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**Nuclear Waste Program
Hanford Project
Dangerous Waste Compliance Inspection**

**Procedural Closure of Physical and Chemical Treatment Test Facilities
and
Thermal Treatment Test Facilities**

1. Introductory Information

Name and Address of Owner:
U.S. Department of Energy (USDOE)
Richland Operations Office
P.O. Box 550
Richland, WA 99352

ID Number: WA7890008967

Operator:
Pacific Northwest Laboratories (PNL)
P.O. Box 999
Richland, WA 99352

Date and Time of Inspection(s):
August 16, 1995, 8:30 am - 4:00 pm
August 18, 1995, 8:30 am - 10:00 am
September 6, 1995, 8:00 am - 12:30 pm

Phone Number and Contact:
Bob DeLannoy, USDOE
(509) 373-8017

Date of Inspection Report:
September 15, 1995

Mike Schlender
(509) 376-8795

Type and Reason for Inspection:

The inspection was performed to determine if the Physical/Chemical Test Facilities and the Thermal Treatment Test Facilities were ever actually used to treat, store, or dispose of hazardous or mixed waste in a manner whereby interim status standards would be required. The inspection focused on the condition of locations in which treatment activities were to have been performed. Information gathered from the inspection will aid Ecology in determining if a procedural closure process is appropriate for the identified units.

Report Prepared By: Laura Russell

Inspection Conducted By: Laura Russell
Bob Wilson
Kevin Christensen
Carissa McGuire



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This inspection was conducted by the following representatives from the Washington State Department of Ecology, Nuclear Waste Program, Kennewick.

Laura Russell

Laura Russell, Team Leader
Environmental Specialist

Bob Wilson

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Environmental Specialist

Kevin Christensen

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Environmental Specialist

Carissa McGuire

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Administrative Intern



Personnel contacted during this inspection include:

Bob DeLannoy, USDOE
Cliff Clark, USDOE
Brian Day, PNL
David Lamar, PNL
Mike Truex, PNL
David Einan, EPA

Harold Tilden, PNL
Mike Schlender, PNL
Ja-Kael Luey, PNL
Patrick Weaver, PNL
Roger Stanley, Ecology
Dennis Faulk, EPA

2. Background

The Tri-Party Agreement (TPA) allows for "procedural closure" of units which were classified as treatment, storage, or disposal units (TSDs), but were never actually used to treat, store, or dispose of dangerous and/or mixed waste, except as provided by WAC 173-303-200 (Accumulating dangerous waste onsite) or WAC 173-303-802 (Permit by rule). *(Note: WAC 173-303-071(s) also offers an exclusion from the requirements of WAC 173-303 for samples undergoing treatability studies at laboratories and testing facilities.)*

For Ecology to procedurally close a unit, the TPA requires USDOE to notify Ecology in writing that the unit never handled hazardous waste and provide signed certification in accordance with WAC 173-303-810(13) (Reference: TPA, Section 6.3.3). On July 14, 1995, USDOE submitted written notification to Ecology initiating the procedural closure process for the Thermal Treatment Test Facilities (TTTF) and the Physical/Chemical Test Facilities (PCTF)(Attachment A).

Part A permit applications for both units were submitted in May 1988 (a revision to the PCTF was submitted in June 1991) (Attachment B). Milestones were established calling for submittal of Part B permit applications for the TTTF by December 1993 (Milestone M-20-42) and the PCTF by December 1994 (Milestone M-20-43). Milestone M-20-42 was extended twice and now requires submittal of a closure plan for the TTTF by September 1995 (Milestone M-20-42A). Milestone M-20-43 was also extended and requires submittal of a closure plan for the PCTF by September 1995 (Milestone M-20-43A) (Attachment C).

The Part A applications list a variety of processes requiring use of "real" waste or "simulated" waste as medium for treatment. Real dangerous waste (material that meets the definition of dangerous waste per WAC 173-303) is managed as such, whereas simulated waste is not. Simulated waste is created using prescribed dangerous waste constituents, typically minus the radiological component, for the purpose of performing treatability tests. This material is not considered a dangerous waste. However, resultant waste streams from both real waste and simulated waste are subject to conditions of WAC 173-303. On September 11, 1995, Ecology sent a letter to USDOE/PNL clarifying management of simulated waste streams (Attachment D).

An inspection summary follows detailing processes and wastes associated with each location specified in the Part A applications. Information was obtained from field inspections, personal interviews, and document reviews.

