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OREGON HANFORD CLEANUP BOARD
MEETING AGENDA

Monday, November 4, 2019

Cannery Pier Hotel
10 Basin Street
Astoria, Oregon

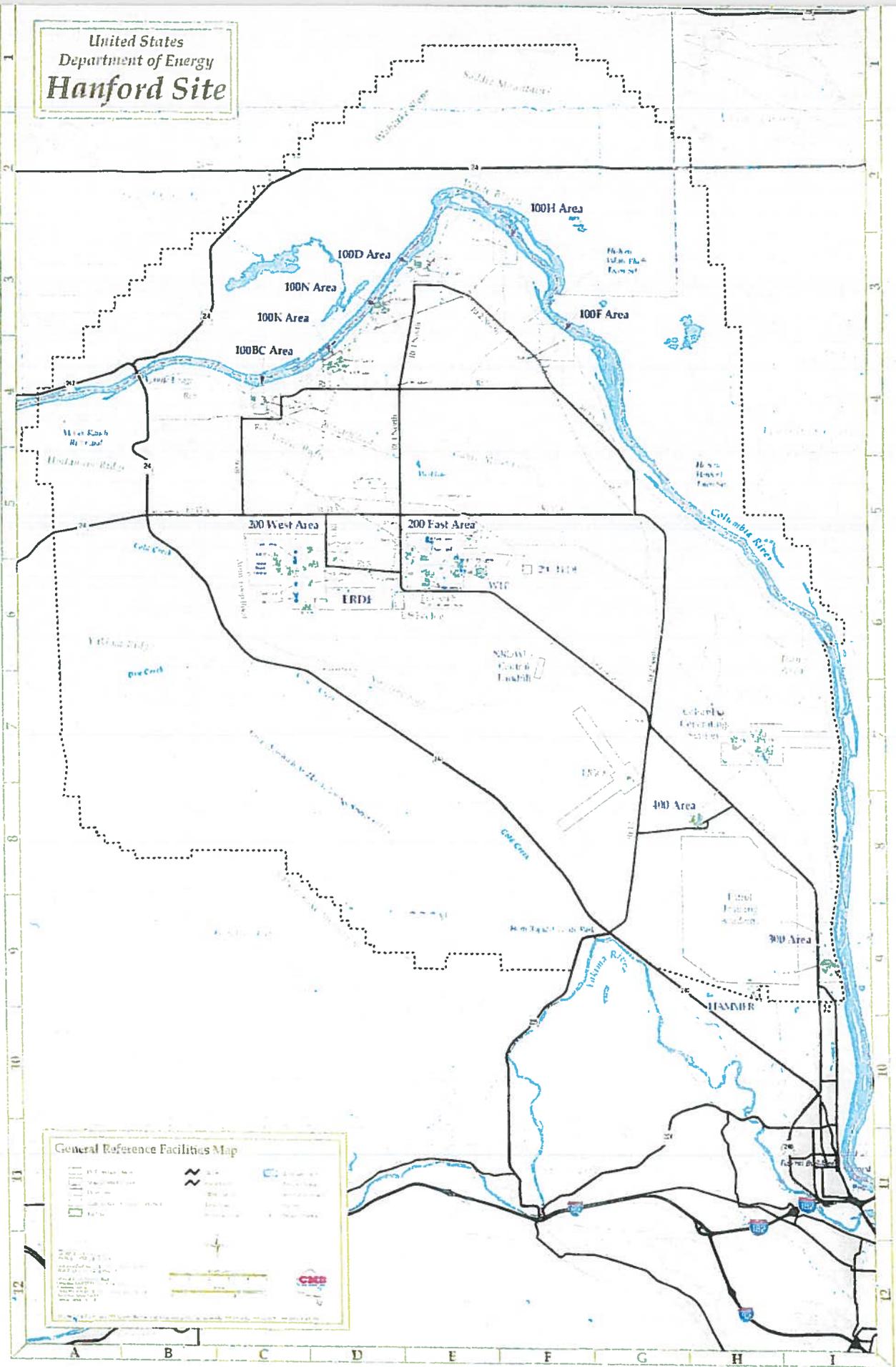
- 1 p.m. Administrative
- Greetings and introductions.
 - Approval of July meeting summary (Tab #3 of briefing book).
 - Introduction of new members/observations on the recent Hanford tour.
- 1:30 p.m. Public Comment opportunity
- 1:35 p.m. Hanford's River Corridor
(Ken Niles, Oregon Department of Energy)
Purpose: To provide the Board with a foundation for the discussions yet to come by providing a visual history of Hanford's River Corridor – from its World War II origins to its current condition.
- 2:15 p.m. River Corridor Groundwater
(Tom Sicilia, ODOE)
Purpose: To provide the Board with information about groundwater issues associated with Hanford's river corridor.
- 3 p.m. Break
- 3:15 p.m. Natural Resource Damage Assessment and Restoration on the River Corridor
(Sara Lovtang, ODOE)
Purpose: To provide the Board with information about natural resource injury that has occurred along the River Corridor and steps that are being taken to restore natural resources.
- 4 p.m. Importance of the River Corridor to Area Tribes
(_____, Confederated Tribes of the Umatilla Indian Reservation)
Purpose: To provide the Board with a tribal perspective on Hanford's River Corridor, including its historical importance to the tribe; history of tribal use of the area; and what it will take for the tribes to be confident that traditional resources will be safe to use.
- 5 p.m. Public Comment/Adjourn for the Day

Tuesday, November 5, 2019

- 8:30 a.m. Administrative
- Greetings and introductions.
- 8:35 a.m. Public Comment/Question Opportunity
- 8:45 a.m. Board discussion of Hanford River Corridor
(Board, with Jeff Burrigh, ODOE, moderating)
Purpose: To discuss observations from the first day of the Board meeting and what action the Board members may wish to pursue.
- 9:45 a.m. Break
- 10 a.m. DOE Update (Tab #___) (VIA PHONE)
(_____, U.S. Department of Energy)
Purpose: To provide the Board with an update on both the Office of River Protection and Richland Office activities, including current Tri-Party Agreement negotiations; tank retrieval progress in AX-102; Direct-Feed Low Activity Waste preparation; completion of the sludge transfer from K-West Basin; overview of work yet to be done with the K-West Basin; preparations for soil removal beneath the 324 Building; and demolition of the Plutonium Finishing Plant.
- 11:15 a.m. Board Business
(Board and Staff)
- Discuss additional actions (if any) based on discussion at this meeting.
- Confirm date and location of the next Board meeting.
- Public Comment/Adjourn
- 11:45 p.m. Board Lunch

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United States
Department of Energy
Hanford Site



General Reference Facilities Map

	Building		Water
	Road		Dam
	Fence		Well
	Pipeline		Creek
	Boundary		River

Scale: 0 to 1000 feet

CH2M

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**Oregon Hanford Cleanup Board
City of Troutdale's Kellogg Meeting Room**

Troutdale, Oregon

Monday, July 15, 2019

Members In Attendance:

Dan Solitz, Acting-Chair

Lori Brogoitti

Jürgen Hess

Steve March

Bryan Wolfe

John Howieson

Erica Elliott

Tom Roberts

Kristen McNall

Justin Iverson, Oregon Water Resources

Janine Benner, Oregon Dept. of Energy

ODOE Staff:

Ken Niles

Mark Reese

Tom Sicilia

Jeff Burrigh

Erica Euen

Tri-Party Agencies:

John Price, Washington Dept. of Ecology

Randy Bradbury, Washington Dept. of Ecology

Public

Marylou Schnoes

Sharon Monteiro

Link to meeting materials:

<https://www.oregon.gov/energy/safety-resiliency/Pages/OHCB-Meetings.aspx>

Administrative

Acting Chair Dan Solitz opened the meeting at 1 p.m.

After introductions, the minutes from the March 2019 meeting were approved.

Link to opening of meeting: [Board opening and discussion](#)¹

¹ <https://soundcloud.com/odoe/oregon-hanford-cleanup-board-1#t=0:01>

Review of Activities / Events since July Meeting

Ken Niles, ODOE, gave the Board a review of Hanford-related activities since the last meeting in March.

Review of activities²

He mentioned several memorable anniversaries this year – the 30th year since the creation of the U.S. Department of Energy’s Environmental Management program; also, the 30th anniversary of the signing of the Tri-Party Agreement; and the 20th anniversary since the first shipment of transuranic waste was received at the Waste Isolation Pilot Plant.

Energy Secretary Rick Perry appeared before Congressional budget committees to defend proposed cuts in the Hanford cleanup budget. He was challenged by Washington Senator Patty Murray, who questioned whether DOE could meet its legal obligations with the budget that was being proposed.

The head of DOE’s cleanup program, Assistant Secretary for Environmental Management Anne White, resigned her job – reportedly because of disagreements with her boss, Energy Undersecretary Paul Dabbar. Ike White, an executive with DOE’s National Nuclear Security Administration, will fill that role.

DOE did move forward with its new interpretation of the definition of the term “high-level waste.” Dabbar said that it had no plans at this time to use this interpretation at Hanford, though Washington, Oregon and others remain skeptical.

Ken also mentioned a series of letters between Washington and DOE, which indicated disagreements related to permitting, lack of consultation, and other disagreements. The two parties do appear to agree with a proposal from Ecology Director Maia Bellon for a new period of negotiation to “collectively identify a holistic and realistic path forward for Hanford’s tank waste...(that) ideally, does not need to be revisited every few years.”

Ken said President Trump has issued an Executive Order requiring all federal agencies to terminate at least one third of their Federal Advisory Committee Act boards by September 30. The Hanford Advisory Board is a FACA Board, but Ken said there has been no indication it will be targeted for elimination.

Public Comment Opportunity

Acting Chair Solitz offered the public an opportunity to make comments or ask questions. There were none.

² <https://soundcloud.com/odoe/oregon-hanford-cleanup-board-1#t=51:17>

Upcoming Meeting Focus-River Corridor

Board, Jeff Burright, Tom Sicilia, ODOE

Focus River Corridor³

Jeff and Tom led an interactive discussion to focus Board discussions about the cleanup priorities for the fall meeting. They took the Board on a Google Earth tour along Hanford's river corridor: outlined cleanup objectives; provided case studies of soil and groundwater remediation actions; and described the anticipated site conditions and restrictions following the cessation of active cleanup. During this "big picture" discussion, the Board was encouraged to ask any and all questions relevant to the river corridor cleanup specifically or Columbia River safety in general.

The attachment at the end of this meeting summary contains information discussed during this topic, as well as "Parking Lot" questions raised by the Board that could not be answered during the meeting. ODOE will work with DOE to address these questions at the November meeting.

National Academies Study

Jeff Burright, ODOE

National Academies Study⁴

Jeff informed the Board about recent work of a National Academies of Sciences committee that is examining the potential of using grout and other treatment methods for a large amount of the Hanford tank waste. Based on the most recent system plan, the existing Low Activity Waste (LAW) vitrification facility is expected to only have sufficient capacity to treat approximately 50 percent of the total amount of LAW. DOE has not yet selected the method of treatment for the other half of the waste, so the study commissioned by Congress is evaluating the risks, benefits, costs, schedules, compliance with applicable standards, and other obstacles associated with three different technologies: vitrification, steam reforming, and grout.

The study is still ongoing, but the available draft documents suggest that grout could be a viable and more cost-effective form for this waste, disposed either at Hanford or off-site at a commercial low-level waste facility in Texas. Jeff took the Board through the major findings of the study, highlighted some of the remaining uncertainties associated with grout, and discussed the potential implications for the future of the tank waste treatment mission. He also solicited Board input on the information provided, to help guide Oregon's formal response to the study.

³ <https://soundcloud.com/odoe/oregon-hanford-cleanup-board-1#t=1:40:20>

⁴ <https://soundcloud.com/odoe/ohcb-15july2019#t=2:50:01>

Public Comment / Adjourn for the Day

Acting Chair Solitz offered the public an opportunity to comment or ask questions.

Sharon Monteiro thanked the Board for continuing the discussions about Hanford cleanup. She also thanked the Board for having a meeting close to Portland.

Acting Chair Solitz adjourned the meeting for the day at 5:15 p.m.

Tuesday, July 16, 2019

Members In Attendance:

Dan Solitz, Acting-Chair

Lori Brogotti

Jurgen Hess

Bryan Wolfe

Steve March

John Howieson

Erica Elliott

Tom Roberts

Kristen McNall

Justin Iverson, Oregon Water Resources Dept.

Ken Niles, Oregon Dept. of Energy

ODOE Staff:

Mark Reese

Tom Sicilia

Jeff Burrright

Erica Euen

Tri-Party Agencies:

John Price, Washington Dept. of Ecology

Mark Pakula, Washington Dept. of Ecology

Randy Bradbury, Washington Dept. of Ecology

Theresa Howell, Washington Dept. of Ecology

Tom Teynor, U.S. DOE Richland Operations
Office

Jolynn Garcia, U.S. DOE Richland Operations
Office

Ben Harp, U.S. DOE Office of River Protection

Jennifer Copeland, CH2M Plateau Remediation

Public

Sharon Monteiro

Marylou Schones

Simone Anter

Irina Phillips

Jeff Breckel

Administrative

Acting Chair Solitz opened the meeting at 8:30 a.m.

Link to opening of meeting: [Board opening and discussion](https://soundcloud.com/odoe/board-business-tuesday#t=0:06)⁵

⁵ <https://soundcloud.com/odoe/board-business-tuesday#t=0:06>

DOE Office of River Protection Update

[Office of River Protection update](#)⁶

Ben Harp provided the Board with an update from the U.S. Department of Energy's Office of River Protection.

Ben emphasized that the entire site is working towards the start of Direct-Feed LAW, to occur within the next several years. He provided a 90-day look ahead at the various activities underway on this project.

DOE does expect to begin retrieval of waste from the AX tank farm yet this year. Ben mentioned new retrieval tools that are being developed to help retrieve hard-packed wastes from both leaking and non-leaking single-shell tanks. One real challenge ahead is retrieving waste from tank A-105, which experienced a steam eruption in 1965 and caused an 8 ½ bulge in the bottom of the tank. DOE believes that there is likely waste beneath the tank.

Ben also shared photos taken from beneath double-shell tank AN-102, obtained through development of tools to access the under-tank air slot region with cameras. There was no evidence of leaks, but there was evidence of spotty pitting and corrosion, typical of humid air corrosion.

In discussing the budget, Ben said that costs for Waste Treatment Plant Commissioning need to grow from \$15 million in fiscal year 2019, to about \$450 million by 2022.

DOE Richland Office Update

[RL update](#)⁷

Tom Teynor provided the Board with an update on the current cleanup activities for DOE's Richland Office.

Tom said DOE is carefully watching Congressional work on the fiscal year 2020 budget, as the President's request would severely impact cleanup at Hanford. The President's proposed budget of \$718 million cut FY 2019 funding by \$236 million.

The grouting of PUREX Tunnel 2 was completed this spring. Tom said workers are making good progress in moving sludge out of the K-West basin and should meet their Tri-Party Agreement milestone to complete that by the end of this calendar year.

⁶ <https://soundcloud.com/odoe/mtng-start-harp#t=2:31>

⁷ <https://soundcloud.com/odoe/teynor-7-16-19#t=0:16>

Work is also progressing on demolition of the Plutonium Finishing Plant. Higher-risk demolition work should resume in August.

Summary of Board Discussion on River Corridor Fall Meeting

River Corridor discussion summary

Tom recapped the previous day's discussion about a fall meeting focus on the River Corridor cleanup.

Update from Ecology on tank-waste related issues

[Ecology update](#)⁸

John Price, Washington Department of Ecology, provided the Board with information about five Tri-Party Agreement change packages recently presented by Ecology to DOE related to the tank waste mission. DOE accepted three of the five proposals. DOE's acceptance establishes new milestones related to an assessment of selective liquid removal from single-shell tanks; establishing closure milestones for waste management area A/AX; and direct-feed low-activity support activities. DOE did not agree to a proposal to establish milestones for the design and permitting of new, compliant storage tanks. Instead, DOE proposed that the topic be included in the new period of negotiations that DOE and Ecology have tentatively agreed to conduct. DOE also did not agree with proposed milestones offered by Ecology related to interim barrier construction over additional single-shell tank farms.

Radioactive Material Transport

[RAD Transport](#)⁹

Ken provided the Board with an informative and historical overview of Oregon's radiological material transportation program, which began in 1981. He noted that the number of shipments has been dramatically reduced through the years, though we still experience 250-400 shipments annually. Shipments related to Hanford have all but been eliminated, as there is a moratorium on sending waste shipments to Hanford for disposal, and shipments of transuranic waste out of Hanford to WIPP are not expected to resume until the mid-to-late 2020s.

⁸ <https://soundcloud.com/odoe/price-07-16-19#t=0:25>

⁹ <https://soundcloud.com/odoe/ken-niles-tuesday-7-16-19#t=0:11>

Board Business

[Board business discussion](#)¹⁰

With Ted Taylor's recent departure, an election was held for Chair and Vice-Chair pursuant to the Bylaws.

Steve March was elected as the new Board Chair and Dan Solitz will remain the Vice Chair.

The Board set its next meeting for November 4 and 5 in Astoria, OR

Public Comment / Adjourn

The public was afforded an opportunity to make comments.

Sharon Monteiro thanked the Board for meeting closer to Portland.

The meeting was adjourned at 1 p.m.

¹⁰ <https://soundcloud.com/odoe/board-business-tuesday#t=0:03>

Attachment: Outputs from the July 15 River Corridor Topic Discussion

Problems	Objectives	Remedies	What will be left over
Reactors (6 cocooned, 2 to be cocooned, 1 national park)	General: 300 Area to Commercial/Industrial; rest of River Corridor to residential standards Decommission & Demolish (D&D) buildings when safe	75 years of decay, then dismantle and dispose in Environmental Restoration Disposal Facility (ERDF)	Waste in ERDF
324 Building, Cesium/Strontium under basement	D&D building achieve residential standards for soil	Dig through basement, then D&D building	Grouted Cs/Sr to ERDF
Contaminated soil sites	<ul style="list-style-type: none"> <15 ft: (based on typical basement depth), achieve direct exposure residential standards based on regulatory values for risk and hazard. >15 ft: No direct exposure pathway. Remediate if groundwater risk only (determined by known plume source, leach tests, or modeling). Achieve drinking water standard or aquatic protection standard for surface water 	Excavate, dispose majority to ERDF	<ul style="list-style-type: none"> Deep soil sites not a risk to groundwater Deed restrictions in perpetuity or until decay Shallow sites close to reactors (inaccessible): deed restriction for industrial exposure (<200 yrs)
Burial Grounds • 618-11 • Burial grounds close to reactors	Dig to bottom or only to 15 feet? (if 618-10 is an indication, they'll dig to the bottom)	Excavate, dispose low-level waste to ERDF and TRU to WIPP	Potentially deed restrictions to prevent well drilling
Ancillary equipment (tanks, cribs, pipelines)	prevent direct human exposure	Cap some with institutional controls, excavate others	Caps and deed restrictions
Cribs	Same as soil sites	Excavate and perform observational sampling >15 ft to determine groundwater source risk	<ul style="list-style-type: none"> Deep soil sites not a risk to groundwater Deed restrictions in perpetuity or until decay
Groundwater Plumes	Achieve drinking water standard or aquatic protection standard for surface water	<ul style="list-style-type: none"> Apatite Barrier for strontium at the aquifer interface Pump & Treat (~25 yrs active pumping + 100 yrs monitoring) Uranium sequestration – "time release capsule" at the aquifer interface 	<ul style="list-style-type: none"> Loaded apatite barrier at aquifer for < 300 yrs. Well restriction Loaded polyphosphate (U) at aquifer line, essentially forever. Well restriction Monitored natural attenuation with restriction (no drink). 70 yrs for Sr in 100 B/C. General limit on Institutional Controls is 70-125 yrs

Parking Lot Questions from the River Corridor Topic Discussion:

- Contaminants on the other side of the river? Can they be going under? How much is daylighting into the river?
- Has there been sampling in Oregon agricultural areas? Both soil and groundwater.
- River sediment concentrations? (both river bank and behind dams)
- Strontium-90 connection to multiple myeloma? (local prevalence)
- Rate of movement for I-129 in the central plateau?
- Basis for the I-129 Maximum Contaminant Level (MCL) for groundwater? (radioactivity compared against I-131)
 - I-129 MCL = 1 pCi/L; I-131 MCL = 3 pCi/L
- Is Iodine-129 bioaccumulation a problem?
- How will the 200-Area Central Plateau plumes factor into the river corridor cleanup?
- Co-mingling of groundwater plumes? How do they behave/combine and what does that do for risk?
- For what duration do we model wastes disposed to ERDF?
- How has a Cascadia quake been incorporated into river corridor risk/cleanup decisions?
- What is the potential for shifts in river flow over time to erode new sediments and migrate contaminants?
- Map of all soil contamination remainders deeper than 15 feet? (i.e., map of future deed restrictions)

4



Oregon

Kate Brown, Governor



550 Capitol St. NE

Salem, OR 97301

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Toll Free: 1-800-221-8035

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www.oregon.gov/energy

July 17, 2019

William F. Hamel,
Assistant Manager for the River and Plateau
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, WA 99352

Dear Mr. Hamel,

Thank you for the opportunity to provide comment on DOE/RL-2016-15 – *Engineering Evaluation/Cost Analysis for the PUREX Complex*. While canyon demolition remains relatively low on Oregon’s cleanup priorities list, we appreciate the need to maintain a workforce with the extensive training and unique skills to conduct demolition of highly contaminated facilities. To maximize this benefit, we recommend DOE begin the pre-demolition work either immediately following or concurrent with the completion of the Plutonium Finishing Plant (PFP) demolition. This work continuity will allow the workforce to retain the technical skills and experience gained during PFP demolition, saving time and on-boarding expenses.

The work proposed at PUREX will also reduce the risk of spreading contamination and reduce “hotel costs” associated with aging infrastructure – both of which we support.

We endorse the U.S. Department of Energy’s preferred alternative, number 4, which includes hazard abatement of the 202A Building; demolition of the 202A East and West Annexes; and “demo prep” of the 202A Canyon above deck areas. Unfortunately, the analysis failed to include the anticipated hotel costs associated with each option, which would be helpful both for decisionmakers and external reviewers to better understand the specific savings that can be accrued from each action.

As the PUREX abatement, demo prep, and annex demolition proceeds, we urge DOE to carefully consider and implement lessons learned from the demolition of PFP. Contamination in the PUREX complex is widespread, requiring deliberate characterization, decontamination, and demo prep to minimize the risk of unintended contaminant spread.

Following annex demolition to slab-on-grade, we suggest at least a screening-level survey to look for evidence of past releases and assist in future contaminant removal actions.

If you have any questions or wish to discuss any of our comments, please contact Tom Sicilia of my staff at 503-378-5584.

Sincerely,

A handwritten signature in black ink, appearing to read "Ken Niles". The signature is written in a cursive style with a large initial "K" and "N".

Ken Niles
Assistant Director for Nuclear Safety

Cc: John Price, Washington Department of Ecology
Dave Einan, U.S. Environmental Protection Agency
Matt Johnson, Confederated Tribes of the Umatilla Indian Reservation
Laurene Contreras, Yakama Indian Nation
Jack Bell, Nez Perce Tribe
Oregon Hanford Cleanup Board
Susan Leckband, Hanford Advisory Board



Oregon

Kate Brown, Governor



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August 14, 2019

Charles D. Ferguson, Ph.D.
Board Director
Nuclear and Radiation Studies Board
Division on Earth and Life Studies
The National Academies of Sciences, Engineering, and Medicine
500 Fifth Street, NW
Washington, DC 20001

Dear Dr. Ferguson:

Oregon appreciates this opportunity to comment once again on the Academies' ongoing study of options for Supplemental Treatment of Low-Activity Waste (LAW) at the Hanford Nuclear Reservation. The State of Oregon retains a long-term interest in the safety of the Columbia River, which stands to be directly affected by the final end-state of Hanford wastes disposed on-site.

We have followed with interest the evolution of the Federally-Funded Research and Development Center's (FFRDC) report. The revised cost comparison between vitrification and grout appears to provide significant incentive to find an acceptable disposal context for a grouted waste form as a way to respond to the rising lifecycle costs at Hanford, which are outstripping even the most optimistic projections of future Congressional funding for cleanup.

We would like to credit both the FFRDC and the Committee for their fair and candid discussions at public meetings regarding both the tradeoffs between Supplemental LAW alternatives and the uncertainties that still remain regarding consistent long-term performance and the adequacy of current available data. We commend also the transparent and inclusive process that has supported the iterative nature of this study.

The conclusion in the FFRDC report of potential greatest concern to us – that Hanford LAW could be safely disposed as grout at Hanford – hinges predominantly on two major lines of evidence. First, the FFRDC compiled recent laboratory test results of short-term performance of reducing grout and grout with getters and proposes to extend these results toward long-term waste form performance in a dynamic disposal facility environment. Second, the FFRDC developed a Performance Evaluation to estimate the potential risk to a future receptor, based on a Performance Assessment (PA) for the Hanford Integrated Disposal Facility (IDF). We echo the point raised by members of the National Academies' Study Committee that until this PA is available for rigorous public review, the ability to judge the veracity of the FFRDC's analysis is severely hindered.

