
EXECUTIVE SUMMARY

Purpose of This Report

This annual environmental monitoring report is published to inform Project stakeholders about environmental conditions at the West Valley Demonstration Project (WVDP). (See *stakeholder* in the Glossary [p. GLO-10].) In accordance with DOE Order 231.1, Environment, Safety, and Health Reporting, the report summarizes the environmental monitoring data gathered during the year in order to characterize the performance of the WVDP's environmental management system, confirm compliance with standards and regulations, and highlight significant programs.

Project Description

The West Valley Demonstration Project (WVDP), the site of a U.S. Department of Energy (DOE) environmental cleanup activity operated by West Valley Nuclear Services Co. (WVNSCO), is in the final stages of stabilizing the high-level radioactive waste that remained at the site after commercial nuclear fuel reprocessing had been discontinued. The Project is located in Western New York State, about 30 miles south of Buffalo, within the New York State-owned Western New York Nuclear Service Center (WNYNSC).

In addition to high-level waste solidification, ongoing work activities at the WVDP during 2001 included:

- preparing spent nuclear fuel for shipment to Idaho
- shipping low-level waste off-site for disposal
- constructing a facility where large high-activity components can be safely packaged for disposal
- packaging and removing expended materials from the vitrification facility
- preparing environmental impact statements for future activities
- removing as much of the residual waste in the high-level waste tanks as was technically feasible
- monitoring the environment and managing contaminated areas within the Project facility premises

A reader opinion survey has been inserted in this report. If it is missing, please contact the Communications Department at (716) 942-4555. Additional Project information is available on the internet at <http://www.wv.doe.gov>.

- flushing and rinsing high-level waste-solidification facilities.

Compliance

Management at the WVDP continued to provide strong support for environmental compliance in 2001. DOE Orders and applicable state and federal statutes and regulations are integrated into the Project's compliance program. Highlights of the 2001 compliance program were as follows:

- No notices of violation or inspection findings from any environmental regulatory agencies were received by the WVDP in 2001.
- Inspections of hazardous waste activities by the New York State Department of Environmental Conservation (NYSDEC) verified Project compliance with the applicable regulations.
- The Project continued to monitor specific waste management areas at the site in order to comply with the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.
- The Project also met the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA) by collecting information about hazardous materials used at the Project and making this information available to the local community.
- The State Pollutant Discharge Elimination System (SPDES) permit currently identifies four permitted liquid outfalls at the Project. A SPDES permit application was submitted to NYSDEC in 2000 to cover process changes and storm water runoff. A permit modification is expected in 2002.
- In accordance with the Site Treatment Plan developed under the Federal Facility Compliance

Act, all calendar year 2001 milestones for the characterization, treatment, and disposition of mixed waste at the WVDP were completed.

- Among other pollution-prevention accomplishments, waste minimization goals for 2001 were met or exceeded in all but one of the waste categories set in the one-year goals statement. Although low-level radioactive waste generation did not meet the established goal of an 80% reduction, generation was reduced by 70%.

Environmental Monitoring Program

Throughout the first four years of vitrification, specific and sustained attention was given to environmental monitoring and assessment of effluents from changing site operations. Project environmental scientists continued in 2001 to sample and measure effluent air and water, groundwater, surface streams, soil, sediment, vegetation, meat, milk, and game animals, and to record environmental radiation measurements. More than 12,000 samples were collected in 2001 in order to assess the effect of site activities on public health, safety, and the environment.

The Project's environmental monitoring network is evaluated and updated to ensure that all the locations and sample types that would be sensitive to process-related changes are monitored. Samples are tested for radioactivity and/or nonradioactive substances using approved laboratory procedures. Both the laboratory test results and direct measurement data are reviewed at several stages for quality and are compared with historical data from the same locations, with background data, and with data from similar locations.

The environmental data are entered into a controlled database and are automatically compared with upper and lower acceptance values. Data

points falling outside these values are brought to the attention of WVDP scientists for further investigation. WVDP scientists assess all data points and evaluate trends at each location.

Doses to the public are calculated using approved computer modeling codes. Dose calculations determine the impacts of air and water releases and from the consumption of game animals and locally grown food.

