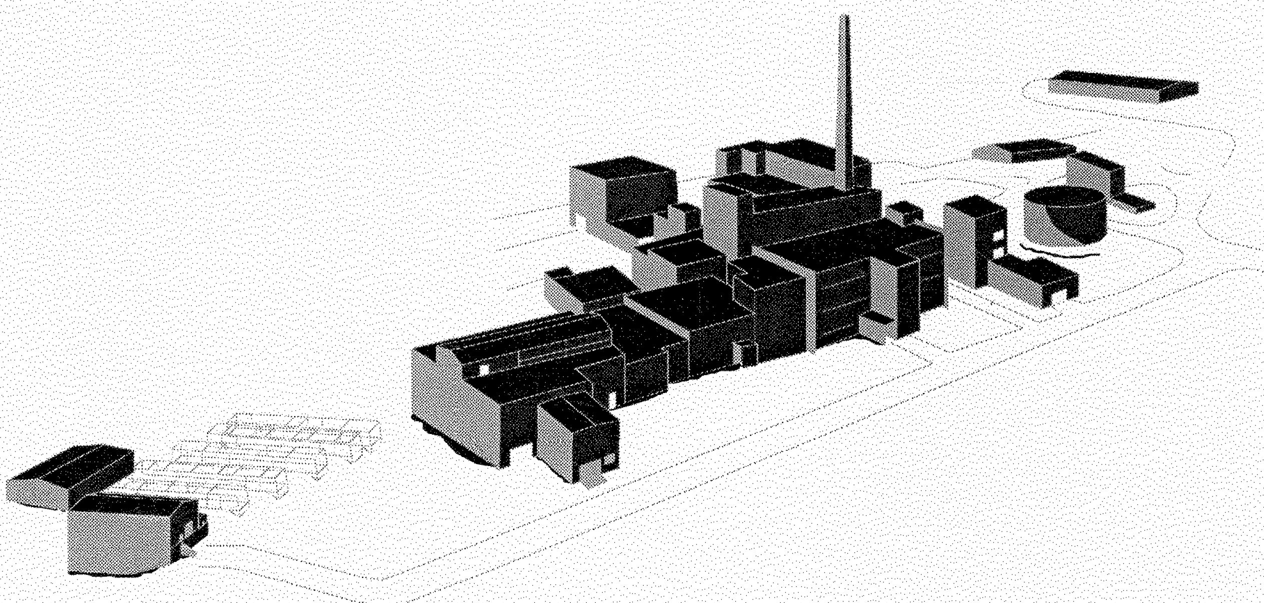
WEST VALLEY DEMONSTRATION PROJECT

SITE ENVIRONMENTAL REPORT

CALENDAR YEAR 1992



West Valley Nuclear Services Company, Inc.

and

Dames & Moore

Prepared for:
U.S. Department of Energy
Idaho Operations Office
West Valley Project Office
Under contract DE-AC07-81NE44139

May 1993
Rock Springs Road
West Valley, New York 14171

West Valley Demonstration Project

Site Environmental Report

for

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Department of Energy
Idaho Operations Office
West Valley Project Office
P.O. Box 191
West Valley, NY 14171

Greetings:

This report, prepared by the U.S. Department of Energy (DOE) West Valley Demonstration Project (WVDP) Office, contains a summary of radiological and nonradiological monitoring data collected by the Project during the 1992 calendar year. Please note that the monitoring data and the results provided in this report include both the premises being used by the DOE to conduct the Project and the New York State-licensed Disposal Area (SDA), which is controlled by and is the sole responsibility of New York State.

Collection and analysis of air, surface water, soil, and biological samples ensured detection of any possible off-site release of radioactive or hazardous material and provided the basis for a comprehensive evaluation of potential impacts. Radionuclide concentrations in biological samples were below detectable levels or statistically identical to background concentrations. In 1992 the Project again did not exceed or even approach any regulatory limit on effluent radioactivity or radiation dose. Calculated doses to the maximally exposed off-site individual from air- and waterborne releases were 0.05% of the DOE limit.

Nonradiological plant effluents are controlled and permitted by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA). Releases were below regulatory limits, with two minor exceptions occurring in treated wastewater discharges permitted under the New York State Pollutant Discharge Elimination System (SPDES).

This 1992 report is the first to contain data from a full calendar year of operation of the new, expanded network of groundwater monitoring wells. While these monitoring data do not indicate a potential for immediate adverse effects on human health or the environment, evaluation of the need to mitigate minor residual contamination indicated by the data is in progress in accordance with applicable laws and regulations.

The quality assurance program required by the Department of Energy through its West Valley Project Office includes control of sample collection and laboratory analysis as well as participation in crosschecks with other laboratories. Chapter 5 of this report provides a complete description of the Project's quality assurance program, which is designed to ensure the validity and accuracy of the monitoring data.

The information contained in this report demonstrates that public health and safety are being protected during operation of the WVDP. If you have any questions, please contact the West Valley Nuclear Services Company, Inc. (WVNS) Manager of Community Relations, John D. Chamberlain, at (716) 942-4610.

Sincerely,

Tom Rowland

T. J. Rowland, Director
West Valley Project Office

Preface

Environmental monitoring at the West Valley Demonstration Project (WVDP) is conducted by the West Valley Nuclear Services Company, Inc. (WVNS), under contract to the U.S. Department of Energy (DOE). The data collected provide an historical record of radionuclide and radiation levels from natural and manmade sources in the survey area. The data also document the quality of the groundwater on and around the site and the quality of the air and water discharged by the Project.

This report represents a single, comprehensive source of off-site and on-site environmental monitoring data collected during 1992 by WVNS environmental monitoring personnel. The data are found in the appendices following this report. Appendix A is a summary of the site environmental monitoring schedule. Appendix B lists the environmental permits and regulations pertaining to the West Valley Demonstration Project. Appendices C through E contain summaries of data obtained during 1992 and are intended for those interested in more detail than is provided in the main body of the report.

Requests for additional copies of the 1992 Site Environmental Report and questions regarding the report should be referred to the WVDP Community Relations Department, P.O. Box 191, Rock Springs Road, West Valley, New York 14171 (716-942-4610).

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The West Valley Demonstration Project

EXECUTIVE SUMMARY

The West Valley Demonstration Project (WVDP) conducts a comprehensive environmental monitoring program that fulfills U.S. Department of Energy (DOE) Orders and directives and the regulatory requirements of the United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The results of this program show that public health, safety, and the environment are being protected with respect to activities at the site and the waste materials stored there.

This annual report, published to meet the requirements of DOE Orders 5400.1 and 5400.5, summarizes the environmental monitoring data collected during 1992. On-site and off-site radiological and nonradiological monitoring in 1992 confirm that site activities, with few exceptions, were conducted well within state and federal regulatory limits. (A description of regulatory issues is found in the *Environmental Compliance Summary: Calendar Year 1992.)* The exceptions noted have resulted in no significant effects upon public health or the environment.

History of the West Valley Demonstration Project

In the early 1950s interest in promoting peaceful uses of atomic energy led to the passage of an amendment to the Atomic Energy Act under which the Atomic Energy Commission encouraged commercialization of nuclear fuel reprocessing as a way of developing a civilian nuclear industry. The Atomic Energy Commission made its technology available to private industry and invited proposals for the design, construction, and operation of reprocessing plants.

In 1961 the New York Office of Atomic Development acquired 3,345 acres near West Valley, New York and established the Western New York Nuclear Service Center (WNYNSC). The Davison Chemical Co., co-licensed with the New York State Atomic Research and Development Authority, which later became the New York State Energy Research and Development Authority (NYSERDA), formed Nuclear Fuel Services, Inc. (NFS) to construct and operate a nuclear fuel reprocessing plant. NFS leased the Western New York Nuclear Service Center and in 1966 began operations to recycle fuel from both commercial and federally owned reactors.

In 1972, while the plant was closed for modifications and expansion, more rigorous federal and state safety regulations were imposed. Most of the changes were concerned with the disposal of high-level radioactive liquid waste and with preventing earthquake damage to the facilities. Compliance with the new regulations was deemed not economically feasible, and in 1976 NFS notified NYSERDA that it would not continue in the fuel reprocessing business.

Following this decision, the reprocessing plant was shut down. Under the original agreement between NFS and New York State, the state was ultimately responsible for both the radioactive wastes and the facility. Numerous studies followed the closing, leading eventually to the passage of Public Law 96-368, which authorized the Department of Energy to demonstrate a method for solidifying the 2.5 million liters (660,000 gal) of liquid high-level waste that remained at the West Valley site. The technologies developed at West Valley would be used at other facilities throughout the United States. West Valley Nuclear Services Co., Inc. (WVNS), a subsidiary of Westinghouse Electric Corporation, was chosen by the Department of Energy to be the management and operations contractor for the West Valley Demonstration Project.

The purpose of the West Valley Demonstration Project is to solidify the high-level radioactive waste left at the site from the original nuclear fuel reprocessing activities, develop suitable containers for holding and transporting the solidified waste, arrange transport of the solidified waste to a federal repository, dispose of any Project low-level and transuranic waste resulting from the solidification of high-level waste, and decontaminate and decommission the Project facilities.

The majority of the high-level waste was contained in underground storage tanks and had settled into two layers — a liquid supernatant and a precipitate sludge. West Valley Nuclear Services, as prime contractor to DOE, secured environmental approval and constructed various subsystems that made possible the successful start-up in May 1988 of the integrated radwaste treatment system (IRTS). The system stripped radioactivity from the liquid supernatant, allowing the major portion of the liquid to be treated as low-level waste. Treatment of the supernatant liquid from the high-level waste tanks through the IRTS was completed in 1990. By the start of 1992, the resulting low-level treated liquid waste had been solidified in 10,393 drums of a special cement mixture and stored on-site in an engineered aboveground vault.

The next step in the process, washing the remaining sludge with water to remove soluble constituents, began in late 1991 and has continued through 1992. (See Chapter 1, *Environmental Monitoring Program Information* for a more detailed description.) The final step will be vitrification of the remaining high-level waste residues.

Compliance

The West Valley Demonstration Project operates within the radiological guidelines of Department of Energy Orders for protection of human health, safety, and the environment. Limits on radioactivity concentrations and exposures to radiation are specified in the DOE Orders. The Project did not exceed or approach any of the limits on radioactivity or radiation doses in 1992, including the emission standards promulgated by the EPA and incorporated in DOE Orders.

Nonradiological plant effluents are regulated by the New York State Department of Environmental Conservation (NYSDEC) and the EPA. New York State inspects nonradiological air emission points periodically even though nonradiological air effluent monitoring is not currently required because discharges resulting from site activities are very limited. Surface effluent water quality, regulated by NYSDEC, is tested for pH, biochemical oxygen demand, and other chemical constituents under a State Pollutant Discharge Elimination System (SPDES) permit, which identifies discharge water quality limits.

There were two SPDES permit exceedances in 1992. The first occurred when a mixture of natural clay and polymer (a filtration material) drained to a sump during a water treatment equipment repair, and for approximately ten minutes the settleable solids permitted concentration at outfall WNSP007 was exceeded. On the second occasion, the concentration of total iron in water exceeded permitted levels. This deviation resulted from flow-weighting formulas in the site's SPDES permit that did not adequately compensate for variations in the high natural iron present in the Project's raw intake water. Appropriate actions were taken in each case to notify NYSDEC in accordance with permit requirements. These deviations resulted in no significant effect on the environment. Evaluations of alternative methods of mitigation continued in order to determine the best way to prevent recurrence. There were no excursions attributable to the sewage treatment plant in 1992. (See the *Environmental Compliance Summary: Calendar Year 1992* for a more detailed description.)

Effects of Project activities upon site groundwaters are regulated by NYSDEC and the EPA. Groundwater sampling and analyses confirm that on-site groundwater quality has been and continues to be affected both radiologically and nonradiologically by past facility operations. Well sampling in 1992 added to the understanding of these effects. Although definite radiological and nonradiological effects upon localized, on-site groundwaters can be seen, these do not affect public health or the off-site environment.

Effluent and Environmental Monitoring Program

The 1992 environmental monitoring program provided radiological and nonradiological measurements of site effluent discharges and of related on-site and off-site samples. Air and surface water samples were collected to monitor these two major pathways by which radioactive material could migrate off-site.

Analysis of animal, soil, and vegetation samples from the facility environs also provided data from which the risk of exposure to radioactivity through ingestion pathways could be determined. Control (background) samples were taken to compare with on- or near-site samples.

Air Pathway Monitoring

Airborne particulate radioactivity was sampled continuously at five WNYNSC perimeter locations and four remote locations during 1992. A sixth perimeter air sampler was brought on line in December 1992. (See Chapter 2, *Environmental Monitoring*.) Sample filters were collected weekly and analyzed for gross alpha and gross beta radioactivity. Airborne gross activity around the site boundary was, in all cases, indistinguishable from background concentrations measured at the remote locations.

The specific alpha, beta, and gamma isotopes measured in the ventilation exhausts were well below the Department of Energy limits. (See *Appendix B*.) Direct monitoring of airborne effluents at the main plant stack and other permitted release points showed all discharges to be well below DOE and EPA effluent limitations.

Surface Water Pathway Monitoring

Automatic samplers collected surface water at six locations along site drainage channels. Samples were analyzed for gross alpha, gross beta, and gamma activity, and for tritium and strontium-90. Analyses for carbon-14, iodine-129, uranium and plutonium isotopes, and americium-241 are also program requirements at several collection points.

As a result of past site activities and continuing releases of treated liquids, gross radioactivity concentrations remained slightly higher in Buttermilk Creek below the West Valley Project site than at the upstream background sample point. However, yearly average concentrations in water below the Project site in Cattaraugus Creek during 1992 were indistinguishable from background concentrations measured in Buttermilk Creek upstream of the Project facilities. All Cattaraugus Creek concentrations observed were well below regulatory limits. Concentrations of cesium-137 and other gamma emitters, strontium-90 and other beta emitters, uranium and plutonium isotopes, and tritium were below DOE guidelines at all sampling locations, including Frank's Creek downstream of the Project at the inner site security fence more than three miles upstream of Cattaraugus Creek.

The low-level liquid waste treatment facility (LLWTF) contributes most of the activity released from the site in liquid discharges. The 1992 annual average liquid effluent concentrations of radionuclides were below DOE release guidelines at the point of discharge.

Food Pathway Monitoring

Radioactivity that could pass through the food chain was measured by sampling milk, beef, hay, corn, apples, beans, fish, and venison. Results were compared to data from 1987 through 1991 and were found to be at similar radioactivity levels. The absence of detectable differences between near-site and background food samples corroborated the low doses calculated from the measured concentrations in site effluents.

Direct Environmental Radiation Monitoring

Direct environmental radiation was measured continuously during each quarter in 1992 using thermoluminescent dosimeters (TLDs) at forty-one points distributed around the WNYNSC perimeter, along the site access road, at points around the Project site, and at various background locations. No significant differences were noted among exposure rates measured at background stations and the WNYNSC perimeter locations. Some TLD data were also collected within the restricted area boundary to monitor the exposure from nearby radioactive waste handling and storage facilities.

Nonradiological Monitoring

Nonradiological discharges from the site are regulated by NYSDEC; however, no special monitoring and reporting of nonradiological airborne effluents is required.

Nonradiological liquid discharges are monitored in accordance with the requirements of the State Pollutant Discharge Elimination System permits. Liquid is discharged at permitted outfalls to surface waters. Project effluents are monitored for biochemical oxygen demand (BOD), suspended solids, ammonia, iron, pH, oil and grease, and other water quality indicators. Although there was one iron and one solids excursion in 1992, monitoring indicated that nonradiological liquid discharges had no observed effect on the off-site environment.

Groundwater Monitoring

The WVDP is directly underlain by layers of glacial sand, clay and rock, and/or by layers of deposited lake and stream materials. The underlying bedrock is primarily Devonian shales and sandstones. As the material deposited across the site is not uniformly distributed, groundwater flow and seepage rates are uneven.

The 1992 monitoring well network included both on-site wells for surveillance of solid waste management units and off-site wells to monitor drinking water. The 1992 on-site groundwater monitoring network included 104 active wells and three points where groundwater emerges from the surface. Two of the wells were added to the network in the latter half of 1992. (See Fig. 3-3 in Chapter 3, *Groundwater Monitoring*.)

The wells provided upgradient and downgradient monitoring of the low-level liquid waste treatment facility (LLWTF) lagoons, the high-level waste tank complex, the Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA), and other solid waste management units. Wells in the groundwater monitoring network were each sampled eight times during 1992. The range of analyses performed was determined by technical regulatory guidelines and site-specific characterization needs.

Monitoring well data is grouped by geologic unit. Data from groundwater monitoring of the sand and gravel unit around the LLWTF lagoons indicate that radionuclides from past plant operations have affected groundwater quality: Compared to background, both tritium and gross beta concentrations are elevated in groundwater surrounding the lagoon system. However, the level of tritium contamination has declined steadily since 1982, as indicated by measurements at the french drain outfall WNSP008. Gross beta activity, which previously had increased, leveled off or declined in 1992 at the sand and gravel LLWTF monitoring points WNSP008, WNW8605, and WNW8603. Gross beta increased in sand and gravel monitoring well WNW8604 in 1992.

Data from monitoring wells around the high-level waste tanks do not suggest any effect of the stored high-level radioactive waste on the groundwater. However, significant radiological differences between upgradient and downgradient wells do indicate that previous site activities have affected groundwater in this area. Most notable are elevated levels of gross beta and tritium in sand and gravel wells WNW0408, WNW0501, and WNW0502, downgradient of the main process plant facilities.

Other measured parameters such as pH and conductivity have shown significant differences between upgradient and downgradient geologic unit locations. Downgradient sand and gravel well WNW0103 demonstrated a high sodium and hydroxide ion level in 1992 samples. This well is located in the vicinity of a spill of sodium hydroxide solution that occurred because of a transfer pipe failure in 1984. Downgradient till-sand well WNW0202 also shows an elevated pH. This higher pH is of unknown origin.

Greater-than-detectable concentrations of 1,1-dichloroethane at wells WNW8609 and WNW8612 continued to be found in 1992. At the WNGSEEP location 1,1,1-trichloroethane remained detectable but at lower levels than in 1990 and 1991. Dichlorodifluoromethane was detected at wells WNW8612 and WNW0803 during the latter half of 1992.

Groundwater monitoring around the NRC-licensed disposal area (NDA) indicates no discernible effects on the deeper unweathered Lavery till deposits in the area, as indicated primarily by measurements for tritium. However, one shallow well (well WNW1107A in the weathered Lavery till) in the vicinity of the New York State-licensed disposal area (SDA), for which NYSERDA is responsible, has shown elevated tritium levels slightly above the New York State groundwater quality standard. Although other SDA and NDA wells in the shallow geologic units have shown detectable tritium, elevated tritium has not been observed in the monitoring wells in the deeper lacustrine unit.

Ongoing environmental characterization and facility investigations are being used to assess the groundwater in greater detail.

A control and remediation effort within the NDA included installation of a gravel-backfilled interceptor trench downgradient of known kerosene-contaminated soils. No solvent or other contaminants were found in the water collected from this interceptor trench in 1992.

In addition to the on-site monitoring, the potential effect of Project activities on near-site groundwater is monitored by annual sampling of designated private drinking water wells. Monitoring of these wells continues to demonstrate that the site has had no effect on residential drinking water supplies in the vicinity.

Radiological Dose Assessment

Potential radiation doses to the public from airborne and liquid effluent releases of radioactivity from the site during 1992 were estimated using computer models. Potential radiation doses from ingestion of locally produced foods were also calculated and compared to results derived from the computer models.

The EPA-approved computer program CAP88-PC was used to calculate hypothetical radiation doses from airborne effluents. A conservative total release value for each effluent point was used to prepare the annual National Emission Standards for Hazardous Air Pollutants (NESHAPs) emission report to the EPA. Using these values, the highest annual effective dose equivalent (EDE) to a nearby resident was estimated to be 2.9×10^{-4} mrem, which is 0.003% of the 10 mrem EPA standard. The collective dose to all persons within a 50-mile radius was estimated to be 2.4×10^{-3} person-rem effective dose equivalent. A more realistic calculation of effluent release values was used in this site environmental report (Chapter 4, *Radiological Dose Assessment*), resulting in a maximum EDE of 1.1×10^{-4} mrem to a nearby resident and a collective dose of 1.6×10^{-3} person-rem to the population.

Computer modeling was also used to estimate a hypothetical maximum annual radiation dose from liquid effluents. The highest EDE to an individual was estimated to be 4.6×10^{-2} mrem, which is 0.05% of the 100 mrem DOE limit. Overall, the annual EDE from air and liquid discharges to the people within an 80-kilometer (50-mi) radius of the site was calculated to be 1.1×10^{-2} person-rem.

Concentrations of radionuclides in locally produced foods are below detectable levels or statistically indistinguishable from background concentrations.

The hypothetical calculated doses presented above should be considered in relation to an average dose of 300 mrem per year to a U.S. resident from natural background radiation. The dose assessment described in Chapter 4, *Radiological Dose Assessment*, predicts an insignificant effect on the public's health as a result of radiological releases from the WVDP.

Quality Assurance

The quality assurance (QA) program overseeing environmental monitoring activities includes the evaluation and control of data generated from both on-site and off-site measurements. Commercial contract laboratories and their internal quality assurance programs are routinely reviewed by site personnel. In addition, commercial laboratories must satisfactorily perform blind analyses of standard or duplicate samples submitted by the WVDP Environmental Laboratory.

WVDP monitoring activities are subject to quality control checks from the time of sample collection through sample analysis and data reduction. Each analytical test of the samples analyzed in the on-site environmental laboratory is reviewed in detail. Specific quality checks include external review of sampling procedures, accurate calibrations using primary standard materials, participation in formal laboratory crosscheck programs (for example, with the EPA and DOE), and appraisals by independent organizations that include the New York State Department of Health (NYSDOH), the U.S. Nuclear Regulatory Commission (NRC), the Department of Energy, and Westinghouse Electric Corporation.

Environmental sample sharing and co-location of measurement points with NYSDOH and the NRC continued in 1992, ensuring that selected samples and locations were routinely measured by two or more independent organizations.

Participation in crosscheck programs, coupled with other internal quality control procedures and external laboratory checks, verified the quality of data gathered in 1992. General program adequacy and specific issues of quality assurance were audited by the WVNS quality assurance department in 1992. Quarterly self-assessments, conducted by an independent team of environmental monitoring staff, identified areas needing improvement and tracked the actions taken.

The major auditing activity in 1992 was a visit by a DOE Idaho Operations Office appraisal team in November. Overall, the environmental monitoring program was found to be satisfactory. (See the *Environmental Compliance Summary: Calendar Year 1992* for a more complete discussion.)

INTRODUCTION

The West Valley Demonstration Project (WVDP) site is located about 50 kilometers (30 mi) south of Buffalo, New York (Fig. 1-1). The Project occupies about 90 hectares (200 acres) within the 1,354-hectare (3,345-acre) Western New York Nuclear Service Center (WNYNSC). The Project site includes a security-fenced area of about 63 hectares (156 acres) that contains the plant facilities.

Activities at the West Valley Demonstration Project are directed toward treatment, solidification, and transport of the high-level waste, leading toward decontaminating and decommissioning the West Valley Demonstration Project and the facilities. This report on the environmental monitoring program at the WVDP provides information about the radioactive and chemical constituents on and around the WNYNSC and the effect, if any, of Project activities on the environment.

The geography, economy, climate, biology, and geology of the region are principal factors in assessing possible effects of site activities on the surrounding population and environment and are an integral consideration in the design and structure of the environmental monitoring program.

Location

The WVDP is located on New York State's western plateau at an average elevation of 400 meters (1,300 ft). The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within 8 kilometers (5 mi) of the plant. Several roads and a railway pass through the WNYNSC, but hunting, fishing, public access, and human habitation is not permitted on the WNYNSC.

Socioeconomics

The WNYNSC lies within the town of Ashford in Cattaraugus County. The nearby population, approximately 9,200 residents within 10 kilometers (6.2 mi) of the Project, relies primarily on an agricultural economy. No major industries are located within this area.

The land immediately adjacent to the WNYNSC is used primarily for agriculture and arboriculture. Cattaraugus Creek is used locally for swimming, canoeing, and fishing. Although some irrigation water for nearby golf course greens and tree farms is taken from Cattaraugus Creek, no public water supply is drawn from the creek downstream of the WNYNSC.

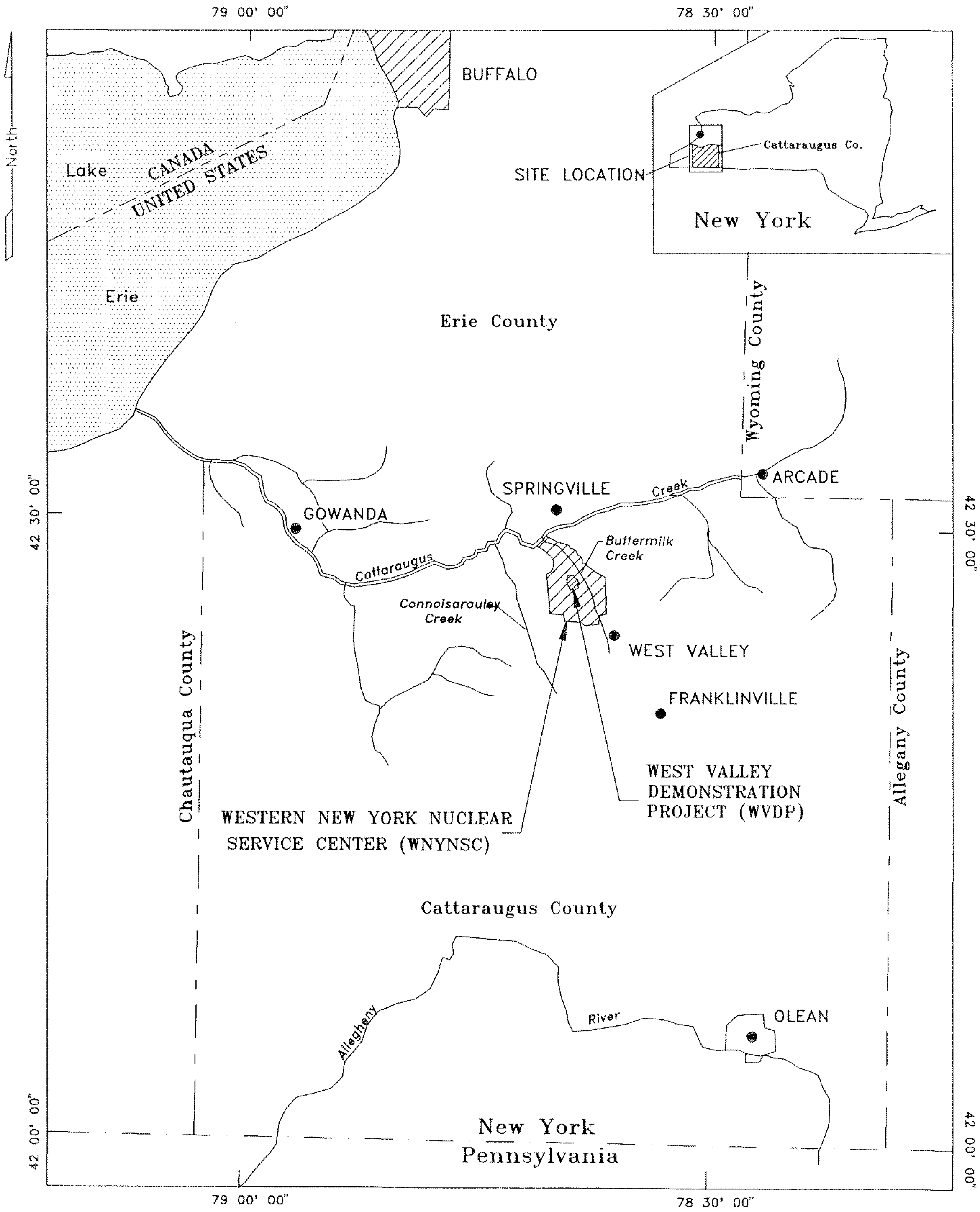


Figure 1-1
Location of the
Western New York Nuclear Service Center

Climate

Although there are recorded extremes of 37°C (98.6°F) and - 42°C (- 43.6°F) in the region, the Western New York climate is moderate, with an average annual temperature of 7.2°C (45.0°F). Rainfall is relatively high, averaging about 104 centimeters (41 in) per year. The 122 centimeters (48 in) of precipitation in 1992 marked a relatively wet year — 17% above the area average. Precipitation is evenly distributed throughout the year and is markedly influenced by Lake Erie to the west and, to a lesser extent, by Lake Ontario to the north. Regional winds were generally from the west and south at about 4 m/sec (9 mph) during 1992.

Biology

The Western New York Nuclear Service Center 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 birds, reptiles, and small mammals. No endangered species on the federal endangered species list are known to be present on the WNYNSC.

Geology and Groundwater Hydrology

The site is underlain by up to five geologic units with varying degrees of permeability. These unconsolidated deposits occupy an older valley that is cut into the sedimentary bedrock underlying the entire region. The bedrock is exposed in the upper drainage channels on the hillsides.

The soil is mainly silty glacial till consisting of unconsolidated rock fragments, pebbles, sand, and clays. The uppermost till unit is the Lavery, a very dense, compact, gray, silty clay. Below the Lavery till is a more granular zone, the recessional unit, sometimes referred to as the lacustrine unit, which is made up of silts, sands, and, in some places, gravels that overlie a layered clay. The recessional unit, in turn, is underlain by an older glacial till, the Kent till, which is quite similar to the Lavery. On certain parts of the site, particularly the north plateau, coarse-grained alluvial sand and gravels overlie the Lavery till.

There are three water-bearing units in the site area. The topmost unit, an unconfined unit, is present in the upper 5 meters (16 ft) of weathered Lavery till on the south plateau and in the upper 1.5 to 12 meters (5 to 40 ft) of the alluvial gravels on the north plateau. High ground to the west of the WVDP and Buttermilk Creek valley to the east each intersect this unit. (In the unweathered Lavery till several shallow, isolated, water-transmitting strata also occur at various other locations within the site boundary but do not appear to be continuous enough to provide avenues for the movement of groundwater from on-site to off-site areas.)

The recessional sequence, which underlies the Lavery till beneath most of the site, is another significant water-bearing unit.

The uppermost weathered bedrock is a third water-bearing unit that consists of fractured and decomposed shale and rubble ranging in thickness up to 3 meters (10 ft) along the top of the solid, unweathered bedrock.

The groundwater flow patterns are related to the recharge and downgradient movement for these aquifers. Groundwater in the surficial unit tends to move east or northeast, away from Rock Springs Road. (See Fig. 2-1.) Most of this groundwater empties into Frank's Creek. Groundwater recharging the recessional unit from bedrock and the Lavery till flows to the northeast and discharges to Buttermilk Creek. Groundwater from the lower aquifer tends to move east toward the lowest point of the valley, about 300 to 350 meters (980 to 1,148 ft) west of Buttermilk Creek, and may emerge to flow north-northwest as surface water. All surface drainage from the WNYNSC is to Buttermilk Creek, which flows into Cattaraugus Creek and ultimately into Lake Erie.

Information in this Report

Individual chapters in this report include information on compliance with regulations, general information about the monitoring program and significant activities in 1992, summaries of the results of radiological and nonradiological monitoring, and calculations of doses to the population. Where appropriate, graphs and tables are included to illustrate important trends and concepts. The bulk of the data, however, is furnished in the appendices following the text.

Appendix A summarizes the 1992 environmental monitoring program at both on-site and off-site locations. Samples are designated by a coded abbreviation indicating sample type and location. (A complete listing of the codes is found in the index to *Appendix A*.) *Appendix A* lists the kinds of samples taken, the frequency of collection, the parameters analyzed, the location of the sample points, and a brief rationale for the monitoring activities conducted at each location.

Appendix B provides a partial list of the radiation protection standards set by the Department of Energy. It also lists federal and state regulations that affect the WVDP and environmental permits held by the site.

Appendix C summarizes analytical data from air, water, sediment, and biological samples (meat, milk, food crops, and fish) as well as direct radiation measurements and meteorological monitoring.

Appendix D provides data from the comparison of identically prepared samples (crosscheck analyses) by both the WVDP and independent laboratories. Radiological concentrations in crosscheck samples of air, water, soil, and vegetation are reported here as are chemical concentrations from water crosscheck samples.

Appendix E summarizes the data collected from on-site groundwater monitoring. Tables and graphs report concentrations at various locations for parameters such as gross alpha and gross beta, tritium, cesium isotopes, and dissolved metals.

Environmental Monitoring Program

The environmental monitoring program for the West Valley Demonstration Project began in February 1982. The program has been developed to detect changes in the environment resulting from Project activities and to assess the effect of any such changes on the human population and the environment surrounding the site.

The monitoring network and sample collection schedule have been structured to accommodate specific biological and physical characteristics of the area. Among the several factors considered in designing the environmental monitoring program were the kinds of wastes and other byproducts produced by the processing of high-level waste; possible routes that radiological and nonradiological contaminants could follow into the environment; geologic, hydrologic, and meteorological site conditions; quality assurance standards for monitoring and sampling procedures and analyses; and the limits and standards set by federal and state governments and agencies. As new processes and systems become part of the program, additional monitoring is provided.

Monitoring and Sampling

The environmental monitoring program consists of on-site effluent monitoring and on-site and off-site environmental surveillance in which samples are measured for both radiological and nonradiological constituents. It includes both the continuous recording of data and the collecting of soil, sediment, water, air, and other samples at various times.

Monitoring and sampling of environmental media provide two ways of assessing the effects of on-site radioactive waste processing. Monitoring generally is a continuous process of measurement that allows rapid detection of any potential effects on the environment from site activities. Sampling is slower than monitoring in indicating results because it must be followed by laboratory analysis of the collected material, but it allows much smaller quantities of radioactivity to be detected through the analysis.

Exposure Pathways Monitored at the West Valley Demonstration Project

The major pathways for potential movement of possible contaminants away from the site are by surface water drainage and airborne transport. For this reason the environmental monitoring program emphasizes the collection of air and surface water samples. Samples are collected on-site from locations such as plant ventilation stacks as well as various water effluent points and surface water drainage locations. Samples of air, water, soils, and biota from the environment surrounding the site would indicate any radioactivity that might reach the public from site releases.

Water and Sediment Pathways

Effluent water is collected regularly or, in the case of lagoon 3, when the lagoon water is released, and the samples are analyzed for various parameters, including gross alpha and gross beta, tritium, pH, conductivity, strontium-90, and gamma isotopes. Additional analyses of composite samples determine metals content, biochemical oxygen demand, organic chemicals, and specific isotopic radioactivity.

On-site groundwater and surface water samples are collected regularly and analyzed, at a minimum, for gross alpha and beta, tritium, and pH. Selected samples are analyzed for conductivity, chlorides, phenols, heavy metals, volatile organic compounds, and other parameters. Potable water on the site is analyzed monthly for radioactivity and annually for chemical constituents. Residential drinking water wells located near the site are sampled annually and analyzed for gross alpha and gross beta, tritium, gamma isotopes, pH, and conductivity.

Permits and Regulations

Data gathering, analysis, and reporting to meet stringent federal and state requirements and standards are an integral part of the monitoring program. The current program meets the requirements of DOE Orders 5400.1, 5400.5, and DOE Regulatory Guide DOE/EH-0173T.

The West Valley Demonstration Project also participates in the State Pollutant Discharge Elimination System (SPDES) as required by the New York State Department of Environmental Conservation (NYSDEC), which regulates discharges of liquid effluents containing nonradiological pollutants. The SPDES permit identifies the outfalls where liquid effluents are released to site drainage and specifies the sampling and analytical requirements for each outfall.

In addition, the site operates under state-issued air discharge permits for nonradiological plant effluents. Radiological air discharges must also comply with the National Emissions Standards for Hazardous Air Pollutants (NESHAPs).

For more information see the ENVIRONMENTAL COMPLIANCE SUMMARY: CALENDAR YEAR 1992. *Environmental permits are listed in* APPENDIX B.

Off-site surface waters, primarily from Cattaraugus Creek and Buttermilk Creek, are sampled both upstream of the Project for background radioactivity and downstream to measure possible Project contributions. Sediments deposited downstream of the facility and at upstream background locations are collected semiannually and analyzed for gross alpha, gross beta, and specific radionuclides. (See *Appendix C-1* for water and sediment data summaries.)

Air Pathways

Effluent air emissions are continuously monitored for alpha and beta activity. Remote alarms indicate any unusual rise in radioactivity. Air particulate filters, which are retrieved and analyzed weekly for gross radioactivity, are also composited quarterly and analyzed for strontium-90 and specific gamma- and alpha-emitting nuclides.

Iodine-129 and tritium also are measured in effluent ventilation air. At two locations silica gel-filled columns are used to extract water vapor that is then distilled from the desiccant and analyzed for tritium. Four samplers contain activated charcoal adsorbent that is analyzed for radioiodine. The silica gel columns are analyzed weekly; the charcoal is collected weekly and composited for quarterly analysis.

Off-site sampling locations include those considered most representative of background conditions and those most likely to be downwind of airborne releases. Among the criteria used to position off-site air samplers are prevailing wind direction, land usage, and the location of population centers.

Air is continuously sampled at nine locations. Background samplers are located in Great Valley and Dunkirk, New York. Nearby community samplers are in Springville and West Valley, New York. (See Figure A-9 in *Appendix A*.) Five samplers are located on the perimeter of the WNYNSC. (See Fig. 2-2 in Chapter 2, *Environmental Monitoring*.) These samples are analyzed for parameters similar to the effluent air samples. (See *Appendix C-2* for air monitoring data summaries.) An additional perimeter air sampler was sited at the bulk storage warehouse on Buttermilk Road east of the site and began operation in December 1992.

Atmospheric Fallout

An important contributor to environmental radioactivity is atmospheric fallout. Sources of fallout materials include earlier atmospheric testing of atomic explosives and residual radioactivity from the Chernobyl nuclear power plant accident. Four site perimeter locations and one on-site location currently are sampled for fallout using pot-type samplers that are collected every month. Long-term fallout is determined by analyzing soil collected annually at each of the nine perimeter and off-site air samplers. (See *Appendix C-2* for fallout data summaries and *Appendix C-1* for soil data summaries.)

Food Pathways

Another potentially significant pathway is through domesticated farm animals and produce raised near the WVDP and through game animals and fish that include the WVDP in their range. Appropriate animal and fish samples are gathered and analyzed for radionuclide content in order to reveal any long-term trends. Fish are collected at several locations along Cattaraugus Creek and its tributaries at various distances downstream from the WVDP. Beef, milk, hay, and produce are collected at nearby farms and at selected locations well away from any possible WVDP influence. (See *Appendix C-3* for biological data summaries.)

Direct Radiation Measurement

Direct penetrating radiation is measured using thermoluminescent dosimeters (TLDs) located on- and off-site. Measurement points within the site are placed near selected waste management units and around the inner security fence. Other measurement locations are situated around the site perimeter and access road and at background locations remote from the WVDP. Forty-one measurement points were used in 1992. The TLDs are retrieved quarterly and read out on-site to obtain the integrated gamma exposure. (See *Appendix C-4* for direct radiation data summaries.)

Meteorological Monitoring

Meteorological data are continuously gathered and recorded on-site. Wind speed and direction, barometric changes, dew point, temperature, and rainfall are all measured. Such data are valuable in evaluating long-term trends and in developing dispersion models. In the event of an emergency, immediate access to the most recent data is indispensable for predicting the path and concentration of any materials that become airborne. (See *Appendix C-6* for meteorological data summaries.)

Quality Assurance and Control

The work performed by and through the on-site Environmental Laboratory is regularly reviewed by several agencies for accuracy and compliance with applicable regulations. Audits of the laboratory routinely focus on proper record keeping and reporting, timely calibration of equipment, training of personnel, adherence to accepted procedures, and general laboratory safety.

The Environmental Laboratory also participates in several quality assurance crosscheck programs administered by federal or state agencies. (See *Appendix D* for a summary of crosscheck performance.) Outside laboratories contracted to perform analyses for the WVDP also are regularly subjected to performance audits.

Environmental monitoring management continued to strengthen its formal self-assessment program, developing and implementing new strategies and procedures for ensuring high quality data. Experienced senior scientists and specialists in varying disciplines follow an annual schedule of quarterly internal appraisals, produce a formal report with recommended corrective actions, and track the planned actions for their implementation.

ENVIRONMENTAL COMPLIANCE SUMMARY

CALENDAR YEAR 1992

Compliance Status

Environmental compliance activities during 1992 at the West Valley Demonstration Project (WVDP) successfully addressed the full range of environmental laws and regulations, including the management of radioactive mixed wastes under the Resource Conservation and Recovery Act (RCRA). The WVDP negotiated a Federal and State Facilities Compliance Agreement (FSFCA) to address compliance issues relating to radioactive mixed waste management, including compliance with RCRA land disposal restrictions (LDRs). (See **Current Issues and Actions** below.)

No compliance findings were raised during inspections and audits conducted by the U.S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), and the Cattaraugus County Health Department. From November 2, 1992 through November 6, 1992 a major audit was conducted by the Department of Energy Idaho Field Office's Office of Environmental Safety and Health Oversight (Environmental Quality Assurance Division). None of the deficiencies found presented an immediate risk to the public health or the environment.

Management at the WVDP continues to provide strong support for environmental compliance issues, ensuring that all state and federal statutes and regulations, as well as Department of Energy (DOE) Orders, are integrated into the compliance program at the Project.

Clean Air Act (CAA)

The Clean Air Act establishes a comprehensive federal and state framework that regulates air emissions from both stationary and mobile sources: any emission sources of a CAA-regulated substance may require a permit or be subject to registration or notification requirements. Emission sources regulated by the CAA may include stacks, ventilators, ventilation ducts, wall fans, open burning, and dust piles.

Nonradiological emissions are regulated by NYSDEC. The construction of three air emission sources related to the scale vitrification system and an extension of the construction period for sources within the cold chemical facility were approved by NYSDEC in 1992. A certificate to operate the blueprinting equipment was also issued. The permit to construct the vitrification off-gas treatment system was reviewed by NYSDEC and was approved. Approval was also given to continue fire brigade training exercises under the conditions contained in a Restricted Burning Permit, which expired in November 1992.

The WVDP operated under twenty-two active air permits in 1992. (See Table B-3 in *Appendix B*.) Of the twenty-two permits, six are for radiological emissions and therefore are regulated under the U.S. Environmental Protection Agency's National Emissions Standards for Hazardous Air Pollutants (NESHAPs) program.

The annual NESHAPs inspection in June 1992 indicated no noncompliance episodes or notices of violation. Calculations to demonstrate compliance with NESHAPs standards showed 1992 doses to be less than 3×10^{-3}% (0.0003 mrem) of the 10 millirem standard.

Emergency Preparedness and Community Right-to-Know Act (EPCRA)

The purposes of EPCRA are to provide local governments and the public with information concerning potential chemical hazards in their communities and to encourage and support emergency planning efforts at the state and local levels.

The EPCRA program requires the WVDP to submit reports to off-site state and local emergency response organizations that give information about the quantities, locations, and any associated hazards of chemicals used and stored on-site. Additionally, the WVDP is required to submit an annual report to the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation on toxic chemical emissions from the site.

All required reports were submitted to the appropriate organizations by the required deadlines. In support of the waste minimization and pollution prevention directives from the EPA and NYSDEC, the number of reportable chemicals stored on-site above their threshold planning quantity (TPQ) during calendar year 1992 was reduced from twenty-one to eighteen, as indicated by the quarterly reports submitted to the state and local emergency planning and response agencies and groups. These updates ensure that the public and emergency organizations have the most recent information about site conditions and operations.

Clean Water Act (CWA)

The Clean Water Act is the primary statute governing water pollution control programs in the United States. It controls discharges to surface water and groundwater through a National Pollutant Discharge Elimination System (NPDES) permit program that requires permits to be issued specifying discharge standards and monitoring and reporting requirements. Authorized states such as New York are allowed to issue equivalent State Pollutant Discharge Elimination System (SPDES) permits.

SPDES-permitted Outfalls

All WVDP point source discharges to surface waters are permitted through the New York SPDES program.

The WVDP has three permitted outfalls, all of which discharge to Erdman Brook. (See Figs. 2-3 and 2-15):

- Outfall 001 (WNSP001) discharges the effluent from the low-level radioactive wastewater treatment facility (LLWTF).

- Outfall 007 (WNSP007) discharges the combined effluent from the site's sewage treatment plant and various nonradioactive industrial and potable water treatment systems. The average monthly flow in 1992 was 1.92 million gallons.

- Outfall 008 (WNSP008) directs groundwater flow from the northeast side of the site's LLWTF lagoon system through a french drain. The average monthly flow in 1992 was 0.21 million gallons.

In 1992 treated water from the low-level waste treatment facility was discharged in seven batches that averaged 5.28 million liters (1.39 million gal) each. The annual average concentration of radioactivity at the point of release was 31% of the DOE's derived concentration guides (DCGs). None of the individual releases exceeded the DCGs. (See Table B-1 in *Appendix B.*)

There were two instances when the SPDES permit levels were exceeded. The first excursion occurred in June when settleable solids from outfall 007 exceeded the permit level of 0.3 ml/L. The actual reported value was 20 ml/L. During a water treatment equipment repair, water containing a high concentration of natural clay and polymer drained to a sump connected with outfall 007. The duration of this condition was estimated to be about ten minutes, during which the excursion was measured.

The second excursion occurred in December when the flow-weighted concentration of iron from all three outfalls was calculated to be 0.37 mg/L. The permit level is 0.31 mg/L. The level of naturally occurring iron in the raw water used by the WVDP was determined to be a contributing source of the iron excursions. Precipitated iron in the site's discharge basins remains to be satisfactorily addressed. It is possible that natural sediments may become resuspended in the water column during batch discharge, thus causing an elevated iron level that is not directly due to the LLWTF effluent. The discharge pipe in the basin was elevated to limit sediment entrainment in the treated water. The limited data available indicates this approach is successful. Other remedial measures are currently being investigated.

Discussions with NYSDEC relating to the pending SPDES permit renewal may result in monitoring requirements that account for the effect of natural iron variations.

There were no excursions attributable to the sewage treatment plant in 1992. A proposal for the expansion of the sewage treatment plant into a wastewater treatment facility has been forwarded to NYSDEC and is awaiting approval. Construction will begin following receipt of the permit application approval. (See **Clean Water Act**, *Environmental Compliance Summary: First Quarter 1993.*)

Stormwater Permit Application

Stormwater from municipal or industrial facilities may contain a variety of pollutants. To protect aquatic resources and the public health, regulations require that facilities such as the WVDP must obtain permits specifying discharge limits.

The WVDP obtained site-specific data through extensive sampling in 1991 and submitted a stormwater discharge permit application to NYSDEC on September 30, 1992. Analytical results of the sampling were included on the application. Detailed maps describing site drainage patterns and the location of various process units and buildings were also included in the permit application. The permit is in the review process.

Safe Drinking Water Act (SDWA)

The Safe Drinking Water Act states that each federal agency having jurisdiction over a federally owned or maintained public water system must comply with all federal, state, and local requirements regarding safe drinking water. The drinking water quality program in the state of New York is administered by the New York State Department of Health (NYSDOH) through county health departments.

The WVDP obtains its drinking water from surface water reservoirs on the Western New York Nuclear Service Center (WNYNSC) site and is considered a nontransient, noncommunity public water supplier (i.e., it does not serve residents of the community outside the workplace but does regularly serve at least the same twenty-five people for six months of the year). As an operator of a drinking water supply system, the WVDP must sample the water and report the results of the analyses to the Cattaraugus County Health Department, which also collects independent samples periodically.

The water is purified by settling, filtration, and chlorination before it is distributed on-site. Monitoring results in 1992 indicated that the Project drinking water met NYSDOH drinking water quality standards. There were no violations of the drinking water program during 1992.

Medical Waste Tracking

The WVDP used the services of Bertrand Chaffee Memorial Hospital for incineration of medical wastes generated at the Project. When the hospital stopped incinerating wastes, the WVDP retained a commercial medical waste removal firm that picks up waste generated at the site and transports it off-site to an approved medical waste incinerator. Less than fourteen pounds of medical waste were removed in 1992.

Petroleum Product Spill Reporting

Under an agreement with the New York State Department of Environmental Conservation, the WVDP reports on-site spills of petroleum products of ten gallons or less onto an impervious surface (such as blacktop) in a monthly log. Spills greater than ten gallons that do not affect ground- or surface water or enter a drainage system must be reported to NYSDEC within twenty-four hours and entered in the monthly log. Spills of any amount that do affect waters of the state (groundwater, surface water, drainage systems) must be reported immediately to the NYSDEC spill hotline and also are entered in the monthly log.

There were fifty-one minor spills of petroleum products in 1992 totaling approximately 31 liters (8 gal). These spills were typically associated with leaks from heavy industrial construction equipment and vendor delivery vehicles.

Of the fifty-one spills, none required immediate notification of NYSDEC under the reporting protocol. All spills were cleaned up in a timely fashion in accordance with the WVDP Spill Prevention, Control, and Countermeasures Plan. None of the spills resulted in any discernible adverse environmental effect.

Toxic Substances and Control Act (TSCA)

There also are radioactively contaminated polychlorinated biphenyls (PCBs) on-site from a hydraulic unit that had been cut up several years ago. PCBs are regulated under the Toxic Substances and Control Act (TSCA), and to comply with TSCA, the WVDP reports to the EPA every year what progress has been made in identifying treatment and disposal facilities that are able to manage this material. The toxic chemical inventory is provided in Chapter 1, *Environmental Monitoring Program Information.*

Resource Conservation and Recovery Act (RCRA)

Hazardous Waste

The WVDP has been operating under RCRA interim status for treatment and storage of radioactive mixed waste since its original submittal of a RCRA Part A permit application in June 1990.

In April 1991 the WVDP amended its RCRA interim status application to allow for limited storage of nonradioactive hazardous waste. During 1992 the WVDP disposed of approximately 12 tons of nonradioactive, hazardous waste off-site, using permitted transportation and disposal services. Sources of these materials ranged from expired laboratory chemicals to maintenance shop wastes. The WVDP also reclaimed, recycled, or rendered nonhazardous by neutralization 945 kilograms (2,083 lbs) of material as part of its waste minimization and reduction program.

Underground Petroleum Storage Tanks

RCRA regulations also cover all solid wastes and underground storage tanks as well as hazardous wastes. There are three 2,000-gallon underground petroleum storage tanks at the WVDP. One contains diesel fuel #2 oil and two contain mid-grade unleaded gas. The tanks are resupplied periodically and stay at about the same total volume throughout the year. For example, as of February 1993, the diesel fuel tank held 1,395 gallons. The other two tanks held 1,697 gallons and 374 gallons of unleaded gas. These totals are measured daily and reconciled monthly with the daily readings. Permits for the tanks are renewed every five years.

Nonhazardous, Regulated Material

The WVDP disposed of 96 tons of nonradioactive, nonhazardous material to permitted facilities in 1992. These shipments consisted of wastewaters and sludges from the sewage treatment facility, industrial wastewaters, and solid wastes such as refractory brick and construction materials.

Radioactive Mixed Waste (RMW) Management Program

Radioactive mixed waste is waste that contains both a radioactive constituent, which is regulated by the Atomic Energy Act (AEA), and a hazardous waste component, which is regulated under RCRA.

Potential conflicts between RMW regulations under the Atomic Energy Act and under RCRA regulations led to the WVDP's initiation of discussions with the regulatory agencies to resolve these conflicts through a Federal and State Facility Compliance Agreement (FSFCA). Negotiations on the FSFCA and a RCRA 3008(h) Administrative Order on Consent continued during 1992. The Consent Order was signed in March 1992. These agreements will provide the means whereby the WVDP can comply with RCRA regulations and with the requirements of the AEA. (See **Current Issues and Actions** below.)

In October 1992 the WVDP received a Notice of Noncompliance from the EPA documenting the site's mixed waste management compliance issues. The EPA indicated, however, that the notice would be resolved once the FSFCA was fully executed. (See **Current Issues and Actions**, *Environmental Compliance Summary: First Quarter 1993*.)

The Federal Facility Compliance Act (FFC Act) of 1992 was signed into law on October 6, 1992. As a result of this law, the federal government will be subject to the "full range of available enforcement tools" provided in federal, state, or local environmental law. The waiver of sovereign immunity became effective on October 6, 1992, except as it relates to certain mixed waste storage requirements for which the FFC Act provides a three-year delay period. During this three-year period, the DOE is to prepare plans for the "development of treatment capacity and technologies for its facilities that generate and store mixed wastes." The Act also requires the DOE to submit a mixed waste inventory to the EPA and the states within which mixed waste is located as well as progress reports regarding implementation of the new law. (See **Current Issues and Actions** below.)

National Environmental Policy Act (NEPA)

The National Environmental Policy Act establishes the nation's policies for the protection of the environment. Its goals are to prevent or eliminate damage to the environment and to restore the environment where necessary. The President's Council on Environmental Quality, established by the National Environmental Policy Act, carries out this policy. Its regulations are found in the Code of Federal Regulations, Title 40, Parts 1500-1508 (40 CFR 1500-1508).

Since 1990 the Department of Energy has been revising its NEPA-compliance program, which was approved by the President's Council on Environmental Quality and was codified in 10 CFR 1021 on April 24, 1992. It went into effect on May 26, 1992. This rule facilitates participation by the public in the NEPA process for proposed DOE actions. It also includes a revised and expanded list of typical classes of action such as categorical exclusions.

1992 NEPA Activities

NEPA requires that any activity of a federal agency that might significantly affect the environment be reviewed through preparation of detailed documents such as an environmental impact statement (EIS) or an environmental assessment (EA), thus ensuring that environmental information is available to public officials and citizens before decisions are made and before actions are taken.

Activities at the West Valley Demonstration Project that are subject to NEPA review are either ongoing activities to support solidification of the high-level waste (Phase I) or activities to support a joint preparation by the DOE and the New York State Energy Research and Development Authority (NYSERDA) of the environmental impact statement that will assess the effect of Project completion activities (Phase II).

Phase I

Phase I activities generally are activities associated with stabilizing the high-level radioactive waste and those that are typical of facility operation and maintenance. During 1992, twenty-five proposed WVDP actions were submitted to the DOE as categorical exclusions, recommending that because of their insignificant environmental impact no further NEPA review be required.

In addition, an environmental assessment for a proposed expansion to the WVDP sewage treatment plant was approved by the DOE and a subsequent finding of no significant impact was issued.

Phase II

Phase II activities, which concern site characterization, continued in 1992. The baseline data collected through this characterization will provide the technical supporting information needed for the environmental impact statement for completion of the West Valley Demonstration Project and closure of the Western New York Nuclear Service Center. Basic research continued in several primary areas of investigation: geology, seismology, hydrology, soil characterization, water quality, radiological survey, and solid waste management unit assessment. Documentation of these studies has been summarized in environmental information documents (EIDs) that provide both data and references to information needed to prepare the EIS.

In late 1992, the DOE selected an independent contractor who will prepare the EIS.

Summary of Permits

Environmental permits in effect at the Project during 1992 are listed in Table B-3 of *Appendix B.*

Current Issues and Actions

Resource Conservation and Recovery Act (RCRA)

In 1992 the WVDP completed negotiations with the EPA and NYSDEC for a Federal and State Facility Compliance Agreement regarding compliance with RCRA regulations pertaining to radioactive mixed waste management, including compliance with RCRA land disposal restrictions (LDRs). The agreement also provides a plan and schedule to address container storage and waste analysis issues at the WVDP. The agreement becomes effective after all parties have signed.

The RCRA 3008(h) Administrative Order on Consent is an agreement between NYSDEC, the EPA, NYSERDA, and the DOE about the kind and extent of the work needed to identify and evaluate any hazardous waste or hazardous constituent that may be at the WVDP site. The Consent Order requires NYSERDA and the West Valley Project Office (WVPO) to conduct investigations at solid waste management units (SWMUs) to determine if there was a release or a potential for release of hazardous waste constituents that require corrective action. The Order provides a framework for compliance with RCRA that is consistent with the EIS site characterization work for completion of the Project.

Finalization of the Consent Order was the primary focus in the first part of 1992. The data-gathering activities required by the Consent Order will continue to be integrated with the data-gathering work that has been under way for the EIS. Tasks were identified and schedules defined for activities that will take place in 1993 and 1994. The WVDP has completed a RCRA facility investigation (RFI) Work Plan, which is being reviewed by NYSDEC. Currently, the WVDP also is conducting SWMU-specific investigations that will be submitted to the EPA and NYSDEC in 1993 and 1994. (See also **Current Issues and Actions**, *Environmental Compliance Summary: First Quarter 1993.*)

Department of Energy Environmental Audit

From November 2 to November 6, 1992 eleven members of the U.S. Department of Energy Idaho Field Office, Office of Environmental Safety & Health Oversight, Environmental and Quality Assurance Division performed a comprehensive appraisal of the WVDP.

The appraisal team reviewed the WVDP programs for environmental protection, quality assurance, emergency preparedness, and firearms safety. Four Environmental Management Systems Concerns, fourteen Compliance Findings, sixteen Observations, and two Noteworthy Practices were identified. According to the appraisal report, none of the deficiencies presented an immediate risk to public health or the environment. All compliance findings were category III, which does not represent a substantial deviation from DOE requirements.

Follow-up to 1991 Department of Energy Environmental Audit

A final report by the Department of Energy Headquarters Office of Environmental Audit on the 1991 environmental audit was received by the WVDP in March 1992. The WVDP completed its final action plan and resubmitted it to DOE Headquarters in April 1992. More than 70% of the identified action items have already been resolved.

ENVIRONMENTAL COMPLIANCE SUMMARY

FIRST QUARTER 1993

Compliance Status

The compliance status of the West Valley Demonstration Project's major environmental programs through the first quarter of 1993 is noted below.

Clean Air Act (CAA)

The WVDP was issued a permit to construct a melter off-gas treatment system. The permit was received from NYSDEC on March 27, 1993 and will allow construction of the vitrification ventilation system to proceed on schedule.

Clean Water Act (CWA)

Approval was granted on March 16, 1993, to proceed with the construction of a wastewater treatment plant expansion at the WVDP.

NYSDEC conducted the annual SPDES inspection at the WVDP on March 29, 1993. No citations were issued, and the WVDP was found in full compliance.

Several meetings and discussions have taken place between the WVDP and NYSDEC to resolve final issues regarding the SPDES permit renewal. The permit is still under review by NYSDEC and has not been issued.

Safe Drinking Water Act (SDWA)

The Cattaraugus County Health Department advised the WVDP of additional drinking water monitoring requirements to be effective in 1993. These tests include monitoring of metals and inorganic and synthetic organic chemicals that had not been previously required. Sampling plans have been prepared and initial sampling began in March 1993.

Emergency Preparedness and Community Right-to-Know Act (EPCRA)

Emergency and Hazardous Chemical Inventory (Tier II) reports for the 1992 reporting period were transmitted to state and local emergency response organizations by the required deadline. These reports contain listings of materials that may be of concern to personnel responding to an emergency at the WVDP.

Resource Conservation and Recovery Act (RCRA)

The annual New York State Department of Environmental Conservation RCRA inspection was conducted at the WVDP on March 22 and 23, 1993. No violations were found or citations issued.

Hazardous waste shipped in January and March 1993 removed chemical wash solutions and laboratory wastes. A large shipment of nonhazardous industrial wastes was also completed in March 1993.

The annual Hazardous Waste Generator/Waste Minimization Report was submitted to the New York State Department of Environmental Conservation by the required deadline.

National Environmental Policy Act (NEPA) Activities

A contractor has been retained and is in the process of preparing the environmental impact statement (EIS) for WVDP completion and site closure or long-term management. The draft EIS is scheduled to be available for public review in June 1994.

Current Issues and Actions

The Federal and State Facility Compliance Agreement (FSFCA) became effective on March 23, 1993. The agreement defines specific requirements for the management of radioactive mixed waste, including compliance with land disposal restrictions.

On February 5, 1993, the WVDP was listed in the EPA's Federal Agency Hazardous Waste Compliance docket. This action will result in an evaluation of the WVDP to ascertain its status relative to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

Deliverables related to the Federal Facility Compliance Act were submitted in 1993. An initial report on current and future mixed waste generating activities and treatment capabilities was submitted to DOE Headquarters in January 1993, and a final report was provided in March 1993 for inclusion in a DOE-wide report.

Progress continues on the RCRA 3008(h) Consent Order implementation. The quarterly report for the last quarter of calendar year 1992 was submitted in early 1993.

Department of Energy Environmental Audit

In March 1993 the WVDP submitted the final action plan responding to the 1992 DOE Idaho Field Office Environmental Appraisal.

The WVDP is currently working on addressing the action items identified in the plan.

Summary of Permits for First Quarter 1993

A letter requesting a one-year extension of the scale vitrification facility construction permit was transmitted to NYSDEC in March 1993. Permits to construct a system to exhaust welding fumes from the vitrification facility and to construct the melter off-gas system were issued by NYSDEC in February 1993 and March 1993, respectively.

ENVIRONMENTAL MONITORING PROGRAM INFORMATION

Introduction

The high-level waste (HLW) presently stored at the West Valley Demonstration Project is the by-product of the reprocessing of spent nuclear fuel conducted during the late 1960s and early 1970s by Nuclear Fuel Services, Inc. (NFS).

Since the Western New York Nuclear Service Center is no longer an active nuclear fuel reprocessing facility, the environmental monitoring program focuses on measuring radioactivity and chemicals associated with the Project's high-level waste treatment operations and the residual effects of NFS operations. The following information about the operations at the Project and about radiation and radioactivity may be useful in understanding the activities of the Project and the terms used in reporting the results of environmental testing measurements.

High-Level Waste Treatment

Most of the waste from NFS operations had been stored in one of four underground tanks (tank 8D-2). Inside the tank the waste had settled into two layers: a liquid — the supernatant — and a precipitate layer on the tank bottom — the sludge.

To solidify the high-level waste, WVDP engineers designed and developed a two-stage process of pretreatment and vitrification.

Pretreatment

The supernatant was composed mostly of sodium and potassium salts dissolved in water. Radioactive cesium in solution accounted for more than 99% of the total fission products in the supernatant. During pretreatment, sodium salts and sulfates were separated from the radioactive constituents in both the liquid portion of the high-level waste and the sludge layer in the bottom of the tank.

Pretreatment of the supernatant began in 1988. A four-part process, the integrated radwaste treatment system (IRTS), reduced the volume of the high-level waste that needed pretreatment by producing low-level waste stabilized in cement.

- The supernatant was passed through zeolite-filled ion exchange columns in the supernatant treatment system (STS) to remove more than 99.9% of the radioactive cesium.

- The resulting liquid was then concentrated by evaporation in the liquid waste treatment system (LWTS).

- This low-level radioactive concentrate was blended with cement in the cement solidification system (CSS) and placed in 269-liter (71-gal) steel drums.

- Finally, the steel drums were stored in an on-site aboveground vault, the drum cell.

Processing of the supernatant was completed in 1990. Eighty percent of the radioactivity in the liquid was removed and 10,393 drums of cemented waste were produced.

The sludge that remains is composed mostly of iron hydroxide. Strontium-90 accounts for most of the radioactivity in the sludge.

Pretreatment of the sludge began in 1991 and continued through 1992. (See **1992 Activities at the West Valley Demonstration Project** below.)

Vitrification

The second stage of the high-level waste treatment process, solidification into glass (vitrification), is scheduled to begin in 1996. The high-level waste mixture of sludge and zeolite from the ion-exchange process will be combined with glass-forming chemicals, fed to a ceramic melter, heated to approximately 2,000°F, and poured into stainless steel canisters. Approximately 300 stainless steel canisters 10 feet long by 2 feet in diameter will be filled with a uniform, high-level waste glass that will be suitable for eventual shipment to a federal repository. Vitrification is scheduled to be completed in 1999.

Radiation and Radioactivity

Radioactivity is a process in which unstable atomic nuclei spontaneously disintegrate or "decay" into atomic nuclei of another isotope or element. (See *Glossary*.) The nuclei continue to decay until only a stable, nonradioactive isotope remains. Depending on the isotope, this process can take anywhere from less than a second to hundreds of thousands of years.

Radiation is the energy released as atomic nuclei decay. By emitting energy the nucleus moves toward a less energetic, more stable state. The energy that is released takes three main forms: alpha particles, beta particles, and gamma rays.

α *Alpha Particles*

An alpha particle is a fragment of a much larger nucleus. It consists of two protons and two neutrons (similar to a helium atom nucleus) and is positively charged. Alpha particles are relatively large and heavy and do not travel very far when ejected by a decaying nucleus. Alpha radiation, therefore, is easily stopped by 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 all of their energy is absorbed by tissue cells in the immediate vicinity of the decay.

β *Beta Particles*

A beta particle is an electron that results from the breakdown of a neutron in a radioactive nucleus. Beta particles are small compared to alpha particles, travel at a higher speed (close to the speed of light), and can be stopped by a material such as wood or aluminum less than an inch thick. If beta particles are released inside the body they do much less damage than an equal number of alpha particles. Because they are smaller and faster and have less of a charge, beta particles deposit energy in fewer tissue cells and over a larger volume than alpha particles.

γ *Gamma Rays*

Gamma rays are high-energy "packets" of electromagnetic radiation called photons. They are similar to x-rays but generally have a shorter wavelength and therefore are more energetic than x-rays. If the alpha or beta particle released by the decaying nucleus does not carry off all the energy made available 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 only be effectively reduced by shielding consisting of several inches of a heavy element, 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 many lifesaving medical procedures.

Measurement of Radioactivity

The rate at which radiation is emitted from a disintegrating nucleus can be described by the number of decay events or nuclear transformations that occur in a radioactive material over a fixed period of time. This process of emitting energy, or radioactivity, is measured in curies (Ci) or becquerels (Bq). One becquerel equals one decay per second. One curie equals 37 billion nuclear disintegrations per second (3.7×10^{10} d/s). Very small amounts of radioactivity are sometimes measured in picocuries. A picocurie is one-trillionth (10^{-12}) of a curie or 2.22 disintegrations per minute.

Measurement of Dose

The amount of energy absorbed by the receiving material is measured in rads (radiation absorbed dose). A rad is 100 ergs of radiation energy absorbed per gram of material. (An erg is the amount of energy necessary to lift a mosquito about 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 twenty 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, which have a quality factor of 1.

Ionizing Radiation

Radiation can be damaging if, in colliding with other matter, the alpha or beta particles or gamma rays knock electrons loose from the absorber atoms. This process is called ionization, and the radiation that produces it is referred to as ionizing radiation because it changes a previously electrically neutral atom, in which the positively charged protons and the negatively charged electrons balance each other, into a charged atom called an ion. An ion can be either positively or negatively charged. Various kinds of ionizing radiation produce different degrees of damage.

Potential Effects of Radiation

The biological effects of radiation can be either somatic or genetic. Somatic effects are restricted to the person exposed to radiation. For example, sufficiently high exposure to radiation can cause clouding of the lens of the eye or loss of white blood cells.

Radiation also can cause chromosomes to break or rearrange themselves or to join incorrectly with others. These changes may produce genetic effects and may show up in future generations. Radiation-produced genetic defects and mutations in offspring of an exposed parent, while not positively identified in humans, have been observed in some animal studies.

The effect of radiation depends on the amount absorbed. An instantaneous dose of 100-200 rem (1-2 Sv) might cause temporary effects such as vomiting but usually would have no long-lasting side effects. At 50 rem (0.5 Sv) a single instantaneous dose might cause a reduction in white blood cell count.

Assessing biological damage from low-level radiation is difficult because other factors can cause the same symptoms as radiation exposure. Moreover, the body apparently is able to repair damage caused by low-level radiation.

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 biological effects.

Background Radiation

Background radiation is always present and everyone is constantly exposed to low levels of such radiation from both naturally occurring and manmade sources. In the United States the average total annual exposure to this low-level background radiation is estimated to be about 360 millirem (mrem) or 3.6 millisieverts (mSv). Most of this radiation, approximately 300 mrem (3 mSv), comes from natural sources. The rest comes from medical procedures and from consumer products.

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 televisions. Actual doses vary depending on such factors as geographic location, building ventilation, and personal health and habits.

The unit of dose measurement to humans is the rem. Rems are equal to the number of rads multiplied by the quality factor of the kind of radiation. Dose can also be measured in sieverts. One sievert equals 100 rem.

Environmental Monitoring Program Overview

Human beings may be exposed to radioactivity primarily through air, water, and food. At the West Valley Demonstration Project all three pathways are monitored, but air and surface water pathways are the two major means by which radioactive material can move off-site.

The geology of the site (kinds and structures of rock and soil), the hydrology (location and flow of surface and underground water), and meteorological characteristics of the site (wind speed, patterns, and direction) are all considered in evaluating potential exposure through the major pathways.

The on-site and off-site monitoring program at the West Valley Demonstration Project includes measuring the concentration of solids containing 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, which can be done within a matter of hours, produces a comprehensive picture of on-site and off-site levels of radioactivity from all sources. In a facility such as the West Valley Demonstration Project, frequent updating and tracking of the overall levels of radioactivity in effluents is an important tool in maintaining acceptable operations.

More detailed measurements are also made for specific radionuclides. Strontium-90 and cesium-137 are measured because they are normally present in WVDP waste streams. Radiation from other important radionuclides such as tritium or iodine-129 are not sufficiently energetic to be detected by gross measurement techniques, so these must be analyzed separately using methods with greater sensitivity. Heavy elements such as uranium, plutonium, and americium require special analysis to be measured because in comparison to background they exist at such low levels at the WVDP. 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 sources of radiation at the Project have been decaying for more than twenty years, the monitoring program does not routinely include short-lived radionuclides, i.e., isotopes with a half-life of less than two years, which would have only 1/1,000 of the original radioactivity remaining. (See *Appendix A* for a schedule of samples and radionuclides measured and *Appendix B* for related Department of Energy protection standards.)

Data Reporting

Because any two samples are never exactly the same, statistical methods are used to decide how a particular measurement compares with other measurements of similar samples. The term *confidence level* is used to describe how certain a measurement is of being a "true" value. The WVDP environmental monitoring program uses the 95% confidence level, which means that 95% of the measurements (19 out of 20) fall within the statistical "uncertainty" range.

The uncertainty range is the expected range of values that account for random nuclear decay and small measurement process variations. The uncertainty range of a measurement is indicated by the plus-or-minus (±) value following the measurement (e.g., 5.30±3.6E-09 μCi/mL, with the exponent of 10^{-9} expressed as "E-09." Expressed in decimal form, the number would be 0.0000000053±0.0000000036 μCi/mL). Within this range a measurement will be "true" 95% of the time. For example, a value recorded as 5.30±3.6E-09 μCi/mL means that 95% of the time the "true" value will be found between 1.7E-09 µCi/mL and 8.9E-09 µCi/mL.

If the uncertainty range is greater than the value itself (e.g., 5.30±6.5E-09 µCi/mL), the result is below the detection limit. The value will be listed as "less than," or " < " 6.5E-09 µCi/mL.

In general, the detection limit is the minimum amount of constituent or material of interest detected by an instrument or method that can be distinguished from background and instrument noise. Thus, the detection limit is the lowest value at which a sample result shows a statistically positive difference from a sample in which no constituent is present.

1992 Activities at the West Valley Demonstration Project

High-Level Waste Pretreatment

Sludge Pretreatment

Pretreatment of the sludge layer in the high-level waste tank 8D-2 began in 1991. Five specially designed 50-foot long pumps were installed in the tank that mixed the sludge layer with water in order to produce a uniform sludge blend and to dissolve sodium salts and sulfates. After mixing and allowing the sludge to settle, processing of the wash water through the integrated radwaste treatment system began. Processing removes radioactive constituents for later solidification into glass, and the wash water containing salts is then stabilized in cement.

In 1992 approximately 63,000 gallons of wash water were processed and 1,636 drums of cemented low-level waste were produced. The WVDP is scheduled to complete processing of the wash water from the first sludge wash in 1993. Three more sludge washes are planned. Following completion of sludge pretreatment, the ion-exchange material used in the IRTS to remove radioactivity will be blended with the washed sludge in the glass-forming feed mixture. A single reprocessing campaign of a special fuel, THOREX, was conducted from November 1968 to January 1969. The high-level waste from this campaign will be added to the feed mixture.

Vitrification

Several major milestones were reached in completing the Project's vitrification facility. Nonradioactive testing of a full-scale vitrification system was conducted from 1984 to 1989. In 1990 all vitrification equipment was removed to allow installation of shield walls for fully remote radioactive operations. The walls and shielded tunnel connecting the facility to the former reprocessing plant were completed in 1991.

More than 100 tons of vitrification equipment, including vessels that will be used to concentrate and blend the waste and key components of the melter off-gas treatment system, were installed in the facility in 1992. In addition, the steel shell for the new melter arrived at the Project ready for installation in 1993.

Low-Level Waste Processing

Aqueous Radioactive Waste

Water containing added radioactive material from site cleanup operations is collected and treated in the low-level liquid waste treatment facility (LLWTF). (Water from the sanitary system, which does not contain added radioactive material, is managed in a separate system.)

The treated process water is held, sampled, and analyzed before it is released through a State Pollutant Discharge Elimination System (SPDES)-permitted outfall. In 1992, 36.9 million liters (9.76 million gal) of water were treated in the LLWTF and released.

The discharge waters contained an estimated 37 millicuries of gross alpha plus gross beta radioactivity. Comparable releases during the previous seven years averaged about 43 millicuries per year. The 1992 release was about 14% below this average.

The 0.47 curies of tritium also released in 1992 was about half of the amount released in 1991.

Solid Radioactive Waste

Low-level waste at the WVDP, stored in above-ground facilities, consists of various materials generated through site maintenance and cleanup activities. Metal piping and tanks are cut up and packaged in a special contact size-reduction facility, and dry compressible materials such as paper and plastic are compacted to reduce waste volume. In 1992 waste volume was reduced from 1991 levels by about 717 cubic meters (25,300 ft^3).

Hazardous Wastes

Hazardous wastes were managed during 1992 by reclaiming, recycling, or by off-site disposal. More than 10,000 kilograms of these wastes were shipped for off-site disposal, and almost 950 kilograms of nonradioactive waste were subject to waste minimization. (See *Environmental Compliance Summary: Calendar Year 1992.*)

Waste Minimization Program

A waste minimization plan that includes long-range planning for waste storage and processing facilities, manpower, funding, and waste minimization at the Project was in effect during 1992.

A major goal of the plan was achieved in 1992 when the amount of hazardous, radioactive, and mixed waste generated by Project activities was reduced by 5% from anticipated levels. The WVDP's goal is to reduce waste generation by 25% over the next five years.

Pollution Prevention Awareness Program

The WVDP's pollution prevention awareness program is a significant part of the Project's overall waste minimization program. The program includes hazard communication training and new employee orientation that provides information about the WVDP's INDUSTRIAL HYGIENE AND SAFETY MANUAL, environmental pollution control procedures, and the HAZARDOUS WASTE MANAGEMENT PLAN.

Hazardous waste operations training programs and radiation worker/hazardous waste requalification programs were modified in 1992 to include information regarding pollution prevention goals and progress. To date, 626 employees have attended this training.

The WVDP's goal is to make all employees aware of the importance of pollution prevention both at work and at home.

1992 National Environmental Policy Act (NEPA) Activities

Under the National Environmental Policy Act, the Department of Energy is required to consider the overall environmental effects of its proposed actions. 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 environmental effect. The levels of documentation include categorical exclusions (CXs), environmental assessments (EAs), and environmental impact statements (EISs).

Categorical exclusions evaluate and document actions that will not have an effect on the environment. Environmental assessments evaluate the extent to which the proposed action will affect the environment. If a proposed action has the potential for significant effects, an environmental impact statement is prepared that describes proposed alternatives to an action and explains the effects.

Phase I NEPA Activities

Phase I NEPA activities at the WVDP generally involve facility maintenance and minor projects that support high-level waste vitrification. Most of these projects are documented and submitted for approval as categorical exclusions.

Twenty-eight proposed activities were submitted in 1992 as having been previously approved within existing NEPA documents or as categorically excluded from further NEPA review.

In addition, an environmental assessment for a proposed expansion to the WVDP sewage treatment plant resulted in the DOE issuing a finding of no significant impact to the environment, and approval to proceed was given.

Phase II NEPA Activities

In December 1988 the DOE published a Notice of Intent to prepare an environmental impact statement for the completion of the West Valley Demonstration Project and closure of the facilities at the Western New York Nuclear Service Center. The environmental impact statement will describe the potential environmental effects associated with Project completion and various site closure alternatives. Completion and closure are Phase II activities. Phase I activities were described in a 1982 environmental impact statement.

In order to assess potential effects associated with alternative closure actions, an extensive multidisciplinary characterization of the site was necessary. Characterization activities began in 1989 and required data collection for several years. Site characterization studies include investigations in geomorphology, soils, geohydrology, surface water hydrology, geochemistry, water quality, air quality, seismology, demography, cultural resources, botany, and terrestrial and aquatic ecology. Many of these studies were completed in 1992.

In late 1992 the DOE selected an independent contractor, Science Applications International Corporation (SAIC) to prepare the environmental impact statement for closure or long-term management of the Western New York Nuclear Service Center. The draft EIS is scheduled to be issued for comment in 1994.

1992 Changes in the Environmental Monitoring Program

Minor updates to the 1992 monitoring program improved the environmental sampling network and supported current site characterization activities. The changes were limited but included addition of an air sampler to the southeast of the site near the bulk storage warehouse (Chapter 2, *Environmental Monitoring*) and replacement of aging air sampling equipment. Several measurements and new on-site locations were added to the routine monitoring program.

The most significant aspect of the 1992 groundwater monitoring program was the completion of a full eight-round sampling regimen for 107 groundwater sampling locations. All the points were sampled in 1991 and 1992, completing the full set of analyses and replicates planned for statistical evaluation of groundwater contaminants.

Appendix A summarizes the program changes and lists the sample points and parameters measured in 1992.

Resource Conservation and Recovery Act (RCRA) Reports

West Valley Nuclear Services Co., Inc. (WVNS) has developed a hazardous waste management plan that ensures proper management of all hazardous waste from the point of generation to final disposition. The plan's basic requisites include properly designating and packaging all hazardous waste generated at the facility; obtaining appropriate samples and characterizing wastes according to hazardous wastes regulations; maintaining required records and reports; stocking and maintaining spill control materials and equipment and ensuring that the appropriate employees are trained in emergency response; and determining nonradioactive hazardous waste release reporting and notification requirements and, when required, making appropriate notifications.

Toxic Chemical Inventory

Under the Superfund Amendments and Reauthorization Act (SARA) Title III requirements, also known as the Emergency Preparedness and Community Right-to-Know Act (EPCRA), hazardous chemical inventories on-site must be reported to the EPA. During the 1992 reporting period the WVDP produced quarterly updates of the inventory of hazardous chemicals stored on-site and sent them to local and state emergency management agencies. The chemicals and the approximate quantities stored and used on-site in 1992 included:

ammonium solution (300 lbs), used in the laboratories and for blueprinting

chlorine (500 lbs), used to disinfect potable water

diesel fuel (19,000 lbs), used for back-up power for generators

ferric hydroxide slurry (30,000 lbs), to be used for vitrification

fuel oil #2 (70,000 lbs), used for back-up power for boilers and other equipment

gasoline, unleaded (24,000 lbs), used for on-site vehicles

ion exchange media (39,000 lbs), used for ion exchange systems

nitric acid (2,500 lbs), used in vitrification testing and for pH control

oils - various grades (10,000 lbs), used to lubricate various equipment

Portland cement (90,000 lbs), used in the solidification of low-level radioactive waste

silicon dioxide (18,000 lbs), to be used for vitrification

sodium hydroxide (9,000 lbs), used in water treatment

sodium silicate - liquid grade 40 (11,000 lbs), used in the solidification of low-level radioactive waste

sodium tetraborate decahydrate (35,000 lbs), to be used for vitrification

sulfuric acid (30,000 lbs), used in water treatment and laboratories

zinc bromide solution (20,000 lbs), used for radiation shielding in viewing windows.

On-Site Environmental Training

The safety of personnel who are involved in hazardous waste operations falls under the Occupational Safety and Health Act (OSHA). This act is a comprehensive law governing diverse occupational hazards such as electrical safety and protection from fire as well as the handling of hazardous materials. The purpose of OSHA is to maintain a safe and healthy working environment for employees.

Training for hazardous waste operations at the West Valley Demonstration Project is job-specific and takes the mixed waste characteristics of the Project into consideration.

OSHA 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response) requires that employees at treatment, storage, and disposal facilities, which are regulated by the Resource Conservation and Recovery Act, who may be exposed to health and safety hazards during hazardous waste operations, receive twenty-four hours of initial training and eight hours of annual refresher training. This training is in addition to the sixteen-hour radiation worker training required for the majority of the operations work force.

The Project's training program identifies employees who are eligible for OSHA instruction, provides an initial twenty-four hour training program and an eight-hour refresher course, and documents the instruction.

Initially offered in 1990, the program provides detailed information on hazardous materials management procedures, focusing on lessons learned in the field. A total of 1,036 employees have participated in this program.

OSHA 29 CFR 1910.120 also requires training in proper response to on-site spills of hazardous materials or wastes. The Project has an organized Hazardous Materials Emergency Response Team that maintains proficiency through classroom instruction and drills.

An eight-hour course for supervisors covers how to determine site hazards, how to assess risk, on-the-job training, and incident command. Forty-four employees have completed this course.

In addition, each visitor or nonworker at the site must receive a site-specific briefing on safety and emergency procedures before being admitted to the site. Currently, each visitor views an information tape that explains site safety policies and emergency evacuation procedures.

Self-Assessment

Self-assessments were conducted periodically in 1992 to review the management and effectiveness of the Project's environmental monitoring program and adherence to various environmental regulatory requirements to which Project activities are subject.

Assessments relating to environmental monitoring and regulatory compliance are summarized in Chapter 5, *Quality Assurance.*

ENVIRONMENTAL MONITORING

Pathway Monitoring

The effluent and environmental monitoring program provides data on surface waters, soils, sediments, food and produce, and on the effluent air and liquids that could provide pathways for the movement of radionuclides or hazardous substances from the facility to the public. Both radiological and nonradiological parameters are monitored in order to ascertain the effect of Project activities.

Sediments are sampled upstream and downstream of the WVDP. The food pathway is monitored by collecting samples of beef, hay, milk, and produce at both near-site and remote locations, samples of fish upstream and downstream of the site, and venison samples from the on-site deer herd and background locations. Direct radiation on-site, at the perimeter of the site, and at background locations is also monitored to provide additional data.

The primary focus of the monitoring program, however, is on air and water pathways, as these would be the major means of transport of radionuclides from the site.

Air and Liquid Pathways

Air and liquid effluents are monitored on-site by collecting samples at locations where small amounts of radioactivity or other regulated substances are released or might be released. These include plant ventilation stacks and various water effluent outfalls.

Surface water samples are collected from the tributaries of Cattaraugus Creek that flow through the 3,345-acre Western New York Nuclear Service Center and from drainage channels within the Project site.

Both air and water samples are collected at perimeter locations where the highest concentrations of transported radionuclides might be expected. Samples are also collected at remote locations to provide background concentration data.

Sampling Codes

The complete environmental monitoring schedule is detailed in *Appendix A*. This schedule provides information on monitoring and reporting requirements and the types and extent of sampling and monitoring at each location. An explanation of the codes that identify the sample medium and the specific sampling or monitoring location is also found in *Appendix A*.

These codes are used throughout this report for ease of reference and to be consistent with the data reported in the appendices. For example, a sample location code such as AFGRVAL indicates an air sample (A), off-site (F), at the Great Valley (GRVAL) sampling station.

Air Sampler Location and Operation

Air samplers are located at points remote from the West Valley Demonstration Project site, at the perimeter of the site, and on the site itself. Figure 2-1 shows the locations of the on-site air samplers; Figure 2-2 and Figure A-9 in *Appendix A* show the location of the perimeter and remote air samplers.

Air samples are collected by drawing air through a very fine filter with a vacuum pump. The total volume of air drawn through the sampler is measured and recorded. The filter traps particles of dust that are then tested in the laboratory for radioactivity. At the Rock Springs Road and Great Valley locations samples are also collected for iodine-129 and for tritium. (A more detailed description of the air sampling program follows below.)

Water Sampler Location and Operation

Automatic samplers collect surface water at points along drainage channels within the WNYNSC that are most likely to show any radioactivity released from the site and at a background station upstream of the site. Figure 2-3 shows the location of the on-site surface water monitoring points. (On-site automatic sampler locations are WNSP006, WNNDADR, and WNSW74A.) Figure 2-4 shows the location of the off-site automatic surface water monitoring points. (Off-site locations are WFBCTCB, WFFELBR, and the background location, WFBCBKG.)

Water samplers draw water through a tube extending to an intake below the stream surface. An electronically controlled battery-powered pump first blows air through the sample line to clear any debris. The pump then reverses to collect a sample, reverses again to clear the line, then resets itself. The cycle is repeated after a preset interval. The pump and sample container are housed in an insulated and heated shed to allow sampling throughout the year. (A more detailed description of the water sampling program follows below.)

Radiological Monitoring

Air Monitoring

On-Site Ventilation Systems

Permits obtained from state and federal agencies allow air to be released from plant ventilation stacks during normal operations. The air released must meet certain federal and state criteria that ensure that the environment and the public's health and safety are not adversely affected by these releases.

Parameters measured include gross alpha and gross beta, tritium, and various isotopes such as cesium-137 and strontium-90. To provide conservatively high values, alpha and beta radioactivity is assumed to come from americium-241 (alpha radiation) and strontium-90 (beta radiation) because the derived concentration guides (DCGs) for these isotopes are the most stringent. (Department of Energy standards and DCGs for radionuclides of interest at the West Valley Demonstration Project are found in *Appendix B*.)

The exhaust from each permitted fixed ventilation system serving the site's facilities is continuously filtered, monitored, and sampled as it is released to the atmosphere. Specially designed isokinetic sampling nozzles continuously remove a representative portion of the exhaust air, which is then drawn through very fine glass fiber filters to trap any particles. Sensitive detectors

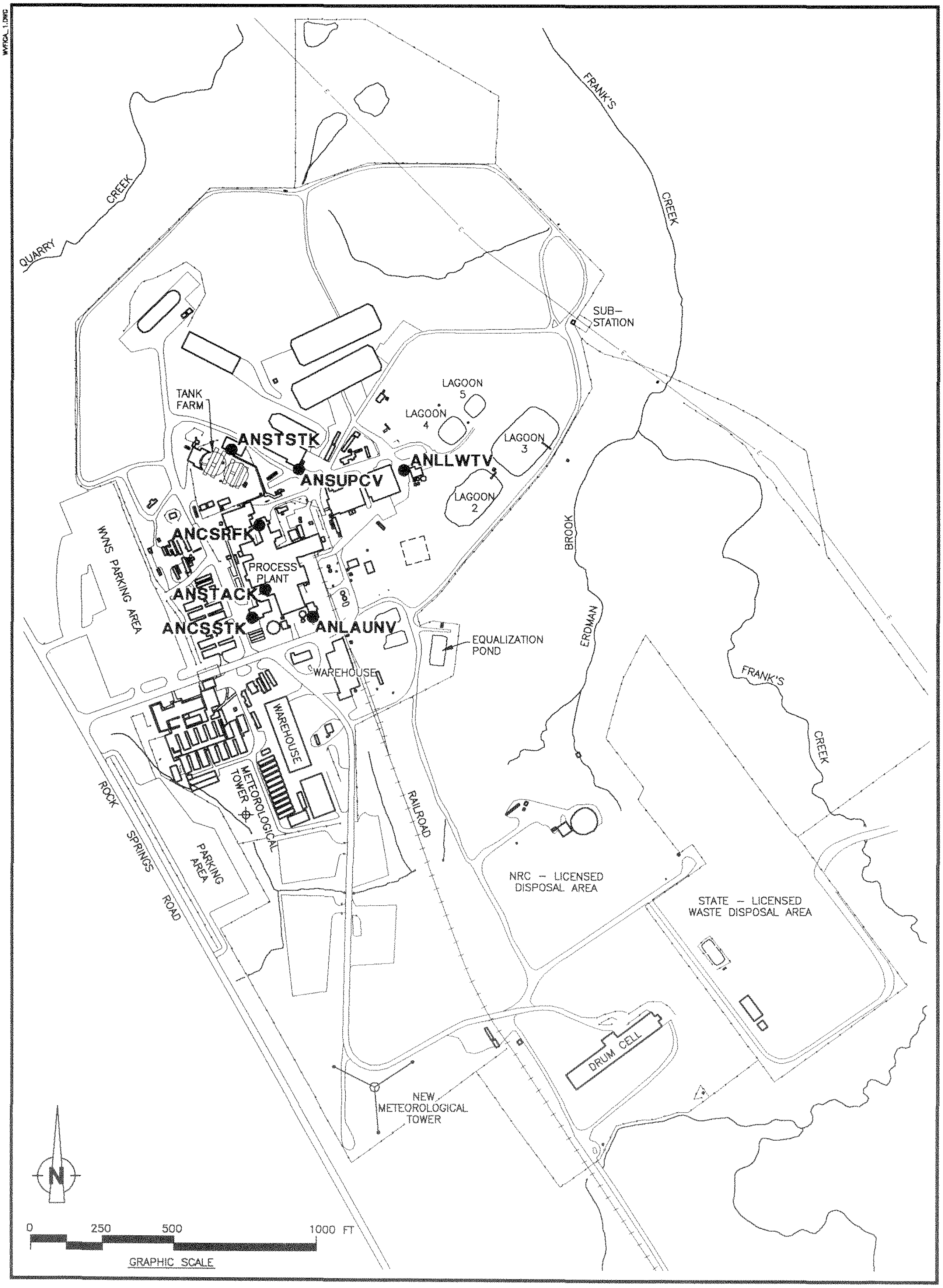


Figure 2-1. Location of On-Site Air Effluent Points.

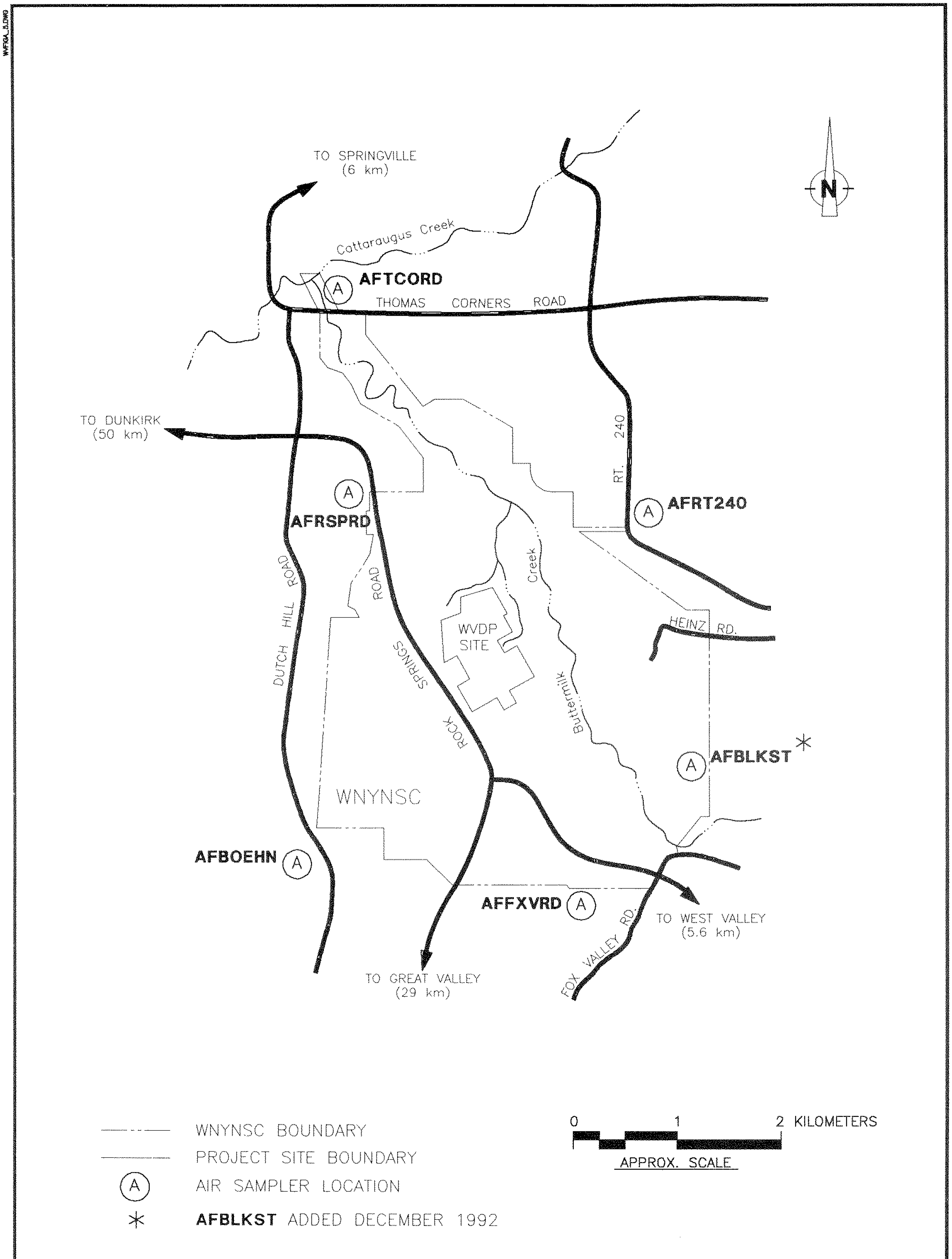


Figure 2-2. Location of Perimeter Air Samplers.

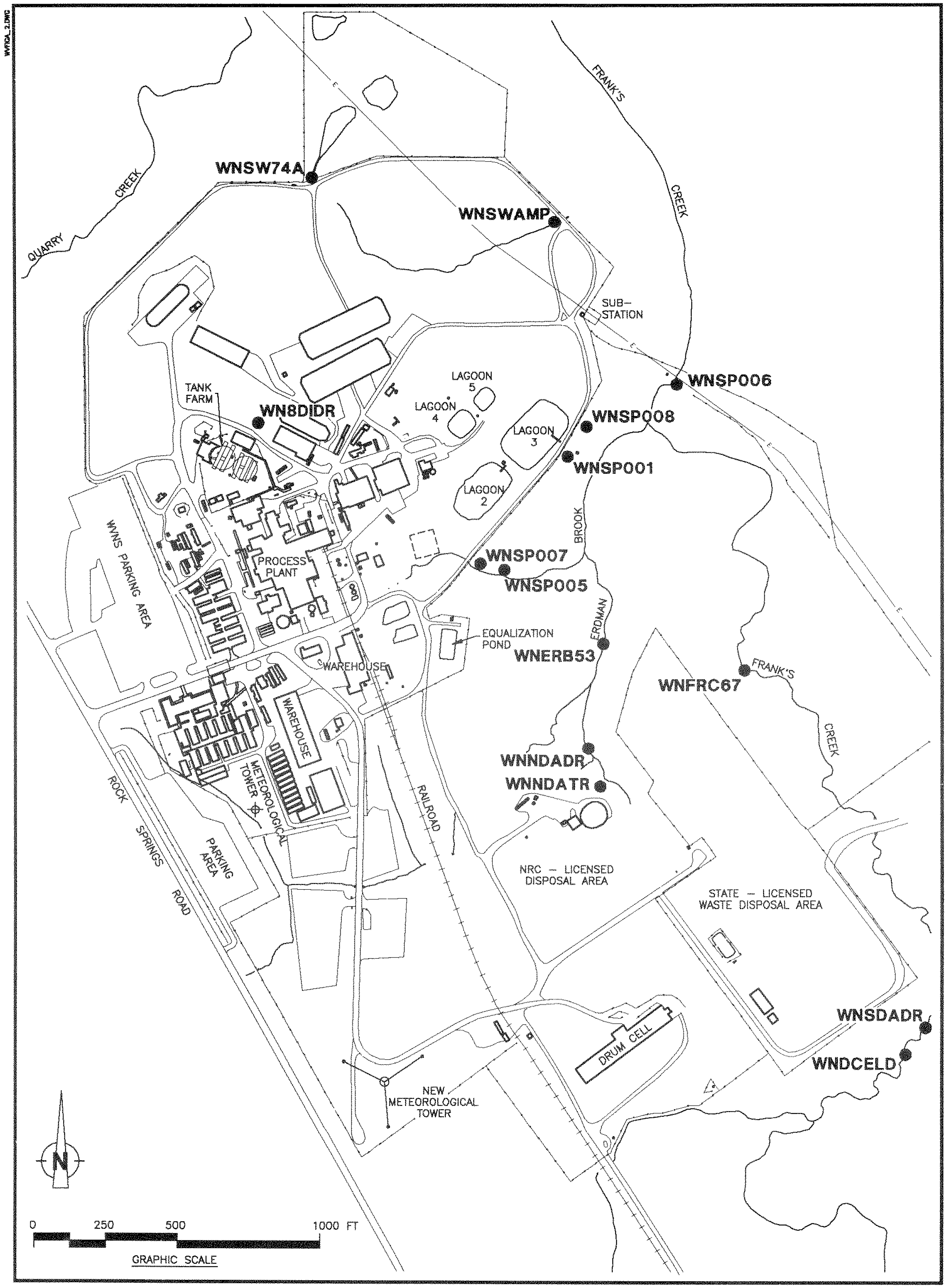


Figure 2-3. Sampling Locations for On-Site Surface Water.

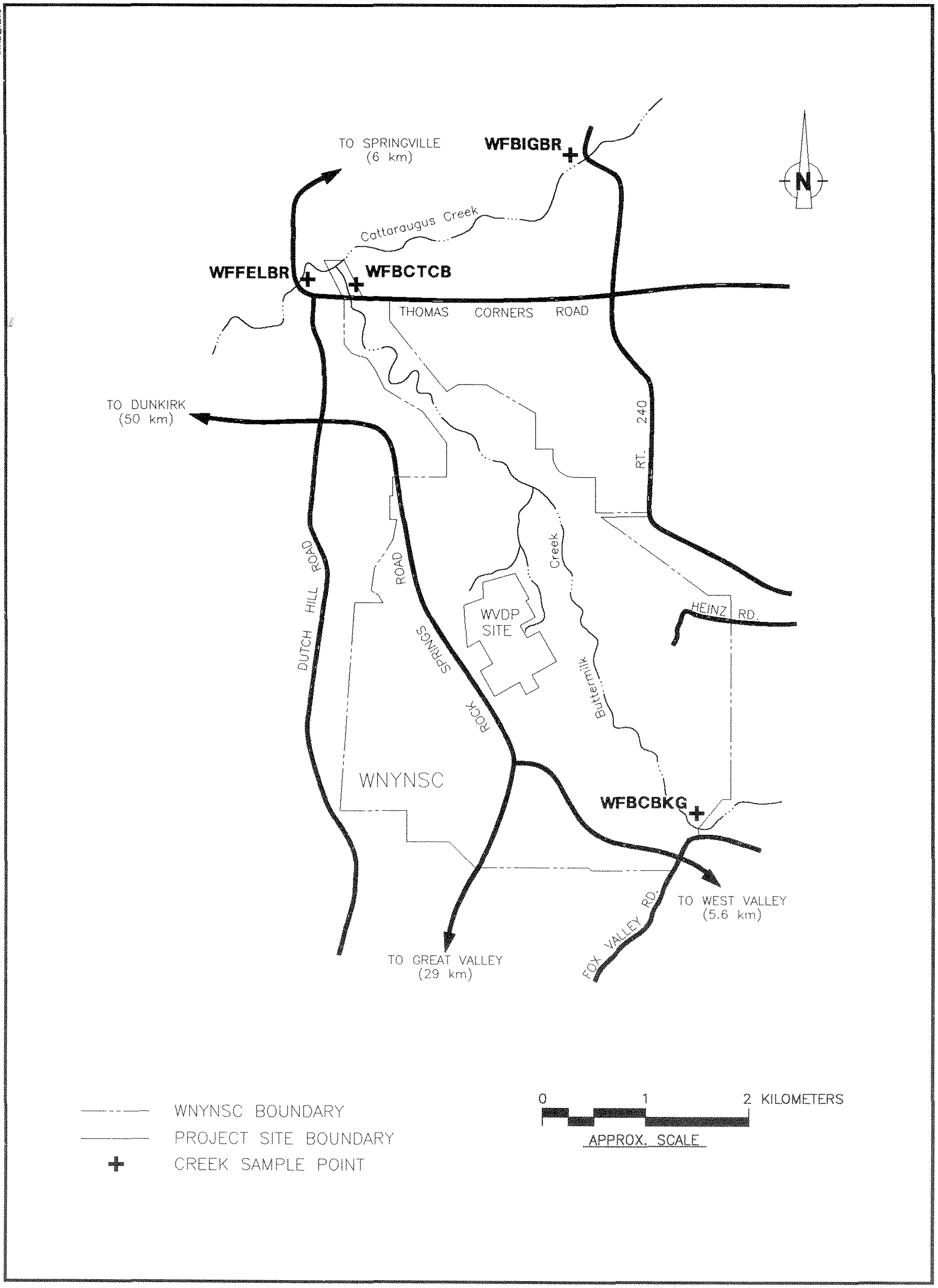


Figure 2-4. Location of Off-Site Surface Water Samplers.

continuously measure the radioactivity on these filters and provide readouts of alpha and beta radioactivity levels.

A separate sampling unit on the ventilation stack of each system contains another filter that is removed every week and tested in the laboratory. This sampling system also may contain an activated carbon cartridge used to collect a sample that is analyzed for iodine-129.

In addition to these samples, water vapor from the main plant ventilation stack (ANSTACK) and the supernatant treatment system (ANSTSTK) is collected by trapping moisture on silica gel desiccant columns. The trapped water is distilled from the silica gel desiccant and analyzed for tritium.

Because tritium, iodine, and other isotopic concentrations are quite low, the large-volume samples collected weekly from the main plant stack and from other emission-point samplers provide the only practical means of determining the amount of specific radionuclides released from the facility.

- The Main Plant Ventilation Stack (ANSTACK)

The main ventilation stack (ANSTACK) sampling system monitors the most significant airborne effluent point. A high sample collection flow rate through multiple intake nozzles ensures a representative sample for both the weekly filter sample and the on-line monitoring system. The total quantity of gross alpha, gross beta, and tritium released each month from the main stack, based on weekly filter measurements, is shown in *Appendix C-2,* Table C-2.1. Figure 2-5 shows the five-year trends for the main stack samples analyzed for gross alpha and gross beta activity. The figure indicates a steady downward trend in activity observed for both gross alpha and gross beta.

Analyses of specific radionuclides in the four quarterly composites of the main stack effluent samples are listed in Table C-2.2. A comparison of the average concentrations of these measured isotopes with Department of Energy derived concentration guides (DCGs) in Table C-2.3 shows

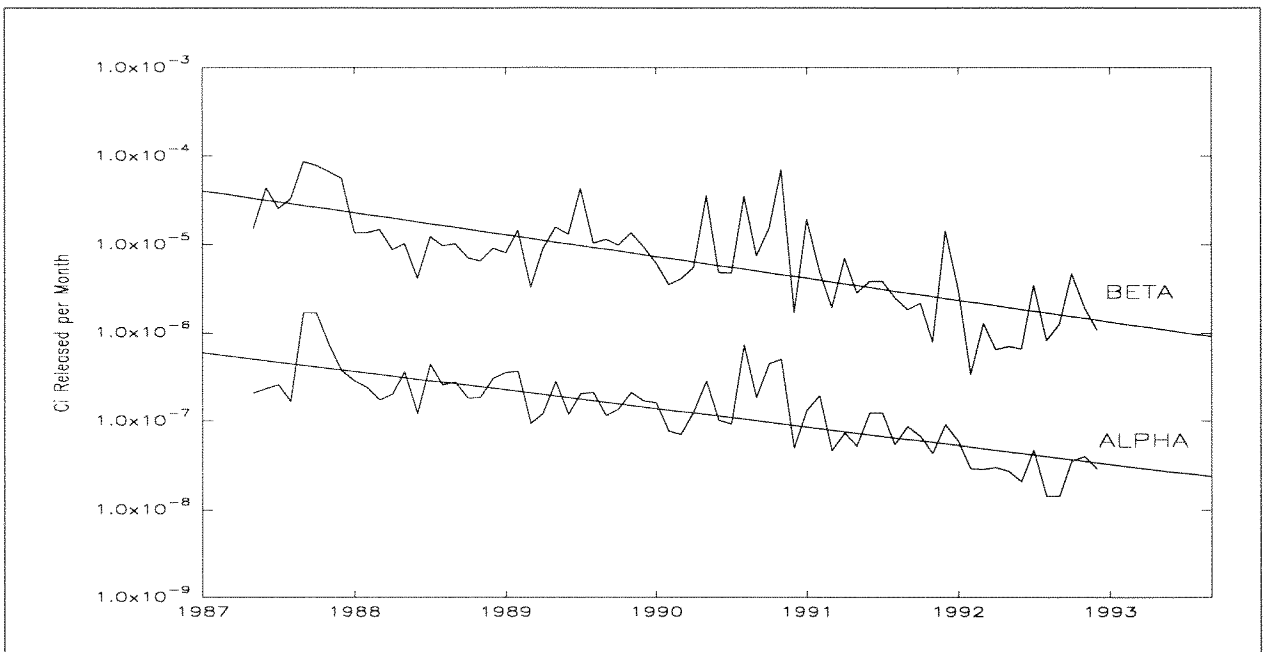


Figure 2-5. Five-Year Trends of Gross Alpha and Gross Beta at the Main Stack Sampling Location (ANSTACK)

that at the point of stack discharge, average radioactivity levels were already below concentration guidelines for airborne radioactivity in an unrestricted environment. Further dilution from the stack to the site boundary reduces the concentration by an average factor of about 200,000.

- Other On-site Sampling Systems

Sampling systems similar to those of the main stack monitor airborne effluents from the cement solidification system ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), and the supernatant treatment system ventilation stack (ANSTSTK). The 1992 samples showed detectable gross radioactivity, including specific beta- and alpha-emitting isotopes, but did not approach any Department of Energy effluent limitations. Tables C-2.4 through C-2.9 in *Appendix C-2* show monthly totals of gross alpha and beta radioactivity and concentrations of specific radionuclides for each of these sampling locations.

Three other operations are routinely monitored for airborne radioactive releases: the low-level waste treatment facility ventilation system (ANLLWTF), the contaminated clothing laundry ventilation system (ANLAUNV), and the supercompactor volume reduction ventilation system (ANSUPCV). ANLLWTF and ANLAUNV are monitored only for gross alpha and gross beta, not for specific radionuclides, as these points are not currently part of the environmental monitoring program.

Silica Gel Columns from the Main Ventilation Stack Sampler

Perimeter and Remote Air Sampling

As in previous years, airborne particulate radioactive samples were collected continuously at five locations around the perimeter of the site and at four remote locations at Great Valley, West Valley, Springville, and Dunkirk, New York. (See Fig. 2-2 and Fig. A-9 in *Appendix A*.) A sixth perimeter location at the bulk storage warehouse southeast of the Project site (AFBLKST) was added to the program in December 1992.

Perimeter locations — on Fox Valley Road, Rock Springs Road, Route 240, Thomas Corners Road, Dutch Hill Road, and the bulk storage warehouse — were chosen to provide historical continuity or because the location would probably provide a high annual average airborne concentration of radioactivity. The five-year trends of concentrations of gross alpha and gross beta at the Rock Springs Road location are shown in Figure 2-6.

The remote locations provide data from nearby communities — West Valley and Springville — and from natural background areas. Concentrations measured at Great Valley (AFGRVAL, 29 km south of the site) and Dunkirk (AFDNKRK, 60 km west of the site) are considered representative of natural background radiation.

The six perimeter samplers and the four remote samplers maintain an average flow of about 40 L/min (1.4 ft^3/min) through a 47-mm glass fiber filter. The sampler heads for each of the locations are set at 1.7 meters above the ground, the height of the average human breathing zone.

Filters from off-site and perimeter samplers are collected weekly and analyzed after a seven-day "decay" period to remove interference from short-lived naturally occurring radioactivity. Gross alpha and gross beta measurements of each filter are made weekly using a low-background gas proportional counter. The gross alpha and gross beta ranges and annual averages for each of the off-site sampling points are provided in Tables 2-1 and 2-2.

In addition, quarterly composites consisting of thirteen weekly filters from each sample station are analyzed. Data from these samplers are provided in *Appendix C-2,* Tables C-2.12 through C-2.20.

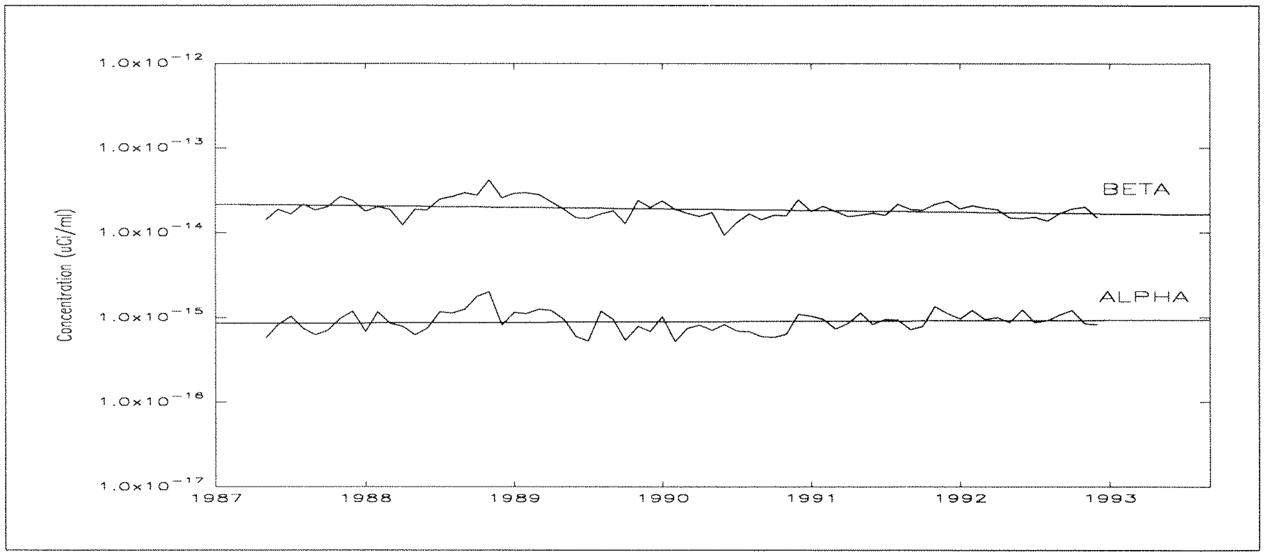


Figure 2-6. Five-Year Trends of Gross Alpha and Gross Beta at the Rock Springs Road Sampling Location (AFRSPRD)

Air samples are measured weekly and the values are averaged each month. The maximum and minimum monthly average values are presented as concentrations that reflect normal seasonal variations. (See Tables 2-1 and 2-2.)

Levels of reported detectable concentrations of iodine-129 at the Rock Springs Road location (AFRSPRD) are comparable to the detection limit values at the Great Valley location (AFGRVAL). Tables C-2.13 and C-2.18 in *Appendix C-2* contain the data for these two samplers.

The 1992 data for the three samplers that have been in operation since 1982 — Fox Valley,

Table 2-1

1992 Gross Alpha Activity at Off-Site and Perimeter Ambient Air Sampling Locations

Location	Number of Samples	Range µCi/mL	Range Bq/m^3	Annual Average µCi/mL	Annual Average Bq/m^3
AFFXVRD	52	<0.57 - 3.21E-15	<0.21 - 1.19E-04	1.01E-15	3.74E-05
AFRSPRD	52	<0.39 - 2.31E-15	<1.45- 8.55E-05	9.49E-16	3.51E-05
AFRT240	52	<0.62 - <3.44E-15	<0.23 - <1.27E-04	9.86E-16	3.65E-05
AFSPRVL	52	<0.46 - 2.51E-15	<1.69 - 9.29E-05	<7.99E-16*	<2.96E-05
AFTCORD	52	<0.40 - 4.49E-15	<0.15 - 1.66E-04	<8.93E-16	<3.30E-05
AFWEVAL	52	<0.38 - <7.85E-15	<0.14 - <2.90E-04	<9.64E-16	<3.57E-05
AFGRVAL	52	<0.45 - 1.90E-15	<1.68 - 7.03E-05	9.06E-16	3.35E-05
AFBOEHN	52	<0.58 - 2.38E-15	<2.15 - 8.81E-05	<8.84E-16	<3.27E-05
AFDNKRK	52	<0.64 - 4.59E-15	<0.24 - 1.70E-04	1.05E-15**	3.88E-05
AFBLKST	4	<0.68 - 1.13E-15	<2.53 - 4.18E-05	<8.69E-16[a]	<3.22E-05

Average monthly concentration range in µCi/mL is 6.17E-16 to 2.49E-15
Average monthly concentration range in Bq/m^3 is 2.3E-05 to 9.2E-05
DCG limit (gross alpha as Am-241) is 2E-14 µCi/mL, 7.4E-4 Bq/m^3

** Reflects the minimum annual average value*
*** Reflects the maximum annual average value*

Table 2-2

1992 Gross Beta Activity at Off-Site and Perimeter Ambient Air Sampling Locations

Location	Number of Samples	Range µCi/mL	Range Bq/m^3	Annual Average µCi/mL	Annual Average Bq/m^3
AFFXVRD	52	<0.22 - 3.12E-14	<0.08 - 1.15E-03	1.65E-14	6.10E-04
AFRSPRD	52	0.82 - 3.15E-14	0.30 - 1.17E-03	1.77E-14	6.55E-04
AFRT240	52	0.85 - 3.32E-14	0.32 - 1.23E-03	1.69E-14	6.25E-04
AFSPRVL	52	0.78 - 2.98E-14	0.29 - 1.10E-03	1.58E-14*	5.85E-04
AFTCORD	52	0.93 - 7.20E-14	0.34 - 2.66E-03	1.83E-14	6.77E-04
AFWEVAL	52	0.87 - 4.28E-14	0.32 - 1.58E-03	1.59E-14	5.88E-04
AFGRVAL	52	0.62 - 2.64E-14	2.29 - 9.77E-04	1.58E-14	5.85E-04
AFBOEHN	52	0.94 - 3.12E-14	0.35 - 1.15E-03	1.66E-14	6.14E-04
AFDNKRK	52	0.95 - 2.89E-14	0.35 - 1.07E-03	1.89E-14**	6.99E-04
AFBLKST	4	1.40 - 2.91E-14	0.52 - 1.08E-03	2.15E-14[a]	7.96E-04

Average monthly concentration range in µCi/mL is 1.04E-14 to 2.88E-14
Average monthly concentration range in Bq/m^3 is 3.8E-04 to 1.1E-03
DCG limit (gross beta as Sr-90) is 9E-12 µCi/mL, 3.31E-01 Bq/m^3

** Reflects the minimum annual average value*
*** Reflects the maximum annual average value*

Thomas Corners, and Route 240 — averaged about 1.67E-14 μCi/mL (6.2E-04 Bq/m^3) of gross beta activity in air. This average is comparable to 1991 data. The average gross beta concentration at the Great Valley background station was 1.63E-14 μCi/mL (6.0E-04 Bq/m^3) in 1991, and in 1992 averaged 1.58E-14 μCi/mL (5.8E-04 Bq/m^3).

Global Fallout Sampling

Global fallout is sampled at four of the perimeter air sampler locations and at the base of the on-site meteorological tower. Precipitation from all of the locations is collected and analyzed every month. Results from these measurements are reported in nCi/m^2 per month for gross alpha and gross beta and in μCi/mL for tritium. (The 1992 data from these analyses are found in Appendix C-2, Table C-2.21. Table C-2.22 contains precipitation pH measurement data).

Fallout-pot data indicate short-term effects; the reporting units for gross alpha and gross beta indicate a rate of deposition rather than the actual concentration of activity within the collected water. Long-term deposition is measured by surface soil samples collected annually near each sampling station. Soil sample data are found in Table C-1.10 of Appendix C-1.

Surface Water and Sediment Monitoring

On-Site Surface Water Sampling: the Low-Level Waste Treatment Facility

The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility (LLWTF) through the lagoon 3 weir (WNSP001, Fig. 2-3) into Erdman Brook, a tributary of Frank's Creek. There were seven batch releases totaling about 36.9 million liters (9.76 million gal) in 1992. In addition to composite samples collected near the beginning and end of each discharge, forty-nine daily effluent grab samples were collected and analyzed.

Off-Site Surface Water Sampling

An off-site sampler (WFFELBR) is located on Cattaraugus Creek at Felton Bridge just downstream of Cattaraugus Creek's confluence with Buttermilk Creek, which is the major surface drainage from the Western New York Nuclear Service Center. (See Fig. 2-4.) The sampler periodically collects an aliquot (a small volume of water, approximately 100 mL/hr) from the creek. A chart recorder registers the stream depth during the sampling period so that a flow-weighted weekly sample can be proportioned into a monthly composite based on relative stream discharge. The samples are analyzed for gross alpha, gross beta, and tritium each week, and the composite is analyzed for strontium-90 and gamma-emitting isotopes.

In addition to the Cattaraugus Creek sampler, two surface water monitoring stations are located on Buttermilk Creek both upstream and downstream of the WVDP. Samplers collect water from a background location upstream of the Project at Fox Valley Road (WFBCBKG) and from a location at Thomas Corners Road that is downstream of the plant and upstream of Buttermilk Creek's confluence with Cattaraugus Creek (WFBCTCB).

The samplers collect a 25-mL aliquot every half-hour. Samples are retrieved biweekly, composited monthly, and analyzed for tritium, gross alpha, and gross beta radioactivity. A quarterly composite of the biweekly samples is analyzed for gamma-emitting isotopes and strontium-90. (Table C-1.3 shows monthly and quarterly radioactivity totals upstream of the site at Fox Valley; Table C-1.4 shows monthly and quarterly radioactivity totals downstream of the site at Thomas Corners.)

The fourth station (WNSP006) is located on Frank's Creek where Project site drainage leaves the security area. (See Fig. 2-3.) This sampler collects a 50-mL aliquot every half-hour. Samples are retrieved weekly and composited both monthly and quarterly. Weekly samples are analyzed for tritium and gross alpha and beta radioactivity. The monthly composite is analyzed for strontium-90 and gamma-emitting isotopes. (See Table C-1.5.) A quarterly composite is analyzed for carbon-14, iodine-129, and alpha-emitting isotopes. (See Table C-1.6.)

Radioactivity Concentrations On-Site: Low-Level Waste Treatment Facility

The total amounts of radioactivity from specific radionuclides in the lagoon 3 effluent are listed in Table C-1.1. The annual average concentrations from the lagoon 3 effluent discharge weir, including all measured isotope fractions, were less than 31% of the DCGs. (See Table C-1.2.)

Radioactivity Concentrations Off-Site: Surface Water Sampling Locations

Radiological concentration data from off-site sample points show that average gross radioactivity concentrations generally tend to be higher in Buttermilk Creek below the WVDP site, presumably because small amounts of radioactivity from the site enter Buttermilk Creek via Frank's Creek. Tables 2-3 and 2-4 list the range and annual averages for gross alpha and gross beta activity at surface water locations.

Springville Dam on Cattaraugus Creek

Table 2-3
1992 Gross Alpha Activity at Off-Site Surface Water Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/L	μCi/mL	Bq/L
WFBCBKG	12	<0.86 - <1.50E-09	<3.18 - <5.55E-02	<1.21E-09	<4.48E-02
WFBCTCB	12	<1.13 - 2.88E-09	<0.42 - 1.07E-01	<1.69E-09	<6.25E-02
WFBIGBR	12	<0.90 - <2.35E-09	<3.34 - <8.70E-02	<1.66E-09	<6.14E-02
WFFELBR	65	<0.59 - <5.03E-09	<0.22 - <1.86E-01	<1.74E-09	<6.44E-02
WNSP006	52	<0.54 - 9.17E-09	<0.20 - 3.39E-01	<2.32E-09	<8.58E-02

Table 2-4
1992 Gross Beta Activity at Off-Site Surface Water Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/L	μCi/mL	Bq/L
WFBCBKG	12	2.06 - 4.60E-09	0.76 - 1.70E-01	2.95E-09	1.09E-01
WFBCTCB	12	3.58 - 9.79E-09	1.32 - 3.62E-01	6.37E-09	2.36E-01
WFBIGBR	12	<1.43 - 4.07E-09	<0.53 - 1.51E-01	2.36E-09	8.73E-02
WFFELBR	65	<0.15 - 1.13E-08	<0.55 - 4.18E-01	3.55E-09	1.31E-01
WNSP006	52	0.18 - 4.46E-07	0.07 - 1.65E+01	5.64E-08	2.09E+00

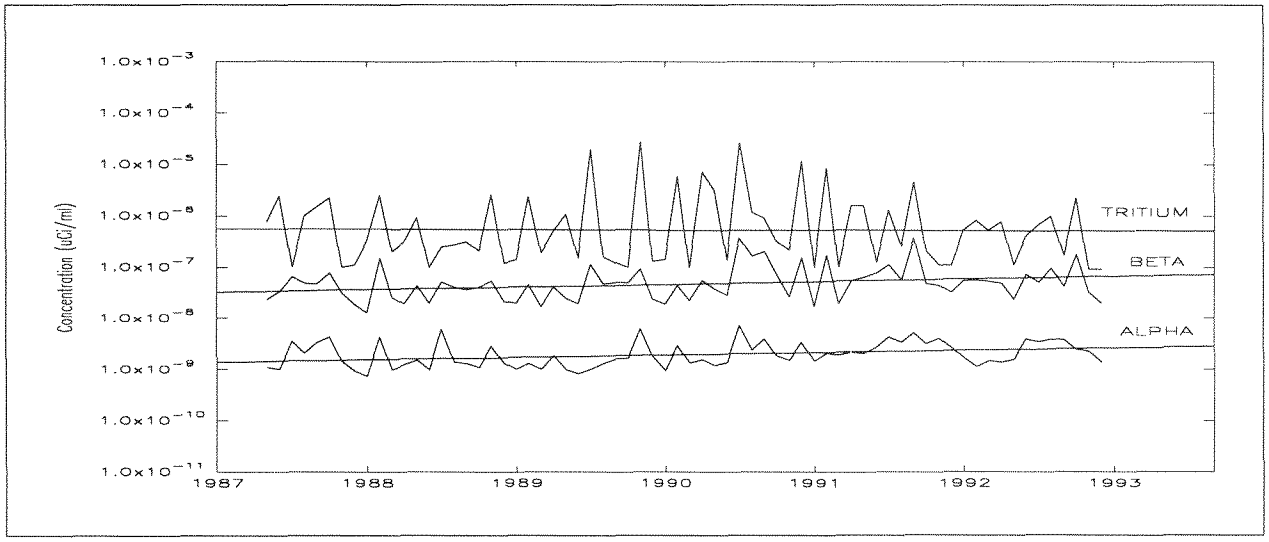


Figure 2-7. Five-Year Trends of Gross Alpha, Gross Beta, and Tritium at Sampling Location WNSP006

Thomas Corners Bridge Sampling Location

These data show that concentrations downstream of the site are only marginally higher than background concentrations upstream of the site. To establish a perspective on these data, note that if the maximum beta concentration in Buttermilk Creek downstream of the Project at Thomas Corners Bridge, to which dairy cattle have access, were assumed to be entirely from iodine-129, which is the most restrictive beta-emitting isotope, then the radioactivity would represent only 2.0% of the Department of Energy's derived concentration guide (DCG) for unrestricted use.

Frank's Creek Sampling Location

At sampling location WNSP006 at the Project security fence more than 4 kilometers from the nearest public access point, the most significant beta-emitting radionuclides were measured at 3.08E-08 µCi/mL (1.1E+00 Bq/L) for cesium-137 and 3.81E-08 µCi/mL(1.4E+00 Bq/L) for strontium-90 during the month of highest concentration. This corresponds to 1.0% of the DCG for cesium-137 and 3.8% of the DCG for strontium-90.

The annual average concentration of cesium at WNSP006 was less than 0.9% of the DCG and the strontium concentration was 2.0% of the strontium DCG. Tritium, at an annual average of 5.0E-07 µCi/mL (1.9E+01 Bq/L), was 0.02% of the DCG value. Of the fifty-two samples collected and analyzed for gross alpha during 1992, eight were above the detection limit. The annual average was 9.0E-10 µCi/mL gross alpha or 3.0% of the DCG for americium-241. The five-year trends of gross alpha, gross beta, and tritium concentrations at location WNSP006 is shown in Figure 2-7.

Cattaraugus Creek at Felton Bridge Sampling Location

The highest concentrations in monthly composite water samples from Cattaraugus Creek during 1992 show strontium-90 to be less than 0.5% of the DCGs for water. No gamma-emitting fuel cycle isotopes were detected in Cattaraugus Creek during 1992. (See Table C-1.7.) Yearly averages for Cattaraugus Creek gross beta activity at Felton Bridge are not significantly higher statistically than background levels. Figure 2-8 shows the five-year trends for Cattaraugus Creek samples analyzed for gross alpha, gross beta, and tritium.

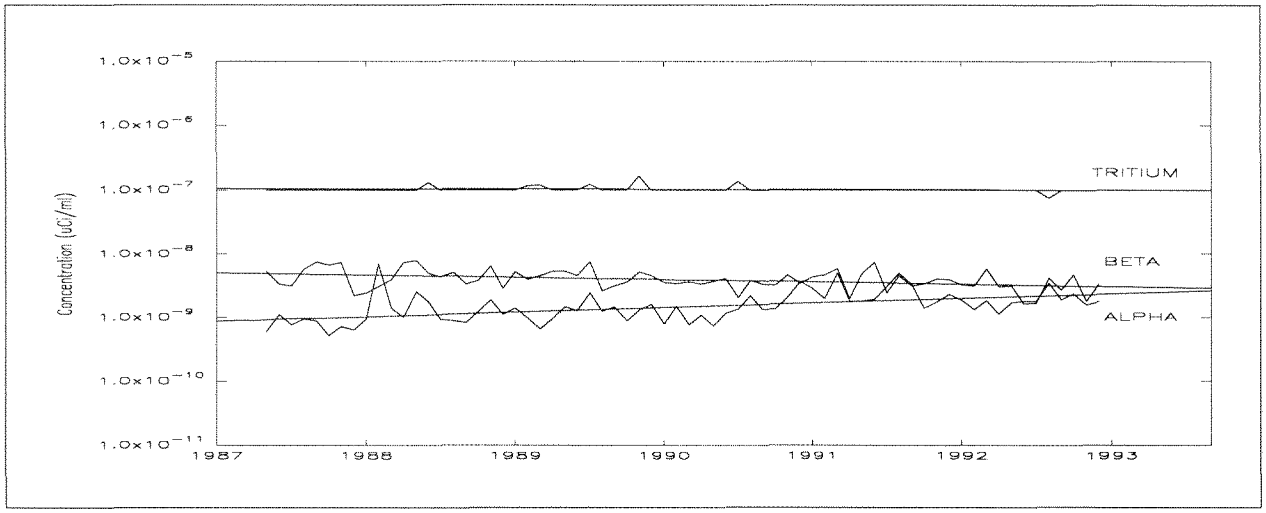


Figure 2-8. Five-Year Trends of Gross Alpha, Gross Beta, and Tritium at Sampling Location WFFELBR

Sediment Sampling

Sediments are grab-sampled semiannually at or near three of the automatic water sampling locations and at two additional points. Downstream locations are Buttermilk Creek at Thomas Corners Road (SFTCSED), Cattaraugus Creek at Felton Bridge (SFCCSED), and Cattaraugus Creek at the Springville Dam (SFSDSED). Upstream locations are Buttermilk Creek at Fox Valley Road (SFBCSE), and Cattaraugus Creek at Bigelow Bridge (SFBISED).

