

# *First of a Kind Cleanup*

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**Office of River Protection**



**Bechtel National, Inc.**



**Washington Group  
International**



**EM Environmental Management**

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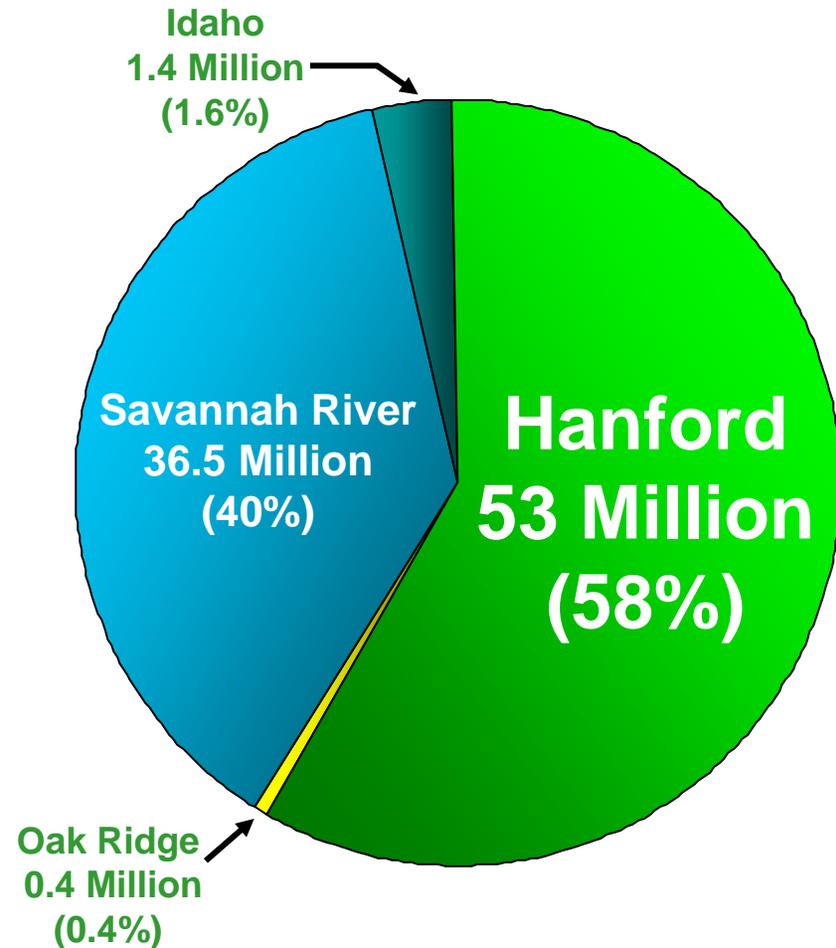
# Hanford Tank Waste Cleanup Challenge



## Hanford has:

- ❑ 63% of DOE tanks (149 single-shell and 28 double-shell tanks); 80% of DOE single-shell tanks
- ❑ 58% of DOE total tank waste
- ❑ ~194 million curies of radioactivity in tanks (148 million already removed)
- ❑ ~190,000 tons of chemicals

## Total Number of Gallons in Waste Tanks at DOE Sites:



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## Safety is Office of River Protection's (ORP) Highest Priority

- Immediate Safety Risk Reduction
  - Interim Stabilized Tanks
  - Tank Retrievals (12.73 million curies transferred to double-shell tanks to date)
- Marked Improvement in Safety by CH2M HILL
- Advancements in Technology Enabling Safe Work
- Integrating Safety into Design Early
- Safety and Quality are Effectively Integrated into All Programs and Processes through Integrated Safety Management

