems. The long-term impacts would be low because the contaminants would be immobilized in glass, which would limit the leaching of contaminants to the groundwater.

The principal disadvantages of this alternative are that there is a high degree of technical uncertainty that the alternative would function as intended, and that, even if technically successful, would not produce a final waste form that would meet waste disposal laws, regulations, or policies. In situ vitrification has been performed on contaminated soil, but has not been used on the tank waste or at the scale needed to vitrify the large tanks.

5. *Ex Situ No Separations* -- Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tanks, either vitrify or calcine (heat to temperatures below the melting point) the waste, and package the treated waste for interim onsite storage and eventual offsite disposal at a national geologic repository.

The principal advantages of this alternative are that the vitrification option would meet all regulatory requirements and both the vitrification and calcination options would result in disposal of all retrieved waste offsite at a national geologic repository. Because this alternative does not involve separations, the technical uncertainties are fewer than those associated with other ex situ alternatives that involve intermediate or extensive separations.

The principal disadvantages of this alternative are that the waste form (either soda-lime glass for vitrification or compacted powder for calcination) may not meet the current waste acceptance criteria at a national geologic repository and the volume of waste to be disposed of at a national geologic repository would be very large and would likely exceed the capacity of the first repository. The costs associated with disposing of all the waste at a national geologic repository make this the most expensive alternative.

6. *Ex Situ Intermediate Separations* -- Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tanks and separate the waste into high-level and low-activity waste streams using sludge washing, enhanced sludge washing, and ion exchange, then vitrify the waste streams in separate facilities. Dispose of the low-activity waste onsite and the high-level waste offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and result in relatively low long-term impacts because the high-level waste would be disposed of offsite in a national geologic repository and the low-activity waste onsite would be immobilized and isolated in onsite disposal facilities covered with an earthen barrier.

The principal disadvantage of this alternative is that it involves a moderate level of technical uncertainty because the alternative would involve construction and operation of treatment facilities where some of the proposed technologies are first-of-a-kind or have not been demonstrated on Hanford Site tank waste. This alternative would involve a potential for higher short-term impacts than the in situ alternatives because of the nature and extent of the activities

required for construction and operation of the full-scale waste treatment facilities. These impacts would include potential health impacts from occupational, operational, and transportation accidents and radiation exposures during normal operations.

7. *Ex Situ Extensive Separations* -- Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tank waste and use a large number of complex chemical separations processes to separate the high-level waste components from the recovered tank waste. Vitrify the waste streams in separate facilities and dispose of the low-activity waste onsite and the high-level waste offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and, due to the extensive separations processes, would result in the smallest volume of high-level waste for offsite disposal. Due to the extent of the separations processes, the low-activity waste that would remain onsite would have lower radioactive contaminant concentrations than the other ex situ alternatives.

The principal disadvantages of this alternative are that it involves the highest degree of technical uncertainty and highest treatment cost among the ex situ alternatives because of the numerous complex separations processes. This alternative would involve slightly higher short-term impacts than the in situ and combination alternatives, though lower short-term impacts than the continued management alternatives. These impacts include potential health impacts from occupational, operational, and transportation accidents and radiation exposures during normal operations.

8. and 9. Ex Situ/In Situ Combination 1 (Alternative 8) Ex Situ/In Situ Combination 2 (Alternative 9) -- Retrieve tank waste (approximately 50 percent of the waste volume for the Combination 1 alternative and 30 percent for the Combination 2 alternative based on long-term risks the contents of the various tanks pose to human health and the environment); separate the retrieved waste into high-level and low-activity waste streams using an intermediate level of separations; then vitrify the waste streams in separate facilities. Dispose of the low-activity waste onsite and the high-level waste at an offsite national geologic repository. Waste in tanks not selected for retrieval would be remediated identical to the In Situ Fill and Cap alternative.

The principal advantage of these alternatives is that they offer the opportunity to lower the remediation cost by remediating the waste in selected tanks based on waste characteristics and contribution to post-remediation risk. The waste that provides the greatest long-term potential human health risks would be remediated. The Combination 2 alternative would have lower remediation costs than the Combination 1 alternative because a smaller volume of waste would be processed. These alternatives would result in short-term impacts (occupational, operational, and transportation accidents and shrub-steppe habitat disturbance) that are generally lower than those for the ex situ alternatives because smaller facilities and fewer personnel would be required to process a smaller volume of waste.

The principal disadvantages of these alternatives are that they would not meet waste disposal laws, regulations, and policies. The ex situ portion of these alternatives would have the same technical uncertainties as the Ex Situ Intermediate Separations alternative. The in situ portion of these alternatives would result in higher long-term impacts than the ex situ alternatives

because the waste disposed of in situ would leach contaminants into the groundwater over a long period of time and expose persons who might consume the groundwater. The Combination 2 alternative would leave more waste disposed of in situ and result in higher long-term impacts than the Combination 1 alternative.

Environmentally Preferable Alternative - Tank Waste: Identifying environmental preferences among alternatives for the tank waste remediation program requires consideration of the short-term human health and environmental impacts, long-term human health and environmental impacts, and the associated uncertainties in the impact assessment process, including technology performance. There are alternatives that would result in low short-term impacts but relatively high long-term impacts, and identifying the environmentally preferable alternative(s) requires judgment concerning these impacts. Comparing short-term human health impacts with long-term human health impacts is complicated by the fact that short-term impacts can be estimated with a greater degree of certainty than long-term human health risks.

In making these comparisons, DOE considered that most estimated short-term impacts involve risks to workers during remediation that are voluntary and can be reduced by applying appropriate worker protection measures. In contrast, the estimated long-term impacts are involuntary in nature because they would result from inadvertent exposure of future populations to contaminant releases.

