# PERMIT ATTACHMENT 1

## Introduction – Section 1.0 of the Permit Application

## Permit Number: WA 7890008967

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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# 1.0 INTRODUCTION

## 1.1 REGULATORY BASIS

This application for a Research, Development, and Demonstration (RD&D) Permit is submitted to the Washington State Department of Ecology (Ecology) pursuant to the provisions of U.S. Environmental Protection Agency (EPA) Regulation Title 40 *Code of Federal Regulations* (CFR) Section 270.65; Section 173-303-809 of the *Washington Administrative Code* (WAC); and the EPA Office of Solid Waste and Emergency Response (OSWER) "*Guidance Manual for Research, Development, and Demonstration Permits under 40 CFR Section 270.6*5" (OSWER Guidance Manual; EPA/530-SW-86-008).

The purpose of the RD&D Permit is to ensure the testing of experimental and innovative hazardous waste treatment alternatives to land disposal in a manner that is fully protective of human health and the environment. An RD&D Permit also has the purpose of determining the efficacy and performance capabilities of the technology or process and the effects of such technology or process on human health and the environment (WAC 173-303-809). The RD&D process allows testing and demonstration of innovative and experimental waste treatment technologies and processes that are not currently subject to activity standards under existing federal or state regulations.

## 1.2 FACILITY OWNER AND OPERATOR INFORMATION

The Test and Demonstration Facility will be owned and operated by the U.S. Department of Energy (DOE), Office of River Protection (ORP). ORP will have responsibility for all administrative, operational, regulatory compliance, and other responsibilities associated with activities under the proposed RD&D Permit. All activities will be conducted at the Hanford Site, Richland, Washington (Figure 1-1). The EPA identification number is WA7890008967, which covers the entire Hanford Site. The RD&D Permit will be a separate permit from the Hanford Site-Wide Final Status Permit. The Test and Demonstration Facility will be managed and co-operated by CH2M HILL Hanford Group, Inc. (CH2M HILL) for ORP under contract DE-AC27-99RL-14047.

**FACILITY NAME**

Bulk Vitrification Test and Demonstration Facility
U.S. Department of Energy Hanford Site
River Protection Project, Tank Farms

**FACILITY LOCATION**

Benton County, Washington; within the 200 Area of the Hanford Site

**OWNER/OPERATOR**

U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

## FACILITY MANAGER/CO-OPERATOR

CH2M HILL Hanford Group, Incorporated
P.O. Box 1500
Richland, Washington 99352

## 1.3 BACKGROUND INFORMATION

ORP has created aggressive initiatives to accelerate the closure of single-shell tanks (SSTs) containing mixed radioactive and dangerous waste at the Hanford Site. To meet the *Hanford Federal Facilities Agreement and Consent Order* (HFFACO) (Ecology et al. 1989) requirements for completing retrieval of SSTs by 2018 and completing tank waste treatment by 2028 (M-45-00 and M-62-00), ORP is evaluating optimizing the Hanford Site Waste Treatment Plant (WTP) high-level waste (HLW) and low-activity waste (LAW) vitrification in addition to treating waste using supplemental technologies.

ORP contracted with vendors in fiscal year 2003 to provide engineering design and testing on simulated LAW to support analysis and selection of appropriate supplemental technologies. Further testing using Hanford tank waste is needed to provide data for waste form qualifications, risk assessments, and performance assessments for treatment and near-surface land disposal of LAW. This RD&D permit application is for the Demonstration Bulk Vitrificaton System (DBVS) and its associated Waste Retrieval System (WRS).

## 1.4 PURPOSE OF TEST AND DEMONSTRATION PROJECT

Implied in the term "RD&D" is that operation of a given treatment system will demonstrate that the treatment has justifiable potential for full-scale operation. That is, a successful demonstration of the treatment should yield results that provide insight and direction to the development of full-scale system design and operations.