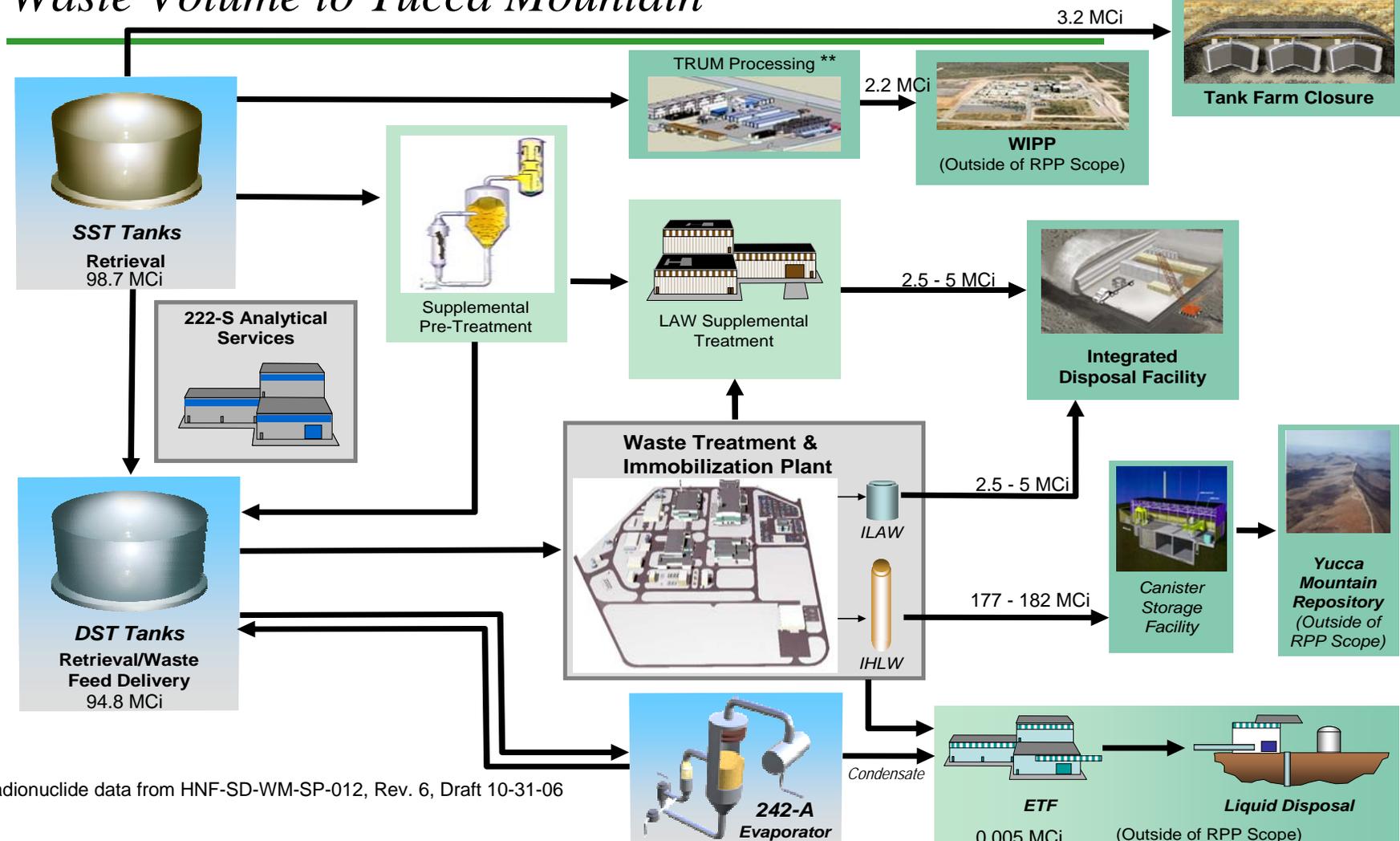


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# The Plan: Send ~97% of Radioactivity and ~10% of Waste Volume to Yucca Mountain



\*Radionuclide data from HNF-SD-WM-SP-012, Rev. 6, Draft 10-31-06

\*\*A decision for disposal at the Waste Isolation Pilot Plant (WIPP) will not be made until (1) the waste meets the WIPP Waste Acceptance Criteria, with special emphasis on the waste determination as delineated in the WIPP recertification decision by the US EPA in March 2006; and (2) it meets the regulatory eligibility requirements for disposal as described in the WIPP Hazardous Waste Facility Permit.