3. Description of Inspection

At 8:30 a.m. on Wednesday, August 16, 1995, Bob Wilson, Kevin Christensen, and I met Mr. Bob DeLannoy, USDOE, Mr. Brian Day, PNL, and Mr. Mike Schlender, PNL, at the 337 Building. The group confirmed the day's field inspection schedule: the 116-B-6-1 crib, the in-situ vitrification (ISV) site, then the 324 Building. At noon, Carissa McGuire, Ecology administrative intern, would meet us at the 324 Building. Mr. Schlender would not go to the crib, but would meet us at the ISV site.

THERMAL TREATMENT TEST FACILITIES

The TTF Part A identifies the following process locations:

- 116-B-6-1 crib (100 Area)
- ISV test site (west of 300 Area)
- engineering development laboratory (EDL) in the 324 Building
- EDL highbay in the 324 Building
- hot cell complex in the 324 Building
- other selected laboratories in the 324, 325, and 331 Buildings
- other facilities and RMW/hazardous waste remedial action locations may be used

The TTF Part A identifies the following processes:

- in-situ vitrification (bench-scale, engineering-scale, pilot-scale, large-scale)
- waste vitrification using prototype equipment (bench-scale, pilot-scale)
- plasma-arc pyrolysis
- in-situ heating of soils and sludges for removal of organics
- metal melting for volume reduction and immobilization of contaminated metals
- gamma induced oxidation of organic chemicals
- thermal treatment for the drying and decomposition of liquid slurries
- in-can melting of soil wastes and liquid slurries
- microwave heating to dry and immobilize liquid and solid wastes

116-B-6-1 Crib (a.k.a. 116-B-6A Crib) - (Attachment E)

Mr. DeLannoy and Mr. Day drove with Kevin, Bob, and me to the 116-B-6A crib. Wayne Soper, Ecology's 100-BC-1 Unit Manager, met us at the site.

In May 1990, a large-scale in-situ vitrification test was performed at the crib. Results of this test are documented in a report entitled, "In Situ Vitrification of a Mixed-Waste Contaminated Soil Site: the 116-B-6A Crib at Hanford." The crib contains radioactive and chemical waste contaminants and is part of a surface contamination area. The treatment produced an ISV block approximately 35 to 40 feet in diameter, 12 feet high, and 800 to 900 tons. Mobile ISV equipment was used; no equipment was left at the crib site. Mr. Schlender reported the equipment used in this ISV test was decontaminated. The hood is currently located at the 300 Area ISV site; the other pieces of large-scale ISV equipment are currently in use at Oak Ridge, Tennessee.

The crib is classified in the TPA as a CERCLA past-practice unit within the 100-BC-1 operable unit. EPA is the lead regulatory agency (Mr. Dennis Faulk, Unit Manager). USDOE/PNL has no plans for further thermal treatment tests at this crib.

The crib is classified in the TPA as a CERCLA past-practice unit within the 100-BC-1 operable unit. EPA is the lead regulatory agency (Mr. Dennis Faulk, Unit Manager). USDOE/PNL has no plans for further thermal treatment tests at this crib.

ISV Test Site (Attachment F and Photos #1-15)

Mr. DeLannoy, Mr. Day, Kevin, Bob, and I met Mr. Schlender and Mr. Ja-Kael Luey at the ISV test site. Brandon Schmorde, Ecology Administrative Intern, also met us at the site. Mr. Luey explained processes taken place at the ISV site. *He said only one in situ vitrification test was performed that involved chemical constituents: a pilot-scale test performed in September 1990.*

1990 Pilot-Scale Test

Details of this pilot-scale test are summarized in a report entitled "Underground Tank Vitrification: A Pilot-Scale In Situ Vitrification Test of a Tank Containing a Simulated Mixed Waste Sludge." The report includes data from samples of soil surrounding the treatment area. Samples were collected and analyzed for strontium, cesium, mercury, cadmium, and lead. Analyses were performed by x-ray fluorescence (XRF) and SW-846 methods involving a hydrofluoric acid/microwave sample digestion. TCLP tests were not performed. The following table compares results from this sampling effort with MTCA levels:

| Constituent Sampled | Maximum Value Detected | MTCA Levels |
|---------------------|------------------------|------------------------------------|
| Strontium | 432 mg/kg (SW-846) | 4.8×10^4 mg/kg (Method B) |
| Cesium* | < 13 mg/kg (XRF) | No MTCA Values |
| Mercury | < 3 mg/kg (XRF) | 24 mg/kg (Method B) |
| Cadmium | < 6.9 mg/kg (XRF) | 80 mg/kg (Method B) |
| Lead | 50 mg/kg | 250 mg/kg (Method A) |

* Mr. Schlender reported the form of Cs used was a "cold isotope" -- what naturally occurs as Cs-133.

