Low Activity Waste Pretreatment System Dangerous Waste Permitting Plan

1.0 INTRODUCTION/PURPOSE

This Permitting Plan documents the overall strategy and schedule for preparing, submitting, reviewing and approving the Low Activity Waste Pretreatment System (LAWPS) dangerous waste permitting documentation per Washington Administrative Code (WAC), Chapter 173-303.

This plan also establishes the information required by the Washington State Department of Ecology (Ecology) to complete the permitting process, and establishes general timeframes within which specific information will be available to prepare the *Resource Conservation and Recovery Act of 1976* (RCRA) permit application by the U.S. Department of Energy, Office of River Protection (DOE-ORP) and its responsible contractor, Washington River Protection Solutions, LLC (WRPS). The plan describes the overall processes and protocols that have been agreed to and will be followed by DOE, WRPS and Ecology for 1) coordinated preparation of permit application documentation; 2) effective review of the application materials and completion of required public involvement processes; and 3) timely issuance of the final modified Hanford Facility dangerous waste permit to allow commencement of construction activities.

This plan does not address RCRA permitting activities related to the AP Tank Farm within the context of the Double Shell Tank System (DST) Operating Unit Group. Those activities are separate from what is described herein.

2.0 BACKGROUND

Direct Feed Low Activity Waste (DFLAW) mission needs and design evolution from 2016 through calendar year 2017 resulted in necessary adjustments to the feed portion of that program. This has included a revised LAWPS design, which requires an adjustment of the facility location closer to the 241-AP Double Shell Tank (DST) Farm than was originally planned. Hot commissioning timeframes for the Waste Treatment and Immobilization Plant (WTP) established the need for an initial filtration and cesium removal capability as an element of LAWPS. A "near-tank" pretreatment approach using equipment defined as Tank Side Cesium Removal (TSCR) has been selected for filtration and cesium removal of tank waste supernatant before the waste is transferred to the WTP Low Activity Waste (LAW) facility for vitrification.

TSCR represents the initial phase of filtration and cesium removal within LAWPS, which will ultimately inform future decisions relative to filtration and cesium removal equipment and systems once TSCR performance is fully assessed. As the project progresses and next phase and/or longer term approaches for filtration and cesium removal to support the mission of treating low activity waste become evident, DOE will continue to coordinate with Ecology to align and execute appropriate permitting strategies. At this time, therefore, the remainder of this document focuses primarily on the permitting of the TSCR.

LAWPS facilities are being designed to replace a portion of the functionality of the WTP Pretreatment Facility (PTF) allowing direct feed of DST supernatant from Tank Farms to the WTP LAW facility. The WTP LAW Facility will vitrify the tank waste into immobilized LAW glass logs that will be disposed of at the Integrated Disposal Facility. Delivering this capability will allow ORP to begin the treatment of the low activity portion of the tank waste (e.g., supernatant).