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## Status of the River Protection Mission

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- Waste Treatment Plant (WTP) Construction
  - Construction 30% complete
  - Design 70% complete
- Tank Retrieval and Closure Activities
  - Six tanks retrieved to date
  - Three tanks in retrieval
  - Two tanks are being outfitted for retrieval
  - New retrieval technologies are working (12 tested and 6 have been deployed to date)
- Additional Low-Activity Waste Treatment Capacity
  - Designing and Testing Bulk Vitrification
- Integrated Disposal Facility
  - Construction completed
- Soil Contamination from Past Leaks
  - Characterizing extent of contamination
  - Implementing remedial actions



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## Single-Shell Tank Waste - Progress

### Tanks Retrieved:

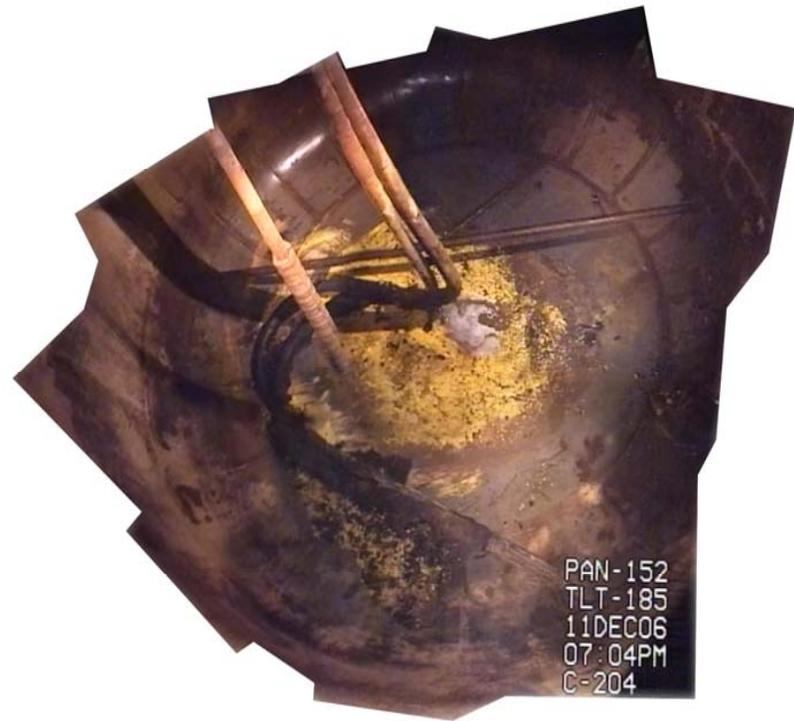
- C-201 – Completed March 23, 2006
- C-103 – Completed November 1, 2006
- C-204 – Completed December 11, 2006
- Total of six single-shell tanks retrieved

### In Progress:

- S-112 – Retrieval resumed February 7, 2007 and ~800 gallons of waste retrieved. This Tank currently contains ~3,000 gallons of waste
- S-102 – Retrieval started December 17, 2004. Approximately 70% of waste retrieved
- C-108 – Retrieval began in December 2006, and is approximately 65% complete

### Bulk Vitrification

- Completed 2 full scale test melts
- Completed and Independently Reviewed the Demonstration Bulk Vitrification System Design

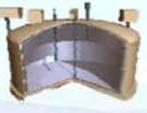
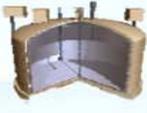
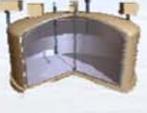
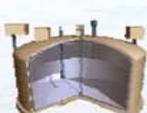


