

April 18, 2019

Dear Ecology and DOE-ORP,

Please find attached the Hanford Advisory Board (Board/HAB) white paper on System Planning Assumptions. This document was prepared to respond to a request by John Price of the Washington State Department of Ecology. At the Board's March 2018, meeting, John challenged the Board to provide the TPA Agencies with a preferred scenario based on System Plan 8. This challenge was associated with the ongoing milestone negotiations between the Tri-Parties related to the Hanford tank waste retrieval and treatment mission.

As a part of this effort, a Sounding Board was performed by the Board at the September 19, 2018 meeting to allow Board Members to express their thoughts on this topic. These Sounding Board comments are an attachment to this document. Board Members not present at the September meeting were given an opportunity to submit additional comments. These comments are also included in this attachment. At the Board's December 05, 2018 meeting, the Board completed the review of this document and adopted it with consensus.

The Board has chosen to not submit a single preferred scenario as originally requested by Ecology. Instead, the Board has provided a list of recommended modeling assumptions which were the basis for the September Sounding Board discussion. The list of assumptions/options does not represent Board consensus.

The system planning assumptions/options presented are based upon the Board's longstanding, fundamental principles that reflect some of our most important values related to the Hanford cleanup. It is our hope that this effort helps to stimulate a focused System Planning discussion among the agencies, the Board and the public.

Sincerely,

Susan Leckband, Chair
Hanford Advisory Board

System Planning Assumptions

At the March 2018 Hanford Advisory Board (Board) meeting, John Price of WA Ecology challenged the Board to provide the TPA agencies with a preferred scenario based on System Plan 8. This challenge is associated with the ongoing milestone negotiations between the Tri-Parties related to the Hanford tank waste retrieval and treatment mission. The system planning options we present are based upon long standing, key, fundamental principles that reflect some of the Hanford Advisory Board's most important values related to the Hanford cleanup. This white paper supported a sounding board discussion at the Hanford Advisory Board meeting on September 19, 2018. The list of assumptions/options does not represent Board consensus. Sounding board responses are included as an attachment.

Contributing Values

The Board has created values and principles related to tank waste treatment over the years and stuck by those values and principles in our advice. The following values supported this proposal.

In addition to the values described in HAB Advice #295, the Board identified the following values that provided a basis for this proposal:

1. All Hanford tank wastes must be stored safely until treatment. No preventable leaks to the environment are acceptable.
2. Any "bad actors" (e.g., mobile long-lived radionuclides) removed from waste should be disposed offsite in a suitable facility.
3. The Board has a preference to retrieve all SSTs to the extent practicable.
4. The Board considers DFLAW to be a priority.
5. If new tank capacity is added to the system, tanks should be designed to safely store and facilitate retrieval of wastes. Tanks should also be designed to improve sampling opportunities for surrounding soil and groundwater and the contents of the tanks themselves.

Guiding Assumptions for Future System Plan Scenarios

Upon review of the System Plan, and in consideration of risks and vulnerabilities in the analysis described in HAB advice #295, the Board has developed the following list of modeling assumptions that may help to guide development of scenarios for System Plan 9. These assumptions could be considered individually or in different combinations, depending on continued discussions between the HAB, DOE, and Ecology. It should be noted that not all listed assumptions represent consensus among members of the Board, but were included to stimulate further analysis and discussion among agencies and the public.

The Board has chosen to not proffer a single preferred scenario as originally requested by Ecology. Instead, the Committee intends for the list of recommended modeling assumptions to provide the basis for a Sounding Board discussion among the HAB at the September Board meeting.