A comparison of annual averaged 1986-1992 cesium-137 concentrations for these five sampling locations is found in Figure 2-9. As the figure indicates, cesium-137 concentrations are decreasing or staying constant with time for the locations downstream of the Project (SFTCSED, SFCCSED, and SFSDSED). Concentrations of cesium-137 at the upstream locations (SFBCSED and SFBISED) have remained consistent throughout the time period.

A comparison of cesium-137 to naturally occurring gamma-emitter potassium-40 (Fig. 2-10) for the downstream location nearest the Project (Buttermilk Creek at Thomas Corners Road — SFTCSED) indicates that cesium-137 is present at levels lower than naturally occurring gamma emitters. Results of sediment sampling upstream and downstream of the Project are tabulated in *Appendix C-1*, Table C-1.9.

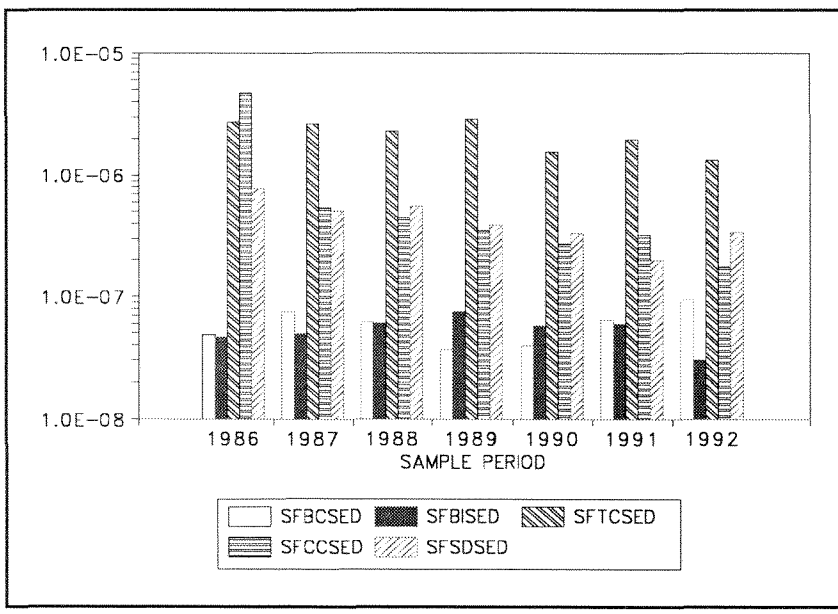


Figure 2-9. Annual Averages of Cs-137 (µCi/g dry) in Stream Sediment for Two Locations Upstream and Three Locations Downstream of the WVDP

Radioactivity in the Food Chain

Each year food samples are collected from locations near the site and from remote locations. Fish and deer are collected during periods when they would normally be taken by sportsmen for consumption. In addition, milk is collected monthly and beef semiannually from cows grazing near the site and at remote locations. Hay, corn, apples, and beans are collected at the time of harvest.

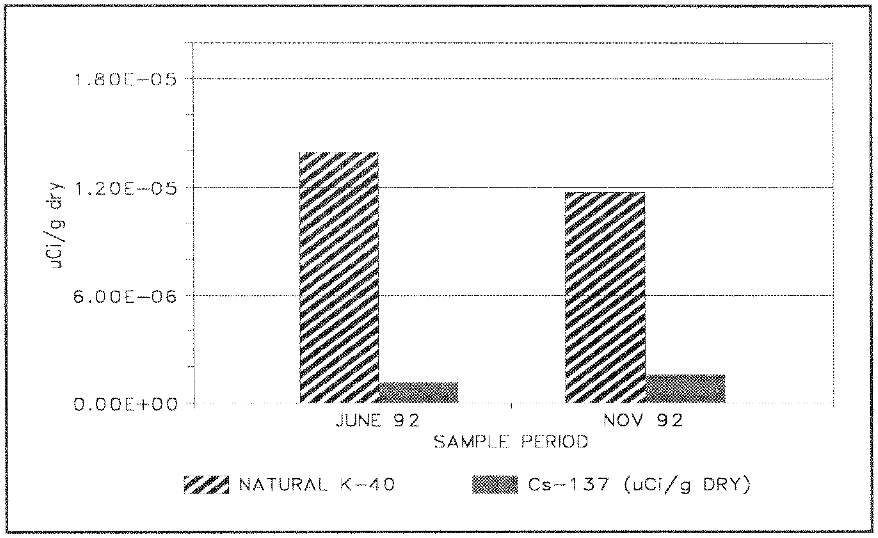


Figure 2-10. Comparison of Cs-137 with Naturally Occurring K-40 Concentrations at Downstream Sampling Location SFTCSED

Fish

Ten fish samples are collected semiannually above the Springville dam from the portion of Cattaraugus Creek that is downstream of WNYNSC drainage (BFFCATC). Ten fish samples are also collected annually from Cattaraugus Creek below the dam (BFFCATD), including species that migrate nearly forty miles upstream from Lake Erie. These specimens are representative of sport fishing catches in the creek downstream of the dam at Springville.

Ten control fish are taken semiannually from waters that are not influenced by site runoff (BFFCTRL). These control samples, containing only natural radioactivity, provide comparisons with the concentrations found in fish taken from site-influenced waters. The control samples are representative of the species collected in Cattaraugus Creek downstream from the WVDP. A combined total of fifty fish were collected from the locations described above. Under a collector's permit, these fish are collected by electrofishing, a method that temporarily stuns the fish, allowing them to be netted for collection. This also allows a more balanced selection as compared to standard line fishing, and unwanted fish can be returned to the creek unharmed.

Radioactivity Concentrations in Fish Samples

The edible portion of each individual fish collected was analyzed for strontium-90 content and the gamma-emitting isotopes cesium-134 and -137. (See Table C-3.4 in *Appendix C-3* for a summary of the results.) Concentrations of strontium-90 in fish collected downstream of the Project in Cattaraugus Creek (BFFCATC) were indistinguishable from upstream control fish (BFFCTRL). Concentrations of strontium-90 ranged from below the minimum detectable concentration (see *Glossary*) to a maximum of 2.0E-06 µCi/g at BFFCATC and from below the minimum detectable concentration to 2.3E-06 µCi/g at the control location (BFFCTRL).

Except for one fish collected downstream of the site that showed a marginal positive detection for cesium-137, fish collected in 1992 showed no detectable concentrations of cesium-134 or cesium-137. Strontium-90 levels in fish taken below the first upstream barrier from Lake Erie on Cattaraugus Creek were at or below background levels. No cesium-134 or cesium-137 isotopes were found in these below-dam downstream fish in 1992.

Venison

Specimens from an on-site deer herd also are analyzed for radioactive components. Historically, concentrations of radioactivity in deer flesh have been very low and site activities have not been shown to affect the local herd.

Radioactivity Concentrations in Venison

Venison from three deer taken from a resident herd on the WNYNSC were analyzed and the data compared with data on deer collected in the towns of Olean, Geneseo, and Allegany, New York. Low levels of radioactivity were detected for both near-site and control samples for tritium, cesium-137, and naturally occurring potassium-40. Results for these samples are shown in Table C-3.2 in *Appendix C-3*. There is no apparent statistical difference in radioactivity concentrations between the control deer and the near-site deer. The range in concentrations observed was similar to 1991 levels. Strontium-90 and cesium-134 were not detected in either near-site or control deer during 1992.

Beef

Historically, very little difference in isotope concentration has been observed between near-site and control herds. Beef samples taken semiannu-

Electrofishing with the New York State Department of Environmental Conservation

ally from near-site and remote locations are analyzed for tritium, strontium-90, and gamma-emitting isotopes such as cesium-134 and cesium-137.

Radioactivity Concentrations in Beef Samples

Analyses of two of the four beef samples collected in 1992, one near-site and one control sample, resulted in positive values for tritium and cesium-137. Results for the remaining near-site and control samples were below the minimum detectable concentrations for tritium and cesium-137. Results of all samples analyzed for strontium-90 and cesium-134 were below the minimum detectable concentrations. These results are presented in Table C-3.2 in *Appendix C-3.*

Milk

Monthly milk samples were taken in 1992 from dairy farms near the site and from control farms at some distance from the site (Fig. 2-11). Besides the quarterly composite of monthly samples from the maximally exposed herd to the north (BFMREED), a quarterly composite of milk also was prepared from a nearby herd to the northwest (BFMCOBO). Single annual samples were taken from herds to the south (BFMWIDR) and the southwest (BFMHAUR). Monthly samples from control herds (BFMCTLN and BFMCTLS) were also prepared as quarterly composites. (See Fig.A-9 in *Appendix A* for control sample locations.)

Radioactivity Concentrations in Milk Samples

Each milk sample was analyzed for strontium-90, iodine-129, gamma-emitting isotopes (cesium-134 and -137), and tritium. Strontium-90 was detectable in all near-site and control samples. The results for near-site milk ranged from 9.8E-10 to 1.6E-08 μCi/mL (3.6E-02 to 5.9E-01 Bq/L), and the control milk samples ranged from 8.2E-10 to 9.9E-09 μCi/mL (3.0E-02 to 3.7E-01 Bq/L). There was no statistical difference between near-site and control milk samples. Iodine-129 was detected in two near-site samples and two control samples. There was no appreciable difference between these near-site sample results and the control sample iodine-129 results. For cesium-137, two control samples and one near-site sample showed positive values. Results for tritium analyses also showed a mixture of detectable and less-than-detectable results for both near-site and control locations. The results of these analyses are shown in Table C-3.1 in *Appendix C-3* and indicate little, if any, difference between near-site and control samples.

Fruit and Vegetables

Results from the analysis of beans, apples, sweet corn, field corn, and hay collected during 1992 are presented in Table C-3.3 in *Appendix C-3.* Cesium-137 and cobalt-60 were below the minimum detectable concentrations for all samples collected. Tritium and strontium-90 analyses produced both detectable and less-than-detectable concentrations for both near-site and control samples, indicating no statistical difference between the sample locations.

Direct Environmental Radiation Monitoring

The current monitoring year, 1992, was the ninth full year in which direct penetrating radiation was monitored at the West Valley Demonstration Project using TL-700 lithium fluoride (LiF) thermoluminescent dosimeters (TLDs).

The dosimeters are processed on-site and are used solely for environmental monitoring, apart from the occupational dosimetry TLDs. The environmental TLD package consists of five TLD chips laminated on a thick card bearing the location identification and other information. These cards are placed at each monitoring location for one calendar quarter (three months) and are then processed to obtain the integrated gamma radiation exposure.

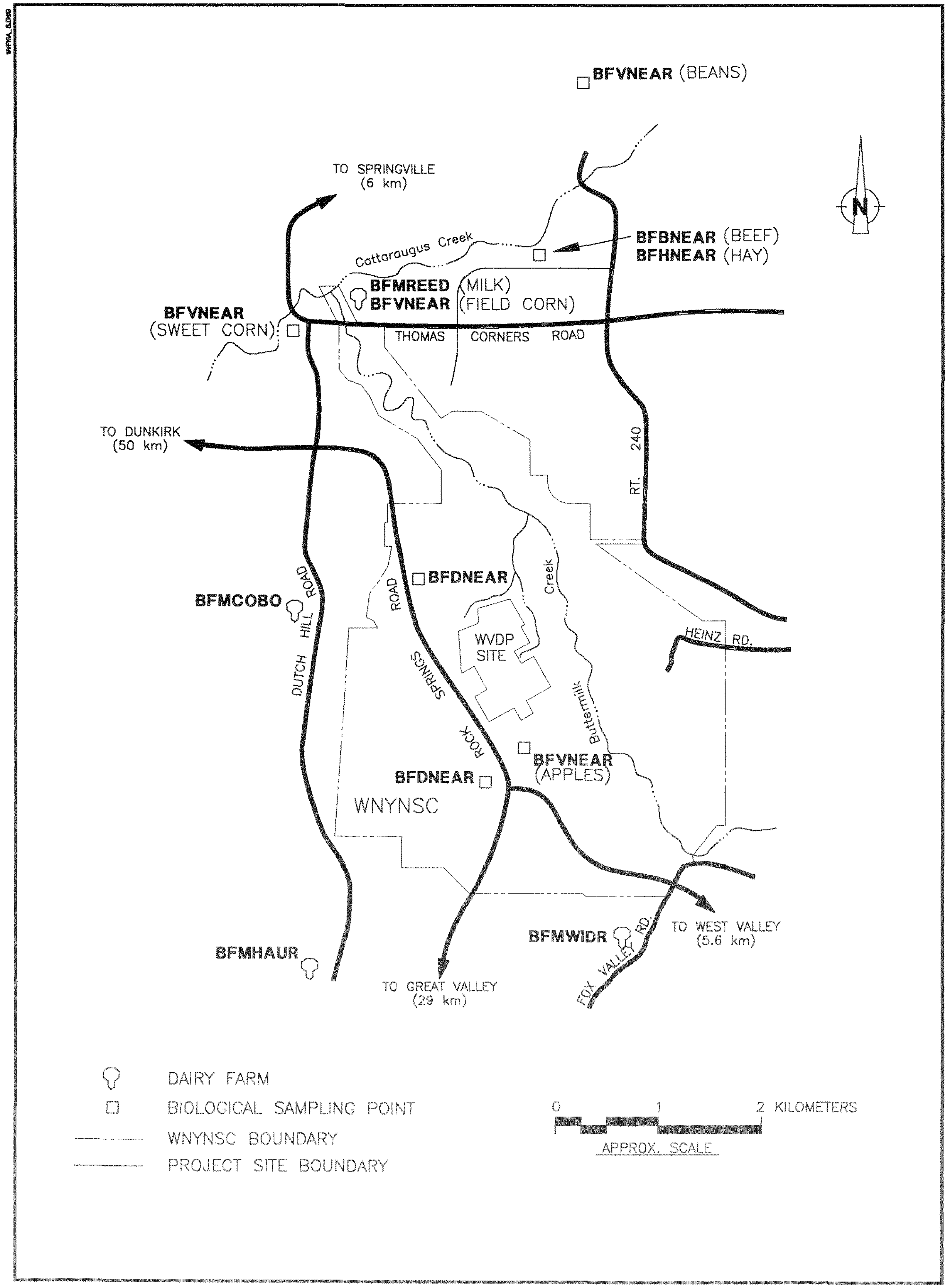


Figure 2-11. Near-Site Biological Sampling Points.

Monitoring points are located around the WNYNSC perimeter and the access road, at the waste management units, at the site security fence, and at background locations remote from the WVDP site. (See Figs. 2-12 and 2-13 and Fig. A-9 in *Appendix A*.) The TLDs are numbered in order of their installation. The monitoring locations are as follows:

THE PERIMETER OF THE WNYNSC: TLDs #1-16, #20

THE PERIMETER OF THE WVDP SITE-SECURITY FENCE: TLDs #24, #26-29, #32-34

ON-SITE SOURCES OR SOLID WASTE MANAGEMENT UNITS: TLDs #18 and #32-36 (RTS drum cell); #18 and #19 (SDA); #24 (component storage, near the WVDP site security fence); #25 (the maximum measured exposure rate at the closest point of public access); #38 (main plant and cement solidification system); #39 (parking lot security fence closest to the vitrification facility); #40 (high-level waste tank farm)

NEAR-SITE COMMUNITIES: TLDs #21 (Springville); #22 (West Valley)

BACKGROUND: TLDs #17 (Five Points Landfill in Mansfield); #23 (Great Valley); #37 (Dunkirk); #41 (Sardinia)

The statistical uncertainty of individual results and averages was acceptable and measured exposure rates were comparable to those of 1991. There were no significant differences between the data collected from the background TLDs (#17, #23, #37, and #41) and from those on the WNYNSC perimeter for the 1992 reporting period.

Appendix C-4 provides a summary of the results for each of the environmental monitoring locations by calendar quarter along with averages for comparison.

The quarterly averages and individual location results show very slight differences due to seasonal variation. The data obtained for all four calendar quarters compared favorably to the respective quarterly data in 1991 with no unusual situations observed. The quarterly average of the seventeen perimeter TLDs was 19.3 milliroentgen (mR) per quarter (18.5 mrem/quarter) in 1992.

The perimeter TLD quarterly averages, expressed in microroentgen per hour (μR/hr) since 1985 are shown in Figure 2-14.

On-Site Radiation Monitoring

Certain locations show slight changes in radiation levels. Presumably because of its proximity to the low-level waste disposal area, the dosimeter at location #19 showed a small elevation in radiation exposure compared to the WNYNSC perimeter locations. Although above background, the readings are relatively stable from year to year. Locations #25, #29, and #30 on the public access road that runs through the site north of the facility and #26 at the east security fence also showed small elevations above background. (See *Appendix C-4*, Table C-4.1.)

Location #24 on the north inner facility fence is not included in the off-site environmental monitoring program; however, it is a co-location site for one Nuclear Regulatory Commission (NRC) TLD. (See *Appendix D*, Table D-6.) This point received an average exposure of 0.52 milliroentgens (mR) per hour during 1992, as opposed to 0.57 mR/hr in 1991 and 0.63 mR/hr in 1990. Sealed containers of radioactive components and debris from the plant decontamination work are stored nearby. The storage area is well within the WNYNSC boundary and is not readily accessible by the public. Locations #27, #28, and #31 at the security fence are at levels near background.

Locations around the radwaste treatment storage (RTS) building — the drum cell — showed a steady state condition during the 1992 calendar year. The average dose rate at these locations (TLDs #18, #32, #33, #34, #35, and #36) was 0.025 mR/hr in 1992, compared to 0.026 mR/hr in 1991. These exposure

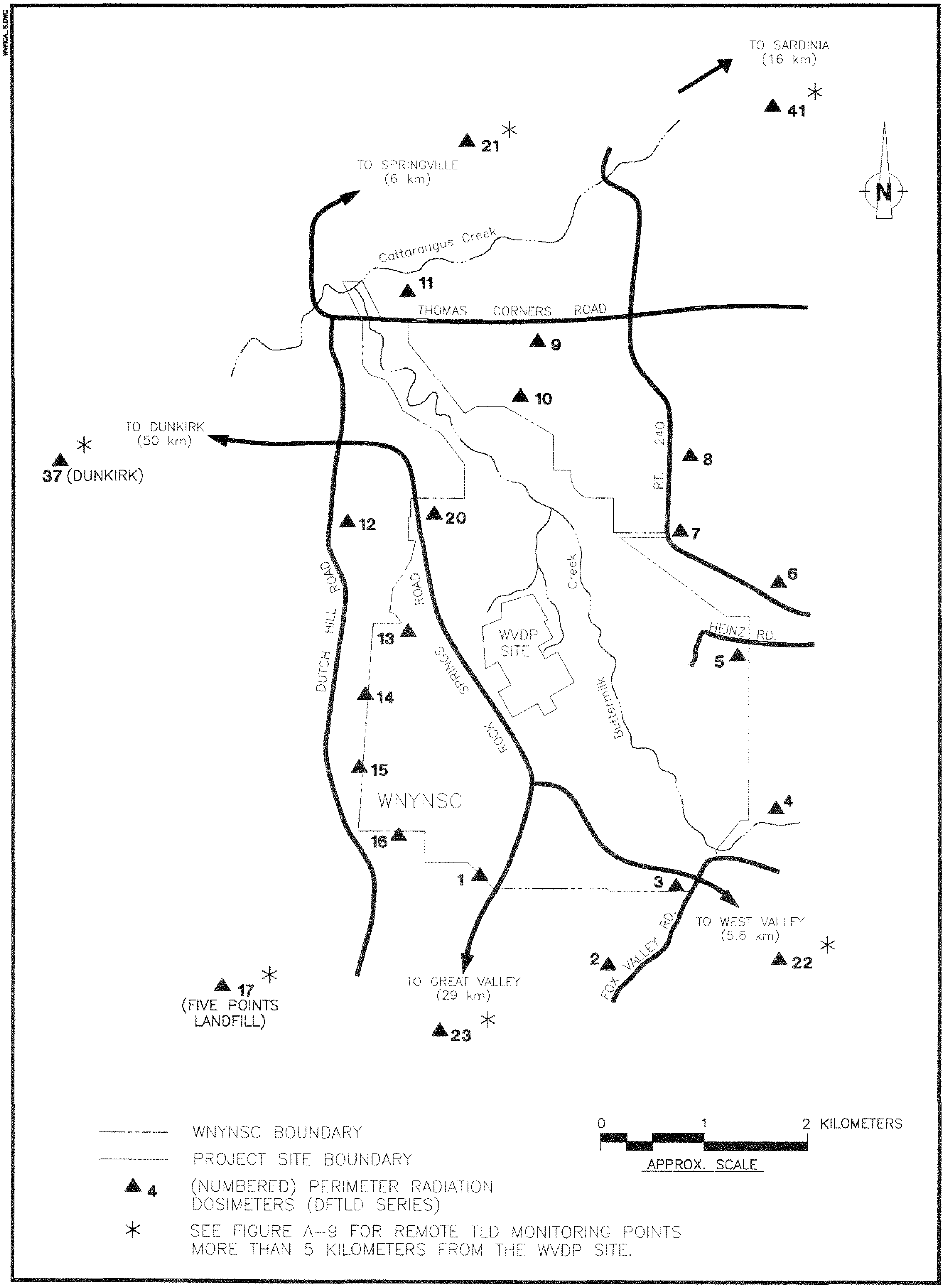


Figure 2-12. Location of Off-Site Thermoluminescent Dosimetry (TLD).

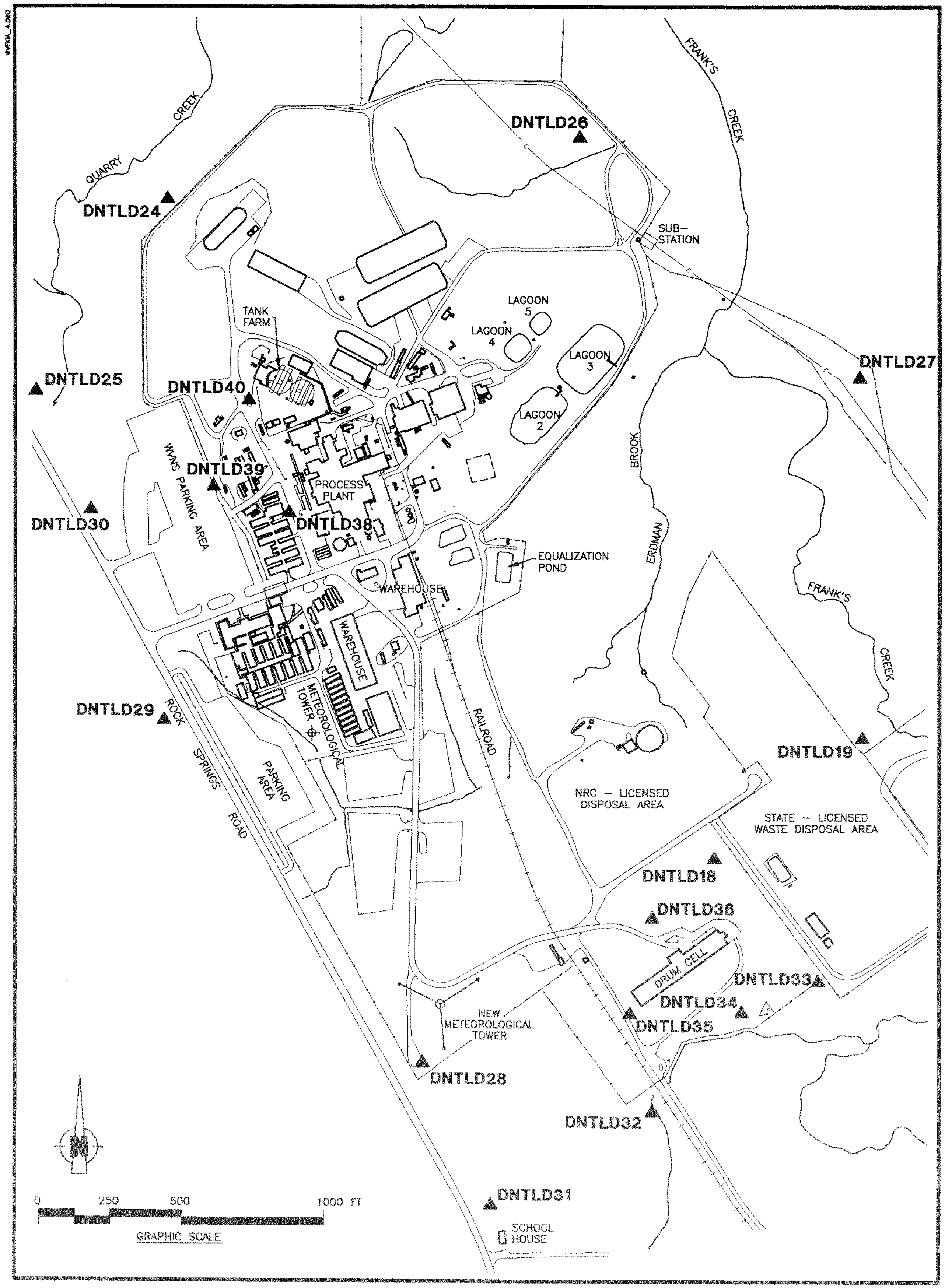


Figure 2-13. Location of On-Site Thermoluminescent Dosimetry (TLD).

rates, which are above background levels, reflect the placement in the building of drums containing decontaminated supernatant mixed with cement. The drum cell and the surrounding TLD locations are well within the WNYNSC boundary and are not readily accessible by the public.

Perimeter and Off-Site Radiation Monitoring

The perimeter TLDs (TLDs #1-16 and #20) are located in the sixteen compass sectors around the facility near the WNYNSC boundary. The quarterly averages for these TLDs (Fig. 2-14) indicate no trends other than normal seasonal fluctuations. TLDs #17, #21-23, #37, and #41 monitor near-site community and background locations. The results from these monitoring points are essentially the same as the perimeter TLDs. Figure C-4.1 in *Appendix C-4* shows the average quarterly exposure rate at each off-site TLD location. Figure C-4.2 shows the average quarterly exposure rate at each on-site TLD.

Meteorological Monitoring

Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local and regional climatology of the site. These data are used to assess potential effects of routine and nonroutine releases of airborne radioactive materials and to calculate dispersion models for any releases that may exceed DOE effluent limits.

Since dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which is a function indicated by the difference in temperature between the 10-meter and 60-meter elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP.

The on-site 60-meter meteorological tower continuously monitors wind speed and wind direction; temperatures are measured at both 60-meter and 10-meter elevations. In addition, an independent, remote 10-meter meteorological station located approximately 5 kilometers south of the site on the top of Dutch Hill Road continuously monitors wind speed and wind direction. Dewpoint, precipitation, and barometric pressure are also monitored at the on-site meteorological tower location.

The two meteorological locations supply data to the primary digital and analog data acquisition systems located within the Environmental Laboratory. All on-site systems are provided with uninterruptible power backup in case of site power failure.

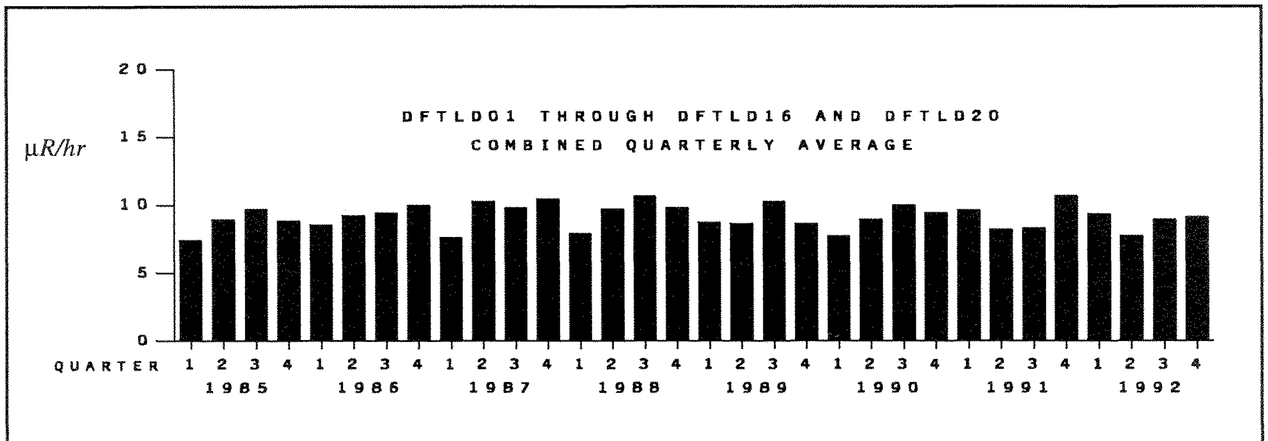
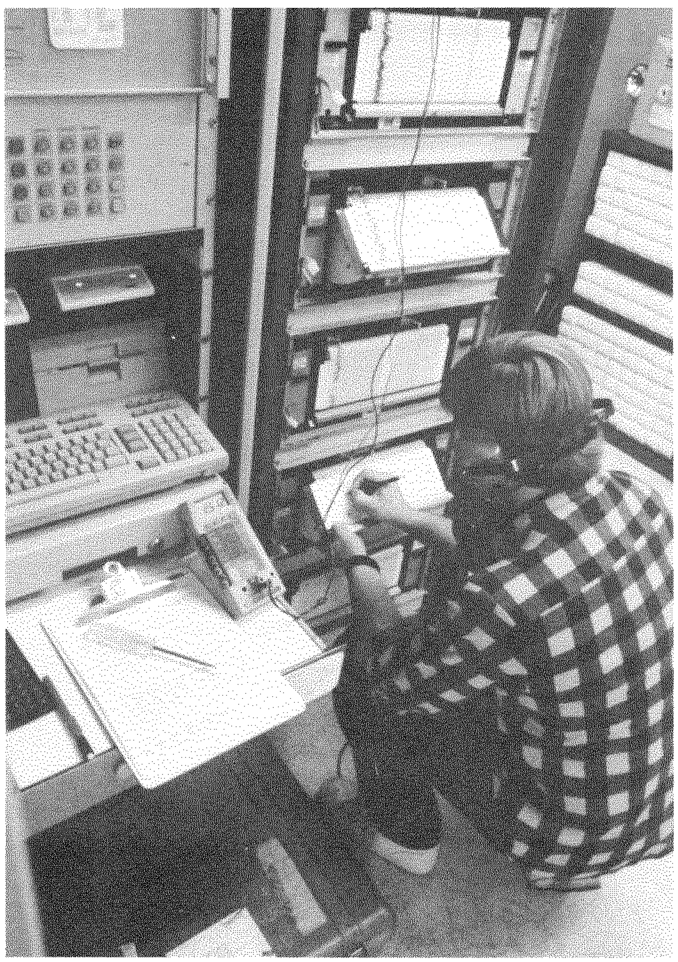


Figure 2-14. Trend of Environmental Radiation Levels (μR/hr)

Figures C-6.1 and C-6.2 in *Appendix C-6* illustrate 1992 mean wind speed and wind direction at the 10-meter and 60-meter elevations.

Cumulative total and weekly total precipitation data are illustrated in Figures C-6.3 and C-6.4 in *Appendix C-6*. Precipitation in 1992 was almost 7 inches (17%) above the annual average of 41 inches.

Information such as meteorological system calibration records, site log books, and analog strip charts are stored in protected archives. Electronic files containing meteorological data are copied (downloaded) daily and stored off-site. Meteorological towers and instruments are examined three times weekly for proper function and calibrated semiannually and/or whenever instrument maintenance might affect calibration.



Checking Data from the Meteorological Tower

Special Monitoring

Stormwater Monitoring

As mandated by the U.S. Environmental Protection Agency NPDES (National Pollutant Discharge Elimination System) program, the New York State Department of Environmental Conservation received permit applications in 1992 for stormwater run-off discharges.

Three locations on-site have been identified as the primary conduits for run-off water in a storm: Frank's Creek at the security fence (WNSP006), the north swamp drainage (WNSW74A), and the northeast swamp drainage (WNSWAMP). Baseline grab samples and samples taken during a storm in 1991 were analyzed for a number of chemical and radiological parameters. Results indicated no radiological or nonradiological contaminants in addition to what is routinely measured and reported in the site environmental reports. Analysis results were included in a permit application for stormwater discharges. The application was filed with the New York State Department of Environmental Conservation in 1992 and is still pending as of the publication of this report.

Solvent Contamination Monitoring

Radioactively contaminated solvent was first discovered at the northern boundary of the NRC-licensed disposal area (NDA) in 1983, shortly after the Department of Energy assumed control of the WVDP site. Extensive sampling and monitoring through 1989 revealed the possibility that the solvent could migrate. To contain this subsurface solvent migration, an interceptor trench and liquid pretreatment system (LPS) were built. The interceptor trench was designed to halt and collect subsurface water, which could be carrying solvent, in order to prevent it from entering the surface water drainage ditch leading into Erdman Brook.

The LPS was designed to separate the solvent from the water and to treat the collected water before its transfer to the low-level waste treatment facility. Pretreatment would remove the solvent and reduce the concentration of iodine-129 in the water. The separated solvent would be stored for subsequent treatment and disposal.

In 1992 and as of the first four months of 1993, no water containing solvent had ever been encountered in the trench, and thus no water or solvent has been treated by the LPS. It should be noted that water containing solvent has never been detected in groundwater monitoring wells outside the NDA or in the surface water drainage downstream of the WVDP.

Survey of Trees near the NDA

During a routine radiation survey by the Radiation and Safety department, radioactivity was detected in several trees located immediately north of the NDA. The trees were surveyed by placing a calibrated hand-held detector against their trunks. Two species of trees, apple and beech, indicated activity above background. Because leaves could be blown off-site by the wind and apples could be eaten by the local deer herd, samples of tree leaves and apples were collected in late fall 1992 and analyzed for radioactivity.

Preliminary analytical results indicate that the only significant isotopes present were naturally occurring. No measurable amounts of fuel cycle radionuclides were detected in the leaves or apples. Further characterization of radioactivity levels is planned.

Local Population Survey

Businesses and residents within 5 kilometers of the center of the Project site were surveyed by WVDP personnel in June and July 1992. (No population or housing units are within 1 kilometer of the center of the site because this area is within the WNYNSC property boundary.) The survey identified 416 housing units (381 occupied, 9 vacant, and 26 seasonal) within the 5 kilometers. Of the total 1,052 residents counted, 735 were more than 18 years of age. School-aged children between 6 and 18 years old numbered 232, and 85 residents were under the age of 5. Based on observed residence upkeep and new construction, an additional 81 residents who were not contacted were estimated to reside within the 5-kilometer radius. Resident numbers were sorted and tallied according to the distance and direction from the plant by sector and corresponding compass direction (e.g., NNW, SSE).

The results of the survey were incorporated into environmental information documents used as bases for environmental impact statement evaluations. This information also adds to the accuracy of near-site dose estimates and unplanned release response action.

Drum Cell Monitoring

Liquid high-level waste (supernatant from tank 8D-2) processed by the integrated radwaste treatment system (IRTS) produced 1,636 drums of cement-solidified low-level waste of 71-gallons each. These were added to the 10,393 drums already placed in the drum cell for a total of 12,029 drums.

Most of the gamma radiation emitted from these drums is shielded by the configuration in which the drums are stacked. However, some radiation is emitted through the roof of the drum cell, which is unshielded. This radiation scatters in air and adds to the existing naturally occuring gamma-ray background.

Radiation exposure levels are monitored at various locations around the drum cell perimeter and at the closest location accessible to the public — approximately 300 meters west at Rock Springs Road. Baseline measurements had been taken in 1987 and 1988 before placing the drums. Two types of measurements were taken: instantaneous, using a high-pressure ion chamber (HPIC), and cumulative, using thermoluminescent dosimeters.

The strength of the gamma-ray field can vary considerably from day to day because of changes in meteorological conditions. TLD measurements provide a more accurate estimate of long-term changes in the radiation field because they integrate the radiation exposure over an entire calendar quarter. Such quarterly readings show evidence of a seasonal cycle. Annual variability in background radiation levels can depend on such factors as average temperature, air pressure, humidity, precipitation (including snow cover on the ground), and solar activity during a particular year. The TLD measurements at the Rock Springs Road location (TLDs #28 and #31) are presented in *Appendix C-4*, Table C-4.1.

To assess any increase in the radiation field contributed at the security fence at Rock Springs Road from the drums in the drum cell, HPIC measurements were compared with earlier studies. The 1992 HPIC measurements indicate that the exposure rate at this location did not differ significantly from background readings obtained at the Environmental Laboratory, which is located about 500 meters away from the drum cell.

Closed Landfill Maintenance

Closure of the on-site nonradioactive construction and demolition debris landfill (CDDL) was completed in August 1986. The landfill area was closed in accordance with NYSDEC requirements for this type of landfill, following a closure plan (Standish 1985) approved by NYSDEC. In 1992 the closed facility was routinely inspected and maintained as specified by the closure requirements, including checking the closure area for proper drainage (i.e., no obvious ponding or soil erosion) and cutting the grass planted on the soil and clay cap. Groundwater monitoring in the area of the closed landfill is described in Chapter 3, *Groundwater Monitoring*.

Nonradiological Monitoring

Air Monitoring

Nonradiological emissions and plant effluents are controlled and permitted under New York State Department of Environmental Conservation and U.S. Environmental Protection Agency regulations. The regulations that apply to the WVDP are listed in Table B-2 in *Appendix B*. The individual air permits held by the WVDP are identified and described in Table B-3.

The nonradiological air permits are for minor sources of regulated pollutants that include particulates, ammmonia, nitric acid mist and oxides of nitrogen, and sulfur. However, because of their insignificant concentrations and small mass discharge, monitoring of these parameters currently is not required.

Surface Water Monitoring

Liquid discharges are regulated under the State Pollutant Discharge Elimination System (SPDES).

The WVDP holds a SPDES permit that identifies the outfalls where liquid effluents are released to Erdman Brook (Fig. 2-15) and that specifies the sampling and analytical requirements for each outfall. This permit was modified in 1990 to include additional monitoring requirements at outfall WNSP001.

Three outfalls are identified in the permit:

- outfall WNSP001, discharge from the low-level waste treatment facility

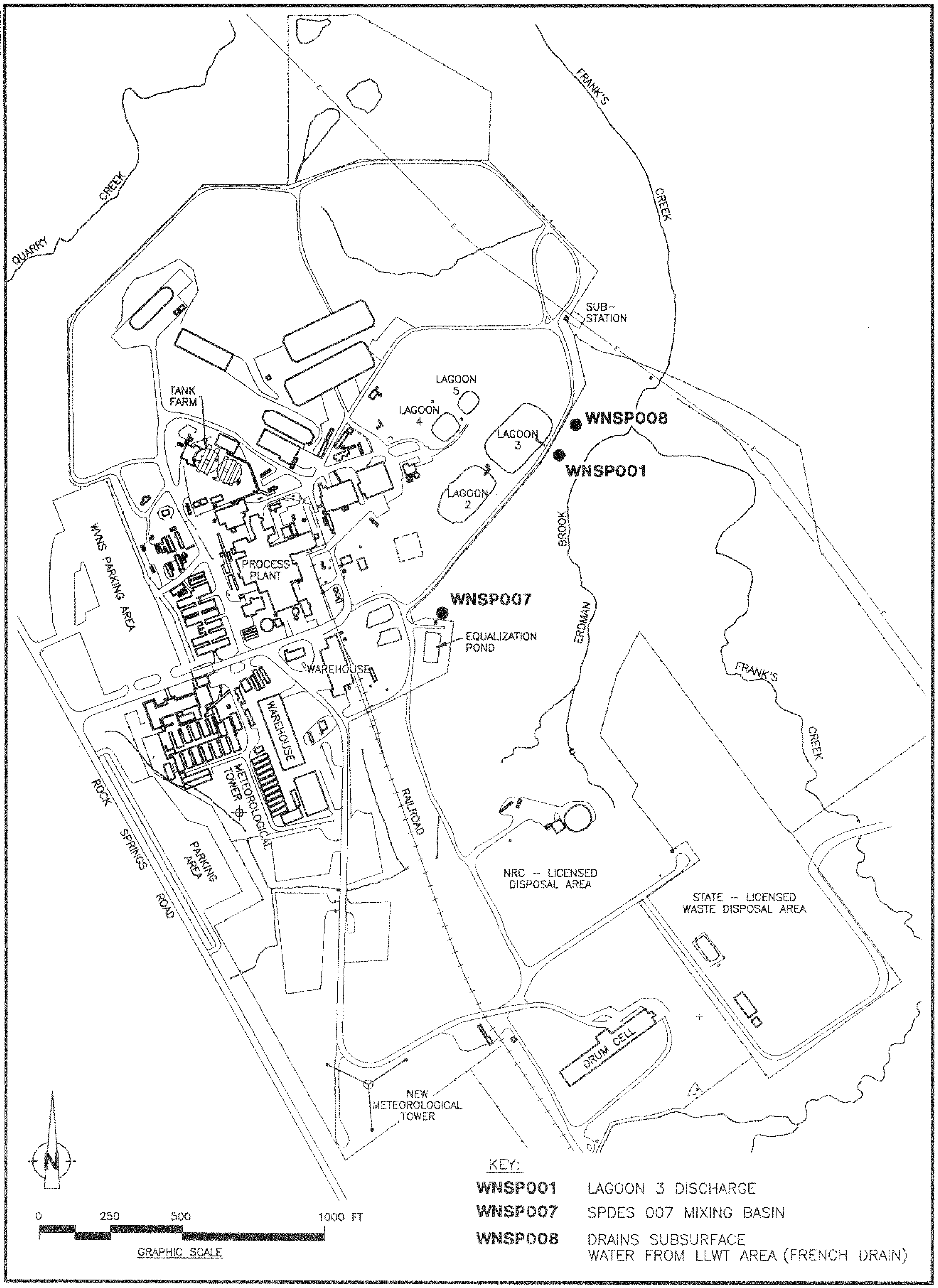


Figure 2-15. SPDES Monitoring Points.

- outfall WNSP007, discharge from the sanitary and utility effluent mixing basin

- outfall WNSP008, groundwater effluent from the perimeter of the low-level waste treatment facility storage lagoons.

The conditions and requirements of the current SPDES permit are summarized in Table C-5.1 in *Appendix C-5.*

The most significant features of the SPDES permit are the requirements to report biochemical oxygen demand, iron, and ammonia data as flow-weighted concentrations and to apply a net discharge limit for iron. The net limit allows the Project to account for amounts of iron that are naturally present in the site's incoming water. The flow-weighted limits apply to the total discharge of Project effluents but allow the more dilute waste streams to have a maximum effect in determining compliance with effluent concentration limits specified in the permit.

The SPDES monitoring data for 1992 are displayed in Figures C-5.2 through C-5.37 in *Appendix C-5*. The WVDP reported a total of two noncompliance episodes in 1992 (Table C-5.2). These are described in the *Environmental Compliance Summary: Calendar Year 1992.*

Semiannual grab sampling at locations WNSP006 (Frank's Creek at the security fence), WNSWAMP (northeast swamp drainage), WNSW74A (north swamp drainage), and WFBCBKG (Buttermilk Creek at Fox Valley) were performed in 1992. These samples are screened for organic constituents and selected anions, cations, and metals. Results of these measurements for WNSP006 and WFBCBKG are found in Table C-1.11 in *Appendix C-1.*

GROUNDWATER MONITORING

Geology of the West Valley Site

The West Valley Demonstration Project is located on the dissected and glaciated Allegheny Plateau at the northern border of Cattaraugus County in southwestern New York. The site is underlain by a thick sequence of Holocene (recent) and Pleistocene (ice age) sediments contained in a steep-sided bedrock valley. From youngest to oldest, these unconsolidated deposits consist of alluvial and glaciofluvial silty coarse-grained deposits, found almost exclusively in the northern part of the site, and a sequence of up to three fine-grained glacial tills of Lavery, Kent, and possible Olean age, which are separated by stratified fluvio-lacustrine deposits. These are underlain by bedrock composed of upper Devonian shales and interbedded siltstones of the Canadaway and Conneaut Groups, which dip southward at about 5 m/km (Rickard 1975).

The sediments above the second (Kent) till are generally regarded as containing all of the potential routes for the migration of contaminants from the WVDP site. (See **Hydrogeology of the West Valley Site** below for a description of these units. See also Figs. 3-1 and 3-2, which show relative locations of these sediments on the north and south plateaus.)

The most widespread glacial unit in the site area is the Kent till, deposited between 15,500 and 24,000 years ago toward the end of the Wisconsinan glaciation. At that time the ancestral Buttermilk Creek Valley was covered with ice. As the glacier receded, debris trapped in the ice was left behind in the vicinity of West Valley. Meltwater, confined to the valley by the debris dam at West Valley and the ice front, formed a glacial lake that persisted until the glacier receded far enough northward to uncover older drainage ways. As the ice continued to melt, more material was released and deposited to form the recessional sequence (lacustrine and kame delta deposits) that presently overlie the Kent till. Continued recession of the glacier ultimately led to drainage of the proglacial lake and exposure of its sediments to erosion (LaFleur 1979).

About 15,000 years ago the ice began its last advance (Albanese et al. 1984). Material from this advance covered the recessional deposits with as much as 40 meters (130 ft) of glacial till. This unit, the Lavery till, is the uppermost unit throughout much of the site. The retreat of the Lavery ice left behind another proglacial lake that ultimately drained, allowing modern Buttermilk Creek to flow northward to Cattaraugus Creek. The modern Buttermilk Creek has cut the present valley since

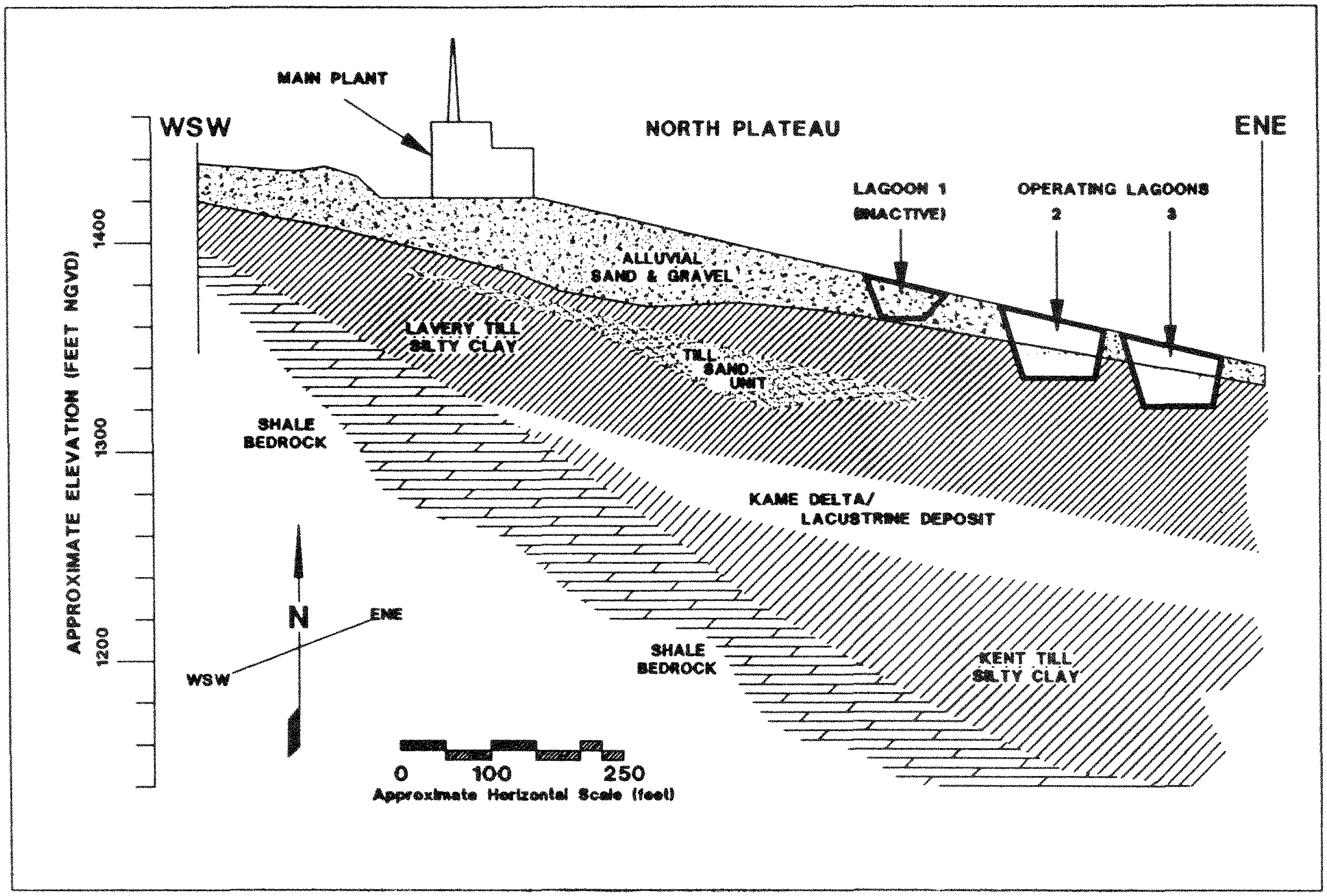


Figure 3-1. Geologic Cross Section through the North Plateau

the final retreat of the Wisconsinan glacier. Post-Lavery outwash and alluvial fans, including the fan that overlies the northern part of the WVDP, were deposited on the Lavery till between 15,000 and 14,200 years ago (LaFleur 1979).

Surface Water Hydrology

The Western New York Nuclear Service Center lies within the Cattaraugus Creek watershed, which empties into Lake Erie about 43 kilometers (27 mi) southwest of Buffalo. Buttermilk Creek, which is a tributary of Cattaraugus Creek, drains most of the WNYNSC and all of the WVDP facilities.

The WVDP site is contained within the Frank's Creek watershed; Frank's Creek is a tributary of Buttermilk Creek. The WVDP is bounded by Frank's Creek to the east and south, and Quarry Creek (a tributary of Frank's Creek) to the north. Another tributary of Frank's Creek, Erdman Brook, bisects the WVDP into a north and south plateau. (See Fig. 3-3.)

The main plant, waste tanks, and lagoons are located on the north plateau. The drum cell, the NRC-licensed disposal area (NDA), and the state-licensed disposal area (SDA) are on the south plateau.

Hydrogeology of the West Valley Site

Unweathered Lavery Till and Recessional Sequence on the North and South Plateaus

The Lavery till is predominantly an olive gray, silty clay glacial till with scattered pods or masses of silt and sand. The till ranges up to 30 meters (100 ft) in thickness beneath the active areas of the site, generally increasing towards Buttermilk Creek and the center of the bedrock valley. The Lavery till is the surficial unit on the south plateau and is the host formation for wastes buried in the SDA and NDA; on the north plateau the Lavery till is immediately overlain by the surficial sand and gravel layer. Groundwater flow in the unweathered till is predominantly vertically downward, towards the underlying recessional sequence. The hydraulic conductivity of the unweathered till ranges from 10^{-8} to 10^{-7} cm/sec (10^{-5} to 10^{-4} ft/day). Values of vertical and horizontal hydraulic conductivity obtained from laboratory analysis of undisturbed cores and field analyses of piezometer recovery data suggest that the unweathered till is essentially isotropic, i.e., it has equal flow properties in both vertical and horizontal directions.

The underlying recessional sequence, commonly called the lacustrine unit, consists of alternating deposits of lacustrine clayey silts and coarser kame delta and outwash type of sands and gravels. These deposits underlie the Lavery till beneath most of the site, pinching out along the southwestern corner where the bedrock valley intersects the sequence. Groundwater flow is predominantly to the northeast, towards Buttermilk Creek, at an estimated velocity of 13 cm/year (0.4 ft/yr). The hydraulic conductivity is approximately 10^{-6} cm/sec (10^{-3} ft/day). Recharge comes from the overlying till and the bedrock in the southwest, and discharge is to Buttermilk Creek. Underneath the recessional sequence is the less permeable Kent till.

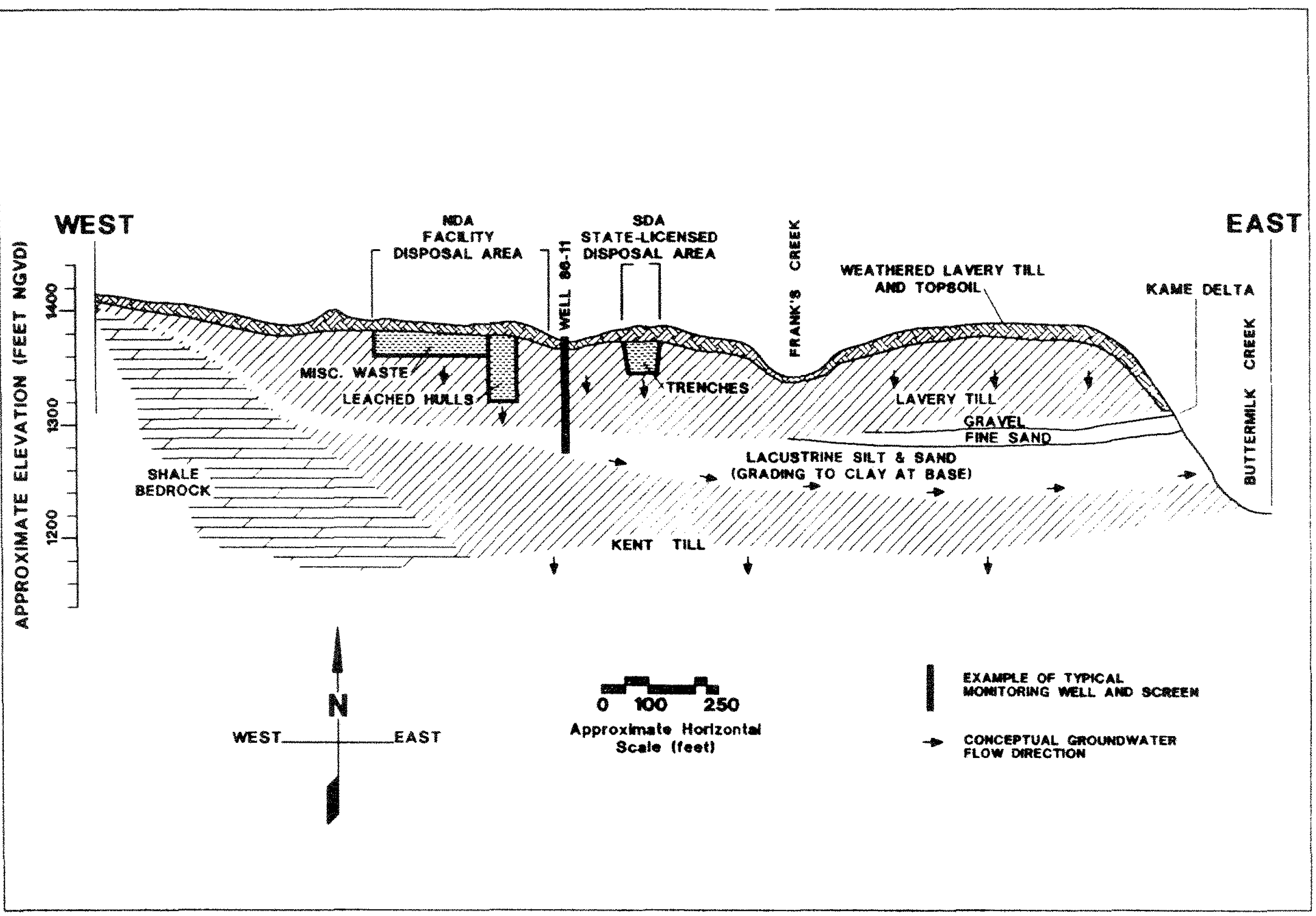


Figure 3-2. Geologic Cross Section through the South Plateau

North Plateau

Surficial Sand and Gravel Layer

The surface of the north plateau is covered by a silty sand and gravel layer composed of younger Holocene alluvial deposits that overlie older Pleistocene-age glaciofluvial deposits. Together, these two layers range up to 12.5 meters (41 ft) in thickness near the center of the plateau and are absent along the northern, eastern, and southern edges of the plateau, where they have been removed by erosion.

Depth to groundwater within this layer varies from 0 meters to 5 meters (0 ft to 16 ft), being deepest generally beneath the central north plateau (beneath the main plant facilities) and intersecting the surface farther north towards the security fence. Groundwater in this layer generally flows across the north plateau from the southwest (near Rock Springs Road) to the northeast (towards Frank's Creek) with an average velocity of 18.6 m/yr (61 ft/yr). The mean hydraulic conductivity is 1.5×10^{-4} cm/sec (0.43 ft/day). Groundwater near the northwestern and southwestern margins of the sand and gravel layer flows radially outward toward Quarry Creek and Erdman Brook, respectively. A very small percentage of groundwater flows downward into the underlying Lavery till.

Till-Sand

On-site investigations from 1989 through 1990 have identified a sandy unit of limited areal extent and variable thickness within the Lavery till, primarily beneath the north plateau. This unit, called the till-sand, was not specifically identified in previous studies as a hydrologic unit. Groundwater flow through this unit is limited, and surface discharge locations have not been observed.

South Plateau

Weathered Lavery Till

On the south plateau, the upper portion of Lavery till exposed at the surface is referred to as the weathered till. It is physically distinct from the underlying unweathered till, as it has been oxidized to a brown color and contains numerous fractures and root tubes. The thickness of this layer generally varies from 0.9 to 4.9 meters (3 to 16 ft). On the north plateau, the weathered till layer is much thinner or nonexistent.

Groundwater that occurs in the upper 4.5 meters (15 ft) flows both horizontally and vertically. This enables the groundwater to move laterally across

Measuring a Soil Core Sample

the plateau before moving downward into the unweathered Lavery till or discharging to nearby land-surface depressions or stream channels. The hydraulic conductivity of the weathered till varies from 10^{-8} to 10^{-5} cm/sec (10^{-5} to 10^{-2} ft/day), with the highest conductivities associated with fracture zones.

Groundwater Monitoring Program Overview

An expanded groundwater monitoring program was phased in during 1991. The 105 groundwater monitoring points provided radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs) and of general site-wide conditions. A full schedule of monitoring for all points was in effect for all of 1992. Two additional sampling points were added for the second half of the year, bringing the total to 107 monitoring points. On-site groundwater monitoring point locations are shown on Figure 3-3.

Monitoring includes the five different geologic units discussed above: the sand and gravel unit, the weathered Lavery till, the unweathered Lavery till, the till-sand unit, and the lacustrine unit. Table 3-1 lists the twelve identified super solid waste management units, the well position within the waste management unit, the geologic unit monitored, and the depth of each well. Figure 3-3 shows the outline of these twelve super solid waste management units at the West Valley Demonstration Project. (Twenty-one of the wells are in the state-licensed disposal area [SDA] and are the responsibility of the New York State Energy Research and Development Authority [NYSERDA]. Although the state-licensed disposal area is a closed radioactive waste landfill contiguous to the Project premises, the WVDP is not responsible for the facilities or activities relating to it. Under a joint agreement with NYSERDA, however, the Project provides specifically requested technical support to NYSERDA in SDA-related matters.)

Groundwater monitoring fulfills multiple technical and regulatory requirements, which are summarized in the site's ENVIRONMENTAL MONITORING PROGRAM PLAN (West Valley Nuclear Services 1992), the draft SAMPLING AND ANALYSIS PLAN FOR THE GROUNDWATER MONITORING NETWORK (West Valley Nuclear Services 1990), the annual site GROUNDWATER PROTECTION MANAGEMENT PROGRAM PLAN, (West Valley Nuclear Services 1990), and the draft RCRA FACILITY INVESTIGATION WORK PLAN (West Valley Nuclear Services 1992).

The data generated as part of the groundwater monitoring program also will be used to support preparation of an environmental impact statement (EIS) that will assess the effect of Project completion and site closure or long-term management.

Four designations are often used to indicate a well's function within a groundwater monitoring program:

Upgradient well. A well installed hydraulically upgradient of the unit under study that is capable of yielding groundwater samples that are representative of local conditions and that are not affected by the unit in question.

Downgradient well. A well installed hydraulically downgradient of the unit that is capable of detecting the migration of contaminants from the unit under study.

Background well. A well installed hydraulically upgradient of all waste management units that is capable of yielding groundwater samples that are representative of natural conditions. In some cases upgradient wells may be downgradient of other units, which makes them unsuitable for use as true background wells. However, they are still useful for providing upgradient information about the unit under study.

Crossgradient well. A well installed to the side of the major downgradient flow path.

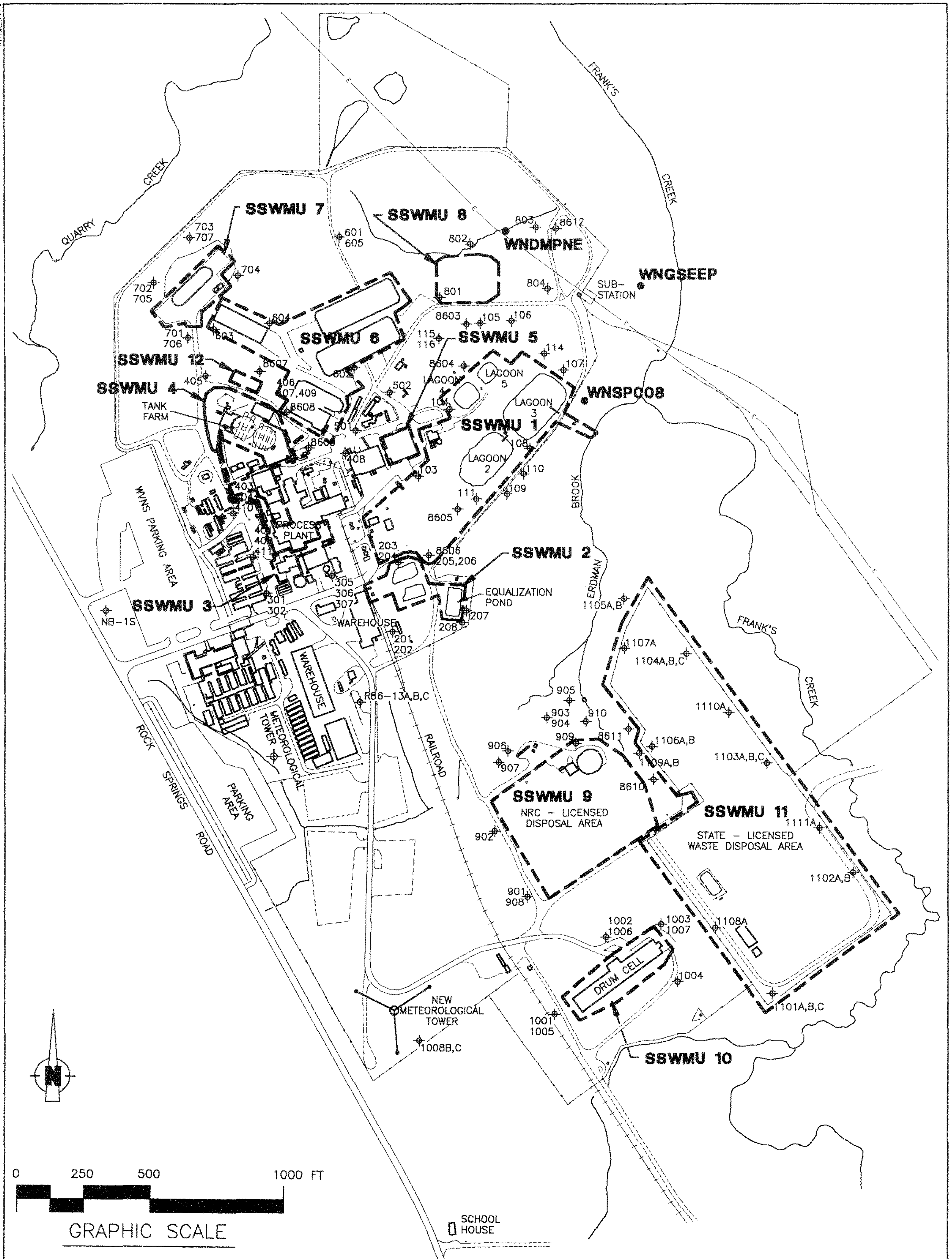


Figure 3-3. Location of On-Site Groundwater Monitoring Network Wells.

TABLE 3-1

GROUNDWATER MONITORING NETWORK: SUPER SOLID WASTE MANAGEMENT UNITS

SSWMUs and Constituent SWMUs	Well Identification Number	Geological Unit Monitored	Well Position in SSWMU	Depth (ft) Below Grade
SSWMU No. 1 - Low-Level Waste Treatment Facilities:				
	WNW0103	S	U	21.00
• Former Lagoon 1	WNW0104	S	U	23.00
• LLWTF Lagoons	WNW0105	S	D	28.00
• LLWTF Building	WNW0106	S	D	14.50
• Interceptors	WNW0107	U	D	28.00
• Neutralizer Pit	WNW0108	U	D	33.00
	WNW0109	U	D	33.00
	WNW0110	U	D	33.00
	WNW0111	S	D	11.00
	WNW0114	U	D	29.00
	WNW0115	U	D*	28.00
	WNW0116	S	D*	11.00
	WNW8603	S	D*	25.42
	WNW8604	S	C*	23.00
	WNW8605	S	D	13.00
	WNSP008	Groundwater French Drain Monitoring Point		
SSWMU No. 2 - Miscellaneous Small Units:				
	WNW0201	S	U	20.00
• Sludge Ponds	WNW0202	TS	U	38.00
• Solvent Dike	WNW0203	S	U	18.00
• Effluent Mixing Basin	WNW0204	TS	U	43.00
• Paper Incinerator	WNW0205	S	D	11.00
	WNW0206	TS	D	37.80
	WNW0207	S,[U]	D	11.00
	WNW0208	TS	D	23.00
	WNW8606	S	D	13.00
SSWMU No. 3 - Liquid Waste Treatment System:				
	WNW0301	S	U	16.00
• Liquid Waste Treatment System	WNW0302	TS	U	28.00
	WNW0305	S	D*	31.00
• Cement Solidification System	WNW0306	L	D*	81.00
• Main Process Bldg. (specific areas)	WNW0307	S	D*	16.00
• Background (North Plateau)	WNWNB1S	S,[W]	B	13.00

Key:

* Position to be further evaluated
Well position in SSWMU: U = upgradient; D = downgradient; B = background; C = crossgradient
Geologic Unit. Primary units monitored are: W = weathered till; U = unweathered till; S = sand and gravel; L = lacustrine; TS = till-sand
Units enclosed in brackets indicate the geologic unit is only a secondary monitoring unit.

TABLE 3-1 (continued)

GROUNDWATER MONITORING NETWORK: SUPER SOLID WASTE MANAGEMENT UNITS

SSWMUs and Constituent SWMUs	*Well Identification Number*	*Geological Unit Monitored*	*Well Position in SSWMU*	*Depth (ft) Below Grade*
SSWMU No. 4 - HLW Storage and Processing Area:				
	WNW0401	*S,[U]*	*U*	*16.00*
• *Vitrification Facility*	*WNW0402*	*TS*	*U*	*29.00*
• *Vitrification Test Tanks*	*WNW0403*	*S*	*U*	*13.00*
• *HLW Tanks*	*WNW0404*	*TS*	*U*	*36.50*
• *Supernatant Treatment System*	*WNW0405*	*U*	*D*	*12.50*
	WNW0406	*S*	*D*	*16.80*
	WNW0407	*L,[U]*	*D*	*75.50*
	WNW0408	*S*	*D*	*38.00*
	WNW0409	*U*	*D*	*55.00*
	WNW0410	*L*	*U*	*78.00*
	WNW0411	*L,[U]*	*U*	*65.50*
	WNW8607	*S*	*D*	*18.75*
	WNW8608	*S*	*D*	*19.00*
	WNW8609	*S*	*D*	*25.00*
SSWMU No. 5 - Maintenance Shop Leach Field:				
	WNW0501	*S*	*U*	*33.00*
• *Maintenance Shop Leach Field*	*WNW0502*	*S*	*D*	*18.00*
SSWMU No. 6 - Low-Level Waste Storage Area:				
	WNW0601	*S*	*D*	*6.00*
• *Hardstands (Old and New)*	*WNW0602*	*S*	*D*	*13.00*
• *Lag Storage*	*WNW0603*	*S*	*U*	*13.00*
• *Lag Storage Additions*	*WNW0604*	*S*	*D*	*11.00*
	WNW0605	*S,[U]*	*D*	*11.00*
	WNW8607	*S*	*U*	*18.75*
	WNW8608	*S*	*U*	*19.00*
SSWMU No. 7 - CPC Waste Storage Area:				
	WNW0701	*TS*	*U*	*28.00*
• *CPC Waste Storage Area*	*WNW0702*	*U*	*D*	*38.00*
	WNW0703	*U*	*D*	*21.00*
	WNW0704	*U*	*D*	*15.50*
	WNW0705	*U*	*D*	*21.00*
	WNW0706	*S*	*U*	*11.00*
	WNW0707	*U,[W]*	*D*	*11.00*

Key:

* *Position to be further evaluated*
Well position in SSWMU: U = upgradient; D = downgradient; B = background; C = crossgradient
Geologic Unit. Primary units monitored are: W = weathered till; U = unweathered till; S = sand and gravel; L = lacustrine; TS = till-sand
Units enclosed in brackets indicate the geologic unit is only a secondary monitoring unit.

TABLE 3-1 (continued)

GROUNDWATER MONITORING NETWORK: SUPER SOLID WASTE MANAGEMENT UNITS

SSWMUs and Constituent SWMUs	Well Identification Number	Geological Unit Monitored	Well Position in SSWMU	Depth (ft) Below Grade
SSWMU No. 8 - Construction and Demolition Debris Landfill:				
	WNW0801	S	U	17.50
• **Former Construction and Demolition Debris Landfill**	WNW0802	S,[U]	D	11.00
	WNW0803	S	D	18.00
	WNW0804	S	U	9.00
	WNGSEEP	Groundwater Seepage		
	WNDMPNE	Monitoring Points		
	WNW8612	S	D	18.83
SSWMU No. 9 - NRC-Licensed Disposal Area:				
	WNW0901	L,[U]	U	136.0
• **NRC-Licensed Disposal Area**	WNW0902	L,[U]	U	128.0
• **Container Storage Area**	WNW0903	L,[U]	D*	133.0
• **Trench Interceptor Project**	WNW0904	U	D	26.00
	WNW0905	TS	D	23.00
	WNW0906	W	D*	10.00
	WNW0907	W,[U]	D*	16.00
	WNW0908	W,[U]	U	21.00
	WNW0909	W,[U]	D	23.0
	WNW0910	U	D	29.6
	WNW8610	L	D	114.0
	WNW8611	L	D	120.0
SSWMU No. 10 - IRTS Drum Cell:				
	WNW1001	L,[U]	U	116.0
• **IRTS Drum Cell**	WNW1002	L,[U]	D	113.0
	WNW1003	L	D	138.0
	WNW1004	L,[U]	D	108.0
	WNW1005	W,[U]	U	19.00
	WNW1006	W,[U]	D	20.00
	WNW1007	W,[U]	D	23.00
• **Background (South Plateau)**	WNW1008B	L,[U]	B	51.00
	WNW1008C	W,[U]	B	18.00

Key:

* *Position to be further evaluated*
Well position in SSWMU: U = upgradient; D = downgradient; B = background; C = crossgradient
Geologic Unit. Primary units monitored are: W = weathered till; U = unweathered till; S = sand and gravel; L = lacustrine; TS = till-sand
Units enclosed in brackets indicate the geologic unit is only a secondary monitoring unit.

TABLE 3-1 (concluded)

GROUNDWATER MONITORING NETWORK: SUPER SOLID WASTE MANAGEMENT UNITS

SSWMUs and Constituent SWMUs	Well Identification Number	Geological Unit Monitored	Well Position in SSWMU	Depth (ft) Below Grade
SSWMU No. 11 - State-Licensed Disposal Area:				
	WNW1101A	W,[U]	U	16.00
• State-Licensed Disposal Area (SDA) [NYSERDA]	WNW1101B	U	U	30.00
	WNW1001C	L	U	110.0
	WNW1102A	W,[U]	D	17.00
	WNW1102B	U	D	31.00
	WNW1103A	W,[U]	D	16.00
	WNW1103B	U	D	26.00
	WNW1103C	L	D	111.0
	WNW1104A	W,[U]	D	19.00
	WNW1104B	U	D	36.00
	WNW1104C	L	D	114.0
	WNW1105A	U	D	21.00
	WNW1105B	U	D	36.00
	WNW1106A	W,[U]	U	16.00
	WNW1106B	U	U	31.00
	WNW1107A	W,[U]	D	19.00
	WNW1108A	W,[U]	U	16.00
	WNW1109A	W,[U]	U	16.00
	WNW1109B	U	U	31.00
	WNW1110A	W,[U]	D	20.00
	WNW1111A	U	D	21.00
SSWMU #12 - Hazardous Waste Storage Lockers	(No wells installed for SSWMU #12)			
Motor Fuel Storage Area (Monitors Underground Storage Tanks. Not a SSWMU.)	R8613A	S,[U]	C	8.00
	R8613B	S	C	8.00
	R8613C	S	D	6.50

Key:

* Position to be further evaluated
Well position: U = upgradient; D = downgradient; B = background; C = crossgradient
Geologic Unit. Primary units monitored are: W = weathered till; U = unweathered till; S = sand and gravel; L = lacustrine; TS = till-sand
Units enclosed in brackets indicate the geologic unit is only a secondary monitoring unit.

Table 3-1 identifies the position of a well relative to the waste management unit monitored. The wells monitoring a given geologic unit (e.g., sand and gravel, lacustrine) also may be arranged in a generalized upgradient to downgradient order based upon their location within the geologic unit. The hydraulic position of a well relative to a super solid waste management unit (SSWMU), i.e., upgradient or downgradient, does not necessarily match that same well's position within a geologic unit. For example, a well that is upgradient in relation to a SSWMU may be located at any position within a geologic unit, depending on the geographic position of the SSWMU within the geologic unit. In general, the following text and graphics refer to the hydraulic position of monitoring wells within their respective geologic units, thus providing a site-wide geologic unit perspective.

Initial sampling of selected wells in the expanded network began in 1990. All wells were gradually incorporated into the program during 1991, and the entire expanded network followed a full sampling schedule in 1992 (Table 3-2) except for the two wells that were added to the network in 1992 (WNW0909 and WNW0910).

The wells were sampled for indicator, groundwater, and drinking water parameters. The one-year planned sampling for U.S. EPA interim primary drinking water standards to establish a baseline for water quality was completed in 1992.

Groundwater Sampling Parameters

The three categories of groundwater sampling parameters, collected as noted in Table 3-3, are contamination indicator parameters, groundwater quality parameters, and EPA interim primary drinking water quality parameters. Table 3-2 indicates the sampling schedule for these parameters during 1992.

Contamination indicator parameters: Samples were collected eight times a year. Monitoring the contamination indicator parameters helps to identify more quickly any potential effect of past or present site operations.

Groundwater quality parameters: Samples were collected two times a year. The groundwater quality parameters selected provide information on the major chemical constituents of the groundwater.

EPA interim primary drinking water quality parameters: Samples were collected four times a year for one year only. These samples establish a baseline for water quality and allow comparison with the drinking water and groundwater standards.

Sampling Methodology

Samples are collected from the monitoring wells using either Teflon well bailers or bladder pumps. Both of these methods meet all regulatory requirements for groundwater sample collection.

The method of collection used depends on well construction, water depth, and the water-yielding characteristics of the well. Teflon bailers are used in wells with low standing volume; bladder pumps are used in wells with good water-yielding characteristics.

The Teflon bailer, a tube with a check valve at the bottom and the top, is lowered into the well until it reaches the desired point in the water column. The bailer is lowered slowly to ensure that the water column is not agitated and is then withdrawn from the well with a sample and emptied into a sample container. The bailer, bailer line, and bottom-emptying device used to drain the bailer are dedicated to the well, i.e., are used exclusively for that well at all times.

Bladder pumps use compressed air to gently squeeze a Teflon bladder, encased in a stainless steel tube, that is located near the bottom of the well. The air forces water out of a sample line extending from the pump to the top of the well. When the pressure is released, new groundwater flows into the bladder. A series of check valves ensures that the water flows only in one direction. The drive air is always kept

Table 3 - 2

1992 Schedule for Expanded Groundwater Monitoring Network

Date	*Sample Rep*	*Contamination Indicator Parameters Scheduled and Collected*	*Groundwater Quality Parameters Scheduled and Collected*	*Drinking Water Quality Parameters Scheduled and Collected*
1/1/92 - 2/15/92	1	F		
2/16/92 - 3/31/92	2	F		F
4/1/92 - 5/8/92	3	F		
7/10/92 - 8/15/92	4	F	F	P
11/1/92 - 11/29/92	5	F		
8/16/92 - 9/30/92	6	F		
10/1/92 - 10/31/92	7	F		
11/30/92 - 12/31/92	8	F	F	P
Total Sample Sets per Well in 1992:		**8**	**2**	**1-3**

Key:

F = All wells sampled for full parameters.

P = Project wells only were sampled for full parameters.

Table 3-3

Schedule of Groundwater Sampling and Analysis

Contamination Indicator Parameters **(Scheduled eight times per year)**	*pH** *Total Organic Carbon* † *Gross Alpha* *Gamma Scan* *Conductivity** *Total Organic Halogens* *Gross Beta* *Tritium* *Volatile Organic Analysis*
Groundwater Quality Parameters **(Scheduled two times per year)**	*Chloride* *Iron* *Sodium* *Manganese* *Phenols* *Sulfate* *Magnesium* *Nitrate + Nitrite-N* *Calcium* *Potassium* *Ammonia* *Bicarbonate/Carbonate*
EPA Interim Primary Drinking Water Quality Parameters **(Scheduled four times per year, one year only)**	*Arsenic* *Barium* *Cadmium* *Chromium* *Lead* *Mercury* *Selenium* *Silver* *Fluoride* *Endrin* *Methoxychlor* *2,4 D* *Radium* *Nitrate + Nitrite-N* *Lindane* *Toxaphene* *2,4,5 - TP (Silvex)* *Turbidity**

* *Field measurement.*
† *Includes non-purgeable organic carbon only.*

separate from the sample and is expelled to the surface by a separate line.

Bladder pumps reduce mixing and agitation of the water in the well. Each bladder pump system is dedicated to its individual well to reduce the likelihood of sample contamination from external materials or cross contamination. The compressor and air control box can be used from well to well because they do not contact the sample.

To ensure that only representative groundwater is sampled, three well volumes are removed (purged) from the well before the actual samples are collected. If three well-casing volumes cannot be removed because of limited recharge, purging the well to dryness achieves the same results. Conductivity and pH are measured before and after sampling to help determine if the quality of the groundwater changed while samples were being collected.

Immediately after the samples are collected they are put into a cooler and returned to the Project's Environmental Laboratory. The samples are then either packaged for overnight delivery to an off-site contract laboratory or put into controlled storage to await on-site testing.

Ten off-site wells, sampled for radiological parameters, pH, and conductivity, were also part of the groundwater monitoring program during 1992. These wells are used by site neighbors as sources of drinking water (Fig. 3-4).

Groundwater Monitoring Results

Results of the 1992 groundwater monitoring program are summarized below. These results reflect the first comprehensive compilation of data from the expanded groundwater program. Complete data are found in *Appendix E.*

Following last year's format, this year's results are grouped and summarized based upon the five geologic units. The purpose of grouping results based on geologic units is two-fold: it presents the results of the groundwater monitoring program on a site-wide basis, and it provides an overview of the results of the groundwater monitoring program that may form the basis for additional reports to follow. More detailed assessments of potential effects of SSWMUs on the environment will be prepared in accordance with the site's RCRA FACILITY INVESTIGATION WORK PLAN, as required by the RCRA 3008(h) Order on Consent.

There are many aspects to the successful implementation of the WVDP's groundwater monitoring program, all of which are integral to generating high quality results representative of the groundwater environment. Some of these aspects include the proper placement of groundwater monitoring wells, the use of appropriate methods to collect samples and to identify and track samples and analytical results, thorough review of analytical data and quality control information, and appropriate methods of presenting, summarizing, and evaluating the resulting data.

Presentation of Results in Tables

Appendix E contains tables showing individual results of sampling for contamination indicator parameters, (Tables E-1 through E-5), groundwater quality parameters, (Tables E-6 through E-10), and EPA interim primary drinking water quality parameters, (Table E-13 through E-17). These parameters are listed in Table 3-3.

The tables in *Appendix E* present the results of the groundwater monitoring program grouped according to the five different geologic units monitored: the sand and gravel unit, the till-sand unit, the unweathered lavery till unit, the lacustrine unit, and the weathered lavery till unit. Results of sampling for volatile organic compounds, part of the contamination indicator parameter grouping, are reported only where confirmed positive values

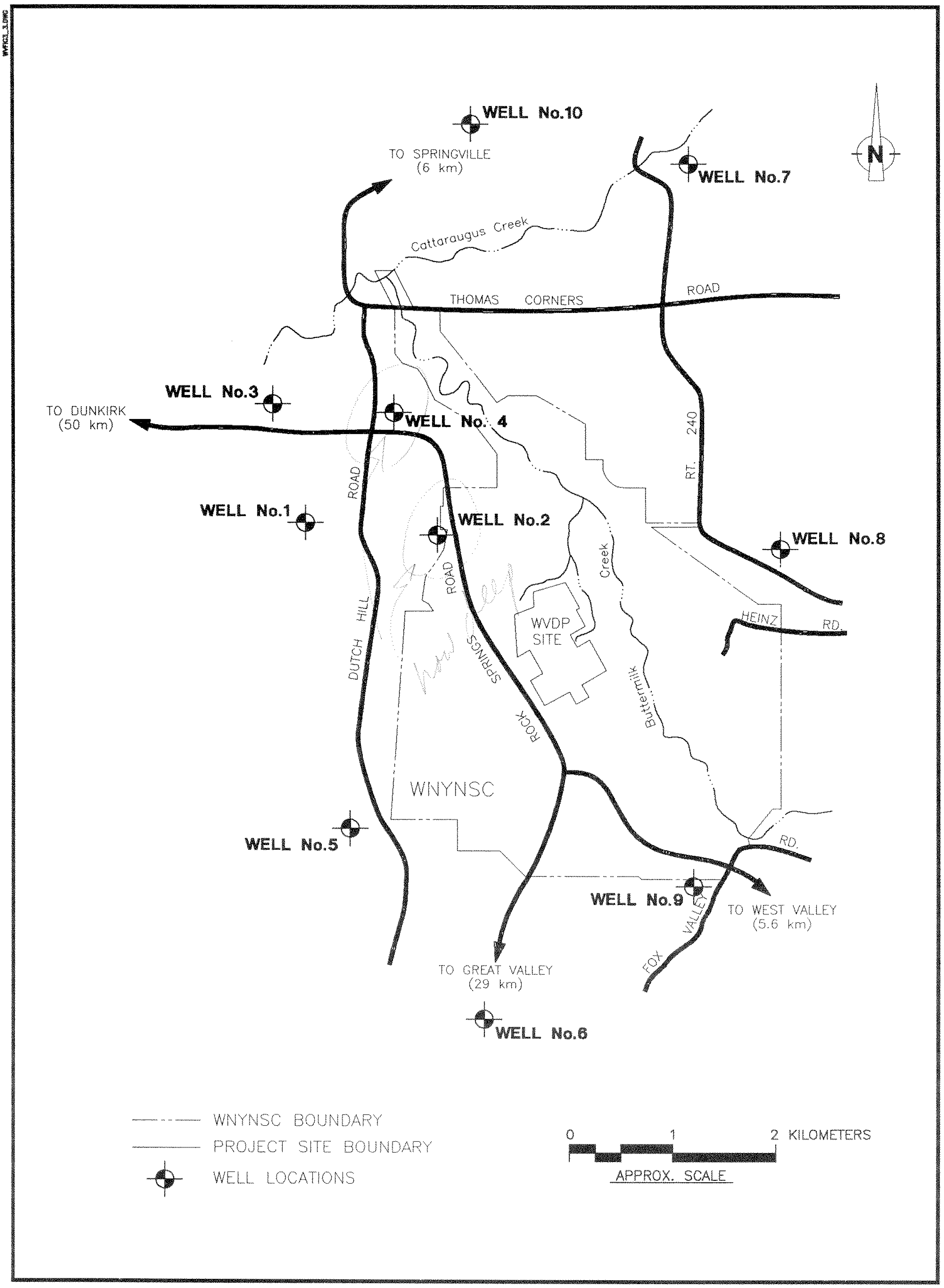


Figure 3-4. Off–Site Groundwater Monitoring Points.

were obtained. (See *Appendix E*, Table E-12, and **Results of Monitoring Site Groundwater for Volatile Organic Compounds** below.)

The tables summarizing the contamination indicator parameters also include general information about each well's hydraulic position relative to other wells within the same geologic unit. These positions are identified as "UP," which refers to either background or upgradient wells, and "DOWN - B," "DOWN - C," and "DOWN - D." Upgradient locations are designated "UP" because they are upgradient of all the other locations. Downgradient locations are designated B, C, or D to indicate their positions relative to each other. For example, wells denoted as "DOWN - C" in the sand and gravel unit are downgradient of "UP" and "DOWN - B" wells and upgradient to "DOWN - D" wells. These groupings have been used in order to provide a logical basis for presenting the groundwater monitoring data in the tables and graphics within this report.

The tables of contamination indicator data also give information about the sample collection period. The groundwater collection year is divided into two semi-annual periods. Each semi-annual period is divided into evenly spaced six-week periods, called "reps," during which each well is sampled once for the specific constituents listed on Table 3-3. The fourth sample rep, originally scheduled to start in mid-May, was collected starting in July because RCRA land disposal restrictions temporarily suspended groundwater sample collection. Consequently, five reps instead of four were taken in the second half of 1992. The sample rep indicates the constituents analyzed, not necessarily the date of the sampling. (See Table 3-2 and Table 3-3.)

Presentation of Results in Graphs

A second way in which groundwater monitoring results are presented is through graphs that show trends in the data or that summarize large amounts of data into an interpretable format. Three different graphic aids are used in this report:

Multiple Box-and-Whisker Plots: The multiple box-and-whisker plot is used to present contamination indicator data well by well for all wells grouped within the same geologic unit. All individual analytical results obtained for a selected parameter (pH, conductivity, total organic carbon, total organic halogens, gross alpha, gross beta, and tritium) were used to form the dimensions of the box-and-whisker diagram for each well within a given geologic unit. Box-and-whisker plots allow results of similar sample analyses for all wells within a geologic unit to be visually compared to each other.

Figure 3-5 is an example of a multiple box-and-whisker plot.

- The horizontal line within the box shows the median of the data set for a given well.

- The box outline itself shows the range of the middle 50% of the data for a given well (the upper and lower quartiles).

- The whisker extension shows the range of the data for a given well. (Values beyond 1.5 times the length of the box are plotted as individual points.)

The sample counting results for gross alpha, gross beta, and tritium, even if below the minimum detectable concentration, were used to generate the box-and-whisker plots. Thus, negative values were included. This is most common for the gross alpha analyses, where sample radiological counting results may be lower than the associated instrument background. In these cases, the sample results would be reported as "less than" values in the data tables in *Appendix E*.

All box-and-whisker plots shown in this section present the upgradient wells on the left side of the figure with the upgradient location code prefixed with the letter "A." Downgradient locations are plotted to the right and use the letters "B" through

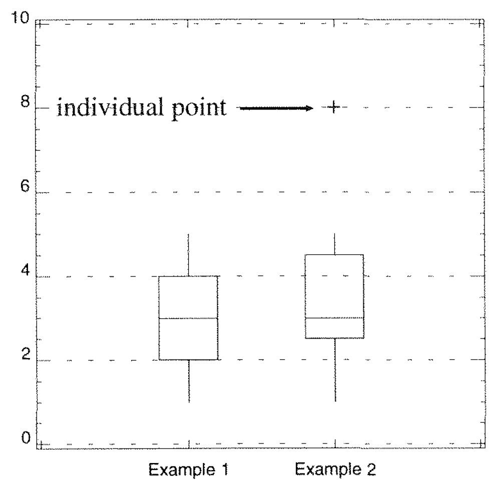


Figure 3-5. Sample Box-and-Whisker Plot

"D," as discussed above, to distinguish relative position within the downgradient flow regime. A well that plots higher in the box-and-whisker plot than the upgradient wells (for example, the well coded C0103 in Fig. 3-7 for pH) indicates that chemistry for that constituent is different than the upgradient well.

Trend Plot: Trend plots or line plots can show how concentrations of a particular parameter change over time at selected monitoring locations. Results for the volatile organic compounds 1,1-dichloroethane (1,1-DCA) and 1,1,1-trichloroethane (1,1,1-TCA) are plotted using this format. (See Fig. 3-42.) Long-term trends of gross beta and tritium for selected groundwater monitoring locations are also shown in Figures 3-43 and 3-44.

Pie Charts: Pie charts showing the major ion composition of groundwater for each well are found in *Appendix E*. These charts were constructed using averaged results of two samples collected for the major cations (calcium, magnesium, sodium, and potassium) and anions (chloride, sulfate, bicarbonate and carbonate and, in some cases, hydroxide). The pie charts also indicate how the levels of cations and anions in the sample balance. Figure 3-6 is an example of a pie chart.

Results of Contamination Indicator Monitoring of the Sand and Gravel Unit

Figures 3-7 through 3-13a show box-and-whisker plots for selected contamination indicator parameters for forty-four wells monitoring the sand and gravel unit of the north plateau of the WVDP. Background site conditions are monitored

- Percentage composition for cations is shown in the upper half of the circle
- Percentage composition for anions is shown in the lower half of the circle
- Difference between the radii of the two circles indicates the measured cation and anion balance expressed in meq/L

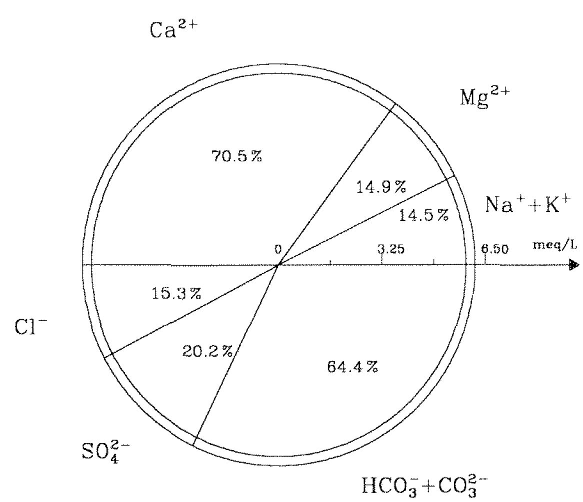


Figure 3-6. Sample Pie Chart

by well WNWNB1S (coded ANB1S on the box-and-whisker plots), and upgradient monitoring is provided by wells WNW0301, WNW0401, and WNW0403 (coded A0301, A0401, and A0403, respectively, in the figures). These four wells are shown in the first four positions on the left of the box-and-whisker charts. Tabular contamination indicator data are presented in *Appendix E*, Table E-1.

Downgradient conditions are monitored at forty locations within the sand and gravel unit. These locations are subdivided into three categories according to the well's general position within the groundwater flow regime. For example, downgradient wells prefixed with "B" in the figures are nearest to the background or upgradient wells (prefixed "A"), while wells prefixed with a "D" are farthest downgradient.

Wells monitoring downgradient conditions in the sand and gravel unit are part of the monitoring network for eight of the identified on-site SSWMUs and for the motor fuel storage area. The SSWMUs monitored by wells in the sand and gravel unit are: SSWMU #1 — the low-level waste treatment facility, SSWMU #2 — miscellaneous small units, SSWMU #3 — the liquid waste treatment system, SSWMU #4 — the high-level waste storage and processing area, SSWMU #5 — the maintenance shop leach fields, SSWMU #6 — the low-level waste storage area, SSWMU #7 — the chemical process cell waste storage area, and SSWMU #8 — the construction and demolition debris landfill. (See Table 3-1, which identifies the SSWMUs and associated individual SWMUs, the geologic unit monitored, and the depth of each well.)

The box-and-whisker plots for the sand and gravel geologic unit show elevated levels of pH at well WNW0103 (coded C0103 in the box-and-whisker plots) and elevated levels of conductivity in wells WNW0103, WNW0205, and WNW8606. Well WNW0103 is part of the monitoring network for the low-level waste treatment facility (SSWMU #1) and is located in the vicinity of a spill of caustic sodium hydroxide that occurred in 1984. Results of groundwater quality analyses of WNW0103 water indicate that elevated levels of sodium and hydroxide have contributed to these elevated levels of conductivity. The levels of pH, the conductivity, and concentrations of associated anions and cations have declined during monitoring performed during 1992 at this location. Wells WNW0205 and WNW8606 are next to each other and monitor groundwater downgradient of the sludge ponds in SSWMU #2. Elevated conductivity values at these locations may be attributed primarily to elevated levels of sodium and chloride. This is shown in the groundwater quality pie plots of major cations and anions in *Appendix E*, Figure E-1 for these two wells. The pH levels for all other sand and gravel wells appear to rest within a normal environmental range.

Figures 3-9 and 3-10 show the box-and-whisker plots for total organic carbon (TOC) and total organic halogens (TOX). Wells WNW0111 and WNW8605 are both near former lagoon 1 in SSWMU #1 and show similarly elevated levels of both TOC and TOX. Wells WNW0205 and WNW8606 are located next to each other in SSWMU #2 and also show very similar levels of TOC and TOX. Well WNW0103 also exhibits an elevated level of TOC. The box-and-whisker plots show fairly tight ranges, as indicated by the relatively small sizes of the central box for most of the remaining sand and gravel wells.

Results of radiological analysis of samples collected from wells monitoring the sand and gravel unit indicate various levels of tritium and gross beta activity across the unit. Results of gross alpha activity are mostly below minimum detectable concentrations except at location WNW8605, which shows seven out of eight of the analyses as positive results, and well WNW0111, which shows four out of eight of the analyses as positive results. This is indicated in Figure 3-11. Gross alpha results at these locations near former lagoon 1 are only marginally above the minimum detectable concentration.

Gross beta results are shown in Figures 3-12, 3-12a, and 3-12b. Three figures are presented to allow for adequate scaling of the y-axis. Figure 3-12 shows results for wells with the highest gross beta concentrations. The wells clearly visible on this figure, WNW0408, WNW0501, WNW0502, and WNW8605, exhibit the highest levels of gross beta activity in on-site groundwater and are very similar to results reported last year for these locations. Trends of gross beta activity for these and other selected groundwater locations are shown in Figures 3-43 and 3-43a.

Sampling with a Dedicated Bladder Pump

Figure 3-12a and 3-12b show gross beta results for the remainder of the sand and gravel wells. Background well WNWNB1S had an average gross beta concentration of 3.17E-09 µCi/mL for 1992. This compares to an average concentration of 2.32E-04 µCi/mL at well WNW0408, which had the highest level of gross beta activity. This represents an approximate 75,000-fold difference in concentration between background and this downgradient location. The available trend data for the background well WNWNB1S is included in Figure 3-43a to allow comparison to downgradient trend data.

Well WNW0408 also showed the highest level of tritium activity for the sand and gravel unit. The concentration observed during 1992 averaged 1.97E-05 µCi/mL. This compares to an average of 1.0E-07 µCi/mL for background well WNWNB1S, representing approximately a 200-fold difference in concentration between these two locations. Results for tritium monitoring of wells within the sand and gravel unit are presented in Figures 3-13 and 3-13a. Two figures are presented to show adequate scaling of the y-axis. These two figures indicate that many of the wells in the sand and gravel unit show tritium concentrations above those observed at background or upgradient locations.

The New York State groundwater quality standard (applicable to water used for drinking) for gross beta activity (1E-6 µCi/mL) was exceeded at wells WNW0408, WNW0501, WNW0502, WNW8605, WNW0111, WNW0104, and WNW8604. The New York State quality standard for tritium (2E-5µCi/mL) was exceeded only at well location WNW0408.

Monitoring of the wells in the sand and gravel geologic unit indicates some measurable effects on groundwater, primarily in areas associated with and downgradient of the main plant facility and the low-level waste treatment facility. These locations are near the central buildings on-site where various operations historically associated with fuel reprocessing have occurred. There is no indication that the groundwater from these areas affects human health or the environment because this water is not used for drinking or general facility needs. In addition, the surface water leaving the site, which includes groundwater flow from this surficial sand and gravel unit, meets the appropriate standards.

Comparisons made to both upgradient groundwater monitoring results and groundwater quality standards indicate differences that imply effects on groundwater. Identification, continued monitoring, and follow-up evaluation of these localized areas will provide the information necessary for either near-term response or eventual facility closure.

Using data obtained during the first two years of the current groundwater monitoring program, the Project is currently evaluating this program to focus on those areas of more immediate concern. Continued development of the groundwater monitoring program in this direction will ensure that adequate information is available to continue to ensure the safety of the public and the environment.

Results of Contamination Indicator Monitoring of the Till-Sand Unit

Nine wells monitor groundwater in the till-sand unit. As noted in the discussion on hydrogeology, the till-sand unit, located within the Lavery till, is limited in extent and thickness. General upgradient conditions are monitored by wells WNW0302, WNW0402, and WNW0404. Wells WNW0202, WNW0204, WNW0206, WNW0208, WNW0701, and WNW0905 monitor general downgradient conditions. Well WNW0905 may be reclassified in a different unit; this reclassification is currently being evaluated.

Figures 3-14 through 3-20 show the box-and-whisker plots for selected contamination indicator parameters for the till-sand unit. Tabular data for contamination indicator parameters for these wells are presented in *Appendix E*, Table E-2. Well WNW0202, which is 38 feet below grade, continues to show elevated levels of pH. This elevated pH condition indicates the presence of measurable hydroxide alkalinity. As indicated by conductivity measurements, the overall ion content of groundwater at WNW0202 is much lower than WNW0103, which also shows elevated levels of pH due to hydroxide. There is no clear connection between the elevated pH values observed at these two groundwater monitoring locations.

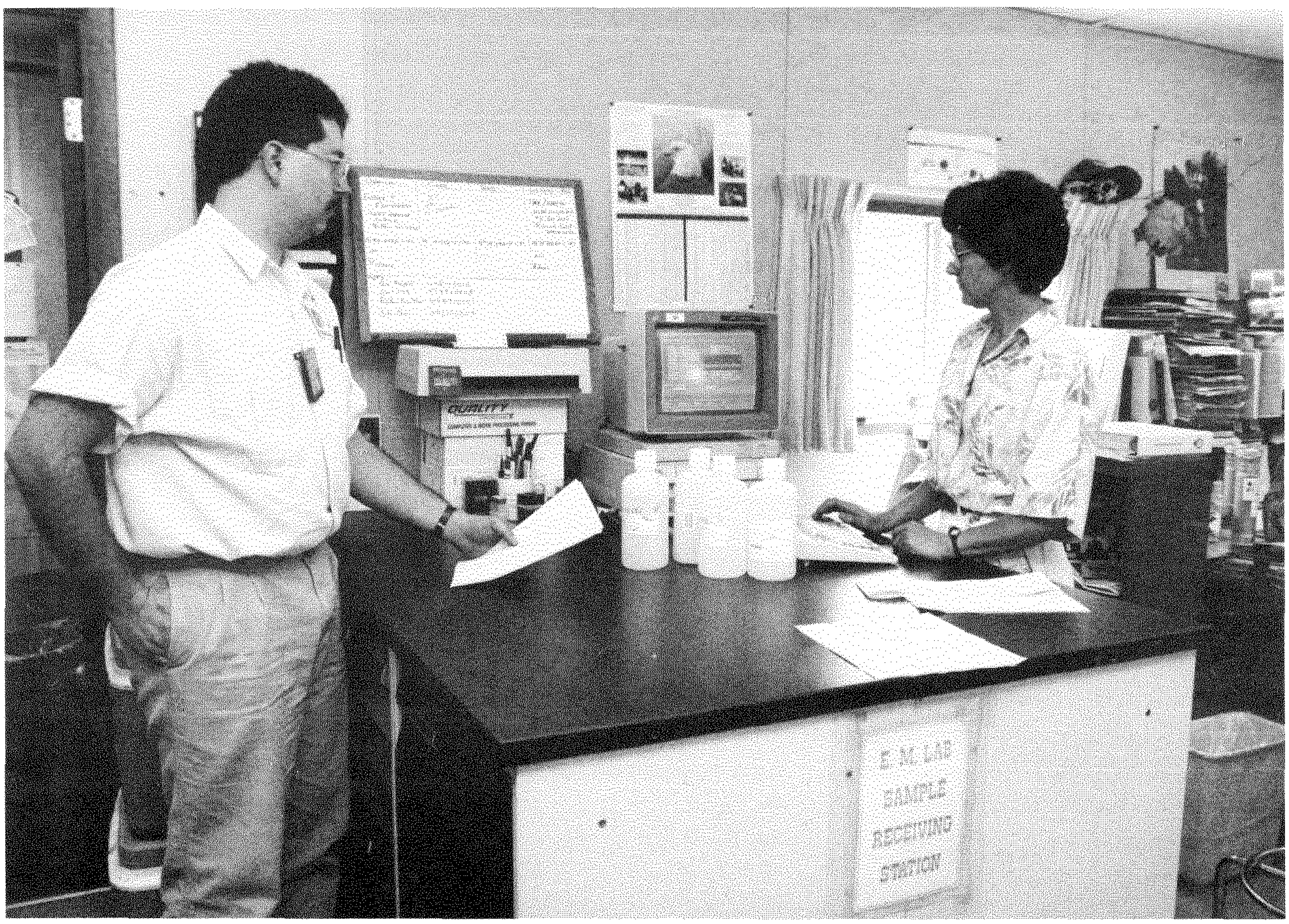
Groundwater quality pie charts for major groundwater constituents for the till-sand unit are shown in *Appendix E*, Figure E-2. The pie chart for well WNW0202 clearly shows the influence of hydroxide alkalinity on the overall ion balance of groundwater at this location. Groundwater monitoring of the surficial sand and gravel well WNW0201 at a depth of 20 feet at the same location indicates no apparent effect on pH from hydroxide. (See Fig. 3-7.)

The box-and-whisker plots for TOC and TOX, Figures 3-16 and 3-17 respectively, indicate no clear separation between upgradient and downgradient monitoring points, although TOC tends to be marginally higher than upgradient concentrations for locations WNW0202 and WNW0905.

Concentrations of all radiological constituents are low in all wells monitoring the till-sand unit, as shown in Figures 3-18 through 3-20. Marginally elevated levels of gross alpha, although below the statistically derived minimum detectable concentration, are indicated at location WNW0905. This location also shows marginally positive tritium concentrations just above the minimum detectable concentration of 1E-7 μCi/mL. This well is 23 feet below grade and is positioned downgradient of SSWMU #9, the NRC-licensed disposal area (NDA). Well WNW0202 shows marginally elevated levels of gross beta activity. The gross beta results shown for this well (*Appendix E*, Table E-2) indicate a slight decline in concentrations as monitoring progressed through 1992. Levels of gross beta and tritium are well below the New York State groundwater quality standards for these constituents (1.0E-6 μCi/mL and 2.0E-5 μCi/mL, respectively).

Results of Contamination Indicator Monitoring of the Unweathered Lavery Till Unit

Twenty-four wells monitor the unweathered Lavery till unit, which extends across both the north and south plateaus of the WVDP. General upgradient conditions of the unweathered till are monitored by wells WNW0405, WNW0704, and



Receiving Groundwater Samples at the Environmental Laboratory Computerized Receiving Station

WNW0707. Although not included as unweathered Lavery till wells, both WNW1008B and WNW1008C may provide additional background information for this unit. These latter wells are located on the western portion of the south plateau.

Wells monitoring the unweathered Lavery till are part of the monitoring network for several SSWMUs: SSWMU #1 — the low-level waste treatment facility, SSWMU #4 — the high-level waste storage and processing area, SSWMU #7 — the chemical process cell waste storage area, SSWMU #9 — the NRC-licensed disposal area, and SSWMU #11 — the state-licensed disposal area for which New York State Energy Research and Development Authority (NYSERDA) is responsible. In addition, most of the wells monitoring SSWMU #10, the IRTS drum cell, may provide useful information about this unit even though they are classified as monitoring primarily the weathered Lavery till or the lacustrine unit. Results of groundwater contamination indicator monitoring for the unweathered Lavery till geologic unit are shown in the box-and-whisker Figures 3-21 through 3-27. Tabulated data are presented in *Appendix E*, Table E-3.

There are no particularly noteworthy anomalies for pH or conductivity data for wells within this geologic unit.

Concentrations of both total organic carbon (Fig. 3-23) and total organic halogens (Fig. 3-24) are elevated at well WNW0704. This well, although generally positioned upgradient in the unweathered Lavery till, is located downgradient in SSWMU #7 and is 15.5 feet deep. Well WNW0910 also indicates a level of total organic carbon that appears higher than concentrations for other wells monitoring this geologic unit. Monitoring at well WNW0910 began in 1992, following installation in the region downgradient of SSWMU #9. Because of the later installation, only two complete sample sets were collected from this location in 1992.

Results of radiological monitoring of unweathered Lavery till wells are shown in Figures 3-25 through 3-27. Results for gross alpha analyses (Fig. 3-25) are mostly below the minimum detectable concentration. Results shown for gross beta (Fig. 3-26) indicate that concentrations at downgradient wells are similar to those of upgradient locations. Figure 3-27 shows results of tritium measurements for wells monitoring the unweathered Lavery till. Wells WNW0107, WNW0109, WNW0110, WNW0114, and WNW0115 of SSWMU #1 showed low but consistently positive results for tritium. Well WNW1109B, which monitors SSWMU #11 (NYSERDA's SDA) also showed low but consistent tritium concentrations. Eight other wells monitoring the unweathered Lavery till near the SDA were below the minimum detectable concentration. Well WNW1109B is located between NYSERDA's SDA and the NDA. (See Fig. 3-3.) The concentrations of gross beta and tritium detected in these unweathered Lavery till wells are below the groundwater quality standard of 1E-06 μCi/mL for gross beta and 2E-05 μCi/mL for tritium. Although some positive results are shown for gross beta and tritium, all concentrations are low and indicate a negligible effect on site groundwater.

Levels of total organic carbon (TOC) and total organic halogens (TOX) for all NYSERDA's SDA wells within this geological unit also are indistinguishable from background.

Results of Contamination Indicator Monitoring of the Lacustrine Unit

Thirteen wells monitor groundwater conditions within the lacustrine unit. These wells are all situated on the site's south plateau and represent the deepest groundwater monitoring points on-site.

Background conditions are monitored by well WNW1008B, which is 51 feet below grade. Three additional wells, WNW0901, WNW0902, and

On-screen Review of a Tritium Sample Count

WNW1001, provide upgradient monitoring of the lacustrine unit. These wells range in depth from 116 to 136 feet below grade.

General downgradient monitoring is provided by eight wells ranging in depth from 108 to 138 feet.

The lacustrine unit is monitored as part of the groundwater monitoring program associated with SSWMU #9 — the NDA, SSWMU #10 — the integrated radwaste treatment system drum cell, and SSWMU #11 — NYSERDA's SDA.

Results of contamination indicator monitoring of the lacustrine unit are seen in Figures 3-28 through 3-34. The pH and conductivity box-and-whisker plots (Figs. 3-28 and 3-29) show variations across well locations. These variations may reflect differences in groundwater geochemistry. Some of the wells in the lacustrine unit exhibit very low groundwater recharge rates, which limit the ability to collect enough sample for all analyses and can also impair the ability to thoroughly flush or purge the well before sampling. For example, NYSERDA's SDA well WNW1103C exhibits very limited recharge, allowing only a limited set of analyses to be made.

Results of sampling for the remaining contamination indicator parameters suggest the lack of any direct site-induced effects on the waters of the lacustrine unit. For example, detection of tritium in groundwater would probably be the first indicator of contamination from tritium becoming incorporated into and moving with the groundwater. Figure 3-34 shows that all tritium values for all wells monitoring this unit are below the minimum detectable level of 1.0E-07 µCi/mL.

NYSERDA's SDA well WNW1103C indicates slightly elevated levels of gross beta activity. However, this well does not show a corroborating level of tritium activity. Further analysis of this beta component would be necessary to help identify its origin.

All levels of radioactivity measured within the lacustrine unit are below New York State groundwater quality standards. These results indicate that little, if any, effect on the lacustrine unit groundwater has occurred because of site operations.

Results of Contamination Indicator Monitoring of the Weathered Lavery Till Unit

Seventeen wells are used to monitor groundwater in the weathered Lavery till unit, which is the surficial geologic unit on the south plateau of the site. Three SSWMUs are monitored as part of groundwater monitoring in the weathered Lavery till: SSWMU #9 — the NDA, SSWMU #10 — the IRTS drum cell, and SSWMU #11 — NYSERDA's SDA.

Well WNW1008C monitors background conditions in the weathered Lavery till. Well WNW0908 and WNW1005, within the weathered Lavery till unit, monitor general upgradient conditions. Wells monitoring this unit range in depth from 10 to 23 feet below grade.

The median results of downgradient monitoring of pH (Fig. 3-35) fall within a range of about 6.5 to 7.5 for wells within this geologic unit. The range of conductivity values is relatively wide across this unit, with the variability within a given well generally small. Downgradient values for conductivity are within the range of the upgradient and background results are as shown in Figure 3-36.

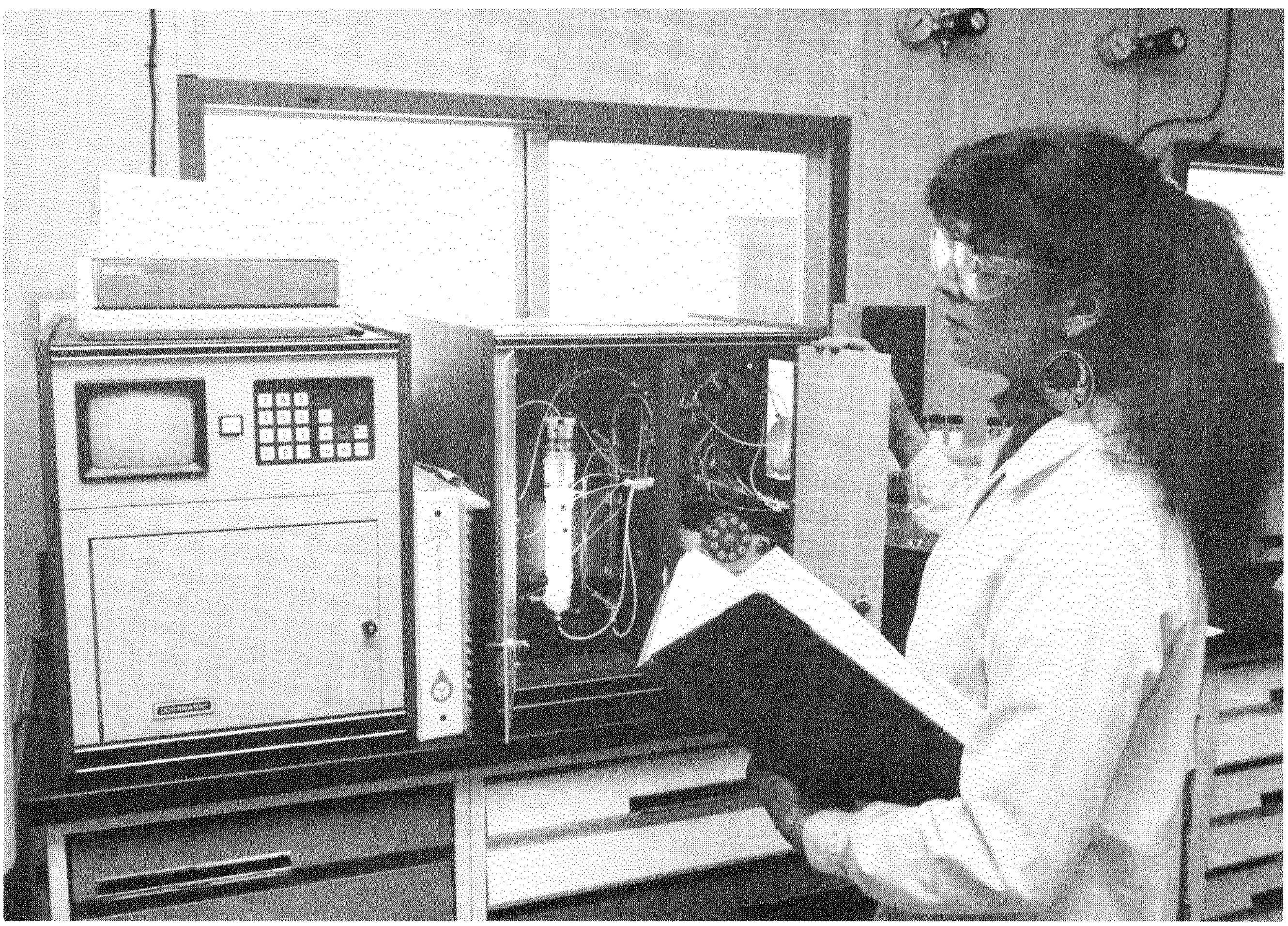
Results for total organic carbon (Fig. 3-37) indicated elevated levels of this constituent at wells WNW0906, WNW0909, WNW1007, and WNW1107A. Additional sampling and analysis followed up these apparently elevated levels of total organic carbon in WNW1107A; the results were reported previously in the 1991 SITE ENVIRONMENTAL REPORT.

Gross alpha (Fig.3-39) and gross beta (Fig.3-40) showed levels for downgradient wells grouped within a range covered by the upgradient wells for this unit, with the exception of well WNW0909, which showed elevated gross beta concentrations. Several of the wells within the unit, e.g., WNW0906, WNW0907, WNW0908, and WNW1108A, exhibit a very limited recharge rate, making them difficult to sample. The variation in gross alpha levels indicated in Figure 3-39 for WNW0908 represents a range of below minimum detectable concentrations associated with elevated levels of dissolved solids in the samples. The apparently elevated levels of gross beta activity in upgradient well WNW0908 (1.18E-08 µCi/mL to 1.87E-08 µCi/mL), although representing positive values, may be related to the elevated levels of dissolved solids discussed above for gross alpha activity. Gross beta concentrations at WNW0909 are higher than upgradient concentrations. However, gross beta results are well below the groundwater quality standard of 1.0E-06 µCi/mL.

Several wells monitoring the weathered Lavery till show detectable levels of tritium activity (Figs. 3-41 and 3-41a). Levels of tritium in well WNW1107A are slightly above the New York State groundwater quality standard of 2.0E-05 µCi/mL. Several other wells (WNW0909, WNW1102A, WNW1103A, WNW1104A, WNW1106A, and WNW1109A) consistently show much lower levels of tritium that are well below the groundwater quality standard. (See Fig. 3-41a.)

Results of Monitoring of Site Groundwater for Volatile Organic Compounds

All groundwater wells that are part of the on-site groundwater monitoring program are routinely monitored for volatile organic compounds (VOCs) as part of the contamination indicator parameters. (See Table 3-3, which summarizes the 1992 sampling schedule.) Samples collected for volatile organic compounds are analyzed by off-site contract laboratories according to method 8240 (Test Methods for Evaluating Solid Waste, SW-846 [U.S.EPA 1986]). Results of the analysis of these samples generate data on fifty-eight volatile organic compounds. *Appendix E*, Table E-11 lists the individual compounds and the practical quantitation limit (PQL) for each compound. The practical quantitation limit is the lowest concentration of the compound that can be reliably determined within the method-specified level of precision and accuracy under routine laboratory conditions. (Practical quantitation limits are roughly equivalent to method detection limits [MDLs]). This listing of volatile organic compounds originates from Appendix IX, 40 CFR Part 264, "Groundwater Monitoring List." The volatile organic compounds are a sub-list of the entire Appendix IX listing.



Checking a Total Organic Carbon Analyzer Run

The results of groundwater monitoring for volatile organic compounds (VOCs) during 1992 reveal the continued positive detection of 1,1-dichloroethane at well WNW8612. The concentration of 1,1-dichloroethane in well WNW8609 has decreased over the year from levels just above the PQL (5µg/L) to just below the PQL at year's end. The compound 1,1,1-trichloroethane continues to be present at WNGSEEP, a location where water emerges to the surface from the sand and gravel unit. However, 1992 concentrations have declined to levels below the PQL and are below 5µg/L. The compounds 1,1,1-trichloroethane and 1,1-dichloroethane are solvents commonly used by industry for degreasing processes. Analytical results for these compounds for the above locations are shown in *Appendix E*, Table E-12. There were additional VOC detections in 1992. These include the positive quantifiable detection of dichlorodifluoromethane at wells WNW8612 and WNW0803 and the positive detection of acetone at WNW0909. While the detections of dichlorodifluoromethane in wells WNW8612 and WNW0803 have persisted, the detection of acetone in waters from WNW0909 has not. Dichlorodifluoromethane is also known as Freon-12, a coolant widely used for air conditioning and refrigeration.

Groundwater wells WNW8612 and WNW0803 and monitoring point WNGSEEP are located on the northeastern side of the site, downgradient of the main plant and the former construction and demolition debris landfill (CDDL). The possibility that detections of 1,1-dichloroethane, dichlorodifluoromethane, and 1,1,1-trichloroethane at these sites may originate from a common source is under investigation. The detection of 1,1,1-trichloroethane at WNGSEEP is the subject of a report that was prepared to fulfill the RCRA 3008(h) Order on Consent, GROUNDWATER SEEP INVESTIGATION REPORT: 1,1,1-TRICHLOROETHANE DETECTION (West Valley Nuclear Services 1992).

Analysis of volatile organic compounds by method 8240 uses an instrument known as a gas chromatograph/mass spectrometer (GC/MS). This instrument has the ability to identify the presence of compounds below the PQL listed in Table E-11. Such detections, taken on an individual basis, must be viewed with caution since they may be false. However, when the same compound is detected repeatedly at levels below the PQL at the same groundwater location, it may actually indicate the presence of that compound, but at levels below that which can be accurately measured. The repeated detection of compounds below their associated PQLs has occurred at the following groundwater monitoring locations:

- WNW8612: 1,1,1-trichloroethane below its PQL of 5µg/L.
- WNW8609: 1,1,1-trichloroethane below its PQL of 5µg/L.
- WNW0202: toluene below its PQL of 5µg/L, acetone below its PQL of 10µg/L, and total xylene below its PQL of 5µg/L.
- WNW1104A: toluene below its PQL of 5µg/L, acetone below its PQL of 10µg/L, and total xylene below its PQL of 5µg/L.
- WNW0803: 1,1-dichloroethane below its PQL of 5µg/L and chloroethane below its PQL of 10µg/L.

Volatile organic compounds in WNW0202 may be related to historical de minimis losses during site motor vehicle fueling; routine bulk storage tank integrity testing and inventory control procedures support this conclusion. Although the source of VOCs in WNW1104A cannot be determined, the compounds toluene and total xylene are common components of petroleum-based products and are known to exist in the trenches of NYSERDA's SDA.

Further sampling and analysis for VOC analytes continues to be performed at all of the locations mentioned above to track the detection of these compounds. (See Tables 3-2 and 3-3 for the groundwater sampling and analysis schedule.) Figures 3-42 and 3-42a present trend plots for selected VOCs over time.

Although several wells show positive concentrations of volatile organic compounds, these levels are very low. They have no potential for affecting human health because on-site groundwater is not used as a source of drinking water. In perspective, the VOC concentrations found in on-site groundwater are quite similar to the levels typically found in a public water supply that is disinfected by chlorination.

It should be pointed out that the VOC detections mentioned above have been compared with relevant New York State groundwater quality standards. This comparison has been performed for VOCs appearing both above and below their appropriate PQLs. In summary, positive detections of 1,1,1-trichloroethane, 1,1-dichloroethane, and dichlorofluoromethane above 5μg/L have exceeded guidelines for class GA groundwaters. (See *Glossary*.) There is no indication that the groundwater from these areas affects human health or the environment because this water is not used for drinking or general facility needs. Other VOC detections on-site show concentrations below the New York State water quality standards.

Long-term Trends of Gross Beta and Tritium at Selected Groundwater Monitoring Locations

Trend graphs showing results of groundwater monitoring from 1986 through 1992 for gross beta (Fig. 3-43) and tritium (Fig. 3-44) were prepared for selected locations. These graphs show annual averaged results for these constituents over a seven-year period. Results are presented on a logarithmic scale to adequately represent locations of differing concentrations. These specific groundwater monitoring locations were selected for trending because they have shown elevated or rising levels of these constituents (WNW8605 and WNW8604, Fig. 3-43), or falling trends (Fig. 3-44) over time.

The results for gross beta activity (Fig. 3-43) indicate a steadily rising trend for location WNW8604. Well WNW8604 is located to the north of lagoon 4 in SSWMU #1 and is 23.0 feet below grade. Well WNW8603, which is north of WNW8604, at a depth of 25.4 feet, shows much lower and consistent levels of gross beta activity. Although the specific source of the increasing gross beta activity at WNW8604 has not been identified, this well is positioned downgradient of wells with higher levels of activity (WNW0408 and WNW0502, both downgradient of the main plant facility) and is crossgradient to the low-level waste treatment facility. Lagoon 1, formerly part of the low-level waste treatment facility, was previously identified as a source of contamination and is believed to be contributing to the gross beta activity at wells WNW8605 and WNW0111. The concentration of gross beta activity at location WNW8604 is lower than that measured for WNW8605. Identification, continued monitoring, and follow-up evaluation of this area will provide the information necessary for either near-term response or eventual facility closure.

Monitoring point WNGSEEP, which has shown elevated levels of some VOCs, as discussed above, exhibits a fairly level long-term trend for gross beta activity.

Figure 3-44 shows the seven-year trend for tritium concentrations for the same monitoring points presented in Figure 3-43. All points, including WNW8604, which shows rising beta activity, show a gradually declining trend for tritium.

Figures 3-43a and 3-44a present gross beta and tritium concentrations for selected wells over the two-year period that the WVDP's expanded groundwater monitoring program has been in place. The results presented in these two figures are individual sample results as opposed to annual averages as presented in Figures 3-43 and 3-44. Well WNWNB1S is a site background well that is included in the figures as a point of reference. The wells selected for these two-year trend graphs represent on-site locations with elevated levels of gross beta and tritium activity. All wells shown in these figures monitor the sand and gravel geologic unit.

Gross beta and tritium concentrations at these locations are generally consistent, with a slightly rising trend noted for gross beta. Well WNW0111 shows a relatively large degree of variability for tritium concentrations. This well is located near former lagoon 1 and well WNW8605 in SSWMU #1. Concentrations shown in these two figures are well above the background concentrations shown for well WNWNB1S.

Groundwater Quality Parameters

Results of the two rounds of sampling for groundwater quality parameters are in *Appendix E,* Tables E-6 through E-10. The results for the major cations (calcium, magnesium, sodium, and potassium) and anions (chloride, sulfate, bicarbonate, carbonate, and, in some cases, hydroxide) are also summarized in pie charts in Figures E-1 through E-5 in *Appendix E.* Compiling groundwater quality results in pie charts provides a convenient way to present data in a format that allows rapid comparison of results between different wells. These pie charts are very useful for identifying the major constituents of the groundwater, the relative percentages of these various constituents, the degree to which the cation and anions balance, and the overall ion content of the groundwater. The pie charts are grouped by geologic unit, and the wells are presented in the same order as in the tables for contamination indicator parameters. (See *Appendix E.*)

Sampling Site Groundwater for EPA Interim Drinking Water Quality Parameters

Site groundwater was sampled for EPA interim primary drinking water quality parameters a total of four times, beginning in 1991 and ending in 1992. (See Table 3-3 for this list.) These results are found in *Appendix E,* Tables E-13 through E-17. The results may be compared to New York State groundwater quality standards for Class GA groundwater. (See *Glossary.*) These standards are derived from Title 6 of the New York Code of Rules and Regulations (NYCRR), Chapter X, Part 703.5. Water meeting these standards is acceptable as a source of drinking water. These standards provide a conservative reference for comparison to site groundwater. However, site groundwater is not used for either on- or off-site drinking water.

Tables E-13 through E-17 of *Appendix E* present four rounds of chronologically ordered analytical results and the mean of the four rounds below them. The mean of the four rounds of analytical results is used for comparison with NYCRR groundwater quality standards.

Comparison of the drinking water metals standards to site groundwater results indicate that there are instances in which groundwater total metals results exceed the respective quality standards. However, it is more appropriate to compare dissolved metals results with these standards: the total metals fraction of groundwater may include solid materials, introduced during the sampling process, that are filtered out in the dissolved fraction. This dissolved fraction is therefore the most realistic portion of the sample for comparison because it best represents actual groundwater conditions.

Comparison of New York State quality standards to site dissolved metals data reveals that with the exception of three wells in the sand and gravel geologic unit, site groundwater met all these standards. Dissolved chromium in WNW0403 and

WNW8613B and dissolved lead in WNW0103 all exceeded their respective New York State quality standard by small margins. The individual results that contribute to the mean for these constituents were sporadic throughout the year of sampling and analysis for these wells. In addition, the mean concentration of nitrate+nitrite–nitrogen in well WNW0403, which is upgradient in SSWMU #4, exceeded the quality standard. Also, the site background well — WNWNB1S — nearly exceeded the nitrate+nitrite–nitrogen quality standard of 10.0 mg/L by exhibiting a resultant mean of 9.4 mg/L. The groundwater quality standards for 2,4-D and 2,4,5-TP (Silvex) are, in some cases, lower than the analytical method detection limit. In these cases, the method detection limit may be above the groundwater quality standard, but the analyte is not detectable.

Discussion of Site Groundwater Monitoring

While these monitoring data do not indicate a potential for immediate adverse effects on human health or the environment, evaluation of the need to mitigate the contamination indicated by the data is in progress in accordance with applicable laws and regulations. An environmental impact statement is being prepared in accordance with the decision-making requirements of the National Environmental Policy Act (NEPA) and the New York State Environmental Quality Review Act. The decontamination and restoration of radiologically affected environmental media at the WNYNSC will be included in this environmental impact statement. The decision-making process will include public review and comment. When completed, an alternative will be selected and implemented. Since the monitoring data also revealed the presence of chemical effects, the results of a facility investigation being performed in accordance with an Administrative Order on Consent under section 3008(h) of the Resource Conservation and Recovery Act of 1976, as amended, will also be considered in the mitigation process. On the basis of these results, the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation will issue appropriate requirements for corrective action.

Off-Site Groundwater Monitoring Program

During 1992 all of the off-site groundwater residential wells were sampled for radiological constituents, pH, and conductivity. Sampling and analysis indicated no evidence of contamination by the WVDP of these off-site water supplies. Analytical results are found in Table C-1.8 in *Appendix C-1*.

