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Supplement Analysis for Transportation, Storage, Characterization, and Disposal of Transuranic Waste Currently Stored at the Battelle West Jefferson Site near Columbus, Ohio

Supplement Analysis

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List of Acronyms and Abbreviations

ac	acre
ALARA	as low as reasonably achievable
CFR	Code of Federal Regulations
CH	contact-handled
Ci	curie
CNS	Chem-Nuclear Systems
DOE	U.S. Department of Energy
EIS	environmental impact statement
ft	foot
ft^2	square foot
ft^3	cubic foot
FY	fiscal year
ha	hectare
INL	Idaho National Laboratory
km	kilometer
LCF	latent cancer fatality
m	meter
m^2	square meter
m^3	cubic meter
MEI	maximally exposed individual
mi	mile
mrem	millirem
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
RH	remote-handled
ROD	Record of Decision
SA	supplement analysis
SRS	Savannah River Site
SRS WM EIS	Savannah River Site Waste Management Environmental Impact Statement
TRU	transuranic

TRUPACT-II	Transuranic Package Transporter-II
WCS	Waste Control Specialists, LLC
WIPP	Waste Isolation Pilot Plant
WIPP SEIS-II	WIPP Disposal Phase Supplemental Environmental Impact Statement
WM PEIS	Waste Management Programmatic Environmental Impact Statement

Supplement Analysis for Transportation, Storage, Characterization, and Disposal of Transuranic Waste Currently Stored at the Battelle West Jefferson Site near Columbus, Ohio

1.0 Purpose and Need for Agency Action

The U.S. Department of Energy (DOE) is responsible for the disposal of approximately 37 cubic meters (m^3) (1,307 cubic feet [ft^3]) of transuranic (TRU) waste generated as part of the cleanup of the Battelle Columbus Laboratory West Jefferson site near Columbus, Ohio, and currently stored on-site. TRU waste is waste that contains alpha particle-emitting radionuclides with atomic numbers greater than uranium (92) and half-lives greater than 20 years in concentrations greater than 100 nanocuries per gram of waste. TRU waste is categorized as either contact-handled (CH) or remote-handled (RH), based on the radiation level at the surface of the waste container. Some TRU waste is also mixed waste, having both radioactive and hazardous components.

The Battelle West Jefferson facility is privately owned; however, as part of the closeout of its nuclear materials research contract, DOE is assisting in the remediation of the site. Contract terms specify that all radioactive waste generated during the facility cleanup is "DOE-owned" for the purposes of disposal. DOE needs to ship the TRU waste off-site by December 2005 to comply with Battelle's Nuclear Regulatory Commission (NRC) license, which will expire at the end of the year. Removal of the TRU waste from the Battelle West Jefferson site is required to allow site closure in fiscal year (FY) 2006.

The Battelle West Jefferson site is approximately 24 kilometers (km) (15 miles [mi]) west of Columbus, Ohio. It is approximately 405 hectares (ha) (1,000 acres [ac]) and is bounded by Big Darby Creek, railroad tracks, and the Plain City-Georgesville Road. The site is approximately 1.6 km (1 mi) south of Interstate 70. The areas immediately surrounding the site are primarily agricultural, and the nearest resident is about 0.7 km (0.5 mi) northeast of the site. The TRU waste is stored outside, on concrete pads in 14 concrete shielding units and in 2 shipping casks.

2.0 Background

In the final *Waste Management Programmatic Environmental Impact Statement* (WM PEIS) (DOE 1997a), DOE analyzed the potential environmental impacts of the management (treatment and storage) of TRU waste at DOE sites. The *Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste* (63 Fed. Reg. 3629 (1998)) (TRU Waste ROD) documented DOE's decision that, with one exception[1], each DOE site that has generated or will generate TRU waste will prepare and store its TRU waste on the site.

[1] Waste at Sandia National Laboratories would be shipped to Los Alamos National Laboratory.

In an amended WM PEIS TRU Waste ROD issued in 2002, DOE decided to ship the Battelle West Jefferson TRU waste to the Hanford Site for storage and characterization prior to disposal at the Waste Isolation Pilot Plant (WIPP), located near Carlsbad, New Mexico (67 Fed. Reg. 56989 (2002)).[2] After issuing that decision, DOE completed three shipments of the Battelle West Jefferson TRU waste to Hanford (approximately 5 m^3 [177 ft^3]). In March 2003, DOE suspended further shipments of this TRU waste to Hanford, and subsequently a preliminary injunction stopping further shipments of TRU waste to Hanford was issued by the U.S. District Court for the Eastern District of Washington in response to actions filed by the State of Washington and Columbia Riverkeeper.

Shipments of TRU waste to Hanford for storage and characterization prior to disposal at WIPP remained suspended pending completion of the *Hanford Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (Hanford Solid Waste EIS) and lifting of the preliminary injunction. The Hanford Solid Waste EIS was completed in January 2004, and a Record of Decision (ROD) was issued in June 2004.[3] On May 13, 2005, the district court issued a decision allowing the shipment of non-mixed TRU waste from the Battelle West Jefferson site to Hanford; however, shipments of mixed TRU waste from Battelle West Jefferson to Hanford are still enjoined.

Although shipment of non-mixed TRU waste to Hanford is no longer enjoined, DOE has identified differences between information in the groundwater cumulative impacts analysis published in Appendix L of the HSWEIS and certain input parameters employed in the computer model files that were used to prepare that analysis.. Until these differences can be addressed, DOE has decided not to ship additional waste from Battelle West Jefferson to Hanford. However, by the end of 2005, DOE needs to ship all Battelle West Jefferson TRU waste to off-site storage so that Battelle can comply with its NRC license and site closure can occur in FY 2006.

DOE is now proposing to ship the Battelle West Jefferson TRU waste to the Savannah River Site (SRS), a DOE site near Aiken, South Carolina, or to Waste Control Specialists, LLC (WCS), a commercial facility in Andrews, Texas. For purposes of analysis, DOE assumed that at SRS, the CH-TRU waste would be characterized and transported to WIPP for disposal, and the RH-TRU waste would be stored for up to 5 years; at WCS, the CH- and RH-TRU waste would be stored for up to 5 years.

DOE has a Hazardous Waste Facility Permit modification request pending before the New Mexico Environment Department that seeks to modify the characterization requirements for CH-TRU waste, apply those modified requirements to RH-TRU waste, and allow DOE to

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[2] DOE confirmed this decision in 2004 (*Revision to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste*, 69 Fed. Reg. 39446 (2004)).