#	Assumption to Consider	Rationale	Purpose
1	Direct-Feed LAW proceeds on schedule per the Consent Decree.	The Board supports initiation of tank waste treatment as soon as possible.	Commit necessary resources to achieve DFLAW as a top priority.
2	Additional Double-Shell Tank failures will continue to occur randomly.	The Board has low confidence that all existing DSTs will be serviceable for the duration of the longer mission represented in System Plan 8, especially considering a flat funding scenario. See accompanying HAB advice 298.	Provide a validated risk assessment that includes a projected retrieval schedule and identifies the “inflection point” when DST failures interfere significantly with retrieval/treatment. Estimate the optimal number of DSTs needed (including potential new DSTs) to ensure no significant mission delays, and account for costs of DST failure response in planning.
3	The 11 identified tanks with TRU waste can be retrieved and sent to WIPP for disposal.	The Board prefers that these wastes are disposed offsite rather than onsite or through the WTP to a deep geologic repository. However, given that these tanks are among the lowest identified risk tanks in terms of their contents and the prospects of potential leaks, this work should not in any way interfere with work necessary to get DFLAW up and running or to complete construction and begin operation of the WTP.	It will reduce demand on the WTP and may achieve earlier offsite disposal of tank waste.
4	Defer physical closure of Single Shell Tanks after retrieval to accommodate other activities.	Tank closures divert funding away from waste treatment and are not a near-term health/safety priority.	Preserve site funding that would otherwise be dedicated to maintaining min-safe conditions or treating tank waste.

5	At best, ORP will have flat funding from 2018 levels, plus a projected escalation, through the duration of the tank mission.	A comment from Brian Vance at the 4/10/18 HAB Committee of the Whole meeting expressed that flat funding is DOE ORP's expectation going forward.	Provide more realistic schedule expectations to compare against funding-unconstrained scenarios shown in System Plan 8. It will also assist in communicating site funding needs. This assumption should not guide future ORP budget requests.
6	Expect reduced throughput for WTP operation and SST retrieval	Reduced throughput seems like a likely possibility based on the 36% efficiency of the vitrification facility at Savannah River and the 17% efficiency of the vitrification at the West Valley Demonstration Project ¹ . Retrieval efficiency is still uncertain and may be hindered by the need for supplied air for tank farm workers. (Note: this assumption is consistent with Scenario 7 of System Plan 8)	This assumption provides a bounding case for providing projected availability based on the complexity of Hanford tank waste and estimating the consequences of other unanticipated project delays.
7	Early U Farm Retrieval	Completion of 16 SST retrievals instead of 8 from the tank farm in the same time span, as well as retrieval of 4 assumed leakers instead of 1, are worth the risk of solids buildup in the DSTs. The latter risk may be mitigated by incorporating additional DST construction. (Note: this assumption is consistent with Scenario 8 of System Plan 8)	Provide cost/schedule information on an accelerated retrieval schedule.
8	Offsite Treatment of WTP Secondary Waste Effluents (if waste is disposed offsite)	The modeling tells us this scenario saves both time and money. It further benefits the overall mission by allowing more SST retrievals during DFLAW, extending the life of glass melters, and accelerating the ability to remediate "Group A" tanks. Due to the potential for Tc-99 to be retained in effluents in significant quantities to make long-term performance of grout at the IDF uncertain, the Board only supports this scenario if grouted waste forms are disposed offsite in a suitable facility. (Note: this assumption is consistent with Scenario 9 of System Plan 8)	Provide cost/schedule information for an offsite effluent treatment scenario.