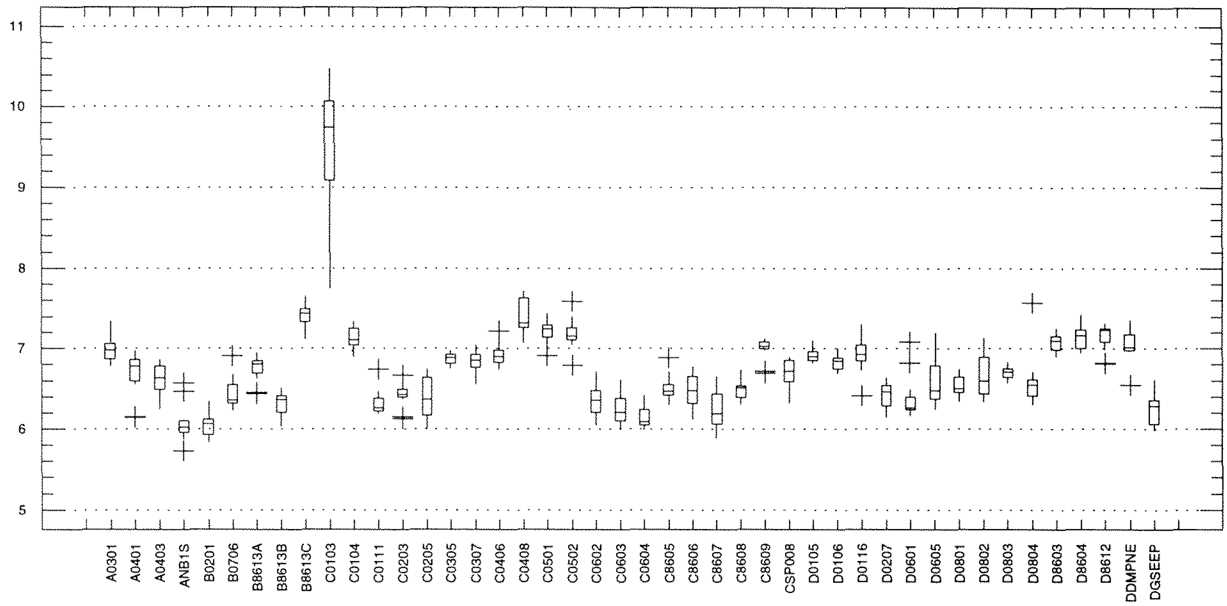


Figure 3-7. pH in Groundwater Samples from the Sand and Gravel Unit

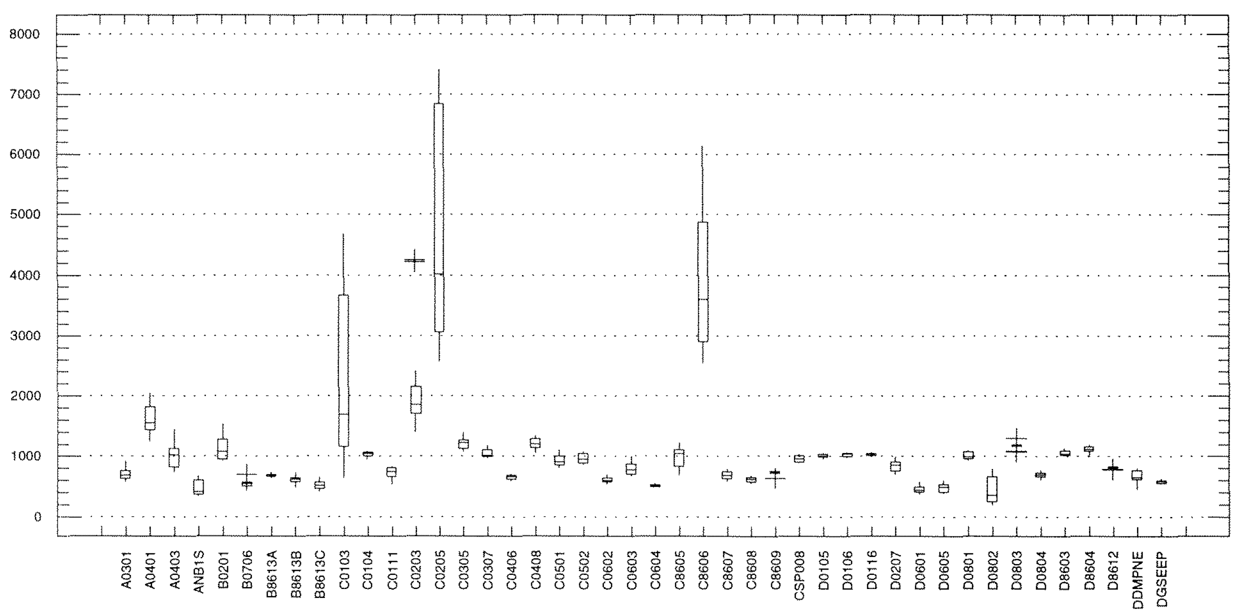


Figure 3-8. Conductivity (μmhos/cm@25°C) from the Sand and Gravel Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

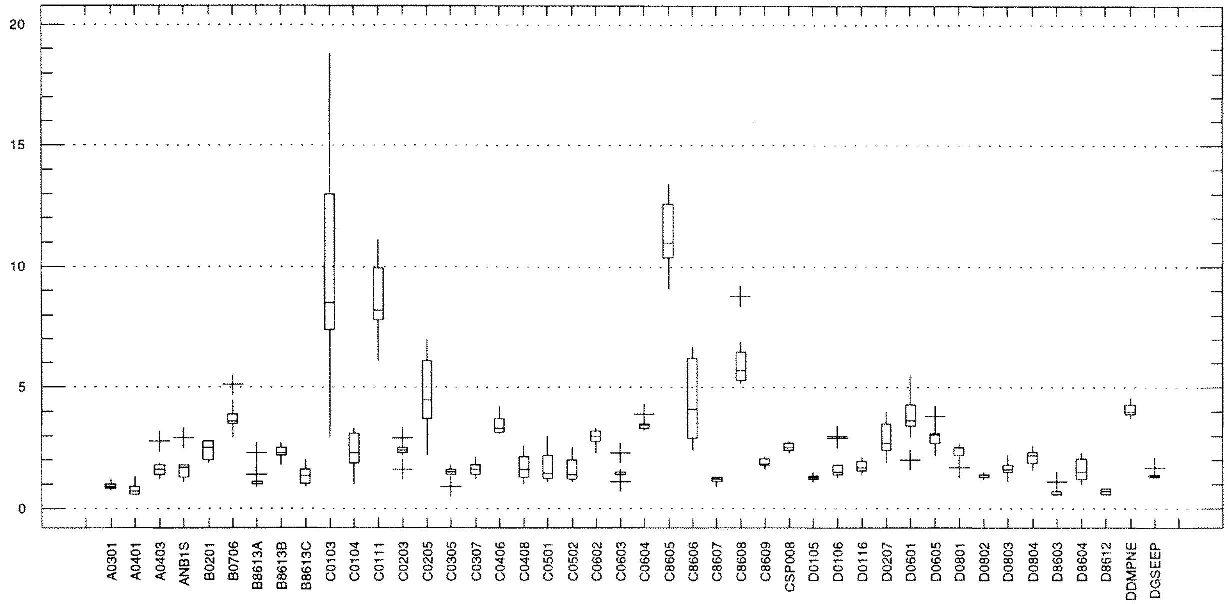


Figure 3-9. Total Organic Carbon (mg/L) in Groundwater Samples from the Sand and Gravel Unit

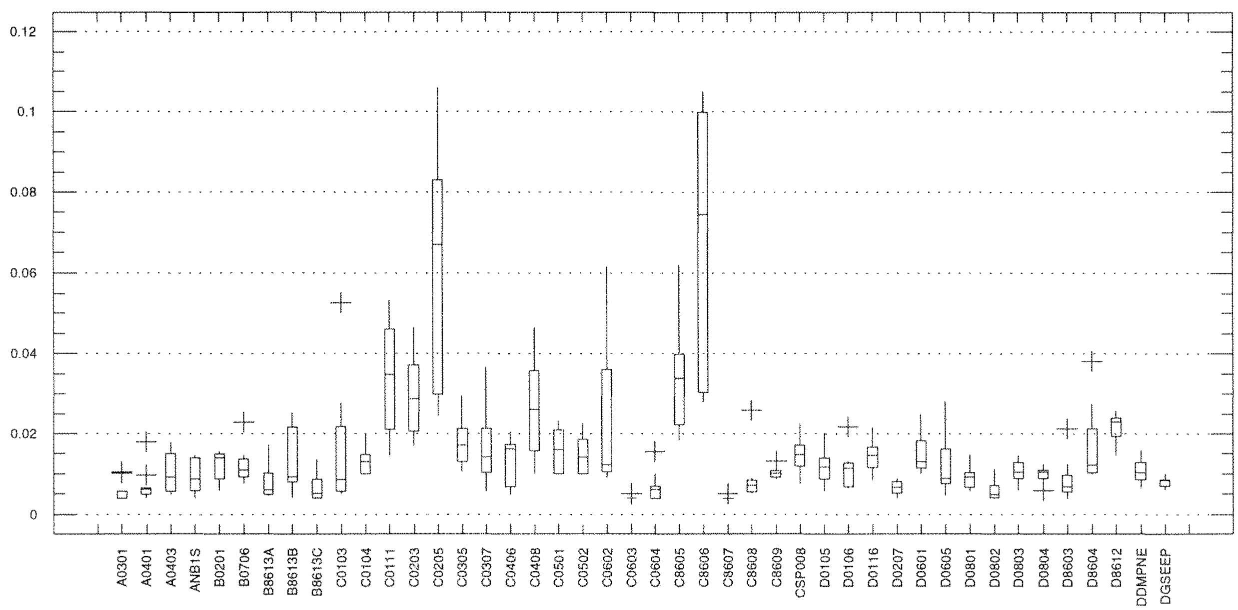


Figure 3-10. Total Organic Halogens (mg/L) in Groundwater Samples from the Sand and Gravel Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

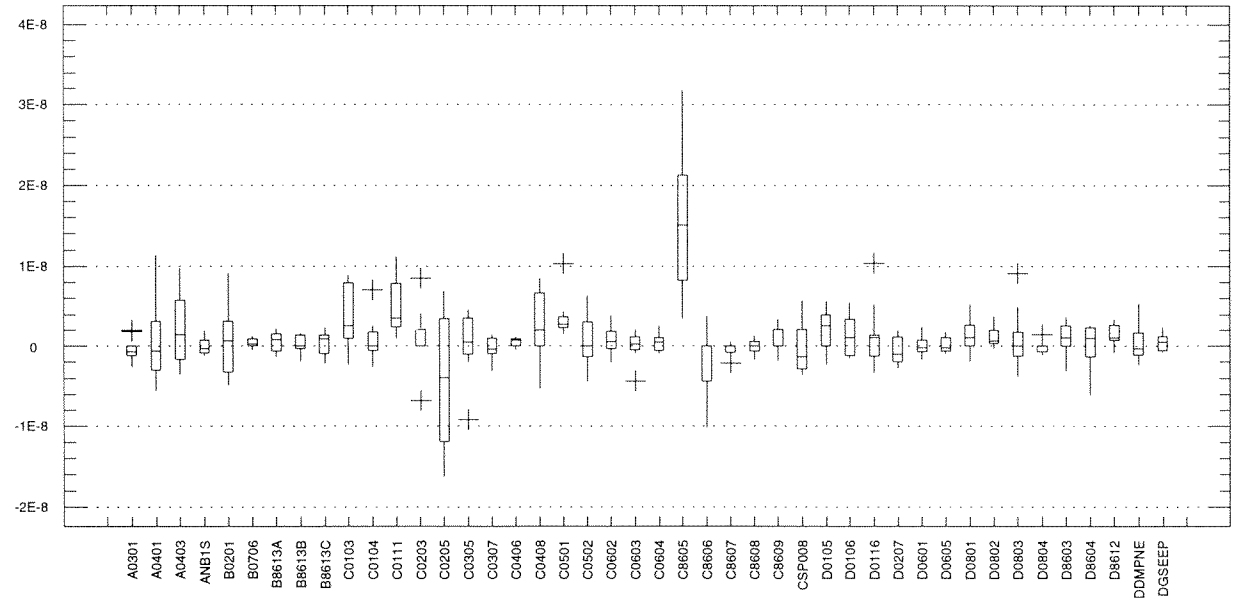


Figure 3-11. Gross Alpha (µCi/mL) in Groundwater Samples from the Sand and Gravel Unit

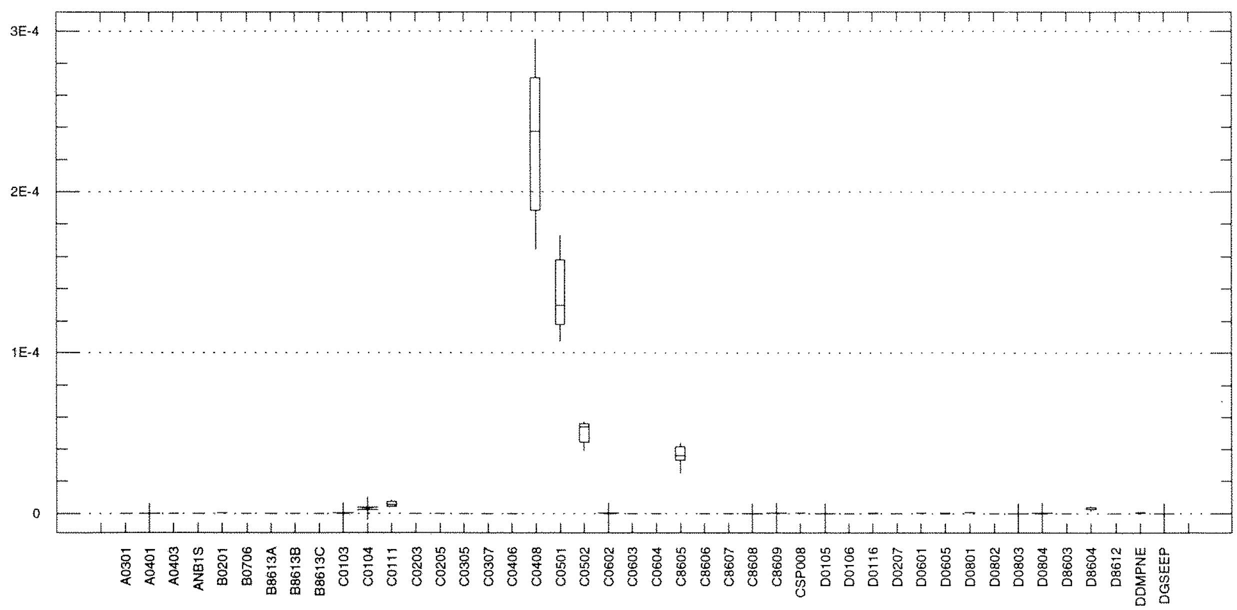


Figure 3-12. Gross Beta (µCi/mL) in Groundwater Samples from the Sand and Gravel Unit
Figures 3-12a and 3-12b follow with expanded scales

Wells are arranged in general upgradient to downgradient order, reading from left to right.

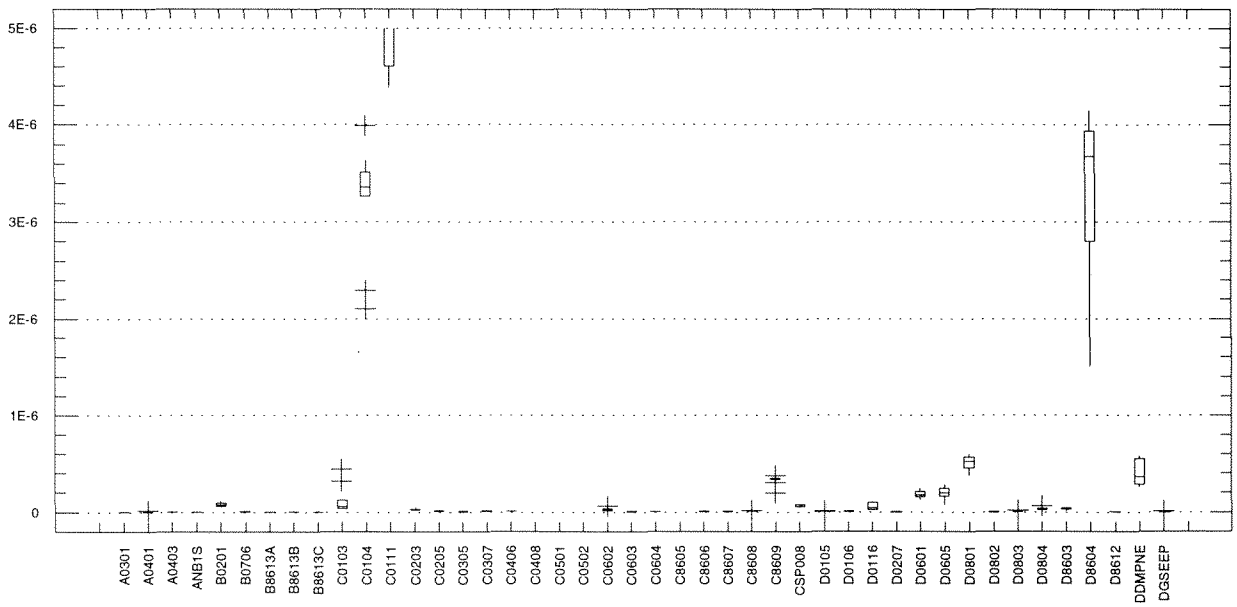


Figure 3-12a. Gross Beta (μCi/mL) in Groundwater Samples from the Sand and Gravel Unit (expanded scale)

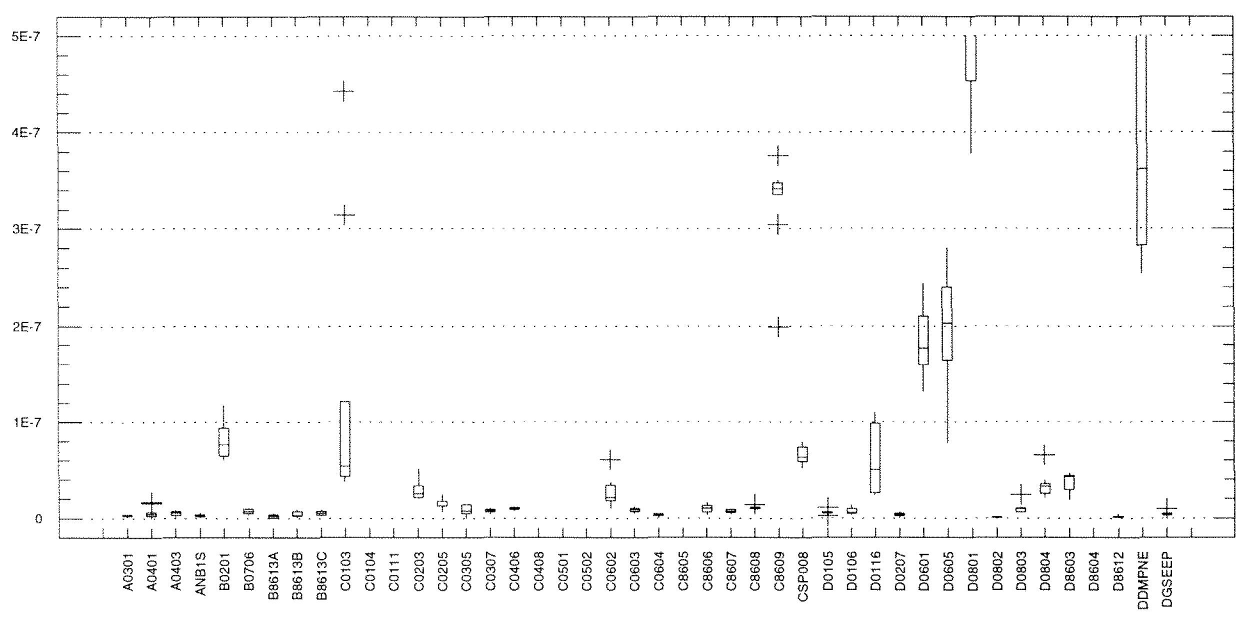


Figure 3-12b. Gross Beta (μCi/mL) in Groundwater Samples from the Sand and Gravel Unit (expanded scale of Fig. 3-12a)

Wells are arranged in general upgradient to downgradient order, reading from left to right.

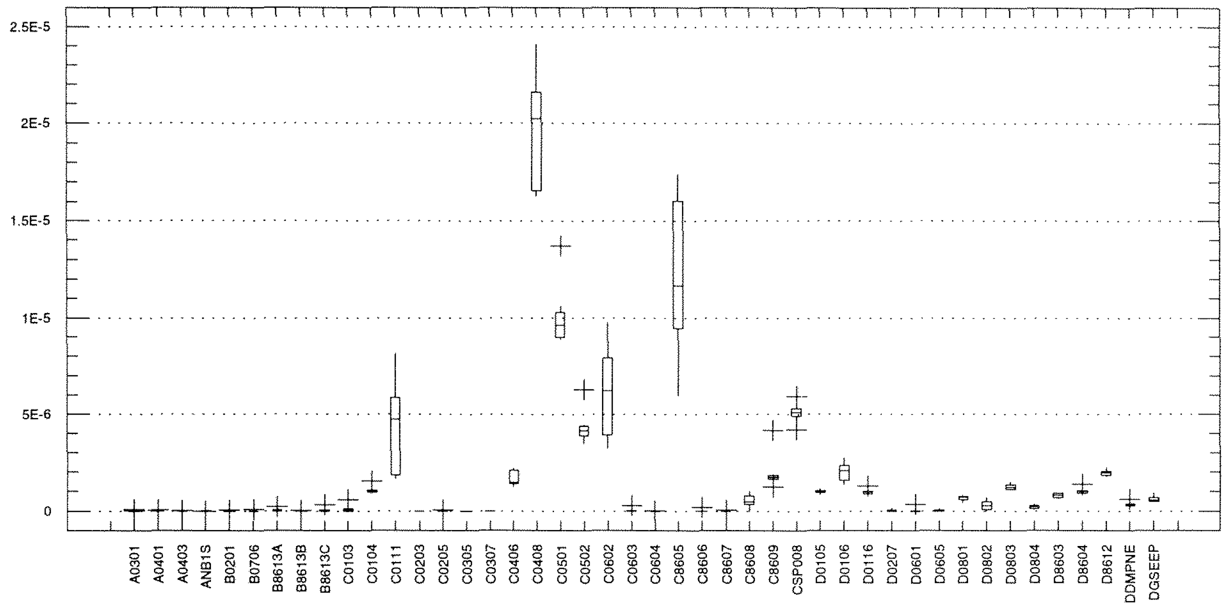


Figure 3-13. Tritium Activity (μCi/mL) in Groundwater Samples from the Sand and Gravel Unit
Figure 3-13a follows with expanded scale

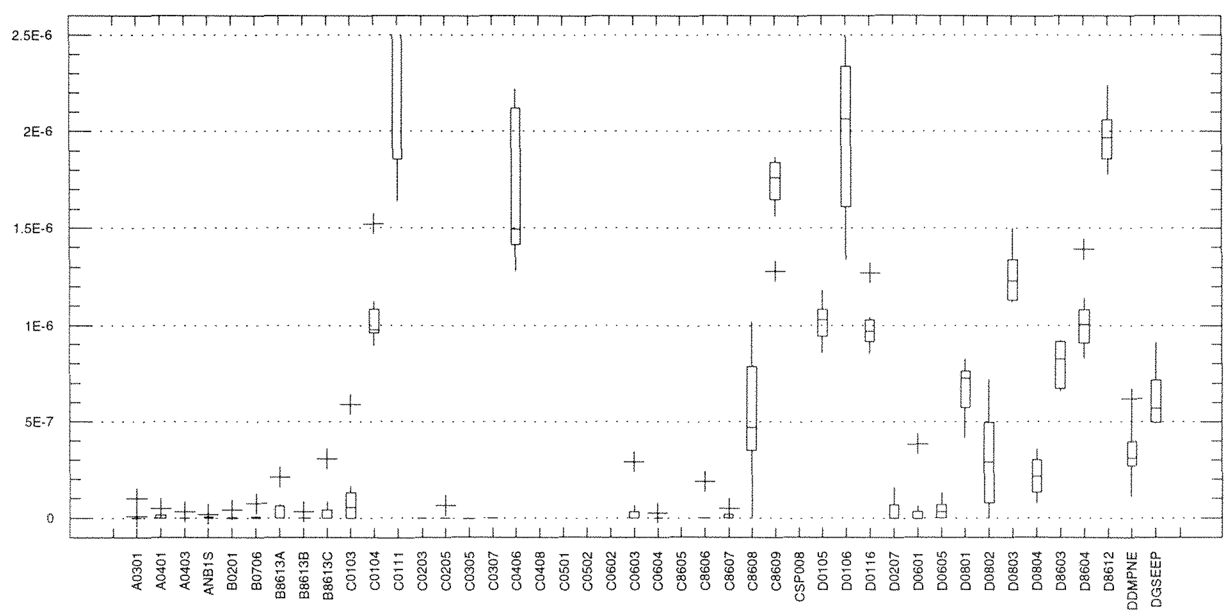


Figure 3-13a. Tritium Activity (μCi/mL) in Groundwater Samples from the Sand and Gravel Unit (expanded scale)

Wells are arranged in general upgradient to downgradient order, reading from left to right.

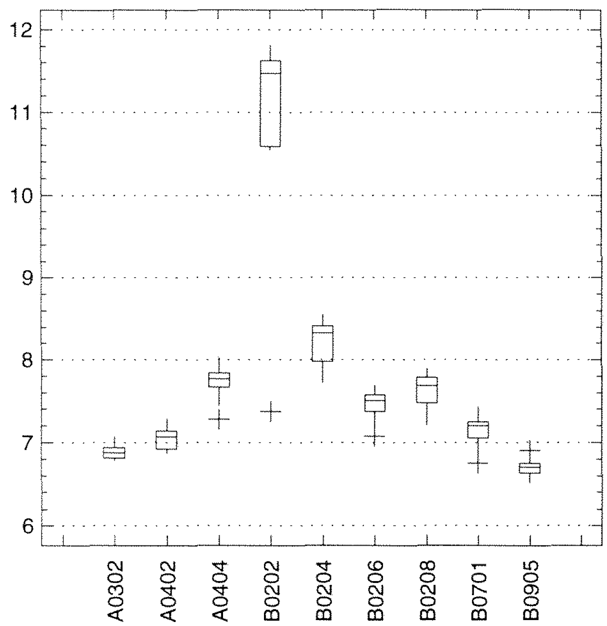


Figure 3-14. pH in Groundwater Samples from the Till-Sand Unit

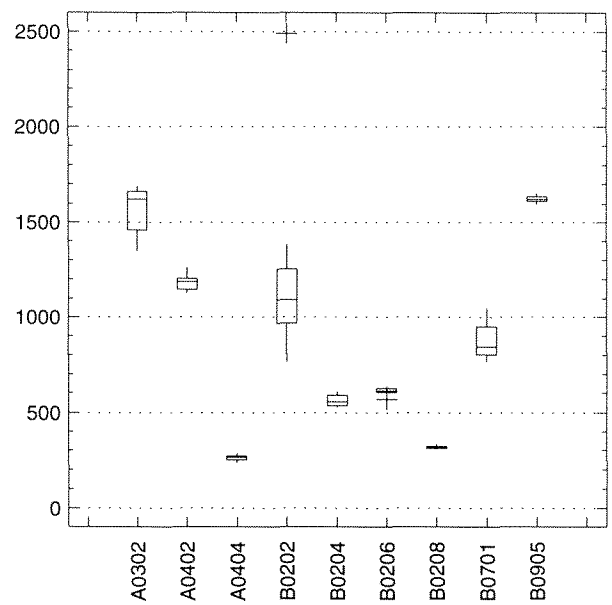


Figure 3-15. Conductivity (μmhos/cm@25°C) in Groundwater Samples from the Till-Sand Unit

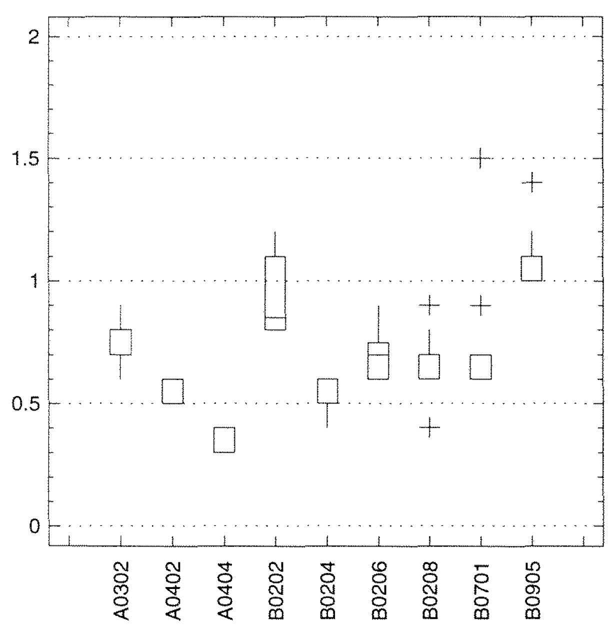


Figure 3-16. Total Organic Carbon (mg/L) in Groundwater Samples from the Till-Sand Unit

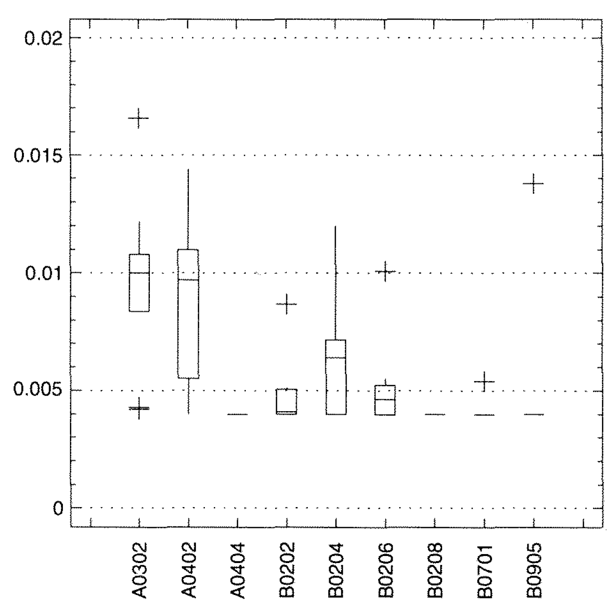


Figure 3-17. Total Organic Halogens (mg/L) in Groundwater Samples from the Till-Sand Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

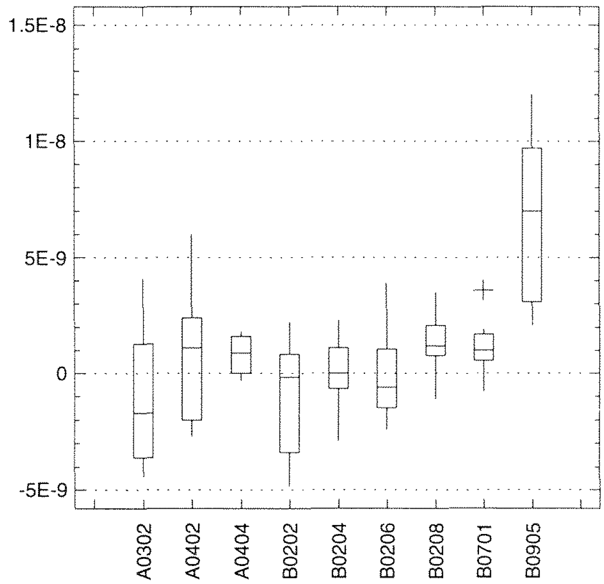


Figure 3-18. Gross Alpha (µCi/mL) in Groundwater Samples from the Till-Sand Unit

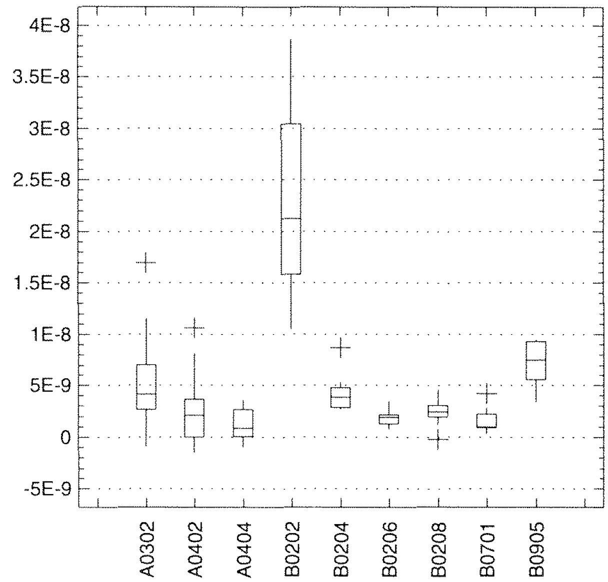


Figure 3-19. Gross Beta (µCi/mL) in Groundwater Samples from the Till-Sand Unit

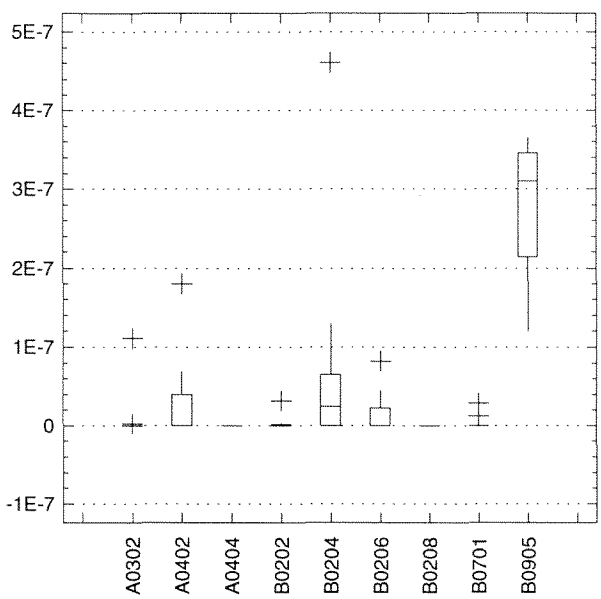


Figure 3-20. Tritium Activity (µCi/mL) in Groundwater Samples from the Till-Sand Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

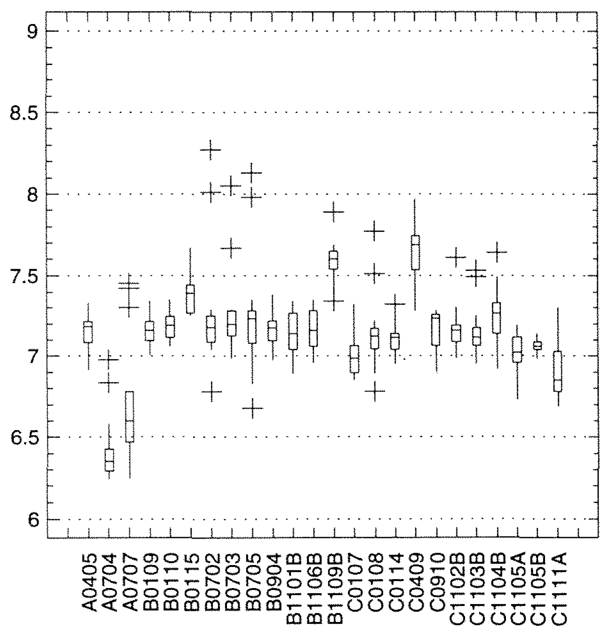


Figure 3-21. pH in Groundwater Samples from the Unweathered Lavery Till Unit

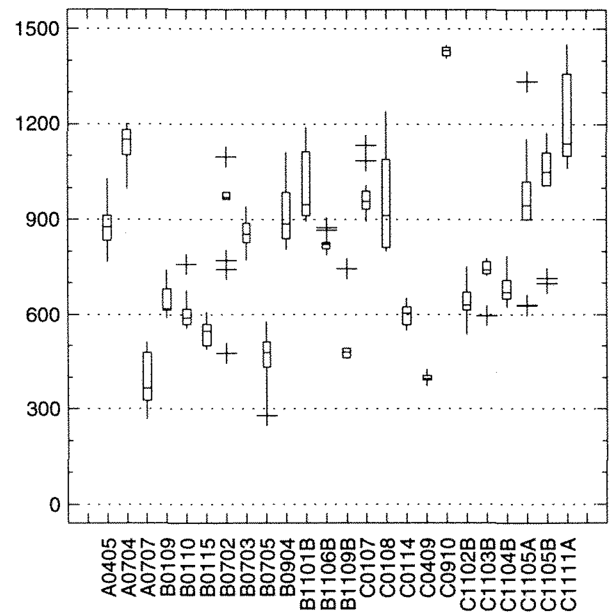


Figure 3-22. Conductivity (µmhos/cm@25°C) in Groundwater Samples from the Unweathered Lavery Till Unit

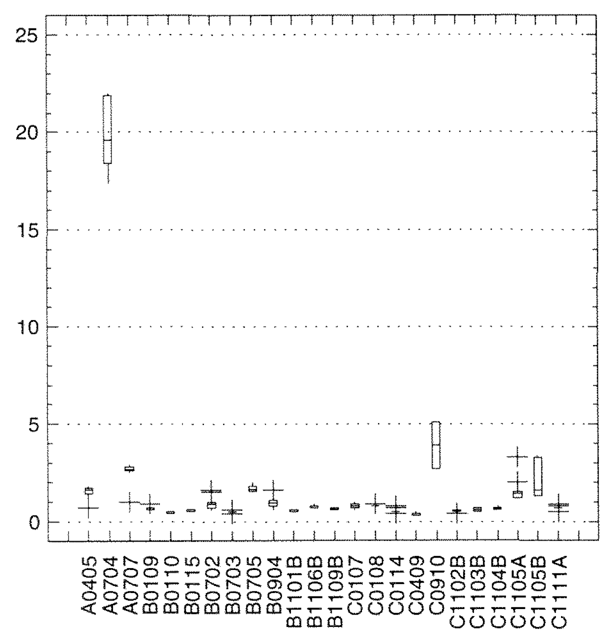


Figure 3-23. Total Organic Carbon (mg/L) in Groundwater Samples from the Unweathered Lavery Till Unit

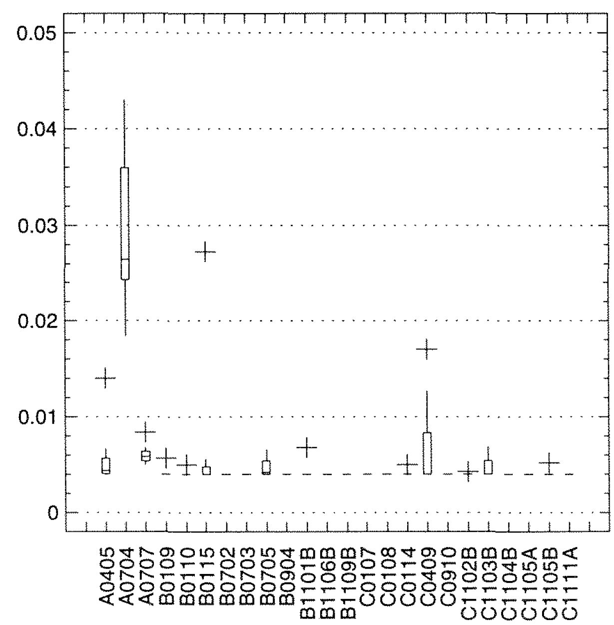


Figure 3-24. Total Organic Halogens (mg/L) in Groundwater Samples from the Unweathered Lavery Till Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

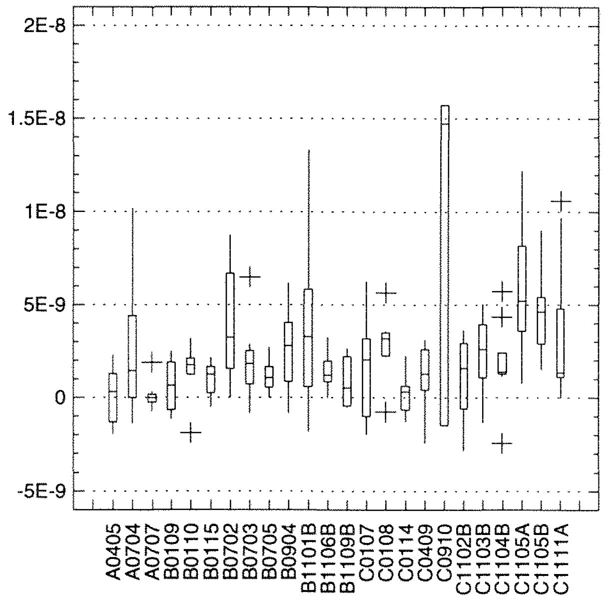


Figure 3-25. Gross Alpha (µCi/mL) in Groundwater Samples from the Unweathered Lavery Till Unit

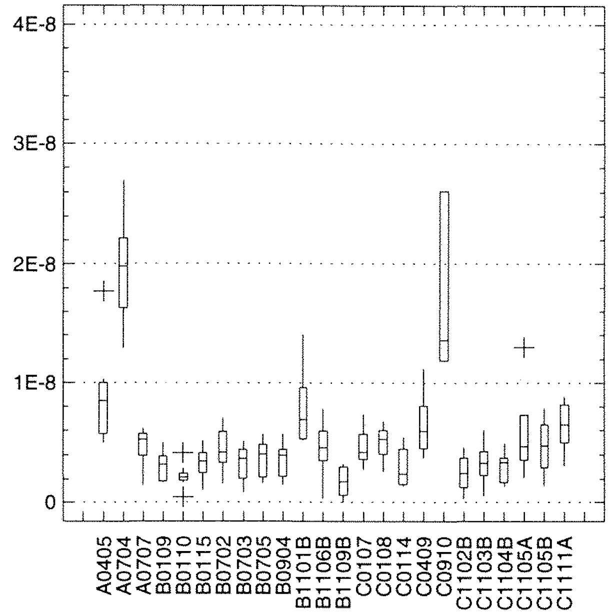


Figure 3-26. Gross Beta (µCi/mL) in Groundwater Samples from the Unweathered Lavery Till Unit

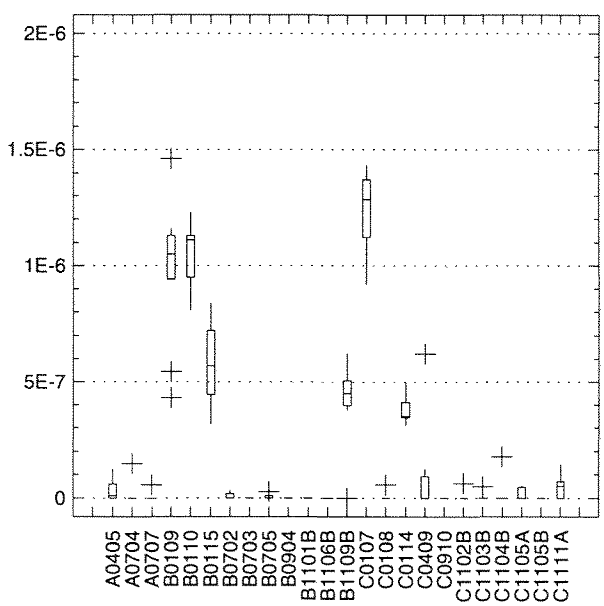


Figure 3-27. Tritium Activity (µCi/mL) in Groundwater Samples from the Unweathered Lavery Till Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

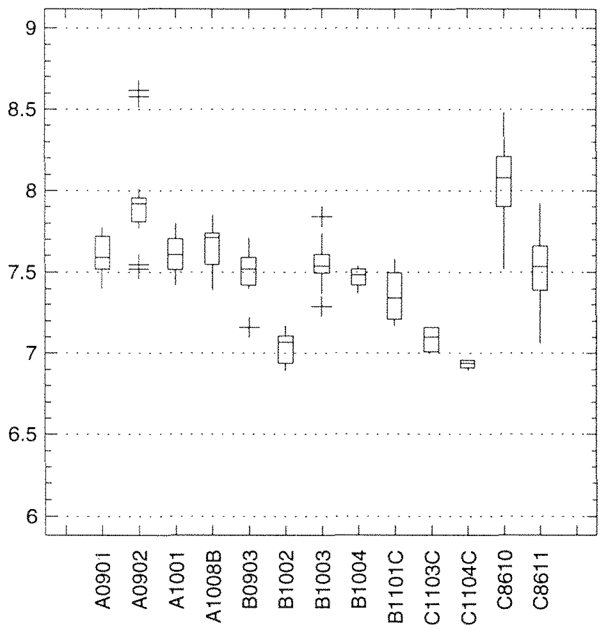


Figure 3-28. pH in Groundwater Samples from the Lacustrine Unit

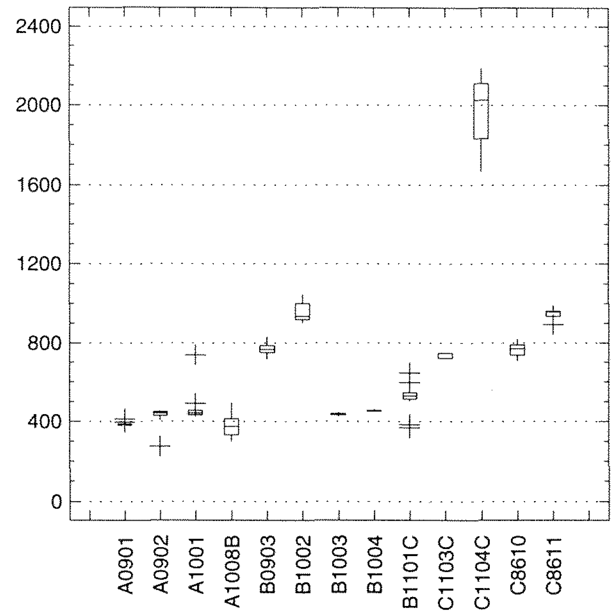


Figure 3-29. Conductivity (µmhos/cm@25°C) in Groundwater Samples from the Lacustrine Unit

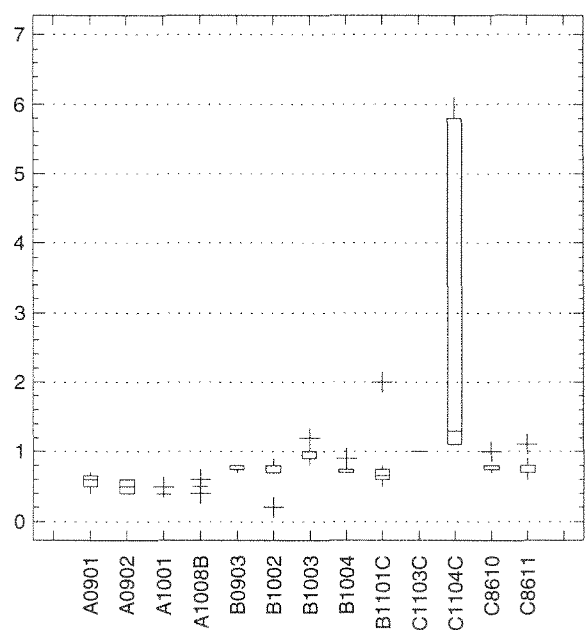


Figure 3-30. Total Organic Carbon (mg/L) in Groundwater Samples from the Lacustrine Unit

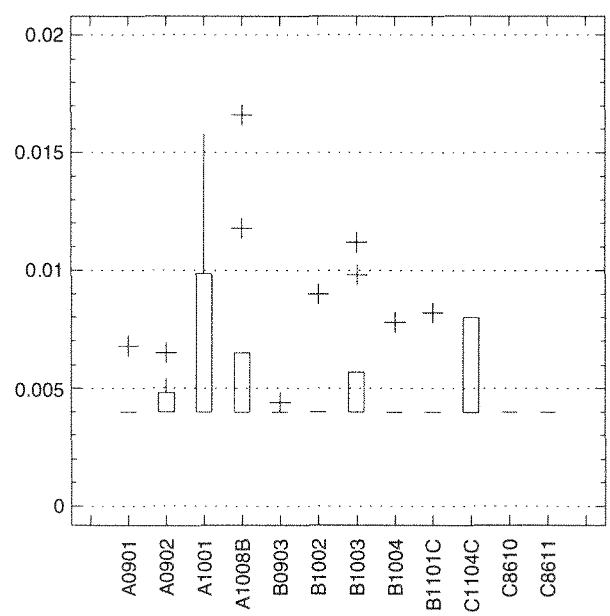


Figure 3-31. Total Organic Halogens (mg/L) in Groundwater Samples from the Lacustrine Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

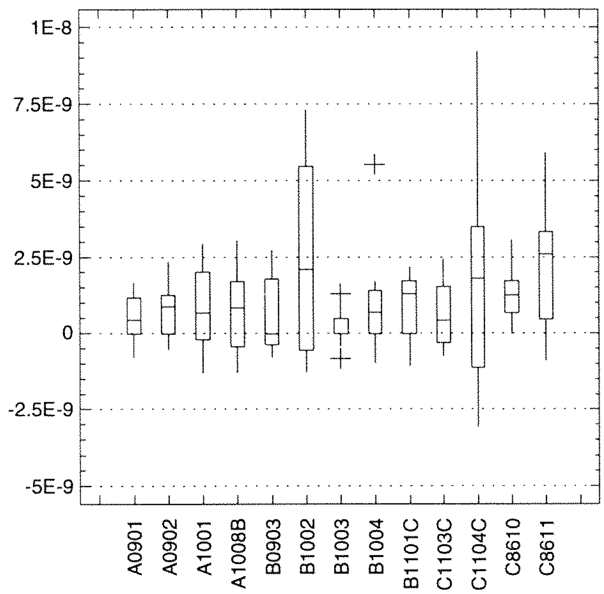


Figure 3-32. Gross Alpha (μCi/mL) in Groundwater Samples from the Lacustrine Unit

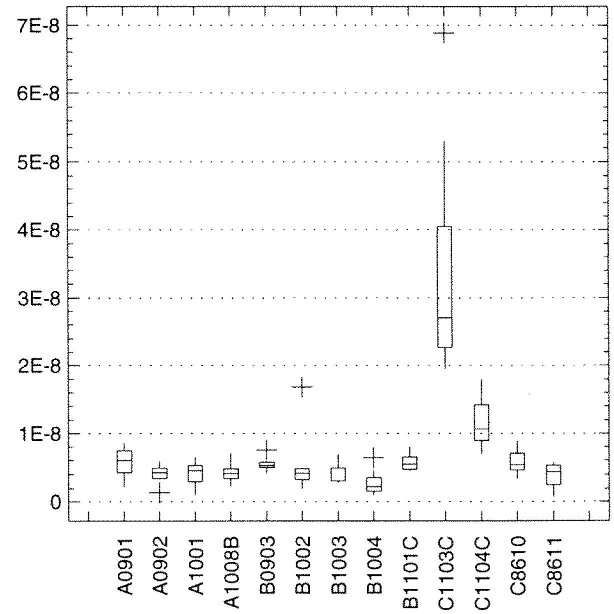


Figure 3-33. Gross Beta (μCi/mL) in Groundwater Samples from the Lacustrine Unit

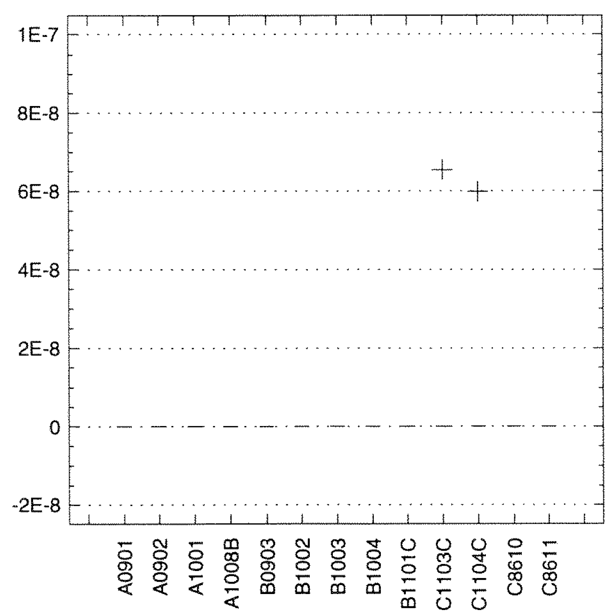


Figure 3-34. Tritium Activity (μCi/mL) in Groundwater Samples from the Lacustrine Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

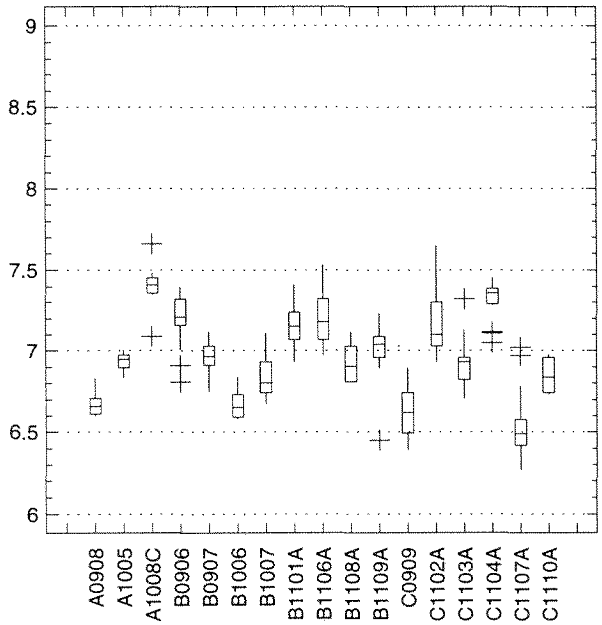


Figure 3-35. pH in Groundwater Samples from the Weathered Lavery Till Unit

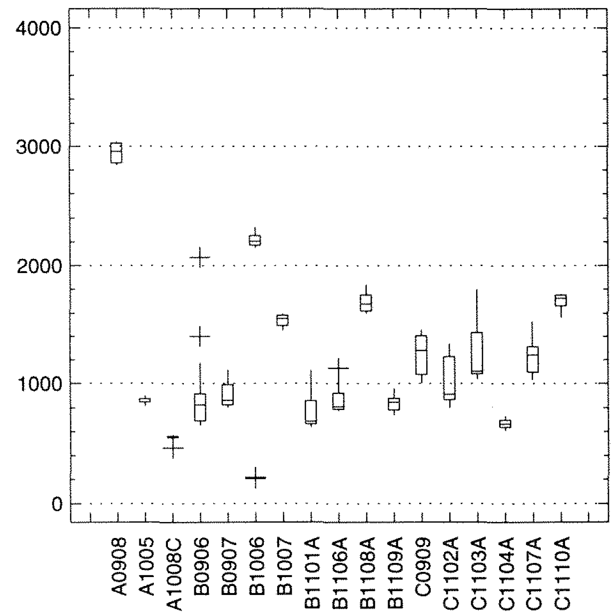


Figure 3-36. Conductivity (μmhos/cm@25°C) in Groundwater Samples from the Weathered Lavery Till Unit

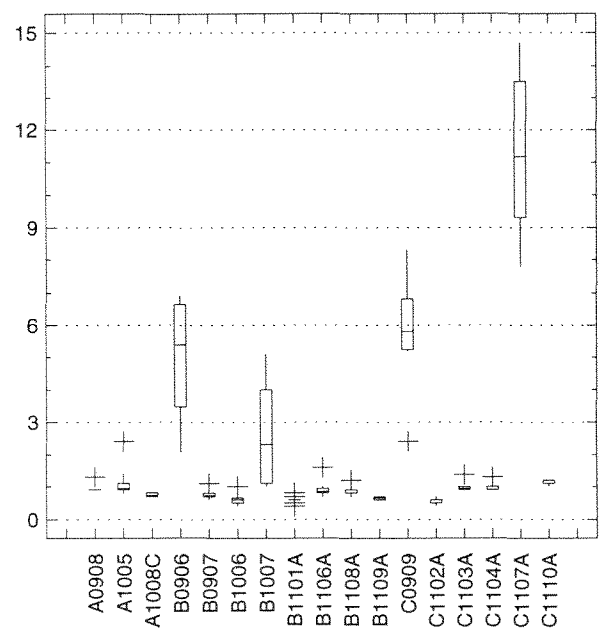


Figure 3-37. Total Organic Carbon (mg/L) in Groundwater Samples from the Weathered Lavery Till Unit

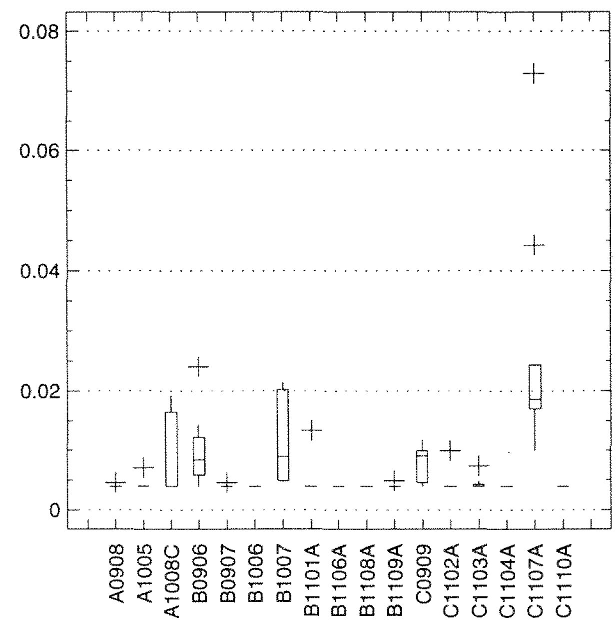


Figure 3-38. Total Organic Halogens (mg/L) in Groundwater Samples from the Weathered Lavery Till Unit

Wells are arranged in general upgradient to downgradient order, reading from left to right.

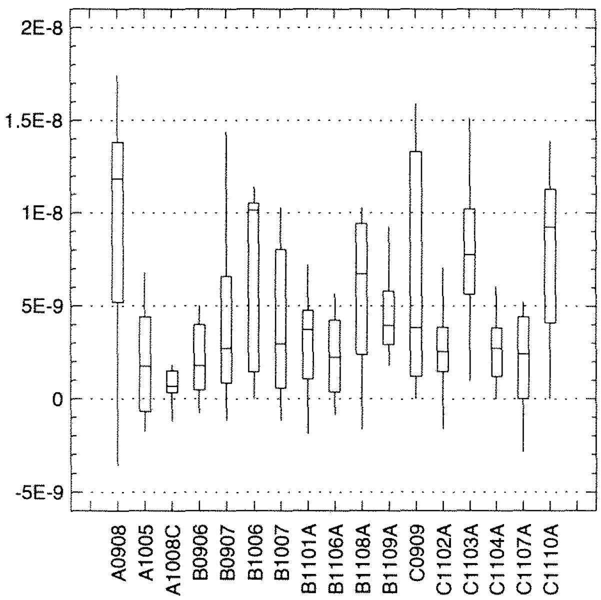


Figure 3-39. Gross Alpha (µCi/mL) in Groundwater Samples from the Weathered Lavery Till Unit

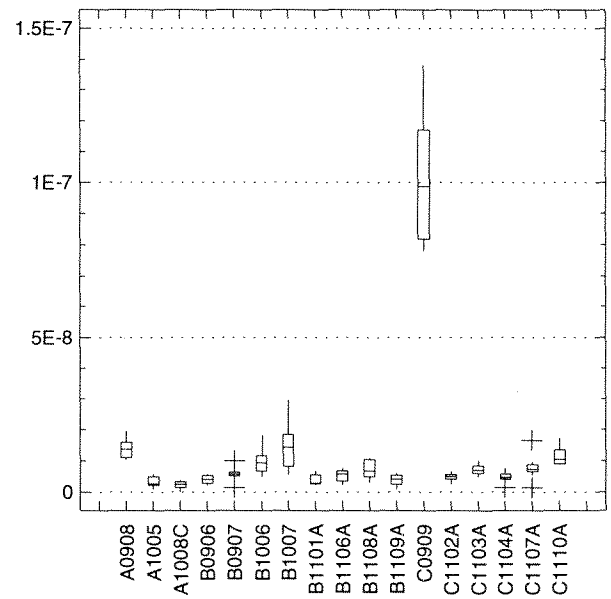


Figure 3-40. Gross Beta (µCi/mL) in Groundwater Samples from the Weathered Lavery Till Unit

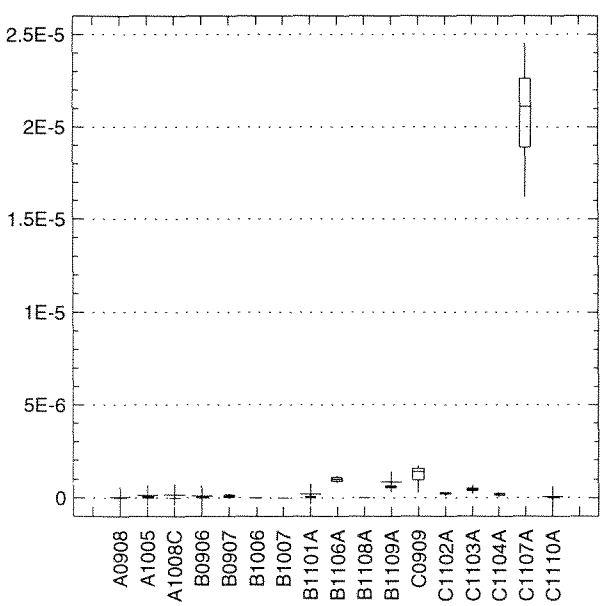


Figure 3-41. Tritium Activity (µCi/mL) in Groundwater Samples from the Weathered Lavery Till Unit Figure 3-41a follows with expanded scale

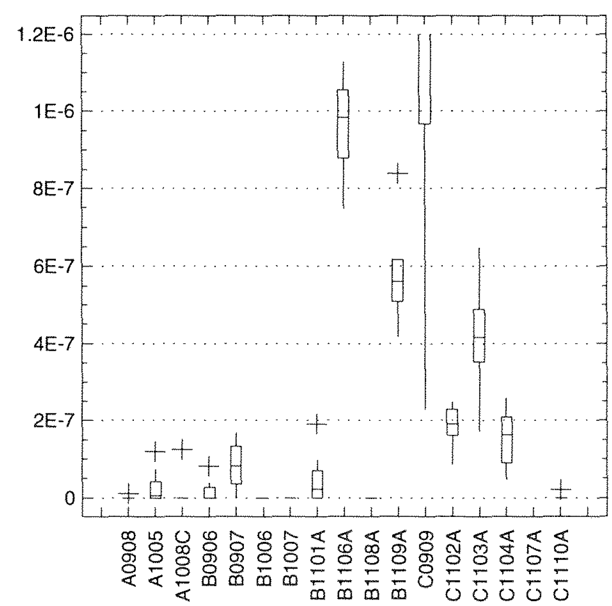


Figure 3-41a. Tritium Activity (µCi/mL) in Groundwater Samples from the Weathered Lavery Till Unit (expanded scale)

Wells are arranged in general upgradient to downgradient order, reading from left to right.

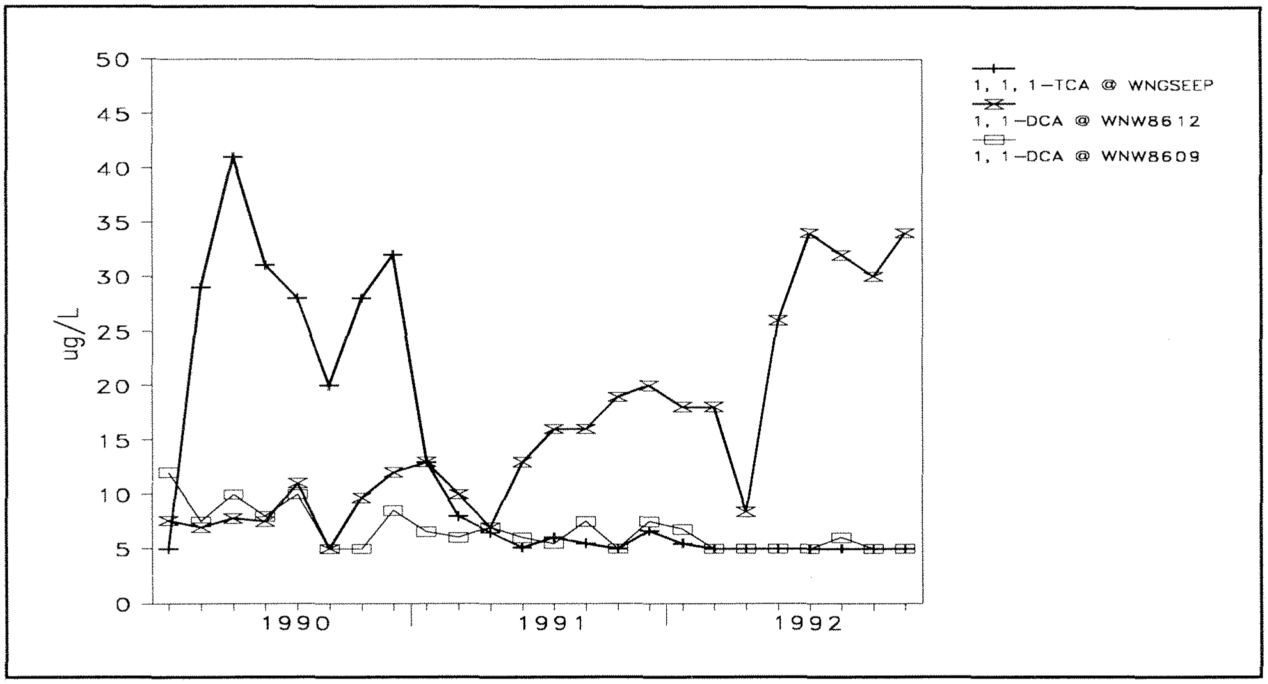


Figure 3-42. Three-Year Trends (1990 through 1992) of 1,1-DCA and 1,1,1-TCA (μg/L) at Selected Groundwater Locations

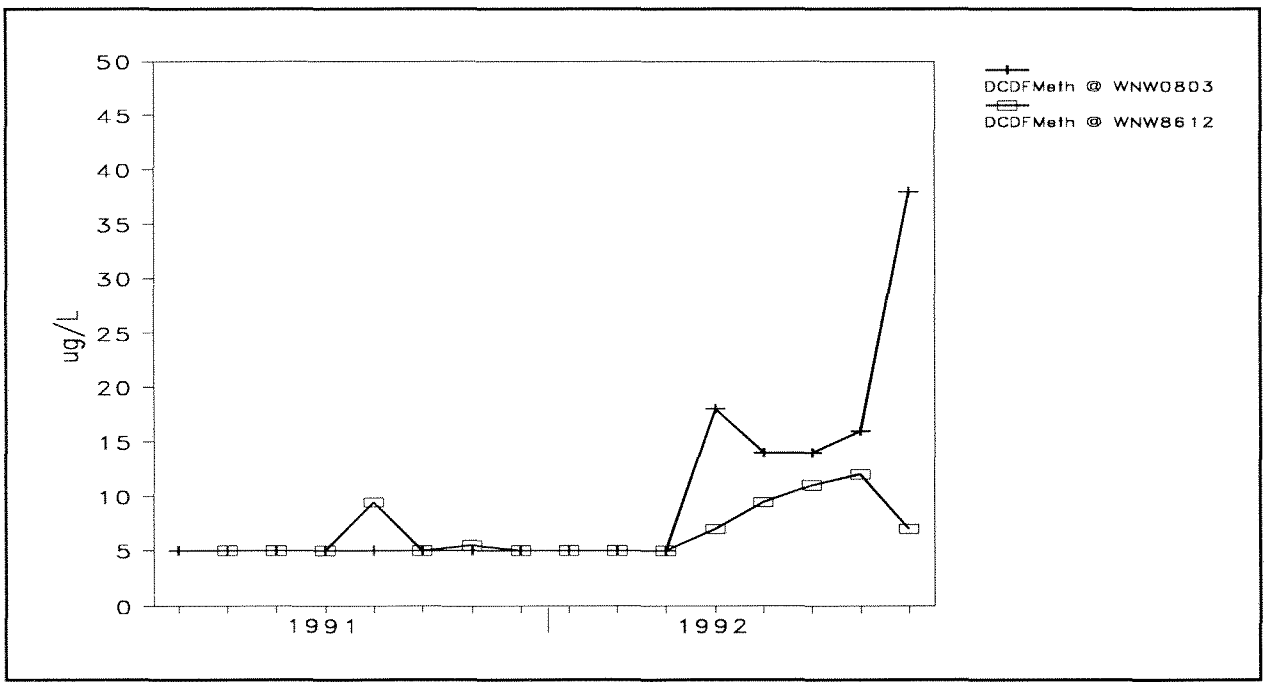


Figure 3-42a. Two-Year Trends (1991 through 1992) of Dichlorodifluoromethane (DCDFMeth) (μg/L) at Selected Groundwater Locations

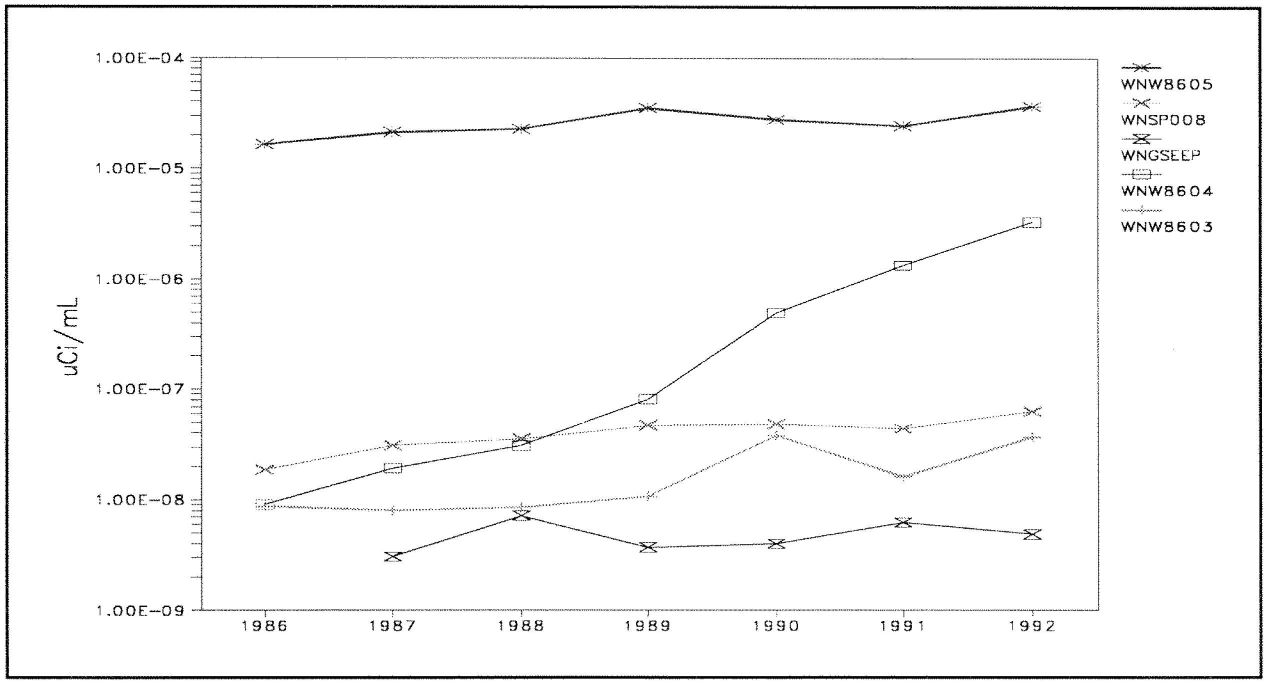


Figure 3-43. Seven-Year Trends of Averaged Gross Beta Activity (μCi/mL) at Selected Locations in the Sand and Gravel Unit

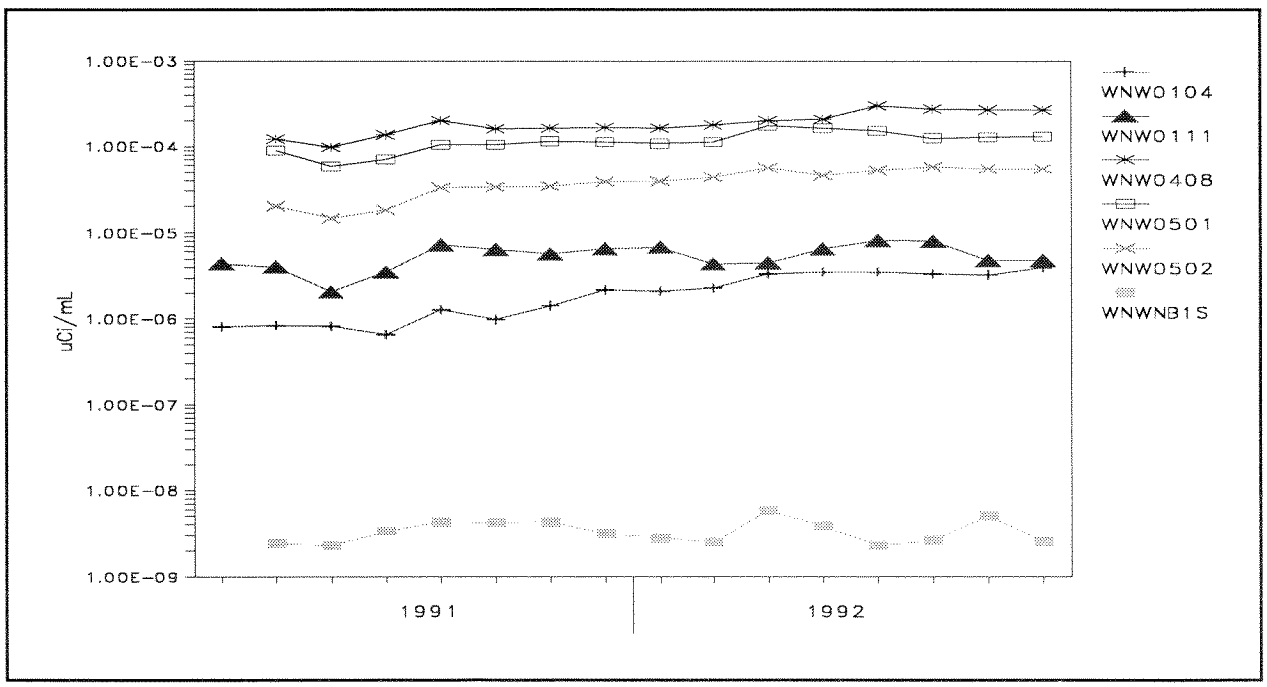


Figure 3-43a. Two-Year Trends of Gross Beta Activity (μCi/mL) for Selected New Wells

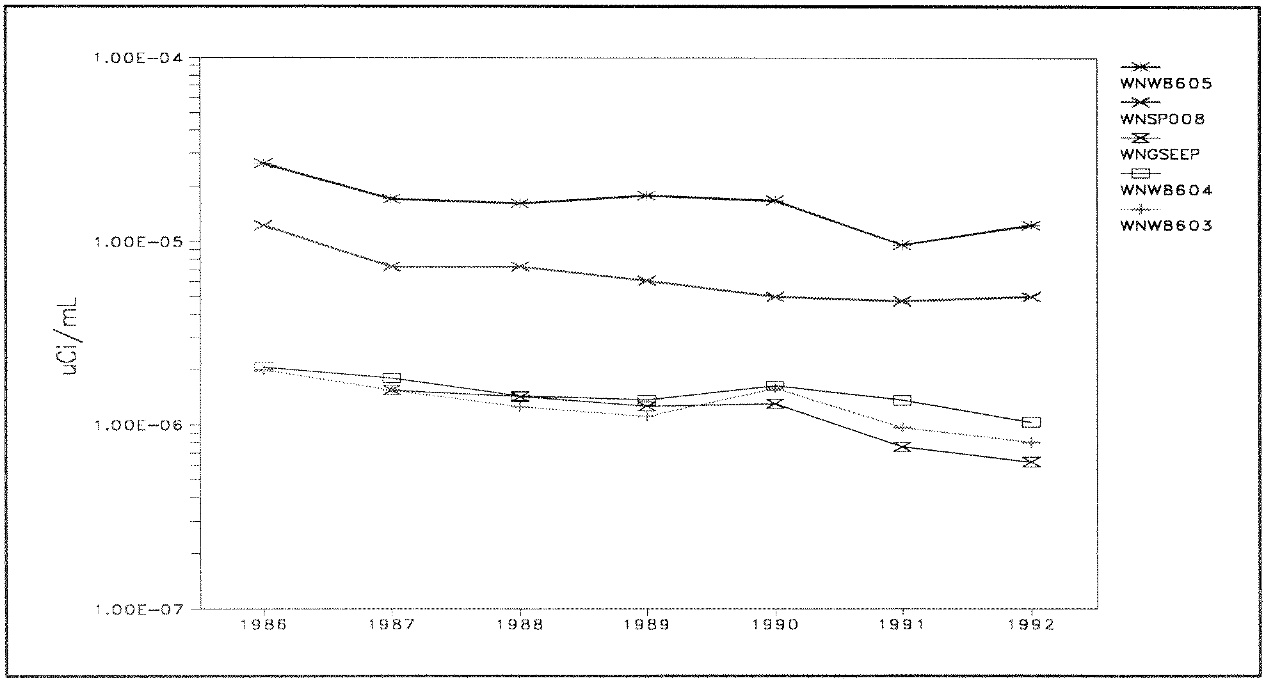


Figure 3-44. Seven-Year Trends of Averaged Tritium Activity (μCi/mL) at Selected Locations in the Sand and Gravel Unit

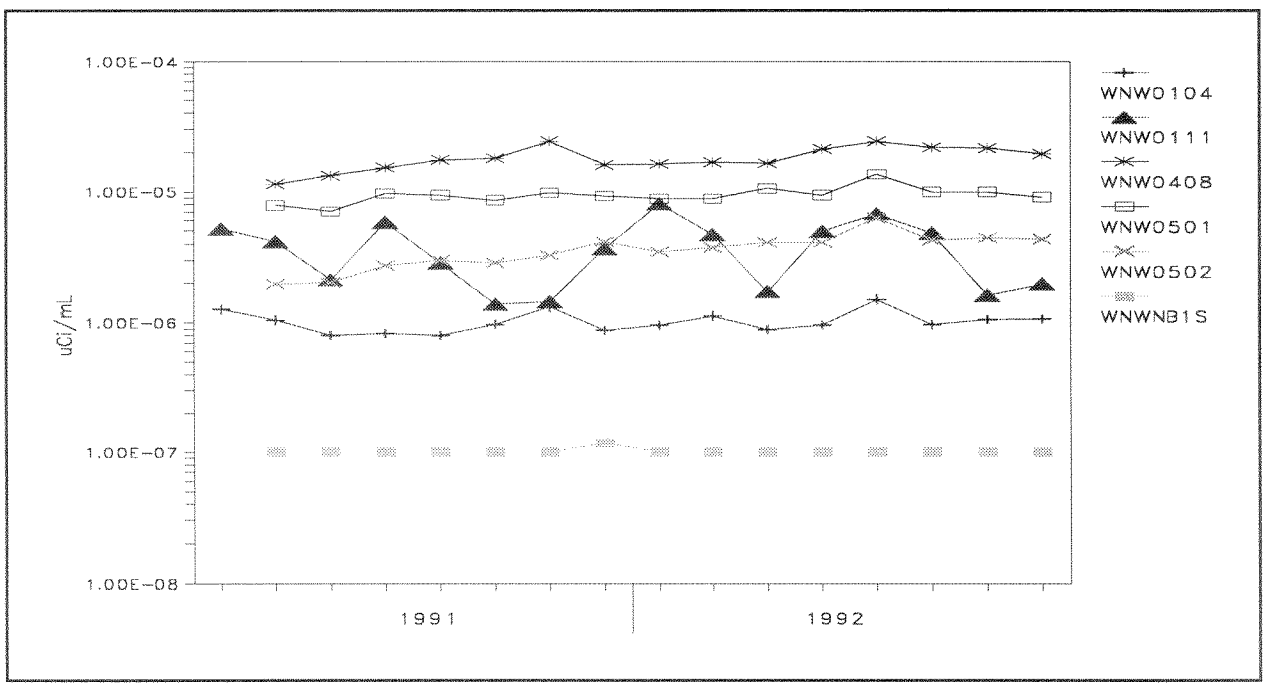


Figure 3-44a. Two-Year Trends of Tritium Activity (μCi/mL) for Selected New Wells

RADIOLOGICAL DOSE ASSESSMENT

Each year the potential radiological dose to the public from the West Valley Demonstration Project is assessed to determine if an individual could possibly have received an exposure exceeding the limits established by the regulatory agencies. The results of these conservative dose calculations demonstrate that the hypothetical maximum dose to an off-site resident is well below permissible standards and is consistent with the "as low as reasonably achievable" philosophy of radiation protection.

Introduction

This chapter describes the methods used to estimate dose to the general public resulting from exposure to radionuclides released by the Project to the surrounding environment during 1992.

Estimated doses are compared directly with current radiation standards established by the Department of Energy (DOE) and the Environmental Protection Agency (EPA) for protection of the public. Doses are also compared to the dose the public receives from natural background radiation and to doses reported in previous years for the Project.

Radioactivity

Atoms that emit radiation are called radionuclides. Radionuclides are unstable isotopes that have the same number of protons and electrons as any other isotope of the element but different numbers of neutrons, resulting in different atomic masses. For example, the element hydrogen has two stable isotopes, H-1 and H-2 (deuterium), and one radioactive isotope, H-3 (tritium). The numbers following the element's symbol identify the atomic mass, which is the number of protons plus neutrons in the nucleus.

Once a radioactive atom decays by emitting radiation, the resulting daughter atom also may be either radioactive or stable. Each radioactive isotope has a unique half-life that represents the time it takes for 50% of the atoms to decay. Strontium-90 and cesium-137 have half-lives of about thirty years, while plutonium-239 has a half-life of 24,000 years. Emitted radiation may consist of electromagnetic rays such as x-rays and gamma rays or alpha or beta particles. Each radionuclide may emit one or more of these radiations at characteristic energies that can be used to identify them.

Radiation Dose

The energy released from a radionuclide is eventually deposited in matter encountered along the path of radiation, resulting in a radiation dose to the absorbing material. 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 mass. 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 skin layer of the body from the outside to deliver a whole body dose or expose internal organs. However, beta and gamma radiation deposit much less energy in tissue per unit mass relative to alpha radiation.

Units of Measurement

The U.S. unit of measurement for dose equivalent is the rem. The international unit of measurement of dose equivalent is the sievert (Sv), which is equal to 100 rem. The millirem (mrem) and millisievert (mSv), used more frequently to report the low dose equivalents encountered in environmental exposures, are the equivalent of one-thousandth of a rem or sievert. The dose equivalent concept was developed by the radiation community to allow comparison of dose from different types of radiation.

The effective dose equivalent (EDE) was developed to account for the relative risk of radiation exposure to a particular organ or tissue. The EDE is calculated by multiplying the organ dose equivalent by the organ-weighting factors developed by the International Commission on Radiological Protection (ICRP) in Publications 26 (1977) and 30 (1979). The weighting factor is a ratio of the risk from a specific organ or tissue dose to the total risk resulting from whole body irradiation. All organ-weighted dose equivalents are then summed to obtain the EDE.

The dose from internally deposited radionuclides usually is calculated for a fifty-year period following one year of intake and is called the fifty-year committed effective dose equivalent (CEDE). The CEDE sums the dose to an individual over fifty years to account for the biological retention of radionuclides in the body. The total EDE is calculated by adding the dose equivalent from external, penetrating radiation to the CEDE. Unless otherwise specified, all doses discussed here are 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. Average individual dose can therefore be obtained by dividing the collective dose by the number in the population.

Sources of Radiation

Members of the public are routinely exposed to different sources of ionizing radiation from both natural and manmade sources. Figure 4-1 shows the relative importance of the annual dose in millirem (mrem) from these sources in comparison to the estimated annual dose from the WVDP. The National Council on Radiation Protection and Measurements (NCRP) Report 93 (1987) estimates that the average annual effective dose equivalent (EDE) received by an individual living in the U.S. is about 360 mrem (3.6 mSv) from both natural and manmade sources of radiation.

As can be seen in Figure 4-1, natural sources of radiation contribute 295 mrem of the total annual dose of 360 mrem. The WVDP contributes a very small amount (0.046 mrem per year) to the total annual manmade radiation dose of about 65 mrem and is less than the average dose received from using consumer products.

While most of the radiation dose affecting the general public is background radiation, manmade sources of radiation also contribute to the average radiation dose to individual members of the public.

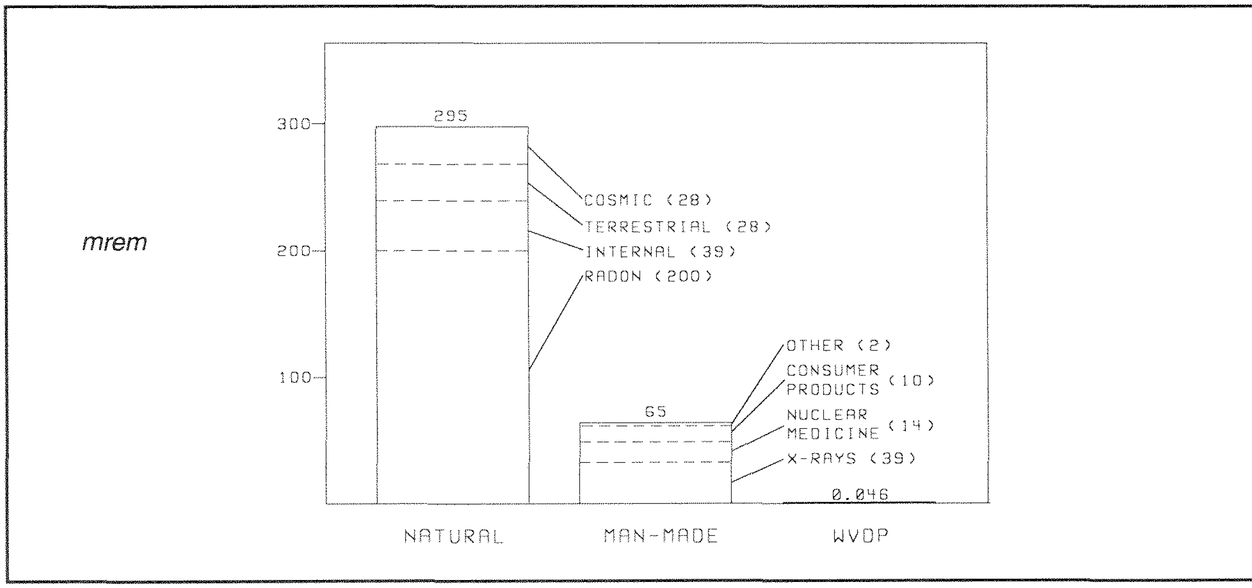


Figure 4-1. Comparison of Annual Background Radiation Dose to the Dose from 1992 WVDP Effluents

Such sources include diagnostic and therapeutic x-rays, nuclear medicine, fallout from atmospheric nuclear weapons tests, effluents from nuclear fuel cycle facilities, and consumer products such as smoke detectors and cigarettes.

Health Effects of Low-Level Radiation

The primary effect of low levels of chronic radiation in an exposed individual is generally assumed to be an increased risk of cancer. Radionuclides entering the body through air, water, or food are usually distributed in different organs of the body. For example, isotopes of iodine concentrate in the thyroid. Strontium, plutonium, and americium isotopes concentrate in the skeleton. When inhaled, uranium and plutonium isotopes remain in the lungs for a long period of time. Some radionuclides such as tritium, carbon-14, or cesium-137 are distributed uniformly throughout the body. Therefore, depending on the radionuclide, some organs may receive quite different doses. Moreover, at the same dose levels, certain organs (such as the breast) are more prone to developing a fatal cancer than other organs (such as the thyroid).

Because of the uncertainty and difficulty in measuring increased cancer resulting from exposure to ionizing radiation, a linear model is used to predict health effects from low levels of radiation. This model assumes that there is an effect on the exposed person at all dose levels even though the body may effectively repair damage incurred from low levels of beta and gamma radiations.

Exposure Pathways

The radionuclides present at the West Valley Demonstration Project site are left over from the reprocessing of commercial nuclear fuel during the 1960s and early 1970s. A very small fraction of these radionuclides is released off-site annually through ventilation systems and liquid discharges. An even smaller fraction actually contributes to the radiation dose to the surrounding population through exposure pathways. An exposure pathway consists of a source of contamination or radiation that is transported by environmental media to a receptor location where exposure to contaminants may occur. For example, a member of the public could potentially be exposed to low levels of radioactive particulates carried by prevailing winds.

The potential pathways of exposure to Project emissions are inhalation of gases and particulates, ingestion of local food products, ingestion of fish, beef, and deer tissues, and exposure to external penetrating radiations emanating from contaminated materials. The drinking water pathway was excluded based on usage surveys of the local population surrounding the WVDP site. Table 4-1 summarizes the potential exposure pathways for the general off-site population.

Dose Assessment Methodology

The general dose assessment methodology was to first assess radionuclide concentrations measured in environmental media to ascertain if any detectable effects from WVDP activities and releases have occurred. Even if the assessment of environmental media concentrations determined that there were no effects, airborne and waterborne releases from the WVDP were modeled to estimate annual doses to individuals and the local population. This two-tiered approach to assessing potential effects and doses resulting from WVDP emissions ensures that a complete evaluation is conducted. This general methodology also allows the collective annual dose to the local population to be calculated.

Environmental Media Concentrations

Near-site and control samples of fish, milk, beef, venison, and local produce were collected and analyzed for various radionuclides, including tritium, cobalt-60, strontium-90, iodine-129, cesium-134, and cesium-137. The measured radionuclide concentrations reported in *Appendix C-3*, Tables C-3.1 through C-3.4 are the basis for comparing near-site and background concentrations.

If statistically significant differences were found between near-site and background sample concentrations, the excess near-site sample concentration was used to conduct further dose assessment. If no significant difference in concentrations was found, then it was concluded that there was no impact from site operations and further dose assessment was not conducted.

The dose to nearby residents from the consumption of foods with radionuclide concentrations above background concentrations was calculated by multiplying the excess concentrations by the maximum adult annual consumption rate for each type of food and the unit dose conversion factor for ingestion of the measured radionuclide. The consumption rates are based on site-specific data and recommendations in *NRC Regulatory Guide* 1.109 for terrestrial food chain dose assessments (U.S. Nuclear Regulatory Commission 1977). The internal dose conversion factors were obtained from *Internal Dose Conversion Factors for Calculation of Dose to the Public* (U.S. Department of Energy 1988).

Predictive Computer Modeling

Because of the difficulty of measuring the small amounts of radionuclides emitted from the site beyond those that occur naturally in the environment, computer codes were used to model the environmental dispersion of radionuclides emitted from on-site monitored ventilation stacks and liquid discharge points. The EDE to the maximally exposed off-site individual and the collective EDE to the population were calculated. These models have been approved by the Department of Energy and the Environmental Protection Agency to demonstrate compliance with radiation standards.

Radiological dose was evaluated for the three major exposure pathways: external irradiation, inhalation, and ingestion of local food products. The dose contributions from each radionuclide and pathway combination were then summed to obtain the reported total dose estimates.

Table 4 - 1

Potential Exposure Pathways under Existing WVDP Conditions

Potentially Exposed Populations	Exposure Pathway and Transporting Medium	Reason for Inclusion/Exclusion
Current off-site residents	*Inhalation: gases and particulates from air*	*Off-site transport of contaminants from WVDP stacks or resuspended particulates from soils*
	Ingestion: cultivated crops	*Local agricultural products irrigated with contaminated ground- or surface water; foliar deposition and uptake of airborne contaminants*
	Ingestion: surface and groundwater	*No documented use of local surface water and downgradient groundwater wells by local residents*
	Ingestion: fish, beef, venison, and milk	*Fish exposed to contaminants in water or sediments may be consumed; beef, venison, and milk consumption following deposition of transported airborne contaminants and surface waters*
	External exposure: radiation emanating from particulates and gases from air or surface water	*Transport of air particulates and gases to off-site receptors; transport of contaminants in surface water during stream use and swimming*

Airborne Releases

Releases of airborne radioactive materials from nominal 10-meter stacks and from the main 60-meter stack were modeled using the EPA-approved CAP88-PC computer code. This air dispersion code estimates effective dose equivalents for the ingestion, inhalation, air immersion, and ground surface pathways. Site-specific data for radionuclide release rates in curies per year, wind data, local agricultural information, and the current local population were used as input parameters. Resulting output from the CAP88-PC code was then used to determine the total EDE to a maximally exposed individual and the collective dose to the local population within an 80-kilometer (50-mile) radius of the WVDP.

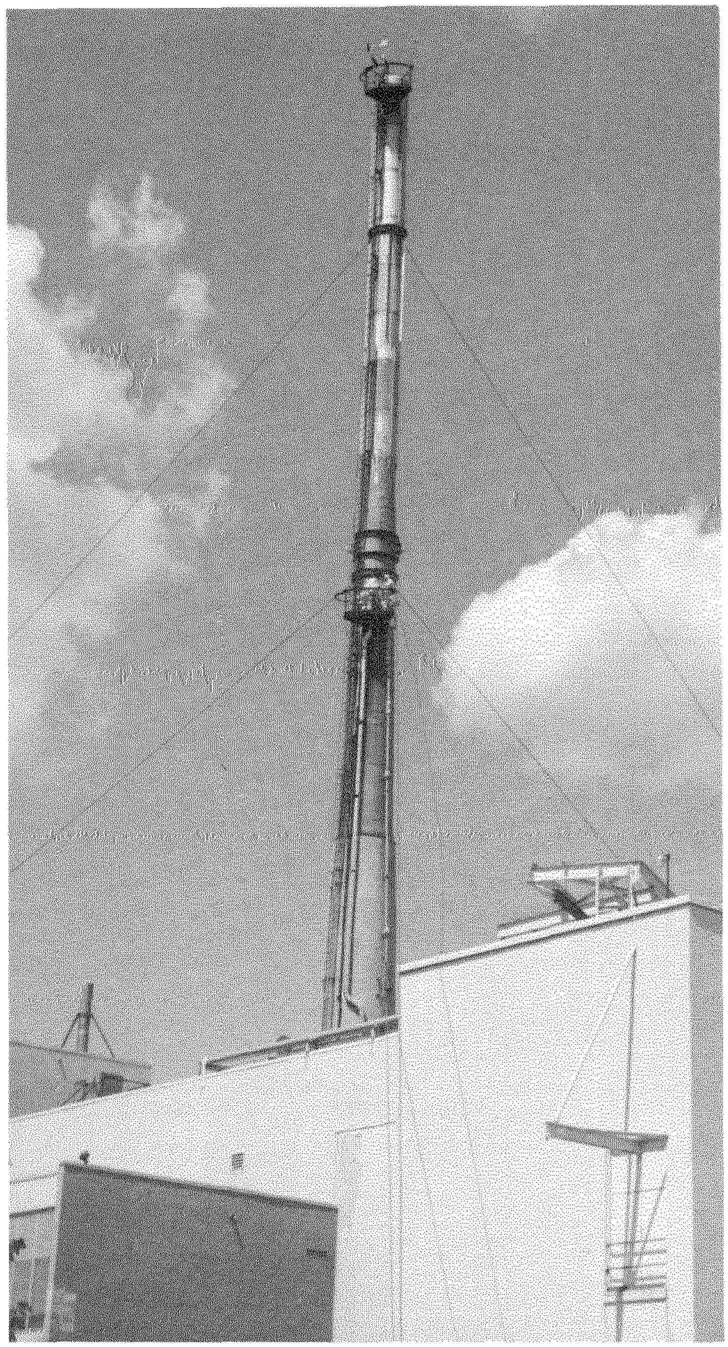
As reported in Chapter 2, *Environmental Monitoring*, five 10-meter stacks were monitored for radioactive air emissions during 1992. The activity that was released to the atmosphere from these stacks is listed in Tables C-2.1 through C-2.11 in *Appendix C-2* and was used as input to the CAP88-PC code.

The main plant stack, which vents to the atmosphere at a height of 63 meters (208 ft), was considered an elevated release; all other releases were considered ground-level releases.

Wind data collected from the on-site meteorological tower during 1992 were used as input to the CAP88-PC code. Data collected at the 60-meter and 10-meter heights were used in combination with elevated and ground-level effluent release data, respectively.

Waterborne Releases

The computer code LADTAP II (Simpson and McGill 1980) was used to calculate the EDE to the maximally exposed off-site individual and the collective EDE to the population from routine waterborne releases and dispersion of these effluents. Since the effluents eventually reach Cattaraugus Creek, which is not used as a source of drinking water, the local exposure pathways calculated by the code are from the consumption of 21 kilograms (46 lb) of fish caught in the creek and exposure to external radiation from shoreline or from water surface contamination.



The Main Plant Ventilation Stack at the West Valley Demonstration Project

Population dose estimates assumed that radionuclides were further diluted in Lake Erie before reaching municipal drinking water supplies and ingested by the local population. A detailed description of LADTAP II is given in *Radiological Parameters for Assessment of WVDP Activities* (Faillace and Prowse 1990).

Seven batch releases of liquid radioactive effluents were monitored during 1992. The radioactivity that was discharged in these effluents is listed in *Appendix C-1*, Table C-1.1, and was used as input data for the LADTAP II computer code. Other input data included site-specific stream flow and dilution, drinking water usage, and stream usage factors. Dose conversion factors for individual and population dose were used for each radionuclide as reported in *Radiological Parameters for Assessment of WVDP Activities.*

Biological Compartment Concentrations

Radionuclide concentrations in samples of fish, milk, beef, venison, and local crops were assessed to determine if near-site concentrations were significantly above concentrations for corresponding background samples.

Fish

Muscle tissue from fish were collected from May through November 1992 in Cattaraugus Creek upstream (background samples) and downstream of the site above and below the Springville dam. Ten tissue samples were collected at each of the three stations and analyzed primarily for strontium-90, cesium-134, and cesium-137. Other gamma-emitting radionuclides were not detected in any sample. Average radionuclide concentrations from samples downstream of the site were found to be statistically indistinguishable from average background concentrations at the 95% confidence levels. Strontium-90 and cesium-134 averages were also numerically below background averages. Individual concentrations for cesium-134 and cesium-137 were all below detection limits except for one cesium-137 value for a downstream sample.

Milk

Milk samples were collected from various nearby dairy farms throughout 1992. Control samples were collected from farms 25-30 kilometers (15-20 mi) to the south and north of the WVDP. Milk samples were measured primarily for tritium, strontium-90, iodine-129, cesium-134, cesium-137, and any other detectable gamma-emitting radionuclides. Ten near-site milk samples were collected and compared with eight background samples. All average radionuclide concentrations from near-site locations were statistically identical to average background concentrations. Individual iodine-129 concentrations in near-site milk were all at or below detection limits. The highest iodine-129 concentration reported was from a background sample.

Beef

Near-site and control samples of locally raised beef were collected in 1992. These samples were measured for tritium, strontium-90, cesium-134, cesium-137, and detectable gamma-emitting radionuclides. Two samples of beef muscle tissue were collected from background locations and two from near-site locations. All individual concentrations of tritium, strontium-90, and cesium-134 were below detection limits in background and near-site samples. The average strontium-90 concentration from near-site samples was below the average for background samples. Cesium-137 concentrations were above detection limits in background and near-site samples but were statistically identical, using 95% confidence intervals.

Venison

Meat samples from three near-site and three control deer were collected in 1992. These samples were measured for tritium, strontium-90, cesium-134, cesium-137, and other gamma-emitting radionuclides. Strontium-90 and cesium-134 concentrations were below detection limits in background and near-site samples. Tritium and cesium-137 were detectable, but average concentrations for background and near-site samples were statistically identical.

Produce (hay, corn, beans, and apples)

Near-site and background samples of hay, corn, beans, and apples were collected during 1992 and analyzed for tritium, strontium-90, cesium-134, cesium-137, and any other detectable gamma-emitting radionuclides. Single samples of each type of produce were collected and compared with single background sample results. Tritium, cesium-134, and cesium-137 were all below detection limits or within the 95% counting error interval of background concentrations. Strontium-90 concentrations were found to be higher in the near-site samples of hay and beans than in background samples.

To further assess strontium-90 concentrations in hay and beans, individual concentrations for near-site and background samples from 1987 through 1992 were statistically compared using conventional one-way analysis of variance. In addition, since the distributional nature of the data was not known, a Mann-Whitney rank sum nonparametric test was performed. The analysis of variance showed average strontium-90 from near-site and controls to be identical at the 95% level of confidence. The rank sum nonparametric test showed similar results, indicating no significant difference between average strontium-90 concentrations for hay or beans collected from background and near-site locations.

Predicted Dose from Airborne Emissions

Applicable Standards

Airborne emissions of radionuclides are regulated by the EPA under the Clean Air Act. Department of Energy facilities are subject to 40 CFR 61, subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAPs). The applicable standard for radionuclides released during 1992 is 10 mrem (0.10 mSv) EDE for any member of the public.

Maximum Dose to an Off-Site Resident

Based on the airborne radioactivity released from the site during 1992, a person living in the vicinity of the WVDP was estimated to receive a total EDE of 1.1×10^{-4} mrem (1.1×10^{-6} mSv). This hypothetical maximally exposed individual was assumed to reside continuously 1.9 kilometers north-northwest of the site and to eat only locally produced foods. Approximately 63% and 70% of the total dose from 1992 airborne emissions were due to iodine-129 from the 60-meter and 10-meter stacks, respectively. Cesium-137 and its daughter product, barium-137m, contributed another 20% to the total dose from the 60-meter stack emissions, followed by americium-241 (7%), tritium (3%), strontium-90 (3%), and plutonium-239 (2%). The shorter 10-meter stack radionuclide contributions were uranium-238 (9%), tritium (6%), uranium-234 (5%), americium-241 (4%), and plutonium-239 (4%).

Total dose to the hypothetical off-site resident was also assessed by individual exposure pathways. Ingestion accounted for 70% and 72%, inhalation for 10% and 23%, and external exposures for 20% and 5% from tne 60-meter and 10-meter stacks, respectively.

The total EDE of 1.1×10^{-4} mrem is far below measurable levels. This dose could be compared to less than one minute of natural background radiation received by an average member of the U.S. population.

This dose is also well below the 10 mrem NESHAPs standard promulgated by the EPA. A more conservative NESHAPs assessment was also conducted using upper detection release rates for airborne radionuclides. The resulting EDE of 2.9×10^{-4} mrem (2.9×10^{-6} mSv) was a factor of 2.6 higher than this analysis, which used actual reported release rates. Both assessments amply demonstrate compliance with EPA standards.

Collective Population Dose

The CAP88-PC version of AIRDOS-EPA was used to estimate the collective total EDE to the population. According to census projections for 1992, an estimated 1.7 million people resided within 80 kilometers (50 mi) of the WVDP. This population received an estimated 1.6×10^{-3} person-rem (1.6×10^{-5} person-Sv) total EDE from radioactive airborne effluents released from the WVDP during 1992. The resulting average EDE per individual was 9.4×10^{-7} mrem (9.4×10^{-9} mSv).

There are no standards limiting the collective EDE to the population. However, the calculated average individual EDE is orders of magnitude lower than the 300 mrem (3 mSv) that an average member of the U.S. population receives in one year from natural background radiation. Using the more conservative values, a collective EDE of 2.4×10^{-3} person-rem (2.4×10^{-5} mSv) was calculated, with a resulting average EDE per individual of 1.4×10^{-6} mrem (1.4×10^{-8} mSv).

Predicted Dose from Waterborne Releases

Applicable Standards

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 141 and 40 CFR 143, *Drinking Water Guidelines* (U.S. Environmental Protection Agency 1984 a,b). The potable water wells sampled for radionuclides are upgradient of the West Valley Demonstration Project and are not considered a pathway in the dose assessment. Since Cattaraugus Creek is not designated as a drinking water supply, the estimated radiation dose was compared with the guidelines provided in DOE Order 5400.5.

Maximum Dose to an Off-Site Individual

Based on the radioactivity in effluents released from the WVDP during 1992, an off-site individual was estimated to receive a maximum total EDE of 4.6×10^{-2} mrem (4.6×10^{-4} mSv). Approximately 97% of this dose is from cesium-137. This dose is about 6,500 times lower than the 300 mrem (3 mSv) that an average member of the U.S. population receives in one year from natural background radiation. The majority of this dose was from the hypothetical ingestion of fish. The external radiation pathway was comparatively insignificant.

Collective Dose to the Population

As a result of radioactivity released in liquid effluents from the WVDP during 1992, the population living within 80 kilometers (50 mi) of the site received a collective EDE of 9.2×10^{-3} person-rem (9.2×10^{-5} person-Sv). This estimate is based on a population of 1.7 million living within the 80-kilometer radius. The resulting average EDE per individual is 5.4×10^{-6} mrem (5.4×10^{-8} mSv), or approximately 55 million times lower than the 300 mrem (3 mSv) that an average person receives in one year from natural background radiation.

Predicted Dose from all Pathways

The potential dose to the public from both airborne and liquid effluents released from the Project during 1992 is the sum of the individual dose contributions. The maximum EDE from all pathways to a nearby resident was 4.6×10^{-2} mrem (4.6×10^{-4} mSv).

This dose is 0.05% of the 100 mrem (1 mSv) annual limit in DOE Order 5400.5. The total collective EDE to the population within 80 kilometers (50 mi) of the site was 1.1×10^{-2} person-rem (1.1×10^{-4} person-Sv), with an average EDE of 6.5×10^{-6} mrem (6.5×10^{-8} mSv) per individual.

Table 4-2 summarizes the dose contributions from all pathways and compares the individual doses to the applicable standards.

Risk Assessment

Estimates of cancer risk from ionizing radiation have recently been presented by the International Commission on Radiological Protection (1990), the National Council on Radiation Protection and Measurement (1987), and the National Research Council Committee on Biological Effects of Ionizing Radiation (1990). These reports estimate that the probability of fatal cancer induction to the public of all ages ranges from 100 to 500 x 10^{-6} cancer fatalities/rem. The most recent risk coefficient by the International Commission on Radiological Protection of 500 x 10^{-6} was used to estimate risk to a maximally exposed off-site individual. The resulting risk to this hypothetical individual from airborne and waterborne releases was 2.3×10^{-8} cancer fatalities. This risk is well below the range of 1×10^{-6} to 1×10^{-5} per year considered acceptable by the International Commission on Radiological Protection Report 26 (1977) for any individual member of the public.

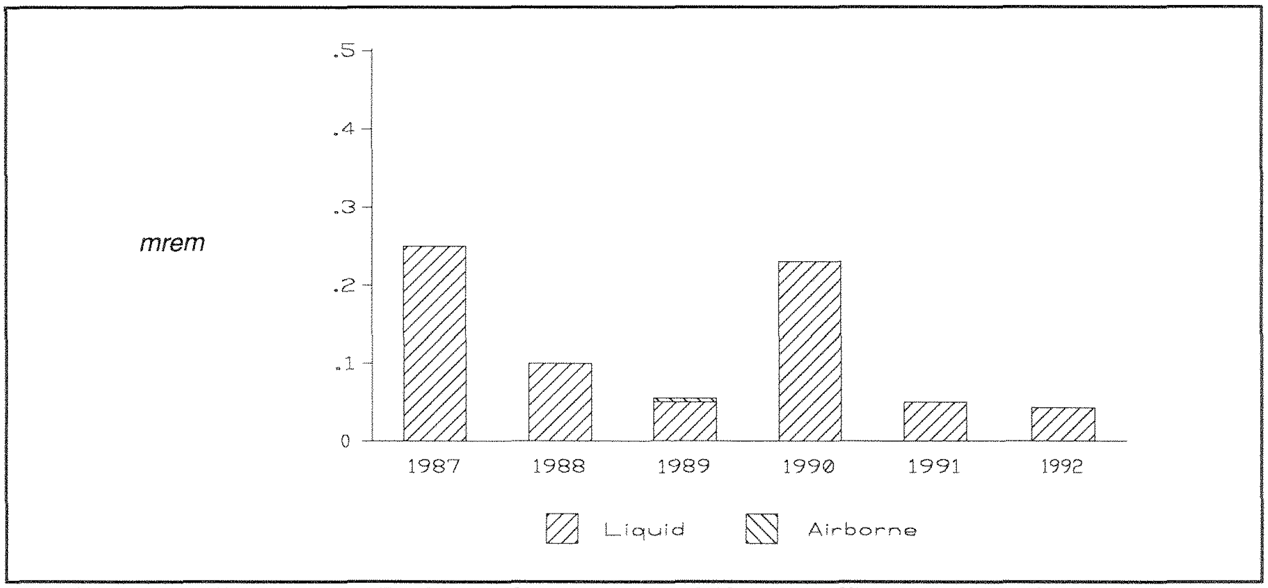


Figure 4-2. Effective Dose Equivalent from Liquid and Airborne Effluents to a Maximally Exposed Individual Residing near the WVDP

Figure 4-2 shows the dose to the maximally exposed individual over the last six years. The estimated dose for 1992 is lower than the dose reported in previous years.

Figure 4-3 shows the collective dose to the population over the last six years. The estimated collective dose for 1992 is also lower than doses reported in previous years.

Table 4 - 2

Summary of Annual Effective Dose Equivalents to an Individual and Population from WVDP Effluents

Exposure Pathway	*Annual Effective Dose Equivalent*	
	Maximum Individual [1] *mrem/y (mSv/y)*	*Collective* [2] *person-rem (person-Sv)*
Airborne Releases [3]	*1.1E-04 (1.1E-06)*	*1.6E-03 (1.6E-05)*
% EPA Standard (10 mrem)	*1.1E-03*	*NA*
Waterborne Releases [4]	*4.6E-02 (4.6E-04)*	*9.2E-03 (9.2E-05)*
Total Releases	*4.6E-02 (4.6E-04)*	*1.1E-02 (1.1E-04)*
% DOE Standard (100 mrem)	*0.05*	*NA*
% Natural Background (300 mrem; 510,000 person-rem)	*0.02*	*2.2E-06*

[1] *Maximally exposed individual at a residence 1.9 kilometers NNW from the main plant.*

[2] *Population of 1.7 million within 80 kilometers of the site.*

[3] *Calculated using AIRDOS-EPA (CAP88-PC for individual and population).*

[4] *Calculated using methodology described in Radiological Parameters for Assessment of WVDP Activities (Faillace and Prowse 1990).*

Exponents, expressed as "E" in the table, are expressed as "10" in the text. Thus, $1.1x10^{-2}$ in the text is the same as 1.1E-02 in the table.

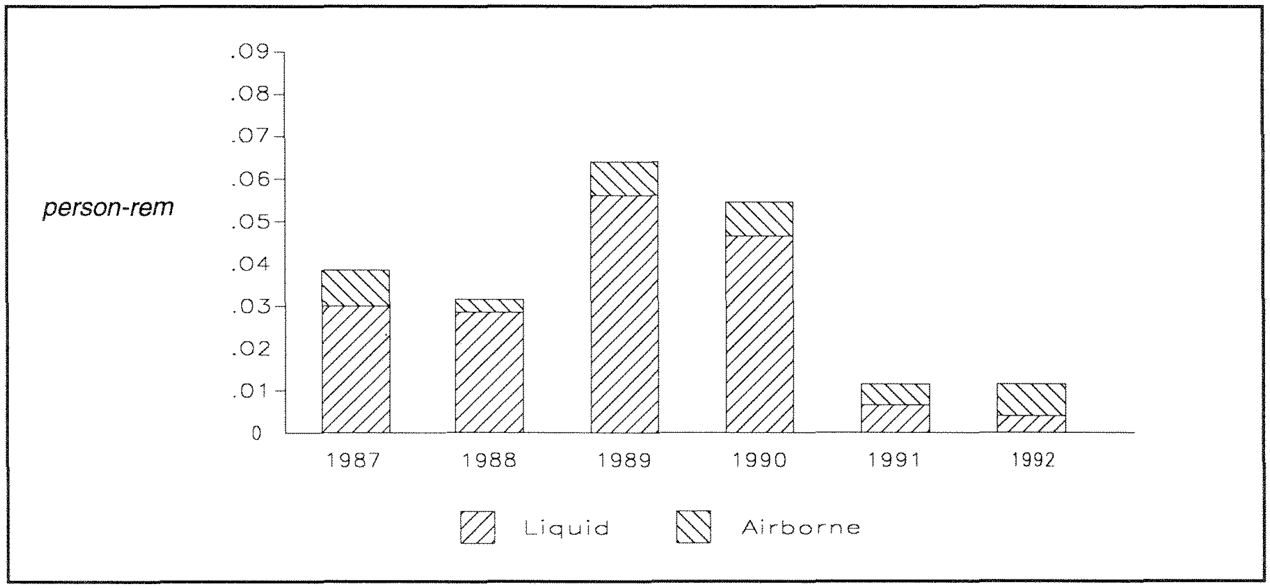


Figure 4-3. Collective Effective Dose Equivalent from Liquid and Airborne Effluents to the Population Residing within 80 Kilometers of the WVDP

Summary

Radionuclide concentrations in biological samples (fish, milk, beef, venison, and local produce) were determined to be below detectable levels or statistically identical to background concentrations. Thus, no specific dose assessment was performed using environmental media concentrations. Predictive computer modeling was performed for airborne and waterborne releases. This analysis resulted in doses to the hypothetical maximally exposed individual that were orders of magnitude below all applicable EPA standards and DOE Orders, which limit 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 natural background radiation doses. Based on the dose assessment, the West Valley Demonstration Project was found to be in compliance with all applicable radiological guidelines and standards during 1992.

QUALITY ASSURANCE

The quality assurance (QA) program at the West Valley Demonstration Project provides for and documents consistency, precision, and accuracy in collecting and analyzing environmental samples and in interpreting and reporting environmental monitoring data.

Organizational Responsibilities

The Safety and Environmental Assessment (S&EA) department is responsible for ensuring the quality of the environmental monitoring program. Environmental Laboratory management and staff are directly responsible for carrying out sampling and analytical activities in a manner consistent with good quality assurance practices.

Program Design

The quality assurance program for environmental monitoring at the WNYNSC is consistent with DOE Order 5700.6C, *Quality Assurance,* and the WVDP's *Environmental Quality Assurance Plan* (West Valley Nuclear Services 1991) and is based directly upon the eighteen-element program outlined in *Quality Assurance Program Requirements for Nuclear Facilities* (American Society of Mechanical Engineers 1989), which describes the major aspects of a good quality assurance program. The program focuses upon assigning responsibilities and upon thorough planning, specification, control, and documentation of all aspects of an activity:

√ *Responsibility.* Responsibilities involved in overseeing and managing an activity are clearly defined. Personnel who check and verify the activity are independent of those who perform the activity.

√ *Planning.* The activity is planned beforehand and the plan is followed. All activities are documented. Similarly, purchases of any equipment or items are planned, specified precisely, and verified for correctness upon receipt.

√ *Control of design, procedures, items, and documents.* Any activity, equipment, or construction is clearly described or defined and tested, and changes in the design are tested and documented. Procedures clearly state how activities will be conducted. Only approved procedures are used. Any equipment or particular items are clearly identified, inspected, calibrated, and tested before use. Calibration status is clearly labeled. Items that do not conform are identified and separated from other items and the nonconformity is documented.

√ *Documentation.* Records are kept of all activities in order to verify what was done. Records must be clearly traceable to an item or activity.

√ *Corrective action.* If a problem should arise, the cause of the problem is identified, a corrective action planned, responsibility assigned, and the problem remedied.

√ *Audits.* Scheduled audits and self-assessments verify compliance with all aspects of the quality assurance program and determine its effectiveness.

Vendors providing analytical services for the environmental monitoring program are contractually required to maintain a quality assurance program consistent with these elements.

Procedures

Activities affecting the quality of environmental monitoring data are conducted according to approved procedures that clearly describe how the activity should be performed and what precautions are to be taken in connection with the activity. Any person performing an activity that could affect the quality of environmental monitoring data must be trained in that procedure and demonstrate proficiency.

New procedures are developed each time an activity is added to the monitoring program. Procedures are reviewed annually and are updated when necessary. All procedures are controlled so that only those that are current are used.

Quality Control in the Field

Quality control (QC), an integral component of environmental monitoring quality assurance, is a way of verifying that samples are being collected and analyzed according to established quality assurance procedures: quality control ensures that sample collection and analysis is consistent and repeatable and is a means of tracking down possible sources of error. For example, sample locations are clearly marked in the field to ensure that future samples are collected in the same locations; collection equipment in place in the field is routinely inspected, calibrated, and maintained; and automated sampling stations are kept locked to prevent tampering.

Samples are collected into appropriate containers and labeled immediately with pertinent information. Date, time, person doing the collecting, and special field sampling conditions are recorded

Review of Regulatory Requirements

and become part of the record for that sample. If necessary, samples are preserved as soon as possible after collection.

In order to monitor quality problems that might be introduced by the sampling process, duplicate field samples, field blank samples, and trip blank samples are collected. Background samples are collected for baseline environmental information.

Field Duplicates

Field duplicates are samples collected at the same location at the same time. From that point they are treated as separate samples. Field duplicates provide a means of assessing the precision of collection methods and are collected at a minimum rate of one per twenty analyses.

Field Blanks

A field blank is a sample of laboratory-distilled water that is put into a sample container at a field collection site and is processed from that point as a routine sample. Field blanks are used to detect contamination introduced by the sampling procedure. They are processed at a minimum rate of one per twenty analyses. No field contamination problems have been detected.

If the same collection equipment is used for more than one site, a special form of field blank known as an equipment blank may be collected by pouring laboratory-distilled water through collecting equipment and into a sample container. Equipment blanks are collected to detect any cross-contamination that may be passed from one sampling location to another by the equipment. Many wells and surface water collection stations on the site have collecting equipment that remains at that location. This equipment is "dedicated" equipment, and special equipment blanks are not necessary at these locations because the equipment is used exclusively at that site.

Trip Blanks

Trip blanks are prepared by pouring laboratory-distilled water into sample bottles in the laboratory. The bottles are then placed into sample coolers and remain there throughout the sampling. Trip blanks are collected only when volatile organics are being monitored in order to detect any volatile organic contamination from the containers, coolers, or from handling during collection, storage, or shipping. No contamination from these sources has been found.

Environmental Background Samples

The environmental monitoring program includes samples taken from locations remote from the site for each pathway being monitored for possible radiological contamination such as air, water, vegetation, and meat. Analysis of these samples that are clearly outside of site influence show natural radiological concentrations and serve as backgrounds or "controls," another form of field quality control sample. These samples provide baseline information to compare with information from near-site or on-site samples so that any possible influence from the site can be determined.

Quality Control in the Laboratory

In order to monitor the accuracy and precision of data produced by the Environmental Laboratory, laboratory quality control practices specific to each analytical method are clearly described in approved references or procedures. Laboratory quality control consists of proper training of analysts, maintenance and calibration of measuring equipment and instrumentation, and specific methods of processing samples as a means of monitoring laboratory performance.

Analytical instruments and counting systems are calibrated at specified frequencies and logs of instrument calibration and maintenance are kept.

Calibration methods for each instrument are specified in procedures or in manufacturers' directions. Standards traceable to the National Institute of Standards and Technology (NIST) are used to calibrate counting and test instrumentation.

Laboratory quality control samples consist of three general types: standards (including spikes), used to assess accuracy; blanks, to assess the possibility of contamination; and duplicates, to assess precision. Results of Environmental Laboratory and vendor laboratory analyses also are compared to certified results from laboratories operated by the Department of Energy and the Environmental Protection Agency.

Standards

Laboratory standards are materials containing a known concentration of the analyte of interest, such as a pH buffer or a Pu-239 counting standard, and are either NIST-traceable standards or standard reference materials from other sources. At a minimum, one reference standard is analyzed for every ten sample analyses, or one per day, to determine if the method is producing results within acceptable limits.

The results of analyses of standards are plotted on control charts, which specify acceptable limits. If the method of analysis produces results within acceptable limits, then analysis of actual environmental samples may proceed and the results are deemed usable.

Laboratory Spikes

Another form of standard analysis is a laboratory spike, in which a known amount of analyte is added to a sample or blank before the sample is analyzed. The percent recovery of the analyte is an indication of how much of the analyte of interest is being detected in the analysis of actual samples; hence, a spike also is an assessment of the accuracy of the method. Acceptance limits are documented for spike recovery and spike results are recorded on control charts.

Control charts are routinely monitored. To supplement the routine analysis of standards, quality control samples of known concentrations are submitted to analysts in the laboratory by the S&EA quality assurance staff. The concentrations of the samples are unknown to the analyst and serve as an additional performance check on the accuracy of Environmental Laboratory analyses.

Laboratory Blanks

Laboratory blanks are prepared from a matrix similar to that of the sample but known to contain none of the analyte of interest. For instance, distilled water, taken through the same preparatory procedure as a sample, serves as a laboratory blank for both radiological and chemical water analyses. A positive result for an analyte in a blank indicates that something is wrong with the analysis and that corrective action should be taken. In general, one laboratory blank is processed daily or with each "run" of samples for a given analyte.

S&EA quality assurance staff also provide blank samples to check possible cross-contamination in the Environmental Laboratory.

A special form of laboratory blank for radiological samples is an instrument background count, which is a count taken of a planchet or vial containing no sample. The count serves three purposes:

1) to determine if contamination is present in the counting instrument

2) to determine if the instrument is responding in an acceptable manner

3) to determine the background correction that should be applied in calculations of radiological activity.

A background count is taken before each day's counting. Background counts are recorded on control charts with defined acceptance limits. An unacceptable count requires corrective action before analyses can proceed.

Laboratory Duplicates

Duplicates are analyzed to assess precision in the analytical process. Laboratory duplicates are created by splitting existing samples before analysis; each split is treated as a separate sample. If the analytical process is in control, results for each split should be within documented criteria of acceptability. As with standards, duplicate samples are submitted for analysis by S&EA quality assurance personnel as an additional performance check on laboratory precision.

Crosschecks

The Environmental Laboratory participates in formal radiological crosscheck programs conducted by the Department of Energy's Radiological and Environmental Science Laboratory (RESL), the Environmental Monitoring Systems Laboratory of the USEPA (EMSL) in Las Vegas, and the Environmental Measurements Laboratory (EML) in New York City. Crosscheck performance is summarized in *Appendix D*.

In conjunction with the on-site Analytical and Process Chemistry Laboratory, the Environmental Laboratory maintains certification with the New York State Department of Health (NYSDOH) to analyze samples for various nonradiological parameters.

More than 15,000 samples were handled by the Environmental Laboratory in 1992, including samples collected by laboratory staff and samples submitted to the laboratory by other departments or agencies. Roughly 60% of these samples were analyzed by the Environmental Laboratory staff, with the rest being sent to other laboratories.

Samples not analyzed by the Environmental Laboratory must maintain a similar level of quality control that is specified in contracts between the site and the vendor laboratories. Vendor laboratories are required to participate in all relevant crosschecks and to maintain all relevant certifications.

Personnel Training

Anyone performing environmental monitoring program activities must be trained in the appropriate procedures and qualified accordingly before carrying out the procedure as part of the site environmental monitoring program.

Record Keeping

Control of records is an integral part of the environmental monitoring program. Field data sheets, chain-of-custody forms, requests for analysis, sample-shipping documents, sample logs, bench logs, laboratory data sheets, equipment maintenance logs, calibration logs, training records, crosscheck performance records, data packages, and weather measurements, in addition to other records, are all maintained as documentation of the environmental monitoring program. All records pertaining to the program are reviewed routinely and securely stored.

The Laboratory Information Management System (LIMS), installed in the Environmental Laboratory in late 1990, is used to log samples, print labels, store and process data, monitor quality control samples, track samples, produce sampling and analytical worklists, and generate reports. The primary vendor laboratory provides data in electronic form for direct entry into the LIMS.

Chain-of-Custody Procedures

Field data sheets, which are filled out when samples are collected, serve as chain-of-custody records for routine samples. Samples are brought in from the field and logged at the sample receiving station, after which they are stored in a sample lock-up before analysis or shipping.

Samples sent to other laboratories for analysis are accompanied by a chain-of-custody/analytical request form. Signature control must be maintained by the agent transporting the samples. By contract, vendor laboratories are required to maintain internal chain-of-custody records and to store the samples under secure conditions.

Audits

Routine internal appraisals of S&EA and the Environmental Laboratory are conducted by site quality assurance personnel, who also audit the environmental monitoring programs. Off-site commercial laboratories under contract to perform environmental analyses for the WVDP are audited at least annually by teams of environmental and quality assurance professionals. In addition, external agencies audit the program as a whole. (See *Environmental Compliance Summary: Calendar Year 1992.*)

Performance Reporting

The performance of the laboratory in cross-check programs is published in the summary of results for each crosscheck. The Environmental Laboratory results are compared with the true value for the samples and with those of other laboratories participating in the crosscheck. Cross-check summaries are issued when results are received, and the causes of missed crosscheck analyses are investigated as part of the corrective action process.

Monthly trend analysis reports document possible warning levels or trends picked up as part of the environmental monitoring program.

Monthly State Pollutant Discharge Elimination System (SPDES) discharge reports are generated and submitted to the New York State Department of Environmental Conservation (NYSDEC). These reports document analysis of permitted water discharges required by NYSDEC.

Independent Data Verification

All Environmental Laboratory analytical data are reviewed and approved by a qualified person other than the person conducting the analysis. As part of the validation procedure, quality control samples analyzed in conjunction with the samples are examined and calculations are checked before approval. Safety and Environmental Assessment quality assurance personnel also conduct checks of the data in addition to the initial routine reviews. All software used to generate data is subjected to a verification procedure before being used.

Data must be formally validated, evaluated, and approved before being reported or used in calculations. Reports generated from data are peer reviewed before being issued. In addition, the correct transcription of data from original documents to the LIMS must be verified before the sample data in the LIMS can be formally approved and used in reports.

Analytical Methods Evaluation

A study was carried out in late 1992 and early 1993 to corroborate observed uranium concentrations in treated waters discharged from lagoon 3 at outfall WNSP001. Values obtained by routine radiological isotopic analyses will be compared to nonroutine uranium isotopic results obtained by high sensitivity thermal ionization mass spectrometry (TIMS).

Self-Assessments

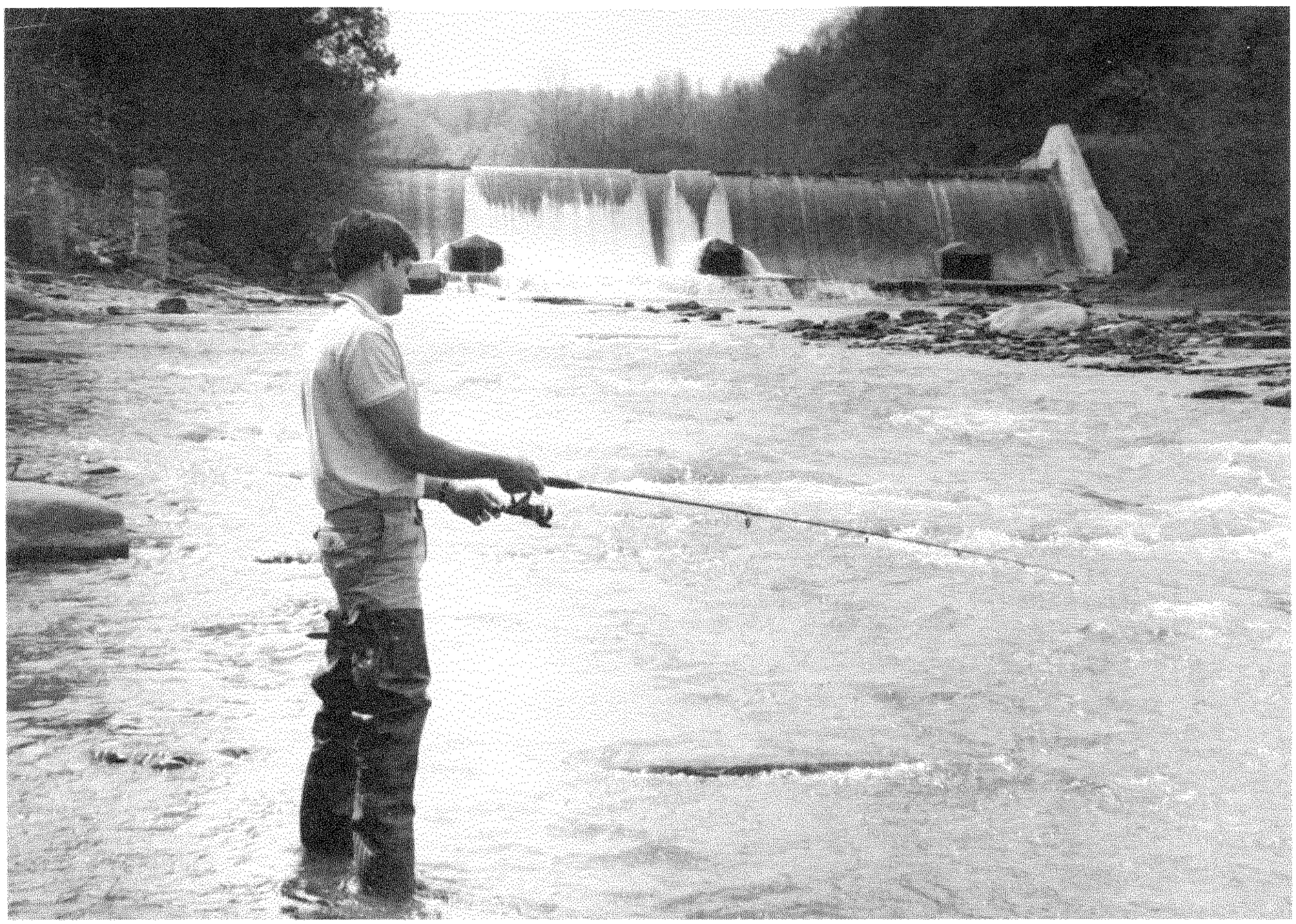
Three major self-assessments of the environmental monitoring program were conducted in 1992. The first assessment in March focused on sampling activities; the second, in June, focused on analytical procedures, calibration, and data validation. A combined assessment in September and October covered sample shipping, personnel training, quality assurance/quality control, chemical hygiene, and records management. All appraisals addressed corrective actions and peer review.

