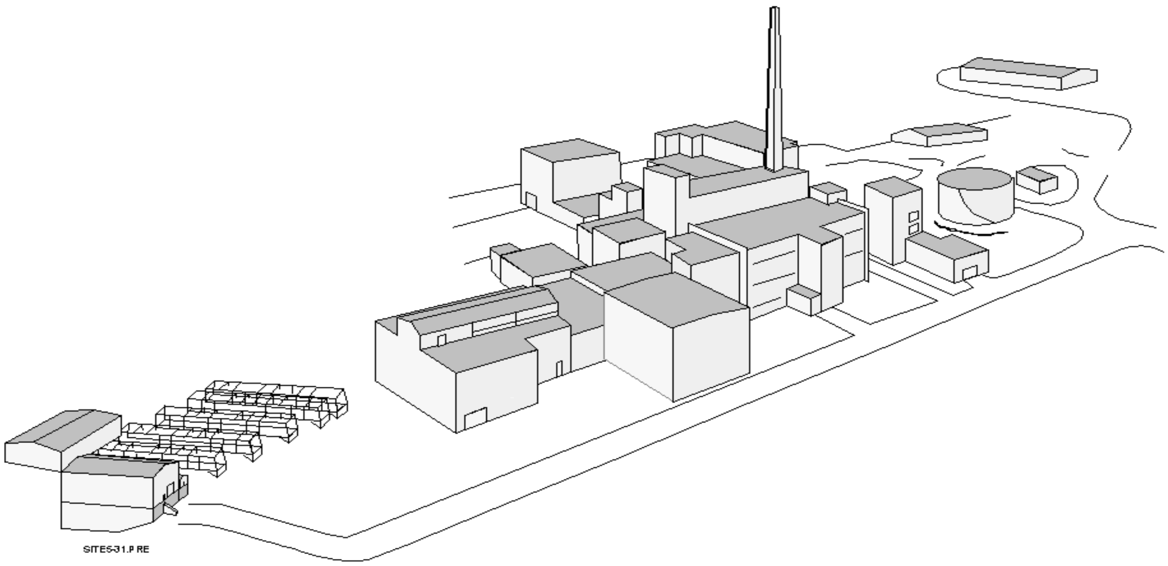
WEST VALLEY DEMONSTRATION PROJECT
ANNUAL SITE ENVIRONMENTAL REPORT
CALENDAR YEAR 2010



CH2MHILL • B&W WEST VALLEY, LLC

Prepared by: CH2MHill • B&W West Valley, LLC

Prepared for: U.S. Department of Energy
DOE-WVDP

Under: Contract DE-EM0001529

September 2011
10282 Rock Springs Road
West Valley, New York 14171-9799

Department of Energy
Ohio Field Office
West Valley Demonstration Project
10282 Rock Springs Road
West Valley, NY 14171-9799

To the Reader:

This report, prepared by the United States (U.S.) Department of Energy (DOE) West Valley Demonstration Project (WVDP), summarizes the environmental protection program at the WVDP for calendar year 2010.

Monitoring and surveillance of the WVDP facilities are conducted to verify that public health and safety and the environment are protected. The quality assurance requirements applied to the environmental monitoring program by the DOE ensure the validity and accuracy of the monitoring data.

At the WVDP, radiological air emissions are controlled and permitted by the U.S. Environmental Protection Agency (EPA) under National Emission Standards for Hazardous Air Pollutants, Subpart H, regulations. Nonradiological liquid effluent discharges are controlled and permitted through the New York State Pollutant Discharge Elimination System. Generation, storage, and treatment of hazardous and mixed wastes are conducted in accordance with Resource Conservation and Recovery Act interim status regulations and New York State Conservation Law.

Air, surface water, groundwater, storm water, soil, sediment, and biological samples are collected and analyzed for radiological and nonradiological constituents. The resulting data are evaluated to assess effects of activities at the WVDP on the nearby public and the environment.

The calculated dose to the hypothetical maximally exposed off-site individual from airborne radiological emissions in 2010 was much less than one-tenth of one percent of the EPA limit. The dose from combined airborne and waterborne radiological releases in 2010 to the same individual was less than one-tenth of one percent of the DOE limit, verifying that the dose received by off-site residents continues to be minimal.

The WVDP was operated in a safe manner during 2010. The employees achieved a cumulative 3.5 million work hours without a lost-time work accident or illness, while accomplishing complex decontamination and waste management activities.

In 2010, deactivation and decontamination of equipment within the main plant process building continued. A tank and vault drying system was installed in the waste tank farm to dry the underground waste tanks and their vaults, formerly used to manage high-level radioactive waste. Radioactive waste handling techniques were refined to reclassify, repackage, and volume-reduce stored legacy waste, including transuranic waste. Installation of the north plateau in-ground, full-scale permeable treatment wall, designed to intercept and treat the strontium-90 groundwater plume, was completed.

On June 29, 2011, the DOE awarded CH2MHill • B&W West Valley, LLC (CHBWV) the Phase 1 Decommissioning – Facility Disposition contract for the WVDP.

If you have any questions or comments about the information in this report, please contact WVDP Communications at (716) 942-4601 or complete and return the enclosed survey.

Sincerely,

Bryan C. Bower, Director
West Valley Demonstration Project

West Valley Demonstration Project

Annual Site Environmental Report

for

Calendar Year 2010

Prepared for the U.S. Department of Energy

West Valley Demonstration Project Office

under contract DE-EM0001529

September 2010

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Disclaimer

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Preface

Environmental monitoring at the West Valley Demonstration Project (WVDP) was conducted by West Valley Environmental Services LLC (WVES), under contract to the United States Department of Energy. The data collected provide a historical record of radionuclide and radiation levels, and chemical data from natural and man-made sources in the survey area. The data also document the chemical and radiological quality of the groundwater on and around the WVDP and of the air and water released by the WVDP. Meteorological data are also presented.

It is the policy at the WVDP to conduct all activities, including design, construction, testing, start-up, commissioning, operation, maintenance, and decontamination and decommissioning, in a manner that is appropriate to the nature, scale, and environmental effects of these activities. The WVDP management is committed to full compliance with applicable federal, New York State, and local laws and regulations for the protection of the environment, to continual improvement, to the prevention and/or minimization of pollution, and to public outreach, including stakeholder involvement.

This report represents a single, comprehensive source of on-site and off-site data collected during 2010. The environmental monitoring program and results are discussed in the body of this report. Additional monitoring information is presented in the appendices. Appendix A contains maps of on-site and off-site sampling locations and a summary of the site environmental monitoring schedule. Appendices B through H can be found in electronic format on the compact disk (as indicated by the CD icon) located inside the back cover. Appendices B through G contain summaries of data obtained during 2010 and are intended for those readers interested in more detail than is provided in the main body of the report. Appendix H contains a copy of the WVDP Act.

A reader opinion survey has been inserted in this report. Requests for additional copies of the 2010 Annual Site Environmental Report (ASER) and questions regarding the report should be referred to WVDP Communications, 10282 Rock Springs Road, West Valley, New York 14171 (telephone: 716-942-4601). Additional Project information, including all WVDP ASERs, is available on the internet at http://www.wv.doe.gov.

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EXECUTIVE SUMMARY

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.

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, 1010, 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^3 [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. Dismantlement 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.

INTRODUCTION

Site Location

The West Valley Demonstration Project (WVDP or Project) is located in western New York State, about 30 miles (50 kilometers [km]) south of Buffalo, New York (Fig. INT-1). The WVDP facilities occupy a security-fenced area of about 152 acres (61 hectares [ha]) within the 3,338-acre (1,351 ha) Western New York Nuclear Service Center (WNYNSC) located primarily in the town of Ashford in northern Cattaraugus County. In 2009, the United States Department of Energy released approximately 15.5 acres of the WVDP (on the north side of the New York state-licensed disposal area [SDA]) back to the New York State Energy Research and Development Authority (NYSERDA) as an SDA buffer area for conducting ongoing erosion monitoring, control, and maintenance activities associated with the SDA.

General Environmental Setting

Climate. Although extremes of 98.6°F (37°C) and -43.6°F (-42°C) have been recorded in western New York, the climate is moderate, with an average annual temperature (1971–2000) of 48°F (8.9°C). Precipitation is markedly influenced by Lake Erie to the west and, to a lesser extent, by Lake Ontario to the north. Regional winds are generally from the west and south at about 9 miles per hour (4 meters/second).

Ecology. The WNYNSC lies within the northern deciduous forest biome, and the diversity of its vegetation is typical of the region. Equally divided between forest and open land, the site provides a habitat especially attractive to white-tailed deer and various indigenous migratory birds, reptiles, and small mammals. No species on the federal endangered species list are known to reside on the WNYNSC.

Geology and Hydrology. The Project lies on New York State's Allegheny Plateau at an average elevation of about 1,300 feet (400 meters) above mean sea level. The underlying geology includes a sequence of glacial sediments above shale bedrock. The Project is drained by three small streams (Franks Creek, Quarry Creek, and Erdman Brook) and is divided by a stream valley (Erdman Brook) into two general areas: the north plateau and the south plateau.

Franks Creek, which receives drainage from Erdman Brook and Quarry Creek, flows into Buttermilk Creek, which enters Cattaraugus Creek and leaves the WNYNSC. (See Figures A-1 and A-5.) Cattaraugus Creek ultimately drains into Lake Erie, to the northwest.

Relevant Demographics

Although several roads and a railway approach or pass through the WNYNSC, the public is prohibited from accessing the WNYNSC. A limited public deer hunting program managed by the NYSERDA is conducted on a year-to-year basis in designated areas on the WNYNSC. No unescorted public access is allowed on the WVDP premises.

Land near the WNYNSC is used primarily for agriculture and arboriculture. Downstream of the WNYNSC, Cattaraugus Creek is used locally for swimming, canoeing, and fishing. Although some water is taken from the creek to irrigate nearby golf course greens and tree farms, no public drinking water is drawn from the creek before it flows into Lake Erie. Water from Lake Erie is used as a public drinking water supply.

The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within approximately 5 miles (8 km) of the Project. The nearby population, approximately 9,200 residents within 6.2 miles (10 km) of the Project, relies largely on an agricultural economy. No major industries are located within this area. The WVDP is one of the largest employers in Cattaraugus County.

Historic Timeline of the WNYNSC and the WVDP

The following summary, presented in Table INT-1, depicts a historic timeline for the WNYNSC and the WVDP beginning with the establishment of the WNYNSC as a commercial nuclear fuel reprocessing facility, to the creation of the WVDP, to the current Project mission. The summary includes significant legal directives, major activities and accomplishments.

FIGURE INT-1
Location of the Western New York Nuclear Service Center

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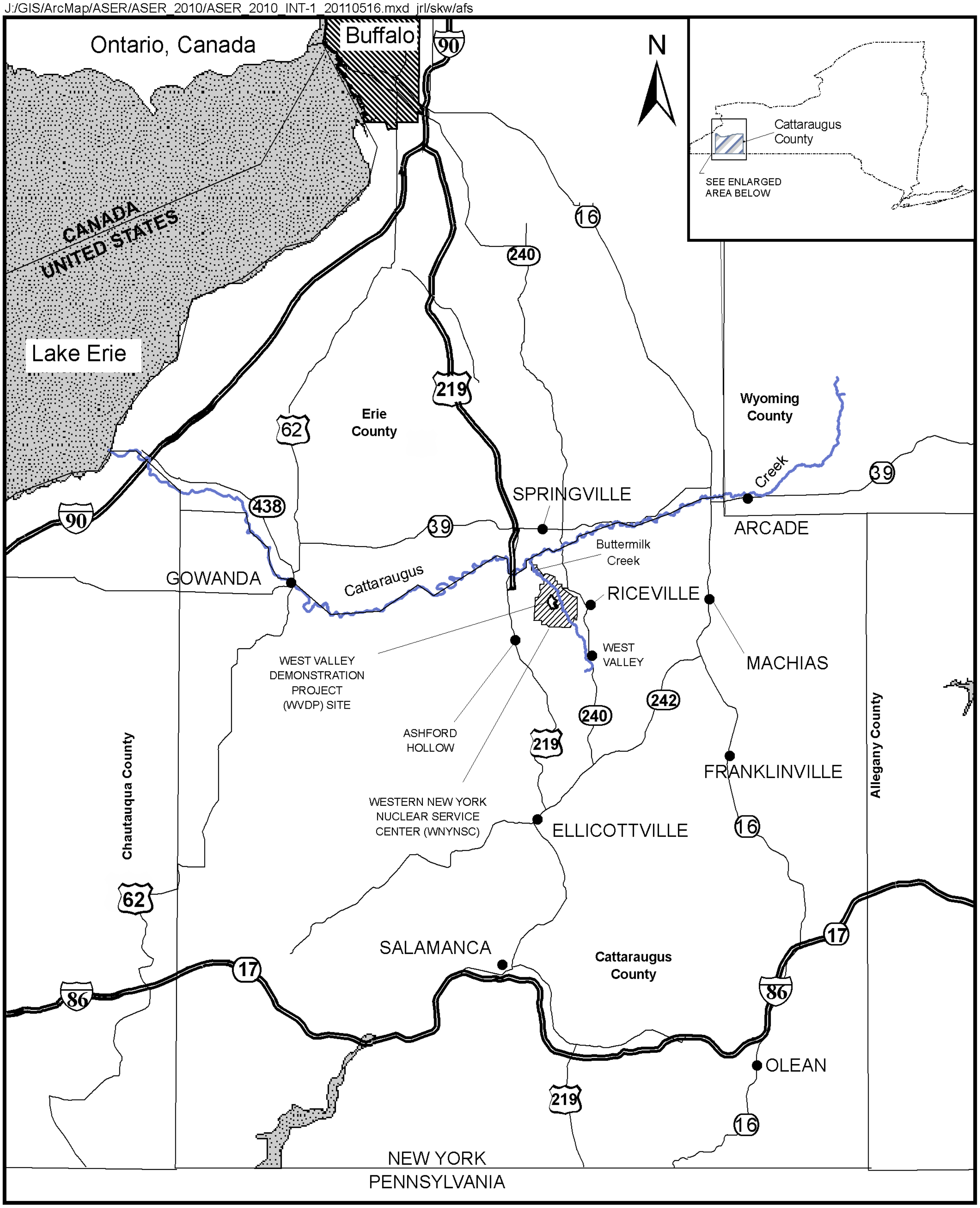

TABLE INT-1
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1954	The Federal Atomic Energy Act promoted commercialization of reprocessing spent nuclear fuel.
1959	New York State (NYS) established the Office of Atomic Development (OAD) to coordinate the atomic industry.
1961	The NYS OAD acquired 3,345 acres (1,354 hectares) of land in Cattaraugus County, Town of Ashford (near West Valley), in western New York and established the Western New York Nuclear Service Center (WNYNSC).
1962	Davison Chemical Company established Nuclear Fuels Services, Inc. (NFS) as a nuclear fuel reprocessing company, and reached an agreement with NYS to lease the WNYNSC (also referred to as "the Center").
1966	NFS constructed and operated the commercial nuclear fuel reprocessing facility at the WNYNSC from 1966 to 1972. NFS processed 640 metric tons of spent reactor fuel at the facility, generating 660,000 gallons (2.5 million liters) of highly radioactive liquid waste. NFS operated a 5-acre landfill, the "U.S. Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA)" for disposal of waste generated from the reprocessing operations from 1966 until 1986. In addition, a 15-acre commercial disposal area, the "state-licensed disposal area (SDA)" regulated by NYS agencies, under delegation of authority from the NRC, accepted low-level radioactive waste (LLW) from operations at the Center and from off-site facilities from 1963 until 1975.
1972	In 1972, while the plant was closed for modifications, more rigorous regulatory requirements were imposed upon fuel reprocessing facilities. NFS determined the costs to meet regulatory requirements of spent nuclear fuel reprocessing were not economically feasible. NFS then notified the New York State Energy Research and Development Authority (NYSERDA), the successor to NYS OAD, in 1976 that they would discontinue reprocessing and would not renew the lease that would expire at the end of 1980.
1975	Water infiltrated into the SDA trenches and waste burial operations ceased. Between 1975 and 1981, NFS pumped, treated, and released liquids to the adjacent stream. Redesigning the covers reduced, but did not eliminate, water accumulation in the trenches.
1980	The United States (U.S.) Congress passed Public Law 96-368, the West Valley Demonstration Project Act (WVDP Act), requiring the U.S. Department of Energy (DOE) to be responsible for solidifying the liquid high-level radioactive waste (HLW) stored in underground tanks, disposing of the waste that would be created by solidification, and decontaminating and decommissioning the facilities used during the process. Per the WVDP Act, the DOE entered into a Cooperative Agreement with NYSERDA that established the framework for cooperative implementation of the WVDP Act. Under the agreement, the DOE has exclusive use and possession of a portion of the Center known as the Project Premises (approximately 167 acres). A supplement to the Cooperative Agreement (1981 amendment) between the two agencies set forth special provisions for the preparation of a joint Environmental Impact Statement (EIS).
1981	The DOE and the NRC entered into a Memorandum of Understanding that established specific agency responsibilities and arrangements for informal review and consultation by the NRC. Because NYSERDA holds the license and title to the West Valley site, the NRC put the technical specifications of the license (CSF-1) in abeyance to allow the DOE to carry out the responsibilities of the WVDP Act.
1982	West Valley Nuclear Services (WVNS), a Westinghouse subsidiary, was chosen by the DOE to be the management and operating contractor. WVNS commenced operations at the WVDP on February 28, 1982.
1983	Before discontinuing fuel reprocessing operations, NFS had accepted 750 spent fuel assemblies which remained in storage in the on-site fuel receiving and storage (FRS) area. Between 1983 and 1986, 625 of those assemblies were returned to the utilities that owned them. In 1983, NYSERDA assumed management responsibility for the SDA and focused efforts to minimize infiltration of water into the trenches. In the 1990s, installation of a geomembrane cover over the entire SDA and an underground barrier wall were successful in eliminating increases in trench water levels. The DOE selected the vitrification (VIT) process as the preferred method for solidifying the HLW into glass.
1984	Nonradioactive testing of a full-scale VIT system was conducted from 1984–1989. NFS entered into an agreement with the DOE in which the DOE assumed ownership of the remaining 125 fuel assemblies in the FRS pool and the responsibility for their removal.

TABLE INT-1 *(continued)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1986	A large volume of radioactive, non-HLW would result from WVDP activities. On-site disposal of most of this waste was evaluated in an Environmental Assessment (DOE/EA-0295, April 1986), and a finding of no significant impact was issued. The Coalition on West Valley Nuclear Waste (The Coalition) and the Radioactive Waste Campaign filed suit contending an EIS should have been prepared. The NYS Department of Environmental Conservation (NYSDEC) was authorized by the U.S. Environmental Protection Agency (EPA) to administer the Resource Conservation and Recovery Act (RCRA) hazardous waste program.
1987	A decision to potentially dispose of LLW at the Project led to a legal disagreement between the Coalition on West Valley Nuclear Waste and the Radioactive Waste Campaign. The lawsuit was resolved by a Stipulation of Compromise which states that LLW disposal at the site and the potential effects of erosion at the site must be included in a comprehensive EIS.
1988	In December 1988, the DOE and NYSERDA issued a Notice of Intent in the Federal Register (FR) to prepare an EIS in accordance with Section 102(2)(C) of the National Environmental Policy Act and Section 8-0109 of the New York State Environmental Quality Review Act (SEQR). To prepare for VIT, the integrated radwaste treatment system was constructed to process the liquid supernatant from the underground HLW tanks by removing most of the radioactivity in the supernatant, concentrating the liquid, and blending it with cement. The HLW sludge layer was then washed to remove soluble salts. The water containing the salts was also stabilized into cement. About 20,000 drums of cement-stabilized LLW were stored in the aboveground drum cell. The process was completed in 1995.
1990	Organic solvent was observed in a groundwater monitoring well immediately downgradient of the NDA in 1983. Following characterization of the area, an interceptor trench bordering the northeast and northwest boundaries of the NDA and a liquid pretreatment system (LPS) were built in 1990–1991. The trench was designed to collect liquid that might migrate from the NDA and the LPS was designed to recover free organic product (if present) from the recovered liquid. To date, no organic product has been detected in the interceptor trench water; therefore, the water has been pumped and treated through the LLW treatment system. In 1990, New York State was granted the authority to regulate the hazardous waste constituents of radioactive mixed waste. Subsequently, a Title 6 New York State Official Compilation of Codes, Rules, and Regulations (6 NYCRR) RCRA Part 373-3 (Part A) Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes.
1992	In 1992, the DOE and NYSERDA entered into a RCRA §3008(h) Administrative Order on Consent (Consent Order) with NYSDEC and the EPA. The Consent Order pertained to management of hazardous waste and/or hazardous constituents from solid waste management units at the WVDP. It also required the DOE and NYSERDA to perform a RCRA Facility Investigation at the WNYNSC to determine if there had been a release or if there was a potential for a release of RCRA hazardous constituents.
1993	In 1993, gross beta activity in excess of 1.0E-06 µCi/mL (the applicable DOE Derived Concentration Guide for strontium-90) was detected in surface water on the north plateau, in the vicinity of sampling location WNSWAMP. The gross beta radioactivity was determined to be strontium-90.
1994	Extensive subsurface investigations delineated the extent of the strontium-90 plume and determined that the plume originated beneath the southwest corner of the main plant process building (MPPB) during NFS operations and migrated toward the northeast quadrant of the north plateau. A second lobe of contamination was attributed to the area of former lagoon 1, which was backfilled in 1984.
1995	In 1995, a groundwater recovery system consisting of three wells was installed on the north plateau to extract and treat the strontium-90-contaminated groundwater. In 1999, a pilot-scale permeable treatment wall (PTW) was constructed to test this passive in-situ remediation technology. The VIT building shielding was installed in 1991, the slurry-fed ceramic melter was assembled in 1993, and the remaining major components were installed and tested by the end of 1994. In 1995, the VIT facility was completed, fully tested, and "cold operations" began.

TABLE INT-1 *(continued)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1996	The DOE and NYSERDA issued a draft EIS (DEIS) for completion of the WVDP and closure or long-term management of the WNYNSC. Following evaluation of the public comments on the DEIS, the Citizen Task Force was convened to enhance stakeholder understanding and input regarding the WVDP/WNYNSC closure process. VIT operations began in 1996 and continued into 2002, producing a total of 275 10-foot-tall stainless-steel canisters of hardened radioactive glass containing up to 12 million curies of radioactive material (primarily cesium/strontium, without radioactivity from daughter products included). The glass melter was shut down in September 2002. NYSDEC and the DOE entered into an Order on Consent negotiated under the Federal Facilities Compliance Act for handling, storage, and treatment of mixed wastes at the WVDP. The Seneca Nation of Indians Cooperative Agreement was signed in 1996 to foster government-to-government relationships between the Seneca Nation and the U.S. government, as represented by the DOE.
1999	VIT expended materials processing was initiated to begin processing unserviceable equipment from the VIT facility. This success helped in developing a remote-handled waste facility (RHWF) to process large-scale, highly contaminated equipment excessed during decontamination and decommissioning activities.
2000	Restructuring of the work force and construction of the RHWF began.
2001	The 125 spent fuel assemblies that remained in storage at the WVDP since 1975 were prepared for transport to the Idaho National Engineering and Environmental Laboratory (INEEL). Initial decontamination efforts began in two significantly contaminated areas in the MPPB, the process mechanical cell and the general purpose cell, to place the cells in a safer configuration for future facility decommissioning. The DOE published formal notice in the Federal Register (66 FR 16447) to split the EIS process into (1) the WVDP Waste Management EIS, and (2) the Decommissioning and/or Long-Term Stewardship EIS at the WVDP and the WNYNSC.
2002	The NRC issued "Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003).
2003	The remaining 125 spent fuel assemblies were shipped to INEEL, allowing for decontamination of the FRS to begin.
2004	The RHWF became operational. Major decontamination efforts continued and site footprint reduction began as 20 office trailers were removed. In December, the 6 NYCRR RCRA Part 373-2 Permit Application (i.e., Part B) was submitted to NYSDEC.
2005	In June, the DOE published its final decision on the "WVDP Waste Management Environmental Impact Statement (68 FR 26587)." The DOE implemented the preferred alternative for the management of WVDP LLW and mixed LLW. The decision on transuranic waste was deferred, and the HLW canisters will remain in on-site storage until they can be shipped to a repository. In November, the WVDP was downgraded to a Category 3 nuclear facility, marking the first time in the site's history that it has been designated the least of the three DOE nuclear facility designations. The categorization is based on amounts, types, and configuration of the nuclear materials stored and their potential risks.
2006	An Environmental Assessment (DOE/EA-1552) evaluating the proposed decontamination, demolition, and removal of 36 facilities was issued. Eleven of the 36 structures were removed by the end of 2006. The DOE-WVDP office initiated a collaborative, consensus-based team process, referred to as the "Core Team," that involved NYSERDA, the EPA, the New York State Department of Health, the NRC, and NYSDEC. This team brought individuals with decision-making authority together to resolve challenging issues surrounding the WVDP EIS process and to make recommendations to move the Project toward an "Interim End-State" prior to issuance of the "Final EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC." Shipment of the cement filled LLW drums was initiated.
2007	Demolition and removal of four more structures identified under the DOE/EA-1552 was completed. On June 29, 2007, the DOE awarded West Valley Environmental Services LLC a four-year contract (Contract DE-AC30-07CC30000) to conduct the next phase of cleanup operations at the WVDP. The remaining drums of cemented LLW in the Drum Cell were packaged and shipped to the Nevada Test Site for disposal. In the fall of 2007, an interim measure to minimize water infiltration into the NDA was initiated with site surveys and soil borings.

TABLE INT-1 *(concluded)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
2008	During 2008, a trench was excavated along two sides of the NDA, on the south plateau. The trench was backfilled with bentonite and clay to form the slurry wall – a low-permeability subsurface barrier to infiltration. The entire landfill was covered with a geomembrane cover. On the north plateau, additional subsurface soil and groundwater samples were collected in the summer and fall of 2008 to enhance the characterization of chemical and radiological constituents in soil and groundwater within the contaminated groundwater plume beneath and downgradient of the MPPB. The revised DEIS for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC was issued in December for public review, which continued through September 8, 2009. Concurrently, the Proposed Phase 1 Decommissioning Plan for the WVDP was prepared and submitted to the NRC.
2009	Extensive characterization was completed on the north plateau in 2009 to delineate the leading edge of the subsurface strontium-90 groundwater plume and to find a suitable material to capture and retain the contamination.
2010	In January, the DOE and NYSERDA issued the Final EIS (FEIS) for the WVDP and the WNYNSC (DOE/EIS-0226). The phased decisionmaking alternative was selected as the preferred alternative. The phase 2 decision was deferred for no more than 10 years. In February, the NRC issued a Technical Evaluation Report for the DP, concluding that the DP was consistent with the preferred alternative in the FEIS. A SEQR notice of completion for the FEIS and acceptance of the FEIS by NYSERDA was issued on January 27. On April 14th, the DOE issued the Record of Decision for the FEIS, and on May 12, NYSERDA issued a SEQR Findings Statement, selecting the phased decisionmaking alternative. On August 17th, the DOE and NYSERDA reached an agreement and signed a Consent Decree that formally defined the cost sharing for cleanup of the WVDP and the WNYNSC. In September, a revised RCRA Part 373-2 Permit Application was submitted to NYSDEC. An 860-foot-long full-scale PTW near the leading edge of the strontium-90 plume was installed and completed. The Tank and Vault Drying System was installed to reduce the harmful effects of corrosion on the underground waste tanks. MPPB cell decontamination and deactivation activities continued.

ENVIRONMENTAL COMPLIANCE SUMMARY

Compliance Program

The United States (U.S.) Department of Energy (DOE) is currently focusing on several goals at the West Valley Demonstration Project (WVDP or Project) to support completion of the requirements identified in the WVDP Act (Public Law 96-368).

Activities at the WVDP are regulated by various federal and state public, worker, and environmental protection laws. These laws are administered primarily by the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Health (NYSDOH) through programs and regulatory requirements for permitting, reporting, inspecting, self-monitoring, and auditing.

The EPA, NYSDEC, and DOE have established standards for effluents that are intended to protect human health, safety, and the environment. The DOE applies to the EPA for permits to release limited amounts of radiological constituents to the air and applies to NYSDEC for permits to release limited amounts of nonradiological constituents to the air and water, in concentrations determined to be safe for humans and the environment. In general, the permits describe release points, specify management and reporting requirements, list discharge limits on those pollutants likely to be present, and define the sampling and analysis regimen. Releases of radiological constituents in water are subject to the requirements in DOE Orders 450.1A (Environmental Protection Program) and 5400.5 (Radiation Protection of the Public and the Environment). A summary of permits is found in Table ECS-3. (See the compliance tables at the end of this chapter.)

Compliance Status

Table ECS-1 describes the WVDP's compliance status with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations applicable to the Project activities.

TABLE ECS-1
Compliance Status Summary for the WVDP in Calendar Year (CY) 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
42 United States Code (USC) §2011 et seq.	The **Atomic Energy Act (AEA)** of 1954 was enacted to assure the proper management of source, special nuclear, and by-product materials. The AEA and the statutes that amended it delegate the control of nuclear energy primarily to the U.S. Department of Energy (DOE), the U.S. Nuclear Regulatory Commission (NRC), and the U.S. Environmental Protection Agency (EPA).	See discussions of the West Valley Demonstration Project (WVDP) Act and DOE Orders 435.1, 450.1A, and 5400.5.
Public Law 96-368	The **WVDP Act** of 1980 authorized the DOE to carry out a high-level liquid nuclear waste demonstration project at the Western New York Nuclear Service Center (WNYNSC [the Center]) in West Valley, New York.	The DOE is focusing on goals that will lead to completion of responsibilities listed in the WVDP Act.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
Cooperative Agreement between the DOE and the New York State Energy Research and Development Authority (NYSERDA)	The Cooperative Agreement Between the DOE and NYSERDA on the WNYNSC established a cooperative framework for implementation of the Project, effective October 1980, as amended in September 1981. In 1990, the first supplemental agreement was signed by the DOE and NYSERDA which set forth specific provisions for the preparation of a joint Environmental Impact Statement (EIS). A second supplemental agreement to the Cooperative Agreement was drafted in January 2010 and issued by DOE and NYSERDA in March 2011.	Except as delineated in specific sections of the agreement, the DOE was given sole responsibility to carry out the requirements of the WVDP Act. The DOE released a Record of Decision (ROD) for the final EIS (FEIS) for the WVDP and the WNYNSC in April 2010, and therefore the 1990 supplemental agreement is no longer applicable. The second supplemental agreement (of 2010) sets forth special provisions for the implementation and management of the Phase 1 studies as referenced in the FEIS.
WVDP Memorandum of Understanding (MOU) between the DOE and the NRC	The 1981 MOU, mandated by the WVDP Act, established procedures for review and consultation by the NRC with respect to activities conducted at the WNYNSC by the DOE. The agreement encompassed development, design, construction, operation, and decontamination and decommissioning activities associated with the Project as described in the WVDP Act. Under the WVDP Act, and to satisfy commitments made to the NRC, the DOE was required to prepare a decommissioning plan for the Project and submit it to the NRC for review.	The NRC was authorized through the WVDP Act to prescribe decommissioning criteria for the WVDP. In 2002, the NRC issued "Decommissioning Criteria for the WVDP (M-32) at the West Valley Site; Final Policy Statement" (67 Federal Register [FR] 5003). The NRC's role under the WVDP Act is to provide informal review and consultation. The "Phase 1 Decommissioning Plan (DP) for the West Valley Demonstration Project" was prepared by the DOE pursuant to its statutory obligations for decontamination and decommissioning of the WVDP under the WVDP Act. The DP was originally submitted to the NRC in December 2008, then updated and resubmitted twice in 2009 (March and December). In February 2010, the NRC issued a Technical Evaluation Report on DOE's Phase 1 DP.
DOE Order 231.1A	DOE Order 231.1A, **Environment, Safety, and Health Reporting,** was issued to ensure timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues as required by law or regulations or as needed to ensure that the DOE and National Nuclear Security Administration are kept fully updated about events that could adversely affect the health and safety of the public or the workers, the environment, the intended purpose of DOE facilities, or the DOE's credibility.	This WVDP Annual Site Environmental Report (ASER) is prepared and submitted annually to DOE Headquarters, regulatory agencies, and interested stakeholders in compliance with DOE Order 231.1A.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
DOE Order 5400.5	DOE Order 5400.5, **Radiation Protection of the Public and the Environment**, established standards for DOE operations and DOE contractors to ensure that (1) operations are conducted to limit radiation exposure to members of the public pursuant to limits established in the Order, (2) potential exposures to members of the public are as low as reasonably achievable, (3) routine and nonroutine releases are monitored and dose to the public is addressed, and (4) the environment is protected from radioactive contamination to the extent practicable.	This ASER summarizes radiological estimates of dose to the public and the environment, and compares these values with release and dose standards established by this Order. In 2010, estimated doses from airborne and waterborne releases to the maximally exposed off-site individual (MEOSI) were 0.066% of the 100-millirem (mrem) standard, and about 0.021**%** of natural background radiation. Refer to Chapter 3, "Dose Assessment," for further discussion.
DOE Order 435.1	DOE Order 435.1, **Radioactive Waste Management**, was issued in 1999 to ensure that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety and the environment, and complies with applicable state, federal and local laws and regulations. Under the Order, sites that manage radioactive waste are required to develop, document, implement, and maintain a site-wide radioactive waste management program which includes actions to minimize radioactive waste generation.	The WVDP maintains program documentation separately for each waste type. Management of high-level waste was conducted in accordance with the "WVDP Waste Acceptance Manual;" Transuranic (TRU) waste was managed in accordance with the "TRU Waste Management Program Plan;" low-level radioactive waste (LLW) was managed as summarized in the "LLW Management Program Plan;" and the radioactive component of mixed LLW was managed as summarized in the "Site Treatment Plan (STP) Fiscal Year (FY) 2010 Update." Refer later in this chapter for further discussion.
DOE Order 450.1A	DOE Order 450.1A, **Environmental Protection Program,** June 4, 2008 replaced DOE Order 450.1. The Order required implementing an environmental management system (EMS) to conduct work at DOE sites to protect air, water, land, and other natural and cultural resources impacted by DOE operations. The DOE is required to conduct environmental effluent and surveillance monitoring to support the WVDP's integrated safety management system (ISMS), to ensure early identification of, and appropriate response to, potential adverse environmental impacts associated with operations. Sites must have a formal third party audit of the EMS, identified findings must be tracked to completion, and a "Declaration of Full Implementation" must be submitted to DOE-Headquarters every three years.	Since 1999, an EMS has been implemented via policies and procedures that provide an integrated site safety management program to accomplish work through proactive management, environmental stewardship, and integrating appropriate technologies across all Project functions. The EMS is an important part of the ISMS at the WVDP. A formal audit of the WVDP EMS was conducted in July 2010 by qualified parties outside the control of the WVDP EMS. On December 23, 2010, consistent with the requirements of DOE Order 450.1A, West Valley Environmental Services LLC (WVES) submitted to the DOE a declaration that the WVDP EMS is fully implemented. Refer to Chapter 1, "Environmental Management System," for further discussion.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
Executive Orders (E.O.) 13423 and 13514	E.O. 13423, Strengthening Federal Environmental, Energy, and Transportation Management, issued in January 2007, replaced several executive orders known as the Greening the Government Executive Orders. E.O. 13514, Federal Leadership in Environmental, Energy, and Economic Performance, issued in November 2009, established goals and targets for greenhouse gas reductions. The E.O.s did not rescind previous requirements, but updated goals and baselines and added new initiatives. The E.O.s set goals in areas of energy efficiency, renewable energy, acquisition, toxics reduction, recycling, sustainable buildings, electronics stewardship, and water conservation.	Waste minimization, pollution prevention, recycling, and affirmative procurement objectives are achieved in accordance with the WVDP "Waste Minimization Pollution Prevention Awareness Plan." The "WVDP FY 2010 E.O. 13514 RCRA/EO Affirmative Procurement Report" and the "Annual Report on Pollution Prevention Progress For FY 2010" were posted to the DOE website on November 30, 2010. (See Tables ECS-6 and ECS-7.)
Title 10 Code of Federal Regulations (10 CFR) Part 830, Subpart A	10 CFR Part 830, **Nuclear Safety Management**, Subpart A, **Quality Assurance Requirements** provides the quality assurance (QA) program policies and requirements applicable to activities at the WVDP.	A QA program that provides a consistent system for collecting, assessing, and documenting data pertaining to radionuclides in the environment is implemented at the WVDP.
42 USC §4321 et seq.	The **National Environmental Policy Act (NEPA)**, of 1969 and as amended in 1970, established a national policy to ensure that protection of the environment is included in federal planning and decisionmaking. The President's Council on Environmental Quality established a screening system of analyses and documentation that requires each proposed action to be categorized according to the extent of its potential environmental impact.	NEPA documents are prepared at the WVDP to describe potential environmental effects associated with proposed activities. The level of documentation depends upon whether the action constitutes a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. Draft documents are prepared and issued for public comment for major federal actions requiring an EIS. Based on the analyses presented, considering regulatory agency and public input, the DOE determines the preferred alternative and issues a ROD. Refer later in this chapter for further discussion of NEPA activities.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 617 New York State (NYS) Environmental Conservation Law (ECL)	The NY **State Environmental Quality Review Act (SEQR) of** January 1, 1996, enacted in September 1976 and as amended on June 26, 2000, requires adequate environmental review and assessment of whether a proposed action has the potential to have a significant environmental impact, prior to a decision regarding the action. Where a project involves both NYS and federal approvals, it is preferred to coordinate the SEQRA and NEPA processes.	The SEQR process is an action-forcing statute that requires state agencies to incorporate environmental considerations directly into their decisionmaking, and where necessary, to modify that action to mitigate adverse environmental effects. Coordinated efforts were made at the WVDP to effectively utilize information from the federal EIS process to make the required SEQR Findings Statement for the WVDP and WNYNSC, which was issued in May 2010.
42 USC §6901 et seq., and NYS ECL	The **Resource Conservation and Recovery Act (RCRA)** of 1976 and the **NYS Solid Waste Disposal Act** (NYS ECL Article 27 [Title 9]) govern the generation, storage, handling, and disposal of hazardous wastes and closure of systems that handle these wastes. RCRA was enacted to ensure that hazardous wastes are managed in a way that protects human health, safety, and the environment.	Generation, storage, handling, treatment, and disposal of hazardous waste, and closure of systems that handle hazardous waste at the WVDP, are conducted in accordance with the RCRA interim status regulations. The New York State Department of Environmental Conservation (NYSDEC) performed a hazardous waste compliance inspection of the WVDP facilities on March 31, 2010 and reported no violations of NYS hazardous waste regulations. The EPA performed a RCRA hazardous waste treatment, storage, and disposal facility inspection on August 11, 2010, and reported no negative findings. A detailed discussion of RCRA activities is presented later in this chapter.
Amendment to 42 USC §6961	The **Federal Facilities Compliance Act (FFCA)** of 1992 (an amendment to RCRA) requires DOE facilities to prepare a site treatment plan (STP) for treating mixed waste inventories to meet land disposal restrictions and to update the plan (i.e., annually) to account for changes in mixed waste inventories, capacities, and treatment technologies. The DOE entered into a Consent Order with NYSDEC for the WVDP in 1996.	The WVDP STP update for fiscal year (FY) 2009, revised in February 2010, consists of two volumes, the background volume and the plan volume. The FFCA requires completing milestones identified in the plan volume. The FY 2009 plan identified three proposed milestones for waste streams managed under the WVDP STP, all of which were completed by September 30, 2010.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Docket No. II RCRA 3008(h) 92-0202	The DOE and NYSERDA entered into the **RCRA §3008(h) Administrative Order on Consent** (the Consent Order) with the EPA (lead agency) and NYSDEC in March 1992. The state and federal RCRA regulations authorize the agencies to issue orders requiring RCRA corrective actions associated with the potential releases of hazardous waste and/or hazardous constituents from solid waste management units at the WNYNSC.	Written procedures and site activities are compliant with the Consent Order. In accordance with the Consent Order, the DOE submits quarterly reports to the EPA and NYSDEC that summarize all RCRA §3008(h) activities and progress conducted at the WVDP for the representative quarter. In 2010, the WVDP transmitted five corrective measures studies for six SWMUs under the Consent Order. A detailed discussion of calendar year (CY) 2010 activities is presented later in this chapter.
RCRA 3016 Statute	The **RCRA 3016 Statute** applies to all Federal hazardous waste facilities currently owned or operated by the government. It requires that facility hazardous waste information be submitted to the EPA and authorized states.	WVDP facility hazardous waste activities are reported biennially to the EPA and NYSDEC. The RCRA 3016 Biennial Report for 2010 was submitted on March 1, 2010.
42 USC §7401 et seq.; 40 CFR 61, Subpart H; and 6 NYCRR Chapter 3, Air Resources	The **Clean Air Act** of 1970 and the **NYS ECL** regulate the release of air pollutants through permits and air quality limits. Emissions of radionuclides are regulated by the EPA via the **National Emission Standards for Hazardous Air Pollutants (NESHAP)** regulations. Nonradiological emissions are permitted under 6 NYCRR Part 201-4 (Minor Facility Registrations).	The DOE maintained six NESHAP permits for radiological emissions and one Air Facility Registration Certificate for nonradiological emissions at the WVDP, during 2010. The annual NESHAP Report summarizing radiological emissions and estimated dose was submitted to the EPA. Estimated dose to the MEOSI from radiological air emissions 2010 was 0.017% of the 10-mrem Subpart H standard. Refer to Chapter 3, "Dose Assessment," for discussion. In January, 2011, DOE performed a review of the WVES NESHAP program. Although four findings were identified, the overall adequacy and implementation of the WVDP NESHAP program is considered effective. (See "EMS Audits and Other Audits and Assessments" section in Chapter 1.) In CY 2010, two utility steam boilers were responsible for nonradiological emissions of nitrogen and sulfur oxides at 0.42% of the 49.5-ton capping limit for maintaining the minor facility registration certificate.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
33 USC §1251 et seq. and NYS ECL	The **Federal Water Pollution Control Act** of 1977 (**Clean Water Act [CWA])** and **NYS ECL** (Article 17 [Title 8]) seek to improve surface water quality by establishing standards and a system of permits. Wastewater and storm water discharges are regulated by NYSDEC through the State Pollutant Discharge Elimination System (SPDES) permit. Discharges of fill material are regulated through permits issued by the U.S. Army Corps of Engineers (USACE) and water quality certifications issued by NYSDEC.	Monthly SPDES Discharge Monitoring Reports are submitted to NYSDEC. Wastewater was monitored for chemical constituents during lagoon discharges, and the SPDES-permitted storm water monitoring was completed during 2010 by sampling the eight drainage basins during qualifying storm events. During 2010, no SPDES permit limit exceedances were noted. A modified SPDES permit became effective on July 1, 2011. Refer to "SPDES Permit" later in this chapter, and to "SPDES Permit Required Monitoring" in Chapter 2 for further discussion.
NYS ECL Article 17, Titles 7 and 8, and ECL Article 70	**NYS ECL Article 17 (Titles 7 and 8), and** ECL **Article 70** regulate storm water discharges related to construction activity. Authorization was required from the NYSDEC, Division of Water, to utilize the general permit (GP-0-10-001) for management of storm water associated with construction activities during the construction and installation of the north plateau full-scale permeable treatment wall (PTW).	WVES submitted to NYSDEC a Notice of Intent and a Storm Water Pollution Prevention Plan (SWPPP) for storm water discharges associated with construction activities for the north plateau PTW preconstruction and construction activities at the WVDP. All requirements of the SWPPP were met by December 2010, and the notice of termination was submitted to NYSDEC in August 2011, following ground disturbance stabilization.
NYS Navigation Law and NYS ECL	**NYS ECL** Article 17 (Titles 10 and 17), 6 NYCRR 612–614 and Parts 595–599, and 6 NYCRR Subpart 360-14 regulate design, operation, inspection, maintenance, and closure of aboveground and underground petroleum bulk storage (PBS) and chemical bulk storage (CBS) tanks. Also regulates spill reporting and cleanup. Under terms of a 1996 agreement, amended in 2005, the DOE is not required to report a spill of petroleum product onto an impervious surface if the spill is less than 5 gallons and is cleaned up within two hours of discovery.	The last CBS tank at the WVDP was closed under these regulations in 2006. There remain nine registered PBS tanks (eight aboveground and one underground) that are periodically inspected and maintained. NYSDEC performed an inspection of PBS tanks on November 17, 2010, noting no issues, violations, or negative observations. Spills are reported and cleaned up in accordance with written policies and procedures. There were no reportable spills during the first or second quarters of 2010. There was one spill of petroleum product (approximately 10 gallons) during the third quarter of 2010 that required immediate notification to NYSDEC. The spill was contained and cleaned up within two hours. There were also three additional smaller spills during the third quarter and five during the fourth quarter of CY 2010. The smaller quantities of less than 5 gallons did not require immediate notification to NYSDEC, but were reported in quarterly reports.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
E.O. 11990	E.O. 11990, **Protection of Wetlands**, directed federal agencies to avoid, where possible, impacts (e.g., destruction, modification, or new construction) that would adversely effect wetlands wherever there is a practical alternative. Activities in wetlands are regulated by the U.S. Army Corps of Engineers and NYSDEC permits. The wetlands on the WVDP are subject to regulation under Section 404 of the CWA and NYS ECL Articles 24 and 36.	Wetlands are periodically identified and delineated on the WVDP. In 2006, the USACE confirmed that 34.09 acres of wetlands, subject to federal jurisdiction, exist within and adjacent to the WVDP. A wetland complex of 17.3 acres is subject to NYSDEC jurisdiction. A re-delineation identified an additional wetland of 0.09 acres, adjacent to the live-fire range, that is hydrologically connected to the NYSDEC jurisdictional wetlands. During 2010, there were no activities performed that adversely impacted the delineated wetlands.
42 USC §9601 et seq.	The **Comprehensive Environmental Response, Compensation, and Liability Act** of 1980 **(CERCLA**, including the **Superfund Amendments and Reauthorization Act** of 1986 **[SARA]**) provided the regulatory framework for remediation of releases of hazardous substances and remediation of inactive hazardous waste disposal sites.	Based on the results of a Preliminary Assessment Report prepared for the DOE, it was determined that the WVDP did not qualify for listing on the national priorities list. Therefore, no further investigation pursuant to CERCLA was warranted. However, if a hazardous substance spill exceeds a reportable quantity, CERCLA reporting requirements may be triggered.
42 USC §11001 et seq.	The **Emergency Planning and Community Right-to-Know Act (EPCRA)** of 1986 (also known as SARA Title III) was designed to create a working partnership between industry, business, state and local government, and emergency response representatives to help local communities protect public health, safety, and the environment from chemical hazards.	Chemical inventories for the WVDP are reported quarterly under EPCRA as appropriate. There were no releases of hazardous substances in 2010 that triggered release notifications under EPCRA. A new 13,000-gallon liquid nitrogen tank was installed in 2009 to support the nitrocision effort. Zeolite, used in construction of the PTW, was held on site in volumes greater than threshold quantities. Refer to Tables ECS-9 and ECS-10.
42 USC §300f et seq.	The **Safe Drinking Water Act** of 1974 requires that each federal agency operating or maintaining a public water system must comply with all federal, state, and local requirements regarding safe drinking water. Compliance in New York State is verified by oversight of the New York State Department of Health (NYSDOH), through NYS Public Health law, and the Cattaraugus County Health Department (CCHD).	The WVDP operates a non-transient, non-community public drinking water system serving a population of less than 500. All CY 2010 results from analyses of drinking water were reported within limits to the CCHD. The CCHD performed an inspection of the treatment and distribution system on March 11, 2010, during which backflow prevention device testing documentation was verified. No issues or concerns were identified.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
10 CFR Part 851	10 CFR 851 **"Worker Safety and Health Program"** of 2006 requires DOE contractors to provide workers with a safe and healthful workplace. To accomplish this objective, the rule established program requirements specific to management responsibilities, worker rights, hazard identification and prevention, safety health standards, required training, recordkeeping, and reporting.	Procedures and programs are revised to maintain requirements that comply with 10 CFR 851. Any proposed modification that may invalidate a portion of the worker health and safety program at the WVDP must be approved by DOE-WVDP. The plan was reviewed by WVES in September 2010, and it was determined that no changes to the current plan were necessary.
10 CFR Part 835	10 CFR Part 835, **Occupational Radiation Protection**, November 2006 as amended June 2007, established radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.	In July 2008, the "WVES Documented Radiation Protection Program and Implementation Plan for 10 CFR Part 835, as amended June 2007" was issued, and full compliance with 10 CFR 835 was achieved by January 1, 2011.
15 USC §2601 et seq., and 12 NYCRR Part 56	The **Toxic Substances Control Act** of 1976 regulates the manufacture, processing, and distribution of chemicals, including asbestos-containing material (ACM) and polychlorinated biphenyls (PCBs). Effective September 2006, the New York State Department of Labor (NYSDOL) significantly revised the asbestos regulations, cited in 12 NYCRR Part 56. As a result, operating procedures were revised, special training for asbestos workers was conducted, and the WVDP applied for and was granted site-specific variances.	During 2010, ACM activities were managed in accordance with the site "Asbestos Management Plan" and activities were completed by personnel certified by NYSDOL. On March 10, 2010, the NYSDOL conducted an unannounced inspection of asbestos-handling activities at the WVDP. No violations, observations, or findings were identified. Refer to Table ECS-5 for a summary of asbestos waste management activities. Management of PCBs was done in accordance with the WVDP "PCB and PCB-Contaminated Material Management Plan." The WVDP operators maintain an annual document log that details PCB use and changes in storage or disposal status.
7 USC §136 et seq.	The **Federal Insecticide, Fungicide, and Rodenticide Act** of 1996 and **NYS ECL** provide for EPA and NYSDEC control of pesticide distribution, sale, and use.	Chemical pesticides are applied at the WVDP only after alternative methods are evaluated by trained and NYSDEC-certified professionals and determined to be unfeasible. In 2010, 108 lbs of a germicidal detergent was used to clean respirators. The cooling tower is no longer in use, therefore biocide use for water treatment is no longer necessary.
NYS ECL, Article 15, Title 5, et seq.	**NYS ECL**, Article 15, Title 5, **Protection of Water** regulates the safety of dams and other surface water impounding structures, including construction, inspection, operation, maintenance, and modification of these structures. Revised dam safety regulations became effective on August 19, 2009. The dams maintained by the WVDP, on the WNYNSC property, are classified as Class A - low-hazard dams.	Two surface water impounding dam structures are located on the WNYNSC: NYS Atomic Development Dam #1 (DEC Dam ID #019-3149) and NYS Atomic Development Dam #2 (DEC Dam ID #019-3150). Inspections and maintenance are routinely performed and documented. Repairs or construction activities related to the dams may require permits from NYSDEC. Refer to "Safety Inspections of the WNYNSC Dams" discussion later in this chapter.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
NYS ECL Article 15, Title 33, Part 675	**NYS ECL,** Article 15, Title 33 **Water Withdrawal Reporting** requires that any person who withdraws or is operating any system or method of withdrawal that has a capacity to withdraw more than 100,000 gallons of groundwater or surface water per day shall file an annual report with NYSDEC. The legislation was enacted to gain more complete information for managing the state's water resources.	WVES operates a non-transient, non-community public water supply system for drinking water and operational purposes at the WVDP. In compliance with the legislation, the "2010 WVDP Water Withdrawal Annual Report" was submitted to NYSDEC on February 3, 2011. The WVDP withdrew an average of 89,000 gallons per day. An updated Water Withdrawal Registration Certificate (NYGL08701) was issued to the DOE by NYSDEC on August 24, 2011.
NYS Public Health Law	**Public Health Law**, Article 5 (Laboratories), Section 502 (Environmental Laboratories, Examinations, and Certificates of Approval)	The WVDP Environmental Laboratory (the URS Corporation Laboratory) is certified by NYSDOH for certain radiological and nonradiological constituents in potable and nonpotable water.
49 CFR Part 172, and 6 NYCRR Part 364.9	6 NYCRR Part 364.9 regulates handling and storage of potentially infectious regulated medical waste. 49 CFR Part 172, Subpart H regulates transportation safety and disposal of regulated medical waste at a licensed facility.	The on-site health services office is registered with NYS as a "Small Quantity Generator" of regulated medical waste. Medical services generate potentially infectious medical wastes that are securely stored in approved biohazard containers and are handled and controlled by authorized personnel.
16 USC §703 et seq., and 6 NYCRR Part 175	The **Migratory Bird Treaty Act** of 1918 implemented various treaties and conventions between the U.S. and foreign countries for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. (See also 6 NYCRR Part 175, **Special Licenses and Permits - Definitions and Uniform Procedures.)**	The DOE maintains, and complies with, a NYSDEC Division of Fish and Wildlife Bird Depredation License and a U.S. Fish and Wildlife Bird Depredation Permit for the WVDP. (See Table ECS-12.)
16 USC §1531 et seq., and 6 NYCRR Part 182	The **Endangered Species Act** of 1973 provided for the conservation of endangered and threatened species of fish, wildlife, and plants. (See also 6 NYCRR Part 182, **Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern**.)	Several ecological surveys of the WNYNSC premises have been conducted. Except for "occasional transient individuals," no plant or animal species protected under the Endangered Species Act are known to reside at the Center.
16 USC §470	The **National Historic Preservation Act** of 1966 established a program for the preservation of historic properties throughout the nation.	Surveys have been conducted of the WNYNSC for historic and archaeological sites. Surveys revealed American Indian and historic homestead artifacts, consistent with the area.

TABLE ECS-1 *(concluded)*
Compliance Status Summary for the WVDP in CY 2010

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
E.O. 11988	E.O. 11988, **Floodplain Management**, was issued to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.	No activities were performed during 2010 at the WVDP that would develop or be adversely impacted by the 100-year floodplain within the premises.
40 CFR §144.26 and 144.24	The EPA regulates injection of tracer solutions into groundwater monitoring wells, in accordance with the **Underground Injection Control Program Regulation**. On November 18, 2010, the EPA authorized the injection of sodium bromide tracer solution into select wells within the north plateau.	A suite of wells in the north plateau PTW were used to inject sodium bromide tracer solution to support activities for the remediation of the strontium-90 plume by estimating local groundwater flow velocities. The tracer tests were performed in February and March 2011.
Stipulation Pursuant to NYS ECL Section 17-0303, and Section 176 of the Navigation Law	In accordance with **Stipulation No. R9-4756-99-03**, dated March 1999, the DOE agreed to install a soil bioventing system to remediate petroleum contaminated soils in the warehouse underground tank site (NYSDEC Spill number 9708617). The remediation plan was to construct a bioventing system, operate it for two calendar years, assess performance, and report to NYSDEC.	The system stimulated natural in-situ biodegradation of petroleum hydrocarbons in the soil by providing abundant oxygen to existing microorganisms. After reviewing soil and water sampling, analyses, and evaluations, NYSDEC determined that no further remediation was required. A determination regarding the potential need for future actions will be made consistent with Phase 2 decisionmaking under the NEPA process.
6 NYCRR 360	**NYS ECL Solid Waste Management Facility Regulations** define requirements for closure of nonradioactive solid waste disposal facilities in a manner that protects the environment.	In 1986, an engineering closure plan was submitted to and approved by NYSDEC for the construction and demolition debris landfill (CDDL). The closure was performed in accordance with landfill closure regulatory requirements specified in the approved closure plan. The plan also requires post-closure perpetual maintenance and annual reporting in this ASER. The CDDL cover was inspected on April 24 and November 23, 2010 for integrity and bare areas and the culverts were inspected for erosion and silting. All areas were found to be in good condition.

2010 Accomplishments and Highlights at the WVDP

West Valley Environmental Services LLC (WVES) operated the WVDP safely and in a manner that continued to be protective of the public, its workers, and the environment throughout 2010. The projects were carried out in accordance with applicable permits and licenses. The following accomplishments contributed to major progress in support of completion of the requirements identified in the WVDP Act.

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. The New York State Energy Research and Development Authority (NYSERDA) published its corresponding decision under the State Environmental Quality Review Act (SEQR) in a statement of findings in May 2010. It was determined that in Phase 1, the Main Plant Process Building (MPPB) including underlying contaminated soils, the vitrification facility, the remote-handled waste facility, wastewater treatment lagoons, and a number of other facilities will be removed. Facility disposition actions identified under Phase 1 Site Decommissioning are scheduled to be carried out under the new contract that was awarded to CH2MHill • B&W West Valley, LLC on June 29, 2011. On March 14, 2011, the DOE and NYSERDA entered into a second supplemental agreement to the cooperative agreement which set forth special provisions for the identification, implementation, and management of the Phase I studies that may provide data for consideration in Phase 2 decisionmaking.

The Phase 2 decommissioning decision, which will address the remaining facilities, will be made within 10 years of the EIS ROD. 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. The complete FEIS and the ROD can be viewed online at the DOE-WVDP website at www.wv.doe.gov.

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 define what the cleanup will be or the end state of the WVDP and the WNYNSC.

Radioactive Waste Processing. 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^3 [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 the waste processing activities were accelerated using American Recovery and Reinvestment Funding (ARRA).

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 the processing of 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. Dismantlement 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 (GPC). All work was done remotely in these three cells because of elevated radiological contamination and limited accessibility. Contaminated coating on the walls and floors of the PMC and the GPC was removed using the Nitrocision® technology. In XC-1, which still contains original process equipment used during commercial nuclear fuel reprocessing, a robotic arm was used to remove the piping. As of early 2011, three large vessels from XC-1 have been remotely removed and packaged in shielded containers.

Work was 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 dose 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 has been 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 trapping and holding the 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 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 volume of liquids in the tanks and the harmful effects of corrosion on the underground waste tanks situated within concrete vaults that were originally installed in the 1960s. Corroded pipe was replaced with stainless-steel ventilation lines, a rotary 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 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 under 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:

- 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 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.

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

Phase 1 Decommissioning Contract. The DOE released the request for proposal for the Phase 1 facility disposition contract for the next phase of work at the WVDP. Services to be provided in the contract include:

- Project management and support;
- Site operations, maintenance, and utilities;
- High-level radioactive waste (HLW) canister relocation;

- Facility disposition, including demolition of the MPPB;
- Waste tank farm management;
- U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA) management;
- Waste management and nuclear materials disposition;
- Environmental monitoring, safeguards, and security.

The contract was awarded to CH2MHill • B&W West Valley, LLC of Englewood, Colorado on June 29, 2011.

National Environmental Policy Act (NEPA)

NEPA requires the DOE to consider the overall environmental effects of its proposed actions. Draft documents are prepared that describe potential environmental effects associated with proposed Project activities. The level of evaluation and documentation depends upon whether the action constitutes a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. The categories of documentation include categorical exclusions (CXs), environmental assessments (EAs) and EISs.

CXs document actions that, by their nature, will not have a significant effect on the environment. EAs are used to evaluate the extent to which a proposed action, not categorically excluded, will affect the environment.

Based on the analyses presented in an EA and considering regulatory agency, stakeholder, and public comment, the DOE may determine that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. As a result, the DOE may issue a notice indicating the finding of no significant impact and therefore would not be required to prepare an EIS.

If a proposed action has the potential for significant environmental effects, an EIS would be prepared that describes proposed alternatives to an action and explains the effects of each. Based on the analyses presented, and considering regulatory agency and public input, the DOE will determine the preferred alternative and issue a ROD regarding the action.

Since the Project began, a number of proposed site activities have warranted environmental impact evaluations. A summary of the significant NEPA document history is presented in Table ECS-2. Decisions resulting from the final EISs and associated RODs and EAs are required before starting new waste management and remediation activities at the Project.

FEIS Issued. In December 2008, the DOE issued a notice of public availability in the Federal Register for the "Revised Draft EIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC" (DOE/EIS-0226-D). The DOE and the NYSERDA were the lead agencies on this EIS, and the EPA, NRC, and NYSDEC were cooperating agencies. NYSDOH was an involved agency under SEQR. The draft was distributed for a six-month public review process, plus a three-month extension.

In January 2010, the DOE and NYSERDA issued the FEIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC (DOE/EIS-0226). On April 14, 2010, the DOE issued the ROD for the FEIS, selecting the phased decisionmaking alternative. In Phase 1, the DOE will decommission the MPPB, the vitrification facility, remote-handled waste facility, the wastewater treatment lagoons, and a number of other facilities. No decommissioning actions will be taken on the underground HLW tanks or the NDA, and the HLW canisters will be safely stored on site. NYSERDA will manage the State-licensed disposal area.

NYSERDA issued a SEQR Findings Statement for the phased decisionmaking preferred alternative on May 12, 2010, as required in accordance with Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 617.12(b).

While decommissioning activities are underway in Phase 1, the DOE and NYSERDA will undertake a number of studies to help determine the best technical approach to complete decommissioning of the remaining facilities. Phase 1 is expected to take up to 10 years, during which time the DOE will manage the site's remaining facilities in a safe manner. The Phase 2 decision will be made within 10 years of the EIS ROD.

Phase 1 Decommissioning Plan for the WVDP. On December 5, 2008, the DOE issued the proposed "Phase 1 Decommissioning Plan (DP) for the West Valley Demonstration Project, West Valley, NY" (73 Federal Register 74162) and transmitted the DP to the NRC for review. The plan was prepared pursuant to statutory obligations required under the WVDP Act and to satisfy commitments made to the NRC in 1981 under the DOE/NRC memorandum of understanding, and again in 2003. The DP addressed Phase 1 of the two phases of the proposed WVDP decommissioning ap-

TABLE ECS-2
National Environmental Policy Act (NEPA) Documents Affecting DOE Activities at the WVDP

Year	*Action*	*Outcome*
1982	The final Environmental Impact Statement (EIS) and associated Record of Decision (ROD) were issued outlining the actions the United States Department of Energy (DOE) proposed for solidification of the liquid high-level radioactive waste (HLW) contained in the underground tanks (DOE-EIS-0081).	The initial period of West Valley Demonstration Project (WVDP) Act work activities, completed in September 2002, removed the HLW from the tanks and immobilized it into borosilicate glass through vitrification. The glass canisters remain on site in storage.
1988	The DOE and the New York State Energy Research and Development Authority (NYSERDA) published a Notice of Intent (NOI) to prepare the EIS for Completion of the WVDP and Closure or Long-Term Management of the Facilities at the Western New York Nuclear Service Center (WNYNSC [or Center]).	The draft EIS was issued in 1996.
1996	The DOE and NYSERDA issued the “Draft EIS for the Completion of the WVDP and Closure or Long-Term Management of the Facilities at the WNYNSC” (DOE/EIS-0226-D).	The draft EIS was issued without a preferred alternative for a six-month review and comment period. After issuance of the draft EIS, and despite long negotiations, the DOE and NYSERDA were unable to reach an agreement on the future course of action for closure at the Center (see Government Accounting Office, 2001).
1997	Following issuance of the draft 1996 EIS, NYSERDA and the DOE formed a stakeholder advisory group (the West Valley Citizen Task Force [CTF]) to provide additional input to the public comment process required by the National Environmental Policy Act (NEPA).	The CTF mission is to provide stakeholder input to decisionmaking for development of a closure option for the WVDP and the WNYNSC.
1997	The DOE Headquarters issued the “Final Waste Management Programmatic EIS,” (WM PEIS [DOE/EIS-0200F]) to evaluate nationwide management and siting alternatives for treatment, storage, and disposal of five types of radioactive and hazardous waste.	The WM PEIS (DOE/EIS-0200F) was issued with the intent to issue a separate ROD for each type of waste generated, stored, or buried over the next 20 years at 54 sites in the DOE complex.
1999	The DOE issued a ROD for nationwide management of HLW, Vol. 64, Federal Register (FR), p. 46661 (64 FR 46661)	The ROD specified that WVDP-vitrified HLW will remain in storage on site until it is accepted at a geologic repository.
2000	The DOE issued a ROD for nationwide management of low-level radioactive waste (LLW) and mixed LLW (65 FR 10061).	The Hanford site in Washington State and the Nevada Test Site were designated as national DOE disposal sites for LLW and mixed LLW.
2001	The DOE published an NOI (66 FR 16447) formally announcing its rescoping plan and preparation of the waste management EIS for the WVDP. The DOE published an Advance NOI (66 FR 56090), announcing in advance, its intention to prepare an EIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC.	The rescoping plan split the scope of the 1996 WVDP Draft EIS into two phases: (1) near-term waste management decisionmaking and (2) final decommissioning and/or long-term stewardship decisionmaking. The advanced NOI informed interested parties of a pending EIS and provided opportunity for public comments early in the process.

TABLE ECS-2 *(concluded)*
National Environmental Policy Act (NEPA) Documents Affecting DOE Activities at the WVDP

Year	*Action*	*Outcome*
2003	The DOE issued a notice of availability of the "WVDP Draft Waste Management EIS" (68 FR 26587).	The draft EIS presented alternatives for near-term management of WVDP LLW, mixed LLW, transuranic (TRU) waste, and HLW.
2003	The DOE, in cooperation with NYSERDA, issued an NOI (68 FR 12044) to issue an EIS for "Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC."	As a result of comments during the scoping process and the complexity of issues relating to long-term agency responsibility, this EIS was delayed (DOE-EIS-0226-R).
2005	The DOE issued a ROD, based on alternative A, for the "WVDP Waste Management EIS (WVDP WM EIS-0337)" (70 FR 35073).	The HLW canisters will remain in storage on site until transfer to a geologic repository, the decision on TRU waste would be deferred until certification is obtained from the Waste Isolation Pilot Plant in Carlsbad, New Mexico, and LLW and mixed LLW would be shipped off site for disposal at commercial or DOE sites.
2005	On August 26, 2005, the Coalition on West Valley Nuclear Wastes (the Coalition) filed a complaint in the U.S. District Court, Western District of New York, against the DOE regarding the NEPA process at the WVDP. The Coalition contended that the DOE's rescoping plan to split the 1996 draft WVDP EIS violated NEPA and the Stipulation of Compromise. The Coalition also sought a declaration that the DOE is not empowered to reclassify waste at the WVDP using the "waste incidental to reprocessing" determination.	On September, 28, 2007, the U.S. District Court, Western District of New York ruled to dismiss the complaint in its entirety. Refer to Case 1:05-cv-00614-JTC, Document 41, filed September 28, 2007 for the ruling.
2006	An Environmental Assessment (EA) (DOE/EA-1552) evaluated the proposed decontamination, demolition, and removal of select facilities at the site. A finding of no significant impact (FONSI) was issued.	The EA, with the associated FONSI, cleared the way for removal of 36 facilities that were (or in the next four years would be) no longer required to support activities at the WVDP.
2007	DOE issued an NOI to prepare an EIS for the disposal of Greater-Than-Class-C (GTCC) LLW (72 FR 40135). In March 2011, the DOE issued the draft EIS for the disposal of GTCC LLW and GTCC-like waste.	Nine scoping meetings were held throughout 2007; the draft was never issued. On February 25, 2011, a notice of availability for the Draft GTCC EIS was issued with the 120-day public comment period ending on June 27, 2011.
2008	The DOE issued a notice of availability for the revised "Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC (DOE/EIS-0226-D [Revised])" (73 FR 74160).	The draft EIS evaluated the range of reasonable alternatives for decommissioning and/or long-term stewardship of the facilities at the Center. This EIS is a revised draft of the 1996 Cleanup and Closure Draft EIS. The draft EIS was distributed December 5, 2008, for a six-month public review period, which was extended through September 8, 2009.
2010	In January 2010, the DOE issued the "Final EIS (FEIS) for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC (DOE/EIS-0226 [Revised])". On April 14, 2010, the DOE issued the ROD for the FEIS, selecting the phased decisionmaking alternative as the preferred alternative. On May 12, 2010, NYSERDA issued a New York State Environmental Quality Review Act Findings Statement selecting the phased decisionmaking alternative as the preferred alternative.	In phase 1 of the phased decisionmaking preferred alternative, the DOE will decommission the main plant process building, the vitrification facility, remote-handled waste facility, the wastewater treatment lagoons, and a number of other facilities. Concurrently, sample data and information will be collected and analyzed to support a more-informed Phase 2 decision. The Phase 2 decision will be made within 10 years of the EIS ROD.

proach based on the phased decisionmaking alternative selected in the ROD and Findings Statement for the WVDP and the WNYNSC.

On September 16, 2009, the NRC held an open house at West Valley, New York to provide the status of NRC's review of the Phase 1 DP to interested members of the public. Representatives of the NRC review team provided information on different aspects of its review. This meeting format provided an opportunity for one-on-one interaction between members of the public and the NRC review team. Topical areas included: DP review status, alternative conceptual model uncertainty, radiological dose assessment, hydraulic barrier evaluation, radiological surveys and sampling, as-low-as-reasonably-achievable evaluations, and NRC monitoring activities.

On December 18, 2009, the DOE submitted the revised Phase I DP (revision 2) after incorporating changes in response to the NRC's request.

On February 25, 2010, the NRC transmitted to DOE-WVDP a Technical Evaluation Report for the Phase 1 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.

Phase 1 Characterization Sampling and Analysis Plan (CSAP) and the Phase 1 Final Status Survey Plan (FSSP). The CSAP provides details about environmental data collection that will take place to support the decommissioning activities described in the Phase 1 DP. The DP provided the foundation for CSAP activities by defining the portions of the WVDP within the Phase 1 DP scope; identifying the radionuclides of interest; developing cleanup guidelines for soils that meet unrestricted release criteria; and describing events required to meet the Phase 1 DP objectives. The CSAP and FSSP are supporting documents that provide additional detail to implement and support Phase 1 DP activities, and support Phase 2 decisionmaking.

The CSAP data collection objectives are divided into four main categories:

- pre-design data collection to support appropriate Phase 1 designs;
- remedial action support to guide phase 1 activities while underway;
- post-remediation status documentation; and
- provide information to support Phase 2 decisionmaking.

Within these categories, specific goals have been defined to evaluate the radionuclides of interest for each waste management area (WMA), establish background data sets if necessary, and to determine the extent of surface contamination above the derived concentration guideline levels (DCGLs).

The FSSP provides protocols for demonstrating that specific portions of the WVDP premises meet the DCGLs developed by the Phase 1 DP. The FSSP applies to soils exposed as part of the WMA 1 and WMA 2 deep excavations, and potentially to surface soils outside those excavations where subsurface contamination is not present. The CSAP and the FSSP have very prescriptive requirements regarding sampling and analysis of soils. The CSAP was written so that data collection to support characterization can potentially be used for final status survey purposes. The data will be needed to verify achievement of Phase 1 DP goals.

NRC reviewed these plans and submitted comments to the DOE on May 17, 2010. The DOE subsequently issued responses to the NRC comments on October 21, 2010.

Resource Conservation and Recovery Act (RCRA)

RCRA and its implementing regulations govern the life cycle of hazardous waste from "cradle-to-grave" and mandate that generators take responsibility for ensuring the proper treatment, storage, and ultimate disposal of their wastes.

The EPA is responsible for issuing guidelines and regulations for the proper management of solid and hazardous waste (including mixed [radioactive and hazardous] waste). In New York, the EPA has delegated the authority to issue permits and enforce these regulations to NYSDEC. In addition, the U.S. Department of Transportation is responsible for issuing guidelines and regulations for labeling, packaging, and spill reporting for hazardous and mixed wastes while in transit.

Hazardous Waste Permitting. A hazardous waste permit is required for facilities that store large quantities of hazardous waste for more than 90 days or treat or dispose of hazardous waste at the facility. In 1984, the DOE notified the EPA of hazardous waste activities at the WVDP and identified the DOE as a generator of hazardous waste.

RCRA Part A Permit Application. In 1990, to comply with 6 NYCRR Part 373-3, a RCRA Part A (i.e., Interim status) Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes. The WVDP has operated under interim status ever since. Facility operations are limited to those described in the RCRA Part A Permit Application and must comply with the interim status regulations; therefore, it must be revised prior to changes to the Project's waste management operations. Revisions to the RCRA Part A Permit Application were submitted to NYSDEC on February 3, 2010 and were conditionally approved by NYSDEC on June 9, 2011.

In accordance with the 6 NYCRR Part 373-3 requirements, the DOE prepared closure plans for the hazardous waste management units at the WVDP. The closure plans were transmitted to NYSDEC in anticipation of closure activities, and are revised as appropriate to address NYSDEC comments or changes in activities. To perform closure of a RCRA unit, NYSDEC must approve the closure plan and must be notified of the closure schedule. Waste is removed, and impacted areas are decontaminated. As identified in the closure plan, confirmatory sampling and analysis are performed, and data are evaluated and presented to NYSDEC in a closure certification report. Since 2006, two units (the interim waste storage facility and the lag storage building) have been clean-closed under interim status. A third unit, the lag storage area #1 (a unit that was not used for the management of hazardous waste), was also demolished and removed from the RCRA Part A Permit Application.

The RCRA Hazardous Waste Closure Plan for the Hazardous Waste Storage Lockers was submitted to NYSDEC on November 23, 2010 and approved on June 27, 2011. Closure plans for the remaining units were submitted with the RCRA Part B Permit application, as described below.

6 NYCRR Part 373-2 Permit Application. In 2003, NYSDEC made an official request for the submittal of a 6 NYCRR Part 373-2 Permit Application (i.e., Part B) for the WVDP. The complete 6 NYCRR Part 373-2 Permit Application was transmitted to NYSDEC in December 2004. This application included RCRA closure plans for all interim status units that continued to be managed in accordance with the 6 NYCRR Part 373-3 Permit Application.

On April 16, 2009, NYSDEC made an official request for submittal of a revised 6 NYCRR Part 373-2 Permit Application for the WVDP. To streamline the permit application, process information and closure plans were excluded for any operating hazardous waste management unit in which no waste will be stored after May 1, 2012. It is anticipated that such units will be closed under interim status. The revised permit application was submitted to NYSDEC on September 30, 2010.

In a correspondence dated December 20, 2010, NYSDEC submitted a request to indefinitely suspend the review timeframe for the permit application due to the scope and breadth of the application. On January 11, 2011, the DOE and NYSERDA, through WVES, submitted a signed agreement for an indefinite suspension of the NYSDEC completeness review.

RCRA §3008(h) Administrative Order on Consent (Consent Order). Section §3008(h) of RCRA authorizes the EPA to issue an order requiring corrective action to protect human health or the environment if there has been a release of hazardous waste or hazardous constituents to the environment from a solid waste management unit (SWMU). The DOE and NYSERDA entered into the Consent Order with NYSDEC and the EPA in March 1992. Consent Order activities performed to date are summarized below.

- RCRA Facility Investigation (RFI)

  The Consent Order required NYSERDA and the DOE's WVDP office to conduct RFIs (unit-specific environmental investigations) at SWMUs to determine if there had been a release or if there were a potential for release of RCRA-regulated hazardous constituents from SWMUs.

  Because many SWMUs are contiguous, or so close together as to make their separate monitoring impractical, many SWMUs were grouped into larger units, referred to as super SWMUs (SSWMUs). This terminology is unique to the WVDP, and is not an official regulatory term. Descriptions of the SSWMUs, and the individual constituent SWMUs, are presented in Table ECS-4. Figures A-7 and A-8 in Appendix A show the locations of the WVDP SSWMUs. The final RFI reports were submitted in 1997, completing the investigative activities associated with the Consent Order. No corrective actions were required at that time as a result of the RFIs.

  Groundwater monitoring, as recommended in the RFI reports and approved by the EPA and NYSDEC, continued during 2010 in compliance with the re-

quirements of the Consent Order. The groundwater monitoring results and the groundwater program at the WVDP are discussed in Chapter 4 "Groundwater Protection Program."

- Current Conditions Report

  Pursuant to a request from NYSDEC, a report entitled "West Valley Demonstration Project Solid Waste Management Unit Assessment and Current Conditions Report" was submitted in November 2004. This report summarized the historic activities at individual SWMUs through the RFI activities and provided environmental monitoring data and information on site activities performed since the completion of the RFI reports.

  This document was revised and submitted on September 29, 2010, incorporating changes in the operational status of each SWMU and providing updated environmental monitoring data. This document supported, and summary information was incorporated with, the revised 6 NYCRR Part 373-2 Permit Application.

- Corrective Measures Study (CMS)

  In 2004, NYSDEC requested CMSs to be performed on six specific SWMUs at the WVDP. The six SWMUs were:

  - NDA Burial Area (SWMU #2);
  - NDA Interceptor Trench (SWMU #23);
  - Demineralizer Sludge Ponds (SWMU #5);
  - Lagoon 1 (SWMU #3);
  - Construction Demolition and Debris Landfill (CDDL) (SWMU #1); and
  - The Low-Level Waste Treatment Facility (SWMUs #17, #17a, and #17b).

  The CMS Work Plan was conditionally approved by NYSDEC in October 2006. The draft CMS reports were revised in 2010 to provide closure information and to be consistent with the FEIS and the ROD. The revised documents were submitted to NYSDEC and the EPA on September 29, 2010.

- Interim Measures (IM)

  The NDA, identified as SSWMU #9, is regulated under the Consent Order. In 1990, a trench system was constructed through the weathered Lavery till along the northeast and northwest sides of the NDA to intercept and collect groundwater that was potentially contaminated with a mixture of radioactive n-dodecane and tributyl phosphate (TBP). Sampling location NDATR is a sump at the lowest point of the interceptor trench. Groundwater is collected at NDATR and is transferred to the low-level waste treatment facility for processing. Monitoring results in 2010 detected no TBP in groundwater from the NDA interceptor trench.

  NDA Cap - Per the "CMS Work Plan for Select SWMUs" and in response to Core Team comments on the work plan, the DOE evaluated engineering controls to improve the integrity of the NDA cap. Pursuant to Section VI, paragraph 7 of the Consent Order, the DOE implemented a second IM to ensure a minimum four-foot-thick earthen cap, minimize the potential release of impacted groundwater from the NDA, and minimize water infiltration into the NDA until the final disposition of the NDA is determined and can be implemented.

  In 2008, an approximately 850-foot-long trench was excavated along the south and western sides of the disposal area. The trench was backfilled with a bentonite and clay mixture that formed a low-permeability barrier (slurry wall) against lateral groundwater infiltration. The second part of the two-phase project involved resurfacing the entire five-acre landfill with additional soils, re-grading, compacting, and applying an impermeable geomembrane cover. The IM was within the scope and intent of the CX for small-scale, short-term cleanup actions, described in 10 Code of Federal Regulations (CFR) §1021, Subpart D, Appendix B, B6.1.

  Following installation of the slurry wall and cap over the NDA, NYSDEC requested submittal of a report and evaluation of the effectiveness of the IM. The plan, "Hydrogeologic Changes Observed at the NDA Since the 2008 IM and Recommendations for Long-term Monitoring," was prepared and submitted for NYSDEC review. The evaluations showed that groundwater elevation measurements have exhibited measurable decreases in groundwater flowing within the NDA since implementing the IM. On the outboard side of the slurry wall, groundwater levels have fluctuated, suggesting some mounding around the south side as water meets the wall and is diverted. The most notable analytical change since 2008 involves increases in the gross beta and strontium-90 concentrations at the trench sampling location (NDATR). These increased concentrations are believed to be due to decreased

water volumes accumulating in the trench, resulting in less dilution. Based on the successful performance of the IM, DOE submitted a proposed revised NDA inspection and monitoring plan to NYSDEC in December 2010.

- Quarterly Reporting to the EPA and NYSDEC

  In accordance with the Consent Order, the DOE transmits a quarterly progress report to the EPA and NYSDEC that summarizes all Consent Order activities conducted at the WVDP for the previous quarter. The summary includes progress and accomplishments, contacts with local community interest groups and regulatory agencies, changes to personnel, projected future work activities, and an inventory of mixed waste that was generated from decontamination activities during the reporting period. Other reports submitted to the EPA and NYSDEC under the Consent Order are the groundwater exception reports, and the NDA interceptor trench water level reports.

Hazardous Waste Management. Under RCRA, hazardous wastes at the WVDP are managed in accordance with 6 NYCRR Parts 370–374 and 376. Hazardous and mixed waste activities are reported to NYSDEC in the WVDP's Annual Hazardous Waste Report, which specifies the quantities of waste generated, treated, and/or disposed of, and identifies the treatment, storage, and disposal facilities used. The Annual Hazardous Waste Report for 2010 was submitted to NYSDEC in February 2011.

Additional reports are submitted each year to document hazardous waste reduction efforts. Pursuant to Article 27, Section 0908 of New York State Environmental Conservation Law, an annual update of the WVDP's Hazardous Waste Reduction Plan must be submitted to NYSDEC. The updates are submitted in two forms which differ slightly in scope. The plan is updated biennially to reflect changes in the types and amounts of hazardous wastes generated at the WVDP. The Annual Status Report for the Hazardous Waste Reduction Plan was submitted to NYSDEC on June 28, 2010. The biennial update to the Hazardous Waste Reduction Plan for CY 2010 was submitted to NYSDEC on June 21, 2011. Every other year, the Annual Status Report, essentially an abbreviated version of the biennial update, is submitted.

Mixed Waste Management. Mixed wastes that cannot be treated or disposed of within one year are managed according to the "Site Treatment Plan," prepared by the DOE under requirements of the Federal Facilities Compliance Act (an amendment to RCRA), in accordance with a Consent Order agreement. The annually updated plan describes the development of treatment capabilities and technologies for treating mixed waste. The fiscal year (FY) 2009 update brought the waste stream inventory and treatment information current to the end of FY 2010. There were three proposed milestones, and all were completed by September 30, 2010. If acceptable treatment or handling options were not available for a specific waste stream, an alternate schedule was prepared. During 2010, 3,793 pounds (1,720.48 kilograms) of hazardous and mixed waste were shipped off site for disposal. (See Table ECS-5.)

When there is a change to a mixed waste stream treatment technology, a Treatability Study Report is required to be submitted to NYSDEC in accordance with requirements of 6 NYCRR Part 371.1. A treatability study was initiated in 2009 and continued in 2010 to "stabilize and solidify radioactive mixed waste liquids generated as a result of decontamination/acid flushing of the liquid waste treatment system." The first step was taking a sample of the mixed waste from the storage tanks for characterization purposes. Based on mixed waste characterization data, Perma-Fix of Florida, Inc. developed a proposed treatment plan and a final recipe for testing. This study supports plans to solidify high-activity wastes from on-site stored liquids.

Nonhazardous, Regulated Waste Management. Nonradioactive, nonhazardous material was shipped off site to solid waste management facilities in 2010. Certain components of this waste (lead-acid batteries and spent lamps [i.e., universal wastes]) were reclaimed or recycled at off-site, authorized reclamation and recycling facilities. Digested sludge from the site sanitary wastewater treatment facility was shipped to the Buffalo Sewer Authority for disposal. Sanitary treated wastewater was routinely sampled and discharged to Erdman Brook in compliance with the WVDP's State Pollutant Discharge Elimination System (SPDES) permit.

Waste Minimization and Pollution Prevention. WVES submitted an annual pollution prevention report to the DOE summarizing recycling and waste generation information. See Table ECS-6, "Pollution Prevention Progress for FY 2010;" Table ECS-7, "Affirmative Procurement Accomplishments for FY 2010;" and Chapter 1, "Environmental Management System." Reports are submitted to the DOE to document hazardous waste reduction efforts, as discussed previously in the "Hazardous Waste Management" section. WVES minimized waste generation by deploying the robotically con-

trolled Nitrocision® technology to decontaminate larger contaminated components. High-pressure liquid nitrogen abrasive evaporates and results in no additional waste. The technology has been highly successful in removing high-activity fixed contamination from cell surfaces and large pieces of equipment. WVES also deployed a filter crusher that processed 38 waste boxes containing high-activity radioactive filters, and remotely volume-reduced TRU waste containers by segregation and reclassification of approximately 80,000 ft^3 (1,476 containers). These efforts reduced waste volumes and costs of final disposal.

CDDL Activities. The CDDL was closed in 1986 under a NYSDEC-approved closure plan for a nonradioactive solid waste disposal facility. Over time, the north plateau strontium-90 plume has migrated from the MPPB into the CDDL area and beyond. Characterization activities were performed during 2008 and 2009 to develop a plan to mitigate migration of the groundwater plume. Some of these activities were performed within and along the southern edge of the CDDL. Activities included Geoprobe® soil sampling and installing microwells within the disposal facility itself. In accordance with the closure plan, NYSDEC was notified of these activities. In 2010, a full-scale PTW was installed, south of the CDDL. Construction of the PTW did not impact the CDDL. See "Strontium-90 Plume Characterization and Remediation Activities in 2010" in Chapter 4.

SPDES Permit

On July 1, 2010, the DOE submitted to NYSDEC a Notice of Intent (NOI) and a storm water pollution prevention plan (SWPPP) applying for authorization from NYSDEC to utilize the SPDES General Permit (GP-0-10-001) for the management of storm water associated with preconstruction and construction activities while installing the north plateau PTW. NYSDEC granted authorization on July 7, 2010. The NOI and SWPPP were developed to address storm water, soil and sediment erosion control, and water quality requirements consistent with NYSDEC Storm Water Guidance Manual. All activities at the PTW construction site were in compliance with the requirements of GP-0-10-001, the SWPPP, and the NOI. The final requirement under GP-0-10-001, the issuance of the Notice of Termination, was submitted to NYSDEC in August 2011, following completion of the ground disturbance stabilization associated with the construction of the PTW.

On July 1, 2011, a modified SPDES permit became effective for the WVDP. Negotiations between the parties had been ongoing since the expiration of the previous permit (February 1, 2009). The terms of the previous permit remained in effect after the expiration date according to provisions of the State Administrative Procedure Act.

Process Sewer Integrity Evaluation. A breach in a laundry process sewer tributary line was identified in 2003, and was subsequently identified as SWMU #45 under the Consent Order. A New York State-licensed professional engineer (PE) performed an integrity evaluation in 2004, and recommended scheduled video inspections and routine cleaning. The 2009 video inspection films were compared with the 2004 films and showed that the lines were in overall sound condition. As long as the pipes are kept clear of obstruction and are not allowed to surcharge, potential concerns would be mitigated. It was recommended by the PE that the lines should be reinspected on a five-year cycle, and that they be further cleaned of sediment and debris prior to future video surveys.

Environmental Issues

Unplanned Radiological Airborne Release. Although emissions were low, there was one unplanned radiological airborne release at the WVDP during CY 2010. A ventilation upset caused by a power outage during 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.) There were no unplanned releases of waterborne radioactivity in 2010.

EPA Interim Approval to Use Environmental Measurements for National Emission Standards for Hazardous Air Pollutants (NESHAP) Compliance. Radiological NESHAP compliance at the WVDP is currently demonstrated by (1) measuring (and/or estimating) radiological emissions in air released from the site during the CY of interest and (2) using EPA-approved computer models to estimate the dose to the MEOSI. This method is referred to as the "measure and model" approach, and is most suitable for point sources of air emissions such as stacks or ducts. Resulting dose estimates for the WVDP have always been far below

the 10-millirem/year compliance standard. (See Chapter 3 for a discussion of dose assessment methodology.)

NESHAP regulations in Title 40 CFR Part 61, Subpart H allow (with prior EPA approval) for use of an alternate method of demonstrating compliance by measuring environmental concentrations of airborne radionuclides at critical receptor locations. As WVDP facilities continue to be closed, the relative importance of diffuse (nonpoint) sources to dose estimates will increase as the number of point sources suitable for emission measurements decrease. Therefore, the measure-and-model approach for demonstrating compliance will become less representative of total WVDP emissions, and the alternative approach of environmental air sampling will become the more appropriate method.