The Test and Demonstration Facility will be used to evaluate: the ability to produce immobilized LAW (ILAW) that is equivalent to WTP ILAW; the compatibility of the technology with actual tank waste; the safety, efficiency, and potential cost-effectiveness of the bulk vitrification process; and the feasibility for full-scale application. This project is designed to investigate requirements for feed material handling, equipment operation, residual material handling, production and control of secondary wastes, and potential environmental impacts associated with the process.

The planned experimental test activities described in this permit application include the construction, operation, and closure of the Test and Demonstration Facility that will consist of the DBVS and the WRS. Construction and operation of the facility are described in Section 2.0. An equipment process description of the DBVS, the WRS and associated support facilities are in Section 4.0. Closure is described in Section 11.0.

Source, special nuclear and by-product materials, as defined in the *Atomic Energy Act of 1954*, are regulated at DOE facilities exclusively by DOE acting pursuant to its AEA authority. These materials are not subject to regulation by the State of Washington under the Washington

"Hazardous Waste Management Act," the federal *Resource Conservation and Recovery Act of 1976* (RCRA), or any other relevant provision of law.

Where information regarding processing, packaging, management, and disposal of the radioactive source, byproduct material and/or special nuclear components of mixed waste (as defined by the *Atomic Energy Act of 1954*, as amended) has been incorporated into this permit, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit modification nor Chapter 70.105 *Revised Code of Washington* (RCW), but is only presented for general knowledge in support of the project discussion.

## 1.5 PROJECT OBJECTIVES

The project objective is to determine that the bulk vitrification product (i.e., ILAW) will meet applicable disposal requirements. The test project and individual campaigns conducted under this project are designed to:

- Provide direct experimental verification of whether or not bulk vitrification is suitable for full-scale treatment of WTP pretreated mixed LAW.
- Determine any equipment or treatment requirements not recognized by testing conducted to date.
- Determine the potential range of feed material characteristics, treatment rates, process operating conditions, and other parameters compatible with successful waste treatment.
- Determine the optimum process operating conditions for successful waste treatment at maximum feed rates.
- Determine optimal process operating conditions with respect to operating and maintenance labor requirements, utility/feed additive consumption, and environmental impact.
- Develop a qualifications approach for the final vitrified waste form to ensure compliance with waste acceptance criteria of the Integrated Disposal Facility (IDF) and EPA/Ecology Land Disposal Restrictions (LDR).
- Gather data for use in determining whether or not scale-up to full-scale operation is feasible on actual tank waste.
- Gather data for use in finalizing full-scale system design and operational requirements.
- Determine whether or not LAW can be immobilized in a waste form that is equivalent to WTP ILAW.
- Gather data to determine whether or not the DBVS can meet applicable environmental regulations in a full-scale production facility, including emission standards.
- Gather data for design to enhance decontamination and decommissioning and closure of a full facility.
- Develop waste minimization procedures for operation of the bulk vitrification equipment.

Draft Test Matrix and Objectives Tables that identify an approach to meet these objectives are provided in Appendix A. This table is under development by ORP and Ecology and is presented for information purposes only.

## 1.6 JUSTIFICATION FOR PROJECT

### 1.6.1 Requirement for Use of Innovative and Experimental Processes

Pursuant to 40 CFR 270.65(a) and WAC 173-303-809(1), an RD&D permit is justified only when the requesting entity proposes to employ "innovative and experimental hazardous (dangerous) waste treatment technology or process for which permit standards for such experimental activity has not been promulgated…"(WAC 173-303-809(i)).

### 1.6.2 Compliance with Requirement

While waste vitrification has established an operating history with other types of waste, it has not been applied to in-container treatment of actual Hanford tank waste on a pilot- or full-scale basis. In-container treatment (i.e., DBVS) and subsequent land disposal of the resulting ILAW represent an innovative approach that minimizes treated waste handling. It is anticipated that waste treatment can be optimized to produce ILAW that is equivalent to the WTP ILAW.