[3] *Record of Decision for the Solid Waste Program, Hanford Site, Richland, Washington: Storage and Treatment of Low-Level Waste and Mixed Low-Level Waste; Disposal of Low-Level Waste and Mixed Low-Level Waste; and Storage, Processing, and Certification of Transuranic Waste for Shipment to the Waste Isolation Pilot Plant*, 69 Fed. Reg. 39449 (2004) (Hanford Solid Waste ROD).

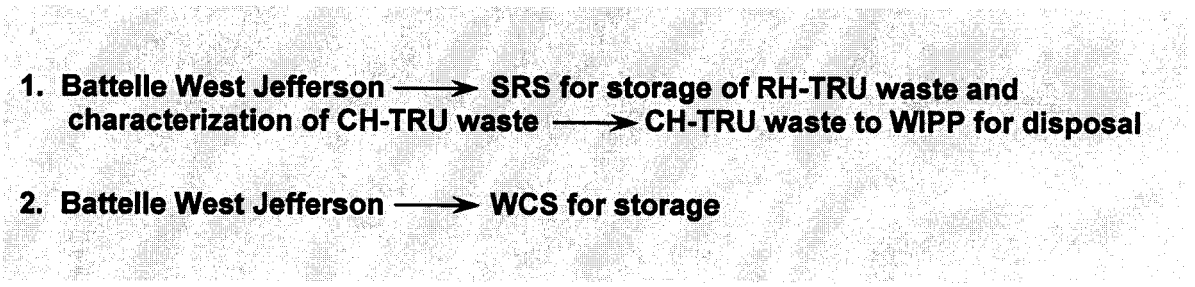
dispose of RH-TRU waste at WIPP. If DOE's request is granted without substantial modification, it may be possible to characterize the Battelle West Jefferson waste based on knowledge of the contents of the waste, without performing sampling and analysis currently required for CH-TRU waste under the WIPP Hazardous Waste Facility Permit. If RH and/or CH characterization can be performed without additional sampling and analysis, DOE would ship the stored waste directly from SRS or WCS to WIPP.

If the WIPP TRU waste characterization requirements that are established by the hazardous waste facility permit modification cannot be met at SRS or WCS, then DOE would ship the waste from SRS or WCS to Hanford, Idaho National Laboratory (INL) (formerly known as the Idaho National Engineering and Environmental Laboratory), or Oak Ridge National Laboratory (ORNL) for characterization prior to shipment to WIPP for disposal. If SRS can meet the characterization requirements, but WCS cannot, the waste might also be shipped from WCS to SRS for characterization prior to shipment to WIPP for disposal.

Future decisions regarding where to characterize the Battelle West Jefferson TRU waste would be made based on (1) consideration of the characterization requirements that are eventually established for that waste, and (2) the characterization capabilities existing or to be established at the different DOE sites to meet those requirements. After TRU waste characterization requirements have been established, and if additional characterization were needed, DOE will conduct appropriate further National Environmental Policy Act (NEPA) review for any additional characterization activities if necessary, including the associated transportation, and shipment to WIPP for disposal.

Figure 1 shows the actions DOE is analyzing in this supplement analysis (SA).

Figure 1. DOE Proposals for Transporting Battelle West Jefferson TRU Wastes Off-site for Storage, Characterization, and Disposal



DOE has prepared this SA in accordance with DOE NEPA regulations (10 CFR 1021.314) to determine whether the proposed off-site shipment of the Battelle West Jefferson TRU waste for storage at SRS or WCS prior to disposal at WIPP is a substantial change to the proposal or whether there are significant new circumstances or information relevant to environmental concerns such that a supplement to the WM PEIS or a new EIS would be needed.

3.0 Proposed Action

Of the approximately 37 m^3 (1,307 ft^3) of TRU waste currently stored at the Battelle West Jefferson site,[4] approximately 12 m^3 (424 ft^3) is CH-TRU waste, most of which is contained in six standard waste boxes and stored in three concrete shielding units. One 30-gallon drum of possible CH-TRU waste from the decontamination and decommissioning of the Battelle West Jefferson site is currently stored outside in a locked cargo container at the site.[5] For purposes of this analysis, this drum of possible TRU waste will be assumed to contain TRU waste. The remaining 25 m^3 (883 ft^3) is RH-TRU waste, which is contained in one hundred ten 55-gallon drums (stored in 11 concrete shielding units) and two RH-TRU 72-B shipping casks (the shipping casks hold a total of five drums). The concrete shielding units are cylinders approximately 3 m (10 ft) tall and 3 m (10 ft) in diameter, with 0.6-m (2-ft) thick walls and removable lids. Each unit weighs approximately 40,000 kilograms (88,000 pounds). The concrete shielding units and the shipping casks are on a concrete pad approximately 400 square meters (m^2) (4,270 square feet [ft^2]) (11 m [35 ft] by 37 m [122 ft]) in size, with 4-m (12-ft) high concrete walls on all sides and a locked gate made of chain-link fencing.

Battelle West Jefferson TRU Waste Inventory

37 m^3 of TRU waste

- *12 m^3* is CH-TRU waste, contained in six standard waste boxes stored in three concrete shielding units.
  - The CH-TRU waste in one of the standard waste boxes includes one 55-gallon drum (2 m^3) that is considered to be mixed waste because of the presence of lead shot.
- *25 m^3* is RH-TRU waste, contained in one hundred ten 55-gallon drums (stored in 11 concrete shielding units) and two casks.
  - The RH-TRU waste in the two casks, which contain a total of about 3 m^3, is mixed waste.

3.1 Preparation for Shipment

The CH-TRU waste would be shipped in up to two shipments consisting of up to four Transuranic Package Transporter-II (TRUPACT-II) shipping containers. In preparation for shipment, the shipping containers and a mobile crane would be parked on the outside of the TRU waste pad. The crane would remove the impact limiter and lid from a container. The crane

[4] In previous estimates, the Battelle West Jefferson site was assumed to have between 27 and 28 m^3 of TRU waste. Since those estimates were derived, approximately 5 m^3 (177 ft^3) of TRU waste were shipped to Hanford. However, additional waste packaging has occurred, and the total waste volume for off-site shipment is now 37 m^3. Of the 37 m^3 of TRU waste, approximately 5 m^3 (177 ft^3) is mixed waste and approximately 32 m^3 (1,130 ft^3) is non-mixed waste. The mixed TRU waste is stored in two shipping casks (RH-TRU waste) and one standard waste box (CH-TRU waste). The non-mixed waste is stored in one hundred ten 55-gallon drums (RH-TRU waste) and five standard waste boxes (CH-TRU waste).

