STRATEGY AND FIELD IMPLEMENTATION FOR DETERMINING A DANGEROUS WASTE MIXTURE IN WASHINGTON STATE

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ABSTRACT

Under the Resource Conservation and Recovery Act (RCRA), states rather than the Environmental Protection Agency (EPA) may be authorized to implement RCRA regulations. Under RCRA, environmental regulations implemented by an authorized state must be at least as stringent as those contained in RCRA. Compared to RCRA, the corresponding regulations of the State of Washington regarding the determination of characteristic wastes are more stringent and complex. This paper discusses the complexities of the regulations and presents a strategy for successfully managing diverse waste streams. This strategy was used during the cleanup of contaminated areas and equipment at the Albany Research Center (ARC) in Albany, Oregon, which processed uranium and thorium for the Manhattan Engineer District and the Atomic Energy Commission during the early days of the nation's atomic energy program. Wastes from the cleanup of ARC were shipped to the Department of Energy (DOE) Hanford Reservation. Because the DOE Hanford Reservation is located in Washington, this paper should be of interest to DOE waste generators.

INTRODUCTION

Under the direction of the Decontamination and Decommissioning Division, DOE is conducting four component programs to remedy radiological conditions at a number of privately owned, institutionally owned, and DOE-owned sites in order to minimize potential risk to the public, to workers, and to the environment. Most of the sites were formerly used to support nuclear activities conducted for DOE and its predecessor agencies. Even after many years, the sites remain contaminated at levels in excess of applicable radiological guidelines. The Formerly Utilized Sites Remedial Action Program (FUSRAP) is one of four major component programs of DOE's Environmental Restoration Program and is directed to a specific category of sites.

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

Bechtel National, Inc. (BNI) is under a DOE contract to manage the remedial action required by FUSRAP. ARC, located in Albany, Oregon, is within this jurisdiction. The operating facility was contaminated with radioactive materials consisting primarily of depleted uranium and thorium. To meet the goals of FUSRAP, BNI began the cleanup of ARC in August 1990 and completed the remediation in May 1991.

ALBANY RESEARCH CENTER

ARC is an operating Department of Interior, Bureau of Mines metallurgical research facility. FUSRAP activities included excavation of contaminated material from six outside areas and decontamination, removal, replacement, and repair of floors, walls, ceilings, sumps, supply piping, pipe trenches, drain bowls, room heaters, duct work, sinks, roof trusses, soffits, drain lines, conduits, cabinetry, insulation, and equipment in 15 buildings. The remedial action resulted in the transportation of five shipments totaling over 126 m^3 (4,500 ft^3) of material to the Hanford Reservation in Richland, Washington, for disposal. Therefore, the topic and discussion of this paper are based on the successful remediation of ARC.

WASHINGTON STATE DANGEROUS WASTE REGULATIONS

Because the radiologically contaminated waste was to be disposed at the DOE Hanford Reservation, compliance with Washington state dangerous waste regulations was required during the designation and packaging of the ARC waste. Under RCRA, states may be authorized to implement hazardous waste regulations in lieu of EPA. The regulations implemented by an authorized state must be at least as stringent as the federal RCRA. Washington is authorized to implement RCRA in lieu of EPA, and the state regulations are more stringent and complex regarding the determination of a dangerous waste. The term "dangerous waste" is used instead of "hazardous waste" in Washington.

The dangerous waste regulated in Washington includes "listed" wastes, "characteristic" wastes, and dangerous waste mixtures. The listed and characteristic dangerous wastes that are regulated by the state are similar to those regulated by EPA. For example, the dangerous waste characteristics in Washington include those promulgated by EPA: corrosivity, reactivity, ignitability, and EP-toxicity. The state regulations for designation of mixtures as dangerous waste are much more stringent than the federal regulations.

The mixtures that are regulated include persistent waste, carcinogenic waste, and toxic waste. Designation of these three mixtures requires knowledge of waste or extensive analysis to determine whether the waste fails one or more of the mixture criteria. The general criteria for determining whether the waste is a dangerous waste mixture are included in Table I; a waste designation flow sheet for the Washington dangerous waste regulations is shown in Fig. 1. The goal of the remediation efforts at ARC included waste minimization and proper, yet cost effective, waste designation.

