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Office of River Protection
Project Managers' Meeting Minutes

2440 Stevens Center
Richland, Washington

December 20, 2017

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CONCURRENCE SIGNATURES

The undersigned indicate by their signatures that these meeting minutes reflect the actual occurrences of the above dated Project Managers' Meeting.

Wahed Abdul, DOE-ORP — Date: 1/24/18

Jeff Bruggeman, DOE-ORP — Date: 1/24/18

Joni Grindstaff, DOE-ORP — Date: 1/22/18

Paul Hernandez, DOE-ORP — Date: 1/24/18

Jeremy Johnson, DOE-ORP — Date: 1/24/18

Steve Pfaff, DOE-ORP — Date: 1/24/18

Dustin Stewart, DOE-ORP — Date: 1/24/18

Jeff Rambo, DOE-ORP — Date: 1/25/2018

Richard Valle, DOE-ORP — Date: 1/24/2018

Jason Young, DOE-ORP — Date: 1/23/2018

Jeff Lyon, Project Manager,
Washington State Department of Ecology

Date: 1-30-18

Dan McDonald, Project Manager,
Washington State Department of Ecology

Date: 1-30-18

Stephanie Schleif, Project Manager,
Washington State Department of Ecology

Date: 1/31/18

TRI-PARTY AGREEMENT MILESTONE REVIEW AND MONTHLY SUMMARY REPORT

1.0 ADMINISTRATIVE ITEMS/MILESTONE STATUS

Upcoming Meetings

The next project managers meeting (PMM) is scheduled for January 18, 2018, from 9:00 a.m. to 11:30 a.m. at the ORP office in Richland, Washington. The ORP quarterly milestone review is scheduled for February 15, 2018, from 8:45 a.m. to 11:00 a.m. at the Ecology office in Richland, Washington.

Recent Items Entered/To Be Entered into the Administrative Record

U.S. Department of Energy (DOE), Office of River Protection (ORP) provided the monthly Tri-Party Agreement (TPA) and Consent Decree (CD) reports.

Tri-Party Agreement Milestone Status

(See pgs 3 & 4 of today's monthly summary report).

Office of River Protection/Washington State Department of Ecology Tri-Party Agreement and Consent Decree Agreements, Issues and Action items – December 2017

The issues and action items were discussed and updated as follows (see agreements, issues and action items table):

Issue No. 1: ORP pointed out that this issue is in reference to System Plan 7, and that System Plan 8 has been submitted. ORP suggested removing this issue. Ecology stated that it would confer with its lawyer and provide a response to ORP.

Action No. 1 (TF-16-11-04)

ORP stated that the T-112 work plan is still in legal review. This action remains on hold.

Action No. 2 (TF-16-11-05)

ORP reported that the ETF engineers in charge of this action and getting the report issued on the four tanks that were visually inspected have committed to providing the report by the end of January 2018. Ecology asked why the date continues to slip. ORP responded that there is a limited number of engineering resources at the facility, and there are higher priority issues that need to be addressed. ORP stated that it would discuss the issues during the LERF/ETF presentation today. This action remains open.

Action No. 3 (TF-17-04-01)

ORP reported that the Class 2 permit modification associated with the 242-A Evaporator diesel generator was granted on December 16, 2017. ORP stated that minor layup activities associated with the diesel generator will be done in FY18, which will include removal of breakers,

disconnecting the batteries, and deleting the monthly maintenance. In parallel with the layup activities, a phased approach plan will be created that will be both short-term for FY18 and then long-term for the eventual removal of the diesel generator. This action remains open.

Action No. 4 (TF-17-08-01)

This action was closed on 11/16/17 and will be removed from the table.

Action No. 5 (TF-17-08-02)

This action was closed on 11/16/17 and will be removed from the table.

Action No. 6 (TF-17-08-04)

ORP stated that Ecology was provided the AY-102 video leak inspection report on Monday, (12/18/17) via letter No. 17-TF-0119, and Ecology had agreed this action could be closed. A meeting will be scheduled with Ecology in January 2018 to discuss the final report and some of the recommendations from the report. Ecology asked if the decision had been made to repair the pump. ORP responded that the recommendation is to close the tank, and there is ample evidence in the report to support the recommendation. This action was closed.

Action No. 7 (TF-17-09-01)

There was no update provided for this action. This action remains open.

Action No. 8 (TF-17-10-01)

ORP stated that a copy of the letter to S-3 was not available to provide to Ecology, but it had six pieces of correspondence letters of direction to WRPS, as well as the external expert review report for the Low Activity Waste Pretreatment System (LAWPS), to provide to Ecology today.

ORP stated that the first letter, 17-CPM-0145, directs WRPS to conduct the external expert review. ORP noted that it had evidence from the project peer review (PPR) and an internal analysis that the cost for the LAWPS project was increasing and approaching $800 million. ORP stated that the DOE acting EM-1 secretary took an action to conduct a review and to assess opportunities to examine the requirements to produce a LAWPS that was back within the range that was established at critical decision 1 (CD-1), which was $470 million. ORP stated that this type of review is typical for the project management critical decision process where each step is evaluated regarding how the project is trending, and then a decision is made if the department is willing to invest more funding in that particular direction or if a re-evaluation and change of direction is needed. ORP noted that that was the first step in evaluating the change in direction for LAWPS.

ORP stated that the next letter is on the external expert review report. ORP noted that the report was attached to the letter from EM-1 to the Director of Ecology on December 1, 2017, and it was being provided today for convenience if the local Ecology office had not received it.

ORP stated that two letters of direction were issued to WRPS immediately after the external expert review letter was issued. The first letter, 17-TF-0085, directs WRPS to provide a new

design description and a total project cost estimate for an optimized LAWPS. Ecology asked if WRPS was directed to stay within a target dollar amount. ORP responded that although the price range capped out at $470 million when CD-1 was established, that did not mean the project was not ever allowed to exceed that amount, but EM-1 requested an evaluation of the possibility to maintain the project within the same price range. ORP noted that it believes it has developed the means to achieve that.

ORP stated that the external expert review, at the end of September 2017, discussed several alternatives, but ORP needed more details to be able to evaluate whether some of the proposed alternatives were viable and what they would cost. ORP stated that was the impetus for the letter directing WRPS to provide the details and cost estimates.

ORP stated that at the same time the letter of direction was given to WRPS, a request for proposal (RFP) was issued to WRPS via letter 17-TF-0088. The letter requested a proposal for a tank-side cesium removal capability, which would be a piece of equipment that could do filtration and ion exchange, and provide low activity waste feed in time for the Low Activity Waste (LAW) facility to meet its Consent Decree (CD) requirement to complete hot commissioning by the end of 2023. Ecology characterized the tank-side cesium removal system as temporary and mobile. ORP agreed with Ecology's characterization, and added that there has been quite a bit of follow-on discussion with Ecology's team, including the permitting side, and a tank-side cesium removal system continues to be a work in progress.

ORP noted that in the overall direct feed LAW (DFLAW) program, changes to tank farm planning need to be considered, both in AP Farm and in the surrounding infrastructure, such as transfer lines, that would allow the DFLAW program to happen. As a result, a different RFP was issued to WRPS to provide a proposal for the AP Farm activities that include the infrastructure upgrades.

ORP stated that WRPS is to submit the tank-side cesium removal capability proposal in early January 2018, and it is anticipated that a briefing to Ecology on the technical aspects of the proposal will be scheduled in January 2018. ORP stated that the proposal for the AP Farm and infrastructure upgrades will be submitted by WRPS in early March 2018, and a proposal on a simplified LAWPS will be received at the same time. ORP stated that a briefing will be scheduled with Ecology in March 2018 on the technical aspects of those proposals as well. ORP indicated that by the March 2018 time frame, there should be a fuller picture of the changes to DFLAW, LAWPS, tank-side cesium removal system, and the AP Farm and infrastructure. ORP noted that the Waste Treatment Plant (WTP) will continue towards its CD milestone of low activity waste feed for the LAW facility.

Ecology asked if the briefing in March 2018 would have enough information to become a baseline for the projects. ORP responded that it wouldn't provide a baseline, and the intent for the briefings in January and March 2018 are to describe the physical aspects of the proposals. ORP acknowledged that contract proposals contain cost and schedule information, but it would be Official Use Only (OUO) until it is evaluated by the Department, and then negotiated and put into a contract. ORP reiterated that the project proposals are still a work in progress, and it is not anticipated that cost and schedule information will be included in the briefings. Ecology asked if it would be later in 2018 before there is enough information for ORP to understand how it will proceed.

In response to Ecology's question, ORP referred to the last letter, 17-TF-0096, directing WRPS to suspend selected design activities on the prior LAWPS design and testing activities, and to begin design activity on a newer, simplified version of LAWPS while producing the proposal. ORP stated that there will not be a waiting period to start design activities while WRPS produces proposals, and funding has been advanced to WRPS to do the design activities in parallel with proposal development. ORP stated that after the January and March briefings are given, Ecology will be provided additional information throughout the year. Ecology inquired about a time frame for the 30/60/90 percent design reviews. ORP responded that the dates aren't readily available, but it is anticipated that there will be some design reviews within FY18, and Ecology will be invited to attend.

ORP suggested closing action Nos. 8 and 9 via the six pieces of correspondence that were discussed and provided to Ecology today. Ecology agreed that action Nos. 8 and 9 could be closed, based on receiving the correspondence today. This action was closed.

Action No. 9 (TF-17-10-02)

See action No. 8 (TF-17-10-01). This action was closed.

Action No. 10 (TF-17-10-03)

ORP stated that Ecology was provided an update from the SST Integrity kick-off meeting, and suggested closing this action. Ecology agreed it could be closed. This action was closed.

Action No. 11 (TF-18-11-01)

ORP stated that a tank-side cesium removal capability briefing will be provided to Ecology in January 2018, and the AP Farm infrastructure upgrades briefing will be provided to Ecology in March 2018. This action remains open.

Action No. 12 (TF-18-11-02)

ORP stated that this action was established via an email request from Ecology, and a meeting will be scheduled in the near future. This action remains open.

Action No. 13 (TF-18-11-03)

ORP stated that this action was established via an email request from Ecology, and a meeting will be scheduled in the near future. This action remains open.

2.0 SYSTEM PLAN

ORP stated that System Plan 8 meetings with Ecology will be starting up in January 2018.

3.0 ACQUISITION OF NEW FACILITIES

ORP stated that there were no changes to the milestones, and they continue to be in abeyance. ORP added that negotiations on the seven elements associated with M-062-45 are going to be

initiated, and at the conclusion of the negotiations, there will be revised dates for the milestones in abeyance.

4.0 SUPPLEMENTAL TREATMENT AND PART B PERMIT APPLICATIONS

ORP stated that the status is the same as the Acquisition of New Facilities milestones, and the timing of the milestones will depend on the M-062-45 negotiations.

5.0 LOW-ACTIVITY WASTE PRETREATMENT SYSTEM (LAWPS)

ORP stated that monthly discussions will be provided on the tank-side cesium removal capability starting next month. Ecology asked if both the proposal for tank-side cesium removal and the status will be discussed. ORP responded that both of those will be discussed during the project manager meetings.

Significant Past Accomplishments - ORP noted that some of the pieces of correspondence listed in today's handout were discussed during the status of action item No. 8. ORP stated that WRPS is developing a proposal for tank-side cesium removal capability and LAWPS, and briefings will be provided to Ecology in 2018 (see discussion under action item No. 8).

ORP referred to the third bullet in today's handout, and stated that the use of a nonelutable ion exchange media is a significant change to the prior design for LAWPS, which was using elutable ion exchange that would return cesium to the tank farms every week. Ecology asked if ORP is considering the maintenance and operations aspect since there will be a new waste stream, and if so, when would ORP start discussing those plans. ORP responded that it is taking into consideration there will be a new waste stream, and a discussion would occur when the briefings are provided to Ecology in January and March 2018, as discussed under action item No. 8. ORP noted that addressing the new waste stream is a crucial part of the whole process. ORP stated that a storage pad will be needed for the nonelutable ion exchange columns, and ORP has been in contact with vendors that have produced the ion exchange columns. Ecology noted that there is a lack of information about the kind of detail regarding volumes and waste loading on elutable resin, and expressed the concern for managing another new waste stream. ORP stated that it was very early in the process, and Ecology's concerns will be considered during the development process.

ORP referred to the fourth bullet in today's handout, and noted that proposals will be received from WRPS in January for the tank-side cesium removal capability and then in March 2018 for the design of an optimized LAWPS. ORP noted that Ecology toured the tank-side cesium removal system that was constructed onsite for Savannah River, and the appropriate tank-side cesium removal capability needs to be analyzed for the Hanford Site, which would be significantly different from the one at Savannah River. Ecology expressed a concern about being able to use the same resin for the tank-side cesium removal system and LAWPS and avoiding having to use two resins, if possible. ORP stated that if the cesium removal method can be safely produced and stored, and the safe disposition can be identified, then having one or two resins should not pose a significant issue. ORP noted that there are capable resin vendors that could provide the resin.

6.0 242-A EVAPORATOR STATUS

ORP reported that as of today, the integrated schedule reflects the EC-08 campaign is expected to start around April 10, 2018, and it represents a critical path schedule. ORP stated that the EC-09 campaign will follow in the June 2018 time frame. ORP stated that the feed tank has been sampled and boiled down, and the analysis is being done at the 222-S Lab. ORP noted that there is about a 90-day window between sampling and the running of a campaign. Oregon Department of Energy (ODOE) inquired about the past practice of running back-to-back campaigns. ORP responded the same feed tank is being used for both campaigns, which impacts the ability to stage the waste quickly enough to conduct a back-to-back campaign. ORP added that there are logistical considerations for tank farms that include preparations to ensure the area is secure, such as covering all the trenches.

ORP stated that efforts are under way to unblock the plugged flammable gas purge air line, and that effort is expected to be completed well before the EC-08 campaign. ODOE asked if the plugging is associated with the nozzle and not the air line. ORP responded that it is the nozzle.

Note: See discussion under the CD section regarding the spare reboiler requirement status.

7.0 LIQUID EFFLUENT RETENTION FACILITY/200 AREA EFFLUENT TREATMENT FACILITY (LERF/ETF)

ORP stated that the amount of effluent in Basin 42 decreased from the previous month, and that effluent was transferred to Basin 43. The transfer from Basin 42 to Basin 43 is to allow for the Basin 42 cover replacement. It was noted that the volume in Basin 42 should be corrected to read 2.76 *million* gallons (the M was not included in the table). ORP reported that the inter-basin transfer from Basin 42 to Basin 43 was paused, and the transfer has not resumed. ORP noted the pause will be discussed in the issue section of today's monthly summary report.

ORP pointed out that the waste volume reduction has remained relatively stagnant at 190,000 gallons, due to equipment failures that continue into December 2017. ORP noted that the field work portion for replacement of the Basin 44 transfer pump was completed. Ecology asked what work remains to complete the transfer pump replacement. ORP responded that a quality assurance approval is needed, which is an administrative action.

ORP stated that the project support and design for the Basin 42 cover replacement project should be getting under way this month (December 2017).

<u>Issues</u> – ORP stated that there was an electrical event in November 2017 that shut down the thin film dryer boiler and then the thin film dryer system. There were some burnt wires observed, and a team from WRPS was immediately assembled to evaluate the source of the failure. A report from the team is expected in the near future before the boiler is turned back on and into operation. ORP noted that the issue was unexpected and has impacted the schedule. The Hanford Advisory Board (HAB) inquired about a time frame for resolution of the thin film dryer boiler. ORP responded that the operations plan for next week should include a time frame when the facility plans to restart the boiler.

ORP stated that when the electrical event occurred, the inter-basin transfer was paused and an increase in the leachate levels in Basin 43 was noted. ORP stated that a value was exceeded as

described in the RCRA permit, and Ecology was notified. ORP added that there was also an operational issue identified with a valve that was nearly closed that should have been in the open position. The closed valve did not allow the leachate pump to work correctly and discharge the leachate back into the basin. The instrumentation has been recalibrated, and the leachate pump is working to get the backlog leachate discharged back into the basin. ***Ecology requested that an update on the leachate be included in the next monthly report.*** ORP agreed with Ecology's request, and noted that the situation occurred before it could be included in today's report. ODOE inquired about a time frame for restarting the inter-basin transfer. ORP responded that a restart date has not been scheduled. ORP added that since the leachate level was exceeded and there are still fluctuations with the leachate being in the wrong configuration, WRPS and ORP are waiting for data to be collected and the leachate being in the right configuration to ensure it's not an anomaly. ORP indicated that it would be at least another two weeks before the inter-basin transfer would be restarted.

ORP stated that the issues at ETF are being addressed through an operational conduct of operations and mechanical systems to ensure all the required maintenance is being done so the facility can continue operation in the near-term as well as in the long-term.

Ecology asked if the current issues at ETF are impacting receipt of the results of the four tanks that were visually inspected at ETF (see action item No. 2). ORP responded that the facility engineers have been occupied with higher priorities, but the report has been drafted and it is a matter of available hours for the engineers to release the report.

8.0 TANK SYSTEM UPDATE

Double-Shell Tanks (DST) Integrity - Significant Past Accomplishments - Ecology referred to the first bullet regarding the contracts for corrosion testing with an emphasis on specific returns, and requested a follow-up with enough information to understand what frame of reference and boundaries will be considered. ORP indicated that it would be the slurry returns after they've been filtered, but it would follow up with Ecology's request.

> ***ORP Action: ORP to provide Ecology follow-up information via email regarding the DFLAW returns to DSTs.***

Significant Planned Actions in the Next Six Months – DST Integrity - ORP stated that the enhanced annulus visual inspections planned for FY18 will be done later in the year after the SST video inspections are done. ORP stated that there are three ultrasonic testing (UT) inspections planned for FY18, and currently the UT inspection is being done in AY-101. ORP noted that the last bullet on page 14 of today's monthly summary needs to be corrected.

Ecology referred to the first bullet on page 15 of today's monthly summary and asked what the reference to groundwater meant. ORP responded that it is vadose zone moisture. Ecology suggested that the word groundwater should be reworded.

Single-Shell Tanks (SST) Integrity - Significant Past Accomplishments - ORP noted that meetings are being held regularly on the SST integrity assessment Independent Qualified Registered Professional Engineer (IQRPE), and the IQRPE is on schedule to meet the milestone due date.

Significant Planned Actions in the Next Six Months – SST Integrity – ORP stated that the 12 SST videos are planned to be completed during the first half of FY18, and the same crew will then move over to do the DST annulus videos.

Independent Qualified Registered Professional Engineer Activities - ORP reported that the

219-S IQRPE is on schedule, and currently an encasement check is being conducted on the line from the 219-S facility to the tank farms. ORP noted that the 219-S facility is located just outside of the 222-S Lab, and 219-S manages some of the waste stream coming out of 222-S via a line that goes to the tank farms. Ecology asked which tank the line goes to in tank farms. WRPS responded that the line goes to the SY valve pit.

There were no updates provided today on the 242-A Evaporator and ETF IQRPEs.

9.0 SINGLE-SHELL TANK INTEGRITY ASSURANCE

ORP stated that the SST IQRPE is on schedule. Ecology stated that it had been provided the scope of work for the SST IQRPE, and it has been kept informed on the status. Ecology noted that it had been invited to attend the PNNL presentation in early January 2018.

10.0 IN-TANK CHARACTERIZATION SUMMARY

Significant Planned Actions in the Next Six Months - ORP noted that there is a fairly aggressive tank sampling schedule for FY18, with eight tanks scheduled.

11.0 SINGLE-SHELL TANK CLOSURE PROGRAM

ORP stated that there were no changes in the milestones related to closure.

Significant Past Accomplishments – Ecology referred to the second bullet regarding construction of the evapotranspiration basin for the SX Tank Farm interim surface barriers, and asked if the barriers are being redesigned. ORP responded that there had been a discussion with Ecology regarding the size and location of the barriers. Ecology asked if ORP is planning to submit the final design. ORP responded that the design will be submitted to Ecology when it is finalized. ORP noted that the 90 percent design review is scheduled today, and the comments from the design review will be evaluated and incorporated into the design. Ecology stated that it had requested an expedited design review, and noted that it will be attending the 90 percent design review today. Ecology indicated that there had been good communication from ORP and WRPS regarding the interim barriers, and encouraged a continuation of the communication on the next barrier review.

Ecology stated that it toured the SX interim barrier area yesterday. Ecology noted that the crew had finished placing the liner on the ET basin, and significant process has been made on the ditch that will carry runoff water from the barriers.

ORP stated that discussions are ongoing regarding the locations of the TX Farm interim barrier.

Ecology referred to the fourth bullet regarding DOE's response letter to Ecology on December 1, 2017, and asked if there could be a discussion regarding closure of C Farm. ORP responded that

it would not have an update regarding closure of C Farm, and that it is mentioned in the bullet item because it was part of the discussions between DOE and Ecology senior management. Ecology stated that there was a discussion yesterday between ORP and Ecology project managers about permitting, and that ORP proposed a permitting plan. Ecology requested clarification on the next step regarding ORP's proposal. ORP responded that it would follow up with Ecology.

Significant Planned Activities in the Next Six Months – ORP noted that discussions are under way regarding comment resolution on the RCRA Tier 1, 2 and 3 closure plans.