On April 19, 1990, (before the pilot-scale test was performed), USDOE wrote a letter to Ecology asking for regulatory guidance on management of the pilot-scale ISV test materials. On April 30, 1990, Mr. Tim Nord, Ecology Project Manager, provided the following written guidance:

- The materials used in the test designate as a dangerous waste, based on two criteria: First, the material meets the solid waste definition of WAC 173-303-016(4)(c), and the material's composition meets the criteria for dangerous waste under WAC 173-303-084, dangerous waste mixtures.
- The simulated underground waste tank ISV tests will be regulated by Ecology under the Interim Status Part A Permit for Thermal Treatment Test Facilities.

Mr. Schlender said USDOE/PNL disagreed with Mr. Nord's determination of the material as a solid waste (although no formal response to Mr. Nord's letter was ever issued). Mr. Schlender said the material was not placed in the ground in a manner constituting disposal and, therefore, does not meet the solid waste definition. On September 11, 1995, Ecology sent a letter to PNL clarifying management of simulated waste streams (See Attachment D).

Management of Vitrified Mass

Mr. Luey said vitrified material from the pilot-scale test was exhumed but not removed from the site. It remains scattered in broken pieces at the "boneyard," located in the northeast corner of

Past Practices at ISV Site

During a follow-up meeting on September 6, 1995, Ecology reviewed PNL certification records. One certification record carried the following statement from Mr. Craig Timmerman:

To the best of my knowledge, an ISV testing under my direction or oversight using waste materials was performed prior to 1988. Any non-DOE client testing allowed for the materials to be sent back to the client per the contract. Most ISV tests were performed using simulated chemicals or materials not actual wastes.

Mr. Timmerman's statement refers to tests performed prior to 1988, the date of the permit. *This statement is not consistent with Mr. Ja-Kael Luey's statement that only one test involving chemical constituents occurred at the ISV site.* Mr. Schlender said he will research this issue further.

The ISV site is classified in the TPA as a CERCLA past-practice unit within the 300-FF-2 operable unit. EPA is the lead regulatory agency (Mr. David Einan, Unit Manager). Mr. Luey said thermal treatment tests will continue at the ISV site; however, tests will be on clean soil or be performed under the treatability study exclusion (WAC 173-303-071).

Engineering Development Lab (EDL) and EDL Highbay - 324 Building (Attachment G and Photos #16-26)

Mr. David Lamar, Senior Development Engineer for PNL, took us through the EDL and EDL Highbay. Waste vitrification is performed in the EDL, room 102. Both a small scale and pilot scale melter are currently in use (Photos #17-19). Simulated waste streams are fed into the two operational melters. Mr. Lamar explained how the process results in two waste streams that are managed as dangerous waste under WAC 173-303-200 requirements:

- sludge from off-gas scrubbing system (tank at base of treatment unit)
- sludge from the filtration process (tank #EDL-22) (Photo #21)

Another stream, effluent from the off-gas scrubbing system filtration tanks, is piped into "pit tanks" in the basement of the 324 Building. (Refer to the Biological Treatment Test Facilities portion of the Physical/Chemical Test Facilities section, below.)

Mr. Lamar said in 1995, one treatability study was performed using actual waste. Documentation on this process is available from the project manager, Mr. Joe Perez. Mr. Schlender provided information that identified a vitrification test performed using spent aluminum potliners. This information was part of quarterly submittals to Ecology on hazardous waste treatability tests at Hanford. Additional testing is planned using simulated wastes.

A third melter, a liquid-fed ceramic melter, is no longer in use. Mr. Lamar said the ceramic melter will be dismantled and disposed of as solid waste, low level waste, or mixed waste depending on contaminants. (Although no radioactive constituents were added to the ceramic melter, it does contain naturally occurring thorium associated with a chrome-based refractory.)

Waste vitrification is performed in the EDL, room 101, using clean or spiked soils. Additional testing is planned.

Plasma-arc pyrolysis is performed in the highbay (Photo #22) using clean soils. Equipment remains in the highbay. Additional treatability tests are planned. Also in the highbay is a 7800

gallon feed preparation tank that holds simulated waste prepared for use in the metals. A similar but smaller-scale system is located on the third floor of the EDL that consists of three 800 gallon feed preparation tanks.

The 324 Building EDL and EDL Highbay are not part of any current facility transition plan. However, equipment used to perform treatability tests become subject to dangerous waste management conditions under WAC 173-303 once equipment is no longer in use and deemed to be waste.

