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SUPERFUND SITE FINAL CLOSEOUT REPORT
U.S. Department of Energy Hanford 1100 Area
Richland, Washington

I. INTRODUCTION

This Final Close Out Report documents that the U.S. Department of Energy (DOE), under the oversight of the Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology), completed all construction activities for the Hanford 1100 Area in accordance with Procedures for Completion and Deletion of National Priority Sites (OSWER Directive 9320.2-3A) and updates thereto. EPA, in conjunction with DOE, conducted the final inspection on December 12, 1995 and determined that the remedial action has been successfully executed.

The lead agency for remediation of the Hanford 1100 Area is DOE. DOE performed an extensive remedial investigation at the site as well as numerous remedial actions. EPA and Ecology are the two agencies responsible for ensuring applicable federal and state environmental regulations have been addressed and that the corrective action taken is consistent with appropriate environmental standards and is protective of human health and the environment.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, also known as Superfund, is the federal legislation that governs the regulatory action of hazardous waste sites and their cleanup activity. CERCLA is administered and enforced by EPA. In addition to CERCLA, hazardous waste cleanup sites in the State of Washington must comply with the requirements of the Model Toxics Control Act (MTCA). MTCA is the State of Washington's counterpart legislation to CERCLA and is administered and enforced by Ecology. MTCA is very similar to CERCLA, but often imposes more stringent standards and cleanup levels. It is important to note that the cleanup and remediation activities performed at the Hanford 1100 Area comply with both CERCLA and MTCA.

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II. SUMMARY OF SITE CONDITIONS

Background

The Hanford 1100 Area NPL Site is located in the southern portion of the Hanford Site and covers less than 5 square miles. The 1100 Area NPL Site was divided into four operable units. Three of the operable units (1100-EM-1, 1100-EM-2, and 1100-EM-3) are located adjacent to the City of Richland and one (1100-IU-1)

is located on DOE's Fitzner-Eberhardt Arid Lands Ecology (AL) Reserve, approximately 15 miles northwest of Richland.

The 1100 Area remains an active area. The area occupied by the 1100-EM-1, 1100-EM-2, and 1100-EM-3 Operable Units contain the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford Site. The ALE Reserve was set aside as a natural resource research area in 1967 by the Atomic Energy Commission. The facilities that comprise the 1100-IU-1 Operable Unit are a former NIKE missile base and control center, and are now used for the ALE headquarters.

The 1100 Area was listed on the National Priorities List in November 1989 based on the proximity of the 1100-EM-1, 1100-EM-2, and 1100-EM-3 Operable Units to groundwater wells used by the City of Richland to supply drinking water and that up to 15,000 gallons of waste battery acid were disposed in a sand pit in the 1100-EM-1 Operable Unit. As a result of the listing, and pursuant to a Federal Facility Agreement (FFA) signed by DOE, EPA, and Ecology on May 15, 1989, DOE conducted a remedial investigation/feasibility study (RI/FS) to determine the nature and extent of contamination at the 1100 Area and to evaluate alternatives for cleanup of contaminated areas.

Remedial Investigation/Feasibility Study

The RI/FS activities at 1100-EM-1 were initiated in 1989 and included the collection and chemical analysis of surface and subsurface soil and groundwater in an effort to characterize the nature and extent of contamination. The first phase of the investigation was complete in August 1990. In the fall of 1992, EPA, DOE, and Ecology decided to accelerate the study and evaluation of the other three operable units (1100-EM-2, 1100-EM-3, and 1100-IU-1) so that all remedial actions in the 1100 Area could proceed as a single project.

1100-EM-1.

The 1100-EM-1 RI addressed potential soil contamination at ten different waste sites in the 1100 Area. The 1100-EM-1 RI also investigated groundwater beneath these waste sites. Of the seven areas, only the following 3 sites required remedial action.

- **Discolored Soil Site.** At this site, bis(2-ethylhexyl)phthalate (BEHP) was identified as the contaminant of concern. BEHP is considered to be carcinogenic. The source of the BEHP was an unrecorded spill. The highest level detected during the RI was 25,000 mg/kg.

- **Ephemeral Pool.** This is an elongated depression adjacent to a parking area where runoff water collects and evaporates. Polychlorinated biphenyls (PCBs) from an unknown release resulted in the Ephemeral Pool being contaminated up to 42 mg/kg.