Issues – Ecology stated that the practicability demonstration review was completed, and ORP provided a response to Ecology. Ecology plans to have an internal discussion and then provide a response to ORP, and ORP is to then complete the practicability demonstration. Ecology stated that the next step will be to conduct a formal completion of the changes and then move on to the RFI/CMS comments. Ecology indicated that it will submit the RFI/CMS comments to ORP, along with the Tier 1, 2 and 3 closure plan comments, within the next month.

12.0 SINGLE-SHELL TANK RETRIEVAL PROGRAM

(See page 23 of the monthly summary report).

13.0 TANK OPERATIONS CONTRACT OVERVIEW

ORP suggested that Ecology send over any questions regarding the earned value management system, and ORP would follow up with answers to those questions.

CONSENT DECREE MONTHLY SUMMARY REPORT REVIEW

1.0 CONSENT DECREE MILESTONE STATISTICS/STATUS - CONSENT DECREE REPORTS/REVIEWS

The reports, agreements, issues, and actions were discussed and updated as follows:

Action No. 1 (WTP-15-01-01)

ORP stated that it will be meeting with the Defense Nuclear Facilities Safety Board (DNFSB) on January 22, 2018, and there may be topics to discuss with Ecology from that meeting. Ecology suggested moving the presentation to February 2018 to accommodate any follow-up from the DNFSB. It was agreed to move the presentation to February 2018 to discuss the outcome of the meeting with the DNFSB and the path forward on the standardized high solids vessel conceptual design study. This action remains open.

Action No. 2 (WTP-17-05-01)

Ecology stated that there have been enough quarterly meetings since this action was established in May 2017 that this action could be closed. Ecology expressed satisfaction that the extra information from the quarterly summary report is being discussed and tracked, including technical issue discussions. Ecology added that the assumption for closing the action is based on the idea that the technical discussions will continue at the same level, and another meeting will be scheduled, if needed. This action was closed.

Action No. 3 (WTP-17-08-01)

ORP stated that a discussion on the T5 corrosion report will be covered during the February 2018 presentation (see action No. 1). This action remains open.

Action No. 4 (WTP-17-10-01)

There was a discussion regarding what the maintenance plan is and the issues associated with it. ORP stated that there is an overall preservation and maintenance program for equipment sitting long-term in the Pretreatment (PT) and High Level Waste (HLW) facilities. The maintenance plan was written by the contractor and has been reviewed by ORP, but the DOE-Headquarters lawyers have not approved the plan.

ORP stated that the concern is how it is being communicated about the time frame for putting equipment in a preservation and maintenance mode and if there would be any impact to the Consent Decree milestones. ORP noted that there has always been a preservation and maintenance plan, but the lawyers have tied this overall maintenance plan to future milestones and the interest in ensuring transparency on what is being planned.

Ecology stated that its understanding was the preservation and maintenance was more about what needs to be done and why, and not the length of time that equipment would be sitting at a facility. ORP stated that after there was a discussion with Ecology regarding the options for preservation and maintenance, the lawyers placed approval of the preservation and maintenance plan on hold until there is further discussion. Ecology pointed out that regardless of what

conclusion is reached by the lawyers, the equipment sitting in the facilities still needs to be preserved. ORP agreed, and pointed out that preservation of existing equipment is ongoing and is funded every year, but the issue is approval of the comprehensive long-term preservation and maintenance plan that covers everything sitting in the facilities, the warehouse, or with the vendors. Ecology acknowledged that it had received a briefing on the overall preservation and maintenance plan.

Ecology requested that this action item be kept open and to track it on a monthly basis. ORP and Ecology agreed to update the status of the action to state that it is pending DOE-Headquarters legal review. This action remains open.

2.0 SPARE REBOILER REQUIREMENT STATUS

ORP indicated that receipt of the spare reboiler is expected ahead of the December 2018 milestone delivery date. ORP stated that ABW Technologies has started fabricating the spare reboiler, and there are no issues to report.

3.0 SINGLE-SHELL TANK RETRIEVAL PROGRAM

Significant Accomplishments During the Prior Three Months - ORP noted that work is under way to prepare for installing the waste retrieval systems in the AX Farm. The AX Farm pits are being cleaned out and long-length equipment is being pulled out of the way that's not required. ORP added that infrastructure upgrades are also being done in support of AX Farm retrievals, and that a major step towards retrieval is installation of the 13.8 kV transformer, which is under way. ORP stated that the next step will be installation of the A Farm exhausters, and the location of the pad has been identified

ORP stated that the C-105 retrieval was completed, and preparations are being made to do the final volume measurement. ORP estimated that the C-105 retrieval completion report will be submitted to Ecology in March 2018.

Ecology noted that the monthly summary report is supposed to be for the previous month, and that today's report is dated December 2017. ORP pointed to the No. 1 footnote at the bottom of the cover page that explains the report covers the November 2017 reporting period.

4.0 TANK WASTE RETRIEVAL WORK PLAN STATUS

ORP noted that all of the current Tank Waste Retrieval Work Plans (TWRWPs) are listed. ORP stated that the TWRWPs for the C Farm tank retrievals that have been completed, including the retrieval data reports (RDRs), were removed from the table with the exception of C-105. The C-105 TWRWP will remain on the table until the RDR is completed and sent to Ecology.

5.0 SINGLE-SHELL TANK RETRIEVAL MONTHLY FISCAL YEAR EARNED VALUE MANAGEMENT SYSTEM (EVMS) DATA

ORP provided an update on the tank farms earned value for the month of October 2017. ORP stated that there was a good performance in October. ORP noted that not as much work was completed as planned, but the actual met the budget and cost for work performed. Ecology referred to the dates on page 11 in the monthly summary report and asked if they were correct.

ORP indicated that the dates are incorrect and will be corrected before the monthly summary is submitted to the AR. ORP noted that all the earned value management system dates in the TPA monthly summary will be corrected before submittal to the AR.

6.0 WASTE TREATMENT AND IMMOBILIZATION PLANT PROJECT

ORP noted that WTP continues to focus on completion of the LAW, BOF and LAB (LBL) facilities, which also includes Direct Feed LAW (DFLAW).

Significant Accomplishments During the Prior Three Months – ORP referred to the first bullet regarding correspondence letters between the DOE acting EM-1 and the Director of Ecology, and noted that there are continuing discussions between the two agencies. ORP stated that the discussion regarding potential initiatives to accelerate cleanup of the Hanford Site includes not just the WTP mission, but there is also discussion about the tank waste mission and DOE-RL's mission.

ORP provided an update on the second bullet regarding the project peer review (PPR) held in October 2017. ORP noted that the PPR was discussed with Ecology during the quarterly meeting held last month, but it was not in the quarterly summary report because of the timing for issuing the summary report. ORP referred to the statement about the PPR that talks about accelerating completion efforts, and clarified that it was not necessarily to accelerate but to consider the way business is being done and if there are ways to find more efficiencies. ORP stated that the letter (17-WTP-0208) directing Bechtel to consider optimization of 12 areas of the WTP project will be included in the February 2018 quarterly summary report, and noted that the quarterly report includes all of ORP's direction letters. ORP added that all 12 optimization areas are reflected in today's monthly summary report and will be discussed.

October 2017 Earned Value Management System Reporting Period – ORP stated that as a result of the optimization efforts, there will be an impact on cost and schedule variances due to completing some activities sooner than the baseline schedule. ORP added that a new forecast schedule is being developed that will reflect some of the changes. ORP stated that when the new schedule comes out at the end of January 2018, WTP will start managing the earned value to that schedule. Ecology asked if development of the new schedule is far enough along to understand what the permitting impacts will be. ORP responded that some of the permitting effects are understood, and it is included in one of the 12 optimization areas. ORP added that there was a discussion with Ecology regarding some opportunities to optimize permitting, and particularly for the Effluent Management Facility (EMF). ORP stated that an area of focus with the new schedule will be the sequencing of procurements for EMF, due to the limited work space.

ORP stated that the delivery for the WTP milestones has not changed, although the schedule for cold and hot commissioning has been moved back to December of 2021 and 2022 respectively, but it is the path towards hot commissioning that is being revised. ORP noted that identifying efficiencies is driven for the most part by funding being limited to $690 million per year, and finding ways to ensure the milestones can be met and stay within the $690 million.

ORP indicated that the new schedule coming out at the end of January 2018 will provide a clear two-year picture and it will need fewer changes. Ecology asked if the new schedule will ultimately feed into the One System schedule and provide an overview of the impacts. ORP

responded that it will provide an overview of the impacts, and noted that the delivery of WTP always accounts for feed from tank farms with certain waste criteria requirements, and that there is a need for it to be there at a certain time. Ecology noted the expectation regarding waste feed, and asked if it will be available on time. ORP responded that the new schedule will provide the information. ORP noted that the terms optimize and accelerate are being used, but the schedule remains the same, and the current effort is looking at ways to be more efficient with the available funding. ORP pointed out that the new EMF poses challenges with permitting and commissioning to support cold commissioning of LAW and will result in big funding spikes. Ecology stated that it isn't a change in scope, but more of an effort to reorient the scope with the available funding. ORP agreed with Ecology's characterization, and reiterated that the 12 areas of optimization, which are finding better ways to do business, will be discussed today.

ORP continued with the earned value management system analysis. ORP noted a correction was needed to the last bullet under the PT cost variances on page 17 of the monthly summary, and the dollar amount will be added. Oregon Department of Energy (ODOE) referred to the cost variance associated with BOF and the greater than planned engineering support needed, and asked for clarification. Ecology asked if it was primarily associated with construction closeout. ORP responded that it was not construction closeout, but more associated with support needed for startup. ORP added that this type of construction will increase when design review for these activities are done ahead of schedule. ORP noted that the information in the monthly summary report is from two months ago, and it is reporting on engineering support needed to support startup.

ORP pointed out that there has been a push to accelerate startup in BOF, and in order to accomplish that, engineering support is needed for startup activities, equipment refurbishments activities, and procurement contracts. ORP added that the need for engineering support will be consistent all the way through BOF startup, and then there will be a spike associated with the closeout of the design phase effort. ORP stated that discussion of the items on page 18 of today's monthly summary will provide more detail on what some of the changes will be.

Significant Planned Activities in the Next Three Months Resulting from the PRR – ORP noted that the seven items on page 18 of today's monthly summary report are part of the 12 areas of optimization, and the remaining five areas are included in the specific facilities in the rest of today's report.

1) ORP stated that it had been noted the baseline was being changed routinely, and for the most part the contractor was managing to the variance. ORP stated that streamlining the WTP baseline change management processes means that the contractor will manage by the earned value management system, and that variances will be allowed. ORP noted that in order to maintain that many changes to the baseline, a large project controls group was needed, and in order to stay within the $690 million, that equates to smaller teams with efficient and strong resources. ORP stated that a workshop was held last week and continued into this week to determine what the frequency of baseline changes would be and what the cost and schedule variances would look like, and those details are still being sorted out.
2) ORP stated that a reduction in project services and facility services infrastructure to achieve a more efficient skill mix represents a shift from an engineering, procurement and construction project to an operational project, and it also relates to where staff is

located. ORP noted that there was a discussion last month about the cost associated with maintaining engineering staff when design activities are completed. ORP stated that when the focus shifts over to HLW and PT, those engineering resources will be needed again, but currently the focus is on DFLAW, due to the limited funding of $690 million.

3) ORP stated that restructuring the procurement process to improve efficiency will be discussed during the BOF portion of today's meeting.
4) ORP stated that an implementation plan to transition engineering resources to field operations was noted under item No. 2.
5) ORP stated that resolving and closing all low-significance and find and fix level C condition reports to eliminate the backlog of these condition reports will involve binning the reports and deciding which ones are OBE, based on the current status of the project, to assure delivery of WTP. Ecology expressed a concern that find and fix level C condition reports will not be dependent on find and fix level A or B reports, particularly in engineering and permitting areas. ORP responded that the management improvement plan had a lot of focus on the corrective action management program, which made improvements in the effort to go backwards and make corrections and close out issues.
6) ORP stated that a team has been set up to identify equipment affected by aging and obsolescence versus waiting for an issue to be identified. ORP noted that evaluating equipment was already being done, but the direction to BNI will make it an official effort.
7) ORP noted that there is a lot of value to the One System organization, and evaluation of the One System is in terms of the number of staff needed and potentially a name change. Ecology asked if the evaluation request is on the contractor side. ORP responded that the request is for both WRPS and BNI to evaluate current staffing and how resources are being provided. ORP added that there is discussion about being more specific about the roles and responsibilities of the organizations.

   Ecology asked if One System would continue to be an entity other than a line organization with no direct responsibilities for cost, scope and schedule. ORP responded that as part of the evaluation, One System would likely continue to be a non-line organization, but it is to be evaluated as part of the overall organization. Ecology asked what part the staff organization would play if it has no authority and responsibility for cost, scope and schedule. ORP responded that the information would be provided as support. ORP added that the evaluation effort is under way, and there will be more information and updates as the discussions continue and reports are completed.

   ORP noted that the optimization efforts will be completed in the near future and will not continue for the next year. ORP added that there is a spread sheet that tracks the action items.

   Ecology stated that none of the 12 initiatives appear to be independent of each other, and asked when ORP envisions a re-identified path forward that could be shared. ORP responded that the 12 initiatives identify what the path forward is, and it is how they are executed and what the impacts of those executions are that will be shared with Ecology. ORP noted that it will not be an all-in-one discussion, but more of follow-on discussions each month.

7.0 PRETREATMENT FACILITY

ORP reported that most of the work in PT is associated with finalizing reports on technical issue resolution, and all of the reports are expected to be issued in January 2018. ORP noted that after submittal of the technical issue resolutions to the DNFSB, it may take several months for the board to respond, and there may be issues or questions raised with some of the resolutions. ORP stated that a letter of direction was sent to BNI to provide what would be needed contractually to place PT and HLW in a preservation and maintenance mode as an option. ORP noted that the direction is separate from the ongoing WTP preservation and maintenance plan, but if the decision was made for BNI to proceed, there would not be a separate plan.

8.0 HIGH-LEVEL WASTE FACILITY

ORP stated that HLW continues with facility preservation and maintenance activities. ORP noted that some work was done to support future rebaselining, and activities continue with fabrication of the RLD7/8 vessels. ORP stated that receipt of the RLD-8 vessel is anticipated by early fall of 2018, and receipt of the RLD-7 vessel by December of 2018.

9.0 LOW-ACTIVITY WASTE FACILITY

ORP stated that payment was authorized to Bechtel for the performance-based incentive milestone (A-4) to complete the bulk cable at the 48-foot elevation.

Significant Planned Activities in the Next Three Months - ORP provided an update on the items that are part of the 12 areas of optimization that resulted from the PPR. ORP stated that one of the items is to complete the LAW design, and another is awarding programmable protection system hardware and software procurements. ORP noted that the software system has been awarded, and the commercial terms for the hardware contract are being worked.

ORP stated that another activity associated with the PPR will be developing the strategy to complete the operational readiness review (ORR), prior to the start of cold commissioning, in an effort to add time to the schedule. ORP noted that Bechtel has made some initial proposals, which ORP is evaluating.

ORP reported that efforts continue with development of the documented safety analysis (DSA), and the projected time frame for ORP's approval of the DSA is the end of March 2018. ORP noted that BNI has submitted all of the chapters for the DSA.

ORP addressed a question that Ecology had sent via email about when ORP starts working to the DSA after it has been approved. ORP stated that following approval of the DSA, the first step is to initiate a safety evaluation (SE) process and then move into the unresolved safety question (USQ) process. ORP stated that during the SE process, part of the strategy is to decide when to start the ORR. ORP stated that the USQ process needs to be in place for a certain time before starting operation and conducting the ORR, but the USQ should not be in place during the entire ORR. Ecology stated that the SE is a precursor to a USQ, and the timing of the transition from an SE to a USQ has not been decided. ORP concurred with Ecology's statement. Ecology asked when the transition would occur during the ORR process. ORP responded that the transition to a USQ will occur before the ORR.

ORP referred to its earlier statement regarding the effort to start cold commissioning earlier than scheduled, and the strategy for timing of the SE, USQ and ORR process plays into that effort. ORP stated that in response to Ecology's question, the process will not affect the permit.

ORP stated that the 90 percent design review of the primary and secondary offgas systems was conducted. Ecology stated that it attended the 90 percent design review.

10.0 BALANCE OF FACILITIES

ORP stated that good progress is being made in BOF, with low and medium voltage power being distributed out through BOF. ORP reported that the cooling tower motor starter repair kits were received after numerous delays, and the repairs were done last week. A walk-down is planned this week to identify the last items needed to get medium voltage to the cooling tower and perform initial medium voltage testing, and then start getting medium voltage power out to the two large motors in front of the cooling tower.

Ecology noted the length of time to receive the motor starter repair kits, and asked if there are plans to order a spare repair kit. ORP responded that there have not been discussions regarding a spare repair kit, and pointed out that the motor starter is not a piece of equipment that would generally wear out. ORP noted that part of the repair was an upgrade to meet certain UL standards that the starters weren't required to meet when they were received and installed. ORP noted that medium voltage power doesn't always fall under UL standards.

ORP stated that there will be efforts to start moving water in the March 2018 time frame, after the freezing weather has passed. Medium voltage power will be needed to start initial checks on the motors that have been sitting since 2005-06. Ecology asked about the number of motors needed. ORP responded that there are three motors, with one motor needed for operations and one in standby, and having three motors is beneficial. ORP noted that rotations checks on the motors were successful.

ORP reported that the water treatment building has gone through startup testing on all three of its main systems, which include the process service water, potable water, and the deionized water. The membranes have been installed for the reverse osmosis systems, and the crew is waiting on a piece of test equipment to start functional testing of the water treatment facility. ORP indicated that the functional testing should be complete and the water treatment facility ready for use by late January 2018, which means four of the five hotel services will be online and available for use: Buildings 87 and 91 for electrical distribution, the LD for the drains, water treatment for the water source, followed by the cooling tower. ORP noted that those five facilities provide the support for the larger BOF facilities and other facilities to start into testing.

ORP stated that there has been improvement with startup procedures, which is yielding success in the field and the ability to work smoothly through testing. ORP added that the goal is to build some momentum with startup testing and carry that over into LAW and eventually in the Effluent Management Facility (EMF) systems.

<u>Significant Planned Activities in the Next Three Months</u> – ORP stated that energizing medium voltage power to the chiller compressor plant is planned for the large pumps that support the chillers. ORP stated that efforts are under way to put a contract in place with the vendor to assist with the startup of the chiller systems. ORP stated that three of the four rotary screw air

compressors will be energized with medium voltage power to support DFLAW. ORP noted that the fourth rotary screw air compressor is newer than the other three, and software issues are being addressed. Ecology asked if separate software will be run on the fourth compressor. ORP responded that it will not, and the software is from the same manufacturer, but there are some minor differences that could be followed up and provided to Ecology.

ORP reported that the modifications on the steam plant are finishing up in support of DFLAW, and most of isolations have been done.

ORP stated that a walk-down of the standby diesel generator (SDG) was conducted, and a lot of refurbishment will be needed. ORP noted that the SDG was purchased and stored starting in 2008, and it was placed on site in 2014. ORP stated that a group of bidders walked down the SDG, and most of them are recommending bringing it offsite for refurbishment. ORP noted that the closest bidder is from Portland, OR, which would reduce the distance and time for shipment. ORP added that Bechtel's preference is to do the refurbishment onsite.

Ecology asked what is involved with the refurbishment. ORP responded that the bearings will need to be addressed, and the vendors indicated that the SDG didn't appear to be in too bad of a condition. ORP added that the bids are for vendor-specified maintenance, and all the specifics are not available. Ecology noted that these type of motors last longer if they are operational instead of just sitting in place. There was some discussion regarding what refurbishment might be required, and Ecology speculated that extensive rework or replacement of the engine block might be needed. ORP responded that bids are being developed, and reiterated that it is vendor-specified maintenance based on a time scale.

ORP reported that excellent progress is being made with the EMF. All of the first lift walls have been poured and are in place. The rebar curtains for the second lift going up to 40 feet are in place, and the curtains are being loaded with the final commodities (penetrations, embeds, etc.) so they can start forming the second lift and getting them poured. The ring beams have been placed in a couple areas, and all of the pump support stanchions are in place. The topping slab for the chemical additional area is done, and progress continues with the topping slab for the EMF.

ORP reported that good progress is being made on fabrication of the low point drain tank at Greenberry, and currently all the penetrations through the head and installation of the nozzles are being done. ORP pointed out that since Greenberry is the vendor for all of the AL6XN vessels, all of the fabrication documents with Greenberry are now Code 1. ORP stated that one of the PPR discussions was in regard to accelerating procurements, and Bechtel had already implemented efforts to cut down turnaround time by sending engineers to the vendor shops to get the final design fabrication documents to Code 1, which allows the vendor to proceed with fabrication. ORP noted that in the past with the large vessels, there has always been a significant delay in the vendor schedule, and it happened with the low point drain vessels. ORP added that with the mitigating actions that Bechtel put in place, the current schedule for the vessels can support the EMF build-out, and delivery of the vessels is expected in the March/April 2018 time frame and the evaporator is expected in early February 2018.