[5] The decontamination and decommissioning of the Battelle West Jefferson site is being performed by Closure Services, Inc., a DOE contractor. Closure Services' characterization data indicates that one drum of waste, previously determined to be low-level radioactive waste, may contain americium-241 and thus would be CH-TRU waste. If this data is confirmed, this one drum would need to be transferred offsite with the other Battelle West Jefferson TRU waste. The drum contains non-mixed waste.

would then reach over the TRU waste pad wall and remove the lid from the concrete shielding unit containing the waste to be shipped. The crane would then transfer the waste from the concrete shielding unit to a shipping container. The lids would then be placed back on the container and the concrete shielding unit. A crew would complete all pre-shipment checks and tests, and the container would be ready for shipment. This process would be repeated until all of the CH-TRU waste from the concrete shielding units was transferred to the TRUPACT-II shipping containers. The one drum of CH-TRU waste not in a concrete shielding unit would also be placed in a TRUPACT-II shipping container. After the CH-TRU waste was loaded into the TRUPACT-II shipping containers, the concrete shielding units would be disassembled and shipped to the receiving site where they would be reassembled, ready to accept most of the CH-TRU originally stored at the Battelle West Jefferson site[6]. Because there is no additional storage space in the concrete shielding units for the one 30-gallon drum of TRU waste, it would be stored at the receiving site with other similar waste.

The RH-TRU waste stored in the concrete shielding units would be shipped in up to 14 shipments using an NRC-licensed shipping cask. The preparation for shipment would be similar to that for the CH-TRU waste. Although most of the RH-TRU shipments would contain 10 drums of waste, two shipments would contain only 5 drums of waste due to the plutonium content of those drums. An empty concrete shielding unit would be sent to SRS or WCS in advance of the RH-TRU shipments in order to be able to receive the RH-TRU drums when they arrived.

3.2 Transportation, Storage and Disposal

DOE proposes to transport the TRU waste currently stored at the Battelle West Jefferson site to SRS or WCS for storage prior to disposal at WIPP. At either location, the RH-TRU waste would be placed into storage. The CH-TRU waste would be stored if it is sent to WCS; if it is sent to SRS, it would be characterized under the existing SRS program and sent to WIPP for disposal. The waste could stay in storage for up to 5 years. Following storage, the stored waste would either be characterized at WCS and SRS, or sent to another DOE site (Hanford, INL, ORNL, or SRS for the waste stored at WCS) for characterization. A decision regarding the future characterization of the waste will be made based on (1) the characterization requirements that are established by the New Mexico Environment Department as a result of DOE's pending Hazardous Waste Facility Permit modification, and (2) the characterization capabilities that are available or planned at Hanford, INL, ORNL, and SRS at the time of that decision. Such a decision would be the subject of appropriate further NEPA review, if necessary. After characterization, the waste would be shipped to WIPP for disposal.

Table 1 shows the number of shipments that would be required for the Battelle West Jefferson TRU waste and the concrete shielding units.

[6] While transportation of all of the concrete shielding units is analyzed here, it is possible that some or all of these storage units may not be needed at SRS and would not be shipped.

The CH-TRU waste would be shipped in four TRUPACT-II shipping containers. Two shipments would be required to SRS or WCS. Two shipments would also be required from SRS to WIPP for disposal.

The 110 drums of RH-TRU waste in the concrete shielding units would be shipped using Chem-Nuclear Systems (CNS) 10-160B shipping casks; up to 12 shipments would be required, depending on the radionuclide content of the drums and the number of casks used in each shipment. After the waste was loaded into the shipping casks, the concrete shielding unit would be disassembled and shipped to SRS or WCS, where it would be reassembled (as noted above, two shipments would contain only five drums of waste due to the plutonium content of those drums; an empty concrete shielding unit would be sent to SRS or WCS in advance of the RH-TRU shipments in order to be able to receive the RH-TRU drums when they arrive). The RH-TRU waste would then be shipped and unloaded into the shielding units at the storage site.

Table 1. Containers and Shipments for Transporting Battelle West Jefferson TRU Wastes Off-Site

Waste Type	Option 1: Battelle West Jefferson to SRS; CH-TRU to WIPP		Option 2: Battelle West Jefferson to WCS	
	Number of Containers	Number of Truck Shipments	Number of Containers	Number of Truck Shipments
CH-TRU waste	5 standard waste boxes (non-mixed) 1 30-gallon drum (non-mixed) 1 standard waste box (mixed)	4 in TRUPACT-II containers[a]	5 standard waste boxes (non-mixed) 1 30-gallon drum (non-mixed) 1 standard waste box (mixed)	2 in TRUPACT-II containers
RH-TRU waste (non-mixed)	110 drums	12 in CNS 10-160B casks	110 drums	12 in CNS 10-160B casks[b]
RH-TRU mixed waste	5 drums	2 in RH-TRU 72-B casks	5 drums	2 in RH-TRU 72-B casks
Concrete shielding units[c] for CH-TRU	3	9 (one way)	3	9 (one way)
Concrete shielding units[c] for RH-TRU	11	30 (one way)	11	30 (one way)
Total Truck Shipments		**57**		**55**

a. Includes two shipments from Battelle West Jefferson to SRS and two from SRS to WIPP.
b. Chem-Nuclear Systems (CNS) 10-160B shipping cask.
c. All 39 shipments of the concrete shielding units would be overdimension. Five of the shipments would also be overweight, with a maximum vehicle weight of about 100,000 pounds.

The RH-TRU 72-B casks would be shipped to SRS or WCS in two shipments. The waste would be stored at SRS or WCS in the casks.

A total of 55 shipments (2 for CH-TRU, 14 for RH-TRU, 39 for the shielding units) would be required to transport the Battelle West Jefferson TRU waste and the concrete shielding units to either SRS or WCS. Two additional shipments would be required to transport the CH-TRU from SRS to WIPP for disposal.

For purposes of the analysis in this SA, DOE assumed that the waste would be stored in concrete shielding units at SRS or WCS in the same manner as it is currently stored at the Battelle West Jefferson site. DOE assumed that, at either storage site, a concrete storage pad of about 400 m^2 (4,270 ft^2) would be constructed in an already disturbed area and that no other construction would be required. The TRU waste in the RH-TRU 72-B casks would be stored in the casks on the concrete pad. The one 30-gallon drum of TRU waste would be stored at the receiving site with other similar waste.