The major findings were a lack of timely follow-up of previously identified items and updating of procedures to keep up with changing documentation needs. These items are being addressed during 1993.

Self-assessments were also conducted to review Project activities relating to the National Environmental Policy Act (NEPA) and to air permitting and compliance management. No major issues were identified, although it was observed that procedures establishing NEPA documentation at the Project needed updating to reflect the current organizational structure. Actions to implement the recommendations are on schedule.

Appendix A

1992 Environmental Monitoring Program



Environmental Sampling — an Art as well as a Science

1992 Environmental Monitoring Program

The following schedule represents the West Valley Demonstration Project routine environmental monitoring program for 1992. This schedule meets or exceeds the minimum program needed to satisfy the requirements of DOE Order 5400.1. It also meets requirements of DOE 5400.5 and DOE/EH-0173T. Specific methods and recommended monitoring program elements are found in DOE/EP-0096, *Effluent Monitoring* and DOE/EP-0023, *Environmental Surveillance*, which are the bases for selecting most of the schedule specifics. Additional monitoring is mandated by Operational Safety Requirements (OSRs) and air and water discharge permits (40 CFR 61 and SPDES), which also require a formal report. These specific cases are identified in the schedule under MONITORING/REPORTING REQUIREMENTS.

Schedule of Environmental Sampling

The following table is a schedule of environmental sampling at the West Valley Demonstration Project. Locations of the sampling points are shown in Figures A-1 through A-9. The index below is a list of the codes for various sample locations. Table headings in the schedule are as follows:

- ***Sample Location Code.*** The physical location where the sample is collected is described. The code consists of seven characters. The first character identifies the sample medium as Air, Water, Soil/Sediment, Biological, or Direct Measurement. The second character specifies oN-site or oFf-site. The remaining characters describe the specific location (e.g., **AFGRVAL** is **A**ir o**F**f-site at **GR**eat **VAL**ley).

- ***Monitoring/Reporting Requirements.*** The basis for monitoring that location and any additional references to permits or OSRs are noted, as well as the reports generated from sample data.

- ***Sampling Type/Medium.*** This describes the collection method and the physical characteristics of the medium.

- ***Collection Frequency.*** Indicates how often the samples are collected or retrieved.

- ***Total Annual Sample Collections.*** The number of discrete physical samples collected annually for each analyte.

- ***Analyses Performed/Composite Frequency.*** Parameters measured for the samples taken at each collection event; the frequency of composite and the analytes for the composite samples are described.

Summary of Monitoring Program Changes in 1992

Location Code	*Description of Changes*
WNSP003	The SDA holding lagoon was filled in and has been removed from the sampling program.
WNDNKEL **WNDNKUR**	The potable water system was upgraded in 1991; the required quarterly analysis of volatile organic compounds for one year was completed and has been deleted from the 1992 program.
AFFXVRD **AFTCORD** **AFRT240**	New air samplers with heads in the human breathing zone have been installed and were brought into operation in 1992.
WNW0909 **WNW0910**	Two additional monitoring wells were installed and brought on line in SSWMU #9 (NDA).
WNW8604	This well was deleted from the listing under SSWMU #6 but remains in SSWMU #1. Its status is currently being re-evaluated as to proper SSWMU assignment, and it may be assigned as a downgradient well of SSWMU #5.
WNWNB1S	This well has been re-assigned to SSWMU #3 to conform to the site RFI Work Plan.
AFBLKST	Additional off-site ambient air monitoring was added in December 1992 at the bulk storage warehouse on Buttermilk Road.

Index of Environmental Monitoring Program Sample Points

** Not detailed on map*

Index of Environmental Monitoring Program Sample Points
(continued)

** Not detailed on map*

Index of Environmental Monitoring Program Sample Points
(concluded)

** Not detailed on map*

1992 MONITORING PROGRAM
ON-SITE EFFLUENT MONITORING:

AIR EFFLUENTS

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
	Airborne radioactive effluent points including LWTS and Vitrification Off-Gas	Continuous off-line air particulate monitors →	Continuous measurement of fixed filter, replaced weekly →	N/A →	Real time alpha and beta monitoring
ANSTACK Main Plant Ventilation Exhaust Stack **ANSTSTK** Supernatant Treatment System (STS) Ventilation Exhaust	Required by: • OSR-GP-1 • 40 CFR 61 Reported in: • Monthly Environmental Monitoring Trend Analysis • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report • Air Emissions Annual Report (NESHAP)	Continuous off-line air particulate filters →	Weekly →	52 each location →	Gross alpha/beta, gamma isotopic*
				Weekly filters composited to 4 each location →	Quarterly composite for Sr-90, Pu/U isotopic, Am-241, gamma isotopic
		Continuous off-line desiccant columns for water vapor collection →	Weekly →	52 each location →	**H-3 (ANSTACK and ANSTSTK only)**
		Continuous off-line charcoal cartridges →	Weekly →	Weekly cartridges composited to 4 each location →	Quarterly composite for I-129

*Weekly gamma isotopic only if gross activity rises significantly.

Sampling Rationale	
ANSTACK	DOE/EH-0173T, 3.0; OSR-GP-1, 1.A, 2.B; and DOE/EP-0096, 3.3. Monitors and samples HEPA-filtered ventilation from most process areas, including cell ventilation, vessel off-gas, FRS and head end ventilation, analytical area.
ANSTSTK	DOE/EH-0173T, 3.0; OSR-GP-1, 1.B, 2.B; and DOE/EP-0096, 3.3. Monitors and samples HEPA-filtered ventilation from building areas involved in treatment of high-level waste supernatant.

1992 MONITORING PROGRAM
ON-SITE EFFLUENT MONITORING:

AIR EFFLUENTS

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
ANCSSTK Cement Solidification System (CSS) Ventilation Exhaust **ANCSRFK** Contact Size-Reduction Facility Exhaust	Airborne radioactive effluent points <u>Required by</u>: • OSR-GP-1 • 40 CFR 61 <u>Reported in</u>: • Monthly Environmental Monitoring Trend Analysis • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report • Air Emissions Annual Report (NESHAP)	Continuous off-line air particulate monitors →	Continuous measurement of fixed filter, replaced weekly →	N/A →	Real-time alpha and beta monitoring
		Continuous off-line air particulate filters →	Weekly →	52 each location →	Gross alpha/beta, gamma isotopic*
				Weekly filters composited to 4 each location →	Quarterly composite for Sr-90, Pu/U isotopic, Am-241, gamma isotopic
		Continuous off-line charcoal cartridges →	Weekly →	Weekly cartridges composited to 4 each location →	Quarterly composite for I-129

*Weekly gamma isotopic only if gross activity rises significantly.

Sampling Rationale	
ANCSSTK	DOE/EH-0173T, 3.0; OSR-GP-1, 1.B, 2.B; and DOE/EP-0096, 3.3. Monitors and samples HEPA-filtered ventilation from process areas and cell used for decontaminated high-level radioactive supernatant solidification with cement.
ANCSRFK	DOE/EH-0173T, 3.0; OSR-GP-1, 1.B, 2.B; and DOE/EP-0096, 3.3. Monitors and samples HEPA-filtered ventilation from process area where radioactive tanks, pipes, and other equipment are reduced in volume by cutting with a plasma torch.

1992 MONITORING PROGRAM
ON-SITE EFFLUENT MONITORING:

AIR EFFLUENTS

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
ANSUPCV Supercompactor Exhaust	Airborne radioactive effluent point <u>Required by</u>: • OSR-GP-1 • 40 CFR 61 <u>Reported by</u>: • Monthly Environmental Monitoring Trend Analysis • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report • Air Emissions Annual Report (NESHAP)	Continuous off-line air particulate monitor during operation →	Continuous measurement of fixed filter →	N/A →	Real time beta monitoring
		Continuous off-line air particulate filter (maximum of 26 operating weeks expected) →	Collected and replaced every seven operating days, or at least monthly when unit is operated →	26 →	Filters for gross alpha/beta, gamma isotopic* upon collection
				Collected filters composited to 4 →	Quarterly composites for Sr-90, Pu/U isotopic, Am-241, gamma isotopic

*Weekly gamma isotopic only if gross activity rises significantly.

Sampling Rationale	
ANSUPCV	DOE/EH-0173T, 3.0; OSR-GP-1, 1.B, 2.B; and DOE/EP-0096, 3.3. Monitors and samples HEPA-filtered ventilation from area where low-level radioactive waste volume is reduced by compaction.

1992 MONITORING PROGRAM
ON-SITE EFFLUENT MONITORING:

LIQUID EFFLUENTS

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNSP001 Lagoon 3 Discharge Weir	Primary point of liquid effluent batch release <u>Required by</u>: • OSR-GP-2 • SPDES Permit <u>Reported in</u>: • Monthly SPDES DMR • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report	Grab liquid	→ Daily, during lagoon 3 discharge*	→ 40-80	→ Daily for gross beta, conductivity, pH, flow
				7-12	→ Every 6 days a sample is analyzed for gross alpha/beta, H-3, Sr-90, gamma isotopic
				Daily samples composited to 4-8	→ Weighted monthly composite for gross alpha/beta, H-3, C-14, Sr-90, I-129, gamma isotopic, Pu/U isotopic, Am-241
		Composite liquid	→ Twice during discharge, near start and near end	→ 8-16	→ Two 24-hour composites for Al, NH_3, As, BOD-5, Fe, Zn, pH, suspended solids, SO_4, NO_3, NO_2, Cr^{+6}, Cd, Cu, Pb, Ni
		Grab liquid	→ Twice during discharge, near start and near end	→ 8-16	→ Settleable solids, pH, cyanide amenable to chlorination, oil and grease, Dichlorodifluoromethane, Trichlorofluoromethane, 3,3-Dichlorobenzidine, Tributyl phosphate, Vanadium
		Composite liquid	→ Annually	→ 1	→ Annually, a 24-hour composite for: Cr, Se, Ba, Sb
		Grab liquid	→ Annually	→ 1	→ Chloroform
		Grab liquid	→ Semiannually	→ 2	→ Bis(2-Ethylhexyl) Phthalate, 4-Dodecene

*Lagoon 3 is discharged between 4 and 8 times per year, as necessary, averaging 10 days per discharge.

Technectium-99 sampling was added during the third quarter of 1992.

Sampling Rationale

WNSP001 DOE 5400.5 and DOE/EH-0173T, 2.3.3.

By DOE Order all liquid effluent streams from DOE facilities shall be evaluated and their potential for release of radionuclides addressed.

New York State SPDES permit no. NY0000973.

These regulations are met for radiological parameters by daily grab sampling during periods of lagoon 3 discharge. Sampling for chemical constituents is performed near the beginning and end of discharge periods to meet the site SPDES permit. Both grab samples and 24-hour composite samples are collected.

1992 MONITORING PROGRAM
ON-SITE EFFLUENT MONITORING:

LIQUID EFFLUENTS

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNSP006 Frank's Creek at Security Fence	Combined facility liquid discharge Required by: • OSR-GP-2 Reported in: • Monthly Environmental Monitoring Trend Analysis • Annual Environmental Monitoring Report	Timed continuous composite liquid	→ Weekly (samples collected simultaneously for NYSDOH)	→ 52	→ Gross alpha/beta, H-3, pH, conductivity
				Weekly samples composited to 12	→ Monthly composite for gamma isotopic and Sr-90
				Weekly samples composited to 4	→ Quarterly composite for C-14, I-129, Pu/U isotopic, Am-241
		Grab liquid	→ Semiannually	→ 2	→ TOC, TOX, Ca, Mg, Na, K, Ba, Mn, Fe, Cl, SO_4, NO_3, F, HCO_3, CO_3
WNSP007 Sanitary Waste Discharge	Liquid effluent point for sanitary and utility plant combined discharge Required by: • SPDES Permit Reported by: • Monthly SPDES DMR • Monthly Environmental Monitoring Trend Analysis • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report	24-hour composite liquid	→ 3 each month	→ 36	→ Gross alpha/beta, H-3, suspended solids, NH_3, BOD-5, Fe, Sr-90, gamma scan
				Samples composited to 12	→ Monthly composite for gamma isotopic and Sr-90
		Grab liquid	→ Weekly	→ 52	→ pH, settleable solids
		Grab liquid	→ Annually	→ 1	→ Chloroform
WNSTPBS Sanitary Waste Sludge	Operational STP Monitoring	Grab sludge	→ On demand (at least monthly)	→ 12	→ Gross alpha/beta, H-3

Sampling Rationale

WNSP006	DOE/EH-0173T, 5.10.1.1. By DOE Order all liquid effluent streams from DOE facilities shall be evaluated and their potential for release of radionuclides addressed.
WNSP007	DOE 5400.5 and DOE/EH-0173T, 2.3.3. Sampling rationale is based on New York State SPDES permit no. NY0000973 and DOE 5400.5 criteria for discharge of radioactivity to and from the sewage treatment plant.
WNSTPBS	DOE 5400.5. Composite of STP surge tank, sludge holding tank, and clarifier sludge analyzed for operational screening.

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE SURFACE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNSWAMP N.E. Swamp Drainage	Site surface drainage <u>Reported in:</u> • Annual Effluent and On-Site Discharge Report	Grab liquid	→ Monthly (samples collected simultaneously for NYSDOH)	→ 12	→ Gross alpha/beta, H-3, pH
		Grab liquid	→ Semiannually	→ 2	→ TOC, TOX, Ca, Mg, Na, K, Ba, Mn, Fe, Cl, SO_4, NO_3, F, HCO_3, CO_3
WNSW74A North Swamp Drainage	Site surface drainage <u>Reported in:</u> • Annual Effluent and On-Site Discharge Report	Timed continuous composite liquid	→ Weekly	→ 52	→ Gross alpha/beta, H-3, pH, conductivity
				Weekly samples composited to 12	→ Monthly composite for gamma isotopic, Sr-90
				Weekly samples composited to 4	→ Quarterly composite for C-14, I-129, Pu/U isotopic, Am-241
		Grab liquid	→ Seimiannually	→ 2	→ TOC, TOX, Ca, Mg, Na, K, Ba, Mn, Fe, Cl, SO_4, NO_3, F, HCO_3, CO_3
WN8D1DR High-Level Waste Farm Underdrain	Drains subsurface water from HLW storage tank area <u>Reported in:</u> • Monthly Environmental Monitoring Trend Analysis	Grab liquid	→ Weekly	→ 52	→ Gross alpha/beta, H-3, pH
				Weekly samples composited to 12	→ Monthly composite for gamma isotopic, Sr-90
WNSP008 French drain	Drains subsurface water from LLWT Lagoon area <u>Required by:</u> • SPDES Permit <u>Reported in:</u> • Monthly SPDES DMR • Annual Effluent and On-Site Discharge Report • Annual Environmental Monitoring Report	Grab liquid	→ 3 each month	→ 36	→ pH, conductivity, BOD-5, Fe
		Grab liquid	→ Monthly	→ 12	→ Gross alpha/beta, H-3
		Grab liquid	→ Annually	→ 1	→ Ag, Zn

Sampling Rationale

WNSWAMP DOE/EH-0173T, 5.10.1.1.

NE site surface water drainage; provides for the sampling of this discrete drainage path for uncontrolled surface waters just before they leave the site's controlled boundary. Waters collected represent surface and subsurface drainages from the construction and demolition debris landfill (CDDL), old hardstand areas, and other possible north plateau sources of radiological or nonradiological contamination.

WNSW74A DOE/EH-0173T, 5.10.1.1.

N site surface water drainage; provides for the sampling of this discrete drainage path for uncontrolled surface waters just before they leave the site's controlled boundary. Waters collected represent surface and subsurface drainages from lag storage areas and other possible north plateau sources of radiological or nonradiological contamination.

WN8D1DR DOE/EH-0173T, 5.10.1.3.

Monitors the potential influence on subsurface drainage surrounding the high-level waste tank farm.

WNSP008 DOE/EH-0173T, 5.10.1.3.

French drain of subsurface water from lagoon (LLWTF) area. NYSDEC SPDES permit also provides for the sampling of this discrete drainage path for uncontrolled subsurface waters before they flow into Erdman Brook. Waters collected represent subsurface drainages from downward infiltration around the LLWTF and lagoon systems. This point would also monitor any subsurface spillover from the overfilling of lagoons 2 and 3. Sampling of significance for both radiological and nonradiological contamination.

This site is also monitored as part of the groundwater program. (See SSWMU #1.)

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE SURFACE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNSP005 Facility Yard Drainage	Combined drainage from facility yard area. Reported in: • Internal Review	Grab liquid	→ Monthly	→ 12	→ Gross alpha/beta, H-3, pH
WNCOOLW Cooling Tower Basin	Cools plant utility steam system water Reported in: • Internal Review	Grab liquid	→ Monthly	→ 12	→ Gross alpha/beta, H-3, pH

Sampling Rationale	
WNSP005	Facility yard surface water drainage; generally in accordance with DOE/EH-0173T, 5.10.1.1. Previously in accordance with NYSDEC SPDES permit no. NY0000973. Provides for the sampling of this discrete drainage path for uncontrolled surface waters just after outfall 007 discharge into the drainage and before they flow to Erdman Brook. Waters collected represent surface and subsurface drainages primarily from the main plant yard area. Historically, this point was used to monitor sludge pond(s) and utility room discharges to the drainage. These two sources have been rerouted. Migration of residual site contamination around the main plant dictates surveillance of this point for radiological parameters primarily.
WNCOOLW	Facility cooling tower circulation water; generally in accordance with DOE/EH-0173T, 5.10.1.1. Operational sampling carried out to confirm no migration of radiological contamination into the primary coolant loop of the HLWTF and/or plant utility steam systems. Migration from either source might indicate radiological control failure. Process knowledge indicates that radiological monitoring is of primary significance.

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE SURFACE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNFRC67 Frank's Creek E of SDA	Drains NYS Low-Level Waste Disposal Area Reported in: • Internal Review • NYSERDA	Grab liquid	→ Monthly (samples collected simultaneously for NYSDOH)	→ 12	→ Gross alpha/beta, H-3, pH
WNERB53 Erdman Brook N of Disposal Areas	Drains NYS and WVDP disposal areas Reported in: • Internal Review • NYSERDA	Grab liquid	→ Weekly	→ 52	→ Gross alpha/beta, H-3, pH
			→ Weekly sample collected for NYSDOH	→ 12	
WNNDADR Drainage between NDA and SDA	Drains WVDP disposal and storage area Reported in: • Internal Review • Monthly Environmental Monitoring Trend Analysis	Timed continuous composite liquid	→ Weekly	→ 52	→ pH
				Weekly samples composited to 12	→ Monthly composite for gross alpha/beta, gamma isotopic, H-3
				Weekly samples composited to 4	→ Quarterly composite for Sr-90, I-129
WNDCELD Drainage S of Drum Cell	Drains WVDP storage area Reported in: • Internal Review	Grab liquid	→ Monthly*	→ 12	→ pH, gross alpha/beta, gamma isotopic, H-3
				Monthly samples composited to 4	→ Quarterly composite for Sr-90, I-129

*Reduction of frequency of drum cell monitoring from weekly to monthly is pending DOE approval.

Sampling Rationale

WNFRC67	DOE/EH-0173T, 5.10.1.1. Monitoring the potential influence of both the New York State low-level waste disposal area (SDA) and drum cell drainage into Frank's Creek east of the SDA and upstream of the confluence with Erdman Brook.
WNERB53	DOE/EH-0173T, 5.10.1.1. Monitors the potential influence of the drainages from the SDA and the WVDP disposal area into Erdman Brook upstream of the confluence with Frank's Creek.
WNNDADR	DOE/EH-0173T, 5.10.1.1. Monitors the potential influence of the WVDP storage and disposal area drainage into Lagoon Road Creek upstream from confluence with Erdman Brook.
WNDCELD	DOE/EH-0173T, 5.10.1.1 Monitors potential influence of drum cell drainage into Frank's Creek south of the SDA and upstream of WNFRC67.

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE POTABLE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNDNK Series Site Potable Water includes: **WNDNKMS** Maintenance Shop Drinking Water **WNDNKMP** Main Plant Drinking Water	Sources of potable water within site perimeter <u>Reported in</u>: • Internal Review	Grab liquid	→ Monthly	→ 12 each per location	→ Gross alpha/beta, H-3, pH
WNDNKEL Environmental Lab Drinking Water **WNDNKUR** Potable Water Storage Tank (UR)		Grab liquid	→ Annually*	→ 1 each location	→ Toxic metals, pesticides, chemical pollutants

*WNDNKEL and WNDKUR only.

Sampling Rationale	
WNDNK Series	Site drinking water; generally according to DOE/EH-0173T, 5.10.1.3. Potable water sampling carried out to confirm no migration of radiological and/or nonradiological contamination into the site's drinking water supply.
WNDNKMS	Site drinking water; generally according to DOE/EH-0173T, 5.10.1.3. Potable water sampled at the maintenance shop in order to monitor a point that is at an intermediate distance from the point of potable water generation and that is used heavily by site personnel.
WNDNKMP	Site drinking water; generally according to DOE/EH-0173T, 5.10.1.3. Same rationale as WNDNKMS but sampled at the main plant water fountain.
WNDNKEL	Site drinking water; generally according to DOE/EH-0173T, 5.10.1.3. Potable water sampled at the Environmental Laboratory in order to monitor the point farthest away from the point of potable water generation.
WNDNKUR	Site drinking water; generally according to DOE/EH-0173T, 5.10.1.3. Sampled at the utility room to monitor the point closest to the point of potable water generation.

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ENVIRONMENTAL SURVEILLANCE:

SURFACE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WNSTAW Series On-site standing water ponds not receiving effluent includes: **WNSTAW4** Border pond SW of AFRT240 **WNSTAW5** Border pond SW of DFTLD13 **WNSTAW6** Borrow pit NE of project facilities **WNSTAW9** North reservoir near intake **WNSTAWB** Background pond at Sprague Brook maintenance building	Water within vicinity of plant airborne or groundwater effluent <u>Reported in</u>: • Internal Review	Grab liquid →	Annually →	1* each location →	Gross alpha/beta, H-3, pH, conductivity, chloride, Fe, Mn, Na, phenols, SO_4

*Sampling depends upon on-site ponding conditions during the year.

Sampling Rationale

WNSTAW Series	DOE-EH-0173T, 5.10.1.1. Monitoring of on- and off-site standing waters at locations listed below. Although none receive effluent directly, the potential for contamination is present except at the background location. Former collecting sites 1, 2, 3, 7, and 8 were deleted from the monitoring program because they were built over or are now dry. This reduction of sites is pending DOE approval.
WNSTAW4	Border pond located south of AFRT240. Chosen to be a location for obtaining high potential concentration, based on meteorological data. Perimeter location adjacent to a working farm. Drainage extends through private property and is accessible to public.
WNSTAW5	Border pond located west of Project facilities near the perimeter fence and DFTLD13. Chosen to be a location for obtaining high potential concentration, based on meteorological data. Location is adjacent to private residence and potentially accessible by the general public.
WNSTAW6	Borrow pit northeast of Project facilities just outside of inner security fence. Considered to be the closest standing water to the main plant and high-level waste facilities (in lieu of the availability of WNSTAW1).
WNSTAW9	North reservoir near intake. Chosen to provide data in the event of potentially contaminated site potable water supply. Location is south of main plant facilities.
WNSTAWB	Pond located near the Sprague Brook maintenance building. Considered a background location approximately 14 km north of the WVDP.

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE GROUNDWATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
Low-Level Waste Treatment Facilities (SSWMU #1) WNW 0103 U 0104 U 0105 0106 0107 0108 0109 0110 0111 0114 0115 0116 8603 8604 8605 Surface: WNSP008 Miscellaneous Small Units (SSWMU #2) WNW 0201 U 0202 U 0203 U 0204 U 0205 0206 0207 0208 8606	Groundwater monitoring wells around site super solid waste management units (SSWMUs) <u>Reported in</u>: • Annual Environmental Monitoring Report • RCRA RFI Reports	Grab liquid	→ 4 times semiannually	→ 8 each well	→ Gross alpha/beta, H-3, gamma isotopic, TOC, TOX, VOA
		Direct measurement of sample discharge water	→ Before and after grab sample collection	→ 16 each well	→ Temperature, pH, conductivity
		Grab liquid	→ Semiannually	→ 2 each well	→ Cl, Mn, Na, K, Ca, Mg, Fe, Phenols, SO_4, NH_3, NO_3+NO_2-N, HCO_3, CO_3
		Grab liquid	→ 4 times annually - first year of monitoring only	→ 4 each well	→ As, Ba, Cd, Cr, F, Pb, Hg, Se, Ag, Endrin, Lindane, Methoxychlor, 2,4,5-TP (Silvex), 2,4-D, Toxaphene, Radium, NO_3+NO_2-N, Turbidity

NOTE: "U" designates upgradient well; "B" designates background well; the remainder are downgradient. Sampling and analysis conducted as outlined in the RCRA Groundwater Technical Enforcement Guidance Document (EPA OSWER 9950.1) and the Statistical Analysis of Monitoring Data at RCRA Facilities (EPA/530-SW-89-026). Well WNW8604 is being re-evalutated for possible SSWMU reassignment.

Sampling Rationale	
On-Site Groundwater	DOE Order 5400.1, IV.9; DOE/EH-0173T, 5.10.1.3; 40 CFR Parts 264 and 265, Subpart F. The on-site WVDP groundwater monitoring program focuses on radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs). The program allows for the determination of water quality. In addition, using wells situated hydraulically upgradient (background) and downgradient of SSWMUs allows for both detection of groundwater contamination and evaluation of the effects associated with the individual SSWMUs. The groundwater monitoring program is covered in the "Sampling and Analysis Plan (SAP) Groundwater Monitoring Network," Draft W, October 1990, in the Annual Site Groundwater Protection Management Program Plan, WVDP-091, and in the 1991 RFI Workplan.
SSWMU #1	Low-level waste treatment facilities, including four active lagoons, lagoons 2, 3, 4, and 5 and an inactive, filled-in lagoon, lagoon 1.
SSWMU #2	Miscellaneous small units, including the sludge pond, the solvent dike, the paper incinerator, and the kerosene tank.

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ENVIRONMENTAL SURVEILLANCE:

ON-SITE GROUNDWATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
Liquid Waste Treatment System (SSWMU #3) WNW 0301 U 0302 U 0305 xx0306 0307 NB1S B HLW Storage and Processing Tank (SSWMU #4) WNW 0401 U 0402 U 0403 U 0404 U 0405 0406 0407 0408 0409 xx0410 U xx0411 U 8607 8608 8609	Groundwater monitoring wells around site super solid waste management units (SSWMUs) Reported in: • Annual Environmental Monitoring Report • RCRA RFI Reports	Grab liquid	→ 4 times semiannually	→ 8 each well	→ Gross alpha/beta, H-3, gamma isotopic, TOC, TOX, VOA
		Direct measurement of sample discharge water	→ Before and after grab sample collection	→ 16 each well	→ Temperature, pH, conductivity
		Grab liquid	→ Semiannually	→ 2 each well	→ Cl, Mn, Na, K, Ca, Mg, Fe, Phenols, SO_4, NH_3, NO_3+NO_2-N, HCO_3, CO_3
		Grab liquid	→ 4 times annually - first year of monitoring only	→ 4 each well	→ As, Ba, Cd, Cr, F, Pb, Hg, Se, Ag, Endrin, Lindane, Methoxychlor, 2,4,5-TP (Silvex), 2,4-D, Toxaphene, Radium, NO_3+NO_2-N, Turbidity

NOTE: "U" designates upgradient well; "B" designates background well; the remainder are downgradient.

xx- Installed wells that are dry and not used for groundwater monitoring.

Sampling Rationale

On-Site Groundwater	DOE Order 5400.1, IV.9; DOE/EH-0173T, 5.10.1.3; 40 CFR Parts 264 and 265, Subpart F. The on-site WVDP groundwater monitoring program focuses on radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs). The program allows for the determination of water quality. In addition, using wells situated hydraulically upgradient (background) and downgradient of SSWMUs allows for both detection of groundwater contamination and evaluation of the effects associated with the individual SSWMUs. The groundwater monitoring program is covered in the "Sampling and Analysis Plan (SAP) Groundwater Monitoring Network" Draft W, October 1990, in the Annual Site Groundwater Protection Management Program Plan, WVDP-091, and in the 1991 RFI Workplan.
SSWMU #3	Liquid waste treatment system containing liquid effluent from the supernatant treatment system.
SSWMU #4	High-level waste storage and processing area, including the high-level radioactive waste tanks, the supernatant treatment sytem, and the vitrification facility.

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ON-SITE GROUNDWATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
Maintenance Shop Leach Fields (SSWMU #5) WNW 0501 U 0502 Low-Level Waste Storage Area (SSWMU #6) WNW 0601 0602 0603 U 0604 0605 8607 U 8608 U CPC Waste Storage Area (SSWMU #7) WNW 0701 U 0702 0703 0704 0705 0706 U 0707	Groundwater monitoring wells around site super solid waste management units (SSWMUs) <u>Reported in</u>: • Annual Environmental Monitoring Report • RCRA RFI Reports	Grab liquid	→ 4 times semiannually	→ 8 each well	→ Gross alpha/beta, H-3, gamma isotopic, TOC, TOX, VOA
		Direct measurement of sample discharge water	→ Before and after grab sample collection	→ 16 each well	→ Temperature, pH conductivity
		Grab liquid	→ Semiannually	→ 2 each well	→ Cl, Mn, Na, K, Mg, Ca, Fe, Phenols, SO_4, NH_3, NO_3+NO_2-N, HCO_3, CO_3
		Grab liquid	→ 4 times annually - first year of monitoring only	→ 4 each well	→ As, Ba, Cd, Cr, F, Pb, Hg, Se, Ag, Endrin, Lindane, Methoxychlor, 2,4,5-TP (Silvex,) 2,4-D, Toxaphene, Radium, NO_3+NO_2-N, Turbidity

NOTE: "U" designates upgradient well; "B" designates background well; the remainder are downgradient.

Sampling Rationale

On-Site Groundwater	DOE Order 5400.1, IV.9; DOE/EH-0173T, 5.10.1.3; 40 CFR Parts 264 and 265, Subpart F. The on-site WVDP groundwater monitoring program focuses on radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs). The program allows for the determinaton of water quality. In addition, using wells situated hydraulically upgradient (background) and downgradient of SSWMUs allows for both detection of groundwater contamination and evaluation of the effects associated with the individual SSWMUs. The groundwater monitoring program is covered in the "Sampling and Analysis Plan (SAP) Groundwater Monitoring Network" Draft W, October 1990, in the Annual Site Groundwater Protection Management Program Plan, WVDP-091, and in the 1991 RFI Work Plan.
SSWMU #5	Maintenance shop sanitary leach field, formerly used by NFS and WVNS to process domestic sewage generated by the maintenance shop.
SSWMU #6	Low-level waste storage area includes metal and fabric structures housing low-level radioactive wastes being stored for future disposal.
SSWMU #7	Chemical process cell (CPC) waste storage area contains packages of pipes, vessels, and debris from decontamination and cleanup of chemical process cell in the former reprocessing plant.

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ON-SITE GROUNDWATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
Construction and Demolition Debris Landfill (SSWMU #8) WNW **0801 U** **0802** **0803** **0804 U** **WNGSEEP** **WNDMPNE** **8612** NRC-licensed disposal area (SSWMU #9) WNW **0901 U** **0902 U** **0903** **0904** **0905** **0906** **0907** **0908 U** **0909** **8610** **8611** RTS Drum Cell (SSWMU #10) WNW 1001 U 1002 1003 1004 1005 U 1006 1007 1008b B 1008c B	Groundwater monitoring wells around site super solid waste management units (SSWMUs) Reported in: • Annual Environmental Monitoring Report • RCRA RFI Reports	Grab liquid	→ 4 times semiannually	→ 8 each well	→ Gross alpha/beta, H-3, gamma isotopic, TOC, TOX, VOA
		Direct measurement of sample discharge water	→ Before and after grab sample collection	→ 16 each well	→ Temperature, pH, conductivity
		Grab liquid	→ Semiannually	→ 2 each well	→ Cl, Mn, Na, K, Mg, Fe, Ca, Phenols, SO_4, NH_3, NO_3+NO_2-N, HCO_3, CO_3
		Grab liquid	→ 4 times annually - first year of monitoring only	→ 4 each well	→ As, Ba, Cd, Cr, F, Pb, Hg, Se, Ag, Endrin, Lindane, Methoxychlor, 2,4,5-TP (Silvex), 2,4-D, Toxaphene, Radium, NO_3+NO_2-N,Turbidity

NOTE: "U" designates upgradient well; "B" designates background well; the remainder are downgradient.

Sampling Rationale

On-Site Groundwater	DOE Order 5400.1, IV.9; DOE/EH-0173T, 5.10.1.3; 40 CFR Parts 264 and 265, Subpart F. The on-site WVDP groundwater monitoring program focuses on radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs). The program allows for the determination of water quality. In addition, using wells situated hydraulically upgradient (background) and downgradient of SSWMUs allows for both detection of groundwater contamination and evaluation of the effects associated with the individual SSWMUs. The groundwater monitoring program is covered in the "Sampling and Analysis Plan (SAP) Groundwater Monitoring Network," Draft W, October 1990, and in the Annual Site Groundwater Protection Management Program Plan, WVDP-091, and in the 1991 RFI Work Plan.
SSWMU #8	Construction and demolition debris landfill, used by NFS and the WVDP to dispose of nonhazardous and nonradioactive materials.
SSWMU #9	NRC-licensed disposal area (NDA) contains radioactive wastes generated by NFS and the WVDP.
SSWMU #10	Radioactive waste treatment drum cell contains stored cement-stabilized low-level radioactive waste.

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ON-SITE GROUNDWATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
State-licensed Disposal Area (SSWMU #11) **WNW** **1101a U** **1101b U** **1101c U** **1102a** **1102b** **1103a** **1103b** **1103c** **1104a** **1104b** **1104c** **1105a** **1105b** **1106a U** **1106b U** **1107a** **1108a U** **1109a U** **1109b U** **1110a** **1111a** Fuel Storage Area **WNW** **8613A** **8613B** **8613C**	Groundwater monitoring wells around site super solid waste management units (SSWMUs) Reported in: • Annual Environmental Monitoring Report • RCRA RFI Reports	Grab liquid	→ 4 times semiannually	→ 8 each well	→ Gross alpha/beta, H-3, gamma isotopic, TOC, TOX, VOA
		Direct measurement of sample discharge	→ Before and after grab sample collection	→ 16 each well	→ Temperature, pH, conductivity
		Grab liquid	→ Semiannually	→ 2 each well	→ Cl, Mn, Na, K, Mg, Pb, Ca, Fe, Phenols, SO_4, NH_3, NO_3+NO_2-N, HCO_3, CO_3
		Grab liquid	→ 4 times annually - first year of monitoring only	→ 4 each well	→ As, Ba, Cd, Cr, F, Pb, Hg, Se, Ag, Endrin, Lindane, Methoxychlor, 2,4,5-TP (Silvex), 2,4-D, Toxaphene, Radium, NO_3+NO_2-N, Turbidity

NOTE: "U" designates upgradient well; "B" designates background well; the remainder are downgradient.

Sampling Rationale

On-Site Groundwater	DOE Order 5400.1, IV.9; DOE/EH-0173T, 5.10.1.3; 40 CFR Parts 264 and 265, Subpart F. The on-site WVDP groundwater monitoring program focuses on radiological and chemical surveillance of both active and inactive super solid waste management units (SSWMUs). The program allows for the determination of water quality. In addition, using wells situated hydraulically upgradient (background) and downgradient of SSWMUs allows for both detection of groundwater contamination and evaluation of the effects associated with the individual SSWMUs. The groundwater monitoring program is covered in the "Sampling and Analysis Plan (SAP) Groundwater Monitoring Network," Draft W, October 1990, in the Annual Site Groundwater Protection Management Program Plan, WVDP-091, and in the 1991 RFI Work Plan.
SSWMU #11	State-licensed disposal area (SDA) operated by NFS as a commercial low-level disposal facility; also received wastes from NFS reprocessing operations.
Fuel Storage Area	Monitors groundwater in the vicinity of underground fuel storage tanks; this is not included in any of the SSWMUs.

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OFF-SITE SURFACE WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WFBCTCB Buttermilk Creek, Upstream of Cattaraugus Creek Confluence at Thomas Corners Road	Restricted surface waters receiving plant effluents Reported in: • Annual Environmental Monitoring Report	Timed continuous composite liquid	→ Biweekly	→ 26	→ pH
				Biweekly samples composited to 12	→ Monthly composite for gross alpha/beta, H-3*
				Biweekly samples composited to 4	→ Quarterly composite for gamma isotopic and Sr-90
WFFELBR Cattaraugus Creek at Felton Bridge	Unrestricted surface waters receiving plant effluents Reported in: • Monthly Environmental Monitoring Trend Analysis • Annual Environmental Monitoring Report	Timed continuous composite liquid	→ Weekly	→ 52	→ Gross alpha/beta, H-3, pH
				Weekly samples composited to 12	→ Flow-weighted monthly composite for gamma isotopic and Sr-90
WFBCBKG Buttermilk Creek near Fox Valley	Unrestricted surface water background Reported in: • Monthly Environmental Monitoring Trend Analysis • Annual Environmental Monitoring Report	Timed continuous composite liquid	→ Biweekly	→ 26	→ pH
				Biweekly samples composited to 12	→ Monthly composite for gross alpha/beta, H-3*
				Biweekly samples composited to 4	→ Quarterly composite for gamma isotopic, Sr-90, C-14, I-129, Pu/U isotopic, Am-241
		Grab liquid	→ Semiannually	→ 2	→ TOC, TOX, Ca, Mg, Na, K, Ba, Mn, Fe, Cl, SO_4, NO_3, F, HCO_3, CO_3
WFBIGBR Cattaraugus Creek at Bigelow Bridge	Unrestricted surface water background	Grab liquid	→ Monthly	→ 12	→ Gross alpha/beta, H-3, Sr-90, and gamma isotopic

*Monthly composite is composited quarterly for NYSDOH.

Sampling Rationale

WFBCTCB DOE/EH-0173T, 5.10.1.1.

Buttermilk Creek is the surface water receiving all WVDP effluents. **WFBCTCB** monitors the potential influence of WVDP drainage into Buttermilk Creek upstream of confluence with Cattaraugus Creek.

WFFELBR DOE/EH-0173T, 5.10.1.1.

Since Buttermilk Creek is the surface water that receives all WVDP effluents and empties into Cattaraugus Creek, **WFFELBR** monitors the potential influence of WVDP drainage into Cattaraugus Creek directly downstream of confluence with Buttermilk Creek.

WFBCBKG DOE/EH-0173T, 5.10.1.1.

Monitors background conditions of Buttermilk Creek upstream of the WVDP. Allows for comparison to downstream conditions.

WFBIGBR DOE/EH-0173T, 5.10.1.1.

Monitors background conditions of Cattaraugus Creek at Bigelow Bridge, upstream of the WVDP. Allows comparison to downstream conditions.

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ENVIRONMENTAL SURVEILLANCE:

OFF-SITE DRINKING WATER

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
WFWEL series: wells near WVDP outside WNYNSC perimeter **WFWEL01** 3.0 km WNW **WFWEL02** 1.5 km NW **WFWEL03** 4.0 km NW **WFWEL04** 3.0 km NW **WFWEL05** 2.5 km SW **WFWEL06** (background) 29 km S **WFWEL07** 4.0 km NNE **WFWEL08** 2.5 km ENE **WFWEL09** 3.0 km SE **WFWEL10** 7.0 km N	Drinking water supply; groundwater near facility Reported in: • Annual Environmental Monitoring Report	→ Grab liquid	→ Annual	→ 1 each location	→ Gross alpha/beta, H-3, gamma isotopic, pH, conductivity

Sampling Rationale	
Off-Site Drinking Water **WFWEL** Series	DOE 5400.1, IV.9; DOE/EH-0173T, 5.10.1.2. Eight of the ten listed off-site private residential drinking water wells represent the nearest unrestricted uses of groundwater close to the WVDP. The ninth sample (**WFWEL10**) is from a public water supply from deep wells. The tenth drinking water well, **WFWEL06**, is located 29 km south of the Project and is considered a background drinking water source.

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

OFF-SITE AIR

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
AFFXVRD 3.0 km SSE at Fox Valley **AFTCORD** 3.7 km NNW at Thomas Corners Road **AFSPRVL** 7 km N at Springville **AFWEVAL** 6 km SSE at West Valley **AFDNKRK** 50 km W at Dunkirk (background) **AFBOEHN** 2.3 km SW on Dutch Hill Road **AFRT240** 2.0 km NE on Route 240 **AFBLKST** Bulk Storage Warehouse 2.2 km ESE at Buttermilk Road	Particulate air samples around WYNNSC perimeter Reported in: • Annual Environmental Monitoring Report • Monthly Environmental Monitoring Trend Analysis (AFBOEHN, AFRT240, AFRSPRD, and AFGRVAL only)	Continuous air particulate filter	→ Weekly	→ 52 each location Weekly filters composited to 4 each location	→ Gross alpha/beta → Quarterly composite for Sr-90, gamma isotopic, U-isotopic**, Pu-isotopic**, Am-241**
AFRSPRD 1.5 km NW on Rock Springs Road **AFGRVAL** 29 km S at Great Valley		Continuous desiccant column for water vapor collection	→ Weekly	→ 52 each location (AFRSPRD and AFGRVAL only)	→ H-3
		Continuous charcoal cartridge	→ Monthly	→ 12 composited to 4 each location (AFRSPRD and AFGRVAL only)	→ Quarterly composite for I-129

**U-isotopic, Pu-isotopic and Am-241 analyses conducted at AFRSPRD and AFGRVAL only.

AFFXVRD **AFTCORD** **AFRT240**	DOE/EH-0173T, 5.7.4. Air samplers put into service by NFS as part of the site's original monitoring program. Perimeter locations chosen to obtain data from places most likely to provide highest concentrations, based on meteorological data. Sample heads are placed 4 meters above the ground. Note: The remaining air sampling heads are positioned within the human breathing zone above ground.
AFRSPRD	Perimeter location chosen to obtain data from the place most likely to provide highest ground-level release concentrations based on meteorological data. AFRSPRD is on WVDP property but outside the main plant operations fence line. I-129 and H-3 are sampled here because the sampling trains were easy to incorporate and the location was most likely to receive effluent releases.
AFBOEHN	Perimeter location chosen to obtain data from the place most likely to provide highest elevated release concentrations based on meteorological data. AFBOEHN is located on privately owned property at the perimeter.
AFGRVAL	DOE/EP-0023, 4.2.3 Off-site (remote) sampler considered to be representative of natural background radiation. Located on privately owned property 29 km south of the site (typically upwind). I-129 and H-3 sampled here also.
AFDNKRK	DOE/EP-0023, 4.2.3 Off-site (remote) sampler considered to be representative of natural background radiation. Located 50 km west of the site (upwind) on privately owned property.
AFBLKST	DOE/EP-0023, 5.7.4 Off-site monitoring of bulk storage warehouse, near the site perimeter.
AFWEVAL	DOE/EP-0023, 4.2.3 Off-site (remote) sampler located on private property in nearby community within 15 km of the site (southeast).
AFSPRVL	DOE/EP-0023, 4.2.3. Off-site (remote) sampler located on private property in nearby community within 15 km of the site (north).

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

FALLOUT, SEDIMENT AND SOIL

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
AFDHFOP 2.5 km SW **AFFXFOP** 3.0 km SSE **AFTCFOP** 3.7 km NNW **AF24FOP** 2.0 km NE **ANGRFOP** Met tower on-site	Collection of fallout particulates and precipitation around WNYNSC perimeter Reported in: • Annual Environmental Report	Integrating liquid	→ Monthly	→ 12 each location	→ Gross alpha/beta, H-3, pH, gamma isotopic
SF Soil Series: Surface soil (at each of nine air samplers)	Long-term fallout accumulation Reported in: • Annual Environmental Monitoring Report	Surface plug composite soil	→ Annually	→ 1 each location	→ Gamma isotopic, Sr-90, Pu-239, Am-241, plus U-isotopic at SFRSPRD, SFBOEHN and SFGRVAL
SFCCSED Cattaraugus Creek at Felton Bridge **SFSDSED** Cattaraugus Creek at Springville Dam **SFBISED** Cattaraugus Creek at Bigelow Bridge (background) **SFTCSED** Buttermilk Creek at Thomas Corners Road **SFBCSED** Buttermilk Creek at Fox Valley Road (background)	Deposition in sediment downstream of facility effluents Reported in: • Annual Environmental Monitoring Report	Grab stream sediment	→ Semiannually, (1st sample of SFBCSED and SFSDSED each spring split with NYSDOH) → Annually	→ 2 each location → 1 each location (SFTCSED and SFBCSED only)	→ Gross alpha/beta, gamma isotopic and Sr-90 → U/Pu isotopic, Am-241
SN On-site Soil Series: **SNSW74A** (Near WNSW74A) **SNSWAMP** (Near WNSWAMP) **SNSP006** (Near WNSP006)	Reported in: • Special Report	Surface plug or grab	→ Annually	→ 1 each location	→ Gamma isotopic, Sr-90, Pu-239, Am-241, U-isotopic, also metals and organic analytes to be determined

	Sampling Rationale
AFDHFOP **AFFXFOP** **AFTCFOP** **AF24FOP**	DOE/EP-0023, 4.7. Collection of fallout particles and precipitation around the site perimeter established air sampling locations. Indicates short-term effects.
ANRGFOP	Collection of fallout particles and precipitation on-site at the meteorological tower. Indicates short-term effects.
SF Soil Series	DOE/EH-0173T, 5.9.1. **SFWEVAL** (West Valley), **SFFXVRD** (Fox Valley Road), **SFSPRVL** (Springville), **SFTCORD** (Thomas Corners), **SFRT240** (Route 240), SFDNKRK (Dunkirk), **SFBOEHN** (Boehn Road-Dutch Hill), **SFGRVAL** (Great Valley), **SFRSPRD** (Rock Springs Road), **SFBLKST** (bulk storage warehouse): Collection of long-term fallout data at established air sampler locations via soil sampling.
SFTCSED	Sediment deposition in Buttermilk Creek immediately downstream of all facility liquid effluents.
SFBCSED	Sediment deposition in Buttermilk Creek upstream of facility effluents (background).
SFCCSED	Sediment deposition in Cattaraugus Creek at Felton Bridge. Location is first access point of Cattaraugus Creek downstream of the confluence with Buttermilk Creek.
SFSDSED	Sediment deposition in Cattaraugus Creek at Springville dam. Reservoir provides ideal settling and collection location for sediments downstream of Buttermilk Creek confluence. Located downstream of SFCCSED.
SFBISED	Sediment deposition in Cattaraugus Creek at Bigelow Bridge. Location is upstream of the Buttermilk Creek confluence and serves as a Cattaraugus Creek background location.
SN Soil Series	DOE/EH-0173T, 5.9.1. On-site soil.
SNSW74A	Surface soil near **WNSW74A**. Location to be specifically defined by geographic coordinates. Corresponds to site drainage pattern flow (i.e., most likely area of radiological deposition/accumulation).
SNWSWAMP	Surface soil near **WNSWAMP**. Location to be specifically defined by geographic coordinates. Corresponds to site drainage pattern flow (i.e., most likely area of radiological deposition/accumulation).
SNSP006	Surface soil near **WNSP006**. Location to be specifically defined by geographic coordinates. Corresponds to site drainage pattern flow (i.e., most likely area of radiological deposition/accumulation).

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

OFF-SITE BIOLOGICAL

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
BFFCATC Cattaraugus Creek downstream of the Buttermilk Creek Confluence **BFFCTRL** Control sample from nearby stream not affected by WVDP (7 km or more upstream of site effluent point) **BFFCATD** Cattaraugus Creek downstream of Springville Dam	Fish in waters up and downstream of facility effluents Reported in: • Annual Environmental Monitoring Report	Individual collection, biological	Semiannually, (Samples at BFFCATC and BFFCTRL shared with NYSDOH) →	20 fish each location →	Gamma isotopic and Sr-90 in edible portions of each individual fish
			Annual (BFFCATD only) →	10 fish →	Gamma isotopic and Sr-90 in edible portions of each individual fish
BFMREED Dairy farm, 3.8 km NNW **BFMCOBO** Dairy farm, 9 km WNW **BFMCTLS** Control location 25 km S **BFMCTLN** Control location 30 km N **BFMWIDR** Dairy farm, 3.5 km SE of site **BFMHAUR** Dairy farm 2.5 km SSW	Milk from animals foraging around facility perimeter Reported in: • Annual Environmental Monitoring Report	Grab biological →	Monthly (BFMREED, BFMCOBO, BFMCTLS, BFMCTLN. Samples at BFMREED and BFMCOBO shared with NYSDOH) →	12 monthly samples composited to 4 each location →	Quarterly composite for gamma isotopic, Sr-90, H-3, and I-129
			Annual (BFMWIDR, BFMHAUR) →	1 each location →	Gamma isotopic, Sr-90, H-3, and I-129

Sampling Rationale	
BFFCATC **BFFCATD**	DOE/EH-0173T, 5.11.1.1. Radioactivity may enter a food chain in which fish are a major component and are consumed by the local population.
BFFCTRL	Background control fish sample.
BFMREED **BFMCOBO** **BFMWIDR** **BFMHAUR**	DOE/EH-0173T, 5.8.2.1. Milk from animals foraging around facility perimeter. Milk is consumed by all age groups and is frequently the most important food that could contribute to the radiation dose. Dairy animals pastured near the site and at two background locations allow adequate monitoring.
BFMCTLS **BFMCTLN**	Background control milk samples collected far from site.

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

OFF-SITE BIOLOGICAL

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
BFVNEAR Nearby locations **BFVCTRL** Remote locations (16 km or more from facility) **BFHNEAR** Beef cattle/milk cow forage from near-site location	Fruit and vegetables grown near facility perimeter downwind if possible Reported in: • Annual Environmental Monitoring Report	Grab biological (fruits and vegetables)	→ Annually, at harvest (BFVNEAR and BFVCTRL)	→ 3 each (split with NYSDOH)	→ Gamma isotopic and Sr-90 analysis of edible portions, H-3 in free moisture
BFHCTLS or **BFHCTLN** Beef cattle/milk cow forage from control location south or north		Grab biological	→ Annually (BFHNEAR, BFHCTLS, or BFHCTLN)	→ 1 each location	→ Gamma isotopic, Sr-90
BFBNEAR Beef animal from nearby farm in downwind direction **BFBCTRL** Beef animal from control location 16 km or more from facility	Meat (beef foraging near facility perimeter, downwind if possible) Reported in: • Annual Environmental Monitoring Report	Grab biological	→ Semiannually	→ 2 each location	→ Gamma isotopic and Sr-90 analysis of meat, H-3 in free moisture
BFDNEAR Deer in vicinity of the site **BFDCTRL** Control deer 16 km or more from facility	Meat (deer foraging near facility perimeter) Reported in: • Annual Environmental Monitoring Report	Individual collection biological	→ Annually, during hunting season (BFDNEAR sample split with NYSDOH)	→ 3	→ Gamma isotopic and Sr-90 analysis of meat, H-3 in free moisture
			During year as available (BFDCTRL sample split with NYSDOH)	→ 3	→ Gamma isotopic and Sr-90 analysis of meat, H-3 in free moisture

Sampling Rationale

BFVNEAR DOE/EH-0173T, 5.8.2.2.

Fruits and vegetables collected from areas near the site. Collected, if possible, from areas near the site predicted to have worst case downwind concentrations of radionuclides in air and soil. Sample analysis reflects steady state/chronic uptake or contamination of foodstuffs as a result of site activities. Possible pathway to humans or indirectly through animals.

BFVCTRL DOE/EH-0173T, 5.8.2.2

Fruits and vegetables collected from area remote from the site. Background fruits and vegetables collected for comparison with near-site samples. Collected in area(s) of no possible site impact.

BFHNEAR DOE/EH-0173T, 5.8.2.2

Hay collected from areas near the site. Same as for near-site fruits and vegetables (**BFVNEAR**). Indirect pathway to humans through animals. Collected with either beef or milk sample location.

BFHCTLS DOE/EH-0173T, 5.8.2.2.
BFHCTLN

Hay collected from areas remote from the site. Background hay collected for comparison with near-site samples. Collected in area(s) of no possible site impact.

BFBNEAR DOE/EH-0173T, 5.8.2.3.

Beef collected from animals raised near the site. Following the rationale for vegetable matter collected near site (**BFVNEAR** and **BFHNEAR**), edible flesh portion of beef animals is analyzed to determine possible radionuclide content passable directly to humans. For animals foraging downwind in areas of maximum probable site impact.

BFBCTRL DOE/EH-0173T, 5.8.2.3.

Beef collected from animals raised far from the site. Background beef collected for comparison with near-site samples. Collected in area(s) of no possible site impact.

BFDNEAR DOE/EH-0173T, 5.8.3.

Venison from deer herd found living near the site. Same as for beef (**BFBNEAR**).

BFDCTRL DOE/EH-0173T, 5.8.3.

Venison from deer herd living far from the site. Background deer meat collected for comparison with near-site samples. Collected in area(s) of no possible site impact.

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

OFF-SITE DIRECT RADIATION

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
DFTLD Series Thermoluminescent dosimetery (TLD) off-site: **#1-16** At each of 16 compass sectors, at nearest accessible perimeter point **#17** "5 Points" landfill, 19 km SW (background) **#20** 1,500 m NW (downwind receptor) **#21** Springville 7 km N **#22** West Valley 5 km SSE **#23** Great Valley 9 km S (background) **#37** Dunkirk 50 km NW (background) **#41** Sardinia-Savage Road 24 km NE (background)	Direct radiation around facility <u>Reported in</u>: • Monthly Environmental Monitoring Trend Analysis • Annual Environmental Monitoring Report	Integrating LiF TLD →	Quarterly →	5 TLDs at each of 23 locations collected 4 times per year →	Quarterly gamma radiation exposure

Sampling Rationale

DOSIMETRY Off-Site	DOE/EH-0173T, 5.5 and DOE/EP-0023, 4.6.3. TLDs offer continuous integrated environmental gamma-ray monitoring and have been deployed systematically about the site. Off-site TLDs are used to verify that site activities have not adversely affected the surrounding environs. In addition to general NRC crosschecks, a biennial HPIC gamma radiation measurement is completed at all TLD locations.

1992 MONITORING PROGRAM
ENVIRONMENTAL SURVEILLANCE:

ON-SITE DIRECT RADIATION

Sample Location Code	Monitoring/Reporting Requirements	Sampling Type/Medium	Collection Frequency	Total Annual Sample Collections	Analyses Performed/ Composite Frequency
DNTLD Series Thermoluminescent Dosimetry (TLD) On-site: **#18, #19, #33** At three corners of SDA **#24, #26-32, #34** (9) at security fence around site **#35, #36, #38-40** (5) On-site near operational areas **#25** Rock Springs Road 500 m NNW of plant	Direct radiation on facility grounds Reported in: • Monthly Environmental Monitoring Trend Analysis • Annual Environmental Monitoring Report	Integrating LiF TLD	→ Quarterly	→ 5 TLDs at each of 18 sites collected 4 times per year	→ Quarterly gamma radiation exposure

Sampling Rationale

DOSIMETRY On-site	DOE/EH-0173T, 5.4 and 5.5. On-site TLDs monitor waste management units and verify that the potential dose rate to the general public (i.e., Rock Springs Road), is below 100 mr/annum from site activities. Potential TLD sampling locations are continually evaluated with respect to site activities.

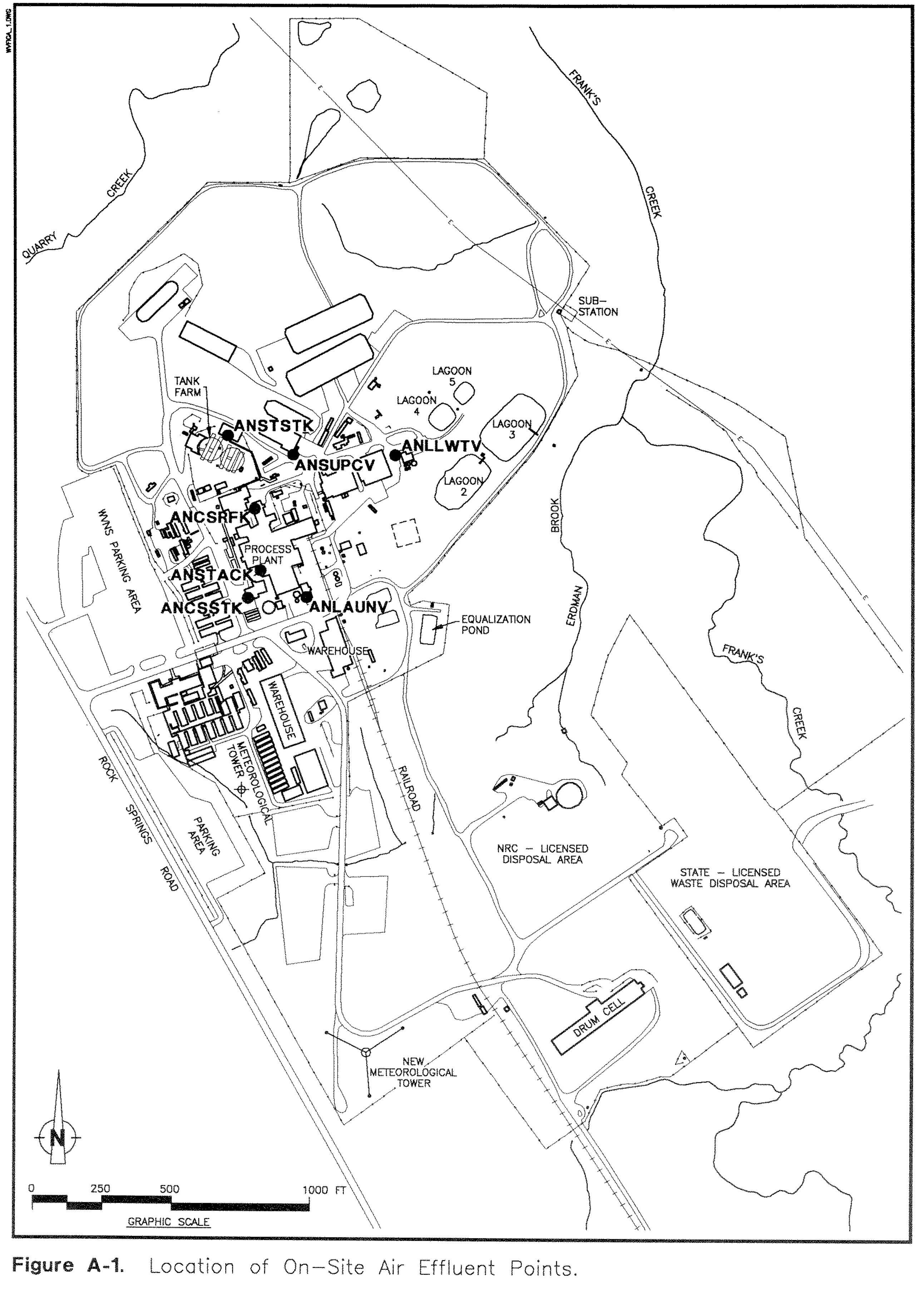


Figure A-1. Location of On-Site Air Effluent Points.

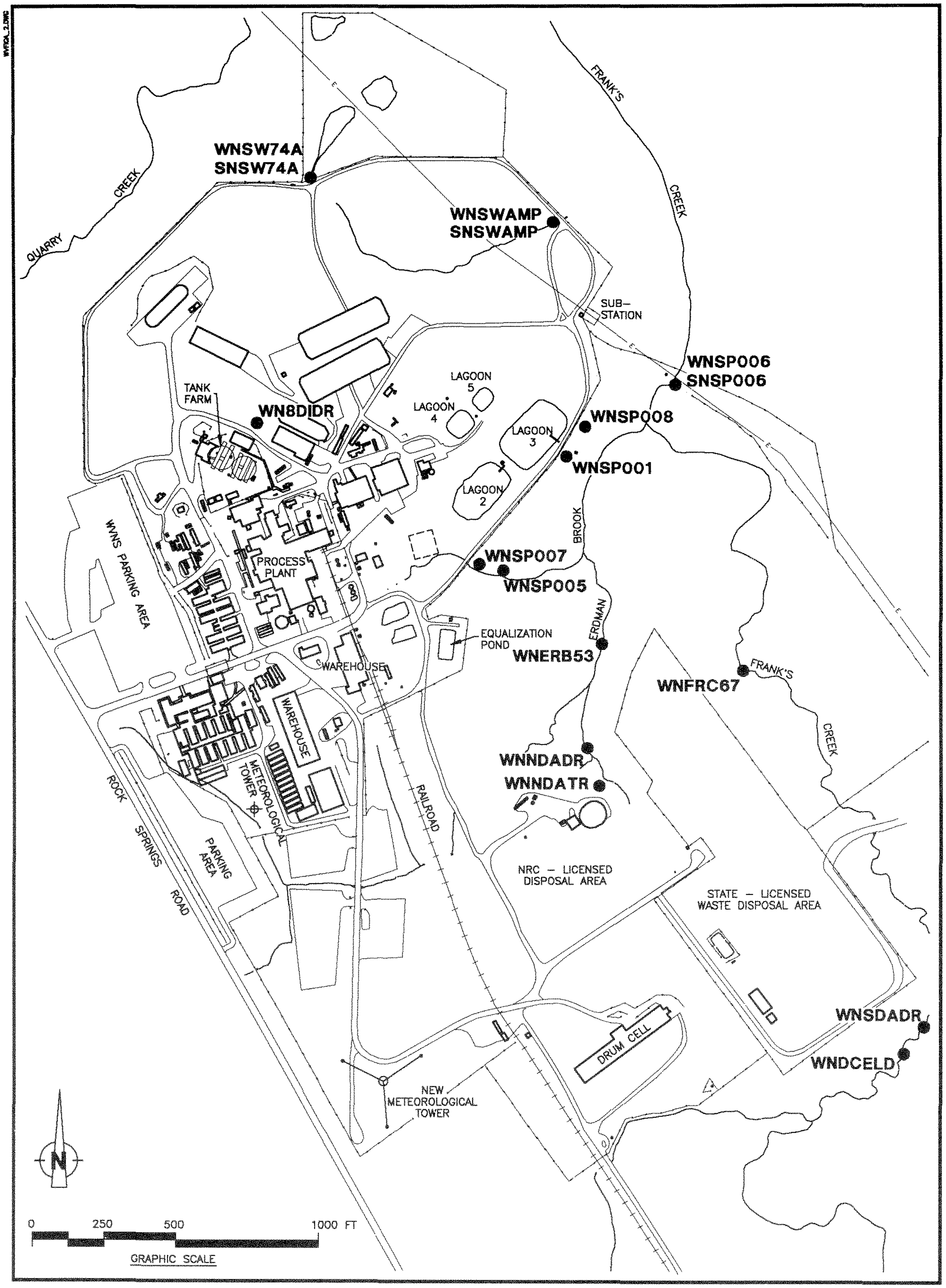


Figure A-2. Sampling Locations for On-Site Surface Water and Soil.

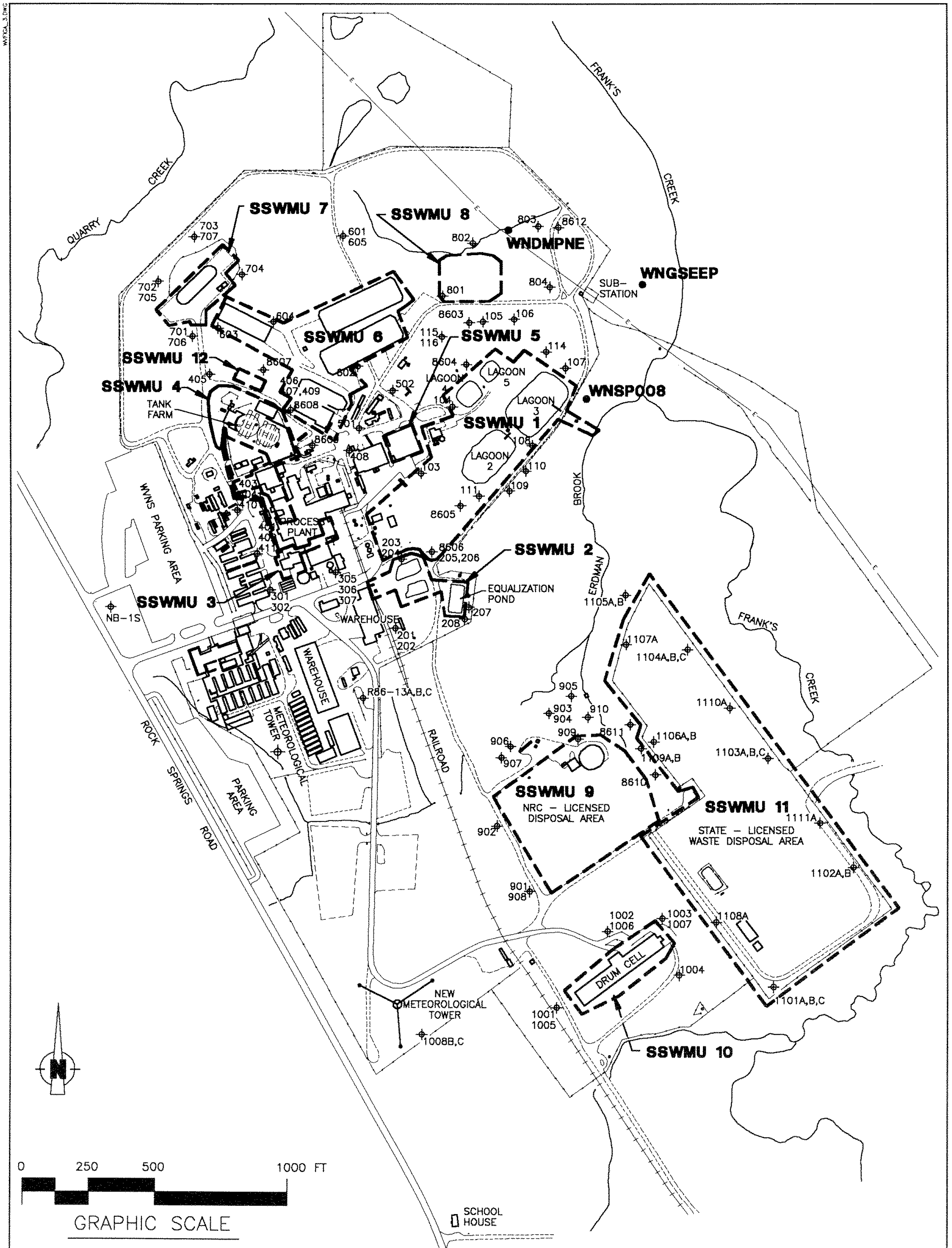


Figure A-3. Location of On-Site Groundwater Monitoring Network Wells.

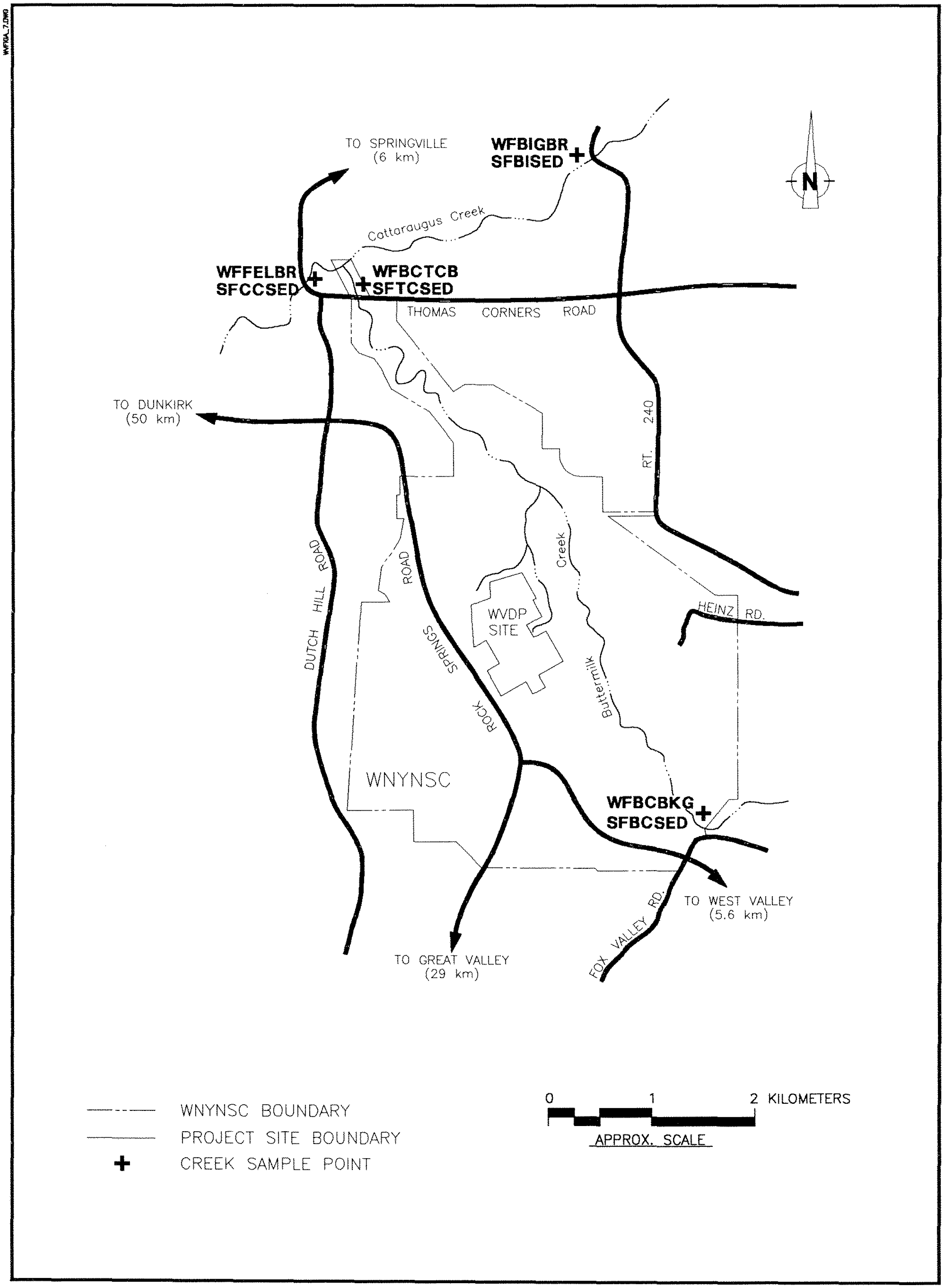


Figure A-4. Location of Off–Site Surface Water Samplers and Sediment Collection.

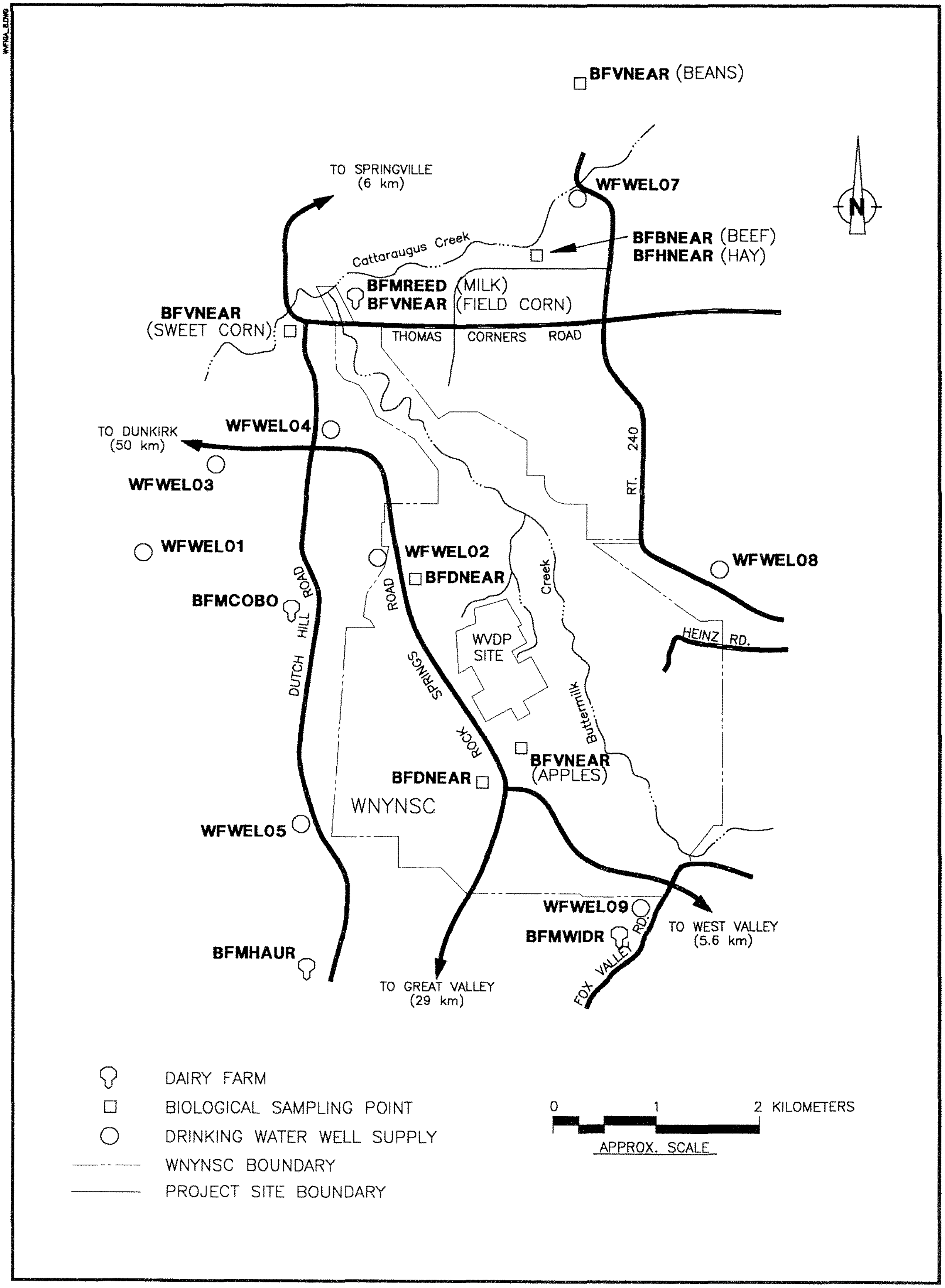


Figure A-5. Near–Site Drinking Water and Biological Sampling Points.

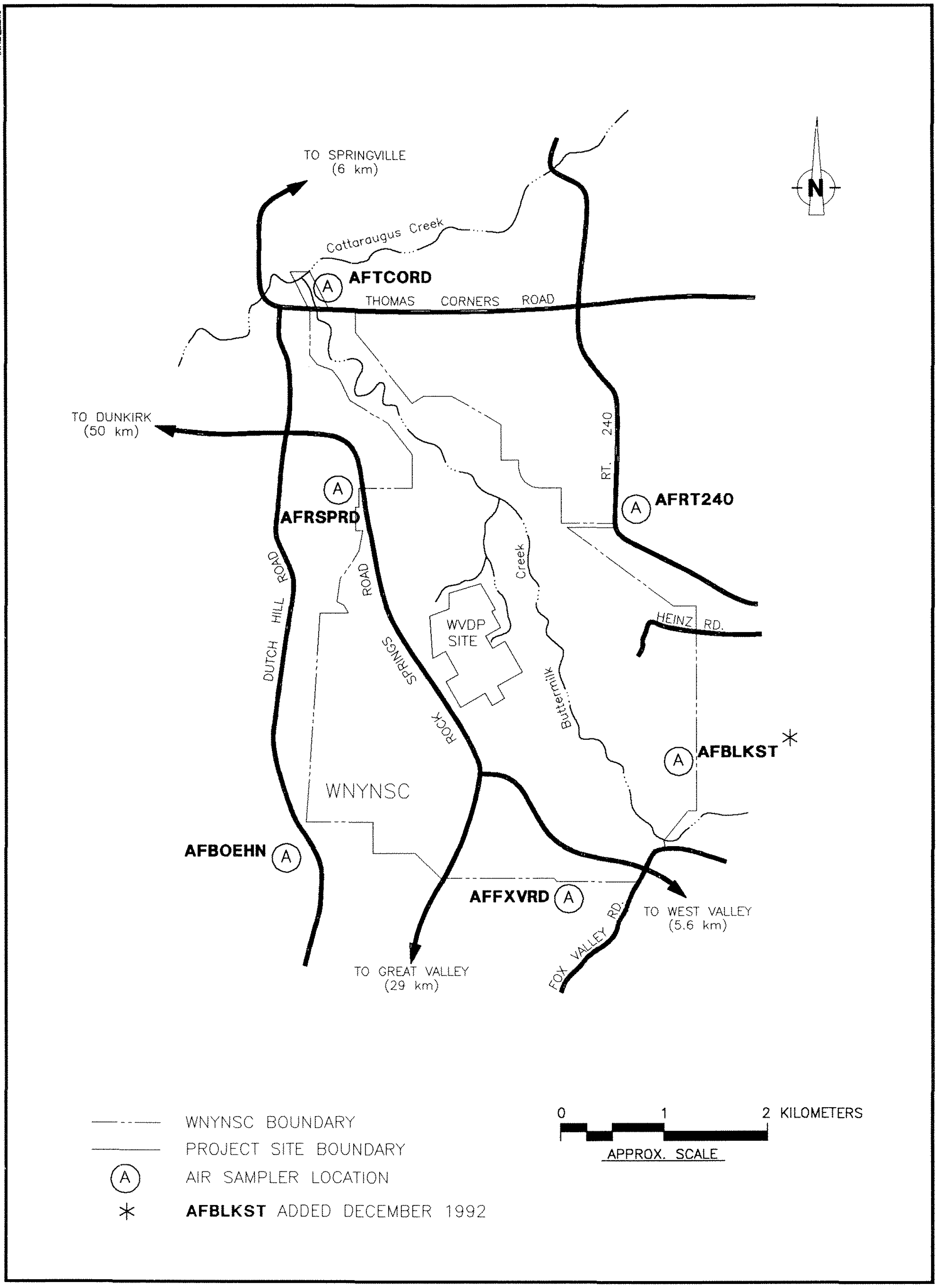


Figure A-6. Location of Perimeter Air Samplers.

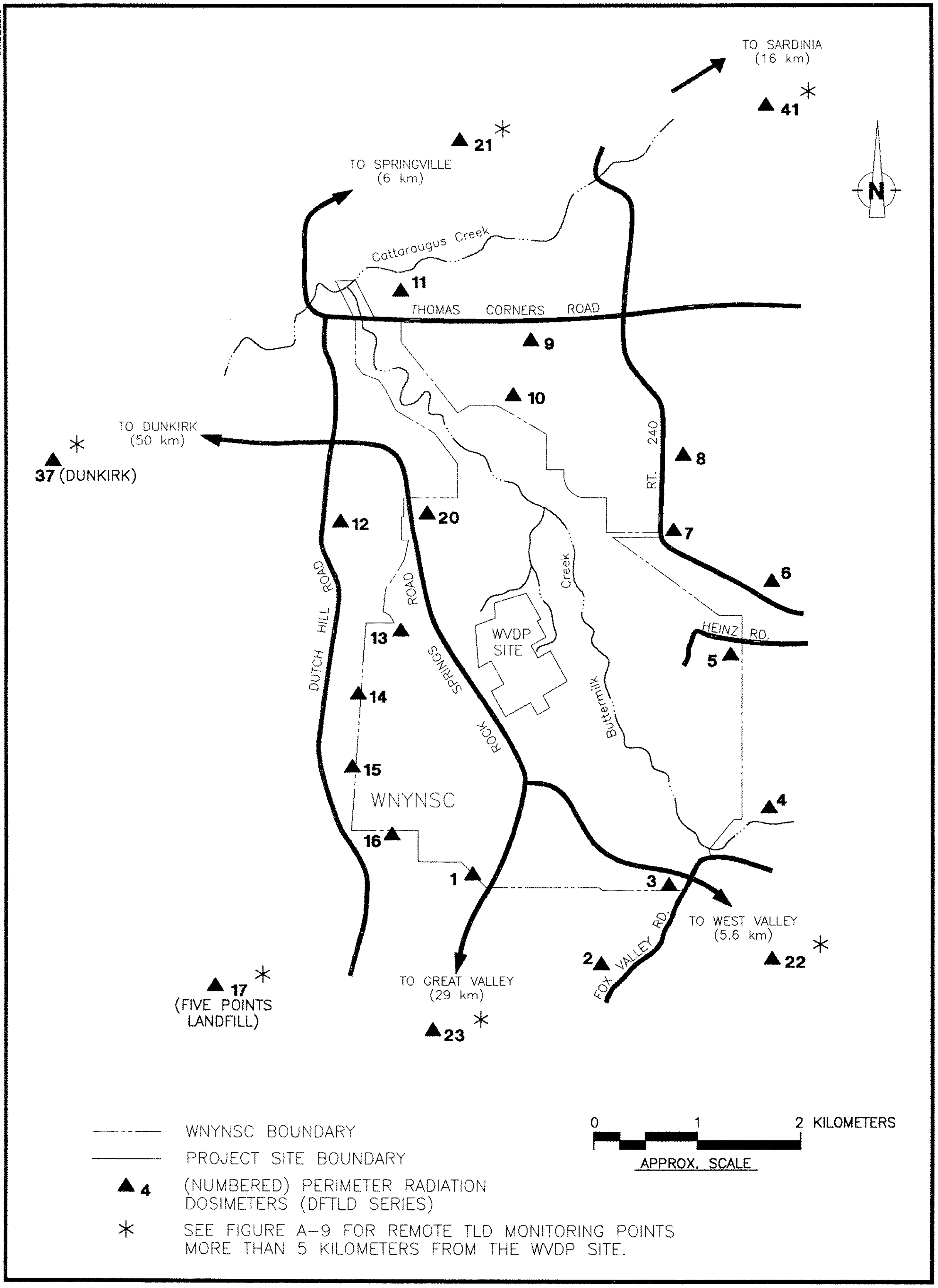


Figure A-7. Location of Off-Site Thermoluminescent Dosimetry (TLD).

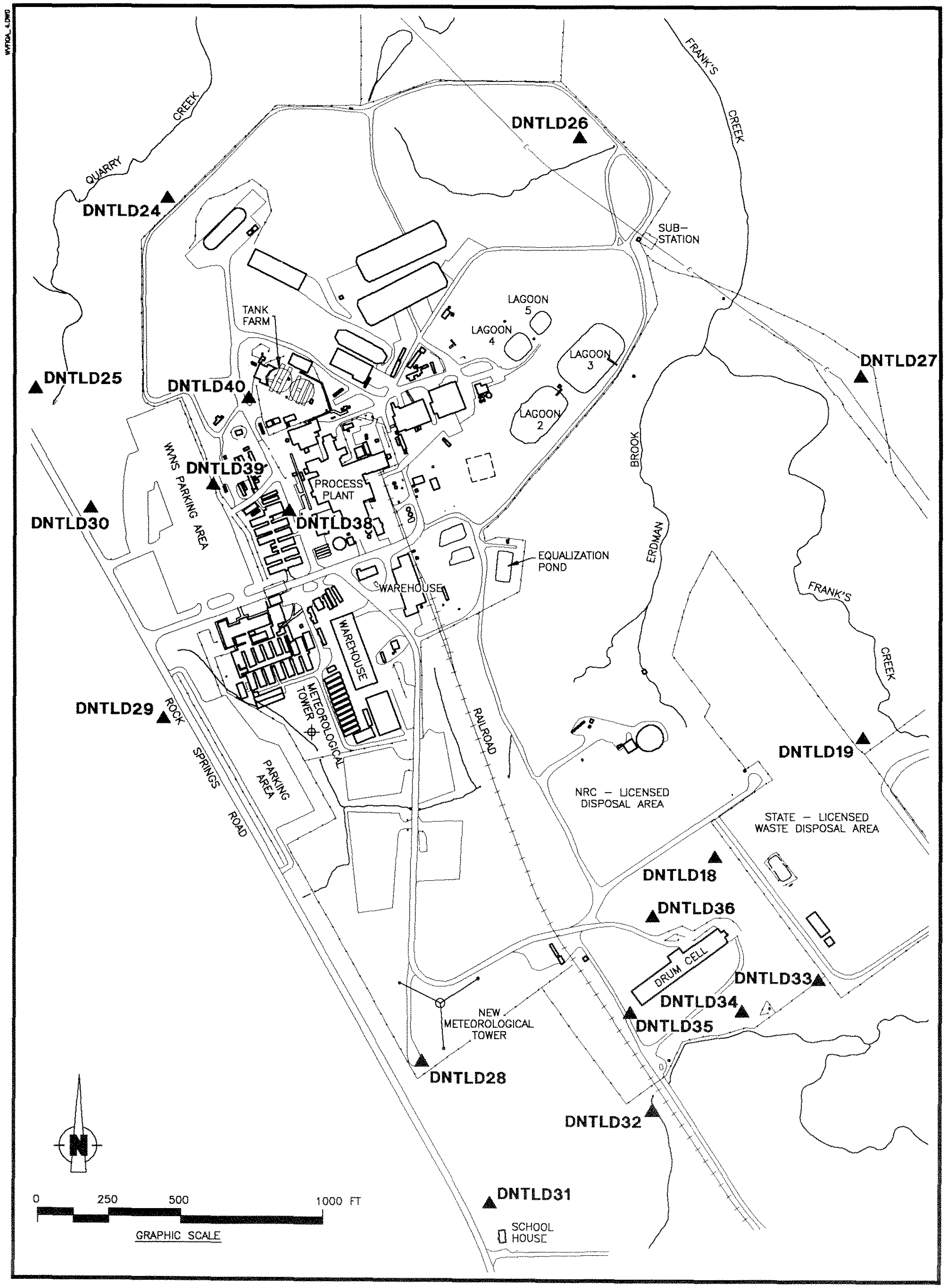
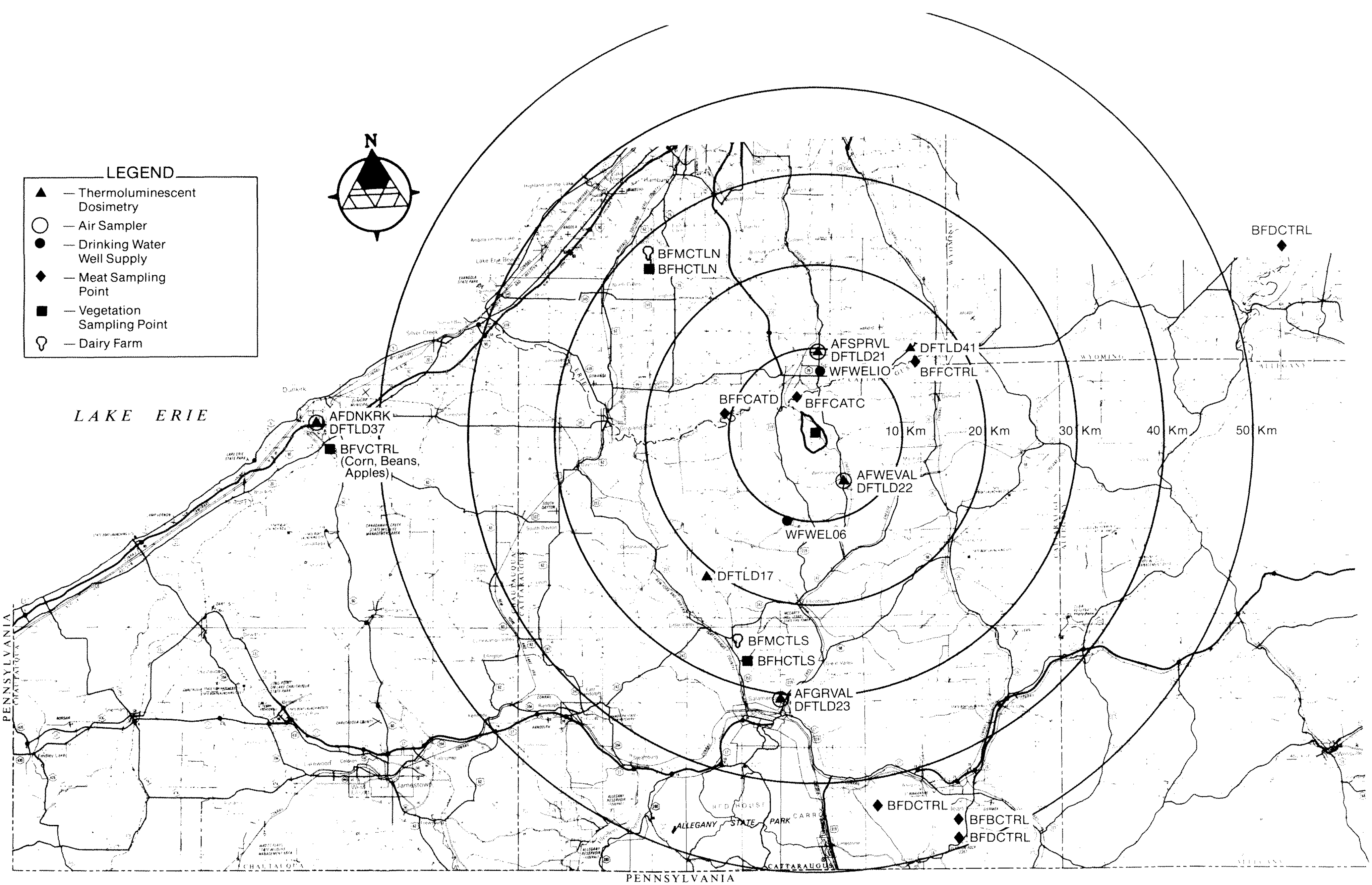


Figure A-8. Location of On–Site Thermoluminescent Dosimetry (TLD).



REF: NYSDOT, New York State Map -- West Sheet,
1:250,000, Revised 1982

Figure A-9. Environmental Sample Points more than 5 Kilometers from the WVDP Site

0 5 10 15 20 25K

Appendix B

Regulations and Standards

Table B - 1

Department of Energy Radiation Protection Standards and Concentration Guides*

Effective Dose Equivalent Radiation Standard for Protection of the Public

Continuous exposure of any member of the public from routine activities: 100 mrem/year (1 mSv/year) from all exposure pathways

Department of Energy Concentration Guides (DCGs) for Ingestion of Drinking Water and Inhaled Air (µCi/mL)

Radionuclides:	In Air	In Water	Radionuclides:	In Air	In Water
H-3	1E-07	2E-03	**Th-232**	7E-15	5E-08
C-14	6E-09	7E-05	**U-232**	2E-14	1E-07
Fe-55	5E-09	2E-04	**U-233**	9E-14	5E-07
Co-60	8E-11	5E-06	**U-234**	9E-14	5E-07
Ni-63	2E-09	3E-04	**U-235**	1E-13	6E-07
Sr-90	9E-12	1E-06	**U-236**	1E-13	5E-07
Zr-93	4E-11	9E-05	**U-238**	1E-13	6E-07
Nb-93m	4E-10	3E-04	**Np-239**	5E-09	5E-05
Tc-99	2E-09	1E-04	**Pu-238**	3E-14	4E-08
Ru-106	3E-11	6E-06	**Pu-239**	2E-14	3E-08
Rh-106m	6E-08	2E-04	**Pu-240**	2E-14	3E-08
Sb-125	1E-09	5E-05	**Pu-241**	1E-12	2E-06
Te-125m	2E-09	4E-05	**Am-241**	2E-14	3E-08
I-129	7E-11	5E-07	**Am-243**	2E-14	3E-08
Cs-134	2E-10	2E-06	**Cm-243**	3E-14	5E-08
Cs-135	3E-09	2E-05	**Cm-244**	4E-14	6E-08
Cs-137	4E-10	3E-06	**Gross Alpha**		
Pm-147	3E-10	1E-04	**(as Am-241)**	2E-14	3E-08
Sm-151	4E-10	4E-04	**Gross Beta**		
Eu-152	5E-11	2E-05	**(as Sr-90)**	9E-12	1E-06
Eu-154	5E-11	2E-05			
Eu-155	3E-10	1E-04			

** Ref: DOE Order 5400.5 (February 8, 1990). Effective May 8, 1990.*

Table B - 2

Environmental Standards and Regulations

The following environmental standards and laws are applicable, in whole or in part, to the West Valley Demonstration Project:

DOE Order 5400.1. November 1988. *General Environmental Protection Program*, including Change 1 (June 29, 1990).

DOE Order 5480.1B. September 1986. *Environment, Safety, and Health Program for DOE Operations*, including Change 4 (March 27, 1990).

DOE Order 5484.1. February 1981. *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*, including Change 7 (October 17, 1990).

Clean Air Act. 42 USC 1857 et seq., as amended, and implementing regulations.

Federal Water Pollution Control Act (Clean Water Act) 33 USC 1251, as amended, and implementing regulations.

Resource Conservation and Recovery Act. 42 USC 6905, as amended, and implementing regulations.

National Environmental Policy Act. PL 911-190. 42 USC 4321-4347, January 1, 1970, as amended, and implementing regulations.

Comprehensive Environmental Response, Compensation, and Liability Act. 42 USC 960 (including Superfund Amendments and Reauthorization Act of 1986), and implementing regulations.

Toxic Substances Control Act. 15 USC 2610, as amended, and implementing regulations.

Environmental Conservation Law of New York State.

The standards and guidelines applicable to releases of radionuclides from the West Valley Demonstration Project are found in DOE Order 5400.5, including Change 2 (January 7, 1993).

Ambient water quality standards contained in the State Pollutant Discharge Elimination System (SPDES) permit issued for the facility are listed in Table C-5.1 in Appendix C-5. Airborne discharges are also regulated by the Environmental Protection Agency under the National Emission Standards for Hazardous Air Pollutants, 40 CFR 61. 1984.

The above list covers the major activities at the West Valley Demonstration Project but does not constitute a comprehensive enumeration.

Table B - 3

West Valley Demonstration Project Environmental Permits Calendar Year 1992

Type of Permit	Issued by	Expiration	Permit Number
Certificates to Operate Air Contamination Source			
Boiler	NYSDEC	6/94	042200-0114-00002
Boiler	NYSDEC	6/94	042200-0114-00003
Incinerator [1]	NYSDEC	6/94	042200-0114-00004
Low-level Waste Treatment Facility Nitric Acid Storage Tank	NYSDEC	6/94	042200-0114-0010
Cement Storage Silo Ventilation System	NYSDEC	6/94	042200-0114-CSS01
Analytical and Process Chemistry Laboratory Equipment	NYSDEC	6/94	042200-0114-15F-1
Tank #35157 Vent	NYSDEC	6/94	042200-0114-35157
Tank #33154 Vent	NYSDEC	6/94	042200-0114-33154
Tank #14D-2 Vent	NYSDEC	6/94	042200-0114-14D-2
Tank #14D-2A Vent	NYSDEC	6/94	042200-0114-14D2-A
Source-Capture Welding System	NYSDEC	6/94	042200-0114-MS001
Nitric Acid Tank (250-gal) Vent	NYSDEC	6/94	042200-0114-MDB07
Blueprinter Ventilation System	NYSDEC	6/94	042200-0114-00012
State Pollutant Discharge Elimination System Permit [2]	NYSDEC		NY0000973
Certificates to Operate Radioactive Air Source [3]			
Building 01-14 Ventilation System	EPA		WVDP-187-01
Contact Size-reduction and Decontamination Facility	EPA		WVDP-287-01
Supernatant Treatment Ventilation System	EPA		WVDP-387-01
Low-level Waste Supercompactor Ventilation System	EPA		WVDP-487-01
Outdoor Ventilation System	EPA		WVDP-587-01
Process Building Ventilation System	EPA		WVDP-687-01

Table B - 3 (concluded)

West Valley Demonstration Project Environmental Permits Calendar Year 1992

Type of Permit	Issued by	Expiration	Permit Number
Permits to Construct			
CTS Solids Transfer System	NYSDEC	12/94	042200-0114-CTS02
CTS Vessel Vent System	NYSDEC	12/94	042200-0114-CTS03
CTS Dust Collection Hood	NYSDEC	12/94	042200-0114-CTS04
SVS Air Emissions Sources	NYSDEC	6/93	042200-0114-SVS01
SVS Vessel Vent System	NYSDEC	6/93	042200-0114-SVS02
SVS Scale Melter	NYSDEC	6/93	042200-0114-SVS04
Vitrification Facility Exhaust Welding Fume Blower	NYSDEC	12/93	042200-0114-00013
Vitrification Melter Off-gas Treatment System	NYSDEC	4/94	9-0422-00005/00036
Depredation Permit	U.S. Dept. of the Interior, Fish & Wildlife Service and NYSDEC	12/93	PRT-747595
Restricted Burning Permit [4]	NYSDEC	11/92	#1027
Hazardous Waste Treatment and Storage Interim Status Application (RCRA Part A) [5]	NYSDEC		NA

[1] *Nonradioactive waste is removed to a commercial landfill and is not incinerated. The permit became inactive in February 1990. The incinerator has been sealed.*

[2] *Renewal application was submitted to the New York State Department of Environmental Conservation in May 1990.*

[3] *National Emission Standards for Hazardous Air Pollutants (NESHAPs) temporary permits are valid until the final permits are issued.*

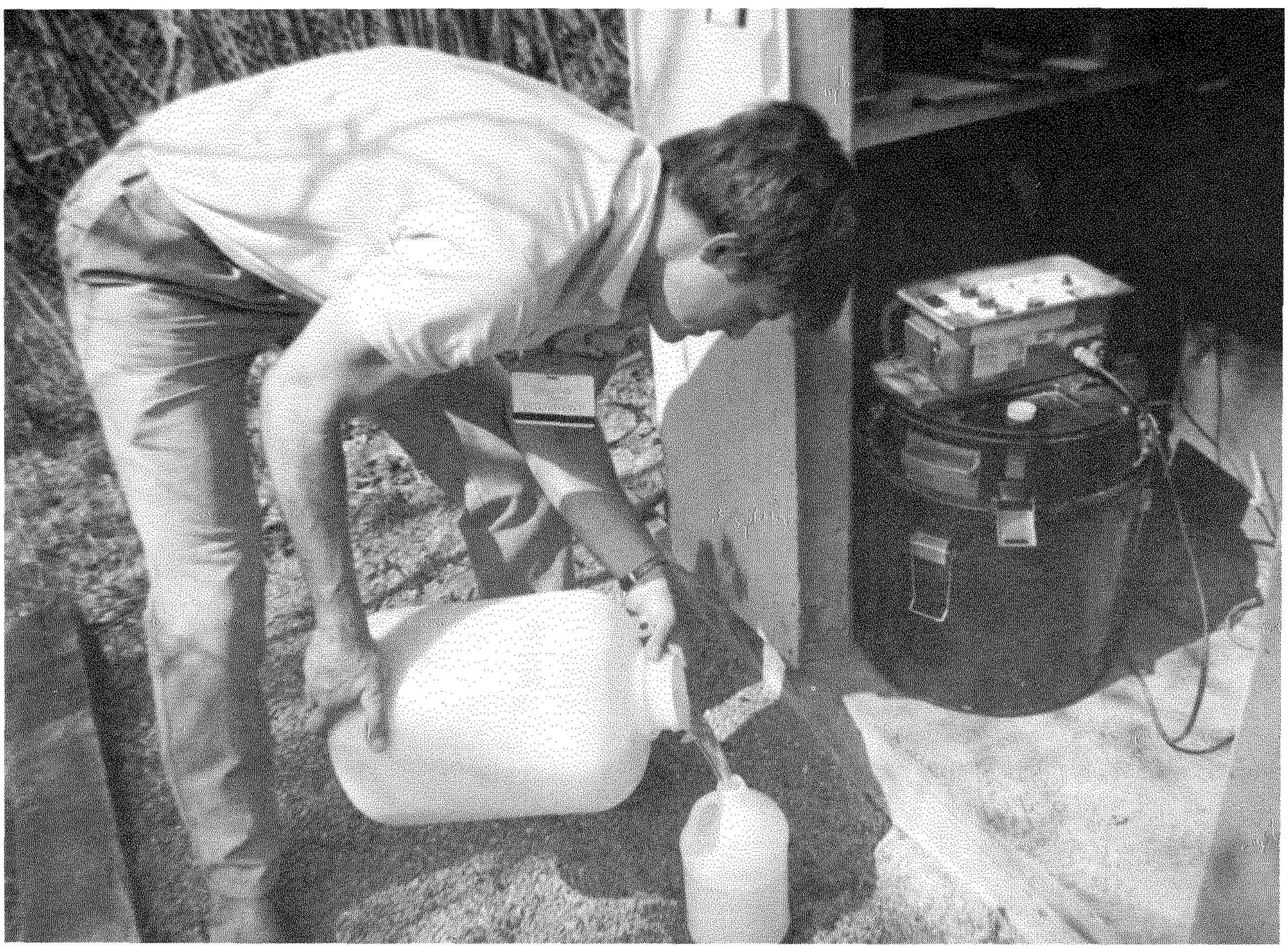
[4] *Permit expired in November 1992.*

[5] *Will operate under RCRA interim status until NYSDEC requests Part B of the RCRA application.*

NA - Not applicable.

Appendix C - 1

Summary of Water and Sediment Monitoring Data



Collecting a Sample at a Continuous-Stream Sampling Station

Table C - 1.1

Total Radioactivity of Liquid Effluents Released from Lagoon 3 in 1992 (curies)

Quarter	Alpha	Beta	H-3	C-14	Sr-90	I-129
1st Qtr	<7.85E-05	9.63±0.46E-03	1.47±0.05E-01	<1.62E-04	1.09±0.08E-03	7.01±4.01E-05
2nd Qtr	1.01±0.50E-04	7.10±0.24E-03	5.34±0.19E-02	<7.36E-05	3.42±0.28E-04	2.02±1.61E-05
3rd Qtr	9.38±7.47E-05	1.46±0.05E-02	1.74±0.05E-01	<7.27E-05	1.00±0.06E-03	5.10±1.76E-05
4th Qtr	7.89±3.53E-05	5.17±0.19E-03	9.45±0.30E-02	3.77±3.14E-05	1.04±0.04E-03	3.65±0.55E-05
Total	**3.35±2.39E-04**	**3.65±0.14E-02**	**4.69±0.15E-01**	**<3.40E-04**	**3.47±0.21E-03**	**1.78±0.79E-04**
Average *(μCi/mL)*	9.08±6.47E-09	9.89±0.37E-07	1.27±0.04E-05	<9.20E-09	9.40±0.58E-08	4.82±2.15E-09

Quarter	U-232	U-233/234	U-235	U-236	U-238	Cs-137
1st Qtr	8.89±0.92E-05	5.23±0.58E-05	<5.32E-07	<6.77E-07	2.13±0.40E-05	4.84±0.56E-03
2nd Qtr	6.22±0.52E-05	3.99±0.31E-05	4.46±3.27E-07	5.70±3.63E-07	1.61±0.21E-05	9.02±1.14E-04
3rd Qtr	1.12±0.10E-04	6.86±0.60E-05	<4.90E-07	<4.27E-07	2.77±0.35E-05	1.45±0.24E-03
4th Qtr	7.63±0.42E-05	3.73±0.25E-05	<2.12E-07	4.11±2.88E-07	1.57±0.17E-05	<1.12E-04
Total	**3.40±0.29E-04**	**1.98±0.18E-04**	**<1.56E-06**	**<1.75E-06**	**8.08±1.13E-05**	**7.29±1.03E-03**
Average *(μCi/mL)*	9.19±0.78E-09	5.36±0.48E-09	<4.23E-11	<4.75E-11	2.19±0.31E-09	1.97±0.28E-07

Quarter	Pu-238	Pu-239/240	Tc-99	K-40	Am-241	Co-60
1st Qtr	<5.20E-07	7.95±7.65E-07	1.38±0.07E-02	6.63±5.74E-03	9.76±7.59E-07	<1.80E-03
2nd Qtr	<2.96E-07	<2.75E-07	4.77±0.52E-04	<1.64E-03	3.68±3.01E-07	<1.23E-04
3rd Qtr	6.54±6.28E-07	5.48±5.36E-07	8.08±0.54E-03	<3.42E-03	<4.65E-07	<2.94E-04
4th Qtr	1.19±0.59E-06	3.48±3.39E-07	4.20±0.08E-03	<2.07E-03	7.63±3.82E-07	<1.17E-04
Total	**2.28±2.04E-06**	**1.93±1.92E-06**	**2.66±0.14E-02**	**<1.29E-02**	**2.54±1.91E-06**	**<2.33E-03**
Average *(μCi/mL)*	6.18±5.52E-11	5.24±5.19E-11	7.19±0.37E-07	<3.49E-07	6.88±5.16E-11	<6.32E-08

Table C - 1.2

Comparison of 1992 Lagoon 3 Liquid Effluent Radioactivity Concentrations with Department of Energy Guidelines

Isotope	Total Ci Released [a]	Avg Conc (µCi/mL)	DCG (µCi/mL)	% of DCG
Alpha	3.35E-04 (1.24E+07 Bq)	9.08E-09	NA [b]	—
Beta	3.65E-02 (1.35E+09 Bq)	9.89E-07	NA [b]	—
H-3	4.69E-01 (1.73E+10 Bq)	1.27E-05	2.00E-03	0.63
Sr-90	3.47E-03 (1.29E+08 Bq)	9.40E-08	1.00E-06	9.40
Cs-137	7.29E-03 (2.70E+08 Bq)	1.97E-07	3.00E-06	6.58
Co-60	<2.33E-03 (<8.63E+07 Bq)	<6.32E-08	5.00E-06	<1.26
K-40	<1.29E-02 (<4.77E+08 Bq)	<3.49E-07	NA [b]	—
U-232 [c]	3.40E-04 (1.26E+07 Bq)	9.19E-09	1.00E-07	9.19
U-234 [c]	1.98E-04 (7.33E+06 Bq)	5.36E-09	5.00E-07	1.07
U-235 [c]	<1.56E-06 (<5.77E+04 Bq)	<4.23E-11	6.00E-07	<0.01
U-236 [c]	<1.75E-06 (<6.49E+04 Bq)	<4.75E-11	5.00E-07	<0.01
U-238 [c]	8.08E-05 (2.99E+06 Bq)	2.19E-09	6.00E-07	0.36
Pu-238	2.28E-06 (8.45E+04 Bq)	6.18E-11	4.00E-08	0.15
Pu-239	1.93E-06 (7.16E+04 Bq)	5.24E-11	3.00E-08	0.17
Am-241	2.54E-06 (9.41E+04 Bq)	6.88E-11	3.00E-08	0.23
I-129	1.78E-04 (6.58E+06 Bq)	4.82E-09	5.00E-07	0.96
C-14	<3.40E-04 (<1.26E+07 Bq)	<9.20E-09	7.00E-05	<0.01
Tc-99	2.66E-02 (9.84E+08 Bq)	7.19E-07	1.00E-04	0.72
TOTAL % OF DCG				**30.78**

[a] *Total volume released: 3.69E+10 mL; Ci values are also expressed in Bq.*

[b] *Derived concentration guides (DCGs) are not applicable (NA) to gross alpha, gross beta, or potassium-40 activity.*

[c] *Total U (µg) = 2.28E+06; Average U (mg/L) = 6.17E-03.*

Table C - 1.3

1992 Radioactivity Concentrations (µCi/mL) in Surface Water Upstream of the WVDP at Fox Valley (WFBCBKG)

Month	Alpha	Beta	H-3	Sr-90	Cs-137
January	<9.37E-10	2.06±1.54E-09	<1.00E-07		
February	<1.24E-09	2.21±1.47E-09	<1.00E-07		
March	1.36±1.09E-09	3.90±1.59E-09	<1.00E-07		
1ST QTR				<1.51E-09	<9.92E-09
April	<1.25E-09	2.67±1.67E-09	<1.00E-07		
May	<1.14E-09	2.98±1.58E-09	<1.00E-07		
June	<8.60E-10	2.73±1.75E-09	<1.00E-07		
2ND QTR				4.44±1.91E-09	<6.65E-09
July	<1.37E-09	2.38±1.61E-09	<7.48E-08		
August	<1.50E-09	2.20±1.63E-09	<1.00E-07		
September	<1.31E-09	3.43±1.68E-09	<1.00E-07		
3RD QTR				2.07±1.49E-09	<6.25E-09
October	<1.07E-09	2.26±1.72E-09	<1.00E-07		
November	<1.30E-09	3.91±1.65E-09	<1.00E-07		
December	<1.42E-09	4.60±2.03E-09	<1.00E-07		
4TH QTR				2.92±2.14E-09	<9.49E-09

Table C - 1.4

1992 Radioactivity Concentrations (µCi/mL) in Surface Water Downstream of the WVDP at Thomas Corners (WFBCTCB)

Month	Alpha	Beta	H-3	Sr-90	Cs-137
January	<1.38E-09	6.64±1.98E-09	<1.41E-07		
February	<1.89E-09	8.29±2.12E-09	<1.00E-07		
March	1.42±1.13E-09	3.58±1.57E-09	<1.00E-07		
1ST QTR				3.56±1.73E-09	<6.45E-09
April	2.13±1.80E-09	4.01±1.78E-09	<1.00E-07		
May	<1.65E-09	7.12±2.00E-09	<8.05E-08		
June	<1.53E-09	4.82±1.99E-09	<1.00E-07		
2ND QTR				3.49±1.77E-09	<9.43E-09
July	<2.69E-09	7.76±2.17E-09	<7.24E-08		
August	2.15±1.99E-09	5.31±2.00E-09	<1.00E-07		
September	<1.73E-09	7.67±2.10E-09	<1.00E-07		
3RD QTR				2.04±1.46E-09	<9.43E-09
October	<1.17E-09	5.80±2.05E-09	<1.00E-07		
November	<1.38E-09	5.60±1.85E-09	<1.00E-07		
December	2.88±1.88E-09	9.79±2.13E-09	<6.20E-08		
4TH QTR				3.29±2.15E-09	<7.10E-09

Table C - 1.5

1992 Monthly Radioactivity Concentrations (µCi/mL) in Surface Water Downstream of the WVDP at Frank's Creek (WNSP006)

Month	Alpha	Beta	H-3
January	<1.14E-09	5.55±0.43E-08	8.03±1.59E-07
February	<1.43E-09	4.66±0.40E-08	4.59±1.43E-07
March	<1.28E-09	4.92±0.41E-08	7.16±1.53E-07
April	<1.62E-09	2.33±0.31E-08	<1.01E-07
May	<3.30E-09	6.72±0.50E-08	3.38±0.90E-07
June	<3.58E-09	5.00±0.47E-08	8.54±1.63E-07
July	<3.83E-09	9.68±0.59E-08	9.96±0.97E-07
August	<3.72E-09	4.12±0.43E-08	1.73±0.76E-07
September	<2.45E-09	1.74±0.07E-07	1.71±0.09E-06
October	<2.18E-09	3.25±0.38E-08	<9.12E-08
November	<1.32E-09	1.96±0.29E-08	<8.90E-08
December	<1.60E-09	3.06±0.35E-08	1.42±0.85E-07

Table C - 1.6

1992 Quarterly Radioactivity Concentrations (µCi/mL) in Surface Water Downstream of the WVDP at Frank's Creek (WNSP006)

	C-14	Sr-90	I-129	Cs-137	U-233/234
1st Qtr	<1.57E-08	1.98±0.36E-08	7.80±4.60E-10	<3.08E-08	3.30±1.30E-10
2nd Qtr	<7.30E-09	1.82±0.31E-08	<1.30E-09	<1.83E-08	2.20±0.90E-10
3rd Qtr	<7.30E-09	2.54±0.39E-08	<1.10E-09	<3.02E-08	9.40±6.60E-11
4th Qtr	9.70±7.40E-09	1.66±0.29E-08	<1.53E-09	<2.62E-08	1.00±0.80E-10

	U-235	U-238	Pu-238	Pu-239/240	Am-241
1st Qtr	<2.52E-11	2.40±1.10E-10	<9.99E-13	<3.80E-11	<3.20E-11
2nd Qtr	<3.50E-11	1.00±0.70E-10	<7.86E-11	<7.86E-11	<3.40E-11
3rd Qtr	<3.30E-11	2.40±1.00E-10	<3.02E-11	<3.02E-11	8.10±5.70E-11
4th Qtr	<3.45E-11	1.60±1.00E-10	<4.97E-11	<4.97E-11	<3.30E-11

Table C - 1.7

1992 Monthly Radioactivity Concentrations (µCi/mL) in Surface Water Downstream of Buttermilk Creek at Felton Bridge (WFFELBR)

Month	Alpha	Beta	H-3	Sr-90	Cs-137
January	<1.31E-09	3.10±1.64E-09	<1.00E-07	4.08±1.75E-09	<7.12E-09
February	<1.83E-09	5.79±1.91E-09	<1.00E-07	3.87±1.84E-09	<6.45E-09
March	<1.12E-09	3.06±1.71E-09	<1.00E-07	3.73±1.77E-09	<6.45E-09
April	<1.72E-09	3.07±1.80E-09	<1.00E-07	1.82±1.55E-09	<6.45E-09
May	<1.79E-09	<1.64E-09	<1.00E-07	<1.54E-09	<9.43E-09
June	<1.79E-09	<1.65E-09	<1.00E-07	2.92±1.60E-09	<9.43E-09
July	<3.46E-09	4.19±1.90E-09	<7.58E-08	2.65±1.64E-09	<6.65E-09
August	<1.92E-09	2.68±1.73E-09	<1.00E-07	2.73±1.67E-09	<9.43E-09
September	<2.34E-09	4.67±1.89E-09	<1.00E-07	4.16±1.81E-09	<6.25E-09
October	<1.58E-09	<1.81E-09	<1.00E-07	2.56±1.49E-09	<1.01E-08
November	1.80±1.44E-09	3.34±1.60E-09	<1.00E-07	4.25±2.15E-09	<9.49E-09
December	<1.39E-09	3.76±1.72E-09	<1.00E-07	2.97±1.98E-09	<9.49E-09

Table C - 1.8

1992 Results of Sampling of Potable Well Water around the WVDP

Well ID	pH	Conductivity (µmhos/cm@25°C)	Alpha (µCi/mL)	Beta (µCi/mL)	H-3 (µCi/mL)	Cs-137 (µCi/mL)
WFWELL01	7.62	403	<2.01E-09	2.14±1.62E-09	<1.00E-07	<2.64E-08
WFWELL02	6.84	325	1.37±1.34E-09	1.52±1.42E-09	<1.00E-07	<2.64E-08
WFWELL03	6.81	595	<1.82E-09	3.34±1.84E-09	<7.90E-08	<2.64E-08
WFWELL04	7.85	1657	<5.14E-09	6.95±4.15E-09	<1.00E-07	<2.05E-08
WFWELL05	6.68	305	1.37±1.20E-09	4.43±1.70E-09	<1.00E-07	<2.14E-08
WFWELL06	7.94	267	<1.33E-09	<1.35E-09	<1.00E-07	<2.14E-08
WFWELL07	7.48	384	<1.42E-09	1.86±1.58E-09	<1.00E-07	<2.64E-08
WFWELL08	7.41	467	<2.33E-09	2.79±1.75E-09	<1.00E-07	<2.64E-08
WFWELL09	7.58	689	4.31±3.45E-09	3.09±1.74E-09	<1.00E-07	<2.14E-08
WFWELL10	6.96	577	<1.72E-09	2.27±1.72E-09	<1.00E-07	<2.64E-08

Table C - 1.9

1992 Radioactivity Concentrations in Stream Sediment around the WVDP (μCi/g dry weight from upper 15 cm)

Location	Date	Alpha	Beta	K-40	Cs-137	Sr-90	Co-60
SFBCSED	6/92	1.40±0.60E-05	3.70±0.30E-05	1.76±0.18E-05	1.48±0.65E-07	1.50±0.50E-07	<3.90E-08
SFSDSED	6/92	1.40±0.60E-05	4.20±0.40E-05	1.55±0.16E-05	4.70±0.47E-07	<5.10E-08	2.50±2.40E-08
SFTCSED	6/92	1.20±0.60E-05	3.30±0.30E-05	1.17±0.12E-05	1.54±0.15E-06	2.60±1.20E-07	<2.03E-08
SFCCSED	6/92	7.70±4.70E-06	4.80±0.40E-05	1.12±0.12E-05	2.59±0.34E-07	9.30±6.30E-08	<1.90E-08
SFBISED	6/92	6.60±4.40E-06	4.20±0.40E-05	1.66±0.17E-05	3.80±3.40E-08	6.20±3.70E-08	<3.53E-08
SFBCSED	11/92	5.70±4.00E-06	3.30±0.30E-05	1.25±0.13E-05	4.00±2.10E-08	<3.20E-08	<1.92E-08
SFSDSED	11/92	9.40±4.90E-06	3.50±0.30E-05	1.29±0.13E-05	2.03±0.32E-07	9.00±4.00E-08	<1.73E-08
SFTCSED	11/92	1.30±0.60E-05	3.70±0.30E-05	1.39±0.14E-05	1.14±0.11E-06	1.50±0.50E-07	<2.00E-08
SFCCSED	11/92	1.24±0.54E-05	3.05±0.30E-05	1.14±0.12E-05	1.32±0.28E-07	5.65±4.05E-08	<1.60E-08
SFBISED	11/92	7.80±4.60E-06	3.10±0.30E-05	1.15±0.12E-05	2.20±1.70E-08	6.90±3.60E-08	<1.50E-08

Location	Date	U-233/234	U-235	U-238	Pu-238	Pu-239/240	Am-241
SFBCSED	6/92	1.10±0.30E-07	<5.00E-09	9.10±2.40E-08	<7.80E-09	<9.30E-09	<1.10E-08
SFTCSED	6/92	1.10±0.30E-07	<6.30E-09	9.40±2.40E-08	<9.13E-09	<1.20E-08	<3.70E-08

Table C - 1.10

1992 Radioactivity Concentrations in Surface Soil Collected at Air Sampling Stations around the WVDP (μCi/g dry weight from upper 15 cm)

Location	K-40	Cs-137	Sr-90	Am-241	Pu-239/240
SFFXVRD	1.04±0.10E-05	6.29±0.63E-07	1.80±0.50E-07	<1.26E-08	<3.20E-08
SFRSPRD	1.37±0.14E-05	1.35±0.14E-06	2.10±1.00E-07	<1.67E-08	<2.38E-08
SFRT240	1.10±0.11E-05	8.82±0.88E-07	3.00±0.60E-07	2.10±1.50E-08	<1.09E-07
SFSPRVL	1.43±0.14E-05	5.17±0.72E-07	2.60±1.00E-07	<9.60E-09	<4.46E-07
SFTCORD	1.98±0.28E-05	4.03±0.55E-07	1.20±0.90E-07	<8.50E-09	<1.08E-08
SFWEVAL	1.16±0.12E-05	6.26±0.63E-07	2.30±0.80E-07	<6.66E-09	<9.30E-09
SFGRVAL	1.02±0.10E-05	3.67±0.37E-06	2.10±0.60E-07	2.40±1.40E-08	<4.80E-08
SFBOEHN	1.75±0.18E-05	1.63±0.16E-06	1.80±0.50E-07	1.40±1.40E-08	<2.65E-08
SFDNKRK	1.33±0.13E-05	5.99±0.60E-07	<5.12E-08	<4.80E-09	<2.30E-08
SFBLKST	1.77±0.18E-05	2.74±0.51E-07	8.90±5.20E-08	<1.60E-08	<1.50E-08

Location	U-233/234	U-235	U-238
SFRSPRD	1.60±0.40E-07	<5.55E-09	1.00±0.30E-07
SFGRVAL	9.00±4.40E-08	<1.58E-08	1.00±0.50E-07
SFBOEHN	8.70±4.20E-08	<1.39E-08	6.80±3.80E-08

Table C - 1.11

1992 Water Quality Concentrations (mg/L) in Surface Water at Locations WFBCBKG and WNSP006

Location	Date	pH	Conductivity*	TOC	TOX	Chloride	Sulfate	Nitrate-N	Fluoride	Bicarbonate Alkalinity (as $CaCO_3$)	Carbonate Alkalinity (as $CaCO_3$)
WFBCBKG	6/11	7.34**	N/A	1.8	0.006	12.0	18.7	0.19	<0.1	102	<10.0
WFBCBKG	11/25	7.62	N/A	3.2	0.006	7.4	37.2	0.10	<0.1	60.1	<1.0
WNSP006	6/11	7.65***	479***	3.4	0.115	174	42.0	11.50	<0.1	114	<10.0
WNSP006	11/25	7.48	476	3.9	0.010	12.4	27.4	2.00	<0.1	71.7	<1.0

Location	Date	Ca Total	Mg Total	Na Total	K Total	Ba Total	Mn Total	Mn Soluble	Fe Total	Fe Soluble
WFBCBKG	6/11	39	5.8	8.4	1.1	0.089	0.030	N/A	0.280	N/A
WFBCBKG	11/25	20	4.8	6.1	1.6	0.054	0.091	0.025	5.320	0.518
WNSP006	6/11	52	7.9	89	5.6	0.068	0.032	N/A	0.330	N/A
WNSP006	11/25	28	5.9	9.2	1.6	<0.050	0.044	0.029	2.210	0.365

* *Measured in μmhos/cm at 25°C.*

** *Average of biweekly measurements during semiannual period.*

*** *Average of weekly measurements during semiannual period.*

N/A - Not available.

Appendix C - 2

Summary of Air Monitoring Data

Table C - 2.1

1992 Airborne Radioactive Effluent Monthly Totals (curies) from the Main Ventilation Stack (ANSTACK)

Month	Alpha	Beta	H-3
January	<2.78E-08	3.36±0.85E-07	3.83±0.11E-03
February	<2.81E-08	1.27±0.15E-06	4.60±0.13E-03
March	3.02±2.69E-08	6.45±1.02E-07	2.94±0.08E-03
April	2.74±2.65E-08	6.96±1.06E-07	2.58±0.07E-03
May	<3.21E-08	6.48±1.22E-07	2.89±0.09E-03
June	4.75±3.39E-08	3.45±0.18E-06	2.34±0.08E-03
July	<2.51E-08	8.10±1.10E-07	6.00±0.18E-03
August	<3.03E-08	1.26±0.14E-06	6.72±0.20E-03
September	3.55±3.12E-08	4.65±0.19E-06	6.38±0.18E-03
October	3.99±3.85E-08	1.94±0.18E-06	9.03±0.21E-03
November	<3.08E-08	1.07±0.12E-06	6.10±0.20E-03
December	3.86±3.65E-08	3.30±0.21E-06	1.89±0.06E-03
TOTALS	**<3.68E-07**	**2.01±0.17E-05**	**5.53±0.16E-02**

Table C - 2.2

1992 Airborne Radioactive Effluent Quarterly Totals (curies) from the Main Ventilation Stack (ANSTACK)

QTR	Co-60	Sr-90	I-129	Cs-134	Cs-137	Eu-154	Am-241
1st Qtr	<2.76E-08	1.90±0.36E-07	4.41±0.20E-06	<2.70E-08	1.19±0.12E-06	<8.77E-08	1.30±0.77E-08
2nd Qtr	<2.52E-08	1.66±0.12E-06	5.50±0.26E-07	<2.75E-08	5.89±0.58E-06	<6.40E-08	5.85±1.95E-08
3rd Qtr	<2.25E-08	2.48±0.21E-06	1.08±0.06E-06	<2.07E-08	7.47±0.74E-06	<5.58E-08	5.17±1.65E-08
4th Qtr	<1.39E-08	3.80±0.42E-07	5.94±0.13E-07	<1.38E-08	2.70±0.27E-06	<4.35E-08	3.10±0.99E-08
TOTALS	**<8.92E-08**	**4.71±0.40E-06**	**6.64±0.30E-06**	**<8.89E-08**	**1.73±0.17E-05**	**<2.51E-07**	**1.54±0.54E-07**

QTR	U-232	U-233/234	U-235	U-236	U-238	Pu-238	Pu-239/240
1st Qtr	<6.85E-09	<4.96E-09	<4.71E-09	<4.71E-09	<3.44E-09	<9.65E-09	<7.91E-09
2nd Qtr	<9.17E-09	<1.07E-08	<5.23E-09	<5.23E-09	<5.23E-09	<1.05E-08	<1.17E-08
3rd Qtr	<6.85E-09	<4.99E-09	<4.99E-09	<6.41E-09	<4.99E-09	<1.53E-08	3.93±2.48E-08
4th Qtr	<8.59E-09	<3.90E-09	<3.90E-09	<3.90E-09	<5.91E-09	<5.63E-09	1.41±0.84E-08
TOTALS	**<3.14E-08**	**<2.46E-08**	**<1.88E-08**	**<2.02E-08**	**<1.96E-08**	**<4.11E-08**	**7.16±5.29E-08**

Table C - 2.3

Comparison of 1992 Main Stack Exhaust Radioactivity Concentrations with Department of Energy Guidelines

Isotope	Half-life	Total Ci Released [a]	Avg Conc (μCi/mL)	DCG (μCi/mL)	% of DCG [c]
Alpha	NA	<3.68E-07 (<1.36E+04 Bq)	<4.95E-16	NA [b]	—
Beta	NA	2.01E-05 (7.44E+05 Bq)	2.70E-14	NA [b]	—
H-3	12.35 years	5.53E-02 (2.05E+09 Bq)	7.43E-11 [d]	1.00E-07	0.1
Co-60	5.27 years	<8.92E-08 (<3.30E+03 Bq)	<1.20E-16	8.00E-11	0.0
Sr-90	29.124 years	4.71E-06 (1.74E+05 Bq)	6.33E-15	9.00E-12	0.1
I-129	1.57 E+07 years	6.64E-06 (2.46E+05 Bq)	8.92E-15	7.00E-11	0.0
Cs-134	2.06 years	<8.89E-08 (<3.29E+03 Bq)	<1.20E-16	2.00E-10	0.0
Cs-137	30 years	1.73E-05 (6.38E+05 Bq)	2.31E-14	4.00E-10	0.0
Eu-154	8.8 years	<2.51E-07 (<9.29E+03 Bq)	<3.37E-16	5.00E-11	0.0
U-232 [e]	72 years	<3.14E-08 (<1.16E+03 Bq)	<4.22E-17	2.00E-14	<0.2
U-234 [e]	2.45 E+05 years	<2.46E-08 (<9.10E+02 Bq)	<3.30E-17	9.00E-14	0.0
U-235 [e]	7.1 E+08 years	<1.88E-08 (<6.96E+02 Bq)	<2.53E-17	1.00E-13	0.0
U-236 [e]	3.415 E+06 years	<2.02E-08 (<7.47E+02 Bq)	<2.72E-17	1.00E-13	0.0
U-238 [e]	4.47 E+09 years	<1.96E-08 (<7.24E+02 Bq)	<2.63E-17	1.00E-13	0.0
Pu-238	87.07 years	<4.11E-08 (<1.52E+03 Bq)	<5.53E-17	3.00E-14	<0.2
Pu-239	2.4 E+04 years	7.16E-08 (2.65E+03 Bq)	9.63E-17	2.00E-14	0.5
Am-241	432 years	1.54E-07 (5.71E+03 Bq)	2.07E-16	2.00E-14	1.0
TOTAL % of DCG					**2.2**

NOTES:

[a] *Total volume released at 50,000 cfm = 7.44E+14 mL/year; Ci values are also expressed in Bq.*

[b] *Derived concentration guides (DCGs) are not specified for gross alpha or gross beta activity.*

[c] *Total percent DCGs for applicable measured radionuclides.*

[d] *Tritium reported in pCi/mL = 7.43E-5.*

[e] *Total U (μg) = <6.69E+04; average U (pg/mL) = <8.99E-05.*

NA - Not applicable.