ORP stated that when the low point drain vessels arrive, the design paperwork will be Code 1. ORP added that engineers will also be at the vendor shops to observe the first weld being done

on the evaporator and the low point drain vessel. ORP noted that the engineers also ensure that the information in the build or data sheets are properly translated to the vendor set of fabrication drawings. ORP summarized that there is a significant amount of vendor interface that occurs after the initial award of the bid, and that represents the effort to optimize the overall procurement process by reducing its duration and minimizing the risk of rework by the vendor.

ORP stated that in terms of permitting, there was a public meeting held recently for the group 1 equipment package, and it is currently in public review. The group 2 equipment package is expected to be formally submitted to Ecology sometime in January 2018, depending on the final agreed-upon documents.

ORP stated that the target date for the BOF design freeze is December 31, 2017. ORP noted that Bechtel has completed the design documents, and they're developing the requirements verification matrices (RVMs), which will be used to populate the test matrices. ORP stated that all the RVMs should be completed in a Rev. A test matrices by the end of 2018. ORP noted that design engineering will be providing Rev. A test matrices to the startup organization, which will be an improvement from the past when a less developed document was provided to startup.

ORP stated that the remaining punch list items for turnover in construction and startup will be broken out as A, B and C items, and all A items have to be closed before turnover. ORP stated that all of the A items will be closed by the end of 2018, and they will be identified and prioritized, based on when the system will be turned over. ORP noted that BOF system turnovers will be done over a long period of time.

ORP stated that with the focus to complete design engineering due to the design freeze, there will be high cost variances in the next few months. ORP stated that the schedule variance will reflect some work not getting done in the planned time frame, whereas other work is being prioritized and getting done earlier than planned.

ORP noted that although the PPR resulted in direction to optimize the permitting approach for EMF, ORP and Ecology had already established a good working relationship and permitting was already very well optimized. ORP stated that the current schedule for the equipment permit is not being accelerated, but the parties are putting forth a considerable effort and continue to look for every opportunity to optimize the schedule. Ecology stated that its permitting team has been very focused on the permitting effort. ORP added that it has been interfacing with Ecology's permitting team on a weekly basis, and acknowledged that Ecology's team has been providing strong support towards the permitting effort.

ORP touched on Bechtel's effort towards optimizing procurement. ORP stated that Bechtel's procurement process is based on a design, procure, and construct model, and all the procurements are done before going into the field to start construction. ORP noted that the process has put challenges on the project, particularly in terms of unique specifications required for pieces of equipment, and Bechtel is looking at ways to streamline the process. ODOE asked about the amount of unique equipment. ORP responded that it's the specifications that are unique and not the equipment, which sometimes does not allow for purchase of off-the-shelf equipment. ORP added that an area in which Bechtel needs to improve efficiency is being able to quickly replace a piece of equipment with unique specifications. ORP noted that that is why the spare parts program combined with an improved procurement process is being developed.

ORP pointed out that the challenges are not always because of Bechtel's process, and establishing contracts with the vendors can be time-consuming and challenging, and the vendors have sometimes been unresponsive.

ORP noted that many of the PPR initiatives reinforce the efforts that were already ongoing with the integrated project team.

11.0 ANALYTICAL LABORATORY

ORP reported that the lease for offsite lab space at Columbia Basin College has been finalized, and that will allow some of the methods development to be done offsite. ORP indicated that occupancy at the offsite lab will be early in 2018, and the work in the offsite lab should be completed during calendar year 2018. ORP noted that most of the methods used in the Analytical Laboratory (LAB) will be the same kind of radiochemistry that has been done in the past, and the work in the offsite lab will be developing the sampling procedures.

ORP stated that during a review of schedules and the PRR discussions, it was identified that it would be advantageous to move startup of LAB systems earlier than scheduled. That has resulted in a shift in scope back into late 2017 and early 2018 to conduct system walk-downs and prepare for turnover and startup of the systems. ORP stated that there are 25 systems in LAB that will transition from construction to startup, and turnover and startup of LAB systems will be prioritized along with the Balance of Facility (BOF) systems. ORP stated that initial walk-downs of the 25 LAB systems were completed this week. ORP noted that no major issues have been identified, although it is anticipated that there will be some issues as further walk-downs are done. ORP pointed out that the LAB has not experienced the same challenges with equipment sitting in a less covered environment as BOF, and it is not anticipated that any issues with equipment will be at the same level as seen in BOF.

ORP stated that there are some systems turning over to startup in LAB, and energization of the low voltage systems is under way.

ORP noted that there is a PPR action to freeze the design on the LAB by the end of calendar year 2017, which is a combined LAB/BOF PPR action. Ecology asked if any new risks have been observed. ORP responded that at this point, there haven't been any issues identified during the walk-downs that weren't expected. ORP noted that the systems are fairly straightforward in LAB, and the ventilation system is the biggest system. Ecology inquired about any punch list items from the walk-downs. ORP responded that it has not seen any punch lists, and the expectation is the lists won't be excessive. ORP added that it will take some time to categorize punch list items as A, B or C and then appropriately disposition the punch list items.

ORP noted that as part of the design freeze, items are being identified for each system as A, B and C, and the turnover point for a particular system will be when all of the A and B items are completed. ORP added that all of the systems for LAB and BOF are scheduled to be turned over and in the startup organization by the end of 2018, and the majority of the initial systems startup work should be completed in 2018. ORP stated that the transition of LAB from construction to startup will be prioritized with BOF since the same startup resources will be used for both facilities.

ATTENDEES:

DOE Office of River Protection:

W. Abdul
J. E. Cheadle
K. A. Ebert
R. L. Evans
J. M. Johnson
D. P. Knight
B. M. Mauss
A. C. McCartney
G. D. Trenchard
B. R. Trimberger
R. J. Valle
W. R. Wrzesinski

Washington State Department of Ecology:

J. Alzheimer
R. K. Biyani
N. Chandron
S. Lowe
J. D. McDonald
J. Price
M. Skorska

Mission Support Alliance/TPA:

R. E. Piippo
M. J. Turner

December 20, 2017
ORP TPA CD Meeting

PRINT NAME	SIGN NAME	ORG
Abdul, Wahed		ORP
Alzheimer, Jim		ECY
Barnes, Mike		ECY
Beehler, Steve		ORP
Bovier, Jan		ORP
Brasher, Stephanie		MSA
Brown, Dennis		ORP
Bruggeman, Jeff		ORP
Burnett, Kaylin		ORP
Cameron, Craig		EPA
Cimon, Shelley		OR State
Curn, Barry		BNI
Diediker, Janet		ORP
Doughty, John		WRPS
Eakins, Reggie Jr		ORP
Evans, Rana		ORP
Gao, Tracy		ECY
Grindstaff, Joni		ORP
Hall, Katie		ECY
Hernandez, Paul	Paul Hernandez	ORP
Jeremy, Johnson		ORP
Jones, Mandy		ECY
Joyner, Jessica		WRPS

December 20, 2017
ORP TPA CD Meeting

PRINT NAME	SIGN NAME	ORG
Keith, Colleen		ORP
Kemp, Christopher		ORP
Knight, Dan		ORP
Knox, Kathy	Kathy Knox	Court Reporter
Kriskovich, Ellen		ORP
Lobos, Rod		EPA
Lowe, Steven		ECY
Lyon, Jeffery		ECY
Martell, John		DOH
Mathey, Jared		ECY
Mattlin, Ellen		ORP
McDonald, Dan	D McDonald	ECY
Menard, Nina		ECY
Parker, Dan		WRPS
Pfaff, Stephen H		ORP
Piippo, Robert E		MSA
Pomiak, Andrew		ECY
Price, John		ECY
Rambo, Jeffrey		ORP
Rochette, Beth		ECY
Schleif, Stephanie		ECY
Schmidt, John		DOH
Serafin, Shane		ORP

December 20, 2017
ORP TPA CD Meeting

PRINT NAME	SIGN NAME	ORG
Skorska, Maria		ECY
Smith, Alex		ECY
Stewart, Dustin		ORP
Trenchard, Glyn		ORP
Trimberger, Bryan		ORP
Turner, Michael		MSA
Turner, Vanessa		ORP
Utley, Randell		DOH
Valle, Richard		ORP
Van Mason, Eric		WRPS
Walmsley, Mign		ECY
Wang, Oliver S		ECY
Whalen, Cheryl		ECY
Whitelely, Craig		ORP
Wold, Kristi		ECY
Young, Jason		ORP
Leckband, SUSAN	Susan L. Leckband	HAB
Pak, Paul		RL

ORP/Ecology TPA and CD Agreements, Issues, and Action Items –December 2017

Agreements:

1. Per an Ecology standing request (4/21/2016), ORP agrees to include any written directives given by DOE to the contractors for work required by the CD in future quarterly CD Reports (see CD Section IV-C-1-e).
2. The ORP and Ecology PMs have developed, signed, and entered an outline for the CD Tank Completion Certification into the TPA Administrative Record. Senior management will continue to be briefed if any follow-on actions arise.

Issues:

1. Ecology disagrees with ORP's letter 15-WSC-0027 and the System Plan.

ORP/Ecology TPA and CD Agreements, Issues, and Action Items –December 2017

#	Action ID	Start Date	Action	Updates / Needs for Closure	Actionee(s)	Status/ Date Closed
1	TF-16-11-04	11-17-16	ORP to provide Ecology the T-112 work plan	In legal review. (4/20/2017)	Dusty Stewart	On Hold
2	TF-16-11-05	11-17-16	ORP to provide Ecology results of the four tanks that were visually inspected at ETF	In clearance process (07/13/2017) This has been elevated to the Engineering Manager	Richard Valle	Open
3	TF-17-04-01	4-20-17	ORP to provide Ecology with schedule updates on the removal of the 242-A Evaporator diesel generator.	Pending Class 2 modification approval (8/17/2017)	Paul Hernandez	Open
4	TF-17-08-01	8-8-17	Ecology to communicate to ORP the outcome of internal meetings related to internal SST Tiers 1-3 meetings		Jeff Lyon	Closed 11-16-17
5	TF-17-08-02	8-17-17	Will a pre-project manager meeting be re-established to occur before the quarterly meeting? (5/18/2017)		Bryan Trimberger	Closed 11-16-17
6	TF-17-08-04	8-17-17	Schedule a meeting to discuss AY102 future actions (repair vs close) after the second HD video report is complete -	Meeting is expected to be scheduled for November 2017 (8/17/2017)	Dusty Stewart	Open
7	TF-17-09-01	9-20-17	ORP and Ecology will meet to discuss appropriate venue for requests related to DSTs		Bryan Trimberger	Open
8	TF-17-10-01	10-19-17	ORP to provide Ecology a copy of letter to S-3 related to LAWPS		Steve Pfaff	Open
9	TF-17-10-02	10-19-17	ORP to provide Ecology a copy of the external expert review report for LAWPS		Steve Pfaff	Open

ORP/Ecology TPA and CD Agreements, Issues, and Action Items –December 2017

#	Action ID	Start Date	Action	Updates / Needs for Closure	Actionee(s)	Status/ Date Closed
10	TF-17-10-03	10-19-17	ORP to provide Ecology an update from the SST Integrity kick-off meeting		Dusty Stewart	Open
11	TF-18-11-1	11-16-17	ORP to brief Ecology on the LAWPS technical scope changes		Steve Pfaff	Open
12	TF-18-11-2	12-1-17	ECY requests ORP to meet on SST RPPP-9937 LDMM		Jeremy Johnson	Open
13	TF-18-11-3	12-1-17	ECY requests ORP to meet on HNF-3484 Double Shell Tank Pumping Guide		Jeremy Johnson	Open

#	Action ID	Start Date	Action	Updates / Needs for Closure	Actionee(s)	Status/ Date Closed
1	WTP-15-01-01	1/22/15	Ecology requests a presentation on standardized high-solids vessel design (SHSVD) to include impacts and optimization in planning area 2, 3, and 4 and DNFSB issues	Conceptual design study from Bechtel is expected around Sept 2017 Ecology is requesting a summary briefing in January 2018 as soon as the testing results are available	Wahed Abdul	Open
2	WTP-17-05-01	05/18/17	Quarterly Report Issues: Ecology noted that there is significantly more information in the CD Quarterly Report than in the monthly. There are noted delays. Eight items were identified with no recovery plans discussed. Delays to contract dates do not indicate a delay to CD dates.	Ecology is asking for forum to discuss these issues. Looking ahead: Will be quarterly report be the topic of discussion at the quarterly meetings?(5/18/2017) Decision for stand-alone meeting on the quarterly report was made in June meeting. Need Ecology confirmation to close the action.(7/20/2017)	Wahed Abdul	Open

ORP/Ecology TPA and CD Agreements, Issues, and Action Items –December 2017

#	Action ID	Start Date	Action	Updates / Needs for Closure	Actionee(s)	Status/ Date Closed
3	WTP-17-08-01	8/17/17	Ecology requests ORP to set up a meeting to discuss how the margins were developed for the T5 corrosion report.	Plan for a meeting in January.	Wahed Abdul	Open
4	WTP-17-10-01	10/19/17	ORP to provide Ecology a copy of the maintenance plan		Wahed Abdul	Open

OFFICE OF RIVER PROTECTION
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

OCT 04 2017

17-TF-0088

Ms. Katie A. Downing, Contracts Manager
Washington River Protection Solutions, LLC
2425 Stevens Center Place
Richland, Washington 99354

Ms. Downing:

CONTRACT NUMBER DE-AC27-08RV14800 – U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION REQUEST FOR PROPOSAL FOR A TECHNOLOGY DEMONSTRATION OF A TANK-SIDE CESIUM REMOVAL CAPABILITY

Reference: ORP letter from W.E. Hader to K.A. Downing, WRPS, "Washington River Protection Solutions LLC – Conduct External Review on Low-Activity Waste Pretreatment System, September 25-28, 2017," 17-CPM-0145, dated September 18, 2017.

The purpose of this letter is to request a contract change proposal for development of a technology demonstration of a tank-side cesium removal capability to provide low-activity waste (LAW) feed that meets the waste acceptance criteria for the Waste Treatment and Immobilization Plant (WTP) LAW vitrification facility, and of sufficient quantity to enable the WTP LAW vitrification facility to complete hot commissioning by December 2021, and to enable initial plant operations until the Low-Activity Waste Pretreatment System (LAWPS) becomes operational.

During the LAWPS Expert Review Team meetings, conducted September 25-28, 2017, Washington River Protection Solutions LLC (WRPS) assisted the team in meeting the objectives in the referenced letter to evaluate LAWPS requirements, capabilities, cost and schedule risks, and alternative strategies–with the intent to provide timely, cost-effective LAW feed to the WTP LAW vitrification facility. The LAWPS Expert Review Team considered information from the ongoing design and fabrication of a technology demonstration for the Savannah River Site–called the Tank Closure Cesium Removal capability. This technology demonstration provides relevant information to WRPS to fulfill this request for a contract change proposal.

WRPS is directed to transmit more detailed scope descriptions for all the activities to be described in the contract change proposal as soon as practicable to facilitate improved delivery timing for the independent government cost estimates.

WRPS shall submit the contract change proposal in accordance with Federal Acquisition Regulation (FAR) 15.408, Table 15-2, "Instructions for Submitting Cost/Price Proposals When

Certified Cost or Pricing Data are Required." WRPS shall ensure that certified cost and pricing data submitted meets the definition in FAR 2.101, "Definitions." The proposal shall provide adequate information to show clear entitlement to any adjustment in contract price.

The contract change proposal shall be delivered to the U.S. Department of Energy, Office of River Protection no later than ninety (90) calendar days following receipt of this letter.

A Not-To-Exceed amount of $6M will be issued under a separate contract modification.

If you have any questions, please contact me (509) 376-2760; or your staff may contact Stephen H. Pfaff, LAWPS Federal Project Director, (509) 376-2188.

Marc T. McCusker
Contracting Officer

TF:SHP

cc: C.A. Burke, WRPS
S.M. Sax, WRPS
C.A. Simpson, WRPS
WRPS Correspondence

washington river protection solutions | PO Box 850 Richland, WA

October 23, 2017

WRPS-1704216 R1

Mr. W. E. Hader, Contracting Officer
U.S. Department of Energy
Office of River Protection
Post Office Box 450
Richland, Washington 99352-0450

Dear Mr. Hader:

Subject: CONTRACT NUMBER DE-AC27-08RV14800 – WASHINGTON RIVER PROTECTION SOLUTIONS LLC SUBMITS RECOMMENDATIONS FROM EXTERNAL EXPERT REVIEW ON LOW-ACTIVITY WASTE PRETREATEMENT SYSTEM

References:

1. Letter, W. E. Hader, ORP, to K. A. Downing, WRPS, "Contract No. DE-AC27-08RV14800 – U.S. Department of Energy, Office of River Protection Request for Design Description and Total Project Cost Estimate to Implement and Optimized Low-Activity Waste Pretreatment System Design Strategy," 17-TF-0085/1704226, dated October 4, 2017.

2. Letter, W. E. Hader, ORP, to K. A. Downing, WRPS, "Contract No. DE-AC27-08RV14800 – U.S. Department of Energy, Office of River Protection Request for Proposal for a Technology Demonstration of a Tank-Side Cesium Removal Capability," 17-TF-0088/1704227, dated October 4, 2017.

3. Letter, W. E. Hader, ORP, to K. A. Downing, WRPS, "Contract No. DE-AC27-08RV14800 – Washington River Protection Solutions LLC – Conduct External Expert Review on Low-Activity Waste Pretreatment System, September 25-28, 2017," 17-CPM-0045/1704216, dated September 18, 2017.

The purpose of this letter is to document Washington River Protection Solutions LLC (WRPS) response to Reference 3. WRPS did conduct an External Expert Review on the Low-Activity Waste Pretreatment System (LAWPS) Project. The External Expert Review Team included representation from the DOE Complex and National Laboratories. The External Expert Review Team developed and recommended an alternative approach to the LAWPS Project, as presently defined.

The External Expert Review Team recommendations are documented in enclosed document, RPP-RPT-60405, Revision 0, External Expert Review of the Low-Activity Waste Pretreatment System (LAWPS) Project. This report is WRPS' recommendation to DOE for meeting the objectives for the review as documented in Reference 3.

WRPS has recently received two letters of direction related to the External Expert Review Team recommendations. The first letter (Reference 1) requests an updated Low-Activity Waste Pretreatment System design description and total project cost estimate to implement an optimized design strategy. The letter directs WRPS to develop a system specification for an optimized design strategy for both elutable and non-elutable ion exchange options. In addition, it directs the development of a Class 4 total project cost and schedule estimate for the new design strategy and that the estimate be developed in accordance with DOE G 413.3-21, Cost Estimating Guide. Finally, it requires that the specifications and estimates be submitted to the U.S. Department of Energy, Office of River Protection (ORP) by November 15, 2017.

In response to this letter the LAWPS Team has developed three teams. The first team is responsible for developing specifications for both the elutable and non-elutable design strategy. The second team is responsible for developing conceptual models based on the new specifications. The conceptual models will be used by Team 3 to develop a Class 4 estimate for the elutable and non-elutable optimized design.

At this time, WRPS has received no formal direction to change the current scope or Project delivery milestones but anticipates direction in the near future. Therefore, WPRS will make prudent decisions to preserve Project funds pending anticipated ORP direction.

Reference 2 requested a contract change proposal for the development of a technology demonstration of a tank-side cesium removal (TSCR) capability. The TSCR will have the capability to provide low-activity waste (LAW) feed that meets the waste acceptance criteria for the Waste Treatment and Immobilization Plant (WTP), LAW vitrification facility. The TSCR will also enable the WTP LAW vitrification facility to complete hot commissioning by December 2021, and to enable initial plant operations until the LAWPS becomes operational.

In response, WRPS has assigned a Project Manager who will be responsible for development of the requested contract change proposal and execution of the Project. The Project Manager is currently assembling an Integrated Project Team. As requested, the contract change proposal will be submitted within 90 days of receiving the letter including near term transmittal of a more detailed scope description for all activities involved.

If you have any questions related to the LAWPS Project response, please contact Mr. C. A. Burke at (509) 372-3305. If you should have any questions related to the Tank Side Cesium Removal Project, please contact Mr. K. H. Subramanian at (509) 372-2917, or you may contact me at (509) 376-4592.

