



*The West Valley Demonstration Project*

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# EXECUTIVE SUMMARY

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## Project Description

**T**he 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. (WVNS), is in the process of stabilizing liquid 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). The WVDP's current focus is on stabilizing the remaining high-level waste, which is stored in underground tanks, in containers suitable for temporary storage on-site and for eventual transport to a federal repository. In 1998 the Project successfully completed the Phase I milestone for vitrification of high-level liquid radioactive waste into a durable, solid glass form.

## Compliance

**M**anagement at the WVDP continued to provide strong support for environmental compliance issues in 1998. DOE Orders and applicable state and federal statutes and regulations are integrated into the Project's compliance program. Highlights of the 1998 compliance program were as follows:

- No State Pollutant Elimination Discharge (SPDES) permit limits were exceeded in 1998.
- No notices of violation from any environmental regulatory agencies were received by the WVDP in 1998.
- Inspections of hazardous waste activities by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA) verified Project compliance with the applicable state and federal 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 identifying information

*A reader opinion survey has been inserted in this report. If it is missing, please contact Public and Employees Communications at (716) 942-4610. Additional Project information is available on the Internet at <http://www.wvdp.com>.*

about hazardous materials used at the Project and making this information available to the local community. All EPCRA reporting deadlines were met ahead of schedule in 1998.

- The SPDES permit currently identifies four permitted liquid outfalls at the Project. A draft SPDES permit to monitor eleven identified storm water outfalls was issued for public comment in June 1997, and a final permit is expected to be issued to the WVDP in 1999.
- Among other pollution-prevention accomplishments, waste minimization goals for 1998 were exceeded in all but two of the waste categories set in the one-year goals statement. The WVDP continues to exceed expectations for the five-year waste-minimization goals.
- In accordance with the Site Treatment Plan developed under the Federal Facility Compliance Act, all calendar year 1998 milestones for the characterization, treatment, and disposition of radioactive mixed waste at the WVDP were completed.
- An integrated environmental, safety, and health (ES&H) management system was developed, implemented, and validated in 1998.
- There were no accidental off-site releases of radiological material in 1998.

## **Environmental Monitoring Program**

**T**hroughout the first two years of vitrification, specific, sustained attention was given to environmental monitoring and assessment of effluents from changing site operations. In 1998 Project environmental scientists continued to sample and measure effluent air and water, groundwater, surface streams, soil, sediment, vegetation, meat, milk, and game animals, and to record environmental radiation measure-

ments. More than 11,000 samples were collected in order to assess the effect of site activities on public health, safety, and the environment.

The Project's environmental monitoring network is continually being 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 or nonradioactive substances using approved laboratory procedures. Both the laboratory test results and direct measurement data are reviewed at several stages for quality and for comparison with similar data.

As environmental data are entered in the controlled database they are automatically compared to 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 key locations.

**Air Monitoring.** WVDP airborne radiological emissions in 1998 included six routinely operated permitted exhaust points and four exhausts excluded from permitting because of their low emission potential. As anticipated, radioactive releases from the Project in 1998 were far below the most restrictive limits that ensure public health and safety. Operating the vitrification process resulted in radiological air releases similar to those noted in the last few months of 1997. The dose from 1998 air emissions was about 0.4% of the most restrictive limit. In 1997 the dose from these emissions was about 0.5%.

Although several fission products contribute to the radioactivity, the most significant continued to be airborne iodine-129, a long-lived radionuclide that exists in gaseous form at the high temperatures of the vitrification process and that is not fully removed during treatment of the air effluent. The 1998 levels of gaseous iodine-129 emissions were slightly lower than 1997 levels. Total radionuclide emissions remained less than

1% of the EPA radionuclide emissions standard of 10 millirem (mrem) per year effective dose equivalent to the maximally exposed off-site individual. Approximately 99% of the 1998 calculated dose to the public is attributable to iodine-129 emissions from the vitrification process.

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. At two of the ten locations test samples are collected for analysis of tritium and iodine-129.

Gross radioactivity (airborne particulate) in 1998 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 1998 as in 1997. Concentrations in samples from three on-site ambient air samplers located near waste storage facilities operated during 1998 also were far below any applicable limits.

Nitrogen oxides, nonradiological byproducts of the vitrification process, are monitored as part of the emission-control process. A single occurrence of nitrogen oxide emissions briefly exceeded the New York State opacity standard, but no permit limit was violated. Although there are a number of permitted air-emissions sources at the Project, none release a sufficient quantity of nonradiological material to warrant continuous monitoring as a condition of a regulatory permit.

**Surface Water Monitoring.** 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 release outfall. The treated effluent water flows into Erdman Brook, which joins Frank's Creek just before exiting the Project's fenced area. Six treated batches totaling 11.5 million gallons were

released over a combined thirty-nine day period in 1998. In 1997, 11.6 million gallons were released.

The combined average concentration of all radionuclides in liquid releases from lagoon 3 in 1998 was approximately 23% of the DOE derived concentration guide (DCG), which is used to evaluate liquid process discharges. (See Chapter 1, p.1-5, for an explanation of derived concentration guides.) The average radioactivity concentrations from 1994 to 1997 were 44%, 43%, 35%, and 22% of the DCG, respectively. The reduction over this period is mostly attributable to steadily decreasing strontium-90 concentrations. The other major contributor to the total combined liquid effluent DCG is uranium-232, which averaged 10% of its DCG in 1998, about 15% lower than in 1997.