In June 2007, the DOE submitted a plan and a request to the EPA for approval to use environmental air measurements for demonstrating NESHAP compliance at the WVDP. In February 2009, the DOE submitted to the EPA a request for approval to proceed with demolition of the MPPB (after shutting down the MPPB ventilation system) and submitted an updated plan for implementing a program of environmental measurements to document NESHAP compliance. The plan included a one-year period of using both the "measure and model" and the environmental measurement approaches to confirm compliance. On July 9, 2009, the EPA granted interim conditional approval for 24 months, subject to incorporating EPA changes to the proposed program. Numerous follow-up communications with EPA were held throughout 2009 and 2010. In a letter dated July 14, 2011, the EPA granted an additional 24-month extension of the interim approval period from July 9, 2011 to July 9, 2013. Implementation of an ambient program remains on hold, pending final decisions relating to demolition.

Safety Inspections of the WNYNSC Dams. A severe rain event in August 2009 caused flood damage to areas of the reservoirs and spillways of the two dams located on the WNYNSC property. These dams are maintained because they provide water for drinking and operational purposes for the WVDP. In 2009, NYSDEC performed a visual inspection after the storm damage and recommended enhancements to the maintenance and inspection plan for the lake dams and spillway. WVES incorporated the recommendations into the standard operating procedure for maintenance, inspection, and operation of the lake dams and emergency spillway. These enhancements include:

- Enhanced mowing and removing scrub vegetation from upstream and downstream lake dam faces and water flow pathway;
- Enhanced weekly inspections, as well as special inspections after a rain event of greater than one inch; and
- Comparison to photos of previous erosion damage.

Lagoon 3 Embankment Inspections. The lagoon 3 embankment was constructed in the 1960s to manage waters from operation of the low-level wastewater treatment facility (LLW2). In 1991, surface erosion and surface soil movement were observed. A stability evaluation, conducted by Empire Soils Investigation, Inc., concluded that overall global or deep-seated stability of the slope was adequate and that the observed soil movement was shallow. Five test borings were installed (piezometers and inclinometers) to provide continued monitoring. During 1998, one inclinometer became unreadable and observations included surface movement in the slope, settlement, new tension cracks, and stair movement/distortion. In 2005, the West Valley Nuclear Services Company retained a New York State-licensed PE from Empire GEO-Services, Inc. to perform a slope stability analysis which generally agreed with the original (1991) stability evaluation.

Slope stability analysis demonstrates that numerous factors determine the overall stability of the slope, the major factors being: soils strength parameters, groundwater elevation, and slope steepness. The most likely mode of slope movement at the site consists of shallow surface failures resulting from the upper portion of the indigenous soils becoming saturated from rainfall and surface waters.

The groundwater and surface water depths and elevations are compared to pre-determined “trigger elevation levels” in an effort to maintain a calculated minimum safety factor. These triggers, if exceeded, would require the lagoon to be held at less than 60% capacity.

In March 2008, a trigger elevation level was exceeded for one sample location. It was determined that surface slope movement resulted in a break of the piezometer. Lagoon 3 has since been held to 60% operating capacity.

During 2009, several actions were implemented to make improvements to the Lagoon 3 slope monitoring, inspection, and reporting. The Lagoon 3 road-

way was regraded to divert storm water runoff and a set of 11 settlement and displacement monitoring points were installed on the north face of the Lagoon 3 embankment.

During 2010, groundwater and surface water elevation measurements were routinely recorded, as well as inclinometer field observations and settlement readings associated with Lagoon 3. Semiannual photographs of the slope toe at Erdman Brook were taken to document visual conditions and for comparison to previous photographs. Based on the measurements and observations, and comparison with previous documentation, there appears to be minor indications of slope movement and sliding in the shallow subsurface portion of the upper embankment. However, no slope movement was observed at the toe of the slope along Erdman Brook.

Project Assessment Activities in 2010

Throughout CY 2010, assessments were conducted through the Integrated Assessment Program (IAP) at the WVDP. This program effectively complies with applicable DOE directives, regulations, standards, and integrated safety management system requirements. The IAP applies to all disciplines including, but not limited to, safety and health, operations, maintenance, environmental protection, quality, decontamination and decommissioning, HLW activities, emergency management, business processes, and management. Inspections, reviews, and oversight activities are routinely conducted to evaluate performance, reduce risk, and identify improvement opportunities.

The local DOE Project office and other agencies with responsibilities for the WVDP also independently reviewed various aspects of the environmental and waste management programs. At the conclusion of the reporting period, there were no outstanding issues that had not been satisfactorily addressed. Overall results reflected continuing, well-managed environmental programs at the WVDP. Refer to Chapter 1, Environmental Management System.

TABLE ECS-3
WVDP Environmental Permits

Permit Name and Number	Agency/Permit Type	Description	Updates	Status
West Valley Demonstration Project (WVDP) Resource Conservation and Recovery Act (RCRA) Part A Permit Application (United States [U.S.] Environmental Protection Agency [EPA] ID #NYD980779540)	New York State Department of Environmental Conservation (NYSDEC)/ Hazardous Waste	Provides interim status under RCRA for treatment and storage of hazardous waste.	The U.S. Department of Energy (DOE) is currently operating under the February 2010 RCRA Part A Interim Status Permit Application. Revisions to the Part A Permit Application were submitted to NYSDEC in February 2010, and conditionally approved on June 9, 2011.	A Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 373-2 (i.e., Part B) Permit Application (Rev. 1), was submitted to NYSDEC on September 30, 2010. In January 2011, the NYSDEC review was suspended indefinitely.
Air Facility Registration Certificate (9-0422-00005/00099)	NYSDEC/Air Emissions	Certificate caps nitrogen oxide and sulfur oxide emissions from 2 boilers.	None	No expiration date.
Main Plant Process Building (MPPB) Ventilation (WVDP-687-01)	EPA/National Emission Standards for Hazardous Air Pollutants (NESHAP)	MPPB ventilation radionuclide emissions (originally the Liquid Waste Treatment System [LWTS])	Conditional approval received on July 9 2009, to discontinue monitoring after establishing an ambient monitoring network and meeting EPA criteria. A 24-month extension of the conditional approval was granted by the EPA on July 14, 2011.	Original approved on December 22, 1987. Modified on May 25, 1989 for laboratories. Modified February 18, 1997 to include the slurry-fed ceramic melter. No expiration date.
Vitrification Facility Heating, Ventilation, and Air-Conditioning (HVAC) System (no permit number)	EPA/NESHAP	Vitrification facility HVAC system for radionuclide emissions	Facility being used for remote waste processing.	Approved on February 18, 1997. No expiration date.
01-14 Building Ventilation System (WVDP-187-01)	EPA/NESHAP	Ventilation of radionuclide emissions in the 01-14 building.	Building being readied for demolition.	Original approved on October 5, 1987. Modified on May 25, 1989 for LWTS. No expiration date.
Contact Size-Reduction Facility (WVDP-287-01)	EPA/NESHAP	Contact size-reduction and decontamination facility radionuclide emissions	Ventilation not in service; ventilated with portable ventilation units	Approved on October 5, 1987. No expiration date.
Supernatant Treatment System/Permanent Ventilation System (WVDP-387-01)	EPA/NESHAP	Supernatant treatment system ventilation for radionuclide emissions	System receives air ventilated from Tank and Vault Drying System.	Original approved on October 5, 1987. Modified on May 4, 1998 for full-time ventilation of waste tank farm. No expiration date.

Note: Permit and license expiration dates are current as of September 2011.

TABLE ECS-3 *(continued)*
WVDP Environmental Permits

Permit Name and Number	Agency/Permit Type	Description	Updates	Status
Outdoor Ventilated Enclosures/Portable Ventilation Units (PVU) (WVDP-587-01)	EPA/NESHAP	Fifteen PVUs for removal of radionuclides.	Since 2007 EPA approval to expand usage of PVUs from 10 to 15, the DOE tracks usage on the basis of annual cumulative estimated dose.	Original approved on December 22, 1987. Modified on December 10, 2007 for 15 units. No expiration date.
State Pollutant Discharge Elimination System (SPDES) (NY0000973)	NYSDEC/ Effluent water	Monitors discharges to surface waters from various on-site sources.	An amended SPDES Permit was issued by NYSDEC, effective July 1, 2011.	The permit expires on June 30, 2016.
North Plateau Permeable Treatment Wall (PTW) storm water discharges associated with construction activities (NYR 10S797)	NYSDEC/ Division of Water	NYSDEC authorization was required to utilize the general permit (GP-0-10-001) for management of storm water associated with construction activities during the installation of the north plateau PTW.	West Valley Environmental Services LLC (WVES) submitted to NYSDEC a Notice of Intent and Storm Water Pollution Prevention Plan (SWPPP) for storm water discharges associated with construction activities for the north plateau PTW preconstruction and construction activities at the WVDP.	All requirements of the SWPPP were met by December 2010, and the notice of termination was submitted to NYSDEC in August 2011, following ground disturbance stabilization.
New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Certification to URS Corporation, Lab ID #10474 EPA Lab Code NY01259	NYSDOH/ELAP certification	Certification of the Environmental Laboratory for the analysis of potable and nonpotable water samples for specific radiological and nonradiological constituents.	Certification transferred from West Valley Nuclear Services Company to URS Corporation in April 2006. Effective February, 2009, the certificate was revised to remove total suspended solids. The certification was renewed on April 1, 2011.	Certification expires April 1, 2012.
Buffalo Pollutant Discharge Elimination System (10-06-TR096)	Buffalo Sewer Authority/ sanitary sewage sludge hauler permit	Permit issued to hauler of waste from the wastewater treatment facility.	Permit renewed in June 2010.	Permit expired on June 30, 2011. Service replaced by a new vendor.
Frank's Vacuum Truck Service (Permit #11-06-TR285)	Sanitary sewage sludge hauler permit	Permit issued to hauler of waste from the wastewater treatment facility.	Permit effective July 1, 2011.	Permit expires June 30, 2012.
Chemical Bulk Storage (CBS) (#9-000158)	NYSDEC/ regulated CBS tanks	Registration of bulk storage tanks used for listed hazardous chemicals.	Currently no tanks at the WVDP are regulated under 6 NYCRR Parts 595–599.	If regulated CBS tanks are needed in the future, a permit application will be submitted under the existing CBS registration.

Note: Permit and license expiration dates are current as of September 2011.

TABLE ECS-3 *(concluded)*
WVDP Environmental Permits

Permit Name and Number	Agency/Permit Type	Description	Updates	Status
Public Water System ID #NY0417557	Cattaraugus County Health Department	The WVDP is a non-transient non-community public drinking water system.	None	No expiration date.
Petroleum Bulk Storage (#9-008885)	NYSDEC/ petroleum bulk storage tank registration	Registration of bulk storage tanks used for petroleum.	Diesel fuel tank FO-D-11 was permanently closed and removed from the license.	License expires September 2, 2011.
Asbestos-Handling License WVES #33657	New York State Department of Labor/asbestos-handling and sampling activities	WVES maintains the asbestos-handling license and specific variances for asbestos handling and monitoring.	Asbestos-handling license was renewed in September 2010	License expires on September 30, 2011; each variance has a unique expiration date.
NYS Atomic Development Dam #1 (ID #019-3149) NYS Atomic Development Dam #2 (ID #019-3150)	NYSDEC Division of Water, Bureau of Flood Protection and Dam Safety	Two Class A Low-Hazard dams on the Western New York Nuclear Services Center property, that supply water for drinking and operational purposes, are maintained at the WVDP.	NYSDEC inspected the dams in 2009 following a major storm rain-event. Repair or construction activities related to the dams may require permits from NYSDEC.	No expiration date.
Great Lakes Water Withdrawl Registration Certificate (NYGL08701	NYSDEC	The legislation was enacted to gain more complete information for managing the state's water resources.	Certificate Issued August 24, 2011.	Certificate expires on August 24, 2013.
Underground Injection Control (UIC) Program Regulation (UICID: 11NY00906001)	EPA Groundwater Compliance Section	EPA regulates injection of tracer solutions into groundwater wells.	A suite of wells in the north plateau PTW were used to inject sodium bromide tracer solution to estimate groundwater flow velocities.	On November 18, 2010, the EPA authorized operation of injection wells.
Bird Depredation License (32)	NYSDEC/ Division of Fish and Wildlife	State license for the removal of nests of migratory birds.	License renewal application was submitted in October 2010.	The current permit remains in effect after the expiration date under the provisions of the State Administrative Procedure Act.
Bird Depredation Permit (MB747595-0)	U.S. Fish and Wildlife Service	Federal permit for the limited taking of migratory birds and active bird nests.	License was submitted on October 1, 2010.	Permit expires September 30, 2011.

Note: Permit and license expiration dates are current as of September 2011.

TABLE ECS-4
Solid Waste Management Units (SWMUs) at the WVDP

WVDP RCRA Super SWMUs (SSWMU) and Constituent SWMUs Identified in the RFI		
SSWMU	***SWMU #***	***Constituent SWMUs***
SSWMU #1 – Low-Level Waste Treatment Facilities (LLWTF)	3, 4, 17, 17a, and 17b	Former Lagoon 1 LLWTF and Lagoons 2, 3, 4, and 5 Neutralization pit and interceptors
SSWMU #2 – Miscellaneous Small Units	5, 6, 7, and 10	Demineralizer sludge ponds and solvent dike Effluent mixing basin Waste paper incinerator
SSWMU #3 – Liquid Waste Treatment System (LWTS)	18, 18a Sealed Rooms, and 22	LWTS Cement solidification system Sealed rooms associated with the LWTS in the main plant process building (MPPB)
SSWMU #4 – High-Level Waste (HLW) Storage and Processing Area	12/12a, 13, 19, and 20	HLW tank farm, vitrification test facility waste storage areas Supernatant treatment system, HLW vitrification facility
SSWMU #5 – Maintenance Shop Leach Field	8	Maintenance shop leach field
SSWMU #6 – Low-Level Waste Storage Area	9/9a, 15, 16/16a, and 38	Lag storage additions (LSAs) #1 and #2 hardstands, old and new hardstand storage areas Lag storage building, lag storage extension and LSAs #3 and #4, and the drum supercompactor
SSWMU #7 – Chemical Process Cell Waste Storage Area (CPC-WSA)	14	CPC-WSA
SSWMU #8 – Construction and Demolition Debris Landfill (CDDL)	1	CDDL
SSWMU #9 – Nuclear Regulatory Commission-Licensed Disposal Area (NDA)	2, 11/11a, 23, 31, and 39	NDA and NDA trench soil containment area, Kerosene tanks and NDA container storage area Interceptor trench project and staging area for NDA
SSWMU #10 – Integrated Radwaste Treatment System (IRTS)	21	IRTS drum cell
SSWMU #11 – New York State-Licensed Disposal Area (SDA)	NA	The SDA is a closed radioactive waste landfill that is contiguous with the Project premises and is owned and managed by the New York State Energy Research and Development Authority (NYSERDA). For more information, see their website at www.nyserda.org.
SSWMU #12 – Hazardous Waste Storage Lockers	24	Hazardous waste storage lockers 1 to 4

Note: The WVDP RCRA SWMUs and SSWMUs are discussed under "RCRA §3008(h) Administrative Order on Consent."

TABLE ECS-4 *(concluded)*
Solid Waste Management Units (SWMUs) at the WVDP

WVDP RCRA Individual SWMUs Not Associated with an SSWMU		
Individual SWMUs	25	Inactive scrap metal landfill adjacent to bulk storage warehouse (NYSERDA SWMU)
	26	Subcontractor maintenance area
	27	Fire brigade training area
	28	Vitrification hardstand
	29	Industrial waste storage area
	30	Cold hardstand area near the CDDL
	32	Old sewage treatment facility
	33	Existing sewage treatment facility
	34	Temporary storage locations for well purge water
	35	Construction and demolition area
	36	Old school house septic system
	37	Contact size-reduction facility
	40	Satellite accumulation areas and 90-day storage areas
	41	Designated roadways
	42	Product storage area
	43	Warehouse extension staging area
	44	Fuel receiving and storage area; high-integrity container and SUREPAK™ staging area
	45	Breach in laundry wastewater line
	46	Vitrification vault and empty container hardstand
	47	Remote-handled waste facility
	----	Sealed rooms in the MPPB

Note: The WVDP RCRA SWMUs and SSWMUs are discussed under "RCRA §3008(h) Administrative Order on Consent."

TABLE ECS-5
Summary of Waste Management Activities at the WVDP in Calendar Year 2010

Waste Description/ Facility	*Type of Project Generating Waste*	*Quantity in 2010*	*Discussion*
Low-level radioactive waste (LLW)	Waste shipped	4,326 cubic feet (ft^3) (122.5 cubic meters [m^3])	Waste processed from the main plant process building (MPPB) under American Recovery and Reinvestment Act work scope.
LLW	Waste Shipped	19,934 ft^3 (564.5 m^3)	LLW shipped for disposal
Transuranic (TRU) legacy waste	Waste processing	444 containers (21,000 ft^3) (594.7 m^3)	Legacy TRU waste processed in preparation for shipment.
Hazardous and Mixed LLW	Waste management according to the Site Treatment Plan	3,793 pounds (1.7 metric tons)	Waste packaged and shipped during calendar year (CY) 2010
Radiological wastewater from the low-level liquid waste treatment facility (LLW2 [WNSP001])	New York State Department of Environmental Conservation regulates point-source liquid effluent discharges of treated process wastewater through the State Pollutant Discharge Elimination System Permit for the West Valley Demonstration Project.	About 10,330,000 gallons (gal) (39,100,000 liters [L])	During CY 2010, six batches of wastewater were processed through the LLW2. This included groundwater recovered from the north plateau groundwater recovery system (NPGRS) and groundwater pumped from the U.S. Nuclear Regulatory Commission-Licensed Disposal Area (NDA) interceptor trench.
Treated sewage and industrial wastewaters (WNSP007)	Wastewater processing, discharge	About 3,480,000 gal (13,200,000 L)	The wastewater treatment facility (WWTF) treated sanitary wastewater that was discharged through outfall WNSP007 in CY 2010.
NPGRS	Pump and treat strontium-90 (Sr-90) contaminated groundwater	About 3,003,600 gal (11,400,000 L)	The NPGRS operated to recover groundwater from an area near the leading edge of the Sr-90 plume on the north plateau. Water was treated by ion exchange to remove Sr-90, then transferred to the LLW2.
NDA interceptor trench	Interceptor trench (WNNDATR) and groundwater pre-treatment	About 63,300 gal (240,000 L)	Groundwater was pumped and transferred to the LLW2. No n-dodecane or tributyl phosphate were encountered in CY 2010. No pre-treatment was necessary.
Digested sanitary sludge	Waste shipping and disposal	30,000 gal (114,000 L)	Digested sludge from the WWTF was shipped to the Buffalo Sewer Authority for disposal during CY 2010.
Asbestos	Asbestos management and abatement	2,055 linear feet pipe insulation; 143 square feet asbestos-containing vessel/duct insulation	Insulation was removed from steam piping, vessels and ventilation ducts in the MPPB during CY 2010.

Note: Certain waste totals are tallied by FY while others are tallied by CY.

TABLE ECS-6
Pollution Prevention Progress for Fiscal Year 2010

Recycled Materials	***2010 Quantity (tons/metric tons)***
Corrugated cardboard	0.059 tons (0.053 metric tons)
Iron	14 tons (13 metric tons)
Office and mixed paper	30 tons (27 metric tons)
Styrofoam	0.015 tons (0.014 metric tons)
Toner cartridges	0.68 tons (0.62 metric tons)
Wood pallets	1.4 tons (1.3 metric tons)
Municipal solid waste	310 tons(281 metric tons)
Universal waste - spent bulbs	0.28 tons (0.25 metric tons)
Universal waste -spent batteries	2.7 tons (2.4 metric tons)
Electronics reuse and recycling campaign	Reuse: 4.1 tons (3.8 metric tons) Recycle: 1.1 tons (0.98 metric tons)
Radioactive Waste Processing - Honorable Mention - DOE E-Star Award	
In 2011, West Valley Environmental Services LLC (WVES) was awarded an Honorable Mention for an Environmental Sustainability (E-Star) Award for radioactive waste processing activities. Three years ago, the United States Department of Energy (DOE) and WVES developed a plan to process and recharacterize and segregate approximately 80,000 ft^3 (1,476 containers) of stored legacy transuranic (TRU) radioactive waste to prepare it for transportation and eventual off-site disposal, which: - used a graded approach, approximately 9,500 cubic feet of the waste was reclassified as low-level radioactive waste; - achieved an overall approximate 75% volume reduction of legacy waste in storage; and - projected a significant cost savings due to TRU waste volume reduction, thereby reducing storage requirements, and projected future disposal cost.	
Other Accomplishments - Transfer or Sale of Excess Material	
Approximately $1,000,000 worth of excess material (based upon estimated and/or actual acquisition costs) has been reused in fiscal year (FY) 2010 by transferring to other DOE facilities, Federal and State agencies, various DOE-sponsored programs, donation programs, auctions, and sales.	
Transfers - estimated and/or actual acquisition cost	$31,198
Computers for learning - actual acquisition cost	$734,868
Energy-related laboratory equipment grants - estimated and/or actual acquisition cost	$142,289
eBay - estimated and/or actual acquisition cost	$20,043
Math & science equipment gift program - estimated and/or actual acquisition cost	$20,126

TABLE ECS-7
Affirmative Procurement Accomplishments for Fiscal Year 2010

Environmentally Preferable Products	***Amount Purchased***
Binders	$256
Bristols (file folders, card stock, tags)	$3,379
Office recycling containers	$116
Paperboard and packaging products	$658
Plastic envelopes	$2,896
Plastic trash bags	$96,190
Printer ribbons	$604
Re-refined lubricating oil	$198
Sanitary tissue products	$36,970
Solid plastic binders	$1,260
Toner cartridges	$7,144
Uncoated printing papers	$44,272
Bio-Based Products	***Amount Purchased***
Adhesives and mastic removers	$576
Air freshener	$629
Bath and spa cleaners	$957
Graffiti and grease removers	$576
Hand cleaners and sanitizers	$648
Laundry products	$804
Greases	$239
Penetrating lubricant	$239

TABLE ECS-8
WVDP 2010 Air Quality Noncompliance Episodes

Permit Type	Facility	Parameter	Date(s) Exceeded	Description/ Solutions
U. S. Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants	All	All	None	None
New York State Department of Environmental Conservation, Air Permit	All	All	None	None

TABLE ECS-9
Status of EPCRA (SARA Title III) Reporting at the WVDP for Calendar Year 2010

EPCRA Section	Description of Reporting	Submission to EPA
EPCRA 302–303	Planning Notification	Not Required
EPCRA 304	Extremely Hazardous Substance Release Notification	Not Required
EPCRA 311	Material Safety Data Sheet	Not Required
EPCRA 312	Hazardous Chemical Inventory	Required
EPCRA 313	Toxic Chemical Release Inventory Reporting	Required

TABLE ECS-10
Reportable Chemicals Above EPCRA 312 Threshold Planning Quantities (TPQ) Stored at the WVDP in 2010

Chemicals Stored at the WVDP Above the TPQ		
Diesel fuel/No. 2 Fuel Oil	Ion-exchange media	Sulfuric acid
Gasoline	Lead-acid batteries	Liquid nitrogen
Oils - various grades	Zeolite	

TABLE ECS-11
WVDP 2010 NPDES/SPDES[a] Permit Noncompliance Episodes

Permit Type	Outfall(s)	Parameter	No. of Permit Exceptions	No. of Samples Taken	No. of Compliant Samples	Percent Compliant Samples
SPDES	All	All	0	1,668	1,668	100%

[a] Radionuclides are not regulated under the site's SPDES permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 5400.5.

TABLE ECS-12
WVDP Migratory Bird Nest Depredation Episodes in Fiscal Year 2010

Permit/License Type	*Parameter*	*Permit/License Limit*	*Total Removed in 2010*
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Barn Swallow Nests	20	0
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active American Robin Nests	15	0
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Eastern Phoebe Nests	5	0
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Canada Goose Nests	5	1
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Common Grackle Nests	15	0
NYSDEC - Bird Depredation License	Removal of Inactive Migratory Bird Nests	Not limited	4

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ENVIRONMENTAL MANAGEMENT SYSTEM

Integrated Safety Management System (ISMS) Implementation

In accordance with the United States (U.S.) Department of Energy (DOE) Policy 450.4, "Safety Management System Policy," a plan to integrate environmental, safety, and health (ES&H) management programs at the West Valley Demonstration Project (WVDP or Project) was developed and initiated in 1998. Implementation of an ISMS at the WVDP was verified by the DOE in November 1998. Environmental subject matter experts routinely participate in a site-wide work review group to review work plans, identify ES&H concerns, and specify practices that ensure work is performed safely. For the purposes of this policy, the term "safety" includes environmental, radiological, industrial/chemical, and nuclear safety and health and encompasses the public, workers, and the environment.

Environmental Management System (EMS)

During the ISMS development, the EMS was identified as an integral part of the ISMS. The WVDP EMS has been established to implement sound stewardship practices that are protective of the air, water, land, and other natural and cultural resources potentially impacted by DOE operations and by which DOE cost effectively meets or exceeds compliance with applicable environmental, public health, and resource protection requirements. The EMS objectives implement sustainable practices for enhancing environmental, energy, and transportation management performance, as stipulated in Executive Order (E.O.) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management."

The key elements of the WVDP EMS are designed to:

- Reflect the EMS elements and framework found in International Organization for Standardization (ISO) 14001:2004 or equivalent, including policies, procedures, and training to identify operations and activities with significant environmental impacts; to manage, control, and mitigate the impacts of these operations and activities; and to assess performance, implement corrective actions where needed, and ensure continual improvement;
- Include environmental, energy, and transportation objectives and measurable targets that are reviewed annually, updated as appropriate, and contribute to achieving the DOE sustainable environmental stewardship goals in DOE Order 450.1A, "Environmental Protection Program," and the energy and transportation goals in DOE Order 430.2B, "Departmental Energy, Renewable Energy and Transportation Management;"
- Address tenant activities wherever such activities affect environmental, energy, and transportation management; and
- Contain the elements of an Environmental Compliance Management Plan pursuant to the Federal Council on Environmental Quality's instructions for implementing E.O. 13423, including:
  - a clear statement by senior leadership committing to achieve and maintain compliance with applicable environmental protection requirements;
  - clearly articulated roles and responsibilities related to environmental performance at all appropriate levels to ensure accountability for less-than-desired environmental performance;
  - an environmental compliance audit and review program that identifies compliance deficiencies and root causes of noncompliance; and
  - integration of compliance management information and resource allocation procedures to ensure that audit findings and root causes of noncompliance are tracked and addressed, including allocation of funding.

The environmental monitoring program is an important component of the EMS, ensuring accomplishment of its mission.

The elements of the WVDP EMS are summarized in Table 1-1. The elements for which activities or achievements were accomplished in calendar year (CY) 2010 are presented in the sections that follow.

TABLE 1-1
Elements of the Environmental Management System (EMS) - West Valley Demonstration Project (WVDP) Implementation

Environmental Policy	
It is the policy at the WVDP to conduct all activities, including design, construction, testing, startup, commissioning, operation, maintenance, and decontamination and decommissioning in a manner appropriate to the nature, scale, and environmental impacts of these activities. West Valley Environmental Services LLC (WVES) is committed to full compliance with applicable federal and New York State laws and regulations for protection of the environment, continual improvement, the prevention and/or minimization of pollution, and public outreach, including stakeholder involvement. The policy establishes the WVDP EMS, which provides the framework for environmental protection at the WVDP.	
Planning	
Environmental Aspects	Since the WVDP is currently in the deactivation, decontamination, and demolition phase, there are significant environmental aspects related to those activities. The environmental aspects are addressed in Work Instruction Packages with the assistance of Hazard Control Specialists, and all building demolitions require the completion of a Demolition Readiness Checklist. The environmental aspects that have been determined to have the potential to affect the environment are: • Waste generation, management, and decontamination activities; • Radiological and/or chemical atmospheric emissions and liquid effluent discharges; • Energy usage and materials consumed and/or recycled; • Natural resource preservation, restoration, and impact; and • Accidental releases or spills, and their subsequent mitigation and future prevention.
Legal and Other Requirements	Established policies and procedures at the WVDP identify legal and other requirements to which WVES subscribes, and which are applicable to the environmental aspects of site activities. These policies and procedures provide identification and access, which range from formal review and implementing requirements from the United States (U.S.) Department of Energy (DOE) Orders, Guides, Manuals, and Technical Standards through Federal and New York State laws and regulations. Environmental Affairs regularly assesses proposed and recently issued requlatory requirements for impact to site activities.
Objectives and Targets	DOE Order 450.1A requires that goals be established to integrate sustainable environmental stewardship into the site's operations as a cost-effective business practice. The Order established five performance-based sustainable environmental stewardship goals to (1) prevent pollution, (2) reduce environmental hazards, (3) protect the public and the environment, (4) minimize pollution control and waste disposal costs, and (5) improve operational capability. DOE Order 430.2B requires that each contractor establish leadership goals to reduce energy intensity needs, strive to purchase renewable energy where economically feasible, operate alternate fuel vehicles, reduce potable water consumption, and to achieve U.S. Green Building Council's Leadership in Environmental Design certifications for new construction. At the WVDP, objectives and measureable targets are developed to meet these goals, which are discussed in Table 1-2.
Environmental Management Program	A key element to successful implementation of an EMS, is an environmental management program that describes aspects of environmental policy implementation applicable to the organization, and may be subdivided to address specific elements of the organization's operations. WVES accomplishes this through policies and procedures, project schedules, milestone tracking, and commitment tracking.

TABLE 1-1 *(continued)*
Elements of the Environmental Management System (EMS) - West Valley Demonstration Project (WVDP) Implementation

Implementation and Operation	
Structure and Responsibility	Site procedures define roles and responsibilities, and management provides resources essential to the implementation and control of the EMS. Specific WVES management representatives have the defined role, responsibility and authority for ensuring that EMS requirements are established, implemented and maintained in accordance with the policy, and for reporting on the performance to staff management. This reporting and review provide the basis for improvement of the EMS.
Training, Awareness, and Competence	Employees are informed of the importance of conformance with the environmental policy and with implementing EMS procedures; the actual or potential significant environmental impacts of their work activities; the environmental benefits of improved personal performance; their roles and responsibilities in achieving conformance with the environmental policy and EMS procedures (including emergency preparedness); and the potential consequences of departure from specified operating procedures.
Communication	WVES provides for internal communication between the various levels and functions of the company and for receiving, documenting, and responding to relevant communication from external interested parties. Key external parties include the regulatory agencies and local emergency responders. Communications with the local stakeholders include monthly meetings with the Citizen Task Force and quarterly meetings with the general public. Project information, including this entire Annual Site Environmental Report (ASER), is available on the internet at http://www.wv.doe.gov.
EMS Documentation	Comprehensive, up-to-date environmental policies are written to describe the core elements of the EMS and their interaction, and to reference related implementing documentation.
Document Control	EMS documentation is maintained via controls that require the availability of documents at locations where operations essential to the effective functioning of the EMS are performed; provide for periodic review and revision; require that obsolete documents be promptly removed from all points of issue and points of use; and, require that any obsolete documents retained for legal use and/or record preservation purposes be suitably identified. Records pertaining to the EMS are classified, inventoried, indexed, retained, and disposed of in accordance with established procedures.
Operational Control	WVES ensures operational control through adherence to all site procedures. WVES has identified those operations and activities that are associated with the identified significant environmental aspects in line with the EMS policy, as well as resultant objectives and targets. Procedures for these operations and activities provide specific conditions and criteria that must be satisfied to ensure compliance and ensure meeting the objectives and targets.
Emergency Preparedness and Response	An emergency preparedness and response program with specialized staff provides timely response to emergency situations, and the prevention and mitigation of the environmental impacts that may be associated with them. Emergency preparedness and response procedures are reviewed and revised routinely and after the occurrence of accidents or emergency situations, when appropriate. Drills and exercises are conducted to assess the effectiveness of the emergency management programs.

TABLE 1-1 *(concluded)*
Elements of the Environmental Management System (EMS) - West Valley Demonstration Project (WVDP) Implementation

Checking and Corrective Action	
Monitoring and Measurement	The EMS is monitored and measured for effectiveness, as well as key characteristics of site operations and activities that can have a significant environmental impact. Liquid effluent and air-emission monitoring helps ensure the effectiveness of controls, adherence to regulatory requirements, and timely identification and implementation of corrective measures. A comprehensive, sitewide environmental monitoring program is in place at the WVDP. Data are reported to regulatory agencies and summarized in this ASER. In addition, monitoring data are assessed for adverse trends to determine site performance, impacts from site conditions, and the need for preventative or corrective measures.
Evaluation of Compliance	WVES has established, implemented, and maintained a process for periodically evaluating compliance with applicable legal requirements. This activity is included under the "Legal and Other Requirements" EMS element.
Nonconformance and Corrective and Preventive Action	WVES has defined responsibilities and authorities for handling and investigating nonconformances, taking action to mitigate any associated impacts, and for initiating and completing corrective and preventative actions.
Records	Environmental records are identified, maintained, and dispositioned in accordance with regulatory requirements for record maintenance. These include training records and the results of audits and other reviews. Environmental records must be legible, identifiable, and traceable to the activity or service involved. Records are maintained in such a way that they are retrievable and protected against damage or loss.
EMS Audit (Assessments)	EMS assessments are performed to determine whether or not the EMS conforms to the requirements of the policy; that the EMS has been properly implemented and maintained; and to provide information to management on the assessment results. They are based on the environmental importance of the site activities and consider the results of previous reviews.
Management Review	
Senior management reviews site environmental performance to ensure the continuing suitability, adequacy and effectiveness of the EMS. The review addresses opportunity for improvement, the need for change, including environmental policy, and environmental objectives and targets.	
EMS Validation	
The WVDP EMS is considered to be fully implemented because: 1 - During July 26–29, 2010, the WVDP EMS was the subject of a formal audit performed by a joint review team of external DOE, DOE-WVDP, and WVES assessors. 2 - The findings of the above audit have been addressed by the Environmental Safety, Health, and Quality (ESH&Q) manager and the DOE-WVDP director. 3 - The ESH&Q manager and the DOE-WVDP director have declared conformance of the EMS to the requirements of DOE Order 450.1A.	

Environmental Policy

Activities at the WVDP during 2010 were conducted in full compliance with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations. Refer to Table ECS-1, "Compliance Status Summary for the WVDP in CY 2010," for details.

Environmental Aspects

The environmental aspects of site activities have been identified within the elements of the WVDP EMS. Activities that have regulatory implications or those that could have significant environmental impacts are identified as significant aspects. Site activities related to hazardous and radiological waste management, pollution prevention, air and water emissions, energy and materials use, and recycling are presented in the "Environmental Compliance Summary" (Tables ECS-3 through ECS-11).

The WVDP site is currently in the decontaminating and decommissioning (D&D) phase of operations, therefore, current work scope encompasses waste disposition, decontamination, deactivation, facility disposition, and infrastructure reduction. For each facility or structure that is considered for demolition, the base environmental aspects are identified. These aspects are addressed during work planning with the assistance of hazard control specialists. In addition, before a building may be demolished, a "Demolition Readiness Checklist" that captures many of these environmental aspects must be completed.

Legal and Other Requirements

Requirements contained in DOE orders and directives are incorporated into the WVDP contract with West Valley Environmental Services LLC (WVES) as specific terms and conditions. Regulatory Affairs conducts environmental regulatory reviews to identify, evaluate, and document changes to applicable environmental regulations. Items that have an effect upon compliance activities at the WVDP are communicated to other appropriate Project personnel.

Objectives and Targets

DOE Order 450.1A requires that goals be established to integrate sustainable environmental stewardship into the site's operations as a cost-effective business practice. Goals are intended to prevent pollution, reduce environmental hazards, protect the public and the environment, reduce waste disposal costs, and improve operational capability. The Order also established five performance-based sustainable environmental stewardship goals that are to be achieved at each DOE site.

The goals and objectives, established specifically for the WVDP, have been evaluated using a graded approach that takes into consideration that all buildings and infrastructure will be demolished in the coming years.

The WVDP's "Waste Minimization and Pollution Prevention Awareness Plan" established the strategic framework for integrating waste minimization and pollution prevention into waste generating and reducing activities, procuring recycled products, reusing existing products, and using methods that conserve energy. The program is a comprehensive and continual effort to prevent or minimize pollution, with the overall objective of reducing health and safety risks, and protecting the environment. The WVDP objectives and targets that were established to meet the EMS goals are presented in Table 1-2. Also refer to the Environmental Compliance Summary Table ECS-6, "Pollution Prevention Progress for Fiscal Year (FY) 2010," and Table ECS-7, "Affirmative Procurement Accomplishments for FY 2010."

Environmental Management Program

An environmental management program is a key element to successfully implementing an EMS. At the WVDP, the program is implemented by the "WVDP Environmental Management System" policy. The policy describes how the objectives and targets are achieved and clearly defines responsibilities and timeframes, and provides for modifications to ensure that environmental management will apply to new developments and new or modified activities. This is accomplished through routine review and update of policies and procedures, as well as through project schedules, milestone tracking, and commitment tracking.

Structure and Responsibility

All project personnel are responsible for adherence to the site's EMS policies. In addition, specific management representatives have defined responsibility and authority for ensuring that EMS requirements are implemented in accordance with the policy, and for reporting to staff management. During 2010, the annual review of the WVES EMS was performed and reported to the DOE in accordance with DOE Order 450.1A, and audits were performed both by internal and external agencies to identify areas for improve-

TABLE 1-2
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Responsibility*	*Target Date*	*Status*	*Driver*
Goal 1	**(United States [U.S.] Department Of Energy [DOE] Order 450.1A) Reduce or eliminate the generation and/or toxicity of waste and other pollutants at the source through pollution prevention**					
1.1	Reduce usage of laundry detergent.	Implement the use of N-45 laundry detergent because it was determined that the amount of detergent could be reduced from 3 pounds to 0.26 pounds per day.	Engineering	2/22/10	Implemented 2/22/10.	Executive Order (E.O.) 13423
1.2	Reduce or eliminate the need for demineralized water.	Eliminate the demineralized water production which requires using approximately 30 gallons of sulfuric acid and 40 gallons of caustic annually.	Engineering	3/31/10	Implemented 3/31/10.	E.O. 13423
Goal 2	**(DOE Order 450.1A) Reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials**					
2.1	Research and evaluate an environmentally friendly alternative to replace Handi-Foam used for filling voids in waste packages.	Determine an acceptable substitute (preferably bio-based).	Waste Planning & Disposition/ Environmental Affairs	Prior to Ordering Foam	Researched. Foaming is only used for low-level radioactive waste. Current waste packaging efforts primarily involve transuranic waste; therefore, foam use was limited. Current stock was used first.	E.O. 13423
2.2	Reduce usage of caustic for wastewater treatment.	Eliminate the need for the cooling tower which requires 1,375 gallons of caustic per year for neutralization. See related goal 7.2 and 6.10.	Engineering	8/31/10	Complete 9/12/10. The K9 water-cooled compressor is installed and operational.	E.O. 13423
Goal 3	**(DOE Order 450.1A) Maximize the acquisition and use of environmentally preferable products in the conduct of operations.**					
3.1	Maximize the purchase of U.S. Environmental Protection Agency (EPA)-designated items and bio-based products.	Provide training to procurement personnel and P-Card holders on the resources available to assist in locating alternative items that meet EPA designated items and bio-based product requirements.	Environmental Affairs	3/31/10	Training briefing TR1367B, "Green Purchasing Training," was developed and presented to procurement personnel and P-Card holders on 3/11/10.	E.O. 13423
Goal 4	**(DOE Order 450.1A) Reduce or eliminate the environmental impacts of electronics assets**					
4.1	Participate in the electronics reuse and recycling challenge (ERRC).	Register on the ERRC website when program is launched for fiscal year (FY) 2010.	Environmental Affairs	When registrat-ion is launched	The Federal ERRC was discontinued. However, WVES voluntarily continued to implement recycling and reuse opportunities. Recycled one ton of electronics, and four tons was sold or donated for reuse.	E.O. 13423

TABLE 1-2 *(continued)*
WVDP EMS Objectives and Targets

Goal	Objective	Target	Responsibility	Target Date	Status	Driver
Goal 5	**(DOE Order 450.1A) Reduce degradation and depletion of environmental resources through post-consumer material recycling**					
5.1	Eliminate the purchase of water in plastic bottles.	Purchase reusable water bottles for all site employees.	Safety	6/17/10	Complete. Reusable bottles were distributed at the 2010 WVDP Safety Fair held on 6/17/10.	E.O. 13423
Goal 6	**(DOE Order 430.2B and E.O. 13423) Energy Efficiency**					
6.1	Reduce energy intensity.	Reduction of at least 30% by FY 2015 from the FY 2003 baseline. Baseline: Electricity - 20,650,000 KWhr Natural Gas - 920,000 ccf Goal: Electricity - 14,455,000 KWhr Natural Gas - 644,000 ccf	Infrastructure	9/30/15	Goal exceeded, results for FY 2010: Electricity - 12,483,517 KWhr - 39.5% reduction. Natural Gas - 283,190 ccf - 69.2% reduction.	DOE Order 430.2B and E.O. 13423
6.2	Update the DOE Order 430.2B Executable Plan for calendar year (CY) 2010.	Update the 430.2B Executable Plan and issue to the DOE.	Engineering	12/15/10	Replaced with the Site Sustainability Plan (SSP). Completed by DOE-WVDP	E.O. 13423
6.3	Obtain DOE approval for the DOE Order 430.2B Executable Plan	Obtain DOE approval for the West Valley Demonstration Project (WVDP) DOE Order 430.2B Executable Plan for CY 2010.	Engineering	2/28/11	Replaced with the SSP. Completed by DOE-WVDP	E.O. 13423
6.4	Reduce energy requirements of air compressors in the vitrification facility.	Replace the obsolete compressor with a new compressor with variable frequency drives.	Engineering	2/28/10	Installation completed in March, 2010.	E.O. 13423
6.5	Reduce energy requirements of the laundry.	Replace existing laundry with a modular facility with a high efficiency washer with an integrated on-demand water heater. The modular design will reduce heating, cooling, ventilation and water demand, therefore reduce energy demand.	Engineering	On hold due to project baseline changes.	Plans to relocate the laundry were put on hold.	E.O. 13423
6.6	Reduce the energy requirements of site office space.	Office space was relocated from the main plant process building (MPPB) and administration building to modular units, allowing conversion of old inefficient boiler systems to use low-pressure steam. Compact fluorescent lighting (CFL) was used. This modular design significantly reduced heating, cooling, and ventilation make-up air demands, resulting in reduced energy demands.	Engineering	4/30/10	Complete, with 47 units installed. One hundred fifty-five personnel have been moved into 40 units, and seven units are used for materials and equipment.	E.O. 13423

TABLE 1-2 *(continued)*
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Responsibility*	*Target Date*	*Status*	*Driver*
6.7	Reduce the energy requirements of the environmental laboratory (ELAB) facility.	The ELAB space will be relocated to modular units with CFLs for lighting. Modular design will significantly reduce heating and cooling demands due to less building cubic	Engineering	On hold due to project baseline changes.	Plans to relocate the ELAB were put on hold.	E.O. 13423
6.8	Reduce energy requirements of the MPPB compressed air system.	Eliminate the use of compressed air to sparge the lagoons.	Engineering/ Maintenance	12/31/10	Complete. Blowers were relocated, tested, and are operational.	E.O. 13423
6.9	Reduce energy requirements of the Ventilation Exhaust Cell blower system.	Install variable frequency drives.	Engineering	6/30/10	Installation was completed on 7/17/10.	E.O. 13423
6.10	Reduce energy requirements of utility room air compressors.	Install chiller units and replace compressor K3 with a new air cooled unit K9 to eliminate the need for the cooling tower. See related goals 2.2 and 7.2.	Engineering	8/31/10	Completed on 9/12/10. The chiller units are installed and operational and installation of K9 compressor is complete.	E.O. 13423
6.11	Reduce energy requirements of the laundry facility.	Purchase and install a more efficient respirator washer in the existing facility.	Engineering	7/31/10	New washer was installed on 7/15/10.	E.O. 13423
6.12	Reduce energy requirements of the ELAB facility.	Replace the chiller in the ELAB from a 50-ton unit to a previously used 30-ton unit that was taken from storage. Reduce air infiltration by installation of sealant.	Engineering	7/31/10	Complete. The unit was installed and the building was sealed on 7/20/10.	E.O. 13423
6.13	Reduce the vehicle fleet petroleum use.	Acquire 3 electric Taylor/Dunn carts from another DOE facility.	Site Operations	11/30/10	Three carts acquired, refurbished, and in use at the site.	E.O. 13423 DOE Order 430.2B.
6.14	Reduce energy usage of the remote-handled waste facility (RHWF) air compressors.	Interconnect MPPB air compressors to RHWF. The MPPB variable frequency drives are more energy efficient.	Site Operations	2/28/11	Complete by mid-February 2011.	E.O. 13423 DOE Order 430.2B.
Goal 7	**Other**					
7.1	Provide environmental management system (EMS) overview training to new hire American Reinvestment Recovery Act employees.	Prepare and present a PowerPoint training presentation on the WVDP EMS program and expectations of employees.	Environmental Affairs	1/31/10	Complete 1/11/10. 68 ARRA new personnel were trained.	WV-980

TABLE 1-2 *(concluded)*
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Responsibility*	*Target Date*	*Status*	*Driver*
7.2	Reduce water usage.	Eliminate the need for the cooling tower which utilizes 500,000 gallons of water per year. This will also eliminate the annual usage of 600 pounds of pesticides and 350 pounds of a corrosion inhibitor. See related goal 2.2.	Engineering	8/31/10	Complete 9/12/10. The chiller units are installed and operational and installation of K9 compressor is complete.	E.O. 13423

ment and assess compliance to the EMS principles. For further discussion of audits, refer to "EMS Audits and Other Audits and Assessments" later in this chapter.

Training, Awareness, and Competence

Human performance/behavior-based safety (HP/BBS) training is conducted across the site. Project personnel are trained to HP/BBS concepts and practices, and HP/BBS observer technique training is provided for safety department and safety observers. Self-assessment activities are also stressed as a mechanism for evaluating, improving, and maintaining worker safety. WVES operated the WVDP throughout 2010 in a safe manner that was protective of its workers, the public, and the environment.

The radiological and hazardous work environment at the WVDP warrants strict adherence to safety procedures. During 2010, the WVDP employees were recognized by 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 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.

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

To accelerate cleanup projects at the site (funded under the American Recovery and Reinvestment Act [ARRA]), 68 employees received training and were introduced to the WVDP's strong safety culture, including the EMS program. The training department developed a systematic approach to assessing individual qualifications and tailoring training requirements to the individuals. The new personnel brought a wealth of field expertise, including hazardous materials management, welding, asbestos-handling certifications, and heavy equipment operation. The ARRA work continued throughout 2010.

10 Code of Federal Regulations (CFR) 851, "Worker Safety and Health Program." 10 CFR 851 became effective in February 2007, with full implementation at the WVDP by May, 2007. The legislation superseded DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," which directed compliance with specific Occupational Safety and Health Administration (OSHA) requirements.

Similar to the OSHA requirements, the rule established the framework for an effective worker health and safety program to provide DOE contractor workers with a safe and healthy workplace in which hazards are abated, controlled or otherwise mitigated in a manner that provides reasonable assurance that workers are adequately protected from identified hazards.

The "WVDP Worker Safety and Health Plan" described how the WVDP complied with 10 CFR 851. The plan was reviewed by WVES in 2010 and no modifications were necessary.

Any person working at the WVDP who has a personal photo badge allowing unescorted access to administrative areas of the site receives general employee training (GET) that covers health and safety, emergency response, and environmental compliance issues. All visitors to the WVDP receive a site-specific briefing on safety and emergency procedures.

Safety-Trained Supervisor Program. WVES maintains a certification program whereby employees complete extensive training to become safety-certified. Standards are established by the Council on Certification of Health, Environmental, and Safety Technologists, and the certification is offered by the Board of Certified Safety Professionals. Certified personnel helped ensure that the workforce stayed current with safety knowledge and practices that are applicable to managers, supervisors, and lead personnel. This is especially important in the hazardous work environment that exists at the WVDP, where every worker is expected to be responsible for safety. In 2010, the WVDP had 70 certified personnel who recertified every five years by completing or conducting 30 hours of safety, health, or environmental training.

Communication

Ongoing communication between regulatory agencies, stakeholders, and other interested parties led to two important agreements in 2010. The Record of Decision for the Phase 1 Environmental Impact Statement for Site Decommissioning and/or Long-Term Stewardship at the WVDP and Western New York Nuclear Service Center (WNYNSC) was issued in April 2010, laying the groundwork for future work at the WVDP. This document underwent a public and regulatory review period from December 2008 through September 2009. Additionally, on August 17, 2010, the DOE and New York State Energy Research and Development Authority (NYSERDA) reached an agreement and signed a Consent Decree that formally defined the cost sharing for cleanup of the WVDP and the WNYNSC.

EMS Documentation, Document Control, and Records

All EMS documentation is maintained, updated, and controlled in accordance with the WVDP records inventory and disposition system, or in accordance with specific regulatory requirements for records maintenance (e.g., National Emission Standards for Hazardous Air Pollutants [NESHAP]). During 2010, WVES prepared and submitted to the DOE, quarterly status/progress reports describing accomplishments related to EMS targets, goals, and objectives. On November 23, 2010, the WVDP FY 2010 EMS Annual Report was submitted via the online Federal Facilities Environmental Stewardship and Compliance Assistance Center website. The Office of the Federal Environmental Executive tracks the progress of EMS implementation by using an Environmental Stewardship Scorecard that includes metrics to measure site-level progress toward EMS implementation. The metrics (red, yellow, or green) are provided to allow facilities that have implemented an EMS to plan for effective reporting of progress, performance, and successes. As in previous years, the WVDP scored "green" based on the rating criteria.

Operational Control

U.S. Nuclear Regulatory Commission-Licensed Disposal Area (NDA) Interceptor Trench and Pretreatment System. Radioactively contaminated n-dodecane, in combination with tributyl phosphate (TBP), was discovered in groundwater at the NDA's northern boundary in 1983, shortly after the DOE assumed control of the WVDP. Investigations during 1983 and 1984 determined the source and location of the kerosene-contaminated water to be from eight 1,000-gallon tanks buried in the NDA. In 1985, the eight tanks were exhumed and the contaminated absorbent and tanks were treated and packaged for disposal. To mitigate subsurface migration of potential remaining organic mixture, an interceptor trench and liquid pre-treatment system (LPS) were installed in 1990. In 2008, a slurry wall was installed upgradient of the NDA and a geomembrane cover was installed over the NDA footprint.

Operations personnel maintain the water levels in the NDA trench and environmental monitoring personnel monitor for any releases from the NDA. As in previous years, n-dodecane/TBP was not detected in the trench water; therefore, no water was treated by the LPS in 2010. Approximately 63,000 gallons (240,000 liters) of radiologically contaminated water were pumped and transferred from the interceptor trench to the low-level waste treatment facility (LLW2) during CY 2010. Refer to the "Environmental Compliance Summary" for additional discussion. Refer also to Chapter 4, "Groundwater Protection Program," under "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA" for a discussion of results of surface and groundwater monitoring in the vicinity of the NDA.

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 has been determined to have been from a piping leak, during pre-project operations, that entered the ground below the southwest corner of the main plant process building (MPPB). In 1995, a

pump-and-treat system was installed to reduce the plume's migration rate. This system continued to operate throughout 2010. In October and November 2010, an 860-foot-long zeolite-filled full-scale PTW was installed along the existing roadway south of the construction and demolition debris landfill (CDDL). The PTW allows groundwater to pass through the wall, while adsorbing the radioactive strontium-90 in place. The zeolite, chosen for the PTW, is a natural mineral with a porous structure that adsorbs positively charged ions, such as strontium. Sixty-six groundwater monitoring wells were installed to monitor the wall's performance. The work for this project was completed using ARRA funding. Refer to Chapter 4, "Groundwater Protection Program," under "Strontium-90 Plume Remediation-Related Activities" for further discussion.

Emergency Preparedness and Response

The emergency response organization (ERO) activates the emergency operations center (EOC) and the technical support center (TSC) in accordance with site emergency response procedures in the event of health, safety, or environmental emergencies.

Emergency management personnel, ERO personnel, and operations personnel participated in 29 drills and/or exercises throughout 2010. On June 23, 2010, the "Sitewide Integrated Emergency Response Exercise - Fire in the FRS with Contaminated/Injured Personnel," was conducted. This exercise included off-site responders from the West Valley Volunteer Hose Company, Inc., and observers from the DOE and Seneca Nation of Indians emergency response personnel. The exercise ended with an actual emergency (minor earthquake) that precipitated an evacuation of the MPPB and the Ashford Office Complex (AOC). The response teams responded appropriately and there were no adverse environmental impacts or releases from the minor earthquake. The exercise was designed to evaluate activation of WVDP emergency response organizations, as well as the interface of these organizations with off-site emergency responders. The objectives and criteria for the exercise were focused on an evaluation of security, plant systems operations shift supervisor, incident command, radiation safety, and the emergency medical response team. Overall, the actions of all organizations evaluated in this exercise demonstrated proper training and knowledge of emergency response processes and procedures.

On September 28, 2010, ERO members responded to a DOE No Notice exercise. The after-action report was submitted to the emergency management program manager and, although several areas for improvement were noted, there were no concerns, findings, or observations.

In 2010, the ERO refresher training was updated and was completed by 100 individuals. The emergency management sections of GET and the WVES annual mandatory briefing were also updated to reflect changes in the program and the WVDP assembly areas. Six new members of the ERO were trained for positions in the EOC, the TSC, and the radiation safety response team. A total of 19 engineers, radiation safety personnel, and subcontracted personnel completed the emergency management overview training and AOC emergency management training.

Environmental Monitoring and Measurement

Since the WNYNSC is not an active nuclear fuel reprocessing facility, the environmental monitoring program at the WVDP focuses on measuring radiological and chemical constituents associated with the aged residual by-products of former Nuclear Fuel Services Inc. operations, the Project's former high-level radioactive waste (HLW) treatment operations, and the current operations for management of HLW, transuranic waste (TRU), and low-level radioactive waste (LLW).

Exposure to radioactivity from site activities could occur through the air, water, and food pathways. Therefore, these three potential pathways are monitored at the WVDP. Air and surface water pathways are the two primary means by which radioactive material could move off site.

The on-site and off-site monitoring program at the WVDP includes measuring the concentration of alpha and beta radioactivity, conventionally referred to as "gross alpha" and "gross beta," in air and water effluents. Measuring the total alpha and beta radioactivity from key locations produces a comprehensive picture of on-site and off-site radioactivity levels from all sources. Frequent updating and tracking of the gross radioactivity in effluents is required to maintain acceptable operations.

More-detailed measurements are also made for specific radionuclides. The radionuclides monitored at the Project are those that might produce relatively higher doses or that are most abundant in air and water effluents. Because man-made sources of radiation at the Project have been decaying for more

than 40 years, the monitoring program does not routinely include short-lived radionuclides, that is, isotopes with a half-life of less than two years, which would currently be present at less than 1/100,000 of their original radioactivity levels.

The WVDP monitoring program includes sanitary wastewater discharges and storm water for nonradiological water quality and chemical constituents. See Appendix A for the schedule of sample locations and analytical requirements, and Chapter 2 for a discussion of radiological and nonradiological program information.

Environmental Management of Wastewater. Water containing radioactive material from site process operations is collected in the site's interceptors, then transferred to the LLW2 and treated. The LLW2 includes the LLW treatment building and associated holding lagoons.

Lagoon 3 water is held, sampled, and analyzed before its release through a New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall. (The SPDES permit is identified in Table ECS-3.) In 2010, about 10.3 million gallons (39.1 million liters) of water were discharged through outfall 001, the lagoon 3 weir. Table 1-3 summarizes the estimated radioactivity releases in the 2010 discharge waters, as compared to the previous 10-year average. (Also, see Table 2-1 in Chapter 2.) Note that releases of tritium activity through outfall 001 were below the 10-year average; however, releases of gross alpha and beta activity were slightly above the 10-year average. (See "Predicted Dose From Waterborne Releases" in Chapter 3.)

TABLE 1-3
2010 Radioactivity Releases Versus 10-Year Averages[a]

Radionuclide	*10-Year Average Curies*	*2010 Curies*	*% of 10-Year Average*
Aqueous Discharge LLW2			
Tritium	0.095	0.028	30%
Gross Alpha and Beta	0.017	0.018	106%
Airborne Discharge ANSTACK			
Gaseous			
Tritium	0.012	0.0028	23%
Iodine-129	0.00024	0.000020	8%
Particulate			
Gross Alpha and Beta	0.00016	0.000093	57%

[a] All numbers were rounded to two significant digits after calculations were complete. Percentages based on the above total curie values may not exactly match those in the table.

Effective operation of the site wastewater treatment facilities is indicated by compliance with the applicable discharge limits regulated by the SPDES permit. Approximately 60 chemical and water quality constituents are monitored regularly. The analytical results are reported to the New York State Department of Environmental Conservation (NYSDEC) via monthly Discharge Monitoring Reports, required under the SPDES program. There were no SPDES effluent limit exceptions for chemical constituents for 2010. Historical limit exceptions are discussed in previous Annual Site Environmental Reports. Although the goal of the LLW2 and sanitary and utility wastewater treatment facility operations is to maintain effluent water quality consistently within the permit requirements, if SPDES permit limit exceptions occur, the exceptions are evaluated to determine their cause and to identify corrective measures. (See "SPDES Permit" discussion in the Environmental Compliance Summary.)

The north plateau groundwater recovery system (NPGRS) operated throughout 2010, recovering groundwater from an area within the western lobe of the strontium-90 plume on the north plateau. During 2010, approximately 3.0 million gallons (11.4 million liters) were recovered and treated by ion exchange to remove strontium-90. The water was transferred to the lagoon system and ultimately discharged through the lagoon 3 weir. For a more-detailed discussion of the plume and the NPGRS, see "Strontium-90 Plume Remediation-Related Activities in 2010" in Chapter 4.

Environmental Management of Airborne Emissions. During operations, ventilated air from various WVDP facilities is continuously sampled for radioactivity in gases and particulate matter. Ventilated air is monitored and an alarm is activated if particulate matter radioactivity increases above preset levels. Samples are analyzed in the laboratory for the specific radionuclides that are present in the radioactive materials being handled in the facilities. (See "Radiological Air Emissions" in Chapter 2.)

Ventilation air through facilities undergoing radioactive material cleanup passes through high-efficiency filters before being released to the atmosphere. The filters are generally more effective for particulate matter

than for gaseous radioactivity. Therefore, facility air treatment tends to remove a lesser percentage of gaseous radioactivity (e.g., tritium and iodine-129) than radioactivity associated with particulate matter (e.g., strontium-90 and cesium-137). However, gaseous radionuclide emissions still remain so far below the most restrictive regulatory limits for public safety that additional treatment technologies beyond those already provided are typically not necessary.

Table 1-3 shows the gaseous and particulate matter radioactivity emissions from the MPPB (location ANSTACK) in 2010 compared to averages from the previous 10-year period. These 2010 values are low in comparison with the 10-year averages that include years when the vitrification system was operating.

Environmental Performance Measures

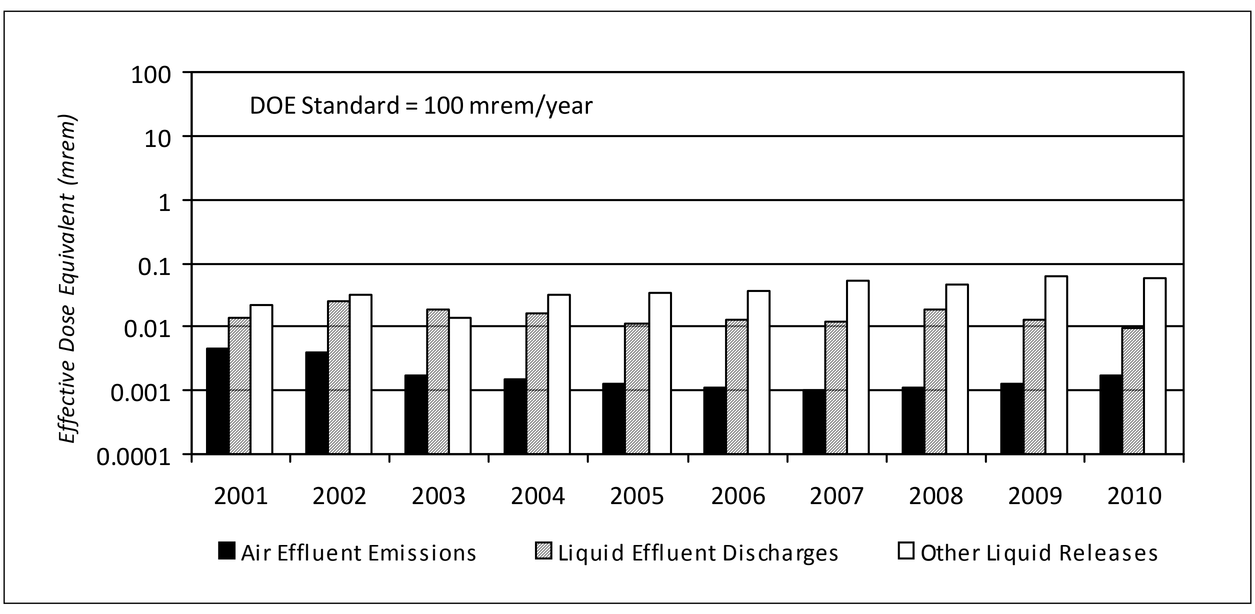
Performance measures can be used to evaluate effectiveness, quality, timeliness, safety, or other areas that reflect achievements related to organization or process goals, and can be used as tools to identify the need to institute changes.

Dose Assessment. As an overall assessment of Project activities and the effectiveness of the as-low-as-reasonably-achievable policy, the low potential radiological dose to the maximally exposed off-site individual is an indicator of well-managed radiological operations. The relative dose equivalents for radiological air emissions, liquid effluent discharges, and other liquid releases (including drainage from the WNSWAMP ditch) from 2001 through 2010 are graphed on Figure 1-1. Note that, when summed, the total dose is well below the DOE standard of 100 millirem per year. The consistently low effluent concentrations indicate that radiological activities at the site are well-controlled. (See also Table 3-2 in Chapter 3, “Dose Assessment.”)

Groundwater Monitoring. The groundwater program is implemented at the WVDP according to DOE Order 450.1A and Resource Conservation and Recovery Act §3008(h) Administrative Order on Consent requirements, as approved by NYSDEC and the U.S. Environmental Protection Agency (EPA). Monitoring continued during 2010. Refer to Chapter 4, "Groundwater Protection Program," for details.

Environmental Management of Radiation Exposure. Ambient environmental radiation is measured with thermoluminescent dosimeters (TLDs) at on-site and off-site locations. (See Figures A-10 through A-12.) Consistent with historical data, results from three of the eight TLDs located near on-site waste storage facilities on the north plateau in 2010 were generally higher than background. Results from perimeter TLDs that would be more representative of exposure to the public were statistically indistinguishable from background concentrations. (See "Environmental Radiation" in Chapter 2.)

FIGURE 1-1
Annual Effective Dose Equivalent to the Maximally Exposed Off-Site Individual



Nonconformance and Corrective and Preventative Action

Throughout CY 2010, comprehensive evaluations, reviews, audits, and assessments were performed evaluating the implementation of EMS elements at the WVDP. During CY 2010, there were no notices of noncompliance, and no regulatory inspection findings. Results from the various assessments indicate that WVES has maintained an effective EMS. Performance against metrics is outstanding and there were few environmental performance issues, none which indicate regulatory noncompliance.

When a deficiency or issue is noted during an audit or assessment, corrective actions are initiated in a timely manner. In addition, WVES has a robust and well-managed Operating Experience Program (Lessons Learned). During CY 2010, over 1,600 items (both internal and external) were screened for Lessons Learned applicability, resulting in 46 Lessons Learned being issued. Refer later in this chapter to "EMS Audits and Other Audits and Assessments" for further discussion.

Quality Assurance (QA) Program

The QA program at the WVDP provides for and documents consistency, precision, and accuracy in collecting and analyzing environmental samples and in interpreting and reporting environmental monitoring data. Under contract with the DOE, WVES implemented the QA program at the WVDP. Subcontractor laboratories providing analytical services for the environmental monitoring program are contractually required to maintain a QA program consistent with WVDP requirements.

10 CFR Part 830, Subpart A, "Quality Assurance Requirements," Section 830.122, "Quality Assurance Criteria," and DOE Order 414.1C, "Quality Assurance" (DOE, 2005), document the QA program policies and requirements applicable to activities at the WVDP. The WVDP QA program serves to implement the DOE Order 450.1A requirement to provide "assurance that analytical work for environmental and effluent monitoring supports data quality objectives, using a documented approach for collecting, assessing, and reporting environmental data." The integrated QA program also incorporates the requirements from the consensus standard "Quality Assurance Program Requirements for Nuclear Facilities" (American Society of Mechanical Engineers NQA-1, 1989). Controlled documents specific to the WVDP are used to implement the integrated QA program.

General areas addressed by the QA program are presented below.

Responsibility. Responsibilities for overseeing, managing, and conducting an activity must be clearly defined. Personnel who verify that an activity has been completed correctly must be independent of those who performed it. Managers of programs, projects, and tasks at the WVDP are responsible for ensuring that QA requirements applicable to activities under their cognizance are implemented.

Planning. Work activities must be planned beforehand, the plan followed, and activities documented. Purchases of quality-affecting equipment or items must be planned, precisely specified, and verified for correctness upon receipt.

Training. Anyone performing an activity in support of the WVDP environmental monitoring program must be trained in the appropriate procedures and qualified accordingly before carrying out the activity.

Control of Design, Procedures, Items, and Documents. Any activity, equipment, or construction must be clearly described or defined and tested. Changes in the design must be tested and documented. Procedures must clearly state how activities will be conducted. Procedures are reviewed periodically, updated when necessary, and controlled so that only approved and current procedures are used.

Equipment or particular items affecting environmental data quality must be identified, inspected, calibrated, and tested before use. Calibration status must be clearly indicated. Items that do not conform to requirements must be identified as nonconforming and segregated to prevent inadvertent use.

Corrective Action. Conditions adverse to quality must be promptly identified, a corrective action planned, responsibility assigned, and the problem remedied.

Documentation. Records of all activities must be kept to verify what was done and by whom. Records must be clearly traceable to an item or activity. Records such as field data sheets, chain-of-custody forms, requests for analysis, sample shipping documents, sample logs, data packages, training records, and weather measurements, in addition to other records in both paper and electronic form, are maintained as documentation for the environmental monitoring program.

Quality Control (QC)

The QC practices, an integral part of the WVDP QA program, are used to ensure that samples are collected and analyzed in a consistent and repeatable manner. QC methods are applied both in the field and in the laboratory.

Field QC. Procedures are defined for collecting each type of sample, such as surface water, groundwater, soil, and air. Trained Environmental Laboratory (ELAB) field personnel collect the samples. Field sampling locations are clearly marked to ensure that routine samples are continually collected in the same location. Collection equipment that remains in the field is routinely inspected, calibrated, and maintained, and automated sampling stations are kept locked to prevent tampering. Samples are collected into certified, pre-cleaned containers of an appropriate material and capacity. Containers are labeled with information about the sample, such as date and time of collection, sample collection personnel, and special field conditions. Collection information is documented and kept as part of the sample record.

Chain-of-custody documentation is maintained to trace sample possession from time of collection through analysis. Samples are stored in a locked, secure location before analysis or shipping. Samples sent off site for analysis are accompanied by an additional chain-of-custody form. Subcontract laboratories are required by contract to maintain internal chain-of-custody records and to store the samples under secure conditions.

Special field QC samples are collected and analyzed to assess the sampling process. Duplicate field samples are used to assess sample homogeneity and sampling precision. Field and trip blanks (laboratory-deionized water in sample containers) are used to detect contamination potentially introduced during sampling or shipping. Environmental background samples (samples of air, water, vegetation, venison, and milk taken from locations remote from the WVDP) are collected and analyzed to provide baseline information for comparison with on-site or near-site samples so that site influences can be evaluated.

Laboratory QC. In 2010, samples were collected by personnel from the URS ELAB. On-site analyses were performed at the ELAB or the Wastewater Treatment Facility Laboratory. Off-site analyses were performed by GEL Laboratories LLC (Charleston, South Carolina), TestAmerica Laboratories, Inc. (Buffalo, New York), and AREVA NP Inc. (Westborough, Massachusetts). As samples were collected, shipped, and analyzed, chain-of-custody documentation was maintained to track sample possession from time of collection through analysis and data reporting. All laboratories are required to maintain relevant certifications, to participate in applicable crosscheck programs, and to maintain a level of QC as defined in their contracts.

To analyze environmental samples originating from the state of New York, both on-site and subcontract analytical laboratories are required to maintain the relevant New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certification.

Laboratory QC practices specific to each analytical method are described in approved references or procedures. QC practices include proper training of analysts, maintaining and calibrating measuring equipment and instrumentation, and routinely processing laboratory QC samples such as standards and spikes (to assess method accuracy), duplicates and replicates (to assess precision), and blanks (to assess the possibility of contamination). Standard reference materials (materials with known quantities or concentrations of constituents of interest) traceable to the National Institute of Standards and Technology are used to calibrate counting and test instruments and to monitor their performance.

Crosschecks. Crosscheck samples (performance evaluation samples) contain a concentration of a constituent of interest known to the agency conducting the crosscheck, but unknown to the participating laboratory. Crosscheck programs provide an additional means of testing accuracy of environmental measurements. Subcontract laboratories are required to perform satisfactorily on crosschecks, defined as having at least 80% of reported results falling within control limits. Crosscheck results that fall outside of control limits are addressed by formal corrective actions to determine any conditions that could adversely affect sample data and to ensure that actual sample results are reliable.

The WVDP participates in formal crosscheck programs for both radiological and nonradiological analyses.

- Radiological Crosschecks

  Organizations performing radiological analyses as part of effluent or environmental monitoring

are encouraged by the DOE to participate in formal crosscheck programs to test the quality of environmental measurements being reported to the DOE by its contractors. Crosscheck samples for radiological constituents are analyzed on site by the ELAB and off site by GEL. In 2010, the WVDP participated in the DOE Radiological Environmental Sciences Laboratory Mixed Analyte Performance Evaluation Program (MAPEP). Results are listed in Appendix G.

The radiological crosscheck results reported by GEL for the March 2010 MAPEP study for air filter radiological analyses were flagged as "not acceptable" by the DOE MAPEP proficiency laboratory. The reported results for the air filter crosscheck (americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239/240, strontium-90, uranium-233/234, and uranium-238) presented a bias of greater than 100% of the actual reference value. A corrective action investigation for the nonconformance was initiated by GEL to determine the root cause. It was determined that human error, combining two filters for digestion and analysis instead of one, resulted in the elevated reported results. Inattention to detail was attributable to the error, which has since been corrected.

- Nonradiological Crosschecks

As a SPDES Permittee, the WVDP is required to participate in the EPA Discharge Monitoring Report (DMR) - QA performance evaluation studies (2010 DMR QA Study #30) for the National Pollutant Discharge Elimination System. Samples from this program are analyzed both on site and by subcontract laboratories. In addition, subcontract laboratories performing nonradiological sample analyses that contain radiological contamination participate in the DOE MAPEP program. This mixed analyte program provides performance evaluation samples for both radiological and nonradiological constituents.

In 2010, nonradiological crosschecks were analyzed by the WVDP Wastewater Treatment Facility Laboratory, the ELAB, GEL, and TestAmerica. Results are summarized in Appendix G.

Results for 2010 from all laboratories that analyzed samples from the WVDP monitoring program are summarized in Table 1-4. As presented, 96.4% of the crosschecks performed in 2010 were acceptable.

TABLE 1-4
Summary of Crosschecks Completed in 2010

Type	*Number Reported*	*Number Within Acceptance Limits*	*Percent Within QC Limits*
Radiological	92	82	89.1%
Non-radiological	213	212	99.5%
All types	305	294	96.4%

Data Management

The Environmental Laboratory Information Management System (ELIMS) is a database system used at the WVDP for establishing sample identification number, maintaining the sample data log, tracking samples, managing field and analytical data, and recording status and results of data validation. The ELIMS is used as a controlled-source database for generating reports and statistical evaluations of data sets to support environmental surveillance activities. Subcontract laboratories are requested to provide data in electronic format for direct entry into the ELIMS by WVDP personnel.

All software packages used to generate data are verified and validated before use. All analytical data produced in the ELAB at the bench level are reviewed and signed off by a qualified person other than the one who performed the analysis. A similar in-house review is contractually required from subcontractor laboratories.

Data Verification and Validation

Data validation is the process by which analytical data from both on-site and off-site laboratories are reviewed to verify proper documentation of sample processing and data reporting, and to determine the quality and usability of the data. A graded approach is applied that, based upon data quality objectives, dictates the rigor of review of the documentation associated with sample collection and/or sample analysis. In the WVDP environmental program, each data point is validated per approved standard procedures before it is assigned approval status and made ready for data assessment.

Data Assessment and Reporting

Validated analytical data, field information, and historical project data are integrated and evaluated to determine whether the constituents of interest are

actually present and, if so, at what concentrations. Data problems identified at this level are investigated and appropriately resolved.

Data from the environmental monitoring program are then evaluated to assess the effect, if any, of the site operations and activities on the environment and the public. Data from each sampling location are compared with historical results from the same location, with comparable background measurements, and (if applicable) with regulatory limits or guidance standards. Standard statistical methods are used to evaluate the data.

EMS Audits and Other Audits and Assessments

Audits, assessments, and surveillances are an important part of the improvement of the safety program at the WVDP. WVES established an Integrated Assessment Council, made up of representatives from different departments, to develop an annual Integrated Assessment Schedule-based on past performance and the risk and hazards of upcoming work. Internal assessments, audits, and self-assessments are performed throughout the year to continuously improve safety programs. Issues discovered through the Integrated Assessment Program are tracked in a centralized database, statused weekly with senior management, and trended via a quarterly performance analysis program.

Audits and assessments are conducted to verify compliance with, and effectiveness of, all aspects of the QA program, and to verify programmatic and functional compliance with site procedures, applicable local, state, and federal environmental regulations, and applicable DOE Directives. The WVDP environmental monitoring program is audited by external agencies and evaluated using internal self-assessments and audits.

Terminology. An audit or assessment provides for objective and independent review of site functions to determine if they are operating within regulatory, programmatic, and procedural parameters. The focus and/or topics of an audit or assessment are selected from specific criteria taken from the protocol, procedure, or regulation against which the function is to be evaluated.

During an audit or assessment, a "finding" is a noncompliance with a program element or a requirement of a specification, procedure, or commitment. Findings that may be considered immediately dangerous or involve any direct violation of a regulation, WVDP policy or procedure, DOE Order, or conduct of operations requirement must be brought to the immediate attention of the cognizant site manager. Such conditions require corrective action and are to be fixed immediately and documented within the assessment. An "observation" is a condition that, if left uncorrected, could lead to a "finding." It may indicate the potential for violating regulations or requirements or an opportunity to improve an existing compliant condition or procedure. Such conditions also require corrective action. If a finding or an observation cannot be fixed before the issuance of the assessment report, an Issue Report (IR) is initiated to document the condition that needs to be addressed, the required corrective action, and the timeline for completing the corrective action. IRs are tracked to closure in the WVDP open items tracking system. A "recommended action" may be identified to improve a program. "Good practices" (noteworthy practices) are identified when actions are above and beyond those required by procedural compliance.

WVES External Audit of GEL Laboratories. An external QA audit was conducted at GEL Laboratories from August 31 to September 1, 2010. The purpose of the audit was to satisfy a DOE Laboratory Accreditation Program requirement to annually evaluate the laboratory contracted by WVES. The audit considered the technical scope of work and quality program requirement of the WVES contract. In addition, continued implementation of resolutions to previously identified issues was verified.

The auditors specifically evaluated the preparation of bioassay samples and standard operating procedures (SOPs) followed when analyzing for strontium-90 in urine. The elements that were evaluated included; organization and management, instructions and procedures, personnel training, document control, equipment and facilities, data integrity, test control, control of measuring and test equipment, corrective action, control of nonconforming items, and indirect radiobioassay criteria. There were no findings identified during the audit; however, one observation and one commendable practice were noted. The observation was noted in the area of document control relating to minor inconsistencies between language in GEL SOPs and actual practice. It was acknowledged that clarification was warranted and review and potential revision of the affected documents will follow. The commendable practice was noted in the area of development of a barcode reader/scanner in the bioassay count room.

ISMS and QA Program Effectiveness Review. During July 26–29, 2010, WVES and DOE-WVDP jointly conducted a comprehensive evaluation and annual ISMS and QA effectiveness review. The audit included a review of self-assessments, WVES and external oversight reviews, corporate reviews, performance against established performance objectives, measures, and commitments, operating experience programs, as well as other feedback, field observations, document reviews, and personnel interviews. The EMS was included in this review. WVES and DOE-WVDP concluded that the ISMS, EMS, and QA programs remain well documented, and are functioning effectively.

This review was performed to support the annual ISMS and QA declaration, which is transmitted to the DOE-Headquarters.

DOE-WVDP Audit of the WVES Environmental Programs. From November 2–17, 2010, the DOE-WVDP performed an audit of the WVES Environmental Programs. The audit focused on elements of compliance with applicable requirements of DOE Order 450.1A, DOE Order 5400.5, the EPA, and the state of New York relative to air emissions, waste minimization, pollution prevention, spill prevention, and reporting, and hazardous and toxic chemical reporting.

There were four findings as a result of the audit. One was procedural and two were related to ineffective or incomplete corrective actions from the previous CY 2009 audit, and the fourth was related to delays in spill reporting. The procedural finding (finding one) was based on inaccurate modifications that were made to the SPDES and Storm Water Pollution Prevention Plan (SWPPP). This plan has since been corrected. The two incomplete/ineffective findings (findings two and three) were based on failure to maintain procedures that were current administratively. Personnel involved with updates to these procedures are now assigned required reading and informed of the controlled document and periodic review process. The fourth finding was in regard to plant systems operator failure to report and notify EA of three spills, including one reportable petroleum spill, within one hour, as required by procedure. All shift supervisors were provided instructions to reiterate the necessity to contact EA directly for spill reporting at all times, including during nonroutine work hours.

All other areas and activities evaluated during this audit were found to be overall effective and in compliance with applicable federal and state regulations and DOE and WVES program requirements.

QA Audit of the URS ELAB and the ELAP Program. An audit of the URS ELAB QA program was conducted on December 15, 2010 as an external audit of contracted off-site and on-site activities performed by URS laboratories. The audit focused on elements of the NYSDOH ELAP program, quality management, training and indoctrination, document control, inspection, test control, and measuring and test and calibrated equipment control. Within the scope of the audit, one commendable practice was recognized relating to an effectively implemented training matrix. Two observations were identified which were both related to a requirement for review of calibration records by an independent reviewer, or management designee. Staff were briefed and the observations were addressed immediately to the satisfaction of the audit team. The audit team concluded that the URS ELAB effectively implements a mature and well-administered system.

Environmental Assessments

During 2010, EA also conducted self-assessments to verify programmatic effectiveness and functional compliance with site procedures and applicable regulations.

- On March 25, 2010 an evaluation of dam safety requirements was performed. As a result of the August 2009 storm event, an agreement with NYSDEC initiated implementation of an enhanced inspection process. The surveillance verified that marker flags were placed at the vertical and lateral extent of the eroded areas, the tall grass and scrub brush had been removed from the dam faces and emergency spillway, and weekly enhanced inspections of the lake dams and emergency spillway had been initiated. There were no findings identified during the assessment. One recommendation was to improve the quality of the documented conditions and notes associated with the inspections.

- From March 16–24, 2010, an assessment was performed to review the records and requirements for Superfund Amendments and Reauthorization Act Title III, Section 311, 312, and 313 reporting. The assessment reviewed the process to track all purchases of chemicals and chemical containing items, and inventories from each user department. Quarterly and annual reports were submitted to the DOE as required. There were no findings observed during this assessment.

- During June 2010, an assessment was conducted to verify that all state and/or federal regulatory requirements for petroleum storage tanks were met. There were no findings observed during the assessment; however, there were three minor observations. Two observations were related to improper location of tank labels, which were immediately attached properly. The third observation noted that hinges on the lid to a fill port catch basin of one of the tanks was broken. The replacement part was ordered. This was not a regulatory non-compliance issue.

- During December 2010, EA performed a SPDES-integrated assessment for storm water associated with construction activities at the north plateau PTW. The north plateau PTW installation/construction project was performed under the SPDES general permit for storm water associated with construction activities (GP 0-10-001) and the SWPPP. Requirements associated with GP 0-10-001 were found to have been satisfactorily performed. There was one finding because one weekly inspection was not performed on December 20, 2010. Due to winter weather conditions in the fall delaying activities, the “notice of termination” was submitted to NYSDEC in August 2011, after the remaining areas of disturbed surface soils were stabilized to the permit requirements.

- During December 2010, a self-assessment was performed to verify that certain implementing requirements associated with National Environmental Policy Act environmental checklists were achieved. The assessment evaluated environmental checklists for the tank and vault drying system and the north plateau PTW. The assessed performance requirements included evaluations of the potential for SPDES or NESHAP permit modifications, evaluating storm water management controls, management and containment of contaminated north plateau soil and water, and airborne radiological-NESHAP evaluations. It was determined that all implementing requirements were met.

- On December 16, 2010, an environmental facility walkdown was performed to observe for environmental issues such as, but not limited to, impacts to storm water quality, general facility housekeeping, waste management concerns, spills or releases, or other issues that could potentially impact the environment, health or safety. There were no findings associated with this assessment. A noteworthy practice for general good housekeeping was noted in the hazardous waste management areas of the RHWF and the lag storage LLW, TRU, and mixed waste storage areas. A few observations were noted regarding labels and status tags on universal waste management containers. Corrective actions for all observations were initiated and completed within the shift they were observed.

QA Assessment of WVES Environmental Protection Program and EMS. From August 11–16, 2010, WVES QA conducted an assessment to evaluate implementation of WVES contract Directive DOE Order 450.1A, "Environmental Protection Program," and ISO 14001:2004, "Environmental Management Systems." The evaluation focused on activities conducted under the ARRA work force scope. Personnel training, the WVDP safety culture, and emergency preparedness were areas of consideration. The assessment concluded that the requirements of the directives have been adequately addressed in WVES implementing documents.

DOE-WVDP Assessment of the WVES NESHAP Program. During January 24–26, 2011, the DOE-WVDP conducted an assessment of the NESHAP program at the WVDP, through interviews with personnel and organizations, observation of work activities, and review of pertinent documents. Among the elements evaluated were compliance with 40 CFR Part 61, and EPA requirements relative to air emissions and reporting.

Although four findings were identified as a result of the assessment, the overall adequacy and implementation of the WVDP NESHAP program is considered effective. The four findings were identified as follows:

- The “Memorandum of Understanding (MOU) between the EPA and the DOE concerning Clean Air Act Emission Standards for Radionuclides 40 CFR 61 Including Subparts H, I, Q, & T” states that the methodologies for assessing diffuse sources will be provided to the EPA. The finding noted that contrary to the requirement, the methodologies have not been submitted. WVES prepared a current document and has submitted it with the CY 2010 NESHAP report to the DOE-WVDP for transmittal to the EPA.

- The second finding noted that WVES had not received EPA approval to discontinue stack inspections. Through 2007, stack inspection requirements of 40 CFR 61, Appendix B, Method 114 were satisfied for sampling systems in use for major emission points at the WVDP. Sampling systems for the main stack, the STS/PVS, the vitrification heating, ventilation, and air-conditioning system, the con-

tact size-reduction facility (CSRF), and OVEs/PVUs were inspected. After notification was made to EPA in the NESHAP Annual Report, inspections were discontinued in CY 2008. Discontinuing inspections was based upon multiple years of documented lack of continuing visible deposits, no evidence of other sample train degradation, and the continuing need to enhance worker safety. Ventilated facilities have been maintained, and inspections for all major point sources were resumed in CY 2011.

- The third finding was procedural, and related to two site procedures containing outdated references to various documents and regulations. The procedures were updated with current references in June 2011.

- The fourth finding related to lack of inclusion of detailed meteorological data in the NESHAP report. In the report, WVES routinely includes the source of meteorological data, but does not include the detailed user-supplied meteorological data. Additional meteorological data were included in the annual NESHAP report documenting 2010 conditions, including those generated by the CAP88-PC computer program output and wind rose information.

Environmental Surveillances

Several surveillances of activities that potentially could impact environmental health or safety were conducted in 2010.

DOE-WVDP Surveillance of Erosion Monitoring of Dams, Emergency Spillway, and Creeks. The surveillance was conducted as a review of WVES's effort to monitor erosion on the reservoir dams, emergency spillway, and creeks. DOE-WVDP performed walkdowns of Erdman Brook, Buttermilk Creek, the emergency spillway, and Dam #1 and Dam #2 on July 26, 2010, August 4, 2010, and September 29, 2010. The initial walkdown was performed after a July 24–25 storm that yielded 2.46 inches of precipitation. No findings or concerns were identified during the surveillance, and there were two comments, discussed below.

- WVES should continue to monitor, document the length, width, and depth or height of identified eroded areas of concern or knick points on the WVDP, and take measures to prevent further erosion as necessary. In accordance with SOPs, WVES performed biennial inspections of the areas that directly affect the WVDP operations, including Lagoon 3 toe area and Erdman Brook knick points that may eventually have impact on the NDA. In addition, an inspection would be performed in the event of a 24-hour storm event of greater than one inch.

- The second comment noted erosion on a gravel roadway used by NYSERDA during a recently completed erosion mitigation project on Erdman Brook. The pathway is currently used as an access to an environmental sampling point located within Erdman Brook. The access previously existed as a dirt pathway, and motor vehicle traffic is not routinely anticipated. Should the observed erosion (rilling) worsen or prevent safe access to the sampling point, necessary repairs would be performed to make it safe for use.

North Plateau PTW Surveillances. On February 23, 2010, a surveillance was performed of the drilling and sampling operations along the north plateau PTW alignment in preparation of the wall installation. Oversight activities included review of work permits, ground disturbance permit notification, instrument calibration checks, sample container and documentation protocols, and record keeping. The results of the surveillance were satisfactory.

On June 1, 2010, storm water sampling was observed at outfall S09 during a rain event. ELAB personnel were witnessed performing field collection activities, field measurements, documentation on sample containers, field logs, and chain of custodies, and preparation of a flow-weighted composite. Information gathered or generated as a result of the storm water program is subsequently reported to NYSDEC. The results of the surveillance were satisfactory.

Multiple surveillances were performed from September through December 2010 relative to activities associated with the installation of the north plateau PTW. The objectives of these surveillances included, but were not limited to the following:

- verification of the construction of the spoils containment structure;

- observation of pump station installation and hydrostatic testing;

- observation of the geosynthetic clay liner, geotextile cover, and base rock cover installation on top of the PTW trench;

- verification that the smart ditch was properly installed and anchored; and
- verification of design modification for the containment structure concrete walls and rebar positioning.

The results of the surveillances conducted during the PTW installation were all satisfactory.

EMS Management Review

As discussed earlier in this chapter ("ISMS and QA Effectiveness Review"), the FY 2010 annual review was conducted by a joint review team of external DOE, DOE-WVDP, and WVES assessors. The EMS and environmental protection is an integral component of the ISMS. The team concluded that the WVDP ISMS mechanisms continue to be implemented in an effective manner and is adequately integrated with other WVDP management systems.

EMS Experiences

EMS Challenges. A major challenge for the WVDP was to minimize waste generation when the work consists of D&D of radiologically contaminated facilities. Overcoming this challenge was accomplished by detailed work planning that considered methods to minimize each of the environmental aspects of the work and drawing upon the lessons learned from other projects. Future challenges will be met by establishing clear goals with a renewed focus on EMS.