### 1.6.3 Equipment Design and Operational Considerations

The waste feed for the DBVS is Hanford tank waste from Tank 241-S-109 that has both dangerous waste and radioactive waste components. The design, operation, and maintenance of processing equipment must be adapted to this environment. The following are innovative aspects of the planned project:

- Conduct of waste handling and processing to minimize worker exposure (as low as reasonably achievable [ALARA]).
- Placement of controls, drive mechanisms, and feed addition points outside of radiation control provisions to minimize potential contamination, thereby minimizing hazardous and radioactive waste upon closure (waste minimization).
- Modification of system operational and maintenance requirements to accommodate remote manipulation and/or access by personnel wearing protective gear in furtherance of ALARA principles.
- Provisions for equipment cleaning and prevention of waste spills beyond those required for normal nonradioactive material processing (waste minimization and ALARA).
- The use of an offgas handling system using aqueous and chemical scrubbing to meet best available control technology (BACT).
- Methods to enhance decontamination and decommissioning.

### 1.6.4 Treated Waste Packaging

The treated waste produced by the DBVS must be an immobilized material suitable for ultimate disposal in a dangerous and/or hazardous waste disposal facility permitted by the State of

Washington and must meet LDR, including underlying hazardous constituents, for land-disposed waste. The Waste Analysis Plan (WAP) for verifying LDR compliance is presented in Section 6.0.

## 1.7 PLANNED SCALE OF OPERATION

### 1.7.1 Phased Approach

Under the planned project, testing will be conducted in two phases with a short period between phases for equipment and site upgrades, if required. Phase 1 operations will utilize only minimal amounts of actual tank waste and will be conducted over a one- to three-month timeframe. At the completion of Phase 1 operations, the DBVS and WRS will be reconfigured for Phase 2 operations.

The phases of operation are described as follows:

- The Phase 1 DBVS and WRS will include all required controls and safeguards for human health and the environment and will be in compliance with all applicable EPA and Ecology regulations. Phase 1 will consist of treatment of up to three container loads, each incorporating up to 1,135 L (300 gal) of tank waste. Simulants (i.e., materials similar in chemical composition to tank waste) will be added to the waste load along with the glass formers to create a container load of treated waste. Appendix B contains process flow diagrams for Phase 1.
- Phase 2 will consist of treatment of up to 50 container loads of waste (including containers vitrified in Phase 1); up to 1,135,500 L (300,000 gal) of tank waste could be used in the DBVS from Tank 241-S-109 (not including liquid added for retrieval). <u>*The 300,000 gal is less than 1% of the 53 million gal of waste stored in Hanford double-shell tanks (DSTs) and SSTs*</u>. Tank waste that does not meet the waste acceptance criteria for the DBVS will be transferred to the DST system or recycled back to Tank 241-S-109. Tank waste, process additives, and process control parameters will be varied to establish acceptable operating process parameters or envelopes. It is anticipated that one container load of material will be vitrified weekly over one operating year (one operating year will consist of 365 total days of waste treatment per the OSWER Guidance Manual). The goal of Phase 2 is to optimize the DBVS performance and operation for full-scale use; LDR; *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063); and the waste acceptance criteria of the receiving treatment, storage, and disposal (TSD) facility. The 50 containers will be temporarily stored at the Test and Demonstration Facility during the RD&D project. Upon closure of the Test and Demonstration Facility, the containers will be transferred to the IDF or another permitted disposal facility. Appendix B contains process flow diagrams for Phase 2.

  The sodium oxide concentration in each container load will vary from approximately two percent (2%) to twenty percent (20%), or the maximum concentration that produces an acceptable waste form (Table 6-2). Container loads up to 54.4 $m^3$ (1,920 $ft^3$) will be processed over a range of process additive types and fractions, waste feeds, and a range of parameter settings in the various campaigns. A campaign is defined as the vitrification of waste in a container.

The DBVS and WRS may be upgraded in Phase 2 to ensure proper performance while meeting treatment rates and applicable air quality requirements at higher waste concentrations. Specific changes planned include additional waste storage capacity, increased process additive storage and handling capacity, and testing to determine optimum offgas treatment systems.

