Washington State Department Ecology
Specific Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement

General Comments

1. The Washington State Department of Ecology (Ecology) is a Cooperating Agency with the United States Department of Energy (USDOE) for the Draft Tank Closure and Waste Management Environmental Impact Statement (Draft EIS). We have actively participated in the process for the EIS since its initial development. We provided guidance, reviewed data, and participated in briefings to the public. We also provided detailed comments on the pre-decisional draft of the EIS, participated in the comment resolution process, and agreed with the resolution of our comments.

   Based on our reviews, the independent reviews of our consultant, the review of the Model Technical Review Group used by USDOE's EIS contractor, and the Government Accountability Office's review, Ecology agrees that the data used are adequate, that adequate Quality Assurance (QA) procedures are in place to control changes, and that the EIS contractor implemented the procedures correctly.

2. Ecology believes the inventories that the modelers used are reasonable. They could be higher in some cases, but lower in others; overall, they are probably fairly close.

3. Ecology requests that USDOE's EIS contractor insert into the Summary more of the tables and graphs that depict long-term impacts in Chapter 5. We also request that in the Summary, the contractor summarize the discussion about these constituents that appears in Chapter 5.

4. On page S-6, the retrieval goal of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) is misstated. The language should be changed to match the TPA. The TPA's retrieval goal is 99% or as much as is technically possible – whichever results in greater retrieval. Thus, the goal is as much as technically possible beyond the 99%.

5. USDOE did not select the final preferred alternative in the Draft EIS. However, USDOE stated that TPA requirements for retrieval will be preferable, that it must provide treatment for secondary wastes before disposal, and that it prefers to construct an additional disposal facility in the East Area on the Central Plateau. In addition, the Draft EIS shows that disposal of off-site waste at the Hanford Site will have significant adverse impacts, and the agency will be extending its moratorium on the receipt of off-site waste shipments. Ecology agrees with the actions that the Draft EIS presented as USDOE preferences (except for USDOE preference on supplemental treatment). With respect to off-site waste, Ecology requests that USDOE include in the Final EIS and adopt in a record of decision (ROD) a preferred alternative to not dispose of any off-site waste at Hanford.

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Groundwater Modeling

1. Based on reviews by Ecology and its consultant (Shannon and Wilson), we think that the modeling is adequate for the purposes of the EIS.

2. Reading the Draft EIS does not lead to clarity on modeling issues. Shannon and Wilson stated in their report that the 2005 carbon tetrachloride and uranium-238 plume modeling has some problems. The document does not clearly explain what factors contributed to problems in modeling.

3. The plume maps for carbon tetrachloride appearing in Appendix U, Figures U-29 through U-32, (with written description on page U-10) and elsewhere in the document should be corrected. The 2005 plume map shows a plume that is much more extensive than the plume appears in other maps. The Final EIS must address why model failed to describe this plume accurately.

4. USDOE's contractor must clarify why they chose the Base Case Flow Model (with 38% flow towards Gable Gap and 62% flow towards east). That model does not use the assumptions that form the bases of other Hanford flow models (for example, 72% flow though Gable Gap and 38% towards east).

5. The text does not state whether the base case model incorporates part of the alternate case model (lowering of the Top of Basalt by 3 meters). To Ecology, there appears to be a significant amount of flow though Gable Gap independent of the model selected. The rationale for the selection of the low flow rate must appear in the Final EIS.

6. There are unusual fluctuations of predictive modeling analysis of both risk assessment (for example, figures 2-90, 2-91, 5-330, 5-331) and contaminant transport analysis (for example, figure 5-409, 5-410, etc.). Some of the fluctuations are of several orders of magnitude, which should not be the case. Text modifications are needed to explain these unusual fluctuations of predictive analysis.

Waste Disposal

1. The sensitivity studies that USDOE's EIS contractor performed for Ecology as a cooperating agency need more data, results, and analysis in the Final EIS. Ecology requests that the EIS contractor develop graphs of concentrations, peak concentration tables, and text for key contaminants at the 200-East Integrated Disposal Facility (IDF) boundary, the 200 Area core zone, and near the Columbia River shore. The contractor should make these additions for the sensitivity study using a recharge rate of 3 millimeters per year.

2. It is clear to Ecology that if USDOE disposes of offsite waste in the preferred location in the 200-East IDF, those wastes will cause significant adverse impacts at the landfill's point of compliance and further down gradient. The impacts are even more pronounced when the Draft EIS models disposal of offsite waste in the 200 West IDF location. The impacts are significant because disposal of the offsite waste will result in concentrations that will exceed drinking water standards.