- **Horn Rapids Landfill.** This landfill was used primarily for the disposal of office and construction waste, asbestos, sewage sludge, and fly ash. The contaminants of concern are the asbestos distributed throughout the landfill and a localized area of soil contaminated with PCBs. The highest PCB concentration identified was 100 mg/kg.

- **Groundwater.** Groundwater in the vicinity of the HRL was found to be contaminated with trichloroethene (TCE). TCE was found both upgradient and downgradient of the landfill. The maximum concentration of TCE was 110 μg/kg, although current concentrations are less than 40 μg/kg. The groundwater monitoring network around the HRL also detected nitrate and Technetium-99 from a plume originating from an adjacent facility.

The feasibility study identified and evaluated cleanup alternatives that included excavation and off-site disposal and various on-site containment and treatment options.

1100-EM-2, 1100-EM-3, and 1100-IU-1.

In place of extensive field investigations, these operable units were evaluated by analysis of existing waste information, detailed visual inspections, and through interviews with site personnel. Eighteen waste sites within 1100-EM-2 and 1100-EM-3 were identified as candidates for remedial actions. Thirty-two waste sites were identified within 1100-IU-1 as candidates for remedial action. In all three operable units, the waste sites primarily consist of tanks that were used for fuel and chemical solvent storage, electrical transformers and pads, spills, and disposal areas.

The cleanup alternatives evaluated for these sites included excavation with off-site disposal of contaminated soil and debris, and excavation with a combination of on-site incineration and off-site disposal. Both alternatives included sampling and chemical analysis to ensure that soil and debris contaminated above cleanup levels were removed.

Record of Decision

The Record of Decision (ROD) for the 1100 Area was signed on September 30, 1993 and all remedial actions were completed by December 1995. The cleanup levels were based on the requirements

of MTCA. At the Discolored Soil Site, a residential cleanup level of 71 mg/kg for BEHP was determined via the MTCA procedures. For the Ephemeral Pool, a cleanup level of 1 mg/kg was selected for the PCB contamination. Because the Horn Rapids Landfill would require closure as an asbestos landfill, a cleanup level of 5 mg/kg for the PCB-contaminated soil was selected. For the sites in 1100-EM-2, 1100-EM-3, and 1100-IU-1, the cleanup levels were based on MTCA residential standards. The major components of the selected remedies included:

- Discolored Soil Site: Excavation and off-site incineration of contaminated soil.
- Ephemeral Pool: Excavation and off-site disposal of PCB-contaminated soil.
- Horn Rapids Landfill: Excavation and off-site disposal of PCB-contaminated soil, followed by capping appropriate to an asbestos landfill and institutional control.
- For the waste sites in the 1100-EM-2, 1100-EM-3, and 1100-IU-1 Operable Units: Excavation and off-site disposal of soil and debris which were found to be contaminated above cleanup levels.

Because the concentrations of TCE and nitrate exceeded the maximum contaminant levels (MCLs), the ROD also required that the groundwater in the vicinity of the Horn Rapids Landfill be monitored for TCE and nitrate. The RI concluded that the TCE plume was attenuating and would be below MCLs in 25 years or less. If, however, TCE concentrations did not continue to attenuate or they exceeded the MCL in a group of early warning wells, additional remedial actions would be considered.

Construction Activities

1100-EM-1

Discolored Soil Site.

Remediation of the discolored soil site began on February 14, 1995, with the excavation and stockpiling of 90 yd3 of waste material (principally, BEHP). Confirmation sampling indicated that the removal action met the cleanup levels established in the ROD. The site was regraded to a smooth, uniform surface. The BEHP-contaminated soil was transported between April 19 and 25, 1995 and disposed of by incineration at Aptus, Incorporated, in Aragonite, Utah.

Ephemeral Pool Site.

Remediation began on February 9, 1995, with an initial phase of sampling. On March 11, 1995, excavation and stockpiling of approximately 90 yd3 of contaminated soil (principally, the PCB Aroclor-1260) was excavated, with a large volume of remaining contaminated soil having PCB-contamination concentrations of between 0.5 and 2 mg/kg when work was halted for consultation with the regulatory agencies and DOE. Following consultation, the final phase of the excavation and stockpiling resumed, and 115 m3 (150 yd3) of waste material was removed. Confirmation sampling indicated that the removal action met the requirements based on the cleanup levels established in the ROD. The site was regraded to a smooth, uniform surface. The PCB-contaminated soil was disposed of at the Chemical Waste Management Facility in Arlington, Oregon, for disposal in a RCRA, Class C/TSCA hazardous waste landfill. The PCB-contaminated soil was transported on April 9, 1995.