The CH-TRU waste would be characterized at SRS under the existing SRS CH-TRU waste characterization program. These activities would be conducted in existing facilities; no modifications to the facilities or additional construction would be required.

Disposal of the CH TRU waste would occur as described in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (WIPP SEIS-II) (DOE 1997b).

4.0 Existing NEPA Analyses

In the WM PEIS, DOE analyzed the potential environmental impacts of the management (treatment and storage) of TRU waste at DOE sites (DOE estimated that 580 m^3 [20,500 ft^3] of RH-TRU waste had been generated and was being stored at the Battelle West Jefferson site, but did not specifically analyze the treatment or storage of that TRU waste at off-site locations).[7] The TRU Waste ROD documented DOE's decision that, in most cases, each DOE site that has generated or will generate TRU waste will prepare and store its TRU waste on the site. DOE noted that in the future, it may decide to ship TRU waste from sites where it may be impractical to prepare the waste for disposal to sites where DOE has or will have the necessary capability. The sites that could receive such shipments of TRU waste are INL, the Oak Ridge Reservation of which ORNL is a part, SRS, and the Hanford Site.

In the WIPP SEIS-II, DOE analyzed the potential environmental impacts associated with disposing of TRU waste at WIPP. DOE's Proposed Action was to open WIPP and dispose of 175,600 m^3 (6.2 million ft^3) of defense TRU waste; this waste volume includes 580 m^3 (20,500 ft^3) of Battelle West Jefferson RH-TRU waste. In addition, DOE analyzed several action alternatives that would consolidate waste from some smaller-quantity DOE sites, including TRU waste from Battelle West Jefferson, at ORNL, SRS, and Hanford. DOE announced its decision to implement the Proposed Action in the *Record of Decision for the Department of Energy's Waste Isolation Pilot Plant Disposal Phase*, 63 Fed. Reg. 3623 (1998) (WIPP ROD).

In the *Savannah River Site Waste Management Final Environmental Impact Statement* (SRS WM EIS) (DOE 1995), DOE examined the environmental impacts of alternative strategies for managing various waste types (including TRU wastes) at SRS. The preferred alternative

[7] After the estimate of 580 m^3 (20,500 ft^3) of RH-TRU waste was submitted, DOE conducted waste minimization and decontamination activities that resulted in a substantial reduction in the volume of waste considered to be RH-TRU waste at the Battelle West Jefferson site.

examined TRU waste storage and characterization technologies compatible with the WIPP waste acceptance criteria. Treatment was planned only for those TRU wastes that did not conform to the shipping requirements (i.e., plutonium-238 and higher activity plutonium-239). All other SRS TRU wastes were expected to meet the WIPP waste acceptance criteria after repackaging and characterization/certification. In its initial ROD (60 Fed. Reg. 55249 (1995)), DOE selected an alternative that included storage of TRU waste at SRS. In a subsequent ROD (62 Fed. Reg. 27241 (1997)), DOE decided to construct and operate a TRU waste characterization/certification facility to characterize, repackage, and certify TRU waste for disposal at WIPP.

5.0 Description of Off-site Locations

The following sections briefly describe the off-site storage, characterization, and disposal locations to which DOE is proposing to ship the Battelle West Jefferson TRU waste.

5.1 Savannah River Site (Storage/CH-TRU Waste Characterization)

The SRS consists of 80,000 ha (198,399 ac) located approximately 40 km (25 mi) southeast of Augusta, Georgia, in the state of South Carolina. It is bordered to the west by the Savannah River and the State of Georgia. SRS's primary mission since its inception in 1950 until the early 1990s was production and separation of plutonium and tritium for use in national defense programs. The current SRS mission involves waste management and vitrification, special nuclear material storage, research and development, and technology transfer. TRU waste has been stored in containers on concrete pads at SRS since 1974. There are 19 storage pads occupying 10,600 m^2 (114,000 ft^2). SRS is currently characterizing CH-TRU waste and shipping it to WIPP for disposal.

5.2 Waste Control Specialists, LLC (Storage)

WCS is a Texas-based firm that operates a hazardous and radioactive waste management facility in Andrews County, Texas. The WCS facility is located approximately 10 km (6 mi) east of Eunice, New Mexico, and 48 km (30 mi) west of Andrews, Texas. A 5,500-ha (13,500-ac) tract owned by WCS surrounds the 540-ha (1,338-ac) permitted site.

The facility's original 1997 low-level waste treatment, processing, and storage license was amended in 1998 to include storage of TRU waste. Consequently, WCS can receive and store the Battelle West Jefferson TRU waste under its existing radioactive materials license issued by the Texas Department of State Health Services. Based on the terms of the license, the site could store the Battelle West Jefferson TRU waste for the proposed 5-year storage period. However, it does not currently have the capability or the authorization to certify TRU waste for disposal at WIPP.

5.3 Waste Isolation Pilot Plant (Disposal)

WIPP is the world's first underground repository licensed to permanently dispose of TRU waste generated by research and production of nuclear weapons. WIPP began operations in early 1999. Located 42 km (26 mi) southeast of Carlsbad in the remote Chihuahuan Desert of southeastern

New Mexico, project facilities include disposal rooms mined 655 m (2,150 ft) underground in a 600-m (2,000-ft) thick salt formation that has been stable for more than 200 million years.

6.0 Change in Proposed Action

The Hanford Site may not be available for the storage and characterization of the Battelle West Jefferson TRU waste as decided in the 2002 amended TRU Waste ROD and the Hanford Solid Waste ROD, and confirmed in the amended 2004 TRU waste ROD. Also, the Battelle West Jefferson TRU waste needs to be moved off-site before the end of 2005. Accordingly, DOE is now proposing to ship the waste to SRS for storage of the RH-TRU waste and characterization of the CH-TRU waste or to WCS for storage of all the Battelle West Jefferson TRU waste. For purposes of analysis, DOE assumed that waste in storage would remain at SRS or WCS for up to 5 years. Following the storage period, DOE would either characterize the waste at WCS or SRS or ship the waste to another DOE site for characterization, and then ship the waste to WIPP for disposal.

