

**Waste Isolation Pilot Plant Status and Plans - 2012 - 12049**

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**ABSTRACT**

The Waste Isolation Pilot Plant (WIPP), a deep geologic repository for safe disposal of long-lived transuranic radioactive waste related to the nation's defense, is completing its 12<sup>th</sup> year of operations. WIPP's mission includes coordination of all Department of Energy (DOE) sites to prepare, package and characterize transuranic (TRU) waste for final shipment and emplacement in WIPP. Five of the 10 disposal panels planned have been filled and sealed from ventilation. Additional small quantity sites have been de-inventoried by consolidating their waste through the certified characterization line at the Idaho National Laboratory (INL). New emplacement methods for RH waste in shielded containers are being considered for disposal by WIPP's regulatory authorities. A new large Type B shipping package, was added to the WIPP transportation fleet, and facility modifications to the WIPP waste unloading and emplacement processes for large containers were completed in 2011. Shipments from the Savannah River site in these new large rectangular packages began in August 2011. Licensing efforts are proceeding for a new criticality control over-pack container that will allow almost twice the fissile content to be shipped than previously. This will reduce the number and cost of shipments of Special Nuclear Material (SNM) declared as waste. Modifications to WIPP regulatory requirements for the disposal footprint and disposal unit closure systems are in progress. These, and other developments, make for exciting times at WIPP.

**INTRODUCTION**

This paper presents an up-to-date look at the many aspects of America's only deep geologic long-lived radioactive waste repository. The WIPP project has been the subject of literally hundreds of papers and presentations over almost 40 years since its conception in the early 1970's, so no introductory description of its operation is given here. Radwaste Solutions Magazine (May/June 2009) devoted the entire issue to WIPP in recognition of the facility's 10<sup>th</sup> operating anniversary. For a detailed look at WIPP and its many attributes, along with a complete description of its operation, the reader is encouraged to review that issue [1].

**2011 ACCOMPLISHMENTS**

Last year saw many WIPP accomplishments, and few setbacks (but there were some). The most notable are summarized in the list below, in no implied order of importance.

- Celebrated 12-years of operations, receiving more than 27,000 shipping packages in more than 10,000 shipments (including more than 500 remotely handled), achieving almost 20 million loaded kilometers of safe transportation, and filling WIPP to about 45% of its legislated capacity
- Began shipping contact handled TRU waste in a new Type B shipping package called the TRUPACT-III, which was licensed for use by the Nuclear Regulatory

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Commission (NRC) last year. Readiness included constructing the first production unit out of 6 planned, and completing WIPP facility modifications to allow receipt, handling and final emplacement

- The Blue Ribbon Commission on America's Nuclear Future visited the WIPP facility and held public meetings in Carlsbad to learn how WIPP was successfully developed, licensed and operated
- Disposal operations in Panel 5 were completed with a total of 16,080 cubic meters emplaced, and concrete block walls were constructed in the two access drifts. Disposal operations began in Panel 6
- Completed mining and outfitting of disposal panel 7
- Removal of legacy TRU waste was completed at both National Laboratories in California and both a static eliminator equipment factory site and the Bettis Atomic Power Laboratory site, both in up-state New York
- WIPP received the Safe Operator of the Year Award by the New Mexico Mining Association and New Mexico Bureau of Mine Safety (23<sup>rd</sup> time out of the last 25 years)
- Continued inter-site shipments from small quantity sites to the Idaho National Laboratory for characterization for disposal and subsequent shipment to WIPP
- Completed testing of a new criticality control over-pack (payload container) that will allow almost twice the fissile content to be shipped than previously (thereby reducing the number and cost of shipments of Special Nuclear Material declared as waste from National Nuclear Security Administration (NNSA) sites)
- Mining to develop a new field test area underground at WIPP began. When completed, this new area could be used as an underground research laboratory (URL). Regulatory approval by EPA to begin the mining was granted, but additional evaluation will be required before field tests can be conducted