Within the FFRDC report, and in the many informational meetings, we lost count of the number of times a member of the Committee or the FFRDC made statements along the lines of, "This is the best we could do given the time available, the resources available, or other constraints." These caveats do not instill

great confidence that the scope and resources of the study commissioned by Congress were equal to the significance of the decision it is intended to support. We strongly encourage the Committee to emphasize in its review the extent and importance of these limitations of the analysis so that a decision-maker may weigh the study's findings accurately.

This report becomes a rumination on what could be accomplished if the many assumptions underlying the analysis are true. The key question is whether they are in fact true and reliable over long time periods. If we treat the FFRDC analysis as a thought experiment and ask whether Oregon could accept grouted LAW disposal at Hanford under the best-case performance scenario, then we would likely answer yes. Our review of the state of the science, however, would suggest that such an assertion cannot be made with sufficient certainty yet, nor is the path of technology development to get us to that point certain to succeed within an expedited timeframe.

DOE's previous commitments on Hanford tank waste treatment included certain conditions to ensure protectiveness. As described in Appendix D to the 2012 Hanford Tank Closure and Waste Management EIS, Hedges (2008)¹ documents the agreement to eliminate technetium-99 removal in the Waste Treatment Plant (WTP) Pretreatment Facility because it was shown that glass would be able to safely confine these wastes. Now the FFRDC asserts that pretreatment is not necessary for onsite disposal of grout, yet for both technetium and iodine they state that in order to obtain best results (or indeed acceptable results for iodine), getters must be added to the mixture. These getters perform a similar function to pretreatment – separating the long-lived constituents into a sub-form within the larger waste form structure of grout. The difference between pretreatment and getters is the final resting place: above an aquifer in communication with a critical river (at Hanford); deep underground (at a geologic repository); or over 600 feet of redbed clay with no underlying drinking water resource (at the Waste Control Specialists disposal site in Texas)?

The FFRDC appears to have concluded that additional pretreatment is not necessary because getters can provide adequate waste form performance for onsite disposal in grout. However, the opposite is also true: getters are not necessary if additional pretreatment of technetium and iodine is pursued. The FFRDC report does not provide an explanation why getters have been given preference over pretreatment. Additionally, because getters represent a "sub form" to a larger grout waste form, their long-term performance should be evaluated with the same rigor and scrutiny as the primary waste forms in the study before they are endorsed as a viable option.

Much discussion in this study has focused on the definition and legal enforceability of the term, "as good as glass," as an expected standard for any supplemental LAW waste form other than glass. Tri Party Agreement Milestone M-062-00, for which Washington Department of Ecology is named the lead regulatory agency, directs DOE to, "Complete pretreatment processing and vitrification of Hanford High Level (HLW) and Low activity (LAW) Tank Wastes." This legally binding milestone gives the State of Washington the discretion to determine the acceptability of any waste form other than glass.

We continue to stand by the comments we made to the Committee² more than a year ago regarding long-term uncertainty in grout performance and the need to exercise a responsible precaution when there is threat of irreversible harm to an irreplaceable resource. We ask the Committee to revisit our

¹ Hedges, J.A., 2008, Washington State Department of Ecology, Richland, Washington, personal communication (letter) to S.J. Olinger, U.S. Department of Energy, Office of River Protection, Richland, Washington, D.A. Brockman, U.S. Department of Energy, Richland Operations Office, Richland, Washington, and W.S. Elkins, Bechtel National, Inc., Richland, Washington, "Draft Waste Treatment and Immobilization Plant (WTP) Dangerous Waste Permit," October 15. <https://pdw.hanford.gov/document/0810160765>

² <https://energyinfo.oregon.gov/blog/2018/03/07/odoes-ken-niles-weighs-in-on-hanford-waste-treatment-we-must-remain-vigilant-informed-and-involved>

specific statements regarding, "Here's what we would need to see to buy into the idea of grouted Hanford tank waste being disposed on site." Despite the optimistic results of the FFRDC's grout scenario for disposal at Hanford, we maintain that given the remaining uncertainties today, a precautionary approach would include removal of technetium-99 and iodine-129 prior to disposal of these wastes at Hanford in any form other than glass.

We hope that the Committee will view the current state of grout performance projection with a critical eye and in its final report specify the type and scale of validation studies that are still necessary before a grout alternative would be tenable for Hanford. We would expect such studies to account for different waste chemistries with and without Land Disposal Restriction (LDR) treatment additions; harmonization of the laboratory results with real-world grout degradation studies; studies of grout setting performance in light of the complex chemistry of Hanford tank waste; greater specificity regarding the additional LDR treatment research needed; long-term performance of getters specific to the disposal context in question; and comprehensive uncertainty analysis regarding waste form performance relative to overall disposal facility performance.

We do not envy the challenge ahead for the Committee as you attempt to explain the complexity and necessary context of the FFRDC's work for a decision-making audience. We urge you to critically evaluate the perceived urgency of a decision for Supplemental LAW treatment given the shifting sands of the tank waste treatment mission today, the potential improvements in glass production rate on the horizon for the existing LAW vitrification facility, and the uncertainties in the technical analysis upon which this study stands. We wonder instead if it might be a wise course of action to continue seeking improvements to secondary waste forms, reevaluate the separation of technetium and iodine from grouted LAW, and ultimately ensure that the long-lived hazardous constituents are placed in the appropriate disposal context.

Our specific technical comments follow.

If you have any questions about our comments, please contact Jeff Burright of my staff at 503-378-3187 or at jeff.burright@oregon.gov.

Sincerely,



Ken Niles
Assistant Director for Nuclear Safety

Long-Term Grout and Getter Performance

Grout Performance Parameter Values and Water Chemistry

- In our research, we discovered that the 2012 Tank Closure and Waste Management EIS (TCWM-EIS) also assumed a Cast Stone formulation using the same percentages of Portland Cement, fly ash, and blast furnace slag as the more recent laboratory experiments. However, the effective diffusion coefficient for grout used in the 2012 EIS did not include blast furnace slag as a reductant in its experiments (DOE (2005)³, which in turn was based on Mattigod et al. (2001)⁴). We acknowledge that this apparent discrepancy in the EIS modeling does provide support for the idea, forwarded by the FFRDC, that while the grout formulation has not changed since 2012, the underlying experimental data that provided the basis for effective diffusion coefficients for Tc-99 retention in grout in particular was likely out of date.
- Since the improved grout performance (represented by the effective distribution coefficients for Supplemental LAW grout) is based on only five papers in the FFRDC report, with the majority of the parameters coming from Cantrell et al. (2016), it would have seemed prudent for the NAS to evaluate these works separately and seek testimony from the authors themselves. Ultimately the future of Hanford, billions of dollars, and potential future risk to water resources may rest on these works of scholarship that are three years old or newer, and which may have not been strenuously tested. We note that these cited works are also careful to caveat their results, for example:
 - Cantrell (2016) states: *“The data package presents the information that is available at this time, but recognizes that there is more work to be done to reduce the uncertainty in the measured properties and to provide perspective on the relevance and scalability of the laboratory work conducted to date and the performance of production-scale Liquid Secondary Waste (LSW) grout waste form in their containers in the disposal facility.”*
- The FFRDC report does not provide diffusivity information for the “low” performing grout analyzed in the IDF PA, which they report could not meet regulatory requirements without 92% Tc-99 removal (p. 64). Instead, the “low performing” grout in the FFRDC Performance Evaluation corresponds to the most recent laboratory data. More information is needed to understand this discrepancy between the values and results in the IDF PA and the FFRDC Performance Evaluation.
- The report contains no formal assessment of the Technology Readiness Level (TRL) of reducing grout or grout with getters relative to waste form performance, only describing a high TRL (7) for the implementability of a grout treatment path. The FFRDC and the Committee should include an evaluation of the necessary timeline to get to a high enough TRL for all aspects of a grout alternative, per DOE policies. We note that the November 2018 public meeting did include some of this discussion, and Cast Stone performance was judged to be “medium” (4-6) because additional research is needed to confirm the understanding of retention characteristics. A getter TRL was not discussed.
- We note an observation made during the November 2018 public meeting that we still do not know the mechanisms of release over time for Cast Stone (e.g., diffusion limited versus other mechanisms) and can only infer “suggestions” from the research, which may not be the true conceptual model. A member of the FFRDC responded that they did not have the resources or

³ DOE, 2005. Technical Guidance Document for Tank Closure Environmental Impact Statement Vadose Zone and Groundwater Revised Analyses. <https://www.hanford.gov/files.cfm/TCEIS-Vadose.pdf>

⁴ Mattigod et al., 2001. Diffusion and Leaching of Selected Radionuclides (Iodine-129, Technetium-99, and Uranium) Through Category 3 Waste Encasement Concrete and Soil Fill Material. PNNL-13639. https://www.pnnl.gov/main/publications/external/technical_reports/pnnl-13639.pdf

enough data in the literature to be able to tackle the question of the exact mechanism [for release]. A disposal decision with this degree of permanence should be based on a better understanding of the mechanisms influencing long-term waste form performance. Without confidence in the conceptual model, the “effective diffusion coefficient” approach (or in the words of one Committee member, “an amalgamation of all the real processes going on”) represents only what has been observed for as long as we have been able to look. If we cannot say with reasonable certainty why a technology works today, it is not possible to say with confidence that it will continue to work for 1,000 or more years.

- The risk of potential interaction between an oxidizing LDR treatment and a reducing grout does not appear to have been completely managed within the FFRDC report (page 110).
- The FFRDC report notes that the recent laboratory data on grout effective diffusion coefficient properties cited in the FFRDC report used two different kinds of water – deionized water (DIW) and vadose zone pore water (VZPW) – which showed markedly different results and essentially trends the Tc-99 leaching data toward “high performance” (Figure C-1 in the FFRDC report). We question whether either of these water chemistries are the appropriate benchmark for experimentation, and thus whether this data is useful as the fundamental basis for the FFRDC’s waste form performance evaluation. As stated in Serne (2015)^[1], the Vadose Zone Pore Water recipe is, “based on several direct measurements of actual VZPW removed from Hanford formation sediments from boreholes in 200 E where the IDF is located.” These measurements were taken from samples at depths 48.5 and 82.5 feet below ground surface, averaged, and charged balanced. Based on the findings of Serne (2015), the VZPW created a secondary precipitate on the surface of the grout monoliths comprised of aragonite and brucite, which was credited for the lower Tc-99 leaching values. This is likely due to the CaSO₄ (i.e., gypsum or Plaster of Paris) and magnesium (MgSO₄ and MgCl₂·6H₂O) added to the VZPW simulant⁵. We surmise that any water within the shallow disposal environment would be meteoric water (i.e., infiltrating precipitation), and the environment directly overlying waste packages – assuming an evapotranspiration barrier and unspecified backfill material - would not be representative of natural subsurface conditions. We reason also that the pH from infiltrating meteoric water would differ between the above scenario and deeper pore waters that have undergone buffering through native soils, as would the dilution and geochemical dissolution effects between shallow and deeper soils. Therefore, the water composition in the future IDF cannot be assumed to be similar to deeper vadose zone pore water. Last et al. (2015)^[2] in their study of technetium and iodine Kds in IDF-specific sediments using VZPW would appear to acknowledge this distinction, stating, “The adsorption/desorption data presented in this report do not apply to the waste form environment itself.” Finally, we note that there has been no discussion or experimentation related to the longevity of this secondary precipitate effect. We recommend additional experimental sensitivity analysis associated with this critical performance parameter.
- As noted in Cantrell (2016), work by Langton (2014) showed that, “*The leachability of technetium in slag-based sodium-salt waste forms may be greater in samples exposed to moist soil (representative of unsaturated vadose zone conditions) than that of samples submerged in deionized water.*” *The potential effect of this finding is that the time to fully reoxidize waste forms is likely lower in a partially saturated environment compared to a fully saturated environment.*” We note that leach tests commonly submerge samples in water, while true conditions in the IDF could instead involve partial saturation or gas-phase oxidation

^[1] Serne, RJ, et al., 2015. Extended Leach Testing of Simulated LAW Cast Stone Monoliths. PNNL-24297. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24297.pdf

⁵ Refer to Tables 2.8 and A.3 in Serne et al. (2016).

^[2] Last, G.V., et al., 2015. Technetium, Iodine, and Chromium Adsorption/Desorption Kd Values for Vadose Zone Pore Water, ILAW Glass, and Cast Stone Leachates Contacting an IDF Sand Sequence. PNNL-24683.

mechanisms. This suggests that the current leach tests may not be sufficiently conservative. Cantrell notes that further research is needed on this front, but reasons that this uncertainty is bounded by the fact that his recommended effective diffusion coefficients are based on DIW, while VZPW generally resulted in lower effective diffusion coefficients. Our comment above regarding the applicability of VZPW in an engineered disposal environment would challenge this reasoning.

Grout Performance in the Field

- The DOE and Nuclear Regulatory Commission (NRC) have been working together since 2012 to resolve concerns associated with long-term grouted waste form performance, beginning with an NRC Technical Evaluation Report for the Saltstone Disposal Facility at the Savannah River Site⁶. Numerous study activities have taken place since then, including a 2015 NRC Technical Review⁷ that identified many information needs regarding the long-term performance of Saltstone to retain Tc-99 in a field setting. A report from May 2018⁸ reviewed the projected Technetium release from Saltstone in light of a DOE coring effort on field-emplaced Saltstone and concluded that most of its concerns remain open. A letter dated October 2018⁹ includes a joint NRC-DOE plan to resolve remaining technical questions associated with Saltstone disposal at Savannah River, including: applicability of laboratory data to field-emplaced Saltstone; waste form matrix degradation; macroscopic fracturing; and radionuclide release from field-emplaced Saltstone. Most recently, a Technical Review from May 2019¹⁰ concludes that some of the waste form degradation issues remain open. Additional studies related to this topic are available in the NRC ADAMS library under Docket# PROJ0734. We wish to draw the Committee's attention to the NRC's technical efforts, which are directly applicable to the study at hand. We further note that because the State of Washington is not covered under Section 3116 of the 2005 National Defense Authorization Act, there is currently no legally mandated mechanism for NRC review of a grouted waste form disposed in the IDF at Hanford.
- Concrete degradation via shrinkage and cracking is an expected mechanism that will affect the constituent release rate over time. Studies by the Center for Nuclear Waste Regulatory Analysis (CNWRA) (contracted to the NRC)¹¹ have shown that over relatively short time periods, concrete monoliths and drums develop multiple extensive crack/microcrack networks and experience permeability variations "ranging over five to seven orders of magnitude, whereas DOE maintains that they expect permeability of tank grout to vary over no more than one order of magnitude" (NRC, 2016; Dinwiddie et al., 2012)¹². These networks both increase the localized diffusion rate

⁶ NRC, 2012. Final Technical Evaluation Report for the Revised Saltstone Disposal Facility at the Savannah River Site. ML121170309. <https://www.nrc.gov/docs/ML1211/ML121170309.pdf>

⁷ Nuclear Regulatory Commission, 2015. TECHNICAL REVIEW: OXIDATION OF REDUCING CEMENTITIOUS WASTE FORMS, DOCKET NO. PROJ0734. <https://www.nrc.gov/docs/ML1509/ML15098A031.pdf>

⁸ NRC, 2018. TECHNICAL REVIEW: UPDATE ON PROJECTED TECHNETIUM RELEASE FROM SALTSTONE. ML18095A122. <https://www.nrc.gov/docs/ML1809/ML18095A122.pdf>

⁹ Nuclear Regulatory Commission, 2018. JOINT PLAN FOR THE SAVANNAH RIVER SITE SALTSTONE DISPOSAL FACILITY. Docket No. PROJ0734. ADAMS ACCESSION NO. ML18235A068. <https://www.nrc.gov/docs/ML1823/ML18235A068.pdf>

¹⁰ NRC, 2019. TECHNICAL REVIEW: SALTSTONE WASTE FORM PHYSICAL DEGRADATION (DOCKET NO. PROJ0734). Accession No.: ML19031B221.

¹¹ Dinwiddie, C., et al., 2012. FISCAL YEAR 2012 MESO- AND INTERMEDIATE-SCALE GROUT MONOLITH TEST BED EXPERIMENTS: RESULTS AND RECOMMENDATIONS. <https://www.nrc.gov/docs/ML1225/ML12251A305.pdf>

¹² Nuclear Regulatory Commission, 2016. TECHNICAL REVIEW: U.S. DEPARTMENT OF ENERGY DOCUMENTATION RELATED TO TANKS 16H AND 12H GROUTING OPERATIONS WITH EMPHASES

of lower pH water into the concrete, as well as provide an advective pathway for constituent migration. Serne and Westsik (2011) also stated, "*The key process that must be addressed in the long-term analysis of Cast Stone performance is how long oxygen can be kept out of the waste form, and when oxygen does invade the waste form, how long does it take to fully reoxidize all the blast furnace slag and reduced 99Tc.*" It is unclear how the FFRDC analysis factors these long-term degradation mechanisms into its Performance Evaluation.

- Another study (CNWRA, 2009)¹³ estimated the radial penetration of the oxidation front from a concrete crack. Figure 3-2 of that report shows calculated oxidation front positions ranging between 2 and 8 cm from each crack, depending on sensitivity parameters, with a wider range of variability depending on the initial reductive capacity of the grout (which is depending on the sulfide content of the slag used in the formulation). These results neglect the effect of microfractures in the grout, which would "enhance the diffusion relative to unfractured grout." It is unclear to what degree of faithfulness these degradation mechanisms are represented by the effective diffusion coefficient approach used in the FFRDC report.
 - Langton et al. (2014) found, "The Tc-99 results indicate that the oxidation front is at least 38 mm below the exposed surface for a sample exposed to ambient laboratory conditions and humid air for 50 days. The total age of the sample was 98 days."¹⁴
- Serne (2015)¹⁵ conducted extended leach tests on LAW Cast Stone samples. One finding of note was that the leach results for a few of the monoliths began to show an increased rate of release that the authors speculated was related to the formation of new surface micro-cracks visually observed after 790 days of leaching. The authors, "wonder if this observation is the first signs of some internal degradation of Cast Stone monoliths after a time period between 550 and 790 days of leaching." This finding casts further uncertainty on the long-term performance of reducing grouts as they begin to degrade.

Radionuclide Retention

- Asmussen (2016)¹⁶ conducted particle digital autoradiography imaging of Cast Stone cross sections containing Tc-99 and found two distributions of the constituent: "a) congregation in a ring near the outer edge of the monolith, and b) isolation in discrete "hot spots"." This finding challenges the assumption that Tc-99 would be homogeneously distributed within a grout monolith, and it suggests that a greater proportion of Tc-99 would be present closer to outer surfaces where they may be more likely to encounter oxidizing agents as the waste form degrades. Asmussen further supposes that the Tc-99 within the grout form may be migrating toward the outer walls, suggesting additional dynamics that may continue to develop over a longer period of time.
- On Page 101 of the FFRDC report, the analysis shows that the Cast Stone grout formulation containing blast furnace slag does not appreciably improve the retention of iodine on its own.

ON SPECIFICATIONS, TESTING, RECOMMENDATIONS AND PLACEMENT PROCEDURES (PROJECT NO. PRO0734). <https://www.nrc.gov/docs/ML1623/ML16231A444.pdf>

¹³ Center for Nuclear Waste Regulatory Analysis, 2009. ESTIMATED LONGEVITY OF REDUCING ENVIRONMENTS IN GROUTED SYSTEMS FOR RADIOACTIVE WASTE DISPOSAL. <https://www.nrc.gov/docs/ML1011/ML101160513.pdf>

¹⁴ Langton, C.A. et al., 2014. Comparison of Depth Discrete Oxidation Front Results and Reduction Capacity Measurements for Cementitious Waste Forms. <http://www.wmsym.org/archives/2014/papers/14330.pdf>

¹⁵ Serne, RJ, et al., 2015. Extended Leach Testing of Simulated LAW Cast Stone Monoliths. PNNL-24297. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24297.pdf

¹⁶ Asmussen, RM, et al., 2016. Solid State Characterizations of Long-Term Leached Cast Stone Monoliths. PNNL-25578. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-25578Rev0.pdf

Serne and Westsik (2011) stated, “The available leach data suggest that iodide is not retained in Cast Stone waste forms as well as 99Tc, sodium or nitrate, the latter is generally used to represent a contaminant that has no chemical interaction with the cementitious minerals and is simply retained by the physical properties of the waste form that hinder diffusion.”

- The new Cast Stone formulations are intended to create a reducing environment, which is not expected to decrease iodine diffusion and may in fact increase the migration of the primary form at Hanford, iodate (Zhang et al. 2013¹⁷; Truax et al., 2015)¹⁸ [note: the cited literature states that on average, 70% of the iodine found in Hanford groundwater samples is in the iodate form]. When iodate is reduced to iodide, it becomes more mobile¹⁹.
 - Recent research at Savannah River National Laboratory²⁰ also found that, “Both iodide and iodate existed in grout porewater, however, the proportion of each species varied with the grout formulation; slag grout contained 99% iodide and 1% iodate, whereas slag-free grout contained 39% iodide and 61% iodate. Furthermore, iodate bound more strongly to grouts than iodide.” These findings suggest that the iodine speciation may be an important factor not currently captured by the effective diffusion coefficient methodology of predicting future environmental release.
- Given that Cast Stone does not appear to adequately improve retention of iodine, the FFRDC assumes the effectiveness of “getters” to retain iodine, while acknowledging that limited data exists regarding the effectiveness or implementability of this technology. As the FFRDC report focuses on silver-containing getters for iodine, our comments will similarly focus on this technology, though we note that several other options are currently under development.
- Silver is the active iodine getter ingredient discussed in the FFRDC report, yet the analysis does not consider the regulatory acceptability of introducing additional RCRA-regulated toxic metal (silver) into the Supplemental LAW waste form. Pierce et al. (2010)²¹ includes a discussion of the regulatory difficulty of disposing iodine-loaded silver adsorbent products in grout.
- Asmussen et al (2017)²² conducted tests with both Tc and I getters and concluded, “It is clear that the presence of the I getter simultaneously with the Tc getter negatively effects (sic) the Tc getter.” Additionally, this work found that sulfur-containing Tc getters can displace and re-release the iodine on the silver iodide (AgI). The report suggests that the interference between Tc and I getters can be overcome through sequential treatment of the waste solution, but the long-term effectiveness of this process adjustment does not appear to have been tested.
- Asmussen (2017) also suggests that the complex chemical environment of technetium getters and the Cast Stone itself may be interfering with iodine retention in silver-containing getters. It states, “From the dissolution experiments, it is likely that the instability of the AgI within the Cast Stone is most likely caused by the sulfide component of the BFS with the alkalinity of the LAW simulant and grout playing a minor role in the dissolution.” The paper points out that previous examples of Ag based materials in less aggressive cementitious waste forms have

¹⁷ Zhang, S. et al., 2013. Iodine-129 and iodine-127 speciation in groundwater at the Hanford site, US: iodate incorporation into calcite.

¹⁸ Truax, MJ, et al., 2015. Conceptual Model of Iodine Behavior in the Subsurface at the Hanford Site. PNNL-24709. <https://pdfs.semanticscholar.org/bef3/53433dbb6ef3fdf68bd742dd474302acba2c.pdf>

¹⁹ Strickland, CE, et al., 2017. Evaluation of Iodine Remediation Technologies in Subsurface Sediments: Interim Status Report. PNNL-26957. <https://pdfs.semanticscholar.org/18da/fa52c017e24b56c3aee7447e461f9b4d8dc6.pdf>

²⁰ Savannah River National Laboratory, 2017. 2017 Laboratory Directed Research and Development Program Annual Report. P. 35. https://srnl.doe.gov/LDRD/pdf/FY17_SRNL_LDRD_Report.pdf

²¹ Pierce, EM et al., 2010. Review of Potential Candidate Stabilization Technologies for Liquid and Solid Secondary Waste Streams. PNNL-19122. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-19122.pdf

²² Asmussen, RM, et al., 2017. Preparation, Performance and Mechanism of Tc and I Getters in Cementitious Waste Forms – 17124. WM2017 Conference, March 5 – 9, 2017, Phoenix, Arizona, USA. http://www.wmsym.org/archives/2017/pdfs/FinalPaper_17124_0317021325.pdf

shown good iodine retention, "However, we have identified processes which will ultimately interfere with AgI stability, and thus alternate encapsulation technologies should be considered as well." These findings nevertheless cast uncertainty on the ability of Cast Stone grouts to obtain consistent long-term performance for iodine with getters.