EMS Best Practices/Lessons Learned. During the last three years, WVES worked an ambitious plan to prepare for transport and eventual off-site disposal all of the legacy transuranic (TRU) radioactive waste stored at the site (approximately 80,000 ft^3 [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 of this waste stream. TRU waste will be safely stored at the WVDP until a disposal facility is available.

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.

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 the processing of TRU waste are developed specifically for individual waste streams and often utilize 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 2011.”

WVES increased its sustainable acquisitions by training purchasing personnel to investigate and find "green" bio-based alternatives to products.

EMS Benefits to Agency Mission. The benefits of implementing an EMS at the WVDP include:

- minimizing the environmental impacts of D&D activities;
- reusing excess materials by transfer to other DOE facilities, Federal and State agencies, various DOE-sponsored programs, donation programs, auctions, and sales; and
- safe removal of asbestos from highly radiologically contaminated areas.

Summary

Although areas for improvement were identified in the course of audits and assessments, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general. During 2010, there were no notices of noncompliance, and there were no unpermitted or permit-exceeding releases to the environment.

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ENVIRONMENTAL MONITORING

Monitoring Program

The goal of the West Valley Demonstration Project (WVDP or Project) environmental monitoring program is to ensure that public health and safety and the environment continue to be protected with respect to releases from site activities. To achieve this goal, possible exposure pathways are monitored.

The primary focus of the monitoring program is on surface water and air pathways, as these are the principal means by which potential contaminants are transported off site. Samples are collected from water, air, and other environmental media and measured for radiological and nonradiological constituents. A description of and schedule for the sampling program at each location and discussion of the environmental monitoring program drivers and rationale are presented in Appendix A, as well as on maps showing the 2010 sampling locations. In accordance with United States (U.S.) Department of Energy (DOE) Order 450.1A, the monitoring program includes both effluent monitoring and environmental surveillance.

Effluent Monitoring. Liquid effluents and air emissions are monitored by collecting samples at locations on site where radioactivity or chemical pollutants are (or might be) released. Release points include discharge outfalls, storm water outfalls, site drainage points, and plant ventilation stacks. At some points, direct measurements (e.g., radioactivity or flow rates) are also taken. The WVDP maintains required permits and/or certificates from regulatory agencies applicable to releases to air and water, as listed in Table ECS-3.

Environmental Surveillance. Surface water, drinking water, air, sediment, soil, venison, fish, and milk are collected at locations where the highest concentrations of transported contaminants might be expected. Samples are also collected at remote locations to provide background data for comparison with data from on-site and near-site samples. Direct radiation is monitored on site, at the site perimeter, and at a remote background location.

Data Evaluation. Data are assessed to determine whether the constituents of interest are present and, if so, their concentrations. Data from each sampling location are compared with regulatory or guidance limits (if applicable) to identify any exceedances. Guidance levels for radiological constituents in air and water are listed in Table UI-4 in the "Useful Information" section of this report. Regulatory limits for nonradiological constituents in discharges to surface water, additional water quality standards, and potable water standards are listed in Appendix B-1.

Data from near-site locations are compared with background concentrations using standard statistical methods as a means of assessing possible site impacts to the environment. Results from each location are also compared with historical data from that location to determine if any trends, such as increasing constituent concentrations, are occurring. If indicated, follow-up actions are evaluated and implemented as warranted.

Effluent Monitoring

Liquid Effluents. The Project is drained by several small streams. Franks Creek enters from the south and receives drainage from the south plateau. As it flows northward, Franks Creek is joined by Erdman Brook, which receives effluent from the low-level waste treatment facility (LLW2) and the site sewage treatment plant. After leaving the Project at the site security fence, Franks Creek receives drainage from the north and northeast swamp areas on the north plateau and from Quarry Creek. Franks Creek then flows into Buttermilk Creek, which, after flowing northward through the Western New York Nuclear Service Center (WNYNSC), enters Cattaraugus Creek and leaves the WNYNSC. (See Figures A-2 and A-5.)

- Radiological Releases

  Two locations, the lagoon 3 weir at outfall 001 (WNSP001 on Figure A-2) and a natural drainage from the northeast swamp (monitoring point WNSWAMP on Figure A-2), are the primary sources of radionuclide releases to surface waters. (Note that two other liquid release points, the sewage treatment outfall [point WNSP007] and another

drainage point on the north plateau [the north swamp, point WNSW74A] are also evaluated each year. Releases from these points are minor and are not included in this discussion. However, they are addressed in Chapter 3, Dose Assessment.)

Discharge through the lagoon 3 weir at SPDES outfall WNSP001 into Erdman Brook is the primary controlled point source of liquid release from the Project. Six batch releases totaling about 10.3 million gallons (gal) (39.1 million liters [L]) were discharged from WNSP001 in 2010. Drainage from the WNSWAMP location in calendar year (CY) 2010 was estimated to be approximately 37.7 million gal (143 million L). Estimates of curies released from these two sources in 2010 and average radionuclide concentrations are summarized in Tables 2-1 and 2-2.

TABLE 2-1
Total Radioactivity Discharged at Lagoon 3 (WNSP001) in 2010 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	9.88±0.89E-04	3.65±0.33E+07	2.53±0.23E-08	NA[e]	NA
Gross Beta	1.68±0.03E-02	6.21±0.11E+08	4.29±0.08E-07	NA[e]	NA
H-3	2.84±0.08E-02	1.05±0.03E+09	7.25±0.21E-07	2E-03	0.0004
C-14	2.43±5.46E-04	0.90±2.02E+07	0.62±1.40E-08	7E-05	<0.0002
K-40	-4.85±8.00E-04	-1.80±2.96E+07	-1.24±2.05E-08	NA[f]	NA
Co-60	1.78±3.08E-05	0.66±1.14E+06	4.55±7.87E-10	5E-06	<0.0002
Sr-90	7.29±0.11E-03	2.70±0.04E+08	1.86±0.03E-07	1E-06	0.186
Tc-99	5.76±0.41E-04	2.13±0.15E+07	1.47±0.10E-08	1E-04	0.0001
I-129	3.00±1.61E-05	1.11±0.60E+06	7.67±4.12E-10	5E-07	0.0015
Cs-137	1.69±0.08E-03	6.24±0.31E+07	4.31±0.21E-08	3E-06	0.0144
U-232[g]	2.50±0.11E-04	9.26±0.41E+06	6.40±0.28E-09	1E-07	0.064
U-233/234[g]	1.85±0.09E-04	6.84±0.34E+06	4.73±0.24E-09	5E-07	0.0095
U-235/236[g]	1.23±0.25E-05	4.54±0.93E+05	3.13±0.64E-10	5E-07[h]	0.0006
U-238[g]	1.34±0.08E-04	4.94±0.29E+06	3.41±0.20E-09	6E-07	0.0052
Pu-238	4.86±1.22E-06	1.80±0.45E+05	1.24±0.31E-10	4E-08	0.0031
Pu-239/240	3.50±1.02E-06	1.30±0.38E+05	8.95±2.60E-11	3E-08	0.003
Am-241	6.21±1.26E-06	2.30±0.47E+05	1.59±0.32E-10	3E-08	0.0053
Sum of Ratios					**0.29**

Note: Radiological measurements are expressed as a result term plus or minus (±) an uncertainty term. Result terms may be positive or negative. If the uncertainty term is larger than the result, the radionuclide was not detected. For more detail, see the “Data Reporting” discussion in the “Useful Information” section.

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 3.91E+10 milliliters (mL) (1.03E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1 Bq = 2.7E-11 Ci: 1 microcurie (µCi) = 1E-06 Ci:

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs are not established for gross alpha and beta. Where there are no radionuclide-specific data, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total uranium (grams [g]) = 4.40±0.04E+02; average uranium concentration (micrograms [µg]/mL) = 1.13±0.01E-02

[h] The DCG for U-236 is used for this comparison.

TABLE 2-2
Total Radioactivity Released at Northeast Swamp (WNSWAMP) in 2010 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	27	0.21±1.50E-04	0.77±5.55E+06	0.15±1.05E-09	NA[e]	NA
Gross Beta	27	6.83±0.07E-01	2.53±0.03E+10	4.79±0.05E-06	NA[e]	NA
H-3	27	5.83±2.13E-03	2.16±0.79E+08	4.09±1.49E-08	2E-03	<0.0001
C-14	2	1.13±3.38E-03	0.42±1.25E+08	0.79±2.37E-08	7E-05	<0.0003
Sr-90	12	3.58±0.01E-01	1.32±0.01E+10	2.51±0.01E-06	1E-06	2.51
I-129	2	0.02±1.24E-04	0.08±4.59E+06	0.16±8.69E-10	5E-07	<0.0017
Cs-137	12	1.26±0.78E-04	4.66±2.89E+06	8.84±5.48E-10	3E-06	0.0003
U-232[f]	2	-0.53±3.05E-06	-0.20±1.13E+05	-0.37±2.14E-11	1E-07	<0.0002
U-233/234[f]	2	1.07±0.63E-05	3.94±2.33E+05	7.47±4.42E-11	5E-07	0.0002
U-235/236[f]	2	1.02±3.19E-06	0.38±1.18E+05	0.72±2.24E-11	5E-07[g]	<0.0001
U-238[f]	2	1.86±0.84E-05	6.88±3.11E+05	1.30±0.59E-10	6E-07	0.0002
Pu-238	2	-0.21±2.25E-06	-0.77±8.33E+04	-0.15±1.58E-11	4E-08	<0.0004
Pu-239/240	2	-1.18±2.41E-06	-4.36±8.91E+04	-0.83±1.69E-11	3E-08	<0.0006
Am-241	2	-0.56±2.20E-06	-2.06±8.15E+04	-0.39±1.54E-11	3E-08	<0.0005
Sum of Ratios						**2.51**

Note: Radiological measurements are expressed as a result term plus or minus (±) an uncertainty term. Result terms may be positive or negative. If the uncertainty term is larger than the result, the radionuclide was not detected. For more detail, see the “Data Reporting” discussion in the “Useful Information” section.

Note: The average pH at this location was 7.17 standard units.

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 1.43E+11 mL (3.77E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1 Bq = 2.7E-11 Ci

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs are not established for gross alpha and beta. Where there are no radionuclide-specific data, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison.

[f] Total uranium (g) = 2.73±0.10E+01; average uranium concentration (µg/mL) = 1.91±0.07E-04

[g] The DCG for U-236 is used for this comparison.

DOE Order 5400.5 defines derived concentration guides (DCGs) as radionuclide concentrations that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 millirem (1 millisievert). The DCGs are applicable only at locations where members of the public could be exposed to effluents containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. Note that DCGs are not used for dose assessment. Methods for estimating dose from the liquid pathway are discussed in Chapter 3.

To evaluate each of the releases with respect to the DCGs, each annual average radionuclide concentration was divided by its respective DCG and the ratios from all nuclides were summed. As a DOE policy, the sum of the ratios (also called the “sum of fractions”) should not exceed 1.0. That is, the sum of percentages should not exceed 100%. Tables 2-1 and 2-2 list the sum of ratios for each release point.

The sum of ratios for the release from WNSP001 in 2010 was approximately 0.29, below the 1.0 criterion. However, the sum of ratios from WNSWAMP was 2.51, above the DOE Order 5400.5 criterion. As in

past years, the elevated sum of ratios was almost entirely attributable to strontium-90.

Drainage at the WNSWAMP location largely consists of emergent groundwater. Elevated gross beta concentrations were first noted at this location in 1993. Subsequent investigations delineated a plume of strontium-90 contaminated groundwater on the north plateau.

Annualized average strontium-90 concentrations, which first exceeded the strontium-90 DCG (1E-06 microcurie [µCi]/mL) in 1995, again exceeded the DCG in 2010. (See Figure 4-7 in Chapter 4, "Groundwater Protection Program.") Activities to limit the migration of the strontium-90 groundwater plume, including installation of the 860-foot-long full-scale permeable treatment wall (PTW), are also discussed in Chapter 4.

Even though waters with elevated strontium-90 concentrations drain from WNSWAMP into Franks Creek, then into Buttermilk Creek, and ultimately into Cattaraugus Creek, concentrations of strontium-90 and gross beta in water collected from Cattaraugus Creek downstream of the WVDP at the first point of public access continue to show little or no difference from background concentrations. (See Table B-5A in Appendix B-5.)

State Pollutant Discharge Elimination System (SPDES) Permit-Required Monitoring. Liquid discharges from the WVDP are regulated for nonradiological constituents under a SPDES permit, as identified in Table ECS-3. The permit identifies compliance points from which liquid effluents are released to Erdman Brook (Figure A-2), and specifies the sampling and analytical requirements for each.

The conditions and requirements of the 2010 SPDES permit are summarized in Appendix B-1. The permit identifies 25 outfalls and compliance points with monitoring requirements and discharge limits. The monitored outfalls include:

- outfall 001 (monitoring point WNSP001), discharge from the LLW2;
- outfall 007 (monitoring point WNSP007), discharge from the sanitary wastewater treatment facility;
- outfall 008 (monitoring point WNSP008, closed in May 2001), a groundwater french drain near the LLW2 storage lagoons (closed in May 2001 but remained on the permit until July 2011);
- outfall 116 (pseudo-monitoring point WNSP116), a location in Franks Creek that represents the confluence of outfalls WNSP001, WNSP007, and WNSP008, as well as storm water runoff, groundwater seepage, and augmentation water. Samples from upstream sources are used to calculate total dissolved solids at this location and to demonstrate compliance with the SPDES permit limit for this parameter (outfall 116 is referred to as a "pseudo-monitoring" point on the SPDES permit);
- outfall 01B (monitoring point WNSP01B), an internal monitoring point for the liquid waste treatment system evaporator effluent, was monitored for flow and total mercury. No effluent was processed or released from this outfall in 2010; and
- Twenty storm water discharge outfalls that also receive flows from other minor sources, such as fire hydrant testing and groundwater seepage, being monitored on a rotational basis. The objectives of SPDES permit requirements for monitoring storm water runoff are to determine (1) the levels of water quality and specific chemicals in storm water discharges from specified locations on the WVDP, (2) the amount of rainfall, (3) duration of the storm event, and (4) the resulting flow at the outfalls. The 20 storm water outfalls at the WVDP are grouped into eight representative drainage basins that could potentially be influenced by industrial or construction activity runoff. One representative outfall from each of the eight outfall groups listed in Appendix A must be sampled on a semiannual basis.

The SPDES permit specifies the following conditions for a qualifying storm water event eligible for monitoring: (1) a period of 72 hours between the monitored event and the previous measurable event of 0.1 inches of precipitation; (2) a total rainfall of more than 0.1 inch; and (3) resultant storm discharge at the outfall.

Appendix B-2 presents process effluent data with SPDES permit limits provided for comparison. Appendix B-3 presents storm water runoff monitoring data for outfalls designated in the WVDP SPDES permit.

All samples were collected and analyzed in accordance with the permit in CY 2010.

Effective July 1, 2011, the New York State Department of Environmental Conservation issued a modified permit for the WVDP which identified the revised conditions of the permit. The new permit removed two

storm water outfalls (S02 and S40) which no longer exist as drainage basins. An additional storm water location (S43) was added that was tentatively identified in 2006 and characterized in 2007 near a wetland near the live-fire range on the WNYNSC.

Radiological Air Emissions. Federal law allows air containing small amounts of radioactivity to be released from plant ventilation stacks during normal operations. The releases must meet dose criteria specified in the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations to ensure that public health and safety and the environment are protected. At the WVDP, radiological releases have been measured and/or estimated from six permitted emission points (see Table ECS-3), five non-permitted points, and four diffuse sources (wastewater storage lagoons, stored waste containers, demolition activities, and installation of a passive groundwater treatment system). Sampling locations for air emissions are shown on Figure A-6 in Appendix A. Releases are evaluated and reported to the U.S. Environmental Protection Agency (EPA) in the annual NESHAP report.

Measured radionuclide concentrations in air are also compared with DOE DCGs. Unlike NESHAP dose criteria, the DOE DCGs are expressed in µCi/mL and can be directly compared with measurements from the monitoring program. Although the DOE DCGs are applicable only where the public may breathe air containing radionuclides, the DCGs are used at the WVDP as a tool for evaluating airborne emissions at the point of release. DCGs for radionuclides of interest at the WVDP are found in Table UI-4 in the "Useful Information" section at the end of this report. When only gross alpha and beta measurements are available, activity is assumed to come from americium-241 and strontium-90, respectively, because the DCGs for these radionuclides are the most limiting for major particulate emissions at the WVDP. No DCGs were exceeded by airborne emissions on an annualized basis during 2010. Locations with results statistically greater than background values are summarized in Table 2-4.

Ventilation and Emission Systems. The exhaust from each EPA-permitted ventilation system is continuously filtered and the permanent systems are monitored as air is released to the atmosphere. Because radionuclide concentrations in air emissions are quite low, a large volume of air must be sampled to measure the radionuclide quantity released from the facility. Emissions are sampled for radioactivity in both particulate (e.g., strontium-90 and americium-241) and gaseous forms (e.g., tritium and iodine-129). The total release of each radionuclide varies from year to year in response to changing site activities. For instance, releases of iodine-129 dropped sharply after vitrification was completed in 2002. Over the years, the annual calculated dose from air emissions at the WVDP has remained a small fraction of the NESHAP standard. (See "Predicted Dose From Airborne Emissions" in Chapter 3.)

- The Main Plant Process Building (MPPB) Ventilation Stack

  The primary controlled air emission point at the WVDP is the MPPB ventilation stack, monitoring location code ANSTACK, which vents to the atmosphere at a height of 208 feet (ft) (63.4 meters [m]). This stack has historically released ventilation exhaust from several MPPB facilities, including the liquid waste treatment system, the analytical laboratories, as well as off-gas from the former vitrification system. In 2010, the MPPB stack continued to release ventilation exhaust from a variety of facility spaces.

  Total curies released from the MPPB stack in 2010 are listed in Table 2-3, together with annual averages, maxima, and a comparison of average isotopic concentrations with the applicable DCGs. The sum of ratios for radiological concentrations from ANSTACK was 0.25, below the DOE guideline of 1.0. Airborne concentrations from the stack to the site boundary were further reduced by dispersion. Historical results from air samples taken near the site boundary have confirmed that WVDP operations have had no discernible effect on off-site air quality. (See "Ambient Air," later in this chapter.)

MPPB Stack Ventilation - Severe Storm Event. In August 2010, elevated levels of gross alpha and gross beta were observed in particulate air filter samples from the MPPB ventilation stack, ANSTACK. A few weeks earlier, a severe thunderstorm occurred between July 24 and 25, 2010, accompanied by a series of tornadoes which touched down in the western New York area. The WVDP experienced heavy rain (approximately 2.5 inches), along with moderately high temperatures and humidity. During this heavy rainfall, precipitation entered the MPPB through leaks in the roofing system. Rainfall migrated through contaminated ceiling overheads and finally onto the floors and stairwells. Many of these leaking areas had been previously identified with postings/precautions in place to preclude the spread of contamination. But in this instance, the heavy rain-

TABLE 2-3
Total Radioactivity Released at Main Plant Stack (ANSTACK) in 2010 and Comparison of Concentrations with DOE DCGs

Isotope [a]	N	Total Activity Released [b] (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [c] (µCi/mL)	Ratio of Concentration to DCG
Gross Alpha	27	4.58±0.16E-06	5.94±0.21E-15	6.42E-14	--	--
Gross Beta	27	8.88±0.06E-05	1.15±0.01E-13	1.25E-12	--	--
H-3	27	2.78±0.05E-03	3.61±0.07E-12	1.24E-11	1E-07	<0.0001
Co-60	2	2.10±4.76E-08	2.73±6.18E-17	<1.02E-16	8E-11	<0.0001
Sr-90	2	2.61±0.10E-05	3.39±0.13E-14	5.59E-14	9E-12	0.0038
I-129	2	1.95±0.13E-05	2.53±0.17E-14	2.73E-14	7E-11	0.0004
Cs-137	2	2.95±0.12E-05	3.83±0.23E-14	6.51E-14	4E-10	0.0001
Eu-154	2	1.04±1.28E-07	1.35±1.66E-16	<3.48E-16	5E-11	<0.0001
U-232[d]	2	7.07±6.48E-09	9.17±8.41E-18	2.04E-17	2E-14	0.0005
U-233/234[d]	2	2.25±0.65E-08	2.91±0.84E-17	3.12E-17	9E-14	0.0003
U-235/236[d]	2	5.16±3.37E-09	6.69±4.37E-18	1.16E-17	1E-13	<0.0001
U-238[d]	2	1.88±0.62E-08	2.44±0.80E-17	2.53E-17	1E-13	0.0002
Pu-238	2	6.73±0.34E-07	8.73±0.45E-16	1.54E-15	3E-14	0.0291
Pu-239/240	2	1.23±0.05E-06	1.59±0.06E-15	2.78E-15	2E-14	0.0795
Am-241	2	2.13±0.18E-06	2.76±0.23E-15	4.85E-15	2E-14	0.138
Sum of Ratios						0.25

N - Number of samples

-- - DOE DCGs are not established for gross alpha and beta. Where there are no radionuclide-specific data, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison.

[a] Half-lives are listed in Table UI-4.

[b] Total volume released at 50,000 cubic feet per minute = 7.71E+14 mL/year.

[c] DCGs are listed for reference only. DCGs are applicable at the point at which air could be inhaled by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.

[d] Total uranium (g) = 6.62±0.15E-02; average = 8.59±0.19E-11 µg/mL

fall caused leakage to spread outside the established contamination areas within the building. The WVDP experienced a power outage during this storm event, temporarily taking the ventilation fans off-line for approximately six hours. Loss of ventilation resulted in condensate in the ventilation ducts, as evidenced by condensate leakage from the off-gas duct.

Following this ventilation failure and severe storm event, elevated gross alpha and gross beta activities were recorded from the biweekly ANSTACK air filter samples retrieved during the routine sample filter change-out on August 12 and again on August 25, 2010. Subsequent samples collected at this location during the following weeks showed that gross alpha and gross beta concentrations returned to expected levels. The semiannual air particulate filter composite (comprised of 26 biweekly filters) was analyzed for specific routine radionuclides, and showed elevated levels of activity for the last half of 2010. Both the primary alpha (americium-241, plutonium-238, and plutonium-239/240) and beta-emitting radionuclides (cesium-137 and strontium-90) showed increased concentrations over this period. Nevertheless, as discussed in the previous section, the total curies released from the ANSTACK and the sum of the ratios for radionuclide concentrations were well below DOE guidelines. Refer to Table 2-3 and the previous discussion of "The Main Plant Ventilation Stack."

During follow-up investigations into these observations, it was determined that these increased concentrations may have been due to several contributing factors: incorporation and evaporation of contaminated liquid and condensate into the ventilation system; ventilation system cycling as the power went off and then back on; and ongoing decontamination projects involving access to high-contamination areas to conduct decontamination and decommissioning (D&D) efforts in the MPPB.

Repair work to help seal the MPPB roof has been completed and D&D work continues. (See "Unplanned Radiological Airborne Release" in Chapter 3.)

During the preparation of this report, another increase in gross alpha and gross beta concentrations was observed at the MPPB stack in samples collected in March and April 2011. The investigation into these elevated gross alpha and beta observations is currently ongoing and has been attributable to cycling of the main stack ventilation system.

- Other On-Site Air Sampling Systems

  Sampling systems similar to those of the MPPB are used to monitor airborne effluents from the former vitrification heating, ventilation, and air-conditioning system (ANVITSK), the 01-14 building ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), the supernatant treatment system ventilation stack (ANSTSTK), the container sorting and packaging facility ventilation stack (ANCSPFK), and the remote-handled waste facility stack (ANRHWFK) (Figure A-6).

  Permitted portable outdoor ventilation enclosures (OVEs) are used to provide the ventilation necessary for personnel safety working with radioactive materials in areas outside permanently ventilated facilities or in areas where permanent ventilation must be augmented for extra area-specific drawthrough. Air samples from OVEs are collected continuously while emission points are discharging, and data from these portable ventilation units are included in annual evaluations of airborne emissions.

  Appendix C presents total radioactivity released for specific radionuclides at each of the on-site air sampling locations, with the exception of ANCSRFK ventilation, which did not operate in 2010. Although this facility was used in 2010, it was ventilated with an OVE/portable ventilation unit (PVU) which was continuously sampled and reported with the other OVEs/PVUs.

  No results exceeding the DOE DCGs were noted at any of the air emission sampling locations. Most results showed no detectable radioactivity.

- Nonradiological Air Emissions

  Nonradiological air emissions at the WVDP are regulated under an air facility registration certificate that caps (limits) nitrogen and sulfur oxide emissions (NO_x and SO_2, respectively) from the facility at 49.5 tons per year each. (See Table ECS-3.) The certificate applies to two site utility steam boilers, which are the primary sources of NO_x and SO_2 at the site. Based on natural gas usage, the boilers are estimated to have released about 0.21 tons of NO_x and 0 tons of SO_2 in 2010, which is well below the capping limit.

  Other units with the potential to emit, such as generators listed in the certificate, are exempted with the understanding that each unit operates less than 500 hours per year.

Environmental Surveillance

Surface Water. On-site surface water drainage is routinely sampled at several points on the north and south plateaus, as shown in Appendix A, Figure A-2. Monitoring points are sited at locations where releases from possible source areas on the north and south plateaus could be detected. Appendices B-4 through B-6 present data for site surface drainage, subsurface drainage, contained water, ambient surface water, and potable (drinking) water monitoring locations. Off-site sampling locations are shown on Figure A-5. Results are presented in Appendix B-5. Also provided for side-by-side comparison with these data are reference values, where available, including background ambient water monitoring data and/or pertinent ambient water quality standards, guidelines, or maximum contaminant levels (MCLs).

Radiological and nonradiological results from surface water samples were compared with applicable water quality standards and guidelines. Radiological results from on-site and downstream locations on Franks and Buttermilk Creeks were also compared with results from the background location on Buttermilk Creek (WFBCBKG), upstream of the WVDP. (Nonradiological results were compared with historical background values from WFBCBKG, because sampling for chemical

TABLE 2-4
2010 Comparison of Environmental Monitoring Results With Applicable Limits and Backgrounds

Sample Type	*Number of Sampling Locations*	*Locations with Results Greater than Applicable Limits or Screening Levels* [a] *(Constituent)*	*Number of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
Air (1 background location)				
On-site air emission points	7	0	6	**ANSTACK** (H-3, Sr-90, I-129, Cs-137,U-232, Pu-238, Pu-239/240, Am-241); **ANSTSTK** (I-129); **ANCSSTK** (I-129); **ANCSPFK** (I-129); **ANVITSK** (I-129); **ANRHWFK** (I-129)
Surface water (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site controlled effluents	2	0	2	**WNSP001** (Gross alpha, Gross beta, H-3, Sr-90, Tc-99, Cs-137, U-232, U-233/234, U-235/236, U-238, Pu-238, Pu-239/240, Am-241, bromide, SO_4, NO_3-N, total B, Hg, dissolved Cu, surfactant (as LAS), total dissolved solids [TDS]); **WNSP007** (Gross beta)
On-site surface water	7	**WNSWAMP** (Sr-90)	6	**WNSP006** (Gross beta, Sr-90, U-233/234, U-238, TDS); **WNSP005** (Gross beta, Sr-90); **WNSWAMP** (Gross beta, H-3, Sr-90, U-238); **WNSW74A** (Gross beta, Sr-90); **WNNDADR** (Gross beta, H-3, Sr-90); **WNERB53** (Gross beta, Sr-90)
Off-site surface water	2	**WFBCTCB**[b] (total Fe[c], dissolved Hg[c])	2	**WFBCTCB** (Gross beta, Sr-90) **WFFELBR** (Gross beta)
Drinking water (1 background location) WNURRAW				
On-site drinking water	1	0	0	None
Soil (1 background location)				
Off-site soil	5	NS	NS	NS
Sediment (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site sediment/soil	3	NS	NS	NS
Off-site sediment	3	NS	NS	NS
Biologicals (3 background deer; 1 background per matrix for remainder)				
Fish	2	NA	NS	NS
Milk	1	NA	0	None
Deer	3	NA	1	**BFDNEAR** -1 (Cs-137)
Vegetables/fruits	3	NA	NS	NS
Environmental dosimetry (1 background)				
On-site, near facilities	8	NA	3	**DNTLDs #24, 38, 40**
Perimeter	17	NA	0	None

NA - No applicable regulatory, guidance, or screening limits are available.
NS - Not sampled in 2010.
[a] Applicable regulatory, guidance, or screening limits are listed in Table UI-4 (radionuclides in air and water) and Appendix B-1 (water).
[b] New York State Class C water quality standards were applied at WFBCTCB.
[c] Measurements at background location WFBCBKG have routinely exceeded the water quality standards.

constituents was discontinued at this location in 2008.) Results from Cattaraugus Creek near Felton Bridge (sampling point WFFELBR), were compared with historical results from the Cattaraugus Creek background at Bigelow Bridge (former sampling point WFBIGBR). Locations with results exceeding applicable limits and those with results statistically greater than background values are summarized in Table 2-4.

- South Plateau

  Two inactive underground radioactive waste disposal areas (the U.S. Nuclear Regulatory Commission-licensed disposal area [NDA], under the control of the U.S. DOE, and the New York State-licensed disposal area [SDA], under the control of the New York State Energy Research and Development Authority [NYSERDA]), lie on the south plateau. These disposal sites are possible contaminant sources to surface water. Areas of the south plateau are being used to store radioactive vessels removed from site facilities and to temporarily store and stage containers of radioactive waste before they are shipped. Also located on the south plateau is the drum cell, a building formerly used to store drums of processed low-level radioactive waste (LLW). The drum cell has been empty since 2007, when the waste drums were shipped off site.

  Surface water drainage downstream of the NDA is monitored at location WNNDADR, immediately north of the NDA, and further downstream at location WNERB53 on Erdman Brook. Some drainage from the western and northwestern portions of the SDA is also captured at WNNDADR and WNERB53. Although no radionuclide concentrations are greater than (or even approach) DOE DCGs, gross beta and strontium-90 concentrations have routinely exceeded background concentrations at both WNNDADR and WNERB53, as have tritium concentrations at WNNDADR. Residual soil contamination from past waste burial activities is thought to be the source.

  As part of an interim measure (IM) to limit infiltration of groundwater, surface water, and precipitation into the NDA, a geomembrane cap and slurry wall were constructed at the NDA. The IM was completed in December 2008. (See Chapter 4, "Interim Measures" under the discussion of "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA" for more detail.)

  Figure 2-1 is a plot of average gross beta and strontium-90 concentrations in surface water at sample points WNNDADR and WNERB53 before and after completion of the IM. In CY 2010, average concentrations were between 50% and 75% lower than historical concentrations, indicating the IM has been effective in reducing groundwater migration through the NDA, which affects infiltration into and surface water drainage at these points.

  Although tritium concentrations at WNNDADR in CY 2010 remained above background, concentrations continued to trend downward, as noted in previous Annual Site Environmental Reports and as shown on Figure 2-2. Because the half-life of tritium is slightly longer than 12 years, decreasing tritium concentrations may be partially attributable to radioactive decay.

  North of the SDA, Franks Creek is sampled to monitor drainage downstream of the drum cell and the eastern and southern borders of the SDA (point WNFRC67, on Figure A-2). In 2010, radionuclide concentrations at this point were indistinguishable from background.

- North Plateau

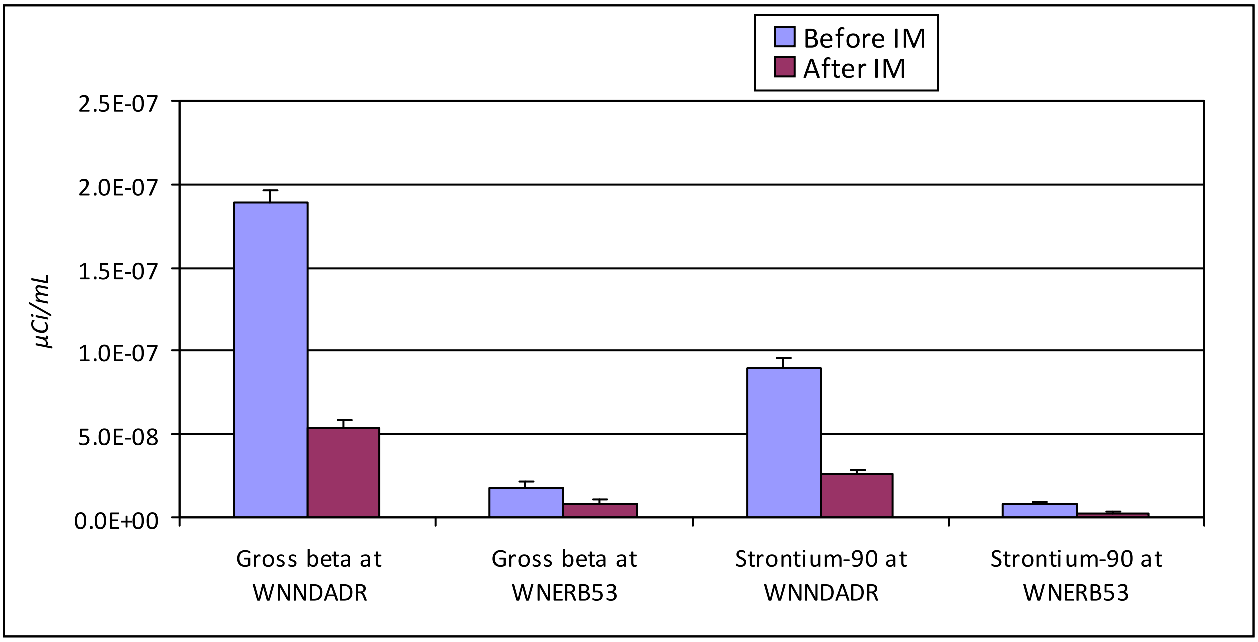
  Besides the effluent and drainage locations discussed earlier in the liquid effluents section, a location on the east side of the MPPB (point WNSP005) monitors surface drainage on the north plateau. Annual average gross beta and strontium-90 concentrations statistically exceeded background concentrations at this sampling location during CY 2010. One other sample point, WNSP006, is sampled at Franks Creek at the security fence. WNSP006 is downgradient of the Lagoon 3 outfall (point WNSP001). In 2010, background concentrations of gross beta, strontium-90, uranium-233/234, uranium-238, and total dissolved solids were also exceeded at WNSP006.

  On the north plateau, possible contaminant sources that could affect surface water include the high-level waste tanks, MPPB, the lagoon system associated with the LLW2, and waste handling and storing facilities.

- Off-Site Surface Water

  Surface water samples are collected at three off-site locations: one upstream background location and one downstream location on Buttermilk Creek and one downstream location on Cattaraugus Creek.

FIGURE 2-1
Average Gross Beta and Strontium-90 Concentrations in Surface Water on the South Plateau at WNNDADR[a] and WNERB53[b] Before and After the NDA Interim Measure (IM) was Installed

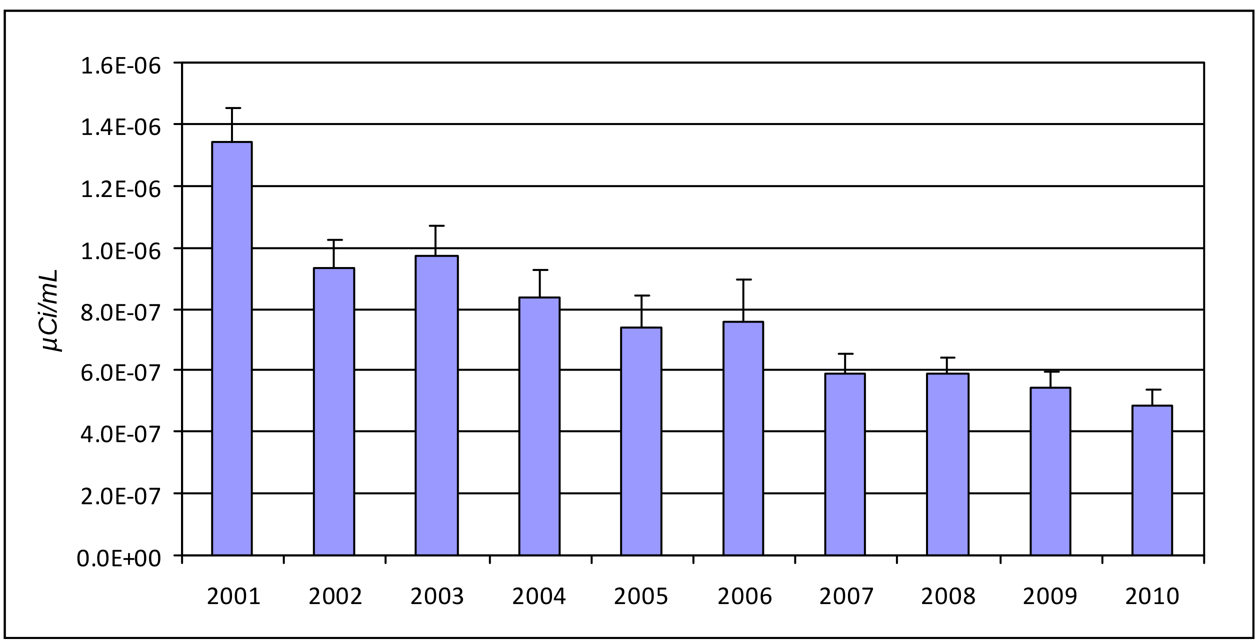


Note: The upper limit of the uncertainty term is indicated with each point. Average gross beta and strontium-90 background concentrations in Buttermilk Creek (WFBCBKG) in CY 2010 were 2.06±1.82E-09 and 0.79±1.06E-09 µCi/mL, respectively.

[a] Sample point WNNDADR is located downstream, immediately north of the NDA.

[b] Sample point WNERB53 is located farther downstream on Erdman Brook.

FIGURE 2-2
Average Concentration of Tritium in Surface Water at WNNDADR: 2001–2010



Note: The upper limit of the uncertainty term is indicated with each point. Average background tritium concentration in Buttermilk Creek (WFBCBKG) in CY 2010 was <4.60E-08 µCi/mL.

- Buttermilk Creek receives surface drainage from the WNYNSC. The background monitoring point is located upstream of the WVDP at Fox Valley Road (WFBCBKG) and the downstream point is located at Thomas Corners Bridge (WFBCTCB), just before where Buttermilk Creek enters Cattaraugus Creek.

- Background samples were collected from Cattaraugus Creek at Bigelow Bridge, at Route 240, before the point where Buttermilk Creek flows into Cattaraugus Creek. Data from this location from 1991 through 2007 have been used to establish an upstream background. Sampling was discontinued in 2008. Downstream of that point, samples are collected at Felton Bridge (WFFELBR), the first point of public access below the WVDP.

Applicable guidance levels were exceeded at two of 11 on-site and off-site surface water monitoring locations affected by the WVDP in 2010.

The New York State Class C and D water quality limit for total iron, 0.3 milligrams per liter (mg/L), was exceeded at location WFBCTCB, with a maximum concentration of 1.46 mg/L. However, the limit was also exceeded at background location WFBCBKG in eight of the 10 years of measurement before sampling for metals was discontinued in 2008. Background results ranged from 0.16 mg/L to 7.4 mg/L. These fluctuating, elevated levels of iron are thought to reflect natural variability of stream conditions, and are not related to WVDP activities. The Class C water quality limit for dissolved mercury (0.0007 micrograms per liter [µg/L]) was exceeded at point WFBCTCB, with a maximum concentration of 0.0025 µg/L. As seen with iron, the Class C limit for mercury was also exceeded at background location WFBCBKG, which ranged from 0.0005 to 0.0062 µg/L, reflecting natural variability.

A DOE DCG was exceeded at the northeast swamp (WNSWAMP), where the average strontium-90 concentration was 2.51E-06 µCi/mL. (The strontium-90 DCG is 1E-06 µCi/mL.) Refer to the WNSWAMP discussion earlier in this chapter and Chapter 4, "Strontium-90 Plume on the North Plateau."

Consistent with historical data, concentrations of radiological constituents above background values, usually gross beta and strontium-90, were noted at several on-site surface water monitoring locations. However, results from samples taken downstream at the first point of public access were statistically indistinguishable from background or, as with gross beta concentrations, only slightly higher than background, indicating little Project influence downstream.

The highest average gross beta result at WFFELBR over the last 10 years (5.99E-09 µCi/mL in 2006) was only about 0.6% of the DOE DCG for strontium-90 (1E-06 µCi/mL). The average result in 2010 (3.42E-09 µCi/mL) was about 0.3% of the DOE DCG.

Drinking Water. Project drinking water (potable water) and utility water is drawn from two on-site surface water reservoirs. This water is sampled at select locations for both radiological and nonradiological constituents. It is monitored at the distribution entry point (WNDNKUR) and at other site tap water locations to verify compliance with EPA and New York State Department of Health (NYSDOH) and Cattaraugus County Health Department (CCHD) regulations. Results from 2010 indicated that no radiological contaminants were found in on-site drinking water and that the Project's drinking water continued to remain below the MCLs and drinking water standards of the EPA, NYSDOH, and the CCHD. The results are presented in Appendix B-6.

Ambient Air. In 2010, samples for radionuclides in air were collected at one background location at Great Valley (AFGRVAL), 18 miles (29 kilometers) south of the site. (See Figure A-12.) This location is considered representative of regional air with no potential to be affected by radiological releases from the WVDP.

Until 2008, ambient air was routinely sampled at near-site locations and at locations in nearby communities. Although variability from year to year was observed from nearly 17 years of monitoring, results from near-site monitoring locations were statistically the same as those from the Great Valley background location. The historical data suggests no evidence of adverse site influence on ambient air quality.

Sediment and Soil. Airborne particulates may be deposited onto soil by wind or precipitation. Particulate matter in streams can adsorb radiological constituents in liquid effluents and settle on the stream bottom as sediment. Soils and sediment may subsequently be eroded or resuspended, especially during periods of high winds or high stream flow. The resuspended particles may provide a pathway for radiological constituents to reach humans either directly via exposure or indirectly through the food pathway. As part of the monitoring program, on-site sediment/soil samples are collected at three loca-

tions on the north plateau where drainage has the potential to be contaminated (SNSP006, SNSWAMP, and SNSW74A on Figure A-2). Off-site sediment samples are collected at one background location on Buttermilk Creek and at two downstream locations, one on Buttermilk and one on Cattaraugus Creek (SFBCSED, SFTCSED, and SFCCSED, respectively [see Figure A-5]). Soil samples are collected at one background and three former near-site air sampling locations and are analyzed for radiological constituents (Figures A-5 and A-12). In 2008, frequency of sampling for sediments and soils was reduced to every five years. In accordance with this schedule, no samples have been collected since 2007, and the next sampling will be done in 2012.

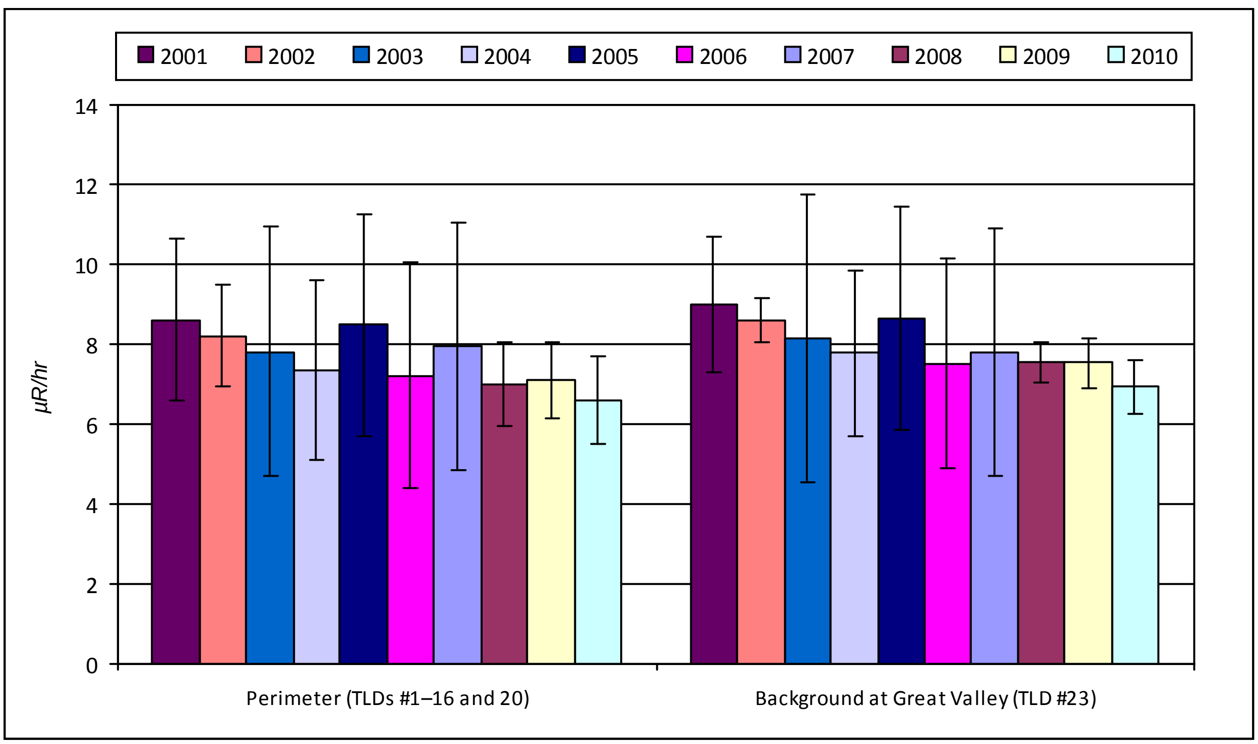
Food. Food samples are collected from locations near the site (Figure A-9) and from remote locations (Figure A-12). Milk and deer are collected annually. Other food items are collected every five years. Fish and deer are collected during periods when they would normally be taken by sportsmen. Corn, apples, and beans are collected at the time of harvest. Edible portions are analyzed for radionuclides. 2010 data are presented in Appendix E[CD].

In 2010, milk and deer were collected. Fish, apples, beans, and corn were last collected in 2007 and will next be collected in 2012. Data have consistently demonstrated that the Project has little or no effect on local food sources. Dose calculations based on results from food sources have consistently confirmed low dose estimates modeled on the basis of results from air and water monitoring. (See Chapter 3, “Dose Assessment.”)

Environmental Radiation. Thermoluminescent dosimeters (TLDs) are placed on site at waste management units, at the WVDP security fence, around the WNYNSC perimeter and the access road, and at a background location remote from the site. The TLDs directly measure radiation in the environment.

Results at perimeter locations were statistically the same as results from the background TLDs, indicating no measurable dose from Project activities at these locations. Figure 2-3 presents a graph of average annual exposure rates (in microroentgen per hour) over the last 10 years at background and perimeter locations. As shown, results at perimeter locations are comparable to background. In addition, no discernible trends over time are evident. Historical measurements at community locations (discon-

FIGURE 2-3
10-Year Trends of Environmental Radiation Levels at Perimeter and Background Thermoluminescent Dosimeters (TLDs)



Note: The upper and lower limits of the uncertainty term are plotted with each result.

tinued in 2008) also showed no difference from background. Perimeter TLD locations (off site) are shown on Figure A-11 in Appendix A, and the data are presented in Table F-1 in Appendix F.

Consistent with historical data, results from three of eight TLDs located near on-site waste storage facilities on the north plateau in 2010 were generally higher than background results. These locations are well within the WNYNSC boundary and are not accessible by the public. On the south plateau, on-site TLD results remained at background levels. On-site TLD locations are shown on Figure A-10 in Appendix A, and the data are presented in Table F-2 in Appendix F.

Meteorological Monitoring. Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local climatology. These data are used to assess potential effects of routine and nonroutine releases of airborne radioactivity and to provide input to dispersion models used to calculate dose to off-site residents. The on-site 197-ft (60-m) meteorological tower (Figure A-1) continuously monitors wind speed, wind direction, and temperature at both the 197-ft (60-m) and 33-ft (10-m) elevations. Precipitation is monitored near the Environmental Laboratory (ELAB). Monthly CY 2010 precipitation totals compared with 10-year monthly averages are presented in Table 2-5.

TABLE 2-5
WVDP 2010 Monthly Precipitation Totals Compared With 10-Year Monthly Averages

Month	*Monthly Total (inches)*	*10-Year Monthly Average (2000 through 2009)*
January	2.19	2.97
February	1.93	2.32
March	1.61	2.89
April	1.61	3.09
May	2.57	3.02
June	5.77	3.25
July	4.85	4.28
August	3.79	4.09
September	5.91	3.55
October	3.10	3.36
November	3.46	3.59
December	2.67	3.83
Total (inches)	39.5	40.2
(Centimeters)	100.2	102.2

Barometric pressure is measured with instrumentation located in the ELAB. The meteorological tower supplies data to the primary digital and analog data acquisition systems located within the ELAB. The systems are provided with either uninterruptible or standby power backup in the event of site power failures. In 2010, the data recovery rate (the time valid data were logged versus the total elapsed time) was 95.0%.

Documentation, such as meteorological system calibration records, site log books, and analog strip charts, is stored in protected archives. "Wind roses" showing the predominant wind direction as measured at the meteorological tower (60-m and 10-m elevations) are shown on Figure 2-4. As shown, wind measurements at the 60-m elevation are predominantly from the west-northwest or south-southeast. Those measured at the 10-m elevation are predominantly from the northwest or the south-southeast, apparently influenced by the orientation of the topography around the site. As expected, wind speeds measured at the 10-m elevation were the lowest, while those from the 60-m elevation were the highest.

Because dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which includes a function of the difference in temperature between two elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP. If an air release occurred, meteorological data would be used to predict the direction of plume migration.

Special Projects

Special projects may be conducted outside the scope of the routine environmental monitoring program to address topics of environmental interest. The following special projects were performed by NYSERDA during 2010:

Seismometer Installed at West Valley Central School. Seismologists from the Lamont-Doherty Earth Observatory of Columbia University have joined with the West Valley Central School (WVCS) District and NYSERDA to install a modern, broadband seismographic station at the WVCS. The project is designed to increase awareness and understanding of the earth by scientists, teachers, students, and the public in

surrounding communities. The new station, West Valley, New York (WVNY), is part of the Lamont Cooperative Seismographic Network (LCSN), and has increased earthquake monitoring capability in western New York. The LCSN can detect, locate, and characterize earthquakes in the northeast. The WVNY station is also part of a national network of stations used by the U.S. Geological Survey to provide authoritative earthquake information to emergency medical first responders, emergency managers, the public, and other stakeholders. The seismic monitoring station records thousands of measurements every minute and transmits them wirelessly to the internet. Access to data and further information about the LCSN can be obtained at www.ldeo.columbia.edu/LCSN/.

Meteorological Station at the SDA. In May 2010, NYSERDA completed the installation of a suite of meteorological instruments at the SDA. Included in the suite are instruments to measure total precipitation (i.e., rain, snow, and sleet); temperature, relative humidity; barometric pressure; wind speed; and wind direction. The instruments are equipped with a battery-powered backup system to ensure data continuity during power outages. Precipitation data have been uninterrupted since June 1, 2010. Configuration and testing of the remaining parameters was completed in the summer of 2010, and data have been uninterrupted since October 1, 2010. Data are logged at the station every 10 minutes and transmitted via cellular modem to NYSERDA's office. NYSERDA maintains an interactive meteorological database for the SDA station on the internet at: http://v4.wqdata.com/webdblink/nyserda.php.

Light Detection and Ranging (LiDAR) Mapping and Orthophotography. In 2010, NYSERDA (jointly funded by DOE) conducted an aerial LiDAR mapping and orthoimagery project. After an extensive ground control survey in October, the entire Buttermilk Creek watershed (including the WNYNSC and SDA) was mapped and photographed from a small airplane on November 1st and 2nd. A detailed topographic map of the Buttermilk Creek watershed was developed with a resolution (grid size) of 1.0 meter. For the WNYNSC and the SDA, a resolution of 0.5 meters was achieved. A high-quality topographic map of the SDA and the surrounding area was derived from a subset of the LiDAR data. This project represents the most accurate and comprehensive large-scale topographic mapping of the Buttermilk Creek Watershed, including the WNYNSC, ever completed.

In conjunction with the LiDAR mapping, high-resolution digital photographs were acquired of the Buttermilk Creek watershed. From these images, rectified orthophotographs were produced with a pixel size of three inches (for the WNYNSC and SDA), and six inches (for the balance of the Buttermilk Creek watershed). These photographs have more than 100 times the resolution of the most recent orthophotographs available of the site, which were collected in 2007 by New York State over Cattaraugus County. NYSERDA is using the topographic data and aerial photographs for erosion and hydrologic analysis and modeling, change detection, erosion mitigation design and construction, and mapping of existing and planned infrastructure.

SDA Replacement Geomembrane Cover. Recent laboratory testing confirmed that the very low-density polyethylene (VLDPE) geomembrane cover over trenches 12 to 14 of the SDA, including an inactive lagoon, was approaching the end of its useful life. NYSERDA, with the assistance of its engineering contractor, evaluated a number of replacement alternatives and decided to place new XR-5 geomembrane on the existing VLDPE cover. The project design included replacing the steel-perforated corrugated metal pipe and manholes in the perimeter trench with new high-density polyethylene (HDPE) storm water piping.

Additional engineering analysis was requested by NYSDEC to determine whether stresses due to frictional forces between the two unlike geomembranes could shorten the useful life of the new geomembrane. Additional testing was performed in the laboratory and, based on the frictional analysis of the two materials, it was concluded that placing the new XR-5 geomembrane directly on the VLDPE geomembrane would not present performance problems in the future.

Upon completing the engineering design, construction commenced in October. The project took two months to complete, and included placing approximately 145,000 square ft of XR-5 material, 1,200 lineal ft of walkway material, and approximately 1,000 lineal ft of HDPE storm water piping in the perimeter collection trench. During the design process, NYSERDA developed a new walkway material that would resist ultraviolet (UV) degradation by utilizing precut patterns of the XR-5 material with a factory-applied yellow-colored aggregate material. This new material was found to have superior adhesive qualities, UV resistance, and a nonslip surface compared to walkway material previously used at the SDA. The estimated life expectancy of this newly installed geomembrane is 20 to 25 years.

Tank T-1 Removal Project. In late November 2009, NYSERDA safely and successfully completed the removal of over 8,000 gal (30,370 L) of leachate in tank T-1, located in the SDA. In the summer of 2010, the second phase of this project was completed. NYSERDA sampled all solid wastes to ensure the waste was not hazardous, and removed the empty tank T-1 and all stored solid wastes in storage at the SDA. The process began by removing the roof hatch on top of the T-1 building with a crane. The tank was secured with rigging, and lifted out of the building through the roof hatch and onto a "low boy" trailer. The empty tank and the miscellaneous solid wastes were safely shipped from the SDA on July 1, 2010 and they arrived at the Pacific Northwest Facility in Richland, Washington, on July 6, 2010, where they were treated and size-reduced. In 2011, the waste will be shipped with other LLW to a disposal facility in Clive, Utah. On November 17, 2010, NYSERDA submitted the Resource Conservation and Recovery Act Closure Plan and Closure Certification Report for the WNYNSC SDA Tank T-1 Building. Final closure is expected to occur in 2011.

Monitoring Program Changes

There were no changes to the routine air, surface water, soil, biological, or TLD monitoring program during CY 2010. However, the groundwater monitoring program and the north plateau PTW monitoring program were enhanced significantly. Four replacement wells were installed downgradient of the MPPB to supplement the strontium-90 source area monitoring. In addition, after installing the north plateau PTW, 66 new groundwater wells were installed within and adjacent to the full-scale PTW to monitor performance of the wall. Refer to Chapter 4, "Groundwater Protection Program" for discussion.

Summary

As in the past, although concentrations of certain radiological and nonradiological constituents from samples collected within the security fence exceeded comparison limits or background concentrations, few results from near-site or downstream locations accessible to the public did. (See Table 2-4.)

Monitoring results from CY 2010 continued to demonstrate minimal or no adverse effects of the WVDP on the surrounding environment and confirmed the effectiveness of radiological control measures practiced at the WVDP.

FIGURE 2-4
Wind Frequency and Speed from the Meteorological Tower (10-m and 60-m Elevations)
January 1–December 31, 2010

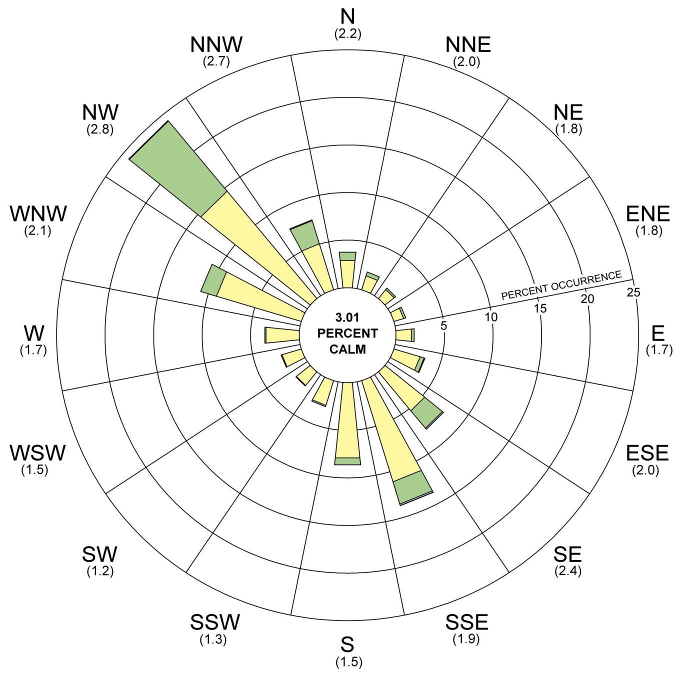
Key:

Numbers indicate sector mean wind speed.

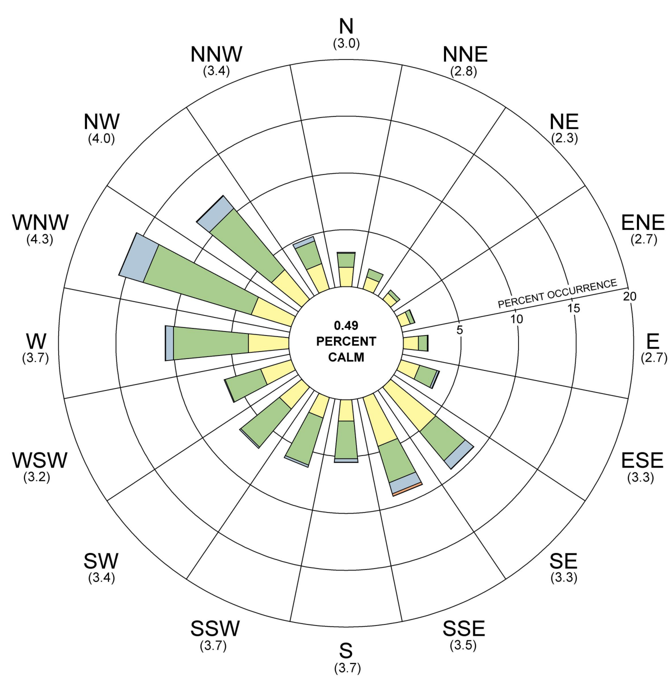
Sectors are directions from which the wind is blowing.

Wind Speed Range (m/sec)

- 0.5–3.0
- 3.0–6.0
- 6.0–9.0
- 9.0–12.0
- >12.0



Meteorological Tower (10-m)



Meteorological Tower (60-m)

DOSE ASSESSMENT

Sources of Radiation at the West Valley Demonstration Project (WVDP or Project)

Members of the public are routinely exposed to natural and man-made sources of ionizing radiation. An individual living in the United States (U.S.) is estimated to receive an average annual effective dose equivalent (EDE) of about 620 millirem (mrem) (6.2 millisieverts [mSv]) (National Council on Radiation Protection [NCRP] and Measurements Report 160, 2009). NCRP Report No. 160, an update of NCRP Report No. 93 (1987), noted that the average member of the U.S. population was exposed to significantly more radiation from medical procedures than from any other source, as had been observed in earlier estimates. (See the "Useful Information" Section at the end of this report for discussions of ionizing radiation. See the inset on p. 3-3 for discussions of “Radiation Dose” and “Units of Dose Measurement.”)

Half of the radiation dose to a member of the public, about 310 mrem/year, is from natural background sources of cosmic and terrestrial origin (Figure 3-1). The other half, also about 310 mrem/year, is from man-made sources, including: diagnostic and therapeutic x-rays, tomography, and fluoroscopy; nuclear medicine; consumer products such as cigarettes and smoke detectors; fallout from nuclear weapons tests; industrial, research, and educational applications; and effluents from nuclear facilities.

Radioactive materials at the WVDP are residues from the commercial reprocessing of nuclear fuel by a former site operator in the 1960s and early 1970s. Each year, very small quantities of the radioactive materials remaining at the WVDP are released to the environment. Emissions and effluents are strictly controlled so that release quantities are kept as low as reasonably achievable (ALARA).

Exposure Pathways

An exposure pathway consists of a route for contamination to be transported by an environmental medium from a source to a receptor. Table 3-1 summarizes the potential exposure pathways to the lo-

FIGURE 3-1
Comparison of Doses From Natural and Man-Made Sources to the Dose From 2010 WVDP Effluents

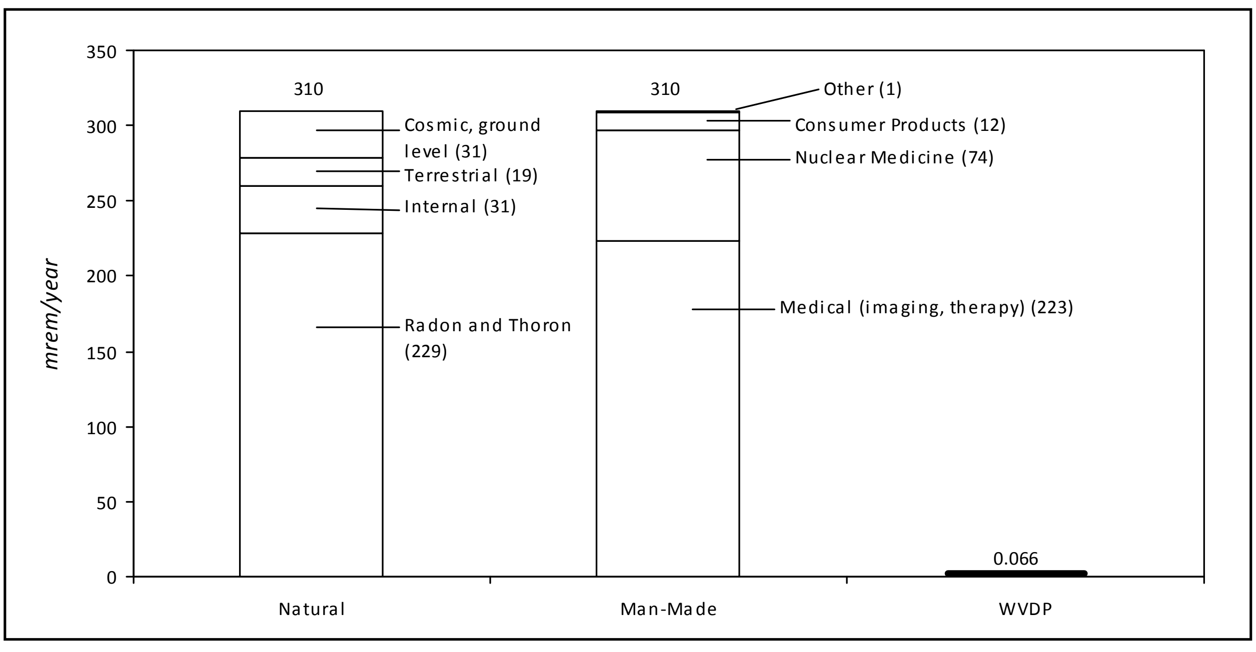


TABLE 3-1
Potential Exposure Pathways from the WVDP to the Local Off-Site Population

Exposure Pathway and Transporting Medium	*Reason for Including/Excluding*
Inhalation of gases and particulates in air (included)	Off-site transport of contaminants from stacks, vents, diffuse sources, or resuspended particulates from soil or water.
Ingestion of vegetables, cultivated crops, venison, milk, and fish (included)	Local agricultural products irrigated with potentially contaminated surface or groundwater; airborne deposition on leaves and uptake of deposited contaminants; venison and milk from animals that have inhaled or ingested contaminants; fish that have been exposed to or ingested contaminants in surface water and sediment.
Ingestion of surface and groundwater (excluded)	No documented use of local surface water or downgradient groundwater wells as drinking water by local residents.
External exposure to radiation from particulates and gases directly from air or surface water or indirectly from surface deposition (included)	Transport of air particulates and gases to off-site receptors; transport of contaminants in surface water and direct exposure when swimming, wading, boating, or fishing.

cal off-site population and describes the rationale for including or excluding each pathway when calculating dose from the WVDP or Project.

Potential exposure pathways that are considered include: inhalation of gases and particulates, ingestion of locally grown food products and game, and exposure to external penetrating radiation emitted from contaminated materials. Drinking water is not considered a pathway from the WVDP because surveys have determined that no public water supplies are drawn from downstream Cattaraugus Creek before Lake Erie or from groundwater in aquifers potentially affected by the WVDP.

Land Use Survey

Periodic surveys of local residents provide information about family size, sources of food, and gardening practices. Updated population data from the calendar year (CY) 2000 census was incorporated into WVDP analyses in 2003. Population around the WVDP by sector and distance is presented on Figure A-13. Information from the most recent land use survey, conducted in early 2002, was used to update the locations of the residences nearest to the site. In 2008, a field verification was conducted to confirm the location of the nearest receptor in each sector. The Canadian population within a 50-mile (80-kilometer [km]) radius of the site (Statistics Canada, 2001) is included with the U.S. population in dose calculations. Population information is required when using computer models for annual dose assessments. An estimated 1.68 million people live within 50 miles of the site. If the WVDP becomes aware of the need to update land use information, it does so, even if full field verification for all sectors is not required.

Dose Assessment Methodology

Dose to the public is evaluated using a two-part method consistent with the requirements of the U.S. Department of Energy (DOE) Order 5400.5. First, measurements (and/or estimates) of radionuclide concentrations in liquid and air released from the Project are assembled from the calendar year of interest. The U.S. Environmental Protection Agency (EPA)- and DOE-approved models are then used to estimate the EDE to the maximally exposed off-site individual (MEOSI) and the collective EDE to the population within a 50-mile (80-km) radius. (See the inset on “Radiation Dose” and “Units of Dose Measurement.”)

Second, measurements of radioactivity in food from locations near the WVDP boundaries are taken to corroborate the results from the modeled dose calculations. Samples of vegetables, fruit, milk, venison, and fish from the vicinity of the WVDP are collected and analyzed for radiological constituents. (Biological sampling locations are shown on Figures A-9 and A-12.) Results are compared with similar measurements from samples collected at background locations far from the WVDP. If any near-site results are higher than background results, dose calculations are performed. These results are used as an independent confirmation of (not added to)

Radiation Dose

The energy released from a radionuclide is eventually deposited in matter encountered along the path of the radiation. The radiation energy absorbed by a unit mass of material is referred to as the absorbed dose. The absorbing material can be either inanimate matter or living tissue.

Alpha particles leave a dense track of ionization as they travel through tissue and thus deliver the most dose per unit path-length. However, alpha particles are not penetrating and must be taken into the body by inhalation or ingestion to cause harm. Beta and gamma radiation can penetrate the protective dead skin layer of the body from the outside, resulting in exposure of the internal organs to radiation.

Because beta and gamma radiations deposit much less energy in tissue per unit path-length relative to alpha radiation, they produce fewer biological effects for the same absorbed dose. To allow for the different biological effects of different kinds of radiation, the absorbed dose is multiplied by a quality factor to yield a unit called the dose equivalent. A radiation dose expressed as a dose equivalent, rather than as an absorbed dose, permits the risks from different types of radiation exposure to be compared with each other (e.g., exposure to alpha radiation compared with exposure to gamma radiation). For this reason, regulatory agencies limit the dose to individuals in terms of total dose equivalent. Refer to the "Useful Information" section for discussion of ionizing radiation.

Units of Dose Measurement

The unit for dose equivalent in common use in the United States is the rem. The international unit of dose equivalent is the sievert (Sv), which is equal to 100 rem. The millirem and millisievert, used more frequently to report the low dose equivalents encountered in environmental exposures, are equal to one-thousandth of a rem or sievert, respectively. Other radioactivity unit conversions are found in the "Useful Information" section at the back of this report.

The effective dose equivalent (EDE), also expressed in units of rem or sievert, provides a means of combining unequal organ and tissue doses into a single "effective" whole body dose that represents a comparable risk probability. The probability that a given dose will result in the induction of a fatal cancer is referred to as the risk associated with that dose. For waterborne releases, the EDE is calculated by multiplying the organ dose equivalent by the organ-weighting factors developed by the International Commission on Radiological Protection in Publications 26 (1977) and 30 (1979). For airborne emissions, the EDE calculation is based upon factors in Federal Guidance Report 13, and National Council on Radiation Protection report Number 123. The weighting factor is a ratio of the risk from a specific organ or tissue dose to the total risk resulting from an equal whole body dose. All organ-weighted dose equivalents are then summed to obtain the EDE.

The dose from internally deposited radionuclides calculated for a 50-year period following intake is called the 50-year committed effective dose equivalent (CEDE). The CEDE sums the dose to an individual over 50 years to account for the biological retention of radionuclides in the body. The total EDE for one year of exposure to radioactivity is calculated by adding the CEDE to the dose equivalent from external, penetrating radiation received during the year. Unless otherwise specified, all doses discussed here are total EDE values, which include the CEDE for internal emitters.

A collective population dose is expressed in units of person-rem or person-sievert because the individual doses are summed over the entire potentially exposed population. The average individual dose can therefore be estimated by dividing the collective dose by the population.

the computer-modeled dose estimates (Table 3-2) because the models already take into account contributions from all environmental pathways.

Measurement of Radionuclide Concentrations in Liquid and Air Releases. Because it is difficult to distinguish by direct measurement the small amount of radioactivity originating from the Project or from naturally occurring radiation in the environment, computer codes are used to model the environmental dispersion of radionuclides that originate from on-site monitored ventilation stacks and liquid discharge points.

Actual data from air and water release monitoring samples are collected, together with annual weather measurements and the most recent demographic information for use in dose calculations. (See Appendices A, B, and C for details of the sampling program and for summaries of results in 2010.)

Dose to the Public

Each year an estimate is made of the potential radiological dose to the public that is attributable to operations and effluents from the WVDP during that CY. Estimates are calculated to confirm that no individual could have received a dose that exceeded the limits for protection of the public, as established by the DOE or the EPA.

Figure 3-1 shows the estimated maximum individual dose from the WVDP in CY 2010 as compared with the average annual dose a U.S. resident receives from man-made and natural background sources. As presented, estimated dose from the WVDP would have contributed a very small amount (0.066 mrem [0.00066 mSv]) of the total annual man-made radiation dose to the MEOSI. This is much less than the average dose received from consumer products and is insignificant compared with average dose from natural sources.

Estimated dose from the Project to an off-site resident is also far below the federal standard of 100 mrem allowed from any DOE site operation in a CY, confirming that efforts at the WVDP to minimize radiological releases are consistent with the ALARA philosophy of radiation protection.

Predicted Dose From Airborne Emissions

Airborne emissions of radionuclides are regulated by the EPA under the Clean Air Act and its implementing regulations. DOE facilities are subject to Title 40 of the Code of Federal Regulations (CFR) 61, Subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAP). Subpart H contains the national emission standards for radionuclides other than radon from DOE facilities. The applicable standard is a maximum of 10 mrem (0.1 mSv) EDE to any member of the public in any year.

Releases of airborne radioactive materials in 2010 from stacks and diffuse sources on the WVDP were modeled using the EPA-approved CAP88-PC computer code (Trinity Engineering, December 2007). This air dispersion code estimates EDEs for the ingestion, inhalation, air immersion, and ground surface pathways. (See "CAP88-PC Computer Code" in the "Useful Information" section.)

Site-specific data for CY 2010 (radionuclide releases in curies per year) were used as input to the CAP88-PC code, as were wind data collected from the on-site meteorological tower during 2010 and information from the most recent local population survey. The output from the CAP88-PC code was then used to determine the total EDE from air emissions to the MEOSI and the collective EDE to the population within a 50-mile (80-km) radius of the WVDP. Results are presented in Table 3-2. Although radon is specifically excluded from the NESHAP regulation, an estimate of dose from radon at the WVDP is also included in Table 3-2 for comparison purposes. (For a detailed discussion of radon in air emissions from the WVDP, see the inset on "Radon-220.")

Maximum Dose (Airborne) to an Off-Site Individual. Based on the nonradon airborne radioactivity released from all site sources during 2010 (i.e., permitted stacks, stacks that do not require permits, and nonpoint sources), it was estimated that a person living in the vicinity of the WVDP could have received a total EDE of 0.0017 mrem (0.000017 mSv) from airborne releases. (See Table 3-2.) The computer model estimated that this MEOSI, who was assumed to eat only locally produced foods throughout the year, was located 1.2 mile (1.9 km) north-northwest of the site.

The dose from airborne sources is equal to about 3 minutes of natural background radiation received by an average member of the U.S. population, and is well below the 10-mrem (0.1 mSv) NESHAP limit established by the EPA and mandated by DOE Order 5400.5.

Iodine-129, a long-lived radionuclide, has routinely been found in main stack emissions. During the vitri-

fication of high-level radioactive waste (HLW), iodine-129 releases increased because gaseous iodine was not as efficiently removed by the vitrification process off-gas treatment system as were most other radionuclides. As more HLW was removed from the tanks and converted into glass, less waste was available to emit iodine-129 and the total emitted decreased. In 2010, iodine-129 concentrations remained at (or below) pre-vitrification levels and accounted for about 25% of the dose to an off-site individual from airborne emissions. A comparison of the dose proportions from various nuclides is presented on Figure 3-2. Note that for this 2010 report, Figure 3-2 presents the primary nuclides or nuclide groups for all airborne emissions, including diffuse sources. As work activities at the WVDP progress toward decommissioning and/or facility demolition, the importance of diffuse sources to dose estimates is expected to increase, and the number of point sources amendable to normal effluent monitoring will decrease. Therefore, these diffuse sources (primarily from the low-level waste treatment facility lagoons during CY 2010) have been added to the annual totals for the purpose of this presentation.

Unplanned Radiological Airborne Release. Although emissions were low, there was one unplanned radiological airborne release at the WVDP during CY 2010. Heavy rainfall and a ventilation upset contributed to higher-than-typical americium-241 and plutonium discharges from the main plant process building (MPPB) stack in July and August 2010. Below stack alarm set points, these discharges were detected by stack monitoring equipment and included in the MPPB stack source term modeled in this report (the dose to the 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.)

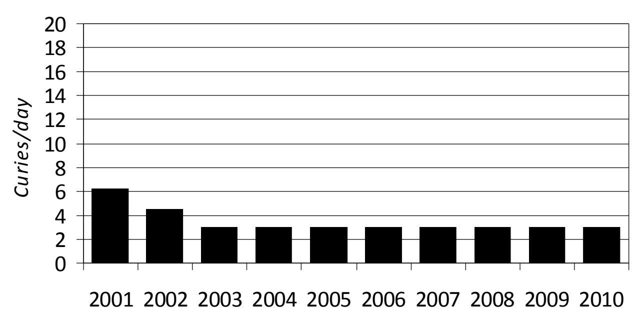
Radon-220

Radon-220, also known as thoron, is a naturally occurring gaseous decay product of thorium-232 present in the airborne emissions from the WVDP main plant process building. Radon-220 is also associated with the thorium reduction extraction (THOREX) process-related thorium-232 and uranium-232 in the high-level radioactive waste (HLW).

As reported in Chapter 2 of the 1996 WVDP Site Environmental Report (West Valley Nuclear Services Company and Dames & Moore, June 1997), thoron levels were observed to increase during startup of the 1996 HLW vitrification process. An estimate of the thoron released during each waste concentration cycle was developed and used to determine a theoretical annual release. During the vitrification phase, an average of about 12 curies per day were assumed to have been released. In 2010, with the vitrification process completed, the average thoron release is conservatively estimated to be about three curies per day.

Although large numbers of curies were released relative to other radionuclides, the calculated dose from thoron is quite small because of its short decay half-life and other characteristics. The NESHAP rule specifically excludes thoron from air emission dose calculations, so a dose estimate using CAP88-PC was calculated separately. The theoretical dose to the MEOSI, located 1.2 miles (1.9 kilometers [km]) north-northwest of the site in 2010, would have been 0.027 mrem (0.00027 mSv), and the collective dose to the population within a 50-mile (80-km) radius would have been 1.8 person-rem (0.018 person-Sv). (See Table 3-2.) These theoretical doses are within the same range as historical doses from the man-made radionuclides found in WVDP effluents.

With vitrification completed, thoron releases have decreased to pre-vitrification levels. The figure presented here provides a relative indication of recent trends in the estimated annual thoron releases.



Estimated Radon-220 Releases From the WVDP

FIGURE 3-2
Air Emissions From All Sources: Dose Percent by Radionuclide in Calendar Year (CY) 2010

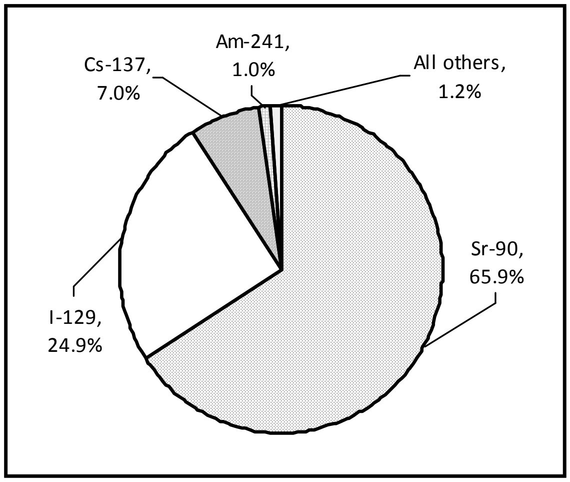


FIGURE 3-3
Water Releases: Dose Percent by Radionuclide in CY 2010

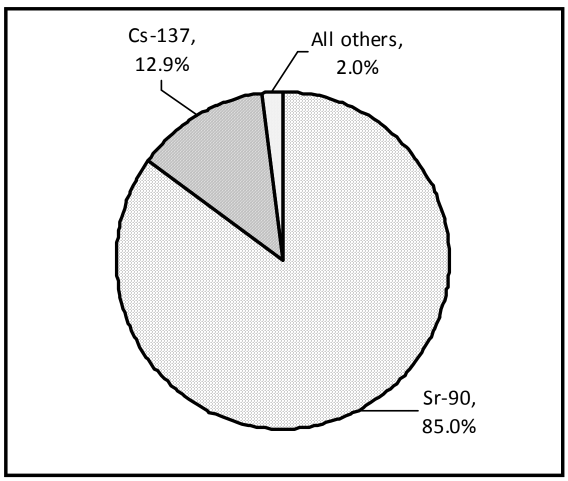
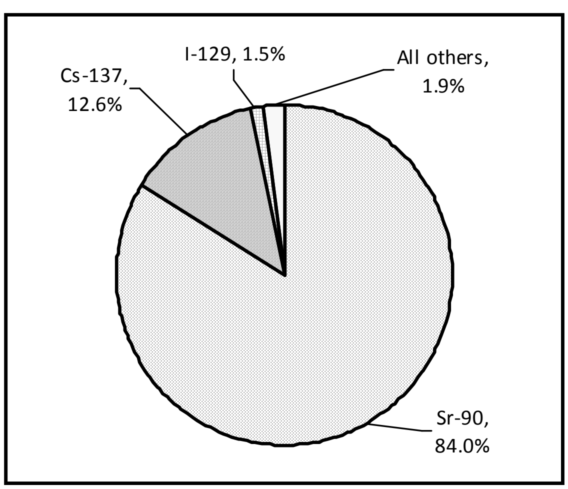


FIGURE 3-4
All Sources: Dose Percent by Radionuclide in CY 2010



Collective Population Dose (Airborne). About 1.68 million people were estimated to reside in the U.S. and Canada within 50 miles (80 km) of the WVDP. (See Figure A-13.) This population received an estimated 0.0077 person-rem (0.000077 person-Sv) total EDE from radioactive nonradon airborne emissions released from WVDP point and diffuse sources during 2010. The resulting average EDE per individual was 0.0000046 mrem (0.000000046 mSv).

Predicted Dose From Waterborne Releases

Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents, except as applied in 40 CFR Parts 141 and 143, Drinking Water Guidelines (EPA, 1984a; 1984b). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York 5-1.52). Radionuclides are not regulated under the site's State Pollutant Discharge Elimination System (SPDES) permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

As indicated in Table 3-1, the only local private residential wells are located upgradient of the WVDP and therefore do not represent a potential source of exposure to radioactivity from Project activities. Cattaraugus Creek is not used as a drinking water supply; therefore, a comparison of estimated doses from this source with the 4-mrem/year (0.04-mSv/year) EPA and NYSDOH drinking water limits is not truly appropriate (although values are well below the drinking water limits). Population dose estimates are based on the presumption that radionuclides are even further diluted in Lake Erie before reaching any municipal water supplies.

Because the Project's liquid effluents eventually reach Cattaraugus Creek, the most important waterborne exposure pathway is the consumption of fish from the creek by local sportsmen and residents. Exposure to external radiation from contamination at the shoreline or in the water is also considered in the model for estimating radiation dose.

The computer codes GENII version 1.485 (Pacific Northwest Laboratory, 1988), which implements the models in the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.109 (NRC, 1977), and LADTAP II (Simpson and McGill, 1980) were used to calculate site-specific unit dose factors (UDFs) for routine waterborne releases and dispersion of these effluents. The UDFs derived from those codes are tabulated in the "Manual for Radiological Assessment of Environmental Releases at the WVDP," WVDP-065 (West Valley Environmental Services LLC, 2010).

Six batches of liquid effluents, totaling about 10.3 million gallons (39.1 million liters), were released from the lagoon 3 weir WNSP001 (SPDES point 001) during 2010. Measurements of the radioactivity discharged in these effluents were combined with the UDFs to calculate the EDE to the MEOSI and the collective EDE to the population living within a 50-mile (80-km) radius of the WVDP. (See Table 3-2.)

In addition to measurements from WNSP001, radioactivity measurements from sewage treatment facility effluents (WNSP007) were included in the EDE calculations. The french drain at WNSP008, a third release point that is listed in the SPDES permit for the WVDP, has been sealed off since 2001 and was therefore not considered a source of discharge in 2010.

Besides the two controlled release points at WNSP001 and WNSP007, water from two natural drainage channels on the north plateau originating on the Project premises contain measurable concentrations of radioactivity: the northeast swamp (WNSWAMP) and north swamp (WNSW74A). Although releases from WNSWAMP and WNSW74A are not considered "controlled" releases, they are well characterized and are routinely sampled and monitored. Results from these monitoring points are included in the EDE calculations for the MEOSI and the collective population. A comparison of proportions of dose attributable to specific waterborne radionuclides is shown on Figure 3-3. As presented, strontium-90 and cesium-137 account for almost all of the estimated waterborne dose, at 85.0% and 12.9%, respectively.

There were no unplanned releases of waterborne radioactivity in 2010.

Maximum Dose (Waterborne) to an Off-Site Individual. Based on the radioactivity in liquid effluents discharged from the WVDP (lagoon 3 and the sewage treatment plant) during 2010, an off-site individual could have received a maximum EDE of 0.0094. mrem (0.000094 mSv). (See Table 3-2.) About 81% of this dose was from cesium-137. The MEOSI EDE due to drainage from the north plateau was 0.055 mrem (0.00055 mSv).

TABLE 3-2
Summary of Annual Effective Dose Equivalents (EDE) to an Individual and Population From WVDP Releases in 2010

Exposure Pathways	*Annual Effective Dose Equivalent*	
	Maximally Exposed Off-Site Individual [a] *mrem (mSv)*	*Collective Effective Dose Equivalent* [b] *person-rem (person-Sv)*
Airborne Releases[c]	**1.7E-03 (1.7E-05)**	**7.7E-03 (7.7E-05)**
% EPA standard (10 mrem)	0.017%	NA
Waterborne Releases[d]	**6.4E-02 (6.4E-04)**	**3.4E-01 (3.4E-03)**
Effluents only	9.4E-03 (9.4E-05)	1.3E-02 (1.3E-04)
North plateau drainage	5.5E-02 (5.5E-04)	3.2E-01 (3.2E-03)
Total From All Pathways	**6.6E-02 (6.6E-04)**	**3.4E-01 (3.4E-03)**
% DOE standard (100 mrem) - air and water combined	0.066%	NA
% of natural background (310 mrem; 522,000 person-rem) - received from air and water combined	0.021%	0.000066%
Estimated Airborne Radon-220[e]	**2.7E-02 (2.7E-04)**[f]	**1.8E+00 (1.8E-02)**[f]

Note: Summed values may not exactly match totals due to rounding.
NA - Not applicable. Numerical regulatory standards are not set for the collective EDE to the population.

[a] The maximum exposure to air discharges is estimated to occur at a residence 1.2 miles (1.9 km) north-northwest of the main plant process building (MPPB).

[b] A population of 1.68 million is estimated to reside in the U.S. and Canada within 50 miles (80 km) of the site.

[c] Releases are from atmospheric nonradon point and diffuse sources. Calculations use CAP88-PC to estimate individual and population doses. EPA and DOE limits for individual airborne dose are the same.

[d] Estimates are calculated using the methodology described in the Manual for Radiological Assessment of Environmental Releases at the WVDP, WVDP-065 (WVES, 2010).

[e] Estimated airborne releases are based on indicator measurements and process knowledge. Dose estimates are calculated using CAP88-PC for the MPPB stack.

[f] The estimated dose from radon-220 is specifically excluded by rule from NESHAP totals.

About 98% of the north plateau dose was attributable to strontium-90, largely from the WNSWAMP drainage point.

The combined EDE to the MEOSI from liquid effluents and drainage was 0.064 mrem (0.00064 mSv). This annual dose is very small in comparison to the 310-mrem (3.10 mSv) dose that is received by an average member of the U.S. population from natural background radiation.

Collective Population Dose (Waterborne). As a result of radioactivity released in liquid effluents from the WVDP during 2010, the population living within 50 miles (80 km) of the site received an estimated collective EDE of 0.013 person-rem (0.00013 person-Sv). The collective dose to the population from the effluents plus the north plateau drainage was 0.34 person-rem (0.0034 person-Sv). The resulting average EDE per individual is 0.00020 mrem (0.000002 mSv), which is a very small percentage of the dose received by the average person from natural background radiation (310 mrem or 3.1 mSv).