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.

Table C - 2.4

1992 Airborne Radioactive Effluent Monthly Totals (curies) from the Cement Solidification System Ventilation Stack (ANCSSTK)

Month	Alpha	Beta
January	<5.64E-09	1.77±1.40E-08
February	<4.45E-09	2.67±1.57E-08
March	<3.14E-09	1.58±1.18E-08
April	<4.25E-09	<1.38E-08
May	<4.49E-09	<1.60E-08
June	<4.30E-09	<1.10E-08
July	<3.69E-09	<1.16E-08
August	<6.82E-09	1.84±1.67E-08
September	<5.19E-09	1.86±1.41E-08
October	<7.15E-09	<1.79E-08
November	<5.95E-09	<1.39E-08
December	<6.33E-09	2.25±1.45E-08
TOTALS	**<6.14E-08**	**1.94±1.71E-07**

Table C - 2.5

1992 Airborne Radioactive Effluent Quarterly Totals (curies) from the Cement Solidification System Ventilation Stack (ANCSSTK)

QTR	Co-60	Sr-90	I-129	Cs-134	Cs-137	Eu-154	Am-241
1st Qtr	<5.32E-09	4.89±3.87E-09	<1.41E-08	5.80±5.80E-09	<4.51E-09	2.32±1.89E-08	<1.79E-09
2nd Qtr	<8.90E-08	<8.40E-08	<4.06E-09	<7.85E-08	<8.81E-08	<2.73E-07	<2.22E-08
3rd Qtr	<3.47E-08	<1.04E-08	<6.73E-09	<2.90E-08	<3.24E-08	<1.11E-07	<4.49E-09
4th Qtr	<6.19E-09	<3.64E-09	3.46±3.07E-09	<6.19E-09	<6.19E-09	<1.87E-08	<9.41E-10
TOTALS	**<1.35E-07**	**<2.63E-08**	**<2.79E-08**	**<1.19E-07**	**<1.31E-07**	**<4.21E-07**	**<2.95E-08**

QTR	U-232	U-233/234	U-235	U-236	U-235/236	U-238	Pu-238	Pu-239/240
1st Qtr	<9.19E-10	<1.11E-09	<6.67E-10	<6.67E-10	<1.33E-09	<9.43E-10	<1.96E-09	<1.11E-09
2nd Qtr	<9.49E-09	<1.72E-08	*	*	<1.59E-08	5.04±2.29E-08	<8.58E-09	<5.45E-09
3rd Qtr	<3.34E-09	1.96±0.89E-08	*	*	<4.77E-09	1.89±0.94E-08	<8.54E-09	<5.08E-09
4th Qtr	<1.21E-09	<8.89E-10	<8.89E-10	<8.89E-10	<1.78E-09	<8.89E-10	<1.33E-09	<2.04E-09
TOTALS	**<1.50E-08**	**3.61±2.81E-08**	N/A	N/A	**<2.38E-08**	**6.98±3.41E-08**	**<2.04E-08**	**<1.37E-08**

** U-235 and U-236 were not measured separately.*
N/A - Not available.

Table C - 2.6

1992 Airborne Radioactive Effluent Monthly Totals (curies) from the Contact Size-Reduction Facility Ventilation Stack (ANCSRFK)

Month	Alpha	Beta
January	<2.54E-09	9.74±7.40E-09
February	<3.57E-09	1.36±0.96E-08
March	<2.98E-09	1.68±0.87E-08
April	<2.72E-09	1.30±0.94E-08
May	<3.47E-09	1.25±1.10E-08
June	<2.54E-09	1.40±0.88E-08
July	<2.82E-09	<8.40E-09
August	<4.10E-09	1.52±1.06E-08
September	<3.47E-09	1.32±0.91E-08
October	<4.30E-09	1.54±1.18E-08
November	<3.66E-09	1.55±0.91E-08
December	<3.19E-09	2.26±0.86E-08
TOTALS	**<3.47E-09**	**1.69±1.12E-07**

Table C - 2.7

1992 Airborne Radioactive Effluent Quarterly Totals (curies) from the Contact Size-Reduction Facility Ventilation Stack (ANCSRFK)

QTR	Co-60	Sr-90	I-129	Cs-134	Cs-137	Eu-154	Am-241
1st Qtr	<2.77E-09	<2.38E-09	1.85±0.09E-07	<2.71E-09	3.60±2.77E-09	<1.12E-08	<4.68E-10
2nd Qtr	<4.00E-09	<2.39E-09	2.45±0.05E-07	<4.33E-09	<3.17E-09	<1.16E-08	8.30±7.30E-10
3rd Qtr	<2.26E-09	<2.31E-09	8.26±4.23E-09	<2.48E-09	<1.83E-09	<5.92E-09	<5.70E-10
4th Qtr	<4.24E-09	<2.27E-09	<1.99E-09	<3.97E-09	<3.70E-09	<1.15E-08	<1.00E-09
TOTALS	**<1.33E-08**	**<9.35E-09**	**4.39±0.20E-07**	**<1.35E-08**	**<1.15E-08**	**<4.03E-08**	**<2.77E-09**

QTR	U-232	U-233/234	U-235	U-236	U-238	Pu-238	Pu-239\240
1st Qtr	<1.38E-09	<6.23E-10	<4.32E-10	<6.09E-10	<6.09E-10	<9.69E-10	<1.02E-09
2nd Qtr	<1.23E-09	<7.55E-10	<5.81E-10	<5.82E-10	<1.06E-09	<4.50E-10	<4.50E-10
3rd Qtr	<9.07E-10	<1.24E-09	<6.44E-10	<5.08E-10	<9.17E-10	<4.73E-10	<6.07E-10
4th Qtr	<9.39E-10	<7.88E-10	<6.06E-10	<6.06E-10	<6.06E-10	<6.69E-10	<7.78E-10
TOTALS	**<4.46E-09**	**<3.40E-09**	**<2.26E-09**	**<2.30E-09**	**<3.19E-09**	**<2.56E-09**	**<2.86E-09**

Table C - 2.8

1992 Airborne Radioactive Effluent Monthly Totals (curies) from the Supernatant Treatment System Ventilation Stack (ANSTSTK)

Month	H-3 *	Alpha	Beta
January		<1.83E-09	<5.81E-09
February		<2.56E-09	9.25±7.46E-09
March		<1.64E-09	1.10±0.63E-08
April		<1.54E-09	8.95±6.57E-09
May		<2.93E-09	1.01±0.88E-08
June		<1.46E-09	1.48±0.42E-08
July		<2.58E-09	<6.96E-09
August		<2.99E-09	1.12±0.86E-08
September		<2.44E-09	1.09±0.70E-08
October		<3.25E-09	1.62±0.93E-08
November		<2.22E-09	2.19±0.82E-08
December		<2.75E-09	2.19±0.78E-08
TOTALS		**<2.82E-08**	**2.81±0.87E-08**

** Tritium could not be accurately quantified in low-moisture effluent air.*

Table C - 2.9

1992 Airborne Radioactive Effluent Quarterly Totals (curies) from the Supernatant Treatment System Ventilation Stack (ANSTSTK)

QTR	Co-60	Sr-90	I-129	Cs-134	Cs-137	Eu-154	Am-241
1st Qtr	<2.53E-09	<1.52E-09	1.89±0.08E-07	<2.33E-09	<2.48E-09	<8.06E-09	<6.97E-10
2nd Qtr	<2.34E-09	<1.66E-09	1.12±0.04E-07	<2.22E-09	<1.73E-09	<5.71E-09	4.50±4.33E-10
3rd Qtr	<2.96E-09	<2.04E-09	3.74±0.44E-08	<3.02E-09	3.94±2.63E-09	<1.01E-08	<4.82E-10
4th Qtr	<2.78E-09	<1.50E-09	9.58±0.22E-08	<2.46E-09	3.44±2.71E-09	<7.53E-09	<6.64E-10
TOTALS	**<1.06E-08**	**<6.72E-09**	**4.34±0.18E-07**	**<1.00E-08**	**<9.55E-09**	**<3.14E-08**	**<2.28E-09**

QTR	U-232	U-233/234	U-235	U-236	U-238	Pu-238	Pu-239/240
1st Qtr	<4.57E-10	<7.62E-10	<4.12E-10	<3.81E-10	<7.40E-10	<6.36E-10	<3.01E-10
2nd Qtr	<4.07E-10	<5.35E-10	<3.95E-10	<3.08E-10	<4.50E-10	<3.20E-10	<5.54E-10
3rd Qtr	<7.47E-10	<5.46E-10	<4.27E-10	<4.27E-10	<4.27E-10	<7.54E-10	<9.64E-10
4th Qtr	<3.94E-10	<5.48E-10	<6.39E-10	<5.48E-10	<5.48E-10	<6.12E-10	<6.12E-10
TOTALS	**<2.00E-09**	**<2.39E-09**	**<1.87E-09**	**<1.67E-09**	**<2.17E-09**	**<2.32E-09**	**<2.43E-09**

Table C - 2.10

1992 Airborne Radioactive Effluent Monthly Totals (curies) from the Supercompactor Ventilation Stack (ANSUPCV)

Month	Alpha	Beta
January	<3.03E-10	1.57±0.73E-09
February	<8.80E-11	<3.54E-09
March	<8.85E-11	6.65±3.25E-10
April	<1.11E-10	4.47±3.09E-10
May	<3.84E-10	1.62±1.29E-09
June	<4.38E-10	4.28±1.49E-09
July	<4.69E-10	1.77±1.31E-09
August	<5.76E-10	2.61±1.64E-09
September	<3.60E-10	1.92±1.28E-09
October	<5.96E-10	2.62±1.66E-09
November	<4.38E-10	2.00±1.31E-09
December	<4.45E-10	1.95±1.21E-09
TOTALS	**<4.30E-09**	**2.20±1.61E-08**

Table C - 2.11

1992 Airborne Radioactive Effluent Quarterly Totals (curies) from the Supercompactor Ventilation Stack (ANSUPCV)

QTR	Co-60	Sr-90	Cs-134	Cs-137	Eu-154	Pu-238	Pu-239/240
1st Qtr	<6.32E-10	<5.59E-10	<5.59E-10	9.84±5.39E-10	<1.82E-09	<2.26E-10	<2.06E-10
2nd Qtr	<5.29E-09	<6.11E-10	<4.40E-09	<5.32E-09	<1.55E-08	<2.23E-09	1.93±1.62E-09
3rd Qtr	<2.18E-09	<9.46E-10	<1.71E-09	<1.80E-09	<6.40E-09	<2.63E-10	<2.28E-10
4th Qtr	<5.95E-10	<8.00E-10	<6.26E-10	<6.22E-10	<2.00E-09	<1.33E-10	<1.33E-10
TOTALS	**<8.69E-09**	**<2.92E-09**	**<7.29E-09**	**<8.27E-09**	**<2.57E-08**	**<2.85E-09**	**2.24±2.19E-09**

QTR	U-232	U-233/234	U-235	U-236	U-235/236	U-238	Am-241
1st Qtr	<4.32E-10	<1.18E-10	<1.18E-10	<1.18E-10	<2.37E-10	<1.18E-10	<2.13E-10
2nd Qtr	<1.46E-09	<2.11E-09	*	*	<1.60E-09	2.98±1.94E-09	<2.00E-07
3rd Qtr	<1.15E-09	<9.86E-10	*	*	<1.29E-09	<1.13E-09	<3.69E-10
4th Qtr	<1.07E-10	<1.11E-10	<8.66E-11	<8.66E-11	<1.73E-10	<1.11E-10	1.73±1.38E-10
TOTALS	**<3.15E-09**	**<3.32E-09**	N/A	N/A	**<3.30E-09**	**4.01±3.30E-09**	**<2.00E-07**

** U-235 and U-236 were not measured separately.*
N/A - Not available.

Table C - 2.12

1992 Radioactivity Concentrations in Airborne Particulates (μCi/mL) at the Fox Valley Air Sampler (AFFXVRD)

Month	Alpha	Beta	Sr-90	Cs-137
January	1.07±0.96E-15	1.35±0.30E-14		
February	9.07±8.96E-16	1.82±0.30E-14		
March	1.79±1.04E-15	1.93±0.30E-14		
1st Qtr			<4.77E-17	<1.91E-16
April	1.25±0.93E-15	1.28±0.27E-14		
May	<8.32E-16	1.37±0.27E-14		
June	9.60±8.89E-16	1.67±0.29E-14		
2nd Qtr			<2.99E-16	<4.20E-15
July	1.16±1.00E-15	1.44±0.28E-14		
August	<9.54E-16	1.69±0.30E-14		
September	1.19±0.94E-15	1.68±0.29E-14		
3rd Qtr			<4.49E-16	<6.16E-16
October	<8.50E-16	1.63±0.28E-14		
November	<6.17E-16	1.55±0.25E-14		
December	1.25±1.03E-15	2.46±0.32E-14		
4th Qtr			<8.26E-17	<2.08E-16

Table C - 2.13

1992 Radioactivity Concentrations in Airborne Particulates (μCi/mL) at the Rock Springs Road Air Sampler (AFRSPRD)

Month	Alpha	Beta	Sr-90	Cs-137	I-129
January	1.21±0.98E-15	2.10±0.32E-14			
February	<9.44E-16	1.93±0.32E-14			
March	1.00±0.81E-15	1.88±0.30E-14			
1st Qtr			<4.44E-17	<2.42E-16	<3.52E-16
April	8.76±8.39E-16	1.49±0.28E-14			
May	1.23±1.01E-15	1.46±0.30E-14			
June	8.69±8.48E-16	1.51±0.28E-14			
2nd Qtr			<5.14E-16	<2.55E-15	3.61±2.11E-16
July	<9.12E-16	1.36±0.27E-14			
August	1.06±1.00E-15	1.68±0.29E-14			
September	1.21±0.93E-15	1.91±0.30E-14			
3rd Qtr			<4.42E-16	<2.76E-15	3.73±3.60E-16
October	<8.33E-16	2.00±0.31E-14			
November	<8.05E-16	1.50±0.27E-14			
December	<9.22E-16	2.40±0.32E-14			
4th Qtr			<1.26E-16	<2.09E-16	2.22±1.11E-16

Table C - 2.14

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the Route 240 Air Sampler (AFRT240)

Month	Alpha	Beta	Sr-90	Cs-137
January	<1.53E-15	2.07±0.47E-14		
February	8.61±8.61E-16	1.87±0.29E-14		
March	1.38±0.93E-15	1.77±0.29E-14		
1st Qtr			<4.93E-17	<2.00E-16
April	<7.25E-16	1.25±0.26E-14		
May	9.73±8.97E-16	1.31±0.27E-14		
June	1.41±1.01E-15	1.45±0.27E-14		
2nd Qtr			<2.86E-16	<2.59E-15
July	<8.86E-16	1.20±0.26E-14		
August	<8.46E-16	1.84±0.30E-14		
September	1.00±0.93E-15	1.79±0.30E-14		
3rd Qtr			7.74±2.56E-16	<6.08E-16
October	1.32±1.05E-15	1.72±0.30E-14		
November	<7.05E-16	1.42±0.24E-14		
December	<9.83E-16	2.55±0.33E-14		
4th Qtr			<6.57E-17	<2.20E-16

Table C - 2.15

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the Springville Air Sampler (AFSPRVL)

Month	Alpha	Beta	Sr-90	Cs-137
January	8.50±7.51E-16	1.84±0.26E-14		
February	<6.80E-16	1.66±0.25E-14		
March	9.38±6.94E-16	1.66±0.25E-14		
1st Qtr			<5.29E-17	<2.18E-16
April	<7.86E-16	1.22±0.27E-14		
May	8.14±7.93E-16	1.35±0.25E-14		
June	8.67±8.26E-16	1.33±0.27E-14		
2nd Qtr			<3.74E-16	<3.46E-15
July	<8.94E-16	1.19±0.26E-14		
August	<8.00E-16	1.63±0.29E-14		
September	<7.61E-16	1.80±0.30E-14		
3rd Qtr			5.44±2.44E-16	<1.18E-15
October	1.14±0.98E-15	1.62±0.28E-14		
November	<6.50E-16	1.33±0.23E-14		
December	<9.58E-16	2.38±0.33E-14		
4th Qtr			<8.72E-17	<2.44E-16

Table C -2.16

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the Thomas Corners Road Air Sampler (AFTCORD)

Month	Alpha	Beta	Sr-90	Cs-137
January	<6.40E-16	1.68±0.27E-14		
February	<1.41E-15	2.86±0.49E-14		
March	1.56±0.97E-15	1.72±0.29E-14		
1st Qtr			<5.08E-17	<1.67E-16
April	1.06±0.87E-15	1.28±0.26E-14		
May	<8.12E-16	1.43±0.28E-14		
June	9.21±8.57E-16	1.42±0.27E-14		
2nd Qtr			<7.78E-16	<2.38E-15
July	<7.64E-16	1.24±0.25E-14		
August	<8.08E-16	2.12±0.31E-14		
September	9.15±8.77E-16	1.78±0.30E-14		
3rd Qtr			<2.31E-16	<8.66E-16
October	<8.81E-16	1.87±0.30E-14		
November	<6.92E-16	1.57±0.25E-14		
December	1.14±1.06E-15	2.80±0.36E-14		
4th Qtr			<1.00E-16	<2.16E-16

Table C - 2.17

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the West Valley Air Sampler (AFWEVAL)

Month	Alpha	Beta	Sr-90	Cs-137
January	<2.48E-15	2.33±0.74E-14		
February	9.04±8.30E-16	1.54±0.27E-14		
March	1.11±0.82E-15	1.57±0.28E-14		
1st Qtr			8.44±6.05E-17	<2.11E-16
April	1.03±0.86E-15	1.33±0.27E-14		
May	8.88±8.75E-16	1.37±0.27E-14		
June	8.29±8.25E-16	1.51±0.28E-14		
2nd Qtr			<3.09E-16	<4.16E-15
July	<8.43E-16	1.32±0.27E-14		
August	<7.55E-16	1.55±0.26E-14		
September	<1.03E-15	1.43±0.31E-14		
3rd Qtr			3.87±2.21E-16	<1.27E-15
October	1.00±0.86E-15	1.61±0.26E-14		
November	<6.80E-16	1.35±0.23E-14		
December	8.62±8.41E-16	2.23±0.29E-14		
4th Qtr			<8.09E-17	<2.33E-16

Table C - 2.18

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the Great Valley Air Sampler (AFGRVAL)

Month	Alpha	Beta	Sr-90	Cs-137	I-129
January	8.52±7.41E-16	1.38±0.24E-14			
February	<6.11E-16	1.44±0.24E-14			
March	1.14±0.81E-15	1.47±0.26E-14			
1st Qtr			<5.95E-17	<1.83E-16	<3.13E-16
April	7.57±6.77E-16	1.04±0.22E-14			
May	9.59±8.61E-16	1.28±0.26E-14			
June	1.19±0.95E-15	1.64±0.29E-14			
2nd Qtr			<4.56E-16	<3.25E-15	<2.04E-16
July	<8.60E-16	1.55±0.29E-14			
August	<9.49E-16	1.70±0.29E-14			
September	1.27±0.98E-15	1.88±0.30E-14			
3rd Qtr			<9.77E-16	<1.31E-15	<3.49E-16
October	<8.74E-16	1.92±0.31E-14			
November	<1.02E-15	1.55±0.32E-14			
December	1.12±1.01E-15	2.05±0.31E-14			
4th Qtr			<1.93E-16	<2.23E-16	<1.27E-16

Table C - 2.19

1992 Radioactivity Concentrations in Airborne Particulates (µCi/mL) at the Dunkirk Air Sampler (AFDNKRK)

Month	Alpha	Beta	Sr-90	Cs-137
January	1.49±1.05E-15	2.24±0.33E-14		
February	9.79±8.91E-16	2.23±0.33E-14		
March	2.09±1.78E-15	2.18±0.51E-14		
1st Qtr			<9.42E-17	<3.85E-16
April	1.26±0.96E-15	1.49±0.29E-14		
May	8.62±8.31E-16	1.36±0.26E-14		
June	1.26±0.96E-15	1.66±0.29E-14		
2nd Qtr			6.79±3.05E-16	<4.19E-15
July	<8.98E-16	1.49±0.28E-14		
August	<8.26E-16	1.91±0.30E-14		
September	<8.41E-16	2.02±0.31E-14		
3rd Qtr			1.15±0.85E-15	<5.68E-16
October	1.41±1.06E-15	2.06±0.32E-14		
November	<8.31E-16	1.81±0.30E-14		
December	<9.16E-16	2.29±0.32E-14		
4th Qtr			<1.73E-16	<2.31E-16

Table C - 2.20

1992 Radioactivity Concentrations in Airborne Particulates (μCi/mL) at the Dutch Hill Air Sampler (AFBOEHN)

Month	Alpha	Beta	Sr-90	Cs-137
January	<7.86E-16	1.85±0.31E-14		
February	<7.65E-16	1.71±0.30E-14		
March	1.34±0.93E-15	1.67±0.29E-14		
1st Qtr			<5.40E-17	<2.20E-16
April	<7.79E-16	1.32±0.27E-14		
May	1.28±0.95E-15	1.22±0.25E-14		
June	1.03±0.88E-15	1.58±0.29E-14		
2nd Qtr			<4.27E-16	<3.63E-15
July	1.14±1.00E-15	1.26±0.27E-14		
August	<8.74E-16	1.90±0.31E-14		
September	1.03±0.97E-15	1.92±0.31E-14		
3rd Qtr			<2.33E-16	<8.29E-16
October	1.01±0.98E-15	1.72±0.30E-14		
November	<7.36E-16	1.68±0.29E-14		
December	<9.47E-16	2.15±0.31E-14		
4th Qtr			<1.02E-16	<2.21E-16

Table C - 2.21

Radioactivity in Fallout in 1992 (nCi/m²/month)

Dutch Hill (AFDHFOP)

Month	Gross Alpha	Gross Beta	H-3 (µCi/mL)
January	2.89E-02	2.44E-01	2.00±1.4E-07
February	<3.49E-03	1.13E-01	<1.00E-07
March	5.00E-03	1.25E-01	<1.00E-07
April	<3.09E-02	3.34E-01	<1.00E-07
May	<8.30E-03	1.45E-01	<1.44E-07
June	4.08E-02	6.36E-01	<1.00E-07
July	1.02E-01	9.14E-01	<1.00E-07
August	<3.27E-02	4.80E-01	<1.00E-07
September	<2.67E-02	2.56E-01	<1.00E-07
October	5.61E-02	5.73E-01	<1.00E-07
November	<4.46E-02	5.71E-01	<1.00E-07
December	<1.89E-02	4.86E-01	<1.00E-07

Fox Valley Road (AFFXFOP)

Month	Gross Alpha	Gross Beta	H-3 (µCi/mL)
January	2.20E-02	2.63E-01	<1.00E-07
February	8.36E-03	1.44E-01	<1.00E-07
March	1.74E-02	1.00E-01	<1.00E-07
April	<3.19E-02	3.66E-01	<1.00E-07
May	1.29E-02	1.34E-01	2.79±1.6E-07
June	1.27E-02	1.50E-01	<1.00E-07
July	1.63E-01	5.78E-01	<8.10E-08
August	<3.24E-02	4.11E-01	<1.00E-07
September	<3.85E-02	3.94E-01	<1.00E-07
October	5.34E-02	5.57E-01	<1.00E-07
November	<5.18E-02	7.55E-01	<1.00E-07
December	5.36E-02	7.07E-01	<1.00E-07

Route 240 (AF24FOP)

Month	Gross Alpha	Gross Beta	H-3 (µCi/mL)
January	<1.38E-02	2.18E-01	4.34±1.5E-07
February	1.92E-02	2.11E-01	<1.00E-07
March	<6.70E-03	1.38E-01	<1.00E-07
April	<2.31E-02	3.50E-01	<1.00E-07
May	<8.48E-03	2.24E-01	<1.00E-07
June	<7.20E-03	3.05E-01	<1.00E-07
July	<5.47E-02	4.28E-01	<1.00E-07
August	<4.05E-02	8.74E-01	<1.00E-07
September	<2.87E-02	5.16E-01	<1.00E-07
October	3.02E-02	8.01E-01	<1.00E-07
November	5.53E-02	6.82E-01	<1.00E-07
December	<2.29E-02	5.72E-01	<1.00E-07

Thomas Corners Road (AFTCFOP)

Month	Gross Alpha	Gross Beta	H-3 (µCi/mL)
January		NO SAMPLE	
February	1.94E-02	2.65E-01	<1.00E-07
March	<6.39E-03	8.10E-02	<1.00E-07
April	<3.45E-02	2.29E-01	<1.00E-07
May	<8.70E-03	1.00E-01	<1.00E-07
June	1.70E-02	1.71E-01	<1.00E-07
July	<6.74E-02	3.04E-01	<7.24E-08
August	<3.58E-02	3.58E-01	<1.00E-07
September	<2.50E-02	3.99E-01	<1.00E-07
October	<1.77E-02	7.20E-01	<1.00E-07
November	7.12E-02	7.78E-01	<1.00E-07
December	<3.38E-02	8.42E-01	<1.00E-07

Rain Gage (ANRGFOP)

Month	Gross Alpha	Gross Beta	H-3 (µCi/mL)
January	2.42E-02	2.05E-01	<1.00E-07
February	8.17E-03	1.17E-01	<1.00E-07
March	1.42E-02	1.05E-01	<1.00E-07
April	<3.95E-02	1.85E-01	<1.00E-07
May	<2.36E-02	1.58E-01	<1.00E-07
June	2.73E-02	3.51E-01	<1.00E-07
July	<4.80E-02	2.88E-01	<7.45E-08
August	<3.57E-02	6.95E-01	<7.09E-08
September	<3.07E-02	4.69E-01	<1.00E-07
October	2.59E-02	7.16E-01	<1.00E-07
November	<5.42E-02	7.86E-01	<1.00E-07
December	<3.35E-02	7.76E-01	<1.00E-07

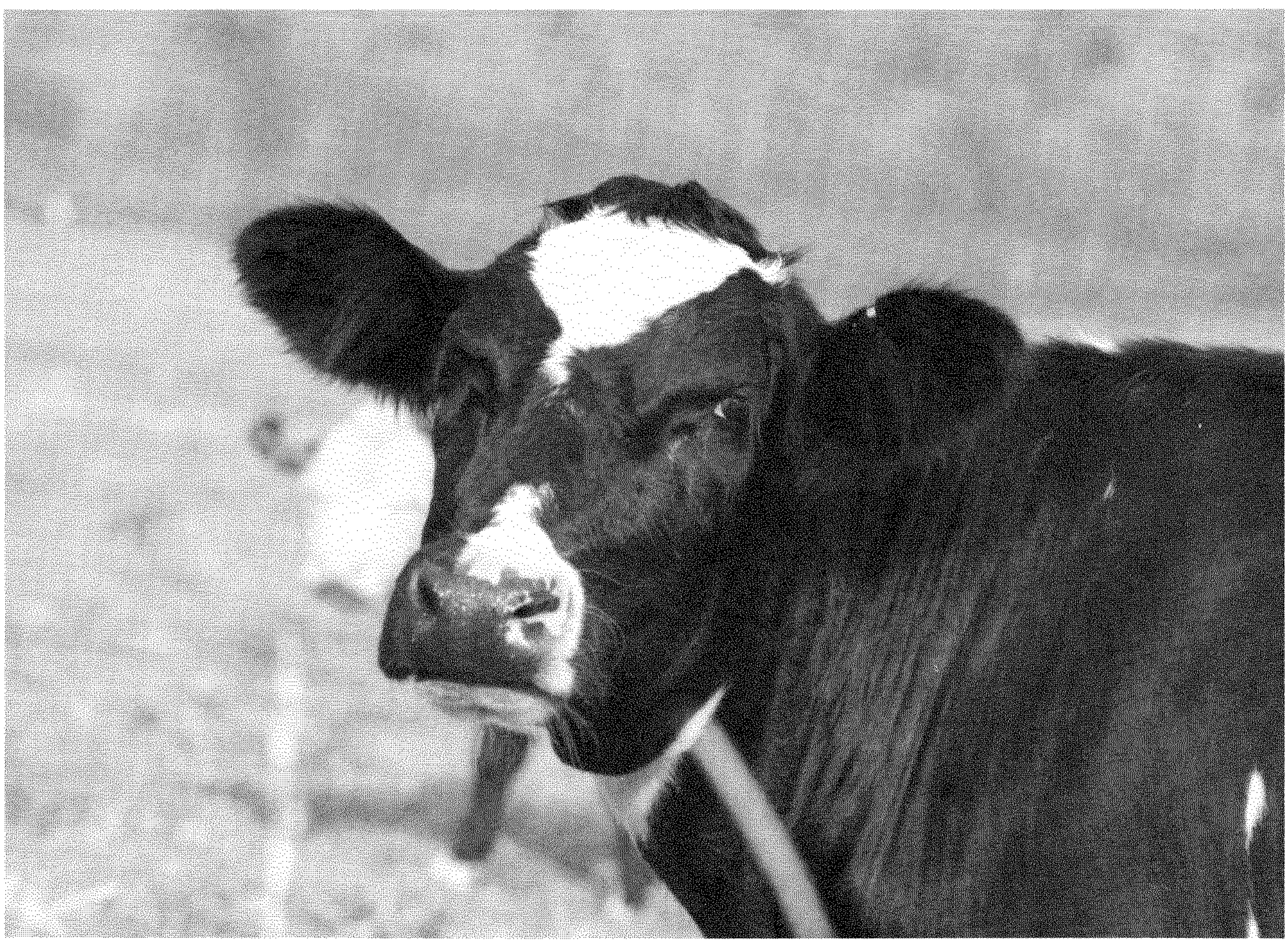
Table C - 2.22

pH of Precipitation Collected in Fallout Pots in 1992

Month	Dutch Hill (AFDHFOP)	Fox Valley Road (AFFXFOP)	Route 240 (AF24FOP)	Thomas Corners Road (AFTCFOP)	Rain Gage (ANRGFOP)
January	3.81	4.01	3.72	4.74	3.94
February	3.69	3.86	3.52	3.84	3.64
March	4.66	3.61	5.36	4.50	4.32
April	3.72	4.05	3.66	3.91	4.08
May	5.24	4.39	4.71	3.96	9.67
June	7.44	3.94	6.08	3.74	6.73
July	4.41	3.99	3.93	3.80	4.79
August	3.85	4.42	6.02	4.00	3.86
September	3.97	3.82	3.80	3.75	3.76
October	5.43	4.49	3.77	4.05	3.92
November	3.89	4.16	3.96	4.01	3.88
December	3.68	4.06	3.71	3.93	3.97

Appendix C - 3

Summary of Biological Data



Milk and Meat Samples are Collected from Local Bovine Herds

Table C - 3.1

1992 Radioactivity Concentrations in Milk (µCi/mL)

Location	Date	H-3	Sr-90	I-129	Cs-134	Cs-137	K-40
BFMCOBO (WNW FARM)	*1st Qtr*	<7.43E-08	2.50±0.30E-09	<3.51E-10	<2.01E-09	<2.30E-09	9.08±0.91E-07
BFMCOBO (WNW FARM)	*2nd Qtr*	<9.37E-08	1.60±0.10E-08	<2.63E-10	<2.41E-09	<2.30E-09	1.05±0.11E-06
BFMCOBO (WNW FARM)	*3rd Qtr*	1.40±0.70E-07	1.50±0.20E-09	<3.50E-10	<2.60E-09	<2.39E-09	8.73±0.87E-07
BFMCOBO (WNW FARM)	*4th Qtr*	1.60±0.80E-07	2.20±0.30E-09	4.10±3.40E-10	<2.33E-09	<2.25E-09	1.17±0.12E-06
BFMCTLN (CONTROL)	*1st Qtr*	<7.90E-08	1.70±0.20E-09	<3.00E-10	<2.07E-09	<2.10E-09	1.04±0.10E-06
BFMCTLN (CONTROL)	*2nd Qtr*	<9.50E-08	2.20±0.40E-09	<2.50E-10	<2.40E-09	<2.72E-09	1.51±0.15E-06
BFMCTLN (CONTROL)	*3rd Qtr*	7.60±7.10E-07	9.20±1.50E-10	<2.68E-10	<3.02E-09	<2.50E-09	1.12±0.11E-06
BFMCTLN (CONTROL)	*4th Qtr*	1.10±0.80E-07	1.10±0.90E-09	3.70±2.90E-10	<3.10E-09	3.20±3.00E-09	1.51±0.15E-06
BFMCTLS (CONTROL)	*1st Qtr*	<7.90E-08	9.50±2.00E-10	<3.80E-10	<2.30E-09	<2.20E-09	7.03±0.70E-07
BFMCTLS (CONTROL)	*2nd Qtr*	<9.50E-08	9.90±0.60E-09	<3.93E-10	<2.55E-09	<2.56E-09	1.43±0.14E-06
BFMCTLS (CONTROL)	*3rd Qtr*	1.60±0.80E-07	8.20±1.50E-10	6.50±3.20E-10	<2.80E-09	2.80±2.50E-09	1.01±0.10E-06
BFMCTLS (CONTROL)	*4th Qtr*	8.60±7.40E-08	2.30±0.30E-09	<3.50E-10	<2.30E-09	<2.10E-09	1.39±0.14E-06
BFMREED (NNW FARM)	*1st Qtr*	<7.80E-08	9.80±2.50E-10	<3.00E-10	<2.64E-09	2.90±2.70E-09	1.03±0.10E-06
BFMREED (NNW FARM)	*2nd Qtr*	<9.60E-08	8.80±0.50E-09	<2.67E-10	<2.59E-09	<2.70E-09	1.40±0.14E-06
BFMREED (NNW FARM)	*3rd Qtr*	8.30±7.21E-08	1.30±0.20E-09	4.40±3.00E-10	<2.67E-09	<2.70E-09	1.21±0.12E-06
BFMREED (NNW FARM)	*4th Qtr*	<7.40E-08	2.40±0.30E-09	<2.90E-10	<2.60E-09	<2.50E-09	1.37±0.14E-06
BFMHAUR (SE FARM)	*Annual*	1.08±0.08E-06	2.06±0.44E-09	<6.80E-10	<3.26E-09	<3.69E-09	1.57±0.17E-06
BFMWIDR (SSW FARM)	*Annual*	5.44±0.86E-07	1.62±0.42E-09	<6.99E-10	<3.77E-09	<4.45E-09	3.63±0.23E-06

Table C - 3.2

1992 Radioactivity Concentrations in Meat (µCi/g Dry)

Location	Moisture %	H-3 (µCi/mL)	Sr-90 (µCi/g)	Cs-134 (µCi/g)	Cs-137 (µCi/g)	K-40 (µCi/g)
DEER FLESH BACKGROUND (BFDCTRL #1)	70.9	<1.90E-07	<1.80E-09	<1.96E-08	<2.10E-08	1.05±0.11E-05
DEER FLESH BACKGROUND (BFDCTRL #2)	72.2	2.60±2.10E-07	<3.26E-09	<1.60E-08	<1.45E-08	9.43±0.94E-06
DEER FLESH BACKGROUND (BFDCTRL #3)	54.7	<2.00E-07	<2.80E-09	<1.20E-08	2.76±0.28E-07	9.81±0.98E-06
DEER FLESH NEAR-SITE (BFDNEAR #1)	74.4	1.83±1.02E-07	<5.39E-09	<3.94E-08	1.99±0.45E-07	1.66±0.14E-05
DEER FLESH NEAR-SITE (BFDNEAR #2)	74.3	5.36±0.91E-07	<9.30E-09	<5.35E-08	1.32±0.43E-07	1.81±0.38E-05
DEER FLESH NEAR-SITE (BFDNEAR #3)	73.5	6.26±0.90E-07	<2.01E-08	<2.82E-08	1.30±0.34E-07	3.08±0.07E-05
BEEF FLESH BACKGROUND (BFBCTRL) 06/92	68.5	<1.07E-07	<2.62E-08	<3.96E-08	<4.13E-08	1.14±1.05E-06
BEEF FLESH BACKGROUND (BFBCTRL) 10/92	71.2	1.10±1.00E-07	<3.30E-09	<9.70E-09	1.20±0.90E-08	9.11±0.91E-06
BEEF FLESH NEAR-SITE (BFBNEAR) 07/92	70.2	<9.94E-08	<8.83E-09	<2.67E-08	<2.82E-08	1.98±0.81E-06
BEEF FLESH NEAR-SITE (BFBNEAR) 12/92	59.5	4.50±2.00E-07	<1.27E-09	<1.01E-08	2.20±1.10E-08	1.02±0.10E-05

Table C - 3.3

1992 Radioactivity Concentrations in Food Crops (μCi/g Dry)

Location	Moisture %	H-3 (μCi/mL)	Sr-90 (μCi/g)	K-40 (μCi/g)	Co-60 (μCi/g)	Cs-137 (μCi/g)
BEANS BACKGROUND (BFVCTRL)	91.3	1.48±0.99E-07	4.23±0.52E-08	4.50±0.13E-04	<6.67E-07	<6.15E-07
BEANS NEAR-SITE (BFVNEAR)	89.4	<1.08E-07	1.73±0.12E-07	7.38±2.22E-05	<3.74E-07	<3.67E-07
APPLES BACKGROUND (BFVCTRL)	86.6	<1.11E-07	1.95±0.30E-08	3.75±1.29E-05	<2.23E-07	<2.01E-07
APPLES NEAR-SITE (BFVNEAR)	83.9	<1.18E-07	2.21±0.20E-08	2.72±0.08E-04	<4.07E-07	<3.99E-07
SWEET CORN BACKGROUND (BFVCTRL)	78.7	2.22±1.04E-07	<3.12E-09	1.42±0.09E-04	<2.00E-07	<1.88E-07
SWEET CORN NEAR-SITE (BFVNEAR)	82.2	3.18±1.04E-07	1.87±0.72E-08	2.93±1.24E-05	<1.89E-07	<1.86E-07
FIELD CORN BACKGROUND (BFVNRQC)	53.9	<1.05E-07	<3.07E-09	8.71±3.94E-06	<6.05E-08	<5.83E-08
FIELD CORN NEAR-SITE (BFVCTQC)	57.5	<1.10E-07	<3.04E-09	5.11±1.48E-06	<4.75E-08	<4.28E-08
HAY BACKGROUND (BFHCTLS)	6.5	N/A	4.56±0.32E-08	2.58±0.72E-05	<2.77E-07	<2.22E-07
HAY NEAR-SITE (BFHNEAR)	11.9	N/A	9.72±0.32E-08	4.52±1.70E-05	<2.94E-07	<2.83E-07

N/A - Not available.

Table C - 3.4

1992 Radioactivity Concentrations in Fish Flesh from Cattaraugus Creek

Cattaraugus Creek (BFFCATC) above Springville Dam

	1st Half (µCi/g dry)			2nd Half (µCi/g dry)		
	Sr-90	*Cs-134*	*Cs-137*	*Sr-90*	*Cs-134*	*Cs-137*
Median	9.8E-08	-4.0E-09	4.6E-08	-8.4E-08	<8.5E-07	<9.3E-07
Geometric Deviation (Avg)		*Not appropriate*			*Not appropriate*	
Maximum	2.0E-06	2.2E-07	5.8E-07	1.1E-07	<1.5E-06	<1.7E-06
Minimum	-1.6E-08	-1.0E-07	-9.8E-08	-4.8E-07	<5.7E-07	<6.0E-07
Moisture (Average %)	75.5			78.2		

Cattaraugus Creek (BFFCTRL) Background

	1st Half (µCi/g dry)			2nd Half (µCi/g dry)		
	Sr-90	*Cs-134*	*Cs-137*	*Sr-90*	*Cs-134*	*Cs-137*
Median	2.2E-07	2.4E-08	2.4E-09	-7.3E-08	<8.3E-07	<8.9E-07
Geometric Deviation (Avg)		*Not appropriate*			*Not appropriate*	
Maximum	2.3E-06	2.2E-07	1.4E-07	1.1E-07	<1.4E-06	<1.6E-06
Minimum	3.1E-09	-7.7E-08	-7.0E-08	-6.0E-07	<4.8E-07	<5.0E-07
Moisture (Average %)	76.2			79.3		

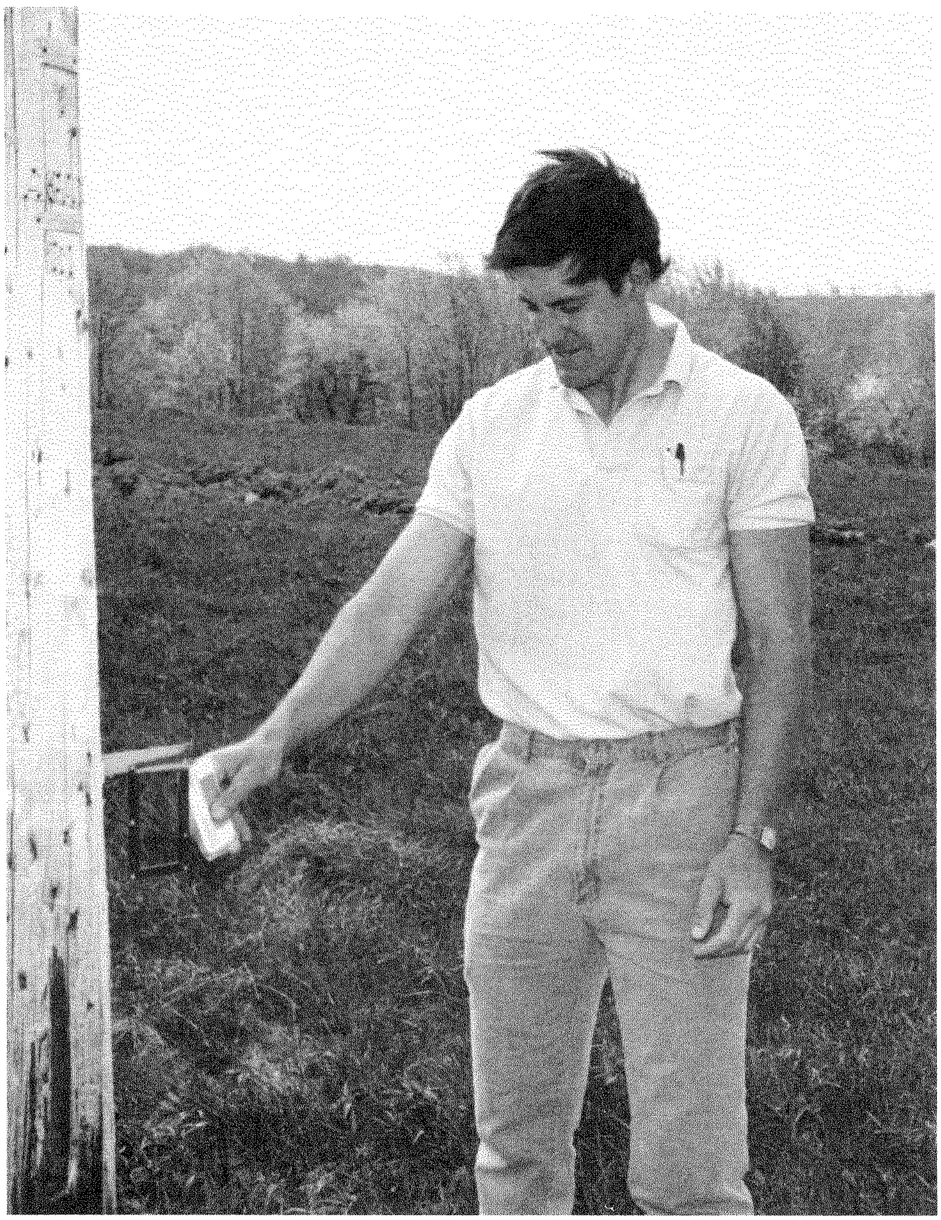
Cattaraugus Creek (BFFCATD) below the Springville Dam (Annual) *

	(µCi/g wet)		
	Sr-90	*Cs-134*	*Cs-137*
Median	-4.2E-08	<4.9E-07	<5.5E-07
Geometric Deviation (Avg)		*Not appropriate*	
Maximum	2.0E-07	<2.6E-06	<2.9E-06
Minimum	-3.4E-06	<1.0E-07	<1.0E-07
Moisture (Average %)	76.0		

** Sample not collected for the first half of 1992.*

Appendix C - 4

Summary of Direct Radiation Monitoring Data



Exchanging an Environmental TLD Package

Table C - 4.1
Summary of 1992 Quarterly Averages of TLD Measurements
(Roentgen ± 3 SD/Quarter)

*Location Number**	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*Location Average*
1	.021 ± .008	.017 ± .003	.023 ± .005	.020 ± .003	.020 ± .004
2	.021 ± .006	.017 ± .003	.021 ± .003	.020 ± .001	.020 ± .003
3	.021 ± .006	.016 ± .001	.019 ± .002	.020 ± .001	.019 ± .003
4	.020 ± .001	.016 ± .001	.020 ± .003	.020 ± .003	.019 ± .002
5	.022 ± .006	.016 ± .001	.021 ± .002	.020 ± .005	.020 ± .003
6	.020 ± .008	.015 ± .005	.020 ± .002	.019 ± .002	.019 ± .004
7	.017 ± .001	.016 ± .003	.018 ± .002	.019 ± .005	.018 ± .003
8	.021 ± .003	.016 ± .003	.020 ± .002	.019 ± .002	.019 ± .002
9	.019 ± .006	.016 ± .002	.019 ± .003	.019 ± .003	.018 ± .003
10	.018 ± .005	.016 ± .002	.021 ± .002	.020 ± .002	.019 ± .003
11	.022 ± .004	.018 ± .005	.022 ± .003	.022 ± .005	.021 ± .004
12	.021 ± .008	.016 ± .003	.020 ± .003	.020 ± .004	.019 ± .004
13	.022 ± .006	.018 ± .001	.022 ± .002	.021 ± .004	.021 ± .003
14	.022 ± .006	.018 ± .003	.022 ± .002	.022 ± .002	.021 ± .003
15	.019 ± .007	.016 ± .001	.020 ± .001	.019 ± .003	.018 ± .003
16	.021 ± .004	.018 ± .004	.021 ± .003	.020 ± .004	.020 ± .003
17	.023 ± .007	.019 ± .003	.021 ± .003	.020 ± .001	.020 ± .004
18**	.044 ± .006	.040 ± .004	.042 ± .003	.046 ± .007	.043 ± .005
19**	.025 ± .013	.022 ± .006	.025 ± .006	.024 ± .003	.024 ± .007
20	.021 ± .003	.017 ± .002	.021 ± .003	.019 ± .002	.019 ± .003
21	.024 ± .014	.017 ± .001	.021 ± .004	.020 ± .001	.021 ± .005
22	.022 ± .004	.017 ± .003	.020 ± .004	.019 ± .001	.019 ± .003
23	.021 ± .003	.015 ± .002	.020 ± .002	.020 ± .002	.019 ± .002
24**	1.290 ± .134	1.125 ± .174	1.082 ± .189	1.079 ± .088	1.144 ± .146
25	.034 ± .004	.032 ± .012	.032 ± .002	.031 ± .002	.032 ± .005
26	.030 ± .005	.028 ± .002	.031 ± .001	.028 ± .005	.029 ± .003
27	.025 ± .009	.019 ± .002	.022 ± .002	.022 ± .004	.022 ± .004
28	.027 ± .016	.021 ± .003	.024 ± .003	.022 ± .002	.023 ± .006
29	.027 ± .007	.020 ± .003	.025 ± .004	.024 ± .003	.024 ± .004
30	.031 ± .006	.025 ± .006	.029 ± .002	.028 ± .002	.028 ± .004
31	.022 ± .005	.019 ± .002	.021 ± .003	.021 ± .004	.021 ± .004
32	.034 ± .021	.029 ± .003	.031 ± .003	.032 ± .002	.031 ± .007
33	.040 ± .010	.034 ± .004	.037 ± .008	.042 ± .003	.038 ± .006
34	.060 ± .006	.056 ± .007	.054 ± .007	.067 ± .007	.059 ± .007
35	.086 ± .010	.079 ± .003	.068 ± .007	.087 ± .011	.080 ± .008
36	.075 ± .010	.070 ± .011	.067 ± .006	.076 ± .006	.072 ± .008
37	.023 ± .006	.016 ± .002	.019 ± .002	.019 ± .001	.019 ± .002
38**	.047 ± .011	.040 ± .007	.043 ± .005	.040 ± .005	.042 ± .007
39**	.087 ± .024	.073 ± .009	.078 ± .014	.073 ± .010	.078 ± .014
40**	.217 ± .039	.190 ± .018	.202 ± .018	.162 ± .020	.193 ± .024
41	.022 ± .004	.016 ± .003	.018 ± .001	.019 ± .003	.019 ± .003
*Quarterly Average***	.028 ± .007	.023 ± .003	.026 ± .003	.027 ± .003	.026 ± .004

* *Locations shown on Figures A-7 and A-8.*
** *TLDs 18, 19, 24, 38, 39, and 40 are not included in the quarterly averages.*

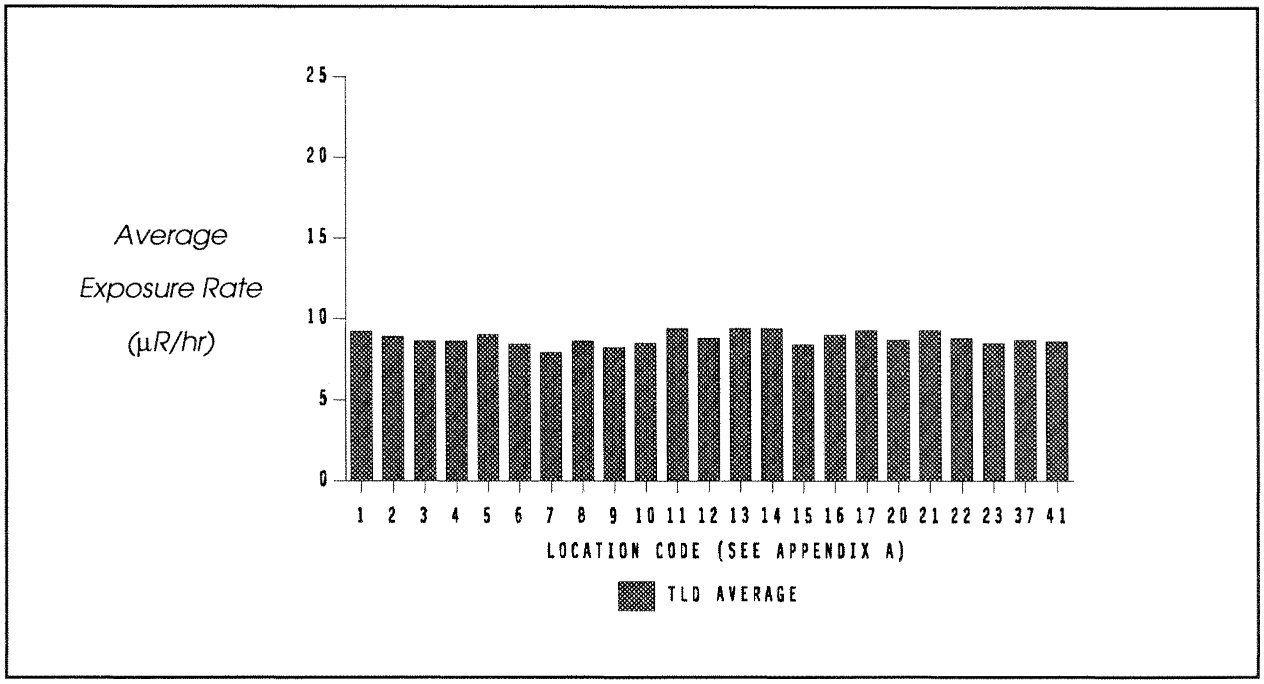


Figure C - 4.1

1992 Average Quarterly Gamma Exposure Rates around the West Valley Demonstration Project Site

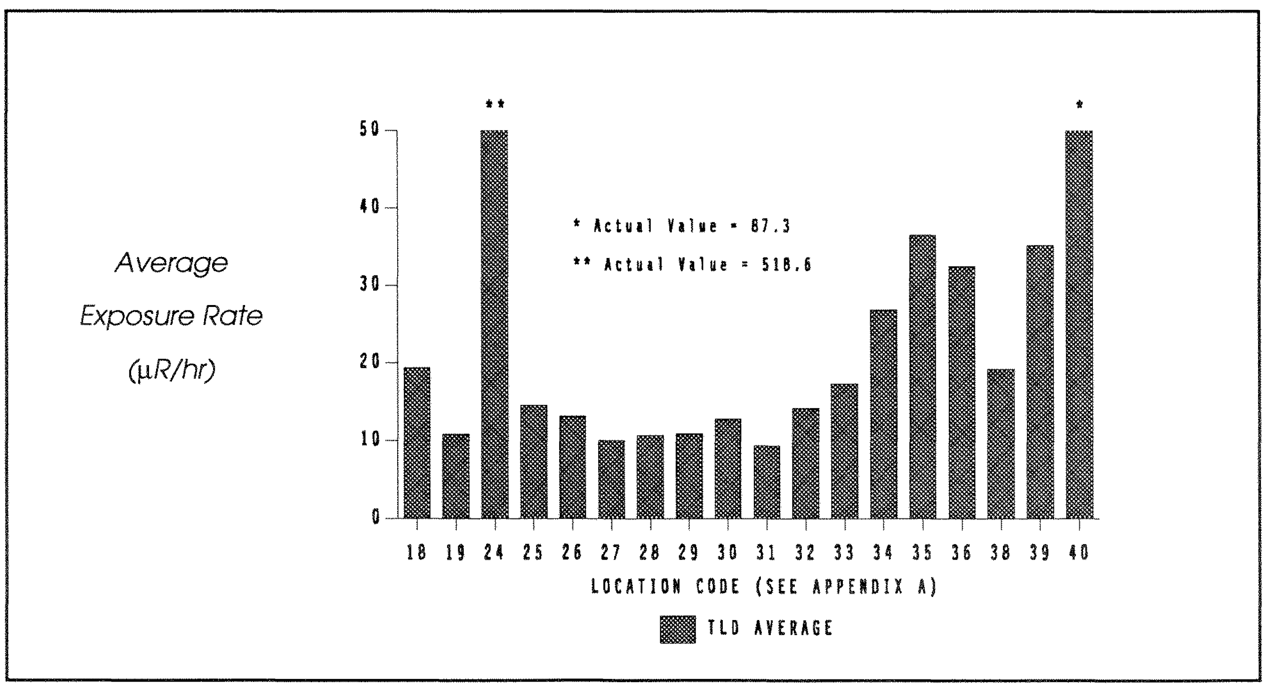


Figure C - 4.2

1992 Average Quarterly Gamma Exposure Rates on the West Valley Demonstration Project Site

Appendix C - 5

Summary of Nonradiological Monitoring Data

Table C - 5.1
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program
(effective September 1990)

Outfall	Parameter	Limit	Sample Frequency
001 (Process and Storm Wastewater)	Flow	Monitor	2 per discharge
	Aluminum, total	14.0 mg/L	2 per discharge
	Ammonia (NH_3)	*	2 per discharge
	Arsenic, dissolved	0.15 mg/L	2 per discharge
	BOD-5	**	2 per discharge
	Iron, total	**	2 per discharge
	Zinc, total recoverable	0.48 mg/L	2 per discharge
	Suspended solids	45.0 mg/L	2 per discharge
	Cyanide amenable to chlorination	0.022 mg/L	2 per discharge
	Settleable solids	0.3 mL/L	2 per discharge
	pH (range)	6.0 - 9.0	2 per discharge
	Oil and grease	15.0 mg/L	2 per discharge
	Sulfate	Monitor	2 per discharge
	Nitrate	Monitor	2 per discharge
	Nitrite	Monitor	2 per discharge
	Chromium (hexavalent), total rec.	Monitor	2 per discharge
	Cadmium, total recoverable	0.007 mg/L	2 per discharge
	Copper, total recoverable	0.03 mg/L	2 per discharge
	Lead, total recoverable	0.15 mg/L	2 per discharge
	Nickel, total	2.7 mg/L	2 per discharge
	Dichlorodifluoromethane	0.01 mg/L	2 per discharge
	Trichlorofluoromethane	0.01 mg/L	2 per discharge
	3,3-dichlorobenzidine	0.01 mg/L	2 per discharge
	Tributyl phosphate	32 mg/L	2 per discharge
	Vanadium	0.19 mg/L	2 per discharge
	Chromium, total	0.050 mg/L	annual
	Selenium, total	0.040 mg/L	annual
	Barium	0.5 mg/L	annual
	Antimony	1.0 mg/L	annual
	Chloroform	0.3 mg/L	annual
	Bis (2-ethylhexyl) phthalate	1.6 mg/L	semi-annual
	4-dodecene	0.6 mgL	semi-annual
007 (Sanitary and Utility Wastewater)	Flow	Monitor	3 per month
	Ammonia	*	3 per month
	BOD-5	**	3 per month
	Iron, total	**	3 per month
	Suspended solids	45.0 mg/L	2 per month
	Settleable solids	0.3 mL/L	weekly
	pH (range)	6.0 - 9.0	weekly
	Chloroform	0.020 mg/L	annual
008 (French Drain Wastewater)	Flow	Monitor	3 per month
	BOD-5	**	3 per month
	Iron, total	**	3 per month
	pH (range)	6.0 - 9.0	weekly
	Silver, total	0.008 mg/L	annual
	Zinc, total	0.100 mg/L	annual

* *Reported as flow-weighted average of outfalls 001 and 007. Limit is 2.1 mg/L.*

** *Reported as flow-weighted average of outfalls 001, 007, and 008. Limits are 5.0 mg/L for BOD-5 and 0.31 mg/L for FE. Iron data are net limits reported after background concentrations are subtracted.*

Table C - 5.2

West Valley Demonstration Project
1992 SPDES Noncompliance Episodes

Date	Outfall	Parameters	Limit	Value	Comments
June 17, 1992	*007*	Settleable Solids	0.3 ml/L	20 ml/L	*Draining of clarifier sump to outfall*
December 9, 1992	*Sum of the outfalls 001, 007, and 008*	Fe	0.31 mg/L	0.37 mg/L	*High iron values at outfall 001*

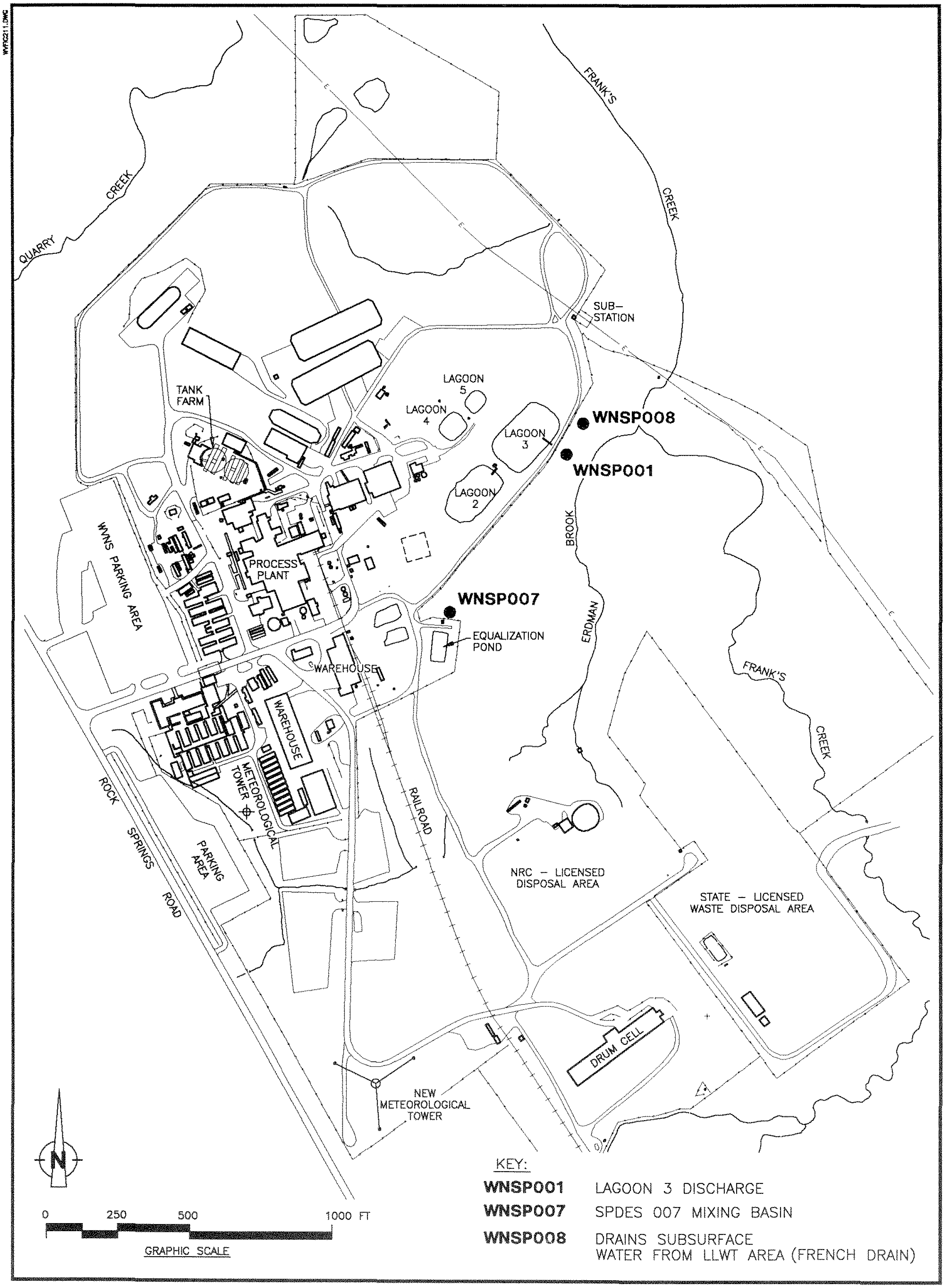


Figure C-5.1. SPDES Monitoring Points.

Figure C - 5.2

BIOCHEMICAL OXYGEN DEMAND-5 (mg/L)

Outfall 001

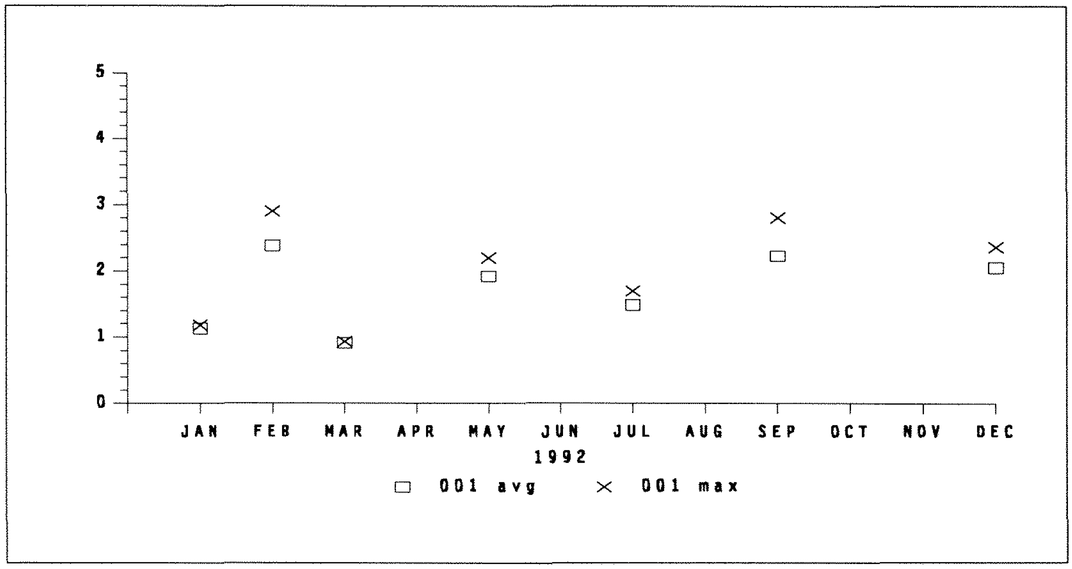


Figure C - 5.3

BIOCHEMICAL OXYGEN DEMAND-5 (mg/L)

Outfalls 007 and 008

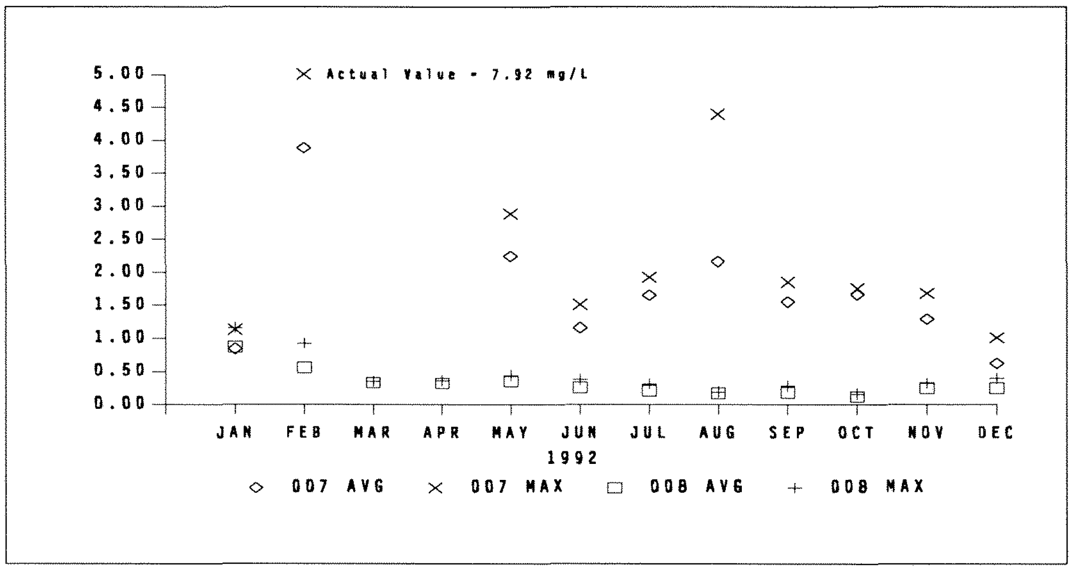
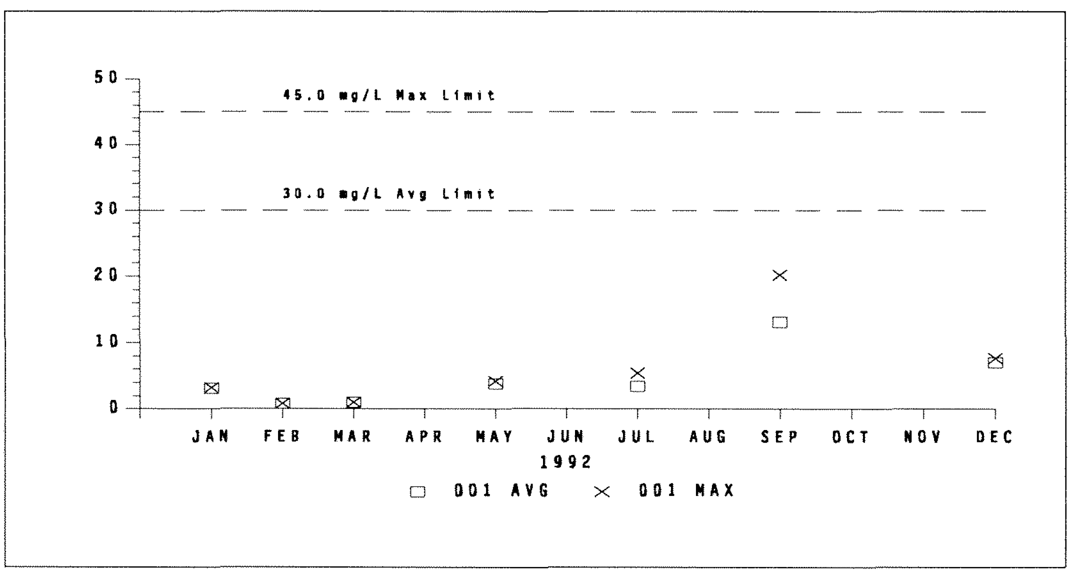


Figure C - 5.4

SUSPENDED SOLIDS (mg/L)

Outfall 001



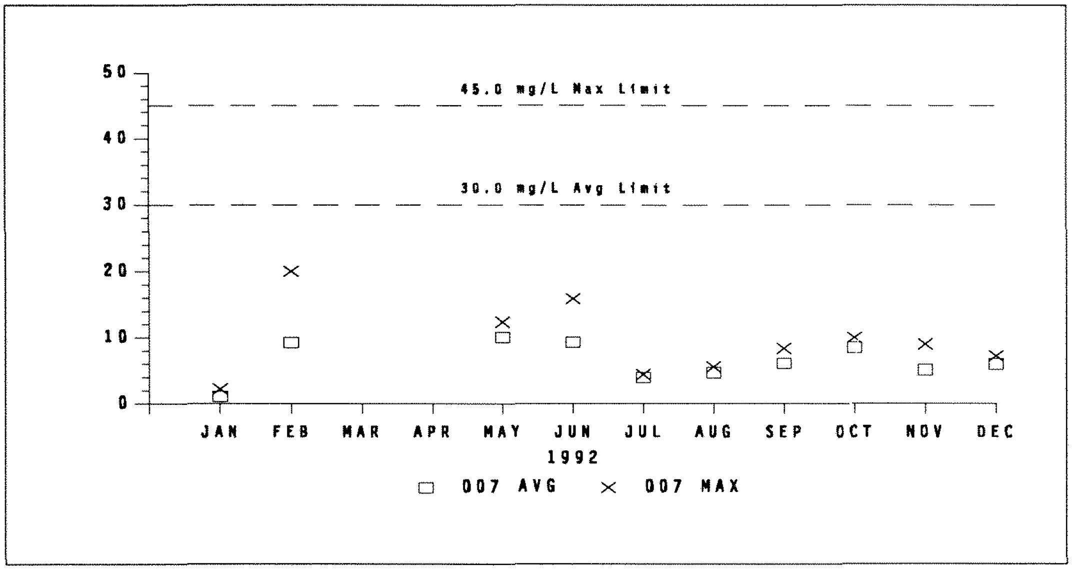


Figure C - 5.5

SUSPENDED SOLIDS (mg/L)

Outfall 007

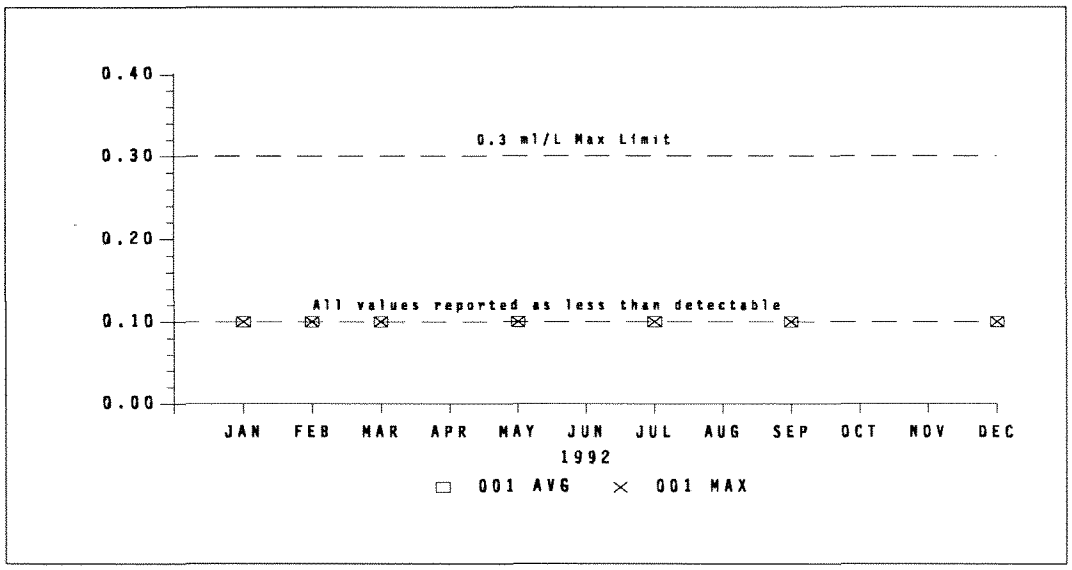


Figure C - 5.6

SETTLEABLE SOLIDS (ml/L)

Outfall 001

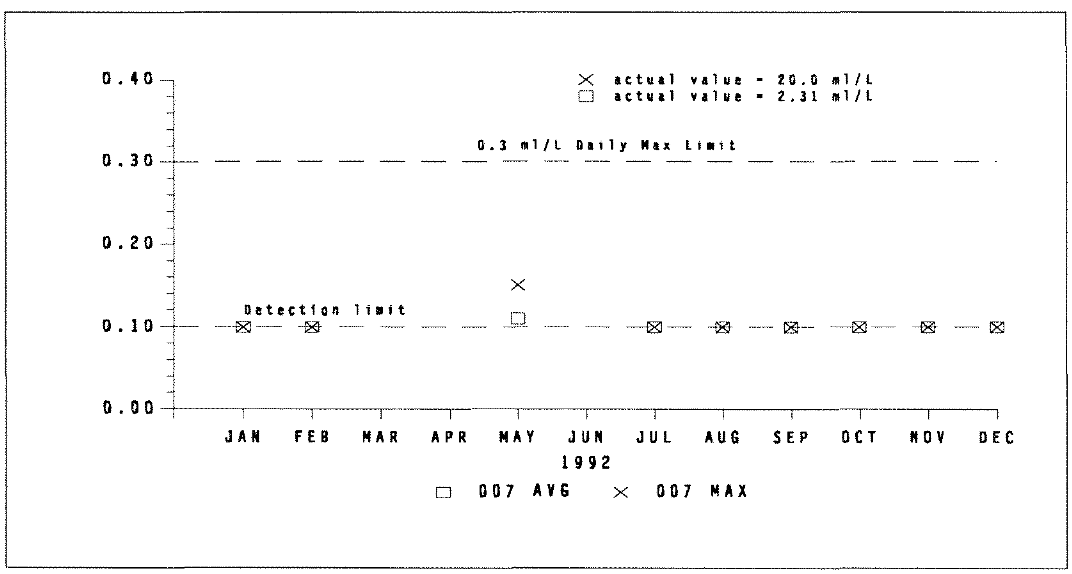


Figure C - 5.7

SETTLEABLE SOLIDS (ml/L)

Outfall 007

Figure C - 5.8

AMMONIA
(mg/L)

Outfall 001

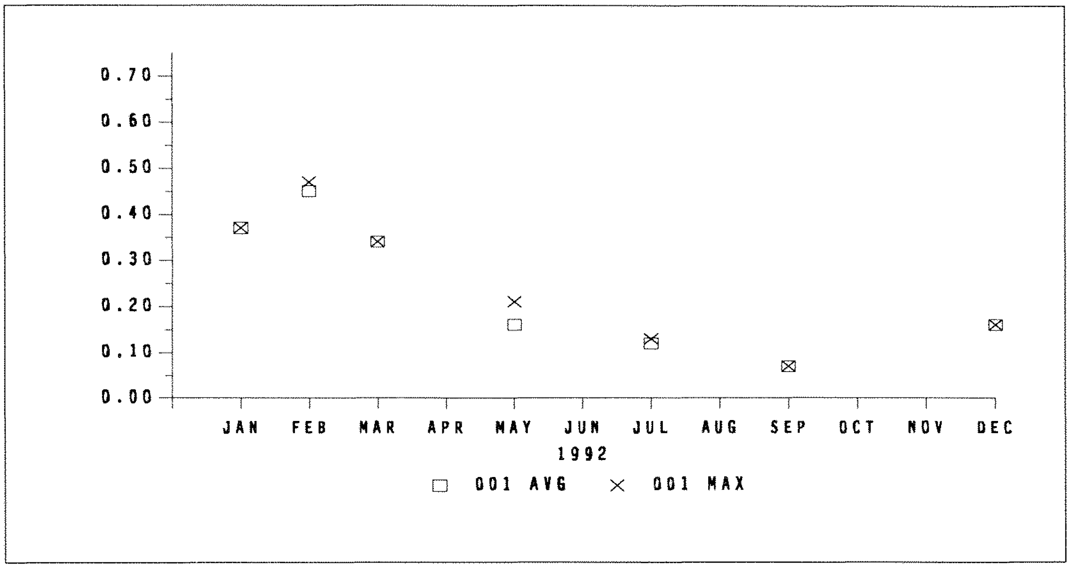


Figure C - 5.9

AMMONIA
(mg/L)

Outfall 007

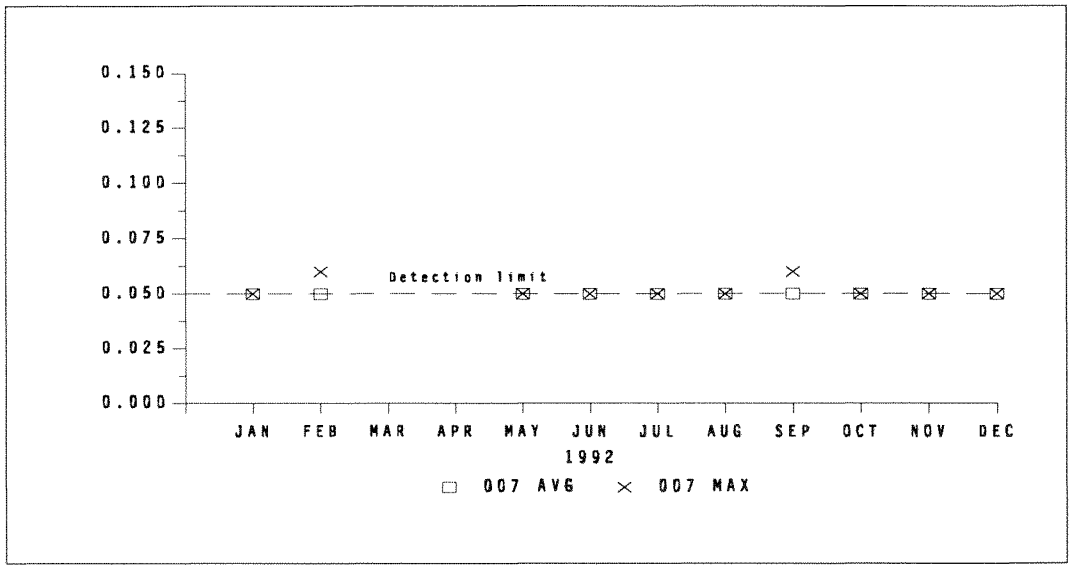
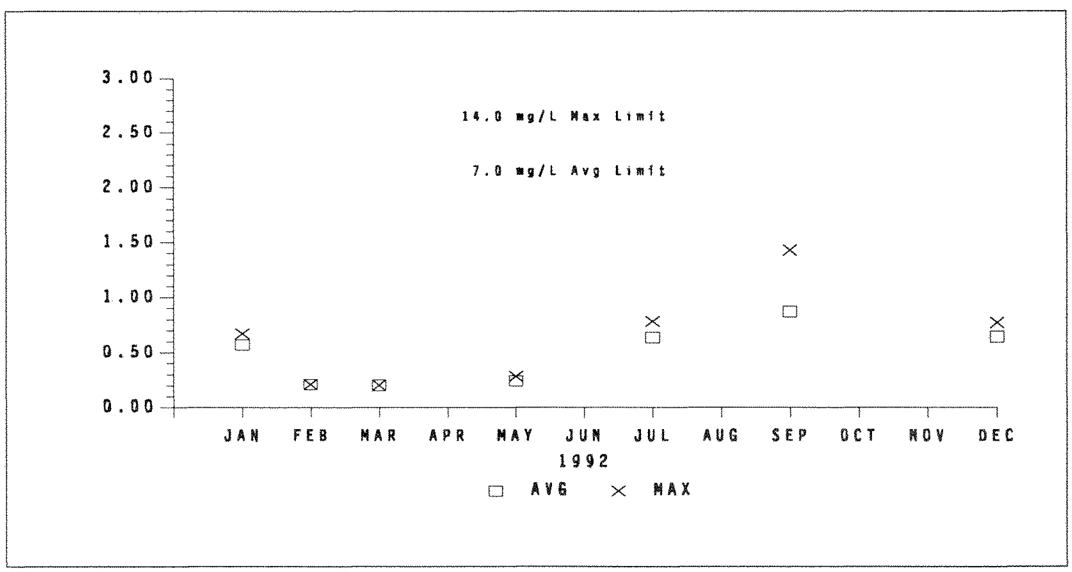


Figure C - 5.10

METALS (ALUMINUM)
(mg/L)

Outfall 001



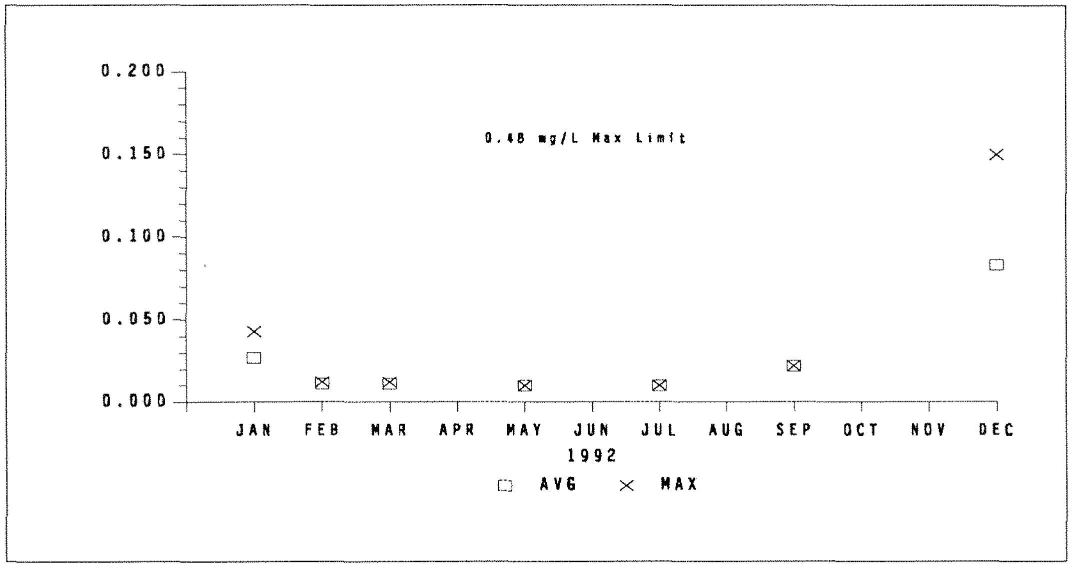


Figure C - 5.11

METALS (ZINC)
(mg/L)

Outfall 001

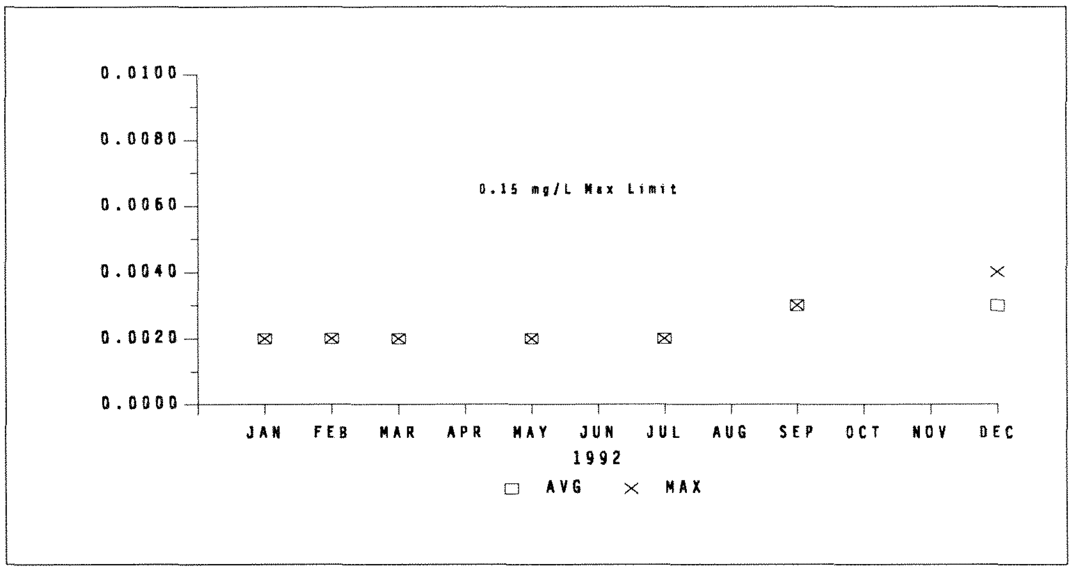


Figure C - 5.12

METALS (ARSENIC)
(mg/L)

Outfall 001

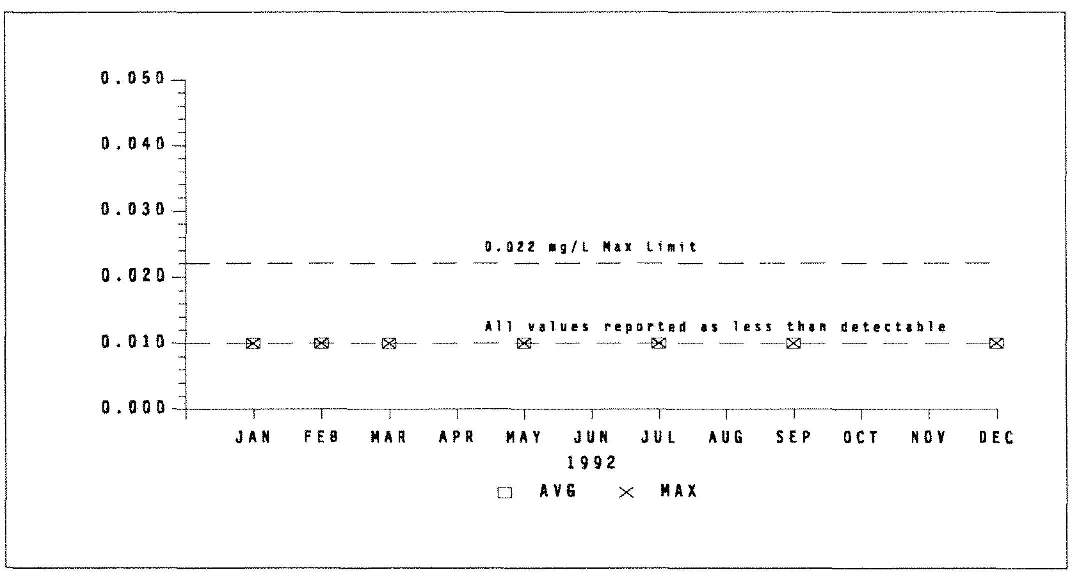


Figure C - 5.13

CYANIDE
(mg/L)

Outfall 001

Figure C - 5.14

METALS (IRON) (mg/L)

Outfall 001

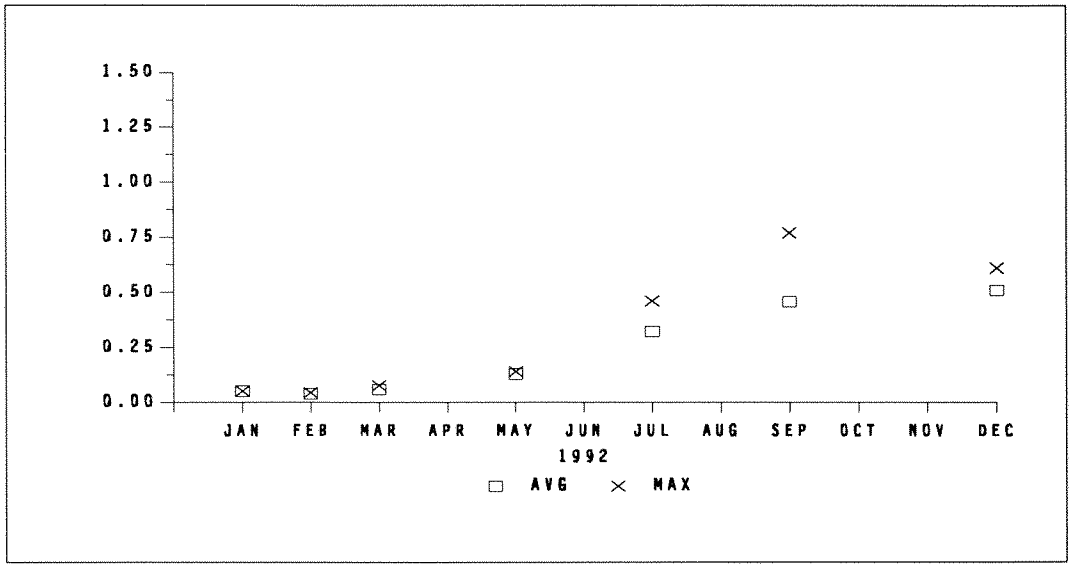


Figure C - 5.15

METALS (IRON) (mg/L)

Outfalls 007 and 008

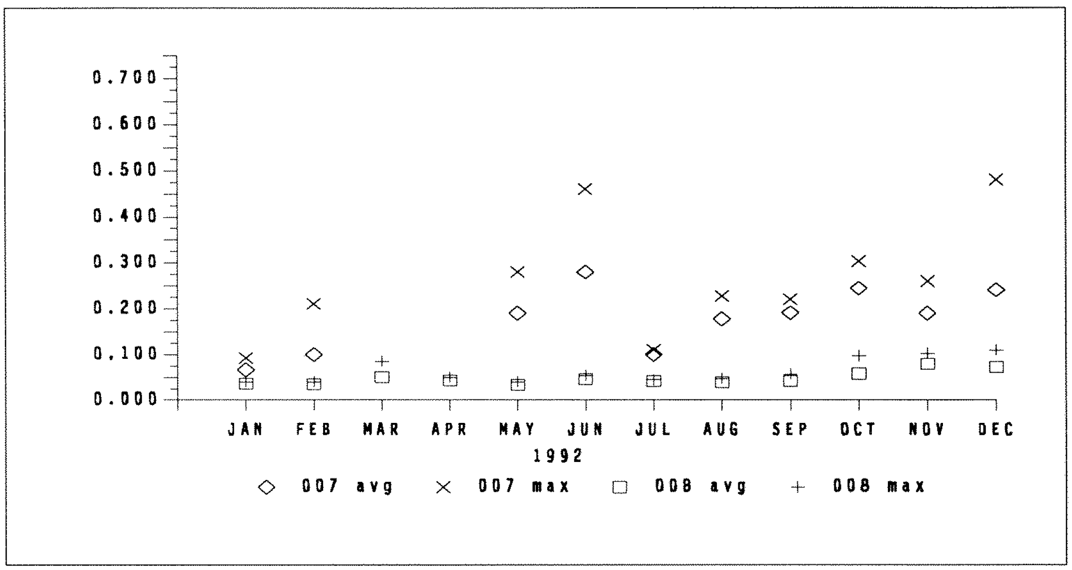
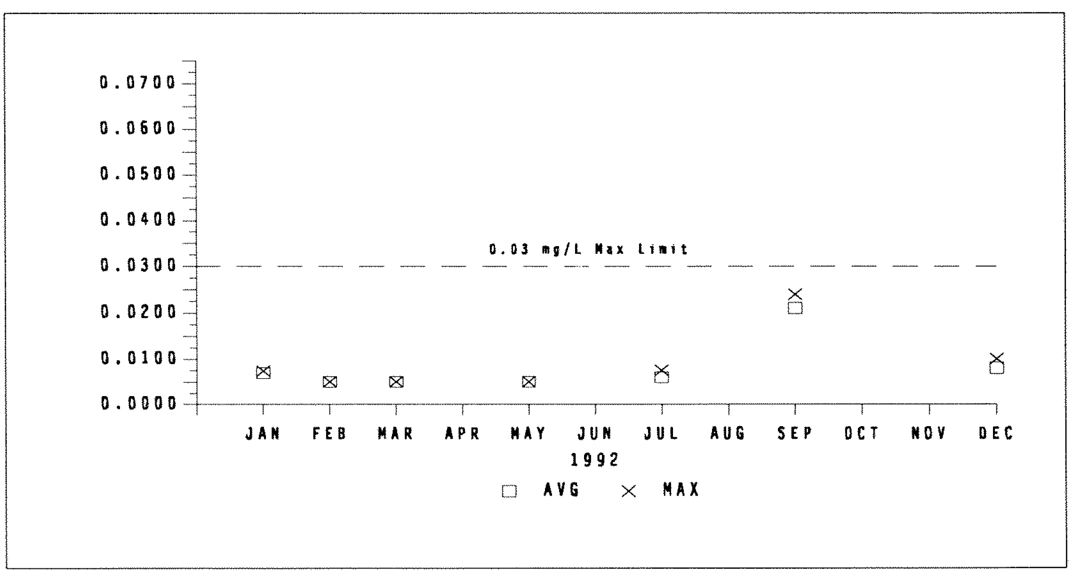


Figure C - 5.16

METALS (COPPER) (mg/L)

Outfall 001



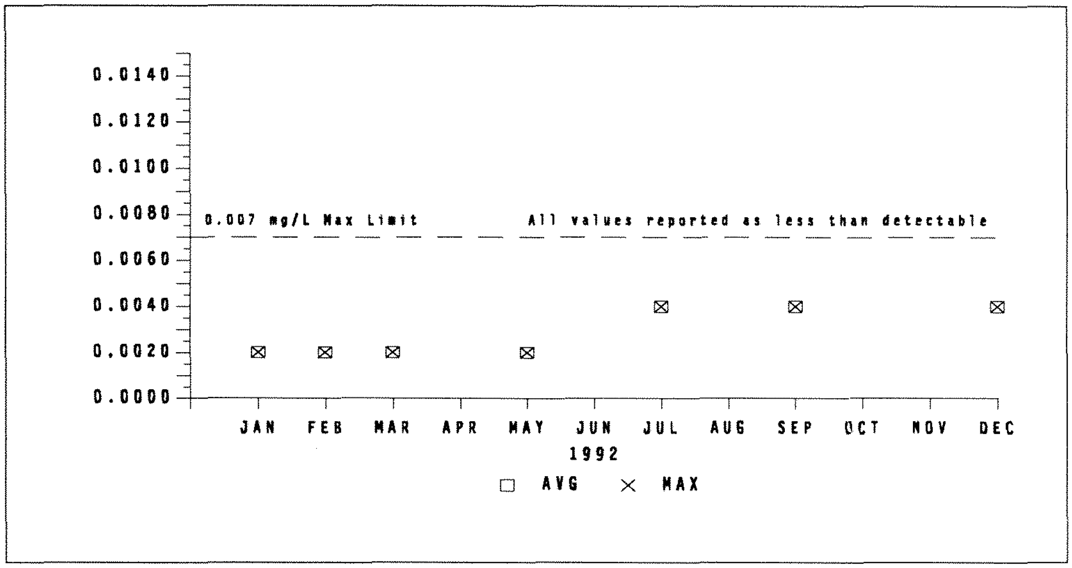


Figure C - 5.17

METALS (CADMIUM) (mg/L)

Outfall 001

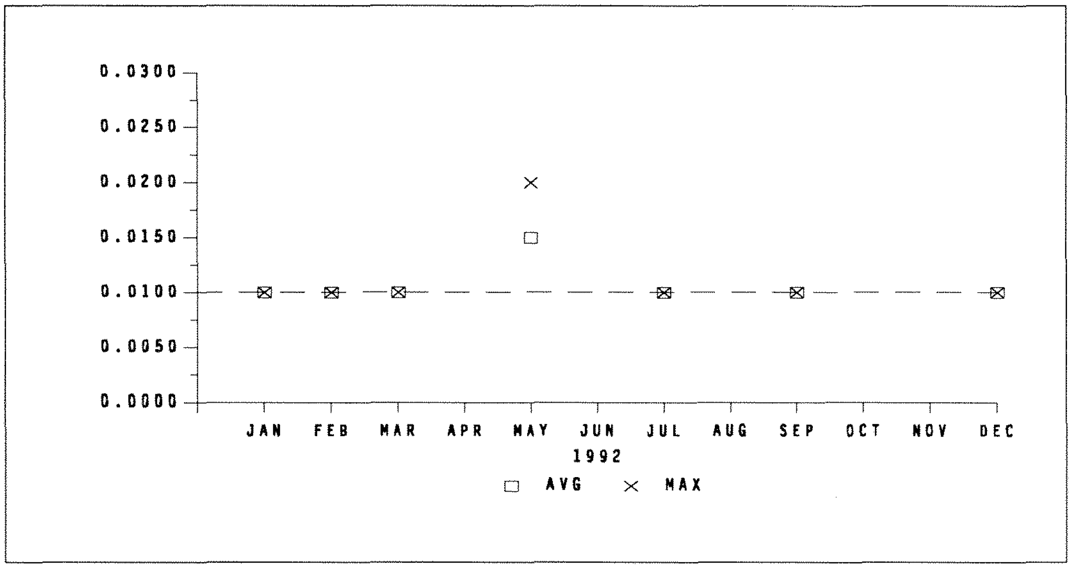


Figure C - 5.18

METALS (CHROMIUM, VI) (mg/L)

Outfall 001

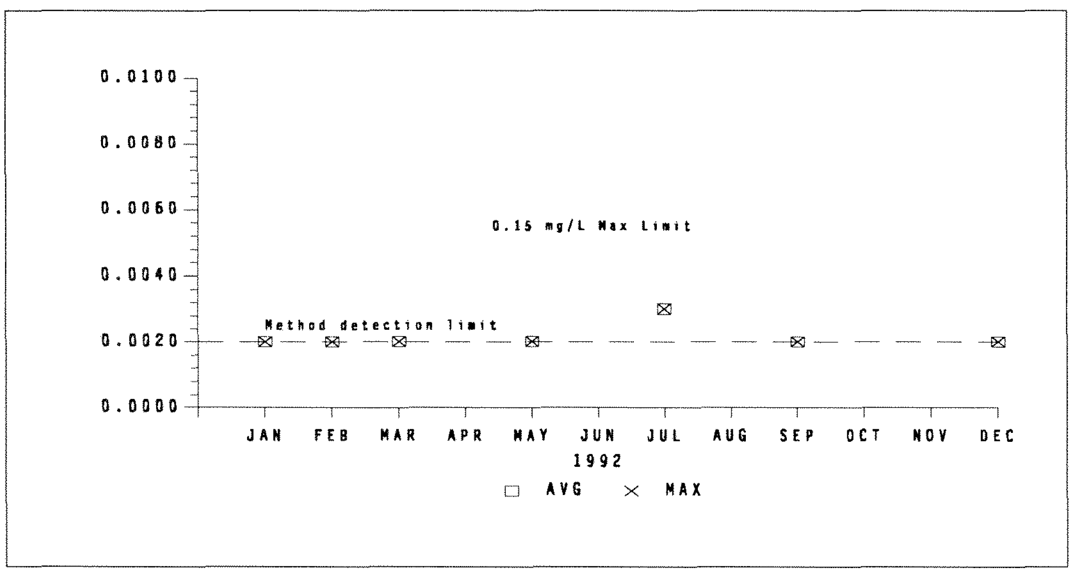


Figure C - 5.19

METALS (LEAD) (mg/L)

Outfall 001

Figure C - 5.20

NITRATE (NO_3-N) (mg/L)

Outfall 001

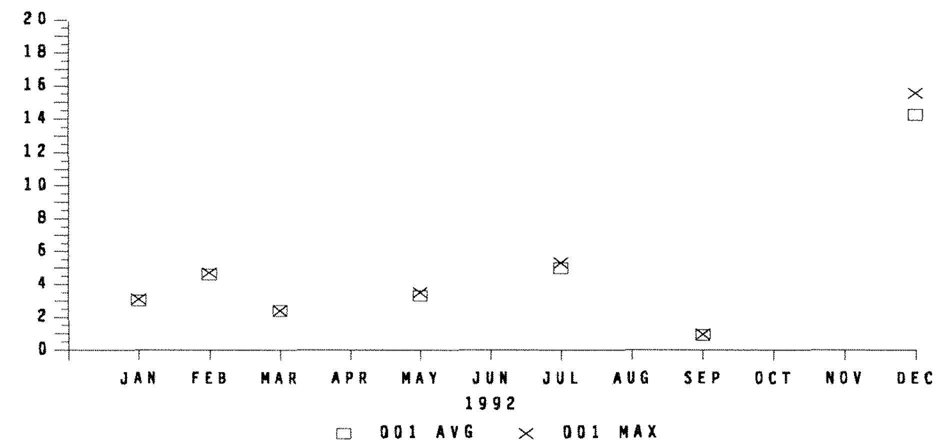


Figure C - 5.21

NITRITE (NO_2-N) (mg/L)

Outfall 001

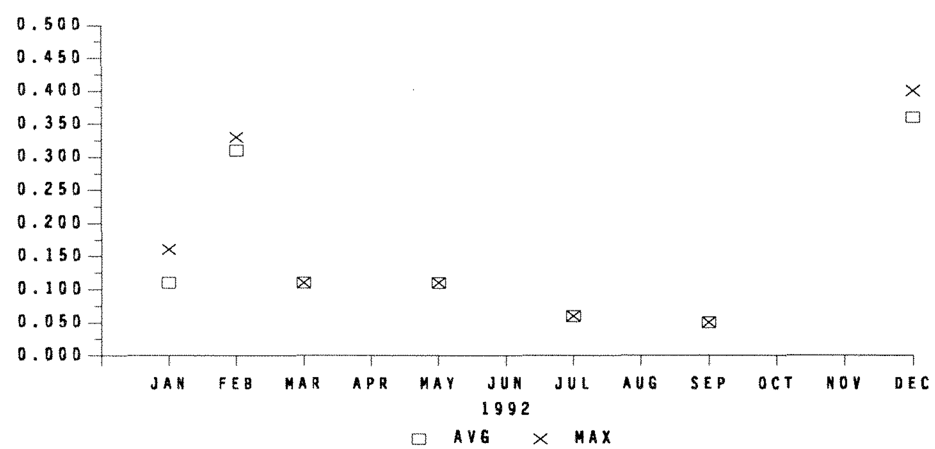
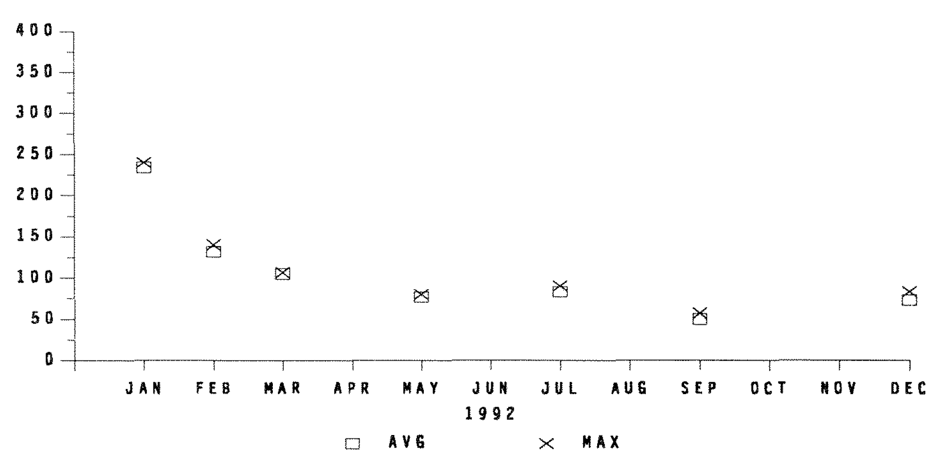


Figure C - 5.22

SULFATE-S (mg/L)

Outfall 001



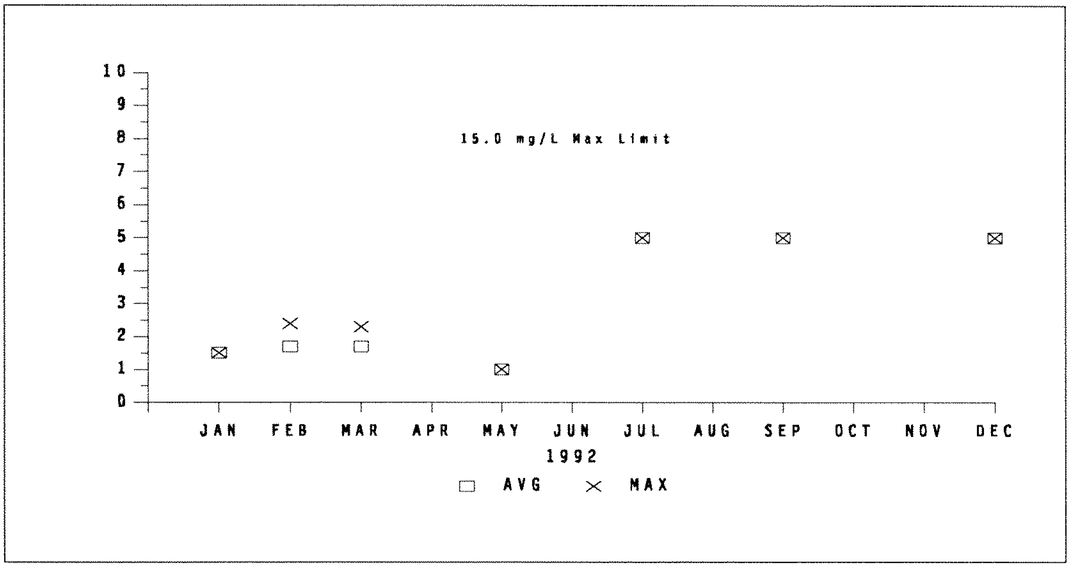


Figure C - 5.23

OIL AND GREASE
(mg/L)

Outfall 001

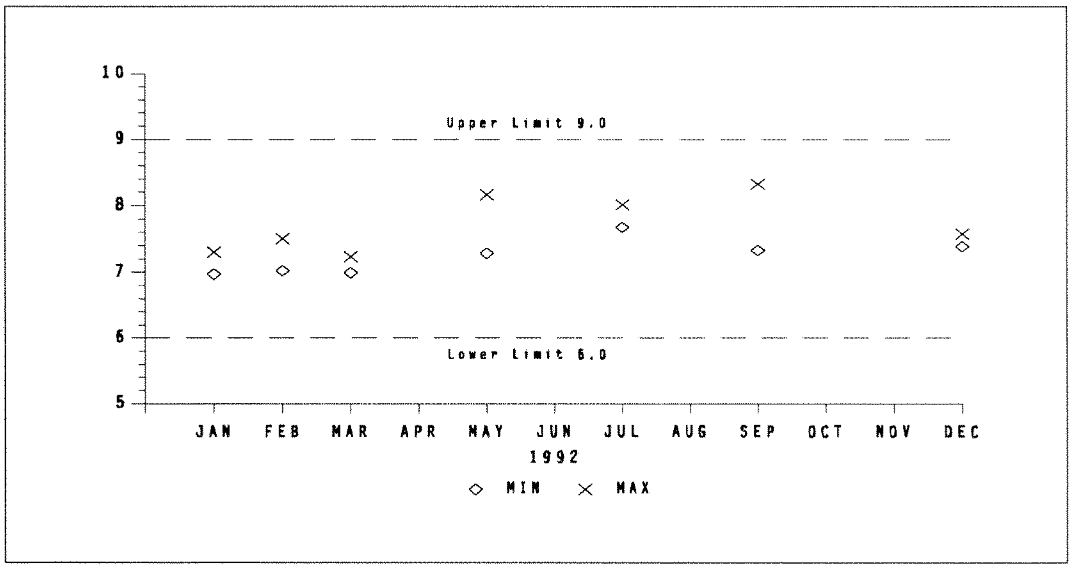


Figure C - 5.24

pH
(standard units)

Outfall 001

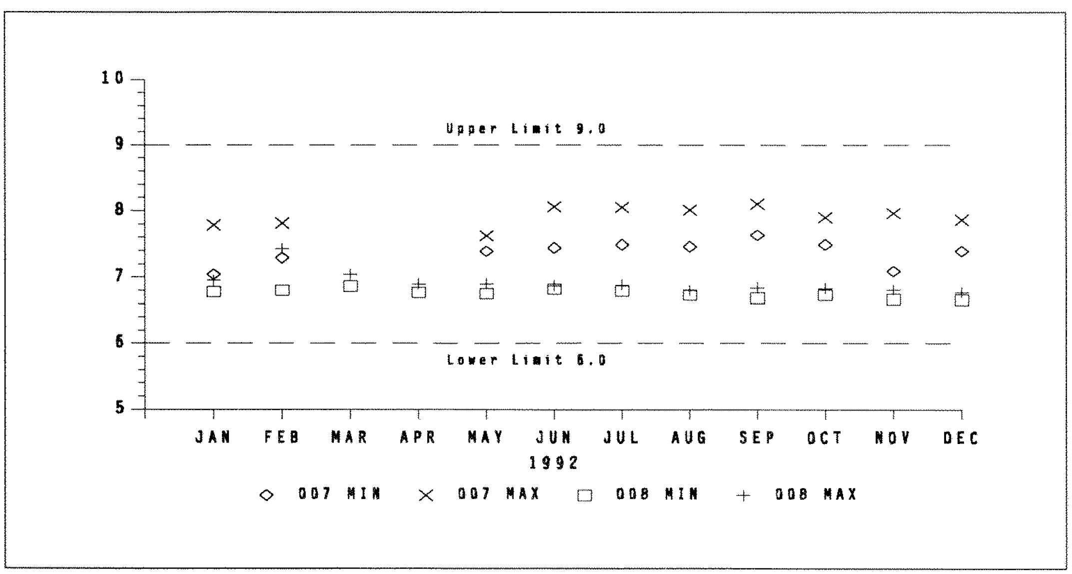


Figure C - 5.25

pH
(standard units)

Outfalls 007 and 008

Figure C - 5.26

DISCHARGE RATE (MGD)

Outfall 001

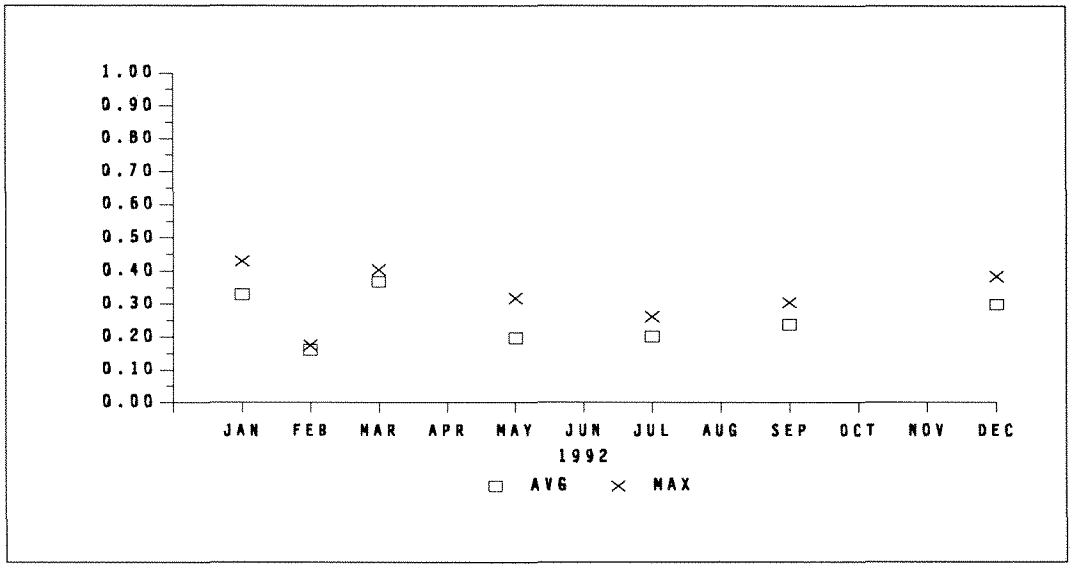


Figure C - 5.27

DISCHARGE RATE (GPD X 1000)

Outfall 007

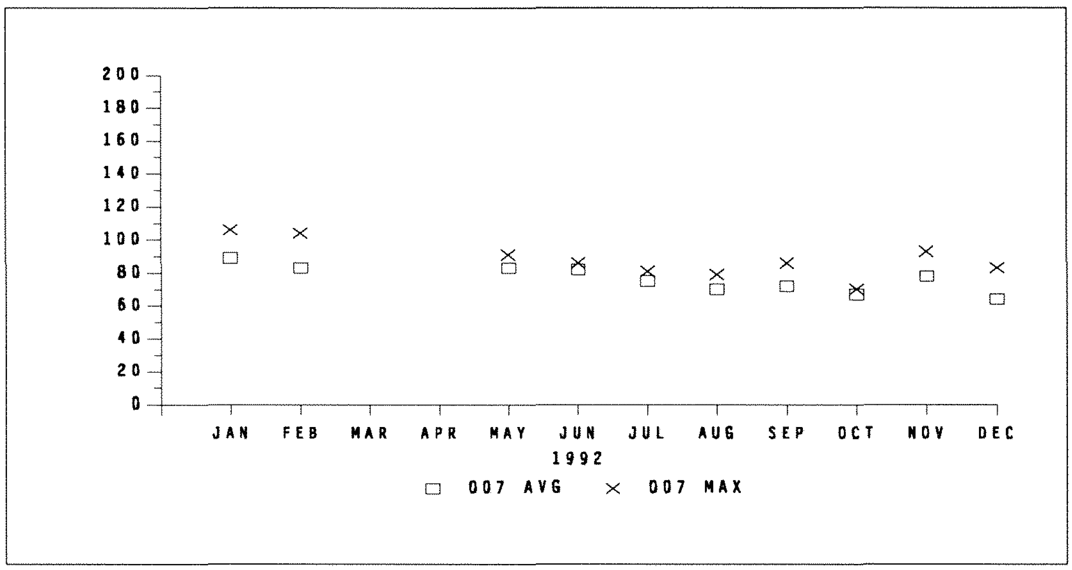
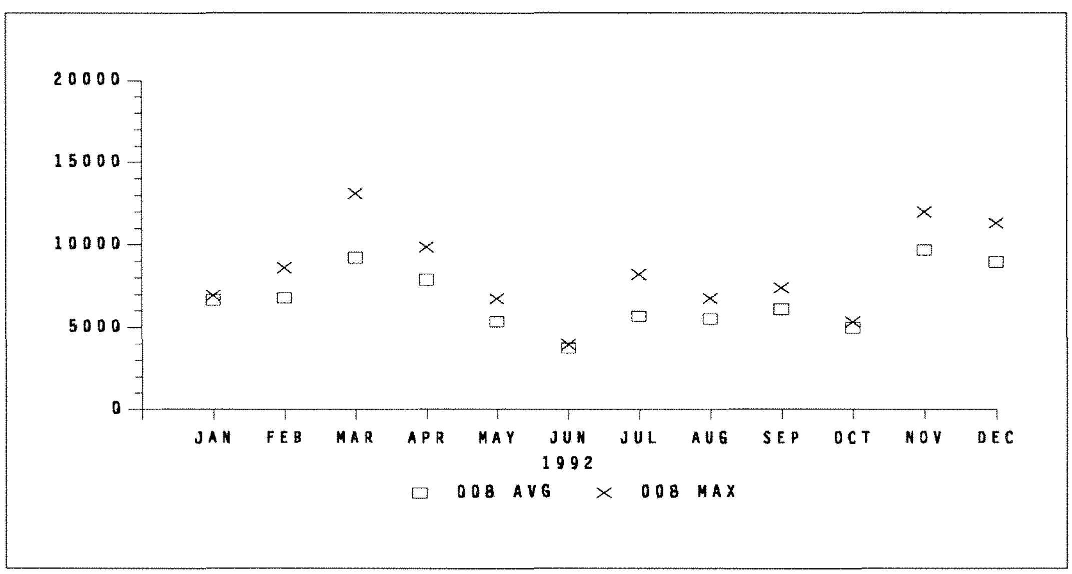


Figure C - 5.28

DISCHARGE RATE (GPD)

Outfall 008



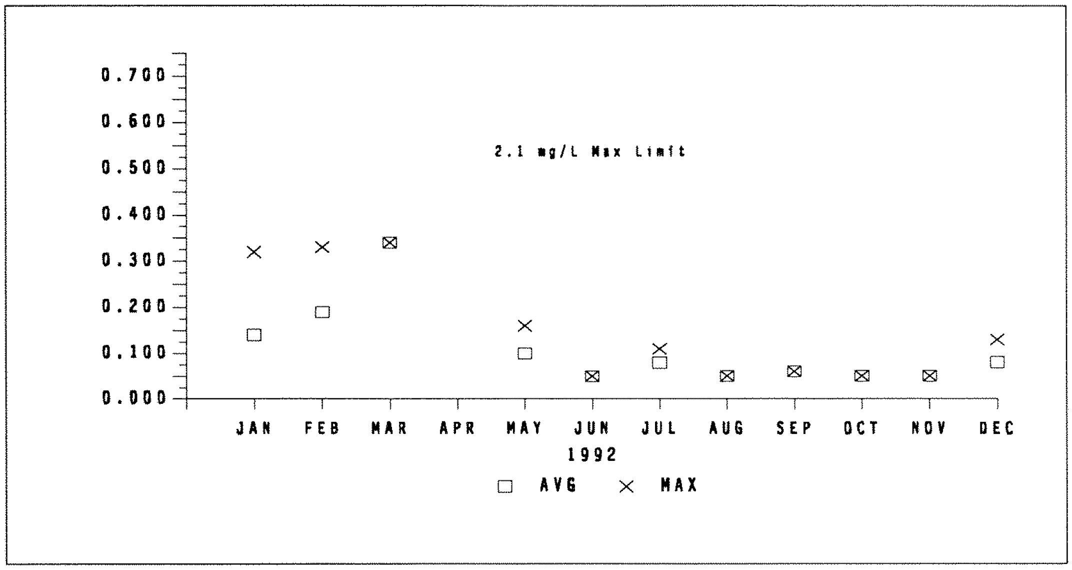


Figure C - 5.29

FLOW-WEIGHTED AVERAGES (mg/L)

Ammonia

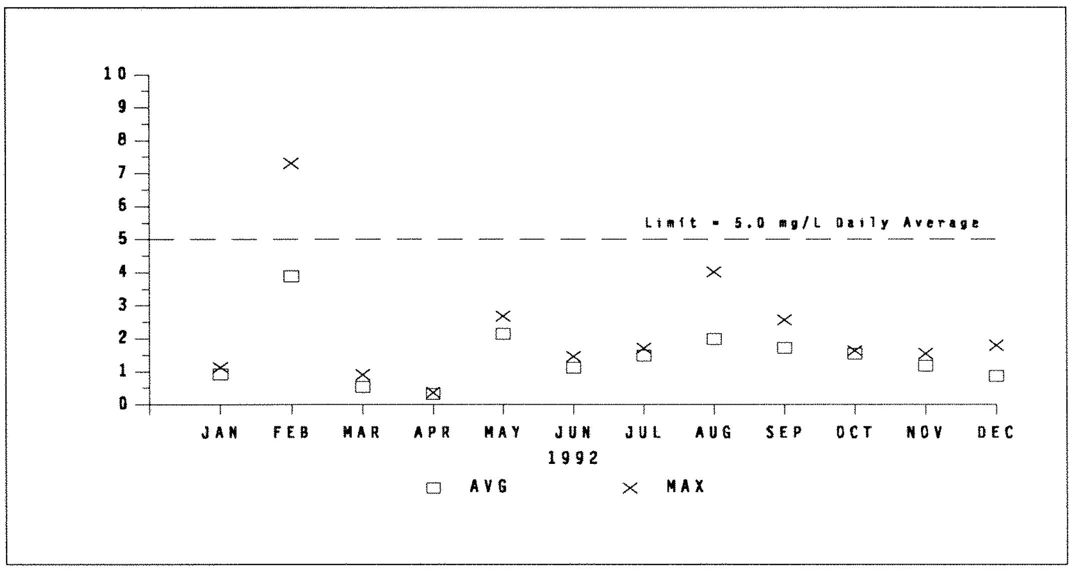


Figure C - 5.30

FLOW-WEIGHTED AVERAGES (mg/L)

Biochemical Oxygen Demand-5

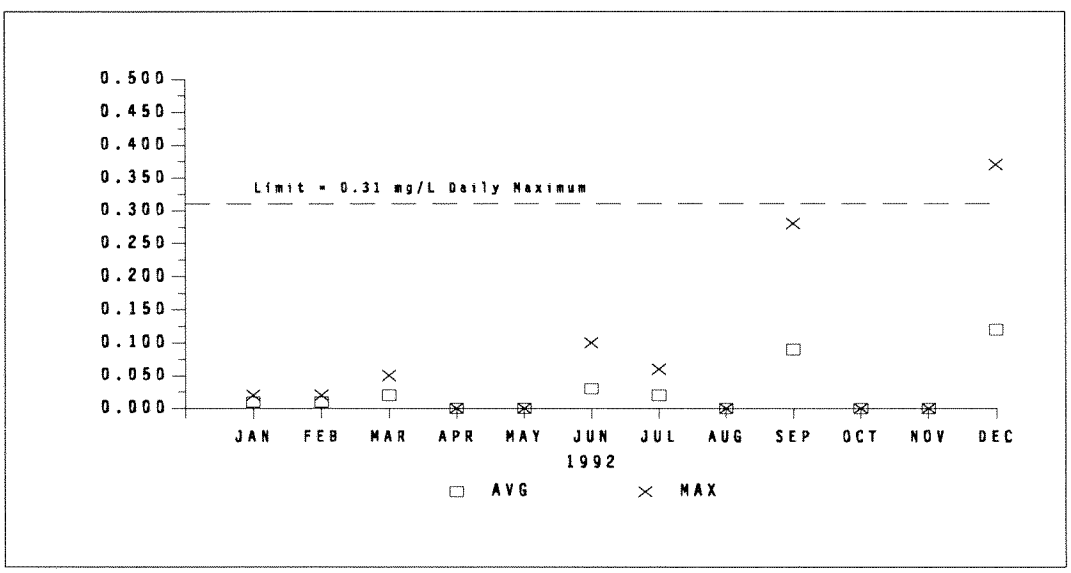


Figure C - 5.31

FLOW-WEIGHTED AVERAGES (mg/L)

Iron

Figure C - 5.32

NICKEL
(mg/L)

Outfall 001

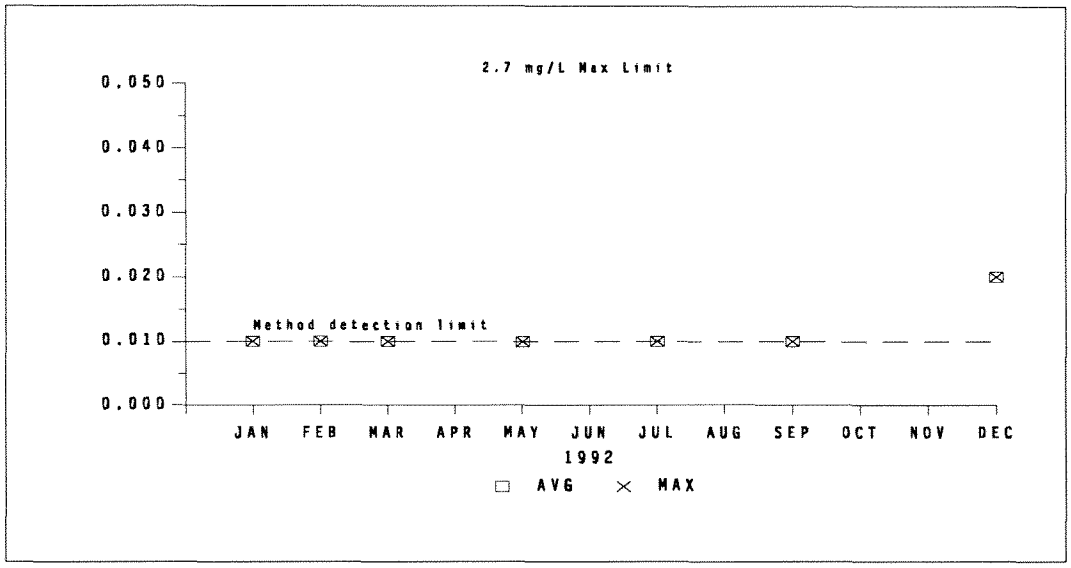


Figure C - 5.33

RICHLOROFLUOROMETHANE
(mg/L)

