

ISO-2 Project WIPP Independent Oversight – DE-AC30-06EW03005

**AN EVALUATION OF THE READINESS OF THE WASTE
ISOLATION PILOT PLANT FOR DISPOSAL OF
REMOTE-HANDLED TRANSURANIC WASTE**

May 2007



PECOS MANAGEMENT SERVICES, INC.

**ISO-2 Project
Carlsbad, NM**

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ACRONYMS

ARM	Area Radiation Monitor
CBFO	Carlsbad Field Office
CFR	Code of Federal Regulations
CH	Contact Handled
CMR	Central Monitoring Room
CORR	Contractor’s Operational Readiness Review
CR	Core Requirements
DOE	Department of Energy
DSA	Documented Safety Analysis
EPA	Environmental Protection Agency
ES&H	Environmental Safety & Health
HERE	Horizontal Emplacement and Retrieval Equipment
HW	Hazardous Waste
ISMS	Integrated Safety Management Systems
NMED	New Mexico Environment Department
ORR	Operational Readiness Review
PECOS	PECOS Management Services, Inc.
POA	Plan of Action
RH	Remote Handled
SER	Safety Evaluation Report
SNR	Startup Notification Report
SSC	Structures, Systems, and Components
TRU	Transuranic
TSRs	Technical Safety Requirements
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions, LLC

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I. PURPOSE AND SCOPE

The purpose of this report is to present the findings of PECOS Management Services, Inc. (PECOS) review of the preparations by the Department of Energy (DOE) and Washington TRU Solutions (WTS), the operating contractor, for receipt and disposal of remote-handled (RH) transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP).

The scope of the review included documentation of the basic waste handling and infrastructure systems at the WIPP designed to support the RH TRU Waste disposal activities and the WTS and DOE plans for determining that the WIPP was ready to receive and dispose of RH TRU waste. The documentation reviews were supplemented by several on-site evaluations of the systems and discussions of operational processes with WIPP personnel, as well as an on-site observation of the receipt and emplacement processes of actual RH TRU waste containers.

II. BACKGROUND

The WIPP is designed and constructed to permanently dispose of defense-related TRU waste. TRU waste is classified as either contact-handled (CH) or RH, based on the radiation level measured on the surface of the waste container. TRU waste containers with a surface radiation level equal to or greater than 200 mrem/hr but less than 1000 rem/hr are considered RH TRU waste and must be shielded for safe handling. Containers with less than 200 mrem/hr are designated as CH TRU waste.

The WIPP is designed to receive and handle 500,000 cubic feet per year (ft³/yr) or (14,160 cubic meters per year [m³/yr]) of CH TRU waste and 10,000 ft³/yr or 283 m³/yr of RH TRU waste. The RH TRU waste from the generator sites will be received in 55-gallon drums contained within RH-72B or CNS10-160B waste shipping containers. The RH-72B container is designed to transport one remote-handled canister containing three 55-gallon drums of waste or three 30-gallon drums of waste. The CNS10-160B container can hold up to 10 55-gallon drums. Both casks are leak-tight and constructed with inner and outer containment vessels.

The disposal capacity of the WIPP is 6.2 million ft³ (175,546 m³) of TRU waste. The disposal capacity for RH TRU waste of the WIPP is limited to 250,000 ft³ (7,079 m³) total volume of RH TRU waste (46 Federal Register 9162). In addition, the WIPP Land Withdrawal Act of 1992 limits total RH TRU activity to 5.1 million curies.

To prepare for receipt and disposal of RH TRU wastes, DOE completed the *WIPP Remote Handled (RH) TRU Waste Documented Safety Analysis (DSA)*, DOE/WIPP-06 – 3174¹ and the *Remote Handled Technical Safety Requirements (TSRs)*, DOE WIPP-06-3178.² These documents were reviewed and approved by the DOE Approval Authority in 2006 as stated in the *Safety Evaluation Report (SER)*, DOE/CBFO-06-3334, Rev 0.³ This SER concludes that the safety basis documented in the DSA is comprehensive, correct, and commensurate with hazards associated with RH TRU waste disposal operations.

WIPP was certified for the disposal of RH TRU waste by the US Environmental Protection Agency in 1999 and by the New Mexico Environment Department through a Hazardous Waste (HW) Facility Permit modification approved in 2006. However, prior to accepting and disposing of RH TRU waste, DOE procedures—as described in the General Guidance, DOE-STD-3006-2000, *Planning and Conduct of Operational Readiness Reviews*⁴ —require a high-level review of all aspects of the WIPP associated with receipt and disposal of RH TRU waste to ensure readiness to operation. This review, called an operational readiness review (ORR), is conducted in accordance with DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*.⁵

III. SUMMARY OF FINDINGS

The findings of PECOS are presented in three sections: Planning and Implementation Documents, Ventilation Systems, and RH TRU Waste Disposal Operations.