### 1.7.2 Project Schedule

Figure 1-2 shows the proposed schedule for the RD&D project. Phase 1 is expected to last one to three months. The interval between the completion of Phase 1 and start of Phase 2 is approximately three months and is based on the best current estimate of tasks to be performed during that interval. Operations are expected to last one operating year and may require more than one calendar year to complete.

### 1.7.3 Evaluation of Nuclear Regulatory Commission Criterion for Low-Activity Waste

The following is for information only. See Section 1.4 for a discussion of what materials are subject to regulation under *Resource Conservation and Recovery Act of 1976* (RCRA). HFFACO Milestone M-62-00 requires: "…pretreatment processing and vitrification of Hanford HLW and LAW wastes," by December 31, 2028. The Bulk Vitrification Demonstration Project will evaluate the ability to produce satisfactory product in the form of ILAW that meets on-site waste disposal acceptance criteria. The technical basis for the Bulk Vitrification Facility product being LAW is identical to the basis for the WTP Nuclear Regulatory Commission (NRC) letter from C.J. Paperiello to J. Kinzer, RL, "Classification of Hanford Low-Activity Tank Waste Fraction," dated June 9, 1997. This subject is also discussed in more detail in the letters: CH2M HILL letter from E. S. Aromi to R. J. Schepens, ORP, "The Application of the Waste Incidental to Reprocessing to Bulk Vitrification," CH2M-0301927, dated June 2, 2003; and, Memorandum from R. Schepens to P. F. Dunigan Jr., "Request Approval of Categorical Exclusion (CX) for the Treatability and Demonstration Testing of Supplemental Technologies on the Hanford Site," dated December 13, 2003.

In brief, the 1997 Agreement between the NRC and DOE (Paperiello 1997) set forth the waste management program to be used with respect to Hanford Site tank waste. The DOE produced a Technical Basis Report (*Technical Basis for Classification of Low-Activity Waste Fraction from Hanford Site Tanks for the Tank Waste Remediation System*, WHC-SD-WM-TI-0699, Rev. 2), which demonstrated compliance with the three criteria in the 1997 Agreement. The three criteria are:

1. "Wastes have been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical." Specifics on how this criterion is satisfied will be elaborated on in the subsequent section.

2. "Wastes will be incorporated in a solid physical form at a concentration that does not exceed the applicable limits for Class C (Low-Level Waste) as set out in 10 CFR Part 61." The DBVS will establish that the Bulk Vitrification form does not exceed the Class C concentrations for low-level waste and will be in compliance with this criterion.

3. "Wastes are to be managed, pursuant to the *Atomic Energy Act of 1954*, so that safety requirements comparable to the performance objectives set out in 10 CFR 61, Subpart C, are satisfied." The DVBS project will establish waste form performance tests for the vitrified product to document that it will perform equivalent to LAW for long-term disposal.

**1.7.3.1 Waste Feed Pretreatment.** Current plans and contracts for the WTP LAW treatment facilities assume pretreatment to meet Criterion One above will be performed in the WTP pretreatment facility. Table 1-1 contains the NRC basis for the Hanford Site LAW and compares the 1997 NRC letter, the WTP processes, and how they relate to Tank 241-S-109 saltcake waste (DOE/ORP-2003-24). It should be noted that with the WTP pretreatment processes (ion exchange), it is always possible to recycle a waste stream one more time through the ion exchange columns (but at ever increasing cost per Curie separated) and that separation below the contract limit is possible in order to optimize the overall facility design and operation. However, since the WTP pretreatment facility will not be available to pretreat waste for the demonstration project, waste that was previously pretreated (using ion exchange technology very similar to that described in the NRC letter) in B Plant in the 1970's will be processed. A simple solids/liquid separation will be used as required by the NRC letter. In addition, a new technology or method called "selective dissolution" will be tested to determine its effectiveness with real waste as a potential additional method of pretreatment during retrieval for the test and demonstration project. If the bulk vitrification technology is selected for full-scale implementation, the waste feed will come from the WTP pretreatment facility or as otherwise agreed during the negotiations required as part of HFFACO milestone M-62-11.