Sincerely,

(Signature Attached)

K. A. Downing
Contracts Manager

CAB:KKW:MDE

Enclosure: RPP-RPT-60405, Revision 0, External Expert Review of the Low-Activity Waste Pretreatment System (LAWPS) Project. (41 pages)

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Title: Contracts Manager
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Meaning: Signed per direction of the TOC President's Office
==========

WRPS-1704216 R1
Enclosure

DOCUMENT RELEASE AND CHANGE FORM

Prepared For the U.S. Department of Energy, Assistant Secretary for Environmental Management
By Washington River Protection Solutions, LLC., PO Box 850, Richland, WA 99352
Contractor For U.S. Department of Energy, Office of River Protection, under Contract DE-AC27-08RV14800

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Release Stamp

DATE: Oct 23, 2017 HANFORD RELEASE

Clearance Review Restriction Type: public

1. **Doc No:** RPP-RPT-60405 **Rev.** 00

2. **Title:** External Expert Review of the Low-Activity Waste Pretreatment System (LAWPS) Project

3. **Project Number:** T5L01 ☐ N/A

4. **Design Verification Required:** ☐ Yes ☒ No

5. **USQ Number:** ☒ N/A N/A-7

6. **PrHA Number** **Rev.** ☒ N/A

7. ***Approvals***

Title	Name	Signature	Date
Checker	VITALI, JASON R	*VITALI, JASON R*	10/04/2017
Clearance Review	RAYMER, JULIA R	*RAYMER, JULIA R*	10/23/2017
Document Control Approval	PORTER, MARY	*PORTER, MARY*	10/23/2017
Originator	VITALI, JASON R	*VITALI, JASON R*	10/04/2017
Responsible Manager	VITALI, JASON R	*VITALI, JASON R*	10/04/2017

8. **Description of Change and Justification**

INITIAL RELEASE

9. **TBDs or Holds** ☒ N/A

10. **Related Structures, Systems, and Components**

a. Related Building/Facilities ☒ N/A	b. Related Systems ☒ N/A	c. Related Equipment ID Nos. (EIN) ☒ N/A

11. **Impacted Documents – Engineering** ☒ N/A

Document Number	Rev.	Title

12. **Impacted Documents (Outside SPF):**

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14. **Distribution**

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Abstract: Washington River Protection Solutions, LLC (WRPS) was tasked by the DOE Office of River Protection (ORP) to conduct an external expert review of the Low Activity Waste Pretreatment System (LAWPS) Project. The Acting Assistant Secretary of Energy for Environmental Management (EM-1) and the Director of Special Projects communicated to this review team their principal concern, that LAWPS Project cost growth and schedule risk are threatening departmental commitments to provide sufficient feed to initiate glass production at the Waste Treatment and Immobilization Plant (WTP) Low Activity Waste (LAW) Vitrification Facility by the end of calendar year (CY) 2021, for a total project cost that is within the approved critical decision 1 (CD-1) cost range of $220M-$470M.

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WRPS-1704216 R1
Enclosure

DATE:
Oct 23, 2017

HANFORD RELEASE

APPROVED
By Julia Raymer at 10:50 am, Oct 23, 2017

Release Approval Date

Release Stamp

Approved For Public Release

RPP-RPT-60405
Rev. 0

External Expert Review of the Low-Activity Waste Pretreatment System (LAWPS) Project

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Prepared for the U.S. Department of Energy
Office of River Protection
Contract No. DE-AC27-08RV14800

washington**river**
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P.O. Box 850
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Approved for Public Release;
Further Dissemination Unlimited

EXECUTIVE SUMMARY

Washington River Protection Solutions, LLC (WRPS) was tasked by the DOE Office of River Protection (ORP) to conduct an external expert review of the Low Activity Waste Pretreatment System (LAWPS) Project. The Acting Assistant Secretary of Energy for Environmental Management (EM-1) and the Director of Special Projects communicated to this review team their principal concern, that LAWPS Project cost growth and schedule risk are threatening departmental commitments to provide sufficient feed to initiate glass production at the Waste Treatment and Immobilization Plant (WTP) Low Activity Waste (LAW) Vitrification Facility by the end of calendar year (CY) 2021, for a total project cost that is within the approved critical decision 1 (CD-1) cost range of $220M-$470M. Note that the contractual date for waste feed delivery to support initiation of LAW glass production is December 2021, and is ahead of the Amended Consent Decree milestone of December 2023. Several subordinate considerations to these primary concerns were also expressed in a charge letter dated September 18, 2017 [1], and are addressed in the body of this document (see **Table ES-1** for a summary discussion).

Based on document reviews and two days of presentations from the LAWPS project team, the review team concluded that the existing LAWPS design, driven by the current Key Performance Parameters (KPPs) and constrained by the approved Code of Record, could not be completed in time or within budget to meet the 2021 LAW feed commitment. The current success-based schedule shows CD-4 for the LAWPS in August of 2022 (or as late as April 2025 with schedule risk), and a total project cost (TPC) of about $790M (including management reserve, DOE contingency and other direct costs). It was also evident that even with optimization of the current LAWPS design to substantially reduce cost while still supporting the mission, it would be impossible to meet the December 2021 target date for feed supply because of the re-design burden and the time it would take to cooperatively implement all the enabling actions discussed in this report.

The review team endorsed an alternative approach using a two-phased pretreatment strategy involving a complementary "first feed" pre-treatment technique to achieve the December 2021 contractual date, and an optimized LAWPS facility as a necessary long-term pretreatment capital asset for production of LAW Vitrification feed. The tank-side first feed pretreatment technique, called the Tank-Side Cesium Removal (TSCR) system, would utilize a design similar to the Tank Closure Cesium Removal (TCCR) system to be demonstrated at the Savannah River Site (SRS). The TCCR system has performed Cs removal successfully using non-elutable ion exchange (IX) material as demonstrated at the Oak Ridge Reservation's Melton Valley Storage Tanks, and deployed at Fukushima. Limited testing and modeling of the non-elutable resin has been previously conducted with Hanford wastes. The review team believes that this system could be quickly adapted to Hanford waste and be operating in time to provide first feed. The TSCR system would produce first feed while design, construction, and commissioning of an optimized version of the LAWPS facility is completed. In this way, the LAWPS capital project can be delivered in a cost-effective manner that is not driven to expensive execution strategies to meet an aggressive 2021 contractual date associated with Amended Consent Decree milestones

for DFLAW. The LAWPS project schedule can then be aligned with the actual processing needs of the overall River Protection Project which the review team considers to be reasonable and achievable.

The optimized LAWPS facility would then provide a permanent, hard shell asset for feed production during the life of WTP operations. It is recommended that an approach preferentially reliant on non-elutable media be pursued to avoid Cs returns to the Tank Farm, which reduces risk to the project. Additionally, this approach results in adsorption of Cs onto a stable, solid IX media, and includes inspectable storage of robust canisters of this material in a substantially safer configuration relative to storing Cs as a liquid. Should this approach drive disproportionate cost or risk through additional design and construction expenditures, supply chain risks, or market pricing volatility, then a decision to eliminate the non-elutable IX media approach may need to be made, and a path forward incorporating an elutable IX media may be warranted (see DOE enabling actions, below). The review team believes that with the enhancements suggested in this document, the new LAWPS facility would reach CD-4 for a cost that is within the approved CD-1 capital cost range.

An optimized version of the LAWPS differs from the present 60% design concept in the following key ways:

- A scheme for double-shell tank (DST) utilization establishes Tank AP-107 as the dedicated feed tank for both TSCR and LAWPS and also sets Tank AP-106 as the dedicated DFLAW feed and waste characterization tank, deleting the need for the three new lag storage tanks and most of the transfer lines currently in the current LAWPS design. This appreciably reduces the material at risk (MAR) inventory in the facility.
- Clarification of the facility KPPs enables removal of the high pressure filtration system and equipment which significantly reduces key accident scenario consequences. This enables subsequent reductions in the facility seismic design criteria (SDC) from SDC-3 to SDC-2, or even SDC-1 in some cases
- Leveraging cost-effective control strategies previously accepted for other site facilities enables a more efficient, yet robust, ventilation and flammable gas control approach.

TSCR's utilization of a non-elutable IX material assumes that pad storage of shielded, spent resin columns is acceptable for early operation (see DOE enabling actions, below). The more permanent LAWPS facility will be optimized to manage the cost through incorporation of the features listed above, and would require a redesign enabled by fundamental changes in the existing paradigm.

This integrated approach for the TSCR prototype and optimized LAWPS is depicted in **Figure ES-1.**

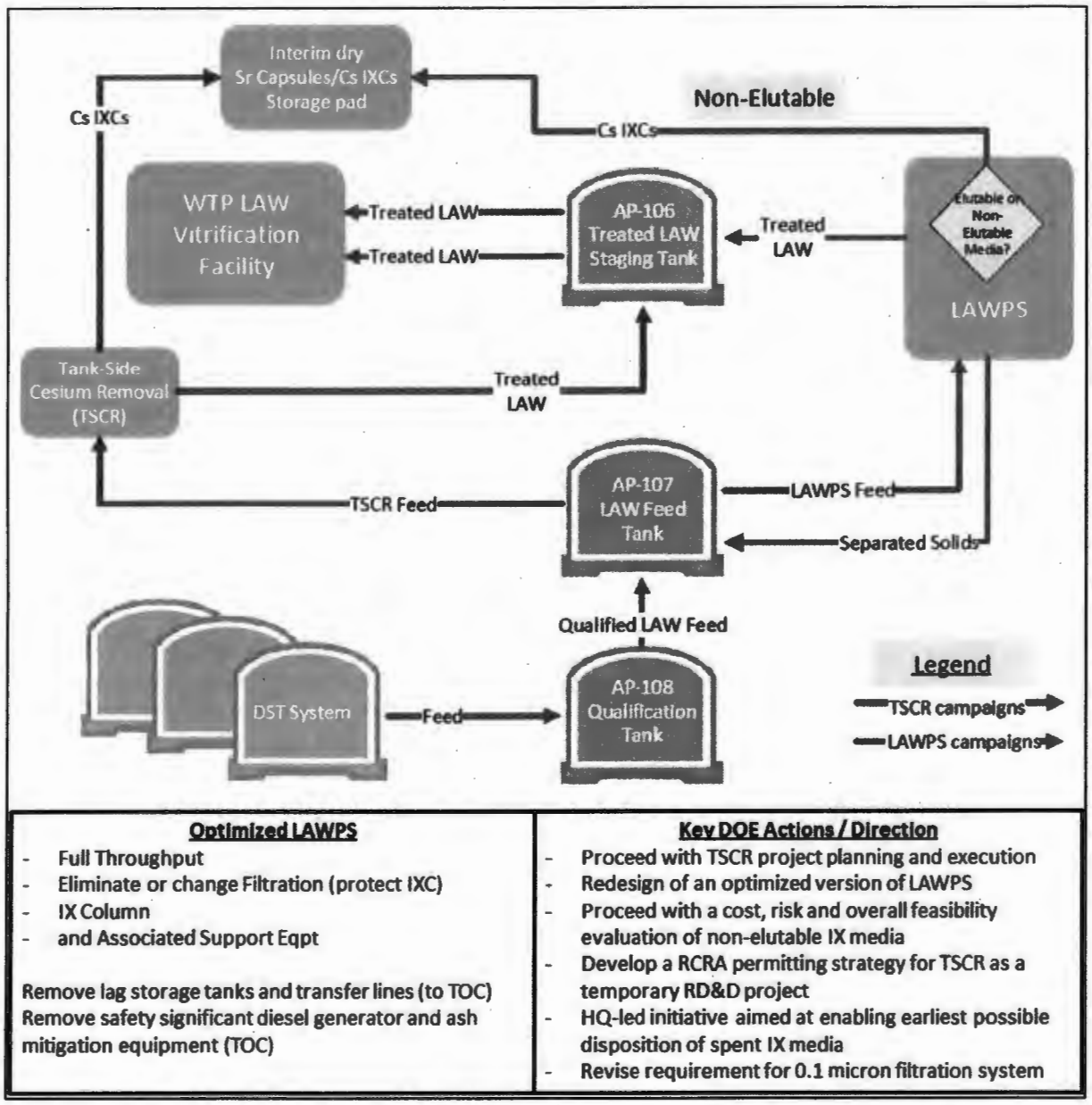

Figure ES-1. Proposed Alternate Treatment Approach to Low-Activity Waste Processing

Primary DOE Enabling Actions

- Based on preliminary cost screening information to be provided by WRPS, provide direction to WRPS to proceed with TSCR project planning and execution, including IX media testing on Hanford waste to verify design, TSCR procurement, and safety document preparation, and tank site preparation for TSCR, and parallel redesign for an optimized version of LAWPS. Utilize a streamlined approach for LAWPS redesign based on the new project execution strategy, considering alternatives such as accelerated re-specification followed by external Engineering, Procurement, and Construction (EPC)

design/build estimates. The streamlined approach should consider removal of cross flow filtration, lag storage and much of the new transfer line scope from the LAWPS Project, considering the revised flow paths as outlined in **Figure ES-1**.

- Direct WRPS to analyze the impacts on the current tank farm baseline of making the changes proposed in **Figure ES-1** (i.e. dedicating AP-107 as the TSCR/LAWPS feed tank and AP-106 as the DFLAW feed tank). This analysis should include impacts on DST space and the current single shell tank (SST) retrieval strategy. WRPS shall provide ORP with a report of this analysis and a proposal for any needed changes to the WRPS baseline.
- Provide direction to WRPS to proceed with a cost, risk, and overall feasibility evaluation of elutable versus non-elutable resin for the LAWPS facility, considering mission level impacts on the cost of each option. Utilize this evaluation to provide direction on a design strategy for the LAWPS project in support of revising the LAWPS specification.
- Work with the State of Washington to develop and implement a Resource Conservation and Recovery Act (RCRA) and Clean Air Act permitting strategy, including exploring the possibility of designating TSCR as a temporary research, development, and demonstration (RD&D) project pursuant to the Washington State Dangerous Waste regulations, WAC 173-303-809. Ensure the acceptability of pad storage of spent TSCR IX media as a means of lowering risk by reducing the potential mobility of Cs in the environment (i.e., by moving from soluble Cs to Cs captured on a stable inorganic IX material in a dry, inspected configuration), and by holding to contractual dates for initiation of LAW glass production by 2021, ahead of the Amended Consent Decree milestone of December 2023.
- Simultaneously, develop a permitting strategy for the LAWPS which facilitates long-term efficient operation and leverages agreement for pad storage of spent inorganic IX media. This action would include seeking approval for a Waste Incidental to Reprocessing evaluation determination in accordance with DOE Order 435.1. *Radioactive Waste Management* and pursuing final disposal pathways, to include those Greater-Than-Class-C waste forms to an appropriately licensed waste disposal site as a long-term disposition strategy.
- Develop a funding strategy for TSCR, and include in the regulatory discussions outlined above any impacts to other tank farm operations (e.g., retrievals) necessary to proceed with TSCR as an expense funded operation.
- Revise wording in section 2.3 and Table 5 of Interface Control Document (ICD)-30 associated with the use of a 0.1 micron filtration system for treating LAW feed to reflect the use of a 10 micron filter. The 0.1 micron wording was an unnecessary artifact of the WTP Pretreatment system, and the revised criteria will protect the associated criticality controls for plutonium particles in the Criticality Safety Evaluation Report for Direct Feed LAW.
- Eliminate the ambiguous KPP for facility flexibility, which begs debate about how much flexibility is adequate and has the potential to add cost.

- Work hand-in-hand with WRPS to efficiently adapt the SRS nuclear safety strategy to a Hanford TSCR, as well as developing a streamlined safety design strategy for an optimized version of LAWPS.
- Sustain a review body (similar to the cross-function review team comprised of various DOE contractors that completed this LAWPS review) as a means of EM-1 staying personally engaged in the implementation of the accelerated dual path, and as a means of ensuring that issues for which DOE action is needed are visible and communicated in a timely manner.

Table ES-1, below, provides a summary of the review team's assessment of the various charge letter attributes based on the current design's ability to meet EM's primary goals (first feed by 2021 and a capital investment within the CD-1 cost range), versus an anticipated result from implementation of the recommended approach using TSCR and an optimized LAWPS.

Table ES-1. Review Team Assessment of Charge Letter Attributes

Charge Letter Attributes	Current State[1]	Future State[2]	Comments
Results in the delivery of a tank waste pretreatment capability within the Critical Decision-1 cost range	●	●	In the opinion of the team, the recommended approach can bring cost back into the CD-1 cost range based on revised requirements and scope.
Results in the delivery of LAWPS by 2021	●	●	Delivery schedule for LAWPS Facility will not support DFLAW hot commissioning need date; but deployment of near-term, complementary treatment technology will meet the timing needs.
In addition to evaluating achievability of delivery of LAWPS by 2021 and evaluation of options to accelerate completion of the LAWPS project to the maximum extent practical, evaluate complementary alternatives that could be deployed to provide some near-term tank waste pretreatment capability for feed to LAW	○	●	A technically mature waste treatment capability has been identified. This near-term available capability is currently being demonstrated at the Savannah River Site. Hanford deployment will result in delivery of suitable feed stock to support the timing of DFLAW commissioning.
Evaluate DOE-directed functional performance requirements, along with Key Performance Parameters for efficacy, based upon their role in driving cost and schedule risks for LAWPS delivery	●	○	Yellow based on adoption of following KPP change: • The implementation of ICD-30 requirements related to the use of a 0.1 micron filtration system results in a series of accident scenarios with consequence driving specifications of excessive design requirements (e.g., SDC-3). Green based on adoption of ICD-30 requirement changes and the following KPP change: • Specification of undefined "flexibility" objectives which have potential to drive cost
Engineered controls and adoption of standards should be commensurate with the hazards so as to minimize unnecessary requirements	○	●	Yellow because preliminary safety calculations drove conservative controls for the existing design, which were not revisited after the design advanced; green considering success on previous KPP; build off of SRR safety basis for TSCR.
Evaluate appropriateness of Hazard Categorization and Seismic Design Criteria designations	●	●	No actions; evaluation and controls were commensurate with requirements.
Evaluate the necessity for the breadth of LAWPS operating envelop	●	●	Throughput was consistent with need.
Identify those remaining key decisions which are hampering progress or are creating cost and schedule risk (i.e., use of eluteable or non-eluteable separations media)	○	○	See Section 7.1; Item COMPLETE.
Considers the previous but simplified design iterations	○	○	See Section 6.1; Item COMPLETE.
Preserves existing design elements to the extent practical	○	○	See Section 6.1; Item COMPLETE.

[1] The current state rating is relative to the External Expert Review Charge Letter objectives of delivering a waste pretreatment capability within the Critical Decision-1 cost range and delivery of LAWPS by 2021.
[2] The future state considers successful execution of the recommendations and approach contained within the External Expert Review report.
○ Scope deemed to be outside the scope of the original LAWPS project, and therefore could not be compared relative to the objectives of the External Expert Review Charge Letter.
● Evaluation of project in its current / proposed state does not adequately meet the objectives of the External Expert Review Charge Letter.
○ Evaluation of project in its current / proposed state may be improved to more satisfactorily meet the objectives of the External Expert Review Charge Letter.
● Evaluation of project in its current / proposed state satisfactorily meets the objectives of the External Review Charge Letter.

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TERMS AND DEFINITIONS

Acronyms and Abbreviations

BNI	Bechtel National, Inc.
CFF	Cross Flow Filter
CSER	Criticality Safety Evaluation Report
CST	Crystalline Silicotitanate
CY	Calendar Year
DFLAW	Direct Feed Low-Activity Waste
DOE	Department of Energy
DST	Double-Shell Tank
EM	Environmental Management
EPC	Engineering, Procurement, and Construction
FPD	Federal Project Director
ICD	Interface Control Document
IX	Ion Exchange
KPP	Key Performance Parameter
LAW	Low-Activity Waste
LAWPS	Low-Activity Waste Pretreatment System
MAR	Material at Risk
NPH	Natural Phenomenon Hazard
ORP	Office of River Protection
PNNL	Pacific Northwest National Laboratory
PT	Pretreatment
RCRA	Resource Conservation and Recovery Act
RD&D	Research, Development and Demonstration
ROM	Rough Order of Magnitude
RPP	River Protection Project
SDC	Seismic Design Category
sRF	Spherical Resorcinol-Formaldehyde
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
SRS	Savannah River Site
SST	Single-Shell Tank
STES	Standby Tank Exhauster System
TCCR	Tank Closure Cesium Removal
TOE	Total Operating Efficiency
TPC	Total Project Cost
TSCR	Tank-Side Cesium Removal
WAC	Waste Acceptance Criteria
WRPS	Washington River Protection Solutions
WTP	Waste Treatment and Immobilization Plant

1.0 INTRODUCTION

The U.S. Department of Energy's (DOE) Hanford Site in southeast Washington State contains 56 million gallons of chemical and radioactive waste stored in underground tanks – the result of more than four decades of plutonium production. The DOE's Office of River Protection (ORP) is responsible for the retrieval, treatment, and disposal of this waste in a safe, efficient manner. The River Protection Project (RPP) is the largest and most complex environmental remediation project in the nation. The RPP mission involves two parallel efforts, both aimed at reducing the threat posed to the Columbia River by Hanford's hazardous, radioactive tank waste.

- Retrieve waste from 149 single-shell tanks (SSTs) to 27 double-shell tanks (DSTs). Waste retrieval from 16 SSTs has been completed to date.
- Treat the tank waste at the Hanford Tank Waste Treatment and Immobilization Plant (WTP), producing a stable waste form which can be permanently disposed.

These efforts must be performed in parallel because, without waste treatment capability, the DST system does not have the capacity to hold all the waste currently in the SSTs. Technical issues associated with the WTP Pretreatment (PT) Facility have delayed its projected start date, impeding the ability to meet SST retrieval and waste treatment commitments. Changes in mission strategies to treat waste as soon as practical (i.e., directly feeding low-activity waste (LAW) to the LAW Vitrification Facility, or Direct-Feed LAW) and advancements in technologies and glass models are two examples of the many efforts being undertaken by ORP to mitigate many of the challenges the RPP mission faces.