IIIA. Planning and Implementation Documents

PECOS initiated this oversight activity by reviewing the DSA, TSRs, and SER cited above. This review was supplemented by an on-site briefing by DOE and WTS personnel addressing the above- and below-ground ventilation systems and the RH TRU waste handling process. No significant issues or concerns were noted with either the documents or the described systems.

PECOS also received and reviewed six documents that describe the processes involved in the contractor's preparation for the DOE ORR of WIPP for acceptance and disposal of RH TRU waste. Five of the documents address the planning for either the contractor's ORR or the DOE ORR. They are as follows:

1. *Remote Handled (RH TRU) Waste Disposal Operations – Contractor Operational Readiness Operational Readiness Review Plan of Action* (DOE/WIPP 05-3328 Rev 0)⁶
2. *Line Management Assessment Plan* (WP 15-OR01, Rev5)⁷
3. *Start-Up and Restart of the WIPP Facility* (WP15-MD3101, Rev3)⁸
4. *RH TRU Line Management Assessment Acceptance Criteria* (Rev7)⁹
5. *RH Waste Disposal Operations CBFO-DOE Operational Readiness Review Plan of Action* (DOE/WIPP 06-3341)¹⁰

These planning documents adequately addressed the requirements included in DOE-STD-3006-2000 and DOE Order 425.1C.

The sixth document was the *Final Report – Contractor’s Operational Readiness Review*.¹¹ This report provided the results of the operator-level ORR conducted by a team of experts contracted by WTS. It identified several significant findings that required correction before the conduct of the DOE ORR, including the following:

1. The Structures, Systems, and Components (SSCs) that perform safety functions were not functionally classified as safety class or safety significant. Interfaces between safety and non-safety SSCs have not been analyzed to identify SSC failures that would prevent safety SSCs from performing their intended function.
2. There were deficiencies in implementing the *unresolved safety questions* process in the major modification to the roof structure of the waste handling building.
3. The RH DSA and TSRs are not consistent within themselves, the field, or DOE requirements.
4. No justification is given to support the fact that the radiation work permit is less restrictive than the basis document used to create it.
5. The placement of the area radiation monitors is inadequate as compared to the requirements in the radiological control position paper 2002-06, rev 4.

After reviewing the above documentation, PECOS submitted a letter to DOE¹³ on November 21, 2006, requesting the *Readiness to Proceed Memo from WTS to CBFO*. This memo was expected to include a

description of corrective actions taken by WTS in response to the above findings. PECOS made the following recommendations:

1. Clarify that the ORR reviews the operational plans and processes for the coordination of the receipt and disposal of both CH and RH TRU wastes to ensure appropriate safeguards related to on-site above-ground storage, etc. are included.
2. Indicate that the CORR and the DOE ORR have reviewed the CH and RH DSAs and TSRs to ensure they are not in conflict with one another.
3. A crosswalk between the core requirements and the CORR findings would facilitate the review and evaluation of the responses made to each deficiency.

PECOS also determined that the RH TRU Waste Implementation Plan and the DOE ORR Report should be reviewed for complete assurance that WTS was ready to receive and dispose of RH TRU Waste. These documents were requested from DOE on several occasions in the October-December 2006 time period but were never received.

IIIB. Ventilation Systems

Separate WIPP ventilation systems serve the surface and underground facilities. They are designed to meet the requirements in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*,¹² including:

- Airflow transfer and leakage are from areas of lower to areas of higher potential for contamination.
- Negative pressure is maintained to minimize the spread of contaminants from building areas that have a potential for contamination.
- A combination of static and dynamic barriers, as required by DOE Order 420.1A,¹⁴ that prevent or minimize:
 - Spread of radioactive and hazardous materials within occupied and unoccupied process areas.
 - Release of radioactive and hazardous materials in facility effluents during normal operation and process interruptions.
 - Release of radioactive and hazardous materials resulting from design basis accidents including severe natural and man-made events.

The on-site examination of the ventilation systems and a review of the associated documentation by PECOS staff indicate that the design and operational procedures and conditions of the WIPP ventilation systems are sufficient to protect both workers and public from potential exposure to radioactive contamination during the

disposal of RH TRU waste, if properly implemented.