Substantial international interest in WIPP was garnered in 2011. Germany and U.S. signed a Memorandum of Understanding on repository science to share results of studies performed in each country. Both Germany and the US use deep geologic salt formations for radioactive waste disposal. WIPP and Carlsbad also hosted the 8th meeting of the U.S./Argentina Joint Standing Committee on Nuclear Energy Cooperation (JSCNEC), sponsored by the US Department of State. JSCNEC bilateral meetings help to coordinate policies, establish technical cooperation activities and discuss policy issues of importance among the U.S. and other countries with nuclear power plants, and include meetings on nuclear energy policy, international security and nonproliferation, technological cooperation and nuclear safeguards. The Department of State indicated it will include deep geologic disposal of radioactive waste in its routine JSCNEC efforts with other nuclear power countries.

## **Regulatory Status**

WIPP waste receipt and disposal operations are conducted within two primary regulatory frameworks. The long-term repository performance and potential for

exposure to radioactivity during the emplacement phase is regulated by the Environmental Protection Agency (EPA) under the national repository disposal standards promulgated in 40 CFR Part 191 and the associated criteria established in 40 CFR Part 194. The second major regulatory regime is the Resource Conservation and Recovery Act (RCRA), which is administered by the State of New Mexico Environment Department. The WIPP Land Withdrawal Act Amendments (104 P.L. 201) exempts the mixed TRU waste disposed of at WIPP from treatment standards and the land disposal restrictions of RCRA. WIPP is classified as a miscellaneous disposal unit under RCRA Subpart X, with operations permitted within the provisions of the Hazardous Waste Facility Permit (HWFP) issued by the State.

The certification under 40 CFR Part 194, issued by EPA, must be reevaluated every five years to demonstrate continued compliance with the disposal standards at 40 CFR Part 191. DOE submitted the second recertification compliance application to EPA in March 2009, and after extensive information exchanges and clarifications, it was declared administratively complete by EPA in June 2010. The basis of the recertification application was not significantly different than the first recertification. Stakeholder participation during this 15-month process was extensive, with multiple opportunities for individuals and organizations representing special interest groups to express their concerns and learn more about the changes that were made since the previous recertification process, five years earlier. EPA issued its decision to recertify WIPP for compliance with the disposal requirements at 40 CFR Part 191 on November 18, 2010. With recertification in hand, DOE will next petition EPA to allow changes to enhance operating efficiency using the planned change request process. Some of these are described below. The next recertification application is due March 26, 2014.

The HWFP was issued by the state of New Mexico Environment Department (NMED) in 1999 for an effective period of 10 years, but has undergone numerous modifications since. DOE submitted a permit renewal application to NMED in May 2009, with a supplemental submittal in October 2009. The NMED declared the renewal application “administratively complete” at the end of November 2009, and a draft permit for comment was issued (by NMED) in April 2010. Extensive negotiations between stakeholders, WIPP and the NMED were conducted throughout this entire process, (primarily after the draft was issued). After a public comment period, NMED conducted a public hearing in August, administered by a hearing officer appointed by the State, and issued a final permit renewal in November 2010 with several new requirements for continued operations. Therefore, the next HWFP renewal will be necessary in 2020.

### **Waste Availability Status**

There are several barriers that affect the rate at which TRU waste that can be shipped to WIPP annually. Probably the most onerous is the ability of generator sites to provide certifiable waste containers to the waste certification processes. This continues to be an issue at all sites. A large fraction of TRU waste remaining throughout the DOE complex requires repackaging or remediation, and each site’s facilities are different. Repackaging work is intrusive, time consuming and costly. Further, most sites have insufficient repackaging capabilities to obtain the feed rates that would allow WIPP to achieve its optimum shipping rates. Remediation primarily involves removing prohibited

items from existing waste containers. Common items include inner containers with liquids (>~60 ml), aerosol spray cans that cannot be definitely identified as punctured, and sealed containers greater than 4 liters.