The Direct-Feed LAW (DFLAW) flowsheet includes the Low-Activity Waste Pretreatment System (LAWPS) between the tank farms and the LAW Vitrification Facility. The current design for LAWPS would encompass many of the same LAW processing capabilities as the WTP Pretreatment Facility, including filtration to remove entrained solids and ion exchange to remove cesium, and would be sized to support feeding two LAW melters operating at 30 MTG/day at 70% Total Operating Efficiency (TOE).

The purpose of this independent review was to evaluate opportunities to optimize the LAWPS and to identify necessary activities to ensure a qualified pretreated solution is available by the end of Calendar Year 2021 (CY21) to feed the LAW Vitrification facility in order to meet the contractual waste feed delivery date and more importantly achieve applicable Amended Consent Decree milestones.. The review was conducted during the week of September 25-28, 2017. The review team members were as shown in **Table 1**.

Table 1. External Expert Panel Review Members

John Eschenberg – AECOM (Team Lead)	
Greg Ashley – Bechtel Corporation	**Connie Herman** – Savannah River National Laboratory (SRNL)
Tom Brouns – Pacific Northwest National Laboratory (PNNL)	**Mike Johnson** – CH2M
Tom Burns – Parsons	**John Krueger** – Atkins Nuclear Secured, LLC
Chris Burrows – Independent Expert	**Ja-Kael Luey** – Veolia
Richard Edwards – AECOM	**Paul Murray** – AREVA
Kent Fortenberry - AECOM	**Jason Vitali** – Washington River Protection Solutions (WRPS); AECOM

2.0 REVIEW SCOPE

As the LAWPS project approaches the Critical Decision phase to develop a performance baseline, the US DOE is concerned about cost growth and the risks to the delivery schedule. The DOE Director of the Special Projects Office, Environmental Management (EM), requested that Washington River Protection Solutions (WRPS) comprise a corporate team of sufficient capability to include representation from the DOE Complex and National Laboratories to develop and recommend an alternative approach to the LAWPS Project, as presently defined, to meet the following objectives [1]:

- Results in the delivery of a tank waste pretreatment capability for within the Critical Decision-1 cost range,
- Results in the delivery of LAWPS by 2021,
- In addition to evaluating achievability of delivery of LAWPS by 2021 and evaluation of options to accelerate completion of the LAWPS project to the maximum extent practical, evaluate complementary alternatives that could be deployed to provide some near-term tank waste pretreatment capability for feed to LAW,
- Evaluate DOE-directed functional performance requirements, along with Key Performance Parameters for efficacy, based upon their role in driving cost and schedule risks for LAWPS delivery,
- Engineered controls and adoption of standards should be commensurate with the hazards so as to minimize unnecessary requirements,
- Evaluate appropriateness of Hazard Categorization and Seismic Design Criteria designations,
- Evaluate the necessity for the breadth of LAWPS operating envelope,
- Identify those remaining key decisions which are hampering progress or are creating cost and schedule risk (i.e., use of elutable or non-elutable separations media),
- Considers the previous but simplified design iterations, and
- Preserves existing design elements to the extent practical.

The purpose of the review team is to provide an overview of the project and to recommend alternative approaches to DOE that may save time and cost. The purpose is not to develop a statement of work or specifications.

With full appreciation of the scope and difficulty of this tasking, given the mission risks presented by any additional delays in initiating the treatment of Hanford low activity tank wastes, WRPS was requested to provide recommendations to DOE by October 6, 2017.

3.0 REVIEW METHODOLOGY

The review team received documentation from the WRPS LAWPS project team on the LAWPS project, including process flowsheet information, project evolution information, and piping and instrumentation diagrams ahead of the review team visit. The review team reviewed this initial set of information from the perspective of their individual expertise in tank waste and similar waste stream pretreatment technologies.

The review team was briefed by the LAWPS project team on the following topics to provide background on attributes driving requirements and cost of the LAWPS project:

- Tank waste disposition flowsheet and the role of LAWPS in completing the tank waste treatment mission as described in the River Protection Project System Plan, Revision 8
- Project Key Performance Parameters approved at Critical Decision 1
- Description and evolution of the LAWPS project to the current status:
  - Defined by the 60-percent design including identification of safety significant systems
  - Natural Phenomena Hazard (NPH) driven criteria
  - Code of record
  - LAW Vitrification Facility throughput considerations
  - Waste feed delivery strategy including plans currently being implemented to provide feed for pretreatment utilizing Tanks AP-106 and AP-107

The LAWPS project team presented to the review team alternative LAWPS project approaches that included the following options:

- Continue with the LAWPS design as-is, utilizing elutable IX resin
- Retrofit existing LAWPS design with non-elutable IX media using the existing Key Performance Parameters (KPPs)
- Utilize LAWPS design with elutable resin, but at a reduced throughput
- Utilize LAWPS design with non-elutable media at reduced throughput
- areas Adjusting project requirements as necessary to reflect practical risks, such as Natural Phenomena Hazard (NPH) category, engineering controls for safety systems, code of record and KPPs

The WRPS team presented complementary "first feed" technology alternatives that could provide feed to the LAW Vitrification Facility by December 2021. The WRPS team proposed a Tank-Side Cesium Removal (TSCR) capability, modeled on the Savannah River Site (SRS) Tank Closure Cesium Removal (TCCR) system currently undergoing factory acceptance tests.

Some of the review team members visited the Columbia Engineering and Environmental Services Facility, where the TCCR system destined for use at SRS is undergoing testing prior to shipment to SRS, and reviewed the functionality of TCCR and its potential application for Hanford.

4.0 REVIEW OF CURRENT LOW-ACTIVITY WASTE PRETREATMENT SYSTEM PROJECT EXECUTION

The LAWPS project team presented the evolution of the project including some of the alternatives analysis that had been considered and how they had arrived at the current Total Project Cost (TPC) and schedule.

4.1 Current LAWPS Baseline

The LAWPS KPPs and other pertinent project information can be found in the LAWPS Project Execution Plan [2]. The KPPs are highlighted in **Table 2** and were reviewed with particular emphasis on their impact on the project design and TPC. The current detailed LAWPS TPC and risk informed schedule can be found in Revision 2 of the Low Activity Waste Pretreatment System Total Project Cost Report [3], and are summarized in **Table 3** and **Figure 1** from the overview material presented by the LAWPS project team [4], [5].

Table 2. LAWPS Key Performance Parameters

Key Parameter	Performance
Facility Throughput	Capacity to support WTP LAW Vitrification operations at 30 metric tons (MT) of glass per day, instantaneous rate. This translates into processing 1,600 MT of sodium from waste per year at a nominal 20% sodium oxide (Na_2O) loading in glass
WTP LAW Vitrification Waste Acceptance Criteria	Perform for Conceptual Design defined by "Early LAW Waste Receipt Criteria Revision", CCN 155899 from R. Hanson to S.A. Saunders, April 8, 2008. Note that this performance parameter will be documented in ICD-30 – Interface Control Document for Direct LAW Feed, 24590-WTP-ICD-MG-01-030, prior to CD-2.
Solids Removal	LAWPS shall be capable of removing undissolved (entrained) solids from tank supernatant waste, ^{90}Sr and transuranic (TRU) shall be limited in the feed to WTP as specified below: ^{90}Sr: 1.12E-03 (Ci/gmol Na) and TRU: 1.30E-05 (Ci/gmol Na) (TRU is defined as alpha emitting radionuclides with an atomic number greater than 92, with half-life greater than 20 years (see HNF-EP-0063, Hanford Site Solid Waste Acceptance Criteria)).
Cesium Removal	The ^{137}Cs concentration in immobilized LAW must be <0.3Ci/m^3 to meet DOE M 435.1-1, Radioactive Waste Management Manual, requirements for near surface disposal. The maximum ^{137}Cs concentration in the feed from LAWPS to WTP must be less than or equal to 1.68 x 10-5 Ci/gmol NA, per CCN 155889
Environmental Compliance	Comply with all applicable environmental regulations. For example, WAC 173-303, Dangerous Waste Regulations, a subsection of which drives secondary containment for waste containing systems (e.g. encased waste transfer lines) and leak detection in the second containment.
Facility Flexibility	LAWPS facility layout accommodates expansion (e.g. ion exchange cells can be added adjacent to the cross flow filter vault; vault walls are large and can accommodate additional penetrations
Future Flexibility	Performance TBD

Table 3 summarizes the current TPC and compares it with the TPC at the 60% design point.

Table 3. LAWPS Total Project Cost Comparison (at CD-1 and Sept. 2017 TPC)

WBS	CD-1 ICE	Sept 17 TPC	Delta
5.5.1 - LAWPS Conceptual Design	$2,067	$9,671	($7,604)
5.5.3 - LAWPS Management	$7,733	$17,771	($10,038)
5.5.4 - LAWPS Project Support	$39,509	$62,143	($22,634)
5.5.5 - LAWPS Permitting	$3,029	$3,159	($130)
5.5.6 - LAWPS Safety Analysis	$4,678	$2,908	$1,770
5.5.7 - LAWPS Technology Maturation	$17,802	$47,113	($29,311)
5.5.8 - LAWPS Design	$26,086	$91,237	($65,151)
5.5.10 - LAWPS Engineering During Construction	$8,521	$13,942	($5,421)
5.5.11 - LAWPS Long Lead Procurements	$9,409	$38,437	($29,028)
5.5.12 - LAWPS Construction	$95,250	$290,211	($194,961)
5.5.13 - LAWPS Commissioning & Turnover	$14,487	$28,681	($14,194)
5.5.99 - LAWPS Fee	$14,982	$50,373	($35,392)
Contractor Reserve	$32,859	$71,000	($38,141)
DOE Contingency	$34,742	$44,000	($9,258)
Government ODCs	$0	$18,918	($18,918)
Total Project Cost	**$311,154**	**$789,565**	**($478,411)**
Cost Range	**$470,000**	**$868,521**	**($398,521)**

Figure 1 shows the current 80% confidence level schedule for the LAWPS project.

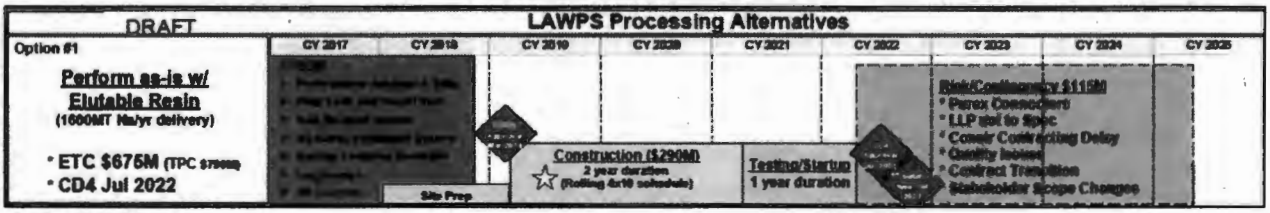


Figure 1. Current LAWPS Risk Informed Schedule

4.2 Project Evolution

The LAWPS project team presented the evolution of the LAWPS project from the Pre-CD-1 Concepts in 2011. These evolutions considered both in-tank and tank-side options with TPC ranges of $110M-$230M. The LAWPS project team then went through the LAWPS CD-1 concept from May 2015, (stated TPC range of $220M-$470M), and the LAWPS 60% design from January 2017 (stated TPC range of $676M +/- 10%). Against each evolution, the LAWPS project team outlined the scope, throughput, key elements of the safety basis, and the building footprint as the key cost drivers. It was noted during the review that the key drivers impacting the increased cost from CD-1 to the September 2017 TPC were that the design was revised to include a lag storage maintenance area, and the weather enclosure footprint was expanded. The LAWPS design team implemented DOE direction to use updated orders and standards such as DOE O 420.1 and DOE - STD 3009 – 2114. The updated design also included 13 Safety

Significant Systems (6 primary and 7 support systems), added DI water, spent resin sampling, permanent safety showers, and the TPC revised construction direct and indirect costs that were previously underestimated.

The LAWPS project team then focused on the current project requirements, particularly the critical drivers that impacted the project scope, the safety basis, and how the design evolutions had impacted the TPC, as summarized in **Table 3**.

A major focus of this discussion was the overall scope, development of the Safety Basis, and the number and complexity of the Safety Significant Control Systems, the NPH categorization, the basis for Seismic Design Categorization, and the development of the Hazard Categorization.

The WRPS team then outlined the waste feed delivery approach including the tank farms strategy for first feed from Tank AP-107 and the Cs eluate returns to Tank AP-105. A key part of this discussion was the requirements of the DFLAW waste acceptance criteria for the LAW Vitrification Facility, Interface Control Document (ICD) 30, and how this impacted the LAWPS design. The most significant impact resulted from the prescriptive expectation to filter insoluble solids down to 0.1 micron, which drove the use of a Cross Flow Filter (CFF) with 0.1 micron filter membranes in the design.

In anticipation of this review, the LAWPS project team had prepared a number of cost reduction scenarios focused on potential use of non-elutable IX media with the existing KPPs, and examined the sensitivity of the project to reduced throughput (i.e., 50% reduction to 800MT Na/yr.). The least costly of these options, use of elutable resin at 50% throughput, still had a stated TPC of $643M and, because of the reduced throughput, would not meet the demands of the DFLAW operating at full capacity.

The DOE cost target for the LAWPS project as stated in the charter for this review is to remain within the CD-1 cost range of $220M-$470M. Given that the LAWPS design effort has expended $115M so far, the DOE target to deliver an optimized LAWPS is no more than $355M. The current LAWPS design results in a stated TPC cost that is significantly in excess of the DOE cost target.

4.3 Conclusions Relative to Cost

Based on the review of the above information, the review team determined that LAWPS, as currently configured, will not meet the to-go cost target of $355M (including MR and contingency) without significant scope reductions and reassessment of the critical cost drivers in the requirements.

The key cost drivers of the LAWPS project include:

- Non-essential scope allocated to the LAWPS – lag storage, filtration, transfer lines, and built in flexibility for potential future unknown requirements.
- Early conservatism in safety basis (e.g., Seismic Design Category (SDC)-3)
- Aggressive schedule driving excessive cost (e.g., over conservative design decisions, safety basis, limited value engineering, rolling 4-10's for construction, etc.)

The review team concludes that meeting the DOE cost target will require significant redesign to reduce unnecessary scope and conservatism which, concomitantly, will reduce costs. The review team also concluded that the execution plan should be revisited to look for opportunities to further reduce cost and improve confidence in both schedule and cost performance.

4.4 Conclusion Relative to Schedule

The key schedule target is to have DFLAW feed available by the end of calendar year 2021. The review team concluded that LAWPS cannot be modified to meet the need for DFLAW feed by end of 2021. The review team then reviewed alternate approaches to provide initial feed by 2021, including what could be done in the Tank Farms that would support both first feed using a tank-side treatment approach and an optimized LAWPS permanent facility required for overall mission support. This review led to a proposed integrated approach utilizing both TSCR for the initial feed, as outlined in Section 5.0, and an optimized LAWPS design as summarized in Section 6.0. This integrated approach ensures first feed is available for DFLAW and also takes LAWPS off the critical path allowing an optimized design that meets DOE's cost target.

4.5 Continuing Need and Justification for Modified LAWPS

With the proposed integrated approach and the move to TSCR for initial feed, there was some consideration of discontinuing the LAWPS project and using a number of TCSR units to provide the necessary ongoing feed to DFLAW. Based on the review of mission level needs of LAWPS in System Plan, Rev. 8, more than one-third of the sodium inventory and three-quarters of the cesium inventory is processed through the LAWPS facility over the course of the entire mission. The use of the LAWPS facility is necessary to provide additional capability to supplement the capacity of the Pretreatment Facility. Further, with a simplified design and revised requirement definition, and recognizing that there will be a continuing need for Cs removal in 200-East Area for at least 25 years, the optimized LAWPS should accommodate the integrated DFLAW program mission needs with less overall risk. With the recommendation that TSCR be evaluated considering an RD&D permit, the facility would provide a near-term solution providing first feed to LAW Vitrification, and the unit would be designed accordingly with a respective MAR assumed in safety basis development. The permanent LAWPS facility, with the optimized configuration, would be designed accordingly with an appropriate maintenance philosophy, to minimize the total cost to the RPP mission.

4.6 Proposed Integrated Approach

The proposed integrated approach has two major objectives:

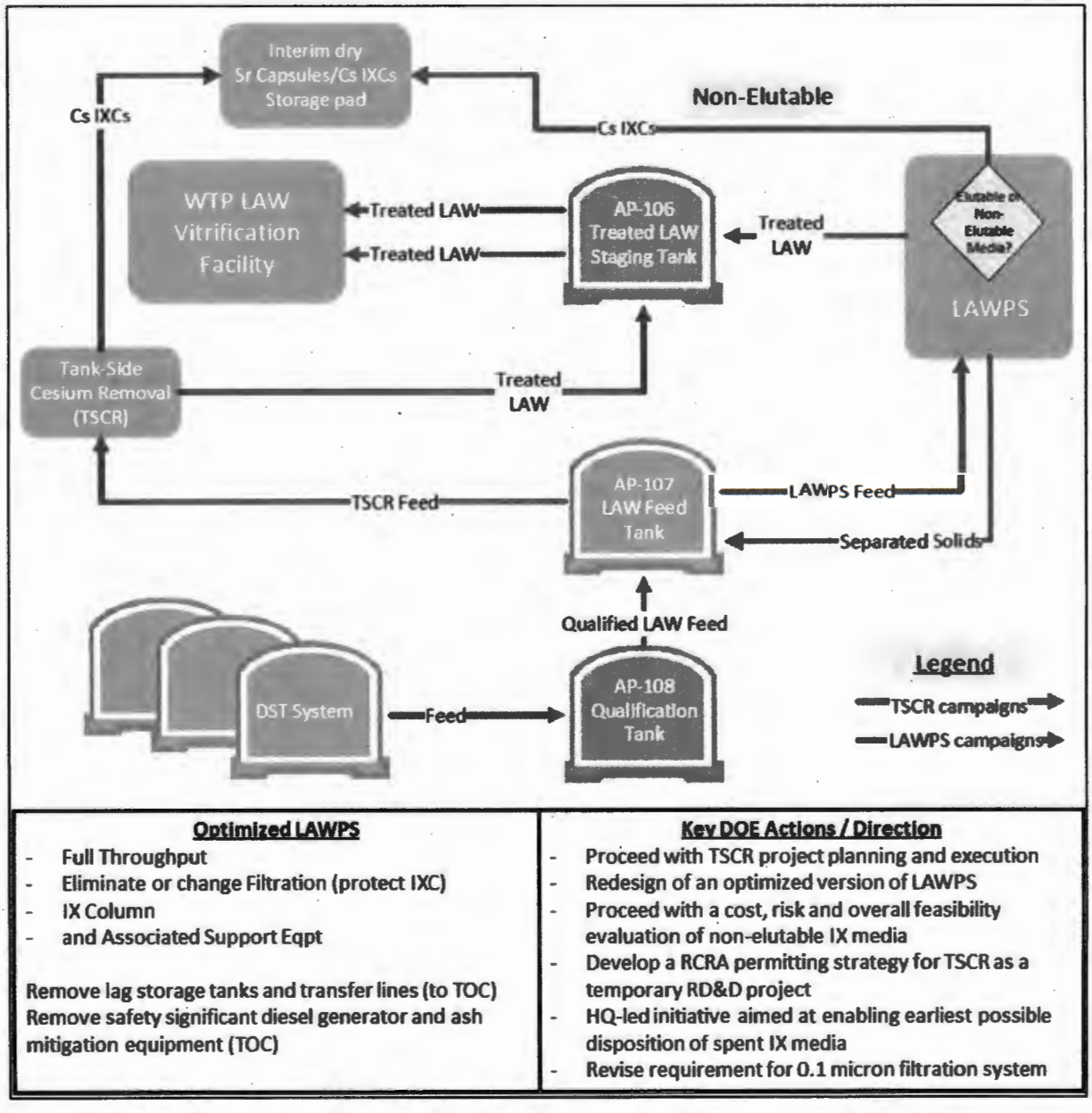
i. Support tank side treatment using TSCR to provide feed to DFLAW by the end of calendar year 2021

ii. Support an optimized LAWPS redesign by leveraging existing Tank Farm facilities allowing significant de-scoping of the LAWPS project.

Figure 2 below shows the proposed approach, which dedicates Tank AP-107 as the TSCR / LAWPS feed tank and dedicates Tank AP-106 as the LAW vitrification feed tank. This allows early preparation and staging of DFLAW feed and targets up to 1M gallons of DFLAW feed staged in Tank AP-106 by the end of 2021. It also removes the need for lag storage tanks in

LAWPS and provides for any necessary sampling and analysis required by the DFLAW program to validate Waste Acceptance Criteria (WAC). The review team challenged the 0.1 micron filtration requirement in the DFLAW Interface Control Document (ICD-30) as this drives the high pressure cross flow filtration requirements in LAWPS, which have a significant impact on the project safety basis and cost. The belief of the review team was that this requirement could either be removed or significantly relaxed and that any required filtration to meet the ICD-30 can be carried out in Tank Farms. After a discussion with the WTP Design Authority and Process Engineering Manager, it was confirmed that the wording in ICD-30 associated with the treatment of feed (Section 2.3 and the solids loading in Table 5 of ICD-30) could be adjusted and still maintain the controls required by the DFLAW Criticality Safety Evaluation Report (CSER) for preventing a criticality from plutonium. It is recommended that the requirement be revised for filtration at 10 microns, which will open up filtration options while protecting the requirements outlined in the CSER.