Surface water is continually sampled on the Project premises by four automatic samplers: Time-composite samples are collected at Frank's Creek where it exits the Project, at two other on-site points where drainage flows off-site, and at a drainage point near the former radioactive waste disposal areas. 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.

As in 1997, the most notable source of gross beta and strontium-90 radioactivity in surface water in 1998 was from groundwater migrating beneath the north plateau and emerging as seepage to join the surface water drainage from the north plateau into Frank's Creek and thence off-site. (See 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 seepage of strontium-90 to surface water on the north plateau. The strontium-90, which originates from pre-Project op-

erations, was about 1.4 times the DCG for liquid discharges in 1998. The 1997 strontium-90 concentration at this point was 1.1 times the DCG. The increase in the 1998 strontium-90 concentration at the northeast swamp drainage may be linked to groundwater beyond the influence of the recovery system.

**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. Three on-site drainage areas are also sampled annually in order to track waterborne movement of contaminants.

Surface soil samples in 1998 showed little change from previous years. For the most part, except for one area that historically has shown average cesium-137 concentrations above background values and one area northeast of the WVDP, the concentrations of radionuclides normally present in soil from both worldwide fallout and from Project air emissions are no different at near-site locations than at background locations. Because of pre-Project releases from nuclear fuel reprocessing activities, the concentrations of cesium-137 in downstream creek sediments have been historically above concentrations in the upstream sediments. However, sediment samples at one downstream location did show a marked decrease in 1998 from historical values as a result of an unusually high June flood. The thirteen-year graph (see Fig.2-4, p.2-12) indicates no upward trends at either upstream or downstream points. No changes were noted in on-site soil/sediment samples between 1998 and previous years.

**Groundwater Monitoring.** Groundwater samples were collected as scheduled from seventy-two on-site locations in 1998. Computerized screening of 1998 data speeded identification and evaluation of changes. Monitoring activities in 1998 included gathering more detailed informa-

tion about the north plateau strontium-90 contamination. The 1998 groundwater program confirmed 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 generally 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 the seepage area.

As in previous years, near-site residential water-supply wells sampled during 1998 were within the historical range of values measured at the background well.

**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. No site-related effects were detected.

**Game Animals.** Fifty fish specimens from Cattaraugus Creek were collected in 1998 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 levels similar to those in 1997 samples.

Three samples of whitetail deer venison from a near-site (WNYNSC) herd were tested for gamma-emitting isotopes and strontium-90. Control deer samples more than thirty miles away from the site also were collected in 1998. A com-

parison of near-site and control samples reflects some variation in low levels of radioactivity from cesium-137, strontium-90, and naturally occurring potassium-40. (A person eating 100 pounds of meat from near-site deer would receive 0.20 mrem, which is 500 times less than the DOE 100 mrem dose standard.) Although results vary from year to year, data from the last eight years show no statistical differences between radionuclide concentrations in near-site and control venison samples.

Special samples also had been collected in 1997 from an on-site herd of approximately fifty deer that was moved from inside the facility fence. Calculation of cesium-137 concentrations indicated that there would be no detectable differences between background cesium-137 concentrations and cesium-137 concentrations in venison from this herd in the fall of 1998, during deer hunting season. In 1998, the fifth year of public access to portions of the WNYNSC for deer hunting, fifty-two deer were taken by hunters during the hunting season.

## **Program Quality**

**T**he WVDP environmental 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. In addition to a formal self-assessment review just before vitrification start-up, the WVDP environmental laboratory also continued the practice of analyzing radiological crosscheck samples sent from a national laboratory. Of 158 radiological analyses performed at both the on-site Project laboratory and off-site commercial service laboratories, 96% were within the control limits. Forty of forty-one samples tested on-site at the Project environmental laboratory (98%) were within acceptable limits. Seventeen of the twenty-three nonradiological check samples

tested at an off-site laboratory were within acceptable limits.

Although no formal external audits of the environmental program were conducted in 1998, 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 the New York State Department of Environmental Conservation (NYSDEC) indicate that high quality standards are being met. The WVNS Environmental Affairs and the Quality Assurance departments periodically conducted and documented reviews of program activities in 1998.

## **Notable 1998 Events**

**T**he major event during 1998 was the continued successful operation of the WVDP vitrification facility and completion of Phase I, a major milestone. Operational tracking of various effluents occupied most of the year. Removal of the resident deer herd from inside the security-fenced area was successfully completed and monitored.

## **Dose Assessment**

**T**here were no events affecting public health and safety or the environment associated with Project operations in 1998. The small amounts of radioactive materials that were released were assessed and doses were calculated using approved computer modeling codes. These evaluations included calculations of doses received from the consumption of game animals and locally grown food. Airborne doses were calculated using CAP88-PC, an EPA-approved computer code. The result was a maximum dose to an off-site individual of 0.034 millirem (mrem). The limit is 10 mrem. Doses from the liquid pathway to the maximally exposed person were estimated to be 0.008 mrem from Project effluents

(excluding north plateau drainage). The north plateau drainage contribution to the total liquid dose was estimated to be an additional 0.023 mrem. The predicted dose from all pathways was less than 0.07 mrem, or 0.07% of the 100-mrem DOE limit.

## **Conclusion**

**T**he 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 addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 1998 indicated that Project activities pose no threat to public health, safety, or the environment.