- Saslow et al. (2017)²³ tested one grout formulation with iodine getters (using hydrated lime instead of the fly ash used in the Cast Stone formula²⁴). This experiment showed very low effective diffusion coefficients for iodine, yet this grout form was the worst performing for Tc-99 retention, resulting in effective diffusion coefficient of $10^{-7.9}$ versus $10^{-10.9}$ - 10^{-12} for the other tests without the iodine getter. This discrepancy is attributed to severe cracks that formed after 7 days of leaching, but this theory is not tested nor is the reason for the crack formation explained. Crawford (2017)²⁵ also found that silver zeolite getter material increased retention of iodide at the expense of chromium and Tc-99. The only explanation offered for this result was that the silver-zeolite could have expended some of the reducing capacity of the blast furnace slag in the premix. These results raise uncertainty regarding compound effects of getters for retention of multiple constituents, and the Saslow results are also interesting in light of the uncertainty regarding the effect of grout degradation on constituent release.

Long Term Getter Performance

The final conclusion of the FFRDC analysis appears to be that grout will only provide adequate performance at Hanford for iodine-129 if the best-case grout from today's lab testing proves feasible to bring out of the lab. The best case relies on effective getters for iodine, LDR treatment, and the Cast Stone reducing grout formula all to work in concert as well as is hoped. The long-term performance of getters in reduced grout is a key scientific uncertainty that would complicate selection of grout for disposal of Supplemental LAW at Hanford.

- Serne and Westsik (2011) stated: "*Past studies using iodide getters containing silver-based reagents show they do reduce iodide leaching significantly in short-term leach tests; however, long-term thermodynamic-based constructs raise concerns whether low solubility silver iodide will remain stable. Thus, iodide getters that do not rely on precipitation of low solubility silver iodide will probably be required to meet the currently desired effective diffusion coefficient of $1 \times 10^{-11} \text{ cm}^2 / \text{s}$.*"
- Dr. Jim Krumhansl of Sandia National Laboratory noted in Serne and Westsik (2011) that, "*At the Earth's surface the calculations indicate that AgI is transformed to the much more soluble AgIO₃, while under strongly reducing conditions AgI releases iodide as it breaks down to form silver metal . . . It should be noted that none of these reactions occur rapidly enough to be easily observed in the short-term lab waste form leaching studies performed to date. Hence, short-term studies will generally just reflect the extremely low solubility of AgI.*"
- Atkins et al. (1990), as summarized by Pierce et al. (2010): "*They concluded that even though AgI is stable in Portland cement in the near term, after disposal in a repository, the oxidation/reduction conditions will cause the AgI to release I⁻ and render the Ag⁺ inert as Ag⁰. From their evaluation of Portland cement and Portland cement containing 85% [blast furnace*

²³ Saslow, SA, et al., 2017. Updated Liquid Secondary Waste Grout Formulation and Preliminary Waste Form Qualification. PNNL-26443. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-26443.pdf

²⁴ The hydrated lime formulation is intended to address high-sulfate Liquid Secondary Wastes. The one Cast Stone sample in this study failed to set properly.

²⁵ Crawford, CL, et al., 2017. Analysis of Hanford Cast Stone Supplemental LAW using Composition Adjusted SRS Tank 50 Salt Solution. <https://sti.srs.gov/fulltext/SRNL-STI-2016-00619.pdf>

slag] as S/S agents for iodine, they conclude that even within 300 years, added silver will have no benefit with respect to iodine release.”

- Maddrell et al. (2019)²⁶ discussed alternate waste forms for silver-zeolite loaded with iodine. The report remarks, “While the silver sodalite wasteform produced is, like the popular AgI-based wasteforms, highly leach resistant to leaching by deionised water it was unstable under highly reducing conditions, which are likely to occur in most geological disposal facilities. Post leaching characterisation revealed the redeposition of AgI and the formation of an aluminosilicate alteration layer under some leaching conditions. Appropriate precautions are required should a silver sodalite wasteform for iodine immobilisation be exposed to reducing groundwater conditions.”
- Kaplan et al. (2019) found that encapsulation of iodine-loaded silver-impregnated zeolite in slag-free grout was “extremely effective” at immobilizing iodine, but encapsulation in slag-containing grout was “entirely ineffective.” They state, “Based on thermodynamic calculations, the strongly reducing conditions of the slag-containing system (Eh was -392 mV) promoted the reductive dissolution of the AgI, forming Ag₀(aq) and releasing iodide (I⁻) into the aqueous phase. . . these results indicate that subsurface grout disposal of AgI/Z waste should be done under oxidizing conditions.” If it can be reasoned that the grouted waste form would begin as a reduced environment and oxidize over time, it is unclear why these results are so seemingly different from the best-case scenario in the FFRDC report.
- A discussion of AgI disposal in deep boreholes²⁷ notes that AgI is redox sensitive, giving the example that iron can reduce AgI to silver metal and release iodide ions.
- Qafoku et al. (2015)²⁸ states in its section on future study: “We will continue our focused efforts to determine if there is an appropriate getter that when used in Cast Stone formulations will significantly decrease the Tc and I diffusivities and their overall release. To achieve this short-term objective we will work in parallel to answer the question of how and why the getter is effective so that we can assess whether or not [it] will exhibit a good long-term performance. In addition, we will continue working in the future to 1) determine an acceptable formulation for the LAW Cast Stone waste form with getters; 2) demonstrate the robustness of the formulation in terms of Tc and I release diffusivities; and 3) provide Cast Stone contaminant release data for risk assessment evaluations.” These research and development goals seem to be a tall order on a short timeframe.
- Qafoku et al. also states, “The long-term performance of the getters as part of monolithic waste forms, which is currently unknown, should be also evaluated (Pierce et al. 2010),” and, “Currently, only a limited number of studies have thoroughly investigated interactions between getters and waste forms (Pierce et al. 2010), and additional experimental work is needed in this area.”
- The FFRDC report (p. 31) notes that silver adsorbents for iodine pretreatment, “represent work at a very low TRL,” and, “If iodine removal is determined to be required, extensive R&D will be required to develop and mature the technology needed.” Yet, when silver grout additives are incorporated as getters to obtain the “best performance” necessary for grouted iodine to be compliant with applicable regulations, the team judged a low risk that the necessary technology R&D could be completed within the project timeframe (p. 110). This is a confusing discrepancy.

²⁶ Maddrell, Ewan & Vance, E.R. & Grant, Charmaine & Aly, Z & Stopic, Attila & Palmer, T & Harrison, J & Gregg, D.J.. (2019). Silver iodide sodalite – Wasteform / Hip canister interactions and aqueous durability. Journal of Nuclear Materials. 517. 10.1016/j.jnucmat.2019.02.002.

²⁷ <https://www.osti.gov/servlets/purl/1109063>

²⁸ Qafoku et al., 2015. “Technetium and Iodine Getters to Improve Cast Stone Performance”. PNNL-23282 Rev 1. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-23282Rev1.pdf

Conclusion

On page 110 of the FFRDC report, the authors judge there to be a “low” risk that the technology research and development necessary to support onsite grout disposal will not be complete within budget or timeline. Given the uncertainties described above, a more substantial basis should be provided for this assertion, or it should be reconsidered.

FFRDC Performance Evaluation

- We note that the site-specific analysis for the Hanford IDF relies on a Performance Evaluation or “mini performance assessment” built on the more developed IDF PA, which has not yet been subject to public review. As members of the Committee have acknowledged, the public has not had an opportunity to validate the methods in the performance assessment or its approach to addressing model uncertainty.
 - For example, the FFRDC report (p. 171) states that the 2017 IDF PA and supporting documents “described in detail” why it is appropriate to decrease the total iodine-129 inventory in the tanks by 39% relative to that used in the 2012 TC&WM EIS, but that justification is not available for public scrutiny.
 - Given how the NRC has recently highlighted numerous potential issues with another recent Hanford performance assessment²⁹, which passed DOE’s internal Low-Level Waste Disposal Facility Federal Review Group (LFRG) review, we emphasize the importance of fully vetting a performance evaluation, including independent expert technical review, before its results are condensed for decision-makers. To do otherwise would irresponsibly anchor their expectations and run the risk that potentially significant uncertainties are not given their due. It is unfortunate that the timing of the NAS study prohibits this crucial decision support step from taking place, and we urge the committee to strongly caution decision-makers against drawing a premature conclusion from the present study.
 - Example issues identified in the NRC review of the Waste Management Area-C PA included the projected speed of flow in the aquifer, which would affect contaminant concentrations in groundwater, and the approach to modeling uncertainties related to alternative future scenarios. These issues would also be relevant to the Supplemental LAW decision based on the IDF PA.
- Unlike performance assessments for other LLW facilities or tank closures, the report’s performance evaluation appears to assume current site conditions persist. This decision provides an incomplete picture of waste form performance, as it does not evaluate each form’s resilience to unexpected changes in the disposal environment. Given that the reader is unable to ascertain whether the majority of performance derives from the waste form or its disposal environment, the evaluation is incomplete. For example, pages 183 – 185 calculate release rates based on a baseline recharge rate from the IDF PA that assumes no recharge during the first 100 years, 0.5 mm/yr for the next 400 years, and 3.5 mm/yr thereafter. A sensitivity case should evaluate the effect of early disposal facility cap failure. To further illustrate this point, the Hanford Solid Waste Landfill Annual Monitoring Report for 2006-2007³⁰ includes a figure of cumulative lysimeter drainage from 1996-2007, which measured an average annual drainage of

²⁹ NRC, 2019. Request for Additional Information on the Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site. ML19112A091. NRC Docket #PROJ0736.

³⁰ Hanford Site Solid Waste Landfill Annual Monitoring Report July 2006 Through June 2007.

<https://pdw.hanford.gov/arpir/pdf.cfm?accession=AR-02383>

49.8 mm/yr, dominated by two wet winters in 1997 and 2003. It is reasonable to evaluate the effects of similar episodic conditions occurring in the event of future cap failure.

- We note that the FFRDC report assumed that the leachate collection system at the IDF would not degrade for 500 years (p. 173), yet institutional controls are assumed to fail in 100 years. It stands to reason that a leachate collection system would eventually fail without human intervention via operations and maintenance activities. This discrepancy may be a sensitive parameter for waste form performance and the time of peak dose.
- Serne and Westsik (2011) acknowledged, “Long-term waste form leaching and durability studies and modeling need to be performed for environmental conditions relevant to the IDF disposal environment. Without such long-term waste form leaching and durability studies and complementary predictive modeling efforts using IDF disposal environment conditions, it will be difficult to create a credible performance assessment.”³¹

Glass Performance and Production Rate

- We wish to call the Committee’s attention to the progress that has been made toward improving the rate of glass generation in the current LAW vitrification facility. In a March 2019 Hanford Advisory Board Tank Waste Committee meeting³², the DOE Hanford Glass Scientist remarked that with a number of prospective enhancements, Hanford is “within striking distance” of not needing a Supplemental LAW treatment capability. For example, the removal of the extra refractory in next-generation melters could increase the glass production rate for each melter from 15 metric tons per day to 50 metric tons per day³³. Additionally, an increase in the tolerance of crystal formation in the glass from 1% to 1.5% could potentially reduce the total glass volume of the WTP mission by 20%³⁴. However, discussions with other DOE staff revealed that the existing LAW facility likely does not have the support infrastructure (e.g., electrical wiring, offgas treatment) necessary to support a melter capacity increase of this scale. As a result, these potential advances were only partially considered in System Plan 8³⁵, which was a foundational information source for the FFRDC. With so much emphasis in the FFRDC report placed on the rewards of additional R&D on grout technology, we see the lack of a similar focus on future glass process improvement as a missed avenue of investigation in the NAS study. This

³¹ Serne and Westsik, 2011. Waste Form Development and Optimization – Cast Stone.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.1951&rep=rep1&type=pdf>

³² https://www.hanford.gov/files.cfm/Enhanced_Waste_Glass_Effort_AJZ.PDF;

https://www.hanford.gov/files.cfm/Final_3_13_19_Sum.pdf

³³ After the M-Area melter at Savannah River exhibited leaking, the design for the Hanford LAW melter included a second layer of refractory material as a precaution. Subsequently the root cause of the M-Area melter failure was determined, and the extra 12-inches of refractory around the LAW melter was determined to have been unnecessary. The 10m² melt pool 1st generation melter weighs 330 tons; a 2nd generation melter with refractory removed would also weigh 330 tons and have identical physical dimensions. (Albert Kruger, pers. comm., 2019).

³⁴ The origin of the 1% crystal tolerance derives from experiments at Mol Belgium performed by Germany in the 1970s-80s. The experiments used reprocessing wastes from a high burn commercial fuel that included high quantities of noble metals. The melter was a bottom electrode design and un-agitated. Due to shear flocculation, conductive metal crystals grew on the floor and walls of the melter, creating a path between the bottom and side electrodes. By contrast, the WTP melters do not use bottom electrodes, the defense wastes have a significantly smaller fraction of noble metals, and the melter uses bubbled agitation. DOE is developing information to support a potential decision that relaxing the crystal tolerance constraint would pose no risk to the WTP melters. (Albert Kruger, pers. comm., 2019).

³⁵ System Plan 8 assumes that next-generation melters will increase capacity by nominally 25% (i.e., 37.5 MT/d maximum) after five years of initial operation using the existing melters.

additional context may also complicate the underlying premise of the NAS study charge and the decision it is intended to support.

- The ability of the LAW vitrification facility to retain Tc-99 is another focus of continual glass improvement. Staff in DOE's Office of River Protection have claimed that their contractor has demonstrated greater than 99% retention of Tc-99 in their pilot vitrification facility if the condensed LAW overheads are recycled back into the feed, however this would result in a 7-15% increase in the total amount of LAW glass produced. As an alternative, DOE is working on ways to retain a "cold cap" at the top of the crucible melt via temperature and feed mass management, which would trap the Tc-99 and not allow it to escape as steam.³⁶ If these improvements are realized in the LAW facility, the liquid secondary waste would contain a significantly lesser quantity of Tc-99. This would improve the performance of glass relative to a grout alternative for Supplemental LAW.

Other Complicating Factors

- We note for the benefit of the Committee that DOE has initiated an Analysis of Alternatives for the WTP in accordance with DOE Order 413.3b. This analysis is in response to the 2018 US Army Corps of Engineers Parametric Evaluation of the Waste Treatment Plant, which concluded that the Pretreatment and high-level waste (HLW) facilities as currently envisioned cannot be completed on time or within a reasonable range of the current budget. The resulting analysis will include five scenarios for a new WTP system configuration, three of which would reconfigure or abandon the Pretreatment facility in favor of a direct-feed HLW configuration.³⁷ The FFRDC analysis explicitly does not evaluate the effects of direct-feed HLW on the LAW fraction of the waste, which demonstrates that the NAS study scope has already begun to depart from a reasonably foreseeable future reality.
- Similarly, the new DOE interpretation of the definition of high-level radioactive waste has the potential to significantly change the WTP mission, as it creates confusion regarding the level of radionuclide separation necessary to distinguish between "high-level" and "low-activity" waste. While we acknowledge that no overt steps have been taken to apply this interpretation to Hanford, a close reading of the newly interpreted definition suggests that the glass coming from the HLW vitrification facility as currently imagined could no longer strictly be high-level waste, but rather may qualify as greater-than-Class-C low-level waste. This development unfortunately casts the applicability of the Committee's chartered study into further doubt.

³⁶ Albert Kruger, DOE Glass Scientist. Pers. Comm., 1/2/18.

³⁷ https://www.hanford.gov/files.cfm/USACE_Parametric_Analysis_Final_ajz.pdf

OREGON HANFORD CLEANUP BOARD

September 3, 2019

Charles D. Ferguson, Ph.D.
Board Director
Nuclear and Radiation Studies Board
Division on Earth and Life Studies
The National Academies of Sciences, Engineering, and Medicine
500 Fifth Street, NW
Washington, DC 20001

Dear Dr. Ferguson:

The Oregon Hanford Cleanup Board provides policy advice on Hanford cleanup issues to the Governor and Legislature of Oregon, and to the state's lead agency on Hanford cleanup, the Oregon Department of Energy. We are writing to endorse recent comments sent to you by the Oregon Department of Energy on the Study of Supplemental Low Activity Waste Options for Hanford.

During our July Board meeting, we received a briefing on the study and the latest work by the Federally Funded Research and Development Center from staff at the Oregon Department of Energy. Based on the presentation and our discussion that followed, the Board strongly agrees with the positions taken by and advocated by the Oregon Department of Energy, which include:

- Hanford tank wastes pose an inherent hazard to the Columbia River. Decisions about waste forms for Low Activity Waste should proceed from an ethical foundation of precaution.
- There remains significant uncertainty regarding whether a grouted waste form at Hanford would achieve the performance necessary to protect groundwater and the Columbia River from the long-term hazards posed by Technetium-99 and Iodine-129.
- Technetium-99 and Iodine-129 removal from Low Activity Waste would make a grouted waste form safer and more feasible for Hanford.
- If Technetium-99 and Iodine-129 stay in the Low Activity Waste, vitrification appears to remain the option most likely to result in long-term safety if disposed at Hanford.

We encourage you to consider the points made by the Oregon Department of Energy staff to better ensure long term protection of the Hanford Site and the Columbia River.

Sincerely,

Steve March

Steve March, Chair

Daniel F. Solitz

Dan Solitz, Vice Chair

phone 503.378.4040 800.221.8035 in Oregon

550 Capitol Street, N.E., Salem, Oregon 97301

<https://www.oregon.gov/energy/safety-resiliency/Pages/Oregon-Hanford-Cleanup-Board.aspx>



HANFORD ADVISORY BOARD

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

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September 19, 2019

Brian Vance, Manager
U.S. Department of Energy, Office of River Protection
P.O. Box 450 (46-60)
Richland, WA 99352

Brian Vance, Acting Manager
U.S. Department of Energy, Richland Operations Office
P.O. Box 450 (46-60)
Richland, WA 99352

Re: Traffic Safety Advice (HAB Consensus Advice #301)

Dear Mr. Vance,

Background

The Hanford Advisory Board (HAB/Board) understands that the U.S. Department of Energy (DOE) is currently focusing on updates to the Hanford Site infrastructure, including water sewer, data, utilities, roads and traffic safety. In 2010, Transportations Solutions Incorporated, at the request of Mission Support Alliance (MSA), prepared a Hanford vehicle safety assessment to evaluate the increasing site traffic issues. The study found that many two-lane arterial roads on Site were operating over capacity and congested during the high-peak traffic periods. The Board subsequently issued advice (#286) regarding Transportation Infrastructure Updates and Safety Considerations in February 2016. Since the issuance of this advice, the Hanford Site-Wide Traffic Safety committee was formed.

MSA was tasked by DOE to work with Hanford contractors to facilitate and implement a Hanford Site-Wide Traffic Safety committee. The Board commends DOE for getting greater worker involvement in this important safety issue. On May 15, 2019, this committee made a presentation to the Board's Health, Safety and Environmental Protection committee. This presentation focused on recommendations that will bolster and sustain an enduring change for improving vehicle and employee safety at the Hanford Site. The items below are a brief description of the presentation.

The Hanford Fire Department is restricted from using the merge lane leaving the 300 area and must travel through an area with vehicles and pedestrians with lights and sirens going. This has caused increased response time as well as a potential for pedestrian and or vehicle accidents. An acceleration lane should be constructed and tied into the existing deceleration lane at the abandoned Apple Street. This would create a substantial acceleration lane for Hanford Fire Department apparatus leaving Station 93.

A lack of turnouts on Route 4 South hinders the Benton County Sheriff when pulling vehicles over. This also poses a problem in an emergency when a vehicle needs to exit traffic. Additional Route 4S lanes and additional turnout lanes should be constructed to

alleviate congestion and aid in exiting the roadway in case of emergency.

The temporary light plant illuminating the turn off from Stevens Drive to the 300 Area has been problematic in that it does not function a majority of the time. This is very unsafe during foggy and dark or rainy conditions. This issue exists primarily during winter months. Relocation of streetlights that are no longer needed on completed projects is recommended.

Motorists crossing SR240 from SR225 to Route 10 do not know the intentions of drivers traveling westbound on SR240. Several accidents have taken place at this intersection over the years. A deceleration lane on Westbound SR240 could be lengthened. Resurrection of an abandoned cutoff road from SR240 to Route 10 would alleviate some of the traffic at the SR225 intersection. Additionally, a turn lane should be installed on westbound SR240 for motorists turning left onto SR225. This will give SR225 motorists a better indication of westbound SR240 intentions.

Advice

The Board advises DOE to pursue cost estimate to complete an acceleration lane coming out of Alger Street. The initial engineering concept has been completed.

The Board advises DOE to pursue an engineering study and cost estimate to add additional pull off areas/lanes on Route 4S Northbound and Southbound.

The Board advises DOE to continue the relocation of streetlights to the 300 Area Stevens Drive and Cypress Intersection.

The Board advises DOE to explore and engage Washington State Department of Transportation (WSDOT) in potential intersection improvements at SR240 and RT10 in order to facilitate a safer and more timely commute and consider the Board's suggestions as outlined above. This should be the first phase towards an overall evaluation to explore potential intersection improvements bordering the site.

The Board advises DOE to engage with the City of Richland and the Washington State Department of Transportation to work together to secure improvements to SR240 as this route is vital to routine operations and emergency response on the Hanford Site.

Sincerely,



Susan Leckband, Chair
Hanford Advisory Board

Enclosure

cc: Dawn Wellman, Executive Director, Benton-Franklin Council of Governments, David Borak, Designated Federal Officer, U.S. Department of Energy, Headquarters
Alexandra Smith, Manager, Washington State Department of Ecology
David Einan, Manager, U.S. Environmental Protection Agency, Region 10, Pam Larsen, National Liaison, City of Richland
James Lynch, Deputy Directed Federal Officer, U.S. Department of Energy Office of River Protection & Richland Operations Officer, JoLynn Garcia, U.S. Department of Energy Office of River Protection & Richland Operations
Oregon & Washington Delegations, Congressional Delegations, WSDOT, Good Roads
Ben Franklin Transit, State Patrol, Benton County Sheriff Office

Advising:

US Dept of Energy
US Environmental
Protection Agency
Washington State Dept
of Ecology

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U.S. Department of Energy, Richland Operations Office
P.O. Box 450 (46-60)
Richland, WA 99352

Re: Public Involvement in Budget Development (HAB Consensus Advice #302)

Dear Mr. Vance,

Background

The Hanford Advisory Board has consistently advised the Tri-Party Agreement (TPA) agencies to provide detailed budgetary information during the TPA annual budget public comment period so that the Board and public are able to make meaningful public comments. Consistent with TPA requirements, the Board has requested that the field offices share their proposed out-year budget numbers, cleanup work funded by that budget proposal, and ensure that a compliant budget is requested that meets TPA and other regulatory or consent decree schedules.

The field offices have historically provided the following budget information to the Board, Tribes, public and regulators:

- The overall funding guidance from headquarters for each field office's proposed budget and how the field office would break that out by Appropriation control point or account, now referred to as Project Baseline Summary (PBS) level.
- Work scope and funding for each major activity within each control point or PBS, e.g., how much funding will be allocated on emptying High Level Waste Tanks out of the \$677 million proposed for PBS ORP-14 for Radioactive Liquid Tank Waste Stabilization and Disposal and how many tanks would be emptied. This is referred to as the "Activity Data Sheet (ADS)" level in the TPA.
- An "Integrated Priority List (IPL)" showing each field office's proposed funding request in a building block format showing what would be the guidance level for the field office's request and what work would be funded if Congress appropriated more funding than the guidance requested.

The Board appreciated the past practice of more robust public involvement activities on the budget including holding a half-day (or longer) public workshop to present the detailed budget information and regional public budget meetings in addition to holding an evening public meeting in Richland to present the proposed out-year budget, answer questions and take comment. The Board would like to see a return to this level of public involvement on the budget, especially in light of escalating cleanup costs as detailed in the 2019 Lifecycle Scope Schedule and Cost Report. It should be noted that the additional public involvement helped build public and Congressional support for funding cleanup work. The Board is looking forward to the Committee of the Whole planned for Oct 2019 on what is currently called the 2024 Vision and Annual Work Priorities and will benefit from learning about current funding priorities, opportunities and constraints. However, the Board does not want this to replace the need for an annual spring budget workshop and public meetings to enable meaningful Board and public comment on the regional DOE Hanford site offices funding proposal.

The Board is frustrated that USDOE has not shared with the public or regulators any proposed funding levels or detailed work scope for fiscal year 2021. USDOE also did not share proposed overall funding by major appropriation account (PBS) for each field office.

If the Hanford field offices were to return to sharing meaningful planning proposals for budget and work scope in a workshop and regional public meetings, public understanding and support for cleanup funding and priorities would be enhanced across the region.

Sharing that information would reduce confusion over how proposed funding levels and work compare to longer term cost and schedule impacts from various funding scenarios discussed in the 2019 Lifecycle Scope, Schedule and Cost Report. It will also allow the public to provide meaningful input to USDOE.

The TPA Article XLVIII Section on Cost, Schedule, Implementation, Planning and Scope begins on Page 65 of the "Legal Agreement" viewable at https://www.hanford.gov/files.cfm/Legal_Agreement.pdf. Paragraphs 148 and 149 require USDOE to provide the regulators and public with the level of budget and work scope detail necessary to enable the regulators and public to review whether the proposed budget will fund the work required in the fiscal year for which the field offices are planning. The TPA agencies are discussing updating the terminology used to describe budget documents and practices in this section of the TPA.