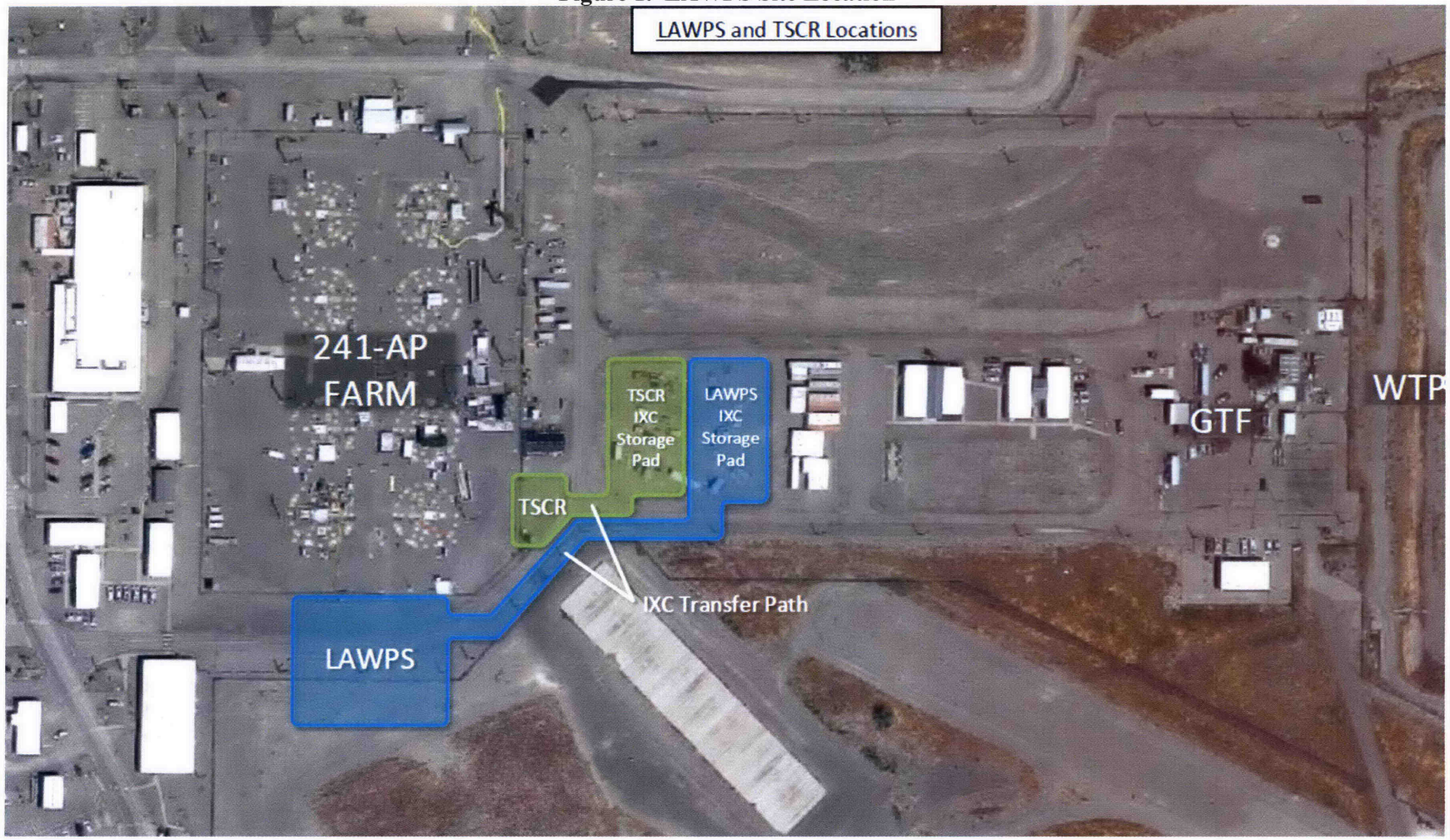
The intended initial approach for cesium removal will be a non-elutable ion exchange (IX) media housed within the TSCR equipment. Because the media cannot undergo elution, IX columns will be used and then replaced to maintain system operations. Therefore, the designs will include a concrete pad for permitted storage of spent IX columns prior to their final disposition. The storage pad will be included within permit application documentation.

The location of the TSCR equipment is planned to be immediately adjacent to the east and south side 241-AP Tank Farm. General layouts of the 200 East Area showing the planned location of TSCR equipment relative to surrounding facilities are shown on Figure 1. Assumptions are required regarding establishing Operating Unit Group (OUG) boundaries. The OUG boundaries will be shown on the RCRA Part A form submitted with the Part B permit application documentation. Initial OUG boundaries will be established to facilitate TSCR equipment operations and IX column placement and may require modification to reflect operational responsibilities before commissioning and readiness activities.

3.0 SYSTEM DESCRIPTION

The LAWPS facilities will provide pretreatment of DST supernatant from tank farms prior to transfer to the LAW facility using underground waste transfer lines. The facilities will use filtration to separate solids from the supernatant as a means to protect the IX columns. Then, a multiple ion exchange (IX) column system in each facility will remove soluble radioactive cesium (Cs) from the liquid. The resulting treated LAW stream is then transferred to an AP Farm DST for temporary storage before being fed to the WTP LAW facility for vitrification. Solids accumulated in the filters will be periodically back-washed and returned to another AP Farm DST.