IIIC. RH TRU Waste Disposal Observation

In January 2007, the DOE Carlsbad Field Office (CBFO) verified to DOE Headquarters that the findings of the DOE ORR conducted in December 2006 had been corrected. Both the EPA and the NMED conducted inspections of the operational aspects of the RH TRU waste disposal program in January 2007 and certified the WIPP as ready to receive and emplace RH TRU waste. As a result, the first RH TRU waste was received at the WIPP on January 23, 2007. However, in order to independently validate the readiness of the WIPP to dispose of RH TRU waste, PECOS requested an opportunity to observe the disposal operations for an actual shipment of RH TRU waste.

PECOS observed the actual waste handling processes for RH TRU waste at the WIPP on March 19 and 20, 2007. The step-by-step procedures during the RH-72B shipping cask unloading process and the final placement of the canister in the underground borehole were conducted under Radiation Work Permit 06-008¹⁵ following Written Technical Procedure WP 05-WH1710,¹⁶ which governs the RH-72B cask processing—including unloading the facility cask onto the horizontal emplacement and retrieval equipment (HERE) underground.

The operational sequence for handling RH TRU waste after entering the WIPP security gate is presented in *Figures 1 and 2*. Each incoming RH TRU shipping cask undergoes a security check and inspection to verify the shipment documentation is complete. A radiological survey of the exterior surface of each container is conducted. The RH TRU waste container is unloaded from the shipping cask in the WIPP Waste Handling Building where the waste hoist and cask unloading room are located. Following removal of the impact limiters, the cask is placed on the transfer car and positioned directly below the Cask Prep Station, where the cask is vented, checked for possible radiation leakage, and the outer lid is removed. An alignment tool is then installed to facilitate canister transfer, and the road cask is wheeled on rails into the transfer cell, where the canister is removed from the road cask robotically and placed inside the facility cask. The facility cask is then repositioned from a vertical to a horizontal position via the facility cask rotating device and lowered onto the facility cask transfer car, where it is then positioned for loading onto the waste shaft cage for lowering into the underground repository.

At the waste disposal level, the facility cask is removed from the transfer car, lifted with a 41-T forklift, and carried to the disposal panel. The facility cask is lowered onto the HERE. The canister is then placed into the borehole followed by a concrete shield plug for permanent storage. It is estimated that about 8 hours are required to complete the sequence.