The TPA requires a comment period to be held each spring on the proposed budget being developed by the Hanford site field offices (e.g., in the Spring of 2019, the Hanford site was planning for the 2021 fiscal year). The workshop which USDOE previously held each spring, and which the Board advises USDOE to resume, would enable the Board and public to understand what work is being proposed for funding and have questions posed and answered at the outset of the comment period. This workshop and regional public meetings aid in the development of the Board's advice.

Advice

The Board advises USDOE to return to sharing detailed budgetary information at the outset of the comment period each spring, including the proposed PBS level funding, guidance from HQ, the funding and work scope for the level below that (regardless of whether USDOE has changed the name of how it breaks out this level from the terminology in the

TPA), and Integrated Priority Lists. The comment period is not meaningful without providing this information. The Board also advises that the information be shared with adequate time for the Board to prepare timely advice, coordinated with the annual Board work plan.

The Board advises the TPA agencies to start the annual budget comment period with a workshop for Board and interested public, Tribes and regulators in which: Detailed budgetary information is shared for the proposed funding request for each field office including project baseline summary numbers, a breakout for each project baseline summary to show major spending categories, budget control points, analytical building blocks, and integrated priorities lists; The cleanup work scope and priorities for the next five years is provided, including work scope at risk if cleanup funding levels drop; Opportunities exist for questions, answers and discussion.

The Board advises the TPA agencies to resume holding regional public meetings on cleanup budget priorities during the comment period and prior to submission of field office budgets to HQ. The Board advises the TPA agencies to make sure these meetings:

- Are planned with input from the HAB and the HAB's Public Involvement and Communications committee;
- Include information about how the proposed budget reflects escalating cleanup costs as detailed in the Lifecycle Scope, Schedule and Cost Report in order to build support for long-term investments and priorities;
- Provide the public with an overview of the work required by TPA and other compliance documents along with the funding which would be required to stay on schedule (the Compliant Budget).

The Board advises that the level of detail provided on budget priorities enable the Board and public to differentiate the costs of "min-safe" and "mortgage costs" from the funding for actual cleanup work.

Sincerely,



Susan Leckband, Chair
Hanford Advisory Board

Enclosure

cc: Dawn Wellman, Executive Director, Benton-Franklin Council of Governments, David Borak, Designated Federal Officer, U.S. Department of Energy, Headquarters
Alexandra Smith, Manager, Washington State Department of Ecology
David Einan, Manager, U.S. Environmental Protection Agency, Region 10, Pam Larsen, National Liaison, City of Richland
James Lynch, Deputy Directed Federal Officer, U.S. Department of Energy Office of River Protection & Richland Operations Officer, JoLynn Garcia, U.S. Department of Energy Office of River Protection & Richland Operations
Oregon & Washington Delegations, Congressional Delegations



5

Tri-City Herald

\$23 billion of Hanford contracts delayed. Current contractors to continue cleanup — for now

BY ANNETTE CARY

AUGUST 13, 2019

The Department of Energy will extend two of the major environmental cleanup contracts at Hanford for up to a year, rather than putting new contracts into place before the others expire Sept. 30 as planned.

The extensions give some certainty to cleanup work being done by about 5,000 workers, allowing them to continue work uninterrupted without contractors starting to gear down for a transition period to a possible new contractor.

Washington River Protection Solutions could continue to manage and retrieve the 56 million gallons of radioactive waste in underground tanks at the nuclear reservation through Sept. 30.

And CH2M Hill Plateau Remediation Co. could continue cleanup in the center of the site, some remaining cleanup near the Columbia River and treatment of contaminated groundwater through the same date.

"Evaluations of proposals for follow-on contracts, the Tank Closure Contract and the Central Plateau Cleanup Contract, continue in earnest," said a DOE memo sent to Hanford employees Tuesday morning.

"Extension of the current contracts would only be in force as long as needed after award of new contracts and transition periods to the new contractors," it said.

TIME RAN SHORT FOR CONTRACTS

A contract extension of some length appeared inevitable as August started, giving less than a two-month transition period to new contracts and possibly new contractors before existing contracts expired in September.

Washington River Protection Solutions is owned by Aecom and Atkins and has about 2,330 employees

CH2M is owned by Jacobs Engineering and employs about 1,660 people.

New contractors typically hire the majority of the former contractors' workers.

Both Washington River Protection Solutions and CH2M start their 12th year of work at Hanford on Oct. 1 under the contract extension.

DOE could award one of its additional two remaining multi-billion-dollar contracts soon.

DOE has not said when it will extend its contract for site-wide services now held by Mission Support Alliance, which employs about 1,960 people.

However, Leidos, the primary owner of Mission Support Alliance, told investors July 30 that it was hopeful that the new site services contract would be awarded within weeks.

It covers services such as utilities, roads, information technology and security across the site.

The 580-square-mile Hanford nuclear reservation in Eastern Washington state was used to produce plutonium for the nation's nuclear weapons program during World War II and the Cold War.

Environmental cleanup, which began at the end of the Cold War, is expected to continue into the second half of this century.

NEW HANFORD CONTRACTS

The new tank farm contract is valued at up to \$13 billion over a decade and the central Hanford cleanup and the site-wide support services contracts are each valued at up to \$10 billion over a decade.

The contract for Bechtel National, which is designing, building and starting up the \$17 billion vitrification plant to treat tank waste at Hanford, is not up for renewal.

The contract extension for CH2M will allow it to complete important work before the transition to the new contract, said Ty Blackford, president of CH2M at Hanford, in a message to employees Tuesday.

The work includes demolition of the highly radioactively contaminated Plutonium Finishing Plant and moving highly radioactive sludge from underwater storage in the K East Basin near the Columbia River to dry storage in the center of the Hanford site, Blackford said.

It also will allow work to advance to remove the highly radioactive soil from a spill beneath the 324 Building just north of Richland and to move radioactive cesium and strontium capsules out of an aging concrete pool to dry storage in casks, he said.

Work on the transition had already begun and will leave CH2M well prepared when the new contract is awarded, Blackford said.

At the tank farms, work should continue uninterrupted to soon resume the removal of waste from the next groups of underground and leak-prone single shell tanks. The waste will be moved for storage in sturdier double shell tanks until it can be treated for disposal.

Work has been underway to build infrastructure for the efficient removal of waste in the A and AX Tank Farms following completion of work to empty the 16 tanks in the group called C Tank Farm in late 2017.

The extension of the tank farm contract is a reflection of DOE's confidence in Washington River Protection Solution's ability to safely continue work, said John Eschenberg, contractor president, in a message to employees on Tuesday.

Tri-City Herald

Deliberately contaminating groundwater at Hanford. Is it the key to faster cleanup?

BY ANNETTE CARY

AUGUST 18, 2019 02:36 PM

Hanford tries new way to keep pollution out of Columbia River

Hanford workers are deliberately contaminating the groundwater at the nuclear reservation.

It's part of a test project to see if driving chromium that's already contaminating the soil deeper down to the groundwater would speed cleanup of the remaining pollution along the Columbia River.

"We're flushing contamination out of the soil that would take decades to slowly come down (to groundwater)," said Mike Cline, the Department of Energy Hanford project director for soil and groundwater

The contaminated water is then pumped up and cleaned before the groundwater can migrate to the nearby Columbia River.

The initial results of the test, done near the defunct K East and K West reactors, have been "quite spectacular," said Bill Barrett, vice president of soil and groundwater remediation for DOE contractor CH2M Hill Plateau Remediation Co.

Chromium can cause cancer in people — it was the drinking water contaminant addressed in the lawsuit that led to the movie "Erin Brockovich."

It is particularly harmful to salmon and other aquatic life in the Columbia River, even at levels that meet drinking water standards.

A form of the chemical was widely used at Hanford reactors north of Richland that produced plutonium for the nation's nuclear weapons program through the Cold War.

CLEANING GROUNDWATER

Sodium dichromate was added as a corrosion inhibitor to river water that was used to cool Hanford reactors. Soil was contaminated from disposed reactor water and from spills of the chemical and leaking pipes.

The Department of Energy has been tackling hexavalent chromium contaminated groundwater at Hanford in two ways.

It has been digging up contaminated soil, sometimes down to groundwater in the most heavily contaminated areas near the Columbia River, to prevent chromium from migrating deeper into the soil to groundwater.

In places that groundwater is contaminated, "pump and treat" plants use wells to pump up contaminated groundwater. The chromium is stripped from the water and the clean water is reinjected into the ground.

The three pump and treat plants being used to treat groundwater near the defunct K East and K West Reactors along the Columbia River have been working well.

By 2015 the plants had cleaned up most of the plume near the two reactors and were shut down.

But continued checks of monitoring wells in the area showed that chromium in the soil was recontaminating the water, with the chromium again at high levels.

CHROMIUM CONTAMINATION

When the Columbia River would rise, the groundwater in the area also would rise and flush more contamination from the soil.

The pump and treat plants were put back into use, again removing most of the groundwater contamination.

But Hanford officials wanted a more permanent fix.

They came up with the idea to see if deliberately driving contaminants into the water could allow cleanup of the contaminated plume once and for all.

Workers installed a system of pipes about 2 feet underground to sprinkle water into the soil over an area of almost an acre above where contamination continued to reappear.

The water goes down through the soil, picking up chromium, until it reaches groundwater about 80 feet deep.

The watering system was turned on in May.

"We saw spikes in contamination at our (groundwater) extraction wells faster than we anticipated," Barrett said. "But the containment has been good. We have driven down the contamination to near drinking water standards."

Chrome levels spiked up to as high as 1,650 parts per billion. Drinking water standards for Washington state are 48 parts per billion and the goal to protect fish is to dilute contamination to even lower levels where the site's groundwater enters the river.

SOIL FLUSHING TESTS

By mid-August, 27 million gallons of water had been flushed through the contamination zone.

"We're not getting anymore out," Cline said on Aug. 13 as the flushing system was shut down.

"Right now it looks very successful," he said.

But he cautioned it was a test project and groundwater will be closely monitored to see if any contamination comes back. The test likely will be done a second time even if additional chromium is not detected to see if contamination spikes again.

In a typical month before the test, half a kilogram of chromium was removed from groundwater for treatment.

But in June, the soil flushing testing allowed 7 kilograms to be removed, or a little more than a year's worth, said Ellwood Glossbrenner, the DOE soil and groundwater project lead.

If the results are as good as they initially appear at the K Reactors area, the project could be expanded to other reactor areas at Hanford along the Columbia River.

The technology could save decades of cleanup work, with chromium no longer slowly trickling down to groundwater and driving up contamination levels to above drinking water standards, Cline said.

Tri-City Herald

Senate committee adds \$420 million to what Trump proposed for Hanford

BY ANNETTE CARY

SEPTEMBER 12, 2019 07:40 PM

Hanford's highly contaminated Plutonium Finishing Plant is getting smaller

Sen. Patty Murray secured what could be the highest level of funding in recent years for the Hanford nuclear reservation in the Senate's proposed fiscal 2020 budget for the Department of Energy.

The proposed budget includes about \$420 million more than requested by the Trump administration for a total Hanford budget that would be a little more than \$2.5 billion.

The proposed budget passed out of the Senate Appropriations Committee, on which Murray, D-Wash., serves. Next it will be considered by the full Senate.

More than 9,000 people work at Hanford.

"The Tri-Cities sacrifices so much to help our nation come through one of the darkest chapters in our history, and it is only right that the federal government honors its commitment to take care of the community by investing the necessary resources in cleaning up Hanford — a complex, long-term project," Murray said.

The Senate budget proposed higher spending for Hanford than does the House's Hanford budget in fiscal 2020.

The Hanford budget that passed out of the House Appropriations Committee was for \$2.4 billion.

It restored \$381 million of the cut proposed by the administration thanks to the work of Rep. Dan Newhouse, R-Wash., but still would fall about \$37 million short of current spending.

“The funding levels in the Senate bill are great for Hanford,” said David Reeploeg, vice president for federal programs for the Tri-City Development Council. “They will allow the site to make substantial progress with the tank waste treatment mission, and to continue important remediation and risk reduction work.”

HANFORD BUDGET PROPOSAL

The budget for the DOE Office of River Protection would be set at \$1.6 billion under the Senate bill.

The office, one of two DOE offices at Hanford, is responsible for the 56 million gallons of radioactive waste held in underground tanks and the \$17 billion vitrification plant being built to treat much of the waste.

The waste is left from the past production of plutonium from World War II through the Cold War for the nation’s nuclear weapons program.

The report accompanying the Senate bill requires some of the money to be spent on facilities that will handle high level radioactive waste.

Now DOE is focused on facilities that will handle the low activity radioactive waste as DOE faces a federal court-enforced deadline to start treating that waste in 2023.

DOE has until 2033 to start treating high level radioactive waste, but has notified regulators it is at risk of missing that deadline.

The proposed budget also includes \$10 million for the Test Bed Initiative, a pilot project to turn 2,000 gallons of low activity radioactive waste into a concrete-like form and ship it to a private repository for government waste in Texas for disposal.

The vitrification plant was not planned to be large enough to treat all 56 million gallons of tank waste.

The other Hanford DOE office, the Richland Operations Office, would receive \$900 million, or \$242 million above the administration budget request. It would be \$35 million above current spending.

The Richland Operations Office is responsible for providing all services for the 580-square-mile site and digging up buried waste, tearing down contaminated facilities and cleaning up contaminated groundwater and soil.

The proposed budget includes \$8.5 million for the HAMMER training center at Hanford, maintenance at the Hanford portion of the Manhattan Project National Historical Park and the Hanford Workforce Engagement Center.

Other amounts proposed for specific Hanford projects, ranging from work at the tank farms to groundwater cleanup, were not yet available Thursday.

BUDGET PROPOSAL AND PNNL

The spending bill also appeared favorable for Pacific Northwest National Laboratory in Richland, which draws money from multiple sources for an annual budget close to \$1 billion.

The spending bill included \$5 million to start work on a national grid energy research facility to be built at Pacific Northwest National Laboratory in Richland.

The budget also included increases above the administration's request in DOE offices and research programs that help fund some of the research at the lab. The lab employs about 4,500.

They include:

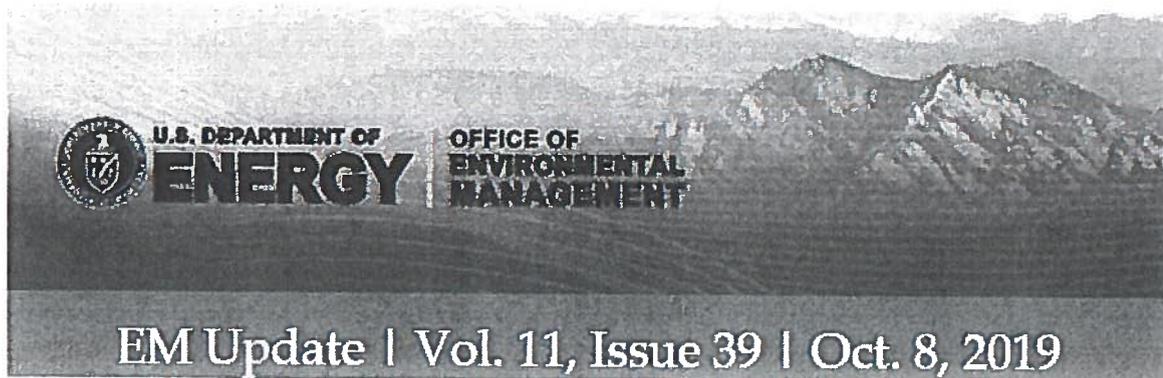
- The DOE Office of Science would receive \$7.2 billion, or \$1.3 billion above the administration's request.

Within the office's budget would be \$26 million for an additional installment toward construction of another new building at PNNL for energy sciences research.

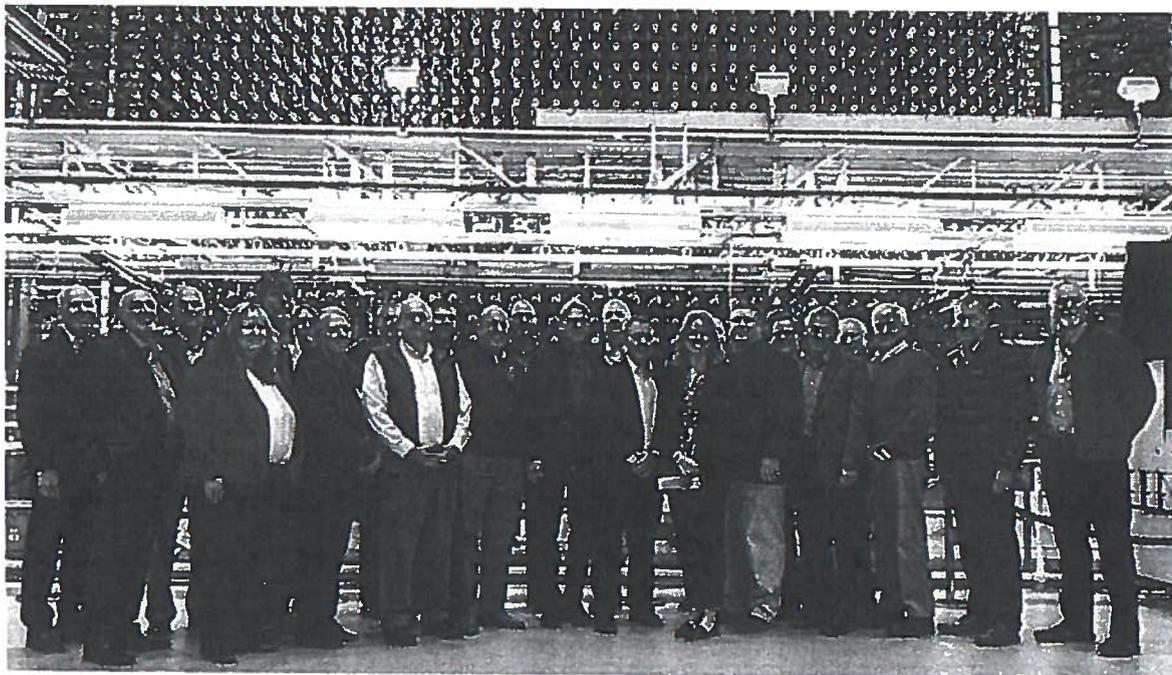
The Office of Science budget also would include \$770 million for the Biological and Environmental Research account, up \$65 million from current spending, which is an important account for PNNL research funding.

- The DOE Energy Efficiency and Renewable Energy program would receive \$2.8 billion, which would be nearly double the administration's request and \$421 more than current spending.
- The DOE Electricity Delivery and Energy Reliability program would receive \$221 million, which is \$64 million more than the administration's request and \$65 million more than current spending.

"We can't thank Sen. Murray enough for her extraordinary leadership on the Appropriations Committee in fighting for Hanford and PNNL funding," Reeploeg said. "We also deeply appreciate Sen. Cantwell's tremendous support on the Energy and Natural Resources Committee."



Secretary Perry Celebrates Success at Hanford



Energy Secretary Rick Perry joined Under Secretary for Science Paul Dabbar, EM Senior Advisor Ike White, and the Hanford Site EM management team at the “front face” of the B Reactor National Historic Monument last week. The Secretary was at Hanford to celebrate the removal of contaminated sludge from the K West Reactor Basin and was briefed on the site’s past, present, and future.

RICHLAND, Wash. – Hanford’s past, present and future were on display last week as Energy Secretary Rick Perry celebrated a significant cleanup milestone of transferring 35 cubic yards of highly radioactive sludge from a reactor basin near the Columbia River to safe storage in the center of the 580-square-mile site.

Perry lauded the accomplishment during a ceremony attended by about 200 Hanford workers, tribal leaders, community leaders, Hanford regulators, and the news media. The Secretary was joined by Rep. Dan Newhouse of Washington state, Rep. Greg Walden of Oregon, Under Secretary for Science Paul Dabbar, EM Senior Advisor Ike White, and Hanford Site Manager Brian Vance.

"This takes a risk away from the Columbia River and this community," Perry said. "I hope today is a confirmation that government can do what it says it is going to do and do it in a reasonable way."



Energy Secretary Rick Perry welcomes invited guests and thanks Hanford workers during a celebration marking the completion of a decade-long project to remove contaminated sludge from near the Columbia River. Rep. Dan Newhouse of Washington state is seated at center and Rep. Greg Walden of Oregon is seated at right.

In his remarks, Dabbar invoked a letter written by famed physicist Albert Einstein to President Franklin D. Roosevelt, calling for action to defend against a potential weapon scientists working for Adolf Hitler were developing.

"From that step, the people of the Tri-Cities heard their call to action and constructed the first plutonium reactor, helping to defeat the tyrannies of World War II," Dabbar said.

During the ensuing Cold War, more reactors were constructed. Hanford's K East and K West reactors were built side by side in the 1950s and operated for 15 years. In the 1970s and 1980s, the reactors' spent fuel basins were used to store irradiated fuel from N Reactor, Hanford's last operating reactor.

The last of the 2,300 tons of fuel was removed from the basins in 2004. Workers transferred sludge from the K East Basin and removed the basin itself. After years of preparation, workers started transferring 35 cubic yards of sludge out of underwater containers in the K West Basin and completed the project in September.

"Today marks the important closing of the door of yesteryear and the successful cleanup of the last reactor," Dabbar said.



Energy Secretary Rick Perry, center, thanked, from left, operations manager Mike Garza, and operators Harvey Brown, Amanda Gustafson, and Frank Vargas, with contractor CH2M HILL Plateau Remediation Company, for their contributions to finishing the removal of 35 cubic meters of sludge from a facility near the Columbia River.



Energy Secretary Rick Perry visited the new control center for the Waste Treatment and Immobilization Plant's Low-Activity Waste Facility, which will begin treating Hanford tank waste by the end of 2023. Hanford Site

Manager Brian Vance is behind Perry at left. Rick Holmes, Waste Treatment Completion Company general manager and Waste Treatment and Immobilization Plant (WTP) site director, is at right. WTP employee Eric Davis is in an orange vest in the background.

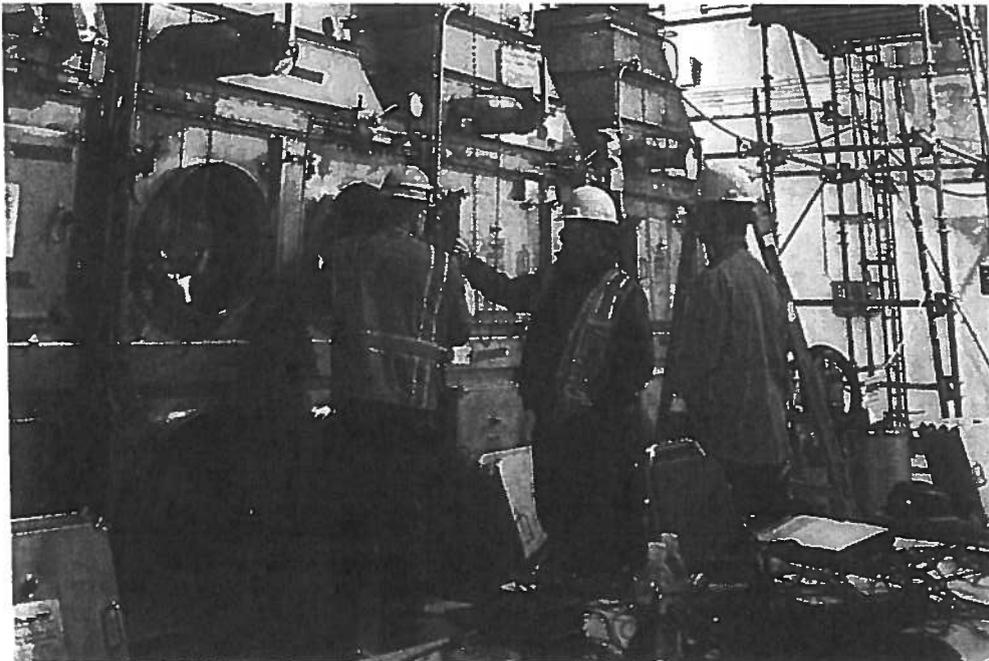
With the sludge removed, efforts are now underway to remove debris, such as contaminated tools and pumps, from the basin, after which dewatering and demolition will begin. The sludge will remain in interim safe storage at Hanford's T Plant until a disposition path is selected.

Perry also visited the B Reactor National Historic Landmark, part of the Manhattan Project National Historical Park, and received an update on the Waste Treatment and Immobilization Plant's Low-Activity Waste Facility, which is set to begin treating Hanford's tank waste by the end of 2023.

Perry finished his visit at a Hanford mockup facility with local science, technology, engineering, and math (STEM) high school students who were learning about future cleanup and potential careers. The facility is used to develop equipment and train workers to remove highly contaminated soil from beneath the 324 Building, a former chemical laboratory.