Figure 1. LAWPS Site Location



3.1 TSCR

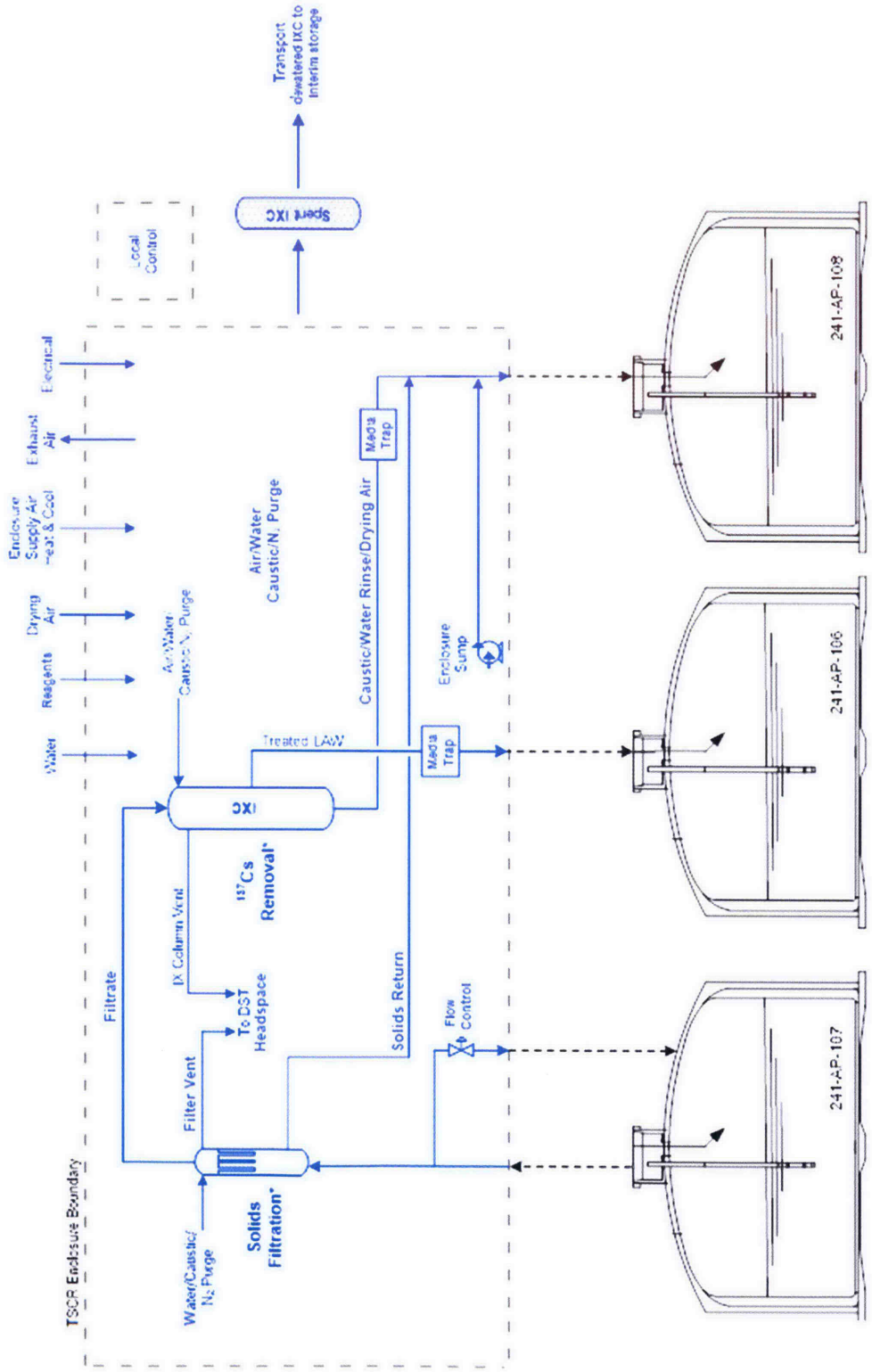
The TSCR system is a modular skid-mounted unit designed to receive tank supernatant from the DST System, filter out undissolved solids, and treat the tank supernatant by removing radioactive cesium using an ion exchange (IX) subsystem. The liquid and gaseous process effluents from the TSCR system will be returned to a DST System tank through a dedicated line. Treated waste will be sent to a separate DST System tank for accumulation prior to being fed forward to WTP for vitrification.

