# HANFORD SITE MIXED WASTE DISPOSAL

Kent M. McDonald and Dale E. McKenney
Fluor Hanford Waste Management Project
Todd A. Shrader, US Department of Energy
Richland, Washington

## ABSTRACT

Significant volumes of mixed low-level waste (MLLW) will be generated as part of the management and remediation of the Hanford Site. The MLLW that is generated as part of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) process will largely be managed as part of that remediation effort, with disposal likely in the centralized Environmental Restoration Disposal Facility (ERDF). Other unique MLLW streams will be produced as part of the Hanford program to disposition tank wastes, and will include failed equipment (melters) and immobilized low-activity wastes. These disposal operations are in the early planning stages and will likely require development of specialized disposal facilities.

This paper will focus on disposal of the more "routine" waste streams, those currently stored onsite in permitted Resource Conservation and Recover Act (RCRA) facilities, or those newly-generated MLLW streams requiring management in permitted RCRA facilities. These waste streams typically include RCRA regulated MLLW debris, sludges, soils and solidified liquids.

In September 1999, the United States Department of Energy, Richland Operations Office and Fluor Hanford began disposing of Land Disposal Restrictions (LDR) compliant MLLW in a RCRA mixed waste disposal facility at the Hanford Site. This facility, one of two at Hanford, is an integral part of a comprehensive program to treat and dispose of the Hanford inventory of stored MLLW, and may aid the DOE Complex in disposing of its legacy of MLLW.

The Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) record-of-decision (ROD) for MLLW identifies Hanford as one of the disposal sites for much of the DOE complex MLLW. A few actions remain to be completed before waste from offsite generators can be shipped to the Hanford Mixed Waste Facilities for disposal. These actions include, but are not limited to, completion of the Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement (SW EIS), resolving equity issues associated with the receipt of offsite MLLW, and verification that the candidate waste streams meet the Hanford Site Waste Acceptance Criteria (WAC). The ROD for the SW EIS is expected in 2002, equity discussions are ongoing, and waste acceptance criteria are already established and can be used to determine acceptability.

## INTRODUCTION

The Richland Operations Office operates lined, RCRA Subtitle C land disposal units, known as the Mixed Waste Disposal Unit (MWDU) or more commonly, the MLLW disposal trenches (See Figure 1). These two trenches are located at the southern end of the 218-W-5 Burial Ground, in the Hanford Site 200 West Area. As RCRA compliant land disposal units, these facilities are double-lined and include leachate collection systems. In September 1999, disposal of MLLW (predominantly macroencapsulated debris) began in Trench 34, constituting the first compliant disposal of Richland Operations Office MLLW at the Hanford Site (Figure 2). Since that time,

1644 m3 of MLLW has been treated and disposed of, most of it in Trench 34 (a small volume was able to exit RCRA, and was disposed of in the low-level burial grounds).

The two MLLW disposal trenches have a combined disposal capacity of approximately 42,000 cubic meters. This disposal capacity is estimated to be sufficient to meet Hanford MLLW disposal needs for through at least Fiscal Year 2007, and construction of additional capacity is accounted for in out year planning.

With the release of the WM PEIS Record of Decision for MLLW disposal on February 25, 2000 (see *Federal Register*, Volume 65, No. 38, pages 10061-10066), the Hanford Site became one of the identified regional disposal locations for MLLW. In light of this decision, offsite MLLW may be directed to Hanford in the near future. Disposal of offsite MLLW may occur at Hanford starting in Fiscal Year 2003 pending the final determination of the SW EIS ROD.

.

Fig. 1. Hanford MLLW Disposal Facility (Trench 34)

Fig. 2. Placement of Macroencapsulated Debris in Trench 34

## FACILITY DESCRIPTION

The two trenches that make up the MWDU are nearly identical in design. Each trench is 250 feet by 100 feet at the base, with a side slope ratio of 3 horizontal to 1 vertical. The bottom of the landfill excavation is sloped to facilitate leachate collection, giving a variable depth of between 25 feet and 30 feet. Each trench has a disposal capacity of approximately 21,000 cubic meters of waste, although this volume can vary significantly based on the waste form and other criteria such as the need for shielding to reduce the dose from remote-handled waste.

Each trench is equipped with a liner and leachate collection system that incorporates the following layers:

- Operations layer – The bottom and sides of the trench are covered with a 3 foot layer of soil to protect the liner system during waste placement operations;
- Primary leachate collection system – This layer consists of a geotextile, drainage gravel, geonet/geotextile geocomposite, primary high density polyethylene (HDPE) geomembrane, and a 1.5 foot soil and bentonite clay (8-10%) admix layer;
- Secondary leachate collection system – This layer consists of a geotextile, drainage gravel, geonet/geotextile geocomposite, secondary HDPE geomembrane, and a 3 foot soil and bentonite clay admix layer.