Ideally, landfills should not impact groundwater. When we compared the concentrations of contaminants in several of the alternatives, a distinct peak represented the release of contaminants from the offsite waste component at the 200-East IDF boundary. Offsite waste results approximately in concentrations of 17 pCi/l for Iodine-129 and 1500 pCi/l for Technitium-99 at the peaks.

- Ecology would like USDOE's EIS contractor to separate the impacts associated with offsite waste from impacts of onsite waste. We request that a discussion of the results appear in chapter 5 and the Summary. Ecology also requests that the contractor show the impacts on the environment that result from disposal of onsite waste only.
- Ecology requests USDOE's EIS contractor analyze and describe specific mitigation measures that would reduce the impacts of any offsite waste disposal. This analysis must be sufficient to ensure that the resulting concentrations of all contaminants will be below health standards when the offsite waste releases are combined with all the other wastes that USDOE has already disposed and plans to dispose at Hanford.
    - Ecology requests that USDOE's contractor add an explanation to the text and summary if the most reliable mitigation for this offsite waste is to prohibit its disposal.
    - Ecology requests that USDOE's EIS contractor analyze USDOE's preferred alternative without offsite waste and incorporate the results of the analyses into the Final EIS.
    - Ecology requests that USDOE add disposal of offsite waste as a sub-alternative to distinguish the impacts that result from offsite waste.
    - Ecology's analysis shows that the impacts from offsite waste disposal to the groundwater begin early and last throughout the 10,000-year modeling period. Early releases of contaminants result in violations of the drinking water standards in the Central Plateau. As time elapses, the contaminants migrate from the Central Plateau to the Columbia River.
    - The offsite waste appears to be a one of the primary reasons why all the alternatives result in unacceptable impacts.

3. Secondary waste causes significant adverse impacts at the 200-East IDF boundary. Ecology does not consider it acceptable for a new landfill containing treated waste to significantly increase groundwater contamination. The Draft EIS shows that several contaminants of potential concern will exceed the levels that ensure safety in groundwater. Most health impacts result from tritium, iodine-129, technetium-99, uranium-238, chromium, nitrate, and total uranium (toxic), which are common to all of the Draft EIS alternatives.

Given the uncertainty of mass balance within the Waste Treatment Plant (WTP) and the variety of secondary waste forms, Ecology requests that USDOE address specific mitigation measures in the Final EIS that would prevent as much of the impact on the groundwater as possible. These measures could include:

- Segregating the key constituents that exacerbate the risk, and sending them offsite for disposal.
- Creating robust secondary waste forms specific for each waste type.
- Additional recycling at the WTP to maximize retention of these constituents in the vitrified glass.

4. The results are clear that locating IDF in its full size in the 200 East has much less lasting impact on the environment than locating a similar facility in the 200 West Area. Ecology requests that USDOE select the 200 East Area IDF location as the preferred alternative in the Final EIS and ROD.

5. The Draft EIS describes many alternative scenarios for disposal of different waste forms that result from processing of tank waste. The USDOE contractor will dispose of that waste in one or two IDF facilities. All of the disposal scenarios result in adverse impacts. The models predict that the concentrations of contaminants in the groundwater will be higher than the drinking water standards. When the contaminants become mobile, they will create a relatively small plume with a very high peak concentration. To mitigate these excessive concentrations, USDOE must improve the waste forms so that it takes longer for the contaminants to become mobile. This is particularly important for secondary waste, assuming that all the low activity waste (LAW) is immobilized in glass.

Supplemental Treatment and Pretreatment

1. Ecology will accept only a supplemental treatment technology that vitrifies the low activity waste at least as well a second LAW vitrification facility. All the other alternatives do not protect the groundwater to within acceptable standards and are not "as good as LAW glass." Ecology asks USDOE to choose construction and operation of a second LAW facility as its preferred alternative in the Final EIS and ROD. With the expansion of the LAW vitrification system (2nd LAW) to include four more LAW melters, USDOE will be able to treat the 60% to 70% of the single-shell tank waste that the current WTP cannot.

   We support a second LAW facility of this capacity because without it the high level waste (HLW) vitrification facilities cannot operate at full capacity. If the WTP does not operate at full capacity, treatment will extend decades beyond the design life of the WTP, and waste will stay in the single-shell tanks longer. LAW technology does not require any further development. Ecology has already issued a dangerous waste permit for the existing design, and the first facility is under construction.

Ecology requests that USDOE not expend limited resources to develop or prove other treatment technologies when LAW vitrification is sufficient and already developed and designed. We ask USDOE to preserve those resources to address other problems with no current solutions.