DOE has prepared this SA to determine whether there is a substantial change in the proposed action that is relevant to environmental concerns or if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, (10 CFR 1021.314) such that a supplement to the WM PEIS or a new EIS would be needed. In this context, the SA also discusses the impacts of transportation, storage, and characterization of the Battelle West Jefferson TRU waste at the storage and characterization sites as addressed in existing NEPA documents.

7.0 Is a Supplemental EIS Needed?

The following discussion provides information regarding the potential impacts of

- preparing the Battelle West Jefferson TRU waste for shipment at the Battelle West Jefferson site,
- transporting the waste to SRS or WCS,
- storing the waste at SRS (RH-TRU waste only) or WCS (CH- and RH–TRU waste),
- characterizing the CH-TRU waste at SRS,
- transporting the CH-TRU waste from SRS to WIPP, and
- disposing of the waste at WIPP.

These impacts are compared to those described in the NEPA documents identified in Section 4.0. In addition, for purposes of comparison, the impacts of continued storage of the waste at the Battelle West Jefferson site are also described.

7.1 Preparation of the Battelle West Jefferson TRU Waste for Shipment

The TRU waste at the Battelle West Jefferson site is in a form that can be loaded into NRC-approved Type B shipping casks and transported off-site. The RH-TRU and most CH-TRU waste is currently stored in concrete shielding units (as noted above, one 30-gallon drum is currently stored outside in a locked cargo container at the Battelle West Jefferson site). In order to ship these wastes, a crane must first lift the lids on the shielding units and place them on the lid of another concrete shielding unit. Then the crane must lift the waste containers from the shielding units and place them into the TRUPACT-II containers for the CH-TRU waste, or into the CNS 10-160B shipping casks for the RH-TRU waste. A total of seven transfers would be required to load the six standard waste boxes and one 30-gallon drum into the TRUPACT-II containers. Because there are 22 pallets of RH-TRU waste, each containing five 55-gallon drums, a total of 22 transfers would be required to load the RH-TRU waste into the CNS 10-160B casks. Thus, a total of 29 crane transfers would be required to transfer the wastes from the concrete shielding units and the cargo container into shipping casks at the Battelle West Jefferson site.

It is envisioned that once the waste has been unloaded from a shielding unit, the shielding unit would be shipped to the receiving site so that when the waste arrives there, it could once again be placed in a concrete shielding unit. This process would be repeated to ship the waste to another site for characterization. The concrete shielding units would not be shipped to WIPP.

For this SA, two potential impacts were analyzed: the exposure to workers as they transfer the wastes from the shielding units to the transport containers, and possible accidents that could occur during the transfer process. Sections 7.1.1 and 7.1.2 describe the potential worker and public exposures associated with preparation of the wastes for shipment and the accident consequences should a crane drop one of the standard waste boxes or pallets during transfer to a shipping cask.

7.1.1 Worker and Public Exposure – Routine Operations

As noted above, the process of transferring the waste from the concrete shielding units to casks would involve a total of 29 lifting operations: 7 for the CH-TRU standard waste boxes and 22 for the RH-TRU pallets. This activity was performed in reverse when the concrete shielding units were first loaded at the Battelle West Jefferson site. At that time, extensive "as low as reasonably achievable" (ALARA) studies were performed as part of the planning process for loading the concrete shielding units. As the process progressed, personnel exposure measurements were made to ensure that the ALARA goals were being met. The goal was to keep total worker exposure from the packaging, transfer, and loading of the waste drums in the concrete shielding units to less than 1 person-rem. The goal was attained.

Fifteen workers and supervisors were involved in the original loading and transfer operation. After the transfer, all radiation surveys outside the storage pad showed normal background readings, indicating that there was no public exposure to radiation before, during, or after the transfer operations.

It is expected that seven or eight workers would be involved in transferring the waste from the concrete shielding units to the shipping casks. Based on earlier transfer operations at the Battelle West Jefferson site, DOE estimates that the exposure from the transfer operation would be less than 0.5 person-rem, a level that is equivalent to a risk of a latent cancer fatality for workers of 2.5×10^{-4}.

In comparison, the WIPP SEIS-II (DOE 1997b) analyzed the impacts of the treatment of RH-TRU waste (including 580 m^3 [20,500 ft^3] of Battelle West Jefferson RH-TRU waste) at ORNL under the Proposed Action (SRS was not a proposed treatment site for RH-TRU waste). Treatment activities include those required for preparing waste for shipment. Based on that analysis, the worker population would be exposed to 15 person-rem, resulting in a risk of a latent cancer fatality in the worker population of 5.9×10^{-3} (DOE 1997b, Appendix B, Table B-3). The WM PEIS did not specifically analyze the impacts of treating the Battelle West Jefferson RH-TRU waste. However, that document did analyze the potential impacts of TRU waste treatment at SRS (CH- and RH-TRU waste). Under the Decentralized Alternative, the worker population would be exposed to 170 person-rem, resulting in a risk of a latent cancer fatality in the worker population of 0.1 (DOE 1997a, Volume II, Tables II-16.3-1 and II-16.3-2; DOE 1997b, Appendix B, Table B-24). The additional impacts due to the Battelle West Jefferson waste are relatively small and would not materially add to the impacts reported in the WM PEIS analysis of TRU waste treatment impacts at SRS.

During the transfers, access to the Battelle West Jefferson site would be controlled, so there would be no exposure of the public to radiation.

7.1.2 Worker and Public Exposure – Accident

For the current proposed action, DOE analyzed the potential impacts of a possible drop accident during the transfer of the wastes from the shielding units to the shipping casks. The two accidents analyzed were the drop of a standard waste box containing CH-TRU and the drop of a waste pallet of RH-TRU waste.

An accident involving the CH-TRU standard waste box with the highest radionuclide inventory had an estimated radiation dose of 4.2×10^{-2} rem, resulting in a risk of a latent cancer fatality to a worker of 2.1×10^{-5} and a risk to the maximally exposed individual (MEI) of a latent cancer fatality of 2.5×10^{-5}. The accident with the highest dose, a drop accident involving a drum of RH-TRU waste, had an estimated radiation dose of 8.5×10^{-2} rem. For a worker, this is equivalent to a risk of a latent cancer fatality of 4.3×10^{-5}; for the MEI, this is equivalent to a risk of a latent cancer fatality of 5.1×10^{-5}.

