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# EXECUTIVE SUMMARY

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## Purpose of This Report

The Annual Site Environmental Report for the West Valley Demonstration Project (WVDP or Project) is published to provide information about environmental conditions at the WVDP to members of the public, to the United States (U.S.) Department of Energy (DOE) Headquarters (HQ), and to other interested stakeholders. In accordance with DOE Order 231.1A, "Environment, Safety, and Health Reporting," this report summarizes calendar year (CY) 2010 environmental monitoring data to describe the performance of the WVDP's environmental management system (EMS), confirm compliance with standards and regulations, and highlight important programs. Activities at the WVDP are being conducted in cooperation with the New York State Energy Research and Development Authority (NYSERDA).

## Major Site Programs

The WVDP is located on the site of a former commercial nuclear fuel reprocessing plant, which was shut down in 1976. In 1980, Public Law 96-368 (the WVDP Act) was passed, which authorized the DOE to demonstrate a method for solidifying approximately 600,000 gallons (2.3 million liters) of liquid high-level radioactive waste (HLW) that remained at the West Valley site. HLW vitrification began in 1996 and was completed in September 2002. Activities for decontaminating and dismantling the facilities and for managing and disposing of wastes were then initiated and continued through CY 2010. The major activities that occurred in 2010 are described below.

**Record of Decision.** In April 2010, DOE released a Record of Decision (ROD) for the Final Environmental Impact Statement (FEIS) for the WVDP and the Western New York Nuclear Service Center (WNYNSC) (DOE/EIS-0226), allowing for the continued decommissioning and cleanup efforts at the site using a two-part phased decisionmaking process. NYSERDA published its corresponding decision under the State Environmental Quality Review Act in a statement of findings in May 2010. It was determined that in Phase 1, the Main Plant Process Building (MPPB), the vitrification facility, the remote-handled waste facility,

wastewater treatment lagoons, and a number of other facilities will be removed. Actions identified under Phase 1 Site Decommissioning will be carried out under a new facilities disposition contract discussed below. The Phase 2 decommissioning decision, which will address the remaining facilities, will be made within 10 years of the EIS ROD. The complete FEIS and the ROD can be viewed online at the DOE-WVDP website at [www.wv.doe.gov](http://www.wv.doe.gov).

On February 25, 2010, the U.S. Nuclear Regulatory Commission (NRC) transmitted to DOE-WVDP the "Technical Evaluation Report for the Phase 1 Decommissioning Plan (DP)," concluding that the Phase 1 DP was consistent with the preferred alternative in the FEIS. The NRC also determined that there is reasonable assurance that the proposed actions will meet the decommissioning criteria.

In order to facilitate interagency consensus while Phase 1 cleanup activities are progressing, additional studies will be conducted to possibly reduce technical uncertainties related to the decision on final decommissioning and long-term management of the balance of WNYNSC. In particular, these studies may address uncertainties associated with the long-term performance models, the viability and cost of exhuming buried waste and tanks, the availability of waste disposal sites, and technologies for in-place containment.

**Environmental Characterization and Support Services Contract.** On December 22, 2010, Safety and Ecology Corporation (SEC) was awarded the WVDP Environmental Characterization and Support Services contract. Under this five-year contract, SEC will perform characterization support services, including, but not limited to, soil, sediment, and groundwater characterization; environmental monitoring; and associated regulatory documentation of decommissioning activities at the WVDP.

**DOE/NYSERDA Consent Decree.** The DOE and NYSERDA reached an agreement on the cost sharing for cleanup of the WVDP and the WNYNSC by signing a Consent Decree on August 17, 2010 in the U.S. District Court, Western District of New York. While the

Consent Decree defines the cost-sharing agreement, it does not affect in any way what the cleanup will be or the end state of the WVDP and the WNYNSC.

**Phase 1 Decommissioning Contract.** The DOE released the final request for proposals for the Phase 1 facility disposition contract on October 13, 2010 for the next phase of work at the WVDP. Services to be provided in the upcoming contract include:

- Project management and support;
- Site operations, maintenance, and utilities;
- HLW canister relocation;
- Facility disposition, including demolition of the MPPB;
- WTF management;
- NRC-Licensed Disposal Area management;
- Waste management and nuclear materials disposition;
- Environmental monitoring, safeguards, and security.

The contract was awarded to CH2M Hill - B&W West Valley, LLC of Englewood, Colorado on June 29, 2011.