Hot Cell Complex (includes Radiochemical Engineering Cells (REC)) - 324 Building (Photos #28-30)

Mr. Pat Weaver, B-cell Project Manager, PNL, took Kevin, Carissa, and me through the REC. The REC consists of four cells: A-cell, B-cell, C-cell, and D-cell. Regulation of the B-cell and D-cell has been addressed through TPA milestone # M-89-00, which requires submittal of a closure plan. This inspection focused on the A-cell and C-cell only.

Mr. Weaver reported no thermal treatment activities in the A-cell or C-cell. (Refer to the Radiochemical Hot Cell Complex portion of the Physical/Chemical Test Facilities section, below.)

Other selected laboratories in the 324, 325, and 331 Buildings

Other facilities and RMW/hazardous waste remedial actions locations

Mr. Schlender reported no thermal treatment activities occurred in these "other" facilities. However, on September 6, 1995, a review of PNL staff certification forms revealed treatment activities had occurred at the Process Development Lab (PDL) in North Richland. The PDL is now known as the Material Development Lab (MDL). Mr. Schlender said the treatments performed were not permitted activities.

PHYSICAL/CHEMICAL TEST FACILITIES

The PCTF Part A identifies the following process locations:

- Radiochemical Hot Cell Complex in 324 Building
- Biological Treatment Test Facilities in 324 Building
- Shielded Analytical Laboratory in 325 Building

The PCTF Part A identifies the following processes:

- pH adjustment
- ion exchange for selective removal of contaminants from waste solutions
- waste concentration by evaporation
- waste dissolution such as waste retrieval from storage tanks by pH adjustment or fusion
- precipitation/filtration and solvent extraction from solutions, slurries, and sludges
- solids washing for separation of contaminants from sludges
- catalytic destruction methods, e.g., electrolytic generation of oxidants such as silver, cerium, and other electrochemically-enhanced processes for decontaminating metals and oxidizing non-metals
- grouting

Radiochemical Hot Cell Complex in 324 Building - (Attachment H and Photos #28-30)

In approximately 1987, the A-cell was used for electropolishing thirty canisters of highly radioactive waste. The A-cell is currently used for the sole purpose of storing these canisters. Mr. Weaver said the waste has been fully characterized and does not designate as dangerous waste. Pyrophoric acid used in the electropolishing effort was shipped out as dangerous waste within 90 days of generation. No further use of A-cell is planned at this time.

C-cell is currently used to store radioactive equipment and has a small satellite storage area where waste oil is accumulating. Future plans for C-cell include a treatment study (sludge washing) on sludge from single-shell tanks. Mr. Schlender provided a report entitled, "Functions and Requirements for the Sludge Pretreatment Demonstration," dated October 1994. Section 4.2.8. states:

Tests on actual hazardous or mixed wastes conducted in this system will be covered by the treatability test exemption in WAC 173-303-071. Environmental compliance aspects of test planning and performance will be coordinated with PNL Environmental Compliance to ensure compliance with regulations.

A-cell and C-cell are not part of any facility transition plan. However, equipment used to perform treatability tests become subject to dangerous waste management conditions under WAC 173-303 once equipment is no longer in use and deemed to be waste.

Biological Treatment Test Facilities in 324 building

Mr. Schlender explained the physical layout of the biological treatment laboratories and the activities that actually took place. He said one piece of equipment, formally located on the first floor (see Part A, page 33 of 35), was used to treat simulated waste (carbon tet and nitrates). Mr. Schlender later reported the equipment, a Bio-Reactor system, has been washed and moved outside the 324 Building to await final disposition.

Mr. Schlender said treatment has occurred on simulated wastes in Rooms 22A and 22B located in the basement of the 324 Building (see Part A, page 35 of 35) (Photo #27). Mr. Mike Truex, a biologist for PNL, explained how all research projects include "risk and prep" forms that detail wastes being used and define criteria for meeting the -071 exclusion. Mr. Truex said Mr. Cameron Anderson manages the risk and prep forms, and added that use of these forms began in the 1980's. Mr. Mike Truex also said Mr. Mike McCoy arranges for material to be brought into the lab for treatment studies. Mr. McCoy also keeps records to show compliance with the -071 exclusion. However, Mr. Schlender said most of the studies are not associated with processes identified on the PCTF Part A. He explained the processes listed in the PCTF Part A are being incorporated into the Part B for 325 Building Hazardous Waste Treatment Units.