DOE and the Central Characterization Project (CCP) are working to ameliorate these barriers at all sites across the complex. CCP is the organization established within the WIPP Management and Operating Contractor to conduct standardized waste characterization and certification required by the WIPP waste acceptance criteria and especially the waste analysis plan required under the HWFP [2]. To optimize feed rate at many sites, additional work areas must be established. While these may be temporary enclosures, there is still a significant lead time associated with procurement, assembly, procedure development, testing, authorization basis, and startup activities. In addition, remediation and repackaging of TRU waste can be a slow, tedious process performed in glove boxes, containment tents, or hot cells. Staffing levels must be sufficient to support multiple shifts or continuous operation. DOE and CCP have identified how and where the waste will be repackaged for each site, based on information obtained from the sites, and have developed plans for each site to produce more feed through repackaging than can be shipped, thus providing some surge capability.

Today, waste is characterized by CCP at a rate that exceeds repackaging rates at all sites, except for work performed at the Advanced Mixed Waste Treatment Project at the Idaho National Laboratory (INL), which is the only other authorized characterization and certification program for WIPP than CCP. In 2011, and extending into 2012 and beyond, funding uncertainty will continue to impact generator sites' ability to provide waste containers for certification. To maintain this capability, adequate budgets need to be provided to generator sites to maintain staffing and capability. Additionally, contractor incentives need to be negotiated to maintain alignment with DOE complex-wide goals. Further, waste retrieval, at almost every site, needs to be accelerated to provide a surge capability for FY12 and beyond.

Another barrier to efficient shipping rates to WIPP is the time and effort to perform the characterization and certification processes required under the HWFP and the EPA's approval process under 40CFR Section 194.8. While the same processes are required at each site, the composition of the waste introduces variability in processing rates. Widely varying isotopic compositions or problematic isotopes (e.g., cesium or neutron-emitting Cf-252) complicate and slow the assay determination. Waste that must be visually examined instead of radiography decreases the characterization rate. Certain waste types containing polychlorinated biphenyls (PCB) cannot have any residual liquid present, which increases rejection rates. DOE took three steps in 2011 to significantly reduce these delays. First, the majority of the waste being repackaged or newly generated is being placed into standard waste boxes (SWB) or standard large boxes (SLB2 - at the Savannah River Site). This allows fewer packages to be processed for a given volume of waste. This has advantages to the generator sites as well as the WIPP site, and has been incorporated into the waste packaging plan for every major site. Second, the waste is being processed through the CCP characterization lines by waste stream, which significantly streamlines the certification process, allowing much more waste to be shipped for a given effort. Any additional surge capacity will most likely

require staff augmentation. Third, WIPP petitioned and received a clarification from EPA that liquids associated with bulk PCB wastes can be managed as non-PCB liquids, based upon waste stream knowledge.

### Disposal Status

At the end of 2011, almost 80,000 m<sup>3</sup> have been emplaced in WIPP (contact-handled transuranic waste volume: 79,385 m<sup>3</sup> and remote-handled transuranic waste volume: 268 m<sup>3</sup>). This represents approximately 46% of the contact-handled waste volume legislatively limited in the WIPP Land Withdrawal Act of 1992, which totals about 175,500 m<sup>3</sup>[3], and almost 4% of the remote-handled waste volume limited by agreement with the State of New Mexico. Disposal operations are currently ongoing in panel 6, as shown in Figure 1.

Contact handled waste (shown as shading) is emplaced in the disposal rooms between the salt pillars (the salt pillars are schematically shown in Figure 1 as the white vertical rectangles). Remote-handled waste is emplaced in the walls of the salt pillars between disposal rooms. Each remote-handled canister emplaced through November 2011 is shown as a small bar. Note that disposal panels 1-3 were filled with contact-handled waste before regulatory approval for the disposal of remote-handled waste was received in January 2007. Thus, panel 4 is the first to contain remote-handled waste.

