# THE TRANSURANIC WASTE MANAGEMENT PROGRAM AT SAVANNAH RIVER

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## ABSTRACT

Defense transuranic waste at the Savannah River site results from the Department of Energy's national defense activities, including the operation of production reactors, fuel reprocessing plants, and research and development activities. TRU waste has been retrievably stored at the Savannah River Plant since 1974 awaiting disposal. The Waste Isolation Pilot Plant, now under construction in New Mexico, is a research and development facility for demonstrating the safe disposal of defense TRU waste, including that in storage at the Savannah River Plant.

The major objective of the TRU Program at SR is to support the TRU National Program, which is dedicated to preparing waste for, and emplacing waste in, the WIPP. Thus, the SR Program also supports WIPP operations. The SR site specific goals are to phase out the indefinite storage of TRU waste, which has been the mode of waste management since 1974, and to dispose of the defense TRU waste. This paper describes the specific activities at SR which will provide for the disposal of this TRU waste.

## BACKGROUND

TRU waste is material declared as having negligible economic value, contaminated with alpha-emitting radionuclides of atomic number greater than 92 and half-lives longer than 20 years, in concentrations greater than 100 nCi/g. Prior to 1970, TRU waste at all sites was buried as low-level waste. In 1970, AEC Manual Chapter 0511 directed that low-level waste contaminated with greater than 10 nCi/g of TRU radionuclides be stored in such manner so as to be retrievable for a period of 20 years. But even prior to this time, waste suspected of containing significant levels of TRU contamination (at the time there was no way to determine whether a waste package was contaminated to this level with TRU radionuclides) was being encased in concrete culverts or concrete monoliths and buried at SR. In 1974, SR implemented the storage of suspect TRU contaminated waste on above grade storage pads which are still in use today. It was anticipated that this storage mode would provide for retrievability for the 20 years required by the AEC Manual Chapter. The Savannah River Laboratory has performed a series of studies, including retrieving simulated waste drums from an identical storage pad to demonstrate the retrievability of waste stored in this manner. All studies to date indicate that this waste will be retrievable for at least 20 years.

In 1984, DOE redefined TRU waste to be that waste contaminated with greater than 100 nCi/g of TRU elements. This redefinition was based on a series of technical analyses which showed there are insignificant impacts on the environment and on the short or long term dose to man of disposing of waste contaminated with less than 100 nCi/g of TRU elements as low-level waste. Therefore, it is waste contaminated with greater than 100 nCi/g of TRU elements which will be prepared for disposal in WIPP.

## CERTIFICATION OF WASTE FOR WIPP

In order that the WIPP may safely demonstrate the disposal of TRU waste, acceptance criteria have been developed. These acceptance criteria assure that transportation, above and below ground handling, disposal, and retrieval (within the first few years of operation, if necessary) can be safely accomplished. They focus on complete documentation of the waste container and its contents. The criteria specify the properties of the waste and the container including limits on weight, surface contamination levels, liquid content, and dispersibility. Newly generated and stored defense TRU waste will be certified for compliance with these waste acceptance criteria and then sent to the WIPP. All TRU waste must meet these criteria before it can be emplaced in the WIPP. Some waste may require processing before meeting the acceptance criteria. A waste package which is demonstrated to meet all the waste acceptance criteria is "certified". The TRU waste at SR falls into three major categories - Pu-239 contaminated waste (approximately 45% by volume), Pu-238 contaminated waste (approximately 45% by volume), and miscellaneous contaminated waste (Americium, Californium, etc.) (approximately 10% by volume). Each of these types of waste may require slightly different processing facilities. In order that all of this TRU waste in storage or being generated at SR meets the waste acceptance criteria, a plan was developed which addresses all the TRU waste generated or stored at the site. This plan outlines a program which will provide for processing the waste as necessary and for certifying that the waste is suitable for disposal. The plan is to proceed in three stages, with each activity building on the previous accomplishments.

## FACILITIES

Several facilities have been proposed which may be necessary to conduct the certification process. The first of these, the Experimental TRU Waste Assay Facility, began operation in January 1986, and evaluates newly generated TRU waste to determine if it is certifiable or requires storage pending a

future processing facility. This facility also contains instrumentation which assays the waste containers to determine if they contain 100 nCi/g or greater TRU contamination. If a waste container does not contain this level of contamination, it will be disposed of as low-level waste at the SR site. The facility also contains x-ray instrumentation which examines the contents of the waste packages to determine if they are certifiable as is, or if they require processing in order to meet the WIPP waste acceptance criteria. This facility will be upgraded in 1986 to provide an area for loading the transporters which will ship the waste to WIPP.

Because much of the waste is not likely to be certifiable as generated or stored, processing facilities will also be necessary. The first of these facilities is the TRU Waste Facility (TWF), which will provide for retrieval of the Pu-239 contaminated TRU waste stored at the SR site. The waste containing greater than 100 nCi/g will be shredded and packaged into a form which meets the waste acceptance criteria. This facility will also provide for a demonstration of retrieval and opening of a Pu-238 contaminated waste storage culvert. The waste drums will be vented, purged, and the waste will be certified. This demonstration will validate the certification plans for Pu-238 contaminated waste. This facility is proposed to receive capital funding in FY 1988, and operations will begin in 1992. Initial estimates are that the facility will cost $38 million to build and approximately $3 million per year to operate.

Plutonium-238 contaminated waste cannot be processed in the TWF without facility modifications. It is also possible that some other waste may not be able to be processed in the TWF to the point of certification. Therefore, additional facilities have been proposed which would process all of SR's TRU waste so it is suitable for disposal. The TRU Waste Processing Facility (TWPF) is anticipated to consist of a sand filter added to the TWF to provide the capability to process plutonium-238 waste. However, this concept assumes that other issues associated with the acceptance of plutonium-238 waste to WIPP are resolved successfully. Specifically, the higher radiation levels of plutonium-238 can cause the radiolytic degradation of water or organics within a waste package. There is some concern that this degradation could cause a potentially explosive mixture of gases to build up within the waste package. To alleviate this concern, Savannah River proposes to vent the waste packages. At this time it is also unclear how many curies will be permitted to be transported in a single shipment to WIPP. It is possible that this curie limit could restrict the shipment of SR's plutonium-238 waste. The sand filter add-on to TWF is based on the assumption that these and any other plutonium-238 issues are successfully resolved. However, if these or other concerns preclude the ability to certify in TWF by addition of a simple sand filter, the TWPF would be designed to contain a size reduction facility which will remove surface contamination to the point that the waste is below the TRU contamination level. The TWPF would also include an incinerator which would burn all combustibles in the waste. The ash from the incineration process would then be immobilized in borosilicate glass in the Defense Waste Processing Facility. Capital funding for the TWPF is proposed for FY 1990, and operations will begin in 1994. It is estimated that the plutonium-238 issues will be resolved well before this date. Initial estimates are that the maximum facility (containing the size reduction, decontamination, and incinerator) will cost approximately $68 million to build and approximately $6.4 million per year to operate.

## CONCLUSION

The implementation of the above plans, including the construction and operation of the above facilities, will end the storage of TRU waste at SR and assure that this waste is disposed of suitably. In addition, the above plans support the National DOE TRU Waste Management Program and the operation of the Waste Isolation Pilot Plant.