Predicted Dose From All Pathways

The potential dose to the public from both airborne and liquid effluents released from the Project in 2010 is the sum of the individual dose contributions. (See Table 3-2 and Figure 3-4.) The calculated maximum EDE from all pathways to a nearby resident was 0.066 mrem (0.00066 mSv). This dose is 0.066% of the 100-mrem (1-mSv) annual limit in DOE Order 5400.5. As in past years, CY 2010 results continued to demonstrate WVDP compliance with applicable radiation stan-

TABLE 3-3
WVDP Radiological Dose and Release Summary

WVDP Radiological Dose Reporting Table Calendar Year (CY) 2010						
Dose to the Maximally Exposed Individual		**% of DOE 100-mrem Limit**	**Estimated Population Dose**		**Population Within 50 Miles[a] (2000 census)**	**Estimated Natural Radiation Population Dose**
0.066 mrem	0.00066 (mSv)	0.066	0.34 person-rem	0.0034 (person-Sv)	1,684,000	522,000 person-rem

WVDP Radiological Atmospheric Emissions[b] CY 2010 in Curies and Becquerels (Bq)										
Tritium	**Kr-85**	**Noble Gases ($T_{1/2}$<40 dy)**	**Short-Lived Fission and Activation Products ($T_{1/2}$<3 hr)**	**Fission and Activation Products ($T_{1/2}$>3 hr)**	**Total Radioiodine**	**Total Radiostrontium**	**Total Uranium[c]**	**Total Plutonium**	**Total Other Actinides**	**Other (Rn-220)**
5.86E-03 (2.17E+08)	NA	NA	NA	1.23E-04 (4.56E+06)	3.23E-05 (1.20E+06)	1.51E-04 (5.57E+06)	1.66E-07 (6.13E+03)	1.91E-06 (7.07E+04)	2.14E-06 (7.90E+04)	1.10E+03 (4.05E+13)

WVDP Liquid Effluent Releases[d] of Radionuclide Material - CY 2010 in Curies and Becquerels (Bq)						
Tritium	**Fission and Activation Products ($T_{1/2}$>3 hr)**	**Total Radioiodine**	**Total Radiostrontium**	**Total Uranium[e]**	**Total Plutonium**	**Total Other Actinides**
3.39E-02 (1.26E+09)	6.03E-03 (2.23E+08)	1.30E-04 (4.81E+06)	3.65E-01 (1.35E+10)	6.20E-04 (2.29E+07)	7.24E-06 (2.68E+05)	2.14E-05 (7.94E+05)

Note: There are no known significant discharges of radioactive constituents from the site other than those reported in this table.

NA - Not applicable

[a] Total population includes the U.S. population from the 2000 census plus the Canadian population residing within a 50-mile (80-km) radius (Statistics Canada, 2001).

[b] Air releases are from point and diffuse sources.

[c] Total uranium (airborne) (grams) = 1.38E-01

[d] Water releases are from both controlled liquid effluent releases and from well-characterized site drainages.

[e] Total uranium (waterborne) (grams) = 4.66E+02

FIGURE 3-5
Effective Dose Equivalent From Liquid and Airborne Effluents to a Maximally Exposed Individual Residing Near the WVDP

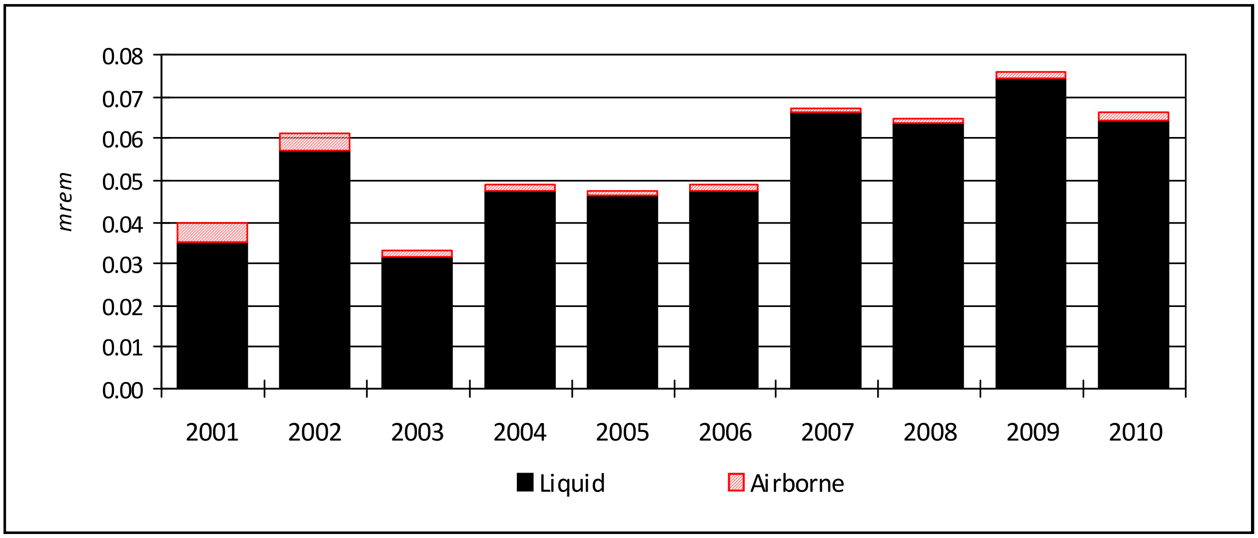
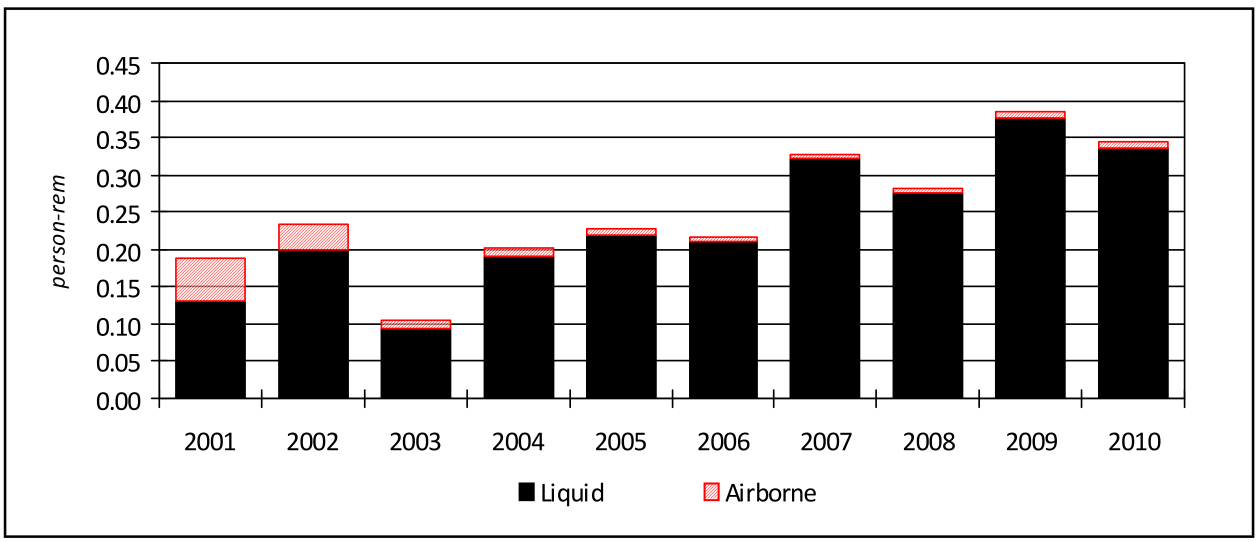


FIGURE 3-6
Collective Effective Dose Equivalent From Liquid and Airborne Effluents to the Population Residing Within 50 Miles (80 km) of the WVDP



Note: See the text box on p. 3-3 under "Units of Dose Measurement" for a discussion of mrem and person-rem.

dards for protection of the public and the environment. Table 3-3 presents the total curies released to the atmosphere from all sources at the WVDP. As presented on Figure 3-4, the largest proportion of estimated EDE to an off-site individual in 2010 was from strontium-90 via the waterborne pathway.

In CY 2010, the total collective EDE to the population within 50 miles (80 km) of the site was 0.34 person-rem (0.0034 person-Sv), with an average EDE of 0.0002 mrem (0.000002 mSv) per individual.

Figure 3-5 shows the calculated annual dose to the hypothetical MEOSI over the last 10 years. The estimated doses for 2010 were slightly lower than those in 2009. As shown by this figure, the largest portion is due to waterborne contributions.

Figure 3-6 shows the collective dose to the population over the last 10 years. The radioactivity in the human pathway represented by these data confirms the continued inconsequential addition to the natural background radiation dose that individuals and the population around the WVDP receive from Project activities.

Calculated Dose From Food. Most radionuclide concentrations in near-site food samples were statistically indistinguishable from concentrations in background samples. For those near-site food samples that were marginally above background, conservative dose estimates due to consuming near-site deer and milk were about 0.21 mrem/year (0.0021 mSv/year), which is about 0.03% of the dose received by an average individual due to natural and other man-made sources in 2010. (See Figure 3-1, "Comparison of Doses from Natural and Man-Made Sources to the Dose from 2010 WVDP Effluents.") This estimate assumes the individual consumes the maximum quantities of each food item. These independent estimates confirmed the low modeled dose estimates based on air and water effluents, as summarized in Table 3-2. Food crops and fish were not sampled in 2010, but will be sampled in 2012.

Risk Assessment

Estimates of cancer risk from ionizing radiation have been presented by the National Council on Radiation Protection and Measurements (NCRP) (1987) and the National Research Council's Committee on Biological Effects of Ionizing Radiation (1990).

The NCRP estimates that the probability of fatal cancer occurring is between one and five per 10,000 people who are each exposed to one rem (i.e., a risk coefficient of between 0.0001 and 0.0005). DOE guidance has, in the past, recommended using a risk coefficient of 0.0005 (International Commission on Radiological Protection [ICRP], 1991) to estimate risk to a MEOSI. Recent DOE guidance recommends using the even more conservative risk coefficient of 0.0006 provided by the Interagency Steering Committee on Radiation Standards (January 2003). The estimated risk to the hypothetical individual residing near the WVDP from airborne and waterborne releases in 2010 was about 4 per 100 million (a risk of 0.00000004). This risk is well below the range of 0.000001 to 0.00001 per year considered by the ICRP to be a reasonable risk for any member of the public (ICRP Report Number 26, 1977).

Release of Materials Containing Residual Radioactivity

The DOE ensures protection of the public and the environment through the implementation of the standards and requirements set forth in DOE Order 5400.5. In addition to discharges to the environment, the release of property containing residual radioactive materials is considered a potential contributor to the dose received by the public.

In 2000, the Secretary of Energy placed a moratorium on the release of volumetrically contaminated metals, and suspended the unrestricted release of metals from radiological areas of DOE facilities for recycling. The moratorium and suspension currently remain in effect.

A graded approach is utilized by the WVDP for the release of equipment and materials to the public for unrestricted use. This approach considers the use of the material, the potential for internal contamination, the location the material was used, and process knowledge of the item(s) to be released. In accordance with WVDP radiological controls manuals and procedures, these criteria are assessed and documented, and the material(s) may be radiologically surveyed to verify the survey results are within the contamination limits presented in DOE Order 5400.5, Figure IV-1. Records of released property are maintained.

Presently there are no approved criteria for releasing WVDP material to the public that may have been contaminated in depth or volume; therefore, no unrestricted release of scrap metal or other material of this type has occurred. Compliance with the Secre-

tary of Energy's suspension of unrestricted release of scrap metal for recycle continues at the WVDP.

The Secretary does encourage efforts to promote reuse and recycling of excess property for use within the DOE complex. These transfers occur only when property is transferred to individuals authorized to use such material.

Dose to Biota

Radionuclides from both natural and man-made sources may be found in environmental media such as water, sediments, and soils. In the past, it has been assumed that if radiological controls are sufficient to protect humans, other living things are also likely to be sufficiently protected. This assumption is no longer considered adequate, because populations of plants and animals residing in or near these media or taking food or water from these media may be exposed to a greater extent than are humans. For this reason, the DOE prepared a technical standard that provides methods and guidance to be used to evaluate doses of ionizing radiation to populations of aquatic animals, riparian animals (i.e., those that live along banks of streams or rivers), terrestrial plants, and terrestrial animals.

Methods in this technical standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (DOE-STD-1153-2002, July 2002), were used in 2010 to evaluate radiation doses to aquatic and terrestrial biota within the confines of the Western New York Nuclear Service Center (WNYNSC), which includes the WVDP. Doses were assessed for compliance with the limit in DOE Order 5400.5 for native aquatic animal organisms (1 rad/day) and for compliance with the thresholds for terrestrial plants (also 1 rad/day) and for terrestrial animals (0.1 rad/day), as proposed in DOE-STD-1153-2002. Note that the absorbed dose unit (rad) is used for biota instead of the units used for indicating human risk (rem).

RESRAD-BIOTA for Windows® (November 2009), a calculation tool provided by the DOE for implementing the technical standard, was used to compare existing radionuclide concentration data from environmental sampling with biota concentration guide (BCG) screening values and to estimate upper bounding doses to biota. Data were taken from surface water samples obtained in 2010 and sediments over the most recent five years of sediment sampling (2003–2007). Soil data from the most recent 10 years (1995–2004) for which special on-site surface soil sampling was conducted and the most recent 10 years of routine on-site surface soil sampling (1998–2007) were used. Differing time periods were used because radionuclide concentrations change more rapidly over time in surface waters than in sediments and soils, as reflected in their sampling frequencies (monthly or quarterly for water, every five years for sediment and surface soil).

Concentration data for radionuclides in each medium were entered into the RESRAD-BIOTA Code. The value for each radionuclide was automatically divided by its corresponding BCG to calculate a partial fraction for each nuclide in each medium. Partial fractions for each medium were added to produce a sum of fractions.

Exposures from the aquatic pathway may be assumed to be less than the aquatic dose limit from DOE Order 5400.5 if the sum of fractions for the water medium plus that for the sediment medium is less than 1.0. Similarly, exposures from the terrestrial pathway may be assumed to be less than the proposed dose limits for both terrestrial plants and animals if the sum of fractions for the water medium plus that for the soil medium is less than 1.0.

It was found that the isotopes with the highest sums of fractions – the radionuclides that contributed the largest component of both aquatic and terrestrial dose to biota – were strontium-90 and cesium-137. Per guidance in DOE-STD-1153-2002, the populations of organisms most sensitive to strontium-90 and cesium-137 in this evaluation – that is, those most likely to be adversely affected via the aquatic and terrestrial pathways – were determined to be populations of riparian animals (such as the raccoon [aquatic dose]) and terrestrial animals (such as the deer mouse [terrestrial dose]). Populations of both animals are found on the WNYNSC.

In accordance with the graded approach described in DOE-STD-1153-2002, a general screening was first conducted using the maximum radionuclide concentrations from surface waters, sediments, and soils. Maximum radionuclide concentrations exceeded applicable BCG limits for both aquatic and terrestrial evaluations.

As recommended in DOE-STD-1153-2002, a site-specific screening was then done using estimates of average radionuclide concentrations derived from measurements in site-wide surface waters, sediments, and soils. Results are summarized in Table 3-4.

At the site-specific screening level, the sums of fractions for the aquatic and terrestrial evaluations were

TABLE 3-4
2010 Evaluation of Dose to Aquatic and Terrestrial Biota

AQUATIC SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Sediment BCG [a] (pCi/g)*	*Mean Sediment Value (pCi/g)*	*Ratio*	*Water and Sediment Sum of Fractions*
Cesium-137	42.7	1.97	4.60E-02	3,130	5.74	1.83E-03	0.048
Strontium-90	279	46.4	1.66E-01	583	1.22	2.09E-03	0.168
All Others	NA	NA	1.00E-03	NA	NA	5.20E-04	0.002
Sum of Fractions			2.13E-01			4.44E-03	**0.217**
Estimated upper bounding dose to an aquatic animal = 0.0045 rad/day; to a riparian animal = 0.022 rad/day.							

TERRESTRIAL SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Soil BCG [a] (pCi/g)*	*Mean Soil Value (pCi/g)*	*Ratio*	*Water and Soil Sum of Fractions*
Cesium-137	599,000	1.97	3.28E-06	20.8	4.64	2.23E-01	0.223
Strontium-90	54,500	46.4	8.51E-04	22.5	1.01	4.47E-02	0.046
All Others	NA	NA	7.20E-07	NA	NA	1.30E-03	0.001
Sum of Fractions			8.55E-04			2.69E-01	**0.270**
Estimated upper bounding dose to a terrestrial plant = 0.0025 rad/day; to a terrestrial animal = 0.027 rad/day.							

NA - Not applicable

[a] The biota concentration guides (BCGs) are calculated values. Except for the sums of fractions and dose estimates, which are rounded to two significant digits, all values are expressed to three significant digits.

0.22 and 0.27, respectively. The sum of fractions for each assessment was less than 1.0, indicating that applicable BCGs were met for both the aquatic and terrestrial evaluations.

Upper bounding doses associated with the aquatic system evaluation were 0.0045 rad/day to an aquatic animal and 0.022 rad/day to a riparian animal, far below the 1 rad/day standard from DOE Order 5400.5 for dose to a native aquatic animal. Upper bounding doses associated with the terrestrial system evaluation were 0.027 rad/day to a terrestrial animal and 0.0025 rad/day to a terrestrial plant, again well below the guidance thresholds (0.1 and 1 rad/day, respectively).

It was therefore concluded that populations of aquatic and terrestrial biota (both plants and animals) on the WNYNSC are not being exposed to doses in excess of the existing DOE dose standard for native aquatic animals (DOE, February 1990) and the international standards for terrestrial organisms (International Atomic Energy Agency [IAEA], 1992).

Summary

Tables 3-2, 3-3, and 3-4 summarize radiological dose and release information for CY 2010.

Predictive computer modeling of airborne and waterborne releases resulted in estimated hypothetical doses to the maximally exposed individual that were orders of magnitude below all applicable EPA standards and DOE Orders that place limitations on the release of radioactive materials and dose to individual members of the public. The collective population dose was also assessed and found to be orders of magnitude below the natural background radiation dose. Additionally, estimates indicated that populations of biota at the WVDP are exposed at a fraction of the DOE and IAEA guidelines for dose to biota.

Based on the overall dose assessment, the WVDP was found to be in compliance with applicable effluent radiological guidelines and standards during CY 2010.

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GROUNDWATER PROTECTION PROGRAM

Groundwater Monitoring Program

Groundwater monitoring at the West Valley Demonstration Project (WVDP or Project) complied with all applicable state and federal regulations and meets the requirements of United States (U.S.) Department of Energy (DOE) Order 450.1A, "Environmental Protection Program," and the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent (Consent Order).

Environmental Surveillance. The WVDP Environmental Management System (EMS) required environmental monitoring to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and to assess the effect of such changes on the public and the environment, including changes due to groundwater contamination. The WVDP EMS included implementation of a site-wide approach for groundwater protection. The "WVDP Groundwater Protection Management Program Plan" documented the Project's approach to the groundwater protection from on-site activities.

The primary focus of the groundwater monitoring program (GMP), summarized in the WVDP "Groundwater Monitoring Plan," identified, delineated, and monitored groundwater migration pathways that could transport contaminants off site and to support mitigative actions. The groundwater monitoring well network at the WVDP was designed to monitor groundwater conditions in six subsurface geologic units. For a description of these geologic units refer to "Geology and Hydrogeology" later in this chapter.

Regulatory Compliance: RCRA §3008(h) Consent Order. The RCRA Facility Investigation (RFI) reports and Consent Order require routine monitoring of certain analytes at specified groundwater monitoring locations.

Groundwater Use and History. Site groundwater is not used for drinking or operational purposes, nor is effluent discharged directly to groundwater. The majority of the site groundwater eventually flows to Cattaraugus Creek and then to Lake Erie. Surveys have determined that no public water supplies are drawn from groundwater downgradient of the site or from Cattaraugus Creek downstream of the WVDP. However, upgradient of the site, groundwater is used as a public and private drinking water supply by local residents.

Highlights of the groundwater monitoring history on the site and the evolution of the GMP are summarized in Table 4-1. The most significant groundwater protection program activity that occurred in 2010 was installing a full-scale permeable treatment wall (PTW) on the north plateau. This is discussed in further detail later in this chapter.

Geology and Hydrogeology

The Western New York Nuclear Service Center (WNYNSC) is situated upon a layered sequence of glacial-age sediments that fill a steep-sided bedrock valley composed of interbedded shales and siltstones (Rickard, 1975). Erdman Brook bisects the WVDP into the north and south plateaus. The main plant process building (MPPB), waste tanks, and lagoons are located on the north plateau. The drum cell, the U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA), and the New York State-Licensed Disposal Area (SDA) are located on the south plateau.

The glacial sediments overlying the bedrock consist of a sequence of three silt- and clay-rich glacial tills of Lavery, Kent, and possibly Olean age. The tills are separated by stratified fluvio-lacustrine deposits (silty or silty/sandy lakebed sediments). The units above the Kent till, which include the Kent recessional sequence, the weathered Lavery till (WLT) and unweathered Lavery till (ULT), the intra-Lavery till-sand, and the alluvial sand and gravel (S&G), are generally regarded as containing all of the potential routes for contaminant migration from the Project via groundwater. The S&G unit only exists on the Project's north plateau. The Kent till has a relatively low permeability and does not provide a pathway for contaminant movement from the WVDP; therefore, it is not discussed here. See Figure 4-1 for a cross-sectional view of the subsurface and Table 4-2 for the descriptions and the geographic distribution of these units. The S&G unit consists of two subunits: the thick-bedded unit (TBU) and the slackwater sequence (SWS).

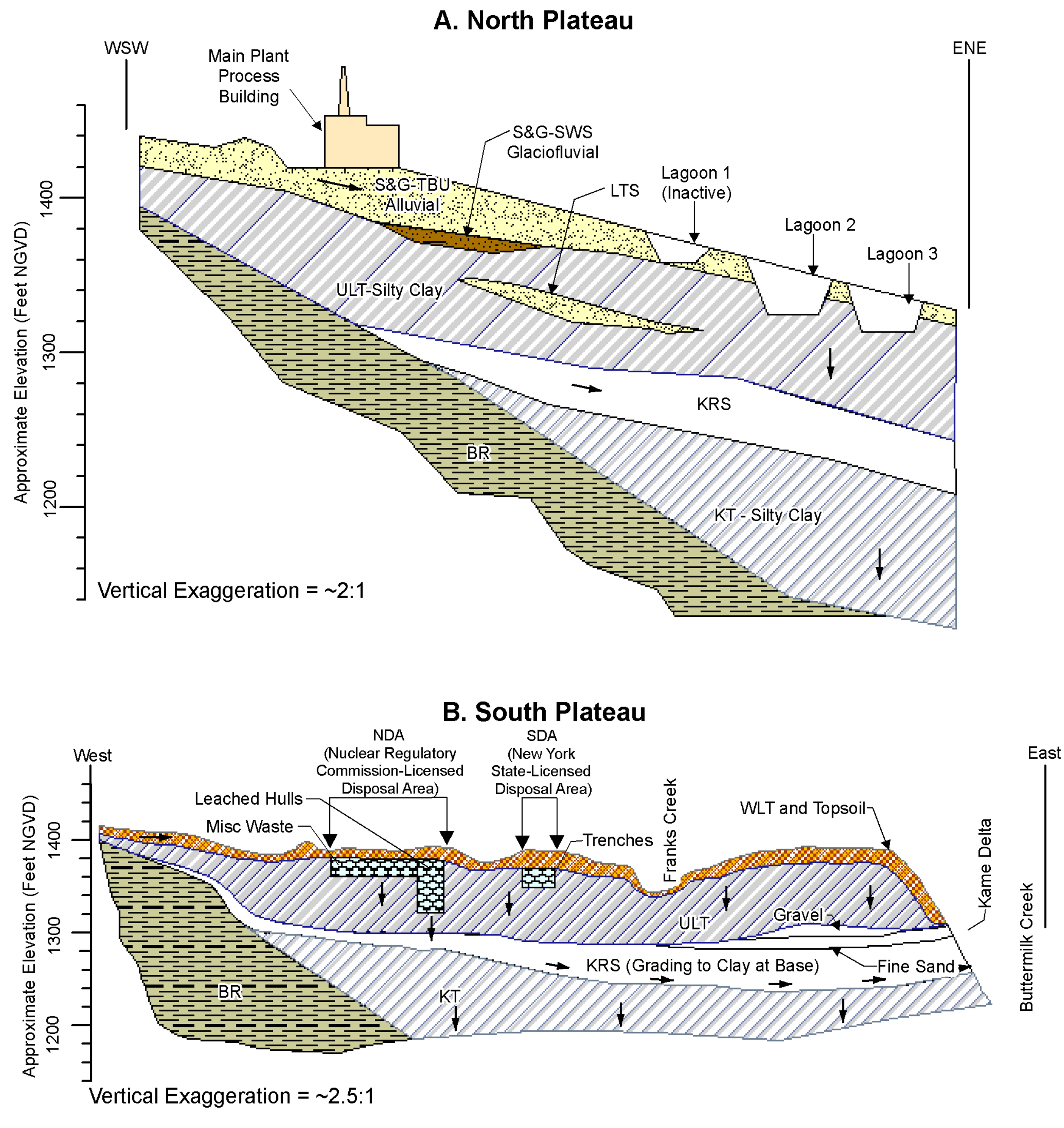
TABLE 4-1
Highlights of Groundwater Monitoring History at the WVDP and the WNYNSC

Year	*Highlight*
1961–1980	From the time the Western New York Nuclear Service Center was established in 1961, to passage of the West Valley Demonstration Project (WVDP) Act in 1980, groundwater at the WVDP was periodically sampled by Nuclear Fuel Services (NFS), the New York Geological Society, and the United States Geological Survey during construction of the main plant process building (MPPB), for spill investigations, and for post-NFS research studies.
1982	Groundwater monitoring at the WVDP began in 1982 under the United States (U.S.) Department of Energy (DOE) and site subcontractor (West Valley Nuclear Services), and continued to expand through 1992.
1984	By 1984, 40 wells provided groundwater monitoring coverage near the MPPB and the U.S. Nuclear Regulatory Commission-Licensed Disposal Area (NDA).
1986	Additional wells were installed to supplement the existing groundwater monitoring network.
1990–1991	Ninety-six wells were installed upgradient and downgradient of the WVDP solid waste management units (SWMUs) for the DOE and Resource Conservation and Recovery Act (RCRA) monitoring programs. (The total included wells at the New York State-licensed disposal area.)
1992	The RCRA 3008(h) Order on Consent was signed.
1993	Elevated gross beta activity was discovered in groundwater from the sand and gravel (S&G) unit on the north plateau. Subsequent investigation delineated a plume of strontium-90-contaminated groundwater originating beneath the MPPB, extending northeast.
1993–1994	A RCRA Facility Investigation (RFI) expanded characterization program was conducted to assess potential releases of hazardous constituents from on-site SWMUs. Results from the RFI influenced decisionmaking for the groundwater monitoring program (GMP).
1994	A Geoprobe® investigation of groundwater and soil beneath and downgradient of the MPPB was performed to characterize the elevated gross beta activity in the S&G unit. The presumed source was found to be near the southwest corner of the MPPB. The primary isotopes responsible for the beta activity were strontium-90 and its daughter product yttrium-90.
1995	The GMP was evaluated and analytical constituents were tailored to each sampling point for a more focused and cost-effective program. The north plateau groundwater recovery system (NPGRS) was installed near the leading edge of the main lobe of the strontium-90 plume to minimize migration. The NPGRS consisted of three extraction wells that recovered groundwater for treatment by ion exchange.
1996	Several groundwater seeps on the northeast edge of the north plateau were added to the monitoring program.
1997	A Geoprobe® soil and groundwater sampling program was conducted to delineate the leading edge of the strontium-90 plume.
1998	In response to recommendations from a 1997 external review of WVDP actions regarding the north plateau, another Geoprobe® soil and groundwater sampling program was carried out to further characterize the core area of the plume. The new radiological data were compared to the 1994 data.
1999	A pilot-scale permeable treatment wall (PTW) was installed in the eastern lobe of the plume to test this passive in-situ remediation technology. Well points were installed near the PTW.
2000–2001	Additional wells and well points were installed across the leading edge of the strontium-90 plume to monitor the plume's movement and assess the effectiveness of the pilot PTW.
2003	Four new wells were installed to monitor groundwater upgradient and downgradient of the newly constructed remote-handled waste facility.
2005	Number of analytes or sampling frequencies were reduced at 14 groundwater monitoring locations.
2007	The GMP was evaluated, considering current site conditions, activities, and environmental exposure pathways. The analytes and sampling frequencies at 20 monitoring points were reduced and sampling at four wells was discontinued. Off-site drinking water sampling was also discontinued after an evaluation of historical data had confirmed that site operations had no impact on off-site upgradient groundwater.
2008	Two replacement wells, and 21 piezometers, were installed near the NDA during installation of a slurry wall and geomembrane cover at the NDA. On the north plateau, three subsurface investigations were performed upgradient, within, and downgradient of the strontium-90 plume.
2010	An approximately 860-foot-long full-scale PTW was installed along the leading edges of the strontium-90 plume. Sixty-six groundwater monitoring wells were installed upgradient, downgradient, and within the PTW to monitor wall performance. Four new wells were installed downgradient of the MPPB to supplement the strontium-90 source area monitoring.

FIGURE 4-1

Geologic Cross Sections of the North and South Plateaus at the WVDP

J:/GIS/ArcMap/ASER/ASER_2010/ASER_2010_Fig4-1_20110602.mxd FJC/skw



Legend

S&G-TBU	Sand and Gravel - Thick-Bedded Unit	KT	Kent Till
S&G-SWS	Sand and Gravel - Slackwater Sequence	BR	Shale Bedrock
LTS	Lavery Till Sand	⟶	Conceptual Groundwater Flow Direction
WLT	Weathered Lavery Till	ENE	East-Northeast
ULT	Unweathered Lavery Till	WSW	West-Southwest
KRS	Kent Recessional Sequence		*(NGVD - National Geodetic Vertical Datum)*

Routine Groundwater Monitoring Program

Monitoring Well Network. The WVDP groundwater monitoring network is an essential component of the Environmental Protection Program implemented under DOE Order 450.1A. Groundwater is routinely monitored across the WVDP north and south plateaus and in the six hydrogeologic units described in Table 4-2. In calendar year (CY) 2010, groundwater samples were collected from a total of 69 on-site routine groundwater monitoring locations (see Figures A-7 and A-8). The on-site locations included 63 monitoring wells and well points, five groundwater seepage points, and one trench sump. Many of the wells were installed to monitor one or more solid waste management units (SWMUs) on the WVDP in accordance with the Consent Order. Table 4-3 lists the wells in the routine groundwater monitoring network, the super SWMUs and the geologic units they monitor, and the analytes measured in CY 2010. Table 4-4 defines the analyte groups. (See "RCRA §3008(h) Administrative Order on Consent" in the "Environmental Compliance Summary.")

Table 4-3 includes four new groundwater monitoring wells, MP-01 through MP-04, that were installed immediately downgradient of the MPPB in March 2010. Two of these wells are replacements for two smaller-diameter direct pushed, pre-constructed wells (WP20S and WP20D) that were removed and two are new wells installed 50 feet east of the fuel receiving and storage (FRS) building. These new wells have been incorporated into the routine site-wide groundwater monitoring program.

The monitoring frequency and the constituents analyzed under the GMP are a function of regulatory requirements, historical site activities, current operating practices, and ongoing evaluations of groundwater data. Tables 4-5 and 4-6 provide an overview of groundwater monitoring performed during CY 2010 organized by geographic area and monitoring purpose.

Groundwater Elevation Monitoring. Water level measurements were taken at the monitoring network wells in conjunction with the quarterly analytical sampling. (See Figures A-7 and A-8 in Appendix A.) Groundwater elevation data were used to produce maps that depict groundwater flow directions and gradients. Long-term trend graphs were used to illustrate variations in groundwater elevations over time, such as seasonal fluctuations or changes resulting from installing water diversions, such as caps, trenches, or slurry walls, and groundwater treatment systems, such as the north plateau pumping wells and pilot- and full-scale PTWs.

Groundwater elevation mapping is particularly important in areas where knowledge of groundwater flow direction is critical for monitoring groundwater that is or may become impacted by contaminant migration, such as for analysis of the strontium-90 plume migration. (See "Strontium-90 Plume on the North Plateau.") Surface water elevations are also measured on the north plateau where the water table in the S&G intersects the ground surface, providing flow direction.

At the NDA on the south plateau, groundwater elevation mapping of the WLT helps evaluate the effectiveness of the interceptor trench, as well as the slurry wall and geomembrane cover that were installed in 2008 to minimize groundwater and surface water migration through the burial area. (See "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA.")

Groundwater Trigger Level Evaluation. A computerized data-screening program uses "trigger levels" – preset conservative values for chemical and radiological concentrations and groundwater elevation measurements – to promptly identify anomalies in monitoring results that may require further investigation. The trigger levels are statistically derived from historical results or are based on regulatory criteria or detection limits.

Analytical results exceeding the trigger levels may be the result of normal seasonal fluctuations, laboratory analytical problems, or changes in groundwater quality. Response actions are identified for each analytical result exceeding a trigger level. Each quarter, trigger level exceptions, defined as a current measurement above or below an upper or lower trigger level, are compiled, evaluated, and summarized with recommended response actions.

Groundwater Screening Levels (GSLs). In 2009, GSLs were developed as a tool to identify the presence of chemical and radiological constituents in groundwater above levels of concern (e.g., regulatory limits, guidance limits, background). Methods used to develop the GSLs are discussed in detail in Appendix D. Analytical results for 2010 are compared with applicable GSLs, and summarized in Table 4-10 at the end of this chapter.

TABLE 4-2
Summary of Hydrogeology at the WVDP

Geologic Unit	Description	Groundwater Flow Characteristics	Hydraulic Conductivity [a]	Location
Sand and Gravel; Thick-Bedded Unit (S&G-TBU)	Silty sand and gravel layer composed of younger Holocene alluvial deposits	Flow is generally northeast across the plateau toward Franks Creek, with groundwater near the northwestern and southeastern margins flowing radially outward toward Quarry Creek and Erdman Brook.	9.0 feet (ft)/day (3.2E-03 centimeters [cm]/second [sec])	Surficial unit on the north plateau
Sand and Gravel; Slackwater Sequence	Interbedded silty sand and gravel layers composed of Pleistocene-age glaciofluvial deposits partially separated from the S&G-TBU by a discontinuous silty clay interval	Flow is to the northeast along gravel layers toward Franks Creek.	17 ft/day (6.0E-03 cm/sec)	Underlies a portion of the north plateau
Weathered Lavery Till	Upper zone of the Lavery till which has been exposed at the ground surface; weathered and fractured to a depth of 3–16 ft (0.9–4.9 meters [m]); brown in color due to oxidation; contains numerous desiccation cracks and root tubes	Flow has both horizontal and vertical components allowing groundwater to move laterally across the south plateau before moving downward into the unweathered lavery till or discharging to nearby incised stream channels.	0.07 ft/day (2.4E-05 cm/sec); the highest conductivities are associated with dense fracture zones found within the upper 7 ft (2 m) of the unit	Surficial unit on the south plateau
Unweathered Lavery Till	Olive gray silty clay with intermittent lenses of silt and sand; ranges up to 130 ft (40 m) in thickness	Flow is vertically downward at a relatively slow rate; unit is considered an aquitard.	0.002 ft/day (8.1E-07 cm/sec)	Underlies both the north and south plateaus
Lavery Till Sand	Thin, sandy unit of limited areal extent and variable thickness within the Lavery till.	Flow is to the east-southeast toward Erdman Brook.	0.2 ft/day (8.6E-05 cm/sec)	Primarily beneath the southeastern portion of the north plateau
Kent Recessional Sequence	Interbedded clay and silty clay layers locally overlain by coarser-grained sands and gravels; pinches out near the east side of Rock Springs Road	Flow is to the northeast; recharge from the overlying till and from bedrock to the southwest; discharges into Buttermilk Creek.	0.01 ft/day (4.3E-06 cm/sec)	Underlies most of the Project, except areas adjacent to Rock Springs Road

Note: Hydrologic conditions of the site are more fully described in “Environmental Information Document, Volume III: Hydrology, Part 4” (West Valley Nuclear Services Co. [WVNSCO], March 1996) and in the “RCRA Facility Investigation Report (RFI) Vol. 1: Introduction and General Site Overview” (WVNSCO and Dames & Moore, July 1997).

[a] Hydraulic conductivities represent an average of testing results from 1991 through 2010.

TABLE 4-3
WVDP Groundwater Monitoring Network Sorted by Geologic Unit

Well ID	*SSWMU*	*Gradient Position*	*Analytical Parameters (See Table 4-4)*	*Well ID*	*SSWMU*	*Gradient Position*	*Analytical Parameters (See Table 4-4)*
Sand and Gravel Wells							
103[a]	1, 3	D	I, RI, V	803[a]	8	D	I, RI, SV, V
104	1	C	I, RI	804[a]	8	D	I, RI, V
105	1	C	I, RI	1302[b]	NA	D	I, RI, M,
106	1	D	I, RI	1304[b]	NA	U	I, RI, M, R
111[a]	1	D	I, RI, M, SV, V	8603	8	U	I, RI
116[a]	1, 8	C, U	I, RI, V	8604	1	C	I, RI
205	2	D	I, RI	8605[a]	1, 2	D	I, RI, M, SV, V
301[a]	3	U	I, RI	8607[a]	4, 6	D, U	I, RI, V
302	3	U	I, RI	8609[a]	3, 4, 6	D, D, U	I, RI, S, V
401[a]	3, 4	U	I, RI, R	8612[a]	8	D	I, RI, SV, V
402	4	U	I, RI	MP-01[a]	3	D	I, RI, M, R-MP, SV, V, T
403	4	U	I, RI	MP-02[a]	3	D	I, RI, M, R-MP, SV, V, T
406[a]	4, 6	D, U	I, RI, R, V	MP-03[a]	3	D	I, RI, M, R-MP, SV, V, T
408[a]	3, 4	D	I, RI, R, V	MP-04[a]	3	D	I, RI, M, R-MP, SV, V, T
501[a]	5	U	I, RI, S, V	WP-A[c]	NA	NA	I, RI
502[a]	5	D	I, RI, S, SM, V	WP-C[c]	NA	NA	I, RI
602A	6	D	I, RI	WP-H[c]	NA	NA	I, RI
604	6	D	I, RI	SP04[d]	NA	NA	RI
605	6	D	I, RI	SP06[d]	NA	NA	RI
706[a]	7	D	I, RI, M	SP11[d]	NA	NA	RI
801[a]	6, 8	U, D	I, RI, S, V	SP12[a,d]	8	D	I, RI, V
802	8	D	I, RI, V	GSEEP[a,d]	8	C, D	I, RI, V
Lavery Till Sand Wells							
204[a]	2, 3	D	I, RI	206	2	C	I, RI
Weathered Lavery Till Wells							
906[a]	9	D	I, RI	1005[a]	9, 10	C, U	I, RI
908R[a]	9	B	I, RI	1006[a]	9, 10	C, D	I, RI
909[a]	9	D	I, RI, M, R, SV, V	1008C[a]	9, 10	U	I, RI
NDATR[a]	9	D	I, RI, M, R, SV, V				
Unweathered Lavery Till Wells							
107	1	D	I, RI	704	7	D	I, RI
108	1	D	I, RI	707	7	C	I, RI
110[a]	1	D	I, RI, V	910R[a]	9	D	I, RI
405	4	D	I, RI, M	1301[b]	NA	D	I, RI
409	4	D	I, RI	1303[b]	NA	U	I, RI, M
Kent Recessional Sequence Wells							
901[a]	9	U	I, RI	1008B	10	U	I, RI
902[a]	9	U	I, RI	8610[a]	9	D	I, RI
903[a]	9	D	I, RI	8611[a]	9	D	I, RI

Gradient Positions: B (background); C (crossgradient); D (downgradient); U (upgradient)

[a] Monitoring for some parameters at this well is required by the RCRA §3008(h) Consent Order.
[b] Monitors upgradient or downgradient of the remote-handled waste facility.
[c] Monitors north and east of the main plant process building.
[d] Monitors groundwater emanating from seeps along the edge of the north plateau.

TABLE 4-4
WVDP Groundwater Sampling and Analysis Agenda

Analyte Group	*Description of Parameters*
Indicator Parameters (I)	pH, specific conductance (field measurements)
Radiological Indicator Parameters (RI)	Gross alpha, gross beta, tritium
Volatile Organic Compounds (V)	Title 6 of the New York State Official Compilation of Codes, Rules, and Regulations (6 NYCRR) Part 373-2 Appendix 33 Volatile Organic Compounds
Semivolatile Organic Compounds (SV)	6 NYCRR Part 373-2 Appendix 33 Semivolatile Organic Compounds and tributyl phosphate
Groundwater metals (M)	6 NYCRR Part 373-2 Appendix 33 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, zinc)
Special Monitoring Parameters for early warning wells (SM)	Aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, Iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc
Radioisotopic Analyses: alpha-, beta-, and gamma-emitters (R)	Carbon-14, strontium-90, technetium-99, iodine-129, cesium-137, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, uranium-238, total uranium
Radioisotopic Analyses MPPB Area (R-MP)	Carbon-14, potassium-40, cobalt-60, strontium-90, technetium-99, iodine-129, cesium-137, europium-154, neptunium-237, plutonium-238, plutonium-239/240, plutonium-241, uranium-232, uranium-233/234, uranium-235/236, uranium-238, americium-240, curium-244
Strontium-90 (S)	Strontium-90
Turbidity (T)	Turbidity

TABLE 4-5
WVDP 2010 Groundwater Monitoring Overview by Geographic Area

Number of...	*Total WVDP*	*North Plateau*	*South Plateau*
Monitoring Points Sampled - Analytical	69	55	14
Monitoring Points - Water Elevations Only	73	34	39
Monitoring Events	4	4	4
Analyses (analyses groups)	1,084	926	158
Results (individual)	8,019	6,830	1,189
Percent of Nondetectable Results	84%	84%	85%
Water Elevation Measurements	554	321	233

TABLE 4-6
WVDP 2010 Groundwater Monitoring Overview by Purpose

Number of...	*Total*	*Regulatory/ Waste Management*	*Environmental Surveillance*
Monitoring Points Sampled - Analytical	69	38	31
Monitoring Points - Water Elevations Only	73	1	72
Monitoring Events	4	4	4
Analyses (analyses groups)	1,084	746	338
Results (individual)	8,019	7,115	904
Percent of Nondetectable Results	84%	88%	52%
Water Elevation Measurements	554	144	410

Strontium-90 Plume on the North Plateau

Elevated gross beta activity has been observed on the north plateau since 1993. This contamination is predominantly confined to the S&G unit, the shallowest hydrogeologic unit on the north plateau. (See the highlights for 1993 and 1994 in Table 4-1.) The routine GMP network in the S&G unit on the north plateau includes 44 monitoring locations (including wells MP-01 through MP-04, installed in March 2010); three well points; and five groundwater seepage locations.

At the WVDP, DOE derived concentration guides (DCGs) are sometimes used as a reference for evaluating liquid radionuclide effluents. Because there is no DCG for gross beta in liquid effluents, the strontium-90 DCG (1E-06 microcuries per milliliter [µCi/mL]) is used as a conservative basis for comparison where beta-emitting radionuclides are detected in groundwater. The strontium-90 DCG is the most restrictive of the beta emitters at the WVDP. For the purpose of the following discussions, the strontium-90 DCG is used for comparison with both gross beta and strontium-90. (See the "Useful Information" section at the end of this report for a discussion of the DOE DCGs, and Table UI-4 for a list of the DCGs for radionuclides of interest at the WVDP.)

Figure 4-2 shows the plume outline, as defined by the 1E-06-µCi/mL gross beta isopleth (the strontium-90 DCG), at three time intervals spanning 17 years (in 1994, 2002, and 2010). As shown, although the plume's western boundary has remained relatively constant since 1994, over time the plume has migrated to the northeast and east, consistent with the groundwater flow direction in the S&G unit. The leading edge has divided into three small lobes due to the variable rate of migration resulting from the heterogeneous nature of soil within the S&G, TBU, and SWS subunits (i.e., the uneven distribution of coarse and fine soils) which creates preferential pathways for groundwater migration. The GMP wells that monitor the plume, and the gross beta concentrations measured in December 2010, are shown on Figure 4-2. In December 2010, a relatively large increase in gross beta concentration was observed in groundwater from well 803, located in the northeast corner of the north plateau downgradient of the plume's central lobe. The gross beta concentration increased by roughly two orders of magnitude during CY 2010, from approximately 1.0E-08 µCi/mL to 9.0E-07 µCi/mL. In March 2011, the gross beta concentration at well 803 exceeded the DOE DCG for strontium-90 (1.0E-06 µCi/mL). This increasing trend is attributable to continued migration of the strontium-90 plume's central lobe. It is anticipated that these concentrations may continue to increase for a period of time, and then eventually decrease when groundwater influenced by the PTW's strontium-90 removal begins to reach the location of well 803.

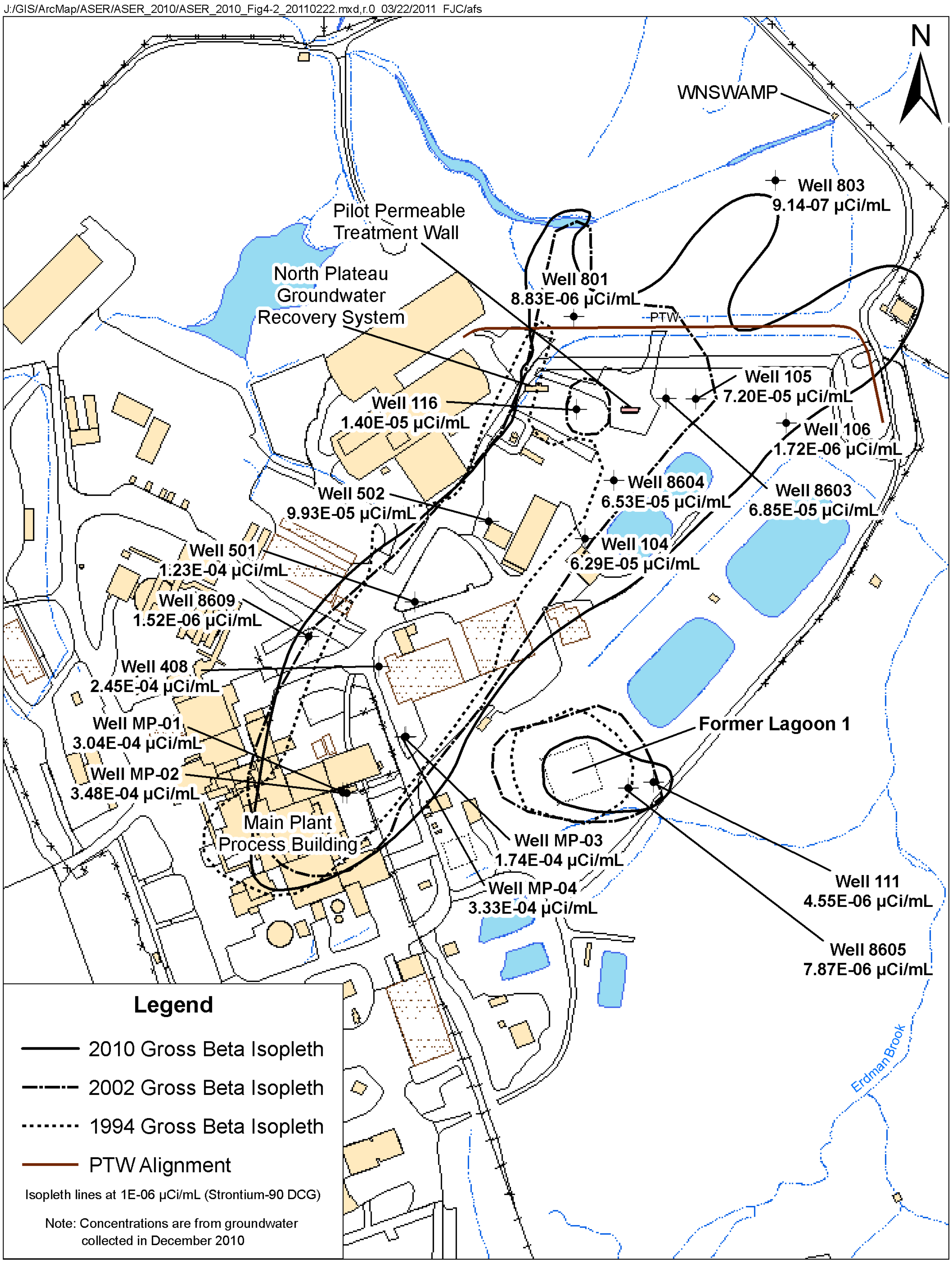
Historical monitoring has established that strontium-90 is the predominant radioisotope contributing to the gross beta activity measured in the north plateau groundwater plume. Therefore, monitoring wells are routinely sampled for gross beta concentrations, supported by periodic sample collection at select wells for strontium-90 analysis. Gross beta concentration trends over the last 10 years at monitoring wells located within the plume are shown on Figures 4-4 and 4-5. These data are plotted on a log scale; therefore, an increase from one gridline to the next represents a 10-fold increase in concentration. The log scale was used so that data from background locations (with concentrations in the 1.0E-09 µCi/mL range) and data from the central plume (with concentrations in the 1.0E-04 µCi/mL range, 100,000 times higher than background) could be plotted on the same graphs.

Figure 4-6 illustrates the gross beta concentrations in groundwater from wells located downgradient of the MPPB and the strontium-90 source area. The four new wells (MP-01, -02, -03, and -04) installed in CY 2010, within the central portion of the plume and closer to the MPPB, exhibit the highest gross beta concentrations of any routinely monitored wells in the program since they are located closest to the source area. The gross beta concentrations range from a high of 6.7E-04 µCi/mL at location MP-02 to a low of 1.8E-04 µCi/mL at location MP-03. All of the gross beta concentrations at the MPPB wells are significantly above the DOE DCG for strontium-90 (1.0E-06 µCi/mL) and consistent with their location within the core of the plume.

Gross beta concentrations in the center of the plume did not change significantly in 2010. Gross beta concentrations, downgradient of the high-level radioactive waste (HLW) tanks near the western edge of the plume, remained about two orders of magnitude lower than the concentrations directly downgradient of the MPPB. Well 8609 is located cross-gradient to the predominant flowpath of the plume.

The leading edge of the plume (defined by the 1.0E-06-µCi/mL isopleth) migrated beyond all of the

FIGURE 4-2
North Plateau Strontium-90 Plume Plotted by Gross Beta Data: 1994, 2002, and 2010



downgradient GMP wells (801, 8603, 105, 106, and 116) in 2008. Consequently, the new leading edge of the plume was delineated during a March 2009 plume characterization program, for which more than 70 geoprobe locations were drilled and sampled. Figure 4-5 illustrates trends in the gross beta concentrations in the GMP wells located downgradient, near the leading edge, where the plume splits into three lobes. Gross beta concentrations at wells 105, 801, 8603, and 8604 upgradient of the leading edge of the plume have not changed significantly since 2009. However, concentrations at wells 106, 116, and 803, closest to the leading edge showed a distinct increase in 2010 as the plume continued to migrate to these downgradient areas.

Monitoring at the Northeast Swamp Drainage. The western and central lobes of the plume are partially intercepted by a drainage ditch flowing west-to-east across the plume's leading edge (see Figure 4-2 and Figure A-2 in Appendix A). The surface water flow rate in this ditch is measured biweekly. Surface water flowing through this ditch is sampled monthly and analyzed for radiological constituents at the WNSWAMP sampling location at the edge of the WVDP property boundary.

Groundwater from the north plateau plume seeping into this ditch is believed to be the main source of the strontium-90 activity at WNSWAMP. An estimated 37.7 million gallons (gal) (143 million liters [L]) of water flowed through this monitoring point in 2010. (See "Effluent Monitoring" in Chapter 2.)

As shown in the 10-year trend plot on Figure 4-7, annual average strontium-90 concentrations in the drainage ditch have been above the strontium-90 DCG for nine of the last 10 years. Gross beta and strontium-90 concentrations at WNSWAMP exhibit seasonal variability. The average annual strontium-90 concentration measured in samples from the WNSWAMP ditch increased in 2010 to a level approximately equal to the 2008 annual average concentration. The flow through WNSWAMP accounted for an annual estimated dose of 5.47E-02 millirem in 2010. See "Maximum Dose (Waterborne) to an Off-Site Individual" in Chapter 3.

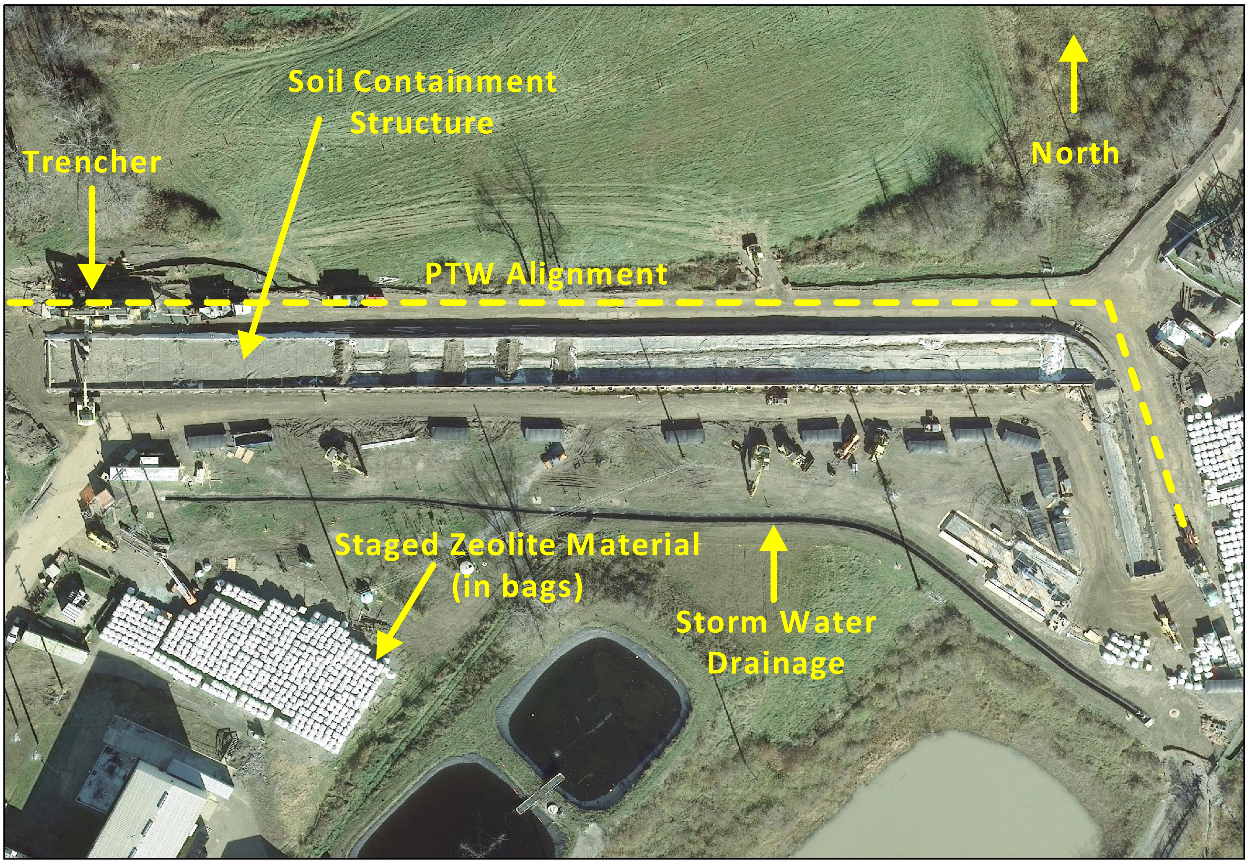
Monitoring of surface water downstream of the WVDP at the first point of public access, Felton Bridge on Cattaraugus Creek (location WFFELBR), continued to show that strontium-90 concentrations in 2010 were indistinguishable from historical concentrations from the Cattaraugus Creek background surface water location at Bigelow Bridge (WFBIGBR).

Monitoring at North Plateau Seeps. Groundwater is also monitored along the northeast edge of the north plateau, where it seeps from the steep banks of the stream channels incised by Erdman Brook and Franks Creek. The seepage locations (GSEEP, SP04, SP06, SP11, and SP12), located east of the construction demolition and debris landfill (CDDL) outside of the WVDP fenceline, monitor conditions on the downgradient edge of the north plateau where the groundwater discharges to the surface. (See Figure A-7 in Appendix A.) Ten-year trends of gross beta concentrations at five seep monitoring points are shown on Figure 4-8. Annual averages were plotted against surface water background values because water from seepage points occasionally may include surface water (i.e., at seepage location SP11).

The highest gross beta concentration among the seepage locations has been observed at SP04, which is believed to be groundwater discharging from the S&G unit to the ground surface. This location first exhibited a significant increase in mid-2007, and has continued to increase through 2010. The December 2010 concentration represents approximately 57% of the DOE DCG for strontium-90. The second highest gross beta concentration at the seeps sampling locations occurred at SP11, located within the discharge area of the swamp drainage ditch. The gross beta at this seep location has slowly, but steadily, increased since monitoring began in 1996. The December 2010 concentration is the highest of record and represents approximately 22% of the DOE DCG for strontium-90. The elevated concentrations at SP11 are thought to be contaminated groundwater from the S&G unit that has come to the surface and percolated back into the ground. Gross beta concentrations at seep locations SP06, SP12, and GSEEP have also increased over the past two years, with the most recent concentration being the highest of record. Average annual concentrations at these three seeps represent approximately 2% to 6% of the DOE DCG for strontium-90.

Recent increasing trends at the seeps are attributable to continued migration of the eastern lobe of the strontium-90 plume. It is anticipated that these concentrations may continue to increase for a period of time, and then eventually decrease when groundwater influenced by the strontium-90 removal by the PTW begins to reach the seep locations.

FIGURE 4-3
Installation of the North Plateau Permeable Treatment Wall (November 2010)



Strontium-90 Plume Remediation-Related Activities

North Plateau Groundwater Recovery System (NPGRS). In 1995, the NPGRS was installed to minimize the advance of the strontium-90 plume. (See Figure 4-2.) The NPGRS consists of three wells that extract contaminated groundwater, which is then treated by ion exchange to remove strontium-90. Treated water is transferred to the lagoon system and is ultimately discharged to Erdman Brook via the New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall 001.

The NPGRS operated throughout 2010, processing about 3.0 million gal (11.4 million L) of water. The system has extracted and processed approximately 59.5 million gal (225 million L) since November 1995.

The NPGRS will remain in operation while the performance of the PTW is evaluated. When the full-scale PTW is determined to be performing as intended, the NPGRS may no longer be needed and the decommissioning of this system could be considered.

North Plateau Groundwater Quality Early Warning Monitoring for NPGRS. Early-warning monitoring of groundwater directly upgradient of the NPGRS is performed to provide the monitoring results that can be used to identify metals concentrations in groundwater that may affect compliance with the SPDES-permitted effluent limits. Metals results from well 502 in CY 2010 were below concentrations likely to affect SPDES permit compliance. (See Appendix D-2.)

Pilot-Scale PTW. A pilot-scale PTW was constructed in 1999 within the eastern lobe of the strontium-90 plume to test this passive, in-situ remediation technology. The pilot PTW is a 7-foot by 30-foot by 25-foot-deep trench that was backfilled with clinoptilolite, a medium selected for its ability to adsorb strontium-90 ions from groundwater. Strontium-90 concentrations have consistently remained several orders of magnitude lower in groundwater from wells within the pilot PTW, compared to wells outside the pilot wall, indicating that strontium-90 is being removed from the water that passes through the wall. Gross beta concentrations inside a portion

of the PTW were as high as 9.0E-07 µCi/mL, suggesting some reduction in treatment capacity.

The limited size of the pilot PTW and complex local geology affected its performance, and the wall itself may be affecting the natural groundwater flow path in a localized portion of the eastern lobe of the plume. In the 12 years since the pilot PTW was installed, the plume migrated past the pilot PTW, as it was not designed to treat the entire plume. Nevertheless, the data collected during the wall's operation helped determine that the PTW technology is an effective remediation method for strontium-90-contaminated groundwater.

Full-Scale PTW. In 2008, a Geoprobe® investigation was completed to characterize soils and groundwater downgradient of the plume to obtain data for use in the full-scale PTW design. The field work included soil and groundwater sampling and installing small-diameter microwells along the leading edge of the strontium-90 plume. In February 2010, 39 soil borings were advanced along the proposed PTW alignment to define the thickness of the S&G subunits and the depth to the ULT.

In June 2010, to prepare for installing the full-scale PTW, 29 monitoring wells and one inclinometer were decommissioned and removed due to their location in the PTW construction zone. The decommissioned wells included select microwells, north plateau monitoring wells installed in 2001, and well points initially installed to support design of the NPGRS. A lined storm water drainage ditch (Smart-Ditch™) was also installed in September 2010 south of the PTW alignment to intercept storm water from upland portions of the site and route it around the PTW to Franks Creek.

In November 2010, installation work was completed for a full-scale 860-foot-long PTW north plateau strontium-90 plume downgradient, along the existing roadway south of the construction and demolition debris landfill, as shown on Figure 4-3. The PTW was installed through the entire thickness of the S&G unit (including the TBU and the SWS, where present), and was keyed into the underlying, low-permeability ULT. The treatment material used in the PTW is a granular clinoptilolite (i.e., zeolite). The zeolite used in the PTW is a natural mineral with a porous structure that can trap positively charged ions, such as strontium, by ion exchange while allowing the groundwater to pass through the wall. The PTW was designed to address three remedial action objectives (RAOs):

- RAO 1: Reduce or eliminate strontium-90 presence in groundwater seepage leaving or potentially exiting the north plateau to as low as practically achievable, with a goal to be less than the DOE DCG of 1.0E-06 µCi/L;
- RAO 2: Minimize the future expansion of the strontium-90 plume beyond its current mapped limits; and
- RAO 3: Ensure that a technology selected for current containment of the strontium-90 plume does not preclude any strategies for addressing the plume during site decommissioning.

The DOE is also evaluating long-term strategies for management of the plume, including excavating subsurface soils from the source area beneath the MPPB. Removal of the MPPB and the plume source area are components of DOE's Record of Decision for decommissioning or long-term stewardship of the WVDP and the WNYNSC.

PTW Performance Monitoring Plan (PMP). A new PTW PMP was developed and implemented immediately following installation of the PTW. This plan required installing 66 new groundwater monitoring wells within and adjacent to the full-scale PTW in December 2010 for performance monitoring. The objectives of the PTW PMP (WVDP-512) include the following activities, with the overall objective of evaluating whether the functional requirements for the PTW are being met:

- Monitoring the physical integrity of the PTW and its components;
- Assessing the movement of strontium-90-affected groundwater in the vicinity of the PTW; and
- Assessing the removal of strontium-90 from groundwater moving through the PTW.

The PTW performance monitoring system consists of 21 existing groundwater monitoring wells, along with the 66 new wells installed within and immediately adjacent to the PTW. The PTW PMP testing activities include: (1) tracer dilution tests in select wells within the PTW to assess flow velocities (e.g., using non-reactive sodium bromide solution as a tracer), (2) hydraulic conductivity testing in select wells within and adjacent to the PTW, and (3) continuous hydraulic head monitoring. The injection of tracer solutions into groundwater wells was authorized by the Environmental Protection Agency in accordance with the Underground Injection Control Program Regulation. The PTW PMP sampling includes sampling and

analysis for strontium-90, as well as for geochemical parameters to evaluate ion-exchange processes occurring within the wall. Table 4-7 summarizes the various elements of the PTW PMP.

North Plateau Groundwater Monitoring Program (NPGMP). With the completion of the full-scale PTW, the objective of the NPGMP has shifted from monitoring overall groundwater conditions within the north plateau and evaluating the NPGRS and the pilot PTW, to monitoring the strontium-90 plume and evaluating the effectiveness of the full-scale PTW. A supplementary NPGMP (WVDP-518) was also developed in 2010, in conjunction with the completion of the full-scale PTW. The primary objective of the NPGMP is to monitor the strontium-90 plume migration in groundwater farther upgradient and downgradient of the PTW than the areas monitored under the PTW PMP.

The NPGMP includes quarterly monitoring for gross beta and water levels at 26 well locations. Fourteen additional wells are monitored for water level only. Groundwater seep and surface water samples continue to be collected on the north plateau as part of other site sampling programs (WVDP-098, Environmental Monitoring Program Plan, and WVDP-239, Groundwater Monitoring Plan).

PTW Protection and Best Management Plan. A protection and best management plan for the PTW (WVDP-516) was also prepared in 2010. The plan includes measures that will be implemented to protect the physical integrity of the PTW during its operational lifetime, and describes best management practices that will be implemented to increase the effectiveness and longevity of the PTW.

Other Groundwater Sampling Observations on the North Plateau

Monitoring Near Former Lagoon 1. Southeast of the strontium-90 plume, elevated gross beta concentrations have also been observed in groundwater downgradient of former lagoon 1, which was backfilled in 1984. (See Figure 4-2.) Gross beta concentrations in wells 8605 and 111 are consistently above the strontium-90 DCG and are remaining stable from year to year, as shown in the 10-year trend graph on Figure 4-9. The source of the gross beta activity is assumed to be radiologically contaminated material in the backfill and remaining sediment in the location of former lagoon 1.

Metals Sampling on the North Plateau. In 2005, 2007, and 2008, select groundwater wells were sampled to evaluate metals concentrations in groundwater within the strontium-90 plume area associated with MPPB sources. In 2008, a Geoprobe® investigation was performed to collect soil and groundwater data to further evaluate metals contamination. Using newly established groundwater background metals concentrations and the Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Groundwater Quality Standards, a set of site-specific GSLs were established. (Refer to Appendix D for a description of the methodology by which GSLs were established.)

During 2010, no special metals sampling was performed. Wells were routinely sampled for metals according to the GMP. Data are presented in Appendix D. These results were compared with the established WVDP GSLs and background levels (see Table 4-10). Nickel and chromium were detected, as in previous years, at concentrations above the GSLs in wells 706, 502, and 405, which are constructed of stainless steel. Elevated concentrations were attributed to corrosion of the well screens. (For additional detail, refer to "Investigation of Chromium and Nickel in the S&G Unit and Evaluation of Corrosion in Groundwater Monitoring Wells" in previous Annual Site Environmental Reports.)

Groundwater from well 1303, a polyvinyl chloride well downgradient of the remote-handled waste facility, contained arsenic at a maximum of 51 micrograms per liter (µg/L) (compared with the GSL of 25 µg/L), beryllium at a maximum concentration of 3.2 µg/L (compared with the GSL of 3.0 µg/L), chromium at a maximum of 86 µg/L (compared with the GSL of 52.3 µg/L), nickel at a maximum concentration of 122 µg/L (compared with the GSL of 100 µg/L), and vanadium at a maximum of 113 µg/L (compared with the GSL of 69.6 µg/L). These values are consistent with historical concentrations from this location.

As discussed previously in this chapter, four new standard-construction monitoring wells (MP-01 through MP-04) were installed downgradient of the MPPB, south and west of the FRS. The wells replaced two well points (WP20D and WP20S) and supplement downgradient surveillance by providing more representative groundwater monitoring data in that area. Groundwater samples from these locations were analyzed for metals listed in Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York Part 373-2 Appendix 33 during three sampling events in 2010. Arsenic, barium, beryllium,

TABLE 4-7
Permeable Treatment Wall (PTW) Performance Monitoring Program (PMP)

Activity or Parameter Type	*Description of Measurement*	*Purpose*
Hydraulic Monitoring		
Water level measurements	Field measurement of depth to groundwater	Water level measurements will allow for evaluation of the three-dimensional flow path in the vicinity of and through the PTW.
Continuous water level monitoring	Water level/pressure-head measurements (measurements continuously recorded at regular intervals)	Continuous water level measurements inside the PTW provide supplemental data to evaluate flow within and through the PTW as well as rate of response to weather events.
Tracer dilution tests	Field measurement of the rate of decreasing concentration of sodium bromide tracer solution injected into wells within the PTW	Dilution tests are used to determine groundwater flow velocity within the PTW.
Hydraulic characterization of hydrogeologic units	Single well tests (slug tests)	Slug tests provide estimates of hydraulic conductivity within and adjacent to the PTW used to evaluate variable rates of groundwater flow at different depths within the zeolite and within the native soils in proximity to the PTW.
Groundwater Quality Monitoring		
Field parameters	Temperature, pH, oxidation-reduction potential, specific conductance, dissolved oxygen, and turbidity	Results from these field tests will be utilized to identify the overall conditions in the groundwater and any potential changes in conditions that may occur due to site decommissioning activities.
Geochemical parameters	Sodium, potassium, calcium, magnesium, carbonate, bicarbonate, sulfate and chloride	Monitoring of geochemical parameters allows for evaluation of cation exchange occurring within and downgradient of the PTW as groundwater flows through the treatment media.
Radioisotopic analyses	Strontium-90 (Sr-90)	Collection and analysis of groundwater samples for Sr-90 provides for evaluation of the performance of the treatment media in reducing Sr-90 concentrations and provides upgradient conditions of groundwater entering the PTW.
Reconnaissance Inspections		
Visual inspections	Inspection Checklist Items	Visual inspections document the condition of the PTW, the PTW wells, and the nearby storm water drainage system.

chromium, lead, nickel, and zinc were sporadically detected in these wells near or slightly above the detection limits. Higher concentrations of metals were detected in the first samples collected at these locations. Metals concentrations and sample turbidity decreased significantly in the subsequent sampling events. Only one sample from the four new MPPB wells exceeded the GSLs for metals. Lead was measured at MP-02 at a maximum of 47 µg/L compared with the GSL of 42.7 µg/L. (See Appendix D.)

Tritium in Groundwater on the North Plateau. On the north plateau, elevated tritium concentrations have historically been observed near the lag storage area, the lag storage hardstand, and adjacent to and downgradient of the lagoon system. Tritium concentrations sitewide have been consistently decreasing. Residual tritium activity is attributed to former operations as part of nuclear fuel reprocessing. No new source of tritium is suspected. As shown in Table 4-8, the maximum tritium concentration measured in groundwater from the north plateau in 2010, 3.5E-05 µCi/mL, was at well point WP-C, downgradient of the MPPB (see Figure A-7). This concentration was two orders of magnitude below the DOE DCG for tritium of 2.0E-03 µCi/mL.

Tritium concentrations in groundwater at the WVDP have been steadily decreasing, because tritium has a relatively short half-life, about 12.3 years. Dilution from surface water infiltration and groundwater recharge is also contributing to the decrease, as is evaporation. Current tritium concentrations in groundwater from most monitoring locations on the north plateau are close to or within the range of background values. Monitoring locations where tritium exceeded GSLs and background concentrations are listed in Table 4-10.

Radioisotopic Sampling Results on the North Plateau. In addition to being analyzed for gross alpha, gross beta, tritium, and strontium-90, samples from eight groundwater wells in the S&G unit in the north plateau (401, 406, 408, 1304, and the new MPPB wells MP-01 through MP-04) were analyzed for specific radionuclides (see Tables 4-3 and 4-4). Well 401 serves as a background well. Two sampling locations in the south plateau (well 909 and the NDA sump [NDATR]) are also analyzed for specific radionuclides. (Note that radium-226, radium-228, uranium-234, and uranium-238 occur naturally in the environment.) (See Appendix D-2.)

TABLE 4-8
2010 Maximum Concentrations of Radionuclides[a] in Groundwater at the WVDP Compared With WVDP Groundwater Screening Levels (GSLs)[b]

Radionuclide	Regulatory Requirement			Environmental Surveillance			GSL (µCi/mL)
	Well ID With Maximum Concentration	Flag[c]	Maximum Concentration (µCi/mL)	Well ID With Maximum Concentration	Flag[c]	Maximum Concentration (µCi/mL)	
Tritium	NDATR		**1.06E-06**	WP-C		**3.50E-05**	1.78E-07
Strontium-90	MP-02		**3.70E-04**	–		–	5.90E-09
Technetium-99	MP-04		**3.42E-08**	–		–	5.02E-09
Iodine-129	NDATR		**1.99E-08**	–		–	9.61E-10
Cesium-137	NDATR	J	3.70E-09	–		–	1.03E-08
Radium-226	408		5.15E-10	–		–	1.33E-09
Radium-228	408		1.40E-09	–		–	2.16E-09
Uranium-232	MP-01	J	1.18E-10	–		–	1.38E-10
Uranium-233/234	MP-04		**1.75E-09**	–		–	6.24E-10
Uranium-235/236	MP-04	J	**2.34E-10**	–		–	8.07E-11
Uranium-238	MP-04		**1.40E-09**	–		–	4.97E-10
Total Uranium	NDATR		**3.03E-03**	–		–	1.34E-03

Note: Bolding indicates that the radionuclide exceeds the GSL.
-- Indicates that none of the environmental surveillance wells exhibited positive results for these radionuclides.
[a] The table presents the maximum concentrations of radionuclides that were positively identified in groundwater wells at the WVDP; all other radionuclides were not positively identified.
[b] GSLs for radiological constituents are set equal to the larger of the background concentrations or NYSDEC Technical and Operational Guidance Series 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).
[c] The "J" flag indicates the result is an estimated value.

The maximum concentration of radionuclides measured in groundwater at the WVDP during 2010 is presented in Table 4-8. No carbon-14 was detected in 2010, so this radionuclide is not included. The maximum concentrations of radionuclides for the RCRA regulatory wells were observed at the recently installed wells, MP-01, -02, -03, and -04, immediately downgradient of the MPPB, and in well 408 in the same vicinity on the north plateau. Strontium-90, technetium-99, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, and uranium-238 were observed at the wells within the core area of the plume immediately downgradient of the MPPB.

The MP wells (MP-01, -02, -03, and -04) were also analyzed for supplemental radioisotopes, not routinely included in the WVDP analytical suites. These isotopes include neptunium-237, plutonium-238, plutonium-239/240, plutonium-241, americium-241, and curium-243/244. Testing for these radionuclides was included in the program to investigate the potential for contamination from historic operations within the MPPB. During the first three rounds of sampling during 2010, none of these supplemental radionuclides were detected. (See Appendix D, Table D-2H.)

Results for Volatile and Semivolatile Organic Compounds (VOCs and SVOCs). In accordance with the Consent Order, select wells within the S&G unit are monitored for VOCs and SVOCs because concentrations exceeding TOGS 1.1.1 Class GA Groundwater Quality Standards were found during the RFI.

Currently, the only S&G monitoring location with consistent positive detections of VOCs is well 8612, located northeast and downgradient of the CDDL at the northeast edge of the north plateau. (See Tables 4-9 and 4-10, and Figure A-7 in Appendix A.) Figure 4-10 illustrates the concentration ranges of four detected VOCs at well 8612. Only one VOC continues to be detected slightly above the TOGS 1.1.1 Class GA Groundwater Quality Standards. The concentrations are steadily decreasing and are currently not significantly above detection limits. The VOCs in well 8612 are presumed to be from wastes buried in the CDDL.

Two SVOCs (benzo[b]fluoranthene and benzo[k]fluoranthene), although estimated below their practical quantitation limit, were above their TOGS 1.1.1 Class GA standard in September 2010. However, these analytes were not detected in the subsequent sampling in December 2010 or March 2011.

In 2010, downgradient of former lagoon 1, the SVOC tributyl phosphate (TBP), which has been detected in this area since routine monitoring began, was again detected in groundwater from well 8605. However, the maximum concentration was significantly lower than the historic high of 700 µg/L in December 1996. TBP has also been detected in well 111, near well 8605, but at concentrations close to the quantitation limit of 10 µg/L. (See Figure 4-11.) TBP in this area is believed to be from residual contamination from liquid waste management activities in the former lagoon 1 area during nuclear fuel reprocessing. No TOGS 1.1.1 screening criterion has been established for TBP.

A summary of maximum concentrations of organic compounds detected in WVDP groundwater wells for TBP and the VOCs that exceeded TOGS 1.1.1 criteria in 2010 is provided in Table 4-9.

Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA

Interim Measures (IM). In 1990, a trench system was constructed through the WLT along the northeast and northwest sides of the NDA to intercept and collect groundwater that was potentially contaminated with

TABLE 4-9
2010 Summary of Maximum Concentrations of Organic Constituents in Select WVDP Groundwater Wells

Constituent	*Regulatory/Waste Management Monitoring Program*		*New York State Class GA Groundwater Quality Standards*[a] *(µg/L)*
	Well with the Highest Concentration	*Maximum Concentration (µg/L)*	
1,2-Dichloroethylene (total)	8612	16	5.0
Tributyl phosphate	8605	181	NA

NA - Not applicable.
[a] Source: 6 NYCRR Part 703, Division of Water TOGS 1.1.1, Class GA Groundwater Quality Standards.

a mixture of radioactive n-dodecane and TBP. Sampling location NDATR is a sump at the lowest point of the interceptor trench. Groundwater is collected at NDATR and is transferred to the low-level waste treatment facility for processing. (See also "Interim Measures [IM]" under "NDA Cap" in the Environmental Compliance Summary and "U.S. Nuclear Regulatory Commission-Licensed Disposal Area Interceptor Trench and Pretreatment System" in Chapter 1.) Monitoring results in 2010 detected no TBP in groundwater from the NDA interceptor trench. Groundwater elevations are monitored quarterly in and around the interceptor trench to ensure that an inward gradient is maintained, thereby minimizing outward migration of contaminated groundwater.

A second IM, to stabilize the NDA cover and to minimize infiltration of groundwater, surface water, and precipitation into the NDA, was completed in December 2008. This included installing a geosynthetic cap over the NDA, a low-permeability subsurface groundwater slurry wall upgradient of the NDA, and surface water drainage diversions. Twenty-one piezometers were installed to monitor groundwater elevation differences both upgradient and downgradient of the slurry wall. Water level data from 2009 and 2010 suggest that water levels in areas covered by the geomembrane are continuing to decline. Water levels in piezometers outside the cap and along the upgradient side of the slurry wall have increased slightly in some areas due to groundwater mounding but generally continue to follow seasonal trends. The reduction in the volume of water extracted from the NDA interceptor trench since the cap and barrier wall were installed is the strongest indication that the IM is effectively reducing flow through the NDA. The volume pumped from the NDA trench in 2010 (63,000 gallons) was less than one-fifth of the volume pumped in CY 2007, before the interim measure. Note that the volume of water pumped from the NDA during 2008 includes volume collected during new cover construction activities, when the old NDA cover was being removed. (See Figure 4-13.)

Refer to Environmental Compliance Summary "Interim Measures" under "RCRA §3008(h) Administrative Order on Consent" for further discussion of the NDA IM.

Radioisotopic Sampling Results on the South Plateau. Gross beta, tritium, and several radioisotope concentrations in groundwater from NDATR (see Table 4-10 in this chapter and Figure A-8 in Appendix A) continued to be elevated with respect to GSLs and to concentrations in background monitoring locations on the south plateau. Gross beta concentrations at NDATR have increased with time, with even steeper increases observed since installing the IM. The most recent increases are believed to be attributable to less dilution of water that collects within the trench because groundwater and surface water infiltration into the NDA has been significantly reduced. Similar to the north plateau, strontium-90 is the predominant contributing radioisotope to the measured gross beta concentrations.

Samples from the NDATR sump also exhibited the highest concentrations for tritium, iodine-129, cesium-137, and total uranium. Tritium concentrations at NDATR have continued to decrease, but remain the highest of any WVDP regulatory/waste management groundwater monitoring location on the site (1.06E-06 µCi/mL, 2010 maximum) (see Table 4-8). However, this tritium concentration is well below the DOE DCG of 2.0E-03 µCi/mL. The recent increases in iodine-129 and cesium-137 are believed to be attributable to less dilution of the water that collects within the trench, as described above.

WLT well 909 also exhibited elevated tritium, and other radioisotopic concentrations above the GSL during 2010, consistent with historical values. The gross alpha concentration exhibited an increase at well 909 during the December 2010 sampling event. This result was the highest of record at 1.53E-08 µCi/mL (marginally above the GSL of 1.50E-08 µCi/mL). Recent gross beta concentrations at well 909 are not increasing.

Radionuclide concentrations in groundwater downgradient of the NDA are presumed to be associated with former waste burial operations.

Additional Monitoring and Investigations

Groundwater Monitoring Downgradient of the Waste Tank Farm (WTF). The HLW in the underground tanks has been removed and solidified through the vitrification process. The tanks containing the residual waste remain in place. In 2005, DOE evaluated the current and historical groundwater conditions in the vicinity of the WTF. Throughout waste processing activities, groundwater controls were in place to (1) reduce the upward hydrostatic pressure on the tanks, and (2) to maintain an inward hydraulic gradient toward the tanks, thereby inhibiting any potential leaks from the tanks. The natural inward hydraulic gradient is influenced by periodically pumping a dewatering well (DWW), located outside the vault, that also controls the hydrostatic pressure near the tanks.

Radioactivity in groundwater near the WTF is routinely monitored and evaluated. Elevated gross beta concentrations from well 8607 have been observed since 1994, with the maximum concentration measured in 2005. Gross beta activity has also been observed in the DWW and the tank 8D-2 pan. Radionuclide samples from these locations were collected in 2007 to determine the source(s) of the gross beta activity. After evaluating the radiological results, it was concluded that the gross beta activity in well 8607 was most likely attributed to residual contamination from historical events in and around the WTF (i.e., minor leaks from condensate lines or the WTF underdrain) and was not believed to have originated from the tanks themselves. Monitoring of specific radionuclides at these sampling points was discontinued in favor of continued gross beta monitoring, because gross beta results provide an adequate indicator of radioactivity concentrations. During 2010, gross beta concentrations at well 8607 continued to exhibit a decreasing trend from the 2005 maximum. The underground waste tanks are being stabilized by a tank and vault drying system that began operations in December 2010. (See "WTF Tank and Vault Drying System" in the Environmental Compliance Summary.)

Groundwater Infiltration to FRS Pool. During mid-2005, water was found trickling into the empty FRS pool during a quarterly inspection. Approximately four to six inches of water had accumulated via a slope in the floor to a deeper stainless-steel-lined cask unloading pool (CUP). Analytical data for the FRS CUP water indicated that groundwater seepage was the source of the water. During periods of high precipitation or snow melt, slight seepage entered along the south wall. Elevated cesium-137 concentrations were observed in water samples collected from within the FRS pool. The cesium-137 is believed to be from residuals that adhered to the FRS pool walls when the pool was full. Groundwater seepage into the pool is thought to have dissolved some of the cesium. Because the water does not pose operational or safety concerns, it has been left in the CUP under routine monitoring. Currently, the water level in the CUP is measured daily by facility operators. There has been no change in these levels that would indicate additional groundwater has seeped into the FRS pool or that would indicate leakage out of the pool.

Summary

Evaluation of groundwater results from 2010, as discussed in the previous sections and summarized in Table 4-10, continued to show that the most widespread area of groundwater contamination at the WVDP is the strontium-90 plume in the S&G unit on the north plateau. Other localized areas of contamination have been observed downgradient of the former lagoon 1, also on the north plateau, and downgradient of the NDA on the south plateau. Near-term measures to reduce water moving through the NDA included installing a slurry wall and geomembrane cover in 2008. The near-term activity to reduce contaminant levels in the strontium-90 plume on the north plateau was the installation of the full-scale PTW across the leading edge of the plume. Longer-term measures described in Phase 1 of the Final Environmental Impact Statement preferred alternative selected by the DOE in the Record of Decision (April 2010), as discussed in the "Environmental Compliance Summary," include removing the MPPB, removing the lagoons, and remediating the source of the north plateau plume.

TABLE 4-10
2010 Groundwater Monitoring Results Exceeding Groundwater Screening Levels (GSLs) and Background Levels

Geologic Unit	*Total # of Sampling Locations*	*# Locations with Results Greater Than GSLs*	*Locations with Results Greater than GSLs [a] (Constituent)*	*# Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
North Plateau					
Sand and Gravel Unit	44	26	***Radiological Parameters*** **GSEEP** (tritium [H-3]) **SP04** (H-3) **104** (Gross beta) **105** (Gross beta, H-3) **106** (Gross beta, H-3) **111** (Gross beta) **116** (Gross beta) **408** (Gross beta, strontium-90 [Sr-90], technetium-99 [Tc-99]) **501** (Gross beta, Sr-90) **502** (Gross beta, Sr-90) **602A** (H-3) **801** (Gross beta, Sr-90) **803** (H-3) **8603** (Gross beta, H-3) **8604** (Gross beta) **8605** (Gross beta) **8609** (Gross beta, Sr-90) **8612** (H-3) **WP-A** (H-3) **WP-C** (H-3) **WP-H** (Gross beta, H-3) **MP-01** (Gross beta, Sr-90, Tc-99, uranium-233/234 [U-233/234], U-235/236) **MP-02** (Gross beta, H-3, Sr-90, Tc-99, U-233/234, U-238, lead) **MP-03** (Gross beta, Sr-90, Tc-99, U-233/234, U-238) **MP-04** (Gross beta, Sr-90, Tc-99, U-233/234, U-235/236, U238 ***Metals*** **502** (Chromium, nickel) **706** (Chromium, nickel) **MP-02** (Lead) ***Organics*** **8605** (tributyl phosphate [TBP]) **8612** (1,2-Dichloroethylene, total) **MP-03** (Benzo[b]fluoranthene, Benzo[k]fluoranthene)	34	***All Parameters*** **GSEEP** (Gross beta, H-3) **SP04** (Gross beta, H-3) **SP06** (Gross beta) **SP11** (Gross beta) **SP12** (Gross beta) **103** (Gross beta) **104** (Gross beta) **105** (Gross alpha, gross beta, H-3) **106** (Gross beta, H-3) **111** (Gross beta) **116** (Gross beta) **302** (Gross beta) **402** (Gross alpha) **408** (Gross beta, Sr-90, Tc-99) **501** (Gross beta, Sr-90) **502** (Gross beta, Sr-90, barium, chromium, copper, nickel) **602A** (H-3) **605** (Gross beta) **706** (Chromium, nickel) **801** (Gross beta, Sr-90) **802** (Gross beta) **803** (Gross beta, H-3) **804** (Gross beta) **8603** (Gross beta, H-3) **8604** (Gross beta) **8605** (Gross alpha, gross beta) **8607** (Gross beta) **8609** (Gross beta, Sr-90) **8612** (H-3, 1,2-Dichloroethylene, total) **WP-A** (Gross beta, H-3) **WP-C** (Gross beta, H-3) **WP-H** (Gross beta, H-3) **MP-01** (Gross beta, Sr-90, Tc-99 U-233/234, U-235/236, barium) **MP-02** (Gross beta, Sr-90, H-3, Tc-99, U-233/234, U-238, arsenic, barium, copper, lead, zinc) **MP-03** (Gross alpha, gross beta, Sr-90, Tc-99, U-233/234, U-238) **MP-04** (Gross beta, Sr-90, Tc-99, U-233/234, U-235/236, U-238)

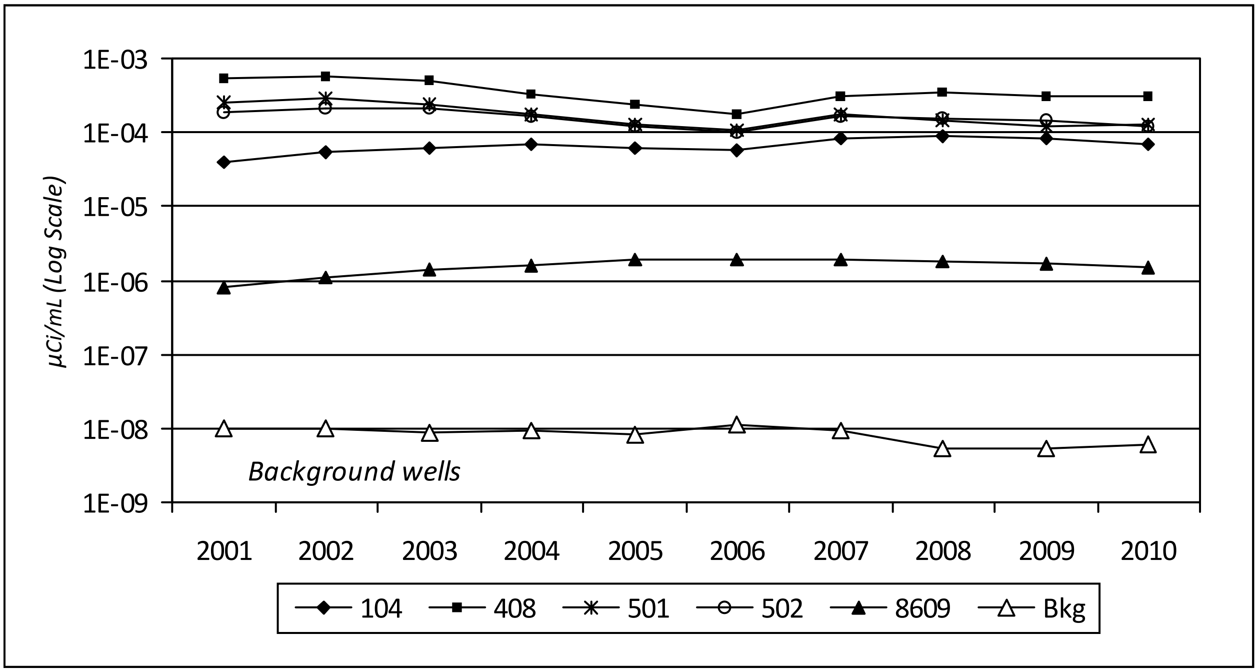
[a] The site-specific GSLs for radiological constituents were set to equal the larger of the WVDP background concentrations or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as discussed on page D-1 and presented in Table D-1A. The GSLs for metals were set to equal the larger of the background concentration or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as presented in Table D-1B. Organic constituents were compared directly with NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards. Tributyl phosphate, detected in wells 111 and 8605, is not shown on these tables because no TOGS 1.1.1 standards have been established.