The In Situ Vitrification alternative would have lower human health and environmental impacts than the other alternatives, if this technology functioned adequately. This alternative would result in the lowest potential short-term human health impacts, other than the In Situ Fill and Cap alternative, and the lowest long-term human health and environmental impacts. However, in situ vitrification has never been performed at the scale necessary to remediate the Hanford tank waste and there is a high degree of technical uncertainty associated with this alternative. Even with extensive technology research and testing, it may not be feasible to develop this technology to the extent that it would function adequately. If this alternative did not function as designed, the long-term impacts on groundwater and future users of the groundwater would be higher. While the In Situ Fill and Cap alternative would result in the lowest short-term impacts, it also would have significant long-term impacts on the groundwater and future users of the groundwater.

On balance, the ex situ alternatives are environmentally preferable to in situ alternatives because they provide for the permanent isolation of contaminants from the human environment. Among the ex situ alternatives, Phased Implementation is environmentally preferable because it offers the best potential to reduce technology risks and uncertainties relevant to both short-term and long-term impacts, while also providing for treatment and disposal of tank wastes to the greatest extent technically and economically practicable.

Cesium and Strontium Capsules Alternatives Considered: For the purposes of analyzing impacts in the TWRS EIS, it was assumed that the cesium and strontium capsules will remain in the Waste Encapsulation and Storage Facility at the Hanford Site until ready for final disposition.

The Waste Encapsulation and Storage Facility is being isolated from B Plant, which previously provided waste handling and utility support. B Plant is scheduled for deactivation.

No Action -- No Action was identified in the Final EIS as the preferred alternative and includes the continued storage of the capsules in the Hanford Site Waste Encapsulation and Storage Facility for 10 years. The cesium and strontium capsules are currently classified as byproduct material and are therefore available for beneficial uses. If beneficial uses cannot be found, the capsules may be subject to management and disposal actions as high-level waste.

The principal advantage of the No Action alternative is that it allows DOE to evaluate potential commercial and medical uses for the cesium and strontium capsules rather than foreclosing these options by implementing a disposal alternative. This alternative also provides an opportunity for further study of long-term environmental impacts. DOE would reevaluate the preferred alternative after a determination is made on the potential for future use of cesium and strontium capsules.

The principal disadvantage of this alternative is that it would not result in the near-term disposal of the capsules. The high costs of storing the capsules would continue. The cost and impacts of disposal would be delayed until some time in the future, if appropriate uses for the capsules are not developed.

Onsite Disposal -- Overpack the cesium and strontium capsules in canisters and dispose of them onsite in a newly constructed shallow drywell disposal facility.

The principal advantage of this alternative is that it is the only alternative that would allow near-term disposal of the capsules because it would not rely on the construction of a national geologic high-level waste repository, which may not be available until after the year 2015.

The principal disadvantage of this alternative is that it would not meet the requirements of the Resource Conservation and Recovery Act for hazardous waste or DOE policy for disposal of readily retrievable high-level waste. The capsules would be disposed of in a near-surface facility where they would be more accessible to inadvertent human intrusion until the cesium and strontium decayed to non-radioactive elements.

Overpack and Ship -- Overpack the cesium and strontium capsules into canisters, place the canisters into Hanford Multi-Purpose Canisters for interim storage, and store the packaged capsules onsite pending offsite disposal at a national geologic repository.

The principal advantage of this alternative is that it would provide for offsite disposal of the capsules in compliance with all regulatory requirements.

The principal disadvantage of this alternative is that the capsules may not meet waste acceptance criteria at a national geologic repository.

Vitrify with Tank Waste -- Remove capsule contents, vitrify with the high-level tank waste, and dispose of offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and the currently planned waste acceptance requirements for a national geologic repository. This alternative is dependent on selecting one of the tank waste alternatives that includes a high-level waste vitrification facility, which would be used to vitrify the cesium and strontium.

Environmentally Preferable Alternative - Cesium and Strontium Capsules: All of the alternatives for remediation of the cesium and strontium capsules are estimated to result in low environmental impacts. There would be no occupational fatalities or increased incidences of cancer or fatal chemical exposures associated with normal operations. There would be no or low adverse impacts on surface waters or groundwater, soils, air quality, transportation networks, noise levels, visual resources, socioeconomic conditions, resource availability, or land use. The No Action, Overpack and Ship, and Vitrify with Tank Waste alternatives would have slightly lower impacts on shrub-steppe habitats than the Onsite Disposal alternative and a slightly lower risk of a fatal accident. Assuming that the capsules would meet waste acceptance criteria at a national geologic repository the Overpack and Ship alternative would result in slightly lower impacts than the other alternatives and is therefore the environmentally preferable alternative.

Decision

Tank Waste: Description of Alternative Selected: DOE has decided to implement the Phased Implementation alternative for the tank waste. The Phased Implementation alternative strikes an appropriate balance among potential short- and long-term environmental impacts, stakeholder

interests, regulatory requirements and agreements, costs, managing technical uncertainties, and the recommendations received from other interested parties.

While carrying out this decision, DOE will continually evaluate new information relative to the tank waste remediation program. DOE also intends to conduct formal evaluations of new information relative to the tank waste remediation program at three key points over the next eight years under its NEPA regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE stays on a correct course for managing and remediating the waste.

As remediation proceeds in the coming years, DOE will learn more about management and remediation of the tank waste and ways to protect public and worker health and the environment. Within this time frame, DOE will obtain additional information on the effectiveness of retrieval technologies, characteristics of the tank wastes, effectiveness of waste separation and immobilization techniques, and more definitive data on the costs of retrieval, separations, and immobilization of the waste. Formal reevaluations will incorporate the latest information on these topics. DOE will conduct these formal evaluations of the entire TWRS program at the following stages: 1) before proceeding into Privatization Phase I Part B (scheduled for May 1998); 2) prior to the start of hot operations of Privatization Phase I Part B (scheduled for December 2002/December 2003); and 3) before deciding to proceed with Privatization Phase II (scheduled for December 2005). In conducting these reviews, DOE will seek the advice of independent experts from the scientific and financial community, such as the National Academy of Sciences which will focus on the expected performance and the costs of

waste treatment. DOE has established a TWRS Privatization Review Board consisting of Senior DOE representatives to provide on-going assistance and interactive oversight of the review of Part A deliverables and discussions with the contractors.