¹ https://www.hanford.gov/files.cfm/15-WTP-0151.LAW-D_O-report-sm.pdf

9	Retrieval Contingency – Additional Double Shell Tanks	<p>See accompanying HAB Advice #298 regarding potential DST failure. When considering the model outcomes of System Plan 8 and the expected further lengthening of the mission schedule under the assumptions provided herein, the Board believes that additional DST failures are a near certainty. A reduction in total DST capacity not only poses potential risk to the environment, but it risks limiting the SST retrieval rate and thereby delaying the whole tank mission. The Board recommends that these DST failure-related risks be proactively managed with additional storage capacity, even if it costs additional time before full WTP treatment starts.</p> <p>Note: This assumption is consistent with Scenario 10 of System Plan 8. The Board accepts that fewer than the 12 new DSTs evaluated in System Plan 8 may be acceptable for contingency storage. A final amount of necessary tank capacity should be determined based on an analysis consistent with the assumptions in this document.</p>	Provide cost/schedule information for retrieval and treatment with the benefit of new DSTs.
10	Retrieval Contingency – Accelerate and Enlarge the planned Tank Waste Characterization & Staging Facility	As an alternative to new DSTs, the Committee is interested in the possibility of accelerating and enlarging the storage capacity of the planned Tank Waste Characterization & Staging (TWCS) facility in lieu of constructing new standalone DSTs. TWCS would add potential emergency storage capability, is a critical component in treating HLW, and could potentially provide future support for the Supplemental LAW facility ² .	Understand the optimal size and configuration of the TWCS facility to provide WTP feed and also act as supplemental retrieval storage space in the event of additional DST failures. Estimate cost/schedule impacts and opportunities of an enlarged TWCS versus new DST construction.
11	Retrieval Contingency – Above-ground tank capacity for LAW following TSCR pre-treatment.	Once Low Activity Waste has been treated to remove Cesium, Strontium, and solids, the associated dose may be low enough to allow for above-ground storage of those wastes.	Estimate whether cost/schedule savings may be gained by adding additional storage capacity in between the TSCR system and the LAW vitrification facility. This scenario could potentially include additional TSCR units and/or be combined with a grouting scenario for LAW.

² At the 2/28/18 National Academies of Sciences meeting in Richland focused on Hanford’s Supplemental LAW, members of the FFRDC recommended the addition of a lag storage capability upstream of the Supplemental LAW facility to support consistent treatment flowrate.

12	Retrieval Contingency – Sludge-only storage capacity	The current DSTs have a limited capacity to store sludge wastes due to hydrogen buildup concerns, therefore the ability to retrieve sludges from SSTs may be constrained by the WTP operating efficiency to vitrify HLW sludge. The addition of tank capacity with alternative configurations and geometry specially designed to store sludges could potentially ease future constraints on SST retrieval.	Understand the cost/schedule impacts of additional sludge-only storage options, and potentially support the development of a sludge-only storage tank design.
13	Treat Low Activity Waste to remove long-lived mobile radionuclides (Tc-99 and I-129), then grout the LAW for offsite disposal. Incorporate the extracted radionuclides in the WTP HLW feed.	If the long-lived, highly mobile radionuclides can be extracted from the LAW waste stream prior to disposal, it is possible that these wastes may be disposed safely via a grouted waste form offsite.	Understand the cost/schedule impacts of an alternative disposal pathway for Low Activity Waste.
14	Treat Low Activity Waste to remove long-lived mobile radionuclides (Tc-99 and I-129), then grout the LAW for offsite disposal. Incorporate the extracted radionuclides in grout for out of state disposal.	The availability of the Waste Control Specialists Federal Disposal Facility in Texas, which has more suitable characteristics for long-term disposal and which does not have restrictions on disposal of Tc-99 and I-129, offers a potential opportunity to reduce cost and overall risk to the public.	Understand the cost/schedule impacts of an alternative disposal pathway for Low Activity Waste.

15	With the State of Washington's concurrence, evaluate delaying the retrieval of SSTs for a negotiable number of years.	Temporary hiatus of SST retrieval could potentially allow prioritization of constructing sufficient mission-scale tank capacity and commencement of treatment sooner than currently possible under a constrained funding outlook.	Understand the potential further tank integrity degradation and cost/schedule impacts resulting from a temporary hiatus on SST retrieval.
16	In-place closure of selected SSTs without retrieval.	Some members of the Board may entertain a scenario wherein select SSTs are closed without prior retrieval, but such a decision should be made on the basis of residual cumulative environmental risks rather than an arbitrary percentage of remaining curie content.	Revise and hone Scenario 4 of System Plan 8 based on projected risk to future receptors instead of curie content and/or residual volume.
17	Manage the non-elutable Cs-137 ion exchange resins from LAW treatment via "greater confinement" disposal in an offsite facility.	The Crystalline Silicotitanate ion exchange resin planned for use in the TSCR pre-treatment system does not have a clearly defined disposal pathway, and there is uncertainty about the feasibility and methodology of extracting the resin from its canisters for vitrification in the WTP after decades of onsite storage.	Understand the cost/schedule and feasibility of disposing the spent ion exchange columns offsite instead of through the WTP.