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# Technology Key to Success

RETRIEVED	IN PROGRESS	NEXT IN LINE
 <p><b>C-204</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 55 Kgals</li> <li>Completion date: December 11, 2006</li> <li>Volume removed: ~1.3 Kgals</li> <li>Curies removed: 450</li> <li>Technology used: Vacuum retrieval</li> </ul>	 <p><b>C-108</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 530 Kgals</li> <li>Retrieval started: December 20, 2006</li> <li>Volume of waste to be removed: 66 Kgals</li> <li>Volume of waste removed to date: 39 Kgals</li> <li>Curies removed to date: 98 K of 167 K</li> <li>Technology used: Modified sluicing</li> </ul>	 <p><b>C-109</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 530 Kgals</li> <li>Volume of waste to be removed: 63 Kgals</li> <li>Curies to be removed: ~ 844 K</li> <li>When retrieval to begin: August 2007</li> <li>Technology to be used: Modified sluicing</li> </ul>
 <p><b>C-103</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 530 Kgals</li> <li>Completion date: November 1, 2006</li> <li>Volume removed: 69 Kgals</li> <li>Curies removed: 2.7 M</li> <li>Technology used: Modified sluicing</li> </ul>	 <p><b>S-102</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 758 Kgals</li> <li>Retrieval started: December 17, 2004</li> <li>Volume of waste to be removed: 464 Kgals</li> <li>Volume of waste removed to date: 326 Kgals</li> <li>Curies removed to date: 428 K of 704 K</li> <li>Technology used: Saltcake Dissolution and High Pressure Mixer</li> </ul>	 <p><b>C-104</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 530 Kgals</li> <li>Volume of waste to be removed: 259 Kgals</li> <li>Curies to be removed: 1.2 M</li> <li>When retrieval to begin: FY 2008</li> <li>Technology to be used: Modified sluicing</li> </ul>
 <p><b>C-201</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 55 Kgals</li> <li>Completion date: March 23, 2006</li> <li>Volume removed: 720 gallons</li> <li>Curies removed: 560</li> <li>Technology used: Vacuum retrieval</li> </ul>	 <p><b>S-112</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 758 Kgals</li> <li>Retrieval started: September 28, 2003</li> <li>Volume of waste to be removed: 614 Kgals</li> <li>Volume removed to date: 611 Kgals</li> <li>Curies removed to date: 602 K of 628 K</li> <li>Technology used: Remote Water Lance/ Modified Sluicing</li> </ul>	
 <p><b>C-202</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 55 Kgals</li> <li>Completion date: August 11, 2005</li> <li>Volume removed: 1.2 Kgals</li> <li>Curies removed: 2.6 K</li> <li>Technology used: Vacuum retrieval</li> </ul> <p><i>Lessons learned from first application reduced retrieval time from nine months to just six weeks.</i></p>	 <p><b>S-112</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 758 Kgals</li> <li>Retrieval started: September 28, 2003</li> <li>Volume of waste to be removed: 614 Kgals</li> <li>Volume removed to date: 611 Kgals</li> <li>Curies removed to date: 602 K of 628 K</li> <li>Technology used: Remote Water Lance/ Modified Sluicing</li> </ul> <p><i>Demonstration project completed, which proved the effectiveness of the remote water lance to break up and mobilize hardened waste at bottom of tank.</i></p>	
 <p><b>C-203</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 55 Kgals</li> <li>Completion date: March 24, 2005</li> <li>Volume removed: 2.4 Kgals</li> <li>Curies removed: 1.1 K</li> <li>Technology used: Vacuum Retrieval</li> </ul> <p><i>First application of this innovative retrieval technology</i></p>		
 <p><b>C-106</b></p> <ul style="list-style-type: none"> <li>Capacity of tank: 530 Kgals</li> <li>Completion date: December 31, 2003</li> <li>Volume removed: 194 Kgals</li> <li>Curies removed: 8.9 M</li> <li>Technology used: Sluicing/Acid dissolution</li> </ul> <p><i>C-106 was a high heat tank and was placed on a safety "watch list." Retrieval of the waste solved this safety issue.</i></p>		