Informal evaluations also will be conducted as the information warrants. These formal and informal evaluations will help DOE to determine whether previous decisions need to be changed.

The Phased Implementation approach allows DOE to start remediating waste earlier than previously planned. With this approach, retrieval and processing of waste will begin on a small scale so that systems can be improved as knowledge is gained. This approach also permits DOE to continue research and development in critical areas, such as improved robotic retrieval systems, that may result in improved methods to reduce tank leaks during retrieval, and methods to remove residual waste that is difficult to retrieve.

The components of the demonstration phase (Phase I) will include: 1) continuing to safely manage the tank waste; 2) constructing and operating demonstration facilities; 3) collecting additional information through tank waste and vadose zone characterization; and 4) performing demonstrations of technologies that have the potential to reduce uncertainties associated with the TWRS program.

Continuing to safely manage the tank farms includes replacement of certain waste transfer piping and routine maintenance activities for tank farm instrumentation, ventilation, and electrical systems. Ongoing activities will include conducting environmental and safety related monitoring, removing pumpable liquids from the single-shell tanks, mitigating flammable gas safety hazards, and transferring currently stored waste and newly generated waste using the replacement cross-site transfer system, rail cars, and tanker trucks. DOE also plans to upgrade certain instrumentation, tank ventilation, and electrical system to upgrade the regulatory compliance status of the current facilities. The environmental impacts of these actions were not assessed in the TWRS EIS because the activities to be performed had not been sufficiently defined. DOE will evaluate the impacts of these actions in future NEPA analyses.

The demonstration phase, which will last approximately 10 years, includes the retrieval and treatment of a portion of the waste from the double-shell and single-shell tanks. The waste will be separated into low-activity waste and high-level waste through physical and chemical processes and then treated in demonstration-scale facilities. Vitrified high-level waste will be placed in interim storage at the Canister Storage Building pending future disposal at a national geologic repository. Immobilized low-activity waste will be prepared for future onsite disposal in existing grout vaults and similarly designed disposal facilities.

During the demonstration phase, DOE will conduct many activities to reduce the uncertainties associated with certain aspects of the project. For example, DOE will obtain extensive operational and cost data on a variety of issues by retrieving waste for treatment and constructing and operating the demonstration-scale facilities. DOE also will obtain more

detailed information on the characteristics of the tank waste and potential impacts on groundwater by continuing to collect data through the existing tank waste and vadose zone characterization programs. Further, DOE will conduct a project known as the Hanford Tanks Initiative that will provide data on single-shell tank residual characteristics, single-shell tank retrieval technologies, tank residual removal technologies, and tank closure technologies. In addition, DOE will further investigate technologies that have the potential to reduce the uncertainties of the TWRS project, including evaluating alternative tank fill material for use during closure, demonstrating the effectiveness and efficiency of waste retrieval with sluicing technology, and evaluating a variety of other technologies through DOE's complex-wide technology development programs. DOE also will prepare appropriate further NEPA documentation before making decisions on closure of the tank farms. This documentation will address the final disposition of the tanks, associated equipment, soils, and groundwater, and will integrate tank farm closure with tank waste remediation and other remedial action activities.

Phase II of the Phased Implementation alternative will begin after Phase I and will last approximately 30 years. Phase II will consist of continuing to safely manage the tank waste and constructing and operating full-scale facilities to treat the remainder of the tank waste. The tank waste will be retrieved and separated into low-activity waste and high-level waste. The low-activity waste will be immobilized and disposed of onsite in near-surface disposal facilities. The high-level waste will be vitrified, temporarily stored onsite, and transported offsite for disposal in a national geologic repository. DOE will use the lessons learned from the demonstration phase and the information obtained from further characterization and technology development activities to optimize operating efficiencies during Phase II and reduce construction and operating costs.

DOE will continue to evaluate the path forward for the tank waste remediation program as additional data and technology development activities provide information relative to key technical and regulatory issues.

DOE currently plans to implement parts of this alternative through a privatization initiative whereby private companies will perform certain aspects of the remediation in an effort to use competition within the marketplace to bring new ideas and concepts to waste remediation and reduce project costs. The goal of privatization is to streamline the TWRS mission, transfer a share of the responsibility, accountability, and liability for successful performance to industry, improve performance, and reduce costs without sacrificing worker and public safety or environmental protection. On September 25, 1996, DOE issued contracts to two companies to initiate the design process for Phase I, Part A. Any of the contractors authorized to proceed to start Part B is anticipated to follow the same general approach described in the EIS for Phase I, Part B of the Phased Implementation alternative, including separating the waste into low-activity waste and high-level waste streams, vitrifying the high-level waste, and using high-temperature processes to immobilize low-activity waste. Both contractors' current plans include vitrifying low-activity waste upon approval to proceed with Phase I, Part B.

Before issuing these contracts DOE independently evaluated the environmental data and analyses submitted by the contractors and prepared a confidential environmental critique of the potential environmental impacts in accordance with DOE NEPA regulation 10 CFR 1021.216. After issuing the contracts, DOE prepared a publicly available environmental synopsis, based on the critique, to document the consideration given to environmental factors and to record that the

relevant environmental consequences of reasonable alternatives have been evaluated in the selection process. This evaluation showed that the two proposals would have similar overall environmental impacts and that the impacts would be less than or approximately the same as the impacts described for Phase I of the Phased Implementation alternative. The environmental synopsis has been filed with the Environmental Protection Agency and is available at the DOE Public Reading Rooms and Information Repositories listed at the end of this Record of Decision. DOE will require the selected contractors to submit further environmental information and analysis and will use the additional information, as appropriate, to assist in the NEPA compliance process, including a determination under 10 CFR 1021.314 of the potential need for future NEPA analysis.