2. Sulfate Removal: We propose a revision to Draft Tank Closure and Waste Management Appendix E, Section E.1.2.3.9, Sulfate Removal. The method described in this section involves treatment of the WTP LAW feed solutions, namely the removal of sulfate by treatment with strontium nitrate solution after appropriate pH adjustment of the LAW feed. The sulfate is removed as a strontium sulfate precipitate. The proposed revision involves the use of barium nitrate solution. This proposal is based upon several factors:

    - Barium sulfate is much more inert in the environment (soil, water, et cetera). Barite (barium sulfate) has been used in the oil industry as an oil-base and water-base drilling mud (drilling lubricant) additive for more than 70 years; it is an inert weighting component.
    - Barium sulfate has a solubility product of 1.1×10^{-10}, whereas strontium sulfate has a solubility product of 3.2×10^{-7}, which is a factor of 3,000 in favor of the stability of barium sulfate.
    - The acidic pH conditions do not have to be as rigorous for the formation of barium sulfate precipitate in contrast with the formation of strontium sulfate precipitate. So initially, less nitric acid would be needed for precipitation and subsequently the caustic demand would also be less.
    - Due to the superior inertness of barium sulfate, more disposal options would be available in the IDF.

3. In Alternative 5 of the Draft EIS, USDOE proposes that sulfate be removed from the LAW stream. After the compound is removed from the treated LAW stream, it would be immobilize in a grout matrix and then dispose of it at Hanford.

    The advantages of such a sulfate removal treatment lie in the extension of the vitrification melter life and the resulting reduction in the frequency of melter replacement. Removing sulfate may also increase sodium levels in the LAW glass, resulting in the need for fewer glass canisters and shorter treatment regimens. The drawbacks include the need for two additional facilities to support sulfate removal: (1) a sulfate removal facility and (2) a sulfate waste grout facility.

    Ecology remains concerned with the durability of any grout matrix over time, as well as with the partitioning of contaminants between the grout and the liquid stream that would return to the WTP LAW facility.

4. Technetium-99 Removal: In Alternative 2B, USDOE proposes to incorporate more technetium-99 (Tc-99) into the HLW glass. That glass must eventually go to an offsite deep geologic repository. Ecology supports the incorporation of Tc-99 into the glass because the isotope is a particularly troublesome contaminant to treat otherwise: it is highly soluble and mobile in groundwater, and plants and animals uptake it readily. It has a long half-life, so it remains dangerous for millennia. Capturing Tc-99 in a glass waste matrix will inhibit its ability to move readily through the environment.

   USDOE does not currently include Tc-99 removal in its WTP design. The original design, however, did include an ion exchange system to remove the isotope from the LAW stream. Alternatives 2B and 3B evaluate the impacts of including Tc-99 removal. In 2B, USDOE would remove Tc-99 from the existing LAW vitrification and a second LAW vitrification feed streams and route to HLW vitrification. In 3B, USDOE would remove the Tc-99 from the LAW feed streams for the 200-East cast stone facility and send it to HLW for vitrification. No other alternative would remove Tc-99 from the LAW feed.

   Ecology reviewed the information in the Draft EIS and found that Tc-99 in groundwater originates from other solid secondary waste, not the immobilized LAW. If the Tc-99 goes to the LAW stream, a smaller amount will remain free after treatment than after HLW treatment. LAW melters appear to capture Tc-99 more efficiently than HLW melters. Regardless of the treatment process, any Tc-99 that treatment does not capture will end up in the melter offgas system. Wastes from that system undergo treatment and become solid waste. If the WTP operates without the capture of Tc-99, the process will release slightly less Tc-99.

   Overall, the impacts to the groundwater from the presence of Tc-99 are significant if Alternative 3B cast stone is the waste matrix. If USDOE removes Tc-99 in the WTP LAW facility and the supplemental 200 East Area cast stone, the Tc-99 concentrations at release are 5,022 pCi/ L (about five times the drinking water standard of 900 pCi/L).

   This EIS analysis shows that moving the Tc-99 to the HLW stream does not affect the risk to the groundwater. However, Ecology would support sending more of Tc-99 offsite in HLW glass if that would not cause more problems with secondary waste disposal. Significant uncertainties in chemical partitioning during the treatment, other uncertainties about retention in the glass during treatment, and long isotope life and high mobility add to the desire to remove Tc-99 and send it into the HLW glass. If USDOE were to determine that including Tc-99 capture is their preferred alternative, Ecology would support restoring the original ion exchange process that incorporates more Tc-99 into the HLW glass, rather than developing another process. That restoration would not delay WTP construction or worsen the treatment of secondary waste.