The TSCR system consists of pre-filtration and cesium ion exchange unit process operations located inside of a process enclosure the approximate size of a connex box. The TSCR system is being permitted as a tank system and does not meet the definition of either a miscellaneous treatment unit or a thermal treatment unit. Waste feed is delivered from a DST to the process enclosure interface via a transfer pump and hose-in-hose transfer lines (HIHTL). The pre-filtration subsystem consists of multiple filter units, so that a clean filter is alternated and on-line at all times. The solids remain in the offline filter until flushed out with dilute caustic solution. Filter flush solution is sent back to a DST. The treated LAW product is then transferred to a separate DST via a HIHTL. When IX column(s) become fully loaded with cesium, they are taken out of service, dewatered and replaced with new IX columns.

The waste in each spent IX column will be displaced with caustic followed by a water rinse. The caustic and water flush will be returned to a DST. Following flushing, each spent column will then be air-dried. The drying process is expected to consist of draining an IX column, and then pushing roughly 30 cubic feet per minute of dry air through each IX column in up-flow for up to four days until all free liquid is removed. Exhaust air and drained liquids generated during the drying process are planned to be returned to a DST system tank through dedicated drain/vent lines. Following drying, the spent IX columns will be moved to a pad for interim storage prior to final disposition. Newly installed IX columns will be flushed with caustic solution and water to ensure the removal of fines and ensure preconditioning prior to use. After preconditioning, the caustic preconditioning solution will be sent to a DST.

The simplified TSCR process flow diagram is provided as Figure 2.

Figure 2. Simplified TSCR Process Flow Diagram



4.0 DANGEROUS WASTE MANAGEMENT UNITS

The following TSCR components reflect preliminary design features that are anticipated to comprise the dangerous waste management units that will need to be part of the dangerous waste permit application. Included are storage of spent IX columns:

1. Feed, return, and transfer piping/secondary containment.
2. Filter piping/secondary containment.
3. IX column systems, piping/secondary containment.
4. Spent IX Column Interim Storage Pad
5. AP Farm to WTP Waste Transfer Piping

5.0 DESIGN BASIS ASSUMPTIONS

Design basis assumptions are set forth below to attempt to avoid programmatic disagreements or ambiguities between DOE and Ecology which could result in significant cost and schedule impacts to a design basis should they occur at a later time during project execution. The following are primary assumptions being used as inputs to the TSCR design. It is acknowledged that design basis changes may be made as the process matures, which could require an update to this section of the plan. As discussed in Section 3.1, there is understanding between the parties that the ventilation system for the first TSCR, and the second TSCR if that is the option picked, will vent back through the AP tank farm ventilation system. The permittees will monitor the returns to confirm low organic emissions. Once low emissions are confirmed, monitoring will be discontinued.

Phase 1 TSCR (to operate for approximately five years)

1. Waste transfer lines between TSCR and AP Farm (feed, return, and transfer to the treated LAW feed tank within the DST System), will be of HIHTL design, installation, and operation in accordance with WAC 173-303-640. At the end of three years the HIHTL will be replaced with new HIHTL.
2. The balance of TSCR waste process components, which include, but are not limited to, IX columns, a treated waste delay tank, inter-module piping, valves, filters, and instrumentation, will be designed, installed, and operated in accordance with WAC 173-303-640.
3. An inorganic non-elutable ion exchange media will be used for cesium removal necessitating storage of spent IX columns.
4. Spent IX storage pad design, installation, and operation will be in accordance with WAC 173-303-630. NOTE: Spent columns will be flushed, drained, and air-dried to remove free liquid, eliminating the need for secondary containment provisions in WAC 173-303-630(7)(a).
5. Treated LAW feed transfer lines from AP Farm to WTP will be of permanent double-encased type utilizing (tied into) a portion of the existing Project W-211 transfer lines.

