1.0 INTRODUCTION

This report presents the annual summary of environmental monitoring data collected at the West Valley Demonstration Project (WVDP) from January 1, 1988 through December 31, 1988. The report also describes the environmental monitoring program and discusses project compliance with state and federal regulations. Environmental monitoring is a continuing effort to help assure public safety with respect to the activities on the site and the waste materials which reside there.

1.1 HISTORICAL OVERVIEW

Starting in 1966 Nuclear Fuel Services (NFS) reprocessed fuel from various nuclear power plants at the Western New York Nuclear Service Center (WNYNSC) under a lease from the New York State Energy Research and Development Authority (NYSERDA). In 1972 the plant was closed for expansion. Increased federal and state regulations aimed at the planned expansion and facility operations made the required capital investment much more costly than had been anticipated. In 1976 NFS decided not to proceed with the plans and notified NYSERDA of its intent to terminate the lease, leaving the liquid radioactive waste in underground steel tanks, the approved method of storing high-level radioactive waste at the time.

The reprocessing plant was maintained and monitored in the shut down condition until Public Law No. 96-368 was enacted in 1980. The law mandated the demonstration of technology to solidify the 2.2 million litres (580,000 gallons) of liquid high-level radioactive waste that remained at the site. The Department of Energy (DOE) was given the responsibility to implement the law and chose West Valley Nuclear Services Company (WVNS), a subsidiary of Westinghouse Electric, for the operation and maintenance of the West Valley Demonstration Project.

The conversion of the plant facilities from reprocessing activities to waste handling and processing was designed to use existing facilities as much as possible. In addition to modification of the plant, WVNS assumed operational control of the environmental monitoring program conducted by NFS for the shutdown facility, as licensed by the Nuclear Regulatory Commission (NRC).

The site is also the location of an NRC-licensed low-level radioactive waste storage area and a state-licensed storage area. These areas are no longer active, but are carefully monitored and eventually will be closed with the remainder of the site when waste processing is completed.

The present environmental monitoring program was started in 1982. As new systems became operational and the activities changed from decontamination and decommissioning to system construction, the monitoring program has been changed to accommodate state and federal regulations and to include additional monitoring points. As recommended in DOE Order 5484.1, the program has provided more than two years of environmental data prior to high-level waste processing.

Activities of the program are documented under the National Environmental Policy Act (NEPA) which provides a formal way to plan and carry out significant work which might affect the environment. A comprehensive Environmental Evaluation (EE) was published in June 1984 to initiate the decision-making process for disposal of Project low-level radioactive waste (LLW). Based on the review of the EE by the DOE, the Project staff was directed to prepare an Environmental Assessment (EA) which analyzed alternative disposal options more thoroughly than was appropriate in the EE. In April of 1986, the DOE approved the LLW disposal EA, and after an appropriate public comment period, issued a Finding of No Significant Impact (FONSI) in August of the same year.

Environmental Evaluations were also prepared in 1985 and 1986 for the major solidification process support systems, including the Vitrification System, Supernatant Treatment System (STS), Cement Solidification System (CSS), and Liquid Waste Treatment System (LWTS). These documents were approved by WVNS management and submitted to DOE for review and approval.

1.2 1988 PROGRAM OVERVIEW

Significant activities during 1988 included startup of the Integrated Radwaste Treatment System (IRTS), increased attention to the management of mixed and hazardous wastes, and program changes to environmental documentation and the monitoring plan.

The IRTS processes high-level waste (HLW) fluids stored at the WVDP into low-level liquid that is stabilized in cement. This system is designed to remove approximately 90 percent of the total volume of liquid waste contained in an underground steel tank.

Approximately 35 million curies of radioactivity are present in this tank. Half of the radioactivity is contained in the supernatant or liquid portion of the waste and the other half is contained in the sludge located on the bottom of the tank. The supernatant is comprised primarily of sodium and potassium salts. Dissolved radioactive cesium makes up greater than 99 percent of the total activity of fission products in the supernatant. Most of the radioactivity in the sludge is due to the decay of strontium. The largest chemical constituent in the sludge is iron hydroxide.