-Contributors: Hanford Office of Communications

Hanford, University Team Up to Test Filters for Waste Treatment Operations



From left, Robert Sprague with Waste Treatment Completion Company, and Zach Phillips and Bill Trainor from Mississippi State University (MSU) test high-efficiency particulate air filters at Hanford's Waste Treatment and Immobilization Plant Analytical Laboratory. The specialized filters are part of the filtration system testing recently conducted by plant workers and MSU technicians.

RICHLAND, Wash. – Mississippi State University (MSU) technicians recently collaborated with EM Hanford Waste Treatment and Immobilization Plant (WTP) Analytical Laboratory (LAB) contractor Bechtel National, Inc. (BNI) to test high-efficiency particulate air (HEPA) filtration systems.

“This testing is an important part of our progress toward starting tank waste treating operations,” said Howard Sawyer, BNI startup manager for the LAB. “We want to ensure that safety and quality are built into the WTP so that we are protecting the public, workers, and the environment during operations.”

The HEPA filters weigh 72 pounds each and are used in multiple banks of four filters, called housings. The LAB holds 34 housings and 136 filters.

The circular shape of the filter traps contaminants better than previous designs and is relatively new to the nuclear industry. The filters are at least five times stronger than standard HEPA filters and exceed WTP-specific standards and codes.

The BNI testing team conducted the test, and the MSU team collected and analyzed the data and will provide a final report in coming weeks.

“Our strong partnership with MSU has been critical to our success,” said Tommy Davis, BNI facility test lead. “This was an intricate and detailed process, from the prep work and procedure development through the actual testing, and we have been in lockstep with MSU the entire time.”

BNI and MSU are now conducting filter tests in WTP’s Low-Activity Waste Facility and will eventually conduct them in the plant’s Effluent Management Facility.

-Contributor: Darcy Richardson

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OFFICE OF RIVER PROTECTION

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19-ORP-0007

SEP 04 2019

Ms. Maia D. Bellon, Director
Washington State
Department of Ecology
PO Box 47600
Olympia, Washington 98504-7600

Ms. Bellon:

DISCUSSION OF AMENDED CONSENT DECREE – STATE OF WASHINGTON V. PERRY (E.D. WASH. NO. 2:08-CV-5085)

Since October 2018, the U.S. Department of Energy (Department) and Washington State Department of Ecology (Ecology) have been conducting integrated workshops to identify safe, efficient, and effective approaches to achieve the high-level tank waste treatment mission. In April/May 2019, the Department initiated an Analysis of Alternatives (AoA)¹ to further assess the alternatives identified through these cooperative workshops.² Through this collaborative effort, the Department and Ecology identified five possible options for further analysis by the AoA. As you are also aware, in August 2019, the Department concurred on a request from the AoA team to conduct analysis of additional alternatives, which will likely extend the time required to complete the AoA. The Department currently anticipates the AoA process will be completed in July 2020.

In June 2019, Ecology communicated its willingness to work in good faith with the Department to collectively identify a holistic and realistic path forward for Hanford's tank waste mission. Through its preparation for those discussions, the Department has considered multiple factors and inputs, including: continued prioritization of the direct feed low-activity waste capability; the currently-defined path for treating high-level tank waste; resolution of the PT Facility technical issues and potential new technical issues that may be identified during remaining design activities; available funding to proceed with design and rebaseline activities; forecasted

¹ AoAs are analytical comparisons of the operational effectiveness, suitability, risk, and life cycle cost of alternatives that satisfy validated capability needs. AoAs are conducted independent of the contractor organization responsible for the project and do not produce decisional documents. AoAs provide inputs that may be used by the Department to derive preferred alternatives for further analyses to support decisions on the approach that best meets the overall mission need at the best value to the taxpayer.

² The integrated workshops and AoA were initiated following the analysis by, and the Department's assessment of, the U.S. Army Corps of Engineers report, *Parametric Evaluation of the Waste Treatment and Immobilization Plant* (July 10, 2018), which suggested that the High Level Waste (HLW) Facility and Pretreatment (PT) Facility could be delayed beyond the milestones contained in the Amended Consent Decree.

funding levels that the Department projects will be necessary to support the tank waste treatment mission; and the significant increase in projected life cycle costs associated with the Waste Treatment and Immobilization Plant.

Milestones for the HLW and PT Facilities remain more than a decade away, and a number of significant variables will materially affect the schedule for completing those two facilities over the next eleven to seventeen years, including the results of the AoA for the treatment of Hanford's high-level waste, congressional appropriations, technological advances, contractor efficiency, and further practical experience with vitrification at Savannah River and at Hanford's Low Activity Waste Facility. Accordingly, the Department cannot project with certainty when the HLW and PT Facilities will be completed.

While these factors and inputs individually may not indicate a serious risk, the Department's examination of the potential interplay of these factors has led it to conclude that it is appropriate, out of an abundance of caution, to provide this notice of serious risk as described in the Amended Consent Decree in *State of Washington v. Perry* (E.D. Wash. Case No. 2:08-CV-5085-RMP). Specifically, the Department is providing notice of a "serious risk . . . that DOE may be unable to meet" Milestones A-1 and A-17 (Waste Treatment Plant), Milestones A-2 to A-4 (HLW Facility), and A-13 to A-16 and A-19 (PT Facility) of that Decree.³ With respect to the "preliminary recovery plan" required by the Amended Consent Decree, completion of the AoA is the first and most critical aspect of that plan. The steps that follow the completion of the AoA will be determined based on the final report's conclusions and the Department's consultations with Ecology.⁴

The Department remains committed to continuing to assess, individually and collectively, the challenges that could impact its ability to meet Amended Consent Decree milestones, and will continue to closely coordinate with Ecology. The Department looks forward to the start of discussions regarding our shared objective of advancing this difficult cleanup in a manner that provides long-term benefits for local communities, the region, the State, and the nation. Ecology's willingness to continue to work collaboratively with the Department to develop safe,

³ Section IV-C-3 of the Amended Consent Decree states that "[i]n the event [the Department] determines that a serious risk has arisen that [the Department] may be unable to meet a schedule as required in Section IV," the Department shall notify Ecology of that risk. The Amended Decree also requires that the Department provide a detailed description of the factors constituting that risk. *See id.* § IV-C-3(a). The State is already well-informed of the multiple factors that constitute the risk here, not only from the Department's filings in the Consent Decree litigation, but also from the continued exchange and discussion between the Department and Ecology since the court amended the Decree. In addition, the Department has shared with Ecology reports and analyses that, taken collectively, suggest a risk that completion of the HLW Facility and the PT Facility may be delayed beyond the milestones in the Amended Decree. *See, e.g.,* note 2 *supra*. Of course, the Department remains willing to discuss those factors in more detail if that would be helpful to the State.

⁴ Ecology will also continue to have the opportunity to be involved in the AoA process prior to any final report being issued by the contractor to the Department.

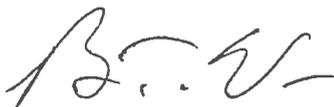
Ms. Bellon
19-ORP-0007

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SEP 04 2019

achievable, affordable, and risk-informed paths to execute the cleanup mission at the Hanford Site remains critical to meaningful progress.

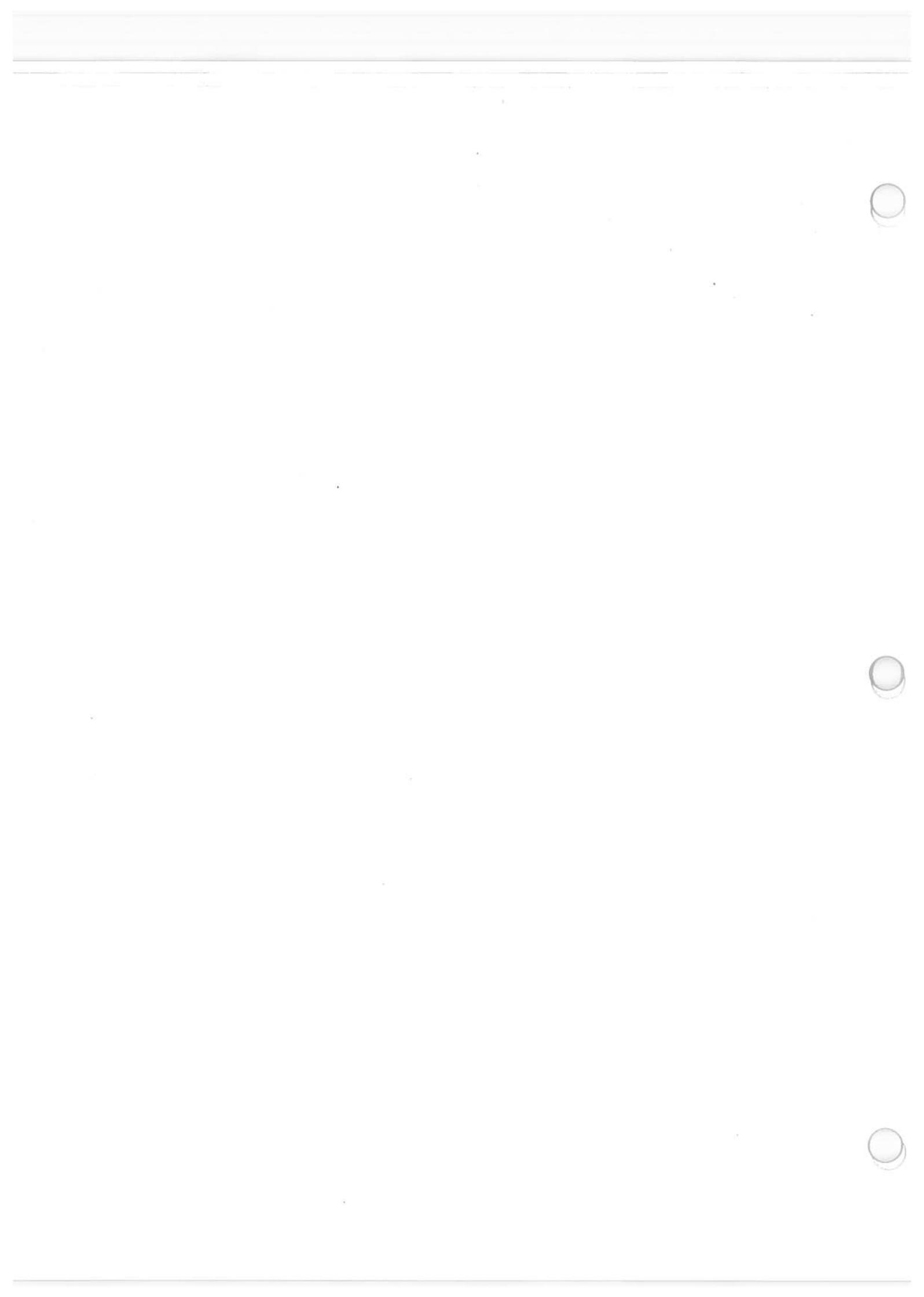
If you have any questions, please contact me at (509) 376-7395.



Brian T. Vance
Manager

ORP:BTV

cc: A.K. Smith, Ecology
K. Niles, ODOE





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SEP 11 2019

19-ORP-0008

Ms. Maia D. Bellon, Director
Washington State
Department of Ecology
PO Box 47600
Olympia, Washington 98504-7600

Dear Ms. Bellon:

Thank you for participating in discussions at the Hanford Senior Executive Committee meeting on August 28, 2019, in Seattle, Washington.

The U.S. Department of Energy (DOE), Washington State Department of Ecology (Ecology), and U.S. Environmental Protection Agency (EPA) discussed the Hanford Federal Facility Agreement and Consent Order (also known as Tri-Party Agreement or TPA) and Amended Consent Decree. During our meeting, Ecology outlined a proposal to work in good faith to collectively identify a holistic and realistic path forward for Hanford's tank waste mission. Specifically, Ecology proposed a series of steps to initiate the negotiations:

1. Within two weeks of the August 28 meeting, DOE should confirm its willingness to proceed with the proposal outlined below.
2. If DOE confirms its willingness to proceed, then within 30 days thereafter, DOE, Ecology, and EPA will convene meetings as needed to identify the scope of the holistic negotiations. By approximately mid-October 2019, staff will present the results of the scoping meetings to the principals of DOE, Ecology, and EPA for concurrence.
3. DOE will transmit a letter notifying Ecology that a serious risk has arisen that DOE may be unable to meet certain Amended Consent Decree milestones.
4. By early November, DOE and Ecology will prepare and present to the court filings describing the parties' intended path forward for holistic negotiations to address Amended Consent Decree activities. The filings will identify the scope of the negotiations, define time frame within which the negotiations will be completed, and a schedule for reporting to the Court on the progress of the negotiations.
5. DOE, Ecology, and EPA will convene holistic negotiations to identify a new path forward. The parties will consider hiring a professional mediator to assist with negotiations. Negotiations will be completed by July 31, 2020.
6. Between November 2019 and the end of the negotiating period, DOE and Ecology will provide regular joint reports to the court regarding the Amended Consent Decree milestones at risk and the status of joint efforts to develop a new path forward. Appropriate briefing(s) will be provided to the State of Oregon.

Ms. Maia D. Bellon
19-ORP-0008

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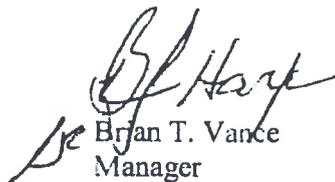
SEP 11 2019

7. If negotiations are successful, DOE and Ecology will present the new path forward, including any proposed new Amended Consent Decree milestones to the Court, and seek permission to amend the Amended Consent Decree.
8. Ecology agrees to hold in abeyance, during the course of negotiations, the filing of any new lawsuit or enforcement action regarding the matters the parties have agreed are within the scope of the holistic negotiations. However, Ecology reserves the right to proceed with a lawsuit or enforcement action if the process for holistic negotiations breaks down at any point.
9. As long as the holistic negotiations progress, DOE and Ecology will put on hold the TPA dispute regarding new Resource Conservation and Recovery Act compliant tank space.

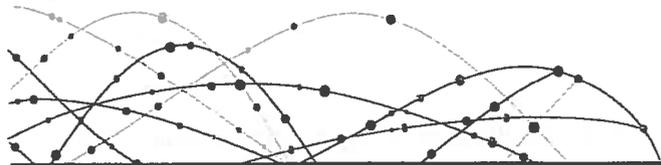
This letter confirms DOE's willingness to participate in holistic negotiations to include the Amended Consent Decree activities. DOE notes that on September 4, 2019 it provided Ecology with written notice that a serious risk had arisen that it may not be able to meet Amended Consent Decree Milestones A-1 and A-17 (Waste Treatment and Immobilization Plant), A-2 to A-4 (High-Level Waste Facility), and A-13 to A-16 and A-19 (Pretreatment Facility). We look forward to further discussions regarding the details of the path forward.

Thank you for your continued commitment to work in partnership with DOE to advance the treatment mission at Hanford. We look forward to starting the month-long scoping discussions. If you have any questions, please contact me, or Todd Shrader, (202) 586-7709.

ORP:BJH


Brian T. Vance
Manager

cc: A.K. Smith, Ecology
K. Niles, ODOE



August 2019

Review of the Final Draft Analysis of Supplemental Treatment Approaches of Low-Activity Waste at the Hanford Nuclear Reservation

At the request of Congress, the U.S. Department of Energy (DOE) commissioned a report to assess options for immobilizing and disposing of low-activity waste from nuclear weapons production at the Hanford Nuclear Reservation. As a check on that work, Congress also requested that the National Academies of Sciences Engineering, and Medicine review the commissioned report in terms of its technical merit and its usefulness in informing DOE's decision-making.



Photo Credit: United States Department of Energy

One of the nation's biggest and most complex nuclear cleanup challenge is at the Hanford Nuclear Reservation (Hanford), which is located in the state of Washington. From 1944, when the first reactor produced plutonium for the Manhattan Project, until 1987, when the ninth and last reactor was shut down, Hanford had produced about two-thirds of the nation's plutonium stockpile for nuclear weapons. The production processes resulted in substantial amounts of radioactive and other hazardous wastes; presently, about 56 million gallons of waste are stored in 177 underground tanks. The waste is chemically complex and diverse, which makes it difficult to manage and dispose of safely.

DOE plans to use vitrification, or immobilization in glass waste forms, for all of the "high level waste" at Hanford, which comprises about 10 percent of the volume and 90 percent of the radioactivity. The remainder—about 90 percent of the volume—is designated "low-activity waste," some of which also will be vitrified. DOE is constructing a Waste Treatment and Immobilization Plant to perform the vitrification.

However, because of capacity limits at the new plant, not all of the low-activity waste can be treated there. DOE must determine how to immobilize the remaining low-activity waste—referred to as "supplemental low-activity waste" or SLAW—so that it will be safe for disposal in a near-surface disposal site. To help inform its decision, DOE contracted with a federally funded research and development center (FFRDC), specifically Savannah River National Laboratory, to analyze and report its findings about at least three potential technologies for immobilizing the SLAW: vitrification, grouting, and fluidized bed steam reforming (see Box 1).

This National Academies review provides an "overall assessment" of the FFRDC report subject to public comments and issuance of the final FFRDC report. This review does not, however, independently evaluate the SLAW treatment approaches, nor does it recommend any particular approach.

Box 1. Three Waste Form Technologies Assessed in the FFRDC Report

Vitrification: This is a high temperature technology that blends the SLAW with glass forming materials at about 1150°C, incorporating most of the radionuclides and metals into a glass waste form.

Grouting: Grouting technology operates at room temperature (about 25°C) and blends the liquid SLAW with dry inorganic materials to produce a cementitious waste form.

Steam Reforming: This high temperature technology blends the liquid SLAW with dry inorganic materials at 750°C, forming dry granular mineral particles with a chemical structure that retains the radionuclides and metals.

CONCLUSIONS OF THE FFRDC

The FFRDC team concluded that a SLAW treatment and disposal option that meets regulatory requirements for disposal could be developed using any of the three treatment technologies evaluated. Regarding time and costs, the FFRDC's final draft analysis concluded that:

- The vitrification technology would take 10 to 15 years to implement and would cost \$20 billion to \$36 billion.
- The grouting technology would take 8 to 13 years to implement and would cost \$2 billion to \$8 billion.
- The fluidized bed steam reforming technology would take 10 to 15 years to implement and would cost \$6 billion to \$17 billion.

In addition, the FFRDC report notes that for some treatment alternatives, "the required time for construction and startup require an immediate start to allow completion by DOE's target date of 2034 for SLAW treatment to begin in combination with the Waste Treatment and Immobilization Plant."

OVERALL ASSESSMENT OF THE FFRDC REPORT

After multiple iterations of comment and response between the FFRDC team and the NAS committee, this review finds that, while the most recent FFRDC report has improved considerably over its predecessors, it is not sufficient, taken alone, for DOE, Congress, regulators,

or other stakeholders to rely upon to evaluate and decide upon a treatment approach for SLAW. It does not yet provide a complete technical basis needed to support a final decision on a treatment approach, and does not yet clearly lay out a framework of decisions to be made among treatment technologies, waste forms, and disposal locations.

Nevertheless, the report represents useful steps forward by:

- (a) Establishing the likelihood that vitrification, grouting, and steam reforming are all capable, in principle, of meeting existing or expected regulatory standards for near-surface disposal, albeit with varying amounts of pre-treatment being required;
- (b) Highlighting the importance of secondary waste in that it will contribute the greatest amount to the radiation dose that an individual could receive several thousand years after disposal of the waste in the Integrated Disposal Facility (IDF) at Hanford;
- (c) Underscoring the regulatory and acceptance uncertainties regarding approaches other than vitrification technology for processing SLAW; and
- (d) Opening the door to serious consideration of other disposal locations, specifically, the Waste Control Specialists, LLC (WCS) facility near Andrews, Texas, and possibly the EnergySolutions facility near Clive, Utah.

In addition, the cost estimates in the FFRDC report are based on technologies that, for the most part, have not yet been fully developed, tested, or deployed for Hanford's complex tank wastes. Instead, the report uses costs from similar technologies. As a result, there are large attendant uncertainties, suggesting that costs could be much higher than estimated, but are unlikely to be much lower.

Stakeholder Concern: "As Good as Glass"

The review committee was repeatedly told that the selection and implementation of an approach to treat tank waste would be hampered by the insistence by the state of Washington and some other stakeholders that any approach other than vitrification must be "as good as glass." The term "as good as glass" is not defined in law, regulation, or agreement, and it is only tentatively defined by its advocates. The report's analysis and public briefings provide a follow-on opportunity to further engage with stakeholders on this topic.

RECOMMENDATIONS

The following steps should be taken to better inform decision-making concerning selection of SLAW treatment alternatives.

Use the Report as a Pilot for a Full Comparative Analysis

This review recommends that the FFRDC report be accepted as a pilot or scoping study for a full comparative analysis of SLAW treatment alternatives, including:

- Vitrification, grouting, and steam reforming as treatments for SLAW;
- Pre-treatment to remove iodine-129 and technetium-99, and other long-lived radionuclides (e.g., selenium-79) to ensure that regulations are met or reduce cost, and pre-treatment to assure that the waste product meets land disposal requirements;
- Pre-treatment of strontium-90, if it is not removed during the cesium-137 pre-treatment process; and
- Disposal at the IDF, WCS, and (possibly) the EnergySolutions facility.

Organize the Report or Decisional Document around Four Interrelated Areas

The final FFRDC report or follow-on decisional document should include technical data and analyses to provide the basis for addressing four interrelated areas, as follows:

1. Selection of a technology that will produce an effective waste form. This has two parts:

- The treatment (immobilization) technology:
 - How well will it work? Is the technology well understood, tested or used under real-world conditions, dependent on other technologies, or relatively simple?
 - What types and volumes of residual waste are created by each technology?
 - What is the lifetime cost and duration, and uncertainties therein?
 - What are the risks (e.g., programmatic and safety) and uncertainties therein?
- The waste forms and associated disposal sites:
 - How effective is each waste form in immobilizing the waste (e.g., the materials science of the incorporation, corrosion, and release processes) and over what time periods?
 - What is their performance under the expected disposal conditions (e.g., release from the disposal facility and transport through the geosphere to a receptor)?

- How do the waste form performances actually differ? This goes further than simply demonstrating compliance, but rather demonstrates an understanding of how the waste forms and disposal environments actually work.

2. Selection among available disposal sites.

Selection requires an understanding of how each site will “work” over time in providing a barrier to the release and migration rate of key radionuclides, especially technetium-99 and iodine-129.

- What is the role of the hydrogeology at each site (the IDF and WCS) in preventing/slowing radionuclide release and migration?
- How might the disposal facility design be modified to enhance the performance of each waste form?

Important site related-issues include regulatory compliance, public acceptance, cost, safety, expected radiation dose to the maximally exposed individual over time, and differences among the disposal environments.

3. Determining how much and what type of pre-treatment is needed to meet regulatory requirements regarding mobile, long-lived radionuclides and hazardous chemicals, and possibly to reduce disposal costs. The congressional charge specifically mentions technetium-99 and iodine-129, but other long-lived radionuclides, such as selenium-79, may be relevant.

4. Consideration of other relevant factors. Other factors that would affect the selection of a SLAW treatment alternative, for example:

- The costs and risks of delays in making decisions or funding shortfalls in terms of additional resource requirements and the increased chance of tank leaks or structural failures over time, and the need to address the consequences (all 149 single-shell tanks have exceeded their design life and the 28 double-shell tanks will have exceeded their design life before the waste is slated to be removed);
- Thorough consideration of the experience at other DOE sites (e.g., Savannah River Site) and relevant commercial facilities; and
- DOE’s proposed reinterpretation of the definition of HLW waste could change the SLAW treatment plant’s size and performance requirements by altering feed volumes and chemical composition, depending on how the reinterpretation is implemented.

Provide Direct Comparison of Alternatives

The analysis in the final FFRDC report and/or a comprehensive follow-on decisional document needs to adopt a structure that pervasively enables the decision-maker to make direct comparisons of alternatives concerning the criteria that are relevant to the decision and which most clearly differentiate the alternatives.

Consider Parallel Approaches

The FFRDC report could also provide the springboard for serious consideration of adopting an approach of multiple, parallel, and smaller scale technologies, which would have the potential for:

- (a) Faster start-up to reduce risks from tank leaks or structural failures, if adequate funding is available to support parallel approaches;
- (b) Resilience through redundancy;
- (c) Taking positive advantage of the unavoidably long remediation duration to improve existing technologies and adopt new ones; and
- (d) Potentially lower overall cost and program risk by creating the ability to move more quickly from less successful to more successful technologies.

this review. For the final phase of the study, the committee will review all received public comments and will assess whether any comments change the committee's findings and recommendations of its review of the FFRDC's final draft analysis. Comments on the review and the FFRDC analysis may be sent to Hanford@nas.edu.