● Acid Dissolution

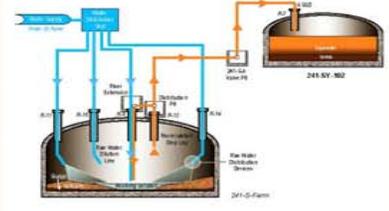
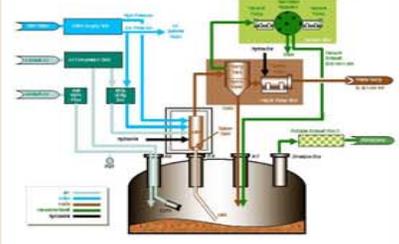
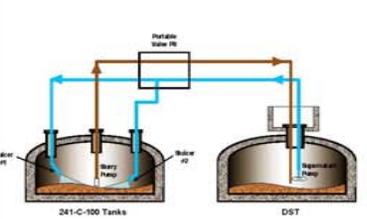
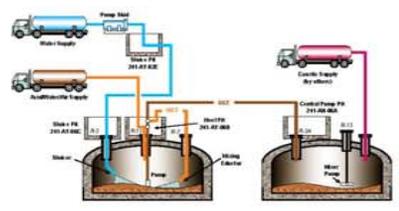
● Modified Sluicing

● Vacuum Retrieval

● Saltcake Dissolution

Remote Water Lance (Salt Mantis)

High Pressure Mixer (Rotary Viper)



## *Bulk Vitrification Technology Demonstration Program*



- Results to date indicate that the technology can immobilize Low Activity Waste comparable to Waste Treatment Plant
- Bulk Vitrification allows for treatment flexibility in treating difficult waste streams
- Secondary waste is minimized and recycled within the process or sent to Effluent Treatment Facility (no orphan waste streams)
- External Review Panel – Implementing ideas and resolving issues to improve performance and safety
- Results from bulk vitrification testing have application to Waste Treatment Plant operations (i.e. off-gas system technology/performance and waste form qualification)
- May allow for interim Low Activity Waste treatment prior to Waste Treatment Plant startup (up to 5 tanks)
- Will allow direct treatment of lower activity tanks in 200 West Area avoiding cross-site transfers to the 200 East Area for treatment.