Surface Water Monitoring. Surface water is routinely sampled on the Project premises by four automatic samplers: Timed composite samples are collected at Frank's Creek where it exits the Project, at two other on-site points where water flows off-site, and at a surface drainage point near the former radioactive waste disposal areas. On-site samples also are collected periodically at nine other points of drainage from facility areas. The data from these samples are used to determine the type, amount, and probable origin of both radiological and nonradiological contaminants.

Radiological Releases. The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 outfall. The treated effluent water flows into Erdman Brook, which joins Frank's Creek just before exiting the Project's fenced area. Five treated batches totaling approximately 8.4 million gallons were released periodically over the course of thirty-three days in 2001. In 2000, 11.5 million gallons were released. The difference can be attributed to a lag in batch releases of water from facility cleanup processes along with less precipitation in 2001 than in 2000.

The combined average concentration of all radionuclides in liquid releases from lagoon 3 in 2001 was approximately 33% of the DOE derived concentration guide (DCG), which is used to evalu-

ate liquid process discharges. (See Chapter 1 [p. 1-5] for an explanation of DCGs.) The average radioactivity concentrations from 1997 through 2000 were 22%, 23%, 32%, and 34% of the DCG, respectively. The major contributors to the total combined liquid effluent in 2001 were strontium-90, cesium-137, and uranium-232.

Seepage of contaminated groundwater from the north plateau was another source of gross beta and strontium-90 radioactivity in surface water. Drainage from the north plateau eventually flows into Frank's Creek. (See location WNSWAMP on Fig. A-2 in Appendix A [p. A-4].) This drainage point has been carefully monitored since the contaminated seep was identified in 1993. A groundwater recovery and treatment system currently is being used to reduce the migration of strontium-90 to surface water on the north plateau. The average strontium-90 concentration at WNSWAMP, which originates from pre-Project operations, increased in 2001 from the concentration in 2000. The increase in the strontium-90 concentrations in 2001 at this northeast swamp drainage is thought to be linked to a combination of decreased groundwater dilution due to less precipitation in 2001 than in 2000 and increases in groundwater activity surfacing in the ditch upstream of WNSWAMP. Nonetheless, the total quantity of radioactivity released, and the associated dose to an off-site individual from this radioactivity, were about 10% lower than in 2000.

The WVDP is evaluating a pilot-scale permeable treatment wall that was installed in 1999 to treat contaminated groundwater on the north plateau. A subsurface trench filled with ion-exchange media, installed in the eastern lobe of the plume, removes contaminants from the groundwater as it flows through the trench. (See Chapter 3 [p. 3-16] for additional discussion of this technology.)

Dose Assessment. Estimated dose to the maximally exposed off-site individual from the liquid pathway was estimated to be 0.035 mrem – 0.014 mrem attributable to Project effluents from lagoon 3 and an additional contribution of 0.021 mrem from the north plateau drainage.

Nonradiological Releases. Nonradiological contaminants, measured at three outfalls and calculated at one monitoring point, were, with one exception, below the New York SPDES permit limits. (The one exception was an elevated lead concentration from a groundwater drain system, which was subsequently capped off.) (See SPDES-Permitted Outfalls [p. ECS-10].)

Soil and Stream Sediments. Surface soil is collected annually near the ten air sampler locations in order to track long-term deposition. Sediments from off-site creeks are collected annually from three downstream and two upstream locations. Soil from three on-site drainage areas is also sampled annually in order to track waterborne movement of contaminants.

Surface soil samples in 2001 showed little change from previous years. Except for one area that historically has shown average cesium-137 concentrations higher than background values, the concentrations of radionuclides normally present in soil from both worldwide fallout and from Project air emissions at near-site locations are close to or indistinguishable from concentrations from background locations.