Basis for Selection: DOE has determined that through the many years of research and development throughout the DOE complex and specific studies on Hanford Site tank waste remediation, the technical uncertainties have been reduced to a manageable level. DOE has determined that the risks associated with proceeding with remediation are less than the risks of future releases of contaminants to the groundwater and of accidents in unremediated tanks that are deteriorating structurally. The cost of continuing to manage the unremediated tank waste facilities is high.

DOE has determined that it is necessary to retrieve the waste from the tanks to meet regulatory requirements, avoid future long-term releases to the groundwater that would threaten human health and the environment, and reduce health impacts to potential inadvertent intruders into the waste if administrative control of the Site were lost. An intermediate level of separating

the waste into low-activity waste and high-level waste was selected because of the high disposal costs of alternatives with low levels of separation and the high degree of technical uncertainty associated with alternatives with extensive levels of separations. To address the remaining technical uncertainties that exist with the tank waste remediation program, the phased implementation approach was selected to provide the flexibility necessary to make midcourse adjustments to the remediation plans based on future characterization data, technology development, and technical and cost data developed during Phase I.

The Phased Implementation alternative provides for the permanent isolation of the waste from humans and the environment to the greatest extent practicable and protection of public health and the environment. A high percentage of the radionuclides will be disposed of offsite in a national geologic repository, which provides a high degree of permanent isolation of the most hazardous waste. Releases of contaminants to the groundwater at the Hanford Site will be reduced to the greatest extent practicable. The waste disposed of onsite will be isolated from humans and the environment by immobilizing the low-activity waste and placing it in near-surface disposal facilities covered with an earthen surface barrier.

The Phased Implementation alternative provides a balance among key factors that influenced the evaluation of the alternatives; short-term impacts to human health and the environment, long-term impacts to human health and the environment, managing the uncertainties associated with the waste characteristics and treatment technologies, costs, and compliance with regulatory requirements. It also provides a balance between the need to proceed with remediation and the potential advantages of delaying remediation to incorporate future

technology developments. This alternative allows DOE to meet all regulatory requirements and reflects the values and concerns of many stakeholders.

Mitigation Measures: This decision adopts all practicable measures to avoid or minimize adverse environmental impacts that may result from the Phased Implementation alternative.

These measures many of which are routine, include the following.

- All DOE nuclear facilities will be designed, constructed, and operated in compliance with the comprehensive set of DOE or commercial requirements that have been established to protect public health and the environment. These requirements encompass a wide variety of areas, including radiation protection, facility design criteria, fire protection, emergency preparedness and response, and operational safety requirements;
- Measures will be taken to protect construction and operations personnel from occupational hazards and minimize occupational exposures to radioactive and chemical hazards;
- Emergency response plans will be developed to allow rapid response to potentially dangerous unplanned events;
- Water and other surface sprays will be used to control dust emissions, especially at borrow sites, gravel or dirt haul roads, and during construction earthwork;
- Areas for new facilities will be selected to minimize environmental impacts to the extent practicable;
- Pollution control or treatment will be used to reduce or eliminate releases of contaminants to the environment and meet regulatory standards;

- Extensive environmental monitoring systems will be implemented to continually monitor potential releases to the environment;
- All newly disturbed areas will be recontoured to conform with the surrounding terrain and revegetated with locally derived native plant species consistent with Sitewide biological mitigation plans;
- Historic, prehistoric, and cultural resource surveys will be performed for any undisturbed areas to be impacted;
- Potential impacts to shrub-steppe habitat and cultural resources will be among the factors considered in a NEPA analysis to support the site selection process for facilities and earthen borrow sites; and
- Consultation with Tribal Nations and government agencies will be performed throughout the planning process to address potential impacts to shrub-steppe habitat, religious sites, natural resources, and medicinal plants.

Mitigation measures will be refined and presented in the Tank Waste Remediation Mitigation Action Plan. Tribal Nations and agencies will be consulted, as appropriate, during preparation of the Mitigation Action Plan.

Cesium and Strontium Capsules: DOE has decided to defer the decision on the disposition of the cesium and strontium capsules for up to two years. In effect, DOE will implement the No Action alternative until a final disposition decision is made and implemented. The encapsulated cesium and strontium have potential value as commercial and medical irradiation or heat sources, and implementing disposal alternatives would foreclose options for these applications. DOE is evaluating the potential for commercial and medical uses. In addition, DOE is considering mixing the cesium with surplus plutonium; the cesium would serve as a radiation barrier and be immobilized with the plutonium. Mixing the cesium with the plutonium would enhance nuclear materials security by making future use of the plutonium by unauthorized persons very hazardous and difficult. DOE will reevaluate the decision on the disposition of the capsules after determinations are made on the potential for future use of cesium and strontium. DOE is preparing a Cesium and Strontium Management Plan that will address alternatives for beneficial uses of the capsules prior to final disposition. If DOE decides not to use the cesium and strontium for any of these purposes, one of the alternatives for permanent disposal of the capsules will be selected and DOE will supplement this Record of Decision. Before making such a decision, DOE intends to further study disposal alternatives to resolve uncertainties and better understand long-term impacts, as recommended by the National Research Council (see Appendix).

Comments on the Draft EIS and Agency Responses: DOE and Ecology received comments on the Draft EIS from 102 individuals, organizations, agencies, or Tribal Nations including the Washington State Department of Wildlife, Oregon State Department of Energy, Nez Perce Tribe, Yakama Indian Nation, and the Confederated Tribes of the Umatilla Indian Reservation. All

comments received were addressed in the Final EIS, Volume Six, Appendix L, and revisions to the Final EIS were made, as appropriate, to address applicable comments. A complete copy of all comments received on the Draft EIS is available in each of the DOE Public Reading Rooms and Information Repositories at the locations listed at the end of this Record of Decision.

Comments Received after Publication of the Final EIS and DOE Responses: DOE received comments from the Washington State Department of Fish and Wildlife on the Final EIS and comments from the National Research Council on the Draft EIS after publication of the Final EIS. A summary of these comments and DOE's responses is attached as an appendix to this Record of Decision. These comments were considered in the preparation of this Record of Decision.