The accident dose estimates for handling the waste at the Battelle West Jefferson site were compared to a container drop accident at other DOE sites as reported in Appendix G of the WIPP SEIS-II (DOE 1997b). The dose to the maximally exposed involved worker in such an accident was estimated to be 140 rem, resulting in a risk of a latent cancer fatality of 0.06 for that worker (DOE 1997b, page G-49). The dose to the MEI was estimated to be 4×10^{-6} rem, resulting in a risk of a latent cancer fatality of 2.0×10^{-9} at SRS (the site with the lowest consequences) (DOE 1997b, Table G-29). For the MEI, the exposure from a container drop accident at SRS was significantly lower that that estimated for a drop accident at the Battelle West Jefferson site

primarily because the site boundary is much closer at the West Jefferson site (assumed to be 10 m [33 ft]) as compared to the site boundary for a much larger site such as SRS.

As noted above, the WM PEIS did not specifically analyze the impacts of treating the Battelle West Jefferson RH-TRU waste. However, that document did analyze the potential impacts of an RH-TRU waste treatment facility accident at ORNL. Under the Centralized Alternative, the worker population would be exposed to 30 person-rem, resulting in a risk of a latent cancer fatality in the worker population of less than 0.5 (DOE 1997a, Table 8.4-10). Moreover, the impacts associated with an accident during the preparation of the waste for shipment to either WCS or SRS are the same as those that would occur if the waste were shipped to Hanford, as contemplated by the existing TRU waste ROD.

7.2 Transportation of the Battelle West Jefferson TRU Waste for Characterization or Storage and for Disposal

For purposes of analysis in this SA, DOE identified transportation routes from the Battelle West Jefferson site to SRS or WCS for storage, and from SRS to WIPP for disposal of the CH-TRU waste. Distances and population densities along the routes are shown in Table 2 and were determined using WebTRAGIS (Johnson and Michelhaugh 2000) which includes the use of 2000 census data.

The potential transportation impacts for shipping the Battelle West Jefferson TRU waste for storage or characterization and subsequent disposal were estimated for the identified transportation routes. As shown in Table 3, the total calculated fatalities for all shipments are much less than one (total fatalities from all causes would range from 3.5×10^{-3} for Option 1 to 5.0×10^{-3} for Option 2).

Table 2. Truck Distances and Population Densities

Origin	Destination	Distances (kilometers)[a]			Population Densities (persons per square kilometer)[b]		
		Rural	Suburban	Urban	Rural	Suburban	Urban
Option 1: Ship Battelle West Jefferson TRU waste to SRS for storage; ship CH-TRU waste to WIPP for disposal							
Battelle West Jefferson	SRS	640.23	450.75	34.76	17.23	332.77	2,260.34
SRS	WIPP	1,737.03	650.46	64.55	13.14	315.71	2,170.81
Option 2: Ship Battelle West Jefferson TRU waste to WCS for storage							
Battelle West Jefferson	WCS	1,568.41	740.95	91.23	14.50	348.21	2,208.91

a. To convert kilometers to miles, multiply by 0.62137.
b. To convert persons per square kilometer to persons per square mile, multiply by 2.59.

In the WM PEIS, DOE analyzed the transportation of TRU waste from generating sites to other DOE sites where the waste would be stored, and then to WIPP for disposal. Under the Decentralized Alternative, in which all TRU waste would be shipped to 10 DOE sites for interim storage and then to WIPP for disposal, DOE estimated a total of 7 fatalities from radiation exposure and injury from traffic accidents (DOE 1997a, Table 8.4-8).

The WIPP SEIS-II (DOE 1997b) analyzed the impacts of the transportation of TRU waste (including 580 m^3 [20,500 ft^3] of Battelle West Jefferson RH-TRU waste) from generator-storage sites to WIPP for disposal. DOE estimated that this transportation campaign would result in 8.8 fatalities from radiation exposure, vehicle pollution, radiological accidents, and traffic accidents (DOE 1997b, Appendix E, Table E-35).

Table 3. Transportation Impacts for Shipping Battelle West Jefferson TRU Waste, By Waste Type

Option	Incident Free		Radiological Accident Risk (LCFs)	Pollution Health Effects	Traffic Fatalities	Total Fatalities
	Public (LCFs)	Worker (LCFs)				
Mixed and Non-Mixed CH-TRU Waste Shipments in TRUPACT-II						
Option 1: Battelle West Jefferson to SRS; CH-TRU waste to WIPP	6.9×10^{-5}	1.2×10^{-4}	8.5×10^{-7}	3.6×10^{-5}	1.9×10^{-4}	4.1×10^{-4}
Option 2: Battelle West Jefferson to WCS	5.0×10^{-5}	7.3×10^{-5}	5.5×10^{-7}	2.9×10^{-5}	1.0×10^{-4}	2.5×10^{-4}
Non-Mixed RH-TRU Waste Shipments in CNS 10-160B						
Option 1: Battelle West Jefferson to SRS	2.0×10^{-4}	4.7×10^{-4}	1.9×10^{-8}	8.6×10^{-5}	4.4×10^{-4}	1.2×10^{-3}
Option 2: Battelle West Jefferson to WCS	4.2×10^{-4}	8.3×10^{-4}	4.1×10^{-8}	1.7×10^{-4}	6.0×10^{-4}	2.0×10^{-3}
Mixed RH TRU Waste Shipments in RH-72B						
Option 1: Battelle West Jefferson to SRS	3.4×10^{-5}	7.8×10^{-5}	8.6×10^{-8}	1.4×10^{-5}	7.3×10^{-5}	2.0×10^{-4}
Option 2: Battelle West Jefferson to WCS	7.0×10^{-5}	1.4×10^{-4}	1.8×10^{-7}	2.9×10^{-5}	1.0×10^{-4}	3.4×10^{-4}
Concrete Shielding Unit						
Option 1: Battelle West Jefferson to SRS[a]	0.0	0.0	0.0	2.8×10^{-4}	1.4×10^{-3}	1.7×10^{-3}
Option 2: Battelle West Jefferson to WCS	0.0	0.0	0.0	5.6×10^{-4}	2.0×10^{-3}	2.5×10^{-3}
Fatality Range: 3.5×10^{-3} (Option 1) to 5.0×10^{-3} (Option 2)						

Note: LCF = latent cancer fatality.

a. The concrete shielding units may not be needed at SRS and would not be shipped to WIPP.