The IRTS is made up of four subsystems, the Supernatant Treatment System , the Cement Solidification System, the Liquid Waste Treatment System, and the Drum Cell. The STS uses the containment of a second steel storage tank identical to the one which holds the HLW. Four ion exchange columns are filled with zeolite to remove more than 99.9 percent of the radioactive cesium from the supernatant. The cesium-loaded zeolite from the STS process, together with some additional waste left from reprocessing will eventually be combined with the sludge in the bottom of the tank and transferred to the Vitrification Facility (VF). Pumps will be used to dislodge and move both sludge and zeolite. The first zeolite pump was installed, checked out and started up in 1988. In the VF the high-level sludge, additional waste, and zeolite resins will be mixed with glass formers and melted to produce borosilicate glass, the final solidified HLW form, which will then be encapsulated in stainless steel canisters.

The remaining three IRTS subsystems, LWTS, CSS, and the Drum Cell, collect, segregate, characterize, pretreat, reduce and solidify in cement all liquid LLW remaining after the STS process. The liquid salt solution from the STS is concentrated by evaporation in the LWTS, encapsulated into cement at the CSS and stored in the Drum Cell. Located southwest of the main plant near the NRC-licensed disposal area, the Drum Cell is a large shielded structure enclosed in a building designed to store 15,000 268-litre (71-gallon) drums of processed LLW. After the Drum Cell is filled, the stored LLW may be removed for disposal or the building may be dismantled and the shielded structure converted into an above-ground tumulus for final disposal. A decision on final disposal of Project LLW will be made after completion of the Environmental Impact Statement (EIS) for the postsolidification phase (Phase II) of the WVDP. A Notice of Intent (NOI) to prepare an EIS was published in December 1988 and a public hearing was held to receive comments in February 1989.

The Drum Cell was completed in 1987 to store Class B and C low-level radioactive wastes (as defined by 10 CFR 61). Covered storage facilities for Class A wastes were also expanded in 1987. The expansion of LLW storage facilities was necessary to fulfill the conditions of a settlement agreement resulting from a lawsuit brought against the Project by the Coalition on West Valley Nuclear Wastes and the Radioactive Waste Campaign. This settlement requires that LLW not be disposed on the Project premises until the EIS is prepared. The NOI to prepare the EIS was published at the end of 1988 to begin the process. Both operational and environmental monitoring programs have been expanded to accommodate these expanded storage operations.

A significant milestone for the WVDP was achieved with start-up of the IRTS on May 23, 1988. After an extensive, independent week-long review of the IRTS, an Operational Readiness Review Board (ORRB) recommended operation of the system. During the review, all operational and environmental safety aspects of the IRTS were thoroughly scrutinized by representatives of the DOE, NYSERDA, WVNS, and the Westinghouse Electric Corporation. Representatives from the NRC also

attended the review and agreed that the IRTS was capable of operating in an efficient and environmentally safe manner. Formal start-up approval from the DOE Idaho Operations Manager was obtained on May 20, 1988.

During the course of the first year of operations 138,000 gallons of waste were processed and 2607 cement drums were filled and stored in the Drum Cell.

Throughout 1988 liquid wastes resulting from plant activities were processed at the existing Low-Level Waste Treatment Facility (LLWTF) prior to discharge. During 1988 the volume discharged from the Project to the environment was 21 million liters (8 million gals.); this was 16 percent below 1987 or a reduction of 5.7 million liters (1.5 million gals.). The total amount of radioactivity released was reduced by 20.5 percent from 34 mCi (gross alpha plus beta) in 1987 to 27 mCi in 1988.

During routine weekly environmental sampling in the former low-level radioactive waste disposal area in mid-August, approximately one cup of slightly radioactive kerosene was discovered in a previously installed groundwater monitoring well. Analysis indicated the kerosene contained residual amounts of fission products and trace amounts of plutonium. Further investigation showed that the solvent had migrated approximately 2 meters (6 feet) from the area where it was disposed by the former site operator. The appropriate local, state, and federal agencies were notified. The monitoring stations for surface water and air in the surrounding vicinity showed no increase in radioactivity, confirming no releases of either solvent or radioactivity off site. A more detailed program is planned to characterize and confirm the localized nature of the migration.

The on-site storage pool contains 125 spent fuel assemblies awaiting shipment to the DOE Idaho National Engineering Laboratory (INEL) as part of a demonstration under the Nuclear Waste Policy Act (NWPA). Shipment is waiting on cask certification by the NRC. The current schedule is to ship half of the elements in FY 1989 and half in FY 1990.