Sounding Board Responses

September 19, 2018 Hanford Advisory Board Meeting

In response to the following question:

“What criteria or assumptions would you like to see considered in the next System Plan?”

Earl Fordham, Washington State Department of Health

“No Comment”

Pam Larsen, City of Richland

“In listening to the National Academy of Sciences meetings discussing the system plan, they presume it is a real system plan which it is not. I think it is really important to change the title of the document. It should be called alternative analysis of the system to retrieve tank waste. I agree with everything on the “what do you think page.”

Angela Day, Citizens for a Clean Eastern Washington

“I am looking at the column that says assumptions to consider. The very first one says that the assumption is that the DFLAW will proceed on schedule. I was wondering if we wouldn't want to consider adding an assumption about what happens if that doesn't proceed on schedule.”

Shelley Cimon, Columbia RiverKeeper

“I guess for me I think about chaos theory. The idea that we got a system and things are happening and we end up with something completely different. That really speaks to the idea and the acceptance that we are going to have more failures in these tanks. We have got to understand. I know that we called it an inflection point here. When DSTs fail. When that failure starts to impact mission delays. I think there has to be some very serious consideration of when is that going to be. Do we not need to address the fact that it is going to happen and address it now? That means building more tanks as preparation to anticipate that it is going to happen. For me, that has always been one of the biggest concerns.”

Steve Wiegman, Public At Large

“I agree with Pam’s comment that this is no longer what the system plan was originally prepared to do. It was designed to connect tanks, delivery, treatment, disposal in a flow of logic so you could see how all the parts interconnected. It no longer does that. Not even close to that. It’s no longer a system plan and shouldn’t be called that. It is a good thought provoking set of analysis to show what kind of trouble we are really in. The 14 points that Jeff developed in the pink sheets, I agree with all but one of those. I do not think we should defer physical closure of SSTs to take that money to take that money and spend it on other stuff. Other than that, I think those assumptions are spot on.”

Bob Suyama, Benton County

“I wanted to thank Jeff for an excellent job. When he sent me those graphs I said that is going to be two hours but he got through it. What I would like to see in System Plan 9 is at least the two scenarios that I thought were the most useful. The first was the baseline. I thought having the unconstrained baseline and what it is going to take to get there was very valuable. Having flat funding; I really don’t think we are going to have \$3 billion dollars per year come to this site. It is kind of like what we have been getting for the last 10 years. We really need to really look at what we are going to be able to accomplish with that flat funding. Just like we talked about before, we have to factor in DST failures for every five years to see how that is going to affect it. We are going to have DST failures. The other issue I would like to see is innovative approaches like the test bed initiative. It is going to allow us to move low-level waste offsite to Texas and it is going to help us empty some of those tanks in the near term. How is that going to affect the process? Maybe it is not a test bed initiative, but something like that. The commercial process if we turn it over to them, we pay them and the waste is offsite.”

David Bolingbroke, Public At Large

“I would like to also thank Jeff for the presentation. I would like to second Bob’s comments on the importance of being able to measure what we will be able to do in the future based off more of a flat funding schedule. It has been relatively flat in the past and it looks like it is going to be relatively flat going forward. I think we need to prioritize realistically on the amount of funding we are going to have. My other comment would be that I really like the different scenarios. For me it comes down to balancing different priorities. What is most important? Is it about finishing the job the most quickly? Is it about dealing with high-level or low-level waste first? Is it about efficiency? It is trying to find a balance between those priorities that I am still trying to figure out. I think it’s about deciding what the most important thing is and then doing the most important thing as quickly as we can.”