Outfall 001

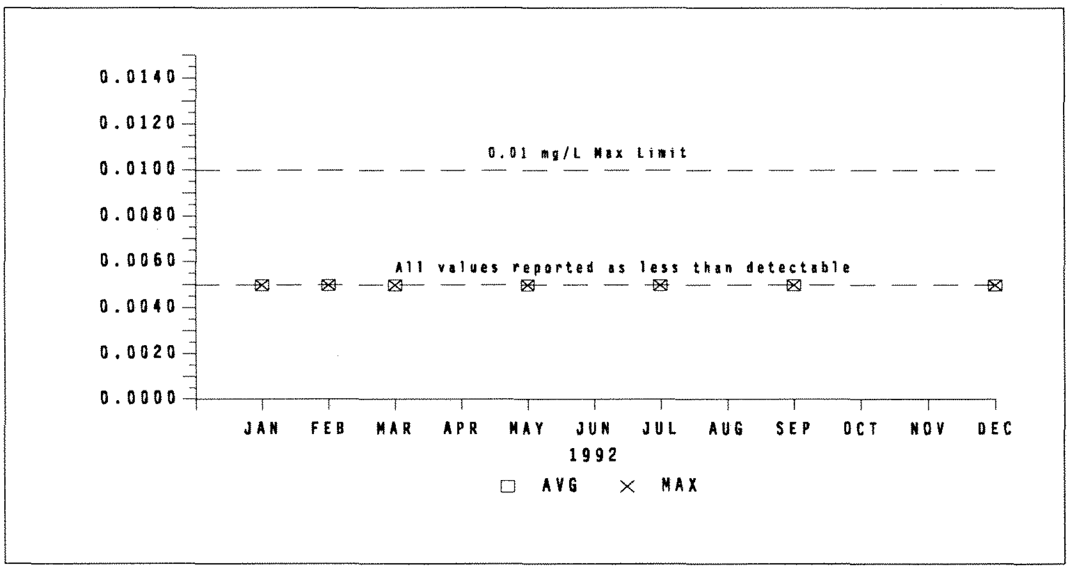
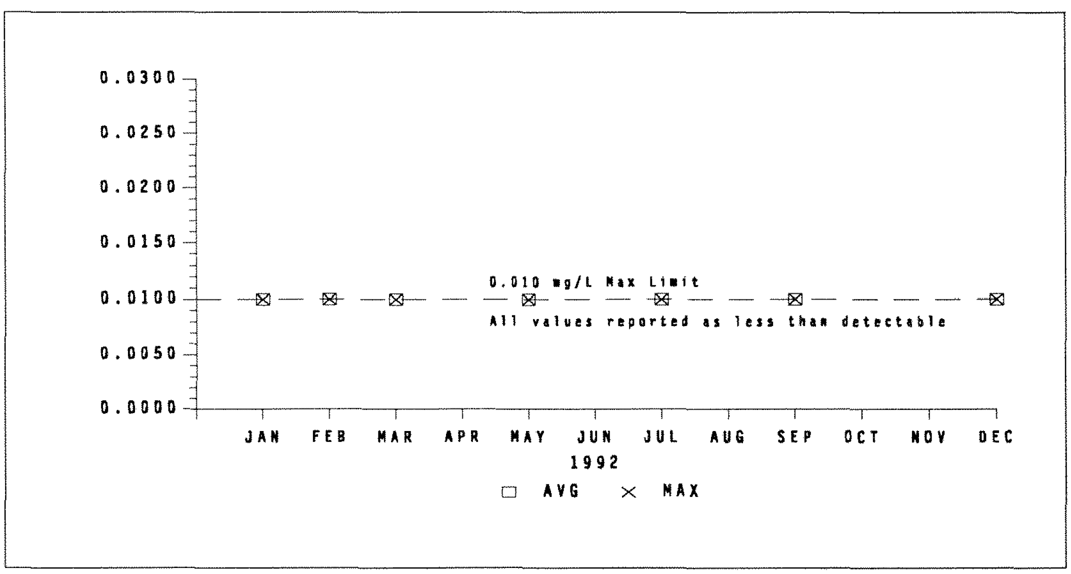


Figure C - 5.34

3,3-DICHLOROBENZIDINE
(mg/L)

Outfall 001



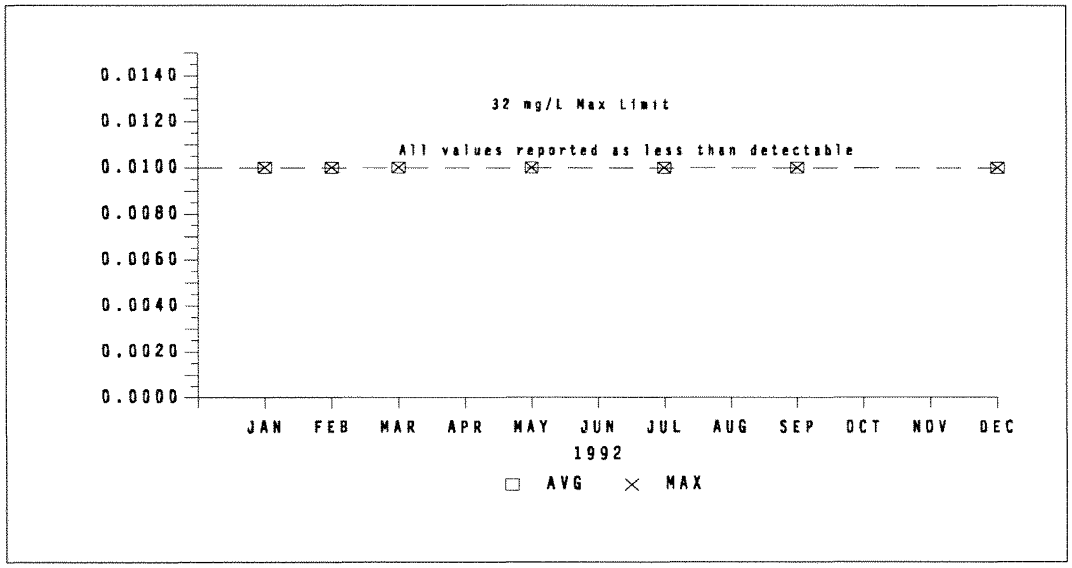


Figure C - 5.35

TRIBUTYL PHOSPHATE (mg/L)

Outfall 001

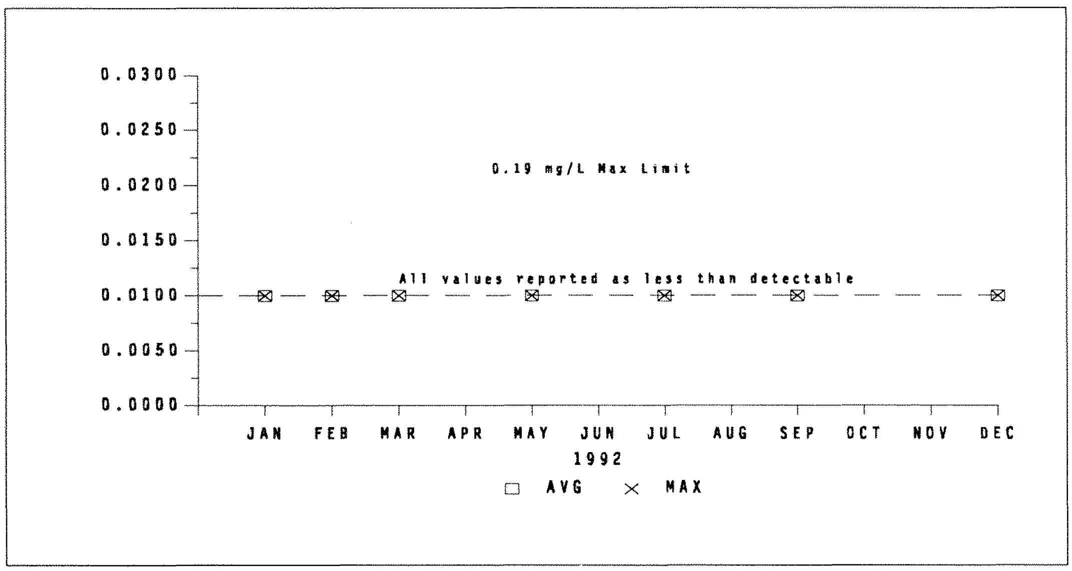


Figure C - 5.36

VANADIUM (mg/L)

Outfall 001

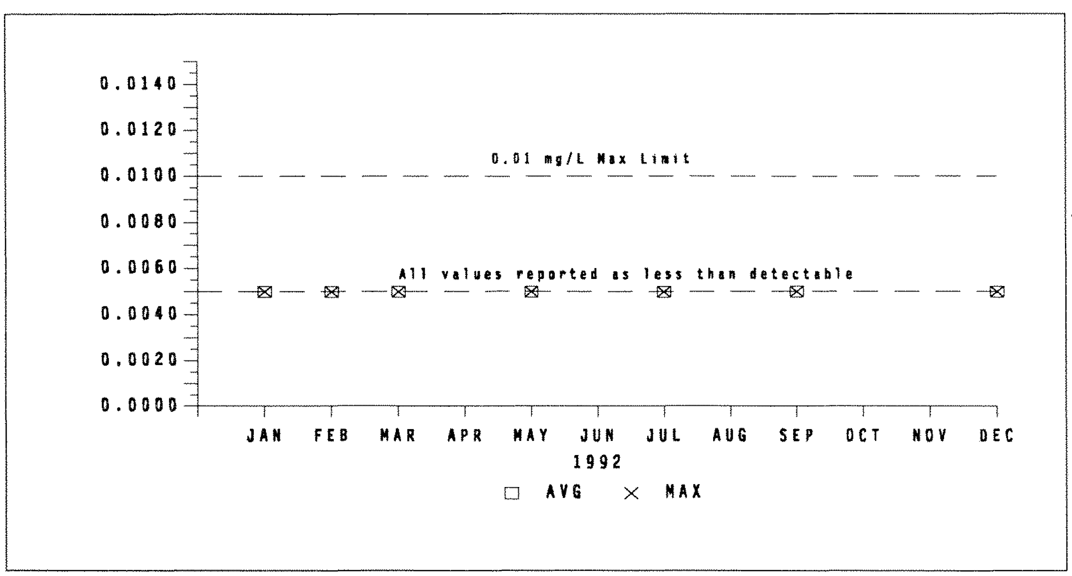


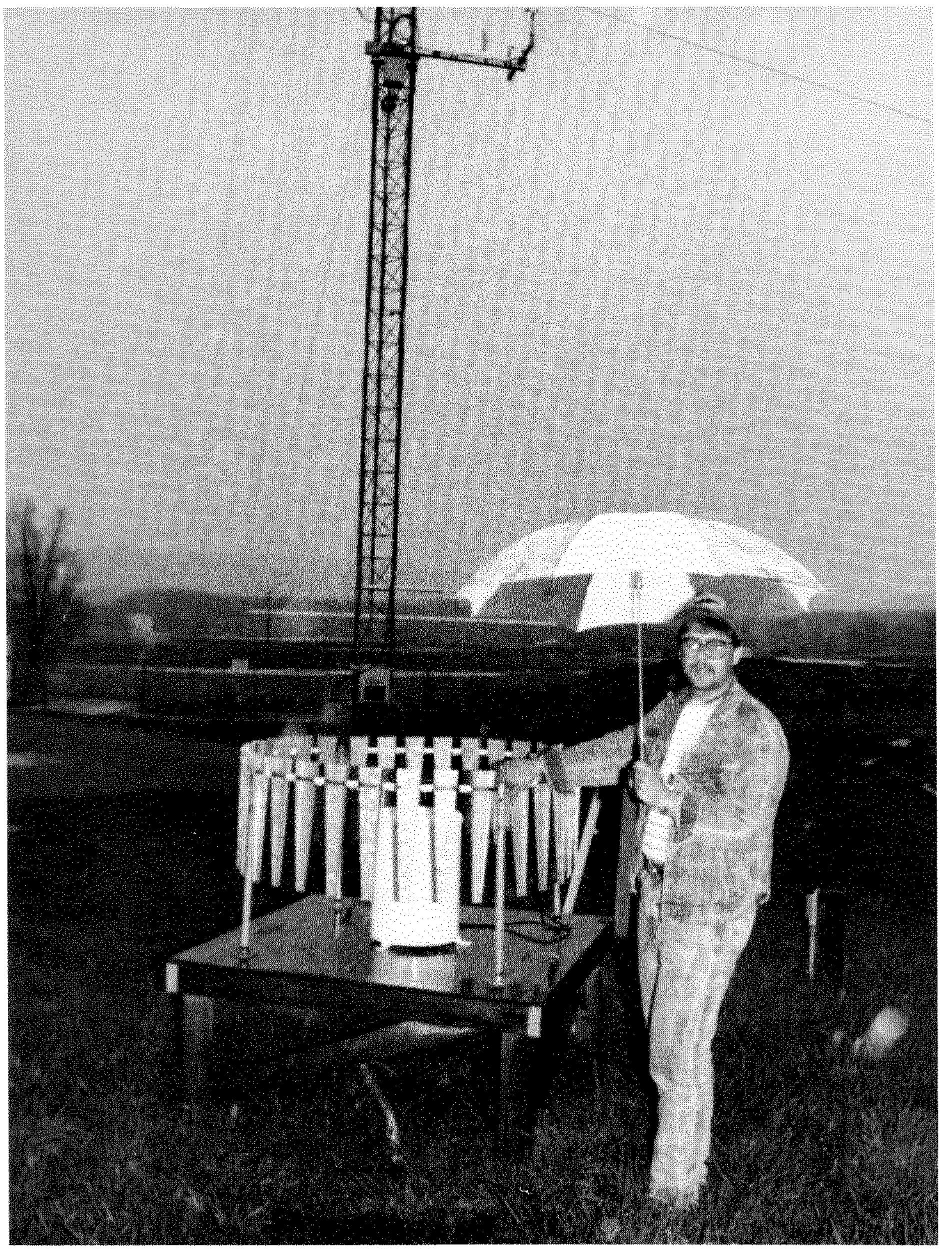
Figure C - 5.37

DICHLORODIFLUOROMETHANE (mg/L)

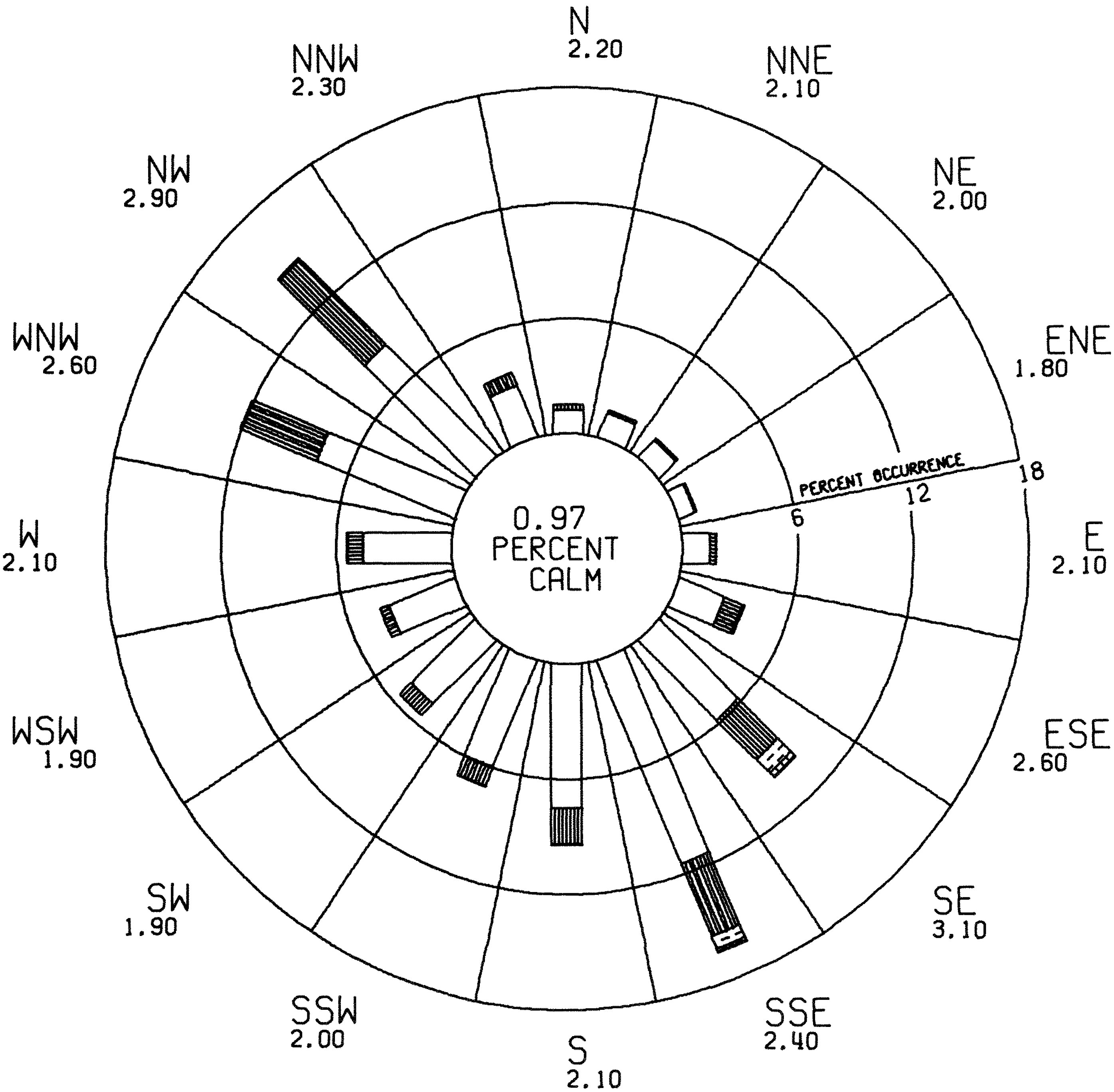
Outfall 001

Appendix C - 6

Summary of Meteorological Data



On-Site Meteorological Tower and Rain Gage



NUMBERS INDICATE SECTOR MEAN WIND SPEED

WIND SPEED RANGE

0.0- 3.0 M/SEC

3.0- 6.0

6.0- 9.0

9.0-12.0

> 12.0

WEST VALLEY NUCLEAR SERVICES

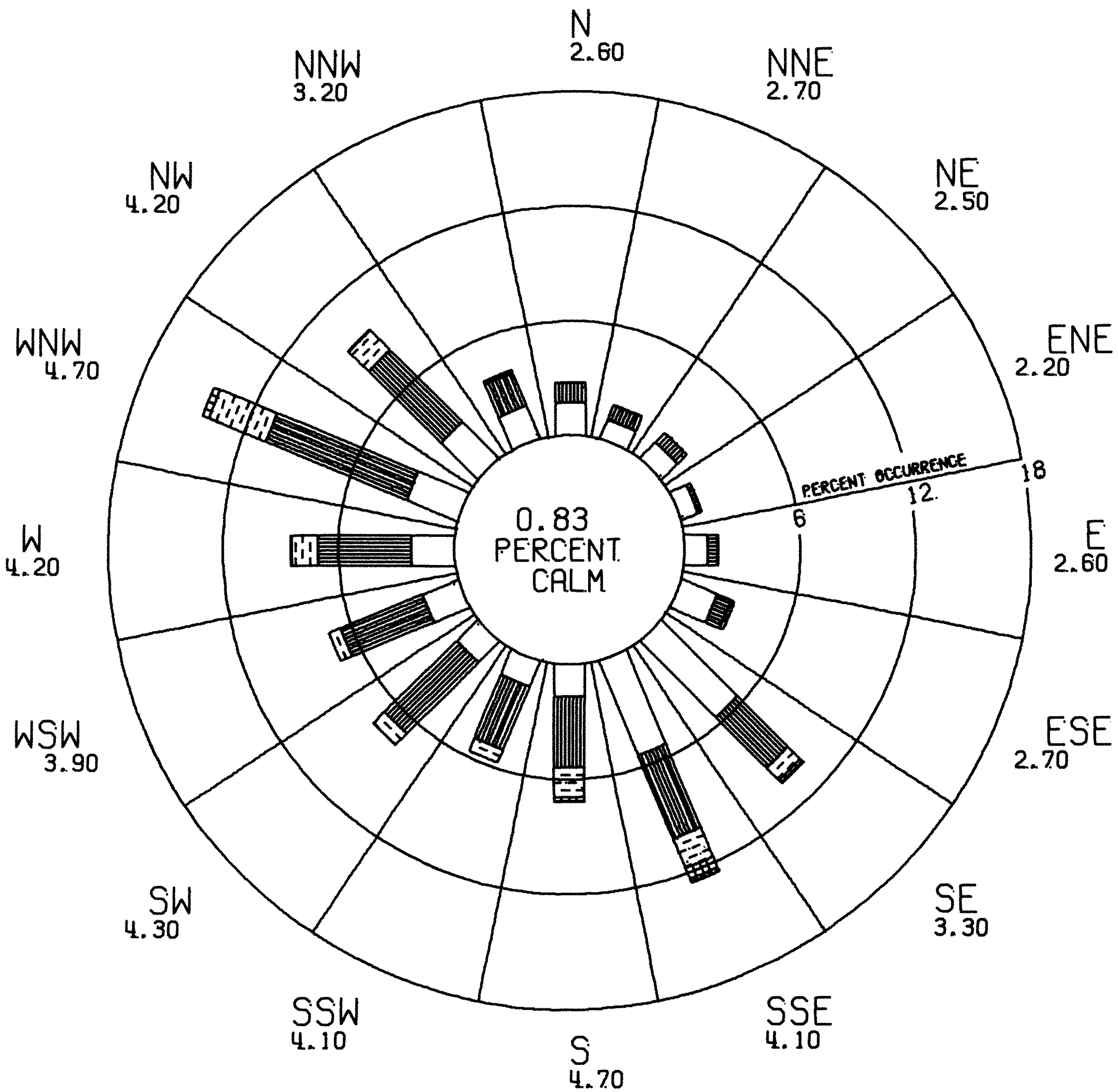
PRIMARY MONITORING STATION

WEST VALLEY, NEW YORK

10.0-METER WIND FREQUENCY ROSE

JANUARY 1, 1992 - DECEMBER 31, 1992

Figure C - 6.1



NUMBERS INDICATE SECTOR MEAN WIND SPEED

WIND SPEED RANGE

☐	0.0- 3.0	M/SEC
▥	3.0- 6.0	
☷	6.0- 9.0	
▥	9.0-12.0	
▦	> 12.0	

WEST VALLEY NUCLEAR SERVICES
PRIMARY MONITORING STATION
WEST VALLEY, NEW YORK

60.0-METER WIND FREQUENCY ROSE
JANUARY 1, 1992 - DECEMBER 31, 1992

Figure C - 6.2

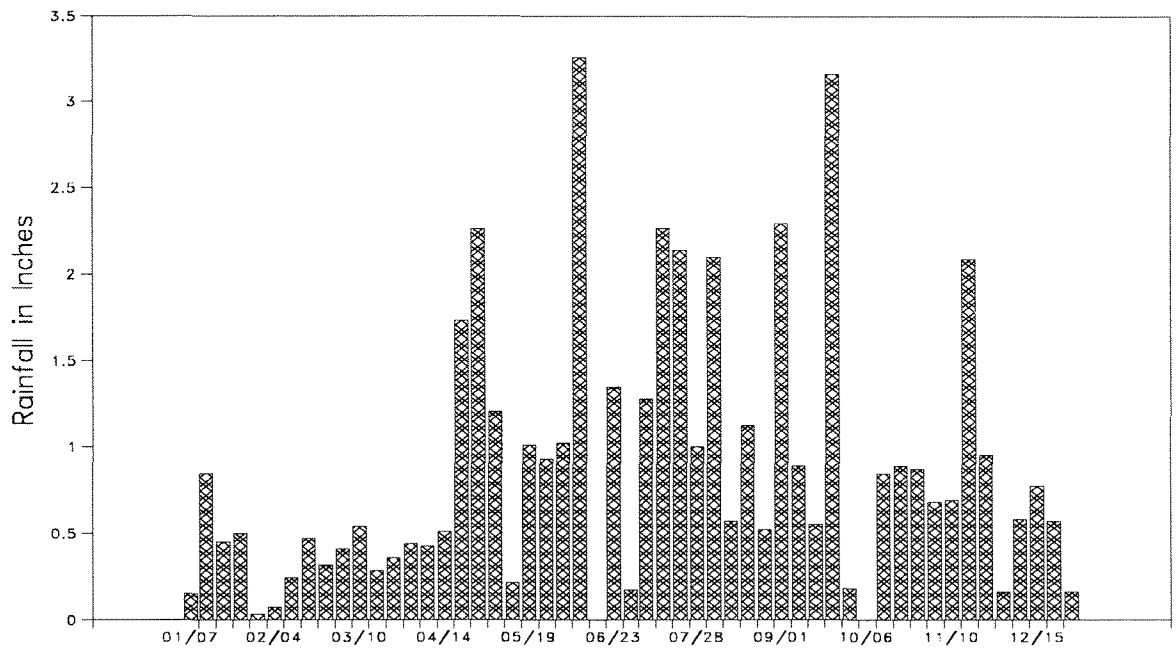


Figure C - 6.3. 1992 Weekly Rainfall

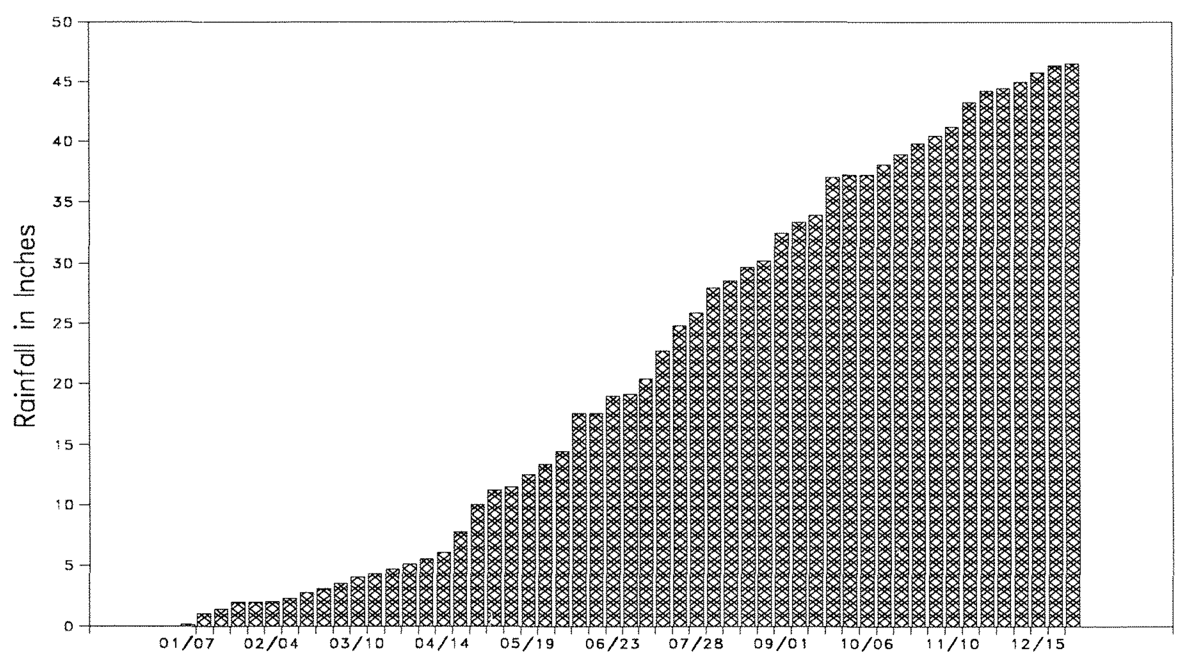


Figure C - 6.4. 1992 Cumulative Rainfall

Table C - 6.1

1992 Site Rainfall Collection Data

Week Ending:	Weekly (inches)	Cumulative (inches)	Week Ending:	Weekly (inches)	Cumulative (inches)
JAN 07	0.15	0.15	*JUL 07*	1.28	20.51
JAN 14	0.94	1.09	*JUL 14*	2.27	22.78
JAN 21	0.44	1.53	*JUL 21*	2.14	24.92
JAN 28	0.50	2.03	*JUL 28*	1.00	25.92
FEB 04	0.07	2.10	*AUG 04*	2.10	28.02
FEB 11	0.24	2.34	*AUG 11*	0.57	28.59
FEB 18	0.47	2.81	*AUG 18*	1.12	29.71
FEB 25	0.32	3.13	*AUG 25*	0.52	30.23
MAR 03	0.41	3.54	*SEP 01*	2.29	32.52
MAR 10	0.54	4.08	*SEP 08*	0.89	33.41
MAR 17	0.28	4.36	*SEP 15*	0.55	33.96
MAR 24	0.36	4.72	*SEP 22*	3.16	37.12
MAR 31	0.44	5.16	*SEP 29*	0.18	37.30
APR 07	0.42	5.58	*OCT 06*	0.00	37.30
APR 14	0.51	6.09	*OCT 13*	0.84	38.14
APR 21	1.73	7.82	*OCT 20*	0.89	39.03
APR 28	2.26	10.08	*OCT 27*	0.87	39.90
MAY 05	1.20	11.28	*NOV 03*	0.70	40.60
MAY 12	0.21	11.49	*NOV 10*	0.69	41.29
MAY 19	1.01	12.50	*NOV 17*	2.09	43.38
MAY 26	0.93	13.43	*NOV 24*	0.95	44.33
JUN 02	1.02	14.45	*DEC 01*	0.16	44.49
JUN 09	3.26	17.71	*DEC 08*	0.58	45.07
JUN 16	0.00	17.71	*DEC 15*	0.77	45.84
JUN 23	1.35	19.06	*DEC 22*	0.57	46.41
JUN 30	0.17	19.23	*DEC 29*	0.16	46.57
			DEC 30 and 31	1.76	48.33

Appendix D

Summary of Quality Assurance Crosscheck Analyses

Table D - 1

Comparison of Radiological Concentrations in Crosscheck Samples

between the West Valley Demonstration Project and the Environmental Measurements Laboratory (EML) Quality Assessment Program 36

Isotope	Matrix	Actual	Reported	Ratio	Accept ?	Analyzed by
Be-7	Air	2.86E+01	2.96E+01	1.03	Yes	TI
Mn-54	Air	5.97E+00	6.10E+00	1.02	Yes	TI
Co-57	Air	7.93E+00	6.99E+00	0.88	Yes	TI
Co-60	Air	5.81E+00	5.81E+00	1.00	Yes	TI
Sr-90	Air	2.07E-01	3.63E-01	1.75	No	TI
Cs-134	Air	4.44E+00	4.11E+00	0.93	Yes	TI
Cs-137	Air	5.76E+00	6.07E+00	1.05	Yes	TI
Ce-144	Air	6.39E+01	6.48E+01	1.01	Yes	TI
Pu-238	Air	2.70E-01	2.52E-01	0.93	Yes	TI
Pu-239	Air	2.85E-01	2.81E-01	0.99	Yes	TI
Am-241	Air	3.34E-01	5.55E-01	1.66	No	TI
U *(Bq/filter)*	Air	2.00E-01	8.81E-01	4.40	No	TI
K-40	Soil	7.19E+02	7.99E+02	1.11	Yes	TI
Sr-90	Soil	4.50E+00	8.88E+00	1.97	No	TI
Cs-137	Soil	5.23E+00	6.81E+00	1.30	Pass	TI
Pu-238	Soil	5.00E-02	7.03E-02	1.41	Pass	TI
Pu-239	Soil	2.55E+01	1.41E+01	0.55	Pass	TI
Am-241	Soil	7.00E-02	9.99E-02	1.43	Pass	TI
U*(Bq/kg)*	Soil	5.93E+01	5.18E+01	1.04	Yes	TI
K-40	Veg	2.94E+02	4.40E+02	1.50	Pass	TI
Sr-90	Veg	3.76E+02	3.70E+02	0.98	Yes	TI
Cs-137	Veg	2.46E+01	3.57E+01	1.45	Pass	TI
Am-241	Veg	2.10E-01	4.07E-01	1.94	No	TI
H-3	Water	2.27E+02	2.26E+02	0.99	Yes	EL
Mn-54	Water	5.66E+01	5.88E+01	1.04	Yes	TI
Fe-55	Water	1.33E+02	2.22E+02	1.67	No	TI
Co-60	Water	9.40E+01	9.69E+01	1.03	Yes	TI
Sr-90	Water	2.13E+00	5.18E+00	2.43	No	TI
Cs-134	Water	7.18E+01	7.36E+01	1.03	Yes	TI
Cs-137	Water	8.46E+01	9.10E+01	1.08	Yes	TI
Ce-144	Water	1.89E+02	1.88E+02	0.99	Yes	TI
Pu-238	Water	4.50E-01	4.44E-01	0.99	Yes	TI
Pu-239	Water	5.80E-01	5.18E-01	0.89	Yes	TI
Am-241	Water	5.10E-01	1.89E-01	0.37	No	TI
U (μ*g/mL*)	Water	3.30E-02	3.00E-02	0.91	Yes	TI

Units for air filters: Bq/filter; soil and vegetation: Bq/kg; water: Bq/L.

Uranium units as listed in the table. Samples analyzed by the Environmental Laboratory (EL) or Teledyne Isotopes (TI).

Acceptance limits of reported to actual ratio: ***Yes*** *indicates a result within warning limits of 0.8 to 1.2;* ***Pass*** *indicates a result within control limits of 0.5 to 1.5 but outside warning limits;* ***No*** *indicates a result outside control limits.*

Table D - 2

Comparison of Radiological Concentrations in Crosscheck Samples
between the West Valley Demonstration Project and the Environmental Measurements Laboratory (EML) Quality Assessment Program 37

Isotope	Matrix	Actual	Reported	Ratio	Accept ?	Analyzed by
Be-7	Air	3.08E+02	4.38E+02	1.42	Pass	CEP
Co-60	Air	3.06E+00	2.01E+00	0.66	Pass	CEP
Sr-90	Air	1.37E-01	2.72E-01	1.99	No	CEP
Cs-134	Air	3.72E+00	3.92E+00	1.05	Yes	CEP
Cs-137	Air	5.82E+00	7.14E+00	1.23	Pass	CEP
Pu-238	Air	4.20E-02	7.03E-02	1.67	No	CEP
Pu-239	Air	4.50E-02	8.07E-02	1.79	No	CEP
Am-241	Air	3.20E-02	3.02E-01	9.44	No	CEP
U *(µg/filter)*	Air	1.28E+00	1.07E+00	0.84	Yes	CEP
K-40	Soil	3.84E+02	6.07E+02	1.58	No	CEP
Sr-90	Soil	9.57E+00	1.63E+01	1.70	No	CEP
Cs-137	Soil	2.85E+02	3.74E+02	1.31	Pass	CEP
Pu-238	Soil	2.19E+01	2.37E+01	1.08	Yes	CEP
Pu-239	Soil	7.76E+00	8.14E+00	1.05	Yes	CEP
Am-241	Soil	1.83E+00	2.18E+00	1.19	Yes	CEP
U *(µg/g)*	Soil	2.32E+00	3.99E-01	0.17	No	CEP
K-40	Veg	1.01E+03	1.11E+03	1.10	Yes	CEP
Sr-90	Veg	4.89E+02	3.40E+02	0.70	Pass	CEP
Cs-137	Veg	2.92E+01	3.22E+01	1.10	Yes	CEP
H-3	Water	1.18E+02	1.23E+02	1.04	Yes	EL
Co-60	Water	2.78E+01	3.04E+01	1.09	Yes	EL
Sr-90	Water	2.29E+00	5.03E-01	0.23	No	CEP
Cs-134	Water	4.41E+01	4.82E+01	1.09	Yes	EL
Cs-137	Water	2.90E+01	3.35E+01	1.16	Yes	EL
Pu-238	Water	1.97E+00	1.21E+00	0.61	Pass	CEP
Pu-239	Water	2.39E-01	3.00E-01	1.26	Pass	CEP
Am-241	Water	2.05E-01	6.25E-01	3.05	No	CEP
U *(Bq/L)*	Water	2.30E-01	7.73E-02	0.34	No	CEP

Units for air filters: Bq/filter; soil and vegetation: Bq/kg; water: Bq/L.

Uranium units as listed in the table. Samples analyzed by the Environmental Laboratory (EL) or Controls for Environmental Pollution (CEP).

Acceptance limits of reported to actual ratio: ***Yes*** *indicates a result within warning limits of 0.8 to 1.2;* ***Pass*** *indicates a result within control limits of 0.5 to 1.5 but outside warning limits;* ***No*** *indicates a result outside control limits.*

Table D - 3

Comparison of Radiological Concentrations in Crosscheck Samples between the West Valley Demonstration Project and the U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory (EMSL)

Sample	Analyte	Matrix	Actual	Reported	Accept ?	Analyzed by
PE-A (April 1992)	Alpha	Water	40.0	34.3	Yes	TI
	Ra-226	Water	14.9	15.3	Yes	TI
	Ra-228	Water	14.0	15.0	Yes	TI
	U(Nat)	Water	4.0	3.9	Yes	TI
PE-B (April 1992)	Beta	Water	140.0	97.7	No	TI
	Sr-89	Water	15.0	15.7	Yes	TI
	Sr-90	Water	17.0	13.0	Yes	TI
	Co-60	Water	56.0	57.0	Yes	TI
	Cs-134	Water	24.0	23.3	Yes	TI
	Cs-137	Water	22.0	25.0	Yes	TI
PE-A (Oct 1992)	Alpha	Water	29.0	25.0	Yes	EL
	Ra-226	Water	7.4	6.07	Pass	CEP
	Ra-228	Water	10.0	11.9	Yes	CEP
	U(Nat)	Water	10.2	4.93	No	CEP
PE-B (Oct 1992)	Beta	Water	53.0	49.0	Yes	EL
	Sr-89	Water	8.0	11.0	Yes	CEP
	Sr-90	Water	10.0	10.7	Yes	CEP
	Co-60	Water	15.0	14.3	Yes	EL
	Cs-134	Water	5.0	5.7	Yes	EL
	Cs-137	Water	8.0	8.0	Yes	EL
GAM (Feb 1992)	Co-60	Water	40.0	45.0	Yes	EL
	Zn-65	Water	148.0	148.3	Yes	TI
	Ru-106	Water	203.0	192.0	Yes	TI
	Cs-134	Water	31.0	33.0	Yes	EL
	Cs-137	Water	49.0	50.3	Yes	EL
	Ba-133	Water	76.0	79.0	Yes	TI
GAM (June 1992)	Co-60	Water	20.0	22.0	Yes	EL
	Zn-65	Water	99.0	107.3	Yes	EL
	Ru-106	Water	141.0	134.3	Yes	EL
	Cs-134	Water	15.0	12.3	Yes	EL
	Cs-137	Water	15.0	17.3	Yes	EL
	Ba-133	Water	98.0	96.7	Yes	EL
TRW (Feb 1992)	H-3	Water	7904.0	83.7	No	EL
TRW (June 1992)	H-3	Water	2125.0	2158.0	Yes	EL

continued on next page

Table D - 3 *(concluded)*

Comparison of Radiological Concentrations in Crosscheck Samples between the West Valley Demonstration Project and the U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory (EMSL)

Sample	Analyte	Matrix	Actual	Reported	Accept ?	Analyzed by
AF (March 1992)	Alpha	Filter	7.0	8.7	Yes	EL
	Beta	Filter	41.0	43.3	Yes	EL
	Sr-90	Filter	15.0	12.7	Yes	TI
	Cs-137	Filter	10.0	10.0	Yes	TI
AF (Aug 1992)	Alpha	Filter	30.0	32.3	Yes	EL
	Beta	Filter	69.0	81.0	Pass	EL
	Sr-90	Filter	25.0	19.7	Yes	CEP
	Cs-137	Filter	18.0	27.0	No	CEP
Milk (April 1992)	Sr-89	Milk	38.0	29.3	Pass	TI
	Sr-90	Milk	29.0	27.7	Yes	TI
	I-131	Milk	78.0	72.7	Yes	TI
	Cs-137	Milk	39.0	43.3	Yes	TI
	Total K	Milk	1710.0	1720.0	Yes	TI
Milk (Sept 1992)	Sr-90	Milk	15.0	27.7	No	TI
	Cs-137	Milk	15.0	21.3	Pass	TI
	Total K	Milk	1750.0	1590.0	No	TI
ABW (May 1992)	Alpha	Water	15.0	8.3	Pass	EL
	Beta	Water	44.0	45.0	Yes	EL
ABW (Sept 1992)	Alpha	Water	45.0	19.7	No	EL
	Beta	Water	50.0	47.0	Yes	EL
PUW (Aug 1992)	Pu-239	Water	9.0	7.8	Pass	CEP

Units for water and milk = pCi/L; for air filters = pCi/filter.

Samples analyzed by the Environmental Laboratory (EL), Teledyne Isotopes (TI), or Controls for Environmental Pollution (CEP) as indicated.

Explanation of codes: PE-A = Performance Evaluation (Alpha); PE-B = Performance Evaluation (Beta); GAM = Gamma in water; TRW = Tritium in water; AF = Air filter; MILK = Milk sample; ABW = Alpha and beta in water; PUW = Plutonium in water.

*Acceptance limits as defined for individual analytes and matrices by EMSL differ from crosscheck to crosscheck. **Yes** indicates a result within warning limits; **Pass** indicates a result within control limits but outside warning limits; **No** indicates a result outside control limits.*

Table D - 4

Comparison of Water Quality Parameters in Crosscheck Samples
between the West Valley Demonstration Project and the U.S. Environmental Protection Agency 1992 Discharge Monitoring Report Quality Assurance Program #11 for the National Pollutant Discharge Elimination System

Analyte	Units	Actual (EPA)	Reported (WVNS)	Accept ?	Analyzed by
Aluminum	µg/L	2100	2080	Yes	E&E
Arsenic	µg/L	100	96.2	Yes	E&E
Beryllium	µg/L	100	83.2	Yes	E&E
Cadmium	µg/L	250	262	Yes	E&E
Chromium	µg/L	800	789	Yes	E&E
Cobalt	µg/L	110	97.4	Check	E&E
Copper	µg/L	790	771	Yes	E&E
Iron	µg/L	1500	1480	Yes	E&E
Lead	µg/L	550	509	Yes	E&E
Manganese	µg/L	810	816	Yes	E&E
Mercury	µg/L	5.3	4.6	Yes	E&E
Nitrate	µg/L	740	773	Yes	E&E
Selenium	µg/L	14.0	13.7	Yes	E&E
Vanadium	µg/L	10000	10000	Yes	E&E
Zinc	µg/L	360	344	Yes	E&E
pH		9.40	9.42	Yes	EL
Total Suspended Solids	mg/L	25.0	25.4	Yes	EL
Oil and Grease	mg/L	19.0	17.4	Yes	E&E
Ammonia-N	mg/L	2.50	2.62	Yes	EL
Nitrate-N	mg/L	15.0	15.1	Yes	E&E
Kjeldahl-N	mg/L	34.0	33.4	Yes	E&E
Total K	mg/L	0.94	1.06	Yes	E&E
Total Organic Carbon	mg/L	22.2	21.6	Yes	EL
BOD-5	mg/L	36.0	37.9	Yes	EL
Cyanide	mg/L	0.610	0.602	Yes	E&E
Phenolics	mg/L	0.207	0.386	No	E&E
Total Residual Chlorine	mg/L	0.440	0.200	No	E&E

Analyses were conducted by Ecology & Environment (E&E) or the Environmental Laboratory (EL) as indicated in the table.

***Yes** indicates a result within warning limits; **Check** indicates a result within control limits but outside warning limits; **No** indicates a result outside control limits. All **Check** or **No** results were analyses conducted by E&E.*

Table D - 5

Comparison of Water Quality Parameters in Crosscheck Samples
between the West Valley Demonstration Project and the New York State Department of Health (NYSDOH) in 1992

Analyte	Units	Actual (NYSDOH)	Reported (WVNS)	Accept ?	Analyzed By
BOD-5	mg/L	38.7	46.8	Yes	EL
		87.6	106.0	Yes	EL
		49.2	46.7	Yes	EL
		81.3	75.1	Yes	EL
Total Suspended Solids	mg/L	38.4	37.4	Yes	EL
		55.4	55.1	Yes	EL
		23.8	23.7	Yes	EL
		72.9	74.9	Yes	EL
pH		4.00	3.96	Yes	EL
		6.50	6.46	Yes	EL
		8.95	8.93	Yes	EL
		3.01	2.96	Yes	EL
NH_3-N	mg/L	2.17	2.31	Yes	EL
		4.29	4.62	Yes	EL
		2.96	3.01	Yes	EL
		3.63	3.71	Yes	EL
Total Organic Carbon	mg/L	24.3	23.6	Yes	EL
		54.4	54.0	Yes	EL
		30.2	29.5	Yes	EL
		49.7	49.3	Yes	EL

Samples analyzed by the Environmental Laboratory (EL).

Acceptable range determined by NYSDOH. ***Yes*** *indicates a result within warning limits;* ***Pass*** *indicates a result within control limits but outside warning limits;* ***No*** *indicates a result outside control limits. The first two results for each analyte were part of the January crosscheck; the second two results were part of the July crosscheck.*

Table D - 6

Comparison of the West Valley Demonstration Project's
Thermoluminescent Dosimeters (TLDs) to the Co-located Nuclear Regulatory Commission (NRC) TLDs in 1992

NRC TLD#	WVDP TLD#	NRC mR/90days	WVDP mR/Qtr	WVDP/NRC Ratio	Accept ?
4th Quarter 1991					
2	22	15.4	21.3	1.38	Pass
3	5	N/A	23.9	N/A	N/A
4	7	16.8	21.1	1.26	Pass
5	9	20.4	21.0	1.03	Yes
7	14	16.6	24.2	1.46	Pass
8	15	17.0	22.1	1.30	Pass
9	25	35.0	36.0	1.03	Yes
11	24	1066	1293	1.21	Pass
1st Quarter 1992					
NRC TLD#	**WVDP TLD#**	**NRC mR/90days**	**WVDP mR/Qtr**	**WVDP/NRC Ratio**	**Accept ?**
2	22	15.8	21.5	1.36	Pass
3	5	14.5	21.6	1.49	Pass
4	7	15.3	17.1	1.12	Yes
5	9	17.8	18.5	1.04	Yes
7	14	15.7	21.8	1.39	Pass
8	15	13.8	18.7	1.36	Pass
9	25	29.2	33.7	1.15	Yes
11	24	1038	1290	1.24	Pass
2nd Quarter 1992					
NRC TLD#	**WVDP TLD#**	**NRC mR/90days**	**WVDP mR/Qtr**	**WVDP/NRC Ratio**	**Accept ?**
2	22	15.6	16.7	1.07	Yes
3	5	15.9	16.4	1.03	Yes
4	7	16.5	16.0	.97	Yes
5	9	19.7	15.8	.80	Yes
7	14	15.9	17.6	1.11	Yes
8	15	16.6	15.7	.95	Yes
9	25	33.8	31.6	.93	Yes
11	24	933	1124	1.21	Pass
3rd Quarter 1992					
NRC TLD#	**WVDP TLD#**	**NRC mR/90days**	**WVDP mR/Qtr**	**WVDP/NRC Ratio**	**Accept ?**
2	22	16.5	20.3	1.23	Pass
3	5	16.8	21.1	1.26	Pass
4	7	16.8	18.2	1.08	Yes
5	9	18.3	19.4	1.06	Yes
7	14	17.9	21.6	1.21	Pass
8	15	16.6	20.2	1.22	Pass
9	25	31.7	32.2	1.02	Yes
11	24	949	1082	1.14	Yes
4th Quarter 1992					
NRC TLD#	**WVDP TLD#**	**NRC mR/90days**	**WVDP mR/Qtr**	**WVDP/NRC Ratio**	**Accept ?**
2	22	N/A	19.3	N/A	N/A
3	5	14.0	20.0	1.43	Pass
4	7	16.1	18.9	1.17	Yes
5	9	20.5	18.8	.92	Yes
7	14	15.5	21.8	1.41	Pass
8	15	16.2	19.3	1.19	Yes
9	25	32.7	30.7	.94	Yes
11	24	1038	1078	1.04	Yes

Acceptance limits of WVDP/NRC ratio: ***Yes*** *indicates a result within limits of 0.8 to 1.2;* ***Pass*** *indicates a result within limits of 0.5 to 1.5 but outside 0.8 to 1.2;* ***No*** *indicates a result outside of 0.5 to 1.5.*
N/A - Not available.

Appendix E

Summary of Groundwater Monitoring Data

Table E - 1
Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0301	UP(1)	7.04	680	0.8	<0.004	<1.38E-09	<2.73E-09	<7.08E-08	<2.14E-08	<2.37E-08
WNW0301	UP(2)	7.00	765	0.9	0.006	<2.67E-09	3.61±2.52E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0301	UP(3)	7.28	755	1.0	0.010	<2.94E-09	<3.02E-09	<1.00E-07	<2.88E-08	<3.06E-08
WNW0301	UP(4)	6.92	704	1.0	<0.004	<3.72E-09	<2.74E-09	1.01±0.73E-07	<3.50E-08	<3.69E-08
WNW0301	UP(6)	6.85	615	1.2	<0.004	<2.62E-09	3.05±2.93E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0301	UP(7)	7.06	838	0.9	<0.004	<3.58E-09	3.53±3.14E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0301	UP(5)	6.89	624	0.7	<0.004	<3.45E-09	2.90±2.48E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0301	UP(8)	6.83	636	0.9	<0.004	<2.31E-09	3.55±2.83E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0401	UP(1)	6.57	1284	0.7	0.006	<3.79E-09	<5.15E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0401	UP(2)	6.71	1971	0.6	0.007	<7.13E-09	1.05±0.54E-08	<1.00E-07	<2.20E-08	<2.40E-08
WNW0401	UP(3)	6.76	2020	0.9	0.018	<1.91E-08	1.55±0.55E-08	<8.52E-08	<3.43E-08	<3.11E-08
WNW0401	UP(4)	6.14	1482	1.2	0.006	<5.46E-09	6.46±4.48E-09	<7.69E-08	<3.50E-08	<3.69E-08
WNW0401	UP(6)	6.93	1713	0.7	0.006	<1.00E-08	4.82±4.45E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0401	UP(7)	6.80	1568	0.6	0.006	<8.71E-09	<4.04E-09	<7.42E-08	<2.05E-08	<2.12E-08
WNW0401	UP(5)	6.87	1512	0.7	0.006	<4.64E-09	<3.41E-09	<1.00E-07	<2.75E-08	<2.64E-08
WNW0401	UP(8)	6.78	1388	0.7	0.004	<6.03E-09	<3.82E-09	<1.00E-07	<2.39E-08	<2.63E-08
WNW0403	UP(1)	6.50	746	1.2	0.006	<1.92E-09	3.24±2.85E-09	<7.94E-08	<2.31E-08	<1.92E-08
WNW0403	UP(2)	6.81	972	1.9	0.016	9.76±6.62E-09	<2.70E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0403	UP(3)	6.74	1147	1.4	0.008	<5.00E-09	6.34±3.34E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0403	UP(4)	6.26	1454	1.8	0.018	<8.39E-09	8.53±3.45E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0403	UP(6)	6.44	1098	2.8	0.014	<7.45E-09	6.92±3.43E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0403	UP(7)	6.82	1091	1.6	0.010	<4.56E-09	<4.89E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0403	UP(5)	6.59	774	1.6	0.005	<3.50E-09	4.30±3.01E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0403	UP(8)	6.73	878	1.2	0.005	<3.97E-09	7.07±3.03E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNWNB1S	UP(1)	6.03	672	1.1	0.014	<2.32E-09	2.82±2.56E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNWNB1S	UP(2)	5.87	478	1.3	0.015	<1.56E-09	<2.52E-09	<6.47E-08	<2.14E-08	<2.37E-08
WNWNB1S	UP(3)	6.02	399	2.9	0.010	<1.55E-09	5.82±2.83E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNWNB1S	UP(4)	5.91	400	1.8	0.012	<1.29E-09	3.80±2.75E-09	<8.26E-08	<2.27E-08	<2.42E-08
WNWNB1S	UP(6)	6.01	363	1.8	0.009	<2.35E-09	<2.31E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNWNB1S	UP(7)	6.57	679	1.5	<0.004	<3.23E-09	2.63±2.52E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNWNB1S	UP(5)	6.02	351	1.7	0.006	<1.09E-09	4.97±2.63E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNWNB1S	UP(8)	6.47	600	1.3	0.008	1.95±1.91E-09	<2.57E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0201	DOWN - B(1)	5.99	1188	2.0	0.006	3.95±3.87E-09	1.02±0.12E-07	<7.93E-08	<2.31E-08	<1.92E-08
WNW0201	DOWN - B(2)	5.86	1364	1.9	0.011	< 4.39E-09	8.62±1.12E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0201	DOWN - B(3)	5.88	1533	1.9	0.014	<1.09E-08	1.17±0.10E-07	<1.00E-07	<3.50E-08	<3.69E-08
WNW0201	DOWN - B(4)	5.99	952	2.8	0.015	< 4.64E-09	7.39±0.74E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0201	DOWN - B(6)	6.12	958	2.8	0.014	< 4.62E-09	6.02±0.66E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW0201	DOWN - B(7)	6.33	1203	2.5	0.016	< 4.57E-09	7.88±0.77E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0201	DOWN - B(5)	6.11	935	2.4	0.006	< 4.55E-09	6.66±0.82E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0201	DOWN - B(8)	6.10	976	2.6	0.015	< 3.50E-09	6.42±0.80E-08	<1.00E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 *(continued)*

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0706	DOWN - B(1)	6.78	503	3.7	0.013	<1.07E-09	3.28±2.72E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW0706	DOWN - B(2)	6.39	596	4.5	0.015	<2.02E-09	6.09±2.96E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0706	DOWN - B(3)	6.34	540	3.9	0.010	<2.49E-09	7.96±3.11E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0706	DOWN - B(4)	6.48	590	3.6	0.009	<2.41E-09	1.05±0.35E-08	<7.63E-08	<3.50E-08	<3.69E-08
WNW0706	DOWN - B(6)	6.57	559	3.1	0.009	<2.02E-09	6.78±3.23E-09	<7.63E-08	<3.50E-08	<3.69E-08
WNW0706	DOWN - B(7)	6.34	526	3.5	0.012	<3.30E-09	9.62±3.23E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0706	DOWN - B(5)	6.26	435	2.9	0.008	<2.45E-09	3.78±2.74E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0706	DOWN - B(8)	6.23	700	5.1	0.023	<2.36E-09	9.65±3.44E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8613A	DOWN - B(1)	6.44	680	1.1	0.017	<1.74E-09	<2.46E-09	2.12±0.82E-07	<3.66E-08	<3.35E-08
WNW8613A	DOWN - B(2)	6.74	685	2.3	0.014	<1.21E-09	4.98±2.70E-09	<7.93E-08	<2.14E-08	<2.37E-08
WNW8613A	DOWN - B(3)	6.87	649	1.4	0.005	<3.79E-09	3.64±2.86E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8613A	DOWN - B(4)	6.77	687	1.0	0.005	<4.48E-09	3.04±2.92E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8613A	DOWN - B(6)	6.83	694	1.1	0.007	<4.43E-09	<2.78E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8613A	DOWN - B(7)	6.69	672	1.0	0.005	<2.67E-09	<2.67E-09	<7.75E-08	<2.05E-08	<2.12E-08
WNW8613A	DOWN - B(5)	6.88	685	0.9	0.006	<2.32E-09	3.70±2.64E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW8613A	DOWN - B(8)	6.80	726	0.9	0.006	<2.43E-09	<2.61E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW8613B	DOWN - B(1)	6.03	642	2.7	0.025	<1.47E-09	4.46±2.94E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW8613B	DOWN - B(2)	6.17	654	2.2	0.025	<2.69E-09	3.24±2.71E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW8613B	DOWN - B(3)	6.44	626	2.5	0.018	<2.49E-09	<2.66E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW8613B	DOWN - B(4)	6.20	714	2.3	0.009	<3.92E-09	9.09±3.45E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8613B	DOWN - B(6)	6.44	613	1.9	0.009	<2.25E-09	9.28±3.20E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8613B	DOWN - B(7)	6.39	575	2.2	0.009	<2.88E-09	<2.57E-09	<7.61E-08	<2.64E-08	<2.75E-08
WNW8613B	DOWN - B(5)	6.43	487	2.5	<0.004	<2.89E-09	2.90±2.45E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8613B	DOWN - B(8)	6.32	612	1.8	0.007	<2.30E-09	3.29±2.73E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8613C	DOWN - B(1)	7.12	644	2.0	0.013	<2.42E-09	6.53±3.19E-09	3.08±0.81E-07	<3.66E-08	<3.35E-08
WNW8613C	DOWN - B(2)	7.33	551	1.5	0.008	<2.62E-09	3.53±2.73E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW8613C	DOWN - B(3)	7.54	521	1.6	0.009	<2.97E-09	<2.82E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8613C	DOWN - B(4)	7.41	579	1.6	<0.004	<2.52E-09	8.19±3.19E-09	8.42±7.65E-08	<2.27E-08	<2.42E-08
WNW8613C	DOWN - B(6)	7.41	490	1.1	0.004	<2.15E-09	4.89±2.89E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8613C	DOWN - B(7)	7.35	464	1.0	<0.004	<2.37E-09	7.41±3.18E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW8613C	DOWN - B(5)	7.62	415	0.9	<0.004	<2.60E-09	6.78±2.84E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8613C	DOWN - B(8)	7.44	474	1.2	0.006	<2.76E-09	3.19±2.48E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNSP008	DOWN - C(1)	6.48	907	2.5	0.011	<3.53E-09	5.38±0.78E-08	4.60±0.21E-06	<3.43E-08	<3.11E-08
WNSP008	DOWN - C(2)	6.32	952	2.5	0.018	<4.88E-09	6.12±0.66E-08	5.19±0.22E-06	<2.88E-08	<3.06E-08
WNSP008	DOWN - C(3)	6.75	1028	2.4	0.023	5.66±5.23E-09	6.93±0.86E-08	5.92±0.24E-06	<3.50E-08	<3.69E-08
WNSP008	DOWN - C(4)	6.74	1046	2.5	0.014	<6.12E-09	5.19±0.63E-08	5.06±0.22E-06	<3.50E-08	<3.69E-08
WNSP008	DOWN - C(4)	6.85	924	2.3	0.017	<4.01E-09	5.85±0.67E-08	4.19±0.19E-06	<3.50E-08	<3.69E-08
WNSP008	DOWN - C(6)	6.89	1013	2.5	0.014	<5.21E-09	6.82±0.72E-08	5.12±0.22E-06	<2.88E-08	<3.06E-08
WNSP008	DOWN - C(7)	6.88	992	2.6	0.017	<5.84E-09	6.06±0.66E-08	4.75±0.19E-06	<3.16E-08	<3.68E-08
WNSP008	DOWN - C(5)	6.59	901	2.4	0.015	<5.33E-09	7.51±0.72E-08	5.01±0.20E-06	<2.64E-08	<2.75E-08
WNSP008	DOWN - C(8)	6.70	994	2.8	0.009	<3.63E-09	7.85±0.75E-08	5.44±0.22E-06	<2.39E-08	<2.63E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 *(continued)*

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0103	DOWN - C(1)	9.62	4310	8.9	0.053	<1.38E-08	1.21±0.25E-07	<7.98E-08	<3.66E-08	<3.35E-08
WNW0103	DOWN - C(2)	9.13	3970	6.5	0.016	<1.01E-08	1.13±0.16E-07	1.66±0.81E-07	<2.27E-08	<2.42E-08
WNW0103	DOWN - C(3)	9.27	1287	8.3	0.028	<5.74E-09	4.34±1.06E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0103	DOWN - C(4)	10.14	1898	18.5	0.005	<9.26E-09	4.53±1.38E-08	5.89±0.84E-07	<3.50E-08	<3.69E-08
WNW0103	DOWN - C(6)	9.64	1400	16.9	0.008	<7.19E-09	4.36±0.94E-08	<9.16E-08	<2.14E-08	<2.51E-08
WNW0103	DOWN - C(7)	9.41	1030	8.7	0.005	<4.92E-09	3.81±0.87E-08	1.16±0.77E-07	<2.64E-08	<2.75E-08
WNW0103	DOWN - C(5)	8.94	1038	7.4	0.006	<5.20E-09	5.48±1.14E-08	8.42±7.52E-08	<2.14E-08	<2.51E-08
WNW0103	DOWN - C(8)	8.04	3465	2.9	0.010	<7.93E-09	3.79±0.27E-07	1.32±0.76E-07	<2.64E-08	<2.75E-08
WNW0104	DOWN - C(1)	6.92	959	3.1	0.015	<4.43E-09	2.10±0.04E-06	9.56±0.95E-07	<2.31E-08	<1.92E-08
WNW0104	DOWN - C(2)	7.25	971	2.4	0.019	<3.05E-09	2.29±0.03E-06	1.12±0.10E-06	<3.43E-08	<3.11E-08
WNW0104	DOWN - C(3)	7.08	1073	2.3	0.020	<8.40E-09	3.36±0.06E-06	8.94±0.89E-07	<2.27E-08	<2.42E-08
WNW0104	DOWN - C(4)	7.13	1057	< 1.0	<0.010	<5.34E-09	3.44±0.06E-06	9.54±0.90E-07	<2.27E-08	<2.42E-08
WNW0104	DOWN - C(6)	7.26	1070	1.4	0.011	<4.28E-09	3.51±0.06E-06	1.52±0.10E-06	<2.64E-08	<2.75E-08
WNW0104	DOWN - C(7)	7.09	1046	3.2	0.014	<3.54E-09	3.46±0.06E-06	9.72±0.90E-07	<2.39E-08	<2.63E-08
WNW0104	DOWN - C(5)	7.19	1052	1.9	<0.010	<2.50E-09	3.27±0.05E-06	1.06±0.09E-06	<2.64E-08	<2.75E-08
WNW0104	DOWN - C(8)	7.02	1032	2.2	<0.010	<2.44E-09	3.99±0.06E-06	1.08±0.09E-06	<2.64E-08	<2.75E-08
WNW0111	DOWN - C(1)	6.26	839	7.8	0.048	8.80±6.91E-09	6.72±0.06E-06	8.15±0.33E-06	<2.31E-08	<1.92E-08
WNW0111	DOWN - C(2)	6.34	775	6.1	0.026	<3.60E-09	4.39±0.05E-06	4.65±0.20E-06	<2.33E-08	<2.58E-08
WNW0111	DOWN - C(3)	6.24	663	8.5	0.045	<3.87E-09	4.44±0.05E-06	1.72±0.12E-06	<2.27E-08	<2.42E-08
WNW0111	DOWN - C(4)	6.31	799	9.2	0.053	<5.84E-09	6.44±0.06E-06	4.94±0.21E-06	<2.27E-08	<2.42E-08
WNW0111	DOWN - C(6)	6.35	821	10.7	0.038	6.88±5.84E-09	8.14±0.07E-06	6.76±0.25E-06	<2.14E-08	<2.51E-08
WNW0111	DOWN - C(7)	6.19	755	11.1	0.031	1.12±0.59E-08	7.96±0.07E-06	4.83±0.19E-06	<9.30E-08	<1.09E-07
WNW0111	DOWN - C(5)	6.58	572	7.8	0.015	<1.36E-09	4.79±0.05E-06	1.64±0.11E-06	<2.14E-08	<2.51E-08
WNW0111	DOWN - C(8)	6.21	525	7.9	0.016	2.82±2.26E-09	4.77±0.05E-06	2.00±0.12E-06	<2.14E-08	<2.51E-08
WNW0203	DOWN - C(1)	6.48	1885	2.9	0.022	<8.22E-09	2.54±1.24E-08	<1.00E-07	<2.14E-08	<2.37E-08
WNW0203	DOWN - C(2)	6.14	2420	2.3	0.036	<1.64E-08	3.27±0.61E-08	<1.00E-07	<2.14E-08	<2.37E-08
WNW0203	DOWN - C(3)	6.37	4250	1.6	0.039	<1.34E-08	5.12±1.54E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0203	DOWN - C(4)	6.43	1832	2.5	0.024	<1.02E-08	2.12±0.76E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0203	DOWN - C(6)	6.42	1393	2.2	0.017	<6.58E-09	2.11±0.70E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW0203	DOWN - C(7)	6.53	1766	2.4	0.019	<9.98E-09	2.25±0.75E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW0203	DOWN - C(5)	6.43	1879	2.5	0.046	<7.16E-09	3.50±0.80E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0203	DOWN - C(8)	6.57	1672	2.3	0.034	<6.81E-09	2.56±0.72E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0205	DOWN - C(1)	6.13	2575	3.7	0.025	<7.81E-09	1.30±1.14E-08	<1.00E-07	<2.14E-08	<2.37E-08
WNW0205	DOWN - C(2)	6.01	3285	2.9	0.030	<1.14E-08	1.73±1.01E-08	<1.00E-07	<3.43E-08	<3.11E-08
WNW0205	DOWN - C(3)	6.23	7405	2.2	N/A	<1.86E-08	2.15±0.83E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0205	DOWN - C(4)	6.27	6855	4.5	0.046	<1.50E-08	<1.74E-08	<7.83E-08	<3.50E-08	<3.69E-08
WNW0205	DOWN - C(6)	6.45	5020	6.8	0.106	<1.89E-08	1.96±1.64E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0205	DOWN - C(7)	6.54	4020	7.0	0.067	<1.54E-08	<1.12E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW0205	DOWN - C(5)	6.72	3055	6.1	0.083	<1.40E-08	<1.39E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0205	DOWN - C(8)	6.73	206*	4.5	0.075	<9.81E-09	<1.35E-08	<1.00E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

** Apparent analytical outlier*

Table E - 1 *(continued)*

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0305	DOWN - C(1)	6.80	1092	1.8	0.019	4.39±4.30E-09	<7.00E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0305	DOWN - C(2)	6.81	1102	1.6	0.014	<4.66E-09	<7.26E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0305	DOWN - C(3)	6.88	1149	0.9	0.029	<5.52E-09	8.49±7.89E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0305	DOWN - C(4)	6.89	1295	1.4	0.018	<6.55E-09	1.33±1.02E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0305	DOWN - C(6)	6.90	1387	1.4	0.010	<7.13E-09	<9.72E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0305	DOWN - C(7)	6.92	1273	1.5	0.016	<6.48E-09	1.50±0.97E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0305	DOWN - C(5)	6.78	1230	1.5	0.012	<6.84E-09	1.50±0.98E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0305	DOWN - C(8)	6.95	1215	1.7	0.023	<3.92E-09	4.97±4.97E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0307	DOWN - C(1)	6.57	1007	1.6	0.009	<2.09E-09	1.01±0.81E-08	<1.00E-07	<2.14E-08	<2.37E-08
WNW0307	DOWN - C(2)	6.90	1003	1.7	0.026	<2.68E-09	5.99±5.16E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0307	DOWN - C(3)	6.81	1054	1.2	0.016	<2.02E-09	4.55±3.15E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0307	DOWN - C(4)	6.85	1180	1.8	0.037	<4.67E-09	7.84±3.33E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0307	DOWN - C(6)	6.88	1180	1.3	0.016	<7.30E-09	7.46±3.49E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0307	DOWN - C(7)	7.01	1015	2.1	0.012	<3.47E-09	1.10±0.35E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW0307	DOWN - C(5)	6.73	1017	1.4	0.006	<3.49E-09	7.52±3.16E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0307	DOWN - C(8)	6.92	983	1.6	0.012	<1.90E-09	6.59±3.23E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0406	DOWN - C(1)	6.75	685	4.2	0.017	6.24±5.72E-09	6.80±3.36E-09	3.69±0.18E-06	<3.43E-08	<3.11E-08
WNW0406	DOWN - C(2)	6.85	703	3.3	0.018	<2.73E-09	7.72±3.28E-09	2.22±0.13E-06	<3.50E-08	<3.69E-08
WNW0406	DOWN - C(3)	7.19	695	3.1	0.010	<1.92E-09	9.06±3.50E-09	2.17±0.12E-06	<3.50E-08	<3.69E-08
WNW0406	DOWN - C(4)	6.90	691	3.1	0.017	<3.67E-09	9.21±3.21E-09	2.07±0.13E-06	<3.50E-08	<3.69E-08
WNW0406	DOWN - C(6)	6.89	613	3.6	0.019	<2.97E-09	9.91±3.28E-09	1.48±0.11E-06	<2.16E-08	<2.27E-08
WNW0406	DOWN - C(7)	6.97	624	3.7	0.005	<3.62E-09	7.97±3.42E-09	1.47±0.10E-06	<3.16E-08	<3.68E-08
WNW0406	DOWN - C(5)	6.79	627	3.2	0.007	<2.36E-09	1.08±0.33E-08	1.43±0.10E-06	<2.39E-08	<2.63E-08
WNW0406	DOWN - C(8)	7.00	594	3.3	0.016	<2.21E-09	1.18±0.35E-08	1.28±0.10E-06	<2.64E-08	<2.75E-08
WNW0408	DOWN - C(1)	7.40	1069	2.0	0.043	<5.36E-09	1.64±0.00E-04	1.63±0.05E-05	<3.66E-08	<3.55E-08
WNW0408	DOWN - C(2)	7.62	1060	<1.0	0.029	<6.39E-09	1.78±0.00E-04	1.68±0.06E-05	<3.43E-08	<3.11E-08
WNW0408	DOWN - C(3)	7.27	1245	1.5	0.046	<1.58E-08	1.99±0.00E-04	1.64±0.05E-05	<2.27E-08	<2.42E-08
WNW0408	DOWN - C(4)	7.49	1327	1.5	0.027	<1.04E-08	2.07±0.00E-04	2.11±0.07E-05	<2.27E-08	<2.42E-08
WNW0408	DOWN - C(6)	7.37	1324	2.6	<0.010	<1.28E-08	2.95±0.01E-04	2.41±0.08E-05	<2.64E-08	<2.75E-08
WNW0408	DOWN - C(7)	7.07	1215	2.3	0.021	<7.24E-09	2.73±0.01E-04	2.18±0.07E-05	<2.14E-08	<2.51E-08
WNW0408	DOWN - C(5)	7.47	1241	1.1	<0.010	<4.17E-09	2.69±0.01E-04	2.14±0.07E-05	<2.14E-08	<2.51E-08
WNW0408	DOWN - C(8)	7.23	1165	1.7	0.025	<3.34E-09	2.68±0.01E-04	1.94±0.06E-05	<2.14E-08	<2.51E-08
WNW0501	DOWN - C(1)	7.17	810	1.3	0.023	<5.08E-09	1.07±0.00E-04	8.87±0.33E-06	<3.66E-08	<3.35E-08
WNW0501	DOWN - C(2)	7.26	860	1.3	0.017	<5.27E-09	1.11±0.00E-04	8.87±0.33E-06	<3.43E-08	<3.11E-08
WNW0501	DOWN - C(3)	7.19	1109	1.2	0.021	<1.24E-08	1.73±0.00E-04	1.06±0.04E-05	<2.27E-08	<2.42E-08
WNW0501	DOWN - C(4)	7.26	1038	1.6	0.021	<8.85E-09	1.62±0.00E-04	9.33±0.34E-06	<3.50E-08	<3.69E-08
WNW0501	DOWN - C(6)	7.32	986	2.1	<0.010	<5.14E-09	1.54±0.00E-04	1.37±0.04E-05	2.55±2.04E-08	<2.51E-08
WNW0501	DOWN - C(7)	6.96	934	2.3	<0.010	<4.68E-09	1.24±0.00E-04	1.0±0.03E-05	<2.64E-08	<2.75E-08
WNW0501	DOWN - C(5)	7.40	881	1.1	0.015	4.36±3.82E-09	1.29±0.00E-04	9.89±0.34E-06	<2.64E-08	<2.75E-08
WNW0501	DOWN - C(8)	7.13	845	3.1	<0.010	<3.02E-09	1.30±0.00E-04	9.11±0.32E-06	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 (continued)

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0502	DOWN - C(1)	7.14	869	1.3	0.014	<3.61E-09	3.92±0.02E-05	3.49±0.17E-06	<3.66E-08	<3.55E-08
WNW0502	DOWN - C(2)	7.18	885	1.4	0.014	<6.58E-09	4.38±0.02E-05	3.73±0.18E-06	<3.43E-08	<3.11E-08
WNW0502	DOWN - C(3)	7.11	1046	1.1	0.023	<6.04E-09	5.66±0.02E-05	4.10±0.18E-06	<3.50E-08	<3.69E-08
WNW0502	DOWN - C(4)	7.34	1070	1.4	0.022	<7.32E-09	4.58±0.02E-05	4.10±0.18E-06	<2.27E-08	<2.42E-08
WNW0502	DOWN - C(6)	7.25	1049	1.7	<0.010	<3.62E-09	5.30±0.02E-05	6.29±0.24E-06	<2.14E-08	<2.51E-08
WNW0502	DOWN - C(7)	6.90	967	2.3	0.015	<3.73E-09	5.70±0.02E-05	4.26±0.18E-06	<2.64E-08	<2.75E-08
WNW0502	DOWN - C(5)	7.39	941	1.1	<0.010	<2.21E-09	5.52±0.02E-05	4.46±0.18E-06	<2.64E-08	<2.75E-08
WNW0502	DOWN - C(8)	7.12	895	2.5	<0.010	<2.14E-09	5.51±0.02E-05	4.34±0.18E-06	<2.14E-08	<2.51E-08
WNW0602	DOWN - C(1)	6.14	545	3.3	0.062	<1.54E-09	1.99±0.42E-08	6.66±0.26E-06	<3.66E-08	<3.35E-08
WNW0602	DOWN - C(2)	6.10	686	2.8	0.057	<4.04E-09	6.08±0.64E-08	3.23±0.16E-06	<2.14E-08	<2.37E-08
WNW0602	DOWN - C(3)	6.43	692	2.3	0.013	<2.70E-09	3.13±0.51E-08	4.26±0.19E-06	<3.50E-08	<3.69E-08
WNW0602	DOWN - C(4)	6.40	603	2.9	0.010	<2.90E-09	2.25±0.44E-08	5.77±0.23E-06	<2.27E-08	<2.42E-08
WNW0602	DOWN - C(6)	6.43	611	2.8	0.009	<3.09E-09	2.14±0.43E-08	7.59±0.19E-06	<3.16E-08	<3.68E-08
WNW0602	DOWN - C(7)	6.65	597	3.1	0.011	<3.86E-09	1.01±0.35E-08	9.75±0.34E-06	<2.64E-08	<2.75E-08
WNW0602	DOWN - C(5)	6.35	615	3.1	0.011	<4.41E-09	1.62±0.38E-08	8.22±0.30E-06	<2.64E-08	<2.75E-08
WNW0602	DOWN - C(8)	6.23	580	3.3	0.016	<3.16E-09	3.77±0.51E-08	3.63±0.17E-06	<2.14E-08	<2.51E-08
WNW0603	DOWN - C(1)	6.02	802	2.3	<0.004	<4.19E-09	9.15±3.58E-09	2.92±0.81E-07	<2.31E-08	<1.92E-08
WNW0603	DOWN - C(2)	6.09	702	1.5	<0.004	<2.75E-09	8.55±4.36E-09	<7.81E-08	<3.43E-08	<3.11E-08
WNW0603	DOWN - C(3)	6.50	714	1.6	<0.004	<3.02E-09	1.22±0.46E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0603	DOWN - C(4)	6.10	697	1.5	<0.005	<3.81E-09	1.04±0.36E-08	<6.28E-08	<3.50E-08	<3.69E-08
WNW0603	DOWN - C(6)	6.23	770	1.5	<0.004	<3.01E-09	7.66±3.37E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0603	DOWN - C(7)	6.56	933	1.1	<0.004	<5.95E-09	4.99±3.36E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0603	DOWN - C(5)	6.18	909	1.4	<0.004	<5.09E-09	9.98±3.36E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0603	DOWN - C(8)	6.32	911	1.4	<0.004	<5.07E-09	6.22±2.98E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0604	DOWN - C(1)	6.02	541	3.9	0.016	<2.01E-09	3.26±2.75E-09	<8.18E-08	<2.14E-08	<2.37E-08
WNW0604	DOWN - C(2)	6.01	528	3.3	0.007	<1.81E-09	4.97±2.58E-09	<1.00E-07	<2.78E-08	<2.74E-08
WNW0604	DOWN - C(3)	6.38	503	3.5	0.006	2.65±2.45E-09	<2.59E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0604	DOWN - C(4)	6.09	496	3.4	0.010	<2.03E-09	<2.68E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0604	DOWN - C(6)	6.19	495	3.3	<0.004	<2.63E-09	3.44±2.81E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0604	DOWN - C(7)	6.29	508	3.5	0.007	<2.29E-09	<2.59E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0604	DOWN - C(5)	6.05	501	3.3	<0.004	<3.12E-09	3.62±2.53E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0604	DOWN - C(8)	6.07	502	3.6	<0.004	<2.21E-09	4.44±2.56E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW8605	DOWN - C(1)	6.39	1035	10.3	0.035	1.72±1.18E-08	4.42±0.02E-05	1.69±0.06E-05	<3.66E-08	<3.55E-08
WNW8605	DOWN - C(2)	6.44	1161	11.9	0.019	2.19±1.28E-08	4.42±0.02E-05	1.74±0.06E-05	<3.43E-08	<3.11E-08
WNW8605	DOWN - C(3)	6.51	899	10.5	0.043	3.18±1.46E-08	3.36±0.01E-05	8.70±0.32E-06	<3.50E-08	<3.69E-08
WNW8605	DOWN - C(4)	6.52	1068	11.2	0.062	2.07±1.60E-08	3.87±0.02E-05	1.07±0.04E-05	<2.27E-08	<2.42E-08
WNW8605	DOWN - C(6)	6.53	1110	13.3	0.033	1.30±0.85E-08	3.66±0.02E-05	1.26±0.04E-05	<2.14E-08	<2.51E-08
WNW8605	DOWN - C(7)	6.33	1078	13.4	0.037	<5.93E-09	3.52±0.01E-05	1.52±0.05E-05	<2.64E-08	<2.75E-08
WNW8605	DOWN - C(5)	6.79	721	9.1	0.018	5.55±3.84E-09	2.53±0.01E-05	5.97±0.23E-06	<2.14E-08	<2.51E-08
WNW8605	DOWN - C(8)	6.49	835	10.8	0.026	1.09±0.59E-08	3.28±0.02E-05	1.02±0.03E-05	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 (continued)
Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW8606	DOWN - C(1)	6.12	2555	2.9	0.029	<6.98E-09	<7.58E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW8606	DOWN - C(2)	6.44	3290	3.2	0.031	<2.50E-08	1.05±0.57E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW8606	DOWN - C(3)	6.25	4870	2.6	0.099	<1.27E-08	1.02±0.94E-08	<1.00E-07	<2.88E-08	<3.06E-08
WNW8606	DOWN - C(4)	6.37	6140	4.1	0.028	<1.42E-08	1.61±1.28E-08	1.91±0.80E-07	<3.50E-08	<3.69E-08
WNW8606	DOWN - C(6)	6.50	4880	6.2	0.088	<1.96E-08	<1.11E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW8606	DOWN - C(7)	6.61	3605	6.7	0.101	<1.41E-08	<1.08E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW8606	DOWN - C(5)	6.77	2900	5.7	0.105	<9.62E-09	1.01±1.01E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW8606	DOWN - C(8)	6.70	205*	3.9	0.061	<1.13E-08	1.57±1.01E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW8607	DOWN - C(1)	5.89	673	1.3	<0.004	<1.68E-09	7.27±3.25E-09	<8.12E-08	<3.66E-08	<3.35E-08
WNW8607	DOWN - C(2)	6.16	604	1.1	<0.004	<2.57E-09	5.01±2.61E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW8607	DOWN - C(3)	6.04	754	1.0	<0.004	<1.49E-09	7.16±3.26E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8607	DOWN - C(4)	6.12	671	1.3	<0.005	<2.44E-09	8.92±3.25E-09	<7.50E-08	<3.50E-08	<3.69E-08
WNW8607	DOWN - C(6)	6.51	781	1.2	<0.004	<4.02E-09	9.07±3.33E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8607	DOWN - C(7)	6.59	744	1.3	<0.004	<3.20E-09	8.66±3.21E-09	<7.24E-08	<2.05E-08	<2.12E-08
WNW8607	DOWN - C(5)	6.37	677	1.2	<0.004	<4.03E-09	4.33±2.94E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW8607	DOWN - C(8)	6.22	606	1.1	<0.004	<2.10E-09	6.85±3.17E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8608	DOWN - C(1)	6.42	675	5.4	0.008	<2.72E-09	9.72±3.32E-09	1.02±0.10E-06	<2.14E-08	<2.37E-08
WNW8608	DOWN - C(2)	6.58	643	6.9	0.005	<2.68E-09	8.19±3.00E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW8608	DOWN - C(3)	6.50	645	5.2	0.008	<2.31E-09	1.11±0.33E-08	9.47±0.96E-07	<3.50E-08	<3.69E-08
WNW8608	DOWN - C(4)	6.33	627	8.8	0.026	<2.85E-09	1.05±0.34E-08	3.08±0.88E-07	<2.27E-08	<2.42E-08
WNW8608	DOWN - C(6)	6.51	595	5.9	0.006	<3.04E-09	1.50±0.37E-08	6.24±0.88E-07	<2.05E-08	<2.12E-08
WNW8608	DOWN - C(7)	6.51	566	6.0	0.009	<2.17E-09	1.24±0.36E-08	3.91±0.84E-07	<2.05E-08	<2.12E-08
WNW8608	DOWN - C(5)	6.37	565	5.2	0.007	<2.39E-09	1.02±0.34E-08	4.77±0.86E-07	<2.14E-08	<2.51E-08
WNW8608	DOWN - C(8)	6.71	536	5.5	0.005	<2.15E-09	1.11±0.32E-08	4.65±0.87E-07	<2.14E-08	<2.51E-08
WNW8609	DOWN - C(1)	6.70	721	1.9	0.011	<3.71E-09	3.39±0.15E-07	2.96±0.16E-06	<2.78E-08	<2.74E-08
WNW8609	DOWN - C(2)	7.10	664	2.1	0.012	<3.67E-09	1.99±0.11E-07	1.84±0.12E-06	<3.43E-08	<3.11E-08
WNW8609	DOWN - C(3)	7.07	743	1.8	0.010	<2.44E-09	3.41±0.15E-07	1.66±0.11E-06	<2.27E-08	<2.42E-08
WNW8609	DOWN - C(4)	6.98	756	2.1	0.010	<6.38E-09	3.50±0.15E-07	1.87±0.12E-06	<3.50E-08	<3.69E-08
WNW8609	DOWN - C(6)	7.01	744	1.8	0.010	<3.27E-09	3.76±0.16E-07	1.79±0.12E-06	<2.27E-08	<2.42E-08
WNW8609	DOWN - C(7)	7.04	751	2.0	0.009	<4.14E-09	3.47±0.15E-07	1.67±0.11E-06	<2.64E-08	<2.75E-08
WNW8609	DOWN - C(5)	7.02	742	1.9	0.011	<2.09E-09	3.35±0.14E-07	1.56±0.11E-06	<2.14E-08	<2.51E-08
WNW8609	DOWN - C(8)	7.10	699	1.8	0.009	<2.53E-09	3.04±0.15E-07	1.28±0.10E-06	<2.64E-08	<2.75E-08
WNDMPNE	DOWN - D(1)	6.97	645	4.1	0.012	<2.93E-09	2.54±0.12E-07	2.72±0.88E-07	<3.43E-08	<3.11E-08
WNDMPNE	DOWN - D(2)	6.55	669	4.0	0.013	<2.33E-09	2.90±0.13E-07	2.74±0.85E-07	<2.27E-08	<2.42E-08
WNDMPNE	DOWN - D(3)	7.20	637	4.0	0.013	<2.64E-09	2.91±0.13E-07	3.36±0.84E-07	<2.88E-08	<3.06E-08
WNDMPNE	DOWN - D(4)	7.17	803	3.7	0.011	<3.52E-09	5.58±0.19E-07	5.96±0.84E-07	<2.88E-08	<3.06E-08
WNDMPNE	DOWN - D(6)	7.02	805	4.3	0.009	<5.41E-09	5.75±0.19E-07	3.98±0.86E-07	<3.50E-08	<3.69E-08
WNDMPNE	DOWN - D(7)	6.99	741	4.0	0.006	<3.26E-09	4.87±0.17E-07	2.97±0.83E-07	<2.05E-08	<2.12E-08
WNDMPNE	DOWN - D(5)	7.01	608	4.6	0.010	<2.39E-09	4.25±0.16E-07	2.90±0.84E-07	<2.14E-08	<2.51E-08
WNDMPNE	DOWN - D(8)	7.35	457	4.5	0.009	<1.92E-09	2.63±0.12E-07	1.13±0.80E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

** Apparent analytical outlier*

Table E - 1 (continued)

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNGSEEP	DOWN - D(1)	6.02	548	1.3	0.008	<9.72E-10	6.78±3.19E-09	9.12±0.92E-07	<2.14E-08	<2.37E-08
WNGSEEP	DOWN - D(2)	5.98	571	1.7	0.010	<1.08E-09	5.68±2.96E-09	7.04±0.88E-07	<2.27E-08	<2.42E-08
WNGSEEP	DOWN - D(3)	6.37	548	1.3	0.006	<1.71E-09	<2.62E-09	7.17±0.88E-07	<2.27E-08	<2.42E-08
WNGSEEP	DOWN - D(4)	6.35	589	1.3	0.007	<2.24E-09	3.80±2.93E-09	7.16±0.84E-07	<3.50E-08	<3.69E-08
WNGSEEP	DOWN - D(6)	6.29	610	1.4	0.007	<2.97E-09	9.52±3.31E-09	4.97±0.85E-07	<2.05E-08	<2.12E-08
WNGSEEP	DOWN - D(7)	6.29	630	1.3	0.008	<2.02E-09	5.26±2.78E-09	5.33±0.85E-07	<3.16E-08	<3.68E-08
WNGSEEP	DOWN - D(5)	6.10	612	1.4	0.009	<2.75E-09	3.52±2.90E-09	5.31±0.84E-07	<2.64E-08	<2.75E-08
WNGSEEP	DOWN - D(8)	6.62	582	1.4	0.007	<3.31E-09	3.40±2.85E-09	4.94±0.83E-07	<2.14E-08	<2.51E-08
WNW0105	DOWN - D(1)	7.09	968	1.2	0.007	<6.61E-09	<2.63E-09	1.02±0.10E-06	<3.66E-08	<3.35E-08
WNW0105	DOWN - D(2)	6.93	1006	1.2	0.019	<4.35E-09	6.11±4.94E-09	1.04±0.11E-06	<3.43E-08	<3.11E-08
WNW0105	DOWN - D(3)	6.87	1009	1.5	0.020	<4.75E-09	6.02±4.26E-09	1.08±0.10E-06	<2.27E-08	<2.42E-08
WNW0105	DOWN - D(4)	6.99	1002	1.1	0.014	<7.28E-09	5.37±3.22E-09	1.18±0.10E-06	<3.50E-08	<3.69E-08
WNW0105	DOWN - D(6)	6.87	1010	1.3	0.012	<7.83E-09	5.18±3.49E-09	1.10±0.10E-06	<3.50E-08	<3.69E-08
WNW0105	DOWN - D(7)	6.92	1032	1.2	0.006	<7.05E-09	7.04±3.51E-09	9.22±0.90E-07	<3.16E-08	<3.68E-08
WNW0105	DOWN - D(5)	6.83	1045	1.3	0.010	<4.60E-09	9.88±4.83E-09	9.86±0.91E-07	<2.39E-08	<2.63E-08
WNW0105	DOWN - D(8)	6.83	1058	1.3	0.010	<5.25E-09	<4.16E-09	8.54±0.95E-07	<2.64E-08	<2.75E-08
WNW0106	DOWN - D(1)	7.00	1057	3.0	0.007	<6.43E-09	1.34±0.60E-08	1.94±0.13E-06	<2.14E-08	<2.37E-08
WNW0106	DOWN - D(2)	6.73	1056	1.4	0.011	<4.25E-09	1.09±0.55E-08	1.51±0.12E-06	<2.14E-08	<2.37E-08
WNW0106	DOWN - D(3)	6.82	1053	1.7	0.012	<5.35E-09	8.96±4.38E-09	1.34±0.10E-06	<2.27E-08	<2.42E-08
WNW0106	DOWN - D(4)	6.88	984	1.8	0.022	<3.30E-09	5.00±4.13E-09	2.75±0.15E-06	<2.27E-08	<2.42E-08
WNW0106	DOWN - D(6)	6.72	986	1.4	0.013	<2.86E-09	5.30±4.53E-09	2.21±0.13E-06	<2.27E-08	<2.42E-08
WNW0106	DOWN - D(7)	6.93	1062	1.5	0.012	<6.50E-09	<4.22E-09	2.18±0.12E-06	<3.16E-08	<3.68E-08
WNW0106	DOWN - D(5)	6.84	1031	1.3	0.007	<6.83E-09	4.68±4.35E-09	2.46±0.13E-06	<2.64E-08	<2.75E-08
WNW0106	DOWN - D(8)	6.73	1058	1.5	0.006	<2.40E-09	6.58±4.52E-09	1.71±0.12E-06	<2.64E-08	<2.75E-08
WNW0116	DOWN - D(1)	7.06	1024	1.6	0.022	<4.18E-09	2.65±0.49E-08	8.50±0.93E-07	<2.14E-08	<2.37E-08
WNW0116	DOWN - D(2)	6.98	1034	2.1	0.017	<3.56E-09	5.01±0.67E-08	9.66±0.95E-07	<3.50E-08	<3.69E-08
WNW0116	DOWN - D(3)	6.92	996	1.4	0.014	<4.14E-09	2.41±0.58E-08	9.90±0.91E-07	<2.88E-08	<3.06E-08
WNW0116	DOWN - D(4)	6.41	989	1.8	0.015	<8.07E-09	7.98±0.77E-08	1.27±0.10E-06	<3.50E-08	<3.69E-08
WNW0116	DOWN - D(6)	6.93	1029	2.0	0.012	1.04±0.96E-08	1.10±0.09E-07	1.04±0.09E-06	<2.27E-08	<2.42E-08
WNW0116	DOWN - D(7)	7.21	1053	1.7	0.013	<5.73E-09	9.85±1.00E-08	9.15±0.89E-07	<2.05E-08	<2.12E-08
WNW0116	DOWN - D(5)	6.75	1059	1.6	0.015	<3.71E-09	10.0±1.02E-08	8.74±0.89E-07	<2.64E-08	<2.75E-08
WNW0116	DOWN - D(8)	6.85	1030	1.9	0.008	<5.40E-09	3.61±0.68E-08	9.75±0.92E-07	<2.64E-08	<2.75E-08
WNW0207	DOWN - D(1)	6.18	723	4.0	0.008	<3.04E-09	<4.70E-09	<7.93E-08	<2.31E-08	<1.92E-08
WNW0207	DOWN - D(2)	6.27	888	3.5	0.008	<3.87E-09	6.09±4.58E-09	8.93±7.87E-08	<2.14E-08	<2.37E-08
WNW0207	DOWN - D(3)	6.35	834	1.9	0.009	<3.95E-09	<5.02E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0207	DOWN - D(4)	6.50	974	2.7	0.005	<3.96E-09	<4.01E-09	1.57±0.76E-07	<2.27E-08	<2.42E-08
WNW0207	DOWN - D(6)	6.53	927	2.4	0.007	<7.26E-09	3.65±3.18E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0207	DOWN - D(7)	6.59	880	2.6	0.004	<4.98E-09	<2.92E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0207	DOWN - D(5)	6.45	758	3.8	0.006	<6.05E-09	<2.59E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0207	DOWN - D(8)	6.54	753	3.0	0.006	<3.31E-09	6.05±2.90E-09	<1.00E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 *(continued)*

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0601	DOWN - D(1)	6.23	490	2.0	0.020	2.45±1.96E-09	2.14±0.11E-07	3.85±0.84E-07	<2.14E-08	<2.37E-08
WNW0601	DOWN - D(2)	6.45	580	3.4	0.014	<1.81E-09	2.44±0.12E-07	<1.00E-07	<2.14E-08	<2.37E-08
WNW0601	DOWN - D(3)	6.93	499	3.2	0.017	<1.27E-09	2.06±0.11E-07	<7.43E-08	<2.27E-08	<2.42E-08
WNW0601	DOWN - D(4)	6.25	424	5.5	0.025	<1.76E-09	1.69±0.10E-07	<1.00E-07	<3.50E-08	<3.69E-08
WNW0601	DOWN - D(6)	6.22	426	4.8	0.012	<1.88E-09	1.70±0.10E-07	<1.00E-07	<3.50E-08	<3.69E-08
WNW0601	DOWN - D(7)	6.30	459	3.7	0.011	<1.52E-09	1.84±0.10E-07	<6.61E-08	<2.64E-08	<2.75E-08
WNW0601	DOWN - D(5)	6.26	372	4.3	0.010	<2.06E-09	1.32±0.09E-07	<1.00E-07	<2.14E-08	<2.51E-08
WNW0601	DOWN - D(8)	6.26	380	3.8	0.012	<2.33E-09	1.50±0.09E-07	<1.00E-07	<2.14E-08	<2.51E-08
WNW0605	DOWN - D(1)	6.39	498	3.4	0.028	<1.83E-09	2.56±0.12E-07	1.33±0.80E-07	<2.31E-08	<1.92E-08
WNW0605	DOWN - D(2)	6.57	594	2.7	0.009	<1.67E-09	2.80±0.13E-07	<1.00E-07	<2.14E-08	<2.37E-08
WNW0605	DOWN - D(3)	6.94	510	3.1	0.011	<1.38E-09	2.24±0.11E-07	<7.42E-08	<2.27E-08	<2.42E-08
WNW0605	DOWN - D(4)	6.45	443	3.8	0.021	<1.78E-09	2.14±0.11E-07	9.74±7.98E-08	<3.50E-08	<3.69E-08
WNW0605	DOWN - D(6)	6.55	485	3.1	0.007	<1.66E-09	1.92±0.11E-07	<7.36E-08	<2.05E-08	<2.12E-08
WNW0605	DOWN - D(7)	7.14	567	2.2	0.005	<3.20E-09	7.88±0.72E-08	<7.47E-08	<2.05E-08	<2.12E-08
WNW0605	DOWN - D(5)	6.36	402	2.7	0.008	<2.30E-09	1.62±0.10E-07	<1.00E-07	<2.64E-08	<2.75E-08
WNW0605	DOWN - D(8)	6.26	389	3.0	0.009	<1.82E-09	1.67±0.10E-07	<1.00E-07	<2.14E-08	<2.51E-08
WNW0801	DOWN - D(1)	6.35	935	2.2	0.006	<4.08E-09	4.17±0.16E-07	4.76±0.87E-07	<3.43E-08	<3.11E-08
WNW0801	DOWN - D(2)	6.55	960	2.5	0.010	<5.36E-09	3.78±0.15E-07	5.74±0.86E-07	<3.50E-08	<3.69E-08
WNW0801	DOWN - D(3)	6.45	958	1.7	0.006	<3.77E-09	4.62±0.20E-07	8.08±0.88E-07	<2.27E-08	<2.42E-08
WNW0801	DOWN - D(4)	6.58	1080	2.5	0.015	<5.78E-09	5.79±0.20E-07	7.25±0.86E-07	<3.50E-08	<3.69E-08
WNW0801	DOWN - D(6)	6.50	1097	2.7	0.009	<6.76E-09	5.24±0.19E-07	7.63±0.85E-07	<2.05E-08	<2.12E-08
WNW0801	DOWN - D(7)	6.71	1080	2.5	0.010	<6.28E-09	5.61±0.19E-07	7.21±0.87E-07	<3.16E-08	<3.68E-08
WNW0801	DOWN - D(5)	6.45	1013	2.3	0.009	<4.62E-09	5.92±0.20E-07	8.23±0.88E-07	<2.14E-08	<2.51E-08
WNW0801	DOWN - D(8)	6.67	982	2.3	0.014	<3.65E-09	5.68±0.23E-07	7.46±0.87E-07	<2.14E-08	<2.51E-08
WNW0802	DOWN - D(1)	6.34	249	1.3	0.008	<1.10E-09	<2.36E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0802	DOWN - D(2)	6.59	347	1.2	0.005	<1.86E-09	<2.46E-09	3.58±0.84E-07	<2.27E-08	<2.42E-08
WNW0802	DOWN - D(3)	6.56	266	1.3	0.011	<1.34E-09	<2.29E-09	2.21±0.81E-07	<3.50E-08	<3.69E-08
WNW0802	DOWN - D(4)	7.11	593	1.4	0.006	<5.59E-09	<3.81E-09	4.12±0.82E-07	<3.50E-08	<3.69E-08
WNW0802	DOWN - D(6)	6.91	722	1.4	<0.004	<3.36E-09	<2.66E-09	7.19±0.85E-07	<2.05E-08	<2.12E-08
WNW0802	DOWN - D(7)	6.88	792	1.5	0.005	<4.44E-09	<2.51E-09	5.82±0.83E-07	<2.14E-08	<2.51E-08
WNW0802	DOWN - D(5)	6.35	285	1.5	<0.004	<1.48E-09	<2.22E-09	1.63±0.79E-07	<2.64E-08	<2.75E-08
WNW0802	DOWN - D(8)	6.60	287	1.4	0.004	<1.34E-09	<2.34E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0803	DOWN - D(1)	6.61	1082	1.1	0.009	<2.18E-09	6.08±4.53E-09	1.34±0.11E-06	<3.43E-08	<3.11E-08
WNW0803	DOWN - D(2)	6.69	1190	1.8	0.010	<5.86E-09	9.47±4.06E-09	1.23±0.10E-06	<2.27E-08	<2.42E-08
WNW0803	DOWN - D(3)	6.73	1300	2.2	0.014	<7.16E-09	2.41±0.61E-08	1.26±0.10E-06	<3.50E-08	<3.69E-08
WNW0803	DOWN - D(4)	6.73	1183	1.6	0.013	<1.09E-08	9.66±3.93E-09	1.50±0.11E-06	<2.27E-08	<2.42E-08
WNW0803	DOWN - D(6)	6.71	1174	1.5	0.009	<6.69E-09	1.07±0.38E-08	1.39±0.10E-06	<2.05E-08	<2.12E-08
WNW0803	DOWN - D(7)	6.75	1177	1.5	0.015	<5.92E-09	9.31±3.56E-09	1.13±0.09E-06	<3.16E-08	<3.68E-08
WNW0803	DOWN - D(5)	6.57	1176	1.6	0.006	<4.34E-09	5.93±4.62E-09	1.17±0.10E-06	<2.64E-08	<2.75E-08
WNW0803	DOWN - D(8)	6.83	1190	1.7	0.012	<4.85E-09	8.69±4.83E-09	1.12±0.09E-06	<2.39E-08	<2.63E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 1 *(concluded)*

Contamination Indicator Parameters for the Sand and Gravel Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0804	DOWN - D(1)	6.38	617	1.8	0.009	<2.67E-09	2.59±0.46E-08	1.63±0.83E-07	<2.14E-08	<2.37E-08
WNW0804	DOWN - D(2)	6.67	658	1.6	0.010	<2.94E-09	2.17±0.42E-08	2.13±0.80E-07	<2.27E-08	<2.42E-08
WNW0804	DOWN - D(3)	6.58	684	1.6	0.011	<1.76E-09	2.40±0.44E-08	3.58±0.83E-07	<2.27E-08	<2.42E-08
WNW0804	DOWN - D(4)	6.87	734	2.1	0.012	<3.59E-09	6.52±0.69E-08	3.02±0.80E-07	<2.27E-08	<2.42E-08
WNW0804	DOWN - D(6)	6.45	731	2.4	0.009	<3.34E-09	3.29±0.51E-08	9.85±7.80E-08	<3.16E-08	<3.68E-08
WNW0804	DOWN - D(7)	6.51	767	2.6	0.009	<2.49E-09	3.94±0.54E-08	1.31±0.79E-07	<3.16E-08	<3.68E-08
WNW0804	DOWN - D(5)	6.32	665	2.3	0.012	<3.54E-09	3.56±0.53E-08	2.25±0.80E-07	<2.14E-08	<2.51E-08
WNW0804	DOWN - D(8)	6.57	713	2.2	0.006	<3.07E-09	2.74±0.53E-08	3.16±0.81E-07	<2.64E-08	<2.75E-08
WNW8603	DOWN - D(1)	6.98	1020	0.7	0.021	<3.83E-09	2.91±0.62E-08	8.24±0.92E-07	<3.43E-08	<3.11E-08
WNW8603	DOWN - D(2)	7.22	1026	0.6	0.005	<4.44E-09	1.93±0.63E-08	6.73±0.89E-07	<3.43E-08	<3.11E-08
WNW8603	DOWN - D(3)	7.01	1044	1.1	0.008	<3.52E-09	2.98±0.75E-08	9.14±0.88E-07	<2.27E-08	<2.42E-08
WNW8603	DOWN - D(4)	7.16	1029	0.7	0.010	<3.61E-09	3.10±0.77E-08	9.20±0.91E-07	<2.27E-08	<2.42E-08
WNW8603	DOWN - D(6)	7.07	1035	0.6	0.007	<5.30E-09	4.26±0.82E-08	9.13±0.90E-07	<2.27E-08	<2.42E-08
WNW8603	DOWN - D(7)	7.13	1092	0.7	0.006	<5.46E-09	4.40±0.83E-08	7.33±0.85E-07	<2.05E-08	<2.12E-08
WNW8603	DOWN - D(5)	7.12	1103	0.6	0.012	<5.11E-09	4.29±0.81E-08	8.69±0.88E-07	<2.14E-08	<2.51E-08
WNW8603	DOWN - D(8)	6.91	1144	0.8	0.005	<5.77E-09	4.62±0.85E-08	6.64±0.86E-07	<2.39E-08	<2.63E-08
WNW8604	DOWN - D(1)	6.96	1035	2.3	0.013	<2.06E-09	1.50±0.03E-06	1.39±0.11E-06	<3.66E-08	<3.35E-08
WNW8604	DOWN - D(2)	7.18	1056	1.1	0.011	<4.20E-09	2.43±0.03E-06	1.14±0.10E-06	<3.43E-08	<3.11E-08
WNW8604	DOWN - D(3)	7.02	1119	1.0	0.028	<4.90E-09	3.18±0.06E-06	8.32±0.87E-07	<3.50E-08	<3.69E-08
WNW8604	DOWN - D(4)	7.20	1108	1.4	0.038	<5.01E-09	3.55±0.06E-06	9.83±0.94E-07	<3.50E-08	<3.69E-08
WNW8604	DOWN - D(6)	7.33	1180	1.9	0.015	<3.72E-09	3.80±0.06E-06	8.29±0.87E-07	<2.64E-08	<2.75E-08
WNW8604	DOWN - D(7)	7.02	1161	2.2	<0.010	<5.98E-09	3.97±0.06E-06	1.01±0.09E-06	<2.64E-08	<2.75E-08
WNW8604	DOWN - D(5)	7.11	1150	1.6	0.011	<3.01E-09	3.90±0.06E-06	1.00±0.09E-06	<2.14E-08	<2.51E-08
WNW8604	DOWN - D(8)	7.23	1125	1.3	<0.010	<2.95E-09	4.15±0.06E-06	1.02±0.09E-06	<2.64E-08	<2.75E-08
WNW8612	DOWN - D(1)	6.99	787	0.6	0.015	<3.96E-09	<2.76E-09	2.09±0.13E-06	<2.14E-08	<2.37E-08
WNW8612	DOWN - D(2)	6.81	815	0.6	0.019	<5.24E-09	<2.55E-09	1.86±0.12E-06	<2.27E-08	<2.42E-08
WNW8612	DOWN - D(3)	7.29	819	0.6	0.025	<3.90E-09	<3.72E-09	2.24±0.13E-06	<3.50E-08	<3.69E-08
WNW8612	DOWN - D(4)	7.18	832	0.6	0.019	<4.30E-09	4.09±3.16E-09	1.97±0.12E-06	<3.50E-08	<3.69E-08
WNW8612	DOWN - D(6)	7.22	829	0.8	0.026	<3.79E-09	<2.72E-09	2.01±0.12E-06	<2.05E-08	<2.12E-08
WNW8612	DOWN - D(7)	7.24	828	0.8	0.023	<3.88E-09	3.01±2.60E-09	1.95±0.12E-06	<2.05E-08	<2.12E-08
WNW8612	DOWN - D(5)	7.25	832	0.8	0.024	<4.16E-09	<2.75E-09	1.88±0.11E-06	<2.14E-08	<2.51E-08
WNW8612	DOWN - D(8)	7.25	836	0.8	0.024	<3.65E-09	<3.34E-09	1.78±0.11E-06	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 2
Contamination Indicator Parameters for the Till-Sand Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0302	UP(1)	6.83	1350	0.7	0.010	<4.88E-09	<4.42E-09	1.11±0.80E-07	<2.14E-08	<2.37E-08
WNW0302	UP(2)	6.90	1396	0.8	0.017	<2.40E-09	1.16±0.75E-08	<1.00E-07	<2.14E-08	<2.37E-08
WNW0302	UP(3)	7.05	1515	0.7	0.009	<5.98E-09	1.70±0.91E-08	<7.10E-08	<3.50E-08	<3.69E-08
WNW0302	UP(4)	6.83	1684	0.8	0.008	<4.98E-09	<5.10E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0302	UP(6)	6.96	1687	0.6	0.004	<9.92E-09	<4.99E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0302	UP(7)	6.90	1643	0.7	0.012	<5.92E-09	<5.67E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0302	UP(5)	6.79	1629	0.8	0.008	<5.55E-09	<4.99E-09	<1.00E-07	<2.39E-08	<2.63E-08
WNW0302	UP(8)	6.82	1612	0.7	0.010	<6.52E-09	<7.03E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0402	UP(1)	6.87	1201	0.6	0.007	<3.73E-09	<4.86E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0402	UP(2)	7.11	1131	0.5	0.011	<4.45E-09	1.06±0.69E-08	<1.00E-07	<3.43E-08	<3.11E-08
WNW0402	UP(3)	7.27	1146	0.6	0.010	<6.27E-09	8.13±5.82E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0402	UP(4)	7.04	1193	0.5	0.014	<5.71E-09	<4.51E-09	1.80±0.80E-07	<3.50E-08	<3.69E-08
WNW0402	UP(6)	7.17	1164	0.5	0.011	<8.76E-09	<4.92E-09	<7.67E-08	<3.50E-08	<3.69E-08
WNW0402	UP(7)	7.08	1191	0.5	0.006	<6.46E-09	<5.22E-09	<7.95E-08	<2.05E-08	<2.12E-08
WNW0402	UP(5)	6.94	1204	0.6	0.010	<6.38E-09	<5.04E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0402	UP(8)	6.89	1247	0.5	<0.004	<6.65E-09	<4.63E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0404	UP(1)	7.71	239	0.4	<0.004	<1.84E-09	<2.34E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0404	UP(2)	7.81	260	0.4	<0.004	<1.73E-09	<2.31E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0404	UP(3)	7.95	269	0.4	<0.004	<2.26E-09	<3.30E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0404	UP(4)	7.68	256	0.3	<0.004	<1.22E-09	<2.20E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0404	UP(6)	7.86	269	0.3	<0.004	<1.77E-09	<2.18E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0404	UP(7)	7.68	267	0.4	<0.004	<1.50E-09	<2.56E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0404	UP(5)	7.36	276	0.4	<0.004	<1.30E-09	3.56±2.46E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0404	UP(8)	7.81	265	0.4	<0.004	<1.87E-09	3.42±2.47E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0202	DOWN - B(1)	11.71	1935	1.2	0.009	<3.08E-09	3.86±0.66E-08	<8.12E-08	<3.66E-08	<3.35E-08
WNW0202	DOWN - B(2)	10.67	1216	1.2	<0.004	<4.80E-09	2.75±0.48E-08	<1.00E-07	<3.43E-08	<3.11E-08
WNW0202	DOWN - B(3)	11.59	1174	0.8	0.004	<2.42E-09	2.34±0.44E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0202	DOWN - B(4)	11.54	1087	1.0	<0.005	<1.89E-08	3.34±0.61E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0202	DOWN - B(6)	7.37	969	0.8	<0.004	<3.37E-09	1.05±0.44E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0202	DOWN - B(7)	10.59	990	0.9	<0.004	<2.48E-09	1.63±0.50E-08	<9.01E-08	<3.16E-08	<3.68E-08
WNW0202	DOWN - B(5)	11.76	763	0.8	<0.004	<5.66E-09	1.53±0.49E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0202	DOWN - B(8)	11.45	789	0.8	0.005	<2.78E-09	1.91±0.49E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0204	DOWN - B(1)	8.29	532	0.6	0.007	<2.81E-09	6.28±3.21E-09	2.31±0.92E-07	<2.98E-08	<2.64E-08
WNW0204	DOWN - B(2)	7.81	544	0.5	0.012	<2.34E-09	4.76±2.86E-09	<7.96E-08	<2.27E-08	<2.42E-08
WNW0204	DOWN - B(3)	8.39	545	0.4	0.005	<2.07E-09	4.73±2.93E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0204	DOWN - B(4)	8.47	527	0.5	0.007	<2.41E-09	2.82±2.64E-09	1.29±0.80E-07	<2.27E-08	<2.42E-08
WNW0204	DOWN - B(6)	8.41	560	0.5	<0.004	<2.00E-09	5.29±2.79E-09	<7.63E-08	<2.05E-08	<2.12E-08
WNW0204	DOWN - B(7)	7.80	585	0.6	<0.004	<2.22E-09	3.81±2.91E-09	<7.28E-08	<3.16E-08	<3.68E-08
WNW0204	DOWN - B(5)	8.38	596	0.5	<0.004	<3.42E-09	2.70±2.49E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0204	DOWN - B(8)	8.12	595	0.6	0.011	<2.91E-09	2.65±2.42E-09	<1.00E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 2 (concluded)
Contamination Indicator Parameters for the Till-Sand Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0206	DOWN - B(1)	7.31	577	0.8	0.010	2.08±2.04E-09	<2.45E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW0206	DOWN - B(2)	7.08	609	0.7	0.004	<2.65E-09	<2.27E-09	8.21±7.90E-08	<2.27E-08	<2.42E-08
WNW0206	DOWN - B(3)	7.45	607	0.9	0.005	3.95±3.32E-09	<2.68E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0206	DOWN - B(4)	7.54	604	0.7	<0.005	<2.64E-09	3.45±2.61E-09	<7.55E-08	<2.27E-08	<2.42E-08
WNW0206	DOWN - B(6)	7.56	621	0.6	0.006	<2.77E-09	<2.58E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0206	DOWN - B(7)	7.42	622	0.7	<0.004	<2.27E-09	<2.72E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0206	DOWN - B(5)	7.63	631	0.6	<0.004	<3.70E-09	<2.30E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0206	DOWN - B(8)	7.63	162*	0.6	0.004	<2.87E-09	<2.41E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0208	DOWN - B(1)	7.43	315	0.8	<0.004	<2.12E-09	2.44±2.34E-09	<1.00E-07	<2.31E-08	2.67±0.54E-08
WNW0208	DOWN - B(2)	7.21	327	0.7	<0.004	2.11±1.69E-09	4.50±2.53E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0208	DOWN - B(3)	7.65	316	0.4	<0.004	<1.71E-09	<2.52E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0208	DOWN - B(4)	7.74	310	0.7	<0.004	<2.09E-09	3.57±2.40E-09	<1.00E-07	<2.88E-08	<3.06E-08
WNW0208	DOWN - B(6)	7.77	324	0.6	<0.004	<2.37E-09	<2.24E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0208	DOWN - B(7)	7.50	315	0.9	<0.004	3.53±2.77E-09	<2.62E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0208	DOWN - B(5)	7.86	317	0.6	<0.004	<1.52E-09	<2.21E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0208	DOWN - B(8)	7.80	321	0.6	<0.004	<1.55E-09	3.07±2.35E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0701	DOWN - B(1)	7.18	853	0.7	0.005	<3.75E-09	<2.64E-09	<1.00E-07	<2.98E-08	<2.64E-08
WNW0701	DOWN - B(2)	6.77	802	1.5	<0.004	<1.87E-09	<2.66E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0701	DOWN - B(3)	7.25	791	0.6	<0.004	<4.72E-09	<2.64E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0701	DOWN - B(4)	7.38	798	0.7	<0.004	<4.10E-09	<2.62E-09	<7.56E-08	<2.27E-08	<2.42E-08
WNW0701	DOWN - B(6)	7.05	843	0.6	<0.004	<3.30E-09	<2.62E-09	<6.93E-08	<3.50E-08	<3.69E-08
WNW0701	DOWN - B(7)	7.21	935	0.6	<0.004	<4.06E-09	<2.70E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0701	DOWN - B(5)	7.25	992	0.6	<0.004	<6.00E-09	<2.76E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0701	DOWN - B(8)	7.06	1007	0.6	<0.004	<3.81E-09	<2.92E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0905	DOWN - B(1)	6.63	1651	1.4	<0.004	<1.30E-08	<7.56E-09	1.20±0.82E-07	<3.66E-08	<3.35E-08
WNW0905	DOWN - B(2)	6.64	1635	1.1	0.014	1.25±1.00E-08	7.49±5.45E-09	2.51±0.77E-07	<2.14E-08	<2.37E-08
WNW0905	DOWN - B(3)	6.74	1628	1.1	<0.004	<8.46E-09	7.76±5.20E-09	3.46±0.79E-07	<2.27E-08	<2.42E-08
WNW0905	DOWN - B(4)	6.67	1629	1.0	<0.004	<9.90E-09	6.59±4.79E-09	3.56±0.78E-07	<3.50E-08	<3.69E-08
WNW0905	DOWN - B(6)	6.74	1609	1.2	<0.004	<8.03E-09	<5.00E-09	3.13±0.84E-07	<3.16E-08	<3.68E-08
WNW0905	DOWN - B(7)	6.70	1617	1.1	<0.004	<8.07E-09	5.56±5.07E-09	1.86±0.83E-07	<2.64E-08	<2.75E-08
WNW0905	DOWN - B(5)	6.89	1612	1.1	<0.004	<8.82E-09	9.48±5.54E-09	3.10±0.83E-07	<2.14E-08	<2.51E-08
WNW0905	DOWN - B(8)	6.52	1600	1.1	<0.004	<4.09E-09	9.42±6.14E-09	2.14±0.81E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

** Apparent analytical outlier*

Table E - 3
Contamination Indicator Parameters for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0405	UP(1)	6.97	843	0.7	0.004	<2.18E-09	5.19±3.14E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0405	UP(2)	7.17	816	1.4	<0.004	<3.06E-09	1.77±0.48E-08	1.23±0.78E-07	<3.43E-08	<3.11E-08
WNW0405	UP(3)	7.20	964	1.2	0.005	<3.12E-09	6.34±4.21E-09	<6.84E-08	<3.50E-08	<3.69E-08
WNW0405	UP(4)	7.14	931	1.8	0.014	<5.87E-09	1.03±0.36E-08	9.81±8.04E-08	<3.50E-08	<3.69E-08
WNW0405	UP(6)	7.31	890	1.5	0.007	<5.44E-09	9.70±3.42E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0405	UP(7)	7.21	886	1.7	<0.004	<3.38E-09	9.34±3.55E-09	<7.57E-08	<2.64E-08	<2.75E-08
WNW0405	UP(5)	6.98	837	1.6	0.005	<4.70E-09	7.66±3.34E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0405	UP(8)	7.24	821	1.8	0.004	<3.91E-09	5.02±2.85E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0704	UP(1)	6.30	1195	19.5	0.036	<3.21E-09	1.29±0.52E-08	<1.00E-07	<2.31E-08	<1.92E-08
WNW0704	UP(2)	6.42	1167	18.4	0.026	<6.12E-09	1.63±0.51E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0704	UP(3)	6.39	1070	17.4	0.018	<6.14E-09	2.70±0.95E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0704	UP(4)	6.39	1112	18.2	0.020	1.02±0.95E-08	2.22±0.60E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW0704	UP(6)	6.90	1147	19.1	0.028	<8.44E-09	2.16±0.50E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0704	UP(7)	6.35	1163	21.8	0.024	<6.46E-09	1.93±0.57E-08	<8.25E-08	<2.60E-08	<2.90E-08
WNW0704	UP(5)	6.33	1162	22.0	0.043	<4.97E-09	1.42±0.40E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0704	UP(8)	6.25	1065	21.9	0.041	<4.72E-09	2.42±0.58E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0707	UP(1)	6.57	358	2.6	0.005	<1.42E-09	6.21±2.80E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW0707	UP(2)	7.36	331	2.5	0.008	<1.26E-09	5.95±2.67E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0707	UP(3)	6.49	276	1.9	0.006	<1.30E-09	5.28±2.72E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0707	UP(4)	6.60	425	2.6	0.006	<2.67E-09	3.78±2.82E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0707	UP(6)	7.00	494	2.6	0.007	<1.49E-09	4.14±2.87E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0707	UP(7)	6.70	492	2.9	0.006	<2.34E-09	5.26±3.03E-09	<7.69E-08	<2.05E-08	<2.12E-08
WNW0707	UP(5)	6.48	408	2.7	0.005	<1.96E-09	<2.53E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0707	UP(8)	6.32	330	2.8	0.006	<1.11E-09	5.52±2.81E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0109	DOWN - B(1)	7.15	739	0.8	<0.004	<3.36E-09	4.74±2.86E-09	4.30±0.85E-07	<2.14E-08	<2.37E-08
WNW0109	DOWN - B(2)	7.18	685	0.6	<0.004	<2.92E-09	3.21±2.73E-09	5.43±0.84E-07	<3.50E-08	<3.69E-08
WNW0109	DOWN - B(3)	7.01	670	0.7	<0.004	<2.53E-09	<2.58E-09	1.17±0.07E-06	<3.50E-08	<3.69E-08
WNW0109	DOWN - B(4)	7.18	616	0.6	0.006	<3.84E-09	<2.45E-09	1.05±0.10E-06	<2.27E-08	<2.42E-08
WNW0109	DOWN - B(6)	7.14	620	0.5	<0.004	<3.05E-09	2.80±2.73E-09	1.05±0.09E-06	<2.27E-08	<2.42E-08
WNW0109	DOWN - B(7)	7.22	612	0.9	<0.004	<2.74E-09	3.29±2.59E-09	1.03±0.09E-06	<2.05E-08	<2.12E-08
WNW0109	DOWN - B(5)	7.05	610	0.6	<0.004	<2.93E-09	<2.68E-09	1.09±0.09E-06	<2.64E-08	<2.75E-08
WNW0109	DOWN - B(8)	7.31	597	0.6	<0.004	<2.92E-09	5.03±2.75E-09	1.46±0.10E-06	<2.64E-08	<2.75E-08
WNW0110	DOWN - B(1)	7.23	660	0.5	<0.004	<3.75E-09	<2.55E-09	9.49±0.96E-07	<2.14E-08	<2.37E-08
WNW0110	DOWN - B(2)	7.18	618	0.5	<0.004	<3.49E-09	2.64±2.64E-09	8.30±0.92E-07	<2.27E-08	<2.42E-08
WNW0110	DOWN - B(3)	7.08	637	0.5	<0.004	<3.35E-09	<2.43E-09	1.05±0.09E-06	<3.50E-08	<3.69E-08
WNW0110	DOWN - B(4)	7.20	572	0.4	<0.005	<2.76E-09	2.42±2.40E-09	1.13±0.10E-06	<3.50E-08	<3.69E-08
WNW0110	DOWN - B(6)	7.17	578	0.4	<0.004	<3.62E-09	4.14±2.70E-09	1.14±0.10E-06	<2.27E-08	<2.42E-08
WNW0110	DOWN - B(7)	7.25	569	0.5	<0.004	<3.73E-09	<2.41E-09	1.23±0.10E-06	<2.05E-08	<2.12E-08
WNW0110	DOWN - B(5)	7.08	602	0.5	<0.004	<3.27E-09	<2.48E-09	1.11±0.09E-06	<2.64E-08	<2.75E-08
WNW0110	DOWN - B(8)	7.30	582	0.5	<0.004	<3.28E-09	<2.40E-09	1.11±0.09E-06	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 3 (continued)
Contamination Indicator Parameters for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0115	DOWN - B(1)	7.31	580	0.6	<0.004	<2.78E-09	4.22±2.64E-09	3.18±0.84E-07	<3.66E-08	<3.35E-08
WNW0115	DOWN - B(2)	7.41	520	0.6	0.006	<2.29E-09	4.08±2.71E-09	3.87±0.82E-07	<2.14E-08	<2.37E-08
WNW0115	DOWN - B(3)	7.25	584	0.6	<0.004	<2.98E-09	5.19±2.71E-09	7.79±0.84E-07	<2.27E-08	<2.42E-08
WNW0115	DOWN - B(4)	7.43	492	0.5	0.027	<2.58E-09	3.80±2.62E-09	8.36±0.90E-07	<3.50E-08	<3.69E-08
WNW0115	DOWN - B(6)	7.39	559	0.5	<0.004	<2.47E-09	<2.69E-09	6.65±0.85E-07	<2.27E-08	<2.42E-08
WNW0115	DOWN - B(7)	7.64	508	0.5	<0.004	<2.68E-09	2.75±2.46E-09	5.03±0.82E-07	<3.16E-08	<3.68E-08
WNW0115	DOWN - B(5)	7.39	544	0.5	<0.004	<2.18E-09	3.08±2.74E-09	5.26±0.83E-07	<2.64E-08	<2.75E-08
WNW0115	DOWN - B(8)	7.27	567	0.5	<0.004	<2.40E-09	<2.52E-09	6.14±0.86E-07	<2.64E-08	<2.75E-08
WNW0702	DOWN - B(1)	7.07	1038	0.6	<0.004	2.96±2.90E-09	3.12±2.83E-09	<7.80E-08	<3.66E-08	<3.35E-08
WNW0702	DOWN - B(2)	6.78	964	1.6	<0.004	8.77±7.40E-09	7.07±3.02E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0702	DOWN - B(3)	7.06	964	0.9	<0.004	<4.17E-09	6.90±3.16E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0702	DOWN - B(4)	7.29	962	0.9	<0.004	7.65±6.00E-09	4.41±3.09E-09	<7.76E-08	<2.27E-08	<2.42E-08
WNW0702	DOWN - B(6)	8.12	756	1.0	<0.004	<7.94E-09	3.57±2.96E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0702	DOWN - B(7)	7.23	984	0.7	<0.004	<4.77E-09	4.91±2.90E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0702	DOWN - B(5)	7.19	980	0.8	<0.004	<3.83E-09	<2.72E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0702	DOWN - B(8)	7.12	474	0.6	<0.004	<4.29E-09	3.97±3.00E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0703	DOWN - B(1)	7.18	857	0.4	<0.004	<2.46E-09	3.42±2.86E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW0703	DOWN - B(2)	7.67	770	0.6	<0.004	<2.95E-09	<2.82E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0703	DOWN - B(3)	7.18	851	0.6	<0.004	<3.97E-09	<2.67E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0703	DOWN - B(4)	7.28	815	0.5	<0.004	<3.32E-09	5.12±3.05E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0703	DOWN - B(6)	7.36	869	0.5	<0.004	6.53±5.49E-09	<2.71E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0703	DOWN - B(7)	7.18	911	0.5	<0.004	<4.24E-09	4.63±2.81E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0703	DOWN - B(5)	7.13	940	0.4	<0.004	<4.79E-09	3.93±2.77E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0703	DOWN - B(8)	6.99	834	0.5	<0.004	<4.35E-09	4.17±2.69E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0705	DOWN - B(1)	7.24	455	1.9	0.006	<1.03E-09	4.96±2.79E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW0705	DOWN - B(2)	6.80	382	1.6	0.005	<1.62E-09	5.68±2.69E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0705	DOWN - B(3)	7.26	430	1.5	0.007	<2.14E-09	3.64±2.66E-09	<7.50E-08	<3.50E-08	<3.69E-08
WNW0705	DOWN - B(4)	7.32	477	1.5	<0.004	<2.20E-09	4.46±2.88E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0705	DOWN - B(6)	8.05	511	1.7	0.005	<2.77E-09	<2.75E-09	<7.32E-08	<2.27E-08	<2.42E-08
WNW0705	DOWN - B(7)	7.21	565	1.6	<0.004	<3.61E-09	4.68±2.76E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0705	DOWN - B(5)	6.96	327	1.7	<0.004	<3.53E-09	<2.63E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0705	DOWN - B(8)	7.11	508	2.0	<0.004	<1.80E-09	<2.57E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0904	DOWN - B(1)	7.06	1064	1.1	<0.004	<3.47E-09	5.71±3.31E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW0904	DOWN - B(2)	7.23	996	1.1	<0.004	<4.69E-09	<2.88E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0904	DOWN - B(3)	7.18	960	1.5	<0.004	<6.39E-09	4.39±3.01E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0904	DOWN - B(4)	7.10	909	0.9	<0.004	<5.23E-09	<2.92E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0904	DOWN - B(6)	7.18	856	0.8	<0.004	<4.71E-09	<2.74E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW0904	DOWN - B(7)	7.20	855	0.6	<0.004	<3.81E-09	3.72±2.64E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0904	DOWN - B(5)	7.37	822	0.8	<0.004	<2.81E-09	4.25±2.71E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0904	DOWN - B(8)	7.00	827	0.6	<0.004	3.60±3.53E-09	4.45±2.99E-09	<1.00E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 3 (continued)
Contamination Indicator Parameters for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1101B	DOWN - B(1)	7.02	1184	0.6	0.007	<4.72E-09	1.41±0.59E-08	<1.00E-07	<3.43E-08	<3.11E-08
WNW1101B	DOWN - B(2)	6.91	1126	0.6	<0.004	7.76±6.58E-09	7.79±4.45E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1101B	DOWN - B(3)	7.15	1103	0.5	<0.004	1.33±0.81E-08	6.08±3.33E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1101B	DOWN - B(4)	7.08	970	0.6	<0.004	<6.28E-09	1.03±0.35E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW1101B	DOWN - B(6)	7.29	928	0.5	<0.004	<3.88E-09	9.05±3.35E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1101B	DOWN - B(7)	7.32	912	0.6	<0.004	<4.87E-09	5.26±3.09E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101B	DOWN - B(5)	7.12	910	0.6	<0.004	<2.52E-09	5.43±3.25E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101B	DOWN - B(8)	7.10	915	0.6	<0.004	<3.50E-09	5.20±3.88E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1106B	DOWN - B(1)	7.24	803	0.9	<0.004	<2.71E-09	4.47±2.82E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1106B	DOWN - B(2)	7.14	830	0.8	<0.004	<3.62E-09	7.81±3.27E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1106B	DOWN - B(3)	7.02	837	0.7	<0.004	<2.40E-09	3.65±3.09E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1106B	DOWN - B(4)	7.13	849	0.7	<0.004	<4.67E-09	6.20±3.00E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1106B	DOWN - B(6)	7.14	814	0.8	<0.004	<5.01E-09	4.71±2.85E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1106B	DOWN - B(7)	7.32	819	0.7	<0.004	<4.73E-09	5.80±3.12E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1106B	DOWN - B(5)	6.98	807	0.7	<0.004	<4.53E-09	3.41±3.00E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1106B	DOWN - B(8)	7.29	821	0.7	<0.004	<4.75E-09	<3.09E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1109B	DOWN - B(1)	7.58	459	0.6	<0.004	<2.28E-09	3.19±2.54E-09	5.05±0.83E-07	<2.14E-08	<2.37E-08
WNW1109B	DOWN - B(2)	7.43	743	0.6	<0.004	<2.15E-09	<2.13E-09	5.50±0.87E-07	<2.88E-08	<3.06E-08
WNW1109B	DOWN - B(3)	7.36	490	0.7	<0.004	<1.93E-09	<2.62E-09	5.48±0.88E-07	<3.50E-08	<3.69E-08
WNW1109B	DOWN - B(4)	7.67	484	0.6	<0.004	<2.72E-09	<2.41E-09	4.68±0.82E-07	<2.27E-08	<2.42E-08
WNW1109B	DOWN - B(6)	7.62	458	0.7	<0.004	<1.86E-09	<2.45E-09	3.79±0.84E-07	<2.05E-08	<2.12E-08
WNW1109B	DOWN - B(7)	7.89	478	0.6	<0.004	<1.80E-09	<2.37E-09	3.98±0.82E-07	<2.05E-08	<2.12E-08
WNW1109B	DOWN - B(5)	7.56	486	0.7	<0.004	<1.73E-09	3.09±2.81E-09	4.51±0.83E-07	<2.64E-08	<2.75E-08
WNW1109B	DOWN - B(8)	7.59	485	0.7	<0.004	<1.77E-09	<2.60E-09	4.14±0.83E-07	<2.39E-08	<2.63E-08
WNW0107	DOWN - C(1)	7.31	1107	0.9	<0.004	<5.76E-09	7.35±3.34E-09	9.20±0.96E-07	<2.14E-08	<2.37E-08
WNW0107	DOWN - C(2)	6.88	1002	0.9	<0.004	<6.32E-09	6.68±4.80E-09	1.26±0.10E-06	<3.43E-08	<3.11E-08
WNW0107	DOWN - C(3)	6.89	926	1.0	<0.004	<4.08E-09	4.03±3.97E-09	1.30±0.10E-06	<2.27E-08	<2.42E-08
WNW0107	DOWN - C(4)	7.11	924	0.8	<0.004	<6.11E-09	2.76±2.75E-09	1.00±0.09E-06	<3.50E-08	<3.69E-08
WNW0107	DOWN - C(6)	6.99	962	0.7	<0.004	<4.75E-09	4.41±3.15E-09	1.43±0.11E-06	<2.27E-08	<2.42E-08
WNW0107	DOWN - C(7)	7.00	965	0.6	<0.004	<5.16E-09	4.69±2.92E-09	1.24±0.10E-06	<3.16E-08	<3.68E-08
WNW0107	DOWN - C(5)	7.01	960	0.7	<0.004	<3.84E-09	3.87±3.06E-09	1.33±0.10E-06	<2.64E-08	<2.75E-08
WNW0107	DOWN - C(8)	6.87	916	0.9	<0.004	<1.97E-09	3.39±2.99E-09	1.40±0.10E-06	<2.64E-08	<2.75E-08
WNW0108	DOWN - C(1)	7.62	1161	0.9	<0.004	<5.36E-09	5.95±3.17E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0108	DOWN - C(2)	6.83	1228	0.8	<0.004	<5.54E-09	6.08±3.07E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0108	DOWN - C(3)	7.06	1077	0.8	<0.004	<5.87E-09	6.76±3.28E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0108	DOWN - C(4)	7.14	912	0.8	<0.004	<3.91E-09	5.73±3.05E-09	<7.85E-08	<2.27E-08	<2.42E-08
WNW0108	DOWN - C(6)	7.04	911	0.8	<0.004	<5.43E-09	4.87±2.92E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0108	DOWN - C(7)	7.12	839	0.8	<0.004	<4.64E-09	4.47±2.79E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0108	DOWN - C(5)	7.12	809	0.8	<0.004	<4.50E-09	3.58±2.71E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0108	DOWN - C(8)	7.19	804	0.8	<0.004	<3.61E-09	<2.77E-09	<1.00E-07	<2.57E-08	<3.01E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 3 *(continued)*
Contamination Indicator Parameters for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0114	DOWN - C(1)	7.29	623	0.5	<0.004	<2.90E-09	4.45±2.84E-09	4.65±0.85E-07	<2.14E-08	<2.37E-08
WNW0114	DOWN - C(2)	7.14	607	0.5	<0.004	<2.47E-09	<2.50E-09	3.54±0.84E-07	<2.27E-08	<2.42E-08
WNW0114	DOWN - C(3)	7.02	611	0.8	<0.004	<2.07E-09	4.52±2.84E-09	3.50±0.78E-07	<2.27E-08	<2.42E-08
WNW0114	DOWN - C(4)	7.12	555	0.5	<0.005	<2.08E-09	5.41±2.73E-09	3.44±0.83E-07	<2.27E-08	<2.42E-08
WNW0114	DOWN - C(6)	7.08	559	0.5	<0.004	<2.26E-09	<2.40E-09	3.56±0.81E-07	<2.27E-08	<2.42E-08
WNW0114	DOWN - C(7)	7.11	566	0.5	<0.004	<3.47E-09	<2.35E-09	3.45±0.80E-07	<2.05E-08	<2.12E-08
WNW0114	DOWN - C(5)	7.13	606	0.5	<0.004	<2.84E-09	<2.75E-09	4.98±0.83E-07	<2.14E-08	<2.51E-08
WNW0114	DOWN - C(8)	6.96	650	0.7	<0.004	<1.87E-09	<2.74E-09	3.13±0.82E-07	<2.64E-08	<2.75E-08
WNW0409	DOWN - C(1)	7.37	404	0.4	<0.004	<1.62E-09	6.75±3.12E-09	6.21±0.86E-07	<2.14E-08	<2.37E-08
WNW0409	DOWN - C(2)	7.94	403	0.4	0.013	<1.69E-09	7.74±2.83E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW0409	DOWN - C(3)	7.58	388	0.4	<0.004	2.46±2.27E-09	8.43±3.18E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0409	DOWN - C(4)	7.74	377	0.3	0.017	<2.50E-09	5.22±2.78E-09	1.22±0.82E-07	<2.27E-08	<2.42E-08
WNW0409	DOWN - C(6)	7.68	396	0.3	<0.004	3.10±2.88E-09	3.74±2.52E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0409	DOWN - C(7)	7.70	399	0.5	<0.004	<3.00E-09	4.54±2.61E-09	<7.19E-08	<3.16E-08	<3.68E-08
WNW0409	DOWN - C(5)	7.46	411	0.4	<0.004	<2.26E-09	4.56±2.59E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0409	DOWN - C(8)	7.79	397	0.5	<0.004	<1.47E-09	1.12±0.33E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0910	DOWN - C(5)	7.25	1434	5.1	<0.004	<5.04E-09	1.36±0.54E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW0910	DOWN - C(8)	7.04	1422	2.7	<0.004	1.57±1.03E-08	1.19±0.51E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW1102B	DOWN - C(1)	7.28	649	0.4	<0.004	<2.40E-09	4.57±2.54E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW1102B	DOWN - C(2)	7.34	688	0.5	0.004	<3.74E-09	<2.67E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1102B	DOWN - C(3)	7.01	670	0.5	<0.004	<4.01E-09	<2.62E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1102B	DOWN - C(4)	7.18	601	0.5	<0.004	<2.75E-09	4.60±2.91E-09	<7.79E-08	<2.27E-08	<2.42E-08
WNW1102B	DOWN - C(6)	7.13	641	0.6	<0.004	<4.43E-09	<2.50E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1102B	DOWN - C(7)	7.13	635	0.5	<0.004	<2.81E-09	<2.64E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1102B	DOWN - C(5)	7.03	612	0.6	<0.004	<3.84E-09	<2.62E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1102B	DOWN - C(8)	7.16	577	0.5	<0.004	<2.74E-09	2.83±2.82E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1103B	DOWN - C(1)	6.98	729	0.6	0.007	<3.86E-09	3.27±2.72E-09	<7.48E-08	<2.14E-08	<2.37E-08
WNW1103B	DOWN - C(2)	7.51	772	0.5	0.007	<5.09E-09	4.81±3.15E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1103B	DOWN - C(3)	7.21	757	0.7	<0.004	<2.92E-09	6.05±3.17E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1103B	DOWN - C(4)	7.13	771	0.6	<0.004	<5.79E-09	3.29±2.83E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1103B	DOWN - C(6)	7.11	742	0.6	<0.004	<4.88E-09	<2.60E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1103B	DOWN - C(7)	7.09	728	0.6	<0.004	<4.17E-09	<2.70E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1103B	DOWN - C(5)	7.00	752	0.7	<0.004	<3.99E-09	<2.52E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1103B	DOWN - C(8)	7.16	659	0.7	<0.004	<2.61E-09	3.66±2.92E-09	<1.00E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Well WNW0910 was incorporated into the groundwater program in late 1992.