Maximum reasonably foreseeable transportation accidents were evaluated in the WIPP SEIS-II for CH-TRU and RH-TRU waste. For both CH-TRU and RH-TRU waste, the maximum reasonably foreseeable transportation accident involved more than 1,000 curies (Ci) of plutonium (DOE 1997b, Table E-17, page E-45). For Battelle West Jefferson CH-TRU waste, the maximum plutonium inventory in a shipment of three TRUPACT-II containers would be less than 55 Ci. For Battelle West Jefferson RH-TRU waste, the maximum plutonium inventory in a shipment would be less than 42 Ci. Therefore, the impacts for the maximum reasonably foreseeable transportation accident presented in the WIPP SEIS-II (DOE 1997b,

Appendix E.4.3.2, page E-56) would exceed the impacts for maximum reasonably foreseeable transportation accidents involving Battelle West Jefferson CH-TRU or RH-TRU waste.

7.3 Storage of the Battelle West Jefferson TRU Waste

With the exception of the one 30-gallon drum, the TRU waste has been present in concrete shielding units at the Battelle West Jefferson site for more than a year, and all of the routine exposures associated with waste storage activities have occurred during that time. There are two sources of routine worker exposure. One is the exposure associated with performing procedurally required quarterly health physics surveys of the shielding units and quarterly purging of the RH-TRU 72-B casks. The second is the worker exposure associated with performing annual nitrogen purges of the concrete shielding units. The health physics surveys show that there is no exposure to the general public or to noninvolved workers (on-site workers not performing monitoring and maintenance activities on the storage pad).

Based on the 1 year of experience with monitoring and maintenance of the storage pad, the total annual exposure to the health physics person performing the health physics surveys has been less than 1 mrem. It takes three people about 2 hours to perform the nitrogen purge on the RH-TRU 72-B cask. The total annual exposure for each individual performing this operation on the RH-TRU 72-B cask is also less than 1 mrem/year, for a total exposure of approximately 3×10^{-3} person-rem/year. All the concrete shielding units are purged with nitrogen annually. It takes four people about 8 hours to perform this operation, and each individual receives less than 1 mrem as a result of the activity.[8]

In addition to these inspections, DOE assumes that a weekly inspection of the mixed waste containers would occur at either of the storage sites as required under the Resource Conservation and Recovery Act. Each week, two individuals would inspect the one concrete shielding unit containing the one standard waste box that contains mixed CH-TRU waste and the two RH-TRU 72-B casks that contain mixed RH-TRU waste. At SRS, each inspection would take about 10 minutes, since the CH-TRU waste would not be stored, for a total of about 17 person-hours a year. At WCS, each inspection would take about 15 minutes, for a total of 26 person-hours per year. The total worker exposure during for this time spent near the mixed TRU waste would be about 1×10^{-3} person-rem/year at SRS or WCS.

Thus, routine exposures from all monitoring and maintenance activities and the expected exposure as a result of weekly mixed waste inspections would result in a total exposure of no more than 8×10^{-3} person-rem annually while the waste was being stored at SRS or WCS. Assuming a 5-year storage period at SRS or WCS, the total worker exposure would be no more than 4×10^{-2} person-rem. This is equivalent to the risk of a latent cancer fatality of 2.0×10^{-5} over the 5-year storage period.

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[8] The radiation level at the surface of the one drum of possible CH-TRU waste not in the concrete storage units is about 10 mrem/hour. Worker exposure during monitoring and maintenance for this drum would be within that estimated for the remainder of the CH-TRU waste at the Battelle West Jefferson site.

At the storage site, it is assumed that the waste must be handled once upon receipt. Based on the estimates for preparing the wastes for shipment, the total exposure of workers to radiation would be less than 0.5 person-rem. Because the radiation dose from the Battelle CH-TRU waste is very low (less than 1.0 mrem per hour), this estimate would also include the dose for preparing CH-TRU waste for shipment from SRS to WIPP. This is equivalent to the risk of a latent cancer fatality of 2.5×10^{-4}.

In comparison, the SRS WM EIS analyzed the potential impacts of on-site storage of TRU waste. Under Alternative B (the preferred alternative and the alternative selected in the ROD), on-site facility workers would be exposed to an estimated 2.2 person-rem over 30 years as a result of activity at the TRU waste storage pads (DOE 1995, Appendix E, Table E.4-2). This would result in exposure of approximately 0.37 person-rem for a 5-year storage period. Such an exposure would result in a risk of a latent cancer fatality to workers of 1.9×10^{-4}.

In terms of accident impacts, the accident impacts would be identical to the impacts of possible accidents when loading the waste for transfer to SRS or WCS (see Section 7.1.2).

At SRS or WCS, the distance to the MEI would be significantly greater than the 10 m (33 ft) assumed for the Battelle West Jefferson site. Based on the WIPP SEIS-II, the handling accident impacts for several DOE sites ranged from 5.1×10^{-4} to 4.0×10^{-6} rem (DOE 1997b, Table G.29), orders of magnitude lower than the values developed for the handling of waste at the Battelle West Jefferson site. The accident exposures developed for the Battelle West Jefferson site were used for storage accidents at SRS and WCS, recognizing that for either of those sites, the public exposures would be orders of magnitude lower. DOE estimates that the maximum radiation dose for accidents involving handling of the CH-TRU waste would be 4.2×10^{-2} rem, and 8.5×10^{-2} rem for accidents involving the handling of RH-TRU waste (see Section 7.1.2). These radiation doses are equivalent to risks to the MEI of a latent cancer fatality of 2.5×10^{-5} and 5.1×10^{-5}, respectively. Moreover, the potential impacts of on-site storage of the TRU waste at SRS or WCS are consistent with the results presented in the WM PEIS, the WIPP SEIS-II and the Hanford Solid Waste EIS, which supported DOE's prior decision regarding the Battelle West Jefferson TRU waste.

7.4 Characterization of the Battelle West Jefferson CH-TRU Waste at SRS

At SRS, characterization operations would be somewhat more extensive than the preparation activities and initial loading operation at the Battelle West Jefferson site; however, the total routine exposures would be expected to be lower because the site would be handling much larger quantities of material, resulting in lower exposure per drum or standard waste box characterized.

At the Battelle West Jefferson site, there are 12 m^3 (424 ft^3) of CH-TRU waste and 25 m^3 (883 ft^3) of RH-TRU waste. DOE expects that the total worker exposure from characterizing the Battelle West Jefferson waste would be about 0.005 person-rem for the CH-TRU waste and about 0.03 person-rem for the RH-TRU waste. This would result in a risk of a latent cancer fatality of 2.5×10^{-6} for the CH-TRU waste and 1.5×10^{-5} for the RH-TRU waste. This would not significantly add to results reported in the WM PEIS.