6. Modifications that are existing and ongoing inside the fence of the AP Tank Farm system will not be included in the LAWPS unit group application and are outside the scope of this plan.

A second TSCR or LAWPS Facility

1. Waste transfer lines; feed, return, and transfer to the treated LAW feed tank, will be of permanent double-encased type designed, installed, and operated in accordance with WAC 173-303-640.
2. The balance of a second phase waste process components, which may include, but are not limited to, IX columns, treated waste delay tank, filter wash tanks, inter-module piping, valves, filters, and instrumentation will be designed, installed, and operated in accordance with WAC 173-303-640.
3. An inorganic non-elutable ion exchange media will be used for cesium removal necessitating storage of spent IX columns.
4. Spent IX storage pad design, installation, and operation will be in accordance with WAC 173-303-630. NOTE: Spent columns will be flushed, drained, and air-dried to remove free liquid, eliminating the need for secondary containment provisions in WAC 173-303-630(7)(a).
5. Treated LAW feed transfer lines from AP Farm to WTP will be of permanent double-encased type utilizing (tied into) a portion of the existing Project W-211 transfer lines.
6. Modifications that are existing and ongoing inside the fence of the AP Tank Farm system will not be included in the LAWPS permit application and are not within the scope of this permitting plan.

6.0 PERMITTING STRATEGY AND APPROACH

This permitting strategy documents the agreed to regulatory approach between Ecology and Permittees regarding modification to the Hanford Facility Dangerous Waste (DW) permit. These actions are necessary to address the scope of the LAWPS Project. The project will provide mixed waste tank storage and treatment capacity to support early direct feed of double-shell tank waste to the WTP LAW facility for subsequent vitrification. Therefore, the LAWPS facilities will be considered a new treatment, storage, or disposal (TSD) unit (aka Operating Unit Group) and will be required to be permitted in accordance with WAC 173-303-803. Permitted systems will consist of mixed waste tank storage and treatment components and associated ancillary equipment subject to the standards of WAC 173-303-640, and mixed waste container storage areas for spent IX columns subject to the standards of WAC 173-303-630.

A permit application will be prepared to include all required portions of a Part A and Part B permit application as required in WAC 173-303-800 through -806. The permit application must be submitted to Ecology at least 180 days before physical construction is expected to begin per WAC 173-303-803(4)(b). Permitting of the LAWPS facilities must meet all requirements of WAC 173-303-280 and includes filing in the Administrative Record a clarification to the Notice of Intent (NOI) that was issued April 28, 2016 (DOE/ORP Letter 16-ECD-0016), in accordance

with WAC 173-303-281. A revised topographic map was added to the unit specific administrative record, which shows the revised location closer to AP tank farm (DOE/ORP 19-ECD-0010). The NOI documents that Siting Criteria set forth in WAC 173-303-282 are satisfied.

The Permittees will submit a certified permit application to Ecology, and this submittal will initiate the Class 3 Modification process as detailed in WAC 173-303-830(4)(c). The Class 3 Permit Modification process will be followed because this application material will serve as a modification to the current Hanford Facility Dangerous Waste Permit, Revision 8c. After the application has been determined complete and accepted by Ecology, Ecology will draft the permit and associated permit conditions as detailed in WAC 173-303-840(2). Public involvement opportunities will be provided to meet the requirements of WAC 173-303-830(4)(c) and 173-303-840, as applicable.

The underground pipe-in-pipe waste transfer lines that will transfer pretreated LAW feed to WTP (and the parallel return line) are considered part of the LAWPS Operating Unit Group. The boundary of the LAWPS Operating Unit Group will extend from the pipe connection point within 241-AP Tank Farm downstream to the WTP piping interface control point number 30/31, including portions of the original WTP feed lines previously installed under Project W-211. In addition, the HIHTLs from the TSCR process enclosure up to the piping flange/interface points in AP Farm are within the LAWPS OUG.