TABLE 4-10 *(concluded)*
2010 Groundwater Monitoring Results Exceeding Groundwater Screening Levels and Background Levels

Geologic Unit	*Total # of Sampling Locations*	*# Locations with Results Greater Than GSLs*	*Locations with Results Greater than GSLs[a] (Constituent)*	*# Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
Lavery Till	2	0	None	0	None
Unweathered Lavery Till	9	4	***Radiological Parameters*** **108** (H-3) **110** (H-3) ***Metals*** **405** (Chromium, nickel) **1303** (Arsenic, beryllium, chromium, nickel, vanadium)	4	***Radiological Parameters*** **108** (H-3) **110** (Gross beta, H-3) ***Metals*** **405** (Chromium, nickel) **1303** (Arsenic, barium, beryllium, chromium, copper, nickel, vanadium, zinc)
Kent Recessional Sequence	2	0	None	0	None
South Plateau					
Weathered Lavery Till	7	2	***Radiological Parameters*** **NDATR** (Gross beta, H-3, Sr-90, Tc-99, I-129, U-233/234, U-238, Total U) **909** (Gross alpha, H-3, Sr-90, iodine-129 [I-129], U233/234, U-238, total uranium)	3	***Radiological Parameters*** **NDATR** (Gross beta, H-3, Sr-90, Tc-99, I-129, U-233/234, U-238, total U, zinc) **908R** (Gross alpha) **909** (Gross alpha, gross beta, H-3, Sr-90, I-129, U-233/234, U-238, total U) ***Metals*** **NDATR** (Zinc)
Unweathered Lavery Till	1	1	***Radiological Parameters*** **910R** (Gross alpha, duplicate<GSL)	1	***Radiological Parameters*** **910R** (Gross alpha)
Kent Recessional Sequence	4	0	None	0	None

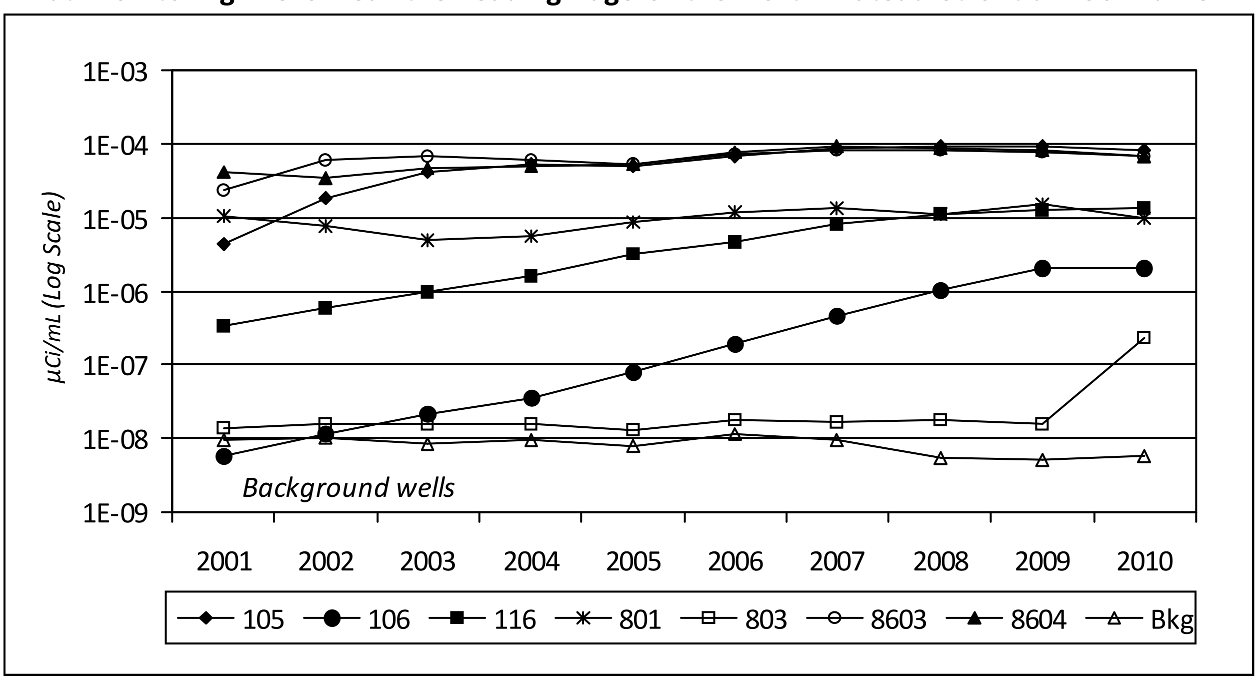
[a] The site-specific GSLs for radiological constituents were set to equal the larger of the WVDP background concentrations or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as discussed on page D-1 and presented in Table D-1A. The GSLs for metals were set to equal the larger of the background concentration or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as presented in Table D-1B. Organic constituents were compared directly with NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards. Tributyl phosphate, detected in wells 111 and 8605, is not shown on these tables because no TOGS 1.1.1 standards have been established.

FIGURE 4-4
Average Annual Gross Beta Concentrations
at Monitoring Wells Centrally Located Within the North Plateau Strontium-90 Plume



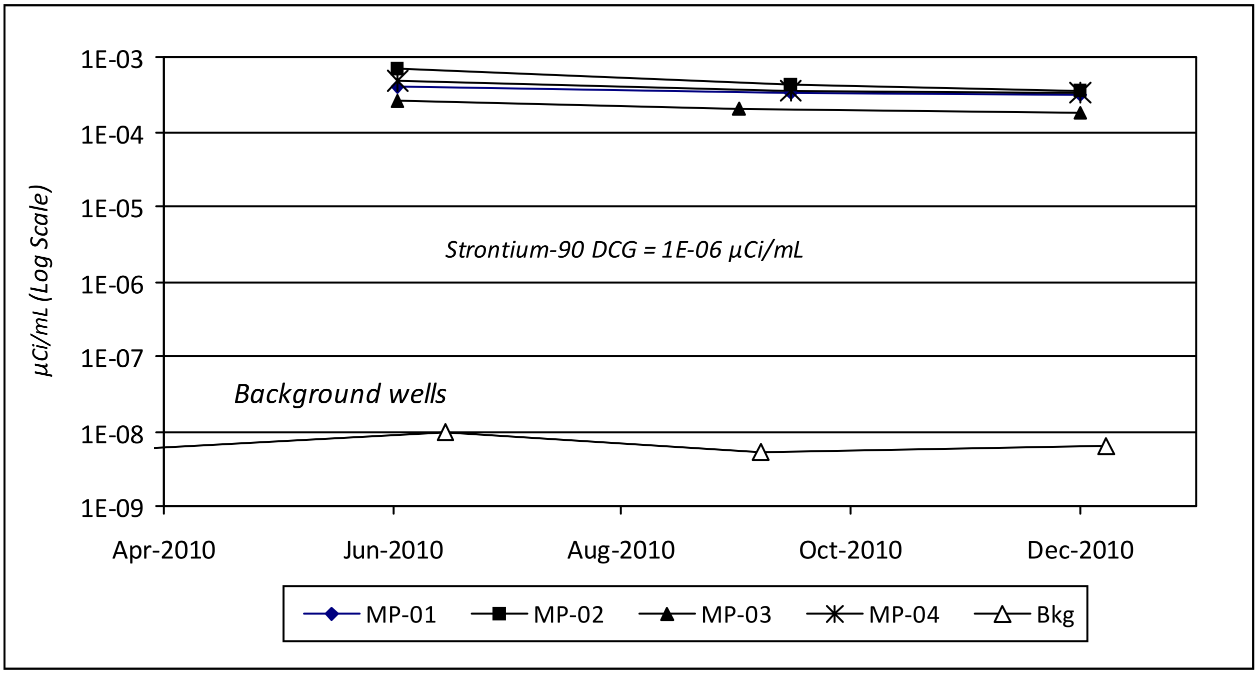
Note: Background (Bkg) wells 301, 401, 706, and 1302 (future proposed background well) are averaged for this comparison.

FIGURE 4-5
Average Annual Gross Beta Concentrations
at Monitoring Wells Near the Leading Edge of the North Plateau Strontium-90 Plume



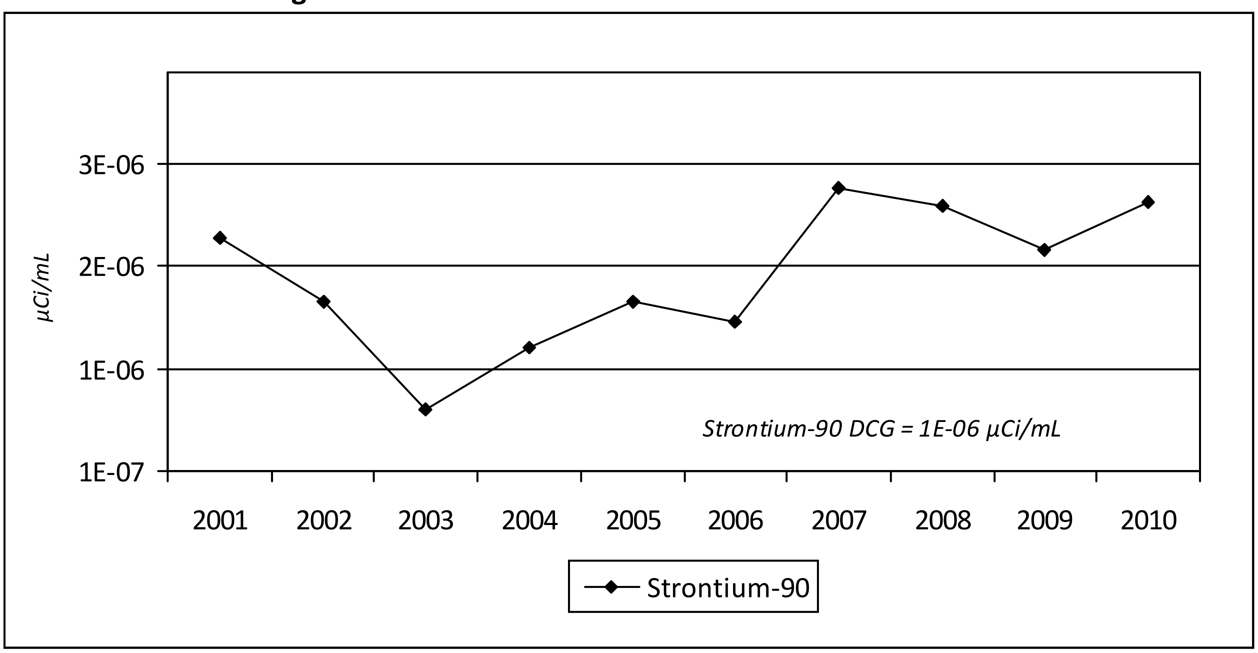
Note: Background (Bkg) wells 301, 401, 706, and 1302 (future proposed background well) are averaged for this comparison.

FIGURE 4-6
First Three Quarters of Gross Beta Concentrations at the New Main Plant Process Building Wells



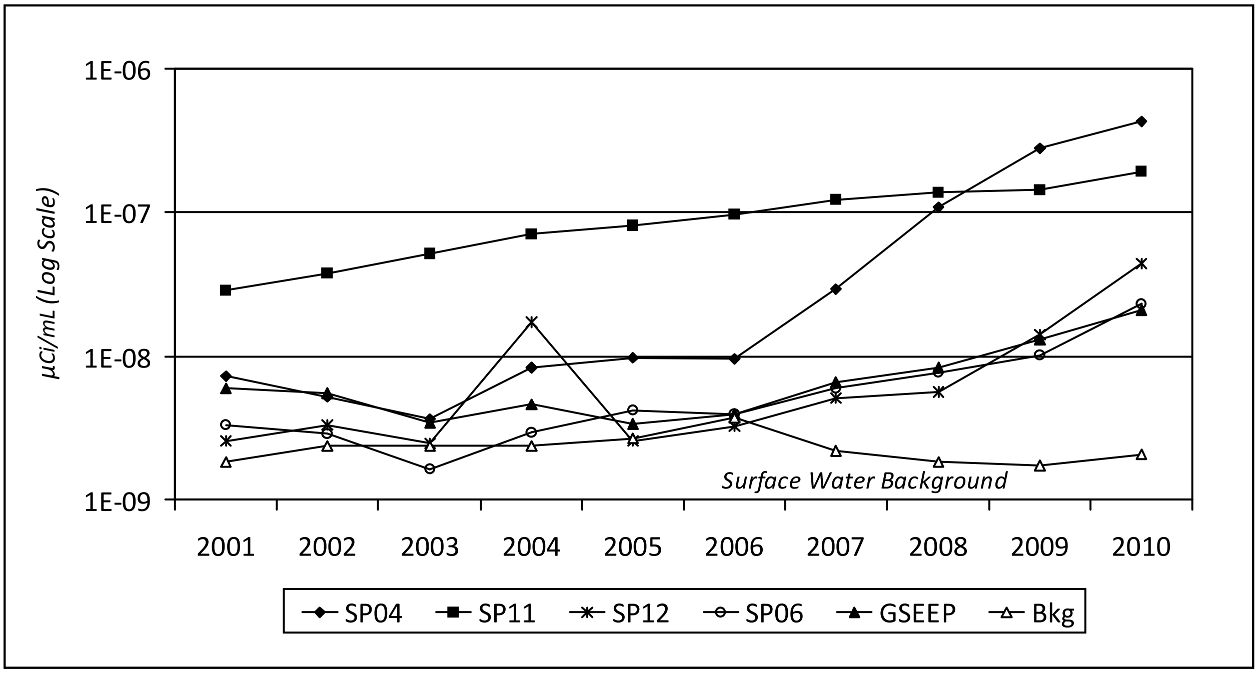
Note: Background (Bkg) wells 301, 401, 706, and 1302 (future proposed background well) are averaged for this comparison.

FIGURE 4-7
Average Annual Strontium-90 Concentrations at WNSWAMP



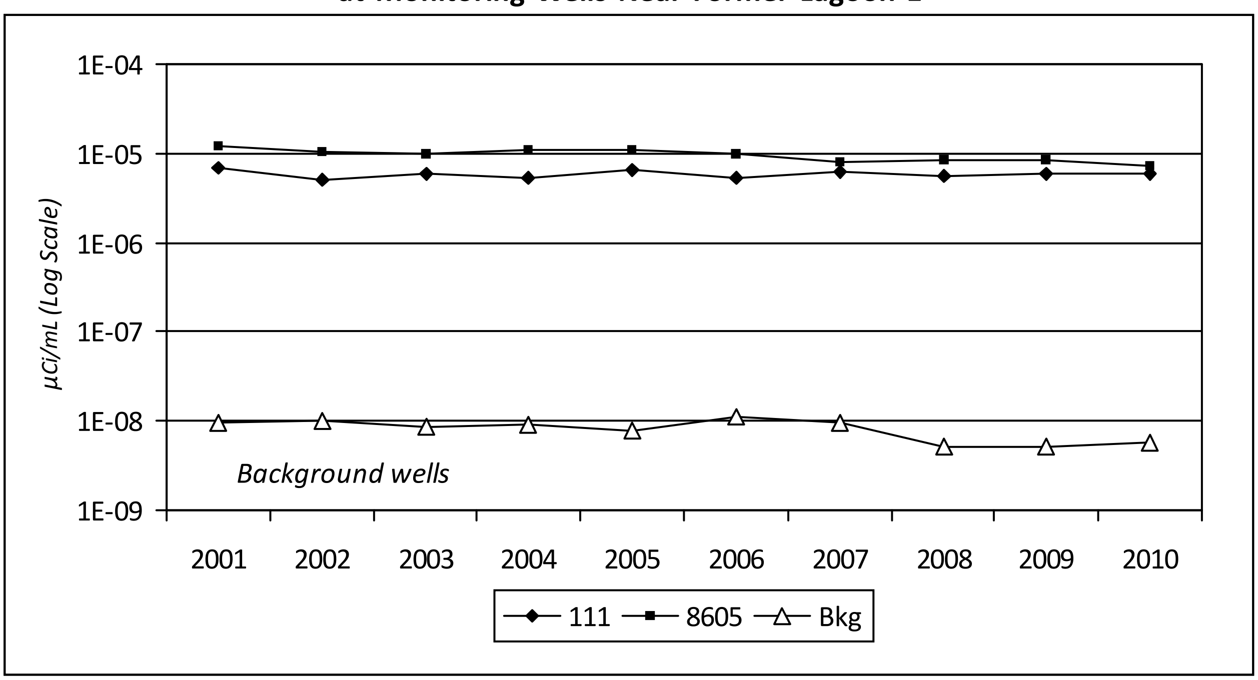
Note: Derived concentration guides (DCGs) are used as an evaluation tool for results from on-site locations as part of the routine environmental monitoring program. However, DOE DCGs are applicable only at locations accessible to members of the public. The WNSWAMP location is not accessible to the public.

FIGURE 4-8
Average Annual Gross Beta Concentrations at Seeps From the Northeast Edge of the North Plateau



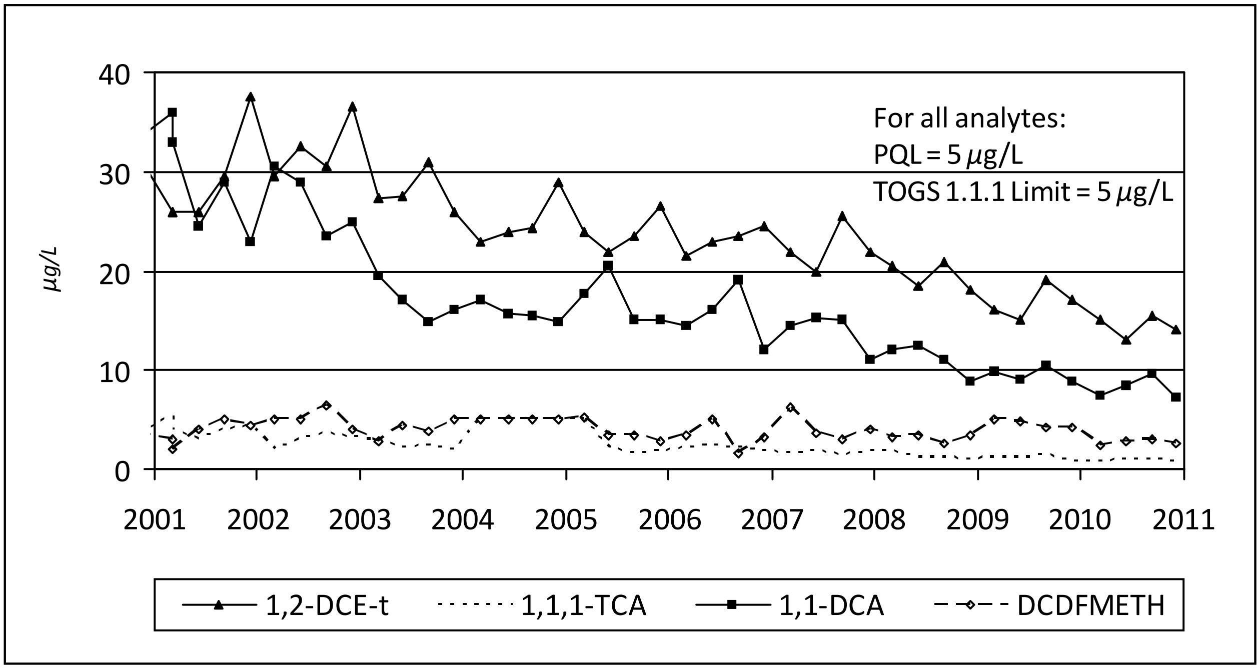
Note: Background (Bkg) from surface water sampling location WFBCBKG at Felton Bridge upgradient of the WVDP.

FIGURE 4-9
Average Annual Gross Beta Concentrations at Monitoring Wells Near Former Lagoon 1



Note: Background (Bkg) wells 301, 401, 706, and 1302 (future proposed background well) are averaged for this comparison.

FIGURE 4-10
Concentrations of 1,2-DCE-t, 1,1,1-TCA, 1,1-DCA, and DCDFMeth at Well 8612 in the Sand and Gravel Unit



Note: PQL = Practical Quantitation Limit
1,2-DCE-t = 1,2-Dichloroethylene (total)
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
DCDFMeth = Dichlorodifluoromethane

FIGURE 4-11
Concentrations of Tributyl Phosphate at Monitoring Wells Near Former Lagoon 1 in the Sand and Gravel Unit

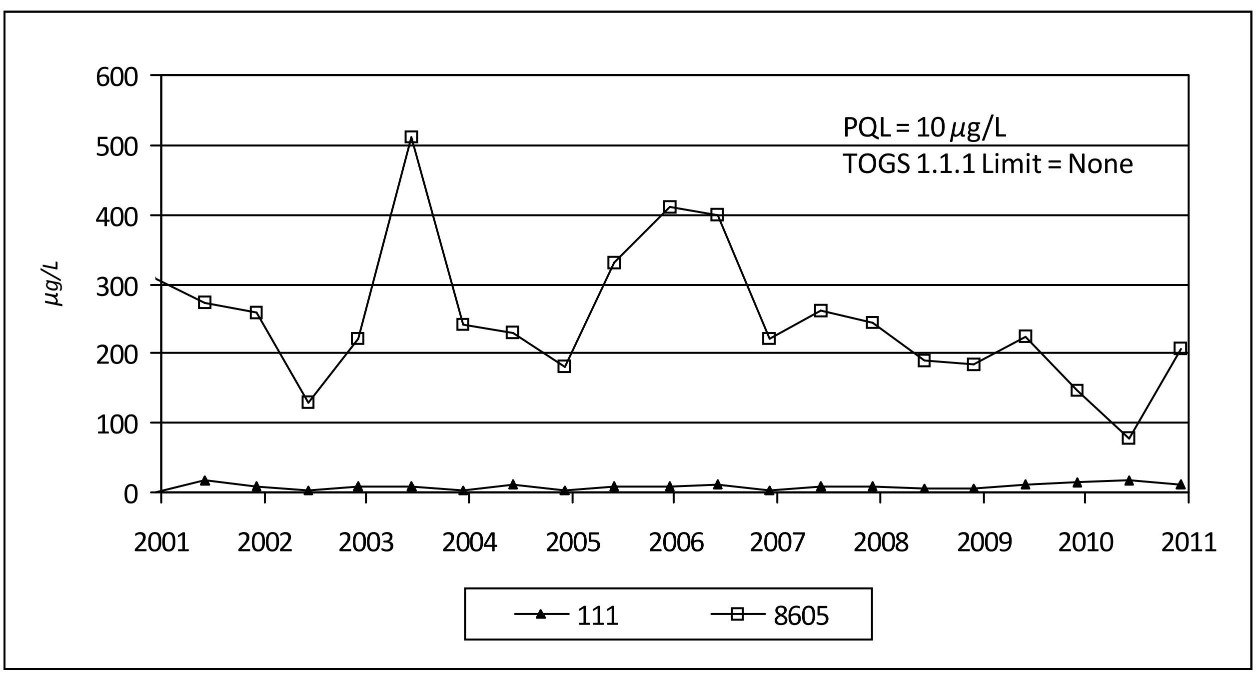
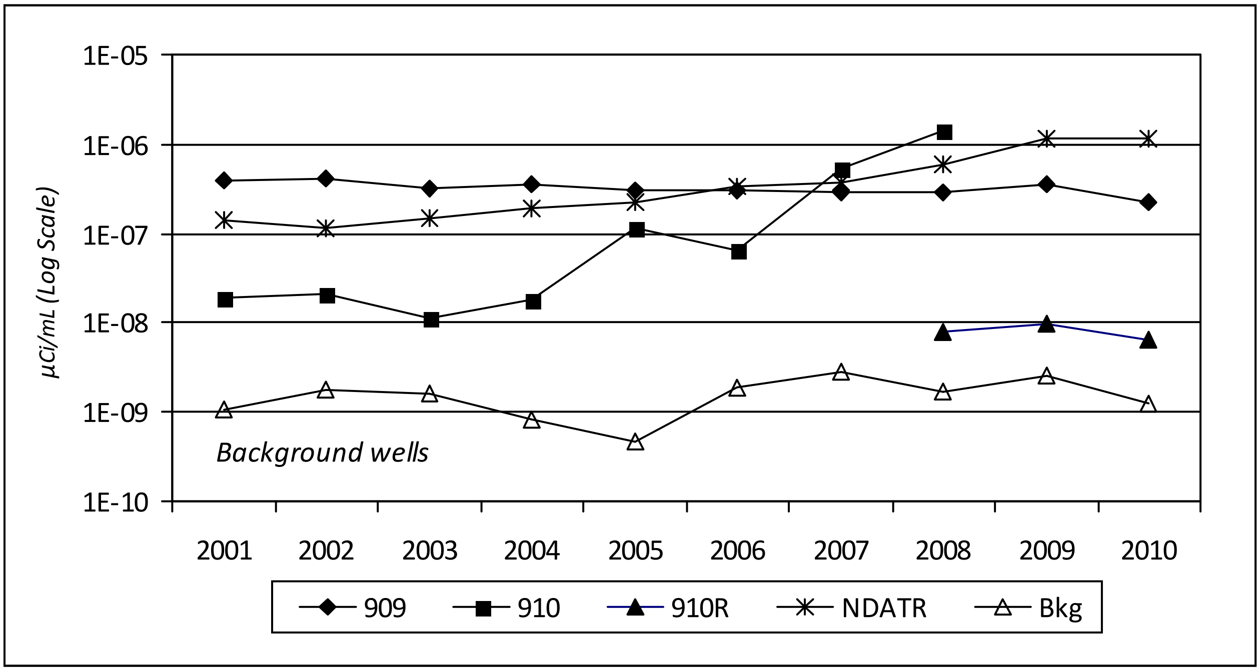


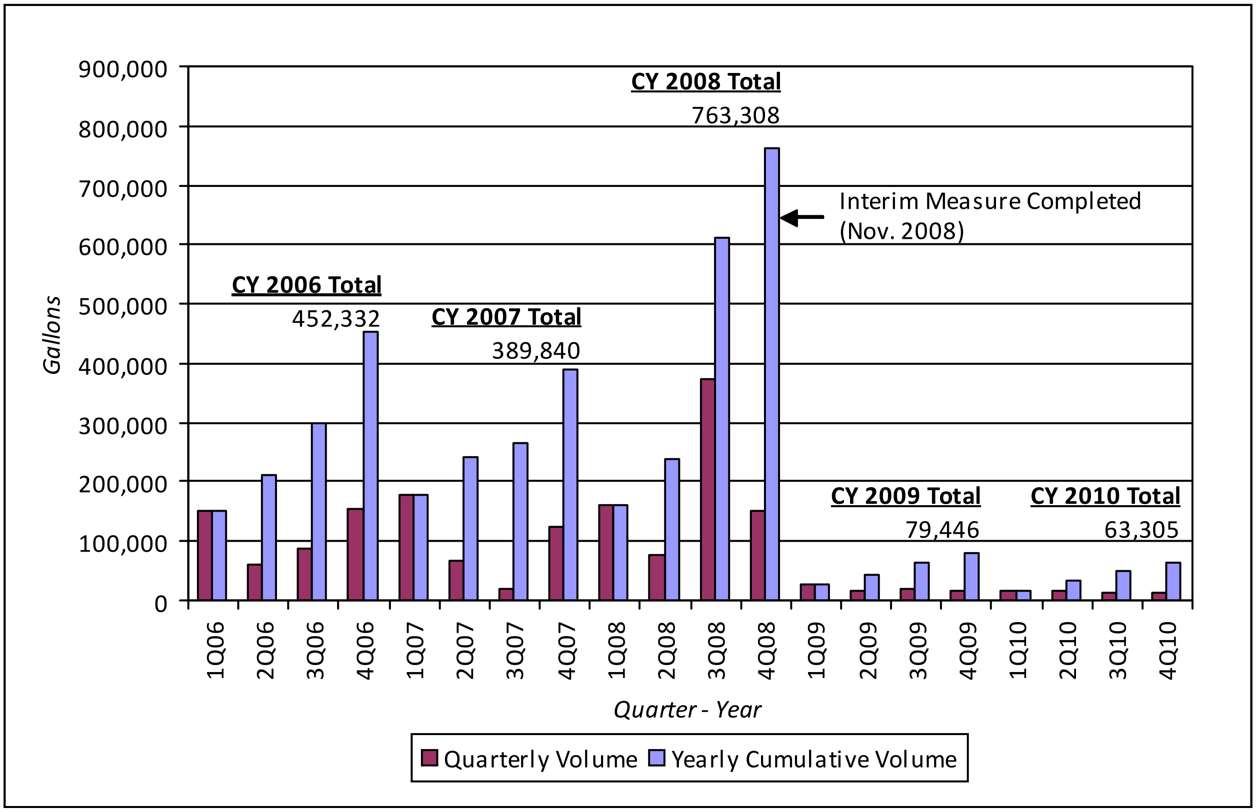
FIGURE 4-12
Average Annual Gross Beta Concentrations
at Monitoring Wells Downgradient of the NDA and at the NDA Trench



Notes: Background well for the south plateau is 1008C.
Well 910 became damaged in 2007 and was decommissioned in 2008 when well 910R was installed.

FIGURE 4-13

Volume of Water Pumped From the NDA Interceptor Trench During Calendar Year (CY) 2010



Note: 1Q = Jan–Mar
2Q = Apr–Jun
3Q = Jul–Sep
4Q = Oct–Dec

APPENDIX A

2010 Environmental Monitoring Program

Environmental Monitoring Program Drivers and Sampling Rationale

The following schedule represents the West Valley Demonstration Project (WVDP) routine environmental monitoring program for 2010. This schedule met or exceeded the requirements of the United States (U.S.) Department of Energy (DOE) Order 450.1A, "Environmental Protection Program," DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance." Specific methods and monitoring program elements were based on DOE/EP-0096, "A Guide for Effluent Radiological Measurements at DOE Installations," and DOE/EP-0023, "A Guide for Environmental Radiological Surveillance at U.S. Department of Energy Installations." Additional monitoring was mandated by air and water discharge permits (under the National Emission Standards for Hazardous Air Pollutants [NESHAP] regulations in 40 Code of Federal Regulations (CFR) 61, Subpart H, and the New York State Pollutant Discharge Elimination System [SPDES], respectively). Specific groundwater monitoring is required by the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.

Permits, agreements, and/or programs may require formal reports of monitoring results. Radiological air emissions from the WVDP are reported annually in the NESHAP report to the U.S. Environmental Protection Agency. Nonradiological releases in water effluent and storm water drainage points covered under SPDES permit are reported monthly to the New York State Department of Environmental Conservation (NYSDEC) in a Discharge Monitoring Report (DMR). Groundwater monitoring results are reported quarterly to NYSDEC. Annual results from the monitoring program as a whole are evaluated and discussed in this Annual Site Environmental Report (ASER), which is prepared as directed in DOE Order 231.1A, "Environment, Safety, and Health Reporting," and associated guidance.

Table A-1 summarizes programmatic drivers and guidance applicable to each environmental medium measured or sampled as part of the WVDP Environmental Monitoring Program.

Sampling Schedule

Sampling locations are assigned a specific identifier, the location code, which is used to schedule sampling, track samples, and trace analytical results. This appendix details the sampling schedule conducted at each location in 2010. There were no changes to the routine sampling program during 2010. Routine sampling locations are shown on Figures A-2 through A-12. Table headings in the schedule are as follows:

- **Sample Location Code.** This code describes the physical location where the sample is collected. The code consists of seven or eight characters: The first character identifies the sample medium as **A**ir, **W**ater, **S**oil/sediment, **B**iological, or **D**irect measurement. The second character specifies o**N**-site or o**F**f-site. The remaining characters describe the specific location (e.g., **AFGRVAL** is **A**ir o**F**f-site at **GR**eat **VAL**ley). Distances noted at sampling locations are as measured in a straight line from the ventilation stack of the main plant process building on site. Groundwater and storm water sampling points (e.g., WNW0408, WNNDATR, WNSO04) are often abbreviated in figures or data tables (i.e., "408," "NDATR," "S04").

- **Sampling Type/Medium.** Describes the collection method and the physical characteristics of the medium or sample.

- **Collection Frequency/Total Annual Samples.** Indicates how often the samples are collected or retrieved and the total number of each type of sample processed in one year.

- **Measurements/Analyses.** Notes the type of measurement taken from the sampling medium and/or the constituents of interest, and (in some instances) the type of analysis conducted.

TABLE A-1
WVDP Environmental Program Drivers and Sampling Rationale

Programmatic Drivers	*Sampling Rationale*
On-Site Air Emissions (Appendix A, p. A-7)	
40 CFR 61, Subpart H (radiological air emissions); DOE Order 450.1A	DOE/EH-0173T, Chapter 3.0 (air effluent monitoring); DOE/EP-0096, Section 3.3 (criteria for effluent measurements)
Ambient Air (Appendix A, p. A-14 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.7.4 (environmental surveillance, air sampling locations); DOE/EP-0023, Section 4.2.3 (air sampling locations and measurement techniques)
On-Site Liquid Effluents and Storm Water (Appendix A, pp. A-8 through A-11)	
New York State SPDES Permit No. NY 0000973 (nonradiological; specified points only), DOE Order 450.1A and DOE Order 5400.5 (radiological)	DOE/EH-0173T, Section 2.3.3 (sampling locations for effluent monitoring); New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certification for nonpotable water
Surface Water (Appendix A, pp. A-11 [on-site] and A-14 and A-15 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.10.1 (environmental surveillance water sampling locations and methods); NYSDOH ELAP certification for nonpotable water
Potable (Drinking) Water (Appendix A, pp. A-12 [on-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.10 (basis and guidance for environmental surveillance, water); NYSDOH ELAP certification for potable water
On-Site Groundwater (Appendix A, pp. A-12 and A-13)	
RCRA §3008(h) Order on Consent (nonradiological); DOE Order 450.1A	DOE/EH-0173T, Section 5.10 (basis for environmental surveillance, water); NYSDOH ELAP certification for nonpotable water
Soil and Sediment (Appendix A, pp. A-13 and A-14 [on-site and off-site])	
DOE Order 450.1A	DOE EH-0173T, Sections 5.9 (environmental surveillance soil sampling locations and methods) and 5.12 (sediment sampling locations and methods)
Biological (Appendix A, pp. A-15 and A-16 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Sections 5.8 (environmental surveillance, terrestrial foodstuffs) and 5.11 (aquatic foodstuffs)
Direct Radiation (Appendix A, p. A-16 [on-site and off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.5 (environmental surveillance external radiation measurement locations and frequency); DOE/EP-0023, Section 4.6 (external radiation)

Index of Environmental Monitoring Program Sample Points

[a] Not detailed on map.

Index of Environmental Monitoring Program Sample Points *(continued)*

Liquid Effluent, On-Site Water, and Storm Water Outfalls (Figures A-2 through A-4) *(concluded)* Page

Index of Environmental Monitoring Program Sample Points *(continued)*

Index of Environmental Monitoring Program Sample Points *(concluded)*

[a] Near-site and background produce samples (corn, apples, and beans) are identified specifically as follows: corn = **BFVNEAC** and **BFVCTRC**; apples = **BFVNEAAF** and **BFVCTRA**; beans = **BFVNEAB** and **BFVCTRB**.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Air Emissions			
ANSTACK[a] Main plant process building ventilation exhaust stack **ANSTSTK**[a] Supernatant treatment system ventilation exhaust **ANCSSTK**[a] 01-14 building ventilation exhaust **ANCSRFK**[a] Contact size-reduction facility exhaust **ANCSPFK**[a] Container sorting and packaging facility exhaust **ANVITSK**[a] Vitrification heating, ventilation, and air conditioning exhaust **ANRHWFK**[a] Remote-handled waste facility exhaust	Continuous on-line air particulate monitors	Continuous measurement of fixed filter; replaced biweekly; held as backup	Real-time alpha and beta monitoring
	Continuous off-line air particulate filters	Biweekly; 26 each location	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of biweekly particulate filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow
	Continuous off-line desiccant columns for collection of water vapor	Biweekly; 26 each at ANSTACK and ANSTSTK only	H-3, flow
	Continuous off-line charcoal cartridges	Cartridges collected biweekly and composited into 2 semiannual samples at each location	I-129
OVEs/PVUs[a] Outdoor ventilated enclosures/portable ventilation units	Continuous off-line air particulate filter	Collected as required by project	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow

[a] Required by 40 CFR 61, Subpart H. Results reported in the Annual NESHAP Report and evaluated in this ASER.
[b] Gamma isotopic analysis done only if gross alpha/beta activity rises significantly.

Sample Location Code	Sampling Type/ Medium	Collection Frequency/ Total Annual Samples	Measurements/Analyses
On-Site Liquid Effluents			
WNSP001[a] Lagoon 3 discharge weir	Grab liquid	Daily during discharge. Lagoon 3 is discharged 4 to 8 times per year, averaging 6 to 7 days per discharge; 24–56 per year	Daily flow, hold for flow-weighted composite
	Grab liquid	Twice during discharge; 8–16 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic
	Flow-weighted composite of daily samples for each discharge	4 to 8 per year	Gross alpha/beta, H-3, C-14, Sr-90, Tc-99, I-129, gamma isotopic, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	24-hour composite liquid	Twice during discharge; 8–16 per year	BOD_5, TSS, SO_4, NO_3-N,NO_2-N, NH_3, total Fe and Hg (method 1631)
	Grab liquid	Twice during discharge; 8–16 per year	Settleable solids, TDS, oil & grease, total recoverable Se
	24-hour composite liquid	Once during discharge; 4–8 per year	Total Al, dissolved As, dissolved sulfide
	Grab liquid	Once during discharge; 4–8 per year	pH, total recoverable V, Co
	24-hour composite liquid	Quarterly; 4 per year	Bromide and total B, total recoverable Pb
	24-hour composite liquid	Semiannually; 2 per year	Total Ti, Mn, dissolved Cu, total recoverable Cu, Cr, Ni, and Zn
	24-hour composite liquid	Annually; 1 per year	Total recoverable Cd, total Ba and Sb
	Grab liquid	Semiannually; 2 per year	Heptachlor, cyanide amenable to chlorination, surfactant (as LAS)
	Grab liquid	Annually; 1 per year	Chloroform, dichlorodifluoromethane, trichlorofluoromethane, 3,3-dichlorobenzidine, tributyl phosphate, hexachlorobenzene, alpha-BHC, xylene, 2-butanone, total recoverable Cr^{+6}
WNSP01B[a] Internal process monitoring point	Continuous; recorded monthly	NA	Total flow, elapsed flow time
	Composite liquid	Twice per month when operating; 0–24 per year	Total Hg
WNSP116[a] Pseudo-monitoring point outfall 116	Calculated	Twice per lagoon discharge; 8–16 per year	TDS

NA - Not applicable

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Liquid Effluents			
WNSP007[a] Sanitary waste discharge	24-hour composite liquid	1 per month; 12 per year	Gross alpha/beta, H-3
	Composite of monthly samples	Annually; 1 per year	Sr-90, gamma isotopic
	24-hour composite liquid	3 per month; 36 per year	TSS, NH_3, NO_2-N, BOD_5, total Fe, flow
	Grab liquid	3 per month; 36 per year	Oil & grease
	Grab liquid	Weekly; 52 per year	pH, settleable solids, total residual chlorine
	Grab liquid	Annually; 1 per year	Chloroform
	Grab liquid	3 per monthly; 36 per year	Flow, flow time
WNURRAW[a] Utility room raw water	Composite liquid	Weekly; 52 per year	Total Fe
	Grab liquid	Three per lagoon discharge; before start, near start, and near end; 12–24 per year	TDS
	Grab liquid	Monthly; 12 per year	TOC, alkalinity
WNSP006 Franks Creek at the security fence	Timed continuous composite liquid	Weekly during lagoon discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3
	Composite of weekly and biweekly samples	Monthly; 12 per year	Sr-90 and gamma isotopic
	Composite of weekly and biweekly samples	Quarterly; 4 per year	C-14, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	Grab liquid	Three per lagoon discharge: before start; near start; and after end, 12–24 per year	TDS
WNSP008[a] French drain (Capped off in 2001; routinely checked to verify no discharge)	Grab liquid	Monthly; 12 per year if discharging	Gross alpha/beta, H-3
	Grab liquid	Three per month if discharging; 36 per year	Conductivity, pH, BOD_5, total Fe, total recoverable Cd and Pb, flow
	Grab liquid	Annually; 1 per year if discharging	Total As, Cr, Ag, and Zn
Storm Water Outfalls			
Group 1[a] **WNSO02 (S02)** **WNSO04 (S04)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, Cd, Cr, Se, V, Cr^{+6}, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Storm Water Outfalls			
Group 2[a] **WNSO06 (S06)** **WNSO33 (S33)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 3[a] **WNSO09 (S09)** **WNSO12 (S12)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, alpha-BHC, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 4[a] **WNSO34 (S34)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 5[a] **WNSO14 (S14)** **WNSO17 (S17)** **WNSO28 (S28)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 6[a] **WNSO36 (S36)** **WNSO37 (S37)** **WNSO38 (S38)** **WNSO39 (S39)** **WNSO40 (S40)** **WNSO41 (S41)** **WNSO42 (S42)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 7[a] **WNSO20 (S20)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Storm Water Outfalls			
Group 8[a] **WNSO27 (S27)** **WNSO35 (S35)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
WNSWR01[a] Site rain gauge	Field measurement of precipitation	1 each storm water event	pH
On-Site Surface Water			
WNSWAMP Northeast swamp drainage **WNSW74A** North swamp drainage	Timed continuous composite liquid	Biweekly; 26 per year	Gross alpha/beta, H-3, pH, flow (at WNSWAMP only)
	Composite of biweekly samples	Monthly; 12 per year	Sr-90 and gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	C-14, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
WNSP005 Facility yard drainage	Grab liquid	Quarterly; 4 per year	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNFRC67 Franks Creek east of the SDA	Grab liquid	Quarterly; 4 per year (collected at same time as **WNNDADR**)	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNERB53 Erdman Brook north of disposal areas	Grab liquid	Quarterly; 4 per year (collected at same time as **WNNDADR**)	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNNDADR Drainage between NDA and SDA	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3, gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90 and I-129

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Potable (Drinking) Water			
WNDFLTR Utility room (entry point [EP-02]) potable water storage	Grab liquid[a]	Annually; 1 per year	As, Ba, Be, Cd, Cr, Hg, Ni, Sb, Se, Tl, cyanide, fluoride
WNDNKMP Main plant drinking water	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3
WNDNKEL Environmental Laboratory drinking water	Grab liquid[a]	Annually; 1 per year	Total haloacetic acids, total trihalomethanes
On-Site Groundwater			
Low-level waste treatment facility: SSWMU #1 (wells 103, 104, 105, 106, 107, 108, 110, 111, 116, 8604, 8605) **Miscellaneous small units:** SSWMU #2 (wells 204, 205, 206) **Liquid waste treatment system:** SSWMU #3 (wells 301, 302) **High-level waste storage and processing tank:** SSWMU #4 (wells 401, 402, 403, 405, 406, 408, 409) **Maintenance shop leach field:** SSWMU #5 (wells 501, 502) **Low-level waste storage area:** SSWMU #6 (wells 602A, 604, 605, 8607, 8609) **Chemical process cell waste storage area:** SSWMU #7 (wells 704, 706, 707) **Construction and demolition debris landfill:** SSWMU #8 (wells 801, 802, 803, 804, 8603, 8612) **NRC-licensed disposal area (NDA):** SSWMU #9 (wells 901, 902, 903, 906, 908, 908R, 909, 910R, 8610, 8611, trench NDATR)	Grab liquid	Quarterly during the fiscal year (generally[b]); 4 per year	Gross alpha/beta, H-3. Select locations for radioisotopic analyses, VOCs, SVOCs, or metals
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH

[a] A sample for NO_3 (as N) is collected by the Cattaraugus County Health Department (CCHD). Pb and Cu are sampled at this site based upon CCHD guidance.

[b] Sampling frequency and analyses vary from point to point.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Groundwater			
IRTS drum cell: SSWMU #10 (wells 1005, 1006, 1008B, 1008C) **Remote-handled waste facility** (not in a SSWMU): (wells 1301, 1302, 1303, 1304)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3. Select locations for radioisotopic analyses, VOCs, SVOCs, or metals
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH
Main plant processing building downgradient wells (installed in 2010): (wells MP-01, MP-02, MP-03, MP-04)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3, Radioisotopic analyses, VOCs, SVOCs, metals, and turbidity
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH
North plateau seeps (not in a SSWMU): (points GSEEP, SP04, SP06, SP11, SP12)	Grab liquid	Semiannually (quarterly at GSEEP); 2 (or 4) per year	Gross alpha/beta, H-3 (also VOCs at GSEEP and SP12)
	Direct field measurement of sampled water	Semiannually at SP12 (quarterly at GSEEP); 2 (or 4) per year	pH, conductivity
Miscellaneous monitoring locations (not in a SSWMU): Well points WP-A, WP-C, WP-H	Grab liquid	Annually (quarterly at NB1S); 1 (or 4) per year	Gross alpha/beta, H-3
	Direct field measurement of sampled water	Annually (quarterly at NB1S); 1 (or 4) per year	pH, conductivity
Surface water elevation points: (SE007, SE008, SE009, SE011)	Direct field measurement	Quarterly; 4 per year at each location	Water level
State-licensed disposal area (SDA) (SSWMU #11)	Groundwater wells in SSWMU #11 are sampled by NYSERDA under a separate program. For information, see the NYSERDA website at www.nyserda.org.		
On-Site Soil/Sediment			
SN on-site soil series; **SNSW74A** (near WNSW74A), **SNSWAMP** (near WNSWAMP), and **SNSP006** (near WNSP006)	Surface plug composite soil/sediment	1 each location every five years (last sampled in 2007)	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
Off-Site Soil			
SF off-site soil series (collected at historical air sampling location[s]); **SFFXVRD, SFRT240, SFRSPRD, SFGRVAL**	Surface plug composite soil	1 each location every five years (last sampled in 2007)	Gross alpha/beta, Sr-90, gamma isotopic, Pu-238, Pu-239/240, Am-241. At nearest site (**SFRSPRD**) and background (**SFGRVAL**), also U-232, U-233/234, U-235/236, U-238, and total U

[a] Sampling frequency and analyses vary from point to point.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Sediment			
SFCCSED Cattaraugus Creek at Felton Bridge **SFSDSED** Cattaraugus Creek at Springville Dam **SFTCSED** Buttermilk Creek at Thomas Corners Road **SFBCSED** Buttermilk Creek at Fox Valley Road (background)	Grab stream sediment	1 each location every five years (last sampled in 2007)	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
Off-Site Air			
AFGRVAL 29 km south at Great Valley (background)	Continuous air particulate filter	Biweekly; 26 per year	Gross alpha/beta, flow
	Composite of biweekly filters	Semiannually; 2 per year	Sr-90, gamma isotopic, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, flow
	Continuous charcoal cartridge	Monthly; 12 per year	Held for composite
	Composite of monthly charcoal cartridges	Semiannually; 2 per year	I-129
Off-Site Surface Water			
WFBCBKG Buttermilk Creek near Fox Valley (background)	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3
	Composite of biweekly samples	Semiannually; 2 per year	C-14, Sr-90, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic
WFFELBR Cattaraugus Creek at Felton Bridge (downstream of confluence with Buttermilk Creek); nearest point of public access to waters receiving WVDP effluents	Timed continuous composite liquid	Weekly during lagoon 3 discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3, pH, flow
	Flow-weighted composite of weekly and biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3, Sr-90, and gamma isotopic

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Surface Water			
WFBCTCB Buttermilk Creek at Thomas Corners Road, downstream of WVDP and upstream of confluence with Cattaraugus Creek	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90, gamma isotopic
	Grab liquid	Monthly; 12 per year	Hardness (Ca and Mg)
	Grab liquid	Semiannually; 2 per year[a]	Temperature (field), pH (field), dissolved oxygen (field), TOX, oil & grease
	24-hour timed continuous composite	Semiannually; 2 per year[a]	TSS, TDS, NPOC, NH_3 (as N), NO_3 (as N), NO_2 (as N), bromide, fluoride, sulfate, total sulfide, surfactant (as LAS), alpha-BHC, B, Ba, Co, Fe, Na, Mn, Sb, Ti, Tl, V, dissolved Al, As, Cd, Cr, Cu, Hg (method 1631), Ni, Pb, Se, Zn
Off-Site Biological			
BFMFLDMN Dairy farm 5.1 km southeast of WVDP	Grab milk sample	Annual; 1 per year	Sr-90, I-129, gamma isotopic
BFMCTLS Control location 22 km south (background) **BFMBLSY** Dairy farm 5.5 km west-northwest **BFMSCHT** Dairy farm 4.9 km south	Grab milk sample	1 each location every five years (last sampled in 2007)	Sr-90, I-129, gamma isotopic
BFDNEAR Deer in the vicinity of the WVDP **BFDCTRL** Control deer 16 km or more from the WVDP	Individual collection of venison samples, usually from deer killed in collisions with vehicles	Six deer collected annually during hunting season (3 near-site, 3 background)	Gamma isotopic and Sr-90 in edible portions of meat, % moisture, H-3 in free moisture
BFVNEAR Apples, beans, and corn from locations near the WVDP **BFVCTRL** Control apples, beans, and corn from locations far from the WVDP	Grab biological	1 every five years at time of harvest (last sampled in 2007)	Gamma isotopic and Sr-90 in edible portions, % moisture, H-3 in free moisture

[a] Samples are collected when points WNSP001 and WNSP007 are discharging.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Biological			
BFFCATC Fish from Cattaraugus Creek downstream of its confluence with Buttermilk Creek **BFFCATD** Fish from Cattaraugus Creek downstream of the Springville Dam **BFFCTRL** Control fish sample from nearby stream not affected by WVDP (7 km or more upstream of site effluent point); background	Individual collection of fish	Once every 5 years; 10 fish from each location (last sampled in 2007)	Gamma isotopic and Sr-90 in edible portions, % moisture
Off-Site Direct Radiation			
DFTLD Series: Off-site environmental thermoluminescent dosimeters (TLDs): **#1 through #16**, at each of 16 compass sectors at nearest accessible perimeter point **#20:** 1,500 m northwest (downwind receptor) **#23:** 29 km south, Great Valley (background)	Integrating TLD	Semiannually; 2 per year at each location	Gamma radiation exposure
On-Site Direct Radiation			
DNTLD Series: On-site TLDs **#33**: Corner of the SDA **#24, #28**: Security fence around the WVDP **#35, #36, #38, #40**: Near operational areas on-site **#43**: SDA west perimeter fence	Integrating TLD	Semiannually; 2 per year at each location	Gamma radiation exposure

Summary of Monitoring Program Changes in 2010

Description of Changes

There were no changes to the air, surface water, soil, biological, or TLD monitoring program during CY 2010. However, the groundwater monitoring program and the north plateau permeable treatment wall (PTW) monitoring program were enhanced significantly. Four replacement wells were installed downgradient of the MPPB to supplement the strontium-90 source area monitoring. In addition, following installation of the north plateau PTW, 66 new groundwater wells were installed within and adjacent to the full-scale PTW to monitor performance of the wall. Refer to Chapter 4, "Groundwater Protection Program" for discussion.

FIGURE A-1
West Valley Demonstration Project Base Map

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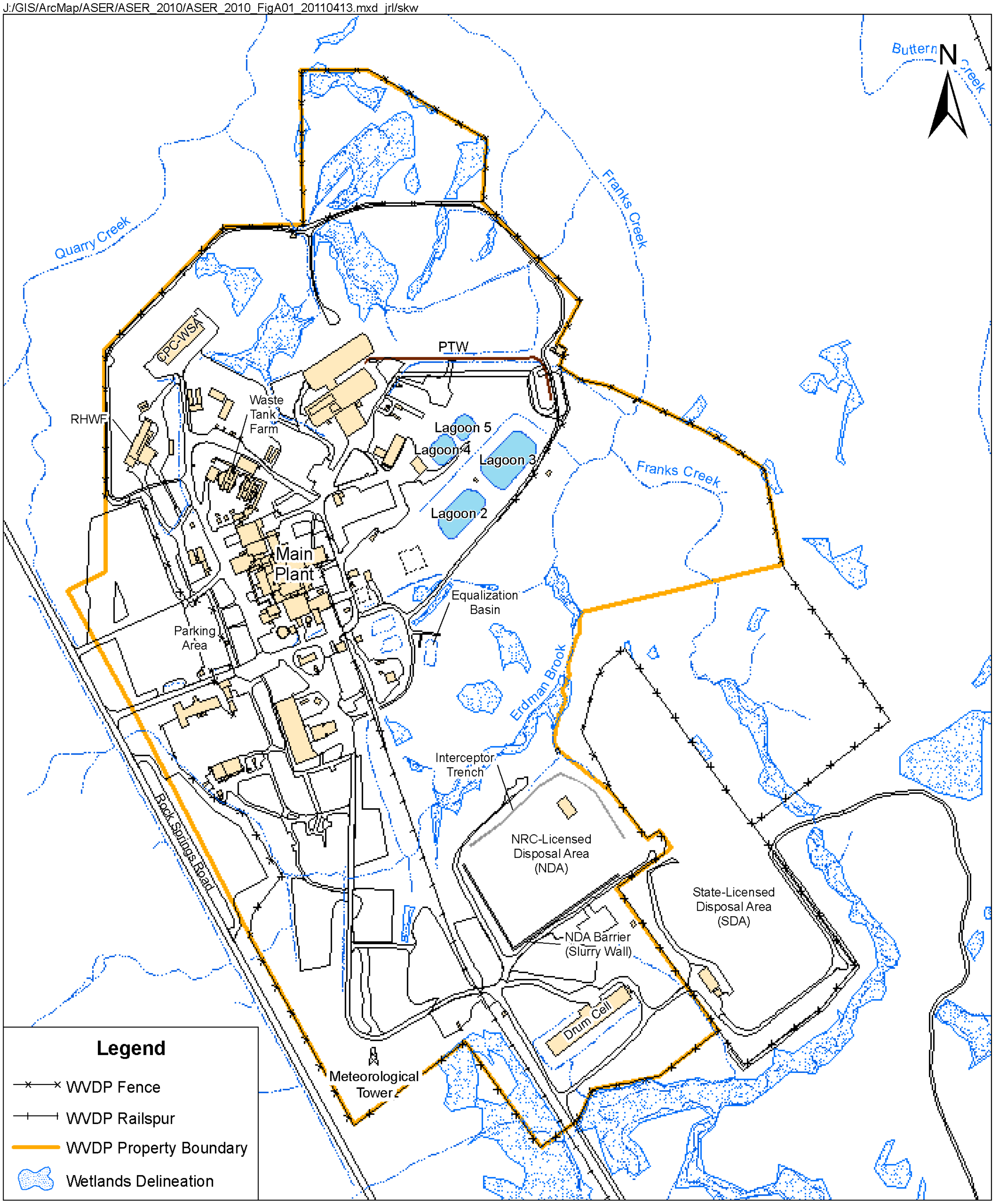

FIGURE A-2
On-Site Surface Water, Drinking Water, and Soil/Sediment Sampling Locations

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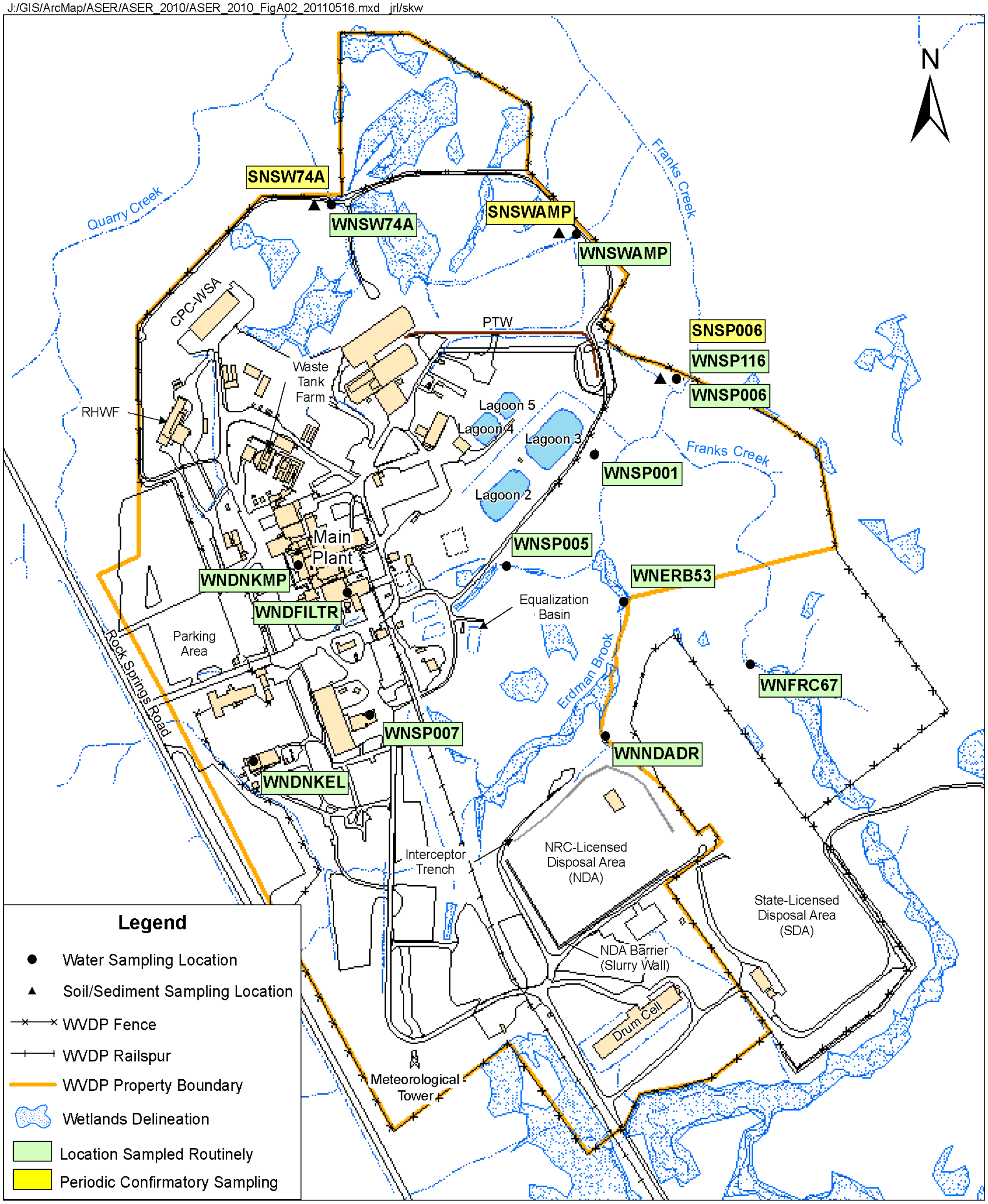

FIGURE A-3
On-Site Storm Water Outfalls

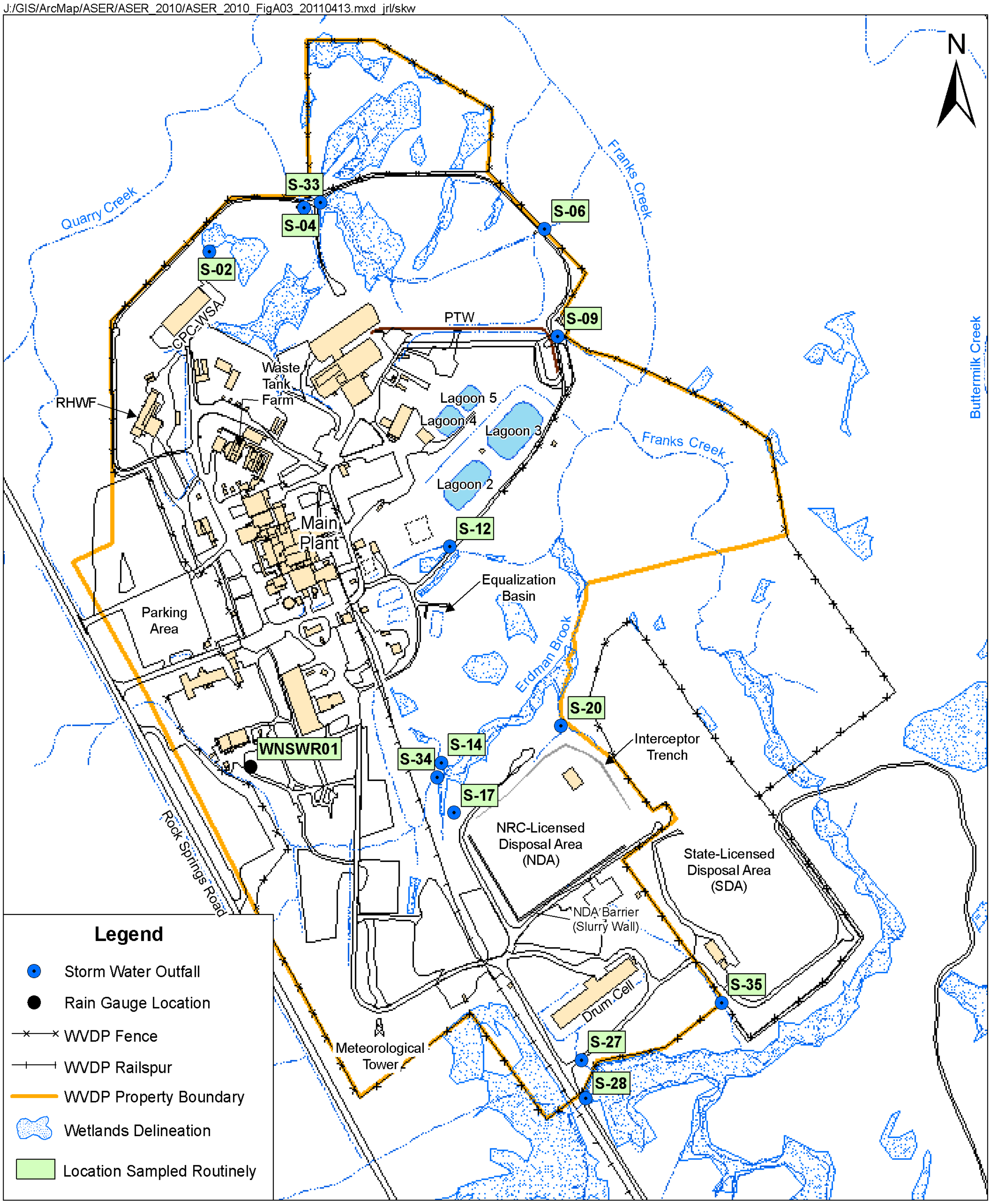

FIGURE A-4
Rail Spur Storm Water Outfalls

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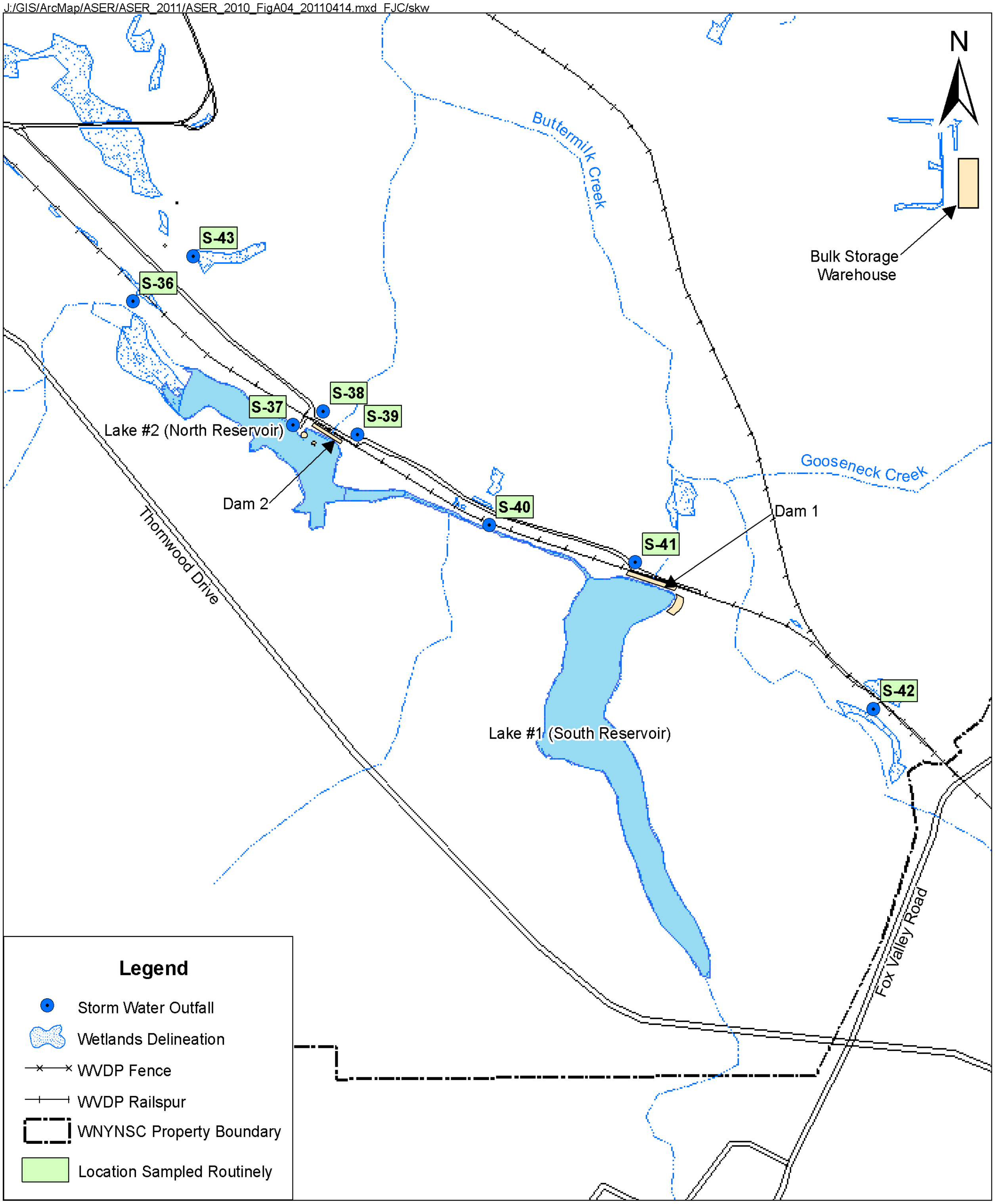

FIGURE A-5
Off-Site Surface Water and Soil/Sediment Sampling Locations

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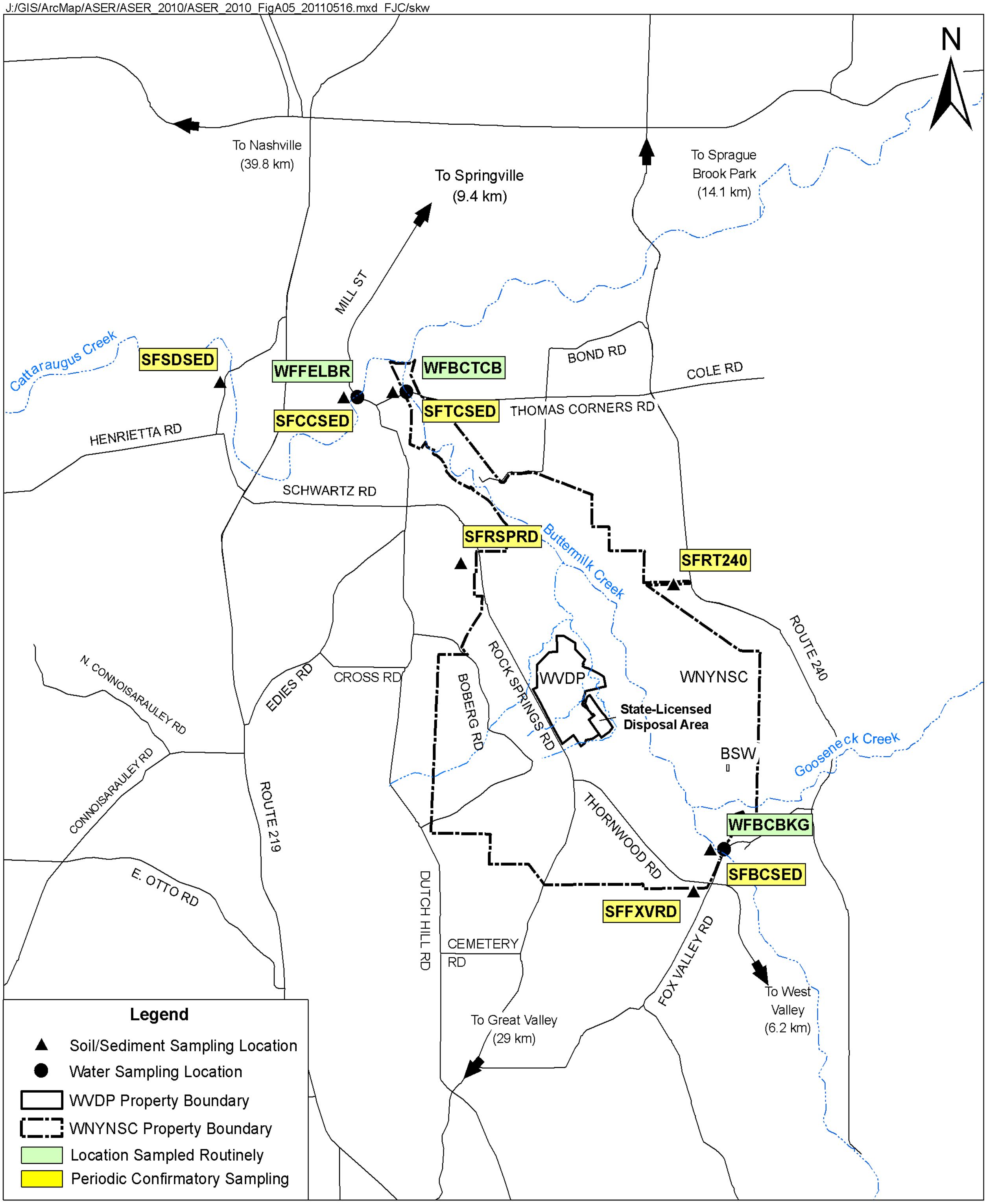

FIGURE A-6
On-Site Air Monitoring and Sampling Locations

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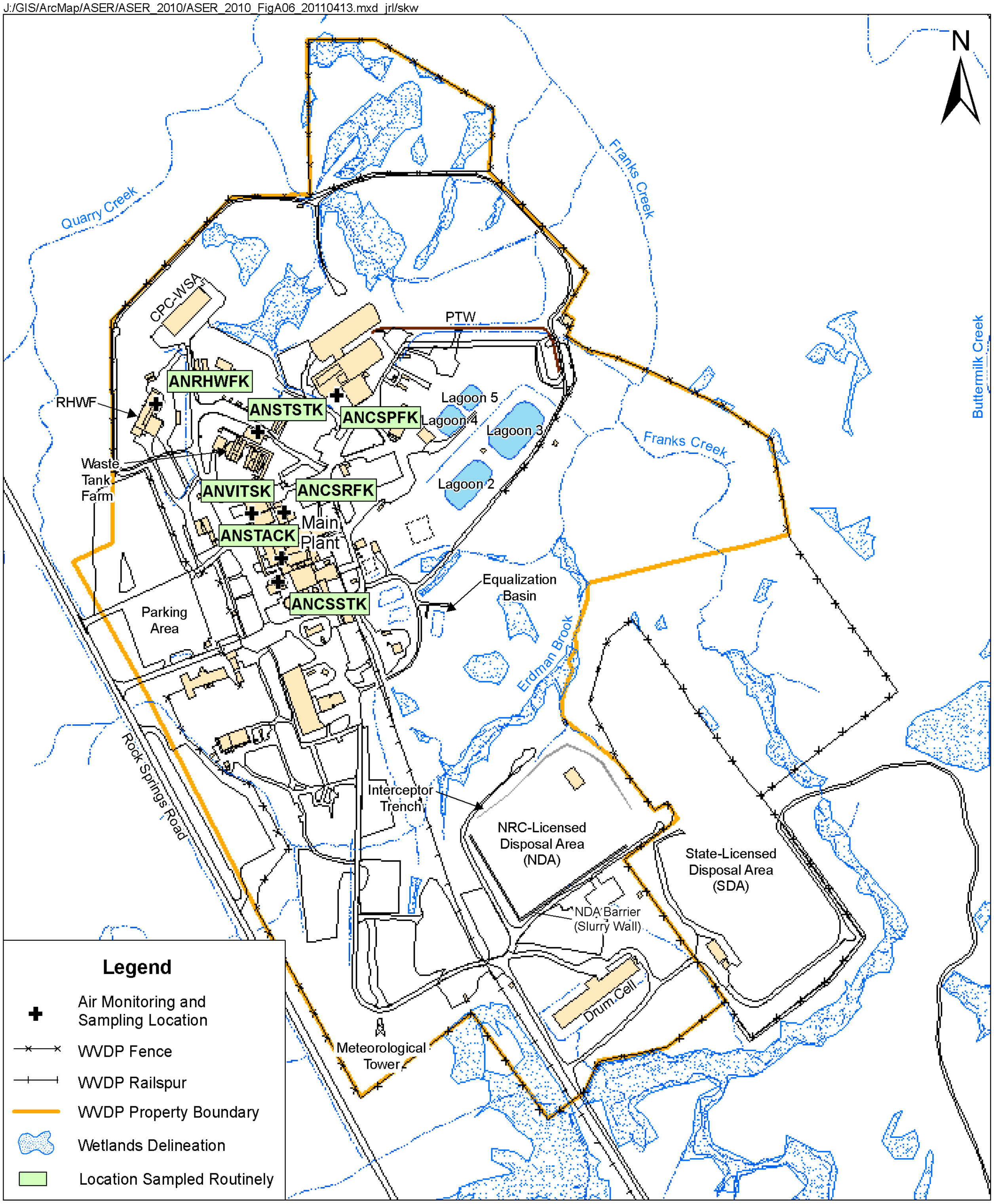

FIGURE A-7
North Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

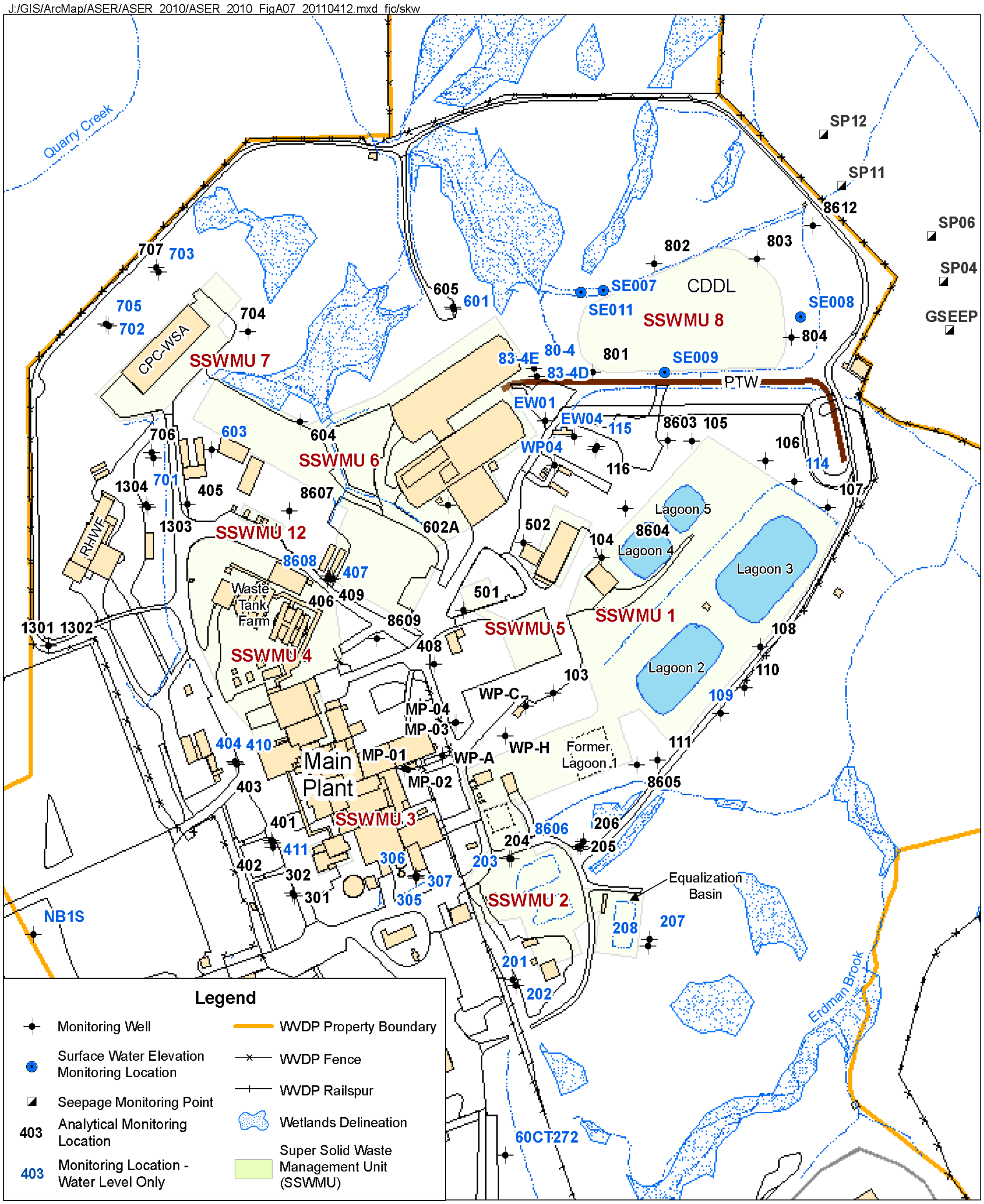

FIGURE A-8
South Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

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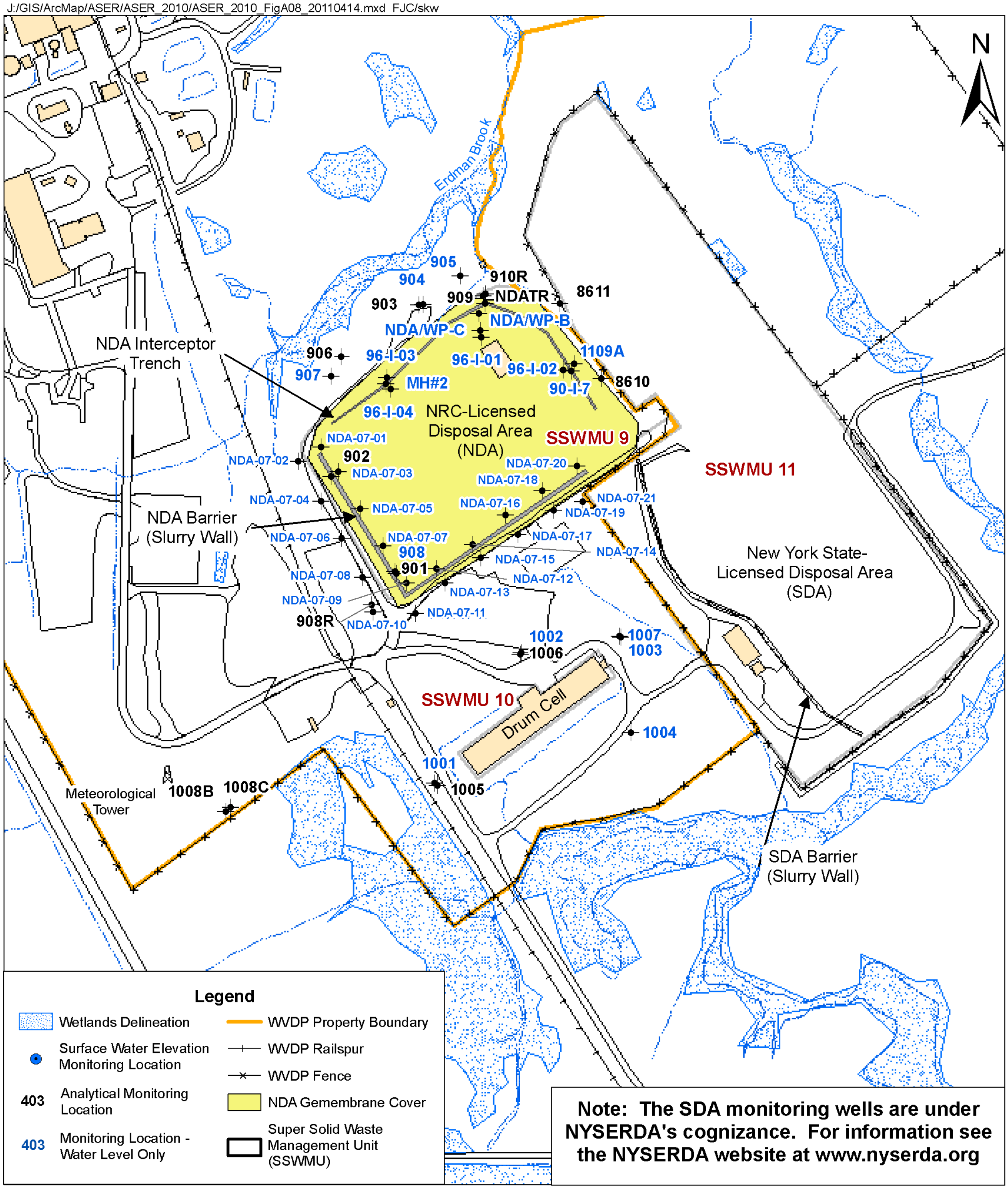

FIGURE A-9
Biological Sampling Locations

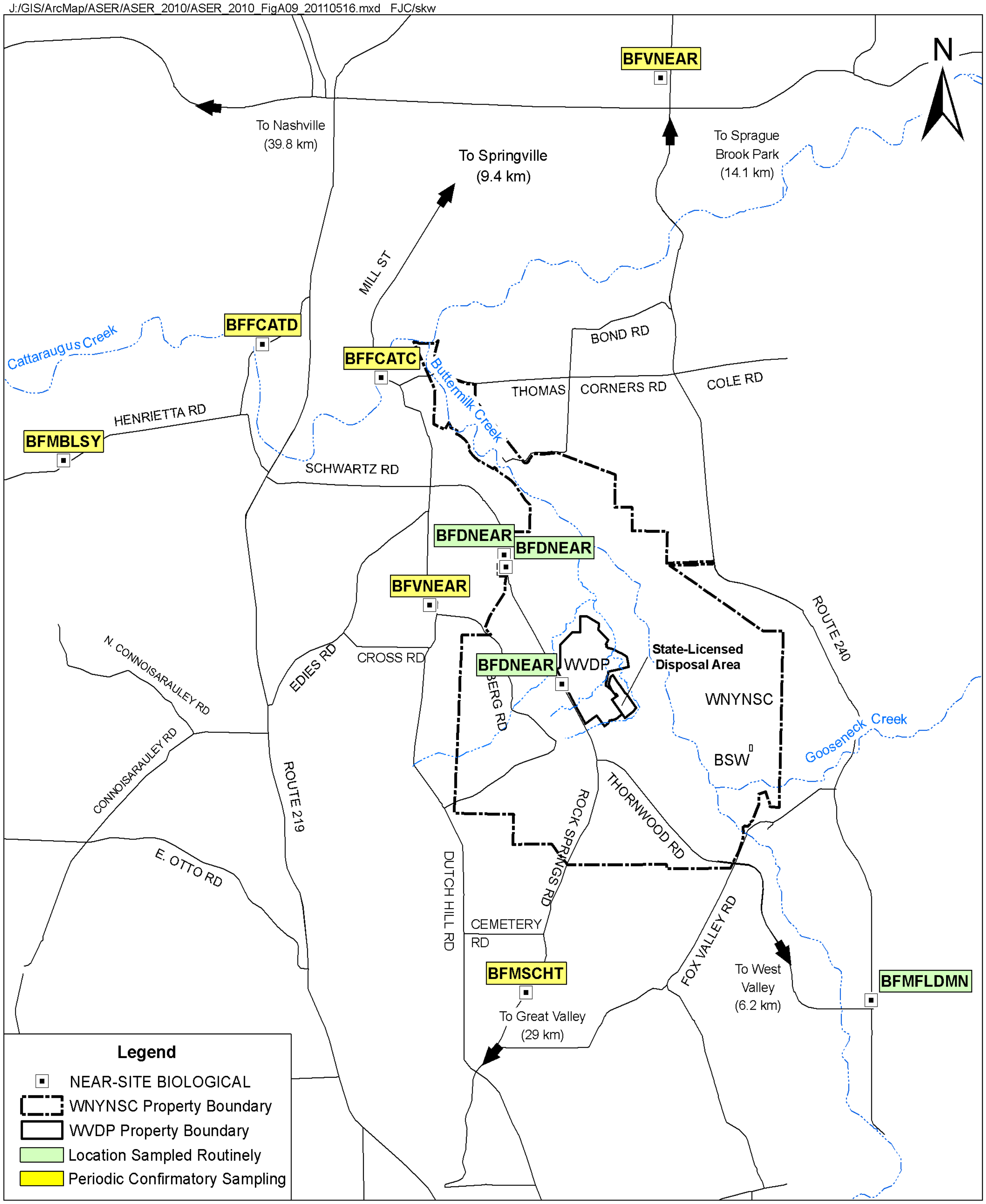

FIGURE A-10
Location of On-Site Thermoluminescent Dosimeters (TLDs)