For the Bulk Vitrification Test and Demonstration Project, the waste will be managed as approved in the Technical Basis Report referred to previously and in accordance with the NRC criteria. The only waste that will be processed will meet the requirement of having been processed to the extent deemed technically and economically practical in the Technical Basis Report, and will not exceed the previous agreement for Cs-137. The waste selected for Bulk Vitrification will contain less than 0.05 curies (Ci) of Cs-137 per liter at a sodium concentration of 7 M. For the Bulk Vitrification Test and Demonstration Project, the need for simple solids/liquid separation is reduced because only salt cake waste will be processed. However, additional solids removal will be required for the Test and Demonstration Project to assist in removal of the insoluble Sr-90 and transuranic constituents, thereby ensuring equivalency between the WTP pretreatment process and DBVS and ensuring compliance with the 1997 NRC letter.

Technical information on the history of the waste in Tank 241-S-109 and detailed technical information on the past processing of the waste, e.g., pretreatment to remove Cs-137, was detailed by M. E. Johnson in a memorandum titled "Synopsis of Tank 241-S-109 Waste History" (Johnson 2004). Planned activities during the retrieval of waste include selective dissolution and simple solids/liquid separation for further pretreatment of the waste to meet NRC criteria.

The waste currently contained in Tank 241-S-109 will meet the first NRC criterion discussed above as follows:

- Supernatant from a series of SSTs was removed to be processed through cesium ion exchange at B Plant. The sludge that contains the majority of the strontium and transuranic wastes remained in the sludge left in the tanks.

- The supernatant was processed through cesium ion exchange at B Plant that removed the majority of the cesium.

- The supernatant was then processed through the 242-S Evaporator to reduce the volume prior to transfer to Tank 241-S-109.

- Storage in Tank 241-S-109 resulted in the crystallization of the saltcake with the cesium remaining in the liquid fraction. This liquid fraction containing the cesium was mostly removed by saltwell pumping that was completed in June 2001.

- Selective dissolution will be used (on a test basis) to further pretreat the wastes, which will further reduce the cesium concentration, along with other chemicals. Selective dissolution is the chemical separation of soluble chemical species (including Cs-137) on the basis of their solubilities.

- Simple solids/liquid separation will be performed as the waste is removed from the tank.

**1.7.3.2 Prior Pretreatment of Tank 241-S-109 Tank Waste.** Tank 241-S-109 first received waste on December 24, 1952. Tank 241-S-109 was used to store reduction and oxidation (REDOX) salt waste from December 1952 to February 1974. The REDOX salt waste was removed from Tank 241-S-109 and processed through the 242-S Evaporator between November 1973 and February 1974. The REDOX salt waste originally in Tank 241-S-109 was concentrated in the 242-S Evaporator and stored in Tanks 241-S-103, 241-S-105, and 241-S-106. A heel of REDOX sludge (13,000-gal) and salt waste (66,000-gal) remained in Tank 241-S-109 in February 1974. (Note that recent core samples were not able to reach down to this sludge layer, but it is assumed to still be present today). Tank 241-S-109 then received concentrated salt waste from the 242-S Evaporator from February 1974 through September 1974. The feed to the 242-S Evaporator during this period was from numerous SSTs in the 200 East and 200 West Areas. By September 30, 1974, Tank 241-S-109 was filled with approximately 653,000 gal of solids (principally saltcake) and 47,000 gal of supernatant. Waste processed through the 242-S Evaporator included supernatant waste decanted from several tanks that had been processed through B Plant for cesium removal by ion exchange (Johnson 2004). Strontium and transuranic wastes are concentrated in the solids that remained in the tanks when the supernatant was decanted for cesium ion exchange. The supernatant was concentrated in the 242-S Evaporator and transferred for storage to Tank 241-S-109. During storage the waste crystallized concentrating the remaining cesium in the interstitial liquid. This is confirmed by the salt cake core samples taken from the tank. Waste was not added to Tank 241-S-109 after 1974.