DOE Public Reading Rooms and Information Repositories

- University of Washington, Suzzallo Library, Government Publications Room, Seattle, WA 98185. (206) 685-9855, Monday-Thursday, 9:00 a.m. to 8:00 p.m.; Friday and Saturday, 9:00 a.m. to 5:00 p.m.
- Gonzaga University, Foley Center, E. 502 Boone, Spokane, WA 99258. (509) 328-4220 ext. 3829, Monday-Thursday, 8:00 a.m. to midnight, Friday, 8:00 a.m. to 9:00 p.m.; Saturday, 9:00 a.m. to 9:00 p.m.; Sunday, 11:00 a.m. to midnight.

- U.S. Department of Energy Reading Room, Washington State University, Tri-Cities Campus, 100 Sprout Road, Room 130W, Richland, WA 99352, (509) 376-8583, Monday-Friday, 10:00 a.m. to 4:00 p.m.
- Portland State University, Bradford Price Millar Library, Science and Engineering Floor, SW Harrison and Park, Portland, OR 97207, (503) 725-3690, Monday-Friday, 8:00 a.m. to 10:00 p.m.; Saturday, 10:00 a.m. to 10:00 p.m.; Sunday, 11:00 a.m. to 10:00 p.m.
- U.S. Department of Energy, Headquarters, Freedom of Information Public Reading Room, 1E-190 Forrestal Building, 1000 Independence Avenue, SW, Washington, D.C. 20585, (202) 586-6020, Monday-Friday, 9:00 a.m. to 4:00 p.m.

A copy of the Record of Decision is also available via the Internet at www.hanford.gov/eis/twrseis.htm and <http://tis-nt.ch.doe.gov/nepa>.

Issued in Washington, D.C., this day February 20, 1997.



Alvin Alm, Assistant Secretary for Environmental Management

APPENDIX

COMMENTS RECEIVED AFTER PUBLICATION OF THE FINAL EIS

The U.S. Department of Energy (DOE) received comments and recommendations from the National Research Council and the Washington State Department of Fish and Wildlife after publication of the Final Environmental Impact Statement (EIS). The following is a summary of these comments and DOE's responses.

National Research Council Comments: On March 4, 1996, DOE requested that the National Research Council (Council), Committee on Remediation of Buried and Tank Waste, review the Tank Waste Remediation System (TWRS) Draft EIS. DOE received the Council's comments and recommendations regarding the Draft EIS on September 6, 1996 (after the Final EIS had been published) in a report entitled "The Hanford Tanks: Environmental Impacts and Policy Choices". Although this report was issued too late to be considered in the Final EIS, DOE did consider the Council's comments in the preparation of this Record of Decision.

DOE generally agrees with the comments and recommendations made by the Council. Because several other commentors on the Draft EIS identified similar concerns, many of the Council's comments and recommendations were incorporated in the Final EIS prior to receipt of the Council's report. DOE believes the Record of Decision reflects stakeholder values regarding the need for action, provides a balance among short- and long-term environmental impacts,

meets regulatory requirements and agreements, and addresses technical uncertainties, while also accommodating, to the extent possible, the underlying concern of the Council regarding the need for phased decision making.

The following is a summary of the National Research Council's comments and DOE's responses.

Comment 1: Uncertainties, both stated and unstated, concerning the Hanford wastes, the environment, and the remediation processes are found throughout the DEIS. Significant uncertainties exist in the areas of technology, costs, performance, regulatory environment, future land use, and health and environmental risks. Among the issues that remain uncertain are:

- effectiveness in practice of technologies to remove and treat waste from tanks,
- costs of operations and offsite waste disposal,
- future policy and regulatory environment,
- characterization of tank wastes,
- relation between tank waste removal, remediation of the surrounding environment, and ultimate land use at the site, and
- long-term risks associated with various alternatives for treating and processing the tank wastes, both in relation to residues left on site and risks transferred offsite when processed wastes are moved to a national geologic repository.

The preferred Phased Implementation alternative presented in the DEIS does not adequately address all of the uncertainties that make it difficult to decide how to complete

remediation of the tanks. During Phase I, cesium and technetium, the most troublesome elements in a vitrifier, are to be removed from the high-level waste that is sent to the pilot vitrification plant, potentially limiting the value of information obtained from the pilot plant operations. This may also delay a decision on the final waste form for these elements.

Plans for building a pilot plant should proceed, but in the context of a phased decision strategy that does not preclude processing of wastes other than the double-shell tank supernatant or producing waste forms other than the glass currently planned.

Response 1: DOE agrees with the Council that there are substantial uncertainties associated with the tank waste remediation program. In response to similar comments, DOE revised the EIS to enhance the discussion of uncertainties, including the relevance of the uncertainties in the evaluation of alternatives. The Final EIS provides an extensive discussion on uncertainties in Appendix K, which includes DOE's detailed evaluation of the uncertainties and impacts associated with the tank waste remediation program alternatives. In light of the uncertainties related to the remediation of tank waste, DOE has committed to reevaluate the program as DOE continues to learn from these activities to ensure that DOE will stay on a correct course for managing the tank wastes.

The Council placed particular emphasis on recommending the use of a "phased decision strategy" because of the technical uncertainties in tank waste management. DOE has decided to implement the Phased Implementation alternative, which DOE believes will achieve many of the goals of the phased decision strategy recommended by the Council. DOE believes that the many

years of technology evaluations throughout the DOE Complex have reduced the uncertainties to a manageable level, and the risks of proceeding with remediation are less than the risks of further releases of contaminants from the tanks and the potential for accidents in unremediated tanks. In addition, the cost of continuing to manage the tank waste in facilities that have exceeded their design life are high. DOE believes the Phased Implementation alternative provides adequate flexibility to accommodate changes in the tank waste remediation program as additional information is developed. Responses to the Council's other comments, below, provide additional detail on how DOE intends to reduce the technical uncertainties while proceeding with the Phased Implementation alternative.