Since environmental safety and health is of the utmost concern at the WVDP, several measures were taken in 1988 to assure continued compliance with federal and state regulations. Among the accomplishments in the area were revision of procedures to comply with the NEPA and a major revision of the Spill Prevention, Control and Countermeasures (SPCC) Plan, which gives procedures for responding to emergencies caused by spills of hazardous liquids. Discussions began with the New York State Department of Environmental Conservation (NYSDEC) and the U. S. Environmental Protection Agency (EPA) on requirements for handling mixed waste.

During 1988 the environmental surveillance plan was again updated to reflect the nearing completion of process facilities. The revisions also reflected Project monitoring experiences to date. The updated plan provides for coverage of new on-site effluent points and monitoring of active waste management areas. The revised plan is described in detail in Appendix A.

1.3 SITE CHARACTERISTICS

The WVDP site is located in a rural setting approximately 50 km (30 mi) south of Buffalo, New York (Figure 1-1), at an average elevation of 400 m (1,300 ft) on New York State's western plateau. The plant facilities used by the Project occupy approximately 63 hectares (156 acres) of chain-link fenced area within a 1,350-hectare (3,300-acre) reservation that constitutes the Western New York Nuclear Service Center (WNYNSC). The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within 8 km (5 mi) of the plant. Several roads and one railway pass through the Center, but no human habitation, hunting, fishing, or public access is permitted on the WNYNSC.

The land immediately adjacent to the WNYNSC is used primarily for agriculture and arboriculture. Cattaraugus Creek to the north serves as a water recreation area (swimming, canoeing, and fishing). Although limited irrigation water for adjacent golf course greens and tree farms is taken from Cattaraugus Creek, no public water supply is drawn from the creek downstream of the WNYNSC.

The average annual temperature in the region is 7.2 °C (45.0 °F) with recorded extremes of 37 °C