Based on the current project schedule, the dangerous waste permitting process is planned to be submitted in logical sections with sufficient and necessary information on permitted systems provided as it becomes available through design development. This will support Ecology with the parallel preparation of a draft permit. It is anticipated that the initial application will be supported by certain TSCR and transfer line design documentation. Subsequent packages will include additional design elements to include those for the balance of facilities and equipment. Reference Section 7.0 for additional information.

Submittal of remaining facility design and compliance information will follow in a timeframe (Section 9.0) to support Ecology's completion of a draft permit modification for the public involvement process. In order to support the design and construction schedule of the LAWPS project, a phased permitting approach will need to be implemented and an Interim Compliance Schedule will be developed to detail the balance of submittals required for incorporation into the Permit.

It is advantageous to follow a sequential permitting approach with technical details being submitted to Ecology as the overall project design elements mature. However, it is recognized that schedule realities are likely to drive DOE and WRPS to prepare and submit temporary authorization (TA) requests, in accordance with WAC 173-303-830(4)(e) for Ecology's review and consideration. If Ecology approves the TA requests, it will allow for construction in a timeframe to support the overall DFLAW initiative. In this case, DOE and WRPS will ensure Ecology has been provided with sufficient information to support the specific work activities being addressed and requested in a submitted TA.

Agreements between Ecology and the Permittees reached on the permitting strategy elements are as follows:

- A simple clarification to the NOI issued April 28, 2016, will be filed in the Administrative Record noting adjustments made to the feed portion of the DFLAW program.
- Dangerous waste codes D001 and D003 will not be listed on the submitted Part A form since the waste being treated by LAWPS and the subsequent feed to WTP LAW do not and will not exhibit these characteristics. The WTP LAW facility is not designed or permitted to receive and treat D001 or D003 dangerous waste. Additionally, the LAWPS facilities and equipment will not be designed or constructed to handle waste that carries D001 or D003 waste codes. Therefore, low-activity supernatant aqueous waste treated through the facilities and fed forward to WTP LAW will not carry these waste codes as agreed to previously.
- Waste acceptance sampling for LAWPS facilities and WTP LAW will occur at the DST system in a feed qualification tank. Resulting analytical data will be used to validate the characteristics of the waste prior to transfer to both the LAWPS facilities and WTP LAW. Any additional sampling of treated LAW prior to transfer to WTP LAW would only be performed for trending or process purposes. Additional detail regarding waste acceptance and waste analysis will be included in the Waste Analysis Plan provided to Ecology as part of the permit application.
- The initial LAWPS permit application and resultant permit are focused primarily on authorization to construct transfer lines, TSCR, associated secondary containment, and IX Column Storage Pad. Additional permit modifications may be required to better align Operating Unit Group process operations and will be coordinated with Ecology at a later date.
- AP tank farm will provide feed to LAWPS facilities and information on the operations at AP tank farm may be included in the permit application material as supplemental supporting information, but neither the AP Farm tanks nor AP Farm operations are part of the LAWPS operating unit group.
- Interim storage of spent IX columns containing cesium at a permitted location will be necessary. In support of determining a final disposition pathway for the cesium, DOE will continue to evaluate potential options available. To ensure waste streams have a disposal pathway DOE and Ecology have agreed to engage in near term workshops to identify what is known about columns treatment and disposal. From this effort it is anticipated that a project plan TPA milestone would be developed for the disposition of the spent IX columns. This evaluation will consider (1) current laws and regulations that affect disposal pathways, (2) potential changes to laws and regulations, (3) existing and reasonably possible options for the disposal of nuclear waste, (4) comparison of the baseline disposal scenario (i.e. vitrification at WTP) and alternative disposal pathways including direct disposal at a deep geological repository, (5) comparison of potential disposal site acceptance criteria for all reasonably possible disposal pathways, (6) capability to vitrify the cesium media at WTP, and (7) comparison of the baseline interim storage scenario with alternative interim storage options including shipment to a permitted treatment and storage facility off the Hanford Site.