Table E - 3 *(concluded)*
Contamination Indicator Parameters for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1104B	DOWN - C(1)	6.98	704	0.8	<0.004	<3.14E-09	3.30±2.42E-09	1.77±0.78E-07	<2.14E-08	<2.37E-08
WNW1104B	DOWN - C(2)	7.13	731	0.7	<0.004	<4.43E-09	3.35±2.95E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1104B	DOWN - C(3)	7.22	716	0.6	<0.004	<3.81E-09	3.83±2.99E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1104B	DOWN - C(4)	7.21	709	0.6	<0.004	<4.53E-09	2.66±2.53E-09	<1.00E-07	<2.88E-08	<3.06E-08
WNW1104B	DOWN - C(6)	7.29	653	0.8	<0.004	<2.41E-09	3.77±2.66E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1104B	DOWN - C(7)	7.44	654	0.6	<0.004	<2.72E-09	4.91±2.89E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1104B	DOWN - C(5)	7.27	645	0.7	<0.004	<3.36E-09	<2.69E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1104B	DOWN - C(8)	7.46	656	0.7	<0.004	<3.52E-09	<2.70E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1105A	DOWN - C(1)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1105A	DOWN - C(2)	6.73	1333	3.3	<0.004	<5.26E-09	1.30±0.40E-08	<8.16E-08	<3.50E-08	<3.69E-08
WNW1105A	DOWN - C(3)	6.87	1100	2.0	<0.004	5.83±5.38E-09	3.54±3.13E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1105A	DOWN - C(4)	7.12	983	1.3	<0.004	<6.79E-09	5.52±3.28E-09	<7.96E-08	<2.27E-08	<2.42E-08
WNW1105A	DOWN - C(6)	7.06	957	1.4	<0.004	1.22±0.68E-08	7.30±3.14E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1105A	DOWN - C(7)	6.99	933	1.4	<0.004	8.19±6.34E-09	4.71±3.00E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1105A	DOWN - C(5)	7.02	628	1.2	<0.004	<5.07E-09	<2.79E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1105A	DOWN - C(8)	7.18	900	1.4	<0.004	<3.34E-09	3.78±3.76E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1105B	DOWN - C(1)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1105B	DOWN - C(2)	N/A	N/A	N/A	N/A	N/A	N/A	<1.00E-07	N/A	N/A
WNW1105B	DOWN - C(3)	N/A	N/A	N/A	N/A	<5.15E-09	<1.21E-08	<1.00E-07	<2.93E-07	<2.66E-07
WNW1105B	DOWN - C(4)	7.02	1172	1.6	<0.004	<9.12E-09	6.53±3.46E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1105B	DOWN - C(6)	7.10	1130	1.3	<0.004	<5.54E-09	7.84±3.26E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1105B	DOWN - C(7)	7.02	1055	1.3	<0.004	<6.04E-09	4.19±2.68E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1105B	DOWN - C(5)	7.07	707	3.4	<0.004	<5.02E-09	<2.92E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1105B	DOWN - C(8)	7.08	1026	2.3	0.005	<6.16E-09	5.30±3.95E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1111A	DOWN - C(1)	6.74	1376	0.7	<0.004	<7.01E-09	8.30±5.15E-09	1.43±0.77E-07	<2.14E-08	<2.37E-08
WNW1111A	DOWN - C(2)	7.16	1418	0.5	<0.004	<6.68E-09	<4.07E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1111A	DOWN - C(3)	6.77	1304	0.7	<0.004	<5.83E-09	5.65±4.57E-09	<8.17E-08	<3.50E-08	<3.69E-08
WNW1111A	DOWN - C(4)	6.81	1104	0.7	<0.004	<1.10E-08	6.49±3.57E-09	<7.83E-08	<2.27E-08	<2.42E-08
WNW1111A	DOWN - C(6)	6.85	1072	0.7	<0.004	9.72±7.53E-09	8.82±3.41E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1111A	DOWN - C(7)	7.03	1102	0.7	<0.004	<6.25E-09	8.15±3.18E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1111A	DOWN - C(5)	6.85	1105	0.8	<0.004	<5.97E-09	5.99±4.46E-09	<7.66E-08	<2.39E-08	<2.63E-08
WNW1111A	DOWN - C(8)	6.74	1138	0.8	<0.004	<5.38E-09	4.88±4.39E-09	<7.83E-08	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 4

Contamination Indicator Parameters for the Lacustrine Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0901	UP(1)	7.58	385	0.5	<0.004	<1.02E-09	7.22±3.00E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW0901	UP(2)	7.65	402	0.5	0.007	<1.32E-09	3.54±2.79E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0901	UP(3)	7.59	389	0.6	<0.004	<2.55E-09	8.54±2.90E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0901	UP(4)	7.73	383	0.4	<0.004	<2.06E-09	7.68±3.18E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0901	UP(6)	7.51	383	0.6	<0.004	<2.24E-09	<2.68E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0901	UP(7)	7.63	383	0.6	<0.004	<1.19E-09	4.88±2.73E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0901	UP(5)	7.42	382	0.7	<0.004	<1.11E-09	6.39±2.96E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0901	UP(8)	7.77	383	0.7	<0.004	<1.54E-09	5.66±2.94E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0902	UP(1)	8.14	422	0.6	<0.004	<1.16E-09	5.90±2.92E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW0902	UP(2)	7.77	445	0.6	0.007	<1.45E-09	4.02±2.87E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0902	UP(3)	7.93	446	0.5	0.004	<2.01E-09	3.67±2.69E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0902	UP(4)	8.17	417	0.4	<0.004	<2.37E-09	4.58±2.67E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0902	UP(6)	7.96	440	0.4	<0.004	<2.61E-09	<2.65E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0902	UP(7)	7.86	364	0.4	<0.004	<2.12E-09	4.82±2.64E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0902	UP(5)	7.92	453	0.5	<0.004	<2.76E-09	5.09±2.63E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0902	UP(8)	7.53	451	0.6	0.005	<1.30E-09	3.34±2.65E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1001	UP(1)	7.53	585	0.4	<0.004	2.28±1.83E-09	2.56±2.55E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1001	UP(2)	7.66	475	0.4	0.016	<1.58E-09	5.84±2.89E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW1001	UP(3)	7.68	443	0.4	0.016	<1.62E-09	4.50±2.74E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1001	UP(4)	7.66	431	0.4	<0.004	2.93±2.71E-09	3.35±2.72E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1001	UP(6)	7.64	444	0.4	<0.004	<2.08E-09	4.60±2.93E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1001	UP(7)	7.48	439	0.5	<0.004	<1.48E-09	6.48±2.78E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1001	UP(5)	7.45	445	0.4	<0.004	<2.44E-09	4.75±2.57E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1001	UP(8)	7.78	455	0.4	<0.004	<1.82E-09	<2.48E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1008B	UP(1)	7.73	467	0.4	0.012	3.03±2.54E-09	4.19±2.85E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1008B	UP(2)	7.52	365	0.5	0.017	1.70±1.66E-09	7.03±2.80E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1008B	UP(3)	7.50	320	0.6	0.007	<2.18E-09	<2.64E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1008B	UP(4)	7.72	352	0.5	<0.004	2.60±2.41E-09	3.44±2.70E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1008B	UP(6)	7.78	420	0.5	<0.004	<2.17E-09	4.25±2.74E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1008B	UP(7)	7.58	403	0.5	<0.004	<1.68E-09	5.18±2.64E-09	<1.00E-07	<2.60E-08	<2.90E-08
WNW1008B	UP(5)	7.46	390	0.4	<0.004	<1.17E-09	2.72±2.30E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1008B	UP(8)	7.78	361	0.5	<0.004	<2.00E-09	4.91±2.94E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0903	DOWN - B(1)	7.44	749	0.8	<0.004	<3.38E-09	5.33±2.95E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW0903	DOWN - B(2)	7.49	773	0.7	0.004	<1.76E-09	4.85±3.09E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW0903	DOWN - B(3)	7.52	772	0.8	<0.004	<2.36E-09	5.20±3.01E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0903	DOWN - B(4)	7.46	770	0.7	<0.004	<2.94E-09	5.22±3.11E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW0903	DOWN - B(6)	7.49	759	0.8	<0.004	<3.77E-09	5.82±3.00E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0903	DOWN - B(7)	7.54	760	0.8	<0.004	<3.14E-09	5.63±2.82E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0903	DOWN - B(5)	7.70	786	0.8	<0.004	<2.69E-09	7.51±3.39E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0903	DOWN - B(8)	7.16	830	0.8	<0.004	<3.03E-09	4.13±2.95E-09	<1.00E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

Table E - 4 (continued)

Contamination Indicator Parameters for the Lacustrine Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1002	DOWN - B(1)	7.05	903	0.8	<0.004	4.33±3.80E-09	1.68±0.63E-08	<1.00E-07	<2.31E-08	<1.92E-08
WNW1002	DOWN - B(2)	7.10	912	0.8	0.009	7.31±5.42E-09	4.84±3.81E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1002	DOWN - B(3)	7.11	927	0.7	<0.004	<6.12E-09	3.73±3.04E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1002	DOWN - B(4)	7.11	931	< 0.2	<0.004	<4.07E-09	4.22±3.02E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1002	DOWN - B(6)	7.08	988	0.7	<0.004	<3.89E-09	<3.10E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1002	DOWN - B(7)	6.93	991	0.8	<0.004	<5.60E-09	4.02±2.87E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1002	DOWN - B(5)	6.90	1013	0.7	<0.004	<9.11E-09	4.88±3.01E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1002	DOWN - B(8)	7.07	1044	0.7	<0.004	<5.75E-09	<4.16E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1003	DOWN - B(1)	7.53	441	1.0	<0.004	<1.64E-09	4.89±2.70E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1003	DOWN - B(2)	7.55	432	0.8	0.011	<1.46E-09	6.90±2.79E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1003	DOWN - B(3)	7.79	441	1.2	0.008	<1.62E-09	5.03±2.89E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1003	DOWN - B(4)	7.53	427	0.9	<0.004	<1.85E-09	4.93±2.61E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1003	DOWN - B(6)	7.63	436	0.8	<0.004	<1.51E-09	<2.76E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1003	DOWN - B(7)	7.33	438	0.9	<0.004	<2.38E-09	3.77±2.51E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1003	DOWN - B(5)	7.43	443	0.9	<0.004	<2.07E-09	2.91±2.39E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1003	DOWN - B(8)	7.59	440	0.9	<0.004	<2.09E-09	3.01±2.71E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1004	DOWN - B(1)	7.49	460	0.7	<0.004	1.69±1.66E-09	<2.57E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1004	DOWN - B(2)	7.43	454	0.7	0.008	<2.20E-09	<2.46E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1004	DOWN - B(3)	7.53	456	0.7	<0.004	<2.18E-09	<2.54E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1004	DOWN - B(4)	7.50	454	0.7	<0.004	<2.15E-09	6.51±2.81E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1004	DOWN - B(6)	7.52	459	0.7	<0.004	<2.29E-09	<2.71E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1004	DOWN - B(7)	7.41	457	0.7	<0.004	5.53±3.75E-09	<2.44E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1004	DOWN - B(5)	7.37	460	0.9	<0.004	<1.37E-09	4.54±2.58E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1004	DOWN - B(8)	7.49	454	0.8	<0.004	<1.97E-09	<2.54E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1101C	DOWN - B(1)	7.42	585	2.0	0.008	<2.26E-09	5.48±3.08E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1101C	DOWN - B(2)	7.19	591	0.5	<0.004	<1.99E-09	7.98±3.15E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1101C	DOWN - B(3)	7.34	545	0.7	<0.004	<2.66E-09	7.36±3.00E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1101C	DOWN - B(4)	7.55	514	0.8	<0.004	<2.08E-09	5.45±2.93E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1101C	DOWN - B(6)	7.34	542	0.7	<0.004	<2.96E-09	5.68±3.09E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1101C	DOWN - B(7)	7.21	531	0.6	<0.004	<1.49E-09	4.74±2.93E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101C	DOWN - B(5)	7.19	377	0.6	<0.004	<3.02E-09	4.74±2.90E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101C	DOWN - B(8)	7.57	514	0.6	<0.004	<2.22E-09	4.63±2.89E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1103C	DOWN - C(1)	N/A	N/A	N/A	N/A	<3.97E-09	6.88±0.84E-08	<7.80E-08	<5.78E-08	<4.80E-08
WNW1103C	DOWN - C(2)	N/A	N/A	N/A	N/A	<3.79E-09	5.30±1.26E-08	<1.00E-07	<2.14E-07	<1.94E-07
WNW1103C	DOWN - C(3)	N/A	N/A	< 1.0	N/A	<4.34E-09	2.68±0.49E-08	<1.00E-07	<6.36E-08	<6.71E-08
WNW1103C	DOWN - C(4)	7.01	722	N/A	N/A	<3.87E-09	2.04±0.42E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW1103C	DOWN - C(6)	N/A	N/A	N/A	N/A	<2.94E-09	2.73±0.56E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW1103C	DOWN - C(7)	7.16	720	N/A	N/A	<2.73E-09	2.79±0.48E-08	<1.00E-07	<5.96E-08	<6.94E-08
WNW1103C	DOWN - C(5)	7.10	746	N/A	N/A	<3.95E-09	2.49±0.50E-08	<1.00E-07	<4.77E-08	<4.96E-08
WNW1103C	DOWN - C(8)	N/A	N/A	N/A	N/A	<3.75E-09	1.96±0.48E-08	<1.00E-07	<4.31E-08	<4.49E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 4 (concluded)

Contamination Indicator Parameters for the Lacustrine Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1104C	DOWN - C(1)	N/A	N/A	N/A	N/A	<1.35E-08	1.21±0.41E-08	<7.78E-08	<3.21E-08	<2.67E-08
WNW1104C	DOWN - C(2)	6.94	1666	1.7	<0.004	<9.52E-09	1.80±0.52E-08	<1.00E-07	<6.35E-08	<5.76E-08
WNW1104C	DOWN - C(3)	N/A	N/A	1.3	<0.004	<9.92E-09	9.36±4.87E-09	<1.00E-07	<2.95E-08	<3.14E-08
WNW1104C	DOWN - C(4)	6.91	1836	N/A	N/A	<9.88E-09	1.34±0.52E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW1104C	DOWN - C(6)	N/A	N/A	6.0	N/A	<9.54E-09	6.96±5.03E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1104C	DOWN - C(7)	6.96	2030	N/A	N/A	<9.41E-09	1.52±0.61E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW1104C	DOWN - C(5)	6.96	2110	1.2	<0.008	<7.77E-09	8.54±8.49E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1104C	DOWN - C(8)	6.89	2190	1.1	N/A	<8.39E-09	<1.08E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW8610	DOWN - C(1)	7.88	729	0.8	<0.004	<2.55E-09	6.73±3.23E-09	<1.00E-07	<3.66E-08	<3.35E-08
WNW8610	DOWN - C(2)	8.04	739	1.0	<0.004	<2.94E-09	3.32±2.77E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW8610	DOWN - C(3)	8.24	764	0.7	<0.004	<3.70E-09	4.58±3.05E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8610	DOWN - C(4)	7.90	768	0.7	<0.004	<2.76E-09	4.83±2.90E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8610	DOWN - C(6)	8.11	783	0.8	<0.004	<2.49E-09	5.91±3.19E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8610	DOWN - C(7)	8.05	770	0.8	<0.004	<3.67E-09	4.67±2.80E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8610	DOWN - C(5)	8.43	816	0.8	<0.004	<3.59E-09	8.90±3.13E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8610	DOWN - C(8)	7.52	721	0.8	<0.004	<1.40E-09	7.38±3.19E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8611	DOWN - C(1)	7.13	977	0.8	<0.004	<3.94E-09	3.32±3.12E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW8611	DOWN - C(2)	7.37	927	0.8	<0.004	<4.09E-09	5.05±4.06E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW8611	DOWN - C(3)	7.43	950	1.1	<0.004	<3.94E-09	<3.93E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW8611	DOWN - C(4)	7.57	972	0.6	<0.004	<4.44E-09	5.75±3.27E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW8611	DOWN - C(6)	7.54	927	0.9	<0.004	<4.04E-09	5.28±3.06E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW8611	DOWN - C(7)	7.43	950	0.7	<0.004	<4.62E-09	5.38±2.98E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW8611	DOWN - C(5)	7.78	953	0.7	<0.004	<3.03E-09	3.66±2.67E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW8611	DOWN - C(8)	7.68	939	0.8	<0.004	5.90±5.45E-09	<3.17E-09	<1.00E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 5
Contamination Indicator Parameters for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW0908	UP(1)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW0908	UP(2)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW0908	UP(3)	6.67	2995	1.3	0.005	<1.25E-08	<1.45E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW0908	UP(4)	6.60	2860	0.9	<0.004	<1.59E-08	1.59±1.18E-08	<7.26E-08	<2.27E-08	<2.42E-08
WNW0908	UP(6)	6.71	2990	0.9	<0.004	<1.62E-08	<1.17E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW0908	UP(7)	6.71	2995	0.9	<0.004	<1.80E-08	1.59±1.10E-08	<1.00E-07	<3.16E-08	<3.68E-08
WNW0908	UP(5)	6.66	2850	0.9	<0.004	<1.45E-08	<1.41E-08	<1.00E-07	<1.70E-08	<1.86E-08
WNW0908	UP(8)	N/A	N/A	0.9	<0.004	<1.15E-08	1.95±1.20E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW1005	UP(1)	6.97	897	1.0	<0.004	<5.71E-09	5.24±3.13E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1005	UP(2)	6.96	884	1.4	0.007	<3.27E-09	4.69±4.08E-09	<7.38E-08	<3.43E-08	<3.11E-08
WNW1005	UP(3)	6.98	847	2.4	<0.004	<6.32E-09	5.61±3.17E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1005	UP(4)	6.96	819	0.9	<0.004	<3.61E-09	<3.77E-09	<7.96E-08	<3.50E-08	<3.69E-08
WNW1005	UP(6)	6.98	845	0.9	<0.004	<5.96E-09	<3.07E-09	1.21±0.78E-07	<2.05E-08	<2.12E-08
WNW1005	UP(7)	6.85	864	1.0	<0.004	<5.27E-09	<2.67E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1005	UP(5)	6.84	860	1.1	<0.004	6.84±5.48E-09	<2.57E-09	<6.84E-08	<2.64E-08	<2.75E-08
WNW1005	UP(8)	6.93	832	0.8	<0.004	<3.46E-09	<3.19E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1008C	UP(1)	7.38	549	0.7	0.017	<3.59E-09	3.18±2.64E-09	<1.00E-07	<2.31E-08	<1.92E-08
WNW1008C	UP(2)	7.44	508	0.8	0.019	<2.01E-09	3.45±2.51E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1008C	UP(3)	7.45	544	0.7	0.016	<2.98E-09	<2.65E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1008C	UP(4)	7.41	556	0.7	<0.004	<2.46E-09	<2.68E-09	1.24±0.75E-07	<2.27E-08	<2.42E-08
WNW1008C	UP(6)	7.40	568	0.8	<0.004	<3.47E-09	<2.64E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1008C	UP(7)	7.09	564	0.8	0.004	<2.64E-09	<2.30E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1008C	UP(5)	7.35	557	0.7	<0.004	<2.12E-09	3.56±2.50E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1008C	UP(8)	7.56	552	0.8	<0.004	<2.33E-09	<2.77E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW0906	DOWN - B(1)	7.02	1125	6.7	0.014	4.23±3.56E-09	<2.75E-09	8.09±8.03E-08	<3.66E-08	<3.35E-08
WNW0906	DOWN - B(2)	7.01	2070	6.8	0.024	<1.67E-09	4.36±3.02E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0906	DOWN - B(3)	7.26	1042	3.2	0.005	<3.44E-09	5.50±3.10E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0906	DOWN - B(4)	7.25	763	4.5	0.007	<3.43E-09	<2.75E-09	<7.99E-08	<3.50E-08	<3.69E-08
WNW0906	DOWN - B(6)	7.33	695	3.8	0.006	<3.81E-09	3.13±2.78E-09	<8.00E-08	<3.50E-08	<3.69E-08
WNW0906	DOWN - B(7)	7.20	869	2.1	<0.004	<3.25E-09	5.42±2.83E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW0906	DOWN - B(5)	7.36	672	5.2	0.010	<3.89E-09	3.94±2.59E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0906	DOWN - B(8)	6.96	791	5.6	0.010	5.02±3.48E-09	4.83±2.90E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW0907	DOWN - B(1)	6.89	1095	1.1	0.005	1.44±0.92E-08	5.58±3.40E-09	1.68±0.80E-07	<3.66E-08	<3.35E-08
WNW0907	DOWN - B(2)	6.89	1015	0.8	<0.004	<3.99E-09	5.43±3.28E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW0907	DOWN - B(3)	6.97	915	0.7	<0.004	<5.06E-09	1.00±0.34E-08	1.09±0.74E-07	<2.27E-08	<2.42E-08
WNW0907	DOWN - B(4)	6.99	861	0.6	<0.004	7.03±5.52E-09	4.52±2.94E-09	1.57±0.81E-07	<2.27E-08	<2.42E-08
WNW0907	DOWN - B(6)	7.03	827	0.8	<0.004	<4.25E-09	6.68±3.18E-09	8.39±7.63E-08	<2.05E-08	<2.12E-08
WNW0907	DOWN - B(7)	7.00	827	0.7	<0.004	<4.16E-09	5.71±2.91E-09	<7.84E-08	<2.64E-08	<2.75E-08
WNW0907	DOWN - B(5)	7.12	803	0.8	<0.004	6.19±5.72E-09	5.36±3.01E-09	7.95±7.83E-08	<2.64E-08	<2.75E-08
WNW0907	DOWN - B(8)	6.75	808	0.7	<0.004	<3.98E-09	<3.18E-09	<1.00E-07	<2.64E-08	<2.75E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 5 (continued)

Contamination Indicator Parameters for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1006	DOWN - B(1)	6.72	2095	1.0	<0.004	1.14±1.05E-08	1.83±0.95E-08	<1.00E-07	<3.66E-08	<3.35E-08
WNW1006	DOWN - B(2)	6.71	2220	0.4	<0.004	1.07±1.05E-08	8.60±7.72E-09	<1.00E-07	<2.14E-08	<2.37E-08
WNW1006	DOWN - B(3)	6.61	2185	0.5	<0.004	<8.62E-09	1.07±0.84E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW1006	DOWN - B(4)	6.67	2320	0.5	<0.004	<1.20E-08	8.24±8.12E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1006	DOWN - B(6)	6.71	2280	0.6	<0.004	<1.26E-08	9.90±6.38E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1006	DOWN - B(7)	6.59	2230	0.6	<0.004	<1.48E-08	<5.65E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1006	DOWN - B(5)	6.58	2210	0.6	<0.004	<9.04E-09	1.26±0.80E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW1006	DOWN - B(8)	6.73	2170	0.7	<0.004	<1.61E-08	<7.13E-09	<1.00E-07	2.68±1.47E-08	<2.75E-08
WNW1007	DOWN - B(1)	6.77	1545	5.1	0.020	1.03±0.95E-08	8.89±4.49E-09	<1.00E-07	<3.43E-08	<3.11E-08
WNW1007	DOWN - B(2)	N/A	N/A	4.2	0.021	<2.84E-09	<5.66E-09	<1.00E-07	<1.37E-07	<1.24E-07
WNW1007	DOWN - B(3)	N/A	N/A	3.9	N/A	<5.51E-09	7.24±5.36E-09	<1.00E-07	<6.14E-08	<6.47E-08
WNW1007	DOWN - B(4)	6.93	1591	3.4	0.020	<8.92E-09	1.90±0.60E-08	<1.00E-07	<2.27E-08	<2.42E-08
WNW1007	DOWN - B(6)	7.11	1551	2.3	0.009	<7.46E-09	1.83±0.59E-08	<1.00E-07	<3.50E-08	<3.69E-08
WNW1007	DOWN - B(7)	6.67	1577	1.5	0.005	<9.44E-09	1.69±0.52E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW1007	DOWN - B(5)	6.77	1502	1.1	0.005	<9.16E-09	1.16±0.47E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW1007	DOWN - B(8)	6.92	1493	1.0	0.006	<5.12E-09	2.97±0.82E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101A	DOWN - B(1)	7.24	1000	0.7	<0.004	<4.68E-09	6.67±2.87E-09	9.70±7.75E-08	<2.14E-08	<2.37E-08
WNW1101A	DOWN - B(2)	6.94	892	0.4	0.013	7.21±4.71E-09	6.50±3.07E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1101A	DOWN - B(3)	7.31	767	0.6	<0.004	<4.41E-09	<2.83E-09	<8.29E-08	<3.50E-08	<3.69E-08
WNW1101A	DOWN - B(4)	7.16	699	0.5	<0.004	5.46±4.58E-09	4.20±2.94E-09	<7.84E-08	<3.50E-08	<3.69E-08
WNW1101A	DOWN - B(6)	7.12	677	0.6	<0.004	<3.79E-09	<2.92E-09	<1.00E-07	<3.16E-08	<3.68E-08
WNW1101A	DOWN - B(7)	7.18	678	0.8	<0.004	<2.74E-09	<2.70E-09	<1.00E-07	<2.64E-08	<2.75E-08
WNW1101A	DOWN - B(5)	7.04	655	0.6	<0.004	<3.37E-09	2.92±2.80E-09	<8.19E-08	<2.64E-08	<2.75E-08
WNW1101A	DOWN - B(8)	7.20	659	0.6	<0.004	<4.08E-09	<2.74E-09	1.90±0.79E-07	<2.14E-08	<2.51E-08
WNW1106A	DOWN - B(1)	7.36	984	1.0	<0.004	<5.30E-09	7.47±3.01E-09	1.13±0.09E-06	<2.31E-08	<1.92E-08
WNW1106A	DOWN - B(2)	7.30	930	0.8	<0.004	<2.86E-09	6.35±3.17E-09	1.08±0.10E-06	<3.50E-08	<3.69E-08
WNW1106A	DOWN - B(3)	7.01	944	0.8	<0.004	<3.61E-09	6.84±3.25E-09	9.68±0.97E-07	<2.27E-08	<2.42E-08
WNW1106A	DOWN - B(4)	7.14	795	0.7	<0.004	<5.76E-09	3.47±2.69E-09	1.00±0.09E-06	<2.27E-08	<2.42E-08
WNW1106A	DOWN - B(6)	7.17	780	1.6	<0.004	<4.45E-09	5.96±2.98E-09	1.02±0.09E-06	<3.16E-08	<3.68E-08
WNW1106A	DOWN - B(7)	7.31	798	0.8	<0.004	<4.36E-09	5.07±5.06E-09	7.47±0.86E-07	<2.64E-08	<2.75E-08
WNW1106A	DOWN - B(5)	7.04	797	0.9	<0.004	<5.86E-09	3.36±2.96E-09	8.17±0.87E-07	<2.64E-08	<2.75E-08
WNW1106A	DOWN - B(8)	7.53	775	0.9	<0.004	<4.16E-09	<3.25E-09	9.40±0.91E-07	<2.14E-08	<2.51E-08
WNW1108A	DOWN - B(1)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1108A	DOWN - B(2)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1108A	DOWN - B(3)	7.12	1796	1.2	<0.004	<1.23E-08	<4.69E-09	<1.00E-07	<2.27E-08	<2.42E-08
WNW1108A	DOWN - B(4)	6.96	1839	0.9	<0.004	<1.50E-08	4.72±4.36E-09	<1.00E-07	<3.50E-08	<3.69E-08
WNW1108A	DOWN - B(6)	7.03	1705	0.8	<0.004	<1.14E-08	1.03±0.49E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW1108A	DOWN - B(7)	6.83	1624	0.7	<0.004	<9.77E-09	8.02±5.80E-09	<1.00E-07	<2.14E-08	<2.51E-08
WNW1108A	DOWN - B(5)	6.81	1613	0.9	<0.004	1.03±0.96E-08	1.08±0.61E-08	<1.00E-07	<2.14E-08	<2.51E-08
WNW1108A	DOWN - B(8)	N/A	N/A	0.9	<0.004	<5.63E-09	<5.84E-09	<1.00E-07	<1.51E-08	<1.78E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 5 (continued)

Contamination Indicator Parameters for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1109A	DOWN - C(1)	7.13	868	0.6	<0.004	<5.00E-09	5.88±2.78E-09	6.18±0.83E-07	<2.31E-08	<1.92E-08
WNW1109A	DOWN - C(2)	6.98	825	0.6	0.005	<3.68E-09	3.58±3.04E-09	8.39±0.89E-07	<3.50E-08	<3.69E-08
WNW1109A	DOWN - C(3)	6.97	954	0.7	<0.004	6.63±5.57E-09	<2.76E-09	5.74±0.88E-07	<3.50E-08	<3.69E-08
WNW1109A	DOWN - C(4)	7.02	770	0.6	<0.004	9.26±5.95E-09	4.72±3.02E-09	4.17±0.81E-07	<3.50E-08	<3.69E-08
WNW1109A	DOWN - C(6)	7.00	801	0.7	<0.004	<4.76E-09	3.67±3.03E-09	4.76±0.85E-07	<2.05E-08	<2.12E-08
WNW1109A	DOWN - C(7)	7.19	836	0.6	<0.004	<3.89E-09	4.24±2.87E-09	5.47±0.83E-07	<2.05E-08	<2.12E-08
WNW1109A	DOWN - C(5)	6.65	837	0.7	<0.004	<4.34E-09	5.57±3.16E-09	6.14±0.84E-07	<2.14E-08	<2.51E-08
WNW1109A	DOWN - C(8)	7.03	847	0.7	<0.004	<4.39E-09	<3.34E-09	5.43±0.84E-07	<2.14E-08	<2.51E-08
WNW0909	DOWN - C(4)	6.73	1239	2.4	0.010	<8.48E-09	8.18±0.78E-08	2.29±0.82E-07	<2.27E-08	<2.42E-08
WNW0909	DOWN - C(4)	6.48	1431	8.3	0.012	<7.24E-09	1.04±0.09E-07	1.72±0.08E-06	<2.27E-08	<2.42E-08
WNW0909	DOWN - C(6)	6.68	1412	7.4	0.010	<1.64E-08	1.38±0.10E-07	1.34±0.10E-06	<3.16E-08	<3.68E-08
WNW0909	DOWN - C(7)	6.57	1332	6.2	0.009	<1.38E-08	1.17±0.10E-07	9.67±0.96E-07	<2.05E-08	<2.12E-08
WNW0909	DOWN - C(5)	6.87	1076	5.3	0.005	<5.28E-09	9.38±0.98E-08	1.45±0.10E-06	<2.64E-08	<2.75E-08
WNW0909	DOWN - C(8)	6.44	1032	5.8	<0.004	<4.48E-09	7.80±0.92E-08	1.57±0.10E-06	<2.14E-08	<2.51E-08
WNW1102A	DOWN - D(1)	7.04	1337	0.6	0.010	7.07±5.94E-09	<4.88E-09	1.64±0.78E-07	<2.14E-08	<2.37E-08
WNW1102A	DOWN - D(2)	7.60	1233	0.4	N/A	<5.27E-09	5.77±4.27E-09	8.47±8.15E-08	<2.27E-08	<2.42E-08
WNW1102A	DOWN - D(3)	6.94	1084	0.5	<0.004	<4.18E-09	4.72±4.34E-09	2.14±0.82E-07	<3.50E-08	<3.69E-08
WNW1102A	DOWN - D(4)	7.06	916	0.5	<0.004	<4.04E-09	<2.84E-09	2.48±0.81E-07	<3.50E-08	<3.69E-08
WNW1102A	DOWN - D(6)	7.10	877	0.5	<0.004	<3.87E-09	5.18±2.90E-09	1.56±0.81E-07	<3.16E-08	<3.68E-08
WNW1102A	DOWN - D(7)	7.30	848	0.6	<0.004	<4.74E-09	4.98±3.02E-09	1.68±0.78E-07	<2.05E-08	<2.12E-08
WNW1102A	DOWN - D(5)	7.12	819	0.6	<0.004	<5.04E-09	6.47±3.23E-09	2.15±0.80E-07	<2.64E-08	<2.75E-08
WNW1102A	DOWN - D(8)	7.08	830	0.7	<0.004	<4.09E-09	4.15±3.74E-09	2.42±0.80E-07	<2.14E-08	<2.51E-08
WNW1103A	DOWN - D(1)	6.76	1607	1.0	0.005	<1.55E-08	9.95±3.88E-09	4.17±0.82E-07	<2.31E-08	<1.92E-08
WNW1103A	DOWN - D(2)	7.32	1792	1.0	0.007	<1.32E-08	8.24±3.62E-09	1.70±0.88E-07	<2.14E-08	<2.37E-08
WNW1103A	DOWN - D(3)	6.87	1507	1.4	<0.004	1.51±1.17E-08	6.22±3.57E-09	6.48±0.87E-07	<2.27E-08	<2.42E-08
WNW1103A	DOWN - D(4)	6.96	1183	0.9	<0.004	<9.16E-09	6.04±3.48E-09	4.86±0.85E-07	<3.50E-08	<3.69E-08
WNW1103A	DOWN - D(6)	6.94	1106	1.0	<0.004	<8.32E-09	5.50±3.08E-09	4.16±0.82E-07	<2.05E-08	<2.12E-08
WNW1103A	DOWN - D(7)	6.93	1086	0.9	<0.004	<7.67E-09	4.85±3.19E-09	4.95±0.83E-07	<2.64E-08	<2.75E-08
WNW1103A	DOWN - D(5)	6.81	1055	0.9	<0.004	<1.17E-08	8.52±3.74E-09	3.40±0.82E-07	<2.64E-08	<2.75E-08
WNW1103A	DOWN - D(8)	7.04	1071	1.0	<0.004	<4.20E-09	7.64±5.09E-09	3.67±0.82E-07	<2.64E-08	<2.75E-08
WNW1104A	DOWN - D(1)	7.08	712	1.3	<0.004	<2.50E-09	5.56±2.87E-09	2.09±0.78E-07	<3.43E-08	<3.11E-08
WNW1104A	DOWN - D(2)	7.19	724	0.9	<0.004	4.22±3.91E-09	6.05±3.02E-09	2.59±0.81E-07	<2.09E-08	2.40±2.21E-08
WNW1104A	DOWN - D(3)	7.34	669	0.9	<0.004	<3.31E-09	3.95±2.98E-09	<8.09E-08	<3.50E-08	<3.69E-08
WNW1104A	DOWN - D(4)	7.30	656	0.9	<0.004	<4.22E-09	5.04±2.79E-09	2.24±0.81E-07	<3.50E-08	<3.69E-08
WNW1104A	DOWN - D(6)	7.41	650	0.9	<0.004	6.08±4.47E-09	3.12±2.90E-09	8.93±7.66E-08	<3.16E-08	<3.68E-08
WNW1104A	DOWN - D(7)	7.37	648	1.0	<0.004	<3.33E-09	5.98±2.71E-09	1.52±0.79E-07	<2.64E-08	<2.75E-08
WNW1104A	DOWN - D(5)	7.41	628	1.0	<0.004	<3.98E-09	<2.70E-09	<7.73E-08	<2.64E-08	<2.75E-08
WNW1104A	DOWN - D(8)	7.38	637	1.0	<0.004	<3.31E-09	4.20±2.94E-09	1.62±0.80E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Well WNW0909 was incorporated into the groundwater program in mid-1992.

Table E - 5 *(concluded)*

Contamination Indicator Parameters for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	pH	Conductivity µmhos/cm25C	TOC mg/L	TOX mg/L	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL	Cs-137 µCi/mL	Co-60 µCi/mL
WNW1107A	DOWN - D(1)	6.51	1127	9.3	0.044	<6.79E-09	6.53±4.80E-09	1.89±0.06E-05	<2.14E-08	<2.37E-08
WNW1107A	DOWN - D(2)	6.86	1068	7.8	0.022	<5.55E-09	9.74±5.70E-09	1.85±0.06E-05	<3.50E-08	<3.69E-08
WNW1107A	DOWN - D(3)	6.49	1095	7.9	0.017	<7.62E-09	<5.23E-09	1.62±0.05E-05	<2.27E-08	<2.42E-08
WNW1107A	DOWN - D(4)	6.47	1449	14.5	0.024	<8.69E-09	8.75±8.23E-09	2.01±0.07E-05	<2.27E-08	<2.42E-08
WNW1107A	DOWN - D(6)	6.47	1352	11.8	0.017	<5.27E-09	1.24±0.78E-08	2.27±0.05E-05	<2.05E-08	<2.12E-08
WNW1107A	DOWN - D(7)	6.34	1311	14.7	0.019	<6.99E-09	7.34±4.57E-09	2.21±0.07E-05	<2.05E-08	<2.12E-08
WNW1107A	DOWN - D(5)	6.37	1247	10.4	0.010	<5.86E-09	6.92±5.62E-09	2.11±0.07E-05	<2.14E-08	<2.51E-08
WNW1107A	DOWN - D(8)	6.66	1239	13.5	0.073	<4.13E-09	5.31±4.25E-09	2.45±0.08E-05	<2.64E-08	<2.75E-08
WNW1110A	DOWN - D(1)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1110A	DOWN - D(2)	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
WNW1110A	DOWN - D(3)	N/A	N/A	N/A	N/A	1.39±0.94E-08	1.73±1.59E-08	<1.00E-07	<7.10E-07	<6.44E-07
WNW1110A	DOWN - D(4)	6.74	1750	1.1	<0.004	<1.47E-08	1.34±0.52E-08	<8.10E-08	<3.50E-08	<3.69E-08
WNW1110A	DOWN - D(6)	6.84	1692	1.0	<0.004	<1.17E-08	8.77±3.65E-09	<1.00E-07	<2.05E-08	<2.12E-08
WNW1110A	DOWN - D(7)	6.98	1759	1.1	<0.004	<8.05E-09	1.04±0.58E-08	<1.00E-07	<2.05E-08	<2.12E-08
WNW1110A	DOWN - D(5)	6.75	1705	1.2	<0.004	<9.97E-09	1.02±0.62E-08	<1.00E-07	<2.64E-08	<2.75E-08
WNW1110A	DOWN - D(8)	6.96	1565	1.2	<0.004	<8.29E-09	8.85±6.20E-09	<1.00E-07	<2.14E-08	<2.51E-08

Hydraulic position is the general position in the geologic unit. Sample rep number is indicated in parenthesis next to the hydraulic position.

N/A - Not available.

Table E - 6

Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as $mgCaCO_3/L$)	Carbonate Alkalinity (as $mgCaCO_3/L$)	Phenols
WNW0301	UP	Jul-92	58.7	10.0	2.5	<0.05	230	<1.0	< 0.005
WNW0301	UP	Dec-92	45.1	48.4	2.3	<0.05	221	<1.0	< 0.005
WNW0401	UP	Jul-92	414	59.5	8.0	<0.05	86.9	<1.0	< 0.005
WNW0401	UP	Dec-92	287	29.8	6.2	<0.05	165	<1.0	< 0.005
WNW0403	UP	Jul-92	357	18.8	15	<0.05	62.4	<1.0	< 0.005
WNW0403	UP	Dec-92	140	36.7	14	<0.05	123	<1.0	< 0.005
WNWNB1S	UP	Jul-92	36.2	27.7	16	<0.05	49.7	<1.0	< 0.005
WNWNB1S	UP	Dec-92	55.0	23.6	7.3	<0.05	119	<1.0	< 0.005
WNW0201	DOWN - B	Jul-92	210	22.0	<0.010	<0.05	111	<1.0	< 0.005
WNW0201	DOWN - B	Dec-92	181	36.4	2.3	<0.05	130	<1.0	0.008
WNW0706	DOWN - B	Aug-92	4.5	322	0.33	<0.05	233	<1.0	< 0.005
WNW0706	DOWN - B	Dec-92	9.6	356	0.23	<0.05	231	<1.0	< 0.005
WNW8613A	DOWN - B	Aug-92	78.7	85.0	2.0	<0.05	183	<1.0	< 0.005
WNW8613A	DOWN - B	Dec-92	76.9	51.6	1.5	<0.05	178	<1.0	< 0.005
WNW8613B	DOWN - B	Aug-92	117	306	3.3	<0.05	93.7	<1.0	0.006
WNW8613B	DOWN - B	Dec-92	72.2	40.8	2.1	<0.05	104	<1.0	< 0.005
WNW8613C	DOWN - B	Aug-92	14.6	160	2.9	<0.05	209	<1.0	< 0.005
WNW8613C	DOWN - B	Dec-92	12.4	37.4	2.2	<0.05	176	<1.0	< 0.005
WNSP008	DOWN - C	Jun-92	137	56.0	0.16*	<0.05	257	<10.0	< 0.005
WNSP008	DOWN - C	Jul-92	132	58.0	0.18	<0.05	250	<1.0	< 0.005
WNSP008	DOWN - C	Dec-92	86.1	102	0.28	0.05	247	<1.0	< 0.005
WNW0103	DOWN - C	Aug-92	141	21.9	0.24	6.2	<2.0	<2.0	<0.002
WNW0103	DOWN - C	Dec-92	1002	10.6	<0.050	2.2	48.3	<1.0	0.016
WNW0104	DOWN - C	Aug-92	45.6	27.6	4.4	0.08	202	<1.0	< 0.002
WNW0104	DOWN - C	Dec-92	176	32.3	1.3	<0.03	203	<1.0	<0.006
WNW0111	DOWN - C	Aug-92	37.8	105	0.26	0.21	272	<1.0	< 0.002
WNW0111	DOWN - C	Dec-92	6.5	60.9	0.14	0.48	193	<1.0	<0.005
WNW0203	DOWN - C	Jul-92	376	54.0	0.71	<0.05	263	<1.0	< 0.005
WNW0203	DOWN - C	Dec-92	329	60.1	2.0	<0.05	239	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.
Hydroxide alkalinity (as $mgCaCO_3/L$) at location WNW0103 = 1,080 in August and <1 in December.
** Nitrate-N only.*

Table E - 6 *(continued)*

Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0301	UP	Jul-92	88.7	94.7	21.1	8.53	21.5	23.3	6.30	1.89	76.6	0.728	2.20	0.119
WNW0301	UP	Dec-92	94.4	93.0	18.8	8.43	20.2	22.5	6.37	1.66	66.6	1.10	1.68	0.018
WNW0401	UP	Jul-92	111	130	9.15	9.87	113	124	2.55	2.32	3.76	0.178	0.072	0.027
WNW0401	UP	Dec-92	126	133	13.8	14.1	109	109	1.56	1.60	0.985	0.032	0.025	0.008
WNW0403	UP	Jul-92	172	188	15.7	16.0	24.4	25.8	2.55	2.30	33.3	3.92	0.487	0.345
WNW0403	UP	Dec-92	112	121	12.1	9.59	30.0	34.1	4.27	1.71	31.5	0.794	0.344	0.009
WNWNB1S	UP	Jul-92	32.2	32.0	4.10	4.45	27.9	27.6	1.17	1.41	0.667	<0.008	0.065	0.011
WNWNB1S	UP	Dec-92	45.6	46.1	5.32	5.08	51.0	58.9	1.39	1.11	1.82	0.044	0.030	0.004
WNW0201	DOWN - B	Jul-92	87.5	79.5	8.33	9.60	69.1	72.6	4.32	4.55	2.21	2.30	1.84	2.15
WNW0201	DOWN - B	Dec-92	80.2	82.8	8.06	8.28	85.5	86.8	4.35	4.57	0.170	0.080	0.762	0.786
WNW0706	DOWN - B	Aug-92	86.8	93.5	16.1	13.8	3.76	6.02	1.70	4.98	10.4	0.468	0.429	0.032
WNW0706	DOWN - B	Dec-92	107	116	18.8	15.9	4.80	6.00	2.65	0.982	31.5	0.430	0.536	0.014
WNW8613A	DOWN - B	Aug-92	79.8	115	13.9	16.9	15.2	18.8	0.652	1.73	5.75	0.381	0.270	0.081
WNW8613A	DOWN - B	Dec-92	88.9	92.2	15.2	15.0	14.7	17.0	2.71	2.56	16.8	0.482	0.380	0.032
WNW8613B	DOWN - B	Aug-92	86.8	81.2	12.2	15.1	19.1	24.2	5.22	1.22	24.7	5.18	0.687	0.407
WNW8613B	DOWN - B	Dec-92	68.8	70.0	13.2	10.4	16.0	20.5	4.61	2.86	43.0	0.394	1.17	0.046
WNW8613C	DOWN - B	Aug-92	96.2	81.2	19.1	17.1	10.9	18.1	6.32	2.53	17.0	0.530	0.584	0.134
WNW8613C	DOWN - B	Dec-92	77.2	66.6	16.6	10.8	5.20	6.70	5.06	3.78	20.7	0.392	0.670	0.059
WNSP008	DOWN - C	Jun-92	98.0	98.7	15.9	16.2	71.3	66.9	1.40	1.32	0.034	0.036	2.65	2.74
WNSP008	DOWN - C	Jul-92	95.9	112	12.8	13.5	60.4	62.4	1.44	1.53	<0.012	0.014	1.67	1.76
WNSP008	DOWN - C	Dec-92	118	122	15.1	15.8	58.1	60.9	1.41	1.58	0.035	0.030	1.74	1.80
WNW0103	DOWN - C	Aug-92	30.2	27.5	1.39	1.32	541	474	0.888	0.671	2.00	0.990	0.209	0.156
WNW0103	DOWN - C	Dec-92	186	205	12.6	10.7	389	362	2.24	1.95	0.888	0.040	0.198	0.064
WNW0104	DOWN - C	Aug-92	114	115	17.6	17.2	57.8	60.3	2.45	2.38	1.63	0.012	0.163	0.087
WNW0104	DOWN - C	Dec-92	107	104	16.1	15.5	51.9	51.1	2.50	2.07	2.56	0.041	0.169	0.075
WNW0111	DOWN - C	Aug-92	101	101	14.2	14.2	32.7	33.1	8.92	9.17	0.102	0.074	3.58	3.70
WNW0111	DOWN - C	Dec-92	70.0	67.3	9.81	9.61	11.9	11.7	5.98	5.67	2.44	0.347	4.01	3.82
WNW0203	DOWN - C	Jul-92	132	114	11.8	12.8	245	241	4.90	4.60	3.68	0.150	0.085	0.025
WNW0203	DOWN - C	Dec-92	137	142	12.5	12.6	160	163	3.95	4.05	1.99	0.090	0.046	0.017

Hydraulic position is the general position in the geologic unit.

Table E - 6 *(continued)*

Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as mg$CaCO_3$/L)	Carbonate Alkalinity (as mg$CaCO_3$/L)	Phenols
WNW0205	DOWN - C	Jul-92	2470	110	0.92	<0.05	155	<1.0	< 0.005
WNW0205	DOWN - C	Dec-92	495	99.0	0.79	<0.05	178	<1.0	< 0.005
WNW0305	DOWN - C	Jul-92	285	22.7	0.091	0.23	191	<1.0	< 0.005
WNW0305	DOWN - C	Dec-92	196	34.8	0.13	0.25	218	<1.0	0.010
WNW0307	DOWN - C	Jul-92	252	21.1	0.90	0.12	175	<1.0	0.005
WNW0307	DOWN - C	Dec-92	191	33.6	0.75	0.10	204	<1.0	< 0.005
WNW0406	DOWN - C	Jul-92	16.8	70.0	2.4	0.37	193	<1.0	0.005
WNW0406	DOWN - C	Dec-92	8.4	109	0.88	0.25	94.4	<1.0	< 0.005
WNW0408	DOWN - C	Aug-92	275	30.9	0.16	0.06	191	<1.0	< 0.002
WNW0408	DOWN - C	Dec-92	33.0	41.2	0.75	<0.03	314	<1.0	0.006
WNW0501	DOWN - C	Aug-92	195	29.5	0.13	0.08	151	<1.0	< 0.002
WNW0501	DOWN - C	Dec-92	132	36.1	3.5	<0.03	161	<1.0	0.005
WNW0502	DOWN - C	Aug-92	200	29.5	1.4	0.09	164	<1.0	< 0.002
WNW0502	DOWN - C	Dec-92	136	39.4	4.6	<0.03	170	<1.0	<0.005
WNW0602	DOWN - C	Jul-92	43.4	36.0	<0.010	0.18	196	<1.0	< 0.005
WNW0602	DOWN - C	Dec-92	23.7	84.0	0.013	0.10	200	<1.0	< 0.005
WNW0603	DOWN - C	Jul-92	20.0	110	2.7	<0.05	172	<1.0	0.006
WNW0603	DOWN - C	Dec-92	19.4	190	0.57	<0.05	260	<1.0	< 0.005
WNW0604	DOWN - C	Jul-92	13.2	73.3	0.011	1.1	153	<1.0	< 0.005
WNW0604	DOWN - C	Dec-92	7.2	78.8	0.040	1.2	174	<1.0	< 0.005
WNW8605	DOWN - C	Aug-92	90.5	107	0.35	1.8	325	<1.0	< 0.002
WNW8605	DOWN - C	Dec-92	220	34.6	<0.050	1.2	176	<1.0	0.006
WNW8606	DOWN - C	Jul-92	2290	126	4.0	<0.05	155	<1.0	0.006
WNW8606	DOWN - C	Dec-92	541	86.1	0.76	<0.05	195	<1.0	< 0.005
WNW8607	DOWN - C	Jul-92	22.1	140	3.1	<0.05	162	<1.0	0.006
WNW8607	DOWN - C	Dec-92	6.0	116	1.2	<0.05	200	<1.0	0.011
WNW8608	DOWN - C	Jul-92	16.6	141	0.48	1.3	190	<1.0	< 0.005
WNW8608	DOWN - C	Dec-92	7.3	93.3	0.46	1.0	188	<1.0	< 0.005
WNW8609	DOWN - C	Jul-92	55.0	49.2	11	<0.05	237	<1.0	< 0.005
WNW8609	DOWN - C	Dec-92	33.1	45.2	6.1	<0.05	250	<1.0	0.010

Hydraulic position is the general position in the geologic unit.

Table E - 6 (continued)

Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0205	DOWN - C	Jul-92	183	177	20.1	22.3	1510	1680	9.40	9.88	0.980	0.432	0.091	0.106
WNW0205	DOWN - C	Dec-92	20.1	22.0	2.62	2.74	381	448	2.37	2.65	1.45	0.200	0.046	0.028
WNW0305	DOWN - C	Jul-92	100	112	12.9	12.9	118	125	4.10	3.34	6.50	0.045	1.82	1.78
WNW0305	DOWN - C	Dec-92	107	108	11.2	11.1	104	113	2.97	2.86	1.26	0.046	1.43	1.42
WNW0307	DOWN - C	Jul-92	82.3	98.7	10.2	11.2	90.0	96.7	2.52	2.66	21.2	0.102	3.68	0.371
WNW0307	DOWN - C	Dec-92	87.1	86.2	8.97	8.76	82.0	91.8	2.18	2.02	1.14	0.562	0.250	0.182
WNW0406	DOWN - C	Jul-92	85.9	89.2	12.9	13.6	13.5	15.1	2.18	2.14	4.95	0.313	3.45	3.25
WNW0406	DOWN - C	Dec-92	89.4	93.6	11.4	11.8	12.1	13.2	2.46	2.45	2.48	0.466	3.68	3.28
WNW0408	DOWN - C	Aug-92	136	133	22.8	22.0	71.1	69.5	3.10	3.39	1.45	0.023	0.215	0.180
WNW0408	DOWN - C	Dec-92	110	103	21.3	18.7	66.3	64.7	4.02	3.00	9.78	0.050	0.209	0.113
WNW0501	DOWN - C	Aug-92	119	114	18.3	15.6	46.0	44.6	2.80	2.58	9.23	0.088	0.248	0.050
WNW0501	DOWN - C	Dec-92	92.0	85.9	13.1	11.9	42.2	41.2	2.14	1.61	3.39	0.005	0.087	0.011
WNW0502	DOWN - C	Aug-92	121	119	17.5	17.7	46.7	45.9	2.09	1.26	2.51	0.139	0.026	0.003
WNW0502	DOWN - C	Dec-92	96.9	96.0	13.9	13.8	41.0	40.8	2.07	1.73	2.95	0.054	0.030	0.003
WNW0602	DOWN - C	Jul-92	69.5	86.8	10.7	11.1	17.3	18.1	2.11	1.92	6.48	0.445	7.56	7.72
WNW0602	DOWN - C	Dec-92	74.2	79.6	10.2	10.3	17.4	19.2	2.24	1.62	6.20	0.570	4.39	4.20
WNW0603	DOWN - C	Jul-92	124	134	16.3	19.2	7.62	8.50	1.44	1.74	0.779	0.026	0.256	0.289
WNW0603	DOWN - C	Dec-92	140	153	19.4	19.6	7.20	7.68	2.27	1.76	1.56	0.050	0.414	0.439
WNW0604	DOWN - C	Jul-92	61.6	51.2	9.48	9.62	6.24	5.82	0.682	0.833	3.62	3.58	17.6	16.9
WNW0604	DOWN - C	Dec-92	64.0	71.8	10.4	11.4	6.67	7.40	1.00	1.06	4.30	4.47	15.8	17.1
WNW8605	DOWN - C	Aug-92	105	108	16.7	17.0	80.2	82.1	12.0	12.5	4.89	4.95	10.7	10.9
WNW8605	DOWN - C	Dec-92	89.0	87.1	14.0	13.8	52.0	51.3	8.65	7.98	4.13	4.08	9.19	9.05
WNW8606	DOWN - C	Jul-92	188	183	20.4*	<0.025*	5310	5130	8.45	8.68	0.300	0.320	0.119	0.113
WNW8606	DOWN - C	Dec-92	34.9	36.9	4.32	4.57	418	457	2.72	2.98	0.240	0.160	0.036	0.034
WNW8607	DOWN - C	Jul-92	95.2	102	12.6	13.6	14.7	15.2	2.34	2.62	0.021	<0.012	0.020	0.023
WNW8607	DOWN - C	Dec-92	93.7	93.1	11.3	11.6	10.0	11.7	3.55	3.26	0.140	<0.020	0.006	0.005
WNW8608	DOWN - C	Jul-92	79.2	86.4	10.1	11.0	16.9	18.4	2.26	2.33	2.54	0.724	17.7	21.2
WNW8608	DOWN - C	Dec-92	70.9	76.8	8.98	9.62	11.8	12.8	2.36	2.47	3.45	0.515	9.65	10.1
WNW8609	DOWN - C	Jul-92	107	118	15.4	16.7	12.9	13.9	1.37	1.51	0.022	<0.012	0.010	0.008
WNW8609	DOWN - C	Dec-92	109	111	14.1	14.5	11.7	15.5	1.44	1.54	0.100	<0.020	0.006	0.006

Hydraulic position is the general position in the geologic unit.

** Apparent analytical outlier.*

Table E - 6 (continued)
Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as $mgCaCO_3/L$)	Carbonate Alkalinity (as $mgCaCO_3/L$)	Phenols
WNDMPNE	DOWN - D	Aug-92	101	36.6	1.9	0.08	190	<1.0	< 0.005
WNDMPNE	DOWN - D	Dec-92	37.2	43.2	0.72	0.06	134	<1.0	< 0.005
WNGSEEP	DOWN - D	Aug-92	64.5	65.2	0.88	<0.05	138	<1.0	0.007
WNGSEEP	DOWN - D	Dec-92	53.1	48.3	1.0	<0.05	145	<1.0	< 0.005
WNW0105	DOWN - D	Jul-92	172	46.0	1.0	<0.05	203	<1.0	< 0.005
WNW0105	DOWN - D	Dec-92	197	43.2	0.94	<0.05	200	<1.0	< 0.005
WNW0106	DOWN - D	Jul-92	147	18.0	0.14	<0.05	231	<1.0	< 0.005
WNW0106	DOWN - D	Dec-92	154	153	0.35	<0.05	236	<1.0	< 0.005
WNW0116	DOWN - D	Jul-92	156	33.2	2.4	<0.05	205	<1.0	< 0.005
WNW0116	DOWN - D	Dec-92	152	67.0	1.6	<0.05	200	<1.0	< 0.005
WNW0207	DOWN - D	Jul-92	<1.0	23.8	0.023	0.27	483	<1.0	0.005
WNW0207	DOWN - D	Dec-92	<1.0	43.0	0.15	0.26	351	<1.0	< 0.005
WNW0601	DOWN - D	Jul-92	56.5	62.0	0.034	<0.05	98.3	<1.0	0.008
WNW0601	DOWN - D	Dec-92	13.8	85.6	0.067	<0.05	99.8	<1.0	< 0.005
WNW0605	DOWN - D	Jul-92	25.2	65.0	0.065	<0.05	113	<1.0	0.006
WNW0605	DOWN - D	Dec-92	13.7	91.0	0.099	<0.05	132	<1.0	< 0.005
WNW0801	DOWN - D	Aug-92	190	35.0	0.44	<0.05	203	<1.0	< 0.005
WNW0801	DOWN - D	Dec-92	27.1	36.4	0.83	<0.05	190	<1.0	< 0.005
WNW0802	DOWN - D	Aug-92	71.7	25.9	<0.010	0.05	162	<1.0	< 0.005
WNW0802	DOWN - D	Dec-92	1.1	30.8	0.020	<0.05	116	<1.0	< 0.005
WNW0803	DOWN - D	Aug-92	95.9	175	0.24	<0.05	309	<1.0	0.029
WNW0803	DOWN - D	Dec-92	109	240	0.27	<0.05	324	<1.0	< 0.005
WNW0804	DOWN - D	Aug-92	70.0	62.5	0.069	<0.05	204	<1.0	< 0.005
WNW0804	DOWN - D	Dec-92	49.4	100	0.072	<0.05	236	<1.0	< 0.005
WNW8603	DOWN - D	Jul-92	191	37.8	2.1	<0.05	209	<1.0	< 0.005
WNW8603	DOWN - D	Dec-92	197	34.7	2.1	<0.05	208	<1.0	< 0.005
WNW8604	DOWN - D	Aug-92	201	28.1	0.22	0.07	207	<1.0	< 0.002
WNW8604	DOWN - D	Dec-92	212	19.9	1.4	<0.03	230	<1.0	<0.006
WNW8612	DOWN - D	Aug-92	78.0	57.0	<0.010	<0.05	253	<1.0	< 0.005
WNW8612	DOWN - D	Dec-92	76.2	79.6	<0.010	<0.05	254	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.

Table E - 6 (concluded)

Groundwater Quality Parameters (mg/L) for the Sand and Gravel Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNDMPNE	DOWN - D	Aug-92	94.5	88.8	13.4	13.9	35.0	36.4	1.70	1.90	0.390	0.092	1.38	1.32
WNDMPNE	DOWN - D	Dec-92	59.0	57.5	7.78	7.32	15.0	16.8	2.02	1.59	1.06	0.301	0.634	0.574
WNGSEEP	DOWN - D	Aug-92	75.1	74.5	11.6	12.6	20.6	21.7	1.41	5.65	0.020	0.871	0.003	0.038
WNGSEEP	DOWN - D	Dec-92	73.1	73.4	10.6	10.7	18.1	18.5	1.41	1.47	<0.020	<0.020	<0.003	0.003
WNW0105	DOWN - D	Jul-92	111	125	19.4	20.9	38.2	41.1	1.32	1.26	9.95	0.022	2.69	2.44
WNW0105	DOWN - D	Dec-92	118	126	19.5	21.0	44.7	48.8	1.32	1.36	6.15	0.050	3.09	3.20
WNW0106	DOWN - D	Jul-92	102	110	20.8	19.3	41.1	41.7	3.65	2.17	17.0	0.121	5.30	4.98
WNW0106	DOWN - D	Dec-92	134	139	23.6	20.2	41.9	47.3	4.36	1.82	25.4	0.125	5.74	4.94
WNW0116	DOWN - D	Jul-92	96.0	96.1	15.4	15.0	60.7	62.8	2.40	1.83	10.7	0.128	1.29	0.903
WNW0116	DOWN - D	Dec-92	116	117	16.7	16.6	61.4	64.4	2.88	1.61	5.80	0.350	0.659	0.185
WNW0207	DOWN - D	Jul-92	135	160	26.8	29.3	7.58	8.88	1.30	1.38	5.18	2.68	1.88	2.06
WNW0207	DOWN - D	Dec-92	109	120	22.7	23.6	5.07	6.10	2.14	1.45	11.8	2.12	2.62	2.84
WNW0601	DOWN - D	Jul-92	50.8	43.0	8.29	7.30	21.2	22.6	2.32	1.72	31.6	5.80	0.481	0.327
WNW0601	DOWN - D	Dec-92	44.2	47.5	7.73	7.16	14.4	16.7	2.00	1.76	9.30	1.12	0.218	0.017
WNW0605	DOWN - D	Jul-92	59.0	53.5	31.1	8.51	20.8	22.9	1.91	2.18	2.81	0.140	0.185	0.007
WNW0605	DOWN - D	Dec-92	50.3	55.2	9.38	8.32	13.7	16.0	2.22	1.55	6.90	0.885	0.087	0.008
WNW0801	DOWN - D	Aug-92	111	106	14.9	15.5	65.3	66.4	1.98	2.22	0.322	0.040	0.755	0.723
WNW0801	DOWN - D	Dec-92	108	114	13.4	14.0	52.2	70.5	1.78	1.78	0.286	0.020	0.682	0.684
WNW0802	DOWN - D	Aug-92	82.2	71.8	6.73	6.84	19.2	18.9	0.818	0.889	0.068	0.026	0.437	0.434
WNW0802	DOWN - D	Dec-92	34.2	33.6	4.07	4.08	9.75	9.95	1.14	0.675	0.877	0.028	0.170	0.074
WNW0803	DOWN - D	Aug-92	178	141	35.0	36.0	23.0	23.3	1.33	1.43	0.408	0.016	0.284	0.276
WNW0803	DOWN - D	Dec-92	191	176	32.8	34.8	20.2	22.6	1.41	1.38	0.265	<0.020	0.300	0.316
WNW0804	DOWN - D	Aug-92	86.9	85.4	11.5	12.0	29.3	31.8	1.60	1.64	2.54	0.031	0.074	0.003
WNW0804	DOWN - D	Dec-92	101	106	12.0	12.6	21.4	22.7	1.55	1.47	0.493	<0.020	0.134	0.124
WNW8603	DOWN - D	Jul-92	114	122	19.5	21.2	40.1	42.9	1.75	2.03	0.016	<0.012	0.007	0.007
WNW8603	DOWN - D	Dec-92	128	133	21.6	22.5	48.4	50.4	2.04	2.17	0.030	<0.030	0.008	0.007
WNW8604	DOWN - D	Aug-92	125	122	20.1	20.2	53.6	53.7	2.43	2.13	0.076	0.026	0.024	0.026
WNW8604	DOWN - D	Dec-92	117	117	18.3	18.6	50.1	49.9	2.45	2.14	0.018	0.021	0.022	0.023
WNW8612	DOWN - D	Aug-92	104	102	26.4	27.2	15.2	15.7	0.980	1.13	0.671	0.565	0.108	0.107
WNW8612	DOWN - D	Dec-92	108	122	23.9	24.5	13.1	15.4	1.05	1.04	0.896	0.398	0.106	0.105

Hydraulic position is the general position in the geologic unit.

Table E - 7
Groundwater Quality Parameters (mg/L) for the Till-Sand Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as $mgCaCO_3/L$)	Carbonate Alkalinity (as $mgCaCO_3/L$)	Phenols
WNW0302	UP	Jul-92	362	23.7	1.0	<0.05	241	<1.0	< 0.005
WNW0302	UP	Dec-92	304	30.7	0.99	<0.05	243	<1.0	< 0.005
WNW0402	UP	Jul-92	235	40.1	0.010	<0.05	203	<1.0	< 0.005
WNW0402	UP	Dec-92	248	39.0	0.018	<0.05	202	<1.0	< 0.005
WNW0404	UP	Jul-92	1.5	20.6	0.012	<0.05	97.3	2.1	< 0.005
WNW0404	UP	Dec-92	<1.0	26.0	0.20	<0.05	106	<1.0	< 0.005
WNW0202	DOWN - B	Jul-92	24.6	28.5	0.015	0.56	<1.0	25.0	< 0.005
WNW0202	DOWN - B	Dec-92	25.5	49.1	<0.010	0.50	<1.0	60.8	< 0.005
WNW0204	DOWN - B	Jul-92	95.1	28.4	0.88	0.17	124	<1.0	< 0.005
WNW0204	DOWN - B	Dec-92	68.2	33.4	<0.010	0.17	150	<1.0	< 0.005
WNW0206	DOWN - B	Jul-92	68.4	35.7	0.028	0.06	156	<1.0	< 0.005
WNW0206	DOWN - B	Dec-92	66.8	35.8	<0.010	0.08	169	<1.0	< 0.005
WNW0208	DOWN - B	Jul-92	1.5	17.5	<0.010	0.17	132	<1.0	< 0.005
WNW0208	DOWN - B	Dec-92	<1.0	28.0	<0.010	0.20	139	<1.0	< 0.005
WNW0701	DOWN - B	Aug-92	<2.0	260	0.022	0.25	167	<1.0	0.029
WNW0701	DOWN - B	Dec-92	<1.0	194	0.025	0.21	162	<1.0	< 0.005
WNW0905	DOWN - B	Jul-92	13.4	476	0.014	0.08	275	<1.0	< 0.005
WNW0905	DOWN - B	Dec-92	12.4	652	<0.010	0.08	406	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.

Hydroxide alkalinity (as $mgCaCO_3/L$) at location WNW0202 = 243 in July and 312 in December.

Table E - 7 (concluded)

Groundwater Quality Parameters (mg/L) for the Till-Sand Unit

Location	Hydraulic	Date	Calcium		Magnesium		Sodium		Potassium		Iron		Manganese	
Code	Position		Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total.	Diss	Total	Diss.
WNW0302	UP	Jul-92	166	182	23.3	24.8	97.4	119	1.88	2.12	0.368	<0.012	0.040	0.037
WNW0302	UP	Dec-92	164	174	20.7	21.4	101	104	2.06	1.94	0.310	<0.030	0.058	0.031
WNW0402	UP	Jul-92	132	154	25.1	26.9	28.3	29.6	2.14	1.65	2.24	0.889	0.134	0.128
WNW0402	UP	Dec-92	156	160	27.9	29.2	32.5	34.0	1.65	1.74	1.15	1.09	0.128	0.128
WNW0404	UP	Jul-92	29.7	34.7	5.44	5.21	7.63	8.11	1.28	0.812	2.69	<0.012	0.040	0.003
WNW0404	UP	Dec-92	36.5	38.8	5.43	5.80	8.84	9.47	0.740	0.800	0.430	<0.030	<0.003	<0.003
WNW0202	DOWN - B	Jul-92	135	314*	0.32	<0.10	33.1	40.7	24.0	24.9	0.192	0.028	<0.002	<0.001
WNW0202	DOWN - B	Dec-92	90.0	135	1.27	0.36	27.4	30.5	13.0	17.4	0.480	<0.030	0.008	<0.003
WNW0204	DOWN - B	Jul-92	67.8	60.5	13.2	15.4	11.2	12.0	1.76	2.31	0.259	0.072	0.054	0.069
WNW0204	DOWN - B	Dec-92	73.0	74.8	16.4	16.8	12.2	12.8	2.02	2.17	0.320	0.120	0.077	0.072
WNW0206	DOWN - B	Jul-92	59.4	75.8	13.5	18.2	9.66	12.8	1.10	1.38	1.47	0.306	0.135	0.184
WNW0206	DOWN - B	Dec-92	80.9	88.7	18.3	20.1	12.7	13.8	1.21	1.22	0.750	0.242	0.167	0.173
WNW0208	DOWN - B	Jul-92	30.8	35.9	8.39	9.06	14.5	15.1	0.960	0.914	0.483	<0.012	0.048	0.047
WNW0208	DOWN - B	Dec-92	38.0	41.4	9.38	10.4	16.0	17.7	1.00	1.05	0.340	<0.030	0.049	0.048
WNW0701	DOWN - B	Aug-92	115	134	24.8	25.5	14.6	16.6	1.38	2.71	3.38	0.068	0.342	0.298
WNW0701	DOWN - B	Dec-92	151	166	28.0	28.9	13.8	17.1	1.78	1.38	4.50	0.320	0.371	0.334
WNW0905	DOWN - B	Jul-92	204	196	77.9	83.0	12.9	12.4	3.49	3.62	2.74	2.14	0.542	0.762
WNW0905	DOWN - B	Dec-92	233	235	83.1	80.6	14.7	14.6	4.44	4.23	2.64	1.41	0.612	0.600

Hydraulic position is the general position in the geologic unit.

** Apparent analytical outlier.*

Table E - 8
Groundwater Quality Parameters (mg/L) for the Unweathered Lavery Till Unit

cation de	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as $mgCaCO_3/L$)	Carbonate Alkalinity (as $mgCaCO_3/L$)	Phenols
IW0405	UP	Jul-92	78.6	163	0.90	<0.05	177	< 1.0	<0.005
IW0405	UP	Dec-92	29.0	159	2.0	<0.05	200	< 1.0	<0.005
IW0704	UP	Aug-92	6.6	204	< 0.01	0.11	411	< 1.0	0.036
IW0704	UP	Dec-92	1.0	218	0.02	0.05	416	<1.0	<0.005
IW0707	UP	Aug-92	6.7	52.5	0.12	<0.05	160	<1.0	<0.005
IW0707	UP	Dec-92	3.5	104	0.23	<0.05	90.7	<1.0	<0.005
IW0109	DOWN - B	Jul-92	2.6	124	0.08	0.08	201	<1.0	<0.005
IW0109	DOWN - B	Dec-92	<1.0	151	0.23	<0.05	194	<1.0	<0.005
IW0110	DOWN - B	Jul-92	<1.0	114	0.06	<0.05	222	<1.0	<0.005
IW0110	DOWN - B	Dec-92	<1.0	73.2	0.12	<0.05	207	<1.0	<0.005
IW0115	DOWN - B	Jul-92	4.2	91.0	0.02	0.08	138	<1.0	<0.005
IW0115	DOWN - B	Dec-92	5.3	210	0.06	0.11	148	<1.0	<0.005
IW0702	DOWN - B	Aug-92	<1.0	430	0.39	0.05	209	<1.0	0.032
IW0702	DOWN - B	Dec-92	<5.0	358	0.43	0.06	211	<1.0	<0.005
IW0703	DOWN - B	Aug-92	3.1	280	0.01	0.07	183	<1.0	<0.005
IW0703	DOWN - B	Dec-92	1.5	303	0.14	<0.05	184	<1.0	<0.005
W0705	DOWN - B	Aug-92	5.7	61.6	< 0.01	0.06	180	<1.0	<0.005
W0705	DOWN - B	Dec-92	3.0	34.2	0.15	<0.05	101	<1.0	<0.005
W0904	DOWN - B	Jul-92	6.4	264	0.08	<0.05	225	<1.0	<0.005
W0904	DOWN - B	Dec-92	6.2	266	0.03	<0.05	234	<1.0	<0.005
W1101B	DOWN - B	Aug-92	1.8	243	0.48	<0.05	250	<1.0	0.018
W1101B	DOWN - B	Dec-92	<1.0	246	0.64	<0.05	284	<1.0	<0.005
W1106B	DOWN - B	Aug-92	<1.0	151	< 0.01	0.18	271	<1.0	0.006
W1106B	DOWN - B	Dec-92	<1.0	182	0.15	<0.05	295	<1.0	<0.005
W1109B	DOWN - B	Aug-92	<1.0	74.5	< 0.01	0.10	181	<1.0	<0.005
W1109B	DOWN - B	Dec-92	1.1	96.5	0.03	0.08	197	<1.0	<0.005

lraulic position is the general position in the unit.

Table E - 8 (continued)

Groundwater Quality Parameters (mg/L) for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0405	UP	Jul-92	111	97.8	19.9	21.1	46.3	48.3	2.26	2.49	0.453	0.287	0.074	0.091
WNW0405	UP	Dec-92	109	108	19.3	19.3	30.0	30.9	2.34	2.37	0.818	0.374	0.032	0.036
WNW0704	UP	Aug-92	180	173	31.9	29.8	11.2	11.8	2.38	2.47	1.17	0.333	5.42	5.55
WNW0704	UP	Dec-92	171	190	25.4	26.3	6.60	8.60	2.24	2.43	0.170	<0.030	6.80	6.00
WNW0707	UP	Aug-92	62.2	61.8	11.1	11.4	5.12	5.37	1.60	1.45	3.60	0.021	0.104	0.045
WNW0707	UP	Dec-92	36.1	40.0	6.30	6.04	4.50	<4.80	1.41	1.03	2.16	0.110	0.043	<0.003
WNW0109	DOWN - B	Jul-92	78.0	84.6	21.9	20.0	18.1	18.3	3.65	1.41	12.4	<0.012	0.248	0.109
WNW0109	DOWN - B	Dec-92	69.8	79.5	16.5	17.1	16.4	19.9	1.71	1.57	1.61	0.030	0.030	<0.003
WNW0110	DOWN - B	Jul-92	62.8	76.9	20.1	22.6	20.0	21.4	1.61	1.78	<0.012	<0.012	0.021	0.024
WNW0110	DOWN - B	Dec-92	74.0	74.5	21.5	20.3	19.4	21.0	1.76	1.74	0.130	0.060	<0.003	<0.003
WNW0115	DOWN - B	Jul-92	63.0	54.5	13.7	11.6	16.0	17.3	2.96	1.90	10.6	0.703	0.198	0.068
WNW0115	DOWN - B	Dec-92	79.0	85.1	15.5	15.8	15.5	18.4	2.47	1.98	5.00	0.680	0.163	0.099
WNW0702	DOWN - B	Aug-92	139	156	33.9	33.0	37.5	38.0	2.74	3.82	4.72	0.322	0.138	0.065
WNW0702	DOWN - B	Dec-92	119	129	28.9	30.1	33.8	38.7	2.38	2.33	1.78	<0.030	0.050	0.018
WNW0703	DOWN - B	Aug-92	109	114	24.8	27.5	18.9	20.9	1.53	1.72	1.26	0.052	0.162	0.174
WNW0703	DOWN - B	Dec-92	111	135	23.4	26.0	18.4	22.4	1.79	1.98	1.34	0.060	0.069	0.054
WNW0705	DOWN - B	Aug-92	65.5	74.9	12.5	13.0	4.19	4.52	1.30	1.32	2.36	0.031	0.078	0.079
WNW0705	DOWN - B	Dec-92	58.4	79.8	9.19	10.8	4.20	5.60	1.38	1.12	3.00	0.070	0.067	0.032
WNW0904	DOWN - B	Jul-92	99.8	96.5	33.6	36.2	19.3	21.1	2.56	2.23	5.42	0.085	0.111	0.003
WNW0904	DOWN - B	Dec-92	98.0	107	30.9	33.6	21.1	24.4	2.20	2.05	2.92	0.169	0.054	0.006
WNW1101B	DOWN - B	Aug-92	106	95.0	39.2	39.1	30.3	28.6	3.40	3.50	0.086	<0.012	0.028	0.006
WNW1101B	DOWN - B	Dec-92	135	128	34.1	34.8	30.5	31.7	5.73	5.92	0.109	<0.020	0.008	<0.003
WNW1106B	DOWN - B	Aug-92	80.2	74.6	40.2	40.9	29.4	26.6	3.95	2.55	2.22	<0.012	0.110	0.076
WNW1106B	DOWN - B	Dec-92	109	94.5	37.2	36.8	25.8	25.6	2.58	2.22	1.26	<0.020	0.026	0.004
WNW1109B	DOWN - B	Aug-92	47.1	45.5	18.4	21.4	13.8	13.4	2.28	1.86	1.40	0.030	0.068	0.047
WNW1109B	DOWN - B	Dec-92	70.8	55.7	19.2	19.9	12.1	13.0	1.94	1.53	1.39	<0.020	0.076	0.058

Hydraulic position is the general position in the unit.

Table E - 8 (continued)

Groundwater Quality Parameters (mg/L) for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as mg$CaCO_3$/L)	Carbonate Alkalinity (as mg$CaCO_3$/L)	Phenols
WNW0107	DOWN - C	Jul-92	6.7	334	0.02	<0.05	230	<1.0	<0.005
WNW0107	DOWN - C	Dec-92	<3.0	283	0.08	<0.05	232	<1.0	<0.005
WNW0108	DOWN - C	Jul-92	<1.0	164	0.32	<0.05	193	<1.0	<0.005
WNW0108	DOWN - C	Dec-92	<1.0	244	0.44	0.07	188	<1.0	<0.005
WNW0114	DOWN - C	Jul-92	12.3	83.0	0.18	<0.05	183	<1.0	<0.005
WNW0114	DOWN - C	Dec-92	10.1	157	0.20	<0.05	207	<1.0	<0.005
WNW0409	DOWN - C	Jul-92	1.8	72.5	0.06	0.06	124	<1.0	0.006
WNW0409	DOWN - C	Dec-92	<1.0	66.8	0.16	<0.05	143	<1.0	<0.005
WNW0910	DOWN - C	Jul-92							
WNW0910	DOWN - C	Dec-92	2.6	582	0.28	0.62	330	<1.0	<0.005
WNW1102B	DOWN - C	Aug-92	2.0	61.0	0.06	<0.05	266	<1.0	0.016
WNW1102B	DOWN - C	Dec-92	<1.0	62.8	0.14	<0.05	279	<1.0	<0.005
WNW1103B	DOWN - C	Aug-92	1.8	130	0.09	0.10	277	<1.0	0.006
WNW1103B	DOWN - C	Dec-92	<1.0	146	0.21	<0.05	304	<1.0	<0.005
WNW1104B	DOWN - C	Aug-92	1.2	129	0.27	0.07	220	<1.0	0.006
WNW1104B	DOWN - C	Dec-92	1.2	144	0.48	<0.05	243	<1.0	<0.005
WNW1105A	DOWN - C	Aug-92	<1.0	262	0.67	0.07	201	<1.0	0.007
WNW1105A	DOWN - C	Dec-92	<1.0	309	0.70	0.05	238	<1.0	<0.005
WNW1105B	DOWN - C	Aug-92	<1.0	372	1.4	<0.05	215	<1.0	0.007
WNW1105B	DOWN - C	Dec-92	1.4	394	1.3	<0.05	229	<1.0	<0.005
WNW1111A	DOWN - C	Aug-92	1.5	285	0.01	0.05	384	<1.0	<0.005
WNW1111A	DOWN - C	Dec-92	1.6	292	0.02	<0.05	402	<1.0	<0.005

Hydraulic position is the general position in the unit.

Well WNW0910 was incorporated into the groundwater program in late 1992.

Table E - 8 (concluded)

Groundwater Quality Parameters (mg/L) for the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0107	DOWN - C	Jul-92	123	139	29.2	31.7	19.4	20.4	2.21	2.37	0.018	<0.012	0.051	0.056
WNW0107	DOWN - C	Dec-92	132	129	28.9	31.3	17.8	21.6	2.42	2.37	0.080	0.090	0.004	0.007
WNW0108	DOWN - C	Jul-92	106	100	28.8	32.2	23.4	25.1	1.84	2.32	0.465	<0.008	0.028	0.051
WNW0108	DOWN - C	Dec-92	99.1	103	26.1	27.9	19.4	22.8	1.88	2.01	0.470	0.050	0.076	0.070
WNW0114	DOWN - C	Jul-92	79.4	85.2	12.0	13.4	9.20	9.93	1.41	1.36	0.504	0.059	0.025	0.011
WNW0114	DOWN - C	Dec-92	98.6	102	15.1	15.9	11.0	13.9	1.67	1.66	0.735	0.070	0.016	<0.003
WNW0409	DOWN - C	Jul-92	35.9	40.4	9.90	9.26	20.4	21.3	7.06	7.41	4.49	<0.012	0.065	0.003
WNW0409	DOWN - C	Dec-92	42.3	45.2	9.14	9.73	22.7	24.9	7.20	7.99	1.16	0.023	0.020	<0.003
WNW0910	DOWN - C	Jul-92												
WNW0910	DOWN - C	Dec-92	151	157	75.9	85.6	31.2	37.7	13.5	16.5	8.66	2.44	0.328	0.338
WNW1102B	DOWN - C	Aug-92	63.0	60.5	32.3	34.4	15.2	14.9	1.72	1.90	0.242	<0.012	0.022	0.014
WNW1102B	DOWN - C	Dec-92	75.5	73.0	31.4	30.2	14.4	14.0	1.97	1.89	0.814	0.350	0.014	0.007
WNW1103B	DOWN - C	Aug-92	70.5	67.2	38.3	40.0	24.9	23.0	1.91	2.30	0.064	<0.012	0.055	0.057
WNW1103B	DOWN - C	Dec-92	92.0	79.5	32.8	31.4	24.5	24.1	2.05	1.95	0.229	0.020	0.012	<0.003
WNW1104B	DOWN - C	Aug-92	68.0	63.1	26.6	28.2	30.7	28.7	1.90	2.06	0.036	0.014	0.014	0.008
WNW1104B	DOWN - C	Dec-92	91.0	89.0	27.1	27.2	26.9	27.6	1.75	1.81	0.020	<0.020	0.006	0.006
WNW1105A	DOWN - C	Aug-92	118	113	29.3	33.5	24.9	24.8	2.49	2.45	0.424	0.068	0.105	0.098
WNW1105A	DOWN - C	Dec-92	145	122	27.4	29.0	25.0	27.0	2.30	2.51	0.198	0.020	0.102	0.112
WNW1105B	DOWN - C	Aug-92	145	141	39.5	44.2	40.2	36.8	3.29	3.12	0.318	0.029	0.030	0.017
WNW1105B	DOWN - C	Dec-92	148	150	33.1	35.6	35.6	38.8	2.99	3.09	0.192	<0.020	0.013	0.006
WNW1111A	DOWN - C	Aug-92	84.1	123	28.3	64.4	11.9	16.7	1.71	2.52	0.018	0.022	0.068	0.068
WNW1111A	DOWN - C	Dec-92	169	146	63.4	63.3	18.7	18.5	2.99	2.83	0.033	<0.020	0.060	0.052

Hydraulic position is the general position in the unit.

Well WNW0910 was incorporated into the groundwater program in late 1992.

Table E - 9

Groundwater Quality Parameters (mg/L) for the Lacustrine Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as mg$CaCO_3$/L)	Carbonate Alkalinity (as mg$CaCO_3$/L)	Phenols
WNW0901	UP	Jul-92	12.2	48.8	<0.010	0.59	179	<1.0	< 0.005
WNW0901	UP	Dec-92	10.5	14.8	<0.010	0.55	210	<1.0	< 0.005
WNW0902	UP	Jul-92	20.1	2.0	<0.010	0.52	189	<1.0	< 0.005
WNW0902	UP	Dec-92	20.6	3.2	<0.010	0.59	193	<1.0	< 0.006
WNW1001	UP	Jul-92	32.7	2.4	<0.010	0.60	160	<1.0	< 0.005
WNW1001	UP	Dec-92	33.1	9.7	<0.010	0.50	184	<1.0	< 0.005
WNW1008B	UP	Jul-92	37.8	<1.0	<0.010	0.39	148	<1.0	0.007
WNW1008B	UP	Dec-92	30.1	7.2	<0.010	0.34	167	<1.0	< 0.005
WNW0903	DOWN - B	Jul-92	<1.0	130	0.012	0.48	266	<1.0	< 0.005
WNW0903	DOWN - B	Dec-92	1.1	438	<0.010	0.58	286	<1.0	< 0.005
WNW1002	DOWN - B	Jul-92	<1.0	108	0.080	0.69	375	<1.0	< 0.005
WNW1002	DOWN - B	Dec-92	28.2	518	0.033	0.83	435	<1.0	< 0.005
WNW1003	DOWN - B	Jul-92	10.7	2.4	<0.010	0.50	205	<1.0	< 0.005
WNW1003	DOWN - B	Dec-92	11.0	9.3	<0.010	0.58	241	<1.0	< 0.005
WNW1004	DOWN - B	Jul-92	<1.0	17.5	<0.010	<0.05	222	<1.0	0.005
WNW1004	DOWN - B	Dec-92	2.0	16.8	<0.010	0.51	241	<1.0	< 0.005
WNW1101C	DOWN - B	Aug-92	1.5	73.5	0.073	0.10	174	<1.0	< 0.005
WNW1101C	DOWN - B	Dec-92	<1.0	101	0.030	0.05	204	<1.0	< 0.005
WNW1103C	DOWN - C	Aug-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1103C	DOWN - C	Dec-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1104C	DOWN - C	Aug-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1104C	DOWN - C	Dec-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW8610	DOWN - C	Jul-92	<1.0	116	0.020	0.27	271	<1.0	< 0.005
WNW8610	DOWN - C	Dec-92	1.1	250	<0.010	0.31	250	<1.0	< 0.005
WNW8611	DOWN - C	Jul-92	<1.0	210	0.10	0.06	389	<1.0	< 0.005
WNW8611	DOWN - C	Dec-92	1.1	316	0.060	0.07	265	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.

Table E - 9 *(concluded)*
Groundwater Quality Parameters (mg/L) for the Lacustrine Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0901	UP	Jul-92	34.0	34.3	9.69	9.28	29.5	31.1	4.55	4.28	4.31	0.188	0.176	0.136
WNW0901	UP	Dec-92	30.6	29.8	9.13	9.40	27.0	30.6	4.36	4.39	1.02	0.104	0.108	0.105
WNW0902	UP	Jul-92	38.8	36.2	12.0	12.8	30.2	30.5	4.59	3.35	0.814	0.222	0.105	0.097
WNW0902	UP	Dec-92	40.9	41.2	13.8	14.0	31.5	32.1	2.63	2.71	0.693	0.391	0.087	0.084
WNW1001	UP	Jul-92	29.8	26.8	8.84	7.96	44.5	40.4	4.18	3.40	3.48	0.304	0.114	0.091
WNW1001	UP	Dec-92	35.4	28.0	9.84	7.72	40.7	44.4	3.59	2.82	9.32	0.110	0.170	0.056
WNW1008B	UP	Jul-92	30.2	26.2	8.10	7.88	32.7	23.7	3.42	2.98	1.29	0.106	0.122	0.140
WNW1008B	UP	Dec-92	33.4	33.9	8.63	8.57	34.6	41.0	3.25	3.05	1.39	0.586	0.112	0.102
WNW0903	DOWN - B	Jul-92	69.5	59.0	32.3	31.4	40.9	46.4	5.18	3.52	20.6	0.042	0.364	0.171
WNW0903	DOWN - B	Dec-92	129	77.6	63.6	36.1	43.2	46.3	9.66	3.67	99.1	<0.020	1.45	0.146
WNW1002	DOWN - B	Jul-92	93.2	100	44.3	45.7	37.9	30.2	2.61	2.85	0.791	0.264	0.090	0.086
WNW1002	DOWN - B	Dec-92	124	114	52.6	52.8	36.0	38.8	3.20	2.81	2.16	1.04	0.104	0.100
WNW1003	DOWN - B	Jul-92	28.6	22.9	9.32	7.49	61.2	58.9	2.67	2.62	2.52	0.125	0.199	0.172
WNW1003	DOWN - B	Dec-92	29.0	25.2	8.86	7.70	48.0	64.5	2.46	2.17	4.66	<0.020	0.186	0.114
WNW1004	DOWN - B	Jul-92	39.0	40.8	16.7	18.3	28.0	23.0	1.57	1.65	0.621	0.349	0.042	0.039
WNW1004	DOWN - B	Dec-92	38.1	36.6	16.4	16.7	25.4	28.2	1.50	1.30	1.51	0.384	0.046	0.030
WNW1101C	DOWN - B	Aug-92	50.2	46.8	12.4	11.1	29.0	28.9	4.54	3.90	4.25	0.039	0.160	0.051
WNW1101C	DOWN - B	Dec-92	65.0	66.5	11.9	10.9	26.8	27.7	4.85	3.93	3.66	0.028	0.131	0.034
WNW1103C	DOWN - C	Aug-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1103C	DOWN - C	Dec-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1104C	DOWN - C	Aug-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW1104C	DOWN - C	Dec-92	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
WNW8610	DOWN - C	Jul-92	42.8	30.2	38.7	38.6	78.5	83.5	12.3	6.06	6.94	0.140	0.165	0.028
WNW8610	DOWN - C	Dec-92	44.4	32.9	36.1	36.0	64.5	71.3	4.82	4.73	11.0	0.318	0.241	0.032
WNW8611	DOWN - C	Jul-92	79.9	83.8	32.9	36.3	66.0	75.1	3.56	3.32	4.71	0.374	0.083	0.033
WNW8611	DOWN - C	Dec-92	76.0	84.7	33.5	34.9	64.6	75.7	3.57	3.53	8.26	0.070	0.141	0.006

Hydraulic position is the general position in the geologic unit.

Well WNW1003 was resampled in September 1992 for dissolved metals.

Table E - 10
Groundwater Quality Parameters (mg/L) for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as $mgCaCO_3/L$)	Carbonate Alkalinity (as $mgCaCO_3/L$)	Phenols
WNW0908	UP	Jul-92	4.3	1230	0.029	<0.05	312	<1.0	< 0.005
WNW0908	UP	Dec-92	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx
WNW1005	UP	Jul-92	1.3	91.0	<0.010	<0.05	369	<1.0	< 0.005
WNW1005	UP	Dec-92	<2.0	66.0	0.012	<0.05	404	<1.0	< 0.005
WNW1008C	UP	Jul-92	35.5	14.2	<0.010	0.06	206	<1.0	< 0.005
WNW1008C	UP	Dec-92	34.3	19.7	<0.010	0.05	232	<1.0	< 0.005
WNW0906	DOWN - B	Jul-92	11.9	140	0.82	0.06	233	<1.0	0.009
WNW0906	DOWN - B	Dec-92	10.2	234	0.26	<0.05	282	<1.0	< 0.005
WNW0907	DOWN - B	Jul-92	1.5	142	<0.010	<0.05	331	<1.0	< 0.005
WNW0907	DOWN - B	Dec-92	2.3	330	<0.010	<0.05	317	<1.0	< 0.005
WNW1006	DOWN - B	Jul-92	1.3	1083	<0.010	0.07	333	<1.0	0.005
WNW1006	DOWN - B	Dec-92	1.6	1320	0.020	0.05	343	<1.0	< 0.005
WNW1007	DOWN - B	Jul-92	2.3	670	0.092	<0.05	303	<1.0	< 0.005
WNW1007	DOWN - B	Dec-92	2.4	626	0.14	<0.05	323	<1.0	< 0.005
WNW1101A	DOWN - B	Aug-92	2.0	144	<0.010	<0.05	220	<1.0	< 0.005
WNW1101A	DOWN - B	Dec-92	1.2	150	0.18	<0.05	209	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.

Table E - 10 *(continued)*

Groundwater Quality Parameters (mg/L) for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW0908	UP	Jul-92	414	262	158	173	20.8	19.6	5.58	5.25	0.556	0.036	0.531	0.401
WNW0908	UP	Dec-92	555	499	148	106	21.3	15.7	6.28	4.49	0.314	0.020	0.523	0.166
WNW1005	UP	Jul-92	102	113	35.2	38.7	10.2	11.0	1.68	1.96	0.846	<0.012	0.072	0.081
WNW1005	UP	Dec-92	116	114	34.6	35.8	10.4	12.2	1.73	1.36	1.18	<0.020	0.023	<0.003
WNW1008C	UP	Jul-92	61.8	58.0	16.0	15.7	11.5	11.7	0.602	0.786	0.115	0.072	0.209	0.322
WNW1008C	UP	Dec-92	73.2	75.8	17.1	17.8	12.7	13.2	0.736	0.740	0.092	0.049	0.154	0.144
WNW0906	DOWN - B	Jul-92	82.9	84.5	28.7	29.1	19.5	22.7	2.30	2.40	1.88	<0.012	0.090	0.050
WNW0906	DOWN - B	Dec-92	67.2	72.0	25.1	25.2	22.2	24.1	2.12	2.13	1.22	0.111	0.018	<0.003
WNW0907	DOWN - B	Jul-92	105	109	38.5	40.9	9.23	9.88	2.00	2.32	0.095	<0.012	0.052	0.030
WNW0907	DOWN - B	Dec-92	103	108	40.4	40.4	10.2	10.4	2.10	2.15	<0.020	<0.020	0.102	0.104
WNW1006	DOWN - B	Jul-92	309	246	136	145	20.2	20.7	3.11	3.40	0.836	0.639	0.458	0.548
WNW1006	DOWN - B	Dec-92	348	331	130	129	19.7	21.2	3.69	3.64	0.331	0.115	0.187	0.124
WNW1007	DOWN - B	Jul-92	215	197	77.4	83.2	18.4	15.6	10.1	11.8	3.22	0.041	0.074	0.022
WNW1007	DOWN - B	Dec-92	204	212	71.3	72.4	18.9	20.0	13.9	15.4	1.12	0.026	0.032	0.004
WNW1101A	DOWN - B	Aug-92	122	75.0	62.4	29.1	18.3	11.4	2.63	1.89	0.096	0.019	0.110	0.052
WNW1101A	DOWN - B	Dec-92	98.0	81.5	24.3	25.0	12.5	12.9	1.83	1.90	0.024	<0.020	<0.003	<0.003

Hydraulic position is the general position in the geologic unit.

Table E - 10 *(continued)*

Groundwater Quality Parameters (mg/L) for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Chloride	Sulfate	Nitrate + Nitrite-N	Ammonia	Bicarbonate Alkalinity (as mgCaCO$_3$/L)	Carbonate Alkalinity (as mgCaCO$_3$/L)	Phenols
WNW1106A	DOWN - B	Aug-92	4.5	125	<0.010	0.10	268	<1.0	< 0.005
WNW1106A	DOWN - B	Dec-92	3.2	150	0.026	0.11	306	<1.0	< 0.005
WNW1108A	DOWN - B	Aug-92	2.0	845	0.011	<0.05	294	<1.0	0.008
WNW1108A	DOWN - B	Dec-92	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx
WNW1109A	DOWN - B	Aug-92	<1.0	197	0.12	<0.05	222	<1.0	< 0.005
WNW1109A	DOWN - B	Dec-92	<1.0	214	0.13	<0.05	225	<1.0	< 0.005
WNW0909	DOWN - C	Jun-92	<1.0	370	N/A	0.40	392	<10.0	<0.005
WNW0909	DOWN - C	Jul-92	17.7	165	< 0.01	0.17	593	<1.0	0.006
WNW0909	DOWN - C	Dec-92	18.3	198	< 0.01	0.38	431	<1.0	<0.005
WNW1102A	DOWN - C	Aug-92	2.0	221	0.011	<0.05	243	<1.0	0.005
WNW1102A	DOWN - C	Dec-92	<1.0	280	0.082	<0.05	243	<1.0	< 0.005
WNW1103A	DOWN - C	Aug-92	2.1	376	<0.010	<0.05	290	<1.0	0.005
WNW1103A	DOWN - C	Dec-92	1.4	361	0.014	<0.05	295	<1.0	< 0.005
WNW1104A	DOWN - C	Aug-92	3.0	110	0.054	<0.05	215	<1.0	< 0.005
WNW1104A	DOWN - C	Dec-92	2.7	117	0.10	<0.05	236	<1.0	< 0.005
WNW1107A	DOWN - C	Aug-92	8.9	271	0.021	0.13	464	<1.0	0.006
WNW1107A	DOWN - C	Dec-92	22.9	248	0.031	0.36	547	<1.0	< 0.005
WNW1110A	DOWN - C	Aug-92	1.4	636	0.065	<0.05	405	<1.0	0.005
WNW1110A	DOWN - C	Dec-92	5.0	656	0.11	0.05	420	<1.0	< 0.005

Hydraulic position is the general position in the geologic unit.

Well WNW0909 was incorporated into the groundwater program in mid-1992.

N/A - Not available.

Table E - 10 *(concluded)*

Groundwater Quality Parameters (mg/L) for the Weathered Lavery Till Unit

Location Code	Hydraulic Position	Date	Calcium Total	Calcium Diss.	Magnesium Total	Magnesium Diss.	Sodium Total	Sodium Diss.	Potassium Total	Potassium Diss.	Iron Total	Iron Diss.	Manganese Total	Manganese Diss.
WNW1106A	DOWN - B	Aug-92	84.2	80.8	36.3	39.0	12.4	12.1	2.36	2.72	0.038	<0.012	0.306	0.306
WNW1106A	DOWN - B	Dec-92	105	112	37.9	39.1	11.5	12.1	2.75	2.84	0.060	<0.020	0.070	0.076
WNW1108A	DOWN - B	Aug-92	223	221	92.9	93.6	23.7	22.3	5.12	4.15	0.894	0.058	0.086	0.031
WNW1108A	DOWN - B	Dec-92	227	224	76.0	80.4	19.6	20.4	4.45	4.16	1.11	0.207	0.117	0.276
WNW1109A	DOWN - B	Aug-92	97.2	91.2	28.6	33.8	11.7	10.8	2.25	2.69	0.084	<0.012	0.009	0.006
WNW1109A	DOWN - B	Dec-92	124	116	27.6	29.4	10.5	11.2	2.33	2.55	0.024	<0.020	0.060	0.054
WNW0909	DOWN - C	Jun-92	168	158	70.3	73.1	11.8	20.2	5.62	5.42	8.44	2.84	0.634	0.636
WNW0909	DOWN - C	Jul-92	198	198	52.6	52.6	10.0	9.95	1.93	2.46	4.69	3.92	5.14	7.53
WNW0909	DOWN - C	Dec-92	149	152	32.6	33.3	15.2	16.1	2.32	2.25	4.13	2.94	3.01	3.07
WNW1102A	DOWN - C	Aug-92	100	100	41.9	42.3	10.7	9.90	2.47	2.67	0.074	0.018	0.076	0.066
WNW1102A	DOWN - C	Dec-92	120	111	39.3	38.0	8.66	8.62	2.59	2.49	0.120	<0.020	0.008	<0.003
WNW1103A	DOWN - C	Aug-92	143	134	59.5	60.3	15.8	13.6	2.68	2.62	0.220	<0.012	0.261	0.147
WNW1103A	DOWN - C	Dec-92	154	143	53.2	50.4	13.2	12.8	3.01	2.60	0.943	<0.020	0.030	0.004
WNW1104A	DOWN - C	Aug-92	70.1	63.9	25.1	25.5	10.8	10.0	1.74	1.92	0.101	<0.012	0.044	0.039
WNW1104A	DOWN - C	Dec-92	95.0	89.0	24.3	24.6	9.15	9.21	1.80	1.87	0.038	<0.020	0.008	0.007
WNW1107A	DOWN - C	Aug-92	154	148	66.8	70.8	11.2	9.78	2.18	2.46	34.8	39.5	4.83	5.24
WNW1107A	DOWN - C	Dec-92	207	178	65.2	64.8	9.96	10.0	2.43	2.44	0.357	<0.020	8.34	8.42
WNW1110A	DOWN - C	Aug-92	175	174	116	119	29.7	27.4	4.42	4.42	0.211	0.055	0.052	0.100
WNW1110A	DOWN - C	Dec-92	210	210	115	109	28.4	26.8	4.55	4.40	0.260	<0.020	0.028	0.006

Hydraulic position is the general position in the geologic unit.

Well WNW0909 was incorporated into the groundwater program in mid-1992.

Table E - 11

Typical Practical Quantitation Limits (PQL) for Appendix IX Volatile Organic Compounds (μg/L)

COMPOUND	PQL	COMPOUND	PQL
Acetone	10	2-Hexanone	10
Acetonitrile	1000	Isobutanol	100
Acrolein	5	Methacrylonitrile	5
Acrylonitrile	5	2-Butanone	10
Allyl chloride	100	Methylene bromide	5
Benzene	5	Methylene chloride	5
Bromomethane	10	Methyl iodide	5
Bromodichloromethane	5	Methyl methacrylate	5
Bromoform	5	4-Methyl-2-pentanone	10
cis-1,3-Dichloropropene	5	2-Picoline	1000
Carbon tetrachloride	5	Pentachloroethane	5
Chlorobenzene	5	Propionitrile	5
Chloroethane	10	Pyridine	30
Chloroform	5	Styrene	5
Chloromethane	10	trans-1,3-Dichloropropene	5
Chloroprene	5	trans-1,4-Dichloro-2-butene	5
Carbon disulfide	5	1,1,1-Trichloroethane	5
Dibromochloromethane	5	1,1,1,2-Tetrachloroethane	5
1,2-Dibromo-3-chloropropane	5	1,1,2-Trichloroethane	5
1,2-Dibromoethane	5	1,1,2,2-Tetrachloroethane	5
1,1-Dichloroethane	5	Trichlorofluoromethane	5
1,2-Dichloroethane	5	1,2,3-Trichloropropane	5
Dichlorodifluoromethane	5	Tetrachloroethene	5
1,1-Dichloroethene	5	Toluene	5
1,2-Dichloroethene (Total)	5	Trichloroethene	5
1,2-Dichloropropane	5	Vinyl acetate	5
1,4-Dioxane	150	Vinyl chloride	10
Ethylbenzene	5	Xylene (M&P)	5
Ethyl methacrylate	5	Xylene (O)	5

Table E - 12

1,1,1-Trichloroethane (1,1,1-TCA) , 1,1-Dichloroethane (1,1-DCA), and Dichlorodifluoromethane (DCDFMethane) for Selected Groundwater Monitoring Locations

Location Code	Sample Date	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	DCDFmethane (µg/L)
WNGSEEP	01/15/92	5.5	<5.0	<5.0
	02/26/92	<5.0	<5.0	<5.0
	04/06/92	<5.0	<5.0	<5.0
	08/10/92	<5.0*	<5.0	<5.0
	09/09/92	<5.0*	<5.0	<5.0
	10/20/92	<5.0*	<5.0	<5.0
	11/19/92	<5.0*	<5.0	<5.0
	12/17/92	<5.0*	<5.0	<5.0
WNW8609	01/15/92	<5.0	6.8	<5.0
	02/24/92	<5.0	<5.0	<5.0
	04/06/92	<5.0	<5.0	<5.0
	07/17/92	<5.0*	5.0	<5.0
	08/26/92	<5.0	5.0	<5.0
	10/06/92	<5.0	6.0	<5.0
	11/04/92	<5.0*	<5.0*	<5.0
	12/09/92	<5.0*	<5.0*	<5.0
WNW8612	01/15/92	<5.0	18	<5.0
	02/26/92	<5.0	18	<5.0*
	04/06/92	<5.0	8.4	<5.0
	08/10/92	<5.0*	26	7.0
	09/09/92	<5.0*	34	9.5
	10/20/92	<5.0*	32	11
	11/19/92	<5.0*	30	12
	2/17/92 †	<5.0*	34	7
WNW0803	01/15/92	<5.0	<5.0*	<5.0
	02/26/92	<5.0	<5.0	<5.0
	04/06/92	<5.0	<5.0	<5.0
	08/10/92	<5.0	<5.0*	18
	09/09/92	<5.0	<5.0*	14
	10/20/92	<5.0	<5.0*	14
	11/19/92	<5.0	<5.0*	16
	12/17/92	<5.0	<5.0*	38

** Compound was detected below practical quantitation limit (PQL).*

Table E - 13
Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0301 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	2.4	>100	7.30 ±2.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	2.9	>100	5.40 ±2.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.5	747	1.02 ±0.24E-08
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.3	637	6.83 ±1.64E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	2.5	NA	7.43 ±2.24E-09
WNW0401 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	<0.10	5.4	>100	7.00 ±2.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	<0.10	7.4	74	2.00 ±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	8.0	12	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	6.2	10	<8.21E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<7.4	<1.2	<0.10	6.7	NA	2.07 ±1.41E-09
WNW0403 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	12.0	>100	6.70 ±2.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	17.0	>100	8.00 ±2.50E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	15.0	17	1.20 ±1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	14.0	308	1.81 ±0.80E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	14.5	NA	4.43 ±1.73E-09
WNWNB1S (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	5.0	0.44	1.10 ±0.70E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	9.5	25	<9.40E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	16.0	20	<1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	7.3	11	<5.62E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	<0.10	9.4	14	<8.26E-10
WNW0201 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.47	1.4	<1.22E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	1.6	3.7	1.70 ±1.10E-09
Jul-92	<0.053	<0.10	<0.53	<1.0	<11	<2.2	<0.10	<0.010	3.2	<1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.3	2.5	<5.22E-10
Mean:	<0.038	<0.08	<0.46	<1.0	<6.3	<1.2	<0.10	1.1	2.7	<9.86E-10
WNW0706 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	2.2	72	6.50 ±2.20E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.2	65	3.60 ±1.60E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.33	36	2.10 ±1.00E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.23	31	6.17 ±1.00E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	<0.10	0.99	51	4.59 ±1.45E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0301 (UP)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.220	0.150	0.720	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0047	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.200	0.110	0.240	0.0096	0.017	<0.0020	< 0.0020	< 0.0020
Jul-92	0.032	<0.0012	0.0006	<0.00005	<0.00020	<0.00020	0.0005	<0.00008	0.483	0.120	0.638	0.0060	0.044	0.0010	< 0.0012	< 0.0012
Dec-92	0.029	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.444	0.126	0.112	<0.0050	0.12	0.0040	< 0.0020	< 0.0020
Mean:	0.017	< 0.0018	0.0029	< 0.0028	<0.00020	<0.00020	0.0018	< 0.0016	0.337	0.126	0.43	0.0064	0.047	0.0022	< 0.0018	< 0.0018
WNW0401 (UP)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.150	0.110	0.270	<0.0050	0.013	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0026	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.245	0.205	0.260	0.0087	0.006	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0025	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.218	0.203	0.645	0.018	0.007	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.159	0.150	0.140	<0.0050	0.005	0.0140	< 0.0020	< 0.0020
Mean:	0.0023	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.193	0.167	0.33	0.0092	0.0077	0.0047	< 0.0018	< 0.0018
WNW0403 (UP)																
Nov-91	0.0036	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.210	0.082	0.064	<0.0050	0.018	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0063	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.290	0.110	0.940	0.010	0.028	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0065	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	0.0002	<0.00008	0.246	0.229	4.02	0.188	0.017	0.0010	< 0.0012	< 0.0012
Dec-92	0.011	<0.0020	<0.0030	<0.0030	0.00040	<0.00020	< 0.0005	< 0.0005	0.238	0.146	0.642	0.0080	0.020	0.0070	< 0.0020	< 0.0020
Mean:	0.0068	< 0.0018	< 0.0030	< 0.0030	0.00025	<0.00020	0.0017	< 0.0016	0.246	0.142	1.4	0.053	0.021	0.0030	< 0.0018	< 0.0018
WNWNB1S (UP)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.090	0.195	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.090	0.086	0.015	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.096	0.102	0.0040	<0.0025	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	< 0.0002	< 0.0002	<0.00020	<0.00020	< 0.0005	< 0.0005	0.090	0.081	0.160	0.0060	0.003	0.0030	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0024	< 0.0024	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0990	0.0898	0.094	0.0046	0.0032	0.0019	< 0.0018	< 0.0018
WNW0201 (DOWN - B)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.120	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.220	0.220	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.148	0.170	0.0032	0.0025	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.148	0.151	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.164	0.165	0.0046	0.0044	0.0018	< 0.0017	< 0.0018	< 0.0018
WNW0706 (DOWN - B)																
Dec-91	0.0053	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.200	0.093	0.023	<0.0050	0.018	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0076	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.180	0.090	0.019	<0.0050	0.017	0.0032	< 0.0020	< 0.0020
Aug-92	0.0070	<0.0012	0.0046	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.190	0.126	0.014	0.0042	0.018	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0080	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.232	0.136	0.017	<0.0050	0.044	<0.0020	< 0.0020	< 0.0020
Mean:	0.0070	< 0.0018	0.0039	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.200	0.111	0.018	0.0048	0.024	0.0020	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 (continued)
Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW8613A (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	2.6	>100	3.50±1.30E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	1.7	450	3.60±1.50E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.0	38	1.50±0.70E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.5	14	1.49±0.52E-09
Mean:‘	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	<0.10	2.0	NA	2.52±1.00E-09
WNW8613B (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	5.6	>100	7.20±1.90E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	2.2	192	5.60±1.80E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	3.3	285	3.50±0.90E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.1	630	5.59±1.53E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	<0.10	3.3	NA	5.47±1.53E-09
WNW8613C (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	5.8	>100	1.70±0.30E-08
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	1.7	280	1.20±0.30E-08
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	2.9	128	<5.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.11	2.2	468	1.66±0.54E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	0.11	3.2	NA	7.69±1.76E-09
WNSP008 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	0.13	0.23	<1.12E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.39	0.14	<1.04E-09
Jun-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.16 *	0.25	<8.40E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	0.18	0.20	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.10	0.28	0.87	<4.61E-10
Mean:	<0.040	<0.08	<0.46	<1.0	<7.0	<1.3	0.10	0.23	0.34	<8.72E-10
WNW0103 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	1.54	3.8	N/A	<6.37E-08
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	0.34	1.3	N/A	<2.32E-09
Aug-92	<0.050	<0.10	<0.50	<5.3	<10	<2.0	0.43	0.24	N/A	<8.00E-09
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	<0.050	N/A	2.08±1.56E-09
Mean:	<0.050	<0.10	<0.50	<3.8	<7.8	<1.5	0.63	1.3	N/A	<1.89E-08
WNW0104 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	1.3	N/A	9.70±2.30E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	1.3	N/A	8.80±6.00E-10
Aug-92	<0.050	<0.10	<0.50	<5.1	<10	<2.0	<0.20	4.4	N/A	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	1.3	N/A	3.03±0.97E-09
Mean:	<0.050	<0.10	<0.50	<3.7	<7.8	<1.5	<0.15	2.1	N/A	3.48±1.12E-09

** Nitrate-N only.*
ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW8613A (DOWN - B)																
Dec-91	0.0035	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.270	0.160	0.320	0.0088	0.024	0.0020	< 0.0020	< 0.0020
Mar-92	0.0089	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.380	0.120	0.970	<0.0050	0.031	0.0049	< 0.0020	< 0.0020
Aug-92	0.0040	<0.0012	0.0024	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.156	0.158	0.260	0.0045	0.007	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0050	<0.0020	0.0002	< 0.0002	<0.00020	<0.00020	< 0.0005	< 0.0005	0.170	0.132	0.088	<0.0050	0.014	0.0020	< 0.0020	< 0.0020
Mean:	0.0054	< 0.0018	0.0026	< 0.0024	<0.00020	<0.00020	< 0.0016	< 0.0016	0.244	0.142	0.41	0.0058	0.019	0.0024	< 0.0018	< 0.0018
WNW8613B (DOWN - B)																
Dec-91	0.0090	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.370	0.220	2.45	0.012	0.037	<0.0020	<0.010	< 0.0020
Mar-92	0.014	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.340	0.290	5.70	0.240	0.041	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0085	<0.0012	0.0091	0.0030	<0.00020	<0.00020	<0.00008	<0.00008	0.192	0.150	1.50	0.124	0.016	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.014	<0.0020	0.0003	< 0.0002	<0.00020	<0.00020	0.0006	< 0.0005	0.240	0.114	1.21	0.0080	0.030	0.0020	< 0.0020	< 0.0020
Mean:	0.011	< 0.0018	0.0044	0.0028	<0.00020	<0.00020	0.0017	< 0.0016	0.286	0.194	2.7	0.096	0.031	0.0017	< 0.0038	< 0.0018
WNW8613C (DOWN - B)																
Dec-91	0.0076	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.320	0.110	0.210	<0.0050	0.048	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0045	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.190	0.095	0.140	<0.0050	0.016	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0098	<0.0012	0.0062	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.180	0.127	0.046	0.0052	0.016	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.010	<0.0020	0.0003	< 0.0002	0.00020	<0.00020	< 0.0005	< 0.0005	0.160	0.086	0.025	<0.0050	0.027	<0.0020	< 0.0020	< 0.0020
Mean:	0.0080	< 0.0018	0.0036	< 0.0024	0.00020	<0.00020	< 0.0016	< 0.0016	0.212	0.104	0.11	0.0050	0.027	< 0.0017	< 0.0018	< 0.0018
WNSP008 (DOWN - C)																
Dec-91	0.0026	0.0024	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.056	0.060	<0.0050	<0.0050	<0.0020	0.0021	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.070	0.074	0.0052	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jun-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.088	0.090	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.073	0.074	0.0030	0.0030	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.084	0.088	<0.0050	<0.0050	0.007	0.0030	< 0.0020	< 0.0020
Mean:	0.0020	0.0019	< 0.0032	< 0.0032	<0.00020	<0.00020	< 0.0024	< 0.0024	0.0743	0.0773	0.0046	0.0046	0.0028	0.0020	< 0.0018	< 0.0018
WNW0103 (DOWN - C)																
Dec-91	0.42	0.44	<0.0010	<0.0010	0.00084	0.00060	<0.0050	<0.0050	0.200	0.184	0.056	0.057	0.12	0.106	<0.030	<0.030
Mar-92	0.062	0.046	<0.0040	<0.0040	<0.00020	0.00020	<0.0050	0.0081	0.064	<0.050	0.025	0.0056	0.059	<0.0050	< 0.0050	< 0.0050
Aug-92	0.074	0.070	0.0014	0.0015	0.00010	0.00007	<0.0045	<0.0045	0.037	0.023	0.020	0.0075	0.042	0.0124	< 0.0020	< 0.0020
Dec-92	0.034	0.027	<0.0030	<0.0030	0.00012	<0.00010	<0.0030	<0.0030	0.044	0.034	0.0068	0.0033	0.012	<0.0010	< 0.0010	< 0.0010
Mean:	0.15	0.14	0.0024	0.0024	0.00031	0.00024	< 0.0044	0.00515	0.0859	0.0728	0.027	0.018	0.057	0.031	< 0.0095	< 0.0095
WNW0104 (DOWN - C)																
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.171	0.162	0.0090	0.0050	0.013	0.0164	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.173	0.150	0.0064	<0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050
Aug-92	<0.0020	<0.0020	<0.0010	<0.0010	<0.00003	<0.00003	<0.0040	<0.0040	0.181	0.171	0.0057	<0.0020	0.004	<0.0010	< 0.0020	< 0.0020
Dec-92	0.0013	0.0010	<0.0030	<0.0030	<0.00010	<0.00010	<0.0030	<0.0030	0.160	0.149	0.017	<0.0030	0.002	0.0013	0.0012	< 0.0010
Mean:	0.0051	0.0050	< 0.0022	< 0.0022	<0.00013	<0.00013	< 0.0042	< 0.0042	0.171	0.158	0.0094	0.0038	0.0061	0.0059	0.0096	< 0.0095

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 (continued)

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0111 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	5.7	N/A	8.70 ±7.50E-10
Mar-92	<0.050	<0.10	<0.50	<2.5	<10	<2.0	0.95	<0.050	N/A	1.10 ±0.70E-09
Aug-92	<0.050	<0.10	<0.50	<5.3	<10	<2.0	<0.20	0.26	N/A	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	0.14	N/A	<1.60E-09
Mean:	<0.050	<0.10	<0.50	<3.8	<7.8	<1.5	0.36	1.5	N/A	9.18 ±9.12E-10
WNW0203 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	1.1	9.3	2.40 ±1.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	2.8	46	2.20 ±1.30E-09
Jul-92	<0.051	<0.10	<0.51	<1.0	<10	<2.0	<0.10	0.71	25	<1.30E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.0	31	<5.18E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	1.7	28	1.46 ±1.18E-09
WNW0205 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<6.0	<0.6	<0.10	0.14	3.6	2.30 ±1.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	1.2	4.9	1.80 ±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.92	4.7	1.50 ±1.30E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.79	27	<5.30E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<7.0	<1.2	<0.10	0.76	10	1.35 ±1.13E-09
WNW0305 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<10	<1.0	0.13	0.12	64	<1.40E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.094	>100	7.60 ±2.80E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.13	0.091	126	1.10 ±0.90E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.15	0.13	6.1	<4.09E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<7.8	<1.3	0.13	0.11	NA	2.30 ±1.38E-09
WNW0307 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	0.13	0.31	37	<1.34E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.58	34	1.20 ±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.16	0.90	75	<1.50E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.75	14	<9.76E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<7.5	<1.3	0.12	0.64	40	<1.23E-09
WNW0406 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	3.9	>100	6.00 ±2.40E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	3.7	76	3.20 ±2.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.4	40	<1.00E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.88	17	<4.07E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	2.7	NA	2.28 ±1.50E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0111 (DOWN - C)																
Aug-91	<0.014	N/A	<0.0010	N/A	<0.00020	N/A	<0.0040	N/A	0.084	N/A	<0.0030	N/A	0.024	N/A	<0.023	N/A
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.133	0.128	0.0040	0.0050	<0.0120	<0.0120	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.094	0.086	<0.0050	<0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050
Aug-92	<0.0020	<0.0020	<0.0010	0.0020	<0.00003	<0.00003	<0.0040	<0.0040	0.104	0.107	0.0047	<0.0020	<0.0010	0.0034	< 0.0020	< 0.0020
Dec-92	0.0016	<0.0010	<0.0030	<0.0030	0.0023	< 0.0010	<0.0030	<0.0030	0.065	0.061	0.0051	<0.0030	0.002	<0.0010	0.0010	< 0.0010
Mean:	0.0069	< 0.0050	< 0.0020	0.0025	0.00059	<0.00036	< 0.0042	< 0.0042	0.0961	0.0954	0.0044	0.0038	0.0089	0.0054	0.012	< 0.0095
WNW0203 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.290	0.310	0.013	0.027	<0.0020	0.0028	< 0.0020	< 0.0020
Mar-92	0.0021	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.200	0.190	0.170	0.0086	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0018	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.207	0.213	0.070	0.0080	0.004	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.172	0.170	0.089	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0020	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.217	0.221	0.085	0.012	0.0024	0.0019	< 0.0018	< 0.0018
WNW0205 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.150	0.150	0.0098	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.160	0.099	0.047	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.404	0.436	0.402	0.010	0.002	0.0025	< 0.0012	< 0.0025
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.041	0.040	0.026	<0.0050	0.003	0.0030	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.184	0.196	0.13	0.017	0.0022	0.0024	< 0.0018	< 0.0021
WNW0305 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.098	0.087	0.010	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0058	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.160	0.079	0.043	<0.0050	0.017	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0028	<0.0012	0.0006	0.0006	<0.00020	<0.00020	<0.00008	<0.00008	0.127	0.115	0.132	0.0025	0.006	0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	0.0005	0.0006	<0.00020	<0.00020	< 0.0005	< 0.0005	0.100	0.097	0.0060	<0.0050	0.002	0.0040	< 0.0020	< 0.0020
Mean:	0.0032	< 0.0018	0.0023	0.0023	<0.00020	<0.00020	< 0.0016	< 0.0016	0.121	0.0945	0.048	0.0044	0.0081	0.0022	< 0.0018	< 0.0018
WNW0307 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.076	<0.050	0.140	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.086	0.062	0.220	0.0067	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0032	<0.0012	0.0004	0.0002	<0.00020	<0.00020	<0.00008	<0.00008	0.185	0.125	2.10	0.0040	0.005	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	0.0003	0.0003	<0.00020	<0.00020	< 0.0005	< 0.0005	0.120	0.111	0.021	<0.0050	<0.0020	0.0020	< 0.0020	< 0.0020
Mean:	0.0023	< 0.0018	0.0022	0.0021	<0.00020	<0.00020	< 0.0016	< 0.0016	0.117	0.0870	0.62	0.0052	0.0040	0.0017	< 0.0018	< 0.0018
WNW0406 (DOWN - C)																
Nov-91	0.0042	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.180	0.110	0.017	<0.0050	0.017	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0026	0.0021	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.100	0.012	<0.0050	0.014	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0030	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	0.0002	0.0008	0.123	0.105	0.0065	<0.0025	0.65	0.0048	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	0.00020	<0.00020	< 0.0005	0.0006	0.100	0.091	0.0050	<0.0050	0.006	0.0060	< 0.0020	< 0.0020
Mean:	0.0030	0.0018	< 0.0030	< 0.0030	0.00020	<0.00020	0.0017	0.00184	0.136	0.102	0.010	< 0.0044	0.17	0.0037	< 0.0018	< 0.0018