Phase I of the Phased Implementation alternative includes both low-activity and high-level waste treatment and immobilization. Any radionuclides separated from the low-activity waste feed stream, including cesium and technetium, will be vitrified in the high-level waste facility. This will provide important information on the performance of the separations process and of vitrification of troublesome elements like cesium and technetium.

By performing Phase I of the Phased Implementation alternative and proceeding with other technology development projects and tank waste characterization, the uncertainties associated with the tank waste program will be reduced further. Initiatives that DOE is pursuing to reduce uncertainties in support of the TWRS program include:

- The Hanford Tanks Initiative, which will provide data on characterization of tank residuals, technologies for waste retrieval, technologies for removing tank residuals, and criteria for closing tanks;

- Completion of the tank waste characterization program, which will provide data relative to tank waste safety issues and the contents of the tanks;
- Determination of the level of contamination in the vadose zone;
- Development of a comprehensive plan to integrate tank waste remediation with tank farm closure and other remediation activities related with the TWRS program;
- Integration of TWRS program implementation with the plans for developing a national geologic repository for high-level waste;
- Demonstrations of the efficiency and effectiveness of retrieval sluicing technology to support the tank waste remediation activities; and
- Demonstrations of various tank waste separations and treatment processes.

Comment 2: The DEIS surveyed a wide range of remediation options, including strategies in which tanks with varying contents are treated differently. However, the committee believes that additional alternatives for management of the tank wastes need to be explored in parallel, using a phased decision strategy like the one outlined in this report. Such a strategy would provide flexibility in the event that specific, preferred technologies or management approaches do not perform as anticipated or that innovative waste management and remediation technologies emerge. Among additional options that should be analyzed are 1) in-tank waste stabilization methods that are intermediate between in situ vitrification and filling of the tanks with gravel, 2) subsurface barriers that could contain leakage from tanks, and 3) selective partial removal of wastes from tanks, with subsequent stabilization of residues, using the same range of treatment technologies as in the alternatives involving complete removal of wastes.

When funding is constrained, it is more difficult to devote resources to the continued development of backup options. However, considering the uncertainty in the cost and performances of the technologies required for the preferred alternative, a time period during which funding is constrained is precisely the wrong time to drop work on alternatives that might achieve satisfactory results at a significantly lower cost. Having such alternatives available could allow remediation to proceed expeditiously, even if funding constraints prevent timely implementation of the currently preferred alternative.

Response 2: As discussed in the response to comment 1, DOE agrees that significant uncertainties exist in the tank waste remediation program and that the strategy selected needs to be flexible to respond to new information and the results of research and development efforts. Additional alternatives and refinements of alternatives need to be developed and evaluated.

The Council's report recommends a "phased decision strategy," while DOE's preferred alternative is the "Phased Implementation alternative." There are important similarities and differences between these two approaches. Under the Council's phased decision strategy, the first phase would identify and develop alternative approaches to remediate the tank waste. Decisions on alternatives for subsequent phases would be deferred until information from the first phase is evaluated. This approach has the advantage of not prematurely foreclosing options enabling DOE to further study and develop technologies and that might reduce cost and/or risk. It has the disadvantage of leaving the total cost, schedule, and final outcome highly uncertain. Under DOE's Phased Implementation alternative, the complete path forward for tank waste remediation has been determined, while recognizing that the path can be modified as new

information becomes available. However, DOE has committed to conduct formal and informal reviews with the intent to mitigate the concern of making long-term decisions in the near-term.

The DOE Phased Implementation decision addresses current regulatory requirements and cleanup commitments while maintaining the flexibility necessary to modify the TWRS program if emerging information (e.g., new characterization data, technology breakthroughs, etc.) indicates there is a need to change the direction of the program. At the same time, technology development activities, such as the Hanford Tanks Initiative, will continue, in order to provide alternative paths if preferred technologies do not perform as anticipated. In addition to current programs, the Conference Report for the Energy and Water Development Appropriations Act, 1997 recommends up to \$15 million in technology development activities to support the tank waste program.

Other activities, which are critical to the overall TWRS program, will be conducted by DOE throughout Phase I. These activities include single-shell tank waste retrieval, developing methods for quantifying and characterizing the waste residuals left in the tanks following retrieval, and studying the leakage rate of tank wastes during the retrieval process. Contractors will have access to technologies being developed by other DOE programs and will be able to use these technologies if appropriate.

The Final EIS evaluated possible alternatives for remediating the tank waste. There are, as the Council noted, a great number of variations or combinations of alternatives; DOE could not evaluate all such combinations in the EIS. Rather, DOE evaluated a complete range of

reasonable tank waste management options, and thereby obtained adequate information for the strategic choice of direction made in this ROD. The use of alternate fill material for tank closure was not evaluated directly, but such alternatives are qualitatively within the range of alternatives analyzed in detail, and DOE was adequately informed about them for the purposes of this EIS. These alternatives will be addressed more directly in future NEPA analysis on tank closure. In this EIS, DOE considered the use of subsurface barriers as a potential mitigation measure during tank waste retrieval. Subsurface barriers were also evaluated in a Feasibility Study completed in 1995. Additional development work is being performed by DOE, and if promising new developments occur, DOE will reconsider the application of subsurface barriers for the tanks. Two alternatives for partial retrieval of the wastes that were similar to the selective partial retrieval alternative that the Council recommended be analyzed were included in the alternatives analyzed. DOE will continue to reevaluate these and other alternatives as more information becomes available.

In situ disposal of single-shell tank wastes and in-tank stabilization of tanks with residuals (not removed by retrieval) have been the subject of previous studies and were evaluated as part of the Systems Engineering Study for the Closure of Single-Shell Tanks. Alternatives for closing tanks with residual waste were evaluated in the Engineering Study of Tank Fill Alternatives for Closure of Single-Shell Tanks released in September 1996. Additional studies supporting stabilization of tanks with residual waste remaining following completion of retrieval operations are planned during Fiscal Year 1997 and Fiscal Year 1998 as part of the Hanford Tanks Initiative.