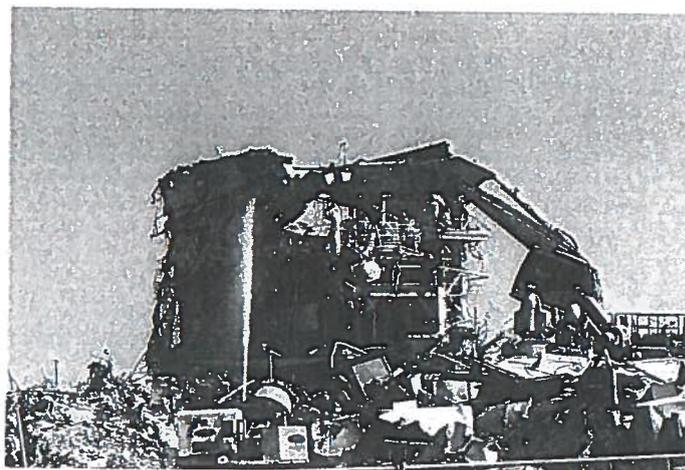


Photo Credit: United States Department of Energy

NEXT STEPS FOR THE STUDY

Publication of this review begins a minimum 60-day public comment period on both the FFRDC report and

COMMITTEE ON SUPPLEMENTAL TREATMENT OF LOW-ACTIVITY WASTE AT THE HANFORD NUCLEAR RESERVATION

John S. Applegate (*Chair*), Indiana University, Bloomington; **Allen G. Croff** (*Vice-Chair*), Vanderbilt University, Nashville, TN (retired), St. Augustine, FL; **Margaret S. Y. Chu**, M. S. Chu + Associates, LLC, New York; **Kenneth R. Czerwinski**, University of Nevada, Las Vegas; **Rachel J. Detwiler**, Beton Consulting Engineers, LLC, Mendota Heights, MN; **Timothy A. Devol**, Clemson University, Clemson, SC; **Rodney C. Ewing**, Stanford University, Stanford, CA; **Craig S. Hansen**, Independent Consultant, Clinton, TN; **Cathy Middlecamp**, University of Wisconsin, Madison; **Alfred P. Sattelberger**, Argonne National Laboratory (*retired*), Argonne, IL; **Barry E. Scheetz**, The Pennsylvania State University; **Anne E. Smith**, National Economic Research Associates, Inc., Washington, DC; **Chris G. Whipple**, ENVIRON (*retired*), Lafayette, California. Technical Adviser: **David W. Johnson, Jr.**, Bell Labs, Lucent Technologies (*retired*), Bedminster, NJ. Staff from the National Academies of Sciences, Engineering, and Medicine: **Charles D. Ferguson** (*Study Director*), **Toni Greenleaf** (*Administrative and Financial Associate*), and **Darlene Gros** (*Senior Program Assistant*).

For More Information . . . This Consensus Study Report Highlights was prepared by the Nuclear and Radiation Studies Board based on the Consensus Study Report *Review of the Analysis of Supplemental Treatment Approaches of Low-Activity Waste at the Hanford Nuclear Reservation* (2018). The study was sponsored by the Office of Environmental Management, Department of Energy. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of any organization or agency that provided support for the project. Copies of the Consensus Study Report are available from the National Academies Press, (800) 624-6242; <http://www.nap.edu> or via the Nuclear Studies and Radiation Board web page at <http://www.nationalacademies.org/nrsb>.

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Tri-City Herald

Feds agree to Hanford waste deadline talks, if the state promises to hold off on lawsuits

BY ANNETTE CARY

SEPTEMBER 12, 2019

Virtual tour of Hanford Vit Plant

Take a virtual tour of the world's largest radioactive waste treatment plant. The Waste Treatment and Immobilization Plant, also known as the Vit Plant, will use vitrification to immobilize most of Hanford's dangerous tank waste. BY DEPARTMENT OF ENERGY
RICHLAND, WA

The Department of Energy has agreed to negotiate with the state of Washington over deadlines for Hanford environmental cleanup that the state fears are at risk of being missed.

It agreed to a framework for negotiations on Wednesday, including a series of steps that came out of August discussions with the Washington state Department of Ecology.

DOE wants Ecology to agree not to file new lawsuits or take enforcement action related to at-risk deadlines during the negotiations.

The two agencies also would put aside a disagreement on whether DOE should build more tanks or other ways to securely store radioactive waste that is now in leak-prone single-shell tanks.

The federal court, which set some of the at-risk deadlines in a 2016 consent decree, would be informed and aware of the negotiations as they proceed.

DOE's formal agreement to enter negotiations was provided to Maia Bellon, director of the Department of Ecology, in a letter from Hanford DOE manager Brian Vance on Wednesday.

It came just a week after DOE notified the state that it was at serious risk of missing some court-enforced deadlines for constructing and operating the \$17 billion Hanford vitrification plant. The notification could return the matter to federal court.

"We're encouraged that Energy is willing to discuss a path forward on those milestones under court supervision, in context with discussing the broader Hanford tank waste mission," Bellon said Wednesday.

DOE: SOME HANFORD DEADLINES AT RISK

However, she had just received the letter and Ecology was evaluating its specific points on Wednesday, she said.

The Hanford nuclear reservation near Richland has 56 million gallons of radioactive and hazardous chemical waste stored in underground tanks.

The waste is left from the past production of plutonium during World War II and the Cold War for the nation's nuclear weapons program.

Work is underway to empty the waste in 149 leak-prone single-shell tanks into 27 newer double-shell tanks for storage until it can be treated for disposal.

Much of the waste could be immobilized in a stable glass form in the \$17 billion vitrification plant, called the Waste Treatment Plant, under construction in the center of the Hanford Site. Construction started in 2002, and DOE is confident it can start limited waste treatment at the plant by a court-enforced deadline of 2023.

Initially, some low-activity radioactive waste separated out of the tank waste would be treated.

At risk are deadlines to construct and operate parts of the plant that would handle the high-level radioactive waste portion of the tank waste.

DOE told the state last week it may not be able to meet consent decree deadlines to start treating high-level waste at the vit plant by 2033 or have the plant fully operational by 2036. Pacing deadlines to keep work on track to meet the 2033 and 2036 deadlines also could be missed.

Potential issues with Hanford deadlines initially were raised by Bellon in a May 29 letter to DOE. She called for a “frank discussion” on challenges DOE appeared to be facing.

STATE WANTS MORE TANKS

Bellon called into question not only whether vit plant deadlines could be met, but also other deadlines related to waste storage tanks, including some in the legally binding Tri-Party Agreement.

She said in May that DOE does not appear able to meet deadlines for emptying tanks by 2040 and having the waste treated by 2047 under its current funding level, which is about \$2.5 billion a year for all Hanford work.

She also called for new waste storage to be built, saying the 27 double-shell tanks are inadequate. DOE has been adamantly opposed to spending money on new double-shell tanks, saying the money would be better spent on getting the waste treated.

“We are willing, in good faith, to work with you to collectively identify a holistic and realistic path forward for Hanford’s tank waste, one that addresses all aspects of the tank waste mission and, ideally, does not need to be revisited every few years,” Bellon said.

DOE’s letter sent Wednesday outlines what DOE said it was agreeing to, based on discussions held Aug. 28 with Ecology in Seattle.

It said DOE, Ecology and the third tri-party agency — the Environmental Protection Agency — would start meetings within 30 days to identify the scope of negotiations.

By early November, DOE and Ecology would prepare and file documents in federal court describing the scope of negotiations, the time needed to complete negotiations and a schedule for reporting progress of the negotiations.

The agencies would consider hiring a professional mediator.

Negotiations should be completed by July 31, and any new proposed consent decree deadlines then would be presented to the court.

Until then, DOE and Ecology would provide regular joint reports to the court on consent decree deadlines and the status of effort to develop a new path forward.

“We look forward to further discussions regarding the details of the path forward,” Vance told Bellon.

Washington State, Feds Plan 'Holistic' Talks on Hanford Waste Disposal



Washington state and federal officials are ready for negotiations on “a holistic and realistic path forward” on the schedule for disposal of radioactive tank waste stored at the U.S. Energy Department’s Hanford Site, the top official at the facility said in a letter this week.

Brian Vance, DOE manager for both the Richland Operations Office and the Office of River Protection at Hanford, on Wednesday formally agreed to negotiations with senior representatives from the Washington state Department of Ecology.

Vance laid out the DOE commitment in a Sept. 11 to the head of the Washington state Department of Ecology.

The two sides will seek agreement on revisions to the 1989 Tri-Party Agreement that governs cleanup at the former plutonium production complex. Washington state

officials are increasingly worried the Energy Department is not doing enough to safeguard against leaks from single-shell tanks holding chemical and radioactive waste, while the federal agency is seeking a better relationship with its state regulator.

The U.S. Environmental Protection Agency, the third party to the Tri-Party Agreement, will also participate in the negotiations. The parties plan to narrow the scope of the talks by mid-October, then apparently begin negotiations by early November.

“The parties will consider hiring a professional mediator to assist with negotiations,” which are expected to finish by July 31, 2020, Vance wrote to Ecology Department Director Maia Bellon.

Plans for the state-federal talks have percolated for months – particularly after Bellon in late May threatened to go to court unless federal officials agreed to “frank discussion” about tank waste disposal at Hanford. Bellon said the state agency is increasingly frustrated by DOE’s frequent failure to meet cleanup timelines in both the Tri-Party Agreement and a 2010 federal court consent decree.

The state director’s May letter was directed to then-DOE Assistant Secretary for Environmental Management Anne Marie White, who resigned the following month.

Bellon wrote that she doubts DOE can meet its Tri-Party Agreement’s 2040 deadline for transferring all waste from single-shell tanks into double-shell tanks, then treating all the waste by 2047. The state wants some new tanks installed prior to full operation of the Waste Treatment Plant being built at Hanford; that milestone is due by 2026. Meanwhile, the Energy Department is cool to investing in what it deems a stopgap solution.

In his Wednesday letter, Vance thanked the state official for meeting with a committee of Hanford senior executives on Aug. 28, and also acknowledged a series of steps sought by the state to get negotiations started. “During our meeting, Ecology outlined a proposal to work in good faith to collectively identify” a mutually-agreeable path forward at Hanford.

In his Sept. 11 letter, Vance noted the state agreed to hold off on legal action while the negotiations are progressing.

In a letter to Bellon one week earlier, Vance acknowledged there is a “serious risk” of missing a 2036 Tri-Party deadline for starting operations on two key components of the \$17 billion Waste Treatment Plant (WTP) being built by Bechtel.

The Energy Department “cannot project with certainty” when the High-Level Waste Vitrification Facility and the Pretreatment Facility will be completed, Vance said in the letter to Bellon on Sept. 4. The WTP will convert much of the 56 million gallons of radioactive waste stored in underground tanks at Hanford into a stable glass form for disposal.

During the talks, regular updates will be submitted to U.S. District Court in Eastern Washington, which is in charge of the 2010 consent decree on Hanford cleanup.

“If negotiations are successful, DOE and Ecology will present the new path forward, including any proposed new consent decree milestones to the court,” Vance said. The state can always pursue litigation if the talks break down.

“Thank you for your continued commitment to work in partnership with DOE to advance the treatment mission at Hanford,” Vance said in his letter this week.

Progress Cited on Hanford Plateau Cleanup

Meanwhile, Energy Secretary Rick Perry on Wednesday hailed a milestone in removing underwater radioactive waste sludge from a Hanford Site facility near the Columbia River.

Perry praised removal of highly radioactive sludge near the river after 10 years of work. The energy secretary told the *Tri-City Herald* the development shows residents of the Northwest the department can deliver on cleanup goals around the Columbia River.

After nearly a decade of preparation, workers at Hanford in June 2018 removed the first batch of highly radioactive sludge from underwater storage in the K West

Reactor Basin. The Energy Department was required by the Tri-Party Agreement to transfer all the sludge to T Plant by the end of 2019. At the Hanford T Plant, containers of the waste are held in below-ground cells for storage. The cells have safety features to detect leaks.

The sludge was produced when irradiated reactor fuel rods began to deteriorate. Eventually the material will be treated and packaged as transuranic waste for disposal underground at the Waste Isolation Pilot Plant in New Mexico.

News of the sludge transfer milestone drew cheers Thursday in Alexandria, Va., at the Energy Department's National Cleanup Workshop, co-sponsored by the Energy Communities Alliance and the Energy Facility Contractors Group.

"I'm happy to report Yesterday we actually finished K Basin sludge," said Ty Blackford, president and CEO of CH2M Hill Plateau Remediation. The Jacobs subsidiary is the Energy Department contractor for cleanup of Hanford's Central Plateau.

"We are making progress in each of these areas," Blackford said during a panel discussion on the Hanford Site. "So, the river is being protected." That's vital, the manager said, because the Columbia River is a key water source for both Oregon and Washington.



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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September 25, 2019

Brian T. Vance, Manager
Office of River Protection
United States Department of Energy
PO Box 450, MSIN: H6-60
Richland, WA 99352

Re: Notice of Serious Risk Under the Amended Consent Decree in *State of Washington v. Perry* (E.D. Wash. No. 2:08-CV-5085)

Dear Mr. Vance:

I received the Department of Energy, Office of River Protection's (the Department) September 4, 2019, notice that it is at "serious risk" of not making the following Milestones in the above-referenced Amended Consent Decree:

- A-1 through A-4 (relating to the Waste Treatment Plant and High Level Waste Vitrification Facility),
- A-13 through A-17, and A-19 (relating to the Pretreatment Facility).

While we appreciate the Department's notice, the Washington State Department of Ecology (Ecology) disagrees with several statements in your letter.

First, we want to reiterate that Ecology's knowledge of the Department's anticipated difficulty in meeting Consent Decree deadlines, or awareness of the ongoing Analysis of Alternatives (AoA) process, in no way constitutes acquiescence in either the Department's anticipated failure to meet legally enforceable milestones or any alternative path forward the Department develops through the AoA process.¹ Ecology has consistently indicated to the Department that all milestones in the Amended Consent Decree remain in full effect unless and until the parties formally agree otherwise, or the Court modifies the at-risk deadlines.

Second, while we appreciate the discussions that the Department and Ecology staff have had regarding the Department's anticipated difficulty in meeting Consent Decree deadlines, these informal discussions do not supplant Consent Decree requirements. As noted in footnote 3 of your letter, Section IV-C-3(a) of the Amended Consent Decree requires the Department to provide Ecology with "a detailed description of the factors constituting the serious risk."

¹ In particular, we are concerned with the impression given in footnote 4 of your letter. As you know, Ecology's "opportunity to be involved in the AoA process" is limited to Ecology serving only as a spectator.



Tri-City Herald

After 17 years of construction, part of Hanford vit plant is done

BY ANNETTE CARY

AUGUST 19, 2019

World's largest plant to treat radioactive waste being built at Hanford

There's something different about the look of some Hanford vitrification plant workers.

After 17 years of construction on the massive plant to treat radioactive waste for disposal, some of the workers are no longer sporting hard hats.

A relatively small, but important, part of the plant is finished.

Construction of the control room in an annex of the Low Activity Waste Facility at the Hanford nuclear reservation plant is done.

Plant workers will now use the room to bring the plant's systems online for treating nuclear waste.

The \$17 billion plant is required by a federal court consent decree to start treating the least-radioactive waste in Hanford's underground tanks by 2023.

The site near Richland has 56 million gallons of radioactive and hazardous chemical waste left from production of plutonium for the nation's nuclear weapons program from World War II through the Cold War.

A ceremony for the 20,000-square-foot, two-story annex that houses the new control room was held Monday, with Rep. Dan Newhouse, R-Wash., and Rep. Kim Schrier, D-Sammamish, on hand for the official opening.

CONTROL ROOM USED FOR STARTUP

“The control room is the operations center of the Low-Activity Waste Facility,” said Brian Vance, DOE Hanford site manager.

“By moving into the annex, we have the capability to monitor and control completed systems inside the 14 support buildings,” he said.

Those buildings include the steam plant, compressor plant and water treatment facility, he said.

It also is being used to do startup and testing activities for the Low Activity Waste Facility and the Analytical Laboratory, both among the four major facilities at the plant.

“We are getting closer to making low-activity waste glass,” said Valerie McCain, Bechtel National project director for the vitrification plant.

The opened control room allows the commissioning team, which includes workers who likely will become part of the team that operates the plant, to be in a single, central location for daily work activities.

Initially, low activity radioactive waste will be separated out of the tank waste and turned into a stable glass form.

Resolution of technical issues related to handling high level waste is expected to delay the start of treatment of that waste, possibly until 2033.

Now workers are coordinating a sequenced construction, startup and commissioning approach for each of the plant’s individual systems.

The Low Activity Waste Facility alone contains the vitrification process, mechanical handling, utility and air supply systems.

Crews have begun startup activities as 72 of 92 of the facility’s systems are undergoing verification that they are complete, tested and in safe working order.

Tri-City Herald

After years of preparation, work to empty Hanford leak-prone waste tanks is ready to restart

BY ANNETTE CARY

AUGUST 29, 2019

Work starts to empty highly radioactive waste at a new Hanford tank farm

Hanford workers are expected to begin pumping radioactive waste from a leak-prone underground tank at Hanford for the first time in nearly two years.

Work is scheduled to begin this weekend to empty several of the 10 single-shell tanks in the adjoining groups of tanks called the A and AX Tank Farms at the nuclear reservation north of Richland.

The Washington state Department of Ecology, the regulator on the project, called it “the beginning of another significant phase in the Hanford cleanup.”

The waste, which also includes hazardous, nonradioactive chemicals, will be transferred to newer double-shell tanks for storage until the waste can be treated for permanent disposal.

Work to empty an initial single-shell tank farm to regulatory standards — the C Tank Farm — was completed in November 2017 after 19 years of work on the 16 tanks.

But the Department of Energy and its contractor, Washington River Protection Solutions, decided to pursue a new strategy on the next group of tanks.

Instead of installing infrastructure one tank at a time as was done in the C Tank Farm, workers spent several years installing all infrastructure to provide electrical power, ventilation, water and transfer lines before work starts to empty the tanks in both the A and AX Tank Farms.

AX TANK TO BE EMPTIED FIRST

Hanford officials have said the change will allow workers to quickly switch to another tank if they encounter an issue at one tank, such as the need to stop retrieval there to replace a pump.

First up will be Tank AX-102.

Unlike the C Tank Farms with tanks of 55,000 or 530,000 gallon capacity, AX-102 has a capacity of 1 million gallons.

Pumpable liquids were removed earlier in a campaign to help prevent all 149 single-shell tanks at the Hanford nuclear reservation from leaking.

The waste is left from the past chemical processing of irradiated uranium fuel to remove plutonium for the nation's nuclear weapons program from World War II through the Cold War.

Tank AX-102 has 30,000 gallons of waste to be removed, the majority of it salt-cake rather than the sludge with the consistency of peanut butter that was common in the C Tank Farms.

Workers will go after the waste with technology they already are experienced in using.

Pressurized water will be sprayed on the remaining waste in the tank to help dissolve the salt cake and then move the waste toward a central pump for removal and transfer to the double-shell tank AZ-102.

Two extended-reach sluicers have been lowered through risers extending from the ground into the tank to spray the water.

The project could be completed in three to four months, although there are uncertainties such as how much hardened material may be in the bottom of the tank,

said Doug Greenwell, manager of single-shell tank retrieval, for Aecom-owned Washington River Protection Solutions in a message to employees.

The goal is to remove all but 360 cubic feet of waste, the equivalent of about an inch spread across the bottom of the tank.

“Well-trained personnel and proven controls for nuclear, industrial, radiological and industrial hygiene will be in place to support the project, Greenwell said.

WASTE TO BE TREATED AT HANFORD VIT PLANT

Safety precautions will include starting the work on nights and weekends and then moving to round-the-clock operations when data on chemical vapors shows the working conditions are safe. Disturbing waste raises the possibility of the release of potentially harmful chemical vapors.

Reader boards will alert workers in the area when waste-disturbing work is in progress. Workers within the boundaries of the AX Tank Farm will wear supplied air respirators as protection against breathing in the vapors.

The work will help build up the inventory of waste available to send to the \$17-billion vitrification plant under construction, DOE said in a statement.

It plans to start sending some low-activity radioactive tank waste to the plant to be turned into a stable glass waste form by a federal-court ordered deadline of 2023.

DOE also has court-ordered deadlines for emptying all but one of the tanks in the A and AX Tank Farms by September 2026.

“We’re glad to see work beginning to retrieve the waste from another set of Hanford’s underground tanks,” said Nina Menard, cleanup section manager for the Department of Ecology’s Nuclear Waste Program.

“We’ve been working with Energy to approve plans for the retrievals and make sure that appropriate permits are in place for this work,” she said.

Tank AX-102 is not suspected of leaking in the past, but two of the A Farm tanks are suspected to be leaking, and care must be taken to limit the liquid added to the tanks during retrieval.

When Tank AX-102 is emptied to regulatory standards, it will bring the total emptied to 18 single-shell tanks and one double-shell tank that sprang a leak from its inner shell. In addition to the 16 C Farm tanks, single-shell Tank S-112 has been emptied.

Tri-City Herald

Hanford's \$17 billion vit plant is at 'serious risk' of not being finished on time

BY ANNETTE CARY

SEPTEMBER 04, 2019

The Department of Energy is at risk of missing deadlines to have the Hanford vitrification plant fully operating by a federal court deadline of 2036.

DOE notified the Washington state Department of Ecology on Wednesday that the 2036 deadline and nine other deadlines to get ready for full operations are at "serious risk" of being missed.

It told the state that it was giving them notice out of an abundance of caution.

The court case that led to a 2016 court consent decrees with new deadlines for the massive plant under construction in the center of the Hanford site north of Richland requires notifying the state if the risk is serious.

"The state is already well-informed of the multiple factors that constitute the risk, and much of this information has also been shared previously with the stakeholders and the Hanford community," DOE said in a statement after sending the letter.

DOE and the Department of Ecology have been in talks after the state told DOE in late May that it wanted to open a "frank discussion" about challenges it believed DOE was facing in meeting legal deadlines related to tank waste and its treatment.

Maia Bellon, the director of the Department of Ecology, said the state wanted to work with the federal agency to identify a "realistic path forward for Hanford's tank waste, one that addresses all aspects of the tank waste mission and, ideally, does not need to be revisited every few years."

But she said the state would not be budging on key terms.

DEADLINE CONCERNS RAISED

Hanford has 56 million gallons of radioactive and hazardous chemical waste stored in underground tanks from the past production of plutonium for the nation's nuclear weapons program.

Workers are transferring the waste from leak-prone single-shell tanks to newer double-shell tanks until it can be treated for disposal.

Much of the waste is expected to be glassified at the \$17 billion Hanford nuclear reservation vitrification plant, which has been under construction since 2002.

Bellon raised multiple concerns about DOE meeting deadlines, including treating some of the least radioactive waste — low activity radioactive waste separated out of the tanks — by a consent decree deadline of 2023.

She also said that high level radioactive waste treatment at the vitrification plant must start on a time frame as close to the current deadlines as possible, she said.

“DOE remains firmly committed to, and is on schedule to meet, its commitment to begin waste treatment by December 2023,” DOE said in a statement.

It is the later deadline related to treating high level radioactive waste that DOE said Wednesday may be at risk.

The earliest of those deadlines is finishing construction of the High Level Waste Facility at the vitrification plant by 2030.

Then there are additional deadlines, including construction work at the vit plant's Pretreatment Plant, to keep work on pace to meet a 2033 deadline to start treating high level waste and to have the plant fully operational by 2036.

DOE said in the letter sent Wednesday that it needs time to come up with the best plan for treating high level waste.

DOE LOOKING AT OPTIONS

Technical issues were raised by then Energy Secretary Steven Chu in 2012 about parts of the plant that would handle high level waste — the High Level Waste Facility, which will turn high level waste into a stable glass form for disposal, and the Pretreatment Facility, which was designed to separate waste into low activity and high level waste streams for separate treatment.

The original issues have only recently been resolved, delaying construction on those two vit plant facilities.

Now, DOE is questioning if there might be a better way to prepare the high level waste for treatment than sending it to the vit plant's Pretreatment Facility.

It already has worked out a way to separate some low activity waste from the storage tanks without sending it to the unfinished Pretreatment Facility to allow some waste treatment to begin by 2023.

Earlier this spring, DOE started an analysis of alternative approaches to treat high level waste. After last month's decision to expand the alternatives under consideration, DOE now expects to have the analysis done in July.

The results of the analysis, plus other variables before deadlines are reached in the next 11 to 17 years, could affect the schedule for the High Level Waste and Pretreatment facilities, DOE said in the letter to the state.

"Accordingly, the department cannot project with certainty when the (two) facilities will be completed," the letter said.

Variables include how much money Congress approves for the vitrification plant each year, technological advances, contractor efficiency and practical experience with vitrification — both as Hanford begins treating low activity waste and DOE's Savannah River facility in South Carolina also vitrifies waste.

"We will continue to work collaboratively with Ecology to assess our challenges and identify the best path forward for addressing the waste in Hanford's tanks as soon as practicable," DOE said.

It seeks a realistic solution that is safe, affordable and considers risk, it said.

Tri-City Herald

Hanford nuclear waste report comes up short, say experts

BY ANNETTE CARY

SEPTEMBER 02, 2019

Not enough is known to decide on the best and most economical way to treat much of the low-activity radioactive waste in Hanford's underground tanks, said a committee of the National Academies of Sciences.