7.0 PERMIT APPLICATION PREPARATION

Draft permit application material will be developed in sequences as they align with design development. This approach is necessary to mitigate schedule constraints within the context of design development. Development of application documentation will commence with those elements in common with Hanford TSD units in general. These would include application elements addressing:

- Addendum A, Part A Form
- Addendum B, Waste Analysis
- Addendum C, Process Information
- Addendum E, Security Requirements
- Addendum F, Preparedness and Prevention
- Addendum G, Training
- Addendum H, Closure
- Addendum I, Inspection
- Addendum J, Contingency

In addition, the initial application package will include information to support Ecology in addressing the Washington State Environmental Policy Act (SEPA), Waste Minimization, Reports and Records, Seismic and Traffic considerations, and references. Any available design information will be included in the initial application as well.

In parallel, permit application elements that are heavily reliant on design maturity would be initiated, but are likely to be less than complete at time of first submittal. These elements would be finalized later in the permitting process as design advances and is completed.

Within the context of a sequenced approach, initial application elements may be provided to Ecology for review, comment, and comment resolution, as schedule allows. Time constraints may make it impossible to afford Ecology advance review of all application materials to be included in the first submittal. Every effort will be made to afford an advance review, with priority given to the most technically challenging and critical components of the application.

Throughout this process, supplemental application materials will be submitted for review as design elements become available and will follow procedures established in Hanford Facility RCRA Permit General Conditions section II.L.2, *Design Changes, Nonconformance, and As-Built Drawings*, should changes occur after permit issuance. It is noted that the project will proceed at risk should any late design change notices be necessary to support minor modifications during construction. These types of supplemental activities and materials could include Independent Qualified Registered Professional Engineer reviews, Process Flow Diagrams, Piping & Instrumentation Drawings, Mass & Energy Balances, etc.

8.0 COMMENCEMENT OF CONSTRUCTION

Consistent with the requirements of WAC 173-303-806(5), construction activities may not commence until approval of the initial Class 3 Permit Modification (except as may be allowed by a temporary authorization). The parties agree that for purposes of the LAWPS facility, construction starts at the point Permittees begin pouring of structural concrete or a foundation (aka "base mat"). Site preparatory activities that are not considered to constitute construction and which may be performed prior to Ecology approval of the Class 3 Permit Modification include: clearing/grubbing of the selected facility location; excavation and soil stabilization activities to prepare the subsurface "mud mat" to support the planned structures; trenching activities in support of planned transfer line installation; and installation of site utilities and infrastructure up to the LAWPS site boundary.

9.0 CURRENT SCHEDULE FORECAST

The current project milestone schedule establishes the following general timelines:

1. Permit application preparation and Class 3 modification request – April 2019. The initial application package will consist of all narrative portions, including addenda and available design media (primarily at the 30% and 60% engineering design stage).
2. Supplemental information package – September 2019. Supplemental information will consist primarily of final design media and may include updates to addenda and other information, as necessary.
3. Based on current project schedules and typical timeframes for processing of the permit application, it is expected that Temporary Authorization Requests will need to be submitted for Ecology's consideration, and their approval would be necessary to support the following construction activities (dates are approximate and may fluctuate depending on project needs):
    a. TSCR (HIHTL/Foundation) – January 2020
    b. Underground Transfer Lines – January 2020
    c. IX Column Storage Pads – March 2020
4. Start of TSCR operations, January 2021.

It is understood that uncertainties associated with design development may impact schedules and require adjustments to the permitting strategy, as necessary. In keeping with the sequenced permitting approach, developing design elements will be shared with Ecology, as schedule allows. The parties agree that every practical effort will be made to expedite both submittals for regulatory review and regulatory agency reviews.

LAWPS Dangerous Waste Permitting Plan

Signature Approvals

Brian Vance, Manager
Office of River Protection
United States Department of Energy

4/12/19
Date

Alex Smith, Manager
Nuclear Waste Program
Washington State Department of Ecology

4/26/19.
Date