**Radioactive Waste Processing and Volume Reduction.**

During the last three years, WVES worked an ambitious plan to prepare for transport and eventual off-site disposal of all of the legacy transuranic (TRU) radioactive waste stored at the site (approximately 80,000 ft<sup>3</sup> [1,476 containers]). Thus far, utilizing several waste processing and characterization methodologies, the amount of legacy TRU waste on site has been reduced by approximately 75%. Through non-intrusive techniques, 40% of the waste was reclassified as low-level radioactive waste (LLW). Targeted invasive techniques were used to segregate and remove higher activity materials, allowing the remainder to be reclassified as LLW. TRU waste reduction is critical due to the increased hazards associated with handling TRU waste, more stringent disposal requirements (and subsequent cost increases), and the lack of a current pathway for disposal. TRU waste will be safely stored at the WVDP until a disposal facility is available.

Stored legacy waste was processed for disposal in a number of waste processing facilities at the WVDP. A number of the radioactive waste containers required remote or robotic processing due to high activity. Upgrades were made to the remote-handled waste processing facilities at the WVDP to increase the rate of waste processing. Upgrades included deploying a filter crusher that processed 38 waste boxes containing high-activity radioactive filters.

WVES also minimized waste generation by deploying the robotically controlled Nitrocision® technology, using a high-pressure liquid nitrogen system, to decontaminate larger pieces. The technology has been highly successful in removing high-activity fixed contamination from cell surfaces and large pieces of equipment. Some of these waste processing activities were accelerated using American Recovery and Reinvestment Act (ARRA) funding.

In March 2011, WVES received Honorable Mention for an Environmental Sustainability (E-Star) Award from DOE-Headquarters for these radioactive waste processing and reduction techniques. Many of the tools and techniques used for processing TRU waste were developed specifically for individual waste streams and often utilized specialized tooling. WVES continued to assess requirements and opportunities to increase efficiencies in waste processing. See Table ECS-6, "Pollution Prevention Progress for Fiscal Year 2010."

**Deactivation and Decontamination of the MPPB.**

Disassembly and decontamination activities continued in radioactive cells in the MPPB: extraction cell 1 (XC-1), the process mechanical cell (PMC), and the general purpose cell. All work was done remotely in these three cells because of elevated radiological contamination and limited accessibility. As of early 2011, three large vessels from XC-1 have been remotely removed and packaged in shielded containers.

Work was also initiated in the off-gas cell to prepare for equipment removal and decontamination, including making the first personnel entry into that area since 1972. Activities, such as grouting and leveling the floor and adding a shielding wall, were conducted to reduce the radiological exposure in the cell, which contains original fuel reprocessing equipment.

Asbestos-removal activities were also completed in a number of aisles in the MPPB. Asbestos insulation on piping was very common during plant construction. Successful decontamination was an important step toward preparing the MPPB for demolition. Some of the decontamination activities were accelerated using ARRA funding.

**North Plateau Full-Scale Permeable Treatment Wall (PTW).**

A plume of groundwater contaminated with strontium-90, migrating to the north-northeast, has been monitored on the north plateau for nearly two decades. The contamination source was determined to have been from a leak in piping, during historical

nuclear fuel reprocessing operations, that entered the ground below the southwest corner of the MPPB. During 2010, an 860-foot-long zeolite-filled PTW was installed along the existing roadway south of the construction and demolition debris landfill. The PTW allows groundwater to pass through the wall, while adsorbing radioactive strontium-90 in place. The zeolite, chosen for the PTW, is a natural mineral with a porous structure that can trap positively charged ions, such as strontium. Subsequently, 66 groundwater monitoring wells were installed to monitor the wall's performance. The work for this project was completed using ARRA funding.

**Waste Tank Farm (WTF) Tank and Vault Drying System (T&VDS).** With an ultimate goal of preventing the underground carbon-steel tanks from corroding under ambient tank and vault conditions, the WVDP installed a T&VDS in the underground WTF in 2010. The T&VDS was designed to reduce the harmful effects of corrosion on the integrity of the underground waste tanks and their surrounding concrete vaults that were originally installed in the 1960s. Corroded pipe was replaced with stainless-steel ventilation lines, a rotary air dryer was installed, and the new T&VDS was brought on line before the end of December 2010. The system has started to dry the remaining liquid in the tanks and vaults. Once the tanks and vaults become dry, the system will maintain a low (about 30%) relative humidity, thereby reducing the harmful effects of corrosion on the underground tanks. The work for this project was completed using ARRA funding.