Mitigations Needed in Final EIS

1. All the tank closure options result in significant adverse impacts to the groundwater at the boundary of the facilities and at the core zone. Ecology requests that USDOE's EIS contractor add a discussion of potential mitigation strategies that could lessen these impacts and help decrease the concentrations of the contaminants to bring them closer to drinking water standards. This discussion should appear in the Final EIS and be integral to USDOE's decisions as they appear in the ROD.

2. The cribs and trenches and waste from past tank leaks are significant sources of contamination that have adverse impacts on the deep vadose zone. Capping does not stop contamination. To prevent impacts to the groundwater beyond the core zone, USDOE must develop mitigation measures very soon. The Final EIS and ROD must provide mitigation for the deep vadose zone.

    - Peak concentrations from the deep vadose occur in the groundwater in 2050. This results from the very deep contamination that is just above the groundwater table and currently in the groundwater. This is a short-term impact in relative terms that requires a distinctive mitigation approach. To be effective, mitigation measures must be developed to address the deep vadose zone contamination on a site-wide basis and be ready for full-scale deployment in the Central Plateau soon.
    - A large amount of the known soil inventory (that is not as deep) would impact the groundwater far beyond 2050. A distinct midterm mitigation approach should be developed for this zone. And the near surface needs a separate mitigation approach.

3. None of the Draft EIS alternatives bring the impacts below acceptable cancer risk or meet the safe drinking water standards

    - SEPA authorizes Ecology to establish enforceable mitigation measures in permitting decisions.
    - All land disposal facilities must account for the risk term created by disposal to the facility (e.g., as provided through performance assessments).
    - The Mitigation Action Plan must identify distinct approaches for near-term impacts, mid-term impacts, and long-term impacts.
    - Ecology must be able to review and provide input into the Mitigation Action Plan.
    - Ecology intends to put conditions in dangerous waste permits to mitigate past releases to the soils and to inhibit releases in the future.

4. Where appropriate and necessary, Ecology intends to make mitigation a condition of adoption of the Final EIS under SEPA. When we issue a SEPA Determination of Significance and a Notice of Adoption, we will list those sections we are adopting. We will inform the public that we are adopting the analyses on cumulative impacts on vadose zone and groundwater contingent on Ecology review and input into the USDOE Mitigation Action Plan. The goal of remedial action should be to protect against further soil and groundwater contamination.

- The preferred alternative should not result in the permanent loss of use of the aquifer.
- We know that further groundwater contamination is going to result from the existing soil contamination as it continues to travel downward.
- Ongoing monitoring and groundwater cleanup are the best near-term responses to the impacts.
- The EIS contractor used assumptions in the Draft EIS for cumulative analysis. Those assumptions were based on the Central Plateau Strategy. The cumulative results show that remedial action is necessary. Capping without removing and treating the waste in some contaminated sites may be unacceptable. More mitigation is essential to future Central Plateau decisions.

5. The Cumulative Impacts indicates that the Hanford Site needs to make decisions in non tank farm contamination sites to reduce contamination in the soil and protect the groundwater from further contamination.

Fast Flux Test Facility (FFTF) Decommissioning

1. Ecology supports USDOE's preference for entombing the FFTF. We agree with USDOE's proposal to remove all above-grade structures, including the reactor building. We do not object to the below-grade structures, the reactor vessel, piping, and other components remaining in place. We consider the proposal to fill the below-grades structures with grout to immobilize the remaining radiological and hazardous constituents to be protective of the environment.

2. We also support USDOE's proposal to construct an engineered barrier over the filled area to prevent intrusion to be protective. Burial in the IDF of any radiologically or chemically contaminated waste that the entombment activities will generate will be appropriate if the release of contaminants does not increase the concentrations of contaminants in the soil or groundwater.

3. Ecology supports using the bulk sodium inventories that came from the FFTF in the WTP. We also agree with USDOE's proposal to process the remote handled-special components at the Idaho National Laboratory.

Tank Waste Farm Closure

1. In regard to tank waste, the biggest reduction in impacts comes from removing as much as possible from the tanks during initial retrieval. The closure actions of mixing any remaining waste with grout and capping the tank farms makes only a limited difference in the long run because both the grout and the caps break down before the risk term of the waste is exhausted. Thus, these closure actions only serve to delay the release and spread it out over time. The bar graphs in Chapter 5 showing releases to the Columbia River clearly reflect this. The Final EIS and ROD should include and select a preferred alternative that supports as much retrieval as possible.