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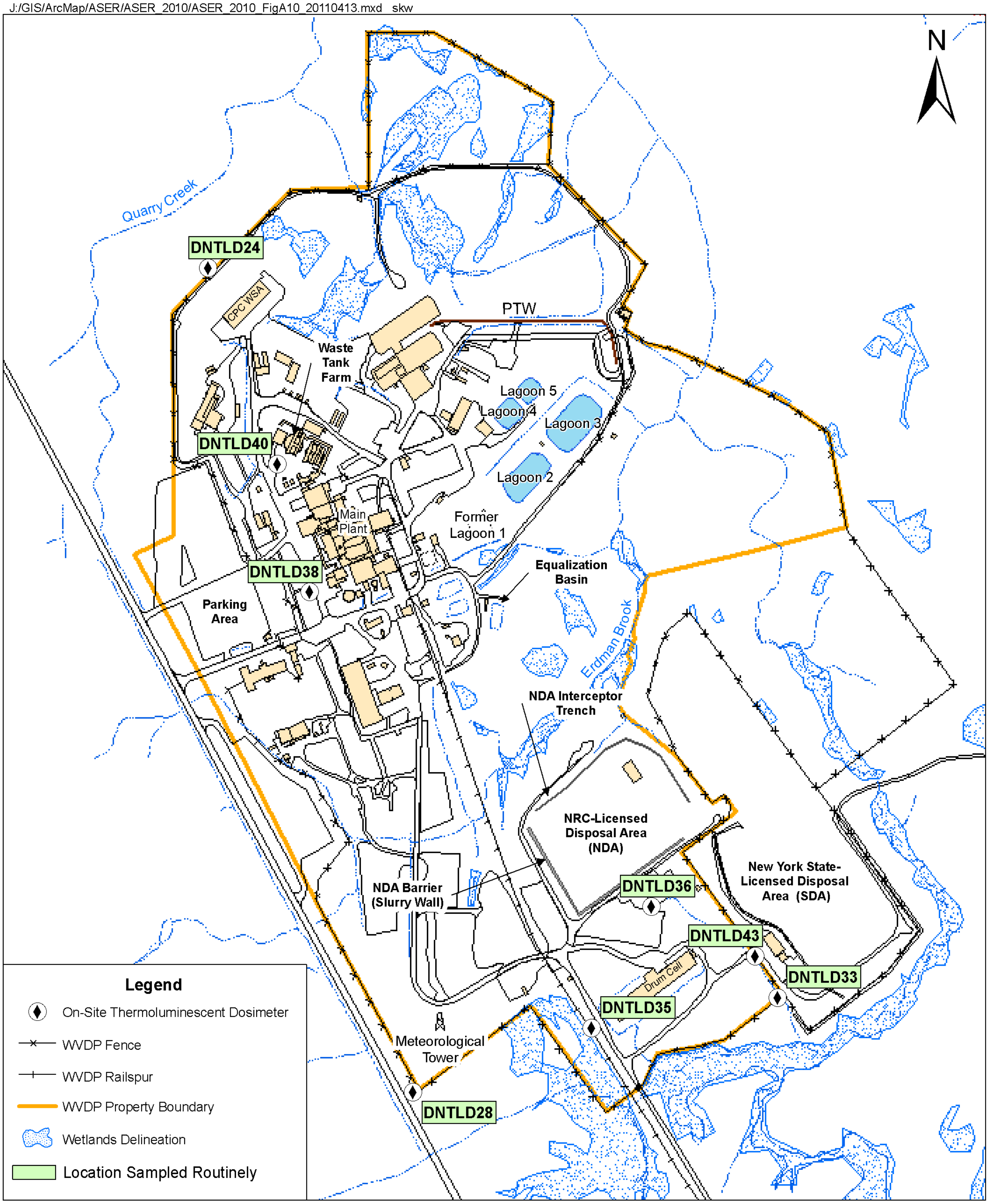

FIGURE A-11
Location of Off-Site Thermoluminescent Dosimeters (TLDs) Within 5 Kilometers of the WVDP

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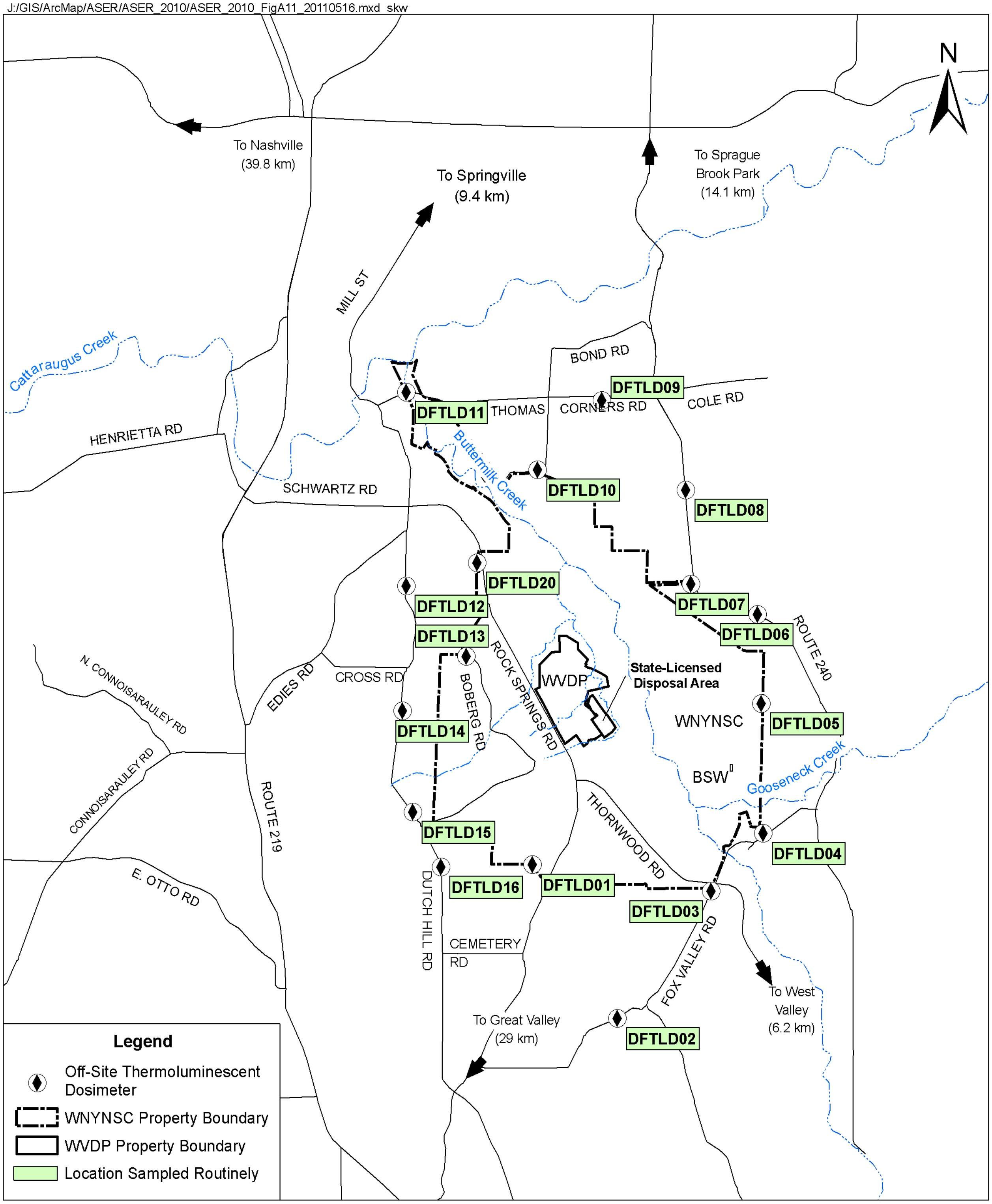


FIGURE A-12
Environmental Sampling Locations More Than 5 Kilometers From the WVDP

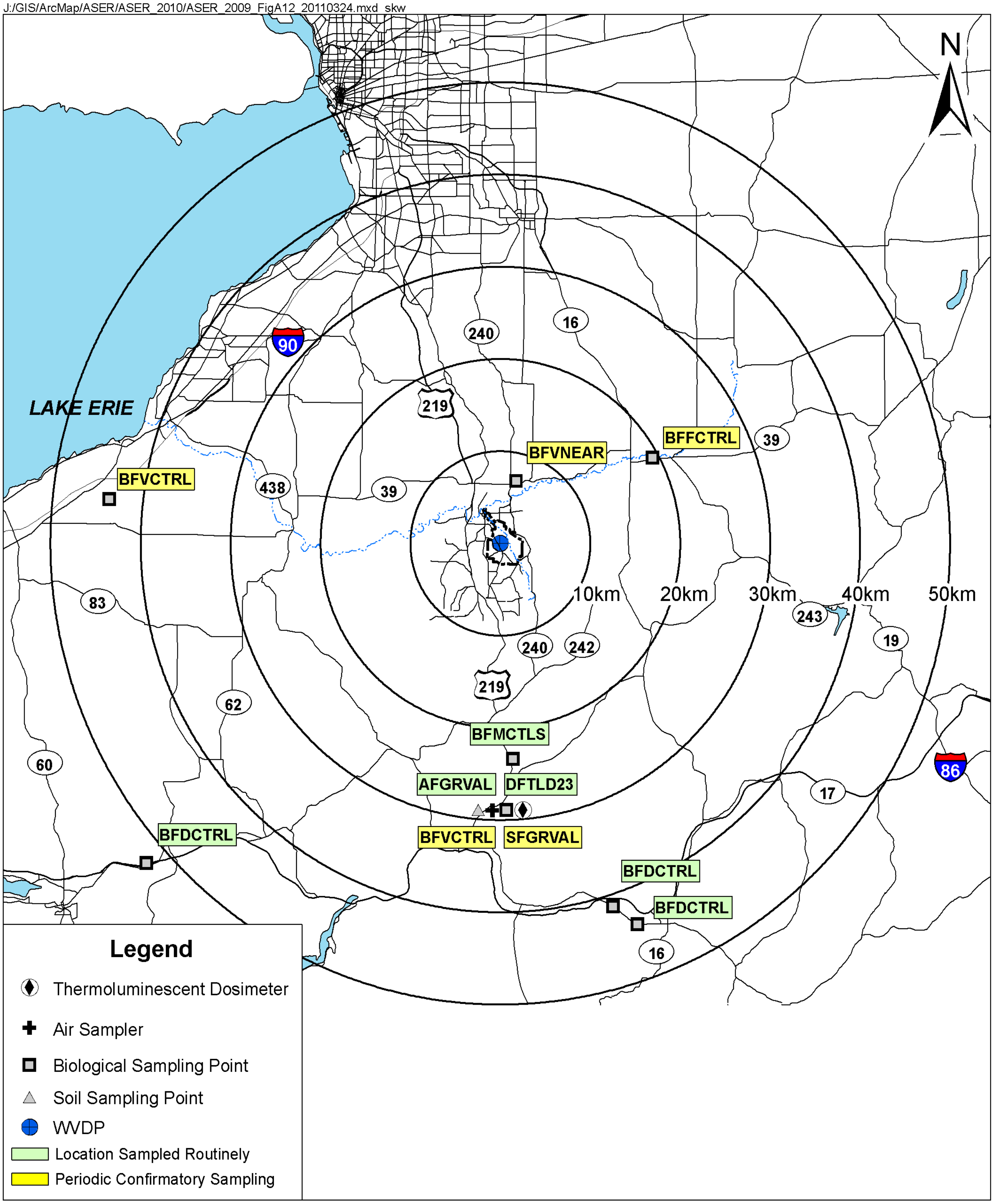
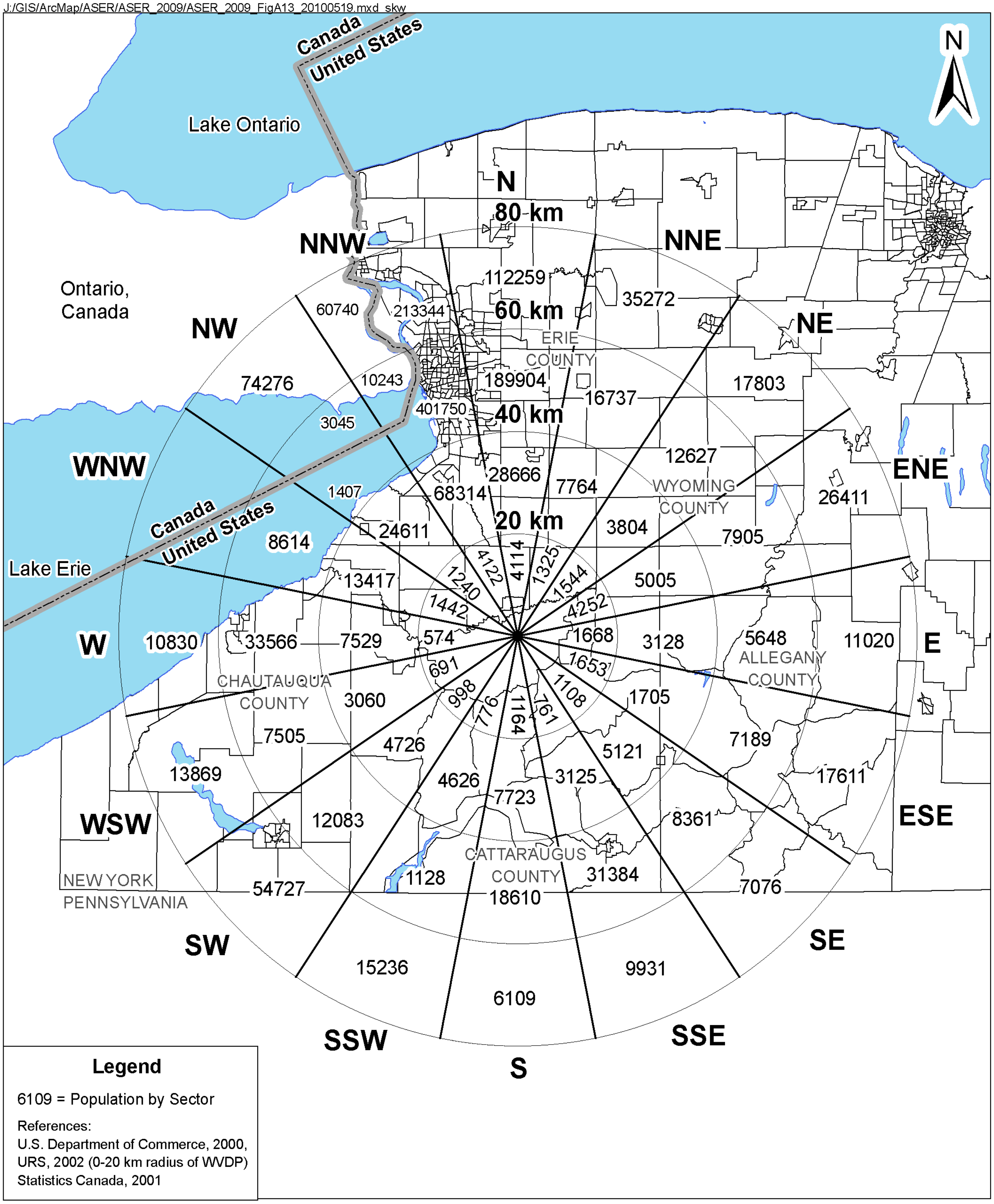


FIGURE A-13
Population by Sector Within 80 Kilometers of the WVDP (2002 Estimate)



USEFUL INFORMATION

This section provides background information that may be useful to the reader in understanding and interpreting the results presented in this Annual Site Environmental Report (ASER). First, it presents brief summaries of concepts pertaining to radiation and radioactivity, including:

- radioactive decay;
- types of ionizing radiation;
- measurement of radioactivity;
- measurement of dose;
- background radiation; and
- potential health effects of radiation.

It describes how data are presented in the ASER, and presents tables of unit prefixes, units of measure, and conversion factors. It discusses limits applicable to air emissions and water effluents, and describes (and presents a table of) the dose-based United States (U.S.) Department of Energy (DOE) derived concentration guides (DCGs). It includes a discussion of CAP88-PC, the computer code used to evaluate compliance with the air dose standard. It also presents discussions of 1) water quality classifications, standards, and limits for ambient water; 2) potable water standards; 3) soil and sediment guidelines; and 4) evaluation of monitoring data with respect to limits.

Radiation and Radioactivity

Radioactivity is a property of atoms with unstable nuclei. The unstable nuclei spontaneously decay by emitting radiation in the form of energy (such as gamma rays) or particles (such as alpha and beta particles) (see inset on following page). If the emitted energy or particle has enough energy to break a chemical bond or to knock an electron loose from another atom, a charged particle (an "ion") may be created. This radiation is known as "ionizing radiation."

As used in this ASER, the term "radiation" refers only to ionizing radiation and does not include nonionizing forms of radiation such as visible light, radio waves, microwaves, infrared light, or ultraviolet light.

Radioactive Decay

An atom is the smallest particle of an element. It cannot be broken down by chemical means. An atom consists of a central core (the *nucleus*), composed of positively charged particles (*protons*) and particles with no charge (*neutrons*), surrounded by negatively charged particles (*electrons*) that revolve in orbits in the region surrounding the nucleus. The protons and neutrons are much more massive than the electrons, therefore most of an atom's mass is in the nucleus.

An element is defined by the number of protons in its nucleus, its atomic number. For example, the atomic number of hydrogen is one (one proton), the atomic number of strontium is 38 (38 protons), and the atomic number of cesium is 55 (55 protons).

The mass number of an atom, its *atomic weight*, is equal to the total number of protons and neutrons in its nucleus. For example, although an atom of hydrogen will always have one proton in its nucleus, the number of neutrons may vary. Hydrogen atoms with zero, one, or two neutrons will have atomic weights of one, two, or three, respectively. These atoms are known as *isotopes* (or *nuclides*) of the element hydrogen. Elements may have many isotopes. For instance, the elements strontium and cesium have more than 30 isotopes each.

Isotopes may be stable or unstable. An atom from an unstable isotope will spontaneously change to another atom. The process by which this change occurs, that is, the spontaneous emission from the nucleus of alpha or beta particles, often accompanied by gamma radiation, is known as *radioactive decay*. Depending upon the type of radioactive decay, an atom may be transformed to another isotope of the same element or, if the number of protons in the

Note: Much of the background information in this section was taken from The Handbook of Health Physics and Radiological Health (Shleien, 1998), from the Environmental Protection Agency website (www.epa.gov/radiation/understand), and from The Health Physics Society website (http://hps.org/publicinformation).

Some Types of Ionizing Radiation

Alpha Particles. An alpha particle is a positively charged particle consisting of two protons and two neutrons. Compared to beta particles, alpha particles are relatively large and heavy and do not travel very far when ejected by a decaying nucleus. Therefore, alpha radiation is easily stopped by a few centimeters of air or a thin layer of material, such as paper or skin. However, if radioactive material is ingested or inhaled, the alpha particles released inside the body can damage soft internal tissues because their energy can be absorbed by tissue cells in the immediate vicinity of the decay. An example of an alpha-emitting radionuclide is the uranium isotope with an atomic weight of 232 (uranium-232). Uranium-232 was in the high-level radioactive waste (HLW) mixture at the West Valley Demonstration Project (WVDP) as a result of a thorium-based nuclear fuel reprocessing campaign conducted by Nuclear Fuel Services, Inc. Uranium-232 has been detected in liquid waste streams.

Beta Particles. A beta particle is an electron emitted during the breakdown of a neutron in a radioactive nucleus. Compared to alpha particles, beta particles are smaller, have less of a charge, travel at a higher speed (close to the speed of light), and can be stopped by wood or a thin sheet of aluminum. If released inside the body, beta particles do much less damage than an equal number of alpha particles because beta particles deposit energy in tissue cells over a larger volume than alpha particles. Strontium-90, a fission product found in the liquids associated with the HLW, is an example of a beta-emitting radionuclide.

Gamma Rays. Gamma rays are high-energy “packets” of electromagnetic radiation, called photons, that are emitted from the nucleus. Gamma rays are similar to x-rays, but are generally more energetic. If an alpha or beta particle released by a decaying nucleus does not carry off all the energy generated by the nuclear disintegration, the excess energy may be emitted as gamma rays. If the released energy is high, a very penetrating gamma ray is produced that can be effectively reduced only by shielding consisting of several inches of a dense material, such as lead, or of water or concrete several feet thick. Although large amounts of gamma radiation are dangerous, gamma rays are also used in lifesaving medical procedures. An example of a gamma-emitting radionuclide is barium-137m, a short-lived daughter product of cesium-137. Both barium-137m and its precursor, cesium-137, are major constituents of the WVDP HLW.

nucleus has changed, to an isotope of another element.

Isotopes (nuclides) that undergo radioactive decay are called *radioactive* and are known as *radioisotopes* or *radionuclides*. Radionuclides are customarily referred to by their atomic weights. For instance, the radionuclides of hydrogen, strontium, and cesium measured at the WVDP are hydrogen-3 (also known as tritium), strontium-90, and cesium-137. For some radionuclides, such as cesium-137, a short-lived intermediate is formed that decays by gamma emission. This intermediate radionuclide may be designated by the letter “m” (for metastable) following the atomic weight. For cesium-137, the intermediate radionuclide is barium-137m, with a half-life of less than three minutes.

The process of radioactive decay will continue until only a stable, nonradioactive isotope remains. Depending on the radionuclide, this process can take anywhere from less than a second to billions of years. The time required for half of the radioactivity to decay is called the radionuclide’s *half-life*. Each radionuclide has a unique half-life. The half-life of hydrogen-3 is slightly more than 12 years, both strontium-90 and cesium-137 have half-lives of approximately 30 years, and plutonium-239 has a half-life of more than 24,000 years.

Knowledge of radionuclide half-lives is often used to estimate past and future inventories of radioactive material. For example, a 1.0 millicurie source of cesium-137 in 2006 would have measured 2.0 millicuries in 1976 and will be 0.5 millicuries in 2036. For a list of half-lives of radionuclides applicable to the WVDP, see Table UI-4.

Measurement of Radioactivity

As they decay, radionuclides emit one or more types of radiation at characteristic energies that can be

measured and used to identify the radionuclide. Detection instruments measure the quantity of radiation emitted over a specified time. From this measurement, the number of decay events (nuclear transformations) over a fixed time can be calculated.

Radioactivity is measured in units of curies (Ci) or becquerels (Bq). One Ci (based on the rate of decay of one gram of radium-226) is defined as the "quantity of any radionuclide that undergoes an average transformation rate of 37 billion transformations per second." In the International System of Units (SI), one Bq is equal to one transformation per second. In this ASER, radioactivity is customarily expressed in units of Ci followed by the equivalent SI unit in parentheses, as follows: 1 Ci (3.7E+10 Bq).

In this report, measurements of radioactivity in a defined volume of an environmental media, such as air or water, are presented in units of concentration. Since levels of radioactivity in the environment are typically very low, concentrations may be expressed in microcuries per milliliter, with SI units (becquerels per liter) in parentheses, as follows: 1.00E-06 µCi/mL (3.7E+01 Bq/L). (One microcurie is equal to one millionth of a curie.)

Measurement of Dose

The amount of energy absorbed by a material that receives radiation is measured in rads. A rad is 100 ergs of radiation energy absorbed per gram of material. (An erg is the approximate amount of energy necessary to lift a mosquito one-sixteenth of an inch.) "Dose" is a means of expressing the amount of energy absorbed, taking into account the effects of different kinds of radiation.

Alpha, beta, and gamma radiation affect the body to different degrees. Each type of radiation is given a quality factor that indicates the extent of human cell damage it can cause compared with equal amounts of other ionizing radiation energy. Alpha particles cause 20 times as much damage to internal tissues as x-rays, so alpha radiation has a quality factor of 20, compared to gamma rays, x-rays, or beta particles, each of which have a quality factor of one.

The unit of dose measurement to humans is the *rem*. The number of rem is equal to the number of rads multiplied by the quality factor for each type of radiation. In the SI system, dose is expressed in sieverts. One sievert (Sv) equals 100 rem. One rem equals 1,000 millirem (mrem), the unit used to express standards for dose to man from air and water sources, as applicable to this ASER. This ASER expresses dose in standard units, followed by equivalent SI units in parentheses, as follows: 1 mrem (0.01 mSv).

Background Radiation

Background radiation is always present, and everyone is constantly exposed to low levels of such radiation from both naturally occurring and man-made sources. In the U.S. the average total annual exposure to low-level background radiation is estimated to be about 620 mrem or 6.2 millisieverts (mSv). About one-half of this radiation, approximately 310 mrem (3.1 mSv), comes from natural sources. The other half (about 310 mrem [3.1 mSv]) comes from medical procedures, consumer products, and other man-made sources (National Council on Radiation Protection and Measurements Report Number 160, 2009). (See Figure 3-1 in Chapter 3.)

Background radiation includes cosmic rays; the decay of natural elements, such as potassium, uranium, thorium, and radon; and radiation from sources such as chemical fertilizers, smoke detectors, and cigarettes. Actual doses vary depending on such factors as geographic location, building ventilation, and personal health and habits.

Potential Health Effects of Radiation

The three primary pathways by which people may be exposed to radiation are (1) direct exposure, (2) inhalation, and (3) ingestion. Exposure from radiation may be from a source outside the body (external exposure) or from radioactive particles that have been taken in by breathing or eating and have become lodged inside the body (internal exposure). Radionuclides that are taken in are not distributed in the same way throughout the body. Radionuclides of strontium, plutonium, and americium concentrate in the skeleton, while radioisotopes of iodine concentrate in the thyroid. Radionuclides such as hydrogen-3 (tritium), carbon-14, or cesium-137, however, will be distributed uniformly throughout the body.

Living tissue in the human body can be damaged by ionizing radiation. The severity of the damage depends upon several factors, among them the amount of exposure (low or high), the duration of the exposure (long-term [*chronic*] or short-term [*acute*]), the type of radiation (alpha, beta, and gamma radiations of various energies), and the sensitivity of the human (or organ) receiving the radiation. The human body has mechanisms

that repair damage from exposure to radiation; however, repair processes are not always successful.

Biological effects of exposure to radiation may be either somatic or genetic. *Somatic* effects are limited to the exposed individual. For example, a sufficiently high exposure could cause clouding of the lens of the eye or a decrease in the number of white blood cells. *Genetic* effects may show up in future generations. Radiation could damage chromosomes, causing them to break or join incorrectly with other chromosomes. Radiation-produced genetic defects and mutations in the offspring of an exposed parent, while not positively identified in humans, have been observed in some animal studies.

Assessing the biological damage from low-level radiation is difficult because other factors can cause the same symptoms as radiation exposure. Moreover, the body is able to repair damage caused by low-level radiation. Epidemiological studies have not demonstrated adverse health effects in individuals exposed to small doses (less than 10 rem) over a period of years. (For comparison, note that average natural background radiation in the U.S. is about 0.31 rem/year, and estimated annual dose from activities at the WVDP in 2010 was calculated to be about 0.000066 rem/year [0.066 mrem/year].)

The effect most often associated with exposure to relatively high levels of radiation appears to be an increased risk of cancer. However, scientists have not been able to demonstrate with certainty that exposure to low-level radiation causes an increase in injurious biological effects, nor have they been able to determine if there is a level of radiation exposure below which there are no adverse biological effects.

Data Reporting

In the text of this ASER, radiological units (e.g., rem, rad, curie) are presented first, followed by the SI equivalent in parentheses. Nonradiological measurements are presented in English units, followed by the metric unit equivalent in parentheses. See Tables UI-1, UI-2, and UI-3 for a summary of unit prefixes, units of measurement, and basic conversion factors used in this ASER.

Where results are very large or very small, scientific notation is used. Numbers greater than 10 are expressed with a positive exponent. To convert the number to its decimal form, the decimal point must be moved to the right by the number of places equal to the exponent. For example, 1.0E+06 would be expressed as 1,000,000 (one million). Numbers smaller than 1 are expressed with a negative exponent. For example, 1.0E-06 would be expressed as 0.000001 (one millionth).

TABLE UI-1
Unit Prefixes Used in This ASER

Multiplication factor			
Scientific notation	**Decimal form**	**Prefix**	**Symbol**
1.0E+06	1000000	mega	M
1.0E+03	1000	kilo	k
1.0E-02	0.01	centi	c
1.0E-03	0.001	milli	m
1.0E-06	0.000001	micro	µ
1.0E-09	0.000000001	nano	n
1.0E-12	0.000000000001	pico	p

Radiological data are reported as a result plus or minus (±) an associated uncertainty, customarily the 95% confidence interval. The uncertainty is in part due to the random nature of radioactive decay. Generally, the relative uncertainty in a measurement increases as the amount of radioactivity being sampled decreases. For this reason, low-level environmental analyses for radioactivity are especially prone to significant uncertainty in comparison with the result. Radiological data are presented in the following manner:

Example: 1.04 ± 0.54 E-09

Where: 1.04 = the result
± 0.54 = plus or minus the associated uncertainty
E-09 = times 10 raised to the power -09

Sources of uncertainty may include random components (e.g., radiological counting statistics) or systematic components (e.g., sample collection and handling, measurement sensitivity, or bias). Radiological data in this report include both a result and uncertainty term. The uncertainty term represents only the uncertainty associated with the analytical measurement which for environmental samples is largely due to the random nature of radioactive decay. When such radiological data are used in calculations, such as estimating the total curies released from an air or water effluent point, the other parameter used in the calculation (e.g., air volumes, water volumes), typically do not have an associated uncertainty value available. As such, the uncertainties in this report for such calculated values only reflect the uncertainty associated with the radiological re-

TABLE UI-2
Units of Measure Used in This ASER

Type	Measurement	Symbol	Type	Measurement	Symbol
Length	meter	m	**Dose**	rad (absorbed dose)	rad
	centimeter	cm		rem (dose equivalent)	rem
	kilometer	km		millirem	mrem
	inch	in		sievert	Sv
	foot	ft		millisievert	mSv
	mile	mi		gray	Gy
Volume	gallon	gal	**Exposure**	roentgen	R
	liter	L		milliroentgen	mR
	milliliter	mL		microroentgen	µR
	cubic meter	m^3	**Concentration**	parts per million	ppm
	cubic feet	ft^3		parts per billion	ppb
Area	acre	ac		parts per trillion	ppt
	hectare	ha		milligrams per L (ppm)	mg/L
	square meter	m^2		micrograms per L (ppb)	µg/L
	square foot	ft^2		nanograms per L (ppt)	ng/L
Temperature	degrees Fahrenheit	^oF		milligrams per kg (ppm)	mg/kg
	degrees Celsius	^oC		micrograms per g (ppm)	µg/g
Mass	gram	g		micrograms per mL (ppm)	µg/mL
	kilogram	kg		milliliters per mL	mL/L
	milligram	mg		microcuries per mL	µCi/mL
	microgram	µg		picocuries per L	pCi/L
	nanogram	ng		microcuries per g	µCi/g
	pound	lb		becquerels per L	Bq/L
	tonne (metric ton)	t		nephelometric turbidity units	NTU
	ton, short	T		standard units (pH)	SU
Radoactivity	curie	Ci	**Flow rate**	gallons per day	gpd
	millicurie	mCi		gallons per minute	gpm
	microcurie	µCi		million gallons per day	mgd
	nanocurie	nCi		cubic feet per minute	cfm
	picocurie	pCi		liters per minute	lpm
	becquerel	Bq		meters per second	m/sec

TABLE UI-3
Conversion Factors Used in This ASER

To convert from	to	Multiply by
miles	kilometers	1.609344
feet	meters	0.3048
inches	centimeters	2.54
acres	hectares	0.4046873
pounds	kilograms	0.45359237
gallons	liters	3.785412
curies	becquerels	3.7E+10
rad	gray	0.01
rem	sievert	0.01
cubic feet	mL	28,316.85

Note: To convert from the units in column two to the units in column one, divide by the conversion factor.

sults used in the calculation. The actual (total propagated) uncertainty of such values would be larger if other components of uncertainty were available and included in these estimates.

Radiological results are calculated using both sample counts and background counts. If the background count is greater than the sample count, a negative result term will be reported. The constituent is considered to be detected if the result is larger than the associated uncertainty (i.e., a "positive" detection). Nonradiological data are not reported with an associated uncertainty.

In general, the detection limit is the minimum amount of a constituent that can be detected, or distinguished from background, by an instrument or a measurement technique. If a result is preceded by the symbol "<" (i.e., <5 parts per million [ppm]), the constituent was not measurable below the detection limit (in this example, 5 ppm).

The number of significant digits reported depends on the precision of the measurement technique. Integer counts are reported without rounding. Calculated values are customarily reported to three significant figures. Dose estimates are usually reported to two significant figures. All calculations are completed before values are rounded.

Limits Applicable to Environmental Media

Dose Standards. The two dose standards against which releases at the WVDP are assessed are those established by the U.S. Environmental Protection Agency (EPA) for air emissions and that established by the DOE regarding all exposure modes from DOE activities.

Radiological air emissions other than radon from DOE facilities are regulated by the EPA under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation (40 Code of Federal Regulation [CFR] 61, Subpart H), which establishes a standard of 10 mrem/year effective dose equivalent to any member of the public. See "CAP88-PC Computer Code" in inset.

DOE Order 5400.5 sets the DOE primary standard of 100 mrem/year effective dose equivalent to members of the public considering all exposure modes from DOE activities. (Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents.)

CAP88-PC Computer Code

The WVDP ASER summarizes the airborne radioactivity released (see Appendix C) and the effect from those releases (Chapter 3) in a manner consistent with that required by the U.S. Environmental Protection Agency (EPA). The computer code Clean Air Act Assessment Package-1988 for personal computers (CAP88-PC), Version 3.0, approved in February 2006, is used to perform radiation dose and risk calculations from WVDP airborne releases. According to the EPA website from whence the most recent release can be obtained, any approved version of the code can be used for compliance.

Version 3.0 of CAP88-PC (Trinity Engineering Associates, Inc., December 2007, which updates edits issued in November 2006, and March and October of 2007) was first approved by the EPA for use in February 2006 to demonstrate compliance with the 10-mrem/year National Emission Standards for Hazardous Air Pollutants (NESHAP) standard. Version 3.0 incorporates updated scientific methods to calculate radiation dose and risk. Version 3.0 also considers age and gender factors not considered in earlier versions. This version uses weighting factors that consider the sensitivity of various human organs to radiation. The model also calculates how long radioactive material will remain in a particular organ or system. Together, these factors are used to calculate dose and cancer risk. The net effect is that dose and risk estimates summarized in the ASER from using CAP88-PC Version 2.0 and Version 3.0 are slightly different, even if the radioactivity released from WVDP and meteorology both remain constant. However, test calculations with both versions have resulted in estimated doses far below the compliance limit.

At this juncture, the EPA accepts the use of any of the three approved versions of CAP88 for compliance purposes. The WVDP used Version 2.0 in 2009 for airborne dose assessment and has used the recommended Version 3.0 code in 2010.

Note that the EPA establishes a drinking water limit of 4-mrem/year (0.04-mSv/year) (40 CFR Parts 141 and 143, Drinking Water Guidelines). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York [NYCRR] 5-152). These limits are not applicable at the WVDP because no drinking water sources within the Cattaraugus Creek drainage basin are affected by the WVDP.

DOE Derived Concentration Guide (DCG). A DCG is defined as the concentration of a radionuclide in air or water that, under conditions of continuous exposure by one exposure mode (i.e., ingestion of water, immersion in air, or inhalation) for one year, would result in an effective dose equivalent of 100 mrem (1 mSv) to a "reference man" (DOE Order 5400.5). DCGs are applicable only at locations where members of the public could be exposed to air or water containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. At the WVDP, DCGs are used as a screening tool for evaluating liquid effluents and airborne emissions. (DCGs are not used to estimate dose.)

State Pollutant Discharge Elimination System (SPDES) Permit Requirements. The site's SPDES permit defines points where sampling must be conducted, sampling frequency, the type of samples to be collected, nonradiological constituents for which samples must be analyzed, and the limits applicable to these constituents. Results are reported monthly to the New York State Department of Environmental Conservation (NYSDEC) in Discharge Monitoring Reports. Requirements of the CY 2010 SPDES permit are summarized in Appendix B-1. On July 1, 2011, a modified SPDES permit became effective for the WVDP.

Radionuclides are not regulated under the SPDES permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

Water Quality Classifications, Standards, and Limits for Ambient Water. The objective of the Clean Water Act of 1972 (CWA) is to restore and maintain the integrity of the nation's waters and ensure that, wherever attainable, waters be made useful for fishing and swimming. To achieve this goal, New York State is delegated with authority under Sections 118, 303, and 510 of the CWA to (1) classify and designate the best uses for receiving waters, such as streams and rivers, within its jurisdiction, and (2) establish and assign water quality standards — goals for achieving the designated best uses for these classified waters.

In addition to achieving CWA goals for fishing and swimming, New York has further classified its jurisdictional waters and established ambient water standards, guidelines, and maximum contaminant levels (MCLs) to achieve objectives under the Safe Drinking Water Act for drinking water. These standards serve as the basis for periodic evaluation of the integrity of the receiving waters and identification of needed controls.

The definitions for best usage classification of New York's jurisdictional waters and the water quality standard goals for these classifications are provided in 6 NYCRR Parts 701–704. Mapping of the Cattaraugus Creek drainage basin and assignment of best usage designations and classification to each receiving water segment within this drainage basin are described in 6 NYCRR Part 838.

According to these regulations, Franks Creek, Quarry Creek, and segments of Buttermilk Creek under the influence of water effluents from the WVDP are identified as Class "C" receiving waters with a minimum designated best usage for fishing with conditions suitable for fish propagation and survival.

Cattaraugus Creek, in the immediate downstream vicinity of the Western New York Nuclear Service Center, is identified as a Class "B" receiving water with best designated usages for swimming and fishing. All fresh (nonsaline) groundwaters within New York are assigned a "GA" classification with a designated best usage as a potable water supply source.

Refer to Appendix B for a summary of the water quality standards, guidelines, and MCLs assigned to these water classifications for those constituents that are included in the WVDP environmental monitoring program for ambient water.

Potable Water Standards. Standards for drinking water are established by the EPA and by NYSDOH. These standards are expressed as MCLs or MCL goals. See Appendix B-1 for a summary of these levels.

Soil and Sediment Concentration Guidelines. Contaminants in soil are potential sources for contamination of groundwater, surface water, ambient air, and plants and animals. No routine soil or sediment

samples were collected in 2010; therefore, no soil or sediment data were available for comparison with applicable guidelines (e.g., from the U.S. Nuclear Regulatory Commission, the EPA, and NYSDEC). Therefore, the guideline levels that were presented in the 2008 ASER have not been included in the 2010 ASER. The routine soil and sediment sampling is next scheduled for 2012.

Evaluation of Monitoring Data with Respect to Limits

Monitoring data for this report were evaluated against the limits presented in Table UI-4, and Appendices B and D. Those locations with results exceeding the limits are listed in Chapter 2, Table 2-4, and in Chapter 4, Table 4-10.

TABLE UI-4
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] for Inhaled Air or Ingested Water (µCi/mL)

Radionuclide	Half-life (years)[b]	DCG in Air	DCG in Water
Gross Alpha (as Am-241)[c]	NA	2E-14	3E-08
Gross Beta (as Sr-90)[c]	NA	9E-12	1E-06
Tritium (H-3)	1.23E+01	1E-07	2E-03
Carbon-14 (C-14)	5.70E+03	6E-09	7E-05
Potassium-40 (K-40)	1.25E+09	9E-10	7E-06
Cobalt-60 (Co-60)	5.27E+00	8E-11	5E-06
Strontium-90 (Sr-90)	2.89E+01	9E-12	1E-06
Technetium-99 (Tc-99)	2.11E+05	2E-09	1E-04
Iodine-129 (I-129)	1.57E+07	7E-11	5E-07
Cesium-137 (Cs-137)	3.00E+01	4E-10	3E-06
Europium-154 (Eu-154)	8.59E+00	5E-11	2E-05
Uranium-232 (U-232)	6.89E+01	2E-14	1E-07
Uranium-233 (U-233)	1.59E+05	9E-14	5E-07
Uranium-234 (U-234)	2.46E+05	9E-14	5E-07
Uranium-235 (U-235)	7.04E+08	1E-13	6E-07
Uranium-236 (U-236)	2.34E+07	1E-13	5E-07
Uranium-238 (U-238)	4.47E+09	1E-13	6E-07
Plutonium-238 (Pu-238)	8.77E+01	3E-14	4E-08
Plutonium-239 (Pu-239)	2.41E+04	2E-14	3E-08
Plutonium-240 (Pu-240)	6.56E+03	2E-14	3E-08
Americium-241 (Am-241)	4.32E+02	2E-14	3E-08

[a] DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv).

[b] Nuclear Wallet Cards. April 2005. National Nuclear Data Center. Brookhaven National Laboratory. Upton, New York.

[c] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

GLOSSARY

A

accuracy - The degree of agreement between a measurement and its true value. The accuracy of a data set is assessed by evaluating results from standards or sample spikes containing known quantities of an analyte.

action plan - An action plan addresses assessment findings and root causes that have been identified in an audit or an assessment report. It is intended to define specific actions that the responsible group will undertake to remedy deficiencies. The plan includes a timetable and resource requirements for implementation of the planned activities.

aquifer - A water-bearing unit of permeable rock or soil that will yield water in usable quantities via wells. Confined aquifers are bounded above and below by less permeable layers. Groundwater in a confined aquifer may be under a pressure greater than the atmospheric pressure. Unconfined aquifers are bounded below by less permeable material, but are not bounded above. The pressure on the groundwater at the surface of an unconfined aquifer is equal to that of the atmosphere.

aquitard - A low-permeability geologic unit that can store groundwater and can transmit groundwater at a very slow rate.

as low as reasonably achievable (ALARA) - An approach to radiation protection that advocates controlling or managing exposures (both individual and collective) to the work force and the general public and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. As used in United States (U.S.) Department of Energy (DOE) Order 5400.5, ALARA is not a dose limit but, rather, a process that has as its objective the attainment of dose levels as far below the applicable limits of the Order as practicable.

B

background radiation - Natural and man-made radiation such as: cosmic radiation, radiation from naturally radioactive elements, and radiation from commercial sources and medical procedures.

becquerel (Bq) - A unit of radioactivity equal to one nuclear transformation per second.

C

categorical exclusion (CX) - A proposed action that the DOE has determined does not individually or cumulatively have a significant effect on the human environment. See 10 Code of Federal Regulations (CFR) 1021.410.

Class A, B, and C low-level waste - Waste classifications from the Nuclear Regulatory Commission's 10 CFR Part 61 rule. Maximum concentration limits are set for specific isotopes. Class A waste disposal is minimally restricted with respect to the form of the waste. Class B waste must meet more rigorous requirements to ensure physical stability after disposal. Higher radionuclide concentration limits are set for Class C waste (the most radioactive), which also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

compliance findings - Conditions that may not satisfy applicable environmental or safety and health regulations, DOE Orders and memoranda, enforcement actions, agreements with regulatory agencies, or permit conditions.

confidence interval - The range of values within which some parameter may be expected to lie with a stated degree of confidence. For example, a value of 10 with an uncertainty of 5 calculated at the 95% confidence level (10±5) indicates there is a 95% probability that the true value of that parameter lies between 5 and 15.

consistency - The condition of showing steady conformity to practices. In the environmental monitoring program, approved procedures are in place so that data collection activities are carried out in a uniform manner to minimize variability.

Core Team - The "core team approach" is a formalized, consensus-based process in which those individuals with decision-making authority, including the DOE, the U.S. Environmental Protection Agency (EPA), and State remedial project managers, work together to reach agreement on key remediation decisions (DOE/EH-413-9911, October 1999). In August 2006, the DOE-West Valley Demonstration Project (DOE-WVDP) requested that the New York State Department of Health (NYSDOH), the U.S. Nuclear Regulatory Commission (NRC), the EPA (region 2), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Energy Research and Development Authority (NYSERDA) participate in a collaborative process (i.e., Core Team) to resolve technical issues associated with the "Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center" (DEIS).

cosmic radiation - High-energy subatomic particles from outer space that bombard the earth's atmosphere. Cosmic radiation is part of natural background radiation.

curie (Ci) - A unit of radioactivity equal to 37 billion (3.7×10^{10}) nuclear transformations per second.

D

data set - A group of data (e.g., factual information such as measurements or statistics) used as a basis for reasoning, discussion, or calculation.

decay (radioactive) - Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons or by spontaneous fission.

derived concentration guide (DCG) - The concentration of a radionuclide in air and water that, under conditions of continuous human exposure for one year by one exposure mode (i.e., ingestion of water, inhalation, or immersion in a gaseous cloud), would result in an effective dose equivalent of 100 millirem (mrem) (1 millisievert [mSv]). See Table UI-4 in the "Useful Information" section of this report.

detection limit or level (DL) - This term may also be expressed as "method detection limit" (MDL). The smallest amount of a substance that can be distinguished in a sample by a given measurement procedure at a given confidence level. (See *lower limit of detection*.)

dispersion (airborne) - The process whereby particulates or gases are spread and diluted in air as they move away from a source.

dispersion (groundwater) - The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through the subsurface.

dosimeter - A portable device for measuring the total accumulated exposure to ionizing radiation.

downgradient - The direction of water flow from a reference point to a selected point of interest at a lower elevation than the reference point. (See *gradient.*)

E

effective dose - (See *effective dose equivalent* under *radiation dose*.)

effluent - Any treated or untreated air emission or liquid discharge to the environment.

effluent monitoring - Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants to determine compliance with applicable standards, permit requirements, and administrative controls.

environmental assessment (EA) - An evaluation that provides sufficient evidence and analysis for determining whether an environmental impact statement is required or a finding of no significant impact should be issued. See 10 CFR 1021.

environmental impact statement (EIS) - A detailed statement that includes the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, and alternatives to the proposed action. Detailed information may be found in Section 10 CFR 1021.

environmental management system (EMS) - The systematic application of business management practices to environmental issues, including defining the organizational structure, planning for activities, iden-

tifying responsibilities, and defining practices, procedures, processes, and resources.

environmental monitoring - The collection and analysis of samples or the direct measurement of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

environmental surveillance - The collection and analysis of samples or the direct measurement of air, water, soil, foodstuff, and biota in the environs of a facility of interest to determine compliance with applicable standards and to detect trends and environmental pollutant transport.

exposure - The subjection of a target (usually living tissue) to radiation.

F

fallout - The settling to earth of radioactive materials mixed into the earth's atmosphere.

finding - A DOE compliance term. A finding is a statement of fact concerning a condition in the Environmental, Safety, and Health program that was investigated during an appraisal. Findings include best management practice findings, compliance findings, and noteworthy practices. A finding may be a simple statement of proficiency or a description of deficiency (i.e., a variance from procedures or criteria). (See also *self-assessment*.)

fission - The act or process of splitting into parts. A nuclear reaction in which an atomic nucleus splits into fragments (i.e., fission products, usually fragments of comparable mass) with the evolution of approximately 100 million to several hundred million electron volts of energy.

G

gamma isotopic (also *gamma scan*) - An analytical method by which the quantity of several gamma ray-emitting radioactive isotopes may be determined simultaneously. Typical nuclear fuel cycle isotopes determined by this method include, but are not limited to, cobalt-60, zirconium-95, ruthenium-106, silver-110m, antimony-125, cesium-134, cesium-137, and europium-154. Naturally occurring isotopes for which samples may be analyzed are beryllium-7, potassium-40, radium-224, and radium-226.

gradient - Change in value of one variable with respect to another variable, such as a vertical change over a horizontal distance.

groundwater - Subsurface water in the pore spaces and fractures of soil and bedrock units.

H

half-life - The time in which half the atoms of a radionuclide disintegrate into another nuclear form. The half-life may vary from a fraction of a second to billions of years.

hazardous waste - A waste or combination of wastes that because of quantity, concentration, or physical, chemical, or infectious characteristics may: a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

high-level radioactive waste (HLW) - The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation. (See also *transuranic waste*.)

hydraulic conductivity - The ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium; the ratio describing the rate at which water can move through a permeable medium.

I

integrated safety management system (ISMS) - A process that describes the programs, policies, and procedures used by West Valley Environmental Services LLC (WVES) and the DOE to ensure that WVES establishes a safe workplace for the employees, the public, and the environment. The guiding principles of ISMS are line management responsibility for safety; clear roles and responsibilities; competence commensurate with responsibilities; balanced priorities; identification of safety standards and requirements; hazard controls; and operations authorization.

interim status - The status of any currently existing facility that becomes subject to the requirement to have a Resource Conservation and Recovery Act (RCRA) permit because of a new statutory or regulatory amendment to RCRA.

ion - An atom or group of atoms with an electric charge.

ion exchange - The reversible exchange of ions contained in solution with other ions that are part of the ion-exchange material.

isotope - Different forms of the same chemical element that are distinguished by having the same number of protons but a different number of neutrons in the nucleus. An element can have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium, with one, two, and three neutrons in the nucleus, respectively.

K

knickpoint - A term in geomorphology to describe a location in a river or channel where there is a sharp change in channel slope resulting from differential rates of erosion.

L

land disposal restrictions (LDR) - Regulations promulgated by the EPA (and by NYSDEC in New York State) governing the land disposal of hazardous wastes. The wastes must be treated using the best demonstrated available technology or must meet certain treatment standards before being disposed.

lower limit of detection (LLD) - The lowest limit of a given parameter that an instrument is capable of detecting. A measurement of analytical sensitivity.

low-level radioactive waste (LLW) - Radioactive waste not classified as high-level radioactive waste, transuranic waste, spent fuel, or uranium mill tailings. (See *Class A, B, and C low-level waste*.)

M

maximally exposed individual (MEI) - On-site (occupational) or off-site (nonoccupational) person that receives the highest dose from a release scenario.

maximally exposed off-site individual (MEOSI) - Member of the general public receiving the highest dose from the effluent release.

mean - The average value of a series of measurements.

metric ton - (See *ton, metric*.)

millirem (mrem) - A unit of radiation dose equivalent that is equal to one one-thousandth of a rem. An individual member of the public can receive up to 100 mrem per year according to DOE standards. This limit does not include the roughly 310 mrem, on average, that people in the U.S. receive annually from natural background radiation.

minimum detectable concentration (MDC) or **method detection limit (MDL) -** Depending on the sample medium, the smallest amount or concentration of a radioactive or nonradioactive analyte that can be reliably detected using a specific analytical method. Calculations of the minimum detectable concentrations are based on the lower limit of detection.

mixed waste (MW) - A waste that is both radioactive and RCRA hazardous.

N

n-Dodecane/tributyl phosphate - An organic solution composed of 30% tributyl phosphate (TBP) dissolved in n-dodecane used to first separate the uranium and plutonium from the fission products in dissolved nuclear fuel and then to separate the uranium from the plutonium.

neutron - An electrically neutral subatomic particle in the baryon family with a mass 1,839 times that of an electron, stable when bound in an atomic nucleus, and having a mean lifetime of approximately 16.6 minutes as a free particle.

Nitrocision® - A robotically controlled, pressurized, liquid nitrogen tooling system used to remove high-activity fixed contamination from cell and equipment surfaces.

notice of violation (NOV) - Generally, an official notification from a regulatory agency of noncompliance with permit requirements. (An example would be a letter of notice from a regional water engineer in response to an instance of significant noncompliance with a State Pollutant Discharge Elimination System [SPDES] permit.)

nucleus - The positively-charged central region of an atom, made up of protons and neutrons and containing almost all of the mass of the atom.

O

outfall - The discharge end of a drain or pipe that carries wastewater or other liquid effluents into a ditch, pond, or river.

P

parameter - Any of a set of physical properties whose values determine the characteristics or behavior of something (e.g., temperature, pressure, density of air). In relation to environmental monitoring, a monitoring parameter is a constituent of interest. Statistically, the term "parameter" is a calculated quantity, such as a mean or variance, that describes a statistical population.

particulates - Solid particles and liquid droplets small enough to become airborne.

person-rem - The sum of the individual radiation dose equivalents received by members of a certain group or population. It may be calculated by multiplying the average dose per person by the number of persons exposed. For example, a thousand people each exposed to one millirem would have a collective dose of one person-rem.

plume - The distribution of a pollutant in air or water after being released from a source.

practical quantitation limits (PQLs) - The PQL is the minimum concentration of an analyte that can be measured within specified limits of precision during routine laboratory operations (NYSDEC, 1991).

precision - The degree of reproducibility of a measurement under a given set of conditions. Precision in a data set is assessed by evaluating results from duplicate field or analytical samples.

proton - A stable, positively-charged subatomic particle in the baryon family with a mass 1,836 times that of an electron.

pseudo-monitoring point - A theoretical monitoring location rather than an actual physical location; a calculation based on analytical test results of samples obtained from other associated, tributary, monitored locations. (Point 116 at the WVDP is classified as a "pseudo" monitoring point because samples are not physically collected at that location. Rather, using analytical results from samples collected from "real" upstream outfall locations, compliance with the total dissolved solids limit in the WVDP's SPDES permit is calculated for this theoretical point.)

Q

quality factor (QF) - The extent of tissue damage caused by different types of radiation of the same energy. The greater the damage, the higher the quality factor. More specifically, the factor by which absorbed doses are multiplied to obtain a quantity that indicates the degree of biological damage produced by ionizing radiation. See *radiation dose*.) The factor is dependent upon radiation type (alpha, beta, gamma, or x-ray) and exposure (internal or external).

R

rad - Radiation absorbed dose. One hundred ergs of energy absorbed per gram of solid material.

radiation - The process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

***alpha radiation* -** The least penetrating type of radiation. Alpha radiation (similar to a helium nucleus) can be stopped by a sheet of paper or the outer dead layer of skin.

***beta radiation* -** Electrons emitted from a nucleus during fission and nuclear decay. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

***gamma radiation* -** A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding such as lead, concrete, or steel to be effectively attenuated.

***internal radiation* -** Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or man-made radionuclides in body tissues.

radiation dose:

***absorbed dose* -** The amount of energy absorbed per unit mass in any kind of matter from any kind of ionizing radiation. Absorbed dose is measured in rads or grays.

collective dose equivalent - The sum of the dose equivalents for all the individuals comprising a defined population. The per capita dose equivalent is the quotient of the collective dose equivalent divided by the population. The unit of collective dose equivalent is person-rem or person-sievert.

collective effective dose equivalent - The sum of the effective dose equivalents for the individuals comprising a defined population. Units of measurement are person-rem or person-sievert. The per capita effective dose equivalent is obtained by dividing the collective dose equivalent by the population. Units of measurement are rem or sievert.

committed dose equivalent - A measure of internal radiation. The predicted total dose equivalent to a tissue or organ over a 50-year period after a known intake of a radionuclide into the body. It does not include contributions from sources of external penetrating radiation. Committed dose equivalent is measured in rem or sievert.

committed effective dose equivalent - The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is measured in rem or sievert.

total effective dose equivalent - The summation of the products of the dose equivalent received by specified tissues of the body and the appropriate weighting factors. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem or seivert.

radioactivity - A property possessed by some elements (such as uranium) whereby alpha, beta, or gamma rays are spontaneously emitted.

radioisotope - A radioactive isotope of a specified element. Carbon-14 is a radioisotope of carbon. Tritium is a radioisotope of hydrogen. (See *isotope*.)

radionuclide - A radioactive nuclide. Radionuclides are variations (isotopes) of elements. They have the same number of protons and electrons but different numbers of neutrons, resulting in different atomic masses. There are hundreds of known nuclides, both man-made and naturally occurring.

reference man - A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

rem - An acronym for Roentgen Equivalent Man. A unit of radiation exposure that indicates the potential effect of radiation on human cells.

remote-handled waste - At the WVDP, waste that has an external surface dose rate that exceeds 100 millirem per hour or a high level of alpha and/or beta surface contamination and, therefore, must be handled in such a manner that it does not come into physical contact with workers.

roentgen - A unit of exposure to ionizing radiation. It is that quantity of gamma or x-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. The unit is named after Wilhelm Roentgen, German scientist who discovered x-rays in 1895.

S

self-assessment - Appraisals of work at the WVDP by individuals, groups, or organizations responsible for overseeing and/or performing the work. Self-assessments are intended to provide an internal review of performance to determine that specific functional areas are in programmatic and site-specific compliance with applicable DOE directives, WVDP procedures, and regulations.

finding - A direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements. A finding requires documented corrective action.

observation - A condition that, while not a direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements, could result in a finding if not corrected. An observation requires documented corrective action.

good practice - A statement of proficiency or confirmed excellence worthy of documenting.

sievert - A unit of dose equivalent from the International System of Units (Systeme Internationale). Equal to one joule per kilogram.

solid waste management unit (swmu) - Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released or created. (See also *super solid waste management unit*.)

spent fuel - Nuclear fuel that has been used in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

spill - A spill or release is defined as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or otherwise disposing of substances from the ordinary containers employed in the normal course of storage, transfer, processing, or use," outside of the intended procedural action.

stakeholder - A person or group that has an investment, share, or interest in something. At the WVDP stakeholders include Project management, scientists, other employees, politicians, regulatory agencies, local and national interest groups, and members of the general public.

standard deviation - An indication of the dispersion of a set of results around their average.

super solid waste management unit (SSWMU) - Individual solid waste management units that have been grouped and ranked into larger units – super solid waste management units – because some individual units are contiguous or so close together as to make monitoring of separate units impractical. This terminology is unique to the WVDP, and is not an official regulatory term. (See also *solid waste management unit*.)

surface water - Water that is exposed to the atmospheric conditions of temperature, pressure, and chemical composition at the surface of the earth.

surveillance - The act of monitoring or observing a process or activity to verify conformance with specified requirements.

T

thermoluminescent dosimeter (TLD) - A device that luminesces upon heating after being exposed to radiation. The amount of light emitted is proportional to the amount of radiation to which the luminescent material has been exposed.

ton, metric (also *tonne*) **-** A unit of mass equal to 1,000 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.")

ton (*short ton*) **-** A unit of weight equal to 2,000 pounds or 907.1847 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.)

transuranic (TRU) waste - Waste containing transuranic elements, that is, those elements with an atomic number greater than 92, including neptunium, plutonium, americium, and curium.

U

universal wastes - Wastes subject to special management provisions that are intended to ease the management burden and facilitate recycling of such materials. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps.

upgradient - Referring to the flow of water or air, "upgradient" is analogous to upstream. Upgradient is a point that is "before" an area of study and that is used as a baseline for comparison with downstream or downgradient data. (See *gradient* and *downgradient*.)

V

vitrification - A waste treatment process that encapsulates or immobilizes radioactive wastes in a glassy matrix to prevent them from reacting in disposal sites. Vitrification involves adding chemicals, glass formers, and waste to a heated vessel and melting the mixture into a glass that is then poured into a canister.

W

watershed - The area contained within a drainage divide above a specified point on a stream or river.

water table - The upper surface in a body of groundwater; the surface in an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure.

well point - A small-diameter well that is hammer-driven rather than placed into a pre-drilled borehole.

X

x-ray - Penetrating electromagnetic radiations having wave lengths shorter than those of visible light. They are usually produced by bombarding a metallic target with fast electrons in a high vacuum. In nuclear reactions it is customary to refer to photons originating in the nucleus as gamma rays and those originating in the extranuclear part of the atom as x-rays. These rays are sometimes called Roentgen rays after their discoverer, W.C. Roentgen.

ACRONYMS AND ABBREVIATIONS

Note: ***For abbreviations of units of measure, see Table UI-2, "Units of Measure Used in This ASER," in the "Useful Information" section.***

A

ACM - Asbestos-Containing Material
AEA - Atomic Energy Act
ALARA - As Low As Reasonably Achievable
alpha-BHC - alpha-hexachlorocyclohexane
ANSI - American National Standards Institute
AOC - Ashford Office Complex
ARRA - American Recovery and Reinvestment Act
ASER - Annual Site Environmental Report
ASME - American Society of Mechanical Engineers
ASQ - American Society for Quality
AWQS - Ambient Water Quality Standard

B

B&P - Baltimore and Pittsburgh Railroad
BAT - Best Available Technology
BCG - Biota Concentration Guide
BEIR - Biological Effects of Ionizing Radiation
BMP - Best Management Plan
BOD_5 - Biochemical Oxygen Demand (5-day)
BR - Shale Bedrock

C

CAA - Clean Air Act
CBS - Chemical Bulk Storage
CCHD - Cattaraugus County Health Department
CCZ - Criticality Control Zone
CD - Compact Disk
CDDL - Construction and Demolition Debris Landfill
CEDE - Committed Effective Dose Equivalent
CEMP - Code of Environmental Management Principles (for Federal Agencies)
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFL - Compact Fluorescent Lighting
CFR - Code of Federal Regulations
CHBWV - CH2MHill • B&W West Valley
CMS - Corrective Measures Study
ConOps - Conduct of Operations
CPC - Chemical Process Cell
CPC-WSA - Chemical Process Cell Waste Storage Area
CSAP - Characterization Sampling and Analysis Plan
CSPF - Container Sorting and Packaging Facility
CSRF - Contact Size-Reduction Facility
CSS - Cement Solidification System
CTF - (West Valley) Citizen Task Force
CUP - Cask Unloading Pool
CWA - Clean Water Act
CX - Categorical Exclusion
CY - Calendar Year

D

D&D - Decontamination and Decommissioning
DCA - Dichloroethane
DCDFMeth - Dichlorodifluoromethane
DCE - Dichloroethylene
DEIS - Draft Environmental Impact Statement
DCG - Derived Concentration Guide
DCGL - Derived Concentration Guideline Level
DL - Detection Limit or Detection Level
DMR - Discharge Monitoring Report
DOE - (U.S.) Department of Energy
DOE-EM - Department of Energy, Office of Environmental Management
DOE-HQ - Department of Energy, Headquarters Office
DOE-WVDP - Department of Energy, West Valley Demonstration Project (title as of June 2006)
DOT - (U.S.) Department of Transportation
DP - Decommissioning Plan
DWW - Dewatering Well

E

E-Star - Environmental Sustainability
E.O. - Executive Order
EA - Environmental Assessment
ECL - (New York State) Environmental Conservation Law
EDE - Effective Dose Equivalent
EHS - Extremely Hazardous Substance
EIS - Environmental Impact Statement
ELIMS - Environmental Laboratory Information Management System
ELAB - (WVDP) Environmental Laboratory

ELAP - (New York State Department of Health) Environmental Laboratory Approval Program
EMS - Environmental Management System
EOC - Emergency Operations Center
EPA - (U.S.) Environmental Protection Agency
EPCRA - Emergency Planning and Community Right-to-Know Act
EPEAT - Electronic Procurement Environmental Assessment Tool
ERO - Emergency Response Organization
ERRC - Electronics Reuse and Recycling Challenge
ES&H - Environmental, Safety, and Health
ESH&Q - Environmental, Safety, Health, and Quality

F

FEIS - Final Environmental Impact Statement
FFCA - Federal Facilities Compliance Act
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FONSI - Finding of No Significant Impact
FR - Federal Register
FRS - Fuel Receiving and Storage
FSS - Final Status Survey
FSSP - Final Status Survey Plan
FY - Fiscal Year

G

GEL - GEL Laboratories LLC
GET - General Employee Training
GMP - Groundwater Monitoring Plan; Groundwater Monitoring Program
GPC - General Purpose Cell
GSL - (Site-Specific) Groundwater Screening Levels
GTCC - Greater Than Class C

H

HDPE - High-Density Polyethylene
HEPA - High-Efficiency Particulate Air (filter)
HLW - High-Level (radioactive) Waste
HP/BBS - Human Performance/Behavior-Based Safety
HPIC - High-Pressure Ion Chamber
HTO - Hydrogen Tritium Oxide
HVAC - Heating, Ventilation, and Air Conditioning

I

IAEA - International Atomic Energy Agency
IAP - Integrated Assessment Program
ICRP - International Commission on Radiological Protection
IM - Interim Measure
INEEL - Idaho National Engineering and Environmental Laboratory (historical)
INL - Idaho National Laboratory
IR - Issue Report
IRTS - Integrated Radwaste Treatment System
ISCORS - Interagency Steering Committee on Radiation Standards
ISMS - Integrated Safety Management System
ISO - International Organization for Standardization
IWSF - Interim Waste Storage Facility

K

KRS - Kent Recessional Sequence
KT - Kent Till
KWhr - Kilowatt hour

L

LAS - Linear Alkylate Sulfonate
LCSN - Lamont Cooperative Seismographic Network
LDR - Land Disposal Restriction
LFR - Live-Fire Range
LiDAR - Light Detection and Ranging
LIMS - Laboratory Information Management System
LLD - Lower Limit of Detection
LLW - Low-Level (radioactive) Waste
LLW2 - Low-Level (liquid) Waste Treatment Facility
LLWTF - Low-Level Waste Treatment Facility (historical)
LPS - Liquid Pretreatment System
LSA - Lag (Low-Level Radioactive Waste) Storage Area
LSA #1 - Lag Storage Addition #1
LSA #2 - Lag Storage Hardstand #2
LSB - Lag Storage Building
LTR - License Termination Rule
LTS - Lavery Till Sand
LWTS - Liquid Waste Treatment System

M

MAPEP - Mixed Analyte Performance Evaluation Program
MCL - Maximum Contaminant Level
MCLG - Maximum Contaminant Level Goal
MDC - Minimum Detectable Concentration
MDL - Method Detection Limit (also Minimum Detection Level)
MEI - Maximally Exposed Individual
MEOSI - Maximally Exposed Off-Site Individual
MGD - Million Gallons per Day
MMBTU - One million BTUs (a thousand thousand BTUs), also expressed as MBTU
MOU - Memorandum of Understanding
MPPB - Main Plant Process Building

MSDS - Material Safety Data Sheet
MW - (Radioactive and Hazardous) Mixed Waste

N

NCRP - National Council on Radiation Protection and Measurements
NDA - Nuclear Regulatory Commission (NRC)-Licensed Disposal Area
NELAC - National Environmental Laboratory Accreditation Conference
NEPA - National Environmental Policy Act
NESHAP - National Emission Standards for Hazardous Air Pollutants
NFS - Nuclear Fuel Services, Inc.
NGVD - National Geodetic Vertical Datum
NH_3 - Ammonia
NIST - National Institute of Standards and Technology
NOAA - National Oceanic and Atmospheric Administration
NOI - Notice of Intent
NOT - Notice of Termination
NOV - Notice of Violation
NO_2-N - Nitrite (as N)
NO_3-N - Nitratte (as N)
NO_x - Nitrogen Oxides
NPDES - National Pollutant Discharge Elimination System
NPGMP - North Plateau Groundwater Monitoring Plan
NPGRS - North Plateau Groundwater Recovery System
NPOC - Nonpurgeable Organic Carbon
NRC - (U.S.) Nuclear Regulatory Commission
NTS - Nevada Test Site
NTU - Nephelometric Turbidity Unit
NYCRR - New York Official Compilation of Codes, Rules, and Regulations
NYS - New York State
NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health
NYSDOH ELAP - (NYSDOH) Environmental Laboratory Approval Program
NYSDOL - New York State Department of Labor
NYSERDA - New York State Energy Research and Development Authority
NYSGS - New York State Geological Survey

O

OAD - Office of Atomic Development
OSHA - Occupational Safety and Health Administration
OVE - Outdoor Ventilated Enclosure

P

PC - Personal Computer
PCB - Polychlorinated Biphenyl
PE - Professional Engineer
PMC - Process Mechanical Cell
PMP - Performance Monitoring Plan
PNL - Pacific Northwest Laboratory
POC - Principal Organic Contaminant
PQL - Practical Quantitation Limit
PTW - Permeable Treatment Wall
PTW PMP - Permeable Treatment Wall Performance Monitoring Plan
PUREX - Plutonium Uranium Reduction Extraction
PVC - Polyvinyl Chloride
PVS - Permanent Ventilation System
PVU - Portable Ventilation Unit

Q

QA - Quality Assurance
QAP - Quality Assessment Program (also Quality Assurance Program)
QC - Quality Control
QF - Quality Factor

R

RAI - Request for Additional Information
RAO - Remedial Action Objectives
RCRA - Resource Conservation and Recovery Act
REM - Roentgen Equivalent Man
RFI - RCRA Facility Investigation
RFP - Request for Proposal
RHWF - Remote-Handled Waste Facility
RMW - Regulated Medical Waste
ROD - Record of Decision

S

S&G - Sand and Gravel Unit
SAR - Safety Analysis Report
SARA - Superfund Amendments and Reauthorization Act
SD - Standard Deviation
SDA - (New York) State-Licensed Disposal Area
SDWA - Safe Drinking Water Act
SEC - Safety and Ecology Corporation
SEQR - (New York) State Environmental Quality Review Act
SI - Systeme Internationale (International System of Units)
SMS - Safety Management System
SNR - Supplier Nonconformance Report
SO_x - Sulfur Oxides

SOP - Standard Operating Procedure
SPCC - Spill Prevention, Control, and Countermeasures (Plan)
SPDES - (New York) State Pollutant Discharge Elimination System
SRM - Standard Reference Material
SSP - Site Sustainability Plan
SSWMU - Super Solid Waste Management Unit
STP - Site Treatment Plan
STS - Supernatant Treatment System
SU - Standard Unit
SVOC - Semivolatile Organic Compound
SWMU - Solid Waste Management Unit
SWPPP - Storm Water Pollution Prevention Plan
SWS - Slack Water Sequence

T

T&VDS - Tank and Vault Drying System
TAGM - Technical and Administrative Guidance Memorandum
TBP - Tributyl Phosphate
TBU - Thick-Bedded Unit
TCE - Trichloroethylene
TDS - Total Dissolved Solids
TEDE - Total Effective Dose Equivalent
THOREX - Thorium Reduction Extraction
TKN - Total Kjeldahl Nitrogen
TLD - Thermoluminescent Dosimeter
TOC - Total Organic Carbon
TOGS - Technical and Operational Guidance Series
TOX - Total Organic Halides
TRI - Toxic Release Inventory
TRU - Transuranic
TSC - Technical Support Center
TSCA - Toxic Substances Control Act
TSDF - Treatment, Storage, and Disposal Facility
TSS - Total Suspended Solids

U

U.S. - United States
UB - State University of New York at Buffalo
UDF - Unit Dose Factor
UIC - Underground Injection Control
ULT - Unweathered Lavery Till
URS - URS - Energy & Construction Division
USACE - U.S. Army Corps of Engineers
USC - United States Code
USGS - United States Geological Survey
UV - Ultraviolet

V

VIT - Vitrification
VLDPE - Very-Low-Density Polyethylene
VOC - Volatile Organic Compound
VPP - (U.S. DOE) Voluntary Protection Program

W

WET - Whole Effluent Toxicity
WLT - Weathered Lavery Till
WMA - Waste Management Area
WMIN/P2 - Waste Minimization/Pollution Prevention
WNYNSC - Western New York Nuclear Service Center
WRES - Washington Regulatory and Environmental Services
WTC - Water Treatment Chemical
WTF - Waste Tank Farm
WVCS - West Valley Central School
WVDP - West Valley Demonstration Project
WVES - West Valley Environmental Services LLC
WVNS - West Valley Nuclear Services (historical)
WVNSCO - West Valley Nuclear Services Company (historical)
WWTF - Wastewater Treatment Facility

X

XC-1 - Extraction Cell 1
XC-3 - Extraction Cell 3

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APPENDIX B-1

Summary of Water Limits, Guidelines, and Standards

TABLE B-1A
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program - Effective During CY 2010

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
001 (Process and Storm Wastewater)	Flow	Monitor	2/discharge
	Aluminum, total	14.0 mg/L	1/discharge
	Ammonia (NH_3)	Monitor	2/discharge
	Arsenic, dissolved	0.15 mg/L	1/discharge
	Biochemical oxygen demand - 5-day (BOD_5)	10.0 mg/L	2/discharge
	Iron, total	Monitor	2/discharge
	Zinc, total recoverable	0.48 mg/L	2/year
	Solids, total suspended	45 mg/L	2/discharge
	Cyanide, amenable to chlorination	0.022 mg/L	2/year
	Settleable solids	0.3 mL/L	2/discharge
	pH (range)	6.5–8.5 SU	1/discharge
	Oil and grease	15.0 mg/L	2/discharge
	Sulfate (as S)	Monitor	2/discharge
	Sulfide, dissolved	0.4 mg/L	1/discharge
	Manganese, total	2.0 mg/L	2/year
	Nitrate (as N)	Monitor	2/discharge
	Nitrite (as N)	0.1 mg/L	2/discharge
	Chromium, total recoverable	0.3 mg/L	2/year
	Chromium, hexavalent, total recoverable	0.011 mg/L	1/year
	Cadmium, total recoverable	0.002 mg/L	1/year
	Copper, total recoverable	0.030 mg/L	2/year
	Copper, dissolved	Monitor	2/year
	Lead, total recoverable	0.006 mg/L	4/year
	Nickel, total recoverable	0.14 mg/L	2/year
	Dichlorodifluoromethane	0.01 mg/L	1/year
	Trichlorofluoromethane	0.01 mg/L	1/year
	3,3-dichlorobenzidine	0.01 mg/L	1/year
	Tributyl phosphate	32 mg/L	1/year
	Vanadium, total recoverable	0.014 mg/L	1/discharge
	Cobalt, total recoverable	0.005 mg/L	1/discharge
	Selenium, total recoverable	0.004 mg/L	2/discharge
	Hexachlorobenzene	0.02 mg/L	1/year
	Alpha-hexachlorocyclohexane (Alpha - BHC)	0.00001 mg/L	1/year
	Heptachlor	0.00001 mg/L	2/year
	Surfactants (as linear alkylate sulfonate [LAS])	0.4 mg/L	2/year
	Xylene	0.05 mg/L	1/year
	2-butanone	0.5 mg/L	1/year
	Total dissolved solids	Monitor	2/discharge
	Mercury, total	200 ng/L	2/discharge

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1A *(concluded)*
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program - Effective During CY 2010

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
01B (Internal Process Monitoring Point)	Flow	Monitor	weekly
	Mercury, total	10.0 µg/L	2/month
007 (Sanitary and Utility Wastewater)	Flow	Monitor	3/month
	Ammonia (as NH_3)	Monitor	3/month
	BOD5	10.0 mg/L	3/month
	Iron, total	Monitor	3/month
	Solids, total suspended	45 mg/L	3/month
	Solids, settleable	0.3 mL/L	weekly
	pH (range)	6.5–8.5 SU	weekly
	Nitrite (as N)	0.1 mg/L	3/month
	Oil and grease	15.0 mg/L	3/month
	Chlorine, total residual	0.1 mg/L	weekly
Sum of Outfalls 001, 007, and 008	Iron, total	0.30 mg/L	3/month
	BOD_5	Monitor	3/month
Sum of Outfalls 001 and 007	Ammonia (as NH_3)	2.1 mg/L	3/month
Pseudo-monitoring point (116)	Solids, total dissolved	500 mg/L	2/discharge

Outfall	Parameter	Action Level	Sample Frequency
001 (Process and Storm Wastewater)	Barium	0.5 mg/L	annual
	Antimony	1.0 mg/L	annual
	Chloroform	0.3 mg/L	annual
	Titanium	0.65 mg/L	semiannual
	Bromide	5.0 mg/L	quarterly
	Boron	2.0 mg/L	quarterly
007 (Sanitary and Utility Wastewater)	Chloroform	0.20 mg/L	annual

Note: Limits for point 008 (French Drain) are not listed because the point has been closed off since 2001.

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1B
New York State Water Quality Standards and Guidelines[a]

Parameter	Units	Class A	Class B	Class C	Class D	Class GA
Gross Alpha[b]	pCi/L (µCi/mL)	15 (1.5E-08)	--	--	--	15 (1.5E-08)
Gross Beta[c]	pCi/L (µCi/mL)	1,000 (1E-06)	--	--	--	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	--	--	--
Alpha BHC	mg/L	0.000002	0.000002	0.000002	0.000002	0.00001
Aluminum, Dissolved	mg/L	0.10	0.10	0.10	--	--
Aluminum, Total	mg/L	--	--	--	--	--
Ammonia, Total as N	mg/L	0.09–2.1	0.09–2.1	0.09–2.1	0.67–29	2.0
Antimony, Total	mg/L	0.003	--	--	--	0.003
Arsenic, Dissolved	mg/L	0.050	0.150	0.150	0.340	--
Arsenic, Total	mg/L	0.050	--	--	--	0.025
Barium, Total	mg/L	1.00	--	--	--	1.00
Beryllium, Total	mg/L	0.003	[d]	[d]	--	0.003
Boron, Total	mg/L	10.0	10.0	10.0	--	1.00
Bromide	mg/L	2.00	--	--	--	2.00
Cadmium, Dissolved[e]	mg/L	--	--	--	--	--
Cadmium, Total	mg/L	0.005	--	--	--	0.005
Calcium, Total	mg/L	--	--	--	--	--
Chloride	mg/L	250	--	--	--	250
Chromium, Dissolved[e]	mg/L	--	--	--	--	--
Chromium, Total	mg/L	0.05	--	--	--	0.05
Cobalt, Total[f]	mg/L	0.005	0.005	0.005	0.110	--
Conductivity	µmhos/cm@25°C	--	--	--	--	--
Copper, Dissolved[e]	mg/L	--	--	--	--	--
Copper, Total	mg/L	0.20	--	--	--	0.20
Cyanide	mg/L	0.0052	0.0052	0.0052	0.22	0.200
Dissolved Oxygen (minimum)	mg/L	4.0	4.0	4.0	3.0	--
Fluoride[e]	mg/L	--	--	--	--	1.5
Hardness	mg/L	--	--	--	--	--
Iron and Manganese (sum)	mg/L	--	--	--	--	0.500
Iron, Total	mg/L	0.30	0.30	0.30	0.30	0.30

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standard for classes "B" and "C" are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1B *(concluded)*
New York State Water Quality Standards and Guidelines[a]

Parameter	Units	Class A	Class B	Class C	Class D	Class GA
Lead, Dissolved[e]	mg/L	--	--	--	--	--
Lead, Total	mg/L	0.050	--	--	--	0.025
Magnesium, Total	mg/L	35.0	--	--	--	35.0
Manganese, Total	mg/L	0.30	--	--	--	0.30
Mercury, Dissolved	mg/L	0.0000007	0.0000007	0.0000007	0.0000007	--
Mercury, Total	mg/L	0.0007	--	--	--	0.0007
Nickel, Dissolved[e]	mg/L	--	--	--	--	--
Nickel, Total	mg/L	0.10	--	--	--	0.10
Nitrate-N	mg/L	10.0	--	--	--	10.0
Nitrate + Nitrite	mg/L	10.0	10.0	10.0	10.0	10.0
Nitrite-N	mg/L	0.10	0.10	0.10	--	1.00
NPOC[g]	mg/L	0.10	--	--	--	--
Oil & Grease	mg/L	--	--	--	--	--
pH	SU	6.5–8.5[h]	6.5–8.5[h]	6.5–8.5[h]	6.0–9.5	6.5–8.5[h]
Potassium, Total	mg/L	--	--	--	--	--
Selenium, Dissolved	mg/L	0.0046	0.0046	0.0046	--	--
Selenium, Total	mg/L	0.01	--	--	--	0.01
Silver, Total	mg/L	0.05	--	--	--	0.05
Sodium, Total	mg/L	--	--	--	--	20.0
Solids, Total Dissolved	mg/L	500	500	500	--	500
Solids, Total Suspended	mg/L	--	--	--	--	--
Sulfate	mg/L	250	--	--	--	250
Sulfide (undissociated form)	mg/L	0.002	0.002	0.002	--	0.050 (as HS)
Surfactants (as LAS)	mg/L	0.04	0.04	0.04	--	--
Thallium, Total[f]	mg/L	0.0005	0.008	0.008	0.020	0.0005
Titanium, Total	mg/L	--	--	--	--	--
TOX (total organic halides)[g]	mg/L	0.10	--	--	--	--
Vanadium, Total[f]	mg/L	0.014	0.014	0.014	0.190	--
Zinc, Dissolved[e]	mg/L	--	--	--	--	--
Zinc, Total	mg/L	2.00	--	--	--	2.00

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standards for classes “B” and “C” are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1C
New York State Department of Health (NYSDOH)/U.S. Environmental Protection Agency (EPA) Potable Water MCLs, MCLGs, and Raw Water Standards

Parameter	*Units*	*NYSDOH or EPA MCL* [a]	*EPA MCLG* [b]	*NYSDOH Raw Water Standards* [c]
Gross Alpha	pCi/L (µCi/mL)	15 (1.5E-08)[d]	0	--
Gross Beta	pCi/L (µCi/mL)	50 (5E-08)[e]	0	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	10 (1E-08)
Antimony, Total	mg/L	0.006	0.006	--
Arsenic, Total	mg/L	0.05	--	0.05
Barium, Total	mg/L	2.00	2.00	1.0
Beryllium, Total	mg/L	0.004	0.004	--
Cadmium, Total	mg/L	0.005	0.005	0.01
Chromium, Total	mg/L	0.10	0.10	--
Conductivity	µmhos/cm@25°C	--	--	--
Copper, Total	mg/L	1.3	1.3	<0.2
Cyanide	mg/L	0.2	0.2	<0.1
E. Coli	NA	one positive sample	0	--
Fluoride	mg/L	2.2	--	<1.5
Free Residual Chlorine	mg/L	0.02 (min) 4.0 (max)	--	--
Haloacetic Acids-Five (5)	mg/L	0.060	--	--
Iron, Total	mg/L	0.3	--	--
Lead, Total	mg/L	0.015	0	0.05
Mercury, Total	mg/L	0.002	0.002	0.005
Nickel, Total	mg/L	--	--	--
Nitrate-N	mg/L	10	10	--
pH	SU	--	--	6.5–8.5
POC (Principle Organic Contaminant)	mg/L	--	0.0005	--
Selenium, Total	mg/L	0.05	0.05	0.01
Solids, Total Dissolved	mg/L	--	--	500
Thallium, Total	mg/L	0.002	0.0005	--
Total Coliform	NA	2 or more positive samples	0	--
Total Trihalomethanes	mg/L	0.080	--	--
Turbidity	NTU	1 (max)	--	--

-- No applicable guideline or reference standard available
Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.
NA - Not applicable
[a] MCL - Listed is NYSDOH or EPA Maximum Contaminant Level. Sources: 40 CFR 141 and/or 5 NYCRR 5-1.52, whichever is more stringent.
[b] MCLG - Maximum Contaminant Level Goal (non-enforceable) as listed in 40 CFR Part 141
[c] Source: 10 NYCRR Part 170.4
[d] Alpha guideline includes radium-226, but excludes uranium; however, WVDP results include these isotopes.
[e] Average annual concentration assumed to produce a total body organ dose of 4 mrem/year

TABLE B-1D
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] in Ingested Water

Radionuclide	Units	Concentration in Ingested Water
Gross Alpha (as Am-241)[b]	µCi/mL	3E-08
Gross Beta (as Sr-90)[b]	µCi/mL	1E-06
Tritium (H-3)	µCi/mL	2E-03
Carbon-14 (C-14)	µCi/mL	7E-05
Potassium-40 (K-40)	µCi/mL	7E-06
Cobalt-60 (Co-60)	µCi/mL	5E-06
Strontium-90 (Sr-90)	µCi/mL	1E-06
Technetium-99 (Tc-99)	µCi/mL	1E-04
Iodine-129 (I-129)	µCi/mL	5E-07
Cesium-137 (Cs-137)	µCi/mL	3E-06
Europium-154 (Eu-154)	µCi/mL	2E-05
Uranium-232 (U-232)	µCi/mL	1E-07
Uranium-233 (U-233)	µCi/mL	5E-07
Uranium-234 (U-234)	µCi/mL	5E-07
Uranium-235 (U-235)	µCi/mL	6E-07
Uranium-236 (U-236)	µCi/mL	5E-07
Uranium-238 (U-238)	µCi/mL	6E-07
Plutonium-238 (Pu-238)	µCi/mL	4E-08
Plutonium-239 (Pu-239)	µCi/mL	3E-08
Plutonium-240 (Pu-240)	µCi/mL	3E-08
Americium-241 (Am-241)	µCi/mL	3E-08

[a] DCG: Derived Concentration Guide. DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv).

[b] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP, americium-241 and strontium-90 (3E-08 and 1E-06 µCi/mL, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

APPENDIX B-2

Process Effluent Data

TABLE B-2A
Comparison of 2010 Lagoon 3 (WNSP001) Liquid Effluent Radioactivity Concentrations With U.S. Department of Energy Guidelines

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	9.88±0.89E-04	3.65±0.33E+07	2.53±0.23E-08	NA[e]	NA
Gross Beta	1.68±0.03E-02	6.21±0.11E+08	4.29±0.08E-07	NA[e]	NA
H-3	2.84±0.08E-02	1.05±0.03E+09	7.25±0.21E-07	2E-03	0.0004
C-14	2.43±5.46E-04	0.90±2.02E+07	<0.62±1.40E-08	7E-05	<0.0002
K-40	-4.85±8.00E-04	-1.80±2.96E+07	-1.24±2.05E-08	NA[f]	NA
Co-60	1.78±3.08E-05	0.66±1.14E+06	<4.55±7.87E-10	5E-06	<0.0002
Sr-90	7.29±0.11E-03	2.70±0.04E+08	1.86±0.03E-07	1E-06	0.186
Tc-99	5.76±0.41E-04	2.13±0.15E+07	1.47±0.10E-08	1E-04	0.0001
I-129	3.00±1.61E-05	1.11±0.60E+06	7.67±4.12E-10	5E-07	0.0015
Cs-137	1.69±0.08E-03	6.24±0.31E+07	4.31±0.21E-08	3E-06	0.0144
U-232[g]	2.50±0.11E-04	9.26±0.41E+06	6.40±0.28E-09	1E-07	0.064
U-233/234[g]	1.85±0.09E-04	6.84±0.34E+06	4.73±0.24E-09	5E-07	0.0095
U-235/236[g]	1.23±0.25E-05	4.54±0.93E+05	3.13±0.64E-10	5E-07[h]	0.0006
U-238[g]	1.34±0.08E-04	4.94±0.29E+06	3.41±0.20E-09	6E-07	0.0052
Pu-238	4.86±1.22E-06	1.80±0.45E+05	1.24±0.31E-10	4E-08	0.0031
Pu-239/240	3.50±1.02E-06	1.30±0.38E+05	8.95±2.60E-11	3E-08	0.003
Am-241	6.21±1.26E-06	2.30±0.47E+05	1.59±0.32E-10	3E-08	0.0053
Sum of Ratios					**0.29**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 3.91E+10 mL (1.03E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1Bq = 2.7E-11 Ci

[d] DOE-derived concentration guides (DCGs) are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and gross beta.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total U (g) = 4.40±0.04E+02; Average U (µg/mL) = 1.13±0.01E-02

[h] DCG for U-236 is used for this comparison.