With respect to potential accidents at characterization sites, the WM PEIS analyzed accidents involving the treatment of TRU waste. While the frequency of the accident would be expected to be sensitive to the volume processed, the consequences of an accident are simply a function of the inventory of isotopes involved in the accident. Thus, DOE assumed that the accident analysis described in the WM PEIS would be similar to the accident consequences when the Battelle West Jefferson TRU wastes are characterized. In the case of the WM PEIS DOE specifically examined the dose to noninvolved workers and to the MEI from accidents involving both CH-TRU waste and RH-TRU waste at SRS. These exposures were 40 rem to the noninvolved worker and 9.0×10^{-6} rem to the MEI (DOE 1997a, Table 8.4-10). DOE expects that these exposures are representative of the exposures that might occur if the Battelle West Jefferson TRU wastes were involved in accidents occurring during characterization of the Battelle West Jefferson TRU wastes at SRS or any characterization site.

7.5 Disposal of the Battelle West Jefferson CH-TRU Waste at WIPP

As noted above, the WIPP SEIS-II analyzed the potential impacts of disposing of 175,600 m^3 (6.2 million ft^3) of defense TRU waste. This waste volume included 580 m^3 (20,500 ft^3) of Battelle West Jefferson RH-TRU waste. Although disposal of Battelle West Jefferson CH-TRU was not specifically analyzed, the total volume of CH-TRU waste analyzed (168,500 m^3 [6 million ft^3]) was sufficient to bound the potential impacts of 12 m^3 (424 ft^3) of Battelle West Jefferson CH-TRU waste. A summary of the potential impacts of TRU waste disposal at WIPP is contained in the WIPP SEIS-II (DOE1997b, Table 3-18).

7.6 Continued Storage of Waste at the Battelle West Jefferson Site

If an off-site storage location cannot be found for the Battelle West Jefferson TRU waste, then the waste will have to remain on the site. The Battelle West Jefferson site is a non-government site subject to regulation by the NRC. The NRC permit expires in December 2005, thus, continued storage would violate the closure agreement with the NRC. Storage for a few months beyond December may be possible under the NRC license, but extended storage can be expected to require Ohio Department of Health and Ohio Environmental Protection Agency permits.

Based on the maintenance and monitoring that has been performed over the last year (see Section 7.3), DOE expects that annual worker exposures would continue to be less than 8×10^{-3} person-rem if the wastes continue to be stored at the Battelle West Jefferson site. Radiation surveys have verified that radiation exposures beyond the storage area would be at background levels, so the exposure to noninvolved workers and the general public would be zero.

The performance of the concrete shielding units was evaluated under severe environmental conditions. The tornado evaluation shows that the shielding units would remain stable under the wind loading from the design basis tornado, that the shielding units would not slide from their initial positions during the design basis tornado, that the lids of the shielding units would remain in place during the design basis tornado, and that the effect of reduced pressure resulting from the design basis tornado would have negligible impact on the shielding units. The flood evaluation shows that the shielding units would remain stable during floods with velocities up to 4.05 to 4.55 m per second (13.28 to 14.94 ft per second). The seismic evaluation shows that the

shielding units would remain stable during earthquakes with horizontal ground accelerations of about 0.5 g, or about 490 centimeters/second^2.

8.0 Conclusion

Table 4 summarizes the potential impacts from the handling, transportation, storage, and characterization of TRU waste currently stored at the Battelle West Jefferson site.

Table 4. Summary of Impacts from Handling, Transportation, and Storage, of Battelle West Jefferson TRU Waste

Description of Activity	Option 1: Battelle West Jefferson to SRS; CH-TRU to WIPP for Disposal		Option 2: Battelle West Jefferson to WCS	
	Total Dose	Total Fatalities[a]	Total Dose	Total Fatalities[a]
Preparation for Shipment				
Worker exposure from preparing waste for shipment	0.5 person-rem	2.5×10^{-4}	0.5 person-rem	2.5×10^{-4}
Public exposure from preparing waste for shipment	0.0 person-rem	0.0	0.0 person-rem	0.0
Largest worker exposure from a handling accident	8.5×10^{-2} rem	4.3×10^{-5}	8.5×10^{-2} rem	4.3×10^{-5}
Largest public MEI exposure from a handling accident	8.5×10^{-2} rem	5.1×10^{-5}	8.5×10^{-2} rem	5.1×10^{-5}
Transportation				
Impacts from shipments of CH-TRU, RH-TRU, and concrete shielding units		3.5×10^{-3}		5.0×10^{-3}
Storage Site (5-Year Period)				
Worker exposure from waste receiving and preparing waste for shipment	0.5 person-rem	2.5×10^{-4}	0.5 person-rem	2.5×10^{-4}
Worker exposure from routine monitoring and maintenance	4.0×10^{-2} person-rem	2.0×10^{-5}	4.0×10^{-2} person-rem	2.0×10^{-5}
Largest worker exposure from a handling accident	8.5×10^{-2} rem	4.3×10^{-5}	8.5×10^{-2} rem	4.3×10^{-5}
Largest public MEI exposure from handling accidents	8.5×10^{-2} rem	5.1×10^{-5}	8.5×10^{-2} rem	5.1×10^{-5}
Characterization of CH-TRU Waste at SRS				
Worker exposure from CH-TRU handling	0.005 person-rem	2.5×10^{-6}	0	0
Worker exposure from RH-TRU handling	0.03 person-rem	1.5×10^{-5}	0	0
Noninvolved worker exposure from handling accidents (CH- and RH-TRU)	40 rem	2.4×10^{-2}	0	0
Largest public MEI exposure from characterization accidents (CH- and RH-TRU)	9.0×10^{-6} rem	5.4×10^{-9}	0	0

a. Including latent cancer fatalities.

The potential impacts summarized in Table 4 are very small and are consistent with, or are bounded by, the analyses performed for and described in the WM PEIS (DOE 1997a), and the WIPP SEIS-II (DOE 1997b). Radiation exposures to workers, noninvolved workers, and the public would be very low (or zero) and would not result in any latent cancer fatalities.

Based on the analyses of the potential impacts of the Proposed Action as discussed in this SA, DOE concludes that the Proposed Action is not a substantial change to the proposal analyzed in prior NEPA documents that are relevant to environmental concerns. Further, there are no significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action or its impacts. Therefore, DOE has determined that a supplement to the WM PEIS or a new EIS is not needed.

Approved in Washington, D.C., on October 12th, 2005.

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