2. The Draft EIS shows the intrinsic relationship between the decisions concerning tank system closure and remediation of past tank leaks. The tank farm systems closure actions are influenced by effectiveness of past leak mitigation and vice-versa. The decisions cannot be undertaken separately. The Final EIS and the ROD needs to reflect this fundamental interrelationship.

3. All alternatives in the Draft EIS include an estimated leak loss from each retrieved tank based on a volume of 4,000 gallons. For the particular EIS impact analysis presented, the estimate of the leak losses should be presented separately from the "other" category. This will improve our understanding of the impacts of the "other" category evaluated, and provide clarity to the reader and decision-maker.

   This highlights a mitigation measure that the EIS contractor should identify in the USDOE Mitigation Implementation Plan or in the Final EIS. The mitigation measure should include retrieval leak detection that is adequate to ensure detection of leaks. Tank Waste Retrieval Work Plans must also have an adequate pre-retrieval risk assessment that provides decision-makers with sufficient information to determine a response to a leak.

4. All alternatives indicate that deep soil contamination will continue to have impacts that exceed regulatory minimums for various durations. These impacts will require response actions for the duration of the Hanford remediation activities.

5. USDOE selected Landfill Closure as its preferred alternative for the Tank Farms in the Draft EIS. It does not identify additional mitigation that USDOE must conduct to support landfill closure. The following mitigation measures must appear in the Mitigation Plan and in the Final EIS:

   a) The enhanced monitoring requirements in the vadose zone within each Tank Farm, following closure.

   b) The need for groundwater flow evaluations that will support the development of a sufficient monitoring system to detect any discharges that Vadose Zone Monitoring may not detect.

   c) Mitigation measures to address the near surface soil, mid level soil and deep soil contamination.

   d) Mitigation measures to address emerging groundwater plumes.

6. Ecology is not making a decision now, based solely on a Draft EIS, with respect to tank farm closure. Ecology will make future decisions in Tank Farm Closure Plans, which will be subject to public comment. This EIS and the Tank Farm-specific Performance Assessments will be used as information for those Closure Plans. However, from this Draft EIS, Ecology can see that:

   a) Clean Closure has significant challenges, including exposure to workers and the nearby public and an increased cost and duration of cleanup.

   b) Removing the tank shells does not seem to yield a great deal of risk reduction.

c) Removing as much tank residual as possible does provide a decrease in risk, as does remediating the contamination in the vadose zone.

d) It may be that different tank farms are closed differently depending on the tank farm specific conditions.

e) Landfill Closure combined with maximum retrieval and significant soil remediation may turn out to be a viable option.

7. Appendix O, page 3, identifies what "lines of analysis" USDOE's contractor used to evaluate impacts of these alternatives. Chapter 5 includes tables that report maximum impacts for each alternative.

   The Final EIS should provide more detail about the effects of installing each tank farm barrier. This information would help decision-makers evaluate the impact of peak concentrations of contaminants on each element and to identify the benefit of any mitigation USDOE considers. USDOE should also provide future maximum impacts in the peak tables.

   Landfill Closure would include:

   - Leaving some amount of mixed waste in place.
   - Removing some soil and equipment to meet standards in WAC 173-340 and the requirements of WAC 173-303-610 and -640.
   - Responding to releases to the uppermost aquifer.

8. In the Mitigation Action Plan, USDOE must provide mitigation measures for both radiological and non-radiological contaminants. The Mitigation Action Plan must include development of milestones for submittal and approval of TPA primary documents for monitoring of the vadose zone and groundwater, and mitigation measures that address significant adverse environmental impacts. USDOE will include applicable portions of this plan in the Resource Conservation and Recovery Act closure permit application.

   a) USDOE's contractor must initiate the process for Corrective Action investigations for the areas that are identified as "B," "S," and "T" Barriers immediately (page O-4, Appendix E, pp.148 and 149). The contractor must complete an additional groundwater sensitivity evaluation to consider the effects of cleaning up T/TX/TY contamination with similar assumptions to those in Alternative 4 cleanup action for the B/BX and S/SX tank farm areas. The Mitigation Action Plan must include milestones to initiate early corrective action investigations for the mostly highly contaminated Tank Farms immediately.

   b) The Mitigation Action Plan must include any necessary technology development to remediate or mitigate soil contamination that could result in unacceptable risks to human health and the environment. USDOE must provide milestones for further development of technology that would mitigate the contamination in the deep vadose zone.