Horn Rapids Landfill.

Remedial actions for the Horn Rapids Landfill began on January 3, 1995, with clearing and road pioneering work. Excavation of the PCB-contaminated soil began on January 30, 1995, and continued until field sampling determined that residual concentrations were less than the established cleanup level (5 mg/kg).

The PCB-contaminated soil was excavated until field observance and field screening indicated that the soil did not exceed the 5 mg/kg cleanup criterion established in the ROD. The results of the confirmation sampling indicated that there was some contamination remaining that exceeded the cleanup criteria for PCBs, and additional removal was performed. The additional removal was accomplished in March 1995. A total of 1,600 yd3 of PCB-contaminated soil (principally, the PCB Aroclor-1248) was excavated and stockpiled for eventual disposal. The PCB-contaminated soil was disposed of at the Chemical Waste Management Facility in Arlington, Oregon, which is a RCRA, Class C/Toxic Substances Control Act (TSCA) hazardous waste landfill. The PCB-contaminated soil was transported between March 4 and April 12, 1995.

The construction of the cap began on January 10, 1995, and was constructed of material from a nearby borrow area. The construction methods and controls for cap construction were performed, as required in DOE-RL 1995a. The random material layer, which comprises the lower portion of the cap, is 18 in. thick. A 6-in. layer of topsoil material was placed over the surface. The cap was completed on April 13, 1995. Revegetation of the site began on November 8, 1995, and was completed on November 14, 1995. The 25-acre cap was seeded with a mixture of

crested wheatgrass (Agropyron cristatum) and Siberian wheatgrass (Agropyron sibericum).

Five groundwater-monitoring wells were installed in August 1995, downgradient of the Horn Rapids Landfill to facilitate compliance evaluation and the remedial action objectives. Compliance with MCLs is anticipated by the year 2018. The design and installation of the wells were in accordance with Washington Administrative Code (WAC) requirements, as described in the work plan (DOE-RL 1995c), and to be consistent with other monitoring wells installed at the Hanford Site (well logs are shown in DOE-RL 1995e).

1100-EM-2

The pre-remediation investigation determined that only one site, the tar flow/stained sands area, required remedial action. Remediation of the tar flow area began June 26, 1995, with the excavation and stockpiling of 1,600 yd3 of petroleum-contaminated soil. The volume of waste excavated and the effort associated with the cleanup was more significant than initially estimated during the investigation. Following excavation, confirmation sampling indicated that the removal actions met the requirements based on cleanup-levels established in the ROD. The site was regraded to a smooth, uniform surface. The petroleum-contaminated soil was disposed of at the Columbia Ridge Disposal Facility, which is a permitted waste disposal facility. The waste was transported between September 13 and 19, 1995.

1100-EM-3

The pre-remediation investigation of the sites in 1100-EM-3 concluded that three sites (a french drain, a suspect spill area, and the 1262 Building solvent tanks) required remedial action. The 1100-EM-3 remediation began with the solvent tanks on June 22, 1995. Upon excavation of the tanks, it was observed that the site consisted of two tanks with vertical orientation and conical bases. One tank was filled with fluid, and the other tank had only a residual of fluid. The fluids were sampled; the contents were found to be nonhazardous water. The fluids were removed and discharged to the Richland sanity sewer. The tanks were cleaned and removed to Twin City Metals, Inc., Kennewick, Washington, on July 11, 1995. Confirmation sampling was conducted, with samples collected from the soil below the tanks and the sides of the excavation, and no hazardous contaminants were detected.

Remediation of the suspect spill site began on July 7, 1995, with the excavation and stockpiling of 70 yd3 of lead-contaminated soil. Confirmation sampling indicated that the cleanup levels were met. The site was regraded to a smooth condition, and 6 in. of base materials were spread over the disturbed area. The contaminated soil was stabilized (to meet

the disposal requirements for lead) and disposed of at the Chemical Waste Management Facility in Arlington, Oregon, for disposal in a RCRA, Class C/TSCA hazardous waste landfill. The contaminated soil was transported between September 14 and 20, 1995.

French drain remediation began on July 11, 1995, with the excavation and stockpiling of 80 yd3 of soil contaminated with TPH, lead, and chromium. Confirmation sampling indicated that the cleanup levels were met. The site was regraded to a smooth condition, and 6 in. of base materials were spread over the disturbed area. The contaminated soil was disposed of at the Chemical Waste Management Facility in Arlington, Oregon, for disposal in a RCRA, Class C/TSCA hazardous waste landfill. The contaminated soil was transported between September 14 and 20, 1995.