The primary leachate collection system is composed of drainage gravel and perforated drainage pipes that lie along the centerline of the trench bottom, and at the base of the side slopes. A secondary leachate collection system is installed below the primary liner and above the secondary liner system. The leachate collection systems are designed to direct leachate to the sump area located at the east end of the trench. Pumps are located in the sump area, and provide for removal and storage of leachate in a tank outside the trench. The facility has been fitted with a rain curtain to divert rainwater for collection and non-regulated disposal (it never contacts waste), minimizing the generation of leachate.

## WASTE ACCEPTANCE

The regulatory requirements for disposal of mixed radioactive waste are complex. At Hanford, waste acceptance criteria have been developed and approved for the disposal of mixed waste. These criteria are based on the various environmental regulations, permit requirements, safety basis requirements, and operational requirements. The complete set of acceptance criteria for Hanford's disposal facilities are contained in the Hanford Site Solid Waste Acceptance Criteria, which can be found at http://www.hanford.gov/wastemgt/wac/index.htm . The Hanford Site does not currently accept mixed waste from other DOE sites pending completion of a number of actions, including the completion of the SW EIS and the issue of an associated ROD. Sites that plan to ship waste to Hanford for disposal after completion of the SWEIS should review this waste acceptance information. It is particularly important for DOE sites that are considering the alternative to ship waste to Hanford understand the site-specific and Washington State requirements ***prior to*** treating their waste. Failure to understand these requirements could result in treated waste that cannot be disposed at the Hanford Site.

The following is a brief summary of the types of waste that can be disposed in the Hanford mixed waste trenches.

- RCRA regulated radioactive waste (i.e., mixed waste) that meets Federal and Washington land disposal restrictions (LDR). Acceptable RCRA waste numbers include F001-F005 and D001-D043.
- Washington state dangerous waste that meets Washington LDRs.
- Certain TSCA regulated PCB wastes, including bulk PCB remediation waste greater than or equal to 50 ppm PCBs and PCB bulk product waste.

It should be noted that in most cases, treated D001-D043 waste no longer exhibits the characteristic, and the waste code would no longer apply. Additionally, it should be noted that Hanford expects to be able to receive waste with most F, U, and P listed waste numbers in the near future (pending approval of a revised delisting petition for the Effluent Treatment Facility which will process the trench leachate).

### Federal Land Disposal Restrictions

**Mixed Waste Disposal Unit Requirements -** Mixed waste disposed at Hanford's Mixed Waste Disposal Unit must meet the Federal LDRs of 40 CFR Part 268. The State of Washington has adopted the LDR regulations effective on July 1, 1999. Generators and treatment facilities that ship mixed waste for disposal at the Hanford Site must perform the following to demonstrate compliance with LDR regulations:

- Waste analysis: If the waste is subject to concentration-based treatment standards, a representative sample of the waste must be tested to demonstrate that it meets the applicable treatment standards.
- LDR certification: Certification must be provided that the waste meets the LDR requirements in accordance with 40 CFR 268.7 and (when applicable) 268.9.

**Unlined Low-Level Burial Grounds: Requirements for Decharacterized Waste and Debris that Exits RCRA -** Characteristic-only (D001-D043) waste and hazardous debris can be treated to exit regulation under RCRA (in accordance with 40 CFR 261.3(d) and (f)) and can be disposed in Hanford's unlined disposal units. For concentration-based treatment standards, you must obtain analytical data and LDR certifications must be provided as described above for mixed waste disposal. LDR certifications for waste that exits regulation under RCRA are typically made to the EPA Region or authorized State program. Hanford requires that generators provide a copy of that certification.

**Washington State Dangerous Waste Regulations**

The Washington State Dangerous Waste Regulations (WAC 173-303) regulate a broader universe of waste than the RCRA regulations and have additional land disposal restrictions. Waste generators and treaters must understand Washington's regulations as they apply to disposal of waste. There are two primary areas in which Washington's regulations are more stringent than the RCRA regulations.

**Waste Designation (Additional Waste Numbers) –** The State of Washington specifies additional regulations. These are:

- Waste number W001 is assigned to discarded transformers, capacitors or bushings contaminated with PCBs between 2 and 50 ppm, and to waste generated from salvaging, rebuilding or discarding 2 - 50 ppm transformers, capacitors or bushings. Additionally, since W001 is a listed waste number (i.e., regulated in the same manner as U, P, F or K listed waste), solid waste that is mixed with or derived from W001 waste continues to be regulated as W001.
- Waste number WSC2 is assigned to solids and semi-solids that exhibit a pH less than or equal to 2 or greater than or equal to 12.5 when tested using SW-846 Method 9045.
- Waste numbers WT01 or WT02 are assigned to certain toxic wastes as defined by WAC 173-303-100.
- Waste numbers WP01 or WP02 are assigned to wastes that contain halogenated organic compounds in combined concentration greater than 100 ppm as defined by WAC 173-303-100.
- Waste number WP03 is assigned to waste that contains certain polycyclic aromatic hydrocarbons in combined concentration greater than 1% (WAC 173-303-100).