ARC WASTE

The ARC waste included a variety of materials, as discussed previously. Each waste, because of its composition, was subject to different waste management regulations. The floor tile contained asbestos and, therefore, was subject to state and federal asbestos regulations. Piping included leaded

TABLE I

Criteria for Determination of Dangerous Waste Mixtures

Toxic:	The determination of a waste as a toxic dangerous waste is completed by evaluating the toxic category for the waste. The toxic category is determined by obtaining toxicity data on the constituents in the waste either through knowledge of the waste or by collecting the data. Data can be obtained through EPA's Spill Table (40 CFR 302) or the NIOSH Registry. Once the toxic categories of the constituents in the waste have been established, the regulations allow the toxicity of the waste to be determined by four methods. The method used at ARC was the book designation procedure. In this procedure, the toxic category and the concentration of each constituent in the waste must be known. With this information, an equivalent concentration of the toxic constituents is calculated using the equation in the regulations. The equivalent concentration and total quantity of waste are subsequently plotted on a graph in WAC 173-303-9906 to determine whether the waste is regulated. Reference: WAC 173-303-101
Persistent:	Persistent dangerous waste is waste containing greater than the regulated percentages of halogenated hydrocarbons or polyaromatic hydrocarbons (PAHs) with more than three and less than seven rings. The determination can be made by testing the waste or by performing the calculations that are specified in the regulations. Regulated wastes include those in which halogenated hydrocarbons compose greater than 0.01% of the waste and those containing greater than 1.0% PAHs with more than three and less than seven rings. Reference: WAC 173-303-102
Carcinogenic:	A regulated carcinogenic waste is any waste containing greater than 0.01% of any substance that is listed in the NIOSH Registry, or in any other scientific or technical documents, as a human or animal, positive or suspected carcinogen as defined by the International Agency for Research on Cancer. Reference: WAC 173-303-103

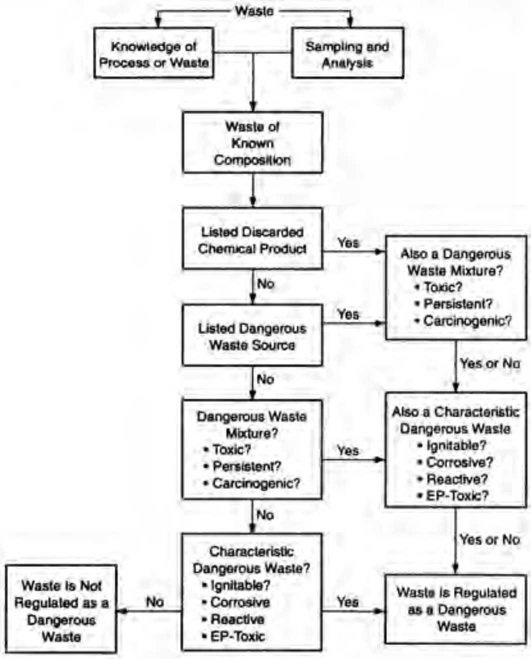

Fig. 1. Washington hazardous waste determination flow sheet.

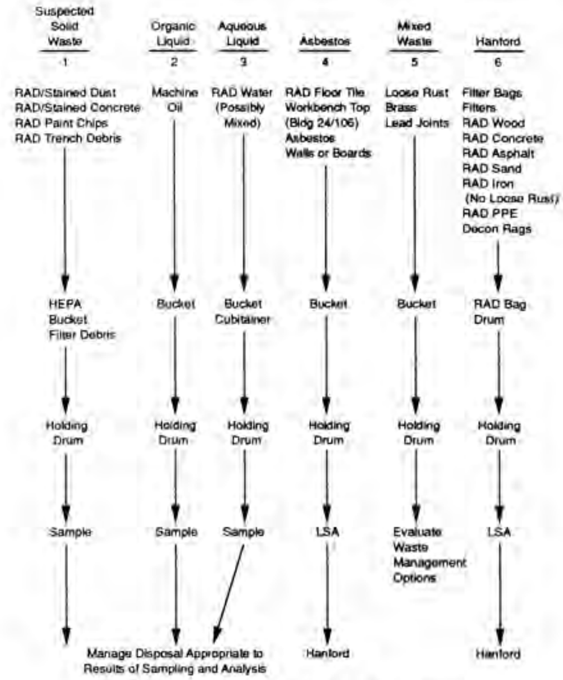

Fig. 2. Waste segregation scheme.

pipe joints that could cause the pipe to fail the federal toxicity characteristic. Since the origin of the paint was not known, it was assumed to contain chromium or lead. To ensure that additional dangerous waste was not inadvertently generated, lead-free lumber crayons were used to mark contaminated areas instead of typically used spray paints, most of which contain lead or chromium.

Contamination was often found to be fixed to concrete or brick surfaces with paint. To minimize waste generation, the contamination was removed by scraping or scabbling. Although these methods minimized the quantity of waste generated, they generated mostly lead-containing paint chips, thereby increasing the likelihood of failing mixture criteria or characteristics. Chemical decontamination methods were not used unless absolutely necessary.

INSPECTION AND DESIGNATION OF WASTE

To minimize the volume of waste generated and to assess the scope of potential generation of mixed or dangerous waste, all known areas of contamination were inspected. Once each area or item had been identified, a strategy was established for remediation techniques and disposal options. In some cases, the remediation technique and disposal option were obvious. For example, contaminated floor tile had to be removed, packaged, and shipped for radioactive-asbestos disposal. Wastes for which the waste management process was not well defined were evaluated based on available information regarding their composition and knowledge of the Washington regulations.