TABLE B-2B
2010 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	Ammonia (as NH_3) (mg/L) Monitor		BOD_5 day (mg/L) 10.0 mg/L daily maximum		Discharge Rate (MGD) Monitor		Nitrate (as N) (mg/L) Monitor	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	0.032	0.040	<2.1	2.2	0.238	0.254	0.568	0.577
February	0.085	0.085	<2.0.	<2.0.	0.245	0.282	1.06	1.16
March [a]	--	--	--	--	--	--	--	--
April	0.130	0.153	<2.0	<2.0	0.272	0.280	0.695	0.744
May [a]	--	--	--	--	--	--	--	--
June	<0.022	0.035	<2.0	<2.0	0.245	0.262	<0.011	<0.011
July [a]	--	--	--	--	--	--	--	--
August	<0.009	<0.009	3.3	3.7	0.183	0.204	<0.016	0.021
September [a]	--	--	--	--	--	--	--	--
October [a]	--	--	--	--	--	--	--	--
November	0.154	0.162	<2.0	<2.0	0.195	0.292	0.18	0.18
December [a]	--	--	--	--	--	--	--	--

Permit Limit	Nitrite (as N) (mg/L) 0.1 mg/L daily maximum		Oil & Grease (mg/L) 15.0 mg/L daily maximum		pH (standard units) 6.5 to 8.5		Solids, Settleable (mL/L) 0.3 mL/L daily maximum	
Month	**Avg**	**Max**	**Avg**	**Max**	**Min**	**Max**	**Avg**	**Max**
January	<0.02	<0.02	<1.5	<1.5	7.4	7.4	<0.1	<0.1
February	0.04	0.04	<1.4	<1.4	6.8	6.8	<0.1	<0.1
March [a]	--	--	--	--	--	--	--	--
April	<0.03	0.04	<1.5	<1.5	7.6	7.6	<0.1	<0.1
May [a]	--	--	--	--	--	--	--	--
June	<0.02	<0.02	<1.5	<1.5	7.2	7.2	<0.1	<0.1
July [a]	--	--	--	--	--	--	--	--
August	<0.02	<0.02	<1.4	<1.4	7.6	7.6	<0.1	<0.1
September [a]	--	--	--	--	--	--	--	--
October [a]	--	--	--	--	--	--	--	--
November	<0.02	<0.02	<1.5	<1.5	7.3	7.3	<0.1	<0.1
December [a]	--	--	--	--	--	--	--	--

MGD - Million gallons per day

[a] No discharge this month

TABLE B-2B *(concluded)*
2010 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	***Solids, Total Dissolved (mg/L)*** ***Monitor***		***Solids, Total Suspended (mg/L)*** ***45 mg/L daily maximum; 30 mg/L daily average***		***Sulfate (as S) (mg/L)*** ***Monitor***		***Sulfide (as S) Dissolved (mg/L)*** ***0.4 mg/L daily maximum***	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	853	857	<4.6	5.2	53	53	<0.02	<0.02
February	776	804	<4.0	<4.0	48	49	<0.02	<0.02
March [a]	--	--	--	--	--	--	--	--
April	753	763	<4.0	<4.0	46	47	<0.05	<0.05
May [a]	--	--	--	--	--	--	--	--
June	911	918	<4.0	<4.0	61	65	<0.05	<0.05
July [a]	--	--	--	--	--	--	--	--
August	1,050	1,069	<6.0	8.0	78	83	<0.05	<0.05
September [a]	--	--	--	--	--	--	--	--
October [a]	--	--	--	--	--	--	--	--
November	914	958	<6.0	8	63	63	<0.05	<0.05
December [a]	--	--	--	--	--	--	--	--

[a] No discharge this month

TABLE B-2C
2010 SPDES Results for Outfall 001 (WNSP001): Metals

Permit Limit	***Aluminum Total (mg/L) 14.0 mg/L daily maximum; 7.0 mg/L daily average***		***Arsenic Dissolved (mg/L) 0.15 mg/L daily maximum***		***Cobalt Total Recoverable (mg/L) 0.005 mg/L daily maximum***		***Iron Total (mg/L) Monitor***	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	0.201	0.201	0.0011	0.0011	<0.0006	<0.0006	0.155	0.171
February	0.536	0.536	0.00090	0.00090	0.0007	0.0007	0.330	0.384
March [a]	--	--	--	--	--	--	--	--
April	1.22	1.22	0.0010	0.0010	<0.0006	<0.0006	0.658	0.804
May [a]	--	--	--	--	--	--	--	--
June	0.473	0.473	0.0019	0.0019	<0.0006	<0.0006	0.433	0.457
July [a]	--	--	--	--	--	--	--	--
August	0.177	0.177	0.0024	0.0024	<0.0006	<0.0006	0.637	0.841
September [a]	--	--	--	--	--	--	--	--
October [a]	--	--	--	--	--	--	--	--
November	3.1	3.1	0.0015	0.0015	0.0008	0.0008	1.43	1.79
December [a]	--	--	--	--	--	--	--	--

Permit Limit	***Mercury, Total (ng/L) 200 ng/L daily maximum***		***Selenium Total Recoverable (mg/L) 0.004 mg/L daily maximum***		***Vanadium Total Recoverable (mg/L) 0.014 mg/L daily maximum***	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	4.39	4.41	<0.0004	<0.0004	<0.0011	<0.0011
February	8.75	9.65	<0.0004	<0.0004	0.0015	0.0015
March [a]	--	--	--	--	--	--
April	4.07	5.01	<0.0004	<0.0004	0.0018	0.0018
May [a]	--	--	--	--	--	--
June	3.44	4.12	<0.0004	<0.0004	<0.0011	<0.0011
July [a]	--	--	--	--	--	--
August	2.27	2.44	<0.0004	<0.0004	<0.0011	<0.0011
September [a]	--	--	--	--	--	--
October [a]	--	--	--	--	--	--
November	5.25	6.03	<0.0004	<0.0004	0.0033	0.0033
December [a]	--	--	--	--	--	--

[a] No discharge this month

TABLE B-2D
2010 SPDES Results for Outfall 007 (WNSP007): Water Quality and Iron

Permit Limit	Ammonia (as NH_3) (mg/L) Monitor		BOD_5 (mg/L) 10.0 mg/L daily maximum		Chlorine Total Residual (mg/L) 0.1 mg/L daily maximum		Discharge Rate (MGD) Monitor		Iron Total (mg/L) Monitor	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	0.073	0.082	<2.3	2.6	0.02	0.03	0.016	0.038	0.100	0.173
February	0.054	0.093	<2.3	2.6	0.03	0.05	0.013	0.029	0.255	0.290
March	<0.009	<0.009	<2.4	3.2	0.04	0.07	0.013	0.028	0.148	0.248
April	<0.011	0.016	<2.5	3.5	0.04	0.05	0.006	0.013	<0.024	0.030
May	<0.011	0.016	<2.0	<2.0	0.01	0.01	0.014	0.035	0.044	0.084
June	<0.009	<0.009	<2.0	<2.0	0.03	0.04	0.011	0.029	0.040	0.053
July	<0.013	0.020	<2.2	2.5	0.01	0.02	0.007	0.020	<0.021	0.024
August	<0.012	0.017	<2.0	2.0	0.03	0.07	0.007	0.012	<0.020	0.021
September	<0.027	0.058	<2.3	2.8	0.04	0.08	0.006	0.015	<0.039	0.068
October	0.024	0.026	<2.0	<2.0	0.03	0.09	0.009	0.013	0.021	0.022
November	<0.010	0.012	<2.1	2.2	0.05	0.09	0.007	0.014	0.028	0.035
December	0.021	0.024	<2.0	<2.0	0.04	0.06	0.005	0.018	0.035	0.059

Permit Limit	Nitrite (as N) (mg/L) 0.1 mg/L daily maximum		Oil & Grease (mg/L) 15.0 mg/L daily maximum		pH (standard units) 6.5 to 8.5		Solids Settleable (mL/L) 0.3 mL/L daily maximum		Solids Total Suspended (mg/L) 45 mg/L daily maximum;	
Month	**Avg**	**Max**	**Avg**	**Max**	**Min**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	<0.02	<0.02	<1.5	<1.5	7.7	8.1	<0.1	<0.1	<4.0	<4.0
February	<0.02	0.03	<1.4	1.5	7.5	8.1	<0.1	<0.1	<4.0	<4.0
March	<0.02	<0.02	<2.4	3.3	7.3	7.7	<0.1	<0.1	<4.0	<4.0
April	<0.02	0.03	<1.5	<1.5	7.6	8.0	<0.1	<0.1	<4.0	<4.0
May	<0.02	0.02	<1.4	<1.4	7.4	8.0	<0.1	<0.1	<4.3	4.8
June	<0.02	<0.02	<1.6	1.7	7.3	7.8	<0.1	<0.1	<4.0	<4.0
July	<0.02	<0.02	<1.5	<1.5	7.1	7.7	<0.1	<0.1	<4.0	<4.0
August	<0.03	0.04	<1.5	<1.5	7.6	8.1	<0.1	<0.1	<4.0	<4.0
September	<0.02	<0.02	<1.5	<1.5	7.3	7.8	<0.1	<0.1	<4.0	<4.0
October	<0.02	<0.02	<1.5	<1.5	7.4	7.9	<0.1	<0.1	<4.0	<4.0
November	<0.02	<0.02	<1.5	<1.6	7.7	7.9	<0.1	<0.1	<4.8	6.4
December	<0.02	<0.02	<1.5	<1.6	7.6	7.9	<0.1	<0.1	<4.0	<4.0

TABLE B-2E
2010 SPDES Results for Sums of Outfalls 001, 007, 008, and 116: Water Quality

2010 Results for Sums of Outfalls 001, 007, and 008

Permit Limit	Ammonia [a] (as NH_3) Flow-Weighted 1.49 mg/L daily average	2.1 mg/L daily maximum	BOD_5 Flow-Weighted 5.0 mg/L daily average		Iron Total Net Effluent Limitation 0.30 mg/L daily maximum	
Month	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*
January	0.043	0.063	<2.3	2.6	0.00	0.00
February	0.073	0.086	<2.2	2.6	0.00	0.00
March	<0.009	<0.009	<2.4	3.2	0.00	0.00
April	<0.088	0.104	<2.0	<2.0	0.00	0.00
May	<0.011	0.016	<2.0	<2.0	0.00	0.00
June	<0.017	<0.034	<2.0	<2.0	0.00	0.00
July	<0.013	0.020	<2.2	<2.5	0.00	0.00
August	<0.012	0.017	<2.8	<3.6	0.00	0.00
September	<0.027	0.058	<2.3	2.8	0.00	0.00
October	0.024	0.026	<2.0	<2.0	0.00	0.00
November	<0.101	0.156	<2.0	<2.0	0.00	0.00
December	0.021	0.024	<2.0	<2.0	0.00	0.00

2010 Results for Outfall 116

Permit Limit	Total Dissolved Solids (mg/L) 500 mg/L daily maximum	
Month	*Avg*	*Max*
January	310	318
February	341	347
March [b]	--	--
April	321	322
May [b]	--	--
June	320	425
July [b]	--	--
August	415	435
September [b]	--	--
October [b]	--	--
November	314	350
December [b]	--	--

[a] Sum of Outfalls 001 and 007 only
[b] No discharge this month

TABLE B-2F
2010 Annual, Semiannual, and Quarterly SPDES Results for Outfall 001: Metals, Organics, and Water Quality

Permit Limit Parameters	*Permit Limit*	*Monitoring Frequency*	*Reporting Date*	*Maximum Measured (mg/L)*
2-Butanone	0.5 mg/L daily maximum	Annual	January 2011	<0.004
3,3-Dichlorobenzidine	0.01 mg/L daily maximum	Annual	January 2011	<0.0008
Alpha-BHC	0.00001 mg/L daily maximum	Annual	January 2011	<0.000007
Cadmium, Total Recoverable	0.002 mg/L daily maximum	Annual	January 2011	<0.0003
Chromium VI, Total Recoverable	0.011 mg/L daily maximum	Annual	January 2011	<0.006
Chromium, Total Recoverable	0.3 mg/L daily maximum	Semiannual	July 2010 January 2011	<0.0009 <0.0009
Copper, Dissolved	Monitor	Semiannual	July 2010 January 2011	0.0066 0.0026
Copper, Total Recoverable	0.030 mg/L daily maximum	Semiannual	July 2010 January 2011	0.0065 0.0056
Cyanide, Amenable to chlorination	0.022 mg/L daily maximum	Semiannual	July 2010 January 2011	<0.003 <0.003
Dichlorodifluoromethane	0.01 mg/L daily maximum	Annual	January 2011	<0.0003
Heptachlor	0.00001 mg/L daily maximum	Semiannual	July 2010 January 2011	<0.000005 <0.000005
Hexachlorobenzene	0.02 mg/L daily maximum	Annual	January 2011	<0.0003
Lead, Total Recoverable	0.006 mg/L daily maximum	Quarterly	April 2010 July 2010 October 2010 January 2011	0.001 0.0007 0.0003 0.002
Manganese, Total	2.0 mg/L daily maximum	Semiannual	July 2010 January 2011	0.063 0.088
Nickel, Total Recoverable	0.14 mg/L daily maximum	Semiannual	July 2010 January 2011	0.0018 0.0021
Surfactant as LAS	0.4 mg/L daily minimum	Semiannual	July 2010 January 2011	<0.01 0.1
Tributyl phosphate	32 mg/L daily maximum	Annual	January 2011	<0.0008
Trichlorofluoromethane	0.01 mg/L daily maximum	Annual	January 2011	<0.0005
Xylene	0.05 mg/L daily maximum	Annual	January 2011	<0.001
Zinc, Total Recoverable	0.48 mg/L daily maximum	Semiannual	July 2010 January 2011	0.0086 0.0020

Note: No results exceeded the permit limits.

TABLE B-2G
2010 SPDES Action Level Requirement Monitoring Results for Outfalls 001, 007, and 008: Metals, Organics, and Water Quality

Outfall	*Action Level Parameters*	*Action Level*	*Monitoring Frequency*	*Reporting Date*	*Maximum Measured (mg/L)*
001	**Antimony, Total**	1.0 mg/L daily maximum	Annual	January 2011	<0.0068
	Barium, Total	0.5 mg/L daily maximum	Annual	January 2011	0.02
	Boron, Total	2.0 mg/L daily maximum	Quarterly	April 2010 July 2010 October 2010 January 2011	0.033 0.061 0.054 0.053
	Bromide, Total	5.0 mg/L daily maximum	Quarterly	April 2010 July 2010 October 2010 January 2011	1.2 0.66 0.82 0.63
	Chloroform	0.3 mg/L daily maximum	Annual	January 2011	<0.0005
	Titanium, Total	0.65 mg/L daily maximum	Semiannual	July 2011 January 2011	0.016 0.0025
007	**Chloroform**	0.20 mg/L daily maximum	Annual	January 2011	0.0011
008	**Arsenic, Total**	0.17 mg/L daily maximum	Annual	[a]	--
	Chromium, Total	0.13 mg/L daily maximum	Annual	[a]	--
	Silver, Total	0.008 mg/L daily maximum	Annual	[a]	--
	Zinc, Total	0.001 mg/L daily maximum	Annual	[a]	--

[a] No discharge at this outfall, drainage pipe was capped in May 2001.

TABLE B-2H
2010 SPDES Results for Outfall 01B (WNSP01B): Water Quality

Internal process monitoring point did not operate during 2010

TABLE B-2I
2010 SPDES Results for Outfall 008 (WNSP008): Water Quality

No discharge; Drainage pipe was capped in May 2001

TABLE B-2J
2010 Radioactivity Results for Sewage Treatment Outfall (WNSP007)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *Becquerels*	*Average Concentration (µCi/mL)*	*DCG (µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	12	1.55±1.40E-05	5.72±5.18E+05	1.17±1.06E-09	NA [d]	NA
Gross Beta	12	1.73±0.14E-04	6.38±0.50E+06	1.31±0.10E-08	NA [d]	NA
Tritium	12	0.32±1.80E-04	1.19±6.65E+06	0.24±1.36E-08	2E-03	<0.0001
Sr-90	1	0.13±1.35E-05	0.48±4.98E+05	0.10±1.02E-09	1E-06	<0.0010
Cs-137	1	0.85±1.26E-05	3.13±4.65E+05	6.41±9.53E-10	3E-06	<0.0003
Sum of Ratios						**<0.0013**

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released; 3.48E+06 gal (1.32E+10 mL)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DOE derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and beta.

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APPENDIX B-3

SPDES-Permitted Storm Water Outfall Discharge Data

Note: Two sets of data are presented for each group: one from samples collected between January and June; the other from samples collected between July and December.

TABLE B-3A
2010 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/22/2010	*3/22/2010*
Aluminum, Total	mg/L	2	2.8	12
Ammonia (as NH_3)	mg/L	2	0.016	0.018
BOD_5	mg/L	2	<2.0	<2.0
Cadmium, Total Recoverable	mg/L	2	<0.00002	<0.00002
Chromium, Total Recoverable	mg/L	2	0.0033	0.011
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.006	<0.012
Copper, Total Recoverable	mg/L	2	0.0065	0.014
Iron, Total	mg/L	2	2.6	7.5
Lead, Total Recoverable	mg/L	2	0.0016	0.0041
Nitrogen, Nitrate (as N)	mg/L	2	0.28	0.24
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	0.062
Nitrogen, Total (as N)	mg/L	2	<0.45	0.47
Nitrogen, Total Kjeldahl	mg/L	2	<0.15	0.17
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.7	NR
Phosphorous, Total	mg/L	2	<0.005	0.038
Selenium, Total Recoverable	mg/L	2	<0.0004	<0.0004
Solids, Total Dissolved	mg/L	2	802	858
Solids, Total Suspended	mg/L	2	58	85
Vanadium, Total Recoverable	mg/L	2	0.0062	0.020
Zinc, Total Recoverable	mg/L	2	0.033	0.055
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.8	
Rainfall During Sampling Event	inches	--	0.32	
Total Flow During Sampling Event	gallons	--	210,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,500	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3A *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/16/2010	*9/16/2010*
Aluminum, Total	mg/L	2	1.0	0.75
Ammonia (as NH_3)	mg/L	2	0.12	0.073
BOD_5	mg/L	2	<2.0	<2.0
Cadmium, Total Recoverable	mg/L	2	0.0003	<0.00002
Chromium, Total Recoverable	mg/L	2	0.0082	0.0017
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.006	<0.006
Copper, Total Recoverable	mg/L	2	0.0034	0.0026
Iron, Total	mg/L	2	1.4	0.64
Lead, Total Recoverable	mg/L	2	0.0008	0.0004
Nitrogen, Nitrate (as N)	mg/L	2	0.26	0.29
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.59	<0.58
Nitrogen, Total Kjeldahl	mg/L	2	0.31	0.27
Oil & Grease[a]	mg/L	1	<1.5	NR
pH	SU	1	7.8	NR
Phosphorous, Total	mg/L	2	0.035	<0.005
Selenium, Total Recoverable	mg/L	2	<0.0004	<0.0004
Solids, Total Dissolved	mg/L	2	577	402
Solids, Total Suspended	mg/L	2	23	<4.0
Vanadium, Total Recoverable	mg/L	2	0.014	0.0016
Zinc, Total Recoverable	mg/L	2	0.021	0.012
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Rainfall During Sampling Event	inches	--	0.08	
Total Flow During Sampling Event	gallons	--	31,000	
Maximum Flow Rate During Sampling Event	gpm	--	670	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3B
2010 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S06

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			6/16/2010	*6/16/2010*
Aluminum, Total	mg/L	2	0.16	0.78
BOD_5	mg/L	2	3.2	3.1
Copper, Total Recoverable	mg/L	2	0.00069	0.0037
Iron, Total	mg/L	2	0.54	1.5
Lead, Total Recoverable	mg/L	2	<0.0005	0.0016
Oil & Grease[a]	mg/L	1	1.9	NR
pH	SU	1	7.1	NR
Phosphorous, Total	mg/L	2	0.042	0.066
Solids, Total Dissolved	mg/L	2	348	340
Solids, Total Suspended	mg/L	2	4.4	34
Surfactant (as LAS)	mg/L	2	<0.016	0.17
Zinc, Total Recoverable	mg/L	2	0.022	0.025
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.0	
Rainfall During Sampling Event	inches	--	0.27	
Total Flow During Sampling Event	gallons	--	34,000	
Maximum Flow Rate During Sampling Event	gpm	--	310	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3B *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S33

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/22/2010	*9/22/2010*
Aluminum, Total	mg/L	2	0.78	2.1
BOD_5	mg/L	2	8.9	2.8
Copper, Total Recoverable	mg/L	2	0.0045	0.0032
Iron, Total	mg/L	2	16	14
Lead, Total Recoverable	mg/L	2	0.0050	0.0029
Oil & Grease[a]	mg/L	1	1.5	NR
pH	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	0.93	<0.005
Solids, Total Dissolved	mg/L	2	320	342
Solids, Total Suspended	mg/L	2	1,010	125
Surfactant (as LAS)	mg/L	2	<0.013	0.070
Zinc, Total Recoverable	mg/L	2	0.034	0.024
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.2	
Rainfall During Sampling Event	inches	--	0.26	
Total Flow During Sampling Event	gallons	--	4,700	
Maximum Flow Rate During Sampling Event	gpm	--	95	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3C
2010 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S09

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			6/1/2010	*6/1/2010*
Alpha-BHC	mg/L	2	<0.0000048	<0.0000046
Aluminum, Total	mg/L	2	16	11
Ammonia (as NH_3)	mg/L	2	0.024	0.017
BOD_5	mg/L	2	3.5	2.9
Copper, Total Recoverable	mg/L	2	0.034	0.029
Iron, Total	mg/L	2	18	12
Lead, Total Recoverable	mg/L	2	0.051	0.038
Nitrogen, Nitrate (as N)	mg/L	2	0.38	0.39
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	0.020
Nitrogen, Total (as N)	mg/L	2	<1.3	<1.0
Nitrogen, Total Kjeldahl	mg/L	2	0.92	0.64
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	8.3	NR
Phosphorous, Total	mg/L	2	0.67	0.39
Solids, Total Dissolved	mg/L	2	574	623
Solids, Total Suspended	mg/L	2	660	860
Zinc, Total Recoverable	mg/L	2	0.048	0.053
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	8.1	
Rainfall During Sampling Event	inches	--	0.39	
Total Flow During Sampling Event	gallons	--	3,100	
Maximum Flow Rate During Sampling Event	gpm	--	91	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3C *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S12

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/22/2010	*9/22/2010*
Alpha-BHC	mg/L	3	<0.000005 / <0.000005	<0.000005
Aluminum, Total	mg/L	3	2.9 / 4.5	1.3
Ammonia (as NH_3)	mg/L	3	0.027 / 0.037	0.054
BOD_5	mg/L	3	5.9 / 4.8	<2.0
Copper, Total Recoverable	mg/L	3	0.012 / 0.011	0.0047
Iron, Total	mg/L	3	6.1 / 7.8	1.5
Lead, Total Recoverable	mg/L	3	0.0055 / 0.0045	0.0012
Nitrogen, Nitrate (as N)	mg/L	3	0.15 / 0.14	0.20
Nitrogen, Nitrite (as N)	mg/L	3	<0.020 / <0.020	<0.020
Nitrogen, Total (as N)	mg/L	3	<0.80 / <0.76	<0.64
Nitrogen, Total Kjeldahl	mg/L	3	0.63 / 0.60	0.42
Oil & Grease[a]	mg/L	2	<1.4 / <1.4	NR
pH	SU	2	7.3 / 7.3	NR
Phosphorous, Total	mg/L	3	0.30 / 0.44	0.063
Solids, Total Dissolved	mg/L	3	211 / 229	182
Solids, Total Suspended	mg/L	3	130 / 25	24
Zinc, Total Recoverable	mg/L	3	0.067 / 0.060	0.026
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.2	
Rainfall During Sampling Event	inches	--	0.26	
Total Flow During Sampling Event	gallons	--	43,000	
Maximum Flow Rate During Sampling Event	gpm	--	700	

Note: The first flush grab samples were sampled and analyzed in duplicate.
gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3D
2010 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/22/2010	*3/22/2010*
Aluminum, Total	mg/L	2	2.3	14
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0024	0.011
Iron, Total	mg/L	2	2.0	11
Lead, Total Recoverable	mg/L	2	0.0011	0.0051
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Total Dissolved	mg/L	2	237	308
Solids, Total Suspended	mg/L	2	37	170
Surfactant (as LAS)	mg/L	2	<0.013	0.045
Zinc, Total Recoverable	mg/L	2	0.023	0.065
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.8	
Rainfall During Sampling Event	inches	--	0.32	
Total Flow During Sampling Event	gallons	--	36,000	
Maximum Flow Rate During Sampling Event	gpm	--	250	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3D *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/22/2010	*9/22/2010*
Aluminum, Total	mg/L	2	2.7	5.3
BOD_5	mg/L	2	2.6	3.0
Copper, Total Recoverable	mg/L	2	0.0040	0.0050
Iron, Total	mg/L	2	3.4	5.9
Lead, Total Recoverable	mg/L	2	0.0026	0.0038
Oil & Grease[a]	mg/L	1	<1.5	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.13	0.089
Solids, Total Dissolved	mg/L	2	253	214
Solids, Total Suspended	mg/L	2	160	115
Surfactant (as LAS)	mg/L	2	0.065	0.048
Zinc, Total Recoverable	mg/L	2	0.046	0.054
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.2	
Rainfall During Sampling Event	inches	--	0.26	
Total Flow During Sampling Event	gallons	--	44,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,100	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3E
2010 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S14

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			5/18/2010	*5/18/2010*
Aluminum, Total	mg/L	2	0.14	0.15
Ammonia (as NH_3)	mg/L	2	<0.009	<0.009
BOD_5	mg/L	2	2.4	<2.0
Copper, Total Recoverable	mg/L	2	0.0014	0.0013
Iron, Total	mg/L	2	0.28	0.28
Lead, Total Recoverable	mg/L	2	0.0001	0.0002
Nitrogen, Nitrate (as N)	mg/L	2	0.038	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.71	<0.93
Nitrogen, Total Kjeldahl	mg/L	2	0.65	0.90
Oil & Grease[a]	mg/L	1	<1.5	NR
pH	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	<0.005	0.017
Solids, Settleable	ml/L	2	0.1	<0.1
Solids, Total Dissolved	mg/L	2	401	397
Solids, Total Suspended	mg/L	2	5.6	<4.0
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	<0.0011	<0.0011
Zinc, Total Recoverable	mg/L	2	0.010	0.0037
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.33	
Total Flow During Sampling Event	gallons	--	37	
Maximum Flow Rate During Sampling Event	gpm	--	0.32	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3E *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S17

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/22/2010	*9/22/2010*
Aluminum, Total	mg/L	2	3.1	6.0
Ammonia (as NH_3)	mg/L	2	0.16	0.034
BOD_5	mg/L	2	8.8	4.2
Copper, Total Recoverable	mg/L	2	0.0049	0.0069
Iron, Total	mg/L	2	1.9	3.5
Lead, Total Recoverable	mg/L	2	0.0021	0.0044
Nitrogen, Nitrate (as N)	mg/L	2	0.53	0.52
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.5	<1.4
Nitrogen, Total Kjeldahl	mg/L	2	0.93	0.87
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.11	0.11
Solids, Settleable	ml/L	2	0.2	<0.1
Solids, Total Dissolved	mg/L	2	329	234
Solids, Total Suspended	mg/L	2	183	117
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	0.016
Vanadium, Total Recoverable	mg/L	2	0.0057	0.0068
Zinc, Total Recoverable	mg/L	2	0.018	0.026
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.2	
Rainfall During Sampling Event	inches	--	0.26	
Total Flow During Sampling Event	gallons	--	77,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,100	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3F
2010 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S41

Analyte	Units	N	First Flush Grab	Flow-weighted Composite
			5/18/2010	5/18/2010
Aluminum, Total	mg/L	2	2.9	4.1
Ammonia (as NH_3)	mg/L	2	0.009	0.031
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0026	0.0037
Iron, Total	mg/L	2	2.2	2.3
Lead, Total Recoverable	mg/L	2	0.0009	0.0011
Nitrogen, Nitrate (as N)	mg/L	2	0.042	0.099
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	0.033
Nitrogen, Total (as N)	mg/L	2	<0.90	1.1
Nitrogen, Total Kjeldahl	mg/L	2	0.84	1.0
Oil & Grease[a]	mg/L	1	2.9	NR
pH	SU	1	8.1	NR
Phosphorous, Total	mg/L	2	<0.005	0.054
Solids, Settleable	ml/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	416	404
Solids, Total Suspended	mg/L	2	23	21
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0041	0.0062
Zinc, Total Recoverable	mg/L	2	0.059	0.016
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.32	
Total Flow During Sampling Event	gallons	--	1,600	
Maximum Flow Rate During Sampling Event	gpm	--	21	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3F *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S42

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			11/17/2010	*11/17/2010*
Aluminum, Total	mg/L	2	0.079	0.089
Ammonia (as NH_3)	mg/L	2	<0.009	<0.009
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.011	0.0063
Iron, Total	mg/L	2	0.12	0.22
Lead, Total Recoverable	mg/L	2	0.00007	0.0002
Nitrogen, Nitrate (as N)	mg/L	2	0.40	0.33
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.58	<0.56
Nitrogen, Total Kjeldahl	mg/L	2	0.16	0.21
Oil & Grease[a]	mg/L	1	<1.6	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.0055	0.0055
Solids, Settleable	ml/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	2,600	2,300
Solids, Total Suspended	mg/L	2	<4.0	<4.0
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	0.039	0.048
Vanadium, Total Recoverable	mg/L	2	<0.0011	<0.0011
Zinc, Total Recoverable	mg/L	2	0.0027	0.0021
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.5	
Rainfall During Sampling Event	inches	--	0.13	
Total Flow During Sampling Event	gallons	--	4,000	
Maximum Flow Rate During Sampling Event	gpm	--	530	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3G
2010 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/22/2010	*3/22/2010*
Aluminum, Total	mg/L	2	4.4	0.86
Ammonia (as NH_3)	mg/L	2	<0.009	0.16
BOD_5	mg/L	2	<2.0	2.8
Copper, Total Recoverable	mg/L	2	0.0034	0.0013
Iron, Total	mg/L	2	4.3	0.77
Lead, Total Recoverable	mg/L	2	0.0021	0.00050
Nitrogen, Nitrate (as N)	mg/L	2	0.64	0.42
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.86	<0.61
Nitrogen, Total Kjeldahl	mg/L	2	0.20	0.17
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.2	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Total Dissolved	mg/L	2	272	67.0
Solids, Total Suspended	mg/L	2	99	14
Sulfide	mg/L	2	<0.022	<0.022
Surfactant (as LAS)	mg/L	2	<0.013	0.021
Zinc, Total Recoverable	mg/L	2	0.017	0.0057
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.8	
Total Rainfall During Sampling Event	inches	--	0.32	
Total Flow During SamplingEvent	gallons	--	43,000	
Maximum Flow Rate During Sampling Event	gpm	--	300	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3G *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/16/2010	*9/16/2010*
Aluminum, Total	mg/L	2	0.88	0.35
Ammonia (as NH_3)	mg/L	2	0.83	0.63
BOD_5	mg/L	2	8.9	5.1
Copper, Total Recoverable	mg/L	2	0.0021	0.0012
Iron, Total	mg/L	2	2.0	0.53
Lead, Total Recoverable	mg/L	2	0.0007	0.0004
Nitrogen, Nitrate (as N)	mg/L	2	1.6	1.0
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<3.0	<1.8
Nitrogen, Total Kjeldahl	mg/L	2	1.3	0.75
Oil & Grease[a]	mg/L	1	<1.5	NR
pH	SU	1	7.8	NR
Phosphorous, Total	mg/L	2	0.052	<0.005
Solids, Total Dissolved	mg/L	2	111	86
Solids, Total Suspended	mg/L	2	12	5.6
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	0.075	<0.013
Zinc, Total Recoverable	mg/L	2	0.014	0.0079
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Total Rainfall During Sampling Event	inches	--	0.08	
Total Flow During SamplingEvent	gallons	--	59,000	
Maximum Flow Rate During Sampling Event	gpm	--	500	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3H
2010 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S27

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			5/18/2010	*5/18/2010*
Aluminum, Total	mg/L	3	14 / 8.0	4.3
Ammonia (as NH_3)	mg/L	3	0.009 / <0.009	0.027
BOD_5	mg/L	3	<2.0 / <2.0	<2.0
Copper, Total Recoverable	mg/L	3	0.0098 / 0.0070	0.0037
Iron, Total	mg/L	3	15 / 8.6	2.9
Lead, Total Recoverable	mg/L	3	0.011 / 0.0067	0.0023
Nitrogen, Nitrate (as N)	mg/L	3	0.020 / 0.028	<0.011
Nitrogen, Nitrite (as N)	mg/L	3	<0.020 / <0.020	<0.020
Nitrogen, Total (as N)	mg/L	3	<5.0 / <1.5	<0.77
Nitrogen, Total Kjeldahl	mg/L	3	5.0 / 1.4	0.74
Oil & Grease[a]	mg/L	2	<1.5 / 1.8	NR
pH	SU	1	7.9	NR
Phosphorous, Total	mg/L	3	<0.005 / <0.005	<0.005
Solids, Total Dissolved	mg/L	3	180 / 220	220
Solids, Total Suspended	mg/L	3	100 / 600	58
Surfactant (as LAS)	mg/L	3	<0.013 / <0.013	<0.013
Zinc, Total Recoverable	mg/L	3	0.060 / 0.046	0.015
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.32	
Total Flow During Sampling Event	gallons	--	1,800	
Maximum Flow Rate During Sampling Event	gpm	--	18	

Note: The first flush grab samples were sampled and analyzed in duplicate.
gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3H *(concluded)*
2010 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S35

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			9/22/2010	*9/22/2010*
Aluminum, Total	mg/L	2	1.0	3.4
Ammonia (as NH_3)	mg/L	2	0.088	0.067
BOD_5	mg/L	2	2.3	<2.0
Copper, Total Recoverable	mg/L	2	0.0037	0.0037
Iron, Total	mg/L	2	0.74	2.0
Lead, Total Recoverable	mg/L	2	0.0053	0.0068
Nitrogen, Nitrate (as N)	mg/L	2	0.67	0.33
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.7	<1.4
Nitrogen, Total Kjeldahl	mg/L	2	1.0	1.0
Oil & Grease[a]	mg/L	1	<1.5	NR
pH	SU	1	7.2	NR
Phosphorous, Total	mg/L	2	0.096	0.087
Solids, Total Dissolved	mg/L	2	400	338
Solids, Total Suspended	mg/L	2	170	86
Surfactant (as LAS)	mg/L	2	0.033	0.093
Zinc, Total Recoverable	mg/L	2	0.023	0.023
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	5.2	
Rainfall During Sampling Event	inches	--	0.26	
Total Flow During Sampling Event	gallons	--	49,000	
Maximum Flow Rate During Sampling Event	gpm	--	385	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

APPENDIX B-4

Site Surface Drainage, Subsurface Drainage, and Contained Water Data

TABLE B-4A
2010 Radioactivity and pH in Surface Water at Facility Yard Drainage (WNSP005)

Analyte	*Units*	*N*	*WNSP005 Concentrations*			*Guideline* [a] *or Standard* [b]
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	4	<1.25E-09	1.43±2.85E-09	1.86E-09	3E-08[c]
Gross Beta	µCi/mL	4	1.22E-07	1.74±0.10E-07	2.22E-07	1E-06[d]
Tritium	µCi/mL	4	<3.36E-08	1.18±4.46E-08	<4.83E-08	2E-03
Sr-90	µCi/mL	2	6.81E-08	7.64±0.50E-08	8.47E-08	1E-06
Cs-137	µCi/mL	2	<1.91E-09	0.78±1.98E-09	<2.04E-09	3E-06
pH	SU	4	7.46	7.66	8.08	6.0–9.5

N - Number of samples
[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[b] New York State Water Quality Standards for Class "D" as a comparative reference for nonradiological results
[c] Alpha as Am-241
[d] Beta as Sr-90

TABLE B-4B
2010 Radioactivity in Surface Water at French Drain (WNSP008)

No Discharge; Drainage pipe was capped in May 2001

TABLE B-4C
2010 Radioactivity in Surface Water at the North Swamp (WNSW74A)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG (µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	27	6.49±3.98E-05	2.40±1.47E+06	1.33±0.82E-09	NA[d]	NA
Gross Beta	27	7.50±0.48E-04	2.78±0.18E+07	1.54±0.10E-08	NA[d]	NA
Tritium	27	-3.12±6.23E-04	-1.15±2.30E+07	-0.64±1.28E-08	2E-03	<0.0001
C-14	2	-0.58±1.09E-03	-2.16±4.02E+07	-1.20±2.23E-08	7E-05	<0.0003
Sr-90	12	3.11±0.21E-04	1.15±0.08E+07	6.39±0.42E-09	1E-06	0.0064
I-129	2	2.11±3.60E-05	0.78±1.33E+06	4.33±7.40E-10	5E-07	<0.0015
Cs-137	12	1.16±2.45E-05	4.30±9.07E+05	2.39±5.04E-10	3E-06	<0.0002
U-232[e]	2	-1.13±1.16E-06	-4.19±4.28E+04	-2.33±2.38E-11	1E-07	<0.0002
U-233/234[e]	2	4.80±2.63E-06	1.77±0.97E+05	9.87±5.40E-11	5E-07	0.0002
U-235/236[e]	2	7.00±9.71E-07	2.59±3.59E+04	1.44±2.00E-11	5E-07[f]	<0.0001
U-238[e]	2	4.60±2.50E-06	1.70±0.93E+05	9.46±5.15E-11	6E-07	0.0002
Pu-238	2	-1.13±6.52E-07	0.42±2.41E+04	-0.23±1.34E-11	4E-08	<0.0003
Pu-239/240	2	-2.68±6.75E-07	-0.99±2.50E+04	-0.55±1.39E-11	3E-08	<0.0005
Am-241	2	3.35±7.97E-07	1.24±2.95E+04	0.69±1.64E-11	3E-08	<0.0006
Sum of Ratios						**0.0103**

Note: The average pH at this location was 7.30 SU.

N - Number of samples

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total estimated volume released: 4.86E+10 mL (1.28E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq= 2.7E-11 Ci

[d] DOE-derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and gross beta.

[e] Total Uranium (g) = -8.90±3.63E-01; Average Total Uranium (µg/mL) = -1.83±0.75E-05

[f] DCG for U-236 is used for this comparison.

TABLE B-4D
2010 Radioactivity in Surface Water at the Northeast Swamp (WNSWAMP)

Isotope [a]	N	Discharge Activity [b] (Ci)	Radioactivity [c] (Becquerels)	Average Concentration (µCi/mL)	DCG [d] (µCi/mL)	Ratio of Concentration to DCG
Gross Alpha	27	0.21±1.50E-04	0.77±5.55E+06	0.15±1.05E-09	NA[e]	NA
Gross Beta	27	6.83±0.07E-01	2.53±0.03E+10	4.79±0.05E-06	NA[e]	NA
H-3	27	5.83±2.13E-03	2.16±0.79E+08	4.09±1.49E-08	2E-03	<0.0001
C-14	2	1.13±3.38E-03	0.42±1.25E+08	0.79±2.37E-08	7E-05	<0.0003
Sr-90	12	3.58±0.01E-01	1.32±0.01E+10	2.51±0.01E-06	1E-06	2.51
I-129	2	0.02±1.24E-04	0.08±4.59E+06	0.16±8.69E-10	5E-07	<0.0017
Cs-137	12	1.26±0.78E-04	4.66±2.89E+06	8.84±5.48E-10	3E-06	0.0003
U-232[f]	2	-0.53±3.05E-06	-0.20±1.13E+05	-0.37±2.14E-11	1E-07	<0.0002
U-233/234[f]	2	1.07±0.63E-05	3.94±2.33E+05	7.47±4.42E-11	5E-07	0.0002
U-235/236[f]	2	1.02±3.19E-06	0.38±1.18E+05	0.72±2.24E-11	5E-07[g]	<0.0001
U-238[f]	2	1.86±0.84E-05	6.88±3.11E+05	1.30±0.59E-10	6E-07	0.0002
Pu-238	2	-0.21±2.25E-06	-0.77±8.33E+04	-0.15±1.58E-11	4E-08	<0.0004
Pu-239/240	2	-1.18±2.41E-06	-4.36±8.91E+04	-0.83±1.69E-11	3E-08	<0.0006
Am-241	2	-0.56±2.20E-06	-2.06±8.15E+04	-0.39±1.54E-11	3E-08	<0.0005
Sum of Ratios						**2.51**

Note: The average pH at this location was 7.17 SU.
N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released: 1.43E+11 mL (3.77E+07 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.
[e] DOE DCGs do not exist for indicator parameters gross alpha and gross beta.
[f] Total Uranium (g) = 2.73±0.10E+01; Average Total Uranium (µg/mL) = 1.91±0.07E-04
[g] DCG for U-236 is used for this comparison.

TABLE B-4E
2010 Radioactivity in Surface Water at Drainage Between the NDA and the SDA (WNNDADR)

Analyte	Units	N	WNNDADR Concentrations		
			Minimum	Average	Maximum
Gross Alpha	µCi/mL	12	<5.58E-10	0.83±1.38E-09	3.90E-09
Gross Beta	µCi/mL	12	2.80E-08	5.41±0.51E-08	6.79E-08
Tritium	µCi/mL	12	2.89E-07	4.86±0.51E-07	8.34E-07
Sr-90	µCi/mL	2	2.41E-08	2.65±0.24E-08	2.89E-08
I-129	µCi/mL	2	<6.08E-10	0.61±6.83E-10	<7.50E-10
Cs-137	µCi/mL	12	<1.38E-09	0.10±1.84E-09	<1.99E-09

N - Number of samples

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APPENDIX B-5

Ambient Surface Water Data

TABLE B-5A
2010 Radioactivity and pH in Surface Water Downstream of the WVDP in Cattaraugus Creek at Felton Bridge (WFFELBR)

Analyte	*Units*	*N*	*WFFELBR Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBIGBR Background Range*	*Guideline [a] or Standard [b]*
Gross Alpha	µCi/mL	12	0.58±1.40E-09	1.70E-09	98	<3.59E-10–4.62E-09	3E-08[d]
Gross Beta	µCi/mL	12	3.42±2.13E-09	4.82E-09	98	<9.03E-10–1.37E-08	1E-06[e]
Tritium	µCi/mL	12	0.61±4.65E-08	<4.81E-08	98	<4.46E-08–2.65E-07	2E-03
Sr-90	µCi/mL	12	0.90±1.01E-09	1.59E-09	98	<3.57E-10–1.10E-08	1E-06
Cs-137	µCi/mL	12	0.68±1.65E-09	1.58E-09	98	<1.34E-09–5.29E-09	3E-06
pH	SU	38	7.91	8.19	98	5.80–8.34	6.5–8.5

Note: Historical background data are from Bigelow Bridge, on Cattaraugus Creek upstream of WFFELBR. Sampling at WFBIGBR was discontinued in 2008. Range was calculated from the most recent 10 years of sampling, 1998–2007.

N - Number of samples

[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[b] New York State Water Quality Standards, Class "B" as a comparative reference for nonradiological results

[c] Values represent composite concentrations weighted to monthly stream flow.

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5B
2010 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

RADIOACTIVITY CONCENTRATIONS

Analyte	*Units*	*N*	*WFBCTCB Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG [a] Background Range*	*Guideline [b]*
Gross Alpha	µCi/mL	12	1.20±1.22E-09	3.25E-09	12	<4.48E-10–2.12E-09	3E-08[c]
Gross Beta	µCi/mL	12	7.96±2.27E-09	1.33E-08	12	<1.33E-09–3.37E-09	1E-06[d]
Tritium	µCi/mL	12	-0.71±4.49E-08	6.13E-08	12	<4.48E-08–5.90E-08	2E-03
Sr-90	µCi/mL	2	3.40±1.04E-09	4.14E-09	2	<1.03E-09–<1.09E-09	1E-06
Cs-137	µCi/mL	2	-0.07±1.93E-09	<2.11E-09	2	<1.94E-09–<1.94E-09	3E-06

N - Number of samples

[a] Background location

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[c] Alpha as Am-241

[d] Beta as Sr-90

TABLE B-5B *(continued)*
2010 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS

Analyte	Units	N	WFBCTCB Concentration		Standard [a]
			Average	Maximum	
Alpha-BHC	µg/L	2	<0.009	<0.009	0.002
Aluminum, Dissolved	mg/L	2	<0.100	<0.100	0.10
Ammonia-N	mg/L	2	<0.02	<0.02	0.09–2.1
Antimony, Total	mg/L	2	<0.003	<0.003	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	0.150
Barium, Total	mg/L	2	0.07	0.08	--
Boron, Total	mg/L	2	0.02	0.03	10.0
Bromide	mg/L	2	<0.50	<0.50	--
Cadmium, Dissolved	mg/L	2	<0.001	<0.001	0.004[b]
Calcium, Total	mg/L	12	45.2	57.7	--
Chloride	mg/L	2	25	29	--
Chromium, Dissolved	mg/L	2	<0.01	<0.01	0.119[b]
Cobalt, Total	mg/L	2	<0.005	<0.005	0.005[c]
Copper, Dissolved	mg/L	2	<0.005	<0.005	0.015[b]
Dissolved, Oxygen	mg/L	2	13.4	14.1	4.0 (min)
Fluoride	mg/L	2	<0.20	<0.20	3.58[b]
Hardness	mg/L	12	144	178	--
Iron, Total	mg/L	2	0.94	1.46	0.30
Lead, Dissolved	mg/L	2	<0.0005	<0.0005	0.007[b]
Magnesium, Total	mg/L	12	7.6	11.3	--
Manganese, Total	mg/L	2	0.02	0.03	--
Mercury, Dissolved, Method 1631	µg/L	2	0.001444	0.00205	0.0007
Nickel, Dissolved	mg/L	2	<0.04	<0.04	0.085[b]
Nitrate-N	mg/L	2	0.18	0.22	--
Nitrite-N	mg/L	2	<0.05	<0.05	0.10
NPOC	mg/L	2	2	2.3	--

N - Number of samples
-- No reference standard available for this analyte
[a] New York State Water Quality Standards, Class "C" as a comparative reference for nonradiological results
[b] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB
[c] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5B *(concluded)*
2010 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS *(concluded)*

Analyte	*Units*	*N*	*WFBCTCB Concentration*		*Standard* [a]
			Average	*Maximum*	
Oil & Grease	mg/L	2	<5	<5	--
pH	SU	2	8.03	8.25	6.5–8.5
Selenium, Dissolved	mg/L	2	<0.001	<0.001	0.0046
Sodium, Total	mg/L	2	16	18.3	--
Solids, Total Dissolved	mg/L	2	228	262	500
Solids, Total Suspended	mg/L	2	<11	17	--
Sulfate	mg/L	2	30.4	35.9	--
Sulfide (as S)	mg/L	2	<0.05	<0.05	0.002
Surfactant	mg/L	2	<0.02	<0.02	0.04
Thallium, Total	mg/L	2	<0.008	<0.008	0.008[c]
Titanium, Total	mg/L	2	<0.0500	<0.0500	--
TOX	mg/L	2	<0.02	0.03	--
Vanadium, Total	mg/L	2	<0.0100	<0.0100	0.014[c]
Zinc, Dissolved	mg/L	2	<0.02	<0.02	0.135[b]

N - Number of samples
-- No reference standard available for this analyte
[a] New York State Water Quality Standards, Class “C” as a comparative reference for nonradiological results
[b] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB
[c] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5C
2010 Radioactivity in Surface Water Downstream of the WVDP at Franks Creek (WNSP006)

Analyte	*Units*	*N*	*WNSP006 Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG* [a] *Background Range*	*Guideline* [b]
Gross Alpha	µCi/mL	34	1.62±1.82E-09	6.60E-09	12	<4.48E-10–2.12E-09	3E-08[c]
Gross Beta	µCi/mL	34	4.17±0.43E-08	1.11E-07	12	<1.33E-09–3.37E-09	1E-06[d]
Tritium	µCi/mL	34	6.22±4.55E-08	2.80E-07	12	<4.48E-08–5.90E-08	2E-03
C-14	µCi/mL	4	-1.09±2.97E-08	<3.25E-08	2	<3.01E-08–<3.20E-08	7E-05
Sr-90	µCi/mL	12	1.74±0.22E-08	2.61E-08	2	<1.03E-09–<1.09E-09	1E-06
Tc-99	µCi/mL	4	0.94±1.55E-09	1.98E-09	2	<1.64E-09–<2.12E-09	1E-04
I-129	µCi/mL	4	3.51±8.19E-10	<1.10E-09	2	<5.32E-10–<8.87E-10	5E-07
Cs-137	µCi/mL	12	1.64±2.47E-09	3.08E-09	2	<1.94E-09–<1.94E-09	3E-06
U-232	µCi/mL	4	2.26±1.25E-10	4.61E-10	2	<2.81E-11–<2.96E-11	1E-07
U-233/234	µCi/mL	4	3.07±1.35E-10	4.97E-10	2	8.06E-11–1.37E-10	5E-07
U-235/236	µCi/mL	4	4.07±5.23E-11	7.00E-11	2	<2.67E-11–<3.64E-11	5E-07[e]
U-238	µCi/mL	4	2.20±1.14E-10	3.19E-10	2	<3.58E-11–<3.77E-11	6E-07
Total U	µg/mL	4	5.14±0.12E-04	9.15E-04	2	1.26E-04–1.89E-04	--
Pu-238	µCi/mL	4	0.80±2.93E-11	<4.14E-11	2	<1.73E-11–<2.25E-11	4E-08
Pu-239/240	µCi/mL	4	0.81±3.01E-11	<3.89E-11	2	<1.92E-11–<3.14E-11	3E-08
Am-241	µCi/mL	4	0.54±2.42E-11	<2.78E-11	2	<2.09E-11–<2.19E-11	3E-08

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[c] Alpha as Am-241
[d] Beta as Sr-90
[e] DCG for U-236 is used for this comparison.

TABLE B-5D
2010 Radioactivity and pH in Surface Water at Erdman Brook (WNERB53)

Analyte	*Units*	*N*	*WNERB53 Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG* [a] *Background Range*	*Guideline* [b] *or Standard* [c]
Gross Alpha	µCi/mL	4	0.73±1.50E-09	2.81E-09	12	<4.48E-10–2.12E-09	3E-08[d]
Gross Beta	µCi/mL	4	8.16±2.37E-09	1.22E-08	12	<1.33E-09–3.37E-09	1E-06[e]
Tritium	µCi/mL	4	-3.11±4.28E-08	<4.75E-08	12	<4.48E-08–5.90E-08	2E-03
Sr-90	µCi/mL	2	2.08±1.02E-09	3.47E-09	2	<1.03E-09–<1.09E-09	1E-06
Cs-137	µCi/mL	2	0.71±1.91E-09	<1.92E-09	2	<1.94E-09–<1.94E-09	3E-06
pH	SU	4	7.9	8.0	292	6.4–8.7	6.0–9.5

N - Number of samples
[a] Background data are from Buttermilk Creek, upstream of the WVDP. Sampling for nonradiological data was discontinued at this location in 2008. The pH range was calculated from the most recent 10 years of sampling, 1998–2007.
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[c] New York State Water Quality Standards, Class "D" for surface waters as a standard for nonradiological results
[d] Alpha as Am-241
[e] Beta as Sr-90

TABLE B-5E
2010 Radioactivity and pH in Surface Water at Franks Creek East of the SDA (WNFRC67)

Analyte	Units	N	WNFRC67 Concentrations			N	Reference Values	
			Average	Maximum			WFBCBKG [a] Background Range	Guideline [b] or Standard [c]
Gross Alpha	µCi/mL	4	1.03±0.97E-09	2.53E-09		12	<4.48E-10–2.12E-09	3E-08[d]
Gross Beta	µCi/mL	4	1.99±1.86E-09	3.48E-09		12	<1.33E-09–3.37E-09	1E-06[e]
Tritium	µCi/mL	4	4.34±4.79E-08	1.60E-07		12	<4.48E-08–5.90E-08	2E-03
Sr-90	µCi/mL	2	0.62±8.99E-10	<9.78E-10		2	<1.03E-09–<1.09E-09	1E-06
Cs-137	µCi/mL	2	0.26±1.93E-09	<1.94E-09		2	<1.94E-09–<1.94E-09	3E-06
pH	SU	4	7.6	8.1		292	6.4–8.7	6.0–9.5

N - Number of samples

[a] Background data are from Buttermilk Creek, upstream of the WVDP. Sampling for nonradiological data was discontinued at this location in 2008. The pH range was calculated from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] New York State Water Quality Standards for Class "D" surface waters as a standard for nonradiological results

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5F
Radioactivity and pH in Surface Water at Fox Valley Road Buttermilk Creek Background (WFBCBKG)

Analyte	Units	N	WFBCBKG [a] Concentrations			Reference Values Guideline [b] or Standard [c]
			Average	Maximum		
Gross Alpha	µCi/mL	12	6.12±9.73E-10	2.12E-09		3E-08[d]
Gross Beta	µCi/mL	12	2.06±1.82E-09	3.37E-09		1E-06[e]
Tritium	µCi/mL	12	0.45±4.60E-08	5.90E-08		2E-03
C-14	µCi/mL	2	-2.36±3.11E-08	<3.20E-08		7E-05
Sr-90	µCi/mL	2	0.79±1.06E-09	<1.09E-09		1E-06
Tc-99	µCi/mL	2	-1.21±1.90E-09	<2.12E-09		1E-04
I-129	µCi/mL	2	3.05±7.31E-10	<8.87E-10		5E-07
Cs-137	µCi/mL	2	0.10±1.94E-09	<1.94E-09		3E-06
U-232	µCi/mL	2	0.05±2.89E-11	<2.96E-11		1E-07
U-233/234	µCi/mL	2	1.09±0.76E-10	1.37E-10		5E-07
U-235/236	µCi/mL	2	1.14±3.19E-11	<3.64E-11		5E-07
U-238	µCi/mL	2	2.65±3.68E-11	<3.77E-11		6E-07
Pu-238	µCi/mL	2	-0.26±2.01E-11	<2.25E-11		4E-08
Pu-239/240	µCi/mL	2	0.71±2.60E-11	<3.14E-11		3E-08
Am-241	µCi/mL	2	0.00±2.14E-11	<2.19E-11		3E-08
pH	SU	292	Range: 6.4–8.7			6.0–9.5

N - Number of samples

[a] Radiological data are from samples collected in CY 2010. Sampling for nonradiological constituents was discontinued in 2008. The pH values represent measurements from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] The New York State Water Quality Standard for Class "D" is provided as a comparative reference for pH.

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5G
Ten-Year Average and Maximum Radioactivity and pH in Surface Water at Bigelow Bridge Cattaraugus Creek Background (WFBIGBR)

Analyte	*Units*	*N*	*WFBIGBR [a] Concentrations*		*Reference Values Guideline [b] or Standard [c]*
			Average	*Maximum*	
Gross Alpha	µCi/mL	98	0.45±1.05E-09	4.62E-09	3E-08[d]
Gross Beta	µCi/mL	98	2.64±1.35E-09	1.37E-08	1E-06[e]
Tritium	µCi/mL	98	0.71±7.79E-08	2.65E-07	2E-03
Sr-90	µCi/mL	98	1.27±1.46E-09	1.10E-08	1E-06
Cs-137	µCi/mL	98	0.59±3.27E-09	5.29E-09	3E-06
pH	SU	98	Range: 5.80–8.34		6.5–8.5

N - Number of samples

[a] Sampling was discontinued in 2008. Data represent measurements from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] The New York State Water Quality Standard for Class "B" is provided as a comparative reference for pH.

[d] Alpha as Am-241

[e] Beta as Sr-90

APPENDIX B-6

Potable Water (Drinking Water) Data

TABLE B-6A
2010 Radioactivity and Water Quality Results in Potable Water at the WVDP

Analyte	*Units*	*N*	*WNDNKMP*	*WNDNKEL*	*Standard* [a]
Gross Alpha	µCi/mL	1	-0.90±3.32E-10	NA	1.5E-08
Gross Beta	µCi/mL	1	9.53±7.06E-10	NA	5E-08
Tritium	µCi/mL	1	0.55±4.67E-08	NA	2E-05
Haloacetic Acids-Five (5)	mg/L	1	NA	0.015	0.06
Total Trihalomethanes	mg/L	1	NA	0.053	0.08

N - Number of samples
NA - Not applicable, constituent not analyzed
[a] New York State Department of Health MCLs for drinking water used as a comparative reference.

TABLE B-6B
2010 Water Quality Results in Utility Room Potable Water (Entry Point 002)

Analyte	*Units*	*N*	*Utility Room Concentrations*		*Standard or Guideline* [a]
			Minimum	*Maximum*	
Antimony, Total	mg/L	1	NA	<0.0004	0.006
Arsenic, Total	mg/L	1	NA	<0.001	0.05
Barium, Total	mg/L	1	NA	<0.20	2.00
Beryllium, Total	mg/L	1	NA	<0.0003	0.004
Cadmium, Total	mg/L	1	NA	<0.001	0.005
Chromium, Total	mg/L	1	NA	<0.007	0.10
Cyanide, Total	mg/L	1	NA	<0.010	0.2
Fluoride	mg/L	1	NA	<0.20	2.2
Free Residual Chlorine	mg/L	1,094	0.10	1.97	0.2–4.0
Iron, Total	mg/L	1	NA	<0.050	0.3
Manganese, Total	mg/L	1	NA	<0.010	--
Mercury, Total	mg/L	1	NA	<0.0002	0.002
Nickel, Total	mg/L	1	NA	<0.005	--
TOC	mg/L	4	1.1	2.8	--
Selenium, Total	mg/L	1	NA	<0.002	0.05
Thallium, Total	mg/L	1	NA	<0.0003	0.0005
Turbidity	NTU	2,190	0.1	0.9	1.0[b]
Zinc, Total	mg/L	1	NA	<0.010	--

Note: Chemical constituent sampling is required by, and reported to, the Cattaraugus County Department of Health.
N - Number of samples
NA - Not applicable, constituents sampled annually
NTU - Nephelometric Turbidity Unit
TOC - Total organic carbon
-- No guideline or standard available for these analytes
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent.
[b] A treatment standard of 0.3 NTU applies to the 95th percentile on a monthly basis.

TABLE B-6C
2010 Water Quality Results in Utility Room Raw (Untreated) Water

Analyte	*Units*	*N*	*Untreated Raw Water Concentrations*		
			Minimum	*Average*	*Maximum*
Alkalinity	mg/L	4	53.2	70.8	92.9
Iron, Total	mg/L	53	0.16	2.5	21.2
Solids, Total Dissolved	mg/L	18	58	134	195
TOC	mg/L	4	1.9	2.5	3.5

Note: Chemical constituent sampling is required by, and reported to, the Cattaraugus County Department of Health.
N - Number of samples
TOC - Total organic carbon

TABLE B-6D
2010 Biological and Chlorine Results From Various Site Tap Water Locations
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Various Site Tap Water Locations Results*	*Standard* [a]
E. coli	NA	12	Negative	one positive sample
Free Residual Chlorine	mg/L	12	Range: 0.03–1.26	4.0 (max)
Total Coliform	NA	12	Negative	two or more positive samples

N - Number of samples
NA - Not applicable
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

TABLE B-6E
2010 Nitrate Results From the Utility Room Raw Tap Water
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Date Collected*	*Annual Concentration*	*Standard* [a]
Nitrate-N	mg/L	1	3/2/2010	<1.0	10

N - Number of samples
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

APPENDIX C

Summary of Air Monitoring Data

TABLE C-1
2010 Effluent Airborne Radioactivity at Main Stack (ANSTACK)

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG* [c] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	27	4.58±0.16E-06	5.94±0.21E-15	6.42E-14	--	--
Gross Beta	27	8.88±0.06E-05	1.15±0.01E-13	1.25E-12	--	--
H-3	27	2.78±0.05E-03	3.61±0.07E-12	1.24E-11	1E-07	<0.0001
Co-60	2	2.10±4.76E-08	2.73±6.18E-17	<1.02E-16	8E-11	<0.0001
Sr-90	2	2.61±0.10E-05	3.39±0.13E-14	5.59E-14	9E-12	0.0038
I-129	2	1.95±0.13E-05	2.53±0.17E-14	2.73E-14	7E-11	0.0004
Cs-137	2	2.95±0.12E-05	3.83±0.23E-14	6.51E-14	4E-10	0.0001
Eu-154	2	1.04±1.28E-07	1.35±1.66E-16	<3.48E-16	5E-11	<0.0001
U-232 [d]	2	7.07±6.48E-09	9.17±8.41E-18	2.04E-17	2E-14	0.0005
U-233/234 [d]	2	2.25±0.65E-08	2.91±0.84E-17	3.12E-17	9E-14	0.0003
U-235/236 [d]	2	5.16±3.37E-09	6.69±4.37E-18	1.16E-17	1E-13	<0.0001
U-238 [d]	2	1.88±0.62E-08	2.44±0.80E-17	2.53E-17	1E-13	0.0002
Pu-238	2	6.73±0.34E-07	8.73±0.45E-16	1.54E-15	3E-14	0.0291
Pu-239/240	2	1.23±0.05E-06	1.59±0.06E-15	2.78E-15	2E-14	0.0795
Am-241	2	2.13±0.18E-06	2.76±0.23E-15	4.85E-15	2E-14	0.138
Sum of Ratios						0.25

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Half-lives are listed in Table UI-4.
[b] Total volume released at 50,000 cfm = 7.71E+14 mL/year
[c] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[d] Total Uranium: 6.62±0.15E-02 g; average = 8.59E±0.19E-11 µg/mL

TABLE C-2
2010 Effluent Airborne Radioactivity at Vitrification System HVAC (ANVITSK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	27	-1.01±1.44E-08	-2.62±3.74E-17	<2.88E-16	--
Gross Beta	27	5.68±4.29E-08	1.47±1.11E-16	1.72E-15	--
Co-60	2	-0.63±2.47E-08	-1.64±6.41E-17	<1.07E-16	8E-11
Sr-90	2	-0.28±2.05E-08	-0.72±5.31E-17	<7.72E-17	9E-12
I-129	2	5.64±1.08E-07	1.46±0.28E-15	1.77E-15	7E-11
Cs-137	2	0.56±1.86E-08	1.44±4.83E-17	<7.46E-17	4E-10
Eu-154	2	-0.75±6.49E-08	-0.19±1.68E-16	<2.60E-16	5E-11
U-232 [b]	2	0.68±3.80E-09	1.77±9.87E-18	<1.73E-17	2E-14
U-233/234 [b]	2	7.65±2.65E-09	1.99±0.69E-18	2.27E-17	9E-14
U-235/236 [b]	2	2.26±1.53E-09	5.87±3.98E-18	6.66E-18	1E-13
U-238 [b]	2	9.02±3.00E-09	2.34±0.78E-17	2.40E-17	1E-13
Pu-238	2	-1.70±2.15E-09	-4.40±5.57E-18	<9.43E-18	3E-14
Pu-239/240	2	1.60±1.99E-09	4.16±5.16E-18	<8.32E-18	2E-14
Am-241	2	1.04±1.05E-09	2.69±2.73E-18	5.62E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 2.84±0.06E-02 g; average = 7.38±0.17E-11 µg/mL

TABLE C-3
2010 Effluent Airborne Radioactivity at 01-14 Building (ANCSSTK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	27	-4.06±5.66E-09	-2.71±3.79E-17	<3.04E-16	--
Gross Beta	27	-0.16±1.64E-08	-0.11±1.09E-16	<6.49E-16	--
Co-60	2	-1.56±9.30E-09	-1.04±6.22E-17	<9.55E-17	8E-11
Sr-90	2	0.37±1.03E-08	2.49±6.87E-17	1.58E-16	9E-12
I-129	2	1.42±0.39E-07	9.52±2.59E-16	9.77E-16	7E-11
Cs-137	2	5.20±7.45E-09	3.48±4.98E-17	<7.51E-17	4E-10
Eu-154	2	1.30±2.32E-08	0.87±1.55E-16	<2.44E-16	5E-11
U-232 [b]	2	-0.47±1.41E-09	-3.15±9.42E-18	<1.71E-17	2E-14
U-233/234 [b]	2	3.48±1.18E-09	2.33±0.79E-17	2.75E-17	9E-14
U-235/236 [b]	2	5.95±5.01E-10	3.98±3.35E-18	<6.08E-18	1E-13
U-238 [b]	2	3.37±1.19E-09	2.25±0.79E-17	2.69E-17	1E-13
Pu-238	2	-0.74±3.46E-10	-0.49±2.32E-18	<4.09E-18	3E-14
Pu-239/240	2	-2.05±4.40E-10	-1.37±2.94E-18	<4.84E-18	2E-14
Am-241	2	-0.45±5.06E-10	-0.30±3.38E-18	<6.03E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.08±0.02E-02 g; average = 7.24±0.16E-11 µg/mL

TABLE C-4
2010 Effluent Airborne Radioactivity at Contact Size-Reduction Facility (ANCSRFK)

Ventilation Off; System Did Not Operate During CY 2010

TABLE C-5
2010 Effluent Airborne Radioactivity at Supernatant Treatment System (ANSTSTK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	27	-3.43±2.93E-09	-4.94±4.22E-17	<2.48E-16	--
Gross Beta	27	8.86±8.99E-09	1.28±1.30E-16	9.59E-16	--
H-3	27	1.28±0.50E-05	1.84±0.73E-13	7.89E-13	1E-07
Co-60	2	0.45±4.28E-09	0.64±6.17E-17	<1.09E-16	8E-11
Sr-90	2	2.96±5.12E-09	4.27±7.38E-17	<1.09E-16	9E-12
I-129	2	8.70±0.55E-06	1.25±0.08E-13	1.51E-13	7E-11
Cs-137	2	1.44±0.51E-08	2.08±0.74E-16	2.12E-16	4E-10
Eu-154	2	-1.49±1.18E-08	-2.14±1.69E-16	<2.85E-16	5E-11
U-232 [b]	2	6.30±5.92E-10	9.09±8.53E-18	2.29E-17	2E-14
U-233/234 [b]	2	1.04±0.54E-09	1.50±0.78E-17	2.02E-17	9E-14
U-235/236 [b]	2	0.89±1.92E-10	1.29±2.77E-18	<4.09E-18	1E-13
U-238 [b]	2	1.89±0.71E-09	2.73±1.02E-17	3.45E-17	1E-13
Pu-238	2	-0.09±1.65E-10	-0.13±2.38E-18	<3.55E-18	3E-14
Pu-239/240	2	-0.60±2.60E-10	-0.86±3.75E-18	<5.95E-18	2E-14
Am-241	2	-0.12±3.68E-10	-0.18±5.31E-18	<1.02E-17	2E-14

N - Number of samples

-- DCGs are not specified for gross alpha and beta activity.

[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.

[b] Total Uranium: 5.07±0.12E-03 g; average = 7.31±0.17E-11 µg/mL

TABLE C-6
2010 Effluent Airborne Radioactivity at Container Sorting and Packaging Facility (ANCSPFK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	27	1.07±0.82E-09	6.13±4.68E-17	5.18E-16	--
Gross Beta	27	5.30±2.15E-09	3.04±1.23E-16	3.88E-15	--
Co-60	2	-0.39±1.08E-09	-2.25±6.20E-17	<9.79E-17	8E-11
Sr-90	2	3.62±9.37E-10	2.07±5.36E-17	7.92E-17	9E-12
I-129	2	5.28±0.62E-08	3.02±0.35E-15	3.23E-15	7E-11
Cs-137	2	1.28±9.38E-10	0.73±5.37E-17	<8.95E-17	4E-10
Eu-154	2	-2.17±3.56E-09	-1.24±2.04E-16	<3.43E-16	5E-11
U-232[b]	2	-0.06±2.11E-10	-0.03±1.21E-17	<2.20E-17	2E-14
U-233/234[b]	2	4.81±1.50E-10	2.75±0.86E-17	2.86E-17	9E-14
U-235/236[b]	2	0.99±4.79E-11	0.57±2.74E-18	<3.86E-18	1E-13
U-238[b]	2	4.23±1.43E-10	2.42±0.82E-17	2.78E-17	1E-13
Pu-238	2	1.51±0.85E-10	8.62±4.89E-18	1.44E-17	3E-14
Pu-239/240	2	1.02±0.92E-10	5.87±5.27E-18	1.75E-17	2E-14
Am-241	2	5.29±1.38E-10	3.03±0.79E-17	4.16E-17	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.33±0.03E-03 g; average = 7.61±0.16E-11 µg/mL

TABLE C-7
2010 Effluent Airborne Radioactivity at Outdoor Ventilation Enclosures/Portable Ventilation Units (OVEs/PVUs)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	127	8.92±3.08E-09	5.45±1.89E-17	3.18E-15	--
Gross Beta	127	5.92±9.18E-09	3.62±5.62E-17	2.96E-15	--
Co-60	2	-1.80±2.04E-09	-1.10±1.25E-17	<2.64E-17	8E-11
Sr-90	2	5.58±3.15E-09	3.41±1.92E-17	5.63E-17	9E-12
Cs-137	2	0.49±1.75E-09	0.30±1.07E-17	<2.18E-17	4E-10
Eu-154	2	-2.61±5.43E-09	-1.59±3.32E-17	<6.85E-17	5E-11
U-232[b]	2	-0.91±4.51E-10	-0.56±2.76E-18	<6.48E-18	2E-14
U-233/234[b]	2	3.29±0.58E-09	2.01±0.35E-17	2.28E-17	9E-14
U-235/236[b]	2	3.09±1.78E-10	1.89±1.09E-18	2.40E-18	1E-13
U-238[b]	2	4.29±0.63E-09	2.62±0.38E-17	2.70E-17	1E-13
Pu-238	2	-0.53±1.18E-10	-3.23±7.22E-19	<1.42E-18	3E-14
Pu-239/240	2	0.13±1.30E-10	0.80±7.95E-19	<1.53E-18	2E-14
Am-241	2	1.85±1.78E-10	1.13±1.09E-18	<1.93E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.02±0.05E-02 g; average = 6.26±0.31E-11 µg/mL

TABLE C-8
2010 Effluent Airborne Radioactivity at Remote-Handled Waste Facility (ANRHWFK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	27	-3.67±8.58E-09	-2.97±6.95E-17	<3.25E-16	--
Gross Beta	27	-0.25±2.42E-08	-0.20±1.96E-16	1.45E-15	--
Co-60	2	-0.26±1.52E-08	-0.21±1.23E-16	<2.22E-16	8E-11
Sr-90	2	1.98±1.48E-08	1.60±1.20E-16	2.03E-16	9E-12
I-129	2	9.51±3.73E-08	7.71±3.02E-16	9.14E-16	7E-11
Cs-137	2	-0.45±1.39E-08	-0.37±1.13E-16	<1.87E-16	4E-10
Eu-154	2	0.30±3.81E-08	0.24±3.09E-16	<5.39E-16	5E-11
U-232 [b]	2	-0.59±1.45E-09	-0.48±1.18E-17	<2.15E-17	2E-14
U-233/234 [b]	2	4.35±1.60E-09	3.53±1.29E-17	3.77E-17	9E-14
U-235/236 [b]	2	6.62±5.80E-10	5.37±4.71E-18	8.60E-18	1E-13
U-238 [b]	2	5.88±1.78E-09	4.77±1.44E-17	4.83E-17	1E-13
Pu-238	2	-1.43±5.92E-10	-1.16±4.79E-18	<8.35E-18	3E-14
Pu-239/240	2	-7.36±6.79E-10	-5.97±5.51E-18	<8.34E-18	2E-14
Am-241	2	1.85±3.72E-10	1.50±3.02E-18	<5.04E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.56±0.03E-02 g; average = 1.27±0.03E-10 µg/mL

TABLE C-9
2010 Ambient Airborne Radioactivity at Background Great Valley Location (AFGRVAL)

Isotope	*N*	*AFGRVAL µCi/mL*	
		Average	*Maximum*
Gross Alpha	27	1.04±0.58E-15	1.91E-15
Gross Beta	27	1.47±0.18E-14	2.43E-14
K-40	2	0.99±1.66E-15	1.68E-15
Co-60	2	0.20±1.25E-16	<1.61E-16
Sr-90	2	-0.85±1.21E-16	<1.26E-16
I-129	2	0.65±1.85E-16	<1.88E-16
Cs-137	2	-0.17±1.14E-16	<1.38E-16
Eu-154	2	-0.57±3.17E-16	<3.81E-16
U-232 [a]	2	-0.43±1.03E-17	<1.10E-17
U-233/234 [a]	2	3.96±1.65E-17	5.79E-17
U-235/236 [a]	2	6.43±7.54E-18	<8.65E-18
U-238 [a]	2	3.35±1.46E-17	3.48E-17
Pu-238	2	-1.47±4.40E-18	<5.70E-18
Pu-239/240	2	-2.90±6.14E-18	<7.09E-18
Am-241	2	1.10±3.64E-18	<3.74E-18

N - Number of samples
[a] Total Uranium: AFGRVAL average = 1.07±0.03E-10 µg/mL

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APPENDIX D-1

Summary of Groundwater Screening Levels and Practical Quantitation Limits

Groundwater Sampling Methodology

Groundwater samples are collected from monitoring wells using either dedicated Teflon® well bailers or bladder pumps. Bailers are used in low-yield wells; bladder pumps are used in wells with good water-yielding characteristics. This sampling equipment is dedicated to an individual well to reduce the likelihood of sample contamination from external materials or cross contamination.

To ensure that only representative groundwater is sampled, three well volumes are removed (purged) from the well before the actual samples are collected. In low-yield wells, pumping or bailing to dryness provides sufficient purging. Conductivity and pH are measured before and after sampling to confirm the geochemical stability of the groundwater during sampling.

The bailer, a tube with a check valve at the bottom, is lowered slowly into the well to minimize agitation of the water column. The bailer containing the groundwater is then withdrawn from the well and emptied into a sample container. Bladder pumps use compressed air to gently squeeze a Teflon® bladder that prevents air contact with the groundwater as it is pumped into a sample container with a minimum of agitation and mixing. A check valve ensures that the water flows in only one direction.

Groundwater samples are cooled and preserved, with chemicals if required, to minimize chemical and/or biological changes after sample collection. A strict chain-of-custody protocol is followed for all samples collected by the WVDP.

Groundwater Screening Levels (GSLs) for Radiological Constituents: Background values for radiological constituents in groundwater were derived for the Corrective Measures Studies in 2009 using data from background wells 301, 401, 706, and 1302 in the sand and gravel unit on the north plateau for samples collected from 1991 through September 2009. The 95% upper confidence limit (UCL) was applied in a similar statistical calculation for each radiological constituent. The site-specific GSLs for radiological constituents were set to the larger of the background level or the TOGS 1.1.1 Class GA groundwater quality standard for each radiological constituent. The NYSDEC TOGS standards are only established for gross alpha and gross beta concentrations, consequently most of the screening values for radiological constituents are set to equal the site background values. The GSLs for radiological constituents are listed in Table D-1A.

The site monitoring well radiological concentrations presented in the data tables in Appendix D-2 are compared with these GSLs. Bolding indicates that the measured concentration exceeded the GSL.

Groundwater Screening Levels for Metals: The calculated WVDP GSLs for metals were established in WVDP-494, *North Plateau Plume Area Characterization Report*. The GSLs for metals were selected as the greater of the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards or background concentrations in groundwater as documented in Appendix E of WVDP-494. The groundwater background concentrations were derived from a statistical calculation of the mean plus two standard deviations for metals data collected from four background wells (301, 401, 706, and well 1302). Elevated levels of chromium and nickel were identified in site wells constructed with stainless steel (which includes 301, 401, and 706), as presented to NYSDEC in a report entitled *Final Report: Evaluation of the Pilot Program to Investigate Chromium & Nickel Concentrations in Groundwater in the Sand & Gravel Unit* (WVNSCO, 1998). The findings of this report were subsequently accepted by NYSDEC in their memorandum dated September 15, 1998.

Consequently, the majority of the chromium and nickel results from these stainless-steel wells were omitted from the dataset used to establish background, relying primarily on the results from polyvinyl chloride (PVC) well 1302 for these two constituents. The groundwater screening values for metals are listed in Table D-1B.

The site monitoring well metals concentrations presented in the data tables in Appendix D-2 are compared with these GSLs. Bolding indicates that the measured concentration exceeded the GSL.

TABLE D-1A
Groundwater Screening Levels for Radiological Constituents

Radiological Constituent	Range of Observed Concentrations From Background Monitoring Wells 301, 401, 706, and 1302 [a] (µCi/mL)	WVDP 95% UCL Background Groundwater Concentration [a] (µCi/mL)	NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards [b] (µCi/mL)	WVDP GSLs [c] (µCi/mL)
Gross alpha	< 7.78E-10 – 1.55E-08	7.61E-09	1.50E-08	1.50E-08
Gross beta	< 2.15E-09 – 2.35E-08	1.56E-08	1.00E-06	1.00E-06
Tritium	< 3.17E-08 – 2.63E-07	1.78E-07	NE	1.78E-07
Carbon-14	< 1.36E-11 – 5.02E-08	2.82E-08	NE	2.82E-08
Cesium-137	5.79E-10 – 1.90E-08	1.03E-08	NE	1.03E-08
Iodine-129	< 2.85E-10 – 1.58E-09	9.61E-10	NE	9.61E-10
Potassium-40	< 5.00E-08 – 3.56E-07	1.99E-07	NE	1.99E-07
Radium-226	< 1.10E-10 – 2.99E-09	1.33E-09	NE	1.33E-09
Radium-228	< 2.23E-10 – 3.20E-09	2.16E-09	NE	2.16E-09
Strontium-90	< 2.41E-10 – 6.40E-09	5.90E-09	NE	5.90E-09
Technetium-99	< 8.21E-10 – 8.61E-09	5.02E-09	NE	5.02E-09
Total Uranium	< 1.27E-06 – 3.46E-03	1.34E-03	NE	1.34E-03
Uranium-232	< 1.71E-11 – 3.78E-10	1.38E-10	NE	1.38E-10
Uranium-233/234	< 3.85E-11 – 1.53E-09	6.24E-10	NE	6.24E-10
Uranium-235/236	< 1.80E-11 – 1.39E-10	8.07E-11	NE	8.07E-11
Uranium-238	< 1.32E-11 – 1.26E-09	4.97E-10	NE	4.97E-10

NE - No NYSDEC TOGS 1.1.1 groundwater quality standard has been established for this analyte.

[a] The data used for the calculation of background values were taken from background wells 301, 401, 706, and 1302 in the sand and gravel unit on the north plateau for samples collected from 1991 through September 2009. The background concentration was set to the upper limit of the 95% confidence interval.

[b] NYSDEC TOGS 1.1.1 (June 1998/2004 addendum) Class GA groundwater quality standards and guidance values.

[c] The GSLs for radiological constituents were set equal to the larger of the background concentrations or the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

TABLE D-1B
Groundwater Screening Levels for Metals

Analyte [a]	***Range of Observed Concentrations From Background Monitoring Wells 301, 401, 706, and 1302*** [a] ***(µg/L)***	***Background Groundwater Concentration*** [b] ***(µg/L)***	***NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards (µg/L)***	***WVDP Groundwater Screening Levels (GSLs)*** [c] ***(µg/L)***
Antimony, total	0.5 – 19.7	15.1	3	15.1
Arsenic, total	1.5 – 34.4	20.9	25	25
Barium, total	71.7 – 499	441	1,000	1,000
Beryllium, total	0.10 – 2.50	1.85	3	3
Cadmium, total	0.30 – 5.30	7.27	5	7.27
Chromium, total[d]	5 – 66	52.3	50	52.3
Cobalt, total	2.05 – 60.9	67.8	NE	67.8
Copper, total	1.4 – 90.5	59.9	200	200
Lead, total	0.5 – 120	42.7	25	42.7
Mercury, total	0.03 – 0.4	0.263	0.7	0.7
Nickel, total[d]	10 – 77.8	59.5	100	100
Selenium, total	1.0 – 25.0	10.1	10	10.1
Silver, total	0.1 – 10	15.5	50	50
Thallium, total	0.3 – 13.1	13.9	0.5	13.9
Tin, total	5.6 – 3,000	4,083	NE	4,083
Vanadium, total	0.6 – 73.1	69.6	NE	69.6
Zinc, total	5.71 – 256	127	2,000	2,000

NE - No NYSDEC TOGS 1.1.1 groundwater quality standard has been established for this analyte.

[a] Analytes listed are those identified in the 6 NYCRR Part 373-2 Appendix 33 List.

[b] Data used for the calculation of background values were taken from wells 301, 401, 706, and 1302 in the S&G unit on the north plateau for samples collected from 1991 to December 2008. The background concentration was set equal to the mean plus two standard deviations (as reported in WVDP-494). Ninety-five percent of measurements are expected to fall below this value. Data were rounded to three significant digits or the closest integer.

[c] Metals GSLs were set equal to the larger of the background concentration or the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

[d] Elevated chromium and nickel concentrations attributed to well corrosion were noted in wells 301, 401, and 706 over the monitoring period. All results suspected to be affected by corrosion (i.e., all chromium and nickel results for 301 and 401, and all results after May 2004 from 706) were excluded from the background calculation.

TABLE D-1C
Practical Quantitation Limits (PQLs)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	**PQL**	**Compound**	**PQL**
Acetone	10	cis-1,3-Dichloropropene	5
Acetonitrile	100	Ethyl Benzene	5
Acrolein	11	Ethyl methacrylate	5
Acrylonitrile	5	2-Hexanone	10
Allyl chloride	5	Isobutyl alcohol	100
Benzene	5	Methacrylonitrile	5
Bromodichloromethane	5	Methyl ethyl ketone	10
Bromoform (methyl bromide)	5	Methyl iodide	5
Bromomethane	10	Methyl methacrylate	5
Carbon disulfide	10	4-Methyl-2-pentanone (MIBK)	10
Carbon tetrachloride	5	Methylene bromide	10
Chlorobenzene	5	Methylene chloride	5
Chloroethane	10	Pentachloroethane	5
Chloroform	5	Propionitrile	50
Chloromethane (methyl chloride)	10	Styrene	5
Chloroprene	5	1,1,1,2-Tetrachloroethane	5
1,2-Dibromo-3-chloropropane	5	1,1,2,2-Tetrachloroethane	5
Dibromochloromethane	5	Tetrachloroethylene	5
1,2-Dibromoethane	5	Toluene	5
trans-1,4-Dichloro-2-butene	5	1,1,1-Trichloroethane (1,1,1-TCA)	5
1,1-Dichloroethane (1,1-DCA)	5	1,1,2-Trichloroethane (1,1,2-TCA)	5
1,2-Dichloroethane (1,2-DCA)	5	Trichloroethylene (TCE)	5
1,1-Dichloroethylene (1,1-DCE)	5	Trichlorofluoromethane	5
trans-1,2-Dichloroethylene (1,2-DCE[trans])	5	1,2,3-Trichloropropane	5
Dichlorodifluoromethane (DCDF Meth)	5	Vinyl acetate	10
1,2-Dichloropropane	5	Vinyl chloride	10
trans-1,3-Dichloropropene	5	Xylene (total)	5
6 NYCRR[a] Appendix 33 Metals	**PQL**	**6 NYCRR[a] Appendix 33 Metals**	**PQL**
Aluminum[b]	200	Lead	3
Antimony	10	Manganese	15
Arsenic	10	Mercury	0.2
Barium	200	Nickel	40
Beryllium	1	Selenium	5
Cadmium	5	Silver	10
Chromium	10	Thallium	10
Cobalt	50	Tin	3,000

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.
[b] Not a 6 NYCRR Appendix 33 parameter; sampled for the north plateau early warning program.

TABLE D-1C *(continued)*
Practical Quantitation Limits (PQLs)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	**PQL**	**Compound**	**PQL**
Acenaphthene	10	2,4-Dinitrotoluene	10
Acenaphthylene	10	2,6-Dinitrotoluene	10
Acetophenone	10	Diphenylamine	10
2-Acetylaminofluorene	10	Ethyl methanesulfonate	10
4-Aminobiphenyl	10	Famphur	10
Analine	10	Fluoranthene	10
Anthracene	10	Fluorene	10
Aramite	10	Hexachlorobenzene	10
Benzo[a]anthracene	10	Hexachlorobutadiene	10
Benzo[a]pyrene	10	Hexachlorocyclopentadiene	10
Benzo[b]fluoranthene	10	Hexachloroethane	10
Benzo[ghi]perylene	10	Hexachlorophene	10
Benzo[k]fluoranthene	10	Hexachloropropene	10
Benzyl alcohol	10	Indeno(1,2,3,-cd)pyrene	10
Bis(2-chloroethyl)ether	10	Isodrin	10
Bis(2-chloroethoxy)methane	10	Isophorone	10
Bis(2-chloroisopropyl)ether	10	Isosafrole	10
Bis(2-ethylhexyl)phthalate	10	Kepone	10
4-Bromophenyl phenyl ether	10	Methapyrilene	10
Butyl benzyl phthalate	10	Methyl methanesulfonate	10
Chlorobenzilate	10	3-Methylcholanthrene	10
2-Chloronaphthalene	10	2-Methylnapthalene	10
2-Chlorophenol	10	1,4-Naphthoquinone	10
4-Chlorophenyl phenyl ether	10	1-Naphthylamine	10
Chrysene	10	2-Naphthylamine	10
Di-n-butyl phthalate	10	Nitrobenzene	10
Di-n-octyl phthalate	10	5-Nitro-o-toluidine	10
Diallate	10	4-Nitroquinoline 1-oxide	40
Dibenz[a,h]anthracine	10	N-Nitrosodi-n-butylamine	10
Dibenzofuran	10	N-Nitrosodiethylamine	10
3,3-Dichlorobenzidine	10	N-Nitrosodimethylamine	10
2,4-Dichlorophenol	10	N-Nitroso-di-n-propylamine	10
2,6-Dichlorophenol	10	N-Nitrosodiphenylamine	10
Diethyl phthalate	10	N-Nitrosomethylethylamine	10
Dimethoate	10	N-Nitrosomorpholine	10
7,12-Dimethylbenz[a]anthracene	10	N-Nitrosopiperidine	10
3,3-Dimethylbenzidine	20	N-Nitrosopyrrolidine	10
2,4-Dimethylphenol	10	Naphthalene	10
Dimethyl phthalate	10	0,0,0-Triethyl phosphorothioate	10
4,6-Dinitro-o-cresol	25	O,O-Diethyl O-2-pyrazinylphosphorothioate	10
2,4-Dinitrophenol	25		

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.