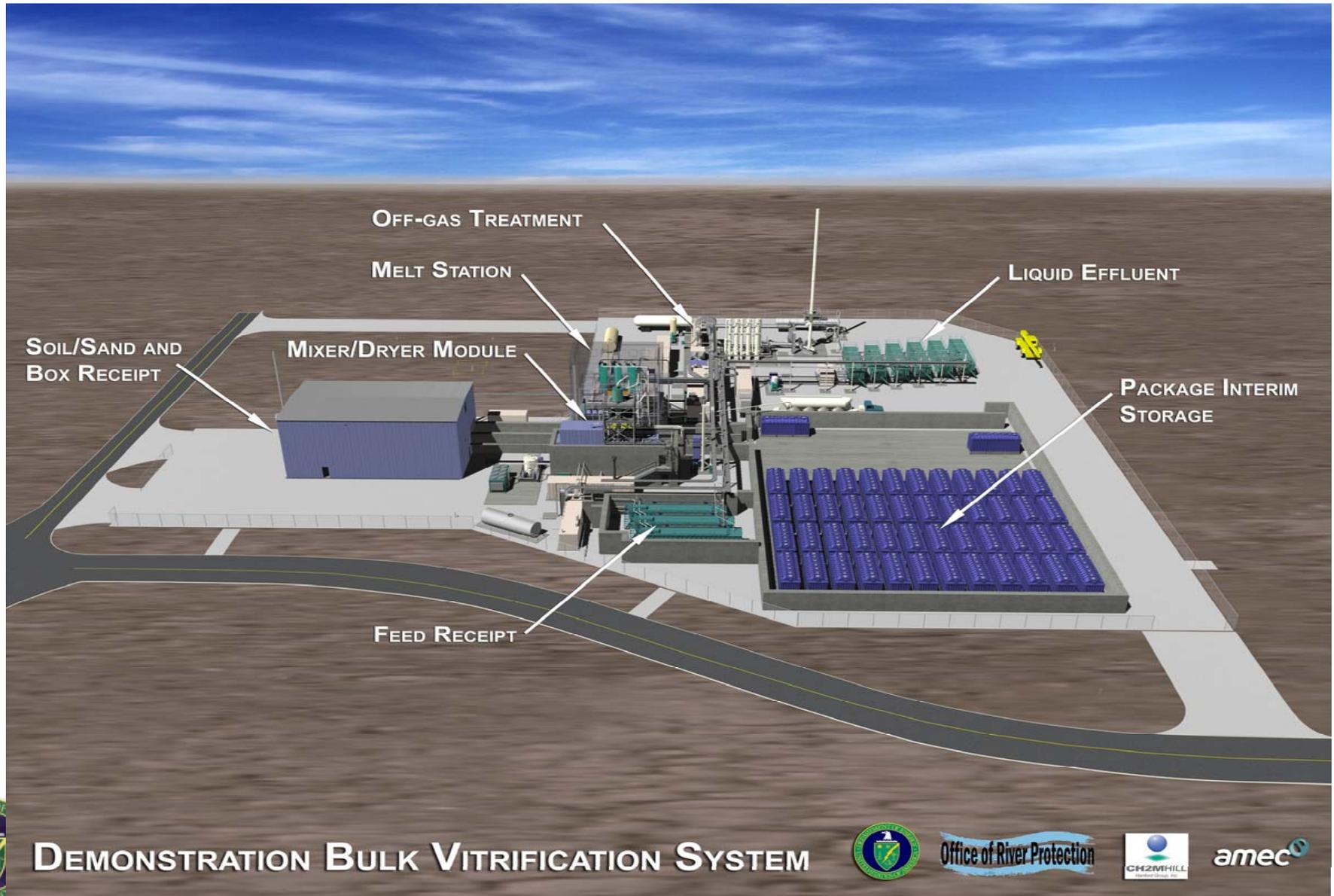


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# Demonstration Bulk Vitrification System