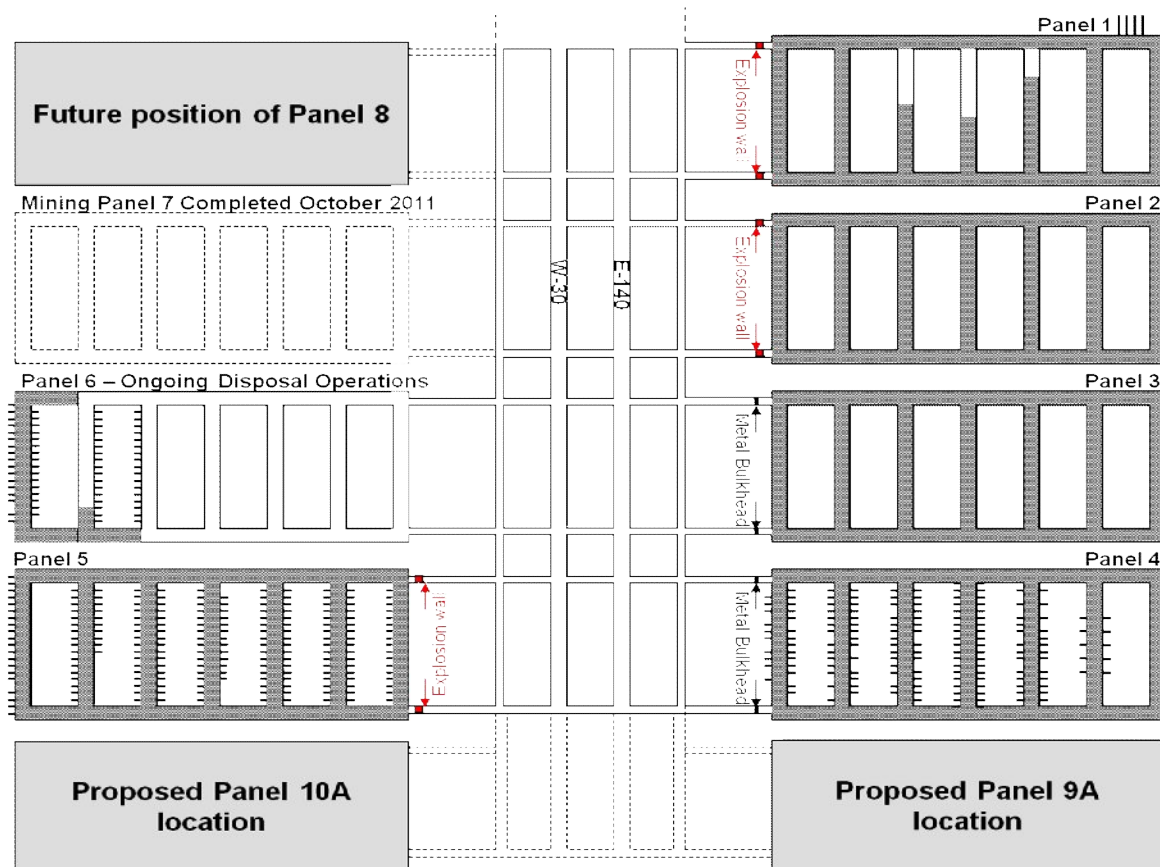


Fig. 1 Disposal status through November 2011 (shaded boxes are discussed in the section on WIPP Plans for future regulatory changes).

In order to optimize the use of disposal room wall space, the relative rates of receipt of contact-handled and remote-handled waste need to be balanced. In other words, when contact-handled waste receipt rates fill a disposal room before remote-handled waste canisters have completely filled the wall space in the adjoining room, that room must be abandoned for further remote handled waste emplacement. This has been and continues to be the case, where the fraction of emplaced remote-handled waste canisters has been about 50% of the permitted emplacement capacity allowed in the permit.

As required by the HWFP, after filling Panels 1 and 2, ventilation was blocked by robust 4 meter thick barriers made of concrete block, called explosion isolation walls. However, panels 3 and 4 are blocked from ventilation by simple metal bulkheads. These ventilation barriers are placed on the inlet and outlet legs of each panel. As a result of negotiations during the HWFP renewal hearings at the end of 2010, DOE was again required to construct the same robust 4 meter thick concrete block walls in the two access drifts to panel 5, when disposal operations there were complete in June 2011. Clearly there is substantial variation between these two designs and their performance requirements.