**Safety Success.** The radiological and hazardous work environment at the WVDP warrants strict adherence to safety procedures. During 2010, the WVDP employees were recognized for numerous safety milestones that occurred during the year:

- The workforce achieved 3.5 million consecutive work hours without a lost time work injury, which translated to 1,347 days without a lost time work injury;
- The site was requalified as a Voluntary Protection Program STAR site under the DOE's voluntary protection program for its safety performance; and
- The site was awarded the 2009 URS Safe Project of the Year Award.

These CY 2010 achievements continued to rank the WVDP among the safest of the DOE's Office of Environmental Management programs.

## Environmental Management System

The WVDP EMS satisfies the requirements of DOE Order 450.1A, "Environmental Protection Program," and is a key part of the WVDP Integrated Safety Management System. In 2010, WVDP employees continued to demonstrate their commitment to an all-inclusive approach to safety, coordinating the EMS with other safety management and work planning processes through the integrated environmental, health, and safety management program.

**Compliance.** Management at the WVDP continued to provide strong support for environmental compliance in 2010. Requirements and guidance from applicable state and federal statutes, executive orders, DOE orders, and standards are integrated into the Project's compliance program. In CY 2010:

- No notices of violation or inspection findings from any environmental regulatory agencies were received.
- Inspections by the New York State Department of Environmental Conservation (NYSDEC) and the Cattaraugus County Department of Health verified Project compliance with the applicable environmental and health regulations.
- WVDP waste management areas were inspected by NYSDEC and the U.S. Environmental Protection Agency (EPA) to ensure compliance with the Resource Conservation and Recovery Act Interim Status Facility regulations. No findings were noted.
- Requirements of the Emergency Planning and Community Right-to-Know Act were met by collecting information about hazardous materials used at the Project and making this information available to the appropriate emergency response organizations.
- No exceedances to the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) dose standard were noted in 2010.

### Environmental Monitoring – Performance Indicators.

As part of the WVDP EMS, environmental monitoring continued on and near the site to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and to assess the effect of any such changes on the environment or human population. Within the environmental monitoring program, airborne and waterborne effluents were sampled and environmental surveillance of the site and nearby areas was conducted.

- Waterborne Radiological Releases

Waterborne releases were from two primary sources. In 2010, treated process water was released in six batches from lagoon 3, totaling approximately 10.3 million gallons (39 million liters). The other primary source was from a well-characterized drainage channel on the WVDP's north plateau that is contaminated with strontium-90 from pre-WVDP operations. Radiological concentrations and flow from the north plateau drainage channel were closely monitored.

There were no unplanned releases of waterborne radioactivity in 2010.

- Airborne Radiological Releases

In 2010, the WVDP maintained six NESHAP permits for point source release of radiological airborne emissions. The primary controlled air emission point at the WVDP is the MPPB ventilation stack.

Although emissions were low, there was one unplanned radiological airborne release at the WVDP during CY 2010. A ventilation upset from a power outage caused by a severe storm event contributed to higher-than-typical americium-241 and plutonium discharges from the MPPB stack in July and August 2010. Below stack alarm set points, these discharges were detected by stack monitoring equipment and are included in the Main Stack source term modeled in this report. The dose to the maximally exposed off-site individual (MEOSI) from the main stack in CY 2010 was 0.0015% of the 10-mrem standard. Initiating conditions were determined and all personnel were briefed on the event to help in preventing recurrence. (See "MPPB Stack Ventilation - Severe Storm Event" in Chapter 2.)

- Estimated Dose

In 2010, the estimated dose to a MEOSI from airborne emissions at the WVDP was 0.0017 millirem (mrem) (0.000017 millisievert [mSv]), about 0.017% of the 10-mrem NESHAP standard. Estimated dose from waterborne sources in 2010 was about 0.064 mrem (0.00064 mSv), with 0.0094 mrem (0.000094 mSv) attributable to liquid effluent releases and 0.055 mrem (0.00055 mSv) attributable to the north plateau drainage.

Total estimated dose to the MEOSI from both airborne and waterborne sources in 2010 was 0.066

mrem (0.00066 mSv), about 0.066% of the annual 100-mrem DOE standard. In comparison, the average dose to a member of the public from natural background sources is 310 mrem per year.

Estimated dose to the population from both air and water within a 50-mile (80-kilometer) radius of the WVDP from DOE activities in 2010 was 0.34 person-rem (0.0034 person-Sv). This same population would have received approximately 522,000 person-rem from natural background radiation in 2010.