Because of pre-Project releases from nuclear fuel reprocessing activities, the concentrations of cesium-137 in downstream creek sediments have been historically higher than concentrations in the upstream sediments. However, in 1998 and 1999 sediment samples at one downstream location showed a marked decrease in cesium-137, when compared with historical values, after an unusu-

ally high June 1998 flood. The calendar year 2000 samples returned to a level of cesium-137 that is consistent with historical values. Samples collected at this location in 2001 are at a level slightly below samples collected in 2000. The sixteen-year graph of cesium-137 in sediments (Fig. 2-4 [p. 2-13]) indicates no upward trends at either upstream or downstream points.

Groundwater Monitoring. Groundwater samples were collected as scheduled from sixty-five on-site locations in 2001. Computerized screening of the groundwater data accelerated identification and evaluation of changes. Monitoring activities in 2001 included gathering more detailed information about the north plateau strontium-90 contamination. Additional monitoring wells were installed in 2001 to improve the definition of subsurface and groundwater conditions. The calendar year 2001 groundwater program continued to indicate that strontium-90 is still the major contributor to elevated gross beta contamination in the plume on the north plateau. The concentrations of other isotopes were below the DCG levels usually applied to surface water.

In addition to collecting samples from wells, groundwater was routinely collected from seeps on the bank above Frank's Creek along the northeastern edge of the north plateau. Results of radiological analyses indicate that gross beta activity from the north plateau plume has not migrated to these seepage areas.

Site groundwater also is tested for a number of nonradiological constituents. In 2001 there were no statistically remarkable changes in the concentrations measured.

Calendar year 2001 sample results from near-site residential water-supply wells were within the historical range of values measured for these wells.

Air Monitoring. WVDP airborne radiological emissions in 2001 included emissions from six routinely operated permitted exhaust points and four exhausts excluded from permitting because of their low emission potential.

Six air samplers on the perimeter of the WNYNSC and four in more distant locations continuously collect samples of air at the average human breathing height. The samples are tested for radioactivity carried by airborne particles. Samples also are collected for tritium and iodine-129 at two of the ten locations, the Rock Springs Road sampler near the site and the Great Valley background sampler.

Radiological Releases. As anticipated, radioactive releases from the Project in 2001 were far below the most restrictive limits that ensure public health and safety, even with an on-site release that took place in the fall of 2001. (See Unplanned Radiological Releases in Chapter 1 [p. 1-11].) Operating the vitrification process at a reduced capacity resulted in radiological air releases that were less in 2001 than those noted in calendar years 1999 and 2000.

Although several fission products contribute to airborne radiological releases, the most significant continued to be iodine-129, a long-lived radionuclide that exists in gaseous form at the high temperatures of the vitrification process. Iodine-129 is not fully removed during treatment of the air effluent. The calendar year 2001 levels of gaseous iodine-129 emissions were lower than 2000 levels.

Gross radioactivity (airborne particulate) in air samples from around the perimeter was within the historical range of radioactivity measured at remote background locations or nearby communities. Gross radioactivity at the nearest perimeter sampler remained the same in 2001 as in 2000. Concentrations in samples from three on-site ambient air samplers and two portable samplers lo-

cated near waste storage facilities operated during 2001 also were far below any applicable limits.

Dose Assessment. The dose from air emissions in calendar year 2001 was about 0.05% of the Environmental Protection Agency (EPA) radionuclide emissions standard of 10 millirem (mrem) per year effective dose equivalent to the maximally exposed off-site individual. (In 1999 the dose from these emissions was about 0.11% and in 2000 the dose was about 0.08%.) Approximately 63% of the total 2001 calculated airborne dose to the maximally exposed off-site individual was attributable to iodine-129 emissions.

Nonradiological Releases. Nitrogen oxides, nonradiological byproducts of the vitrification process, are monitored as part of the emission-control process. The WVDP continues to monitor nitrogen oxides and sulfur dioxide emissions as a condition of the New York State Facility Air permit. The monitoring demonstrates that emissions are well below the 99-ton cap for each. No opacity or permit limits were exceeded in 2001.

Vegetation, Meat, and Milk. Test results from near-site samples of beans, apples, corn, hay, beef, and milk were consistent with results noted in previous years. When near-site samples were compared with background samples, no site-related effects were noted.