The benefits of this approach are that it enables a high confidence in early DFLAW feed at a reduced cost by using existing Tank Farm facilities and TSCR. This approach also allows the removal of cross flow filtration, lag storage, and much of the new transfer line scope from the LAWPS Project.



Optimized LAWPS	Key DOE Actions / Direction
- Full Throughput - Eliminate or change Filtration (protect IXC) - IX Column - and Associated Support Eqpt Remove lag storage tanks and transfer lines (to TOC) Remove safety significant diesel generator and ash mitigation equipment (TOC)	- Proceed with TSCR project planning and execution - Redesign of an optimized version of LAWPS - Proceed with a cost, risk and overall feasibility evaluation of non-elutable IX media - Develop a RCRA permitting strategy for TSCR as a temporary RD&D project - HQ-led initiative aimed at enabling earliest possible disposition of spent IX media - Revise requirement for 0.1 micron filtration system

Figure 2. Proposed Alternate Treatment Approach to Low-Activity Waste Processing

From the initial analysis, the review team believes that the integrated approach provides an economical platform to proceed with a TSCR approach for initial DFLAW feed treatment and staging to meet the 2021 target date, and provides the opportunity to reduce the scope of an optimized LAWPS plant at a TPC within the CD-1 cost range. WRPS/ORP need to develop this concept to ensure it is deliverable within the time frames proposed, that the TSCR deployment and transfer line upgrades are affordably within the Tank Farm operational budget, and that the impacts of these changes do not significantly impact other tank farm priorities.

It is recommended by this review team that ORP provide contract direction to WRPS to develop this integrated concept.

5.0 ALTERNATIVE LOW-ACTIVITY WASTE TREATMENT TECHNOLOGIES

As described in Section 4.6, use of a tank-side LAW pretreatment technology is necessary to ensure pretreated waste is available to feed the LAW Vitrification Facility by the end of 2021. The following sections outline the proposed tank-side treatment technology and associated risk and safety basis considerations.

5.1 Proposed Alternate Treatment Approach

The previous LAWPS alternative analysis considered elutable and non-elutable ion exchange media and a tank side process versus a new facility for solids-liquid separation and cesium removal [6]. The use of a non-elutable cesium ion exchange media was discounted due to the presumption that the cesium loaded media had to be disposed at a repository and was not a standard waste form (i.e. not glass). Additionally, the alternatives analysis concluded that sRF was a more modern Hanford specific ion exchange resin since it is planned for use in the WTP Pretreatment Facility.

Tank-side treatment had not been demonstrated on a large-scale for DOE application at the time of the evaluation. Design and construction of a tank side cesium removal system using non-elutable crystalline silicotitanate (CST) ion exchange media is currently underway at the Savannah River Site [7]. This system is referred to as the TCCR unit. A demonstration of tank-side Cs removal using CST was previously completed at Oak Ridge Reservation's Melton Valley Storage Tanks [8]. Industry has similarly designed, fabricated, and deployed analogous ion exchange systems that are in use at the Fukushima Daiichi nuclear power station. Savannah River Remediation (SRR) awarded a fixed price subcontract for the design, fabrication, testing and delivery of the TCCR process equipment to Westinghouse Electric Company on July 7, 2016, with a 15-month period of performance. The TCCR equipment will utilize a modular design concept to accommodate minimal onsite assembly and preparation work. Nuclear safety analysis and hazards assessment of TCCR are being conducted by SRR with participation from the subcontractor.

SRR will site the TCCR equipment near Tanks 10 and 11 such that the TCCR equipment will be sufficiently compact to minimize the processing area footprint, the length and number of above-grade transfer lines, and the volume of liquid radioactive material outside of the tank. TCCR performance attributes and the desired features are summarized in **Table 4**.

Table 4. SRS TCCR System Performance Attributes

Attribute	Feature
Engineered mobile enclosure	Provides treatment portability
Modular design	Major components in the enclosure are removable
Pre-filtration	Reduce insoluble solids and prolong bed life
5 gpm minimum processing rate	Rate selected to balance size, cost, schedule
Decontamination factor ≥ 1000	DF necessary to not impact disposal
Multiple IX columns	Flexibility for continuous processing
Column design	Balance size, shielding, heat load
Integral column shielding	Reduces column rad rates to 5 mrem @ 30 cm
Post-IX filtration	Retains resin, fines within system
Onsite interim storage for 10 years	Allows development of alternatives and implementation of disposition pathway

WRPS evaluated a tank side cesium removal system to deliver pretreated LAW solution to the LAW Vitrification Facility by December 2021. The TSCR unit to the extent possible would be used to remove cesium from supernatant stored in the Hanford site 241-AP tank farm as shown in **Figure 2**. WRPS defined upgrades to the tank farm infrastructure needed to deploy the tank side cesium removal system. When spent, the shielded ion exchange columns can be flushed with caustic solution and water, disconnected and placed on a concrete pad for storage, similar to the cesium/strontium capsules placed into vertical concrete casks.

The use of a non-elutable ion exchange media such as CST in the Hanford tank side cesium removal unit will not return ^{137}Cs nor add chemicals to the waste stored in the DST system. CST is chemically stable in alkaline waste solutions such as the supernatant or dissolved saltcake stored in the Hanford site double-shell and single-shell tanks [6]. CST was used to treat alkaline wastes at Oak Ridge National Laboratory and contaminated waters at the Fukushima Daiichi nuclear power station. Small-scale laboratory tests have been performed with CST and Hanford site supernatant and dissolved saltcake solutions. Savannah River Site has performed similar bench-scale tests with CST, as well as scaled demonstrations with a test column, with SRS wastes. SRNL personnel used the available CST test data to update a model to predict column performance at large-scale using the three sites' data, including Hanford site supernatant and dissolved saltcake solutions [9].

5.2 Review of Proposed Alternate Treatment Approach

The review team reviewed the tank side cesium removal unit proposed by WRPS. The review team also considered alternative cesium removal technologies such as the SRS utilized caustic side solvent extraction process, but considered these alternate processes as unlikely to have pretreated LAW feed ready for delivery to the LAW Vitrification Facility by December 2021. The review team members concur that deployment of the TSCR unit should result in having pretreated LAW feed ready for delivery to the LAW Vitrification Facility by December 2021.

The SRS will be deploying TCCR in mid-2018. This allows WRPS to leverage results from TCCR in the final design of the TSCR system. WRPS can initiate pre-conceptual design immediately based on the TCCR design. WRPS can finalize design / initiate procurement following SRS demonstration of the TCCR. This allows TSCR unit commissioning and operations to begin by the end of 2020 to pretreat feed solution prior to the end of 2021.

5.3 Risks Associated with Proposed Alternate Treatment Approach

As identified by the review team, there are several risks associated with the alternate treatment technology (i.e., TSCR).

SOLE SOURCE FOR MEDIA

Similar to sRF, CST is currently only available from a single supplier. It is recommended that CST tests are performed with Hanford supernatants to ensure applicability of the IX media to Hanford wastes, and to expand testing to include other commercially available IX media.

DEPLOYMENT SCHEDULE

The TCCR functionality requirements may not be aligned with providing feed for LAW Vitrification. As such, it is recommend that a review of the TCCR design be completed to identify any potential gaps in its ability to meet the feed performance requirements, and to determine and identify required interfaces with AP-Farm for consideration in the TSCR design. Additionally, it would be beneficial to perform contact testing of the Tank AP-107 supernatant with CST as soon as reasonably practical to understand column loading impacts.

It is recognized that the permitting strategy and duration may ultimately drive the implementation date associated with TSCR. It is recommended that DOE work with the State of Washington to develop and implement a RCRA and Clean Air Act permitting strategy, including exploring the possibility of designating TSCR as a temporary Research, Development and Demonstration (RD&D) project pursuant to the Washington State Dangerous Waste regulations, WAC 173-303-809. It is also recommended that TSCR utilize TCCR design information, recognizing that there may be required modification to the design.

Another risk associated with deployment of the TSCR is acceptance of a safety basis for the unit. The TSCR team should coordinate review of the TCCR safety basis documentation at the Savannah Rivers Site and seek to adopt the TCCR safety basis with minimal modification to meet Hanford site-specific conditions. Contact testing of the Tank AP-107 supernatant with CST would also be beneficial in providing information related to column loading in support of safety basis development.

REGULATORY ACCEPTANCE

The disposition pathway for spent ion exchange media for Hanford is not defined. It is recommended to seek concurrence by the State of Washington and stakeholders for a similar approach to that planned by Savannah River Site: Interim Storage with future feed of media to HLW Vitriciation facility or other suitable disposal site. NOTE – Since the previous alternatives analysis was completed, the Hanford Site is proceeding with a project to dry store cesium/strontium capsules in vertical concrete casks. This is analogous to the Interim Storage approach at the Savannah River Site.

6.0 OPTIMIZE LOW-ACTIVITY WASTE PRETREATMENT SYSTEM

Section 4.0 introduces the concept of an optimized LAWPS project with a reduced scope, as part of a proposed integrated approach enabled by the use of TSCR for first feed to DFLAW. This section summarizes the scope and strategy for an optimized LAWPS with the primary objective of reducing the TPC within the original CD-1 cost range.

The LAWPS design currently consists of a cross flow filtration system to separate entrained solids, which may contain strontium-90 and transuranic radionuclides, from the supernatant. The filtered supernatant is processed through lead and lag ion exchange columns containing spherical resorcinol formaldehyde (sRF) resin to separate cesium-137 (^{137}Cs). The pretreated supernatant is collected in a treated waste delay tank. The ^{137}Cs activity in the pretreated supernatant is measured using an in-line radiation detection unit as the pretreated supernatant is pumped from the delay tank to one of three, 124,000 gallon capacity lag storage tanks. The ^{137}Cs (and other cations) loaded onto the sRF resin in the ion exchange columns is eluted using 0.45M nitric acid solution, with the eluate collected in a 35,000 gallon capacity cesium product tank. Regeneration of the sRF resin is accomplished by passing water and dilute sodium hydroxide solution through the ion exchange columns with the regeneration solutions also collected in the cesium tank. Sodium nitrite solution and additional sodium hydroxide solution are added to the cesium tank to meet corrosion prevention specifications for the double-shell tank system. The chemically adjusted cesium solution is periodically transferred from the cesium tank to a DST.

6.1. Proposed Optimized LAWPS Design Approach

The proposed optimized design approach focuses on 4 major initiatives:

SCOPE REDUCTIONS

Several opportunities were identified that provide significant reduction in the LAWPS scope. Examples of major scope reductions are:

- Deletion of Cross Flow Filtration – In the current design Cross Flow Filtration is driving one of the major safety concerns, high pressure spray leak release. The requirement for a CFF is being driven by DFLAW ICD-30, which restricts undissolved solids being delivered to DFLAW. This is implemented in ICD-30 by requiring 0.1 micron filtration and has driven the LAWPS design to include a 0.1 micron CFF filter. The review team challenged this feature of DFLAW ICD-30 as it was not apparent why this limitation was required for LAWPS. Initial responses from ORP indicate that it should be possible to remove this requirement but this needs confirmation from the WTP team. Discussions were held with BNI and it appears that relaxation of the requirement for a 0.1 micron filter is possible. For the purpose of proceeding with optimized LAWPS, the primary assumption is that the DFLAW filtration requirement will be relaxed; however, in the event that this is not possible the fall back is that any necessary filtration to meet the DFLAW ICD-30 will be carried out in tank farms prior to LAW Vitrification Facility transfer.

- Deletion of Lag Storage – The proposed use of Tank AP-106 as the DFLAW feed staging and delivery tank eliminates the need for lag storage and feed sampling, etc. in LAWPS. However, the impacts on DST space availability and the SST retrieval strategy by

dedicating Tanks AP-106 and AP-107 as feed tanks needs to be addressed as part of overall RPP mission planning.

- Deletion of DFLAW Transfer Lines – The integrated approach provides the opportunity to make use of existing transfer lines, at least for the initial feed to DFLAW. This should reduce the need for dedicated LAWPS transfer lines; however, it will not eliminate the need for dedicated lines between LAWPS and the AP tank farm. This needs further analysis as part of the optimized LAWPS design.

OPTIMIZED SAFETY STRATEGY

The proposed optimized safety strategy is primarily enabled by the scope reductions discussed above which result in important changes such as decreased material at risk and lower processing pressures (see summary list of proposed optimized safety strategy in **Table 5**). By controlling loading on the IX columns, radiological consequences to the collocated worker are reduced below the thresholds of concern. This allows for an efficient and cost-effective set of controls to be identified for the remaining in-facility worker hazards that the review team considers to be consistent with applicable requirements. The revised control set includes an SDC-2 facility structure and no longer requires the standby tank exhauster system (STES) and permanent ash filter system.

Table 5. Summary of Proposed Optimized Safety Strategy

Hazard	Control Strategy
IX Overheat/Spray (radiological – 100 m)	• Product Inventory Management System (SDC-3 located outside facility - no II/I)
Spray (radiological/chemical – in-facility)	• Locate waste piping below grade in cells • Reduce operating pressure • SAC to not operate without cell covers in place
Exposure from Misrouted Transfers (radiological/chemical – in-facility)	• Double block and bleed valves
Hydrogen Explosion (physical – in-facility)	• Portable ventilation or nitrogen purge (TOC precedent) • WTP HPAV analysis for pipe - <4" no shrapnel (WTP precedent) • Becht analysis for IX column and TWDT – no shrapnel (WTP precedent)

DEFINED DESIGN

One of the major cost drivers in the current LAWPS design is the ambiguous requirement for built-in flexibility for future potential requirements. The review recommended moving forward with a clearly defined design specification to preclude scope creep, including use of a non-elutable IX media pending a cost, risk, and feasibility evaluation recommended to be directed by DOE. The use of non-elutable IX media would reduce risk to the project by avoiding Cs returns to the Tank Farm. Further, this approach results in adsorption of Cs onto a stable, solid IX media, and includes inspectable storage of robust canisters of this material in a substantially safer configuration relative to storing Cs as a liquid.

There was some discussion regarding a potential move to caustic side solvent extraction but the review team considers the use of IX to be viable under the proposed safety strategy and concluded that further options analysis would not be warranted unless unexpected changes to the

proposed safety strategy drive elevated costs beyond the DOE CD-1 target range. There was also consideration of reduced throughput requirements, especially with the decision to provide TSCR for the initial start-up. The review team endorsed the current throughput requirement for the optimized LAWPS at 1,600 MT of sodium per year.

SCHEDULE

The current LAWPS is a schedule driven contract trying to meet an unrealistic start-up date. The consequence of this is significant upward cost pressure. Lack of time to challenge design and safety basis conservatism, lack of time to appropriately value engineer the project, aggressive construction techniques (e.g., rolling 4 x 10's schedule 7-days per week), and close coupling of related activities also significantly increase the schedule risk which is reflected in increased management reserve. The introduction of TSCR for initial feed takes LAWPS off the critical path for DFLAW feed and provides the opportunity to plan and execute the project in a more cost-effective manner commensurate with the DOE-defined cost target to remain within the original CD-1 cost range.

6.2.Review of Proposed Revised LAWPS Execution Approach

WRPS has been requested to develop a new facility design specification reflecting the optimized design approach discussed in Section 6.1 and to develop a cost and schedule rough order of magnitude (ROM) estimate based on the current project execution approach by mid-November. The review team acknowledged that removing the extremely aggressive schedule constraint of a 2021 startup date from the optimized LAWPS project provides the opportunity to develop an alternative project execution approach, which is expected to result in significant reduction in cost.

Once the LAWPS project team has developed a revised facility design specification and ROM estimate based on the current strategy, the review team believes it is imperative that ORP and WRPS explore alternate Project Execution strategies including potential Engineering, Procurement, and Construction (EPC) approaches to drive further cost reductions. ORP and WRPS need to carry out this revised project execution analysis and provide a recommendation to DOE- HQ prior to proceeding with the optimized LAWPS design, procurement, and construction.

6.3.Timing of Key Attributes of Revised LAWPS Approach

To maintain LAWPS project continuity and momentum, ORP needs to provide direction to the LAWPS project team to pivot to the new execution strategy as soon as possible.

The major focus is to develop the revised facility design specification and direct the LAWPS project team to develop the revised design concept to underpin a ROM estimate and schedule by mid-November based on the current execution strategy. In parallel with developing the design and estimate, ORP and WRPS need to consider potential alternate execution approaches targeted at driving further cost reductions with the objective of providing DOE-HQ with a revised project execution plan focused on the most cost-effective approach for delivering the optimized LAWPS project.

7.0 INTEGRATED OVERALL NEEDS AND APPROACH

Considering the proposed integrated approach, the following sections outline key direction and decisions required by DOE, fundamental changes to the approach, and concurrence by key stakeholders that will be needed to capitalize on the revised approach to feeding DFLAW.

7.1 Direction / Decisions Required to Support the Integrated Approach

Several key DOE decisions and directions are needed to initiate and execute changes to the LAWPS strategy and project.

COMMUNICATION STRATEGY:

- **Recommendation:** A two-phased strategy including TSCR for early LAW feed along with an optimized LAWPS capital project for permanent LAW feed capability is a key and substantial change to the current baseline. A clear and immediate communication strategy is needed to support decision making, contractor direction, and successful rollout of a revised LAWPS plan to DOE, contractors, regulators, and stakeholders, and tribes.

DECISION TO PROCEED/CONTRACTOR DIRECTION;

- **Recommendation:** The timely decision to move to a two-phased strategy and subsequent contractor direction is needed, and should include:
  - Decision and direction to initiate planning and execution of a TSCR Treatment project from Tank Farm operations funding as a First Feed Option for supplying feed for DFLAW [ORP to WRPS]. Key attributes and requirements of the TSCR direction should include:
    - Adaptation of the existing SRS TCCR design and lessons-learned to develop a conceptual design approach for treatment of Tank AP-107 supernate using a TSCR system
    - Project design, procurement, installation and operations of the TSCR to support staging of decontaminated supernate feed to DFLAW by 2021, including Cost Estimate and required operational funding profile
  - Decision and direction for WRPS to change its current baseline to accommodate the revised approach proposed in **Figure 2** (i.e., dedicate Tank AP-107 to TSCR/LAWPS feed and dedicate Tank AP-106 to LAW Vitrification Facility feed staging and delivery). This may require additional RPP mission assessment and re-prioritization of other tank farm activities (e.g., DST space management and SST retrievals, etc.).
  - Decision and direction to optimize LAWPS requirements to support a decision to proceed with a revised system design that is within the CD-1 cost estimate. Key attributes and requirements of the LAWPS direction should include:

- Development of revised system requirements as outlined in Section 6 and including confirmation of revised KPPs leading to a decision point for development of a revised LAWPS design.
- Development of a revised cost estimate, and overall schedule, and alternate execution strategy leading to revised project scope and direction.
- Development of options to enable an elutable/non elutable selection for the IX column media.

KPP REVISIONS:

- **Recommendation:** Successful execution of the two-phased strategy requires revision and DOE confirmation of several key KPPs that impact TSCR and LAWPS design assumptions. Specifically:
  - Revise the current KPP DFLAW ICD-30 LAW Vitrification Facility criteria for 0.1 micron pore size filtration that is driving ultrafiltration capability and corresponding cost and safety implications.
  - Remove facility flexibility that add unnecessary cost and ambiguity to the LAWPS.

SAFETY STRATEGY:

- **Recommendation:** The two-phased strategy for LAW pretreatment is predicated on a safety strategy for both LAWPS and the TSCR implementation. Finalization and DOE approval is critical to:
  - The LAWPS design, including implementation of key safety features within the existing tank farm documented safety analysis.
  - Collaboration between DOE-SR and ORP in translating the safety strategy and lessons learned for the SRS TCCR to the TSCR.

National Environmental Policy Act COVERAGE:

- **Recommendation:** An assessment of the applicability of the National Environmental Policy Act (NEPA) to the revised two-phased strategy rand delineation of any actions that will have to be taken under NEPA to provide appropriate coverage for project execution.

REGULATORY STRATEGY AND SUPPORT:

- **Recommendation:** Implementation of TSCR to support first feed requires key support and collaboration with regulators to address RCRA and air permitting for the TSCR system, and dry storage of Cs-loaded media. Each of these areas represent potential schedule and regulatory obstacles that could take a significant amount of time to overcome. Fortunately, there are several lessons learned and project attributes that provide encouragement that regulatory hurdles can be overcome. Specifically,
  - Pursuing a RCRA demonstration permit for the TSCR should be viable based on experience gained previously. The Washington State Department of Ecology was a proactive partner and advocate for implementation of a RCRA RD&D (WA

7890008967) permit of the Demonstration Bulk Vitrification System for tank waste treatment from 2004 – 2007 [10].

- Following the SRS TCCR model, TSCR should be implemented within the current Tank Farms operations and upgraded AP Tank Farm ventilation system and air permit.
- Dry storage of Cs-loaded media provides a temporary solution, at least enabling first feed to meet regulatory milestones. Several plausible disposition paths are available for the Cs-loaded media that should alleviate regulatory concerns.
- Expand the negotiations with Ecology to include the potential to move to non-elutable IX media for LAWPS and the impacts of Cs-loaded media being stored beyond the initial TSCR requirements.