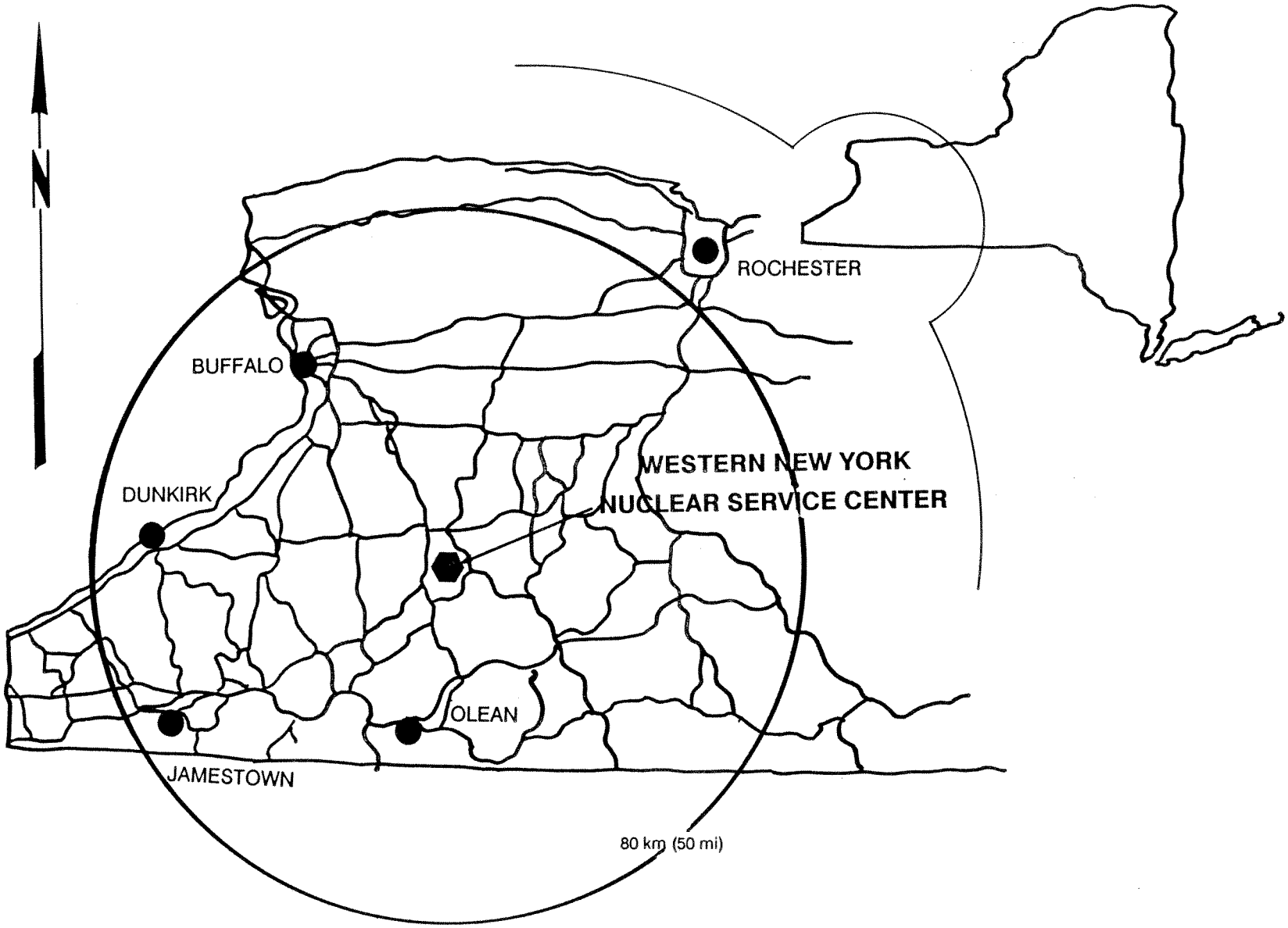

Figure 1-1. Location of the Western New York Nuclear Service Center.

(98.6 °F) and -42 °C (-43.6 °F). Rainfall is relatively high, averaging about 104 cm (41 in.) per year. Precipitation is evenly distributed throughout the year and is markedly influenced by Lake Erie to the west and Lake Ontario to the north. All surface drainage from the WNYNSC is to Buttermilk Creek which flows into Cattaraugus Creek and ultimately into Lake Erie. Regional winds are predominantly from the west and south at over 4 m/s (9 mph) during most of the year.

The WNYNSC lies within the northeastern deciduous forest biome, and the diversity of its vegetation is typical of the region. Equally divided between forest and open land, the site provides habitats especially attractive to white-tailed deer and the various indigenous birds, reptiles, and small mammals. No endangered species are known to be present on the WNYNSC.

The geology of the site is characterized by glacial deposits of varying thickness in the valley areas underlain by sedimentary rocks which are exposed in the upper drainage channels in hillsides. The soil is principally silty till consisting of unconsolidated rock fragments, pebbles, sand, and clays. The uppermost till unit is the Lavery, a very compact gray silty clay. Below the Lavery till is a more granular unit referred to as the Lacustrine unit comprised of silts, sands, and in some places, gravels which overlie a layered clay.

There are two aquifers in the site area. The upper aquifer is a transient water table aquifer in the upper 6 m (20 ft) of weathered till and alluvial gravels concentrated near the western edge of the site. High ground to the west and the Buttermilk Creek drainage to the east intersect this aquifer, precluding off-site continuity. Several shallow, isolated, water-bearing strata also occur at various other locations within the site boundary but do not appear to be continuous. The zone at which the till meets bedrock forms another aquifer that ranges in depth from 2 m (6 ft) underground on the hillsides to 170 m (560 ft) deep just east of the boundary of the facility exclusion area.

A more detailed description of the site hydrogeology is included in Section 3.1.

1.4 ARRANGEMENT OF REPORT

The report is arranged in five sections followed by references and appendices. After the introduction, Section 2 includes a description of the environmental monitoring plan and summarizes results from the 1988 program. Section 3 provides information about the groundwater monitoring program and results. Section 4 explains the methods of estimating doses to the public from air and water effluents and biological pathways. Section 5 provides a listing of DOE Orders and regulations affecting the Project and explains the quality assurance provisions of the monitoring program. Section 6 contains the references for the report. The appendices begin with a full schedule of environmental monitoring for on-site, off-site and effluent monitoring. Appendix B is a listing of DOE derived concentration guides for the nuclides of concern in this report. Appendices C-1 through C-5 provide the summarized data from this year's monitoring in table format. Appendix D is a listing of cross-check sample results to support the quality assurance section. Appendix E provides supporting tables and figures for the groundwater monitoring section. The report ends with a glossary, listing of acronyms, and unit abbreviation and conversion tables for items and values used in the report.