- Dose to Biota

An evaluation of dose to biota for CY 2010 concluded that populations of aquatic and terrestrial biota (both plants and animals) were not exposed to doses in excess of the existing DOE dose standard for native aquatic animal organisms (1 rad/day) nor the recommended thresholds for terrestrial animals (0.1 rad/day) and plants (1 rad/day).

- Nonradiological Releases

Nonradiological releases from Project wastewater and storm water monitoring points were measured and documented under the site's State Pollutant Discharge Elimination System (SPDES) permit. In 2010, no exceedances of any SPDES permit limits were noted.

## Environmental Performance Goals and Objectives

DOE Order 450.1A requires establishing goals to integrate sustainable environmental stewardship into a site's operations as a cost-effective business practice. The goals are intended to prevent pollution, reduce environmental hazards, protect public health and the environment, reduce waste disposal costs, and improve operating capability.

Objectives were evaluated and goals were determined using the graded approach, taking into consideration that the WVDP is currently in the decommissioning phase and demolition plans are being developed. The WVDP submitted the fiscal year (FY) 2010 EMS Annual Report via the online reporting system on November 30, 2010. As in previous years, the WVDP scored "Green" based on the rating system. A summary of the achieved objectives and goals accomplished during FY 2010 were:

- To reduce or eliminate the generation and/or toxicity of waste and other pollutants at the source through pollution prevention.
  - Reduced the amount of laundry detergent usage by switching to a biodegradable detergent. Also removed the need for demineralized water, which eliminated the annual usage of approximately 30 gallons of sulfuric acid and 40 gallons of caustic.
- To reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials.
  - Eliminated the need for the cooling tower, which annually used 1,375 gallons of caustic for neutralization. Also, researched the use of a bio-based replacement for Handi-foam, which is used for filling voids in LLW packages. However, the waste packaging efforts primarily involved TRU waste. Nevertheless, efforts continued in 2010 to find a replacement product for future LLW packaging.
- To maximize the acquisition and use of environmentally preferable products in the conduct of operations.
  - Trained personnel to incorporate requirements to maximize the purchase of EPA-designated bio-based products and environmentally friendly products. During 2010, approximately \$4,700 worth of bio-based products were purchased, and approximately \$194,000 was spent for environmentally preferable products.
- To reduce or eliminate the environmental impacts of electronic assets.
  - Even though the federal electronics reuse and recycling challenge campaign was cancelled for 2010, the site transferred or donated for reuse approximately 4.1 tons (3.8 metric tons) of electronics and recycled approximately 1.1 tons (0.98 metric tons) of electronics.
- To reduce degradation and depletion of environmental resources through post-consumer material recycling.
  - Approximately 365 tons (330 metric tons) of material was recycled at the WVDP. Eliminated the use of plastic water bottles for site employees by distributing reusable bottles at the WVDP safety

fair, and continued the WVDP's long-term waste minimization and pollution prevention program.

- To improve energy efficiency.
  - Reduced energy use by decreasing electricity and natural gas consumption by 39.5% and 69.2%, respectively. This was accomplished by replacing obsolete compressors with new compressors with variable frequency drives, installing air-cooled chiller units, eliminating use of the cooling tower, converting an old inefficient boiler to use low-pressure steam, reducing the size of the chiller unit in the environmental laboratory, installing a more efficient respirator washer unit, and acquiring and refurbishing three electric carts from another DOE facility.
- Other goals
  - A training session on the EMS program and expectations for energy efficiency, waste minimization, and pollution prevention was presented to 68 ARRA employees.
  - Reduced the need for corrosion inhibitor and pesticides by eliminating the cooling tower.

**Quality Assurance (QA).** In 2010, the QA program continued for activities supporting the environmental monitoring and groundwater monitoring programs at the WVDP. As part of this ongoing effort, on-site and subcontract laboratories that analyze WVDP environmental samples participated in independent radiological and nonradiological constituent performance evaluation studies. In these studies, environmental test samples with concentrations only known by the testing agency, were analyzed by the laboratories. Of 305 performance evaluation analyses conducted by or for the WVDP, 96.4% fell within acceptance limits.

Numerous inspections, audits, assessments, and surveillances of components of the environmental monitoring program were conducted in 2010. Although actions were recommended to improve the program, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general. Refer to "EMS Audits and Other Audits and Assessments" in Chapter 1.

## Conclusion

In addition to demonstrating compliance with environmental regulations and directives, evaluation of

data collected in 2010 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.