Helen Wheatley, Heart of America Northwest

“I echo the previous the previous comments except for assumption number four which of course I would argue that it is important to include physical closure of SSTs. I wanted to thank Jeff for these graphs and especially for the one that jumps out at me. I know it would jump out at people I would talk to in the general public. In particular, SST retrieval rates. It is really striking to look at and look at the year 2045 and it really shoots it up. To think about how old those SSTs are. When we talk about assuming that there will be a DST failure every five years, I think it’s also important to consider the possibility of more a catastrophic failure all at once. I don’t know how you would factor that in. It just doesn’t seem likely that those failures are going to be gradual and predictable. On a graph line, it is more likely that it is going to be catastrophic, all at once and probably fairly early in this 100 year picture we are looking at. That would be my concern. Is there some way we can add that thought?”

Jeff Burrigh, Oregon Department of Energy

“So John, I don’t know if you are hearing this but there aren’t a whole lot of preferred scenarios coming out. I think the reason why is because there is not an answer in here. There is not a silver bullet. If there is not a clear way to make this mission better, I think it switches to a paradigm of how we manage failure better. How do we be ready for failures in a longer road ahead? We had talked as a committee. Scenario 7, things take longer than you thought. Scenario 8 and 9 are some little ways to gain efficiency. Scenario 10 which envisions some additional storage. I would challenge you to be creative when you think about storage. It’s not just DSTs. I think about this TWX facility that is not yet designed. It is something we know we need already. It is something that if we switch to a direct-feed high-level waste paradigm, it’s suddenly the long pole in the tent overnight. Is there a way to negotiate the design of that to kill two birds with one stone? I also think about the waste-receiving facilities that are planned to be built around the site. I think about things like above ground tanks after waste has gone through the TSCR. Maybe it doesn’t have a dose restriction that makes it have to go underground. Maybe there is some cost savings there. You will be able to see those as potential alternatives to the pink paper. Of the assumptions that we included in here, the only one that Oregon really cannot stand behind is #16 which envisions not even trying to retrieve waste from the tanks. We think you have to try. If high-level waste is going to drive the mission then don’t stop building the high-level waste facility. My last point would be that technetium and iodine are really bad actors. If we can find ways to manage that, your options improve.”

Rebecca Holland, Hanford Atomic Metal Trade Council

“I agree with what Pam said. Assuming that this is a real plan and it’s not. It’s not a real plan. I love it when a plan comes together. I think assumption #4, deferring closure of SSTs after retrieval I can totally stand behind that. I think retrieving the tanks is most important. I think as we have seen over the years, new technology comes around. Eventually, I think there will be some new technology that will help to physically close these tanks. In the meantime I think we should continue to retrieve waste out of those tanks. Get those tanks to a place where they can be closed.”

Tom Galioto, Public At Large

“I am still wrestling with this concept but I will give you my thoughts. I think it would take a lot more thought, rationale and understanding to go through these 16 or 17 items to pick and choose which one I thought was best. I like what Bob has just addressed. That is to include flat funding impact and also separately include a baseline of the current planning. Based on the way that this is structured, I would think you would want to discuss those two items in the text as opposed to putting those in the table. That is where we are currently. These alternatives that we are presenting here are things to consider to improve that. In addition to those 17 items, I think we should have an additional item in the table is what we as a Board heard and discussed back in March and June. We were looking at a DOE sponsored report on the same subject. We said we don’t like the assumptions that were chosen. We liked pieces of number 2 and 3. We discussed this in a previous meeting this year at the HAB. To that would be more of what John is asking for. It would go more towards what you would recommend. That was the recommendation that was written up for our Board to consider.”

Melanie Myers-Magnuson, “Non-Union, Non-Management”

“I believe that the decision should be made off the risk. I believe there are a lot of SSTs that are of a higher risk to harm the environment or have the potential to leak. I don’t like dropping those off of the list. I am sure there are some that can be held back for a while. I do not believe that they all can be. The only scenario that I really like as it is written is the U farm retrievals because it seemed realistic. The scenario #9 I have a problem with. It is the offsite effluent treatment. The effluents are a secondary waste which means it is a low-level waste which does not require a WIR. We already have capabilities onsite to treat effluents. The cost of offsite treatment includes road closures, expensive transportation, and proper containers. The actual cost of treatment is enormous. When it’s treated, you have a form of waste that is no longer a hazard to the environment or people. In this scenario, it is suggesting treating the condensates offsite. To me that doesn’t make sense because we have the capability onsite to manage that.