In addition to the two ex situ/in situ tank waste disposal alternatives that were evaluated in the TWRS EIS, selective partial removal of wastes from tanks, using a risk-based approach, was evaluated in the study entitled "*Remediation and Cleanout Levels for Hanford Site Single-Shell Tanks*" (Westinghouse Hanford Company, 1995, WHC-SD-WM-TI-711).

This Record of Decision adopts a long-term strategy that will focus efforts on achieving the ultimate TWRS remediation goals while continuing to characterize tank wastes, evaluate new technologies and improve risk assessments. DOE believes that its past studies have reduced the uncertainties enough to enable DOE to make a decision on a long-term tank waste remediation strategy. Although this approach differs from the phased decision strategy recommended by the Council, DOE intends to implement its decision in a manner that is flexible enough to accommodate appropriate mid-course corrections in the tank waste remediation strategy, based on lessons learned in the pilot studies or from other new information.

Comment 3: The scope of the DEIS also has significant limitations. Because the DEIS does not address remediation of the tanks themselves and associated environmental contamination, the alternatives it considers for tank waste remediation are not defined well enough. In addition, the connections between tank remediation alternatives and other cleanup activities at the Hanford Site are not taken into account. Because tank waste remediation alternatives are analyzed and evaluated in isolation from other geographically-related contamination at the Hanford Site, information about risks and costs in the DEIS is difficult to place in a proper perspective.

Response 3: DOE agrees with the Council's observation that there is a need to integrate remediation of the tank waste with future tank closure decisions and other geographically related remedial actions at the Hanford Site. The Final EIS addresses tank farm closure and other geographically related contamination and remediation activities to the extent possible with current information and to the extent necessary for DOE to make decisions concerning tank waste remediation. The EIS presents 1) information relative to closure to provide the public and decision makers with information on how decisions made now may affect future decisions on closure; 2) information on which alternatives would preclude the future selection of clean closure for the tank farms; and 3) information on cumulative impacts, including the effects of other site activities. This information provides a context for understanding the strategic decisions, now ripe, that are the focus of this EIS. To support the analysis, DOE used closure of a landfill as a representative closure scenario for each alternative, thus providing for a meaningful comparison of the alternatives. DOE intends to prepare a comprehensive plan to integrate tank waste remediation with tank farm closure activities and other Hanford Site remediation programs.

Comment 4: Decisions regarding tank remediation must consider risk, cost, and technical feasibility. Where risks are involved, care should be taken to present a range of potential risks, including expected or most likely estimates as well as the upper-bound estimates presented in the DEIS. While upper-bound estimates may give confidence that actual impacts will not exceed those presented in the DEIS from a worst-case perspective, the inherent uncertainties in risk assessments can distort the comparison of alternatives. This is of particular concern when the upper-bound estimates are derived from a cascade of parameters, much of which was also derived on an upper-bound basis.

While the committee recognizes the utility of quantitative risk assessment in the comparison of remedial alternatives, the limitations of analysis must be underscored. Given the complexity of the Hanford tank farms, many of the potential uncertainties cannot be measured, quantified, or expressed through statistically derived estimates. According to the 1996 National Research Council report *Understanding Risk*, the 1996 U.S. Environmental Protection Agency report *Proposed Guidelines for Carcinogen Risk Assessment*, and a recent draft report by the Commission on Risk Assessment and Risk Management, characterization of risk should be both qualitative and quantitative. In this case, qualitative information should include a range of informed views on the risks and the evidence that supports them, the risk likelihood, and the magnitude of uncertainty. Such evaluations of risk should be based on deliberative scientific processes that clarify the concerns of interested and affected parties to prevent avoidable errors, provide a balanced understanding of the state of knowledge, and ensure broad participation in the decision-making process.

Response 4: DOE agrees with these comments and has modified the EIS accordingly in response to similar comments on the Draft EIS received during the public comment period. For example, DOE believes that characterization of the risk should be quantitative when possible and qualitative when parameters are uncertain by more than an order of magnitude. The Final EIS presents the “expected”, or “nominal” ranges of risk and upper-bound estimates, and includes (in Appendix E) detailed analysis of uncertainties.

Comment 5: It should be expected that the environmental regulations governing the tank wastes, and the Hanford Site in general, will change over the time during which waste management and

environmental remediation occur. DOE should work with the appropriate entities to ensure that future regulatory changes and the future selection of tank remediation approaches are on convergent paths. The development, testing, and analysis of alternatives during the first phase should continue unconstrained by current regulatory requirements and should examine currently untested technologies.

Response 5: DOE agrees that ongoing dialogue with the regulators is necessary to making sound tank waste management decisions. DOE continues to work with the Federal and State regulatory authorities and with the stakeholders to share evolving information regarding impacts and technologies. Toward that end, DOE developed the reasonable alternatives to be analyzed in the EIS on a scientific and engineering basis, then evaluated the alternatives for compliance with regulations. Only four of the ten alternatives addressed in the EIS could be implemented consistent with existing Federal and State regulations. The Record of Decision, however, selects a compliant approach.

Comment 6: Concerning the management and disposal of the cesium and strontium capsules and of the miscellaneous underground storage tanks, the committee found that the DEIS lacks enough substantive information for an evaluation of the proposed remediation strategies. Over 99 percent of the tank wastes is in the single-shell and double-shell tanks, and that is where the greatest potential for health and environmental risk exists. However, the extremely high concentration of radioactivity and the nature of the materials in the capsules necessitate a more thorough discussion of their treatment, disposal, and environmental impact. There are serious deficiencies in the attention given to the long-term changes in the chemical and isotopic

composition of the cesium and strontium capsules. The large number and wide distribution of the miscellaneous underground storage tanks make a more complete discussion of their management necessary.

Response 6: DOE agrees with the Council that there is not enough substantive information regarding the cesium and strontium capsules to make a long-term decision on their final disposition. DOE also wants to evaluate potential beneficial uses of the capsules and has decided to defer any disposition of the capsules. In the meanwhile, a Cesium and Strontium Management Plan is currently being prepared by DOE that will address alternatives for beneficial uses of the capsules prior to final disposition. As part of the plan, DOE will continue to collect and analyze information regarding the capsules to reduce uncertainties and better understand long-term impacts, and to ensure that the long-term decision is appropriate.