A manual was developed that described each waste, the desired remediation technique, and the segregation stream into which the waste was to be placed upon generation. The manual was used to develop the segregation scheme and served as a reference for field personnel during remediation. The segregation scheme is shown in Fig. 2.

SEGREGATION STRATEGY

The segregation strategy that was developed included each type of waste. All the waste to be generated would be placed in one of the six waste streams that were identified (Fig. 2). The titles of the waste stream categories are mostly self-explanatory; however, some explanation is warranted for three of these categories. Radioactively contaminated material that would not fail the Washington characteristics for a dangerous waste (e.g., unpainted wood) was assigned to the Hanford waste stream, which included waste that, if not radioactively contaminated, could be disposed in a sanitary landfill (e.g., non-asbestos, non-hazardous, solid waste). "Mixed waste" included radioactively contaminated waste that would fail the characteristics (e.g., lead pipe and brass). Fortunately, all the mixed waste generated was radiologically decontaminated by washing with soap and water, thereby eliminating the expense of disposal as a mixed waste. "Suspected solid waste" was waste that is physically a solid and may fail characteristics or mixture criteria for a dangerous waste in Washington (e.g., concrete and paint chips). This waste stream would be sampled after generation to determine whether the waste exceeded DOE criteria for disposal.

SAMPLING AND ANALYSIS OF WASTE STREAMS

The solid waste at ARC was collected in four low specific activity (LSA) containers. Sampling of the LSA boxes consisted of collecting samples from five boreholes per box (one in each corner and one in the center of the box) and compositing into a single sample. Each of the four composite samples was analyzed by gamma spectroscopy. Results confirmed that the thorium-232 content was below the DOE remedial action guidelines (5 picocuries per gram); therefore, the waste was transported to a local landfill and disposed of as non-hazardous solid waste following approval by the Oregon Department of Energy and the landfill manager, who were provided with all analytical results as well as the complete inventory of the LSA boxes.

Organic waste was collected in three 208-L (55-gal) drums. The waste was composed of motor oil and spent hydraulic oil. A composite sample representing the waste was obtained using a thieving rod. Samples were analyzed for hydrocarbons and radioactive constituents. The waste contained no PCBs or hydrocarbons above detection or action limits. No radioactive contaminants were present at levels exceeding DOE guidelines. ARC had already established an onsite waste collection and disposal system for organic liquids and agreed to handle the organic waste and disposal since no hazardous constituents were present.

During remedial action at ARC, numerous concrete trenches containing discolored liquids were discovered in several buildings. All of the aqueous liquids were recovered and stored in 208-L (55-gal) drums. Several composite samples were collected for both chemical and radiological analysis; analytical results showed that no hydrocarbons, metals, or radionuclides exceeding DOE guidelines were present. ARC also had a liquid waste staging and treatment facility and agreed to manage the waste and to perform a verification analysis. The liquid was processed following verification.

All asbestos waste collected at ARC was double-bagged, labeled as asbestos-containing material, and placed in an LSA box labeled "asbestos/radioactive material." The asbestos waste was shipped to the Hanford burial grounds without further sampling requirements as specified by the Hanford Westinghouse Waste Acceptance Criteria.

The mixed wasted at ARC consisted of brass-plated valves and numerous cast-iron drainpipes with poured lead sealants. The brass valves were decontaminated by using small quantities of soap and a dry rag. The lead sealants were removed from the pipes. Measurements were made for both removable and fixed contamination to ensure that the valves and lead sealants were below the DOE release criteria; they were then returned to ARC for future use, at ARC's request. The contaminated pipes and rags were placed in LSA boxes for disposal at Hanford.

WASTE TRACKING AND SECURITY

To facilitate implementation in the field, the flow chart in Fig. 2 was used by trained field personnel for each category of waste in the cleanup at ARC. Properly segregating the waste according to the flow chart ensures minimization for each waste stream. Collecting the various types of waste separately instead of mixing wastes together in one common waste stream minimizes the specific amount of waste for each stream developed.

Waste is further minimized through waste management practices involving a database tracking system for container and waste contents that features daily inventory sheets to ensure accountability for the waste at all times. The tracking system prevents erroneous introduction of unwarranted containers of waste into the waste inventory.

As a final measure, a security plan (which is necessary at an operating facility such as ARC) was devised to prevent the introduction of unauthorized waste while containers were unattended. Padlocks with controlled keys were installed on smaller containers such as 208-L (55-gal) drums and HEPA vacuums, and metal strapping bands were installed on the larger LSA containers.

CONCLUSIONS

Options for cost-effective site remediation are becoming fewer as waste remediation management, techniques, and disposal options are increasingly driven by regulations. Strategies for management of the waste as it is generated are essential to minimize hazardous waste generation and the cost of treatment and disposal of such waste. The successful remediation of ARC demonstrates that waste segregation and management can reduce the overall cost of site remediation and can be conducted in compliance with stringent regulations.