The 4 meter thick explosion isolation walls were originally proposed and required by the HWFP as a very conservative precaution against the presence or build up of explosive gases (methane, hydrogen and non-liquid residual flammable volatile organic compounds in the waste itself) [4]. By the time panel 2 was filled, DOE had successfully argued that the possibility of flammable levels of gases was extremely low, and installed gas intake sampling lines in the inlet and outlet sides of every disposal room of panel 3. The HWFP was modified to reflect that as long as samples from disposal panels sealed from ventilation showed low concentrations of flammable gases, the explosion walls could be replaced with a simple metal bulkhead to prevent air exchange and preclude personnel access to filled disposal units. Since then, literally thousands of sample analyses have consistently confirmed the extremely low levels of flammable gases in panels 3-5 [4].

So, why were explosion walls again required in the access drifts to panel 5 after it was filled? During the permit renewal process (a period of almost 2 years), elevated concentrations of carbon tetrachloride, a non-flammable volatile organic compound, were measured in the ventilation air exhausted from WIPP [5]. It was determined to be due to a particular waste stream, originally from the Rocky Flats site, but subsequently being shipped from the Idaho National Laboratory site to WIPP. This specific waste stream began being received while panel 4 was filling up, but it was projected that the waste stream would also make up a significant fraction destined for emplacement in panel 5.

DOE made arguments during the HWFP renewal process that the levels would not approach health based limits for workers underground, and took several specific actions to reduce the possibility of the inflammable carbon tetrachloride being released from the waste containers. These steps included packaging those containers with the carbon tetrachloride waste matrix in an over-pack with more restrictive filter vents (lower diffusivity), and installing an active collection and treatment system in the access drifts

to panel 4. However, during the HWFP renewal negotiations, it was agreed that the original design of a 4 meter thick explosion isolation wall constructed of concrete block might further ameliorate releases from panel 5 better than a simple metal bulkhead, so it was written into the HWFP as a requirement. DOE continues to monitor the carbon tetrachloride levels in the exhaust air from WIPP, which have consistently been well below actions levels of concern. DOE believes the levels will continue to fall, and intends to request approval to resume the use of a simple metal bulkhead as a ventilation barrier when panel 6 is filled. Additional discussion of DOE plans to seek approval of a different panel closure design is presented in a subsequent section.

### Completion of American Recovery and Reinvestment Act Work

WIPP funding under the American Recovery and Reinvestment Act (ARRA) ended in 2011. WIPP was obligated a total of \$172 million over the 3-year period since its enactment. Table I compares the transuranic waste volumes emplaced in WIPP between the base WIPP project funding and the ARRA funding.

Table I – Waste Volume Emplaced - Base WIPP Funding Versus ARRA Funding

Fiscal Year	Base				ARRA			
	CH TRU Dispositioned (m <sup>3</sup> )		RH TRU Dispositioned (m <sup>3</sup> )		CH TRU Dispositioned (m <sup>3</sup> )		RH TRU Dispositioned (m <sup>3</sup> )	
	Actual	Target <sup>b</sup>	Actual	Target <sup>b</sup>	Actual	Target	Actual	Target
FY09	9,916	8,990	41	127	180	180	17	17
FY10	7,452	7,409	4.4	0	1,471.80	1,412	37.6	40
FY11 <sup>a</sup>	5,746	4,779	3.21	0	3,317	2800.4	32.4	23.8
				<b>TOTAL</b>	4,968.8	4,392	87	81

<sup>a</sup>FY 11 actual volumes as of 9/30/11.

<sup>b</sup>Targets adjusted annually with the Congressional Budget Requests for base program (the original 2009 target stated in the 2009 Congressional Budget Request was 10,130 m<sup>3</sup>)

Another accomplishment funded by ARRA in 2011 includes the design and procurement of a light-weight facility cask (LWFC). To date, remote handled waste received at WIPP has been unloaded from the shipping casks into a much more robust facility cask, which provides shielding as the payload canister is taken underground and emplaced into pre-drilled boreholes in the walls of disposal rooms. Only one of these unique facility casks was built prior to WIPP opening, and it has been in service since. However, the existing facility cask was designed to shield the maximum dose rate canister allowed for disposal at WIPP (<10 Sv/hr). Because the great majority of remote handled waste exhibits dose rates far less than 10 Sv/hr, the existing facility cask is more robust than necessary for most operations. Also, because of its weight, there is more wear on it, and associated transport machinery, than necessary for most remote handled waste streams. It also represents a single-point failure mode, since there is only one piece of equipment that can be used for the task. Therefore, ARRA funding was used in 2011 to design and procure a new light-weight facility cask to accommodate canisters with dose rates up to 1 Sv/hr. Although the existing robust facility cask will still be used for emplacing the small amount of remote handled waste with dose rates greater than 1 Sv/hr, the LWFC will become the workhorse when it is placed into service in 2012.