With regard to the miscellaneous underground storage tanks, DOE believes, based on currently available information, that the waste contained in the miscellaneous underground storage tanks is similar to the waste contained in the single-shell tanks. Because the miscellaneous underground storage tanks represent a small percentage (0.5 percent) of the overall waste volume, the potential long-term impacts posed by the miscellaneous underground storage tanks are within the range of impacts calculated for the single-shell tanks and double-shell tanks. The short-term and long-term impacts associated with the miscellaneous underground storage tanks for activities such as waste retrieval and transfer were analyzed in the EIS.

Comment 7: The proper approach to decision making for tank farm cleanup is to use a phased decision strategy in which some cleanup activities would proceed in the first phase while important information gaps are filled concurrently to define identified remediation alternatives more clearly, and possibly to identify new and better ones. As part of this strategy, periodic independent scientific and technical expert reviews should be conducted so that deficiencies may be recognized and midcourse corrections be made in the operational program.

Response 7: DOE agrees with the Council that periodic independent scientific and technical expert reviews are essential to the success of the TWRS program. While carrying out the current decisions, DOE will continually evaluate new information relative to the tank waste remediation program. DOE also intends to conduct formal evaluations of new information relative to the tank waste remediation program at three key points over the next eight years under its NEPA regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE will stay on a correct course for managing and remediating the waste. As remediation proceeds in the coming years, DOE will learn more about management and remediation of the tank waste and ways to protect public and worker health and the environment. Within this time frame, DOE will obtain additional information on the effectiveness of retrieval technologies, characteristics of the tank wastes, effectiveness of waste separation and immobilization techniques, and more definitive data on the costs of retrieval, separations, and immobilization of the waste. These formal reevaluations will incorporate the latest information on these topics. DOE will conduct these formal evaluations of the entire TWRS program at the following stages: 1) before proceeding into Privatization Phase I Part B

(scheduled for May 1998); 2) prior to the start of hot operations of Privatization Phase I Part B (scheduled for December 2002/December 2003); and 3) before deciding to proceed with Privatization Phase II (scheduled for December 2005). In conducting these reviews, DOE will seek the advice of independent experts from the scientific and financial community, such as the National Academy of Sciences which will focus on performance criteria and the costs of waste treatment. DOE has established a TWRS Privatization Review Board consisting of Senior DOE representatives to provide on-going assistance and interactive oversight of the review of Part A deliverables and discussions with the contractors.

Informal evaluations also will be conducted as the information warrants. These formal and informal evaluations will help DOE to determine whether previous decisions need to be changed.

Washington State Department of Fish and Wildlife Comment

Comment: The Washington State Department of Fish and Wildlife recommends that the following language be included in the Record of Decision:

“The site selection of the precise location of remediation facilities for the selected alternative shall be subject to future supplemental NEPA analysis. This supplemental NEPA analysis shall commit to a supplemental Mitigation Action Plan. The Mitigation Action Plan and supplemental Mitigation Action Plan will be prepared in consultation with the Washington State

Department of Fish and Wildlife and the U.S. Fish and Wildlife Service, with input from the Hanford Site's Natural Resource Trustee Council.”

“Impacts to State priority shrub-steppe habitat would be one of the evaluation criteria used in site selection. The site selection process would include the following hierarchy of measures:

- Avoid priority shrub-steppe habitat to the extent feasible by locating or configuring project elements in pre-existing disturbed areas.
- Minimize project impacts to the extent feasible by modifying facility layouts and/or altering construction timing.”

“Compensatory mitigation measures for the loss of shrub-steppe habitat shall be identified and implemented in the supplemental NEPA analysis and Mitigation Action Plan.”

Response: DOE believes that the following approach satisfies the substance of these comments. The EIS (Section 5.20) describes both mitigation measures that are integral parts of all of the alternatives (Section 5.20.1) and further mitigation measures that could be implemented when indicated or appropriate (Section 5.20.2). In selecting the preferred alternative DOE has committed to all of the mitigation measures in Section 5.20.1, which include measures to restore newly disturbed areas. As the State requested, the Record of Decision commits to conducting NEPA analysis for site selection of facilities.

DOE intends to implement those further measures described in Section 5.20.2 as may be necessary to mitigate potential impacts on priority shrub-steppe habitat, and will consider the potential for such impacts as a factor in the site selection process for TWRS facilities. The site selection process will include the following hierarchy of measures: 1) avoid undisturbed shrub-steppe areas to the extent feasible; 2) minimize impacts to the extent feasible; 3) restore temporarily disturbed areas; 4) compensate for unavoidable impacts by replacing habitat; and 5) manage critical habitat on a Sitewide basis.

DOE believes that mitigation of impacts to habitats of special importance to the ecological health of the region is most effective when planned and implemented on a sitewide basis. Recognizing this, DOE is preparing a sitewide biological management plan to protect these resources. Under this sitewide approach, the potential impacts of all projects would be evaluated and appropriate mitigation would be developed based on the cumulative impacts to the ecosystem. Mitigation to reduce the ecological impacts from TWRS remediation would be performed in compliance with the sitewide biological management plan. Mitigation would focus on disturbance of contiguous, mature sagebrush-dominated shrub-steppe habitat. Compensation (habitat replacement) would occur where DOE deems appropriate. Specific mitigation ratios, sites, and planting strategies (e.g., plant size, number, and density) for TWRS facilities and operations would be defined in the TWRS Mitigation Action Plan, which would be revised for each specific TWRS facility siting decision. The Mitigation Action Plan would be prepared in consultation with the Washington State Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and Tribal Nations, with input from the Hanford Site's Natural Resources

Trustees Council. DOE will make the Mitigation Action Plan publicly available before taking action that is the subject of a mitigation commitment.