Game Animals. Fifty fish specimens from Cattaraugus Creek were collected in 2001 for testing. Ten of these were from below the Springville dam, including species that migrate up from Lake Erie. Two semiannual sample sets of ten fish each were collected downstream of Buttermilk Creek, which receives Project liquid effluents, and two sets were collected upstream. These samples represent sportfishing species and bottom-feeding indicator species. Testing for gamma-emitting isotopes and

strontium-90 showed a slight statistical difference in median concentrations of strontium-90 between upstream (background) fish and downstream fish collected above the dam. (See *gamma isotopic* in the Glossary [p. GLO-4].) No statistical differences were noted between cesium-137 concentrations in upstream and downstream fish.

Three samples of venison from near-site (WVNSCO) whitetail deer were tested for gamma-emitting isotopes and strontium-90. Control deer samples from locations more than thirty miles away from the site also were collected in 2001. Low levels of radioactivity from strontium-90, cesium-137, and naturally occurring potassium-40 were detectable in both control and near-site deer samples. Although results vary from year to year, data from the last ten years show no statistical differences between radionuclide concentrations in near-site and control venison samples. In 2001 public access to the WVNSCO for deer hunting was curtailed due to security restrictions.

Program Quality

The WVDP environmental monitoring program is designed to produce high-quality, reliable results. To maintain this standard, each scientist must give continuous attention to the details of sample handling, following approved collection and analysis procedures and data review. Formal self-assessments were performed, and the environmental laboratory also continued the practice of analyzing radiological crosscheck samples sent from a national laboratory. Of 117 radiological crosscheck analyses performed at both the on-site Project laboratory and the off-site commercial service laboratory, 117 (100%) were within the control limits. Off-site laboratories address data deficiencies under approved quality assurance programs.

Test results from the crosscheck program, self-assessments, and comparisons of co-located

sample measurements taken by independent agencies such as the New York State Department of Health (NYSDOH) and NYSDEC indicate that high quality standards are being met.

The WVNSCO Environmental Affairs and Quality Assurance departments also periodically conducted and documented reviews of program activities in 2001.

In addition, in August and September 2001 the DOE Ohio Field Office conducted a surveillance of a discharge from lagoon 3 to evaluate whether the WVDP procedures for discharge of liquid plant effluent are being effectively implemented to ensure compliance with the Site SPDES permit. (See Audits and Appraisals [p. 5-6] in Chapter 5.)

Safety and Environmental Management

In 2001 the WVDP continued to demonstrate its commitment to an all-inclusive approach to safety through implementation of its Integrated Safety Management System (ISMS). As an integral part of the ISMS, the site-wide work review group reviewed work plans, identified environmental safety and health concerns, and specified practices to ensure that work was performed safely. The Environmental Management System (EMS) was coordinated with other safety management and work planning processes through the integrated environmental, health, and safety management program. (See Environmental Management System [EMS] Implementation and Integrated Safety Management System [ISMS] Implementation in Chapter 1 [p. 1-16] for a more detailed discussion of these management systems at the WVDP.)

Notable 2001 Events

In 1999 WVNSCO was recommended for STAR status, the highest safety award given within the

DOE. This award, received in early 2000, was granted in recognition of superior health and safety performance by contractor management and employees. In 2001 this award was reconfirmed by the DOE in their bestowing of the Star of Excellence on WVNSCO for an outstanding safety record.

The WVDP also was recognized in 2000 by induction into the EPA's National Environmental Performance Track. The WVDP was accorded Charter Member status as one of the first facilities to receive this award.

In May 2001 the WVDP was visited by EPA representatives who toured the facilities and reviewed the WVDP environmental management system. Their assessment confirmed that the WVDP meets the Performance Track Program Criteria.

The WVDP is one of only two DOE sites to hold both the EPA's highest award for environmental sustainability and the DOE's STAR award.

Conclusion

The West Valley Demonstration Project conducts extensive monitoring of on-site facilities and the surrounding environment. This program fulfills federal and state requirements to assess the effect of Project activities on public health and safety and the environment. In 2001 the predicted dose from the Project via all pathways was 0.04 mrem, or 0.04% of the 100-mrem DOE limit.

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2001 continued to indicate that Project activities pose no threat to public health or safety or the environment.

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