7.2 Project Execution / Oversight Enhancement

Implementation of the tank waste pretreatment function will be a multiple year activity. As noted in Section 4.6, the TSCR should be capable of providing pretreated feed to the LAW Facility by December 2021. An optimized LAWPS project/capability is needed to provide continuing feed capability for the LAW Facility and optimize the tank waste treatment mission.

The independent review team evaluating LAWPS was comprised of senior technical and management personnel from AECOM corporate, national laboratories, and other DOE contractors with extensive nuclear project experience. The individuals were able to collectively bring to bear on this effort, a high-level of expertise based upon their involvement with a range of nuclear projects, with a focus on DOE tank waste pretreatment and treatment activities and facilities. The benefits of utilizing such a diverse group of experts to provide an independent review function had been previously demonstrated in early Construction Project Reviews of major EM tank waste projects, including the WTP and the Salt Waste Processing Facility. The benefits were determined to be particularly valuable if the same individuals were members of subsequent reviews, since they were familiar with the projects and were able to apply their experience to evaluate whether expected progress had been made or assist with recommendations to address issues.

Similarly, a cadre of members with a diverse experience from across the DOE contractors is proposed to serve on a continuing basis in a similar function, but more focused on the engineering, procurement, and construction aspects of the two-phased approach. This cadre would have some ownership for the success of TSCR and LAWPS by providing periodic technical evaluation of both activities. The President, WRPS, working with the ORP LAWPS Federal Project Director (FPD), will identify opportunities for their engagement. Expected activities or project events warranting engagement include pending increases in project scope, changes in project requirements (e.g., new DOE directives, or changes in safety requirements driven by revised DOE Technical Standards). Other opportunities for engagement by the team might include dry-runs for design reviews, (e.g., 60% design review, independent cost estimate determinations, or development of safety basis strategies).

The team will provide recommendations, jointly, to the WRPS President and the ORP LAWPS FPD on issues that the team believes could jeopardize either meeting established milestones or trends that indicate appreciable escalation of costs and potential solutions to these issues. These recommendations will be shared with the Director, Special Projects Office.

8.0 SUMMARY OF CONCLUSIONS

Based on document reviews and two days of presentations from the LAWPS project team, the review team concluded that the existing LAWPS design, driven by the current Key Performance Parameters (KPPs) and constrained by the approved Code of Record, could not be completed in time or within budget. The current success-based schedule shows CD-4 for the LAWPS in August of 2022 (or as late as April 2025 with schedule risk), and a total project cost (TPC) of about $790M (including management reserve and DOE contingency and other direct costs). It was also evident that even with optimization of the current LAWPS design to substantially reduce cost while still supporting the mission, it would be impossible to meet the 2021 target date for feed supply because of the re-design burden and the time it would take to implement all the enabling actions discussed in this report.

The review team endorsed an alternative approach using a two-phased pretreatment strategy involving a complementary, "first feed" pre-treatment technique to achieve the 2021 deadline, and an optimized LAWPS as a necessary long-term pretreatment capital asset for production of LAW Vitrification feed (see **Figure 2**). The first feed pretreatment technique, called the Tank-Side Cesium Removal (TSCR) system, would utilize a demonstrated (at Fukushima) non-elutable IX media for Cs removal. The review team believes that this system, already nearing deployment as a demonstration of a similar application at the Savannah River Site (SRS), could be quickly adapted to Hanford waste and operating in time to provide first feed. The TSCR system would operate as a research and development project producing first feed while WRPS completes design, construction, and commissioning of an optimized version of the LAWPS. In this way, the LAWPS capital project can be delivered in a cost-effective manner that is not unduly driven to expensive execution strategies to meet an aggressive 2021 contractual date associated with Amended Consent Decree milestones for DFLAW. The LAWPS project schedule can then be aligned with the actual processing needs of the overall River Protection Project which the review team considers to be reasonable and achievable.

The optimized LAWPS facility would then provide a permanent, hard shell asset for feed production during the life of WTP operations. It is recommended that an approach preferentially reliant on non-elutable media be pursued to avoid Cs returns to the Tank Farm, which reduces risk to the project. Additionally, this approach results in adsorption of Cs onto a stable, solid resin, and inspectable storage of robust canisters of this material in a substantially safer configuration relative to storing Cs as a liquid. Should this approach drive disproportionate cost or risk through additional design and construction expenditures, supply chain risks, or market pricing volatility, then a decision to eliminate the non-elutable IX media approach may need to be made, and a path forward incorporating an elutable IX media may be warranted (see DOE enabling actions, below). The review team believes that with the enhancements suggested in this document, the new LAWPS facility would reach CD-4 for a cost that is within the approved CD-1 capital cost range.

An optimized version of the LAWPS differs from the present 60% design concept in the following key ways:

- A scheme for double-shell tank (DST) utilization establishes Tank AP-107 as the dedicated feed tank for both TSCR and LAWPS and also sets Tank AP-106 as the dedicated DFLAW feed and waste characterization tank deleting the need for the three new lag storage tanks and most of the transfer lines currently in the current LAWPS design. This appreciably reduces the material at risk (MAR) inventory in the facility.
- Clarification of the facility KPPs enables removal of the high pressure filtration system and equipment which significantly reduces key accident scenario consequences. This enables subsequent reductions in the facility seismic design criteria from SDC-3 to SDC-2, or even SDC-1 in some cases.
- Leveraging cost-effective control strategies previously accepted for other site facilities enables a more efficient, yet robust, ventilation and flammable gas control approach.

TSCR's utilization of a non-elutable IX media assumes that pad storage of spent media is acceptable for temporary operation (see DOE enabling actions, below). The more permanent LAWPS would be optimized to manage the cost through incorporation of the features listed above, and would require a redesign enabled by fundamental changes in the existing paradigm.

In order to enable this proposed approach, the following DOE actions are required:

- Based on preliminary cost screening information to be provided by WRPS, provide direction to WRPS to proceed with TSCR project planning and execution, including IX media testing on Hanford waste to verify design, TSCR procurement and safety document preparation, and tank site preparation for TSCR, and parallel redesign of an optimized version of LAWPS. Utilize a streamlined approach for LAWPS redesign based on the new project execution strategy, considering alternatives such as accelerated re-specification followed by external Engineering, Procurement, and Construction (EPC) design/build estimates. The streamlined approach should consider removal of cross flow filtration, lag storage and much of the new transfer line scope from the LAWPS Project, considering the revised flow paths as outlined in **Figure 2**.
- Direct WRPS to analyze the impacts on the current tank farm baseline of making the changes proposed in **Figure 2** (i.e., dedicating Tank AP-107 as the TSCR/LAWPS feed tank and Tank AP-106 as the dedicated DFLAW feed tank). This analysis to include impacts on DST space and the current single shell tank (SST) retrieval strategy. Provide ORP with a report of this analysis and a proposal for any needed changes to the WRPS baseline.
- Provide direction to WRPS to proceed with a cost, risk and overall feasibility evaluation of elutable versus non-elutable resin for the LAWPS facility, considering mission level impacts on the cost of each option. Utilize this evaluation to provide direction on a design strategy for the LAWPS project in support of revising the LAWPS specification.
- Work with the State of Washington to develop and implement a RCRA and Clean Air Act permitting strategy including exploring the possibility of designating TSCR as a

temporary research, development, and demonstration (RD&D) project pursuant to the Washington State Dangerous Waste regulations, WAC 173-303-809. Ensure the acceptability of pad storage of spent TSCR IX media as a means of lowering risk by reducing the potential mobility of Cs in the environment (i.e., by moving from soluble Cs to Cs captured on a stable inorganic IX material in a dry, inspected configuration), and by holding to contractual dates for initiation of LAW glass production by 2021, ahead of the Amended Consent Decree milestone of December 2023.

- Simultaneously develop a permitting strategy for the LAWPS which facilitates long-term efficient operation and leverages agreement for pad storage of spent inorganic IX media. This action would include seeking approval for a Waste Incidental to Reprocessing evaluation determination in accordance with DOE Order 435.1. *Radioactive Waste Management* and pursuing final disposal pathways, to include those Greater-Than-Class-C waste forms to an appropriately licensed waste disposal site as a long-term disposition strategy.
- Develop a funding strategy for TSCR, and include in the regulatory discussions outlined above any impacts to other tank farm operations (e.g., retrievals) necessary to proceed with TSCR as an expense funded operation.
- Revise wording in section 2.3 and Table 5 of Interface Control Document (ICD)-30 associated with the use of a 0.1 micron filtration system for treating LAW feed to reflect the use of a 10 micron filter. The 0.1 micron wording was an unnecessary artifact of the WTP Pretreatment system, and the revised criteria will protect the associated criticality controls for plutonium particles in the Criticality Safety Evaluation Report for Direct Feed LAW
- Eliminate the ambiguous KPP for facility flexibility, which begs debate about how much flexibility is adequate and has the potential to add cost.
- Work hand-in-hand with WRPS to efficiently adapt the SRS nuclear safety strategy to a Hanford TSCR, as well as developing a streamlined safety design strategy for an optimized version of LAWPS.
- Sustain a review body (similar to the cross-functional review team comprised of various DOE contractors that completed this LAWP review) as a means of EM-1 staying personally engaged in the implementation of the accelerated dual path, and as a means of ensuring that issues for which DOE action is needed are visible and communicated in a timely manner.

Table 6, below, provides a summary of the review team's assessment of the various charge letter attributes based on the current design's ability to meet EM's primary goals (first feed by 2021 and a capital investment within the CD-1 cost range), versus an anticipated result from implementation of the recommended approach using TSCR and an optimized LAWPS.

Table 6. Review Team Assessment of Charge Letter Attributes

Charge Letter Attributes	Current State[1]	Future State[2]	Comments
Results in the delivery of a tank waste pretreatment capability within the Critical Decision-1 cost range	●	●	In the opinion of the team, the recommended approach can bring cost back into the CD-1 cost range based on revised requirements and scope.
Results in the delivery of LAWPS by 2021	●	●	Delivery schedule for LAWPS Facility will not support DFLAW hot commissioning need date; but deployment of near-term, complementary treatment technology will meet the timing needs.
In addition to evaluating achievability of delivery of LAWPS by 2021 and evaluation of options to accelerate completion of the LAWPS project to the maximum extent practical, evaluate complementary alternatives that could be deployed to provide some near-term tank waste pretreatment capability for feed to LAW	○	●	A technically mature waste treatment capability has been identified. This near-term available capability is currently being demonstrated at the Savannah River Site. Hanford deployment will result in delivery of suitable feed stock to support the timing of DFLAW commissioning.
Evaluate DOE-directed functional performance requirements, along with Key Performance Parameters for efficacy, based upon their role in driving cost and schedule risks for LAWPS delivery	●	○	Yellow based on adoption of following KPP change: • The implementation of ICD-30 requirements related to the use of a 0.1 micron filtration system results in a series of accident scenarios with consequence driving specifications of excessive design requirements (e.g., SDC-3). Green based on adoption of ICD-30 requirement changes and the following KPP change: • Specification of undefined "flexibility" objectives which have potential to drive cost
Engineered controls and adoption of standards should be commensurate with the hazards so as to minimize unnecessary requirements	○	●	Yellow because preliminary safety calculations drove conservative controls for the existing design, which were not revisited after the design advanced; green considering success on previous KPP; build off of SRR safety basis for TSCR.
Evaluate appropriateness of Hazard Categorization and Seismic Design Criteria designations	●	●	No actions; evaluation and controls were commensurate with requirements.
Evaluate the necessity for the breadth of LAWPS operating envelop	●	●	Throughput was consistent with need.
Identify those remaining key decisions which are hampering progress or are creating cost and schedule risk (i.e., use of eluteable or non-eluteable separations media)	○	○	See Section 7.1; Item COMPLETE.
Considers the previous but simplified design iterations	○	○	See Section 6.1; Item COMPLETE.
Preserves existing design elements to the extent practical	○	○	See Section 6.1; Item COMPLETE.

[1] The current state rating is relative to the External Expert Review Charge Letter objectives of delivering a waste pretreatment capability within the Critical Decision-1 cost range and delivery of LAWPS by 2021.

[2] The future state considers successful execution of the recommendations and approach contained within the External Expert Review report.

○ Scope deemed to be outside the scope of the original LAWPS project, and therefore could not be compared relative to the objectives of the External Expert Review Charge Letter.

● Evaluation of project in its current / proposed state does not adequately meet the objectives of the External Expert Review Charge Letter.

○ Evaluation of project in its current / proposed state may be improved to more satisfactorily meet the objectives of the External Expert Review Charge Letter.

● Evaluation of project in its current / proposed state satisfactorily meets the objectives of the External Review Charge Letter.

A generic, high-level schedule detailing key activities associated with the proposed, integrated approach to feeding DFLAW is shown in **Figure 3**.

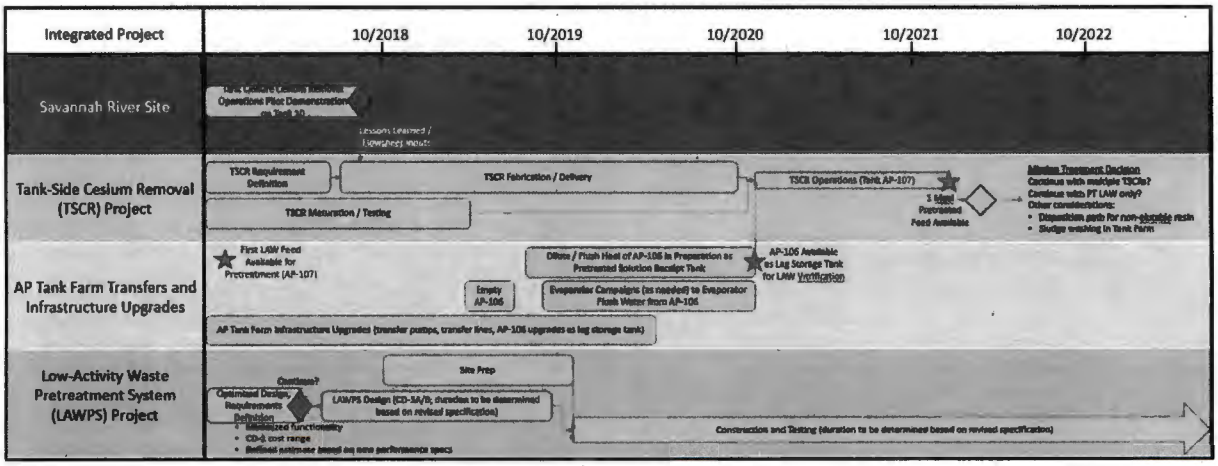


Figure 3. Review Team Proposed Integrated Approach

From the initial analysis, the review team believes that the integrated approach provides an economical platform to proceed with a TSCR approach for initial DFLAW feed treatment and staging to meet the 2021 target date, and provides the opportunity to reduce the scope of an optimized LAWPS at a TPC within the CD-1 cost range. WRPS/ORP needs to develop this concept to ensure that it is deliverable within the time frames proposed, that the TSCR deployment and transfer line upgrades are affordable within the Tank Farm operational budget, and that the impacts of these changes do not unacceptably impact other tank farm priorities.

It is recommended by this review team that ORP direct WRPS to develop this integrated concept immediately, giving contract direction to initiate this change.

9.0 REFERENCES

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[2] J. E. Filip and F. Aguilar, "Low Activity Waste Pretreatment System (LAWPS) Project (T5L01) Project Execution Plan," RPP-PLAN-57106, Rev. 2, 2017.

[3] "Low Activity Waste Pretreatment System Total Project Cost Report," WRPS-1604740, Rev. 2, 2017.

[4] "LAWPS Review," TOC-PRES-17-4675, Rev. 0, 2017.

[5] "Support Documentation for LAWPS Review," WRPS-16410, Rev. 0, 2017.

[6] J. Reynolds, "Low-Activity Waste Pretreatment System Alternatives Analysis Summary," RPP-RPT-58066, Rev. 1, 2014.

[7] T. B. Caldwell, "Tank Closure Cesium Removal (TCCR) System," X-SOW-H-00002, Rev. 2, 2015.

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[9] L. L. Hamm, T. Hang, D. J. McCabe and W. D. King, "Preliminary Ion Exchange Modeling for Removal of Cesium from Hanford Waste Using Hydrous Crystalline Silicotitanate Material," WSRC-TR-2001-00400, 2002.

[10] "Permit for Dangerous and or Mixed Waste Research, Development, and Demonstration," Permit No.: WA 7890008967, December 13, 2004.

Appendix A - Review Team Biographies

John Eschenberg – AECOM (Team Lead)

John has over twenty-five years of industry experience in a variety of highly regulated defense, commercial, and government settings. He has demonstrated achievement in leading (as the owner) the execution of large value environmental cleanup project portfolios, nuclear facility operations and multi-billion dollar, first-of-a-kind, construction projects. John has a proven ability to build long-term relationships with internal and external stakeholders by establishing a high level of confidence and trust throughout the duration of some of the largest and most complex construction projects in the U.S. He is currently leading site-level infrastructure and plant integration efforts required to put a $2B supplemental waste processing facility into operating service at the Savannah River Site. Before joining AECOM, he worked as Director of Capital Projects and Infrastructure for PricewaterhouseCoopers, LLP where he was leading the firm's third-party advisory efforts for new nuclear plant construction both domestically and internationally. He was also responsible for leading several advisory efforts for capital projects related to nuclear plant decommissioning, license transfer, dry fuel storage campaigns, and independent spent fuel storage installations. John spent part of his career as a Senior Executive within the DOE while playing a lead role in managing large federal investments in science, national security, and environmental remediation. He earned a Bachelor of Science degree, Summa Cum Laude, from the University of Maryland, is a graduate of the Federal Executive Institute in Charlottesville, Virginia, and the Executive Management Program at Massachusetts Institute of Technology.

Greg Ashley – Bechtel Corporation

Greg Ashley is a Senior Vice President and Corporate Manager of Engineering and Technology. In this role, he is responsible for the oversight and management of the company's global engineering and technology functions, Bechtel Fellows and Distinguished Engineers and Scientists program. During his 35 years of management experience in the commercial and government sectors, Greg has led high-performance teams on some of the world's most challenging and complex projects. He is a senior vice president of Bechtel Group, one of a small number of executives who currently hold that top-level position in a company of 52,700 employees.

Greg was previously Bechtel's President of the global nuclear power business. Prior to that he was Bechtel's Technical Director for the Department of Energy's Waste Treatment Plant (WTP) Project at Hanford. In this role he had overall responsibility for the technical design development of this complex process facility. In addition, he has specific technical expertise in the areas of structural design, including seismic design, and structural dynamics. He has represented commercial nuclear utilities during the licensing process as the technical expert representing the structural basis of design. He has been the principal reviewer for completion of the Individual Plant Examination for External Events (IPEEE) for a number of nuclear power facilities. He has developed technical methodologies for consideration of complex hydrodynamic post-LOCA loads in the suppression pool of Boiling Water Reactors (BWRs). These

methodologies were confirmed by test and subsequently utilized in the designs to increase the post-LOCA ECCS reliability of over seventy percent of the BWRs in the U.S.

Mr. Ashley is a registered professional engineer in Illinois, and a member of the American Society of Civil Engineers, American Society of Mechanical Engineers and the American Nuclear Society. He is a Six Sigma Champion and qualified in the Leadership in Energy and Environmental Design (LEED) program. He received his BS and MS in Civil Engineering (Structural and Geotechnical) from the University of Illinois and is a member of the Chi Epsilon civil engineering honorary fraternity.

Tom Brouns – Pacific Northwest National Laboratory

Tom Brouns is a senior program, project, and business development manager with more than 30 years of experience developing and managing large research, development, and demonstration projects and programs involving government, industry, research, and university partners. Mr. Brouns is a chemical engineer with extensive technical and management experience in the disposition and remediation of chemical and nuclear waste, including processing, disposal, and subsurface cleanup. Since joining Pacific Northwest National Laboratory in 1987, his career includes more than 20 years as a leader of major science and technology programs for the U.S. Department of Energy's Office of Environmental Management and DOE's contractors, including the Tanks Focus Area, a national science and technology program supporting the processing and disposition of DOE's radioactive tank wastes at Hanford, Idaho, Savannah River, West Valley, and Oak Ridge sites; the Seismic boreholes project, which resolved uncertainties in the seismic design basis for DOE's Waste Treatment and Immobilization Plant; Hanford low-activity waste supplement treatment technology evaluation and down-selection program; and Research and field demonstration program for DOE's VOC-Arid Integrated Demonstration program, focused on subsurface environmental remediation technologies.

Mr. Brouns previously served as PNNL's lead for the Office of Civilian Radioactive Waste Management, supporting the submittal of the Yucca Mountain license application; the Hanford tank operations contractor, leading development of strategies and technologies for managing low-activity waste; and PNNL's entire portfolio supporting DOE-EM. Tom is currently serving as the PNNL Lead to the tank operations contractor program addressing tank vapors. Tom is a fellow of Waste Management Symposia, and serves as co-chair of the high-level radioactive wastes and spent/used nuclear fuel track. Mr. Brouns earned his bachelor's and master's degrees in Chemical Engineering from Washington State University.