## Shipping Status

At the time this paper was prepared, shipments were continuing in 2011, and the rate was on-track to set an annual record for total shipments (when all three kinds of shipments are included - contact-handled + remote-handled + inter-site waste shipments from small quantity sites to INL). Table II shows the shipments received at WIPP through November 30, 2011, and compares them with the total number of shipments received by site since March 1999, when WIPP first opened. Note that WIPP nominally suspends shipments from the Thanksgiving to New Year Holidays each year for critical maintenance activities (typically underground to accommodate cumulative salt creep issues). This maintenance outage is also timed to avoid winter weather delays, which are common in the winter months for northern generator sites. Also, agreements with many transportation authorities along WIPP routes call for shipping suspension during peak holiday traffic periods.

Table II – Summary of Shipments by Generator Site (2011 and Totals).

Generator Site	2011		Total (1999-2011)	
	CH	RH	CH	RH
Argonne National Laboratory	0	42	14	106
Bettis Atomic Power Laboratory	0	5	0	5
GE Vallecitos Nuclear Center	0	0	0	32
Idaho National Laboratory	508	29	4776	260
Los Alamos National Laboratory	170	0	886	16
Lawrence Livermore National Laboratory	0	0	18	0
Nevada Nuclear Security Site	0	0	48	0
Oak Ridge National Laboratory	13	9	58	73
Rocky Flats Site	0	0	2045	0
Richland Operations (Hanford)	80	0	572	0
Savannah River Site	125	1	1240	40
Total Shipments to WIPP	896	86	9657	532

Clearly evident is that the dominant fraction has been (and continues to be) received from INL, which should not be surprising. Most of the TRU legacy waste is retrievably stored at INL and the Advanced Mixed Waste Treatment Project, which was specifically built to disposition this large inventory of legacy waste.

Implied with the record number of shipments in 2011, is a record number of safe transport miles. WIPP's transportation protocols, set forth and negotiated with transportation authorities along WIPP routes, continue to serve the program well. Sparkling clean records like these support the claim that the WIPP transportation system is the safest program for hazardous materials in the US [6].

Not shown in Table II are the many inter-site shipments from small quantity sites to INL as part of the small site consolidation program [7]. In addition to shipments to WIPP for direct emplacement, shipments were made to INL from a static control equipment facility near Buffalo New York (NRD), the Hanford site in Washington State, and the two



National Laboratories in California. These wastes were temporarily stored (compliantly) while being characterized and certified for disposal using the certified programs at INL. They were characterized within 6 months of their shipment to INL, and then shipped to WIPP within 6 months of their characterization under the provisions of the so-called “Batt” agreement between DOE and the State of Idaho [8]. The nominal shipments to WIPP for disposal and the inter-site consolidation shipments, taken in concert, made 2011 another record shipping year for WIPP.

During 2011, several new shipping routes were opened and older routes, no longer needed, were closed. In 2010, consolidation of wastes from small quantity sites in Nevada and California required re-opening routes from the Nevada Nuclear Security Site to Idaho. In 2011, with all legacy waste from that site removed (and emplaced in WIPP), the route was closed. Similarly, as the small quantity sites in the northeast (Bettis Atomic Power Laboratory and NRD) were de-inventoried in 2011, the routes from these sites were opened, and training provided to first responders along them. Both the Midwestern Council of State Governments (Radioactive Materials Transportation Committee) and the Northeastern States Energy Board provided assistance and support with the various transportation authorities along these new routes and made the quick route additions possible.