**DEMONSTRATION BULK VITRIFICATION SYSTEM**



Office of River Protection



amec

# Waste Treatment Plant Progress

Project 37% Complete

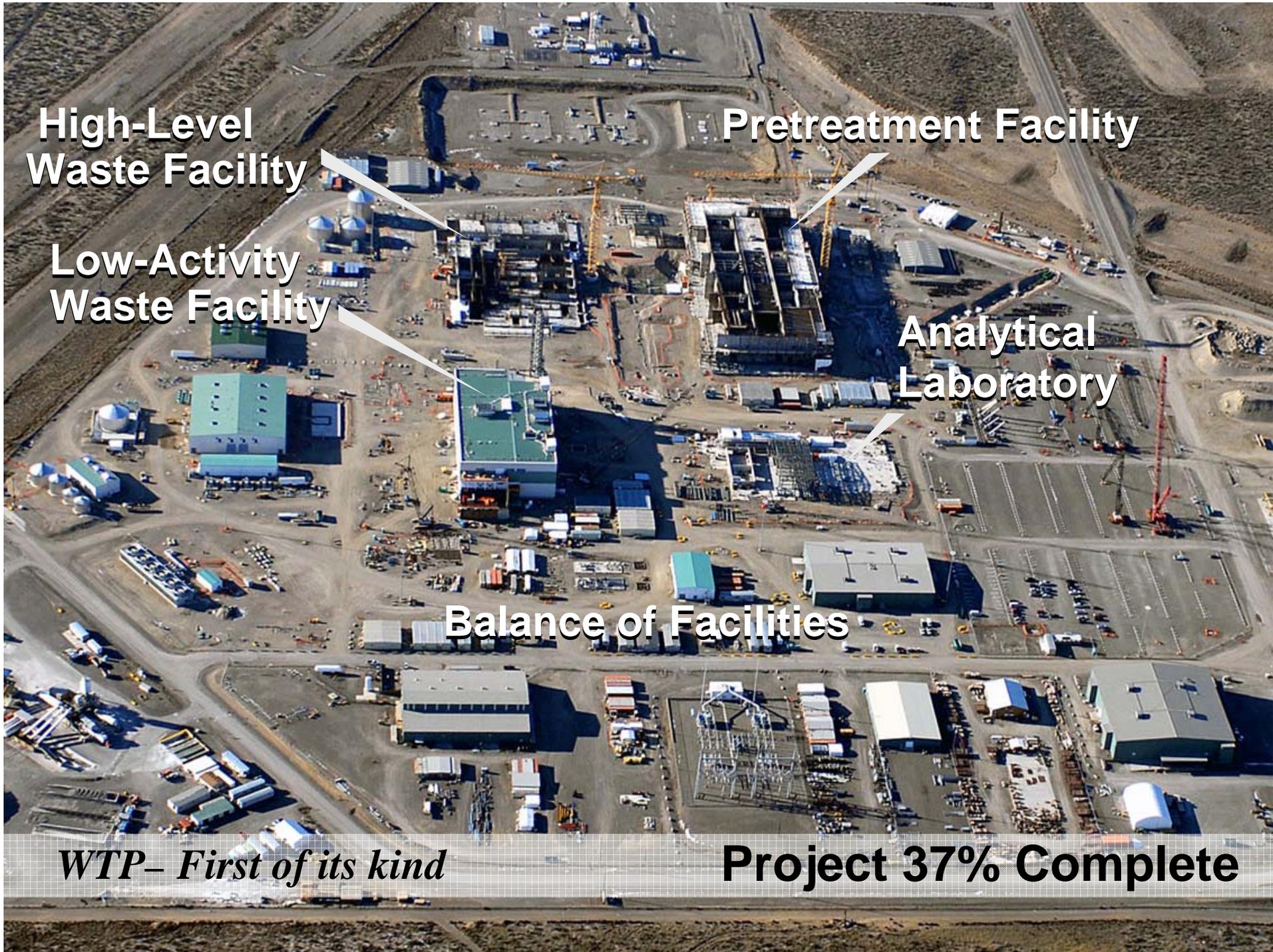
- Low-Activity Waste Facility
  - Design 91% complete
  - Construction 42% complete
  
- Analytical Laboratory
  - Design 85% complete
  - Construction 33% complete
  - Structural steel was delivered to the Analytical Laboratory. Erecting structural steel is a significant milestone in the construction of the full-service laboratory
  
- Balance of Facilities (BOF)
  - Design 80% complete
  - Construction 50% complete
  - 13 of the 20 BOF are under construction
  - 3 are complete and 4 are being designed
  
- High-Level Waste Facility
  - Design 79% complete
  - Construction 20% complete
  
- Pretreatment
  - Design 69% complete
  - Construction 25% complete



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**High-Level  
Waste Facility**

**Pretreatment Facility**

**Low-Activity  
Waste Facility**

**Analytical  
Laboratory**

**Balance of Facilities**

*WTP- First of its kind*

**Project 37% Complete**

## Solving Cleanup Challenges Through Risk Reduction

River Protection Budget Summary – PBS Level		FY 2006 Approp	FY 2007 CR	FY 2008 Request
<b>Defense Environmental Cleanup</b>				
<u>Office of River Protection</u>				
<i>Tank Farm Activities</i>				
	ORP-0014: Radioactive Liquid Tank Waste Stabilization and Disposition	327,109	273,656	272,972
	ORP-0100: River Protection Community and Regulatory Support	466	471	471
	<i>Subtotal, Tank Farm Activities</i>	327,575	274,127	273,443
<i>Waste Treatment and Immobilization Plant</i>				
	ORP-0060: Major Construction-Waste Treatment Plant			
	01-D-16A: Low Activity Waste Facility	161,376	186,000	143,000
	01-D-16B: Analytical Laboratory	44,552	59,000	45,000
	01-D-16C: Balance of Facilities	64,352	57,000	72,000
	01-D-16D: High Level Waste Facility	102,964	177,000	177,000
	01-D-16E: Pretreatment Facility	147,515	211,000	253,000
	<i>Subtotal, Waste Treatment and Immobilization Plant</i>	520,759	690,000	690,000
	<i>Subtotal, Office of River Protection</i>	848,334	964,127	963,443
	<u>Program Direction</u>	17,530	22,069	22,333
	<b>Subtotal, Defense Environmental Cleanup</b>	<b>865,864</b>	<b>986,196</b>	<b>985,776</b>
	<b>Total, River Protection</b>	<b>865,864</b>	<b>986,196</b>	<b>985,776</b>