Tom Burns – Parsons Infrastructure & Technology

Dr. Tom Burns is currently the Senior Vice President/SWPF Deputy Project Manager/Director of Engineering for Parsons Infrastructure & Technology, where he provides overall leadership and guidance for all aspects (Engineering, Procurement, Construction, Commissioning, and Operations) of the multi-billion dollar Salt Waste Processing Facility (SWPF) line item nuclear project with line responsibility for more than 850 personnel.

Prior to his current position, Tom has held positions as the Vice President/SWPF Director of Engineering leading all Engineering, Construction Support, and Nuclear Safety (E/CS/NS) activities for the Salt Waste Processing Facility project with direct line responsibility for more than 150 personnel (total Engineering budget greater than $400 M), Vice President leading multidisciplinary project team consisting of more than 40 project, client, and sub-contracted engineers and analysts in resolving all open regulatory safety issues regarding geotechnical, seismic and structural analysis and design for the multi-billion dollar Salt Waste Processing Facility (SWPF) line-item nuclear project, Vice President leading Parsons Risk Management program for baselining the multi-billion dollar SWPF line-item nuclear project, and Senior Program Director leading Parsons multidisciplinary technology development program in support of the DOE Advanced Remediation Technology initiative.

Prior to joining Parson Infrastructure & Technology, Dr. Burns held various positions as an Executive Engineer with MPR Associates, Inc., Site Representative and Technical Staff Specialist for the Defense Nuclear Facilities Safety Board, Adjunct Professor of Mathematics at American University, Nuclear Engineering Research Exchange Associate for the Commissariat a l'Energie Atomique in Cadarache, France, and a Nuclear Engineering Research Associate at Oak Ridge National Laboratory, Idaho National Engineering Laboratory, and University of Virginia. He holds a Bachelor's of Science, Masters of Science, and Doctor of Philosophy degrees in Nuclear Engineering from the University of Virginia.

Chris Burrows – Independent Expert

Dr. Burrows has 40 years of nuclear technology, engineering and project management experience spanning both the UK and the US which covers all aspects of the nuclear fuel cycle. He is a strategic thinker and has a lot of commercial experience both working with Government organizations in the UK and US and also a number of commercial organizations in the UK, US, Japan and Europe. He has been responsible for delivering a broad range of major, first of a kind, capital projects and has been through all aspects of the projects, from front-end conceptual design, through procurement, construction, commissioning to start of operations and handover to the client.

Dr. Burrows came to the US in 1998 as the Project Manager for the Hanford WTP Project and has held a number of Executive positions for British Nuclear Fuels Inc, British Nuclear Group America and Energy Solutions, including President of Energy Solutions Engineering and Technology Division. In 2008, he joined Washington River Protection Solutions as the Deputy Project Manager but also had responsibility for the Waste Treatment Plant Support, Strategic Planning and Technology.

In 2015 Dr. Burrows retired from his corporate role with Energy Solutions and set up an independent consulting company. In his consulting role Dr. Burrows has worked for a number of clients. He has been involved in major proposals and project reviews in the US, UK, China and the Middle East. Dr. Burrows is working as an individual subject matter expert and does not have any employees.

Richard Edwards – AECOM

Mr. Edwards is a Chemical Engineer with over 35 years of experience in the chemical and nuclear industries, with 23 years in management positions. He is currently managing the SRR Nuclear Safety and Flowsheet Integration Organizations and was previously the SRR Deputy Chief Engineer. At SRR, he previously served as the SRR acting Tank Farm Engineering Manager and the Project Engineering Manager for the Strategic Salt Processing Initiatives involving deployment of Small Column Ion Exchange processing capability and the ARP/MCU Life Extension program.

Before coming to SRR, Richard was the Chief Process Engineer for the Hanford Waste Treatment Project (WTP) where he managed the Process Engineering and Technology Department. Prior to the WTP position, he managed the Process Science and Engineering section within the Savannah River National Laboratory (SRNL). Other key management experience includes managing Process Engineering organizations at the Savannah River Site (SRS) DWPF vitrification facility during initial startup and radioactive operations; managing HLW Program Development, Integration, and Process Engineering Organizations; and managing the $70M+ SRNL R&D effort for pretreatment and vitrification of Hanford radioactive waste.

Mr. Edwards has a broad understanding of chemical processing technology, especially as applied to the treatment and disposal of nuclear waste, and has been active in technology development and exchanges in this area. He holds a Bachelor's degree in Chemical Engineering from the Georgia Institute of Technology and a Master's of Science degree in Chemical Engineering from the University of Tennessee.

Kent Fortenberry – AECOM

Kent Fortenberry is the Chief Engineer for Savannah River Remediation, where he manages, plans, and integrates all engineering services required to support the liquid waste work scope. He implements and manages programs for systems engineering, configuration management, and nuclear safety and fire protection; and provides engineering for operations support, including surveillance, maintenance, and system modifications and upgrades. He also has responsibility as SRR's Waste Disposal Authority.

Mr. Fortenberry has 35 years of experience in the design, licensing, operation, and safety oversight of both government and commercial nuclear facilities. He started his career as a nuclear propulsion design engineer at the Knolls Atomic Power Laboratory. He moved into commercial nuclear power with the Entergy Corporation, where he built a solid base of expertise, including plant operations as a licensed Senior Reactor Operator, nuclear fuels engineering, reactor physics, safety analysis, and licensing.

He also has previously worked for the Defense Nuclear Facilities Safety Board (DNFSB) where he was the agency's Technical Director, and with Parsons Corporation to provide technical services related to the design and construction of uranium processing, uranium enrichment, and high-level radioactive liquid waste treatment facilities. During this time, Mr. Fortenberry also directed Parsons' engineering activities at the DOE's National Energy Technology Laboratory.

He joined the URS Corporation in 2009, working on radioactive waste missions at both Hanford and Savannah River Site. In addition, he worked on URS corporate performance assurance and oversight to support safe and effective execution of nuclear activities across the DOE complex and abroad. From 2012 to 2014, Mr. Fortenberry served as Chief Engineer for the B&W Conversion Services DUF6 Project. At this project, he was responsible for engineering and nuclear safety, and achieved significant increases in sustainable processing rates and availability by executing design and nuclear safety basis improvements.

Connie Herman – Savannah River National Laboratory

Connie Herman has worked at the Savannah River Site since 1990 and in the laboratory since 1991. She started in the Pu-238 fabrication facility supporting production of space heat sources and then shifted to supporting the start-up of the Defense Waste Processing Facility through lab scale testing and qualification of the glass produced during qualification runs. She simultaneously supported the development of stabilization technologies for other radioactive and mixed waste streams. During a 2 ½ year assignment at Lawrence Livermore National Laboratory, she led the integrated laboratory team developing the ceramic fabrication process for disposition of excess plutonium. After this, she returned to SRNL to lead programs in chemical processing, investigation of alternative melter technologies, and management of the spectroscopy and materials characterization analytical development group and the research and development programs in support of the Defense Waste Processing Facility. She has worked with the Office of River Protection organization since 2013 to support HLW and Pretreatment Facility Technical Issue resolution and LAW Facility issues. Currently, Connie is the Director of the Wasteform Processing Technology section, where she manages the wasteform and feed processing competencies and EM research and development programs for the Hanford, Idaho, and Oak Ridge sites.

Mike Johnson – CH2M

Mike Johnson has 36 years of experience in research and testing, process engineering, fission product separations, and solvent extraction operations at DOE nuclear waste processing facilities. He managed research and testing activities for the Hanford Waste Treatment Plant (WTP) during conceptual design and preliminary design phases. He developed and patented a process for processing fissile material mixtures containing zirconium and / or carbon material (US patent no. 8,475,747 B1, July 2, 2013). Mr. Johnson has operated an ion exchange process for separating cesium from alkaline waste solutions and developed and operated an ion exchange process to separate strontium from alkaline waste solutions. Additionally, Mr. Johnson managed an engineering team responsible for plutonium recovery from wastes utilizing solvent extraction technology.

John Krueger – Atkins Nuclear Secured, LLC

John W. Krueger is the new Vice President in charge of DOE business development in the eastern United States for Atkins Nuclear Secured. Until recently, Mr. Krueger was serving as the Isotope Production Manager at Oak Ridge National Laboratory. During his tenure at Oak Ridge, Krueger also served as Pu-238 Supply Project Manager, and was assigned to DOE as the Federal

Project Director for the U-233 Disposition Project, where he was awarded two Secretarial achievement awards for re-engineering the project toward a more efficient path forward. Prior to that, Mr. Krueger served as Vice President and Pacific Coast Division Manager for Weston Solutions, Inc., and President and CEO of WESKEM, LLC, its subsidiary responsible for most of the waste management operations in Oak Ridge and Paducah in the early 2000s. His DOE experience also includes serving as the Waste Management Manager, and later Deputy Site Manager for the Mound Closure Project, Solid RadWaste Section Leader at Los Alamos National Laboratory, and Compliance Agreement Project Coordinator at the Rocky Flats Plant. John has a B.S. in Chemical Engineering from University of Nebraska – Lincoln, and an M.S. in Environmental Engineering and Science from Stanford University.

Ja-Kael Luey – Veolia

Mr. Luey is a Professional Engineer with Veolia. He has led design, fabricate, and operate projects for treatment systems deployed at the Fukushima Daiichi Nuclear Plant in Japan and projects in progress governed by the Nuclear Regulatory Commission (Cimarron, Oklahoma City) and the Nuclear Decommissioning Authority (Magnox, United Kingdom). When with AECOM, served as Technical Lead for design of processing facilities at Department of Energy sites that include Los Alamos (Radioactive Liquid Waste Treatment Facility) and Hanford (Demonstration Bulk Vitrification System, K-West Basin Annex Addition Project). Projects for the Department of Energy were per requirements such as DOE Order 420.1B Facility Safety and DOE Standard 1189 Integration of Safety into Design. Mr. Luey's background also includes research and development of waste treatment technologies while with the Pacific Northwest National Laboratory.

Paul Murray - AREVA

Mr. Murray has 37 years of continuous experience in the nuclear industry, including experience in Europe working on nuclear fuel cycle facilities, including reactor systems design /refurbishment, R&D related to Gen IV reactors/fuel, research, testing and commission of used nuclear fuel recycling facilities. He is currently the Senior VP for technology and strategy working primarily for US Government.

Paul relocated to the US in 1996 in order to provide leadership in the transfer of technology from the UK to the US to support government to government MOU and to build a sustainable and growing Research and Development business with the Department of Energy. While in the US, Paul continued as a senior consultant for UKAEA, BNFL, NDA, Karlsruhe, SOGIN and AECL in Canada, and supported Karlsruhe in their interactions with China.

Paul joined AREVA as the Technology Director for used fuel management and generation IV reactors before being promoted to SrVP. He currently sits on the Nuclear Energy Advisory Committee for DOE NE, is a member of the utility advisory panel for working with DOE and sits on the steering committee for CESAR.

Jason Vitali – Washington River Protection Solutions; AECOM

Jason Vitali has over 15 years of experience in science, engineering, and technology aspects of tank waste processing and technology development within the DOE complex. He is currently the Chief Technology Officer (CTO) for Washington River Protection Solutions (WRPS), the Hanford Tank Farm Operating Contractor. Jason manages all aspects of the CTO, including coordination with the National Labs, development of alternate retrieval and tank inspection technologies, maturation of the immobilized low-activity waste glass testing program, maturation of the tank vapor monitoring and detection system, and LAWPS technology maturation. Before joining WRPS, he worked for SRR in roles of increasing responsibility, including managing the DWPF Melter and Saltstone Engineering Group, managing the Flowsheet Development and Facility Integration Group, and managing the Closure Process Engineering Group. Jason holds a Bachelor of Science degree in Chemical Engineering from Clemson University.

OFFICE OF RIVER PROTECTION
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

NOV 0 2 2017

17-TF-0101

Ms. Katie A. Downing, Contracts Manager
Washington River Protection Solutions LLC
2425 Stevens Center Place
Richland, Washington 99354

Ms. Downing:

CONTRACT NO. DE-AC27-08RV14800 – THE U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION REQUEST FOR PROPOSAL FOR THE BALANCE OF PLANT WORKSCOPE TO OPERATE THE TANK-SIDE CESIUM REMOVAL TECHNICAL DEMONSTRATION

The purpose of this letter is to request Washington River Protection Solutions LLC (WRPS) to submit a contract change proposal for activities to support the tank-side Cesium removal (TSCR) capability technology demonstration. The activities to support the operations of the TSCR capability technology demonstration include:

- Procurement and installation of balance of plant equipment/materials at Tank AP-107 (e.g., pump, power upgrades, concrete pads, hose-in-hose transfer lines, jumpers, valves, support systems and infrastructure, etc.);
- Procurement and installation of hose-in-hose transfer line from TSCR to Tank AP-106;
- Repurposing Tank AP-106 to receive treated waste (e.g., transfers, sampling, caustic additions, evaporator campaigns and filtration, etc.);
- Installation, construction acceptance testing, start-up testing, and commissioning of TSCR; and
- Development of operations and maintenance procedures and training; and possible expansion of AP Farm.

Certified cost or pricing data shall be provided through Fiscal Year 2021.

WRPS is directed to transmit more detailed scope descriptions for all of the activities to be described in the contract change proposal as soon as practicable to facilitate improved delivery timing for the independent government cost estimates.

WRPS shall submit the contract change proposal in accordance with Federal Acquisition Regulation (FAR) 15.408, Table 15-2, "Instructions for Submitting Cost/Price Proposals When Certified Cost or Pricing Data are Required." WRPS shall ensure that certified cost and pricing data submitted meets the definition in FAR 2.101, "Definitions." The proposal shall provide adequate information to show clear entitlement to any adjustment in contract price.

NOV 0 2 2017

The contract change proposal shall be delivered to the U.S. Department of Energy, Office of River Protection no later than 120 calendar days following receipt of this letter. A not-to-exceed amount (NTE) of $5M is authorized upon receipt of this letter of direction. A contract modification for the $5M NTE will be prepared and submitted to WRPS at a later date.

If you have any questions please contact me at (509) 376-3388; or your staff may contact Jeremy Johnson at (509) 376-1866.

Wade E. Hader
Contracting Officer

TF:DMS

Attachment

cc w/attach:
J.E. Geary, WRPS
D. Scott, WRPS
G.T. Wright, WRPS
WRPS Correspondence

OFFICE OF RIVER PROTECTION
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

OCT 0 4 2017

17-TF-0085

Ms. Katie A. Downing, Contracts Manager
Washington River Protection Solutions, LLC
2425 Stevens Center Place
Richland, Washington 99354

Ms. Downing:

CONTRACT NUMBER DE-AC27-08RV14800 – U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION REQUEST FOR DESIGN DESCRIPTION AND TOTAL PROJECT COST ESTIMATE TO IMPLEMENT AN OPTIMIZED LOW-ACTIVITY WASTE PRETREATMENT SYSTEM DESIGN STRATEGY

Reference: ORP letter from W. E. Hader to K. A. Downing, WRPS, "Washington River Protection Solutions LLC – Conduct External Review on Low-Activity Waste Pretreatment System, September 25-28, 2017," 17-CPM-0145, dated September 18, 2017.

The purpose of this letter is to request an updated Low-Activity Waste Pretreatment System (LAWPS) design description and total project cost estimate to implement an optimized design strategy identified during the LAWPS Expert Review Team meetings, conducted from September 25-28, 2017.

During the LAWPS Expert Review Team meetings, Washington River Protection Solutions LLC (WRPS) assisted the team in meeting the objectives in the referenced letter to evaluate LAWPS requirements, capabilities, cost and schedule risks, and alternative strategies – with the intent to provide timely, cost-effective low-activity waste (LAW) feed to the Waste Treatment and Immobilization Plant LAW vitrification facility. WRPS developed an optimized LAWPS design strategy that could result in significant cost savings while preserving LAWPS feed delivery capabilities.

WRPS is directed to develop a system specification for an optimized LAWPS design strategy – for both elutable and non-elutable ion exchange options – with corresponding detail to the current LAWPS System Specification, RPP-SPEC-56967, to enable direction to a design agent. WRPS is also directed to develop a new Class 4 total project cost and schedule estimate for the optimized LAWPS design strategy, in accordance with Cost Estimating Guide, DOE G 413.3-21, using an expected accuracy range of -30% to +50%. The updated LAWPS system specification and corresponding total project cost and schedule estimate shall be delivered to the U.S. Department of Energy, Office of River Protection no later than November 15, 2017.

OCT 0 4 2017

This letter is not considered to constitute a change to the contract. In the event the Contractor disagrees with this interpretation, it must immediately notify the Contracting Officer orally, and otherwise comply with the requirements of the Contract Clause entitled 52.243-7, "Notification of Changes."

If you have any questions, please contact me at (509) 376-2760, or your staff may contact Stephen H. Pfaff, LAWPS Federal Project Director, (509) 376-2188.

Marc T. McCusker
Contracting Officer

TF:SHP

cc: C.A. Burke, WRPS
S.M. Sax, WRPS
C.A. Simpson, WRPS
WRPS Correspondence

OFFICE OF RIVER PROTECTION
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

SEP 18 2017

17-CPM-0145

Ms. Katie A. Downing, Contracts Manager
Washington River Protection Solutions LLC
2425 Stevens Center Place
Richland, Washington 99354

Ms. Downing:

CONTRACT NUMBER DE-AC27-08RV14800 – WASHINGTON RIVER PROTECTION SOLUTIONS LLC - CONDUCT EXTERNAL EXPERT REVIEW ON LOW-ACTIVITY WASTE PRETREATMENT SYSTEM, SEPTEMBER 25-28, 2017

The purpose of this letter is to issue authority for Washington River Protection Solutions LLC (WRPS) to conduct an external expert review of the Low-Activity Waste Pretreatment System (LAWPS) project in Richland, Washington during September 25-28, 2017. Authorization is granted to complete this task with $150K in not-to-exceed funding. As the LAWPS project approaches the Critical Decision phase to develop a performance baseline, the U.S. Department of Energy (DOE) is concerned about cost growth and the risks to the delivery schedule. The DOE Director of the Special Projects Office, Environmental Management, requested that WRPS comprise a corporate team of sufficient capability to include representation from the DOE Complex and National Laboratories to develop and recommend an alternative approach to the LAWPS Project, as presently defined, to meet the following objectives:

- Results in the delivery of a tank waste pretreatment capability for within the Critical Decision-1 cost range.
- Results in the delivery of LAWPS by 2021.
- In addition to evaluating achievability of delivery of LAWPS by 2021 and evaluation of options to accelerate completion of the LAWPS project to the maximum extent practical, evaluate complementary alternatives that could be deployed to provide some near-term tank waste pretreatment capability for feed to LAW.
- Evaluate DOE-directed functional performance requirements, along with Key Performance Parameters for efficacy, based upon their role in driving cost and schedule risks for LAWPS delivery.
- Engineered controls and adoption of standards should be commensurate with the hazards so as to minimize unnecessary requirements.
- Evaluate appropriateness of Hazard Categorization and Seismic Design Criteria designations.
- Evaluate the necessity for the breadth of LAWPS operating envelop.

- Identify those remaining key decisions which are hampering progress or are creating cost and schedule risk (i.e., use of eluteable or non-eluteable separations media).
- Considers the previous but simplified design iterations.
- Preserves existing design elements to the extent practical.

In formulating your review team, a concern has been raised as to whether companies participating in the review team would be precluded from proposing on the LAWPS project itself because of its participation. However, the nature of this review should not give rise to an organizational conflict of interest (OCI), and to the extent any OCI could arise, DOE expects WRPS to take appropriate mitigation measures.

Most fundamentally, the review team is not part of a federal procurement, and any subsequent procurement for LAWPS would not be a federal procurement. As stated above, the purpose is for WRPS to review the project and to recommend alternative approaches that may save time and cost and provide those recommendations to DOE. The purpose is not to develop a statement of work or specifications. In addition, more than one company will be involved in the review team, further eliminating certain OCI concerns. See Systems Made Simple, Inc. B-412948.2, July 20, 2016, 2016 CPD ¶ 207.

While neither the review team nor the LAWPS procurement are federal procurements, DOE expects any future procurement will be fair to all potential bidders. It is expected that all information from the review will be made available to all bidders for any LAWPS procurement. To the extent the review team must see any proprietary information or other information that cannot be made publicly available, and the information is relevant to a subsequent LAWPS procurement, members of the review team should sign a nondisclosure agreement (NDA). The NDAs should be shared with the participants' companies and create a firewall within their companies such that no non-public information can be shared with the participants' companies and the reviewers do not participate as part of a proposal team.

With full appreciation of the scope and difficulty of this tasking, given the mission risks presented by any additional delays in initiating the treatment of Hanford low activity tank wastes, WRPS is requested to provide recommendations to DOE by October 6, 2017.

The DOE Office of River Protection point of contact for this specific review is Steve Pfaff; Federal Project Director. If you have any questions, please contact Mr. Pfaff at (509) 376-2188; or you may contact me at (509) 376-3388.

Wade E. Hader
Contracting Officer

CPM:WEH

cc: WRPS Correspondence