In March 2010, NRC issued a Certificate of Compliance for the TRUPACT-III, which is a large rectangular Type B transportation cask. With the ability to ship internal boxes almost 2 x 2 x 2.5 meters, the high cost of facility modifications to build a glove box capability to re-package these large legacy waste containers can be avoided. DOE issued a procurement for the manufacture of six production units at the end of 2010 and in parallel, began WIPP facility modifications to receive, unload and handle the large interior payload boxes. A readiness assessment was conducted over the summer in parallel with the regulatory approval process to allow emplacement of the large boxes in WIPP. Another parallel process included the certification by both EPA and the State of New Mexico Environment Department of the non-destructive assay system and the non-destructive examination system employed at SRS to certify waste in the large boxes. Still another parallel process over the summer included training and outreach to transportation authorities along the route from SRS to WIPP to familiarize them with the new shipping configuration.

By the end of 2011, one of the six planned TRUPACT-III production units was available and shipments in this new configuration began. Figure 2 shows the SRS personnel involved, alongside the first TRUPACT-III shipment, just prior to its departure for WIPP in October 2011. The remaining five TRUPACT-III transportation casks are scheduled for delivery during 2012 and DOE plans to be shipping 4-5 per week by the end of 2012 from SRS. There are also many large boxes at Hanford that could be shipped without repackaging using the TRUPACT-III after the SRS large box campaign is completed.



Fig. 2 Photograph of the first TRUPACT-III shipment from the Savannah River Site.

## WIPP PLANS

With the completion of the HWFP renewal and the recertification processes, DOE plans several changes which will likely be considered quite significant by WIPP's critics (compared with previous changes). One of these is a footprint change, which will seek approval to replace disposal panels 9 and 10 (interior common access drifts in the north-south mains) with panels 9A and 10A, which would be situated just south of existing panels 4 and 5. See Figure 1.

Initial discussions with EPA indicate it believes that a rule making would not be required to make this change in layout, since it considers the difference to be a simple design change. DOE has shown that long-term repository performance would not be affected by simply changing the geometric location of the 9<sup>th</sup> and 10<sup>th</sup> panels. A planned change request to allow this simple footprint change was submitted to EPA in late 2011, and it is undergoing initial review at the time this paper was written [9]. It is expected the EPA will grant approval in early 2012.

While EPA approval may seem likely, WIPP critics will reflexively oppose any changes. Therefore, a subsequent permit modification request to make the footprint change in the HWFP could result in NMED requiring that such a change be made via a class 3 permit modification request. If a class 3 modification is required, this process could take several years.

Another significant upcoming change will be for a new panel closure design. The approved panel closure design (required by both EPA and NMED) calls for a very large robust engineered plug involving several hundred cubic meters of special salt-based concrete and an explosion-isolation wall. DOE presented five options for panel closure in its initial compliance certification application in 1996. At that time, DOE did not recommend a particular design choice, but simply described five concepts that would survive a postulated flammable gas deflagration. While unlikely, the postulated presence of flammable gases was considered possible because of incomplete knowledge of the gas generation mechanisms that might be observed once waste disposal rooms were filled. It was considered prudent to plan for the worst. Both regulatory bodies imposed the most robust closure design, referred to as “Option D”, as their concept of a conservatively effective way to “seal” each disposal panel from other parts of the underground.

When Option D was written into the EPA certification and the HWFP, DOE conducted a feasibility test to see if the specifications for the special concrete could even be met. These tests indicated it would be extremely difficult to produce such a large and massive structure underground that would meet the restrictive specifications. DOE believed at the time of application, and continues to believe today, that such a robust structure is not necessary to effectively close individual disposal panels.

DOE submitted a planned change request to EPA in 2011 to change the panel closure design to a relatively simple plug consisting of ~30 meters of run of mine salt pushed, and possibly blown floor-to-ceiling, within both the inlet and outlet drifts of each disposal panel [10]. DOE believes this design will be even more effective than Option D in precluding inter-panel communication (in the event of a hypothetical future intrusion that introduces brine into the repository). This is because the fully reconsolidated state of the run of mine salt (in a few hundred years) will resemble the porosity and permeability of undisturbed native salt of the formation, which would be much tighter than any man-made material placed in the inter-panel drifts. This is one of the primary attributes for using a salt rock host media for isolating long-lived radioactive waste from the biosphere in the first place. EPA has decided that this panel closure design change will require a rule making. NMED has indicated that it considers this change to require a Class 3 permit modification request.