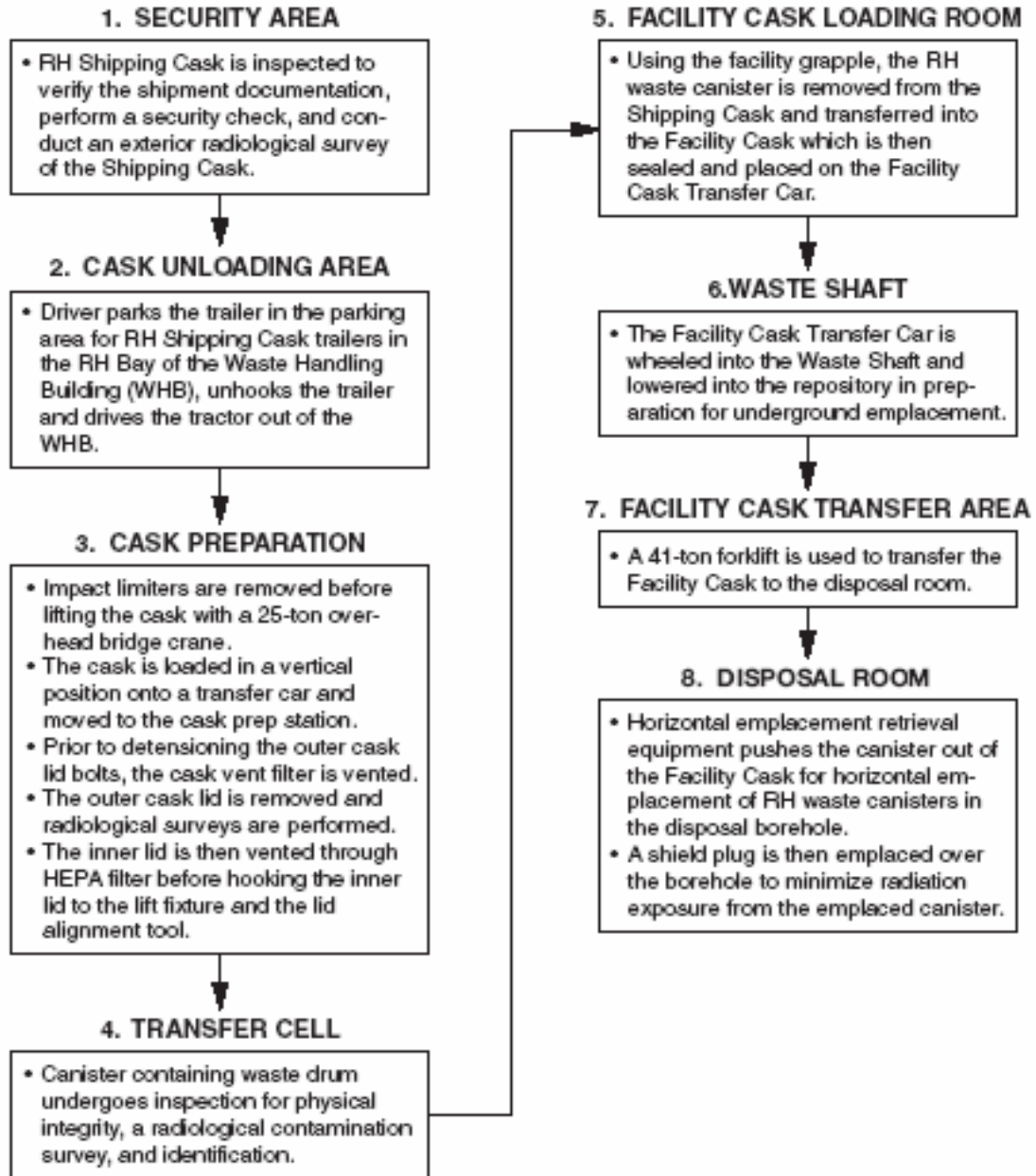


Figure 1. RH TRU Waste Handling Sequence of Operations

RH-72B Overview

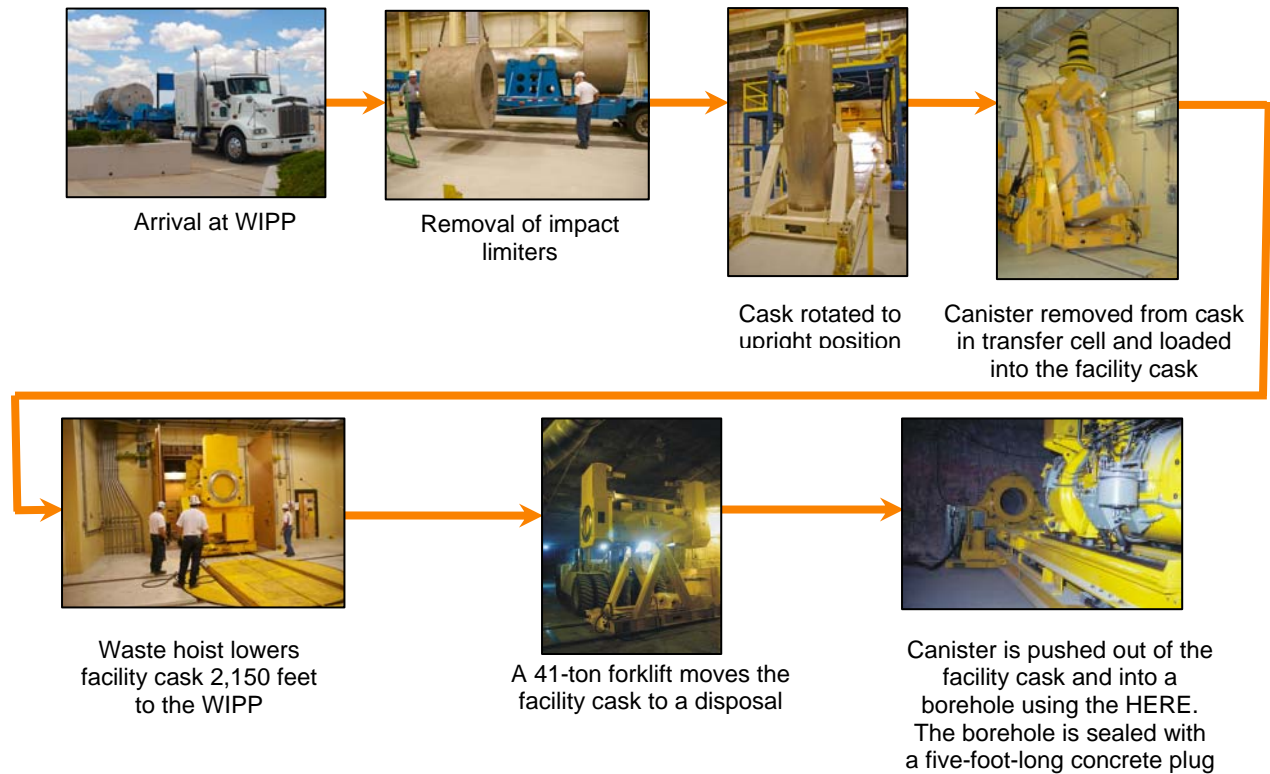


Figure 2 - The RH Disposal Process

Operations were conducted following all applicable sections of the *Written Technical Procedure WP 05-WH1710*.¹⁶ These procedures for handling the RH canisters are very detailed. For example, the Canister Swipe Sequence for transferring the RH canisters from the road cask into the canister transfer and then into the facility cask involved a detailed description of each of 57 steps. For each procedure, the operator reads each step aloud before initiating it. A second member of the operating team is responsible for documenting the proper completion of each step of the procedure.

Two incidents occurred during PECOS’ observation of RH TRU waste disposal operations. First, there was a loss of the RH Bay ventilation, which resulted in the brief suspension of the RH road cask unloading process. There was an announcement from the Central Monitoring Room (CMR) advising workers to cease RH operation at the time the ventilation system went down, but the announcement did not include any instructions to evacuate the WHB or to take any other type of personal protective action. Further, no

announcement indicating it was safe to resume work was heard. The system was only out of operation for a short time, but there was no indication when it restarted whether the backup system came on line automatically as called for in the ventilation system operational procedures, or whether the main system was restarted. Information subsequently provided by WTS indicated that a supply fan had stopped operating and the automatic change-over to back-up fans failed due to equipment malfunction. Consequently, the facility shift manager had manually started the backup fans. The CMR log entries do not indicate the cause of the primary fan failure.

At the site, there was a 2-hour delay due to repairs to the 41-T forklift, which had a flat tire. This resulted in a delay in transferring the facility cask—held in the WHB until the repairs were completed—from the waste shaft to the disposal panel underground. After the forklift was repaired, operators emplaced the waste canister and shield plug following the *Written Technical Procedure WP 05-WH1700*¹⁷ for the HERE.