1100-IU-1

Two 2,000-gal fuel tanks were discovered and removed. Soils from beneath these tanks were sampled and sent off-site for analysis. Laboratory results indicated that these soils were clean and that no further actions were required. Six cubic yards of soil was discovered within one of the tanks. Analysis of this soil indicated the presence of petroleum hydrocarbons above regulatory limits. This soil was disposed of at the DOE petroleum contaminated soil (PCS) landfarm in the 100 Areas.

Based on findings from similar landfills on the North Slope of the Hanford Site, EPA and Ecology required that limited characterization of the Horse Shoe landfill be carried out. This would require excavation at each identified geophysical anomaly; however, full excavation of the anomaly was not required. Instead, a 5 to 10-ft trench would be excavated through the long axis of any anomalous feature. Full excavations would only be required when field screening indicated the possible presence of contaminants. Activities conducted consisted of geophysical investigations, excavation and field screening of buried waste, sampling and analysis of suspect waste, and segregation of confirmed hazardous or contaminated materials. Geophysical investigations employed electromagnetic profiling and magnetic techniques, as well as ground-penetrating radar to locate buried metallic and nonmetallic waste materials. Areas exhibiting anomalous geophysical response were marked in the field for subsequent excavation. A bulldozer and trackhoe were used to uncover and excavate landfill cells and other buried waste. Waste was field screened using several criteria, including visual observation, direct-reading instruments, and analyte-specific field analytical kits. Suspect waste was sampled for characterization by an offsite laboratory under a quick turnaround schedule. Materials confirmed as hazardous or contaminated by nonregulated substances (i.e., petroleum

hydrocarbons) were segregated pending determination of proper waste designation and disposition. Excavations were backfilled and compacted using nonhazardous materials and clean fill and graded to original conditions.

At the Horse Shoe landfill, approximately 2,500 yd3 of soil contaminated with the pesticide DDT and its breakdown products were discovered. These soils were shipped to the Chemical Waste Management hazardous waste landfill in Arlington, Oregon. No other contaminants were detected above regulatory cleanup levels. Because of the presence of DDT contaminated soil, EPA and Ecology then required that limited characterization be performed at the H-52-L Nike Base landfill. Field screening did not detect any contaminated materials at this site. This was later confirmed by samples sent off site for analysis.

Soil sampling and analysis results showed only two sites with contaminants above the prescribed MTCA levels. Both sites were on top of Rattlesnake Mountain and were associated with the former Nike Missile Control Center. One site was the location of five burn pits that were excavated into the basalt formation. Soil analyses indicated the presence of lead above regulatory limits in two of the burn pits. Because of concern for cultural and ecological resources at this site, DOE proposed that a concrete cap (approximately 4 ft in diameter) be placed over the two burn pits that contained lead. Ecology and EPA concurred with this proposal.

The second area of contamination was discovered at the former location of an aboveground fuel storage tank. Diesel-contaminated soil above regulatory limits was discovered within an approximate 3-ft radius circle to a depth of 1.4 ft (basalt bedrock was encountered at this depth). Approximately 0.5 yd3 of contaminated material was excavated and disposed of at the 100 Areas PCS landfarm. Excavation was guided by field screening methods specific to petroleum hydrocarbons and was stopped when field screening indicated that regulatory levels were met. Because soil was removed down to bedrock, offsite confirmatory sampling was not performed.

An ordnance and explosive waste (OEW) record search was initiated in November 1993. The search consisted of a records review and site visit, ordnance and explosive waste contamination analysis, and an archives search. The search concluded that there is a very small potential for the presence of OEW. Given the expanse of the ALE Reserve, the likelihood of finding any ordnance through a field search would be minimal, and the costs would be great. Therefore, no further action was recommended.

In July 1994, sampling at two ALE Reserve lysimeter plots previously used by the Pacific Northwest National Laboratory (PNNL) for radiological experiments was initiated. At the

conclusion of the experiments, the radioactive materials were removed and the areas in question were sampled by PNNL. The results of the PNNL sampling indicated that no residual contamination remained. However, the Washington State Department of Health (WDOH) raised concerns with the analytical methods used by PNNL (i.e., gross alpha and beta counting) and suggested that these methods might not adequately detect all of the types or quantity of radiation expected due to matrix effects and shielding in the soil being analyzed. DOE also wanted to conduct an independent verification of PNNL's claimed clean closure in preparation of excessing these lands.