**1.7.3.3 Pretreatment for Bulk Vitrification Demonstration Project Waste Feed.** Tank 241-S-109 was recently saltwell pumped (2001) to remove free liquids and likely resulted in the removal of additional dissolved cesium. The average Cs-137 concentration in the saltcake is currently 0.009 Ci/L (relative to 7 M sodium) (Best Basis Inventory [BBI] 2001). Additional pretreatment methods that will be employed during retrieval of the waste include:

- Cs-137 reduction through selective dissolution during the retrieval process. Selective dissolution is solubilizing of contaminants that will undergo dissolution when liquid is added. A description is located in Section 6.2.3.
- Post-retrieval simple solid/liquid separation. This will be accomplished with a hydroclone solids/liquid separator. Additional information is contained in Section 4.2.2.

**Table 1-1. NRC Basis for Hanford Site LAW**

| 1997 NRC Letter, Classification of Hanford Low-Activity Waste Fraction | Waste Treatment Plant Processes | S-109 Saltcake Waste Processes Applicable to Bulk Vitrification Test and Demonstration Facility RD&D Permit |
|---|---|---|
| "… a simple solids liquid separation …" | Filtration: Entrained solids are to be separated using a filter. | Two stage filtration: 1) in-tank pumping above the sludge layer and in-tank solid/liquid separation using settling and selective retrieval (solids in the sludge are not retrieved), 2) out of tank, post retrieval, simple solid /liquid separations |
| The LAW should be separated using "… single cycle ion exchange removal of cesium-137 from certain wastes…" if the "… $^{137}$Cs concentrations > 0.05 Ci/L" (7 Molar basis). | Cesium separation using ion exchange to an average level of 0.0018 Ci/L to meet disposal system specifications (specification is < 3 Ci/m$^3$ of $^{137}$Cs in the glass product, see basis below). | Saltcake waste was separated using single cycle ion exchange during the 1970's and 1980's. The waste in S-109 was reduced in Cs concentration in 1974 to a tank average level of less than 0.0086 Ci/L (current BBI for Saltcake waste in tank). Additional separation will be tested as part of the RD&D by a) in-tank Cs-137 reduction through crystallization of the salt solution in the tank that leaves the Cs-137 in the liquid phase which can then be removed separately by, b) Saltwell pumping which removes the higher concentration liquid thus reducing the average Cs concentration remaining in the tank. And finally by c) Cs-137 reduction through selective dissolution during the retrieval process |
| And the "… wastes will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C [low-level waste] as set forth in 10 CFR Part 61." Which results in a concentration limit of "4,600 Ci/m$^3$ "of $^{137}$Cs. The DOE waste management plan was to be, on the average, below 32 Ci/m$^3$ of $^{137}$Cs. | < 3 Ci/m$^3$ of $^{137}$Cs. This is based on a surface dose rate limit for the disposal package to meet disposal system specifications and not on waste form performance. | About 22 Ci/m$^3$ of $^{137}$Cs in glass at 20wt% $NaO_2$ waste loading while still meeting the surface dose limit for the disposal package to meet disposal system specifications |
| Vitrified waste form | Vitrified waste form: borosilicate glass | Vitrified waste form: borosilicate glass |
| Meet disposal performance assessment criteria | Meet disposal performance assessment criteria | Meet disposal performance assessment criteria |

### 1.7.4 Total Amount of Waste Processed

To accomplish the RD&D project objectives at least 757,000 L (200,000 gal), but not more than 1,135,500 L (300,000 gal), of tank waste will be treated. Tank waste storage and treatment limits are proposed in Section 1.7.5.

### 1.7.5 Planned Processing Rates

To ensure the successful acquisition of data during the RD&D project and to ensure that sufficient waste quantities are stored at any given time to meet the required treatment rates of the DBVS, the waste storage and treatment rates noted in Table 1-2 are planned. The treatment rates and quantities represent dangerous waste entering the treatment process prior to mixing with any process additives or soil (i.e., mixer/dryer) and may not be directly reflected in the amount of treated waste produced.