I asked about the "holding tanks for effluent" in the "pit tank" area located next to rooms 22A/B (see PCTF Part A, page 35 of 35). Mr. Schlender said the tanks are not part of the biological treatment test facility, rather they serve as surge tanks from filtrate tanks used in waste vitrification processes performed in the EDL. Mr. Schlender later reported the condensate or "effluent" is either 1) used as process makeup water for the next treatment test campaign, 2) sampled and discharged to the 300 Area Waste Effluent Treatment Facility, or 3) sampled and managed as waste, i.e., shipped to the 305 Building for storage/disposal. I informed Mr. Schlender the status of these tanks must be determined, i.e., if they are generator accumulation

tanks, the requirements of WAC 173-303-200 apply. If dangerous and/or mixed waste is accumulated within the tanks for greater than 90 days, storage facility requirements of WAC 173-303 would apply. Mr. Schlender said he would research this issue further.

Mr. Schlender also discussed the "risk and prep" forms. These forms, completed by PNL laboratory users prior to starting their projects, include information on the type and amount of waste to be produced. Mr. Schlender said he used the forms to track funding and lab activities in an effort to determine which facilities performed thermal or physical/chemical treatment.

The 324 Hot Biological Treatment Test Facilities are not part of any facility transition plan. However, equipment used to perform treatability tests become subject to dangerous waste management conditions under WAC 173-303 once equipment is no longer in use and deemed to be waste.

Shielded Analytical Laboratory in 325 Building

This portion of the PCTF Part A is being moved to the 325 Hazardous Waste Treatment Units Part A.

On August 18, 1995, Kevin and I returned to Building 337 and met with PNL and USDOE staff to review records and discuss the field inspection. Copies of the certification forms PNL sent to researchers were formally requested.

On September 6, 1995, Ecology, PNL, and USDOE staff met to discuss progress to date on the procedural closure process and complete the record review.

4. Summary of Conclusions and Recommendations

General

- USDOE/PNL management appear well aware of requirements associated with management of waste under the treatability exclusion of WAC 173-303-071(s). A follow-up inspection may be warranted at a later date to verify continuing waste management practices with regard to treatability tests.
- A follow-up inspection may be warranted on disposition of treatment equipment, management of resultant waste streams, etc.

116-B-6-1 Crib

- USDOE/PNL has no plans for further thermal treatment tests at this crib.
- Future remedial actions at this site could be managed under CERCLA as part of the 100-BC-1 operable unit.

ISV Test Site

- A review of the data from sampling soil surrounding the simulated waste tank test is needed to determine if closure of the area is appropriate.
- Research is needed on activities conducted at the ISV Test Site prior to 1988. A note from a former PNL employee suggests ISV tests were performed using simulated and/or actual wastes at the site. Further site characterization may be warranted.
- USDOE/PNL does report plans for more thermal treatment tests at the ISV site; however, the tests would be performed under the treatability exclusion WAC 173-303-071(s).

- Future remedial actions at the ISV test site could be managed under the existing Part A (i.e., closure plan), under CERCLA as part of the 300-FF-2 operable unit, or as an independent remedial action under MTCA.
- It is NOT appropriate to procedurally close the ISV test site without a mechanism to investigate and assess environmental contamination.

324 Building Facilities

- Tanks located in the "pit tank" area next to rooms 22A/B must be appropriately classified as generator accumulation tanks, waste storage tanks, or process tanks. If the tanks are being used as generator accumulation tanks, requirements of WAC 173-303-200 must be followed. If they are being used as >90 day storage tanks, then facility requirements of WAC 173-303-400 apply, and the Part A should not be withdrawn.
- An overall facility transition plan does not currently exist for the 324 Building. However, equipment used to perform treatability tests become subject to dangerous waste management conditions under WAC 173-303 once equipment is no longer in use and deemed to be waste.

5. Attachments

- A. Letter, USDOE to Ecology, "Initiation of Procedural Closure for Nonoperational Treatment, Storage, and/or Disposal Units, dated July 14, 1995.
- B. Part A Permit Applications:
 - o Thermal Treatment Test Facilities, dated May 19, 1988.
 - o Physical/Chemical Treatment Test Facilities, dated June 14, 1991.
- C. Change Requests for Milestones.
- D. Letter, Ecology to USDOE/PNL, "Regulation of 'Simulated' Waste," dated September 11, 1995.
- E. Information Packet from 116-B-6-1 Crib.
- F. Information Packet from ISV Site.
- G. Information Packet from EDL and EDL Highbay.
- H. Diagram of 324 Building Radiochemical Engineering Cells.
- I. Photo Log.