Those costs could be placed somewhere else. We could invest that money in other technologies or disposal. I also think that as a whole it would be nice to have a system plan to have a hard look at cost savings associated with waste disposal. There are a lot of nuisances in the regulations that require additional treatment. There are other nuisances where you don't have to treat. I don't think we do a good job at trying to save money. Because it is such a significant cost, millions of dollars can be saved in just a few days."

Dana Miller, Yakama Nation

"Thank you for the presentation. At this time, I will have to pass. This has to go through the proper process within my Government Agency. I will be sending comments at a later time."

Kristie Baptiste-Eke, Nez Perce Tribe

"I am also in the same position for the Nez Perce Tribe."

Dan Solitz, Oregon Hanford Cleanup Board

"There are lots of choices here. The situation here is dire. We are operating on a failure mode. We have to make the best of what we can get from the government to mitigate or reduce the amount of damage we do to human health, environment, and the safety of the workers. I think the thing we need to do is to go after even the most threatening waste first. Assume a flat funding and try to least harmful failure that we can manage based on the technical ability we have now. I guess we go after the most liquid portions of the waste and get that. Then we go after the next most harmful portion of the waste. If we have a catastrophe, we can get more funding. We should assumed flat funding."

Emmett Moore, Washington State University

"I am here to inform myself more than anything else. I do have a question I would like to ask. The discussion today is based on the near-term tank problem. What is the final date for ending treatment and how many new melters is it going to take to reach that?"

Emmitt Jackson, "Non-Union, Non-Management"

"No Comment"

Liz Mattson, Hanford Challenge

“I have a few thoughts. I agree with changing the title to make it more clear about how it is used. I do have an idea about potentially restructuring or making it more clear about dealing with some of the worst case scenarios. Having them be ad- ons. You would have some improvement scenarios, some setback scenarios and some funding scenarios. They all kind of do different things to what happens. As we move forward, restructure the document so you could put things together. If we have this improvement, this setback and this funding, see what happens. You could move them around more like building blocks versus thinking about one or the other. That might help with how the title is changed. In the negotiations, I hear talks about let’s be realistic about funding. I also know that if you don’t push for what you want, you don’t get it. Not accepting budgetary defeat and balancing realistic ideas of milestones that are achievable with pushing more than you think you are going to get. If you are not asking for it, you are not going to get it. I think it is helpful to include some kind of scenario that shows flat funding and accelerated funding in different ways. You could really use this as a tool for congress to potentially relate to the life-cycle scope cost report to show what happens when we actually fund things.”

Susan Leckband, Washington League of Women Voters

“We all know how important infrastructure is. I don’t see anywhere in here and I assume that the evaporator component of some of these actions. I don’t see the assumption that the evaporator could fail. We all know that has happened and it is a single point of failure. It doesn’t have a backup. I would suspect that in some of these that the assumption should consider the fact that the evaporator, as a critical part of achieving whatever scenario you would pick could fail.”

Richard Bloom, City of West Richland

“I have been listening to all the gloom and doom and am trying to figure out how you insert the gloom and doom into the title of the system plan. I kept thinking in terms of a risk mitigation plan. After my experience with AY-102, we can look at that but we don’t seem to be learning any lessons from moving C-106 to AY-102. Every time we move more waste, we make more waste and it gets bigger. A lot of these items are focused around the aspect of DST failures in the future. As we retrieve these other tanks, we are just making our DST problem worse. Yes, SSTs are leaking. The liquid factor is gone. I would like to see a scenario where we delay the SST retrieval against migration to the environment. When we put it in a DST with a million gallons of liquid on top of it, now we have made it a lot more mobile. Also we are putting greater stress on

these DSTs. The scenarios where we are looking at additional capacity and possibly not adding to the problem is what I would like to see.”

DRAFT