During Phase 1, the amount of waste to be treated in an individual container load is limited to 1,135 L (300 gal) or 1,700 kg (3,745 lb) calculated using a density of 1.29 kg/L (10.75 lb/gal). The Phase 1 hourly waste treatment rate listed in Table 1-2 is derived from the total amount of waste placed in the mixer/dryer divided by the minimum mixer/dryer cycle time of six hours.

**Table 1-2. Proposed Waste Storage Quantities and Treatment Rates**

| Project Phase | Waste Storage Quantity | Maximum Monthly Waste Treatment Quantity | Maximum Hourly Waste Treatment Rate |
|---|---|---|---|
| 1 | 4,880 kg (10,750 lb) | 4,880 kg (10,750 lb) | 285 kg/hr (625 lb/hr) |
| 2 | 351,090 kg (774,000 lb) | 231,700 kg (510,900 lb) | 1,205 kg/hr (2,660 lb/hr) |

During Phase 2 operations, the amount of waste treated per container will be increased to levels representative of full-scale operation. The maximum hourly treatment rate for this phase will be based on a mixer/dryer of 10,000 L (2,640 gal) capacity and 48.4% fill, resulting in a load volume of 4,840 L (1,280 gal). The corresponding weight of waste in the load is 7,240 kg (15,970 lb). The nominal mixer/dryer cycle time will be 8 hours for waste feed with a nominal 5 M sodium concentration. However, for waste with a higher salt concentration than 5 M sodium (i.e., waste feed solution with less water to evaporate), the mixer/dryer cycle time may be as short as 6 hours. The Phase 2 hourly throughput assumes the 6-hour cycle time will be used, resulting in a maximum expected treatment rate of 1,205 kg/hr (2,660 lb/hr). It is anticipated that up to eight mixer/dryer loads will be placed in each container for vitrification and that four container loads will be treated monthly. The resulting monthly treatment rate is 231,700 kg/month (510,900 lb/month).

Waste storage requirements for the system are directly related to treated waste container size and the frequency of container filling. One mixer/dryer load will contain 7,240 kg (15,970 lb). With up to 8 mixer/dryer loads deposited in one container for vitrification, one container load will contain up to 57,940 kg (127,720 lb). It is planned to allow a storage equivalent of approximately four container loads of tank waste, where two container loads of waste will be available for processing and two container loads of tank waste will be undergoing sampling and analysis. A total waste storage capacity of 351,090 kg (774,000 lb) is planned for Phase 2, based on capacities of commercially available tanks (Section 2.3.2).

## 1.8 OTHER FACILITY PERMITS

In addition to the RD&D Permit, ORP will apply for and obtain the following permits prior to facility operation:

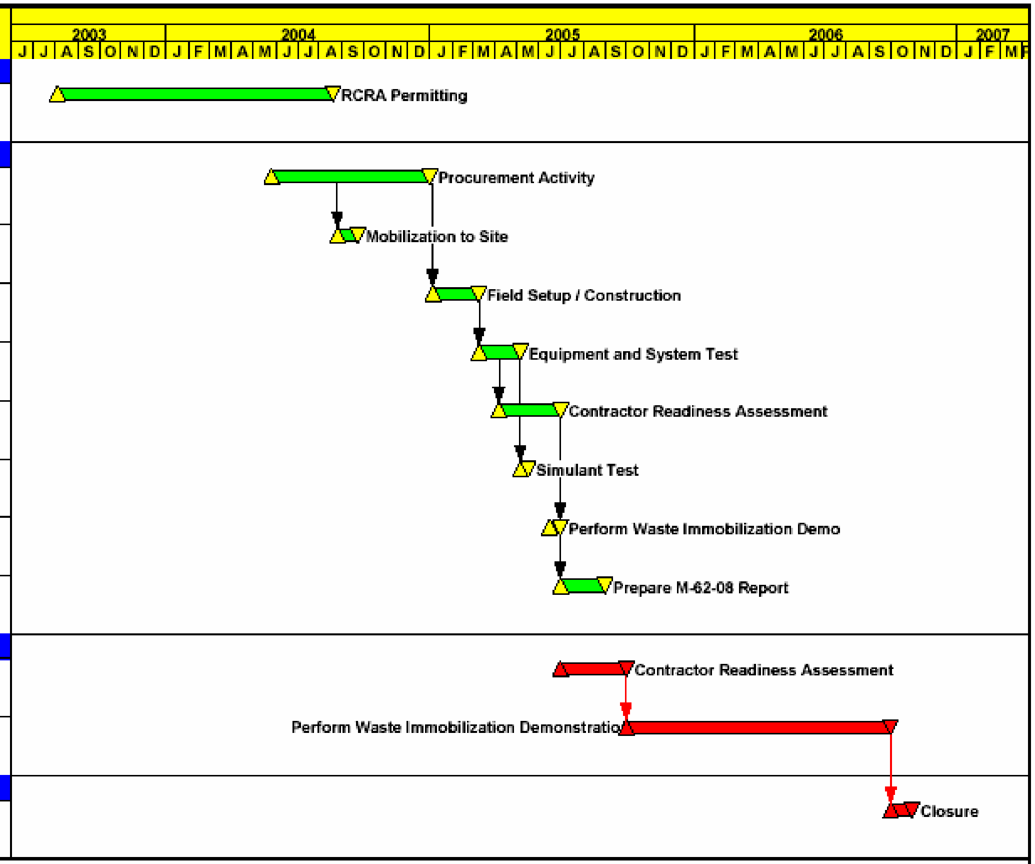
- Emissions Source Construction Permit (Washington State Department of Ecology, Nuclear Waste Program). If nonradioactive emissions are below permitting thresholds found in WAC 173-400-102, an exemption from permitting requirements will be requested.
- Radioactive Emissions Source Construction Permit (Washington Department of Health).
- National Emissions Standards for the Hazardous Air Pollutants (EPA).
- Radioactive Air Emissions Notice of Construction Application for a Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II – Waste Retrieval Operations (Washington State Department of Health).
- Criteria & Toxics Air Emissions, Categorical Notice of Construction Application for Operations of Waste Retrieval Systems in Single-Shell Tank Farms (Ecology).

**Figure 1-1. Hanford Site**

OFFICIAL USE ONLY -- IMAGE REDACTED

# Figure 1-2. Proposed Project Schedule

| Activity Description | Early Start | Early Finish |
|---|---|---|
| **Permitting Related Activities** | | |
| RCRA Permitting | 04AUG03* | 19AUG04 |
| **Construction/Operation Related Activity Phase 1** | | |
| Procurement Activity | 27MAY04* | 31DEC04 |
| Mobilization to Site | 26AUG04 | 21SEP04 |
| Field Setup / Construction | 04JAN05 | 08MAR05 |
| Equipment and System Test | 09MAR05 | 05MAY05 |
| Contractor Readiness Assessment | 06APR05 | 30JUN05 |
| Simulant Test | 06MAY05 | 16MAY05 |
| Perform Waste Immobilization Demo | 16JUN05 | 30JUN05 |
| Prepare M-62-08 Report | 01JUL05 | 30AUG05 |
| **Construction/Operation Related Activity Phase 2** | | |
| Contractor Readiness Assessment | 01JUL05* | 30SEP05 |
| Perform Waste Immobilization Demonstration | 01OCT05 | 30SEP06 |
| **Closure** | | |
| Closure | 30SEP06 | 30OCT06 |

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| Start Date | 01APR03 |
| Finish Date | 30OCT06 |
| Data Date | 01APR03 |
| Run Date | 26APR04 12:04 |

Early Bar
Progress Bar
Critical Activity

PERC
Sheet 1 of 1
CH2M HILL Hanford Group
RD&D Schedule

| Date | Revision | Checked | Approved |
|---|---|---|---|