To address these concerns, a sampling plan was devised in close consultation with WDOH. The plan called for the sampling of more than 20% of the 500 locations that had contained lysimeters. These samples were analyzed for the specific radioisotopes associated with the individual lysimeters. In addition, split samples were analyzed by the WDH laboratory to provide additional quality assurance; independent verification was coordinated with the Oak Ridge National Laboratory to provide the DOE-required independent analysis. The results from the contract laboratory essentially substantiated that clean closure was accomplished by PNNL. All but one sample had activities of less than 1.2 pCi/g. The one exception was a sample that had 53 pCi/g of the Pu-238 isotope. This sample was taken from an area within the lysimeter plot where insects may have compromised certain lysimeters and may have brought small amounts of contamination to the surface. A qualitative radiological risk analysis was completed. At this activity level and volume of material, associated exposure risks are extremely small (on the order of 0.25 mrem/yr). DOE excavated approximately 0.25 yd3 of material to further mitigate any exposure risks. The material was taken to the low level radioactive burial grounds in the 200 Areas.

Detailed field reports on specific activities conducted on the ALE Reserve are contained in A Compendium of field Reports for the Fitzner-Eberhardt Arid Lands Ecology Reserve Remedial Action, Hanford, Washington.

Community Relations Activities

Community relations activities for the 1100 Area have been multi-faceted. Activities for the 1100 Area are under the community relations plan covering all of the CERCLA actions at Hanford. Activities specific to the 1100 Area include: public comment periods for the remedial investigation work plan and the proposed plan, a public meeting during the remedy selection, publication of fact sheets, and newspaper advertisements. Additional public involvement opportunities will occur during the process of deleting the 1100 Area from the NPL.

III. DEMONSTRATION OF QA/QC FROM CLEANUP ACTIVITIES

EPA has required all sampling and analytical work associated with the remedy selection and remedial action to meet exacting QA/QC standards. DOE submitted detailed quality assurance project plans (QAPjP) for the remedial investigation and the remedial action which required compliance with EPA QA/QC procedures and protocols. Field procedures followed standard operating procedures and were thoroughly documented. Samples were collected and shipped under strict chain-of-custody requirements and analyzed according to approved EPA analytical methods. EPA has determined that all analytical results reported are accurate to the degree needed to assure satisfactory execution of the remedial action consistent with the ROD and remedial design plans and specifications.

IV. MONITORING RESULTS

To ensure compliance with remedial action objectives, a detailed and rigorous monitoring program was developed for the 1100 Area remedial actions. The program's objectives were to protect on-site workers and confirm compliance with the remedial action objectives outlined in the ROD. To guide the excavation, soil samples were screened using field test kits or an on site laboratory. After these methods indicated that cleanup levels were met, confirmation samples were taken for analysis at off-site laboratories.

Groundwater in the vicinity of the Horn Rapids Landfill continues to be monitored on an annual basis to verify that the TCE-contamination continues to attenuate and that the plume does not expand beyond the designated early warning wells.

V. SUMMARY OF OPERATION AND MAINTENANCE

Plans are in place for DOE to inspect and maintain the integrity of the cap and fencing at the Horn Rapids Landfill.

Continued groundwater monitoring around the Horn Rapids Landfill is necessary to verify the modeled contaminant attenuation predictions and to evaluate the need for active remedial measures.

All other remedial actions at this site have been completed and do not require long-term operation and maintenance.

VI. PROTECTIVENESS

The ROD for the 1100 Area addressed all areas of concern described in the NPL listing as well as areas that were not initially mentioned at the time of the listing. As a result of the remedial actions performed at the Hanford 1100 Area, all possible exposure pathways from contaminated soils were eliminated and all remedial action objectives established in the ROD have been met. Active groundwater remediation was not required to protect human health or the environment at the 1100 Area; however, continued monitoring was necessary to ensure that contamination levels continued to decrease. No further Superfund response is appropriate in order to provide protection of human health and the environment at this site.

VII. FIVE YEAR REVIEW

Since hazardous substances will remain on site above levels allowing for unlimited use and unrestricted exposure, a statutory five-year review will be conducted in September 1998, pursuant to OSWER Directive 9355.7-02, "Structure and Components of Five-Year Reviews" (May 23, 1991).

Randall F Smith

Director
Environmental Cleanup Office

July 25, 1996
Date

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