An additional concern regarding the emplacement of RH TRU wastes involves optimizing the use of the available space. There are no “backups” for several unique items of equipment, such as the facility cask and the HERE. Therefore, if these unique items were to become inoperable, it might be necessary to bypass one or more of the RH TRU waste boreholes in order to accommodate the disposal of CH TRU waste. The DOE’s most recent forecast regarding RH TRU waste to be disposed at the WIPP indicates the entire RH TRU waste capacity allowed by the NMED will be required. Also, the current HW facility permit is very restrictive on the amounts of RH TRU waste that are allowed to be disposed in each particular panel, limiting any operational adjustments that could be made to offset any such equipment breakdowns. Therefore, any loss of RH TRU waste disposal space due to equipment breakdowns would have a significant adverse impact on DOE’s TRU Waste Management Plan.

IV. CONCLUSIONS

Startup of the WIPP RH TRU waste disposal operations was carried out in accordance with the requirements of DOE Order 425.1C, Section 4.a.(1)(f), as startup of new activity in an existing Hazard Category 2 designated non-reactor nuclear facility. All pre-start findings resulting from the DOE ORR are assumed to have been addressed by WTS, since both EPA and NMED approved WIPP for RH TRU waste disposal in January 2007.

The design and operation of the underground ventilation system meets or exceeds the criteria specified by 30 CFR Part 57, Subpart G.¹⁸

The unloading, transfer and disposal processes are well documented and will ensure that, if all applicable

procedures are followed, the public, workers, and the environment are adequately protected from hazards posed by the WIPP TRU waste handling operations.

The response to the loss of ventilation in the WHB indicates a weakness in the monitoring and alert system, because there was a period of several minutes between noticeable loss of ventilation airflow and an announcement to cease RH operations. The lack of description of the cause of the ventilation failure in the CMR logbooks indicates a weakness in the documentation of system malfunctions.

Operational failures of the unique items of equipment used for RH TRU waste emplacement, such as the facility transfer cask and the HERE, could result in loss of RH capacity or unacceptable operational delays.

V. RECOMMENDATIONS

1. DOE should arrange for the installation of a warning device, such as a rotating beacon light, in the RH bay of the waste handling building that would automatically alert workers with a *visual* indication of loss of ventilation airflow in addition to an announcement from the CMR.
2. Backup units for the unique items of RH TRU waste handling equipment, such as the facility cask and the HERE, should be acquired in order to avoid lengthy delays and possible loss of repository capacity in case of a major breakdown of those unique items.
3. The sequencing of RH and CH TRU wastes at the WIPP should be reviewed by PECOS to ensure appropriate ES&H measures are in place and in use.

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