Still, a decision may need to be made soon to be ready to treat the waste on schedule, it said.

The Hanford nuclear reservation near Richland has 56 million gallons of radioactive and hazardous chemical waste stored in underground tanks from the past production of plutonium for the nation's weapons program.



The Department of Energy plans to separate the waste into high level radioactive and low activity radioactive waste for treatment at the \$17 billion vitrification plant under construction in the center of the Hanford site.

But the plant was not planned to be large enough to treat all the low activity waste. Options include expanding the plant or finding supplemental treatments for the waste to provide additional treatment capacity by 2034.

The National Academies of Sciences committee has prepared a final draft analysis of a study ordered by Congress that looked at three ways to treat the waste and found that vitrifying, or glassifying, the waste for disposal would be considerably more expensive than other options.

The study of treatment options prepared under the leadership of the Savannah River National Laboratory in South Carolina is a good starting point for making a decision on how to treat millions of gallons of Hanford low-activity radioactive waste, the National Academies of Sciences committee said in its analysis.

TREATMENT COSTS UNCERTAIN

But the report, which is only in draft form so far, does not yet provide the complete technical basis needed to support a final decision on a treatment approach, nor does it clearly lay out a framework of decisions to be made among treatment technologies, waste forms and disposal locations, the committee concluded.

Among the report's findings was that vitrification, grouting waste into a concrete-like form or using "fluidized bed steam reforming" to turn it into ceramic-like particles are each potential options.

But grouting and steam reforming would be significantly less expensive, it found.

The committee cautioned that cost estimates are based on technologies that, for the most part, have not yet been fully developed or deployed and are based on costs from similar technologies and consistent funding.

"There are large attendant uncertainties, suggesting that costs could be much higher than estimated, but are unlikely to be much lower," the committee analysis said.

It also noted that a decision on a technology may need to be made soon to make sure that design, construction and startup for any treatment facility is completed by a target date of 2034.

The tank waste is expected to be about 90 percent low activity radioactive waste, which contains less than 10 percent of the tank waste radioactivity.

The vitrification plant, or Waste Treatment Plant, might not have the capacity to treat as much as half of the low activity radioactive waste in a reasonable time.

If the vitrification plant were expanded, the cost would be \$20 billion to \$36 billion, according to the report reviewed by the commission.

Grouting could cost \$2 billion to \$8 billion and steam reforming could cost \$6 billion to \$17 billion.

RICHLAND MEETING SCHEDULED

Steam reforming is the least technically mature of the three processes, and grouting would create large amounts of treated waste for disposal.

Disposal options include a lined landfill at Hanford, but the Washington state Department of Ecology has been adamant that any waste form disposed of there must be "as good as glass" from vitrification to protect the groundwater beneath it for hundreds or thousands of years.

Out-of-state disposal also is potentially possible, including at the Clive radioactive waste disposal facility in Utah, if the treated waste meets requirements to be consider Class A low level radioactive waste, the least hazardous classification.

The Waste Control Specialists disposal facility in Texas also could be an option and already has accepted three gallons of Hanford low activity radioactive waste grouted in the initial phase of a pilot project.

The National Academies of Sciences committee recommended that the completed report it reviewed form the basis for further work to pick the best treatment option.

The committee will be in Richland for a meeting Oct. 31 to hear from organizations and others interested in Hanford site cleanup. The Savannah River-led team that prepared the study of treatment options will present its final report.

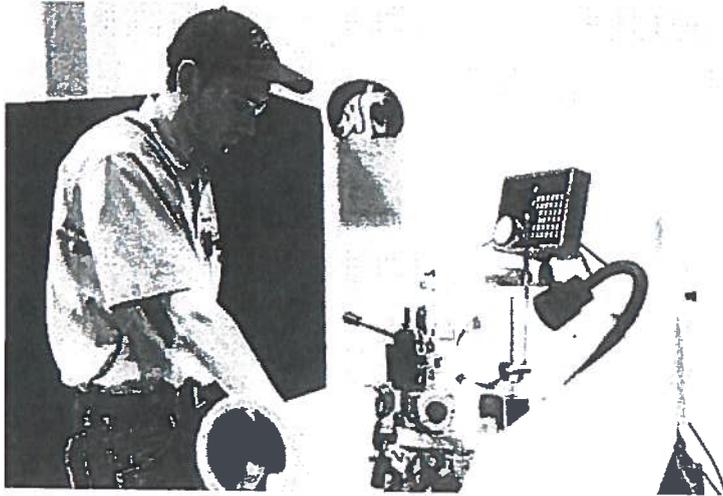
Public comments on the National Academies of Sciences committee's review can be submitted until Oct. 31 at bit.ly/LAWcomment or mailed to ATTN: Dr. Charles Ferguson, Nuclear and Radiation Studies Board, The National Academies, 500 5th St. NW, Washington, D.C. 20001.

Comments also may be submitted at the 8:30 a.m. to 5 p.m. Oct. 31 meeting at the Courtyard Richland Columbia Point.

WSU INSIDER

WSU Tri-Cities students design prototype to determine layout of radioactive, solid waste

August 12, 2019



WSU Tri-Cities student engineer Bryan Chronister works in the engineering high bay to craft an instrument prototype that could one-day be used in Hanford tanks.

By Maeghan Murray, WSU Tri-Cities

A team of Washington State University Tri-Cities student mechanical engineers partnered with Washington River Protection Solutions (WRPS) to design a prototype instrument that could one day be implemented to assess the exact location, amount and arrangement of solid radioactive waste in Hanford tanks.

The device could solve a significant challenge at the Hanford site by providing engineers and scientists with a reliable, three-dimensional picture of the layout of solid waste. It would allow the researchers to better assess and prepare for future situations at the Hanford site as compared with currently used methods.

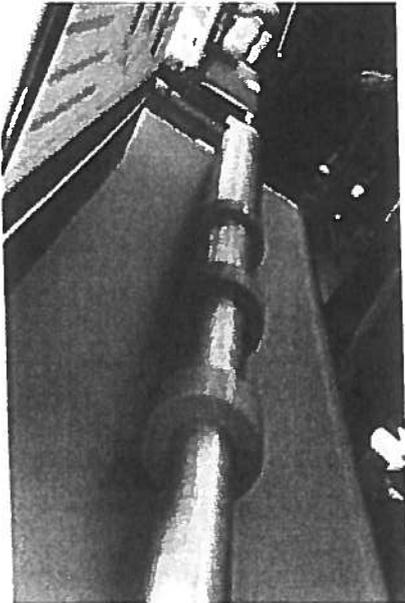
WRPS currently use devices that measure levels of solid waste at only one location in the tanks. They use either a sludge weight or other device that must sink down to the bottom of a tank's liquid waste in order to determine the level of the solid waste. The current devices, however, only provide information about the levels of solid waste at one location in the tanks, the students said.

The student group, comprised of Bryan Chronister, Tanner Reyff, Rayce Barnes and Tomokazu Hager, designed a deploying system known as SLIM, or Solid Liquid Interface Monitor, for their senior design capstone project.

SLIM uses a sonar device to create an accurate picture of the levels of solid waste in a Hanford tank. It is resistant to radioactive contamination and decay and could be left in a tank as a long-term solution for creating a reliable picture of the placement of solid waste, Reyff said.

“It is submerged into the liquid level of the waste, and takes about five minutes to do a full scan of the tank with the sonar device,” Hager said. “Essentially, it creates a topographical scan of the full tank, which can be used for a range of future uses out at the Hanford site.”

Developing the design



The engineering students utilized facilities at WSU Tri-Cities to create their prototype. The student group spent their first semester developing four different designs, which they later consolidated into one seamless design.

The team’s final design uses a winch to lower a telescoping tube into the liquid waste. The tubing is encapsulated in a chamber that protects the outside environment from radioactive contamination. The tube contains an existing sonar device that is also resistant to radioactive exposure. When the device is removed from a tank of waste, it has a high-impact spray system that washes the tubing, further reducing potential for contamination.

“We created a rigid design that provides control to the depth that is required and a stable insertion that would produce an accurate image of the solid waste within the tanks,” Reyff said. “The goal was to minimize the amount of radiation exposure.”

Supporting students to invest in the future

WRPS’ primary goal is to reduce the environmental risk posed by 56 million gallons of radioactive and chemical waste stored in 177 underground tanks at the Hanford Site that dates back to as early as World

War II. The organization partners with WSU to develop technology that is specifically tailored to the needs of operating in one of the most radioactively contaminated environments in the world.

Kayle Boomer, manager of the Technology Management and Field Solution group with WRPS' Chief Technology Office, said he is impressed with the student's design and that it has potential for use at Hanford.

"The team worked well together," Boomer said. "They were very diligent and tried to ensure that the design addressed as many design requirements as possible. The other Hanford engineers working with them thought they were developing a workable design for the tank farm."

WRPS provided the student group, as well as one additional student engineering group, with a total of \$10,000 to develop prototypes that could one day be applied at the Hanford site. The other student group, which is comprised of students Anthony Jenkins, Melissa Rivas, Oleg Tyshchuk and Michelle Wheeler, developed a device to sample any interface within the Hanford tanks.

"It was a great experience working with the WSU senior engineering students on their senior design project," said Jon Barnes, design services engineer for WRPS.

"Their energy and creativity were infectious. I'm hoping I'll see them again in the engineering work world, and perhaps get a chance to work together as peers."

Jason Vitali, chief technology officer for WRPS, said the solutions identified by the students during their capstone project are extremely creative, thorough, and have the potential for resolving some of the challenges encountered in the high-hazard environment.

"It is important that the students continue to tackle real-world challenges during their education so they are able to transition after school and make contributions early in their professional careers," he said.

7



Tool Compiles Data Almost Immediately, Helping Protect Hanford Workers



A new data compilation tool being used at the Hanford Site shows environmental conditions critical to understanding potential vapor concentrations in the site's tank farms.

RICHLAND, Wash. – [EM's Office of River Protection](#) (ORP) is developing another layer of worker protection by providing a data compilation tool in a pilot program at the [Hanford Site tank farms](#).

Hanford contractor Washington River Protection Solutions (WRPS) is testing the system, which compiles vast amounts of data from instruments that monitor tank farm and weather conditions and presents the information in a user-friendly dashboard. Previously, this amount of data would require weeks of compilation and analysis by several experts to put into a usable format.

"This improves worker communication and allows the Hanford tank farms workforce to view tank farm conditions based on historical and near-real-time data," said Jim Lynch, ORP program manager for tank farm projects. "This tool will assist in keeping the workforce informed."



Employees at the Hanford Site watch a demonstration of the new data compilation tool.

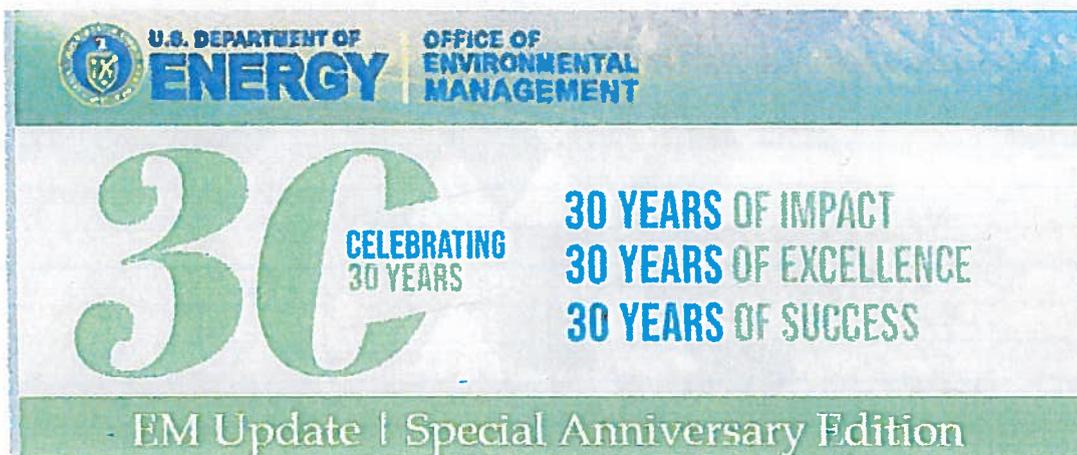
Mark Garrett, with WRPS production operations, said the tool will also aid tank farm operations. The system collects and interprets data from various sources to protect workers against potential chemical vapor exposure.

"Sharing this information with the workforce will help improve worker safety and maintain an efficient pace of operations," said Garrett. "It's really a visionary product."

Workforce engagement has been key to the development and ultimate success of the tool. Users are encouraged during this pilot program and testing period to provide feedback before implementation later this fall.

"We've asked for this for many years, and it's exciting because this is a tool we can use in the field to help us predict conditions that affect the workers," said Don Slaugh, safety representative with Hanford Atomic Metal Trades Council, a union that represents employees on the site. "If there is something going on in the farm, we'll know we need to get out or take extra measures to protect ourselves. It's awesome."

-Contributor: Denise Mellene



Marking Three Decades of Progress, EM Celebrates Milestone Anniversary

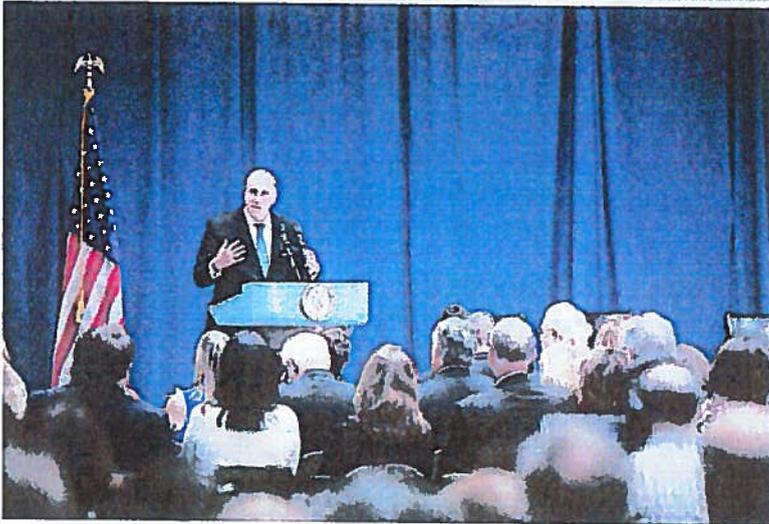


DOE Under Secretary for Science Paul Dabbar highlighted EM's accomplishments to a crowd of past and present colleagues at the EM 30th anniversary celebration.

WASHINGTON, D.C. – Current and former leaders and colleagues past and present gathered to mark the 30th anniversary of EM achievements and progress in cleaning up the environmental legacy of the nation's nuclear production and research.

At a September 10 celebration, DOE Under Secretary for Science Paul Dabbar recognized EM's federal employees and contractors for their ongoing dedication to a demanding job, acknowledging the hurdles they've overcome and their commitment to continued progress in the years ahead.

“Three decades ago, the task seemed almost insurmountable — the cleanup of 107 sites must have seemed really daunting,” Dabbar told guests. “It’s been a long way, and we’re not just looking back, but we’re looking forward to the future. It’s about our commitment not only to the progress which has happened, but where we see it going forward.”



DOE Under Secretary for Science Paul Dabbar emphasized the progress EM has made at cleanup sites through technology and reliable partnerships.

EM was established in 1989 to lead the cleanup of the nation’s most hazardous radioactive sites, a legacy of World War II and Cold War nuclear weapons production and government-sponsored nuclear energy research. EM has completed cleanups at 91 of the 107 nuclear sites across the country, and the 16 sites that remain are some of the most challenging.

In his address, Dabbar spoke of how EM is incorporating new technologies, deploying partnerships to share knowledge and gain insights, and collaborating with local communities to advance its work.

“There have been some amazing things that have been done around technology. We should be proud of the last 30 years,” Dabbar said, citing examples such as drones, 3-D printing and unique collaborations that have accelerated progress at the sites. He also applauded success stories such as cleanup at the the Fernald site in Ohio and the local partnerships EM has established in Carlsbad, New Mexico.

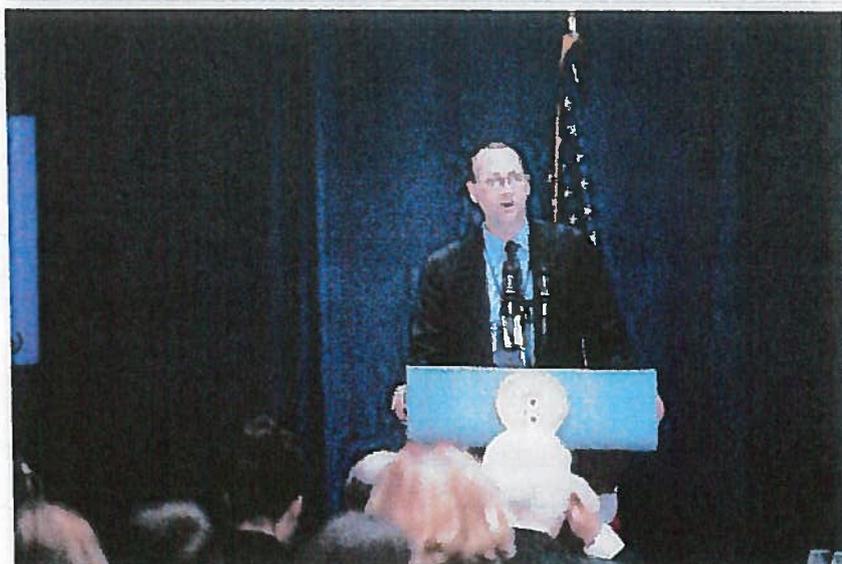
“The program has come very far, the Under Secretary said. “A tremendous amount of progress has been made.”



From left, former EM Assistant Secretaries Ines Triay, Jessie Roberson, Carolyn Huntoon and Thomas Grumbly attended the 30th anniversary celebration.

The 30th anniversary event drew more than 200 people to DOE headquarters, including U.S. Representative Dan Newhouse of Washington state and former EM Assistant Secretaries Ines Triay, Carolyn Huntoon, Thomas Grumbly and Jessie Roberson. Also in attendance were Suzanne Rudzinski, EM's former director of the Office of Policy, as well as Joyce Connery, a member of the Defense Nuclear Facilities Safety Board who previously served as the White House's Director of Nuclear Energy Policy.

To further mark the anniversary, EM produced a new [video](#) that shares the history of the program's creation and the important work it has accomplished over the past three decades.



EM Principal Deputy Assistant Secretary Todd Shrader welcomed guests and led a panel discussion with long time EM associates.



From left, James Owendoff, Mell Roy and Thomas Johnson, Jr. participated in a panel discussion of their most memorable moments and the advancements in the EM program.

A panel discussion featuring veterans of EM and moderated by EM Principal Deputy Assistant Secretary Todd Shrader looked back at key moments in the program.

“One of the things that’s really important that we all appreciate is that the journey to get here is built on the work of many, many people before and going forward for the complex and for the cleanup,” Shrader said.

James Owendoff spent more than 20 years with EM in posts including Acting Assistant Secretary, Principal Deputy Assistant Secretary, and Chief Operations Officer among other roles. He recalled working with many of EM’s Assistant Secretaries over the years, thanking each for their contributions to the program

Owendoff, who presently is DOE Chief Risk Officer, said his most memorable highlight was the palpable excitement the night before the Waste Isolation Pilot Plant (WIPP) opened, once all regulatory approvals had been secured and the site could begin receiving shipments of waste.

Mell Roy, Chief Counsel and Assistant Director of the Office of Chief Counsel at the Environmental Management Consolidated Business Center in Cincinnati, noted how sites have succeeded in bringing together diverse groups with different perspectives, from local communities to state and federal regulators.

In nearly 30 years at EM, Roy said she has seen sites transition from being an “idle curiosity” to being more integrated with their communities, something she believes should continue as EM works toward turning sites back to their communities for multipurpose uses.

Thomas Johnson, Jr., Associate Deputy Manager of the Savannah River Operations Office, said EM has become much stronger in recent years, particularly through innovations in the contracting process.

Among Johnson’s memorable highlights was the injection of funds into nuclear waste cleanup through the American Recovery and Reinvestment Act of 2009. He also emphasized how EM has partnered with local colleges and universities to reach the next generation of workers.

"There are no easy answers for our sites. If it was easy, someone else would be doing our jobs," Roy said. "We're here because we take on the challenge, and in taking on the challenge we recognize there are unique aspects of each of our sites and unique aspects to the different waste management challenges we have, and we're going to take those challenges and move forward."

Hanford Site Carries Commitment Into Future

RICHLAND, Wash. – The line running through the past, present and into the future of the Hanford Site is filled with markers of success.

"From its earliest days as a scientific and engineering wonder through the years in which we characterized waste, developed technologies, and built the trained workforce to carry out our plans for progress in the years ahead, the Hanford Site is a testament to our workers' dedication to what we have achieved and what our nation has asked us to do," according to Brian Vance, Hanford Site manager,

Vance said remediating the 220-square-mile Columbia River Corridor has been the hallmark of all aspects of cleanup. "Tearing down the small cities that supported six nuclear reactors, and cocooning the reactor cores, was a monumental achievement that changed the Hanford footprint," he said. "Removing more than 18 million tons of soil and debris, treating more than 20 billion gallons of contaminated groundwater, and removing more than 12,000 cubic meters of plutonium contaminated waste are just a few examples of our significant and measurable progress."

"Through the skills and technologies we have developed, our Soil and Groundwater program continues to protect the Columbia River. We have remediated hundreds more facilities and waste sites, and are now moving into the next phase of cleanup where we are tackling some of our hardest sites," Vance said.



Demolition continues at the Plutonium Finishing Plant, once considered the most hazardous facility in the EM complex, shown here in 2010 and immediately below in 2019.



Hundreds of facilities have been demolished or removed around the plutonium production reactors at the Hanford Site. Six of the nine reactors are now in interim safe storage, including the former D and DR Reactors, shown below.



On the Site's Central Plateau, workers are continuing their focus on treatment of the 56 million gallons of waste stored in 176 underground tanks, the by-product of Hanford's plutonium production mission.

"As we develop our vision for the site's future, we remain committed to being results-driven and completion-focused, while making sure we deliver a Hanford Site cleanup that is the best value to the taxpayer," Vance said. "Our successes of the past have positioned us to achieve future cleanup successes."

Click [here](#) for more information on the Richland Operations Office and [here](#) for more information on the Office of River Protection.

Tri-City Herald

Hanford's key role in historical world events detailed in Tri-Citian's new book

BY TRI-CITY HERALD STAFF

SEPTEMBER 13, 2019

A new look at the history of the Hanford nuclear reservation is being released by two well-known Tri-Citians at a book launch party Friday.

"Something Extraordinary — A Short History of the Manhattan Project, Hanford and the B Reactor" is the result of the collaboration between Robert Ferguson and C. Mark Smith.

Ferguson, of Richland, brought firsthand knowledge to the book. He was a physicist based at Hanford reactors starting in 1957, the beginning of a 60-year career in the nuclear industry that included serving as deputy assistant secretary for nuclear programs for the Department of Energy.

Smith, of Richland, was the regional director of the federal Economic Development Administration for eight Western states.

Their book takes a broader look at Hanford than some previous books, putting Hanford's role in the context of world history.

Hanford has "just a remarkable story of science and the ability to do that in such a short period of time," Ferguson said.

In 1942, the first sustaining nuclear reaction was achieved as part of the Manhattan Project to build an atomic bomb before Nazi Germany did.

FERGUSON: B REACTOR ENDED WWII

By 1944 the world's first full-scale production reactor, B Reactor, started up at the Hanford nuclear reservation in the Eastern Washington desert.

Plutonium produced at Hanford was used in the atomic bomb dropped over Nagasaki, Japan, helping end World War II in 1945.

"World War II never would have ended without B Reactor," Ferguson said.

If the Japanese thought the United States had only one atomic bomb — the bomb dropped over Hiroshima, Japan, fueled with uranium 235 rather than plutonium — it would not have surrendered, he said.

The Allies would have lost another 1 million men, and prisoners of war held by the Japanese would have been killed, he said.

"Something Extraordinary" also covers the Cold War years when Hanford ramped up plutonium production, and it includes a chapter on the current environmental cleanup mission at the site.

Its release was timed to coincide with key Hanford anniversaries.

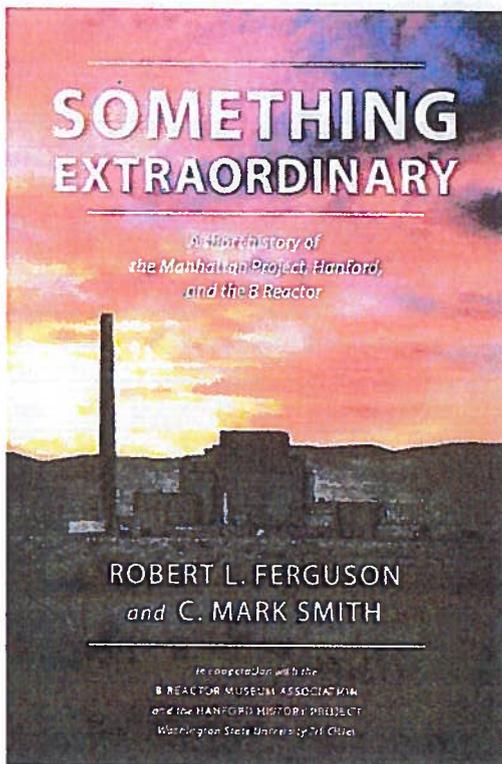
Eighty years ago, WWII broke out in Europe. Seventy-five years ago, B Reactor went critical for the first time.