### **Plans For Shipping and Disposal Efficiency Improvements**

Another regulatory change that has been in planning for several years came closer to reality in 2011. DOE developed several new payload containers and NRC approved their use in the existing TRUPACT-II, HalfPact and RH-72B shipping packages [11]. Application was made to EPA in the form of a planned change request in 2007 for use of a gamma shielded container. The second recertification process began while EPA was in the middle of deliberating that application. EPA decided to postpone their review of the planned change during the recertification process. When the second recertification was eventually approved (November 2010), EPA resumed its evaluation of the 3-year old planned change request. EPA approved use of gamma-shielded containers to ship remote handled waste as contact handled waste in June 2011. This will allow much greater efficiency in shipping and emplacement operations for remote

handled waste [11]. With NRC and EPA approval in hand, the next step was to seek a change in the HWFP to approve gamma-shielded containers. DOE submitted a class 2 permit modification request for use of the gamma shielded containers at the end of September 2011. At the time of this writing, NMED had not taken action on the request.

Retrieval, compliant packaging and shipment of retrievably stored legacy TRU waste have dominated disposal operations at WIPP since it began operations 12 years ago. But because most of this legacy waste has successfully been emplaced in WIPP, the TRU waste clean-up focus is turning to newly-generated TRU materials. A major component will be SNM, currently managed in safeguards-protected vaults around the weapons complex. As DOE and NNSA continue to consolidate and shrink the weapons complex footprint, it is expected that significant quantities of SNM will be declared surplus to the nation's needs. To enhance the efficiency of shipping waste with high fissile content to WIPP, DOE designed an over-pack container, similar to the pipe component, called the criticality control over-pack (CCO). Prototype units were tested in 2011, which indicated that shipments with about 350 grams of plutonium equivalent fissile content could be shipped safely as contact handled waste in the TRUPACT-II shipping casks. In contrast, the pipe component, which was used to ship several tons of impure oxides from the Rocky Flats site in 2003-2005, was limited to less than 200 grams fissile equivalent. The CCO was also designed so that fabrication costs would be substantially less than the pipe component. DOE plans to submit a license application for the CCO to the NRC in 2012. While it is too early to predict, DOE is targeting a cost savings of one half and a fissile content limit of twice that of the pipe component over-pack, thereby realizing an efficiency gain of a factor of four for SNM directly discarded as TRU waste to WIPP.

## **CONCLUSIONS**

This paper provides an up-to-date look at the many aspects of America's only deep geologic long-lived radioactive waste repository, which is completing its 12<sup>th</sup> year of operations. A record year of safe and compliant shipments to WIPP tops the list of accomplishments in 2011.

Four more small quantity sites were de-inventoried by consolidating their waste through the certified characterization line at INL in 2011. A new Type B shipping package, the TRUPACT-III has been added to the transportation fleet, and large waste boxes are being shipped from SRS without the need for repackaging.

New emplacement methods for remote-handled waste in shielded containers are undergoing regulatory review. WIPP plans to license a new criticality control payload container that will allow almost twice the fissile content to be shipped than previously, thereby reducing the number and cost of shipments of SNM declared as waste. Other regulatory modifications planned in 2012 include approval of a design change that would replace the disposal concept for panels 9 and 10 from using the common access drifts (the "mains") with a new footprint south of panels 4 and 5. DOE also plans to change the panel closure design set forth in its certification by EPA and the HWFP by the NMED. The panel closure design change will be a rule making under EPA's procedures and a class 3 permit modification request under NMED procedures.

Plans for achieving 90% of legacy TRU waste retrieval and emplacement in WIPP by 2015 have been developed. Key to the success of this so-called 90/15 plan is adequate funding, both for WIPP operations, as well as for TRU retrieval programs at the generator sites.

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