Waste numbers W001 and WSC2 can apply to any waste, whether it has RCRA waste numbers or not. Waste numbers WT01, WT02, WP01, WP02 and WP03 would apply only to waste that does not have RCRA waste numbers. Any waste streams requiring these waste numbers can only be disposed in the Mixed Waste Disposal Unit.

### Washington Land Disposal Restrictions

In addition to the LDRs of 40 CFR 268, Washington State has other types of waste that are restricted from land disposal, as described in WAC 173-303-140. Washington's LDRs prohibit disposal of the following types of waste:

- Extremely hazardous waste (as defined by WAC 173-303-070 and 100)
- Liquid waste
- Organic/carbonaceous waste (as defined by WAC 173-303-140)
- Solid acid waste (as defined by WAC 173-303-140)

### Hanford Site Permit Requirements

As with any permitted disposal facility, the Hanford Site must implement additional requirements under its permit with the State of Washington. In particular, the Hanford Site performs physical and/or chemical screening of a portion of the waste sent to its disposal units. Physical screening consists of nondestructive examination or visual inspection of the waste. Chemical screening consists of fingerprint chemical analyses.

Hanford's Waste Analysis Plan requires screening of nearly all waste streams. Certain types of waste, such as macroencapsulated debris, may be difficult or impossible to screen after treatment. In cases where a treated waste will be difficult to screen, alternate screening arrangements must be made, such as screening at the generator's or treater's facility. As a result, it is extremely important that sites that plan to ship waste for disposal at the Hanford Site obtain approval to ensure that screening can be performed prior to beginning treatment. The best way to obtain approval is to submit a Waste Profile Sheet prior to treatment (understanding that additional LDR data must be provided subsequent to treatment). Verification requirements will be identified on the Waste Profile Sheet approval documentation. *Failure to obtain approval of a Waste Profile Sheet before treatment could result in waste that cannot be disposed at the Hanford Site.*

## OFFSITE WASTE

The Hanford Site may accept MLLW from offsite generators at some future date for disposal in the mixed waste trenches. This potential disposal mission is identified in the Waste Management Programmatic EIS Record-of-Decision (ROD) for MLLW, which identifies Hanford as one of the regional disposal alternatives for MLLW (Nevada being the other). A site specific, lower-tier EIS is being prepared at Hanford, the Hanford Site Solid (Radioactive and Hazardous) Waste Environmental Impact Statement (SW-EIS), to provide the necessary analysis to allow disposal of offsite MLLW if such an action is supported by the resulting ROD.

One alternative in the SW-EIS analyzes the scenario of all MLLW identified in the WM PEIS for disposal at a regional disposal site coming to Hanford. While this may not be the most likely or even the most desirable scenario, the analysis will bound the environmental impacts of any subset of the waste that is eventually sent to Hanford. The ROD for the SW-EIS is estimated to issued in late Fiscal Year 2002. Assuming that the impacts of disposing of offsite MLLW are deemed acceptable, Hanford could start receiving that waste soon after that date. No major changes are expected to the waste acceptance criteria as described above. Generators evaluating the potential disposal of their waste at Hanford are encouraged to become familiar with the acceptance criteria as they are presently applied.

## WASTE PROJECTIONS/DISPOSAL CAPACITY

The Hanford Site maintains a detailed life-cycle solid waste forecast for all waste categories, including MLLW. The forecast information is included in the *Solid Waste Integrated Forecast Technical (SWIFT) Report 2001.0: FY2001 to* FY2046, and can be accessed at the following address: http://www.hanford.gov/docs/ep0918/index.htm.

The total volume of MLLW forecasted to be produced life-cycle on the Hanford Site is approximately 65,000 cubic meters (both contact-handled and remote-handled, including currently stored inventory). Given a disposal capacity for the existing MLLW trenches of approximately 42,000 cubic meters, and considering that there may be changes in MLLW volumes as a result of treatment, it is anticipated that additional capacity will have to be constructed for disposal of Hanford Site MLLW. The planning baseline for Hanford includes construction of additional capacity to meet this need.

Should the decision be made to accept offsite waste, additional disposal capacity will be required. Decisions regarding how much offsite waste might be received, the timing of such receipts, the source of funding to construct the additional capacity, etc. will have to be deferred until appropriate actions are completed which would allow offsite MLLW acceptance for disposal.

## CONCLUSIONS

The Hanford Site has begun disposing of mixed low-level waste in RCRA-compliant mixed waste disposal trenches. To date, waste disposed has consisted of existing Hanford waste, treated to meet land disposal restrictions. Future near-term disposal efforts will continue to be concentrated on Hanford waste, but pending the completion of several actions, including the issuance of the Hanford Solid Waste EIS Record-of-Decision, the potential exists for disposal of offsite waste from other DOE generators.