Thirty years ago, the Tri-Party Agreement was signed, providing a framework for cleanup of the massive amounts of contamination left at the site from the production of plutonium.

The authors write that the book tells the story "of the triumph of physics, chemistry, engineering, construction, and, most of all, the human willpower of the scientists, soldiers and companies that developed the bomb and built the facilities to produce it, and . . . (those) who have had to deal with the aftermath."

The book launch is 4:30 to 6 p.m. Friday at the B Reactor Visitor Center, 2000 Logston Blvd., Richland.

It costs \$19.95 and is available at bookstores and online retailers. It was published in cooperation with the B Reactor Museum Association and the Washington State University Tri-Cities Hanford History Project.





U.S. DEPARTMENT OF
ENERGY

OFFICE OF
ENVIRONMENTAL
MANAGEMENT

EM Update | Vol. 11, Issue 36 | Sept. 17, 2019

Pioneers in the Cleanup Program Look Back on EM's 30 Years

ALEXANDRIA, Va. – Leaders and key stakeholders integral to the cleanup program over the past three decades looked back at key moments and lessons learned as [EM](#) recognized its 30-year anniversary at this year's [National Cleanup Workshop](#).

A thread running through the years and EM's successes has been the program's relationships and partnerships in the cleanup communities that shared in their challenges and achievements.

Thomas Grumbly, who served as EM Assistant Secretary from 1993 to 1996, recounted early challenges in setting a course and ramping up the program swiftly following its establishment in 1989 with a mission to remediate 107 former nuclear weapons production and research sites. EM has completed cleanup at 91 of those sites.

Grumbly said he came to an important realization that would remain a touchstone of the EM program.

"One of the things I recognized right away was that cleanup was not a technical problem. It was a political problem," he said. "We worked very hard then and I'm happy to say over the years everyone followed up. We tried very hard not to have this be a partisan political issue. If it was ever turned into a partisan political issue, the program would have no money today.

"We also had to recognize that while on paper (EM) was a federal program, it really is a state-federal program and not a whole lot could be accomplished without the agreement of states," Grumbly said.

"One of the main things we did was to reach to communities around the country and bring them into the process," he said. "Show them to the extent we could how difficult the cleanup was, and how difficult the choices were and try to get away from the antagonism. Getting out of the attitude that DOE knew best all the time, and into an attitude that this was a joint project of the state and the feds, and that the people who lived around these places had to be involved."

The fifth annual National Cleanup Workshop, held Sept. 10-12, brought together nearly 800 DOE, state and local officials, contractors, and community stakeholders to discuss the EM program.



Thomas Grumbly, EM Assistant Secretary from 1993 to 1996.



Keith Klein, former manager of EM's Carlsbad Field Office.

Keith Klein, former manager of EM's Carlsbad Field Office (CBFO), said the initiative, support, and persistence of local leaders in New Mexico was key to the establishment of the [Waste Isolation Pilot Plant](#) (WIPP), the nation's only underground waste repository.

"WIPP is the story of science, perseverance, regulatory frontiers, and politics," Klein said. "The story is complete with drama and lessons learned, including lessons that still apply today."

Klein was acting manager of CBFO when WIPP finally accepted its first shipment in 1999, 10 years after construction. He recalled it was an emotional experience when the shipment rolled through Carlsbad, where people gathered to welcome it in the middle of the night.

"Townpeople were out in the streets cheering, clapping, holding up signs. It was just un-fricking believable," he said. "At 3:30 in the morning. Talk about passion. These workers who had been there 10 years waiting for this day. They were cheering, applauding, and swear to God, crying. It's all true."

Paul Golan served as acting EM Assistant Secretary from July 2004 to May 2005 and also was deputy manager of the field office at [Rocky Flats](#), one of EM's signature cleanup completions.

Golan said it took discipline, commitment, strong relationships, a willingness to set aside ego and to compromise — all while maintaining a steadfast devotion to safety — to achieve success at Rocky Flats.

"We committed to maintaining a strong relationship and an ongoing dialogue with our community advisory board that was critical as we worked through some very difficult issues," he said. "We built strong relationships and today they would be called partnership agreements. We were actually in partnerships before the department coined the term partnership agreements."



Paul Golan, acting EM Assistant Secretary from 2004 to 2005.



Jack Craig, former manager of the Savannah River Site.

Jack Craig, former manager of the [Savannah River Site](#) in South Carolina, and former deputy manager of the Ohio Field Office where he was responsible for the management, cleanup, and restoration of the [Fernald](#), [Mound](#), Battelle-Columbus, and Ashtabula sites, said successes in Ohio would not have been possible without strong relationships with community advisers.

"Never underestimate the power of collaboration with the community and the regulators," he said.

Former U.S. congressman Doc Hastings of Washington state, founder of the U.S. House Nuclear Cleanup Caucus, noted that the caucus was created to educate new lawmakers from key states about the cleanup program's worth and needs.

Hastings said the cooperation among lawmakers from districts that supported cleanup culminated in the creation of the [Manhattan Project National Historical Park](#), established in 2015 to highlight the roles of [Hanford](#), Washington; [Los Alamos](#), New Mexico; and [Oak Ridge](#), Tennessee, in the nation's nuclear defense, including the preservation of the historic [B Reactor](#) at Hanford.

Former U.S. congressman Doc Hastings of Washington state.



Seth Kirshenberg, executive director of Energy Communities Alliance.

Rick McLeod, president and CEO of the Savannah River Site Community Reuse Organization.



Seth Kirshenberg, executive director of Energy Communities Alliance (ECA), which represents local communities near DOE sites, and Rick McLeod, president and CEO of the Savannah River Site Community Reuse Organization, pointed to the importance of local communities having a voice in the cleanup, including when a cleanup at a site is complete.

Kirshenberg said ECA was formed at a time when DOE sites were transitioning from weapons production roles to cleanup, with resulting impacts on their workforces and potential opportunities for future uses of the properties.

"The partnership was built because the communities, the states, and the Department of Energy actually had to work through a lot of very difficult issues," he said.

Kirshenberg said the cleanup program and the people who work there are key to their communities.

"When I think of people at the sites, I think of the contractors and the Department of Energy people," Kirshenberg said. "I also think of them — they are the Rotary Club members. They are the elected officials a lot of times. They are the Little League baseball coaches. And as we go forward they are the people who have done the work, who have really made a difference."

"When we talk about 30 years, they are the people I really think about," he said. "In the end, it really is the working relationships and the partnerships that make this thing work."

Hanford Crews Safely Complete Sludge Transfer, Reducing Risk to River



Workers prepare the 20th and final sludge container for shipment at the Hanford Site. The transfer of sludge from K West to T Plant reduces a significant risk to the Columbia River and marks a key accomplishment in the overall Hanford cleanup mission.

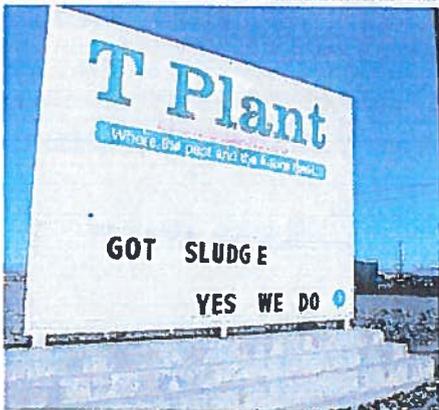
RICHLAND, Wash. — [EM](#) workers recently completed an important project, transferring 35 cubic yards of highly radioactive sludge from the K West Reactor fuel storage basin to T Plant, located on the [Hanford Site's](#) central plateau, for safe interim storage.

"Everyone who has worked on this project and contributed to its success should be very proud of what they have done for Hanford, the nearby communities, and the entire Pacific Northwest. This is a fantastic testament to their dedication," Energy Secretary Rick Perry said.

Sludge consists of sand, dirt, corrosion products from uranium-fuel, and other materials. It was created when irradiated fuel rods began to deteriorate after decades of sitting in a fuel storage basin.

Hanford Site Manager Brian Vance said years of planning and training went into protecting workers and the environment to reduce a significant risk to the Columbia River.

"Removing the sludge is a critical step in moving forward with other work near the K reactors to reduce Hanford's annual operating costs," Vance said.



The sludge containers were transferred from the K West Reactor Basin to T Plant, about 10 miles away in the center of the Hanford Site. The containers will be safely stored here until final disposition plans are completed and implemented.



Sludge transfer began in June 2018 and was recently completed, more than three months ahead of a Tri-Party Agreement milestone.

The transfer of the sludge began in June 2018 and is done three months ahead of a Tri-Party Agreement milestone.

"This important mark of progress is a result of the whole CH2M HILL Plateau Remediation Company (CHPRC) team working together, and also making a dedicated team effort with the Department of Energy, workers, labor and labor leadership, regulatory agencies, and community leadership," said Ty Blackford, president and CEO of CHPRC, in a message to his workers Sept. 11.

Efforts are already underway to remove debris, like contaminated tools and pumps, from the basin, which will in turn enable dewatering and demolition to begin. The sludge will remain in interim safe storage at T Plant until a disposition path is selected.

-Contributor: Mark Heeter

8

Upcoming Tri-Party Agreement (TPA) and Consent Decree Milestones for Hanford Cleanup

Note: This is NOT a complete list of upcoming milestones – it focuses on issues of concern to Oregon. This summary also does not include the exact language from the TPA.

Note: Reports/assessments/negotiations/decisions are in black text.

Cleanup/monitoring actions are in red text.

Milestones at risk, in dispute, in abeyance, or that will be missed are in purple text.

New milestones are in green text.

2017

Sept 30, 2017 DOE will complete Plutonium Finishing Plant to “slab on grade” (M-83-00A).
MISSED.

2018

Apr 30, 2018 DOE will start construction of supplemental vitrification treatment facility and/or WTP enhancements (M-062-32-T01). This is a TARGET, not an enforceable milestone. IN DISPUTE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Sept 30, 2018 DOE will initiate characterization work for the 200-SW-2 unlined landfills (M-015-93C). IN DISPUTE (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).

2019

- June 30, 2019** DOE will complete remedial investigation of U Plant related waste sites (M-015-98). DOE invoked dispute resolution at the Project Manager Level (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).
- Sept 30, 2019** DOE will submit to Ecology a Remedial Investigation/Feasibility Study Work Plan for 200-CB-1 (B Plant and associated waste sites) (M-085-70). DOE invoked dispute resolution (from 200 Area Project Managers Meeting, July 18, 2019).
- Oct 31, 2019** DOE will complete construction of interim surface barriers 1 and 2 in the SX tank farm (M-045-92V). COMPLETE (from DOE letter to Ecology October 10, 2019).
- Oct 31, 2019** DOE will submit a design to Ecology for interim tank farm barrier 3 in the TX Farm. (M-045-92W). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).
- Nov 30, 2019** DOE will remove 10 mixed-waste containers from Outside Storage Area A and/or B. (M-091-52-T01B). COMPLETE (from Central Plateau/River Corridor Milestone Review Meeting, June 20, 2019).
- Dec 31, 2019** DOE will complete remedial investigation of Plutonium Finishing Plant related waste sites (M-015-99). DOE invoked dispute resolution at the Project Manager Level (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).
- Dec 31, 2019** DOE will complete sludge removal from the K West Reactor basin (M-016-176). COMPLETED SEPT 9, 2019.

Dec 31, 2019 DOE will initiate deactivation of the K-West Fuel Storage basin (M-016-178). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, July 18, 2019).

Dec 31, 2019 DOE will submit a change package for proposed interim milestones for KE and KW reactors interim safe storage (M-093-28). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, September 19, 2019).

Dec 31, 2019 DOE will resolve all current technical issues for the pre-treatment and high-level waste facilities (from the Amended Consent Decree, March 11, 2016 – listed as an assumption by the court, not a milestone).

2020

June 30, 2020 DOE will submit to Ecology a report that describes and analyzes alternatives and technologies for removing drainable liquids from single-shell tanks; selection of a preferred method of doing so; and a proposed sequence (M-045-93). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Sept 30, 2020 DOE will submit to Ecology a preliminary performance assessment/closure analysis for the A/AX Waste Management Area (M-045-99). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Sept 30, 2020 DOE will submit a change request to establish a schedule for achieving the offsite shipment of all transuranic mixed waste (M-091-44T) (from DOE budget briefing to Oregon, January 23, 2019).

Sept 30, 2020 DOE will submit a remedial investigation/feasibility study Work Plan for 200-CP-1 (PUREX canyon and associated waste sites) (M-085-80). **AT RISK** (from 200 Area Project Managers Meeting, July 18, 2019).

Nov 30, 2020 DOE will remove 20 mixed-waste containers from Outside Storage Area A and/or B. (M-091-52-T01C). ON SCHEDULE (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).

Dec 31, 2020 LAW Facility construction substantially complete (Amended Consent Decree, Milestone D-00A-07). ON SCHEDULE (from Consent Decree Monthly Report, August 1-31, 2019).

Dec 31, 2020 DOE will have a remedy in place to contain existing groundwater plumes (except iodine, nitrate, and tritium) in the 200 Area (M-016-119-T01). This is a TARGET, not an enforceable milestone. ON SCHEDULE (from 200 Area Project Manager's Meeting, May 19, 2016).

Dec 31, 2020 DOE will have taken such action as necessary to remediate hexavalent chromium groundwater plumes to meet drinking water standards in each of the 100 Areas (M-016-110-T02). This is a TARGET, not an enforceable milestone.

2021

Jan 30, 2021 DOE will submit to Ecology a Mass Balance Flow from tank farms to LAW pretreatment to effluent management facility to recycle to tank farms and to LERF/ETF (M-062-50) (from Change Control Form June 25, 2019).

March 31, 2021 DOE will submit CD-1 for facility to store spent ion exchange columns prior to DF-LAW (M-090-14). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Apr 30, 2021 DOE will complete construction of supplemental vitrification treatment facility and/or WTP enhancements (M-062-33-T01). This is a TARGET, not an enforceable milestone. IN DISPUTE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

June 30, 2021 DOE will complete retrieval of at least five of the single-shell tanks listed in Milestones B-1 and B-2 (Third Amended Consent Decree, Milestone B-03). ON SCHEDULE (from Consent Decree Monthly Report, August 1-31, 2019).

July 31, 2021 DOE will submit Feasibility Study Reports and Proposed Plans for the 200 West Inner Area to EPA (M-015-91B).

Sept 30, 2021 DOE will complete remote excavation of the 300-296 waste site (M-016-85A) Milestone extended by two years by EPA June 27, 2019. ON SCHEDULE (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).

Sept 30, 2021 DOE will submit a remedial investigation/feasibility study report for the REDOX canyon and associated waste sites (M-085-90). ON SCHEDULE (from DOE budget briefing to Oregon, January 23, 2019).

Sept 30, 2021 DOE will complete remedial actions for the 618-11 burial ground (M-016-86) AT RISK (from Central Plateau/River Corridor Milestone Review meeting, September 19, 2019).

Oct 31, 2021 DOE will complete construction of interim surface barrier number three in the TX Tank Farm (M-045-92Y). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Oct 31, 2021 DOE will submit a design and monitoring plan to Ecology for interim tank farm barrier 4 in the U Farm. (M-045-92Z). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Dec 31, 2021 DOE will complete remedial investigation of the 200 West Inner Area and the BC cribs and trenches (M-015-84) DOE invoked dispute resolution at the Project Manager Level (from 200 Area Project Manager's Meeting, September 19, 2019).

Selected “key” later deadlines

- Jan 31, 2022** DOE will initiate negotiations to establish interim TPA milestones for closure of the remaining SST waste management areas (M-045-85). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).
- Sept 30, 2022** DOE will select K Basin sludge treatment and packaging technology and propose new interim sludge treatment and packaging milestones (M-016-173). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, September 19, 2019).
- Sept 30, 2022** DOE will submit to Ecology a performance assessment maintenance plan for the A/AX Waste Management Area (M-045-102). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).
- Nov 30, 2022** DOE will submit to Ecology a Facility Investigation/Corrective Measures Study and RI/FS for the 200 East Inner Area (M-015-92B). AT RISK (from 200 Area Project Managers Meeting, September 19, 2019).
- Dec 30, 2022** DOE will complete hot commissioning of supplemental vitrification treatment facility and/or WTP enhancements (M-062-34-T01). This is a **TARGET**, not an enforceable milestone. IN DISPUTE (from August 1-31, 2019 ORP TPA Monthly Summary Report).
- Dec 31, 2022** DOE will start LAW Facility cold commissioning. (*Amended Consent Decree, Milestone D-00A-08*). ON SCHEDULE (from Consent Decree Monthly Report, August 1-31, 2019).
- Jan 31, 2023** DOE will submit remedial investigation/feasibility study report and proposed plan for the 200 Area solid waste burial grounds (M-015-93B). AT RISK (from 200 Area Project Managers Meeting, July 18, 2019).

Apr 15, 2023 DOE will achieve substantial completion of all LERF/ETF upgraded necessary to support LAW hot commissioning by 2023 (M-062-51). **ON SCHEDULE** (from August 1-31, 2019 ORP TPA Monthly Summary Report).

June 30, 2023 DOE will achieve substantial completion of all secondary waste construction upgrades necessary to support LAW hot commissioning by 2023 (M-062-52) (From Change Control Form June 25, 2019).

July 31, 2023 DOE will submit a feasibility study/proposed plan for the 200 West Inner Area and the BC cribs and trenches (M-015-91B) DOE invoked dispute resolution at the Project Manager Level (from 200 Area Project Manager's Meeting, September 19, 2019).

Aug 15, 2023 DOE will achieve Effluent Management Facility cold commissioning start (M-062-53) (From Change Control Form June 25, 2019).

Aug 15, 2023 The Integrated Disposal Facility will be operational (M-062-57) (From Change Control Form June 25, 2019).

Sept 30, 2023 DOE will submit a Corrective Measures Study and Feasibility Study for the Deep Vadose Zone Operable Unit to Ecology (M-015-110B). **ON SCHEDULE** (from 200 Area Project Managers Meeting, September 19, 2019).

Sept 30, 2023 DOE shall complete deactivation, demolition and removal of the K-West fuel storage basin (M-016-181). **ON SCHEDULE** (from 100/300 Area Unit Manager Meeting, September 19, 2019).

Sept 30, 2023 DOE shall complete initial baseline visual inspections of all single-shell tanks (M-045-91K).

- Oct 31, 2023** DOE will complete construction of interim surface barrier number four in the U Tank Farm (M-045-92). ON SCHEDULE (from August 1-31, 2019 ORP TPA Monthly Summary Report).
- Dec 31, 2023** DOE will submit a permit application for design and construction of the LAW pretreatment capability (M-062-56) (From Change Control Form June 25, 2019).
- Dec 31, 2023** DOE shall complete low-activity waste facility hot commissioning (Amended Consent Decree, Milestone D-00A-09). ON SCHEDULE (from Consent Decree Monthly Report, August 1-31, 2019).
- Dec 31, 2023** DOE shall initiate soil remediation under the 105 KW fuel basin (M-016-186). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, September 19, 2019).
- Mar 31, 2024** DOE will complete retrieval of tank wastes from C-102, C-105 and C-111. (Amended Consent Decree, Milestone D-16B-01). COMPLETE (letter from DOE to Ecology, copied to Oregon, August 7, 2018).
- Sept 30, 2024** DOE will complete K East Reactor and K West Reactor Interim Safe Storage (M-093-27). ON SCHEDULE for 100-KE, TBD for 100-KW (from 100/300 Area Unit Manager Meeting, September 19, 2019).
- Sept 30, 2024** DOE will complete closure of B Pond and S Pond and Ditch (M-037-11). IN ABEYANCE (from 200 Area Project Managers Meeting, September 19, 2019).
- Sept 30, 2024** DOE will complete U Plant demolition (M-016-200A). ON SCHEDULE (from 200 Area Project Managers Meeting, September 19, 2019).
- Sept 30, 2024** DOE will complete all response actions in the 100 K Area (M-016-00C). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, September 19, 2019).

Aug 31, 2025 DOE will complete the transfer of the cesium and strontium capsules from the Waste Encapsulation and Storage Facilities to a new, permitted interim safe storage facility (M-092-21). ON SCHEDULE (from DOE budget briefing to Oregon, January 23, 2019).

Sept 30, 2025 DOE will complete remedial actions for soil contamination beneath the 324 Building plus final disposition of the 324 Building (M-016-85). Milestone extended by four years by EPA June 27, 2019. ON SCHEDULE (from 300 Area Unit Manager meeting, September 19, 2019).

Sept 30, 2025 DOE will initiate response actions for the B Plant geographic area (M-085-76). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, July 18, 2019).

Sept 30, 2025 DOE will initiate response actions for the PUREX geographic area (M-085-84). ON SCHEDULE (from 100/300 Area Unit Manager Meeting, July 18, 2019).

June 30, 2026 DOE will complete the remedial investigation/feasibility study process for all non-tank farm operable unit (excluding canyons as well). (M-015-00).

Sept 30, 2026 DOE will remove all mixed waste containers from Outside Storage Areas A & B at the Central Waste Complex (M-091-52-T04). ON SCHEDULE (from DOE budget briefing to Oregon, January 23, 2019).

Sept 30, 2026 DOE will complete retrieval of tank wastes from the A and AX tank farms (excepting A-103). (Third Amended Consent Decree, Milestone B-02). UNDER ANALYSIS (from Consent Decree Monthly Report, August 1-31, 2019).

Sept 30, 2027 DOE will complete U Canyon barrier construction (M-016-200B). ON SCHEDULE (from 200 Area Project Manager Meeting, September 19, 2019).

- Sept 30, 2028 DOE will complete the retrieval and designation of remote-handled retrievably stored waste (including from the 200 Area caissons), and contact-handled retrievably stored waste from three designated burial grounds. (M-091-49).**
- Sept 30, 2030 DOE will complete offsite shipment of all mixed transuranic waste (in above-ground storage as of June 30, 2009 and in retrievable storage) (M-91-48).**
- Dec 31, 2030 HLW facility construction substantially complete (Amended Consent Decree, Milestone D-00A-02). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**
- Dec 31, 2031 Pre-treatment facility construction substantially complete (Amended Consent Decree, Milestone D-00A-14). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**
- June 30, 2032 Start HLW facility cold commissioning (Amended Consent Decree, Milestone D-00A-03). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**
- Dec 31, 2032 Start pre-treatment facility cold commissioning (Amended Consent Decree, Milestone D-00A-15). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**
- Dec 31, 2033 DOE shall complete high-level waste facility hot commissioning (Amended Consent Decree, Milestone D-00A-4). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**
- Dec 31, 2033 DOE shall complete pre-treatment facility hot commissioning (Amended Consent Decree, Milestone D-00A-16). AT SERIOUS RISK (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).**

Dec 31, 2033 DOE shall begin hot start of Waste Treatment Plant (*Amended Consent Decree, Milestone D-00A-17*). **AT SERIOUS RISK** (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).

Sept 30, 2034 DOE will obtain a written assessment, reviewed and certified by an Independent Qualified Registered Professional Engineer, attesting to single-shell tanks structural integrity for such a period as they believe they can reasonably certify (M-045-91L).

Dec 31, 2036 DOE shall achieve initial plant operations of the waste treatment plant (*Amended Consent Decree, Milestone D-00A-1*). **AT SERIOUS RISK** (letter from DOE Hanford Manager Brian Vance to Ecology Director Maia Bellon, September 4, 2019).

Dec 31, 2036 DOE will acquire/modify facilities for storage of first two years of immobilized high-level waste (M-090-00). **ON SCHEDULE** (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Dec 31, 2040 DOE will complete waste retrieval from all remaining single-shell tanks (M-045-70). **AT RISK** (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Sept 30, 2042 DOE shall complete remedial actions for all non-tank farms and non-canyon Operable Units (M-16-00). **ON SCHEDULE** (from DOE budget briefing to Oregon, January 23, 2019).

Jan 31, 2043 DOE will complete closure of all single-shell tank farms (M-045-00). **AT RISK** (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Dec 31, 2047** DOE will complete pretreatment, processing, and vitrification of all high-level and low-activity tank wastes (M-062-00). **AT RISK** (from August 1-31, 2019 ORP TPA Monthly Summary Report).

Dec 31, 2047 DOE will complete acquisition of new facilities or modification of existing facilities for the storage, treatment/processing, and disposal of Hanford site cesium and strontium capsules and bulk sodium (M-092-00). ON SCHEDULE (from DOE budget briefing to Oregon, January 23, 2019).**

Sept 30, 2052 DOE will complete closure of all double-shell tank farms (M-042-00A).**

****no later than**