[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

TABLE D-1C *(concluded)*
Practical Quantitation Limits (PQLs)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	**PQL**	**Compound**	**PQL**
p-(Dimethylamino)azobenzene	10	2,3,4,6-Tetrachlorophenol	10
p-Chloroaniline	10	Tetraethyl dithiopyrophosphate	10
p-Chloro-m-cresol	10	1,2,4-Trichlorobenzene	10
p-Cresol	10	2,4,5-Trichlorophenol	25
p-Dichlorobenzene	10	2,4,6-Trichlorophenol	10
p-Nitroaniline	25	alpha,alpha-Dimethylphenethylamine	50
p-Nitrophenol	25	m-Cresol	10
p-Phenylenediamine	10	m-Dichlorobenzene	10
Parathion	10	m-Dinitrobenzene	10
Pentachlorobenzene	10	m-Nitroanaline	25
Pentachloronitrobenzene	10	o-Cresol	10
Pentachlorophenol	25	o-Dichlorobenzene	10
Phenacetin	10	o-Nitroaniline	25
Phenanthrene	10	o-Nitrophenol	10
Phenol	10	o-Toluidine	10
Pronamide	10	sym-Trinitrobenzene	10
Pyrene	10	2-Picoline	10
Safrole	10	Pyridine	10
1,2,4,5-Tetrachlorobenzene	10	1,4-Dioxane	10
Other Organic Compounds			
1,2-Dichloroethylene (Total)	5		
N-Dodecane	60		
Tributyl phosphate	10		

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

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APPENDIX D-2

Groundwater Monitoring Data

TABLE D-2A
2010 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
301	UP	Mar-10	6.69	1,323	3.20±2.48E-09	5.62±2.63E-09	2.84±4.80E-08
301	UP	Jun-10	6.46	1,670	-0.53±7.53E-09	1.01±0.50E-08	0.20±3.20E-08
301	UP	Sep-10	6.53	2,644	-5.73±9.37E-09	2.37±6.46E-09	-1.77±3.21E-08
301	UP	Dec-10	6.86	1,264	0.98±1.67E-09	6.90±2.05E-09	-0.16±4.70E-08
302	UP	Jun-10	6.95	4,755	-1.29±1.68E-08	1.83±1.19E-08	-1.96±4.49E-08
302	UP	Dec-10	6.93	4,520	0.00±4.52E-09	3.98±5.27E-09	1.44±4.72E-08
401	UP	Mar-10	6.76	1,645	-0.35±1.83E-09	1.86±2.78E-09	1.74±4.66E-08
401	UP	Jun-10	6.97	2,834	0.16±1.16E-08	1.31±0.78E-08	4.28±4.57E-08
401	UP	Sep-10	6.63	2,707	0.33±1.11E-08	7.69±8.03E-09	0.68±4.58E-08
401	UP	Dec-10	6.93	2,648	2.99±3.66E-09	4.72±3.41E-09	3.66±4.78E-08
402	UP	Jun-10	6.84	5,030	0.89±1.96E-08	8.34±9.80E-09	1.76±4.56E-08
402	UP	Dec-10	6.85	5,458	7.84±7.69E-09	-1.74±5.70E-09	-0.81±4.71E-08
403	UP	Jun-10	7.12	876	2.03±3.51E-09	5.31±2.23E-09	-1.56±4.48E-08
403	UP	Dec-10	6.97	756	0.00±7.95E-10	4.28±2.43E-09	0.47±4.73E-08
706	UP	Mar-10	7.21	780	0.28±3.22E-09	8.10±3.26E-09	-1.42±4.02E-08
706	UP	Jun-10	6.96	1,020	-0.26±4.09E-09	6.76±2.72E-09	2.58±4.64E-08
706	UP	Sep-10	6.67	872	0.24±4.32E-09	6.00±2.83E-09	0.98±4.56E-08
706	UP	Dec-10	6.80	734	0.55±1.01E-09	1.02±0.31E-08	0.29±3.24E-08
1302	UP	Dec-10	6.92	976	7.63±8.36E-10	2.68±2.32E-08	0.98±4.73E-08
1304	DOWN	Mar-10	7.18	2,314	-3.22±8.68E-09	7.78±4.56E-09	-3.83±4.59E-08
1304	DOWN	Jun-10	6.93	2,838	-3.42±7.41E-09	3.40±4.44E-09	-3.32±4.53E-08
1304	DOWN	Sep-10	7.35	1,475	-1.18±6.78E-09	1.64±3.52E-09	2.09±4.64E-08
1304	DOWN	Dec-10	6.83	1,482	1.00±1.72E-09	3.15±2.63E-09	-3.54±4.66E-08
103	DOWN	Mar-10	8.56	2,451	1.45±3.15E-09	2.19±0.46E-08	-1.48±4.73E-08
103	DOWN	Jun-10	8.08	2,808	0.91±1.05E-08	3.87±0.78E-08	2.50±4.77E-08
103	DOWN	Sep-10	8.35	2,004	1.33±6.51E-09	1.52±0.50E-08	2.15±3.25E-08
103	DOWN	Dec-10	8.32	1,664	1.98±2.43E-09	1.05±0.28E-08	-3.22±3.31E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(continued)*
2010 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
104	DOWN	Mar-10	7.19	1,738	1.31±3.32E-09	**6.93±0.15E-05**	1.76±0.50E-07
104	DOWN	Jun-10	7.15	2,059	-0.06±1.08E-08	**7.22±0.18E-05**	5.20±4.80E-08
104	DOWN	Sep-10	7.05	2,390	1.58±2.45E-09	**7.91±0.35E-05**	1.47±0.48E-07
104	DOWN	Dec-10	7.23	2,015	2.47±6.25E-09	**6.29±0.27E-05**	1.73±0.50E-07
111	DOWN	Mar-10	6.32	684	5.39±2.44E-09	**5.97±0.16E-06**	7.66±4.88E-08
111	DOWN	Jun-10	6.63	821	3.76±5.15E-09	**6.18±0.17E-06**	2.06±4.83E-08
111	DOWN	Sep-10	7.07	1,246	4.61±2.30E-09	**7.33±0.38E-06**	8.80±4.70E-08
111	DOWN	Dec-10	6.57	798	6.61±3.58E-09	**4.55±0.20E-06**	4.46±4.82E-08
205	DOWN	Jun-10	6.95	2,463	2.94±8.84E-09	1.45±0.56E-08	-0.70±4.80E-08
205	DOWN	Dec-10	7.29	1,808	0.32±1.91E-09	8.61±2.66E-09	2.02±4.76E-08
406	DOWN	Mar-10	7.32	706	1.81±1.32E-09	6.55±2.65E-09	2.70±4.80E-08
406	DOWN	Jun-10	7.11	886	1.04±3.50E-09	6.11±2.51E-09	5.18±4.60E-08
406	DOWN	Sep-10	6.83	798	1.25±3.17E-09	4.51±2.39E-09	1.37±4.60E-08
406	DOWN	Dec-10	7.06	968	-0.17±1.02E-09	8.09±3.72E-09	0.48±4.73E-08
408	DOWN	Mar-10	7.11	3,126	0.00±5.36E-09	**2.87±0.07E-04**	1.04±0.49E-07
408	DOWN	Jun-10	7.19	3,766	-0.81±1.71E-08	**3.04±0.08E-04**	8.82±4.68E-08
408	DOWN	Sep-10	7.22	3,740	1.99±3.91E-09	**2.77±0.14E-04**	8.07±4.72E-08
408	DOWN	Dec-10	7.18	3,428	0.78±1.12E-08	**2.45±0.12E-04**	5.17±4.79E-08
501	DOWN	Mar-10	7.46	2,289	0.00±3.81E-09	**1.22±0.03E-04**	8.91±4.89E-08
501	DOWN	Jun-10	7.36	2,648	-0.47±1.14E-08	**1.13±0.03E-04**	1.02±0.47E-07
501	DOWN	Sep-10	7.26	2,726	0.91±2.51E-09	**1.11±0.05E-04**	1.18±4.59E-08
501	DOWN	Dec-10	7.36	2,568	6.68±8.87E-09	**1.23±0.06E-04**	8.71±4.73E-08
502	DOWN	Mar-10	7.40	2,089	-2.62±2.72E-09	**1.06±0.02E-04**	8.83±4.87E-08
502	DOWN	Jun-10	7.21	2,434	0.12±1.11E-08	**1.01±0.03E-04**	6.72±4.68E-08
502	DOWN	Sep-10	7.57	2,570	0.89±2.47E-09	**1.08±0.05E-04**	0.20±4.57E-08
502	DOWN	Dec-10	6.89	2,312	4.95±7.77E-09	**9.93±0.45E-05**	1.04±0.48E-07
602A	DOWN	Jun-10	6.81	792	0.40±2.94E-09	1.40±0.39E-08	**2.13±0.49E-07**
602A	DOWN	Dec-10	6.82	664	2.24±1.20E-09	9.19±2.62E-09	**2.45±0.50E-07**
604	DOWN	Jun-10	6.06	1,050	1.21±3.65E-09	6.14±2.46E-09	5.90±4.64E-08
604	DOWN	Dec-10	6.21	1,569	0.00±1.65E-09	6.58±3.00E-09	4.90±4.67E-08
8605	DOWN	Mar-10	6.79	1,258	1.24±0.48E-08	**8.63±0.22E-06**	7.72±4.76E-08
8605	DOWN	Jun-10	6.66	1,098	5.41±7.94E-09	**7.56±0.21E-06**	7.16±4.72E-08
8605	DOWN	Sep-10	6.45	2,338	1.23±0.50E-08	**4.54±0.28E-06**	3.11±4.83E-08
8605	DOWN	Dec-10	6.70	908	1.21±0.49E-08	**7.87±0.34E-06**	4.34±4.79E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(continued)*
2010 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
8607	DOWN	Mar-10	6.41	1,515	2.63±6.64E-09	2.23±0.41E-08	-3.84±4.58E-08
8607	DOWN	Jun-10	6.07	1,405	-0.81±5.72E-09	2.09±0.47E-08	2.77±3.30E-08
8607	DOWN	Sep-10	6.53	1,725	0.00±7.03E-09	2.27±0.48E-08	-0.94±4.80E-08
8607	DOWN	Dec-10	6.51	1,102	2.98±7.53E-10	2.01±0.31E-08	-4.12±4.68E-08
8609	DOWN	Mar-10	6.75	1,830	1.45±2.60E-09	**1.29±0.05E-06**	1.23±0.48E-07
8609	DOWN	Jun-10	6.31	1,938	0.33±1.00E-08	**1.15±0.05E-06**	1.44±0.48E-07
8609	DOWN	Sep-10	6.62	2,112	1.27±2.49E-09	**1.35±0.12E-06**	1.64±0.51E-07
8609	DOWN	Dec-10	7.01	1,970	4.27±6.70E-09	**1.52±0.08E-06**	1.39±0.35E-07
105	DOWN	Mar-10	7.09	2,451	-1.16±3.58E-09	**8.74±0.20E-05**	1.62±0.50E-07
105	DOWN	Jun-10	7.11	2,425	-0.73±1.09E-08	**8.36±0.21E-05**	1.29±0.50E-07
105	DOWN	Sep-10	7.11	2,656	-0.95±1.86E-09	**9.04±0.42E-05**	9.99±4.73E-08
105	DOWN	Dec-10	7.14	2,458	1.00±0.85E-08	**7.20±0.32E-05**	**1.98±0.51E-07**
106	DOWN	Mar-10	6.91	1,960	-0.47±3.07E-09	**2.28±0.08E-06**	**7.03±0.58E-07**
106	DOWN	Jun-10	6.62	1,994	-2.24±9.71E-09	**2.26±0.08E-06**	**6.19±0.57E-07**
106	DOWN	Sep-10	6.64	1,950	2.17±2.46E-09	**1.88±0.15E-06**	**8.38±0.58E-07**
106	DOWN	Dec-10	6.82	1,794	4.17±5.99E-09	**1.72±0.09E-06**	**9.20±0.60E-07**
116	DOWN	Jun-10	7.08	1,791	-4.12±8.68E-09	**1.21±0.03E-05**	2.88±4.84E-08
116	DOWN	Dec-10	7.10	2,056	4.41±6.92E-09	**1.40±0.06E-05**	8.34±3.45E-08
605	DOWN	Jun-10	6.99	915	-1.38±3.14E-09	1.90±0.33E-08	6.08±4.63E-08
605	DOWN	Dec-10	6.64	579	1.10±7.18E-10	1.93±0.32E-08	4.08±4.62E-08
801	DOWN	Mar-10	6.90	1,364	-1.05±2.06E-09	**1.29±0.03E-05**	2.50±4.67E-08
801	DOWN	Jun-10	6.64	1,111	1.63±5.96E-09	**8.50±0.22E-06**	6.70±4.67E-08
801	DOWN	Sep-10	6.88	1,390	1.17±1.17E-09	**9.41±0.34E-06**	4.70±4.64E-08
801	DOWN	Dec-10	6.69	1,286	3.97±3.24E-09	**8.83±0.27E-06**	1.12±0.48E-07
802	DOWN	Mar-10	6.43	148	0.94±1.03E-09	2.72±0.26E-08	1.33±4.75E-08
802	DOWN	Jun-10	7.10	633	0.70±2.90E-09	2.16±0.11E-07	1.10±4.75E-08
802	DOWN	Sep-10	7.05	1,396	-0.05±4.89E-09	5.88±0.18E-07	5.23±4.69E-08
802	DOWN	Dec-10	6.59	520	3.94±5.13E-10	1.53±0.05E-07	5.31±4.69E-08
803	DOWN	Mar-10	6.80	1,108	0.00±5.29E-09	1.30±0.33E-08	-0.66±4.61E-08
803	DOWN	Jun-10	6.83	1,109	2.09±5.88E-09	1.14±0.41E-08	2.29±3.36E-08
803	DOWN	Sep-10	7.23	1,184	0.71±6.30E-09	6.26±3.29E-09	3.41±4.65E-08
803	DOWN	Dec-10	7.28	2,347	1.53±3.13E-09	9.00±0.42E-07	**1.99±0.49E-07**

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(continued)*
2010 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
804	DOWN	Mar-10	6.58	1,168	0.28±4.79E-09	2.06±0.12E-07	6.86±4.85E-08
804	DOWN	Jun-10	6.91	902	2.91±4.25E-09	1.56±0.09E-07	4.43±4.83E-08
804	DOWN	Sep-10	6.91	934	-2.18±4.00E-09	1.47±0.08E-07	2.13±3.30E-08
804	DOWN	Dec-10	6.46	1,276	0.23±1.52E-09	2.69±0.14E-07	4.91±4.68E-08
8603	DOWN	Jun-10	7.26	2,337	-3.27±7.94E-09	**7.02±0.12E-05**	1.70±0.50E-07
8603	DOWN	Dec-10	7.32	2,418	4.00±7.73E-09	**6.85±0.31E-05**	**1.80±0.50E-07**
8604	DOWN	Jun-10	7.20	2,034	-0.56±9.80E-09	**7.34±0.18E-05**	1.46±0.48E-07
8604	DOWN	Dec-10	7.32	2,144	5.89±7.27E-09	**6.53±0.28E-05**	1.53±0.49E-07
8612	DOWN	Mar-10	7.17	1,692	0.41±6.94E-09	6.49±3.51E-09	8.05±4.85E-08
8612	DOWN	Jun-10	7.15	1,688	-1.07±7.53E-09	2.46±4.14E-09	1.32±0.34E-07
8612	DOWN	Sep-10	7.21	1,762	-1.87±7.89E-09	4.16±4.30E-09	6.03±4.91E-08
8612	DOWN	Dec-10	7.15	1,786	1.76±2.29E-09	7.65±3.76E-09	1.07±0.49E-07
GSEEP	DOWN	Mar-10	6.84	1,197	-0.54±4.49E-09	1.78±0.33E-08	**4.72±0.38E-07**
GSEEP	DOWN	Jun-10	6.60	584	0.35±5.13E-09	1.90±0.40E-08	**3.60±0.53E-07**
GSEEP	DOWN	Sep-10	6.72	1,354	-0.91±5.24E-09	2.56±0.47E-08	**4.61±0.55E-07**
GSEEP	DOWN	Dec-10	6.88	515	1.78±9.24E-10	2.15±0.41E-08	**3.65±0.38E-07**
SP04	DOWN	Jun-10	NS	NS	1.82±7.81E-09	3.59±0.30E-07	**2.19±0.51E-07**
SP04	DOWN	Sep-10	NS	NS	4.37±7.43E-09	3.56±0.19E-07	**1.82±0.51E-07**
SP04	DOWN	Dec-10	NS	NS	1.80±2.04E-09	5.66±0.28E-07	1.19±0.35E-07
SP06	DOWN	Jun-10	NS	NS	1.06±5.23E-09	1.22±0.34E-08	1.29±0.49E-07
SP06	DOWN	Sep-10	NS	NS	-0.70±6.02E-09	3.03±0.51E-08	4.45±4.87E-08
SP06	DOWN	Dec-10	NS	NS	2.29±1.58E-09	2.62±0.46E-08	2.02±4.79E-08
SP11	DOWN	Jun-10	NS	NS	-2.52±5.71E-09	1.65±0.15E-07	4.99±4.81E-08
SP11	DOWN	Sep-10	NS	NS	-1.71±5.81E-09	1.96±0.12E-07	1.60±4.81E-08
SP11	DOWN	Dec-10	NS	NS	0.62±1.72E-09	2.15±0.13E-07	3.00±4.79E-08
SP12	DOWN	Jun-10	7.13	878	6.17±8.86E-09	2.92±0.64E-08	1.73±0.50E-07
SP12	DOWN	Sep-10	7.25	2,071	-5.53±7.45E-09	4.13±0.66E-08	9.36±4.96E-08
SP12	DOWN	Dec-10	6.69	1,018	3.36±3.08E-09	6.12±0.68E-08	1.15±0.50E-07
WP-A	DOWN	Sep-10	8.32	116	2.67±9.64E-10	1.64±0.25E-08	**1.09±0.02E-05**
WP-C	DOWN	Sep-10	7.08	640	-0.55±1.63E-09	8.72±0.44E-08	**3.50±0.11E-05**
WP-H	DOWN	Sep-10	7.03	978	1.13±1.28E-09	**5.89±0.33E-06**	**9.70±0.44E-07**

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
NS - Not sampled
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(concluded)*
2010 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
MP-01	DOWN	Jun-10	7.48	3,552	0.54±1.98E-08	**3.99±0.11E-04**	8.04±4.73E-08
MP-01	DOWN	Sep-10	7.25	3,386	2.45±2.66E-09	**3.25±0.11E-04**	-3.08±4.75E-08
MP-01	DOWN	Dec-10	7.06	3,102	0.40±1.02E-08	**3.04±0.14E-04**	-3.13±4.64E-08
MP-02	DOWN	Jun-10	7.33	3,053	-1.73±3.21E-09	**6.74±0.01E-04**	**2.54±1.21E-07**
MP-02	DOWN	Sep-10	7.06	2,406	0.48±1.05E-08	**4.13±0.01E-04**	2.79±6.33E-08
MP-02	DOWN	Dec-10	7.09	2,116	0.15±1.69E-09	**3.48±0.01E-04**	4.81±7.18E-08
MP-03	DOWN	Jun-10	7.75	2,124	0.64±1.21E-08	**2.63±0.07E-04**	1.01±0.48E-07
MP-03	DOWN	Sep-10	7.61	1,876	0.33±1.71E-09	**1.98±0.08E-04**	-0.58±4.80E-08
MP-03	DOWN	Dec-10	7.49	2,101	1.03±0.77E-08	**1.74±0.07E-04**	0.79±4.74E-08
MP-04	DOWN	Jun-10	7.44	2,459	0.81±1.39E-08	**4.68±0.12E-04**	1.07±0.48E-07
MP-04	DOWN	Sep-10	7.58	2,110	4.14±3.04E-09	**3.54±0.15E-04**	-3.63±4.71E-08
MP-04	DOWN	Dec-10	7.13	2,073	4.80±6.89E-09	**3.33±0.14E-04**	-0.98±4.68E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2B
2010 Indicator Results From the Lavery Till-Sand Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
204	DOWN	Mar-10	6.95	1,585	0.91±1.97E-09	1.80±2.55E-09	0.02±4.65E-08
204	DOWN	Jun-10	7.44	1,524	-1.32±6.15E-09	5.93±4.08E-09	1.38±4.82E-08
204	DOWN	Sep-10	7.16	1,726	0.43±7.22E-09	1.46±5.49E-09	1.76±4.60E-08
204	DOWN	Dec-10	7.27	1,770	1.30±2.20E-09	2.42±2.26E-09	1.87±4.73E-08
206	DOWN	Jun-10	7.28	1,696	1.51±7.45E-09	6.85±4.71E-09	-4.51±4.76E-08
206	DOWN	Dec-10	7.25	1,920	3.18±2.85E-09	1.58±2.22E-09	0.02±4.72E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2C
2010 Indicator Results From the Weathered Lavery Till Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
908R	UP	Jun-10	6.87	1,704	6.87±6.94E-09	1.25±0.44E-08	-1.08±4.70E-08
908R	UP	Dec-10	7.22	1,815	1.23±0.46E-08	7.29±3.53E-09	-7.58±4.53E-08
1005	UP	Jun-10	7.09	790	4.44±4.82E-09	0.33±2.34E-09	-0.36±4.72E-08
1005	UP	Dec-10	6.87	792	0.89±1.16E-09	2.89±2.93E-09	1.38±4.73E-08
1008C	UP	Jun-10	7.38	622	-0.25±1.68E-09	-0.94±2.45E-09	0.40±4.73E-08
1008C	UP	Dec-10	7.34	610	6.59±8.57E-10	3.42±2.25E-09	-1.37±4.67E-08
906	DOWN	Jun-10	7.27	607	4.21±3.30E-09	4.14±3.62E-09	-3.73±4.65E-08
906	DOWN	Dec-10	7.42	647	1.59±1.22E-09	3.22±2.31E-09	0.59±4.62E-08
1006	DOWN	Jun-10	6.90	1,678	5.00±7.19E-09	6.88±4.06E-09	-1.06±4.70E-08
1006	DOWN	Dec-10	6.84	1,660	6.58±3.40E-09	2.33±2.99E-09	-1.37±4.67E-08
NDATR	DOWN	Mar-10	7.71	744	0.49±2.36E-09	8.45±0.21E-07	**1.06±0.06E-06**
NDATR	DOWN	Jun-10	7.26	1,054	1.58±4.97E-09	**1.54±0.04E-06**	**4.30±0.54E-07**
NDATR	DOWN	Sep-10	6.71	1,196	5.69±3.03E-09	**1.44±0.10E-06**	**5.39±0.56E-07**
NDATR	DOWN	Dec-10	7.99	734	3.02±2.13E-09	7.70±0.29E-07	**6.75±0.40E-07**
909	DOWN	Jun-10	6.61	1,320	0.00±6.01E-09	1.96±0.16E-07	**6.88±0.57E-07**
909	DOWN	Dec-10	6.87	1,376	**1.53±0.47E-08**	2.61±0.15E-07	**8.54±0.59E-07**

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
NS - Not sampled
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2D
2010 Indicator Results From the Unweathered Lavery Till Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
405	UP	Mar-10	7.35	1,960	0.00±2.14E-09	4.49±3.02E-09	-2.00±4.76E-08
405	UP	Jun-10	7.12	2,497	1.54±7.61E-09	9.40±4.43E-09	-1.17±4.50E-08
405	UP	Sep-10	6.97	1,694	0.67±5.98E-09	4.54±4.56E-09	0.00±4.54E-08
405	UP	Dec-10	7.07	1,244	7.61±9.85E-10	5.70±2.56E-09	4.80±4.80E-08
1303	UP	Mar-10	8.06	240	-0.13±1.05E-09	1.48±1.15E-09	-3.91±3.30E-08
1303	UP	Jun-10	7.57	245	0.44±1.34E-09	1.10±1.54E-09	-5.48±4.50E-08
1303	UP	Sep-10	7.78	272	-0.34±1.44E-09	1.95±1.82E-09	-1.30±4.56E-08
1303	UP	Dec-10	7.70	300	5.51±4.65E-10	1.94±1.45E-09	-8.96±4.52E-08
110	DOWN	Mar-10	7.05	528	3.58±7.75E-10	0.37±1.98E-09	**9.23±0.60E-07**
110	DOWN	Jun-10	7.17	524	0.41±1.75E-09	1.35±0.26E-08	**8.32±0.60E-07**
110	DOWN	Sep-10	6.80	609	1.45±2.06E-09	0.62±1.53E-09	**8.71±0.58E-07**
110	DOWN	Dec-10	7.42	576	2.62±0.91E-09	2.37±1.27E-09	**7.78±0.59E-07**
704	DOWN	Mar-10	6.59	1,292	0.18±5.98E-09	7.84±3.22E-09	-1.03±4.62E-08
704	DOWN	Jun-10	6.62	1,192	3.36±5.28E-09	8.41±3.61E-09	4.94±4.66E-08
704	DOWN	Sep-10	6.34	1,109	-2.89±5.30E-09	2.80±3.05E-09	-2.14±4.51E-08
704	DOWN	Dec-10	6.76	900	0.87±1.33E-09	3.98±3.39E-09	5.46±4.66E-08
707	DOWN	Jun-10	6.74	556	2.05±1.90E-09	2.33±2.09E-09	1.96±4.57E-08
707	DOWN	Dec-10	6.82	403	5.98±6.21E-10	3.70±1.64E-09	4.70±4.66E-08
107	DOWN	Mar-10	6.97	573	0.84±1.03E-09	1.46±0.30E-08	1.14±0.48E-07
107	DOWN	Jun-10	6.97	628	0.82±3.08E-09	1.40±0.29E-08	1.15±0.50E-07
107	DOWN	Sep-10	7.39	652	2.66±3.53E-09	1.03±0.28E-08	1.51±0.48E-07
107	DOWN	Dec-10	7.26	634	2.18±1.31E-09	1.25±0.24E-08	7.40±4.86E-08
108	DOWN	Jun-10	7.56	538	1.40±1.71E-09	3.14±2.00E-09	**2.07±0.51E-07**
108	DOWN	Dec-10	7.60	584	2.48±0.87E-09	1.34±1.23E-09	**1.95±0.50E-07**
409	DOWN	Mar-10	7.63	310	1.01±0.69E-09	1.24±1.26E-09	0.46±4.65E-08
409	DOWN	Jun-10	7.69	322	1.40±1.52E-09	3.86±1.81E-09	-2.45±3.17E-08
409	DOWN	Sep-10	7.84	346	2.34±1.76E-09	0.93±1.15E-09	-3.51±4.49E-08
409	DOWN	Dec-10	7.99	338	1.82±0.81E-09	2.10±1.47E-09	3.53±4.65E-08
910R	DOWN	Mar-10	7.15	1,402	1.48±0.32E-08	5.73±2.06E-09	-4.25±4.60E-08
910R	DOWN	Jun-10	7.10	1,546	1.23±0.74E-08	7.23±3.59E-09	-1.68±3.30E-08
910R	DOWN	Dec-10	7.12	1,600	9.69±3.80E-09	6.27±3.06E-09	-0.58±3.20E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2E
2010 Indicator Results From the Kent Recessional Sequence

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	***1.50E-08***	***1.00E-06***	***1.78E-07***
901	UP	Jun-10	7.39	438	1.86±2.08E-09	3.04±2.28E-09	-5.76±4.64E-08
901	UP	Dec-10	7.02	404	4.25±1.26E-09	4.42±1.62E-09	-0.58±4.55E-08
902	UP	Jun-10	7.84	401	0.94±2.01E-09	1.07±2.25E-09	2.18±4.71E-08
902	UP	Dec-10	8.03	408	1.48±0.85E-09	4.24±1.59E-09	3.88±4.61E-08
1008B	UP	Dec-10	7.76	376	6.48±5.94E-10	3.42±1.55E-09	-0.39±4.68E-08
903	DOWN	Jun-10	7.42	944	2.30±3.98E-09	1.72±2.48E-09	-0.85±4.68E-08
903	DOWN	Dec-10	7.52	962	1.25±1.44E-09	4.43±3.30E-09	-5.44±4.46E-08
8610	DOWN	Jun-10	7.38	1,316	-0.70±4.94E-09	7.16±3.45E-09	-3.31±4.52E-08
8610	DOWN	Dec-10	7.12	1,410	0.27±1.38E-09	4.13±2.50E-09	-8.19±4.54E-08
8611	DOWN	Jun-10	7.12	1,089	-0.92±4.31E-09	2.74±2.73E-09	-0.78±4.55E-08
8611	DOWN	Dec-10	7.35	647	3.06±2.01E-09	2.64±2.34E-09	-1.02±0.45E-07

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2F
2010 Metals Results for Early Warning Monitoring Well 502

Location	*Date Collected*	*Aluminum µg/L*	*Iron µg/L*	*Manganese µg/L*
502	Jun-10	882	30,400	131
	Dec-10	721	9,410	92

TABLE D-2G
2010 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Antimony µg/L*	*Arsenic µg/L*	*Barium µg/L*	*Beryllium µg/L*	*Cadmium µg/L*	*Chromium µg/L*	*Cobalt µg/L*	*Copper µg/L*
Groundwater Screening Levels [a]			*15.1*	*25*	*1,000*	*3*	*7.27*	*52.3*	*67.8*	*200*
Sand and Gravel Unit										
706	UP	Mar-10	<10	<10	85	<1	<5	**64**	<50	<25
706	UP	Jun-10	<10	<10	113	<1	<5	**94**	<50	<25
706	UP	Sep-10	<10	<10	<200	<1	<5	27	<50	<25
706	UP	Dec-10	<3	<10	<200	<1	<5	28	<50	<25
1302	UP	Dec-10	<3	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Mar-10	<10	<10	112	<1	<5	<10	<50	<25
1304	DOWN	Jun-10	<10	<10	160	<1	<5	<10	<50	<25
1304	DOWN	Sep-10	<10	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Dec-10	<3	<10	<200	<1	<5	<10	<50	<25
111	DOWN	Dec-10	<3	<10	<200	<1	<5	<10	<50	<25
502	DOWN	Jun-10	NS	<10	590	NS	<5	**1,760**	<50	71
502	DOWN	Dec-10	NS	<10	429	NS	<5	**589**	<50	<25
8605	DOWN	Dec-10	<3	<10	<200	<1	<5	<10	<50	<25
MP-01	DOWN	Jun-10	<3	<10	483	<1	<5	<10	<50	<25
MP-01	DOWN	Sep-10	<3	<10	444	<1	<5	<10	<50	<25
MP-01	DOWN	Dec-10	<3	<10	371	<1	<5	12	<50	<25
MP-02	DOWN	Jun-10	<3	25	618	2	<5	38	<50	83
MP-02	DOWN	Sep-10	<3	<10	202	<1	<5	<10	<50	<25
MP-02	DOWN	Dec-10	<3	<10	<200	<1	<5	22	<50	<25
MP-03	DOWN	Jun-10	<3	<10	304	<1	<5	<10	<50	<25
MP-03	DOWN	Sep-10	<3	<10	310	<1	<5	<10	<50	<25
MP-03	DOWN	Dec-10	<3	<10	253	<1	<5	<10	<50	<25
MP-04	DOWN	Jun-10	<3	<10	365	<1	<5	<10	<50	<25
MP-04	DOWN	Sep-10	<3	<10	263	<1	<5	<10	<50	<25
MP-04	DOWN	Dec-10	<3	<10	242	<1	<5	<10	<50	<25

Note: Bolding indicates a metal concentration that exceeds the GSL.
NS - Not sampled
[a] GSLs have been established by selecting the larger of the WVDP background concentrations or the 6 NYCRR TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1B).

TABLE D-2G *(continued)*
2010 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Lead µg/L*	*Mercury µg/L*	*Nickel µg/L*	*Selenium µg/L*	*Silver µg/L*	*Thallium µg/L*	*Tin µg/L*	*Vanadium µg/L*	*Zinc µg/L*
Groundwater Screening Levels [a]			***42.7***	***0.7***	***100***	***10.1***	***50***	***13.9***	***4,083***	***69.6***	***2,000***
Sand and Gravel Unit											
706	UP	Mar-10	<3	<0.2	**161**	<5	<10	<10	<3,000	<50	<10
706	UP	Jun-10	<3	<0.2	**216**	<5	<10	<10	<3,000	<50	<10
706	UP	Sep-10	<3	<0.2	**127**	<5	<10	<10	<3,000	<50	<20
706	UP	Dec-10	<3	<0.2	**136**	<5	<10	<0.5	<3,000	<50	<20
1302	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1304	UP	Mar-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<10
1304	UP	Jun-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	11
1304	UP	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1304	UP	Dec-10	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
111	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	21
502	DOWN	Jun-10	<3	<0.2	**208**	<5	<10	NS	NS	<50	<20
502	DOWN	Dec-10	<3	<0.2	88	<5	<10	NS	NS	<50	<20
8605	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Jun-10	<3	<0.2	<40	<5	<10	<10	NA	<50	<20
MP-01	DOWN	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Jun-10	**47**	<0.2	54	<5	<10	<10	NA	<50	241
MP-02	DOWN	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	22
MP-03	DOWN	Jun-10	<3	<0.2	<40	<5	<10	<10	NA	<50	<20
MP-03	DOWN	Sep-10	7	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-03	DOWN	Dec-10	3	<0.2	<40	<5	<10	<10	<3,000	<50	20
MP-04	DOWN	Jun-10	6	<0.2	<40	<5	<10	<10	NA	<50	30
MP-04	DOWN	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-04	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20

Note: Bolding indicates a metal concentration that exceeds the GSL.
NA - Not available; data were rejected; not useable
NS - Not sampled
[a] GSLs have been established by selecting the larger of the WVDP background concentrations or the 6 NYCRR TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1B).

TABLE D-2G *(concluded)*
2010 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Antimony µg/L*	*Arsenic µg/L*	*Barium µg/L*	*Beryllium µg/L*	*Cadmium µg/L*	*Chromium µg/L*	*Cobalt µg/L*	*Copper µg/L*
Groundwater Screening Levels [a]			*15.1*	*25*	*1,000*	*3*	*7.27*	*52.3*	*67.8*	*200*
Weathered Lavery Till Unit										
NDATR	DOWN	Mar-10	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Jun-10	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Sep-10	<3	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Dec-10	<3	<10	<200	<1	<5	<10	<50	<25
909	DOWN	Dec-10	<3	17	278	<1	<5	<10	<50	<25
Unweathered Lavery Till Unit										
405	UP	Mar-10	<10	<10	110	<1	<5	**80**	<50	<25
405	UP	Jun-10	<10	<10	149	<1	<5	**102**	<50	<25
405	UP	Sep-10	<10	<10	<200	<1	<5	28	<50	<25
405	UP	Dec-10	<3	<10	<200	<1	<5	**123**	<50	<25
1303	UP	Mar-10	<10	**51**	633	3.2	<5	**86**	<50	68
1303	UP	Jun-10	<10	**38**	441	2	<5	52	<50	40
1303	UP	Sep-10	<10	<10	<200	<1	<5	<10	<50	<25
1303	UP	Dec-10	<3	11	<200	<1	<5	17	<50	<25

Location Code	*Hydraulic Position*	*Date Collected*	*Lead µg/L*	*Mercury µg/L*	*Nickel µg/L*	*Selenium µg/L*	*Silver µg/L*	*Thallium µg/L*	*Tin µg/L*	*Vanadium µg/L*	*Zinc µg/L*
Groundwater Screening Levels [a]			*42.7*	*0.7*	*100*	*10.1*	*50*	*13.9*	*4,083*	*69.6*	*2,000*
Weathered Lavery Till Unit											
NDATR	DOWN	Mar-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
NDATR	DOWN	Jun-10	11	<0.2	<40	<5	<10	<10	<3,000	<50	191
NDATR	DOWN	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	83
NDATR	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
909	DOWN	Dec-10	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
Unweathered Lavery Till Unit											
405	UP	Mar-10	<3	<0.2	**1,610**	<5	<10	<10	<3,000	<50	<10
405	UP	Jun-10	<3	<0.2	**3,180**	<5	<10	<10	<3,000	<50	<10
405	UP	Sep-10	<3	<0.2	**1,110**	<5	<10	<10	<3,000	<50	<20
405	UP	Dec-10	<3	<0.2	**1,820**	<5	<10	<0.5	<3,000	<50	<20
1303	UP	Mar-10	41	<0.2	**122**	<5	<10	<10	<3,000	**113**	236
1303	UP	Jun-10	24	<0.2	73	<5	<10	<10	<3,000	68	153
1303	UP	Sep-10	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1303	UP	Dec-10	5	<0.2	<40	<5	<10	0.5	<3,000	<50	36

Note: Bolding indicates a metal concentration that exceeds the GSL.
NS - Not sampled
[a] GSLs have been established by selecting the larger of the WVDP background concentrations or the 6 NYCRR TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1B).

TABLE D-2H
2010 Radioactivity in Groundwater From Selected Monitoring Locations

Location	Hydraulic Position [a]	Date Collected	C-14 µCi/mL	Sr-90 µCi/mL	Tc-99 µCi/mL	I-129 µCi/mL	Cs-137 µCi/mL	Ra-226 µCi/mL
Groundwater Screening Levels [b]			2.82E-08	5.90E-09	5.02E-09	9.61E-10	1.03E-08	1.33E-09
Sand and Gravel Unit								
401	UP	Dec-10	0.07±3.24E-08	1.18±0.92E-09	-0.93±2.18E-09	**9.64±5.51E-10**	0.76±1.15E-09	3.48±1.57E-10
1304	UP	Dec-10	1.20±3.17E-08	6.81±9.39E-10	-0.67±1.62E-09	5.11±8.91E-10	0.34±1.40E-09	3.90±1.67E-10
406	DOWN	Dec-10	-1.07±3.19E-08	0.81±1.13E-09	0.50±2.38E-09	1.39±7.72E-10	1.15±1.41E-09	2.04±1.41E-10
408	DOWN	Dec-10	-0.57±3.21E-08	**1.05±0.01E-04**	**1.16±0.20E-08**	1.31±1.01E-09 [c]	0.97±1.72E-09	5.15±1.77E-10
501	DOWN	Dec-10	NS	**6.71±0.06.E-05**	NS	NS	NS	NS
502	DOWN	Dec-10	NS	**5.15±0.05E-05**	NS	NS	NS	NS
8609	DOWN	Dec-10	NS	**6.77±0.12E-07**	NS	NS	NS	NS
801	DOWN	Dec-10	NS	**4.69±0.15E-06**	NS	NS	NS	NS
MP-01	DOWN	Jun-10	-0.37±4.02E-08	**1.92±0.01E-04**	**2.68±0.25E-08**	-0.61±1.05E-09	-0.62±2.57E-09	NS
MP-01	DOWN	Sep-10	2.42±2.64E-08	**1.69±0.02E-04**	**3.18±0.25E-08**	1.11±1.05E-09 [c]	0.99±2.38E-09	NS
MP-01	DOWN	Dec-10	0.25±3.57E-08	**1.54±0.01E-04**	**2.56±0.35E-08**	-0.60±1.21E-09	0.75±1.76E-09	NS
MP-02	DOWN	Jun-10	-0.66±4.01E-08	**3.70±0.01E-04**	**2.71±0.27E-08**	-2.55±4.86E-10	-0.20±3.19E-09	NS
MP-02	DOWN	Sep-10	0.66±2.57E-08	**1.80±0.02E-04**	**3.25±0.25E-08**	2.72±3.51E-09	3.40±4.77E-09	NS
MP-02	DOWN	Dec-10	-2.11±3.50E-08	**1.49±0.01E-04**	**2.29±0.35E-08**	0.00±2.50E-09	-0.28±3.78E-09	NS
MP-03	DOWN	Jun-10	-2.31±2.82E-08	**1.35±0.01E-04**	**1.54±0.23E-08**	5.30±4.89E-10	-0.33±2.53E-09	NS
MP-03	DOWN	Sep-10	0.67±2.57E-08	**1.21±0.02E-04**	**2.82±0.34E-08**	0.00±1.27E-08	0.59±2.30E-09	NS
MP-03	DOWN	Dec-10	0.51±3.59E-08	**8.65±0.06E-05**	**1.47±0.31E-08**	0.00±1.51E-09	-0.37±1.61E-09	NS
MP-04	DOWN	Jun-10	0.42±2.91E-08	**2.55±0.01E-04**	**2.58±0.26E-08**	0.79±1.06E-09	0.29±2.64E-09	NS
MP-04	DOWN	Sep-10	1.45±2.60E-08	**1.86±0.02E-04**	**3.42±0.25E-08**	0.00±3.16E-09	-1.27±2.50E-09	NS
MP-04	DOWN	Dec-10	0.58±3.64E-08	**1.56±0.01E-04**	**2.93±0.37E-08**	-0.21±1.51E-09	1.70±1.92E-09	NS
Weathered Till Unit								
NDATR	DOWN	Mar-10	NS	NS	NS	**7.18±1.47E-09**	NS	NS
NDATR	DOWN	Jun-10	-0.61±2.88E-08	**8.86±0.19E-07**	1.54±1.76E-09	**1.97±0.29E-08**	3.70±2.57E-09	2.77±1.91E-10
NDATR	DOWN	Dec-10	-1.27±3.17E-08	**4.18±0.50E-07**	**5.80±2.72E-09**	**1.99±0.18E-08**	0.34±3.44E-09	2.23±1.60E-10
909	DOWN	Dec-10	-0.78±3.20E-08	**1.30±0.05E-07**	1.67±1.89E-09	**1.07±0.21E-08**	-0.10±1.34E-09	4.52±1.81E-10

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NS - Not sampled
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents were set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).
[c] Result for I-129 at wells 408 and MP-01 were qualified as "not detected" and are therefore not bolded even though the result presented is greater than the GSL.

TABLE D-2H *(continued)*
2010 Radioactivity in Groundwater From Selected Monitoring Locations

Location	*Hydraulic Position* [a]	*Date Collected*	*Np-237* [b] *µCi/mL*	*Pu-238* [b] *µCi/mL*	*Pu-239/240* [b] *µCi/mL*	*Pu-241* [b] *µCi/mL*	*Am-241* [b] *µCi/mL*	*Cm-243/244* [b] *µCi/mL*
Sand and Gravel Unit								
MP-01	DOWN	Jun-10	1.13±2.56E-11	-0.46±2.72E-11	1.85±2.86E-11	-0.25±1.02E-08	-1.32±1.75E-11	-1.34±1.75E-11
MP-01	DOWN	Sep-10	0.05±2.55E-11	-0.25±2.10E-11	0.54±2.16E-11	-2.77±4.80E-09	-1.34±2.15E-11	-0.90±2.15E-11
MP-01	DOWN	Dec-10	1.02±3.77E-11	0.00±2.36E-11	-1.16±2.62E-11	0.83±6.15E-09	0.19±2.51E-11	0.00±2.38E-11
MP-02	DOWN	Jun-10	2.93±3.05E-11	0.44±3.78E-11	-2.65±3.47E-11	-0.72±1.01E-08	3.93±8.31E-12	-0.43±1.18E-11
MP-02	DOWN	Sep-10	9.26±8.08E-11	-0.28±2.33E-11	2.31±3.20E-11	3.52±5.63E-09	-0.04±2.15E-11	0.10±2.23E-11
MP-02	DOWN	Dec-10	8.37±8.57E-11	0.00±2.14E-11	-0.52±2.26E-11	-1.52±5.57E-09	0.51±1.86E-11	0.00±1.86E-11
MP-03	DOWN	Jun-10	-1.16±2.04E-11	-0.56±1.55E-11	0.56±3.28E-11	-0.52±1.13E-08	0.07±1.36E-11	-0.95±1.61E-11
MP-03	DOWN	Sep-10	1.30±2.56E-11	-1.57±3.25E-11	-1.61±2.45E-11	5.18±5.04E-09	-2.29±2.07E-11	-0.21±1.73E-11
MP-03	DOWN	Dec-10	-1.26±2.86E-11	0.00±2.19E-11	1.12±2.19E-11	1.29±5.48E-09	1.15±3.41E-11	-0.49±2.12E-11
MP-04	DOWN	Jun-10	-1.35±2.05E-11	0.00±1.42E-11	0.51±1.73E-11	-0.27±1.09E-08	-1.73±2.05E-11	-0.86±1.68E-11
MP-04	DOWN	Sep-10	3.60±4.78E-11	-0.53±2.27E-11	2.76±3.79E-11	2.37±5.47E-09	-0.44±2.37E-11	0.00±2.38E-11
MP-04	DOWN	Dec-10	-0.60±2.57E-11	-0.24±1.97E-11	0.98±1.92E-11	-1.48±4.77E-09	-0.19±1.91E-11	0.90±1.76E-11

[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.

[b] Groundwater screening levels have not been established for Np-237, Pu-238, Pu-239/240, Pu-241, Am-241, or Cm-234/244.

TABLE D-2H *(concluded)*
2010 Radioactivity in Groundwater From Selected Monitoring Locations

Location	*Hydraulic Position* [a]	*Date Collected*	*Ra-228 µCi/mL*	*U-232 µCi/mL*	*U-233/234 µCi/mL*	*U-235/236 µCi/mL*	*U-238 µCi/mL*	*Total U µg/mL*
Groundwater Screening Levels [b]			*2.16E-09*	*1.38E-10*	*6.24E-10*	*8.07E-11*	*4.97E-10*	*1.34E-03*
Sand and Gravel Unit								
401	UP	Dec-10	4.12±4.14E-10	0.07±4.28E-11	1.22±1.05E-10	1.03±4.08E-11	1.18±0.94E-10	3.82±0.18E-04
1304	UP	Dec-10	2.53±4.00E-10	2.72±6.35E-11	2.38±1.37E-10	1.26±4.01E-11	9.54±8.60E-11	3.24±0.14E-04
406	DOWN	Dec-10	3.31±3.07E-10	-3.67±5.71E-11	1.98±1.39E-10	4.93±6.83E-11	1.47±1.18E-10	2.06±0.17E-04
408	DOWN	Dec-10	1.04±0.56E-09	3.98±8.00E-11	5.21±1.95E-10	0.00±3.67E-11	3.55±1.60E-10	9.49±0.28E-04
MP-01	DOWN	Jun-10	NS	4.33±9.46E-11	4.50±2.17E-10	**1.07±1.05E-10**	3.13±1.81E-10	NS
MP-01	DOWN	Sep-10	NS	8.22±7.30E-11	**7.29±2.03E-10**	1.46±2.87E-11	3.87±1.49E-10	NS
MP-01	DOWN	Dec-10	NS	1.18±0.97E-10	4.32±1.74E-10	0.92±3.64E-11	3.08±1.46E-10	NS
MP-02	DOWN	Jun-10	NS	1.26±1.48E-10	**1.07±0.34E-09**	1.35±1.25E-10 [c]	**1.22±0.36E-09**	NS
MP-02	DOWN	Sep-10	NS	3.23±4.38E-11	**7.10±1.92E-10**	7.92±6.34E-11	**5.79±1.71E-10**	NS
MP-02	DOWN	Dec-10	NS	8.05±7.34E-11	**7.09±2.00E-10**	6.95±6.43E-11	**5.75±1.81E-10**	NS
MP-03	DOWN	Jun-10	NS	-2.33±8.57E-11	6.17±2.52E-10	7.85±8.89E-11	4.44±2.11E-10	NS
MP-03	DOWN	Sep-10	NS	-2.35±4.62E-11	**8.60±2.65E-10**	5.24±7.20E-11	**6.59±2.30E-10**	NS
MP-03	DOWN	Dec-10	NS	3.19±5.19E-11	**7.64±2.21E-10**	6.65±6.52E-11	**8.58±2.35E-10**	NS
MP-04	DOWN	Jun-10	NS	0.91±1.07E-10	**1.30±0.37E-09**	**2.34±1.58E-10**	**1.11±0.34E-09**	NS
MP-04	DOWN	Sep-10	NS	6.99±7.48E-11	**1.29±0.26E-09**	**1.45±0.92E-10**	**9.71±2.29E-10**	NS
MP-04	DOWN	Dec-10	NS	8.60±9.21E-11	**1.75±0.34E-09**	**1.91±1.13E-10**	**1.40±0.30E-09**	NS
Weathered Till Unit								
NDATR	DOWN	Jun-10	8.72±6.23E-10	1.52±7.77E-11	**1.05±0.29E-09**	-0.51±4.25E-11	**1.02±0.29E-09**	**2.86±0.10E-03**
NDATR	DOWN	Dec-10	1.12±0.42E-09	0.73±5.02E-11	**1.42±0.30E-09**	7.77±7.20E-11	**1.09±0.26E-09**	**3.03±0.08E-03**
909	DOWN	Dec-10	9.28±4.48E-10	2.71±5.71E-11	**9.75±2.73E-10**	5.85±6.62E-11	**6.41±2.19E-10**	**1.69±0.06E-03**

Note: Bolding indicates a radiological concentration that exceeds the GSL.

NS - Not sampled

[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.

[b] The GSLs for radiological constituents were set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

[c] Result for U-235/236 at well MP-02 was qualified as “not detected” and are therefore not bolded even though the result presented is greater than the GSL.

APPENDIX E

Summary of Biological Data

TABLE E-1
2010 Radioactivity Concentrations in Milk

Location	*K-40 (µCi/mL)*	*Sr-90 (µCi/mL)*	*I-129 (µCi/mL)*	*Cs-137 (µCi/mL)*
BFMFLDMN Annual	1.36±0.20E-06	1.02±0.70E-09	1.13±2.56E-10	1.04±3.75E-09

Note: The control milk sample (BFMCTLS) was last sampled in 2007. It will next be sampled in 2012.

TABLE E-2
2010 Radioactivity Concentrations in Venison

Location	*% Moisture*	*H-3 (µCi/mL)*	*K-40 (µCi/g - dry)*	*Sr-90 (µCi/g - dry)*	*Cs-137 (µCi/g - dry)*
Deer Flesh Background (BFDCTRL 12/10)	71.5	0.35±1.18E-07	9.87±1.34E-06	1.97±2.91E-09	1.15±2.27E-08
Deer Flesh Background (BFDCTRL 12/10)	72.4	1.51±1.21E-07	9.58±1.19E-06	-2.92±2.48E-09	1.78±0.41E-07
Deer Flesh Background (BFDCTRL 12/10)	71.3	0.94±1.18E-07	1.06±0.12E-05	2.11±2.90E-09	5.86±3.03E-08
Deer Flesh Near-Site (BFDNEAR 10/10)	72.3	0.28±1.20E-07	1.08±0.13E-05	1.58±2.84E-09	6.98±3.70E-08
Deer Flesh Near-Site (BFDNEAR 10/10)	74.1	0.37±1.23E-07	1.21±0.18E-05	1.62±2.86E-09	4.32±0.76E-07
Deer Flesh Near-Site (BFDNEAR 12/10)	72.5	1.77±1.22E-07	1.05±0.15E-05	4.26±3.02E-09	7.87±5.33E-08

TABLE E-3
2010 Radioactivity Concentrations in Food Crops

The frequency of sampling of food crops has been decreased from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T.
Food crops will next be sampled in CY 2012.

TABLE E-4
2010 Radioactivity Concentrations in Edible Portions of Fish

The frequency of sampling fish has been decreased from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T.
Fish will next be sampled in CY 2012.

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APPENDIX F

Summary of Direct Radiation Monitoring Data

TABLE F-1
Summary of 2010 Semiannual Averages of Off-Site TLD Measurements[a]
(mR±2 SD/quarter)

Location Number[b]	*1st Half*	*2nd Half*	*Location Average*
DFTLD01	16±1	16±1	16±1
DFTLD02	17±1	15±1	16±1
DFTLD03	14±1	13±1	13±1
DFTLD04	15±1	14±1	15±1
DFTLD05	15±1	14±1	15±1
DFTLD06	16±1	14±1	15±1
DFTLD07	13±1	12±1	12±1
DFTLD08	16±1	14±1	15±1
DFTLD09	16±1	15±1	15±1
DFTLD10	14±1	13±1	14±1
DFTLD11	14±1	13±1	14±1
DFTLD12	17±1	[c]	9±1
DFTLD13	16±1	15±2	15±1
DFTLD14	15±1	14±1	14±1
DFTLD15	15±1	13±1	14±1
DFTLD16	15±1	15±1	15±1
DFTLD20	13±1	12±1	13±1
DFTLD23	16±1	15±1	15±1

[a] The frequency of collection at the TLD locations was reduced from quarterly to semannual in 2008, however data are reported in units of mR per quarter for comparability with historical results.
[b] Off-site locations are shown on Figure A-11.
[c] The TLD at this location was lost in the field.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

TABLE F-2
Summary of 2010 Semiannual Averages of On-Site TLD Measurements[a]
(mR±2 SD/quarter)

Location Number[b]	*1st Half*	*2nd Half*	*Location Average*
DNTLD24	755±53	555±64	655±59
DNTLD28	16±2	16±2	16±2
DNTLD33	17±1	17±1	17±1
DNTLD35	17±1	17±1	17±1
DNTLD36	15±1	16±1	15±1
DNTLD38	35±3	45±5	40±4
DNTLD40	127±27	123±13	125±21
DNTLD43	15±2	14±1	14±2

[a] The frequency of collection at the TLD locations was reduced from quarterly to semannual in 2008, however data are reported in units of mR per quarter for comparability with historical results.
[b] On-site locations are shown on Figure A-10.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

APPENDIX G

Summary of Quality Assurance Crosscheck Analyses

TABLE G-1
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 22, March 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 10 - GrF22, Air Filter - Gross Alpha/Beta							
Gross alpha	Air Filter	Bq/sample	0.189	0.427	>0.0–0.854	Yes	ELAB
Gross beta	Air Filter	Bq/sample	1.35	1.29	0.65–1.94	Yes	ELAB
MAPEP - 10 - RdF22, Air Filter - Radiological							
Am-241	Air Filter	Bq/sample	0.2637	0.146	0.102–0.190	No	GEL
Cs-137	Air Filter	Bq/sample	3.070	1.53	1.07–1.99	No	GEL
Co-60	Air Filter	Bq/sample	5.187	2.473	1.731–3.215	No	GEL
Pu-238	Air Filter	Bq/sample	0.010	0.0010	[c]	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.164	0.0832	0.0582–0.1082	No	GEL
Sr-90	Air Filter	Bq/sample	-0.004	[d]	[d]	Yes	GEL
U-233/234	Air Filter	Bq/sample	0.137	0.068	0.048–0.088	No	GEL
U-238	Air Filter	Bq/sample	0.147	0.071	0.050–0.092	No	GEL
MAPEP - 10 - GrW22, Water - Gross Alpha/Beta							
Gross alpha	Water	Bq/L	0.516	0.676	>0.0–1.352	Yes	ELAB
Gross beta	Water	Bq/L	3.16	3.09	1.55–4.64	Yes	ELAB
Gross alpha	Water	Bq/L	0.559	0.676	>0.0–1.352	Yes	GEL
Gross beta	Water	Bq/L	3.110	3.09	1.55–4.64	Yes	GEL
MAPEP - 10 - MaW22, Water - Radiological							
Cs-137	Water	Bq/L	60.1	60.6	42.4–78.8	Yes	ELAB
Co-60	Water	Bq/L	-0.0394	[d]	[d]	Yes	ELAB
H-3	Water	Bq/L	98.4	90.8	63.6–118.0	Yes	ELAB
Sr-90	Water	Bq/L	0.129	[d]	[d]	Yes	ELAB
Am-241	Water	Bq/L	1.0323	1.30	0.91–1.69	Pass	GEL
Cs-137	Water	Bq/L	63.1	60.6	42.4–78.8	Yes	GEL
Co-60	Water	Bq/L	-0.021	[d]	[d]	Yes	GEL
H-3	Water	Bq/L	107	90.8	63.6–118.0	Yes	GEL
Pu-238	Water	Bq/L	1.213	1.93	1.35–2.51	No	GEL
Pu-239/240	Water	Bq/L	0.026	0.009	[d]	Yes	GEL
Sr-90	Water	Bq/L	-0.01	[d]	[d]	Yes	GEL
Tc-99	Water	Bq/L	-0.4	[d]	[d]	Yes	GEL
U-233/234	Water	Bq/L	1.163	1.22	0.85–1.59	Yes	GEL
U-238	Water	Bq/L	1.223	1.25	0.88–1.63	Yes	GEL

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Not detected, reported as a statistically zero result.
[d] Although no actual value or acceptance range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 22, March 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 10 - MaW22, Water - Inorganic							
Antimony	Water	mg/L	0.903	0.8711	0.6098–1.1324	Yes	GEL
Arsenic	Water	mg/L	<0.030	<0.01	[c]	Yes	GEL
Barium	Water	mg/L	3.65	3.6278	2.5395–4.7161	Yes	GEL
Beryllium	Water	mg/L	0.127	0.1243	0.0870–0.1616	Yes	GEL
Cadmium	Water	mg/L	0.628	0.6281	0.4397–0.8165	Yes	GEL
Chromium	Water	mg/L	0.813	0.7920	0.5544–1.0296	Yes	GEL
Cobalt	Water	mg/L	1.96	1.8546	1.2982–2.4110	Yes	GEL
Copper	Water	mg/L	3.28	3.1509	2.2056–4.0962	Yes	GEL
Lead	Water	mg/L	2.87	2.8511	1.9958–3.7064	Yes	GEL
Nickel	Water	mg/L	<0.005	<0.01	[d]	Yes	GEL
Selenium	Water	mg/L	0.568	0.5881	0.4117–0.7645	Yes	GEL
Thallium	Water	mg/L	4.45	4.3639	3.0547–5.6731	Yes	GEL
Uranium - total	Water	mg/L	0.107	0.101	0.071–0.131	Yes	GEL
Vanadium	Water	mg/L	<0.005	<0.01	[d]	Yes	GEL
Zinc	Water	mg/L	4.27	4.3366	3.0356–5.6376	Yes	GEL
MAPEP - 10 - MaS22, Soil - Inorganic							
Antimony	Soil	mg/kg	<1.0	<1.0	[d]	Yes	GEL
Arsenic	Soil	mg/kg	83.9	79.51	55.66–103.36	Yes	GEL
Barium	Soil	mg/kg	171	180.95	126.67–235.24	Yes	GEL
Beryllium	Soil	mg/kg	50.1	51.36	35.95–66.77	Yes	GEL
Cadmium	Soil	mg/kg	6.43	7.11	4.98–9.24	Yes	GEL
Chromium	Soil	mg/kg	57.2	61.89	43.32–80.46	Yes	GEL
Cobalt	Soil	mg/kg	76.0	89.7	62.8–116.6	Yes	GEL
Copper	Soil	mg/kg	125	116.05	81.24–150.87	Yes	GEL
Lead	Soil	mg/kg	42.6	40.05	28.04–52.07	Yes	GEL
Mercury	Soil	mg/kg	0.653	0.6243	0.4370–0.8116	Yes	GEL
Nickel	Soil	mg/kg	140	164.3	115.0–213.6	Yes	GEL
Selenium	Soil	mg/kg	6.42	6.15	4.31–8.00	Yes	GEL
Silver	Soil	mg/kg	48.3	45.19	31.63–58.75	Yes	GEL
Thallium	Soil	mg/kg	163	200.15	140.11–260.20	Yes	GEL
Uranium - total	Soil	mg/kg	3.60	5.1	3.6–6.6	Pass	GEL
Vanadium	Soil	mg/kg	116	113.43	79.40–147.46	Yes	GEL
Zinc	Soil	mg/kg	174	162.76	113.93–211.59	Yes	GEL

GEL - GEL Laboratories, LLC

Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] The detection limit is greater than the CLP limit.

[d] Although no actual value or acceptance range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 22, March 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 10 - MaS22, Soil - Radiological							
Am-241	Soil	Bq/kg	0.07	[c]	[c]	Yes	GEL
Cs-137	Soil	Bq/kg	831.7	779	545–1013	Yes	GEL
Co-60	Soil	Bq/kg	670.3	622	435–809	Yes	GEL
Pu-238	Soil	Bq/kg	17.9	24.1	16.9–31.3	Pass	GEL
Pu-239/240	Soil	Bq/kg	0.21	[c]	[c]	Yes	GEL
K-40	Soil	Bq/kg	638.7	559	391–727	Yes	GEL
Sr-90	Soil	Bq/kg	261.0	288	202–374	Yes	GEL
Tc-99	Soil	Bq/kg	-3.0	[c]	[c]	Yes	GEL
U-233/234	Soil	Bq/kg	65.27	60	42–78	Yes	GEL
U-238	Soil	Bq/kg	70.23	64	45–83	Yes	GEL
MAPEP - 10 - RdV22, Vegetation - Radiological							
Am-241	Veg	Bq/sample	0.179	0.225	0.158–0.293	Pass	GEL
Cs-137	Veg	Bq/sample	2.185	3.06	2.14–3.98	Pass	GEL
Co-60	Veg	Bq/sample	3.076	3.27	2.29–4.25	Yes	GEL
Pu-238	Veg	Bq/sample	0.149	0.160	0.112–0.208	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.0026	0.0008	[d]	Yes	GEL
Sr-90	Veg	Bq/sample	0.033	[c]	[c]	Yes	GEL
U-233/234	Veg	Bq/sample	0.184	0.216	0.151–0.281	Yes	GEL
U-238	Veg	Bq/sample	0.184	0.223	0.156–0.290	Yes	GEL
MAPEP - 10 - OrW22, Water - Organic Compounds							
Heptachlor	Water	µg/L	5.33	10.16	3.91–16.40	Yes	GEL
1,2,4-Trichlorobenzene	Water	µg/L	26.9	42.51	11.89–73.13	Yes	GEL
1,2-Dichlorobenzene	Water	µg/L	44.1	54.26	9.46–99.07	Yes	GEL
1,3-Dichlorobenzene	Water	µg/L	29.5	38.15	7.57–68.73	Yes	GEL
1,4-Dichlorobenzene	Water	µg/L	16.5	22.33	3.24–43.22	Yes	GEL
2,4,5-Trichlorophenol	Water	µg/L	88.2	108.01	46.65–169.38	Yes	GEL
2,4,6-Trichlorophenol	Water	µg/L	40.1	51.94	20.57–83.31	Yes	GEL
2,4-Dichlorophenol	Water	µg/L	62.8	73.46	29.85–117.07	Yes	GEL
2,4-Dimethylphenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
2,4-Dinitrophenol	Water	µg/L	112	133.36	19.87–260.12	Yes	GEL
2,4-Dinitrotoluene	Water	µg/L	74.9	90.74	42.14–139.34	Yes	GEL
2,6-Dichlorophenol	Water	µg/L	106	129.71	57.21–202.21	Yes	GEL
2,6-Dinitrotoluene	Water	µg/L	63.0	80.34	39.80–120.88	Yes	GEL
2-Chloronaphthalene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
2-Chlorophenol	Water	µg/L	48.9	54.00	20.96–87.03	Yes	GEL
2-Methylnaphthalene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL

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Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.

[a] MAPEP monitors performance and requests corrective action as required.

[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.

[c] Although no actual value or acceptance range was provided, the results were assessed by MAPEP as acceptable.

[d] Not detected, reported as a statistically zero result.

TABLE G-1 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 22, March 2010

Analyte	Matrix	Units	Reported Value	Reference Value	Acceptance Range	Accept?[b]	Analyzed by:
MAPEP - 10 - OrW22, Water - Organic Compounds							
2-Methylphenol	Water	µg/L	42.5	50.91	13.37–88.45	Yes	GEL
2-Nitrophenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
3 Methyl and 4-Methylphenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4,6-Dinitro-2-methylphenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4-Bromophenyl-phenylether	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4-Chloro-3-methylphenol	Water	µg/L	112	133.48	62.68–204.28	Yes	GEL
4-Chlorophenyl-phenylether	Water	µg/L	35.4	53.56	24.71–82.42	Yes	GEL
4-Nitrophenol	Water	µg/L	49.8	89.51	16.19–217.29	Yes	GEL
Acenaphthene	Water	µg/L	12.8	21.80	11.45–32.15	Yes	GEL
Acenaphthylene	Water	µg/L	19.2	29.25	13.49–45.01	Yes	GEL
Anthracene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Benzo(a)anthracene	Water	µg/L	12.2	19.30	9.61–28.99	Yes	GEL
Benzo(a)pyrene	Water	µg/L	24.6	39.45	14.91–63.98	Yes	GEL
Benzo(b)fluoranthene	Water	µg/L	16.3	28.24	11.00–45.48	Yes	GEL
Benzo(g,h,i)perylene	Water	µg/L	23.1	32.86	11.10–54.62	Yes	GEL
Benzo(k)fluoranthene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
bis(2-chloroethoxy)methane	Water	µg/L	39.8	47.79	23.48–72.10	Yes	GEL
bis(2-chloroethyl)ether	Water	µg/L	102	119.39	42.89–195.88	Yes	GEL
bis(2-chloroisopropyl)ether	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Bis(2-ethylhexyl)phthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Butylbenzylphthalate	Water	µg/L	43.4	43.72	5.56–81.87	Yes	GEL
Chrysene	Water	µg/L	13.4	20.84	9.80–31.87	Yes	GEL
Di-n-butylphthalate	Water	µg/L	48.7	58.30	23.24–93.37	Yes	GEL
Di-n-octylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Dibenzo(a,h)anthracene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Dibenzofuran	Water	µg/L	49.1	64.36	28.37–100.35	Yes	GEL
Diethylphthalate	Water	µg/L	86.7	97.79	23.48–172.09	Yes	GEL
Dimethylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Fluoranthene	Water	µg/L	45.0	[c]	[c]	No	GEL
Fluorene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Hexachlorobenzene	Water	µg/L	23.9	38.34	18.95–57.72	Yes	GEL
Hexachlorobutadiene	Water	µg/L	56.1	77.48	14.05–140.91	Yes	GEL
Hexachlorocyclopentadiene	Water	µg/L	83.8	80.85	13.72–178.15	Yes	GEL
Hexachloroethane	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Indeno(1,2,3-c,d)pyrene	Water	µg/L	15.9	21.85	3.27–40.42	Yes	GEL
Isophorone	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Napthalene	Water	µg/L	33.2	43.99	16.91–71.07	Yes	GEL
Nitrobenzene	Water	µg/L	58.1	69.76	28.54–110.97	Yes	GEL
Pentachlorophenol	Water	µg/L	39.3	42.10	10.60–73.60	Yes	GEL
Phenanthrene	Water	µg/L	37.7	50.55	28.18–72.91	Yes	GEL
Phenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Pyrene	Water	µg/L	43.7	59.63	22.88–96.37	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 23, September 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP – 10 – GrF23, Air Filter – Gross Alpha/Beta							
Gross Alpha	Air Filter	Bq/sample	-0.000817	[c]	[c]	Yes	ELAB
Gross Beta	Air Filter	Bq/sample	0.515	0.50	0.25–0.75	Yes	ELAB
MAPEP – 10 – RdF23, Air Filter – Radiological							
Am–241	Air Filter	Bq/sample	0.0917	0.115	0.081–0.150	Pass	GEL
Cs–137	Air Filter	Bq/sample	-0.019	[c]	[c]	Yes	GEL
Co–60	Air Filter	Bq/sample	2.97	2.92	2.04–3.80	Yes	GEL
Pu–238	Air Filter	Bq/sample	0.049	0.0489	0.0342–0.0636	Yes	GEL
Pu–239/240	Air Filter	Bq/sample	0.076	0.082	0.057–0.107	Yes	GEL
Sr–90	Air Filter	Bq/sample	0.854	1.01	0.71–1.31	Yes	GEL
U–233/234	Air Filter	Bq/sample	0.124	0.122	0.085–0.159	Yes	GEL
U–238	Air Filter	Bq/sample	0.122	0.127	0.089–0.165	Yes	GEL
MAPEP – 10 – GrW23, Water – Gross Alpha/Beta							
Gross Alpha	Water	Bq/L	1.34	1.92	0.58–3.26	Yes	ELAB
Gross Beta	Water	Bq/L	4.37	4.39	2.20–6.59	Yes	ELAB
Gross Alpha	Water	Bq/L	1.67	1.92	0.58–3.26	Yes	GEL
Gross Beta	Water	Bq/L	4.407	4.39	2.20–6.59	Yes	GEL
MAPEP – 10 – MaW23, Water – Radiological							
Cs–137	Water	Bq/L	44.2	44.2	30.9–57–5	Yes	ELAB
Co–60	Water	Bq/L	28.1	28.3	19.8–36.8	Yes	ELAB
H–3	Water	Bq/L	456	453.4	317.4–589.4	Yes	ELAB
Sr–90	Water	Bq/L	10.0	8.3	5.8–10.8	Pass	ELAB
Am–241	Water	Bq/L	0.0004	[c]	[c]	Yes	GEL
Cs–137	Water	Bq/L	45.5	44.2	30.9–57.5	Yes	GEL
Co–60	Water	Bq/L	29.10	28.3	19.8–36.8	Yes	GEL
H–3	Water	Bq/L	429.3	453.4	317.4–589.4	Yes	GEL
Pu–238	Water	Bq/L	0.866	1.81	1.27–2.35	No	GEL
Pu–239/240	Water	Bq/L	1.220	1.35	0.95–1.76	Yes	GEL
Sr–90	Water	Bq/L	7.03	8.3	5.8–10.8	Yes	GEL
Tc–99	Water	Bq/L	33.3	33.6	23.5–43.7	Yes	GEL
U–233/234	Water	Bq/L	1.937	2.01	1.41–2.61	Yes	GEL
U–238	Water	Bq/L	2.043	2.07	1.45–2.69	Yes	GEL

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.

[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 23, September 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
			MAPEP – 10 – MaW23, Water – Inorganic				
Antimony	Water	mg/L	1.51	1.359	0.951–1.767	Yes	GEL
Arsenic	Water	mg/L	2.19	1.969	1.378–2.560	Yes	GEL
Barium	Water	mg/L	2.35	2.260	1.582–2.938	Yes	GEL
Beryllium	Water	mg/L	<0.001	<0.005	[c]	Yes	GEL
Cadmium	Water	mg/L	0.285	0.2731	0.1912–0.3550	Yes	GEL
Chromium	Water	mg/L	1.85	1.74	1.22–2.26	Yes	GEL
Cobalt	Water	mg/L	<0.005	<0.025	[c]	Yes	GEL
Copper	Water	mg/L	1.46	1.298	0.909–1.687	Yes	GEL
Lead	Water	mg/L	<0.01	<0.010	[c]	Yes	GEL
Mercury	Water	mg/L	<0.0002	<0.0002	[c]	Yes	GEL
Nickel	Water	mg/L	7.57	7.37	5.16–9.58	Yes	GEL
Selenium	Water	mg/L	0.227	0.2280	0.1596–0.2964	Yes	GEL
Thallium	Water	mg/L	1.95	1.915	1.341–2.490	Yes	GEL
Uranium – total	Water	mg/L	0.189	0.168	0.118–0.218	Yes	GEL
Vanadium	Water	mg/L	7.36	6.71	4.70–8.72	Yes	GEL
Zinc	Water	mg/L	4.12	3.92	2.74–5.10	Yes	GEL
			MAPEP – 10 – MaS23, Soil – Inorganic				
Antimony	Soil	mg/kg	5.98	[d]	[d]	Yes	GEL
Arsenic	Soil	mg/kg	30.6	26.8	18.8–34.8	Yes	GEL
Barium	Soil	mg/kg	323	336	235–437	Yes	GEL
Beryllium	Soil	mg/kg	52.6	57.0	39.9–74.1	Yes	GEL
Cadmium	Soil	mg/kg	15.8	17.41	12.19–22.63	Yes	GEL
Chromium	Soil	mg/kg	56.6	65.4	45.8–85.0	Yes	GEL
Cobalt	Soil	mg/kg	96.4	107.4	75.2–139.6	Yes	GEL
Copper	Soil	mg/kg	88.1	82.9	58.0–107.8	Yes	GEL
Lead	Soil	mg/kg	67.0	66.0	46.2–85.8	Yes	GEL
Mercury	Soil	mg/kg	0.103	0.0965	0.676–0.1255	Yes	GEL
Nickel	Soil	mg/kg	102	116.4	81.5–151.3	Yes	GEL
Selenium	Soil	mg/kg	16	18.26	12.78–23.74	Yes	GEL
Silver	Soil	mg/kg	64.2	62.0	43.4–80.6	Yes	GEL
Thallium	Soil	mg/kg	80	90.6	63.4–117.8	Yes	GEL
Uranium – total	Soil	mg/kg	20.143	23.4	16.4–30.4	Yes	GEL
Vanadium	Soil	mg/kg	89.5	91.1	63.8–118.4	Yes	GEL
Zinc	Soil	mg/kg	199	207	145–269	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.
[d] Analyte was not evaluated by MAPEP.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 23, September 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 10 – MaS23, Soil – Radiological							
Am–241	Soil	Bq/kg	63.27	87	61–113	Pass	GEL
Cs–137	Soil	Bq/kg	685	670	469–871	Yes	GEL
Co–60	Soil	Bq/kg	360	343	240–446	Yes	GEL
Pu–238	Soil	Bq/kg	12.4	64	45–83	No	GEL
Pu–239/240	Soil	Bq/kg	21.87	71	50–92	No	GEL
K–40	Soil	Bq/kg	774	699	489–909	Yes	GEL
Sr–90	Soil	Bq/kg	4.6	[c]	[c]	Yes	GEL
Tc–99	Soil	Bq/kg	272.3	325	228–423	Yes	GEL
U–233/234	Soil	Bq/kg	266.33	278	195–361	Yes	GEL
U–238	Soil	Bq/kg	275.33	289	202–376	Yes	GEL
MAPEP – 10 – RdV23, Vegetation – Radiological							
Am–241	Veg	Bq/sample	0.210	0.270	0.189–0.351	Pass	GEL
Cs–137	Veg	Bq/sample	4.759	5.88	4.12–7.64	Yes	GEL
Co–60	Veg	Bq/sample	-0.019	[c]	[c]	Yes	GEL
Pu–238	Veg	Bq/sample	0.258	0.221	0.155–0.287	Yes	GEL
Pu–239/240	Veg	Bq/sample	0.0068	0.0010	[d]	Yes	GEL
Sr–90	Veg	Bq/sample	2.790	2.63	1.84–3.42	Yes	GEL
U–233/234	Veg	Bq/sample	0.392	0.320	0.224–0.416	Pass	GEL
U–238	Veg	Bq/sample	0.405	0.330	0.231–0.429	Pass	GEL
MAPEP – 10 – OrW23, Water – Organic Compounds							
Heptachlor	Water	μg/L	<0.02	[c]	[c]	Yes	GEL
1,2,4–Trichlorobenzene	Water	μg/L	28.8	31.58	8.02–55.15	Yes	GEL
1,2–Dichlorobenzene	Water	μg/L	78.7	91.30	17.94–164.66	Yes	GEL
1,3–Dichlorobenzene	Water	μg/L	<9.43	[c]	[c]	Yes	GEL
1,4–Dichlorobenzene	Water	μg/L	45.2	55.06	8.49–102.60	Yes	GEL
2,4,5–Trichlorophenol	Water	μg/L	<9.43	[c]	[c]	Yes	GEL
2,4,6–Trichlorophenol	Water	μg/L	98.7	84.65	34.28–135.01	Yes	GEL
2,4–Dichlorophenol	Water	μg/L	43.2	37.60	13.64–61.56	Yes	GEL
2,4–Dimethylphenol	Water	μg/L	53.3	47.42	11.62–83.21	Yes	GEL
2,4–Dinitrophenol	Water	μg/L	<18.9	[c]	[c]	Yes	GEL
2,4–Dinitrotoluene	Water	μg/L	48.7	44.65	19.01–70.28	Yes	GEL
2,6–Dichlorophenol	Water	μg/L	<9.43	[c]	[c]	Yes	GEL
2,6–Dinitrotoluene	Water	μg/L	102	104.23	52.11–156.35	Yes	GEL
2–Chloronaphthalene	Water	μg/L	22.5	23.49	8.72–38.26	Yes	GEL
2–Chlorophenol	Water	μg/L	<9.43	[c]	[c]	Yes	GEL
2–Methylnaphthalene	Water	μg/L	<0.943	[c]	[c]	Yes	GEL

GEL - GEL Laboratories, LLC

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

[d] Not detected, reported as a statistically zero result.

TABLE G-2 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 23, September 2010

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP – 10 – OrW23, Water – Organic Compounds							
2–Methylphenol	Water	µg/L	36.6	39.01	10.18–67.84	Yes	GEL
2–Nitrophenol	Water	µg/L	110	91.31	28.59–154.03	Yes	GEL
3 Methyl and 4–Methylphenol	Water	µg/L	86.8	81.56	12.15–157.11	Yes	GEL
4,6–Dinitro–2–methylphenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4–Bromophenyl–phenylether	Water	µg/L	73.1	80.75	31.72–129.79	Yes	GEL
4–Chloro–3–methylphenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4–Chlorophenyl–phenylether	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
4–Nitrophenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Acenaphthene	Water	µg/L	18.3	21.70	11.40–32.00	Yes	GEL
Acenaphthylene	Water	µg/L	18.7	19.52	8.51–30.53	Yes	GEL
Anthracene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Benzo(a)anthracene	Water	µg/L	16.5	14.85	7.21–22.48	Yes	GEL
Benzo(a)pyrene	Water	µg/L	22.0	20.07	7.49–32.66	Yes	GEL
Benzo(b)fluoranthene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Benzo(g,h,i)perylene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Benzo(k)fluoranthene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
bis(2–chloroethoxy)methane	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
bis(2–chloroethyl)ether	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
bis(2–chloroisopropyl)ether	Water	µg/L	155	137.69	45.31–230.07	Yes	GEL
Bis(2–ethylhexyl)phthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Butylbenzylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Chrysene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Di–n–butylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Di–n–octylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Dibenzo(a,h)anthracene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Dibenzofuran	Water	µg/L	53.3	54.65	24.13–85.17	Yes	GEL
Diethylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Dimethylphthalate	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Fluoranthene	Water	µg/L	102	106.72	57.48–155.97	Yes	GEL
Fluorene	Water	µg/L	83.2	87.74	47.11–128.36	Yes	GEL
Hexachlorobenzene	Water	µg/L	21.2	28.03	13.30–42.76	Yes	GEL
Hexachlorobutadiene	Water	µg/L	86.2	108.93	21.25–196.62	Yes	GEL
Hexachlorocyclopentadiene	Water	µg/L	103	107.07	17.94–230.30	Yes	GEL
Hexachloroethane	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Indeno(1,2,3–c,d)pyrene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Isophorone	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Napthalene	Water	µg/L	<0.943	[c]	[c]	Yes	GEL
Nitrobenzene	Water	µg/L	128	105.23	42.91–167.55	Yes	GEL
Pentachlorophenol	Water	µg/L	<9.43	[c]	[c]	Yes	GEL
Phenanthrene	Water	µg/L	26.3	29.61	16.66–42.55	Yes	GEL
Phenol	Water	µg/L	36.4	62.59	11.13–150.16	Yes	GEL
Pyrene	Water	µg/L	42.8	46.78	17.61–75.95	Yes	GEL

GEL - GEL Laboratories, LLC

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-3

Comparisons of Results From Crosscheck Samples Analyzed for Water Quality Parameters as Part of the EPA's 2010 Discharge Monitoring Report - Quality Assurance (DMR-QA) Study 30 (August 2010) for the National Pollutant Discharge Elimination System (NPDES)

Analyte	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range* [a]	*Accept?* [b]	*Analyzed by:*
Aluminum	µg/L	988	915	734–1090	Yes	TestAmerica
Ammonia (as N)	mg/L	8.71	10.6	7.86–13.2	Yes	TestAmerica
Antimony	µg/L	295	283	192–343	Yes	TestAmerica
Arsenic	µg/L	460	445	372–522	Yes	TestAmerica
Barium	µg/L	1,730	1,650	1,430–1,860	Yes	TestAmerica
Biochemical oxygen demand	mg/L	25.9	28.0	13.9–42.2	Yes	TestAmerica
Cadmium	µg/L	268	258	220–294	Yes	TestAmerica
Chlorine (total residual)	µg/L	190	173	113–233	Yes	WWTF
Chromium (total)	µg/L	740	718	626–811	Yes	TestAmerica
Chromium (hexavalent)	µg/L	422	472	384–556	Yes	TestAmerica
Cobalt	µg/L	276	268	235–301	Yes	TestAmerica
Copper	µg/L	341	348	314–384	Yes	TestAmerica
Cyanide, total	mg/L	0.377	0.340	0.179–0.508	Yes	TestAmerica
Iron	µg/L	2,150	2,050	1,820–2,310	Yes	TestAmerica
Lead	µg/L	1,730	1,680	1,480–1,880	Yes	TestAmerica
Manganese	µg/L	360	344	308–383	Yes	TestAmerica
Mercury	µg/L	3.64	3.74	2.32–5.19	Yes	GEL
Nickel	µg/L	876	844	759–943	Yes	TestAmerica
Nitrate (as N)	mg/L	10.8	10.9	8.47–13.1	Yes	TestAmerica
Nitrite (as N)	mg/L	0.970	0.955	0.763–1.14	Yes	TestAmerica
Oil & Grease (Gravimetric)	mg/L	65.9	80.0	55.5–94.1	Yes	TestAmerica
pH	SU	6.38	6.30	6.10–6.50	Yes	ELAB
Phosphorus (total, as P)	mg/L	7.06	6.79	5.60–8.04	Yes	TestAmerica
Selenium	µg/L	332	323	254–375	Yes	TestAmerica
Silver	µg/L	235	228	196–262	Yes	TestAmerica
Sulfate	mg/L	92.4	90.0	74.6–103	Yes	TestAmerica
Settleable solids	mL/L	23.0	18.5	14.1–24.0	Yes	WWTF
Suspended solids (total)	mg/L	32.4	40.4	30.3–47.0	Yes	TestAmerica
Total dissolved solids	mg/L	302	298	224–372	Yes	ELAB
Total Kjeldahl nitrogen (as N)	mg/L	20.9	25.7	17.0–33.1	Yes	TestAmerica
Vanadium	µg/L	525	506	443–566	Yes	TestAmerica
Zinc	µg/L	1,500	1,430	1,230–1,640	Yes	TestAmerica

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
TestAmerica - TestAmerica Laboratories, Inc., Buffalo
WWTF - WVDP Wastewater Treatment Facility Laboratory
Note: Samples provided by National Environmental Laboratory Accreditation Conference (NELAC)-accredited providers.

[a] Acceptance limits are determined by NELAC-accredited providers.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable but outside warning limits; "No" - Result not acceptable.

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APPENDIX H

West Valley Demonstration Project Act

West Valley Demonstration Project Act
(Public Law 96-368 [S. 2443]; October 1, 1980)

(As presented in Exhibit G of the Cooperative Agreement between United States Department of Energy and New York State Energy Research and Development Authority on the Western New York Nuclear Service Center at West Valley, New York; Effective October 1, 1980 as amended September 18, 1981.)

EXHIBIT G

WEST VALLEY PROJECT DEMONSTRATION ACT

PUBLIC LAW 96-368 [S. 2443]; October 1, 1980

WEST VALLEY DEMONSTRATION PROJECT ACT

For Legislative History of this and other Laws, see Table 1, Public Laws and Legislative History, at end of final volume

An Act to authorize the Department of Energy to carry out a high-level liquid nuclear waste management demonstration project at the Western New York Service Center in West Valley, New York.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

West Valley Demonstration Project Act. 42 USC 2021a note.

SECTION 1. This Act may be cited as the "West Valley Demonstration Project Act".

42 USC 2021a note.

SEC. 2. (a) The Secretary shall carry out, in accordance with this Act, a high level radioactive waste management demonstration project at the Western New York Service Center in West Valley, New York, for the purpose of demonstrating solidification techniques which can be used for preparing high level radioactive waste for disposal. Under the project the Secretary shall carry out the following activities:

Activities.

(1) The Secretary shall solidify, in a form suitable for transportation and disposal, the high level radioactive waste at the Center by vitrification or by such other technology which the Secretary determines to be the most effective for solidification.

(2) The Secretary shall develop containers suitable for the permanent disposal of the high level radioactive waste solidified at the Center.

(3) The Secretary shall, as soon as feasible, transport, in accordance with applicable provisions of law, the waste solidified at the Center to an appropriate Federal repository for permanent disposal.

(4) The Secretary shall, in accordance with applicable licensing requirements, dispose of low level radioactive waste and transuranic waste produced by the solidification of the high level radioactive waste under the project.

(5) The Secretary shall decontaminate and decommission—

(A) the tanks and other facilities of the Center in which the high level radioactive waste solidified under the project was stored,

(B) the facilities used in the solidification of the waste, and

(C) any material and hardware used in connection with the project,

in accordance with such requirements as the Commission may prescribe.

(b) Before undertaking the project and during the fiscal year ending September 30, 1981, the Secretary shall carry out the following:

Hearings.

(1) The Secretary shall hold in the vicinity of the Center public hearings to inform the residents of the area in which the Center is located of the activities proposed to be undertaken under the project and to receive their comments on the project.

(2) The Secretary shall consider the various technologies available for the solidification and handling of high level radioactive waste taking into account the unique characteristics of such waste at the Center.

94 STAT. 1347

(3) The Secretary shall—

(A) undertake detailed engineering and cost estimates for the project.

(B) prepare a plan for the safe removal of the high level radioactive waste at the Center for the purposes of solidification and include in the plan provisions respecting the safe breaching of the tanks in which the waste is stored, operating equipment to accomplish the removal, and sluicing techniques,

(C) conduct appropriate safety analyses of the project, and

(D) prepare required environmental impact analyses of the project.

(4) The Secretary shall enter into a cooperative agreement with the State in accordance with the Federal Grant and Cooperative Agreement Act of 1977 under which the State will carry out the following:

42 USC 501 note.

(A) The State will make available to the Secretary the facilities of the Center and the high level radioactive waste at the Center which are necessary for the completion of the project. The facilities and the waste shall be made available without the transfer of title and for such period as may be required for completion of the project.

(B) The Secretary shall provide technical assistance in securing required license amendments.

State costs, percentage.

(C) The State shall pay 10 per centum of the costs of the project, as determined by the Secretary. In determining the costs of the project, the Secretary shall consider the value of the use of the Center for the project. The State may not use Federal funds to pay its share of the cost of the project, but may use the perpetual care fund to pay such share.

Licensing amendment application.

(D) Submission jointly by the Department of Energy and the State of New York of an application for a licensing amendment as soon as possible with the Nuclear Regulatory Commission providing for the demonstration.

(c) Within one year from the date of the enactment of this Act, the Secretary shall enter into an agreement with the Commission to establish arrangements for review and consultation by the Commission with respect to the project: *Provided,* That review and consultation by the Commission pursuant to this subsection shall be conducted informally by the Commission and shall not include nor require formal procedures or actions by the Commission pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, or any other law. The agreement shall provide for the following:

42 USC 2011 note. 42 USC 5801 note.

(1) The Secretary shall submit to the Commission, for its review and comment, a plan for the solidification of the high level radioactive waste at the Center, the removal of the waste for purposes of its solidification, the preparation of the waste for disposal, and the decontamination of the facilities to be used in solidifying the waste. In preparing its comments on the plan, the Commission shall specify with precision its objections to any provision of the plan. Upon submission of a plan to the Commission, the Secretary shall publish a notice in the Federal Register of the submission of the plan and of its availability for public inspection, and, upon receipt of the comments of the Commission respecting a plan, the Secretary shall publish a notice in the Federal Register of the receipt of the comments and of the availability of the comments for public inspection. If the Secre-

Publications in Federal Register.

tary does not revise the plan to meet objections specified in the comments of the Commission, the Secretary shall publish in the Federal Register a detailed statement for not so revising the plan.

(2) The Secretary shall consult with the Commission with respect to the form in which the high level radioactive waste at the Center shall be solidified and the containers to be used in the permanent disposal of such waste.

(3) The Secretary shall submit to the Commission safety analysis reports and such other information as the Commission may require to identify any danger to the public health and safety which may be presented by the project. Reports and other information to Commission.

(4) The Secretary shall afford the Commission access to the Center to enable the Commission to monitor the activities under the project for the purpose of assuring the public health and safety.

(d) In carrying out the project, the Secretary shall consult with the Administrator of the Environmental Protection Agency, the Secretary of Transportation, the Director of the Geological Survey, and the commercial operator of the Center. Consultation with EPA and others.

SEC. 3. (a) There are authorized to be appropriated to the Secretary for the project not more than $5,000,000 for the fiscal year ending September 30, 1981. Appropriation authorization. 42 USC 2021a note.

(b) The total amount obligated for the project by the Secretary shall be 90 per centum of the costs of the project.

(c) The authority of the Secretary to enter into contracts under this Act shall be effective for any fiscal year only to such extent or in such amounts as are provided in advance by appropriation Acts.

SEC. 4. Not later than February 1, 1981, and on February 1 of each calendar year thereafter during the term of the project, the Secretary shall transmit to the Speaker of the House of Representatives and the President pro tempore of the Senate an up-to-date report containing a detailed description of the activities of the Secretary in carrying out the project, including agreements entered into and the costs incurred during the period reported on and the activities to be undertaken in the next fiscal year and the estimated costs thereof. Report to Speaker of the House and President pro tempore of the Senate. 42 USC 2021a note.

SEC. 5. (a) Other than the costs and responsibilities established by this Act for the project, nothing in this Act shall be construed as affecting any rights, obligations, or liabilities of the commercial operator of the Center, the State, or any person, as is appropriate, arising under the Atomic Energy Act of 1954 or under any other law, contract, or agreement for the operation, maintenance, or decontamination of any facility or property at the Center or for any wastes at the Center. Nothing in this Act shall be construed as affecting any applicable licensing requirement of the Atomic Energy Act of 1954 or the Energy Reorganization Act of 1974. This Act shall not apply or be extended to any facility or property at the Center which is not used in conducting the project. This Act may not be construed to expand or diminish the rights of the Federal Government. 42 USC 2021a note. 42 USC 2011 note. 42 USC 5801 note.

(b) This Act does not authorize the Federal Government to acquire title to any high level radioactive waste at the Center or to the Center or any portion thereof.

SEC. 6. For the purposes of this Act: Definitions. 42 USC 2021a note.

(1) The term "Secretary" means the Secretary of Energy.

(2) The term "Commission" means the Nuclear Regulatory Commission.

(3) The term "State" means the State of New York.

(4) The term "high level radioactive waste" means the high level radioactive waste which was produced by the reprocessing at the Center of spent nuclear fuel. Such term includes both liquid wastes which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the Commission designates as high level radioactive waste for purposes of protecting the public health and safety.

(5) The term "transuranic waste" means material contaminated with elements which have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and which are in concentrations greater than 10 nanocuries per gram, or in such other concentrations as the Commission may prescribe to protect the public health and safety.

(6) The term "low level radioactive waste" means radioactive waste not classified as high level radioactive waste, transuranic waste, or byproduct material as defined in section 11 e. (2) of the Atomic Energy Act of 1954.

42 USC 2014.

(7) The term "project" means the project prescribed by section 2(a).

(8) The term "Center" means the Western New York Service Center in West Valley, New York.

Approved October 1, 1980.