## *FY 2007/2008 Planned Accomplishments*

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### **Tank Farms (PBS ORP-0014) FY 2008 = \$273M**

- Complete retrievals of S-112, S-102, C-108 and C-109.
- Continue Double-Shell Tank integrity activities (Ultrasonic testing and visual examination of 7 DST's and 11 physical samples supporting DST chemistry control)
- Operate the 242-A Evaporator, perform approximately two campaigns processing at least 1.3M gallons of tank waste.
- Radiological characterization for C Farm and the Tank Farm Project soils. (Take 70 deep soil samples utilizing Direct Push, complete one Borehole, and deploy Surface Geophysical Exploration technology in four tank farms).
- Complete installation and monitor performance of interim surface barrier to control water infiltration through deep soils contamination in T Farm.
- Complete DBVS integrated mixer dryer test



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## *FY 2007/2008 Planned Accomplishments*

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### **Waste Treatment and Immobilization Plan (PBS ORP-0060) FY 2008 = \$690M**

- **LAW Facility**-Concrete placements finished. Minus 21 foot elevation bulk piping complete and drywall to start. Mechanical and electrical work to continue.
- **LAB Facility**-Long-lead procurements will continue. Continue Fire Proofing/Protection, Hot Cell walls/liner plate, complete special coatings. Substantial progress on Heating/Air, mechanical process and handling systems. Bulk installations begin for electrical and piping.
- **BOF Facility**-Construction continues on multiple facilities. Anhydrous Ammonia Facility, Steam Plant, Fire Water Pump-house, Non-Dangerous Non-Radioactive Effluent Facility, and the Chiller Compressor Plant will be completed. Continue installation of BOF piping, utilities, and pipe rack structural steel.
- **HLW Facility**- Final Seismic Spectra will be certified. Ramp-up construction in the 1st quarter FY 2008. Focus on concrete walls from main floor to second floor, initiate elevated slab placements and structural steel installations on 2nd floor and, piping installation in the basement corridors. Civil design to be complete for 2nd floor elevated slabs, 4th floor's/roof's electrical and instrumentation cable layouts and, structural steel for roof. Continue 4th floor piping design. Major equipment purchases.
- **PT Facility**- Final Seismic Spectra will be certified. Ramp-up construction during the 1st quarter of FY 2008. Complete civil design of 3rd floor walls and 4th floor elevated slabs. Continue with piping design in the black and hot cells. Procure Major equipment items. Emphasis will be on concrete walls from elevation 2nd to 4th floors, elevated slabs on the 2nd and 3rd floors, piping installation in the black and hot cell, heating/air ducting design and fabrication, fire protection piping, misc. equipment sets, and initiation of installation of seismic upgrade kits in the vessels. Resolution of technical issues resulting from the External Flowsheet Review Team will be completed.
- Provide Technical and Managerial support to the Federal Project Director.
- **External Flowsheet Review Team (EFRT)** - Resolution of all EFRT issues will be complete by September 2008. This includes testing with scaled vessels to demonstrate mixing and off-bottom resuspension; testing of prototypic plant system geometries to demonstrate material transfer can occur without plugging; and design, construction, and testing of an Engineering Scale Pretreatment System (ESPS) to demonstrate ultrafiltration system performance including washing, caustic leaching, oxidative leaching, and transitional modes of operation.



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