N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0408 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	0.15	N/A	4.50 ±1.50E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	0.47	N/A	1.90 ±1.10E-09
Aug-92	<0.050	<0.10	<0.50	<5.1	<10	<2.0	<0.20	0.16	N/A	<1.60E-09
Dec-92	NA	NA	NA	NA	<1.0	0.2	<0.20	0.75	N/A	<1.38E-09
Mean:	<0.050	<0.10	<0.50	<3.3	<7.8	<1.6	<0.15	0.38	N/A	2.19 ±1.40E-09
WNW0501 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	2.3	N/A	2.30 ±1.10E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	3.9	N/A	<5.90E-10
Aug-92	<0.050	<0.10	<0.50	<5.0	<10	<2.0	<0.20	0.13	N/A	<1.40E-09
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	3.5	N/A	<1.90E-09
Mean:	<0.050	<0.10	<0.50	<3.7	<7.8	<1.5	<0.15	2.5	N/A	1.38 ±1.25E-09
WNW0502 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	4.8	N/A	1.30 ±0.80E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	4.7	N/A	<7.00E-10
Aug-92	<0.050	<0.10	<0.50	<4.9	<10	<2.0	<0.20	1.4	N/A	<1.60E-09
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	4.6	N/A	<1.50E-09
Mean:	<0.050	<0.10	<0.50	<3.7	<7.8	<1.6	<0.15	3.9	N/A	<1.15E-09
WNW0602 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	0.067	87	3.10 ±1.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.32	35	4.60 ±3.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	2.8	1.20 ±0.90E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.013	24	1.41 ±0.66E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.3	<1.1	<0.10	0.10	37	2.58 ±1.64E-09
WNW0603 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<6.0	<0.6	<0.10	0.16	4.5	<1.34E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.8	21	1.70 ±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.7	2.6	<1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.57	55	7.85 ±5.86E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.8	<1.2	<0.10	1.3	21	<1.06E-09
WNW0604 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.11	<0.050	1.1	6.20 ±2.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.7	<0.2	<0.10	<0.050	3.7	<7.95E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.11	0.010	2.1	<1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.040	4.6	<6.80E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.4	<1.1	0.11	0.038	2.9	1.66 ±1.29E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0408 (DOWN - C)																
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.241	0.195	0.127	0.0030	0.007	<0.0120	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.228	0.178	0.143	<0.0050	0.007	0.0088	< 0.0050	< 0.0050
Aug-92	<0.0020	<0.0020	<0.0010	<0.0010	<0.00003	<0.00003	<0.0040	<0.0040	0.271	0.256	0.035	<0.0020	0.003	0.0114	< 0.0020	< 0.0020
Dec-92	0.0028	<0.0010	<0.0030	<0.0030	< 0.0010	<0.00010	<0.0030	<0.0030	0.239	0.198	0.116	0.0050	0.004	0.0011	< 0.0010	< 0.0010
Mean:	0.0054	< 0.0050	< 0.0022	< 0.0022	<0.00036	<0.00013	< 0.0042	< 0.0042	0.245	0.207	0.11	0.0038	0.0053	0.0083	< 0.0095	< 0.0095
WNW0501 (DOWN - C)																
Aug-91	<0.014	N/A	<0.0010	N/A	<0.00020	N/A	<0.0040	N/A	0.308	N/A	0.035	N/A	0.10	N/A	<0.023	N/A
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.260	0.213	0.019	0.0030	0.007	0.0090	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.234	0.195	0.014	<0.0050	0.006	<0.0050	< 0.0050	< 0.0050
Aug-92	0.0054	<0.0020	0.0014	0.0012	<0.00003	<0.00003	<0.0040	<0.0040	0.287	0.238	0.023	0.0033	0.006	0.0013	< 0.0020	< 0.0020
Dec-92	0.0015	<0.0010	<0.0030	<0.0030	<0.00010	<0.00010	<0.0030	<0.0030	0.206	0.182	0.010	<0.0030	0.005	0.0016	< 0.0010	< 0.0010
Mean:	0.0076	< 0.0050	0.0021	0.0023	<0.00015	<0.00013	< 0.0042	< 0.0042	0.259	0.207	0.020	0.0036	0.025	0.0042	<0.012	<0.0095
WNW0502 (DOWN - C)																
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.252	0.212	0.311	0.0080	0.011	0.0070	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.213	0.200	0.047	<0.0050	0.008	<0.0050	< 0.0050	< 0.0050
Aug-92	<0.0020	<0.0020	0.0014	0.0015	<0.00003	<0.00003	<0.0040	<0.0040	0.270	0.260	0.191	0.010	0.004	0.0048	< 0.0020	< 0.0020
Dec-92	0.0024	<0.0010	<0.0030	<0.0030	<0.00010	<0.00010	<0.0030	<0.0030	0.217	0.202	0.260	0.0037	0.002	<0.0010	< 0.0010	< 0.0010
Mean:	0.0054	< 0.0050	0.0024	0.0024	<0.00013	<0.00013	< 0.0042	< 0.0042	0.238	0.218	0.20	0.0067	0.0062	0.0044	< 0.0095	< 0.0095
WNW0602 (DOWN - C)																
Nov-91	0.0034	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.086	0.021	<0.0050	0.015	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0031	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.110	0.010	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0030	<0.0012	0.0002	0.0001	<0.00020	<0.00020	0.0004	<0.00008	0.128	0.102	0.129	0.0060	0.006	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.104	0.085	0.025	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Mean:	0.0034	< 0.0018	0.0028	0.0028	<0.00020	<0.00020	0.0017	< 0.0016	0.136	0.0958	0.046	0.0052	0.0082	< 0.0017	< 0.0018	< 0.0018
WNW0603 (DOWN - C)																
Nov-91	0.0041	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.150	0.150	0.011	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.076	<0.050	0.014	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.092	0.100	0.0058	0.0045	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.078	0.067	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	0.0023	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0990	0.0918	0.0090	0.0049	0.0029	< 0.0017	< 0.0018	< 0.0018
WNW0604 (DOWN - C)																
Nov-91	0.0035	0.0032	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	0.0033	0.085	0.083	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0028	0.0034	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.065	0.062	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0040	0.0035	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.064	0.064	<0.0025	<0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	0.0050	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.069	0.070	0.0060	<0.0050	0.015	0.0030	< 0.0020	< 0.0020
Mean:	0.0036	0.0038	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	0.00172	0.0708	0.0696	0.0046	< 0.0044	0.0049	0.0019	< 0.0018	< 0.0018

N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW8605 (DOWN - C)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	<0.050	N/A	1.30±0.90E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	0.94	<0.050	N/A	<6.10E-10
Aug-92	<0.050	<0.10	<0.50	<4.9	<10	<2.0	<0.20	0.35	N/A	2.20±0.80E-09
Dec-92	<0.050	<0.10	<0.50	<5.0	<1.0	<0.2	<0.20	<0.050	N/A	2.70±1.50E-09
Mean:	<0.050	<0.10	<0.50	<3.7	<7.8	<1.6	0.36	0.13	N/A	1.66±0.95E-09
WNW8606 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	<0.10	0.16	2.0	<8.40E-10
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.96	0.23	<8.00E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	4.0	1.7	<1.10E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.76	1.4	<6.95E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	1.5	1.3	<8.59E-10
WNW8607 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	<0.10	8.3	2.8	<9.70E-08
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	3.8	4.2	<8.80E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	3.1	1.2	<1.30E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.2	1.8	<1.04E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6	<1.1	<0.10	4.1	2.5	<2.51E-08
WNW8608 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.5	<0.4	<0.10	3.5	29	<1.02E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1	<0.1	<0.10	2.4	16	<7.50E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.48	5.0	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	0.46	34	<7.12E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.1	<1.1	0.11	1.7	21	<8.46E-10
WNW8609 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	<0.10	4.0	2.1	3.70±1.60E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	9.3	1.6	5.70±1.90E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	11.0	1.1	2.20±1.00E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	6.1	16	<4.07E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	7.6	5.2	2.82±1.23E-09
WNDMPNE (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.84	4.3	<1.10E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.4	3.8	7.10±2.00E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.9	13	<1.35E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.72	17	1.35±0.63E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	<0.10	1.2	9.4	2.28±1.27E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW8605 (DOWN - C)																
Dec-91	<0.012	<0.012	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.136	0.138	0.0050	0.0030	<0.0120	<0.0120	<0.030	<0.030
Mar-92	0.0059	0.0052	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.137	0.134	<0.0050	<0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050
Aug-92	0.0079	0.011	0.0016	<0.0010	<0.00003	<0.00003	<0.0040	<0.0040	0.135	0.135	0.0035	0.0054	<0.0010	<0.0010	< 0.0020	< 0.0020
Dec-92	0.0062	0.0062	<0.0030	<0.0030	<0.00010	0.00012	<0.0030	<0.0030	0.104	0.101	0.0056	<0.0030	<0.0010	<0.0010	N/A	< 0.0010
Mean:	0.0080	0.0085	0.0024	< 0.0022	<0.00013	0.00014	< 0.0042	< 0.0042	0.128	0.127	0.0048	0.0041	< 0.0048	< 0.0048	<0.012	<0.0095
WNW8606 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.089	0.084	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.120	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.340	0.369	0.010	0.0068	< 0.00075	0.0018	< 0.0012	< 0.0025
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.050	0.052	0.0080	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.155	0.156	0.0071	0.0054	0.0019	0.0020	< 0.0018	< 0.0021
WNW8607 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.054	0.054	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.039	0.040	0.0028	0.0035	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	< 0.0002	< 0.0002	<0.00020	<0.00020	< 0.0005	< 0.0005	0.044	0.041	<0.0050	<0.0050	0.026	0.0050	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0024	< 0.0024	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0467	0.0462	0.0044	0.0046	0.0077	0.0024	< 0.0018	< 0.0018
WNW8608 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.110	<0.0050	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.130	0.110	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0022	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	0.0046	<0.0025	0.117	0.121	0.0030	0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.099	0.098	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	0.0026	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	0.0028	< 0.0022	0.116	0.110	0.0045	0.0044	0.0028	< 0.0017	< 0.0018	< 0.0018
WNW8609 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.190	0.190	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.180	0.180	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.190	0.199	0.0040	0.0030	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	< 0.0002	< 0.0002	<0.00020	<0.00020	< 0.0005	< 0.0005	0.180	0.178	<0.0050	<0.0050	0.003	0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0024	< 0.0024	<0.00020	<0.00020	< 0.0022	< 0.0022	0.185	0.187	0.0048	0.0045	0.0019	0.0017	< 0.0018	< 0.0018
WNDMPNE (DOWN - D)																
Nov-91	0.0036	<0.0020	<0.0040	<0.0040	0.0025	<0.00020	<0.0030	<0.0030	0.092	0.100	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.089	0.087	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.141	0.138	<0.0025	0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.079	0.072	<0.0050	<0.0050	0.002	<0.0020	< 0.0020	< 0.0020
Mean:	0.0022	< 0.0018	< 0.0030	< 0.0030	0.00078	<0.00020	< 0.0022	< 0.0022	0.100	0.0994	< 0.0044	0.0044	0.0017	< 0.0017	< 0.0018	< 0.0018

N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNGSEEP (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	0.40	0.10	<1.12E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.93	0.13	<1.00E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.88	0.10	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.0	0.27	<9.20E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	<0.10	0.80	0.15	<9.10E-10
WNW0105 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	<0.10	1.1	3.5	1.13±1.00E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.1	30	<9.00E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.0	7.5	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.94	84	<3.38E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	1.0	31	<7.85E-10
WNW0106 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	<0.050	>100	3.00±1.70E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.34	>100	2.40±1.40E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.14	75	1.10±1.00E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.35	73	3.72±0.60E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.3	<1.1	<0.10	0.22	NA	2.56±1.17E-09
WNW0116 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	1.5	>100	2.20±0.40E-08
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.5	53	1.40±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.4	57	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.6	63	<6.36E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.3	<1.1	<0.10	1.8	68	5.68±1.68E-09
WNW0207 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<20	<2.0	<0.10	0.052	23	3.20±1.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.25	35	4.70±2.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.023	3.2	<1.50E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.15	24	1.15±0.76E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<10	<1.5	<0.10	0.12	21	2.26±1.59E-09
WNW0601 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.21	>100	9.70±2.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.36	>100	1.30±0.40E-08
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.034	352	<1.30E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.067	388	1.23±0.61E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	<0.10	0.17	NA	6.23±2.18E-09
WNW0605 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.29	61	3.50±2.10E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.51	31	2.30±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.065	25	<7.30E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.099	10	1.84±0.65E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	0.24	32	1.95±1.20E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(continued)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNGSEEP (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.125	0.135	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.100	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.124	0.137	<0.0025	0.0042	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.109	0.110	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.114	0.120	< 0.0044	0.0048	< 0.0017	< 0.0017	< 0.0018	< 0.0018
WNW0105 (DOWN - D)																
Nov-91	0.014	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.130	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	0.014	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.160	0.130	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.018	<0.0012	<0.0012	0.0013	<0.00020	<0.00020	<0.0025	<0.0025	0.159	0.137	0.0045	0.0040	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.014	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.151	0.146	0.0090	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.015	< 0.0018	< 0.0030	0.0031	<0.00020	<0.00020	< 0.0022	< 0.0022	0.152	0.136	0.0059	0.0048	0.0019	< 0.0017	< 0.0018	< 0.0018
WNW0106 (DOWN - D)																
Nov-91	0.0035	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.087	0.190	<0.0050	0.008	<0.0020	< 0.0020	< 0.0020
Feb-92	0.0045	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.150	0.071	0.047	<0.0050	0.010	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0065	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.157	0.095	0.066	0.0040	0.012	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.012	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.211	0.107	0.043	<0.0050	0.021	<0.0020	< 0.0020	< 0.0020
Mean:	0.0066	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.164	0.0901	0.086	0.0048	0.013	< 0.0017	< 0.0018	< 0.0018
WNW0116 (DOWN - D)																
Nov-91	0.0030	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.084	0.099	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Feb-92	0.0062	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.230	0.120	1.10	0.0074	0.01	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0058	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.143	0.103	1.11	0.0050	0.01	0.0010	< 0.0012	< 0.0012
Dec-92	0.0030	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.205	0.173	0.217	0.0060	0.051	<0.0020	< 0.0020	< 0.0020
Mean:	0.0045	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.174	0.120	0.63	0.0058	0.019	0.0018	< 0.0018	< 0.0018
WNW0207 (DOWN - D)																
Nov-91	0.0033	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.170	0.0071	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0056	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.220	0.160	0.013	<0.0050	0.01	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0045	0.0032	0.0001	0.00008	<0.00020	<0.00020	<0.00008	<0.00008	0.169	0.168	0.0060	0.0048	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0050	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.200	0.180	0.0070	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Mean:	0.0046	0.0023	0.0028	0.0028	<0.00020	<0.00020	< 0.0016	< 0.0016	0.190	0.170	0.0083	0.0050	0.0056	< 0.0017	< 0.0018	< 0.0018
WNW0601 (DOWN - D)																
Nov-91	0.0057	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.190	<0.050	0.300	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0060	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.093	<0.050	0.059	<0.0050	0.020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0060	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.078	0.050	3.88	0.098	0.013	0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.052	0.043	0.180	0.0080	0.020	0.0030	< 0.0020	< 0.0020
Mean:	0.0054	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.103	0.0482	1.1	0.029	0.014	0.0019	< 0.0018	< 0.0018
WNW0605 (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.078	<0.050	0.041	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.012	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.259	0.056	0.016	<0.0025	0.003	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0030	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.074	0.056	0.022	<0.0050	1.8	<0.0020	< 0.0020	< 0.0020
Mean:	0.0020	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.115	0.0530	0.023	< 0.0044	0.46	< 0.0017	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 (continued)
Drinking Water Quality Parameters for the Sand and Gravel Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0801 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<9.0	<0.9	<0.10	1.1	2.7	1.70±1.20E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.83	9.0	6.90±1.90E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.44	3.9	<1.70E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.83	4.8	<1.10E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<7.5	<1.3	<0.10	0.80	5.1	2.10±1.48E-09
WNW0802 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	<0.050	0.79	<1.20E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	18	<9.50E-10
Aug-92	0.025	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	1.2	<1.70E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.020	14	7.20±6.31E-10
Mean:	<0.031	<0.08	<0.45	<1.0	<6.3	<1.1	<0.10	0.033	8.4	<1.12E-09
WNW0803 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<7.0	<0.7	<0.10	0.42	5.1	1.55±1.15E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.14	3.2	<9.10E-10
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.24	9.5	<5.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.27	19	7.90±7.22E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<7.3	<1.2	<0.10	0.27	9.2	<8.21E-10
WNW0804 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	1.0	85	1.50±1.20E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.31	>100	<8.60E-10
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.069	47	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.072	6.1	6.39±6.29E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	<0.10	0.36	NA	<8.22E-10
WNW8603 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	<0.10	1.9	0.14	1.30±1.10E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	2.1	0.10	3.20±1.50E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.1	0.00	<7.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	2.1	0.24	<5.88E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	2.1	0.12	<9.72E-10
WNW8604 (DOWN - D)										
Dec-91	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	1.3	N/A	9.00±2.40E-09
Mar-92	<0.050	<0.10	<0.50	<2.4	<10	<2.0	<0.10	1.2	N/A	<3.30E-10
Aug-92	<0.050	<0.10	<0.50	<5.3	<10	<2.0	<0.20	0.22	N/A	9.00±6.00E-10
Dec-92	<0.050	<0.10	<0.50	<5.0	<0.9	<0.2	<0.20	1.4	N/A	<9.32E-10
Mean:	<0.050	<0.10	<0.50	<3.8	<7.7	<1.5	<0.15	1.0	N/A	2.62±1.07E-09
WNW8612 (DOWN - D)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	2.1	1.95±1.30E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	3.1	<7.66E-10
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	49	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	5.9	8.93±6.65E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	<0.10	<0.030	15	<8.33E-10

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 13 *(concluded)*

Drinking Water Quality Parameters for the Sand and Gravel Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0801 (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.120	<0.0050	<0.0050	<0.0020	0.0027	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.094	0.096	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.139	0.140	0.0025	<0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.114	0.116	0.0060	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.117	0.118	0.0046	< 0.0044	< 0.0017	0.0019	< 0.0018	< 0.0018
WNW0802 (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	1.20	1.30	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.220	0.220	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.878	0.890	<0.0025	0.0028	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.219	0.214	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.629	0.656	< 0.0044	0.0044	< 0.0017	< 0.0017	< 0.0018	< 0.0018
WNW0803 (DOWN - D)																
Nov-91	<0.0020	0.0022	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.100	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.110	0.0051	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.153	0.150	0.0035	0.0035	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.113	0.116	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.119	0.119	0.0046	0.0046	< 0.0017	< 0.0017	< 0.0018	< 0.0018
WNW0804 (DOWN - D)																
Nov-91	0.0060	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.100	0.068	0.0074	0.003	<0.0020	< 0.0020	< 0.0020
Feb-92	0.0023	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.077	0.180	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.107	0.102	0.036	<0.0025	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.094	0.096	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0029	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.110	0.0938	0.072	0.0050	0.0030	< 0.0017	< 0.0018	< 0.0018
WNW8603 (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.220	0.220	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.230	0.220	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.222	0.236	0.0030	0.0038	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.250	0.256	<0.0050	<0.0050	<0.0020	0.0025	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.230	0.233	0.0045	0.0047	< 0.0017	0.0018	< 0.0018	< 0.0018
WNW8604 (DOWN - D)																
Dec-91	<0.012	<0.012	0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050	0.202	0.195	0.0060	0.0050	0.021	0.0135	<0.030	<0.030
Mar-92	<0.0050	<0.0050	<0.0040	<0.0040	<0.00020	<0.00020	<0.0050	<0.0050	0.189	0.181	<0.0050	<0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050
Aug-92	<0.0020	<0.0020	0.0014	<0.0010	<0.00003	<0.00003	<0.0040	<0.0040	0.214	0.216	0.0038	<0.0020	0.002	0.0107	< 0.0020	< 0.0020
Dec-92	<0.0010	<0.0010	<0.0030	<0.0030	<0.00010	<0.00010	<0.0030	<0.0030	0.194	0.198	<0.0030	<0.0030	<0.0010	0.0017	< 0.0010	< 0.0010
Mean:	< 0.0050	< 0.0050	0.0024	< 0.0022	<0.00013	<0.00013	< 0.0042	< 0.0042	0.200	0.198	0.0044	0.0038	0.0073	0.0077	< 0.0095	< 0.0095
WNW8612 (DOWN - D)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.320	0.330	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	0.0031	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.330	0.340	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0022	0.0022	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.361	0.366	0.0025	<0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0030	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.300	0.314	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0026	0.0020	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.328	0.338	0.0044	< 0.0044	< 0.0017	< 0.0017	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 14
Drinking Water Quality Parameters for the Till-Sand Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0302 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	<0.10	1.4	3.3	2.00±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	1.2	4.5	<9.90E-010
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	1.0	5.0	1.30±0.90E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.99	2.0	<4.32E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<7.5	<1.3	<0.10	1.1	3.7	<9.56E-010
WNW0402 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	<0.10	<0.050	47	4.30±1.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	8.5	2.60±1.50E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.010	2.0	<1.00E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.018	6.3	<4.29E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<7.3	<1.2	<0.10	0.032	16	1.93±1.18E-09
WNW0404 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.10	0.12	8.5	<1.60E-009
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.12	<0.050	18	3.20±1.90E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	0.012	17	<9.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.13	0.20	8.6	<9.83E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	0.12	0.10	13	<1.35E-009
WNW0202 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<6.0	<0.6	0.28	<0.050	6.3	1.70±1.40E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.34	<0.050	3.0	1.30±1.00E-09
Jul-92	<0.051	<0.10	<0.51	<1.0	<10	<2.0	0.27	0.015	9.2	<1.40E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.28	<0.010	6.7	<1.00E-009
Mean:	<0.038	<0.08	<0.46	<1.0	<7.0	<1.2	0.29	0.032	6.3	<1.20E-009
WNW0204 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	4.2	2.40±1.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	7.3	1.50±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.88	14	<1.10E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	5.5	<5.53E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	<0.10	0.25	7.8	<1.14E-009

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 14 *(continued)*

Drinking Water Quality Parameters for the Till-Sand Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0302 (UP)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.330	0.320	<0.0050	<0.0050	<0.0020	0.0034	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.320	0.320	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.00005	<0.00005	<0.0002	<0.0002	<0.00008	<0.00008	0.434	0.452	0.0058	0.0060	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.381	0.405	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0028	< 0.0028	<0.0002	<0.0002	< 0.0016	< 0.0016	0.366	0.374	0.0052	0.0052	0.0019	0.0020	< 0.0018	< 0.0018
WNW0402 (UP)																
Nov-91	0.0024	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.490	0.520	0.0059	<0.0050	0.002	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.480	0.480	0.0098	0.0062	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0012	<0.0012	<0.0012	<0.0012	<0.0002	<0.0002	<0.0025	<0.0025	0.537	0.552	0.0085	0.0050	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.589	0.599	<0.0050	<0.0050	0.004	0.0030	< 0.0020	< 0.0020
Mean:	0.0019	< 0.0018	< 0.0030	< 0.0030	<0.0002	<0.0002	< 0.0022	< 0.0022	0.524	0.538	0.0073	0.0053	0.0024	0.0019	< 0.0018	< 0.0018
WNW0404 (UP)																
Nov-91	0.0058	0.0054	<0.0040	<0.0040	<0.0002	0.00022	<0.0030	<0.0030	0.120	0.120	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0080	0.0067	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.150	0.120	0.011	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0085	0.0058	<0.0012	<0.0012	<0.0002	<0.0002	<0.0025	<0.0025	0.127	0.119	0.0045	<0.0025	0.009	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0070	0.0080	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.131	0.136	<0.0050	<0.0050	0.005	0.0030	< 0.0020	0.0020
Mean:	0.0073	0.0065	< 0.0030	< 0.0030	<0.0002	0.00021	< 0.0022	< 0.0022	0.132	0.124	0.0064	< 0.0044	0.0049	0.0019	< 0.0018	0.0018
WNW0202 (DOWN - B)																
Nov-91	0.0028	0.0023	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.110	0.120	<0.0050	<0.0050	<0.0020	0.0027	< 0.0020	< 0.0020
Mar-92	0.0032	0.0038	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.200	0.230	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0035	0.014	<0.00005	0.0005	<0.0002	<0.0002	<0.00008	0.0015	0.342	0.456	0.0068	0.0088	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0080	0.0050	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.158	0.198	<0.0050	<0.0050	0.004	0.0050	< 0.0020	< 0.0020
Mean:	0.0044	0.0062	< 0.0028	0.0029	<0.0002	<0.0002	< 0.0016	0.00200	0.202	0.251	0.0054	0.0060	0.0022	0.0026	< 0.0018	< 0.0018
WNW0204 (DOWN - B)																
Nov-91	0.0048	0.0044	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.400	0.400	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0064	0.0060	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.390	0.390	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0055	0.0052	<0.0012	<0.0012	<0.0002	<0.0002	<0.0025	<0.0025	0.368	0.421	0.0028	<0.0025	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0060	0.0060	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.411	0.423	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	0.0057	0.0054	< 0.0030	< 0.0030	<0.0002	<0.0002	< 0.0022	< 0.0022	0.392	0.408	0.0044	< 0.0044	0.0020	< 0.0017	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 14 (continued)
Drinking Water Quality Parameters for the Till-Sand Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0206 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	11	<1.70E-009
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	11	1.50±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.028	27	<1.10E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	9.6	<9.55E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	<0.10	0.035	15	<1.21E-009
WNW0208 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	0.27	<0.050	5.8	2.60±1.70E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	13	<7.70E-010
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.25	<0.010	5.6	<1.05E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.25	<0.010	5.2	<9.62E-010
Mean:	<0.038	<0.08	<0.46	<1.0	<7.3	<1.2	0.22	<0.030	7.4	<1.12E-009
WNW0701 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	74	2.20±1.00E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	37	<1.05E-009
Aug-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.11	0.022	15	<6.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	0.025	58	1.41±0.46E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.10	0.037	46	1.20±0.78E-09
WNW0905 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.12	<0.050	2.0	<7.00E-010
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	20	<8.50E-010
Jul-92	<0.052	<0.10	<0.52	<1.0	<10	<2.0	0.18	0.014	1.6	<7.50E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	<0.010	11	<1.39E-009
Mean:	<0.038	<0.08	<0.45	<1.0	<5.7	<1.1	0.13	0.031	8.5	<9.22E-010

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 14 *(concluded)*

Drinking Water Quality Parameters for the Till-Sand Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0206 (DOWN - B)																
Nov-91	0.0031	0.0026	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.360	0.360	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0038	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.380	0.370	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0038	0.0028	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.311	0.425	0.0050	<0.0025	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0020	0.0030	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.412	0.422	<0.0050	<0.0050	0.007	0.0060	< 0.0020	< 0.0020
Mean:	0.0032	0.0026	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.366	0.394	0.0050	< 0.0044	0.0032	0.0027	< 0.0018	< 0.0018
WNW0208 (DOWN - B)																
Nov-91	0.0044	0.0044	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.250	0.240	<0.0050	<0.0050	<0.0020	0.0037	< 0.0020	< 0.0020
Mar-92	0.0040	0.0037	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.240	0.250	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0038	0.0039	0.00006	<0.00005	<0.00020	<0.00020	<0.00008	<0.00008	0.300	0.312	<0.0025	<0.0025	0.00088	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	0.0040	<0.0030	<0.0030	0.00080	<0.00020	< 0.0005	< 0.0005	0.328	0.330	<0.0050	<0.0050	0.004	0.0060	< 0.0020	< 0.0020
Mean:	0.0040	0.0040	0.0028	< 0.0028	0.00035	<0.00020	< 0.0016	< 0.0016	0.280	0.283	< 0.0044	< 0.0044	0.0022	0.0031	< 0.0018	< 0.0018
WNW0701 (DOWN - B)																
Dec-91	0.0033	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.065	<0.050	0.0056	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0039	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.062	<0.050	0.0096	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0030	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.053	0.052	0.0070	0.0042	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	0.0030	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.055	0.038	<0.0050	<0.0050	0.033	0.0210	< 0.0020	< 0.0020
Mean:	0.0036	0.0020	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.0587	0.0475	0.0068	0.0048	0.011	0.0064	< 0.0018	< 0.0018
WNW0905 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	<0.010	<0.010
Mar-92	0.0028	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0025	0.0025	0.0025	0.0016	<0.00020	<0.00020	<0.00008	<0.00008	0.020	<0.012	0.012	0.010	0.00088	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0030	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.019	0.011	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0026	0.0021	0.0034	0.0032	<0.00020	<0.00020	< 0.0016	< 0.0016	0.0348	0.0309	0.0067	0.0062	0.0017	< 0.0017	< 0.0038	< 0.0038

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0405 (UP)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.5	<0.3	<0.10	3.6	3.5	<1.20E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	2.9	4.0	1.20 ±9.00E-10
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.90	4.7	<1.00E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	2.0	6.9	6.43 ±4.20E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<6.2	<1.1	<0.10	2.4	7.8	<8.80E-10
WNW0704 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	3.5	20	<6.00E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	< 0.05	35	1.40 ±1.10E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	< 0.01	2.8	<1.40E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.016	6.4	<3.31E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<5.8	<1.1	<0.10	0.89	16	<8.58E-10
WNW0707 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	<0.10	0.69	>100	2.10 ±1.00E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.70	45	4.00 ±1.60E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.12	48	<1.60E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.23	45	1.21 ±6.00E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<7.3	<1.2	<0.10	0.44	NA	1.40 ±1.20E-09
WNW0109 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.14	0.57	>100	<1.5E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.16	0.085	149	3.00 ±1.40E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.14	0.081	39	1.90 ±1.40E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.20	0.23	>100	7.84 ±3.95E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	0.16	0.11	NA	1.70 ±1.17E-09
WNW0110 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<6.5	<0.7	0.18	0.13	5.4	2.80 ±1.70E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.14	0.13	5.1	2.00 ±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<1.0	0.14	0.060	2.0	1.30 ±9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.19	0.12	3.2	5.32 ±3.71E-10
Mean:	<0.035	<0.07	<0.44	<1.0	<5.7	<1.0	0.16	0.11	3.9	1.69 ±1.07E-09
WNW0115 (DOWN - B)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	>100	2.90 ±1.50E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	<0.050	38	8.50 ±2.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.12	0.015	174	<8.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.15	0.064	98	<7.11E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<5.8	<1.1	0.13	0.045	NA	2.87 ±1.33E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 (continued)

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0405 (UP)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.041	0.044	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.0070	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.043	0.042	0.022	0.0090	0.002	0.00075	< 0.0012	< 0.0012
Dec-92	0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.043	0.040	0.113	0.012	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.0441	0.0440	0.037	0.0078	0.0020	0.0017	< 0.0018	< 0.0018
WNW0704 (UP)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	0.002	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0023	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.103	0.086	0.0042	0.0050	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.036	0.034	<0.0050	<0.0050	0.011	0.0100	< 0.0020	< 0.0020
Mean:	0.0019	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0598	0.0550	0.0048	0.0050	0.0040	0.0037	< 0.0018	< 0.0018
WNW0707 (UP)																
Dec-91	0.0052	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.240	0.066	0.043	<0.0050	0.020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.090	0.060	0.0064	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0012	<0.0012	0.0030	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.098	0.088	0.0042	<0.0025	0.012	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.070	0.061	<0.0050	<0.0050	0.030	0.0130	< 0.0020	< 0.0020
Mean:	0.0026	< 0.0018	0.0035	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.124	0.0688	0.015	< 0.0044	0.016	0.0044	< 0.0018	< 0.0018
WNW0109 (DOWN - B)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.081	0.090	<0.0050	<0.0050	0.002	<0.0020	< 0.0020	< 0.0050
Feb-92	0.0039	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.080	0.018	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0058	<0.0012	<0.0012	0.0025	<0.00020	<0.00020	<0.0025	<0.0025	0.178	0.076	0.016	0.0040	0.014	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.076	0.070	0.0050	<0.0050	0.020	0.0200	< 0.0020	< 0.0020
Mean:	0.0034	< 0.0018	< 0.0030	0.0034	<0.00020	<0.00020	< 0.0022	< 0.0022	0.126	0.0790	0.011	0.0048	0.011	0.0062	< 0.0018	< 0.0026
WNW0110 (DOWN - B)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.170	0.018	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.145	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.139	0.140	<0.0025	<0.0025	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.120	0.116	0.0050	0.0070	0.009	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.142	0.143	0.0076	0.0049	0.0037	< 0.0017	< 0.0018	< 0.0018
WNW0115 (DOWN - B)																
Nov-91	0.024	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.630	0.140	0.074	<0.0050	0.038	0.0029	< 0.0020	< 0.0020
Feb-92	0.0061	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.280	0.100	0.025	<0.0050	0.010	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0038	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	0.0003	0.0003	0.122	0.067	0.014	0.0025	0.011	0.0170	< 0.0012	< 0.0012
Dec-92	0.0040	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.144	0.124	0.0060	<0.0050	0.014	<0.0020	< 0.0020	< 0.0020
Mean:	0.0095	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	0.0017	0.00170	0.294	0.108	0.030	0.0044	0.018	0.0060	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 (continued)
Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0702 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<6.0	<0.6	0.13	0.11	28	2.10 ±1.10E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.066	36	2.20 ±1.40E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.14	0.39	130	1.80 ±1.30E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.15	0.43	25	<5.41E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<6.8	<1.2	0.13	0.25	55	<1.09E-09
WNW0703 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.14	<0.050	6.7	<1.40E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	<0.050	316	<1.03E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	< 11	<2.2	<0.10	0.010	7.3	<1.60E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.12	0.14	2.8	1.84 ±7.80E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<6.0	<1.1	0.12	0.063	83	<1.20E-09
WNW0705 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<8.0	<0.8	<0.10	0.13	>100	9.30 ±7.40E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.07	246	<1.20E-09
Aug-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	< 0.01	47	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.15	50	<8.51E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<7.3	<1.2	<0.10	0.090	NA	<8.48E-10
WNW0904 (DOWN - B)										
Dec-91	<0.250	<0.05	<0.40	<1.0	< 10	<1.0	<0.10	0.29	>100	1.30 ±4.00E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.14	0.15	186	3.40 ±1.90E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.16	0.08	91	1.10 ±7.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.17	0.029	68	<6.33E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<7.8	<1.3	0.15	0.14	NA	4.33 ±1.81E-09
WNW1101B (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.16	< 0.10	0.8	1.00 ±8.00E-10
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.15	0.62	1.0	2.10 ±1.20E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.16	0.74	1.1	4.00 ±2.70E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.73	2.0	1.50 ±1.30E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.8	<0.2	0.14	0.55	1.2	2.15 ±1.50E-09
WNW1106B (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.18	< 0.10	68	<1.74E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.18	<0.050	>100	1.90 ±1.10E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.19	<0.050	35	2.40 ±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.16	<0.050	>100	2.50 ±2.10E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.8	<0.2	0.18	<0.062	NA	2.10 ±1.61E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 (continued)

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0702 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	0.0026	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Aug-92	0.0025	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	<0.00008	0.078	0.047	0.0090	0.013	0.004	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.046	0.037	<0.0050	<0.0050	0.026	0.0140	< 0.0020	< 0.0020
Mean:	0.0021	0.0020	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	< 0.0016	0.0560	0.0460	0.0060	0.0070	0.0085	0.0047	< 0.0018	< 0.0018
WNW0703 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.069	<0.050	0.0073	<0.0050	0.008	<0.0020	< 0.0020	< 0.0020
Mar-92	0.018	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.370	0.058	0.050	<0.0050	0.057	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.051	0.047	<0.0025	0.012	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.056	0.053	<0.0050	<0.0050	0.011	0.0180	< 0.0020	< 0.0020
Mean:	0.0057	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.136	0.0520	0.016	0.0066	0.019	0.0057	< 0.0018	< 0.0018
WNW0705 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.071	0.073	0.0061	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0040	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.130	0.095	0.0086	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Aug-92	<0.0012	<0.0012	<0.0012	0.0020	<0.00020	<0.00020	<0.0025	<0.0025	0.138	0.135	<0.0025	<0.0025	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.107	0.111	0.0050	<0.0050	0.031	0.0160	< 0.0020	< 0.0020
Mean:	0.0023	< 0.0018	< 0.0030	0.0032	<0.00020	<0.00020	< 0.0022	< 0.0022	0.112	0.104	0.0056	< 0.0044	0.011	0.0052	< 0.0018	< 0.0018
WNW0904 (DOWN - B)																
Dec-91	0.0030	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.140	0.077	0.015	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0030	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.058	0.0079	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0015	<0.0012	0.0004	<0.00005	<0.00020	<0.00020	<0.00008	<0.00008	0.070	0.041	0.010	0.0028	0.006	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	0.0030	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.062	0.048	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mean:	0.0024	0.0020	0.0028	< 0.0028	<0.00020	<0.00020	< 0.0016	< 0.0016	0.0954	0.0560	0.0095	0.0044	0.0043	< 0.0017	< 0.0018	< 0.0018
WNW1101B (DOWN - B)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.067	0.087	<0.0050	0.0078	<0.0020	<0.0050	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.062	0.061	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.076	0.054	0.014	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.0073	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0028	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.0638	0.0630	0.0078	0.0057	< 0.0020	< 0.0028	< 0.0028	< 0.0028
WNW1106B (DOWN - B)																
Jun-91	<0.0020	<0.0020	<0.0040	0.0059	<0.00020	<0.00020	<0.0030	<0.0030	0.075	0.070	0.0056	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Sep-91	0.0021	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.084	0.065	0.0083	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.064	0.049	0.0078	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.064	0.052	0.0075	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Mean:	0.0020	< 0.0020	< 0.0040	0.0045	<0.00020	<0.00020	< 0.0030	< 0.0030	0.0718	0.0590	0.0073	< 0.0050	0.0055	< 0.0020	< 0.0020	< 0.0020

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 *(continued)*

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW1109B (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.17	0.14*	>100	3.60±2.20E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.16	<0.050	26	1.70±1.00E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.17	<0.050	72	<1.10E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	0.15	<0.050	>100	3.50±1.85E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<2.6	<0.2	0.16	0.073	NA	2.41±1.54E-09
WNW0107 (DOWN - C)										
Nov-91	<0.025	<0.05	< 0.4	<1.0	<4.0	<0.4	<0.10	0.090	23	2.9 ± 1.8E-09
Feb-92	<0.025	<0.05	< 0.4	<1.0	<1.0	<0.1	<0.10	0.088	0.6	1.7 ± 1.2E-09
Jul-92	<0.050	<0.10	< 0.5	<1.0	< 10	<2.0	<0.10	0.021	0.4	2.9 ± 1.1E-09
Dec-92	<0.050	<0.10	< 0.5	<1.0	< 10	<2.0	0.12	0.082	1.4	4.62±4.62E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.3	<1.1	0.11	0.070	1.0	1.99±1.12E-09
WNW0108 (DOWN - C)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.16	0.35	31	2.30±1.90E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	0.97	8.2	2.00±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.11	0.32	12	<9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.15	0.44	11	3.73±3.57E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	0.14	0.52	16	1.14±1.11E-09
WNW0114 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	<0.10	0.16	12	3.70±2.10E-09
Feb-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.24	13	<1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.18	9.0	<8.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	<0.10	0.20	68	1.38±6.00E-10
Mean:	<0.038	<0.08	<0.45	<1.0	<6.3	<1.1	<0.10	0.20	23	1.37±1.15E-09
WNW0409 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<5.0	<0.5	0.26	0.22	58	3.30±1.90E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.23	75	5.10±2.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.20	0.059	38	1.20±9.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.23	0.16	26	9.02±7.28E-10
Mean:	<0.038	<0.75	<0.45	<1.0	<6.8	<1.2	0.20	0.17	49	2.17±1.43E-09
WNW0910 (DOWN - C)										
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.18	0.28	18	<1.22E-09
Mean:	<0.050	<0.10	<0.50	<1.0	< 10	<2.00	0.18	0.28	18	<1.22E-09

** Nitrate-N only.*
ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.
Well WNW0910 was incorporated into the groundwater program in late 1992.

Table E - 15 (continued)

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW1109B (DOWN - B)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.280	0.300	<0.0050	<0.0050	0.003	0.0043	< 0.0050	< 0.0050
Sep-91	<0.0020	0.0025	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.320	0.300	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	0.0036	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.280	0.270	0.0058	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0024	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.305	0.300	<0.0050	<0.0050	0.002	<0.0020	< 0.0020	< 0.0020
Mean:	0.0032	0.0029	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.296	0.292	0.0052	< 0.0050	0.0024	0.0026	< 0.0028	< 0.0028
WNW0107 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00022	<0.00020	<0.0025	<0.0025	0.038	0.039	0.0055	0.0050	0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.039	0.038	0.0060	<0.0050	0.003	0.0040	0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0442	0.0442	0.0054	0.0050	0.0019	0.0022	0.0018	< 0.0018
WNW0108 (DOWN - C)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.063	0.054	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.0080	0.0096	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.00008	0.0005	<0.0050	<0.0050	0.0065	0.0035	0.004	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.041	0.034	<0.0050	<0.0050	0.005	0.0050	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0016	0.00174	0.0398	0.0358	0.0061	0.0058	0.0036	0.0024	< 0.0018	< 0.0018
WNW0114 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.120	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Feb-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.098	0.0099	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00031	<0.00020	<0.0025	<0.0025	0.092	0.091	0.0095	0.0030	0.001	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.119	0.124	0.0050	<0.0050	0.005	0.0050	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.00023	<0.00020	< 0.0022	< 0.0022	0.113	0.108	0.0074	0.0045	0.0025	0.0024	< 0.0018	< 0.0018
WNW0409 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.150	0.0084	<0.0050	0.005	0.0026	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.160	0.140	0.0064	<0.0050	0.007	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0022	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.171	0.150	0.012	0.010	0.006	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.145	0.146	0.054	0.016	0.003	0.0160	< 0.0020	< 0.0020
Mean:	0.0020	< 0.0018	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.162	0.146	0.020	0.0090	0.0052	0.0053	< 0.0018	< 0.0018
WNW0910 (DOWN - C)																
Dec-92	0.0060	0.0040	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.039	0.030	0.0060	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Mean:	0.0060	0.0040	< 0.0030	< 0.0030	<0.00020	<0.00020	<0.00050	<0.00050	0.0390	0.0300	0.0060	< 0.0050	0.0050	< 0.0020	< 0.0020	< 0.0020

Well WNW0910 was incorporated into the groundwater program in late 1992.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 (continued)

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW1102B (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.23	< 0.10	11	9.30±7.40E-10
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.21	0.090	14	1.00±9.00E-10
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.22	0.090	33	1.20±1.10E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.12	48	3.20±2.20E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	0.19	0.10	27	1.58±1.24E-09
WNW1103B (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	< 10	<1.0	0.17	0.15	5.0	1.50±9.00E-10
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.18	0.29	5.2	3.80±1.60E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.18	0.41	6.9	1.30±1.20E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.17	2.2	1.30±1.20E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.16	0.26	4.8	1.98±1.22E-09
WNW1104B (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.18	0.12	0.8	<1.62E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.20	0.72	2.0	1.20±1.00E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.18	0.80	0.3	<1.11E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.15	0.66	0.3	1.70±1.20E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	0.18	0.58	0.9	1.24±1.23E-09
WNW1105A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.14	*0.99	0.5	1.50±1.48E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.15	0.29	1.1	<2.60E-09
Dec-91	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	1.30	13	5.80±2.50E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.13	0.86	4.9	3.00±2.19E-09
WNW1105B (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.18	*1.20	1.3	2.10±1.70E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.15	1.4	3.1	1.60±1.00E-09
Dec-91	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx	0.90	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx
Mean:	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.17	1.20	2.2	1.70±1.53E-09
WNW1111A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.15	2.60	2.5	1.10±8.00E-10
Sep-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.19	< 0.05	6.6	1.40±1.00E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.17	< 0.05	3.5	2.10±1.40E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	< 0.05	3.7	6.10±2.70E-09
Mean:	<0.020	<0.05	<0.00	<1.0	<1.5	<0.2	0.15	1.38	4.1	2.68±1.48E-09

** Nitrate-N only.*
ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 15 *(concluded)*

Drinking Water Quality Parameters for the Unweathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW1102B (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.120	0.100	<0.0050	<0.0050	0.011	0.0120	< 0.0050	< 0.0050
Sep-91	0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.100	0.0063	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Dec-91	0.0026	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.120	0.011	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.083	0.088	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0029	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.106	0.102	0.0068	< 0.0050	0.0046	0.0045	< 0.0028	< 0.0028
WNW1103B (DOWN - C)																
Jun-91	<0.0020	<0.0020	0.0043	0.0065	<0.00020	<0.00020	<0.0030	0.0035	0.093	0.095	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.094	0.088	<0.0050	0.0069	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.078	0.076	<0.0050	<0.0050	<0.0020	0.0022	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.068	0.069	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0020	< 0.0020	0.0041	0.0046	<0.00020	<0.00020	< 0.0030	0.00312	0.0832	0.0820	< 0.0050	0.0055	< 0.0020	0.0020	< 0.0020	< 0.0020
WNW1104B (DOWN - C)																
Jun-91	<0.0020	<0.0020	0.0044	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.046	0.050	<0.0050	0.0054	0.004	<0.0020	< 0.0020	< 0.0020
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.055	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0020	< 0.0020	0.0041	< 0.0040	<0.00020	<0.00020	< 0.0030	< 0.0030	0.0502	0.0500	< 0.0050	0.0051	0.0024	< 0.0020	< 0.0020	< 0.0020
WNW1105A (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.083	0.080	<0.0050	<0.0050	0.002	<0.0020	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.082	0.120	0.0064	<0.0050	<0.0020	<0.0020	< 0.0020	0.0023
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.110	0.0076	<0.0050	<0.0020	<0.0020	0.0024	< 0.0020
Mean:	< 0.0030	< 0.0030	< 0.0035	< 0.0035	<0.00020	<0.00020	< 0.0037	< 0.0037	0.0917	0.103	0.0063	< 0.0050	0.0020	< 0.0020	0.0031	0.0031
WNW1105B (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.067	0.066	<0.0050	0.0069	<0.0020	<0.0020	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0050	<0.00020	<0.00020	<0.0030	<0.0030	0.064	0.064	<0.0050	N/A	0.003	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.062	0.056	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mean:	< 0.0030	< 0.0030	< 0.0035	< 0.0038	<0.00020	<0.00020	< 0.0037	< 0.0037	0.0643	0.0620	< 0.0050	0.0060	0.0024	< 0.0020	< 0.0030	< 0.0030
WNW1111A (DOWN - C)																
Jun-91	<0.0020	<0.0020	0.0057	0.0066	<0.00020	<0.00020	0.0035	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	0.0034	< 0.0020	< 0.0020
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.0058	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0020	< 0.0020	0.0044	0.0046	<0.00020	<0.00020	0.0031	< 0.0030	<0.0500	<0.0500	0.0052	< 0.0050	< 0.0020	0.0024	< 0.0020	< 0.0020

Well WNW1105A was resampled in November 1992 for dissolved metals only. Results are reported with September data.
N/A - Not available.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 16
Drinking Water Quality Parameters for the Lacustrine Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0901 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.34	<0.050	15	1.40±0.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.38	<0.050	20	2.50±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.36	<0.010	6.0	8.00±7.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.40	<0.010	2.8	2.48±0.77E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.37	<0.030	11	1.80±0.87E-09
WNW0902 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<10	<1.0	0.31	<0.050	81	<5.80E-010
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.32	<0.050	5.5	2.20±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.36	<0.010	5.1	1.90±1.70E-09
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.30	<0.010	3.8	<6.59E-010
Mean:	<0.038	<0.08	<0.45	<1.0	<7.8	<1.3	0.32	<0.030	24	<1.06E-009
WNW1001 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.38	<0.050	7.9	<7.30E-010
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.16	<0.050	56	3.50±1.40E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.40	<0.010	20	<2.00E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.33	<0.010	9.8	1.39±0.83E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	0.32	<0.030	23	1.74±1.24E-09
WNW1008B (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.37	<0.050	60	9.00±8.40E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.16	<0.050	55	<8.60E-010
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.37	<0.010	43	8.00±7.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.32	<0.010	37	1.37±0.69E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.0	<1.1	0.30	<0.030	49	9.53±7.73E-10
WNW0903 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.19	<0.050	>100	1.10±0.70E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.20	<0.050	972	3.90±1.60E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.22	0.012	75	<7.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.21	<0.010	1261	1.98±0.75E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	0.20	0.031	NA	1.92±0.94E-09
WNW1002 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.20	<0.050	3.5	1.40±0.80E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	17	2.00±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.21	0.080	17	<5.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.23	0.033	22	1.30±0.69E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.18	0.054	15	1.20±0.80E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 16 *(continued)*

Drinking Water Quality Parameters for the Lacustrine Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0901 (UP)																
Dec-91	0.0044	0.0038	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.590	0.540	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	0.011	0.0042	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.570	0.530	0.014	<0.0050	0.011	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0052	0.0042	0.00008	<0.00005	<0.0002	<0.0002	<0.00008	<0.00008	0.630	0.642	0.0048	<0.0025	0.004	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0050	0.0060	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.616	0.641	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0064	0.0046	0.0028	< 0.0028	<0.0002	<0.0002	< 0.0016	< 0.0016	0.602	0.59	0.0072	< 0.0044	0.0051	< 0.0017	< 0.0018	< 0.0018
WNW0902 (UP)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.620	0.590	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	0.0038	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.660	0.650	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.0002	<0.0002	<0.0025	<0.0025	0.662	0.658	<0.0025	<0.0025	< 0.00075	0.0015	< 0.0012	< 0.0012
Dec-92	<0.0020	0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.722	0.728	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	0.0022	< 0.0030	< 0.0030	<0.0002	<0.0002	< 0.0022	< 0.0022	0.666	0.66	< 0.0044	< 0.0044	< 0.0017	0.0019	< 0.0018	< 0.0018
WNW1001 (UP)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.380	0.370	<0.0050	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Mar-92	0.010	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.545	0.520	0.130	<0.0050	0.037	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0020	<0.0012	0.0020	0.0018	<0.0002	<0.0002	<0.00008	<0.00008	0.429	0.459	0.0040	<0.0025	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0020	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.481	0.473	0.010	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mean:	0.0041	< 0.0018	0.0032	0.0032	<0.0002	<0.0002	< 0.0016	< 0.0016	0.459	0.46	0.037	< 0.0044	0.013	< 0.0017	< 0.0018	< 0.0018
WNW1008B (UP)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.570	0.590	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.500	0.500	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	0.0015	<0.0012	<0.0002	<0.0002	<0.00008	<0.00008	0.513	0.466	0.0030	<0.0025	0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.616	0.658	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	0.0031	< 0.0030	<0.0002	<0.0002	< 0.0016	< 0.0016	0.550	0.55	0.0045	< 0.0044	0.0020	< 0.0017	< 0.0018	< 0.0018
WNW0903 (DOWN - B)																
Dec-91	0.0070	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.170	0.081	0.025	<0.0050	0.012	<0.0020	< 0.0020	< 0.0020
Mar-92	0.012	0.0041	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.140	0.062	0.024	<0.0050	0.015	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0068	0.0022	0.0001	<0.00005	<0.0002	<0.0002	<0.00008	<0.00008	0.112	0.085	0.015	0.0025	0.01	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.030	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.264	0.074	0.065	<0.0050	0.033	<0.0020	< 0.0020	< 0.0020
Mean:	0.014	0.0026	0.0028	< 0.0028	<0.0002	<0.0002	< 0.0016	< 0.0016	0.172	0.076	0.032	0.0044	0.017	< 0.0017	< 0.0018	< 0.0018
WNW1002 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.051	0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.0002	<0.0002	<0.0030	<0.0030	0.053	0.051	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.0002	<0.0002	<0.0025	<0.0025	0.061	0.056	0.0030	0.0030	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.0002	<0.0002	< 0.0005	< 0.0005	0.070	0.066	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0018	< 0.0018	< 0.0030	< 0.0030	<0.0002	<0.0002	< 0.0022	< 0.0022	0.0586	0.056	0.0045	0.0045	< 0.0017	< 0.0017	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 16 *(continued)*

Drinking Water Quality Parameters for the Lacustrine Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW1003 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.38	<0.050	28	8.85±8.60E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.16	<0.050	264	2.50±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.26	<0.010	27	<2.00E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.28	<0.010	152	2.50±0.95E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.26	<0.030	118	1.92±1.28E-09
WNW1004 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.28	<0.050	1.3	<8.10E-010
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.14	<0.050	4.6	1.90±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.27	<0.010	5.5	<1.80E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.28	<0.010	8.5	1.47±0.84E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.8	<1.1	0.24	<0.030	5.0	1.16±1.14E-09
WNW1101C (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.26	<0.10*	>100	<1.69E-009
Sep-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.23	<0.050	48	1.20±1.00E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.24	<0.050	72	2.80±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	11	3.20±2.20E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.21	<0.063	NA	2.15±1.60E-09
WNW1103C (DOWN - C)										
Mar-92	xxxx	xxxx	xxxx	Low	Volume	xxxx	xxxx	xxxx	7.9	xxxx
WNW1104C(DOWN - C)										
Mar-92	xxxx	xxxx	xxxx	Low	Volume	xxxx	xxxx	xxxx	0.60	xxxx
WNW8610 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<5.0	<0.5	0.10	< 0.05	88	2.40±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	<0.050	3.2	1.50±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.18	0.020	65	<2.00E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.14	<0.010	141	1.69±1.55E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	0.14	0.032	74	1.90±1.54E-09
WNW8611 (DOWN - C)										
Nov-91	<0.025	<0.05	<0.40	<1.0	<5.0	<0.5	0.14	0.20	3.2	3.10±1.60E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	0.17	69	2.20±1.30E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.29	0.10	27	7.00±6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	< 10	<2.0	0.16	0.060	258	1.40±0.10E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<6.5	<1.2	0.18	0.13	89	1.85±0.90E-09

ND - A standard defined by "ND" means not detectable by the analytical method.
** - Nitrate-N only.*
NA - Not applicable.
WNW1103C - Dry for all other sampling episodes.
WNW1104C - Dry for all other sampling episodes.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 16 *(concluded)*

Drinking Water Quality Parameters for the Lacustrine Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW1003 (DOWN - B)																
Dec-91	0.0030	0.0031	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.170	0.180	0.012	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0066	0.0047	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.250	0.190	0.017	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0045	0.0045	<0.0012	N/A	<0.00020	<0.00020	<0.0025	N/A	0.209	N/A	0.0055	<0.0025	0.004	< 0.00075	< 0.0012	< 0.0012
Sep-92	N/A	N/A	<0.0038	<0.0025	N/A	N/A	< 0.0006	< 0.0002	0.250	0.199	N/A	N/A	N/A	N/A	< 0.0031	< 0.0012
Dec-92	0.0030	0.0030	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.240	0.235	0.0050	<0.0050	0.002	<0.0020	< 0.0020	< 0.0020
Mean:	0.0043	0.0038	< 0.0032	< 0.0034	<0.00020	<0.00020	< 0.0019	< 0.0017	0.224	0.20	0.0099	< 0.0044	0.0035	< 0.0017	< 0.0021	< 0.0017
WNW1004 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.160	0.160	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0030	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.190	0.160	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	0.0022	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.147	0.144	<0.0025	<0.0025	< 0.00075	0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.138	0.138	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0020	0.0020	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.159	0.15	< 0.0044	< 0.0044	< 0.0017	0.0017	< 0.0018	< 0.0018
WNW1101C (DOWN - B)																
Jun-91	<0.0050	<0.0050	0.0032	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.140	0.130	0.018	<0.0050	0.004	0.0032	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.099	0.024	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Dec-91	0.0050	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.084	0.067	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.090	0.080	0.016	<0.0050	0.002	<0.0020	< 0.0020	<0.010
Mean:	0.0035	< 0.0028	0.0038	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.108	0.098	0.031	< 0.0050	0.0038	0.0023	< 0.0028	< 0.0048
WNW1103C (DOWN - C)																
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
WNW1104C (DOWN - C)																
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
WNW8610 (DOWN - C)																
Nov-91	0.0076	0.0035	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.053	0.020	<0.0050	0.019	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0050	0.0042	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.057	<0.050	<0.0050	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0065	0.0030	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.083	0.054	0.013	<0.0025	0.008	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.011	0.0050	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.087	0.056	0.012	<0.0050	0.009	<0.0020	< 0.0020	< 0.0020
Mean:	0.0075	0.0039	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0817	0.053	0.012	< 0.0044	0.010	< 0.0017	< 0.0018	< 0.0018
WNW8611 (DOWN - C)																
Nov-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.021	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0022	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.026	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0030	<0.0012	0.0037	<0.0012	<0.00020	<0.00020	0.0010	<0.00008	0.050	0.036	0.015	0.0052	0.007	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.044	0.029	0.032	<0.0050	0.014	<0.0020	< 0.0020	< 0.0020
Mean:	0.0028	< 0.0018	0.0037	< 0.0030	<0.00020	<0.00020	0.0019	< 0.0016	0.0485	0.041	0.024	0.0050	0.0082	< 0.0017	< 0.0018	< 0.0018

N/A - Not available.
WNW1003 was resampled in September 1992 to provide an additional sample for metals not completed in July.
WNW1103C - Dry for all other sampling episodes.
WNW1104C - Dry for all other sampling episodes.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17
Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW0908 (UP)										
Nov-91	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxx	xxxx
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.18	0.029	2.6	<6.00E-010
Dec-92	xxxx	xxxx	xxxx	Low	Volume	xxxx	xxxx	xxxx	1.7	xxxx
Mean:	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.18	0.029	2.2	<6.00E-010
WNW1005 (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<10	<1.0	0.16	<0.050	44	6.40±2.20E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	65	2.30±1.20E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.15	<0.010	24	<6.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.14	0.012	60	3.20±0.93E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<7.8	<1.3	0.14	0.031	48	3.08±1.23E-09
WNW1008C (UP)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.12	<0.050	5.2	9.20±7.30E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	1.6	1.20±1.00E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.13	<0.010	9.0	<1.80E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	<0.10	<0.010	1.1	1.37±0.68E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.11	<0.030	4.2	<1.05E-009
WNW0906 (DOWN - B)										
Nov-91	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.14	0.15	17	1.50±1.00E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.22	0.82	14	<6.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.17	0.26	2.9	<1.23E-009
Mean:	<0.042	<0.08	<0.47	<1.0	<7.0	<1.4	0.18	0.41	11	<9.43E-010
WNW0907 (DOWN - B)										
Dec-91	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.15	<0.050	1.5	1.20±0.90E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.16	<0.010	3.3	<6.00E-010
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.18	<0.010	0.36	<7.20E-010
Mean:	<0.042	<0.08	<0.47	<1.0	<7.0	<1.4	0.16	<0.024	1.7	<7.40E-010
WNW1006 (DOWN - B)										
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.15	<0.050	0.50	1.10±0.90E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	2.4	1.20±1.10E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.14	<0.010	4.4	<1.80E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.14	0.020	1.2	1.34±0.99E-09
Mean:	<0.038	<0.08	<0.45	<1.0	<5.5	<1.1	0.13	0.033	2.1	<1.20E-009

ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17 *(continued)*

Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW0908 (UP)																
Nov-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.0002	<0.00020	<0.0025	<0.0025	0.024	0.022	0.018	0.012	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0040	0.0030	0.0070	<0.0040	<0.0004	<0.00040	< 0.0005	< 0.0005	0.018	0.012	0.013	0.014	<0.0020	0.0480	0.0030	< 0.0020
Mean:	0.0026	0.0021	0.0041	< 0.0026	<0.0003	<0.00030	< 0.0015	< 0.0015	0.0209	0.0169	0.016	0.013	< 0.0014	0.024	0.0021	< 0.0016
WNW1005 (UP)																
Dec-91	0.0031	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.130	0.110	<0.0050	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.100	0.110	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	0.0001	<0.00005	<0.00020	<0.00020	<0.00008	<0.00008	0.104	0.101	<0.0025	<0.0025	0.002	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.124	0.119	<0.0050	<0.0050	<0.0020	0.0020	< 0.0020	< 0.0020
Mean:	0.0021	< 0.0018	0.0028	< 0.0028	<0.00020	<0.00020	< 0.0016	< 0.0016	0.114	0.110	< 0.0044	< 0.0044	0.0024	0.0017	< 0.0018	< 0.0018
WNW1008C (UP)																
Dec-91	0.0053	0.0052	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.210	0.220	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	0.0049	0.0045	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.190	0.230	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0072	0.0072	0.0023	0.0015	<0.00020	<0.00020	<0.00008	<0.00008	0.216	0.226	<0.0025	0.0028	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	0.0070	0.0070	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.197	0.206	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0061	0.0060	0.0033	0.0031	<0.00020	<0.00020	< 0.0016	< 0.0016	0.203	0.220	< 0.0044	0.0044	< 0.0017	< 0.0017	< 0.0018	< 0.0018
WNW0906 (DOWN - B)																
Nov-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.0020	0.0043	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.073	<0.050	0.0090	<0.0050	0.002	<0.0020	0.0052	0.0053
Jul-92	<0.0012	<0.0012	0.0001	0.00005	<0.00020	<0.00020	<0.00008	<0.00008	0.063	0.059	0.0045	0.0028	0.002	< 0.00075	0.0020	0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.064	0.064	<0.0050	<0.0050	0.002	0.0020	0.0060	0.0050
Mean:	< 0.0017	0.0025	0.0024	0.0024	<0.00020	<0.00020	< 0.0012	< 0.0012	0.0668	0.0576	0.0062	0.0043	0.0020	0.0016	0.0044	0.0038
WNW0907 (DOWN - B)																
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	0.0064	< 0.0020	< 0.0020
Jul-92	<0.0012	<0.0012	0.00008	0.00005	<0.00020	<0.00020	<0.00008	<0.00008	0.048	0.050	<0.0025	<0.0025	<0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.042	0.041	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0017	< 0.0017	0.0024	0.0024	<0.00020	<0.00020	< 0.0012	< 0.0012	0.0468	0.0471	< 0.0042	< 0.0042	<0.0016	0.0030	< 0.0017	< 0.0017
WNW1006 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Jul-92	0.0032	0.0032	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.027	0.013	0.023	0.0095	< 0.00075	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.015	0.014	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0023	0.0023	< 0.0030	< 0.0030	<0.00020	<0.00020	< 0.0022	< 0.0022	0.0355	0.0317	0.0094	0.0061	< 0.0017	< 0.0017	< 0.0018	< 0.0018

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17 *(continued)*

Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW1007 (DOWN - B)										
Dec-91	xxxx	Low	Volume	xxxx	<3.0	<0.3	0.24	xxxx	> 100	<1.90E-009
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
Jul-92	<0.056	<0.11	<0.56	<1.1	<10	<2.0	0.18	0.092	3.8	<2.00E-009
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.18	0.14	1.2	<4.09E-010
Mean:	<0.053	<0.11	<0.53	<1.1	<7.7	<1.4	0.20	0.12	NA	<1.44E-009
WNW1101A (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.14	<0.10*	1.3	<6.71E-010
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.15	<0.050	0.42	7.40±3.60E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.17	0.075	50	<1.70E-009
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	0.061	1.6	<1.09E-009
Mean:	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.14	0.072	13	2.46±1.77E-09
WNW1106A (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.17	0.13	29	<7.22E-010
Sep-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.17	<0.050	35	1.50±1.10E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.17	<0.050	27	2.30±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.16	0.054	1.8	<9.60E-010
Mean:	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.17	0.071	23	1.26±1.07E-09
WNW1108A (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.16	<0.10*	41	2.60±1.90E-09
Sep-91	xxxx	Low	Volume	xxxx	<1.0	<0.1	xxxx	xxxx	97	xxxx
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
Dec-92	xxxx	xxxx	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx	xxxx
Mean:	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	0.16	<0.010	69	2.60±1.90E-09
WNW1109A (DOWN - B)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.13	0.35*	32	1.80±1.00E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.14	0.17	1.8	2.40±1.20E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.13	0.088	8.0	2.20±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.11	0.072	18	<8.20E-010
Mean:	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.13	0.17	15	1.63±1.13E-09
WNW0909 (DOWN - C)										
Jun-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.22	<0.010	92	4.60±1.70E-09
Jul-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.12	<0.010	4.8	<6.00E-10
Dec-92	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.16	<0.010	15	2.98±9.50E-10
Mean:	<0.050	<0.10	<0.50	<1.0	<10	<2.0	0.17	<0.010	37	2.63±1.08E-09

** - Nitrate-N only*
ND - A standard defined by "ND" means not detectable by the analytical method..
NA - Not applicable.
Well WNW0909 was incorporated into the groundwater program in mid-1992.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17 *(continued)*

Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW1007 (DOWN - B)																
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	0.0078	<0.0050	0.006	<0.0020	< 0.0020	< 0.0020
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Jul-92	<0.0012	<0.0012	<0.0012	<0.0012	<0.00020	<0.00020	<0.0025	<0.0025	0.050	0.046	0.014	0.0090	0.003	< 0.00075	< 0.0012	< 0.0012
Dec-92	<0.0020	<0.0020	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.037	0.034	0.0080	<0.0050	0.005	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0017	< 0.0017	< 0.0027	< 0.0027	<0.00020	<0.00020	< 0.0020	< 0.0020	0.0458	0.0433	0.010	0.0063	0.0045	< 0.0016	< 0.0017	< 0.0017
WNW1101A (DOWN - B)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.050	0.052	<0.0050	<0.0050	0.003	0.0120	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.064	<0.050	0.0060	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.051	<0.050	0.0052	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.064	0.060	0.0089	0.010	<0.0020	<0.0020	< 0.0020	0.0023
Mean:	< 0.0028	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.0572	0.0530	0.0063	0.0062	0.0023	0.0045	< 0.0028	0.0028
WNW1106A (DOWN - B)																
Jun-91	<0.0020	<0.0020	<0.0040	0.0067	<0.00020	<0.00020	<0.0030	<0.0030	0.053	0.056	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.059	0.065	<0.0050	0.0056	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.058	0.061	<0.0050	<0.0050	<0.0020	<0.0020	<0.010	<0.010
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.054	0.053	<0.0050	<0.0050	<0.0020	0.0035	< 0.0020	< 0.0020
Mean:	< 0.0020	< 0.0020	< 0.0040	0.0047	<0.00020	<0.00020	< 0.0030	< 0.0030	0.0560	0.0588	< 0.0050	0.0052	< 0.0020	0.0024	< 0.0040	< 0.0040
WNW1108A (DOWN - B)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.029	0.015	<0.0050	<0.0050	0.005	0.0046	< 0.0050	< 0.0050
Sep-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Low Volume		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Dec-92	<0.0020	N/A	0.0080	N/A	<0.00040	N/A	< 0.0005	N/A	0.020	N/A	0.0070	N/A	<0.0020	N/A	0.0020	N/A
Mean:	< 0.0035	< 0.0050	0.0052	< 0.0025	<0.00030	<0.00020	< 0.0028	< 0.0050	0.0245	0.0150	0.0060	< 0.0050	0.0036	0.0046	0.0035	< 0.0050
WNW1109A (DOWN - B)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.054	0.052	<0.0050	<0.0050	0.004	0.0068	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.052	0.063	<0.0050	<0.0050	0.003	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.042	0.041	0.0059	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	0.0020	< 0.0020
Mean:	< 0.0028	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.0495	0.0515	0.0052	< 0.0050	0.0026	0.0032	0.0028	< 0.0028
WNW0909 (DOWN - C)																
Jun-92	0.020	0.018	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.087	0.073	0.0070	<0.0050	0.003	<0.0020	0.0060	< 0.0020
Jul-92	0.0050	0.0040	0.0026	0.0027	<0.00020	<0.00020	<0.00008	<0.00008	0.137	0.132	0.0075	0.0065	0.004	0.0010	< 0.0012	< 0.0012
Dec-92	0.0040	0.0040	<0.0030	<0.0030	<0.00020	<0.00020	< 0.0005	< 0.0005	0.101	0.102	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0097	0.0087	0.0032	0.0032	<0.00020	<0.00020	< 0.0012	< 0.0012	0.108	0.102	0.0065	0.0055	0.0028	0.0017	0.0031	< 0.0017

N/A - Not available.
Well WNW0909 was incorporated into the groundwater program in mid-1992.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17 (continued)
Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Lindane	Endrin	Methoxychlor	Toxaphene	2,4-D	Silvex	Fluoride	Nitrate+ Nitrite-N	Turbidity	Radium
Quality Standards	ND µg/L	ND µg/L	35 µg/L	ND µg/L	4.4 µg/L	0.26 µg/L	1.50 mg/L	10.00 mg/L	NA NTU	$5x10^{-9}$ µCi/mL
WNW1102A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.16	0.20	0.25	1.40±0.90E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<10	<1.0	0.18	0.14	3.3	2.50±1.70E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.17	<0.050	1.3	2.30±2.20E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	1.1	<1.03E-009
Mean:	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.15	0.11	1.5	1.74±1.46E-09
WNW1103A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.21	0.50	13	3.40±2.20E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.21	<0.050	35	4.00±1.60E-09
Jan-92	<0.025	<0.05	<0.40	<1.0	<0.1	<0.1	0.23	<0.050	>100	8.80±4.00E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	<0.050	16	2.90±1.40E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.3	<0.2	0.19	0.16	NA	4.78±2.30E-09
WNW1104A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.20	0.81	9.9	1.20±0.80E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.20	0.28	12	2.30±1.25E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	0.23	0.14	5.5	6.30±2.40E-10
Mar-92	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	<0.10	0.20	10	1.90±1.40E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<4.0	<0.4	0.18	0.36	9.4	1.51±0.92E-09
WNW1107A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1.5	<0.2	0.10	<0.10*	1.2	3.35±1.25E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<3.0	<0.3	0.12	0.062	2.7	3.00±1.30E-09
Dec-91	<0.025	<0.05	<0.40	<1.0	<1.0	<0.1	0.13	<0.050	2.2	2.40±1.50E-09
Mar-92	<0.025	<0.05	<0.40	<1.0	<2.0	<0.2	<0.10	<0.050	1.1	1.60±1.20E-09
Mean:	<0.025	<0.05	<0.40	<1.0	<1.9	<0.2	0.11	0.065	1.8	2.59±1.31E-09
WNW1110A (DOWN - C)										
Jun-91	<0.025	<0.05	<0.40	<1.0	<1	<0.1	0.17	<0.10*	2.5	1.50±0.90E-09
Sep-91	<0.025	<0.05	<0.40	<1.0	<4	<0.4	0.16	0.13	5.0	1.80±1.10E-09
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx
Mean:	<0.025	<0.05	<0.40	<1.0	<2.5	<0.3	0.16	0.12	3.8	1.65±1.00E-09

** - Nitrate-N only.*
ND - A standard defined by "ND" means not detectable by the analytical method.
NA - Not applicable.
Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Table E - 17 (concluded)

Drinking Water Quality Parameters for the Weathered Lavery Till Unit

	Arsenic		Cadmium		Mercury		Silver		Barium		Chromium		Lead		Selenium	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Quality Standards	0.025 mg/L		0.010 mg/L		0.002 mg/L		0.050 mg/L		1.00 mg/L		0.050 mg/L		0.025 mg/L		0.010 mg/L	
WNW1102A (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.061	0.057	<0.0050	<0.0050	0.002	0.0260	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.058	0.062	0.0062	<0.0050	<0.0020	<0.0020	< 0.0020	<0.010
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.056	0.059	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.050	<0.0050	<0.0050	<0.0020	<0.0020	0.0031	< 0.0020
Mean:	< 0.0028	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.0562	0.0570	0.0053	< 0.0050	0.0021	0.0080	0.0030	< 0.0048
WNW1103A (DOWN - C)																
Jun-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.091	0.086	<0.0050	<0.0050	0.003	0.0055	< 0.0020	< 0.0020
Sep-91	0.0023	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.120	0.110	0.012	<0.0050	0.004	<0.0020	< 0.0020	< 0.0020
Dec-91	0.0079	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.089	<0.050	0.0055	<0.0050	0.004	<0.0020	< 0.0020	<0.010
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.067	<0.050	0.0072	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0036	< 0.0020	< 0.0040	< 0.0040	<0.00020	<0.00020	< 0.0030	< 0.0030	0.0918	0.0740	0.0074	< 0.0050	0.0032	0.0029	< 0.0020	< 0.0040
WNW1104A (DOWN - C)																
Jun-91	<0.0020	<0.0020	0.0050	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.064	0.086	<0.0050	<0.0050	0.006	0.0033	< 0.0020	< 0.0020
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.084	0.086	0.0080	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.066	0.068	<0.0050	<0.0050	<0.0020	<0.0020	0.0029	0.0030
Mar-92	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.071	0.074	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	< 0.0020	< 0.0020	0.0042	< 0.0040	<0.00020	<0.00020	< 0.0030	< 0.0030	0.0711	0.0785	0.0058	< 0.0050	0.0031	0.0023	0.0022	0.0022
WNW1107A (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.115	0.135	<0.0050	<0.0050	0.003	0.0110	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.110	0.120	<0.0050	0.0062	<0.0020	<0.0020	< 0.0020	< 0.0020
Dec-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.094	0.095	<0.0050	<0.0050	<0.0020	<0.0020	<0.010	<0.010
Mar-92	0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	0.083	0.095	<0.0050	<0.0050	<0.0020	<0.0020	< 0.0020	< 0.0020
Mean:	0.0028	< 0.0028	< 0.0036	< 0.0036	<0.00020	<0.00020	< 0.0035	< 0.0035	0.100	0.111	< 0.0050	0.0053	0.0022	0.0042	< 0.0048	< 0.0048
WNW1110A (DOWN - C)																
Jun-91	<0.0050	<0.0050	<0.0025	<0.0025	<0.00020	<0.00020	<0.0050	<0.0050	0.032	0.025	<0.0050	<0.0050	0.006	0.0022	< 0.0050	< 0.0050
Sep-91	<0.0020	<0.0020	<0.0040	<0.0040	<0.00020	<0.00020	<0.0030	<0.0030	<0.050	<0.0050	<0.0050	<0.0050	<0.0020	<0.0020	<0.010	<0.010
Dec-91	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mar-92	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Dry	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Mean:	< 0.0035	< 0.0035	< 0.0032	< 0.0032	<0.00020	<0.00020	< 0.0040	< 0.0040	0.0410	0.0150	< 0.0050	< 0.0050	0.0040	0.0021	< 0.0075	< 0.0075

Quality Standards for Class GA groundwater are from 6 NYCRR Part 703.5.

Figure E - 1
1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

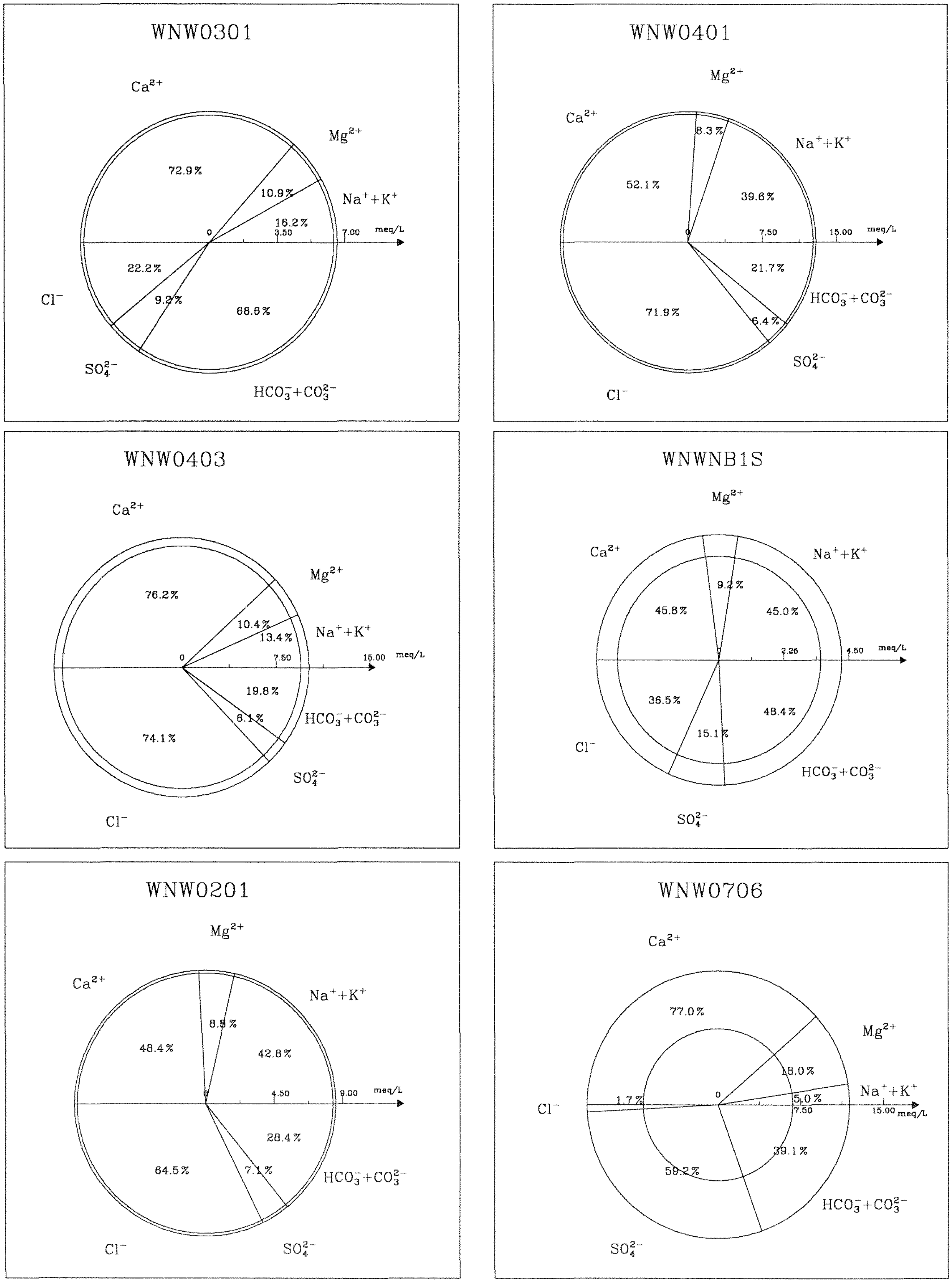
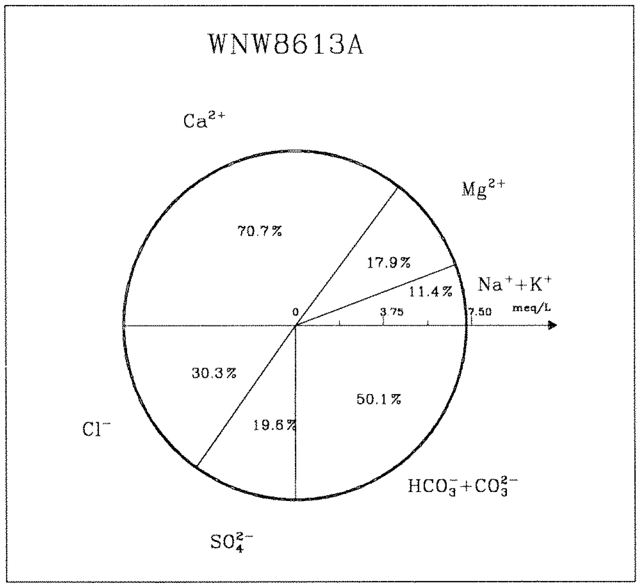
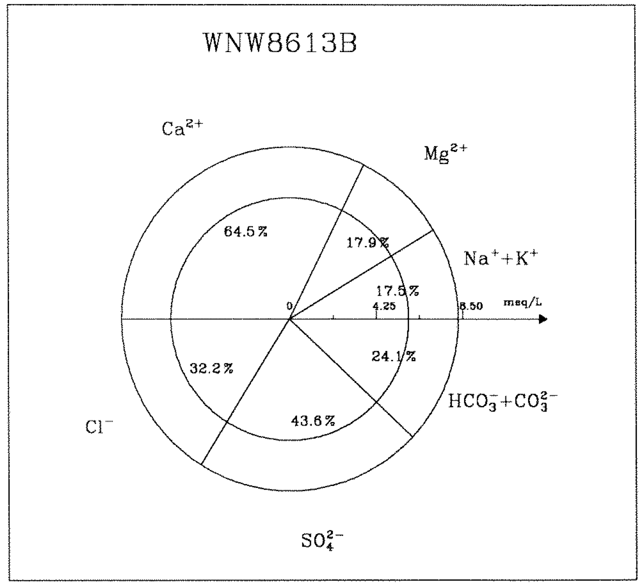
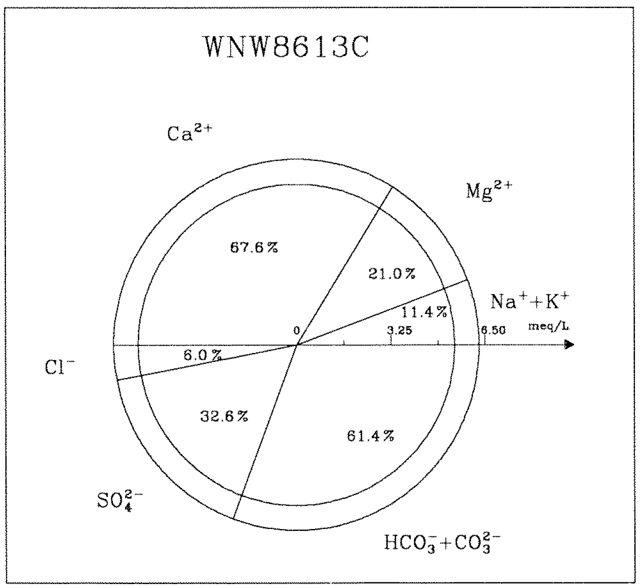


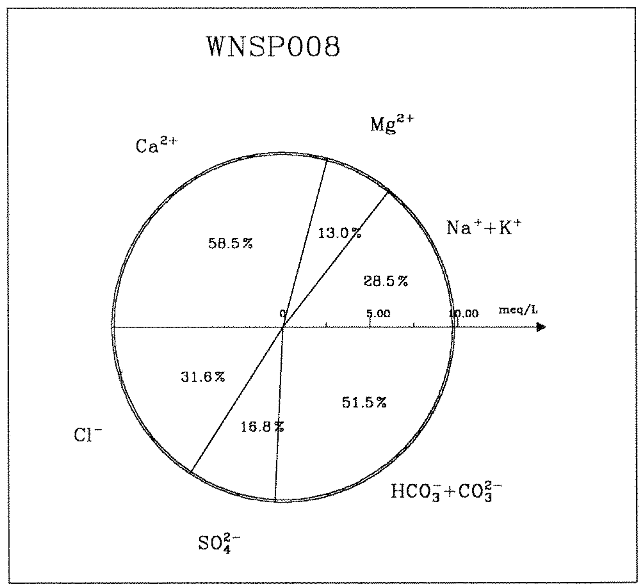
Figure E - 1 (continued)

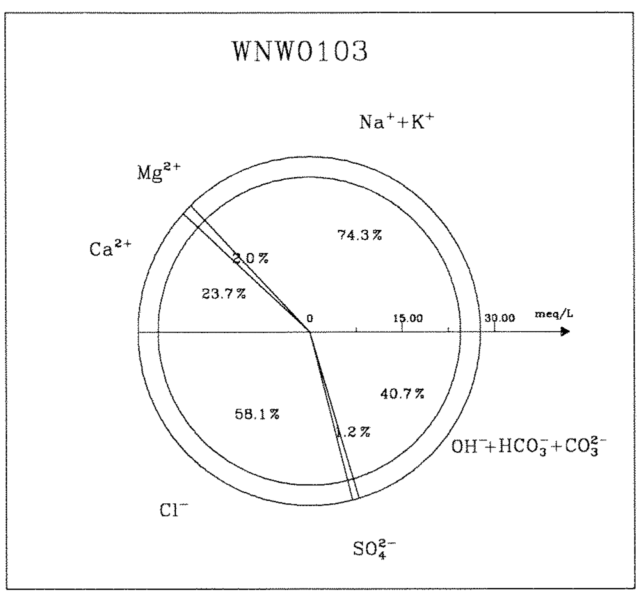
1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells











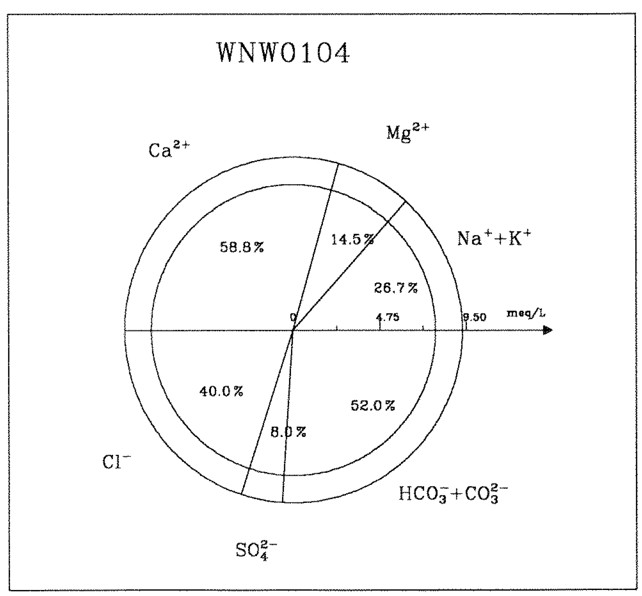


Figure E - 1 (continued)

1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

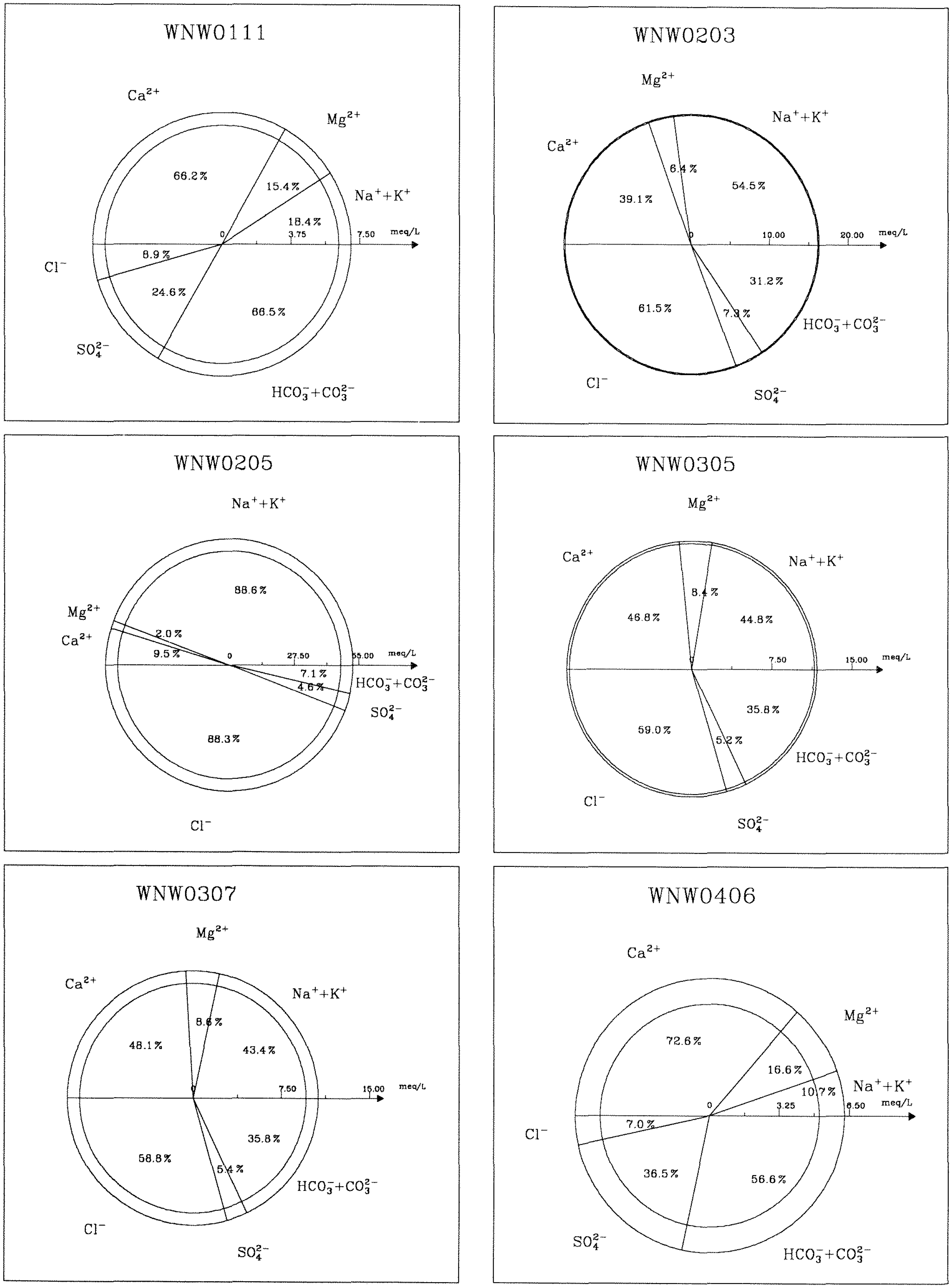


Figure E - 1 (continued)
1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

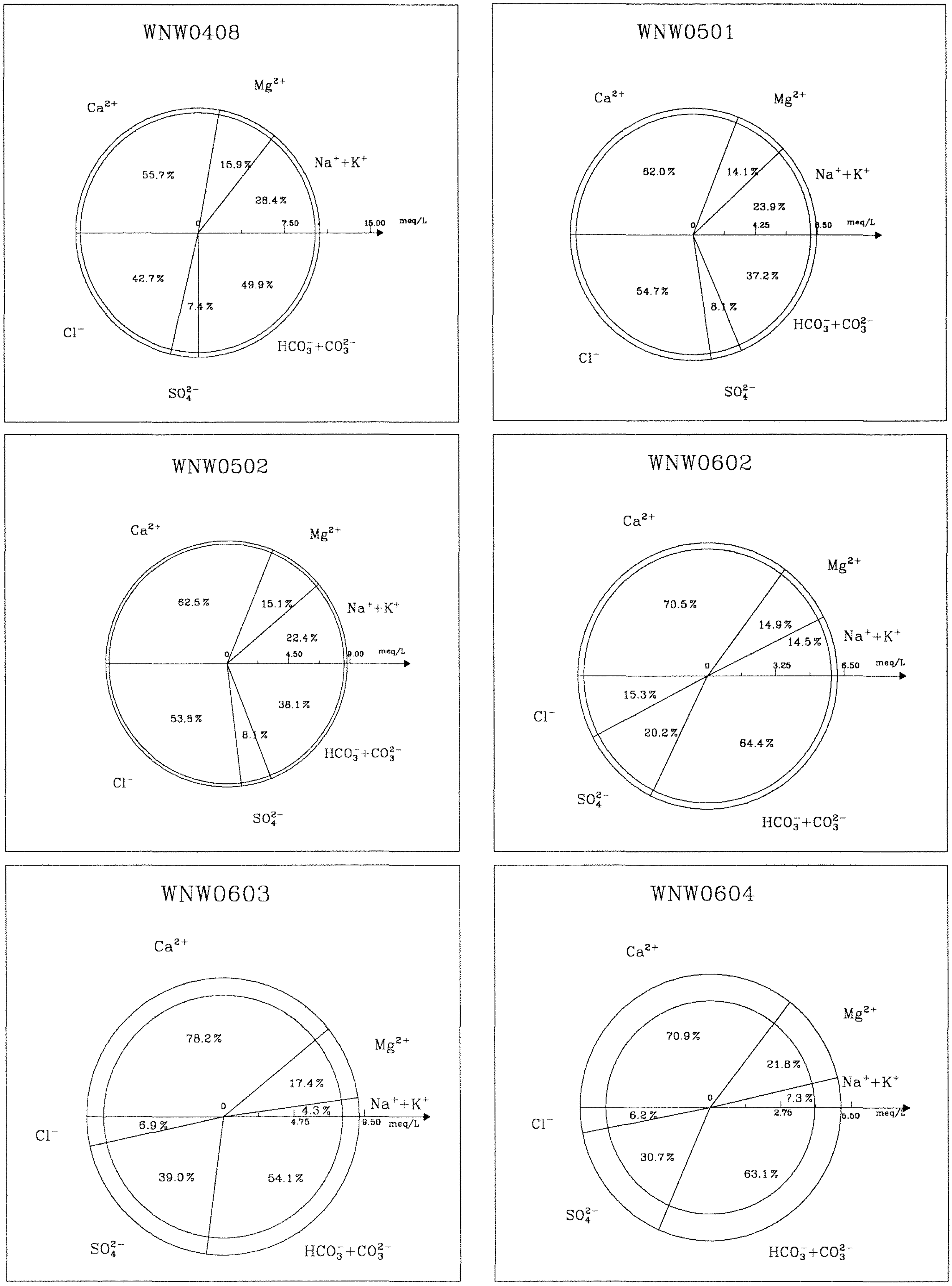
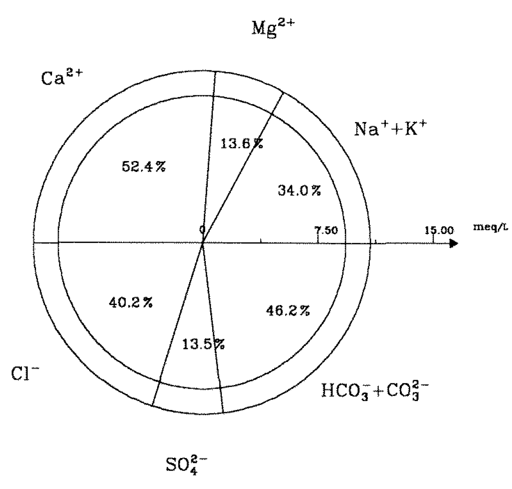


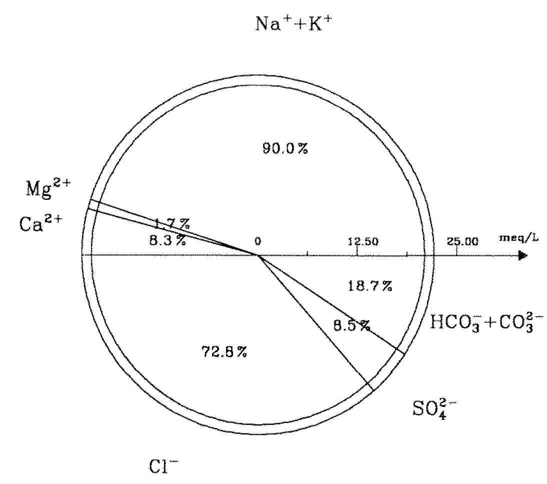
Figure E - 1 (continued)

1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

WNW8605



WNW8606



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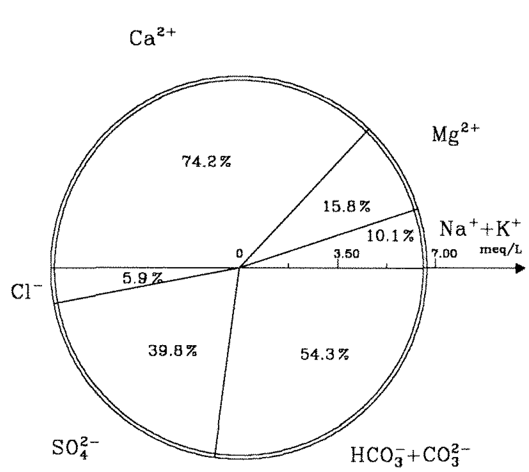

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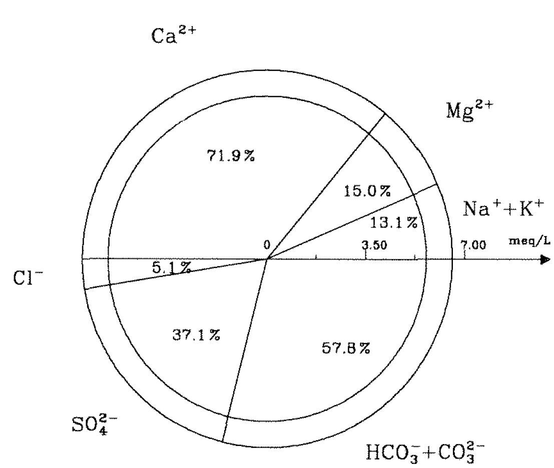

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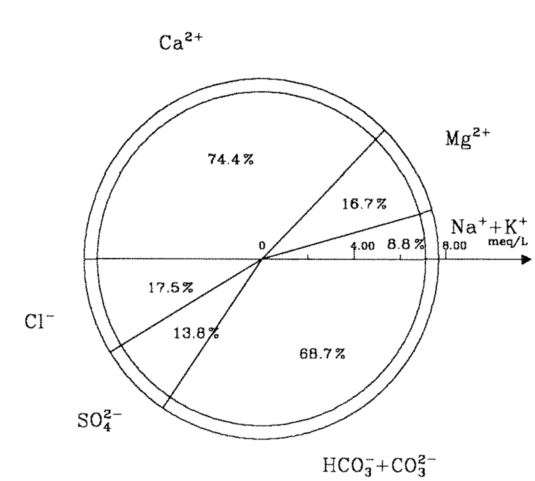


WNDMPNE

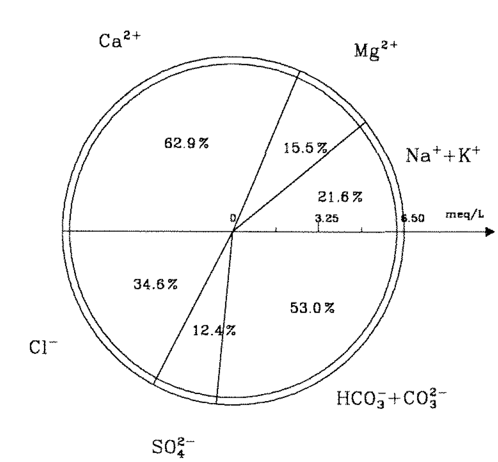


Figure E - 1 (continued)

1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

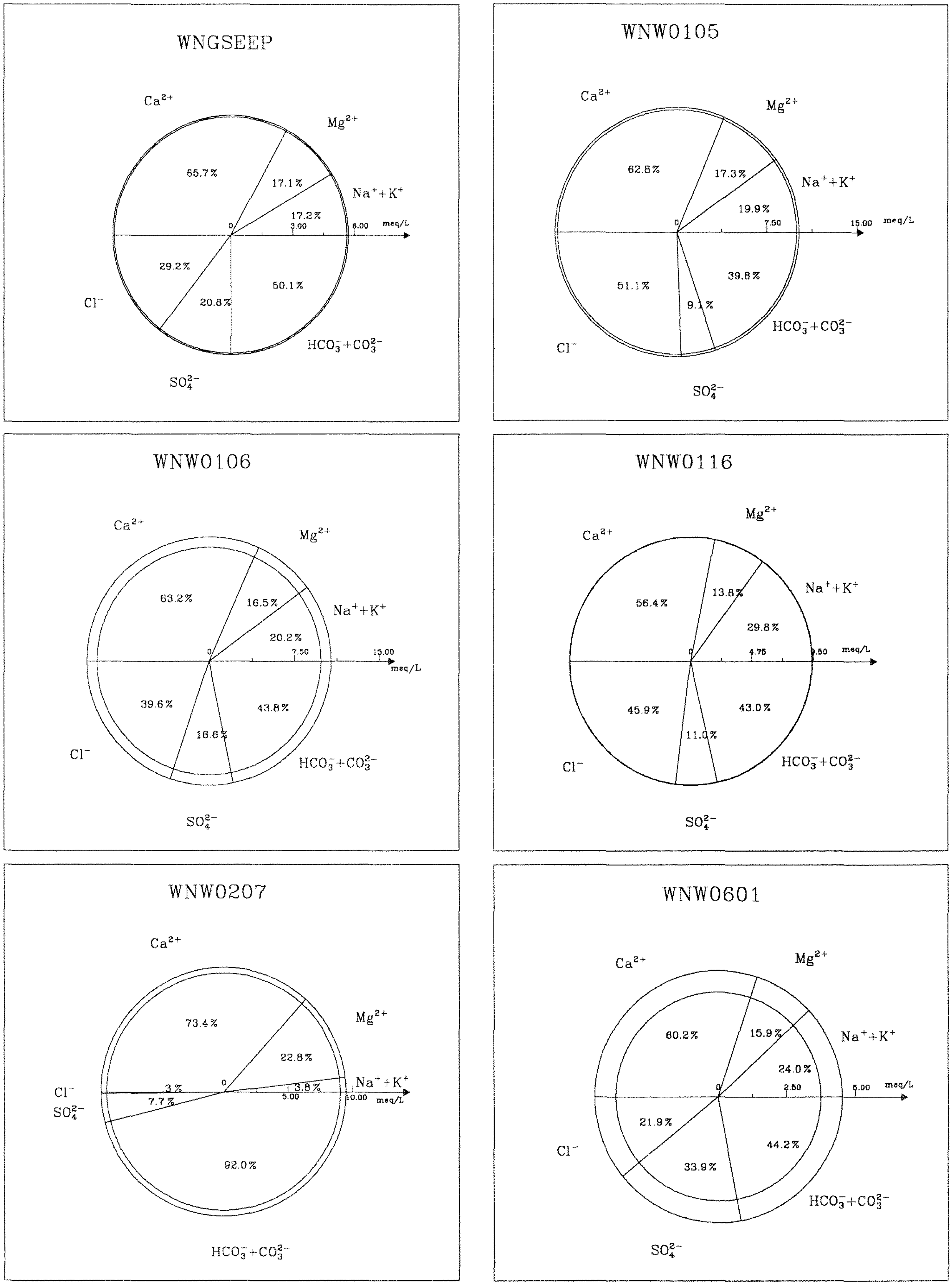


Figure E - 1 (continued)

1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells

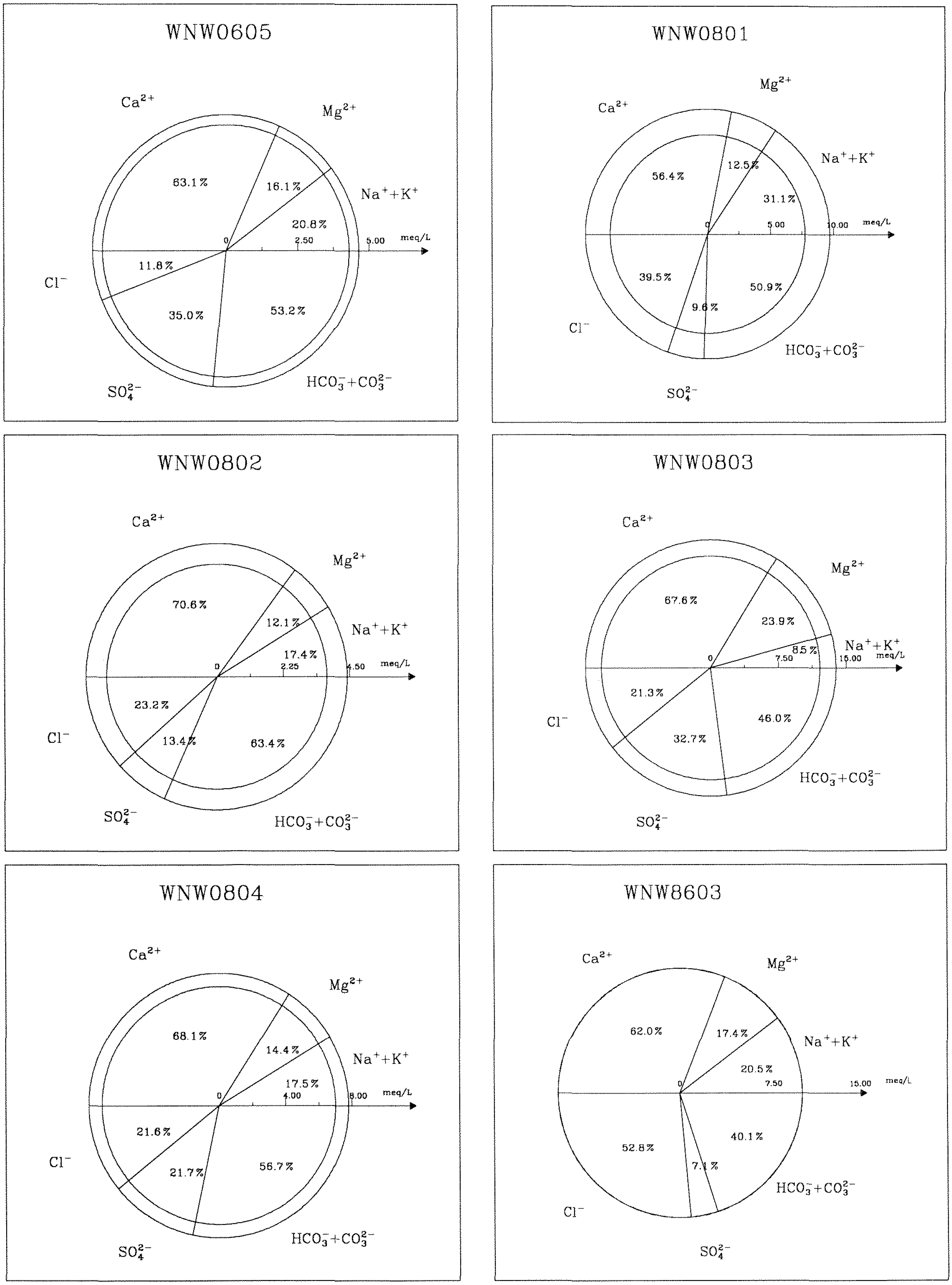
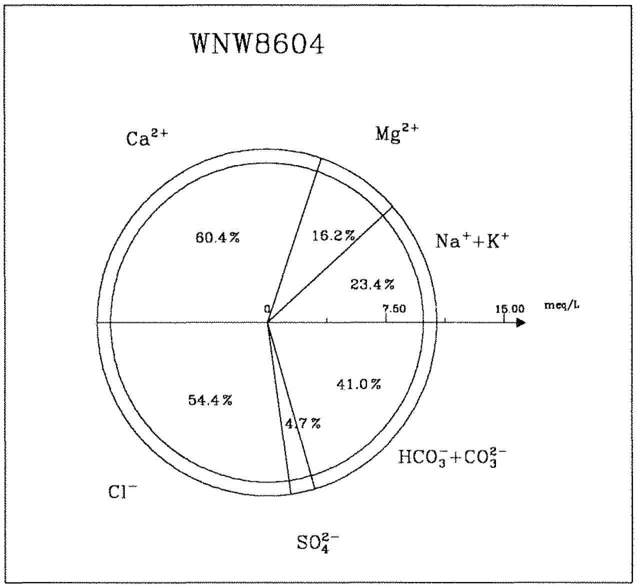


Figure E - 1 (concluded)

1992 Groundwater Quality Plots for the Sand and Gravel Unit Wells



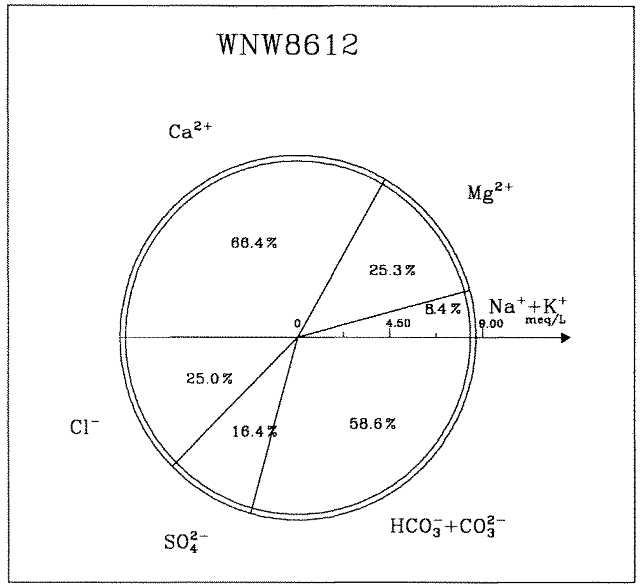


Figure E - 2

1992 Groundwater Quality Plots for the Till-Sand Unit Wells

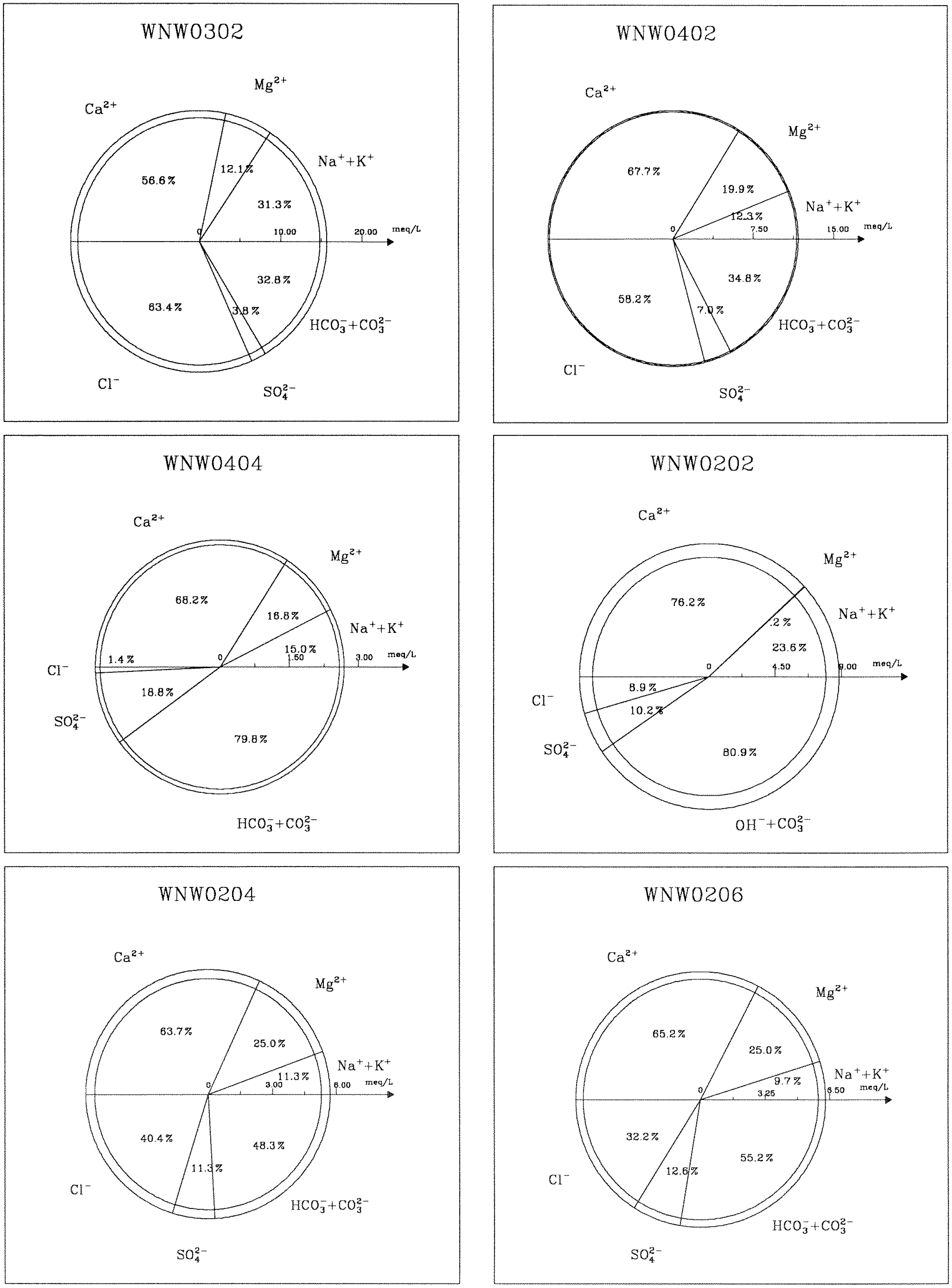


Figure E - 2 (concluded)

1992 Groundwater Quality Plots for the Till-Sand Unit Wells

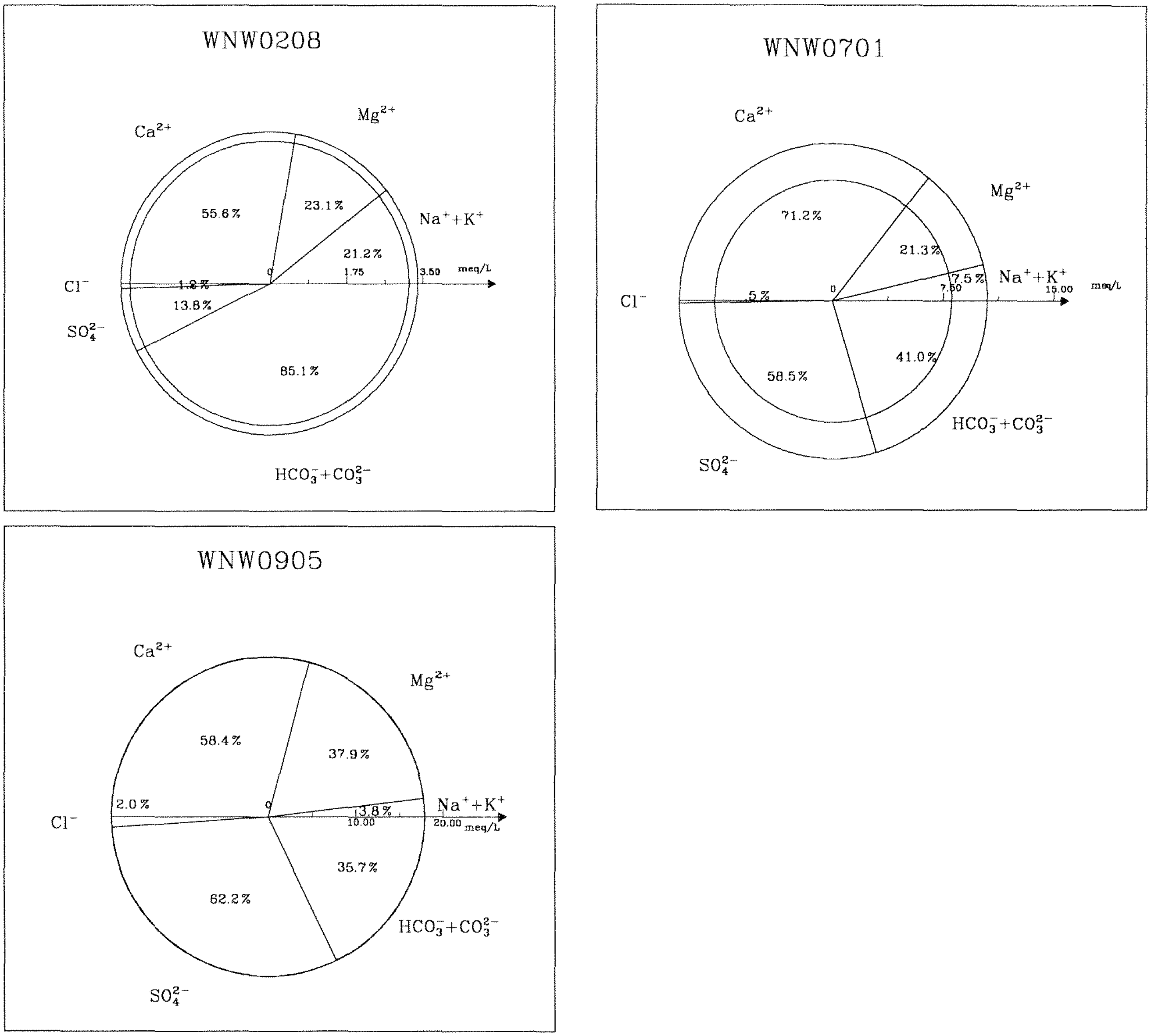


Figure E - 3

1992 Groundwater Quality Plots for the Unweathered Lavery Till Unit Wells

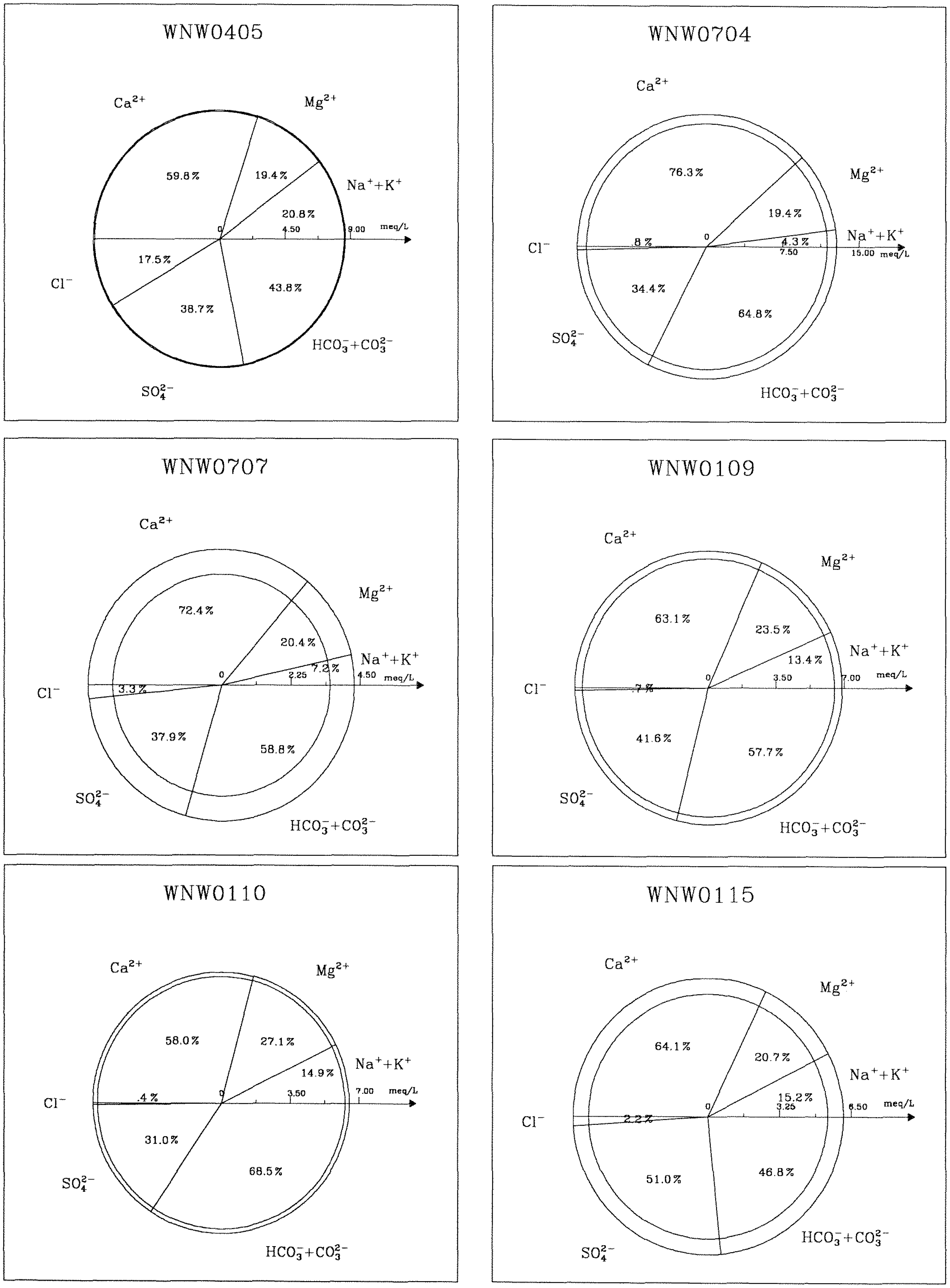


Figure E - 3 (continued)

1992 Groundwater Quality Plots for the Unweathered Lavery Till Unit Wells

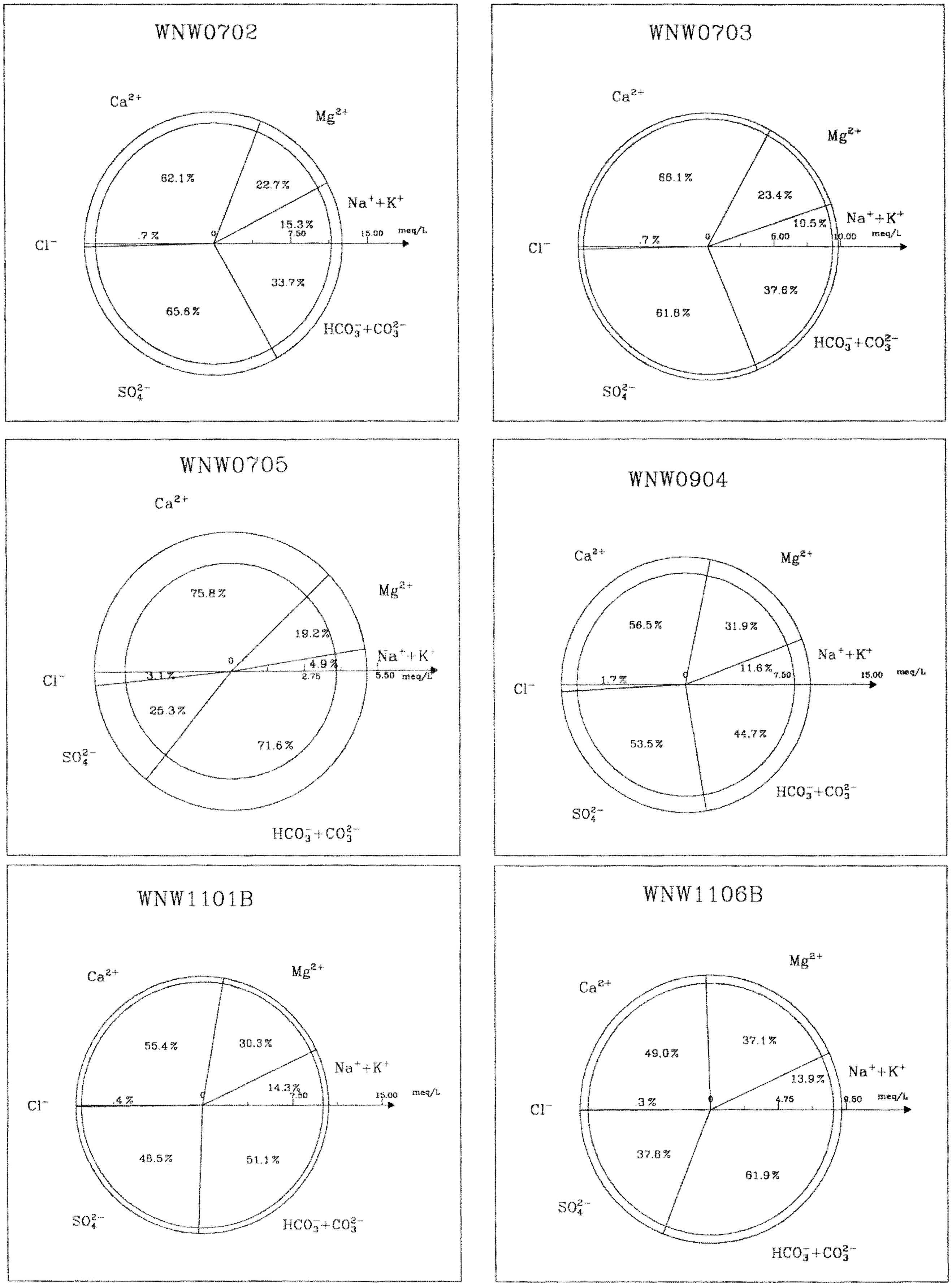
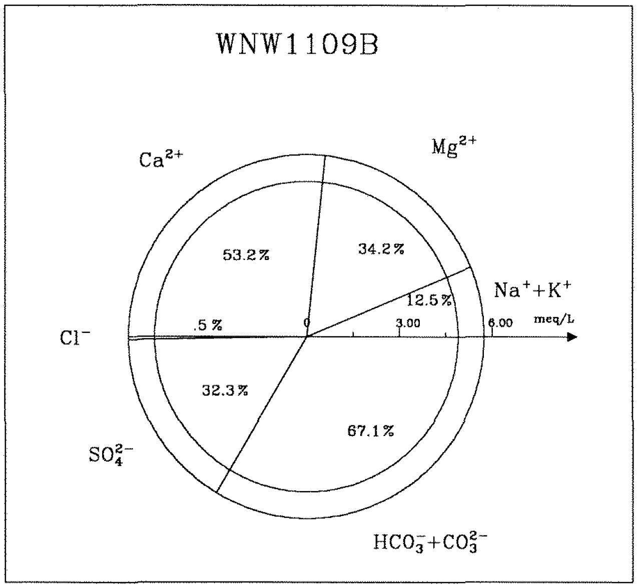
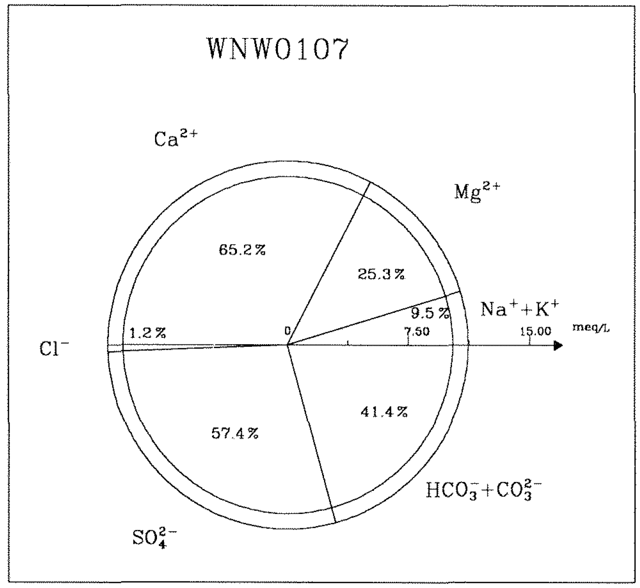
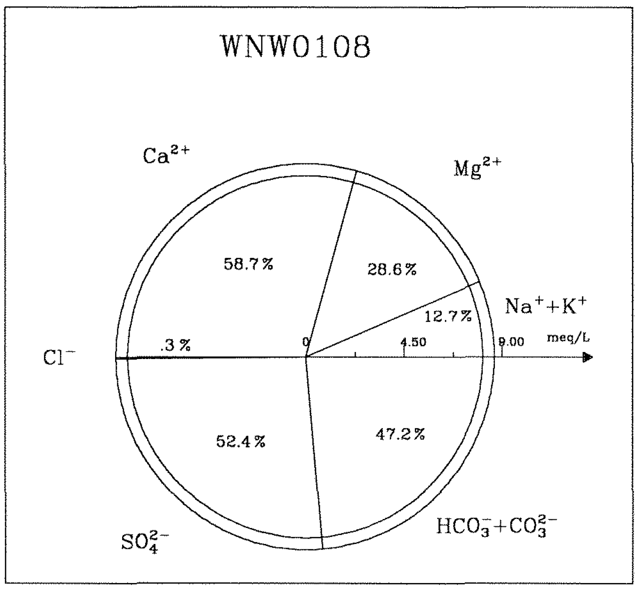


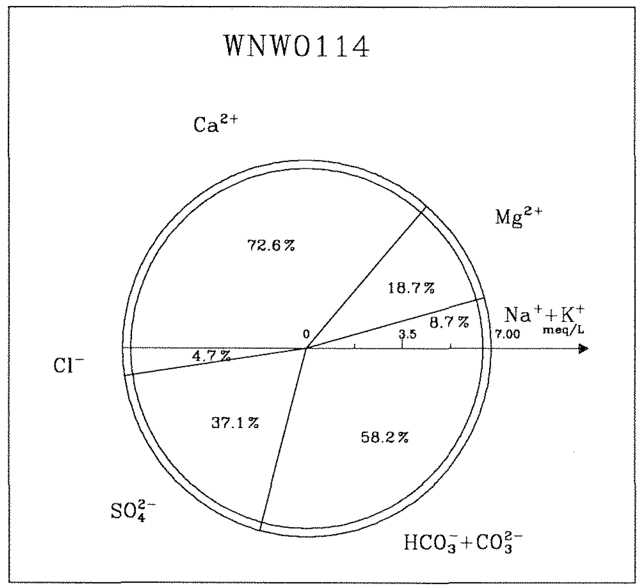
Figure E - 3 (continued)

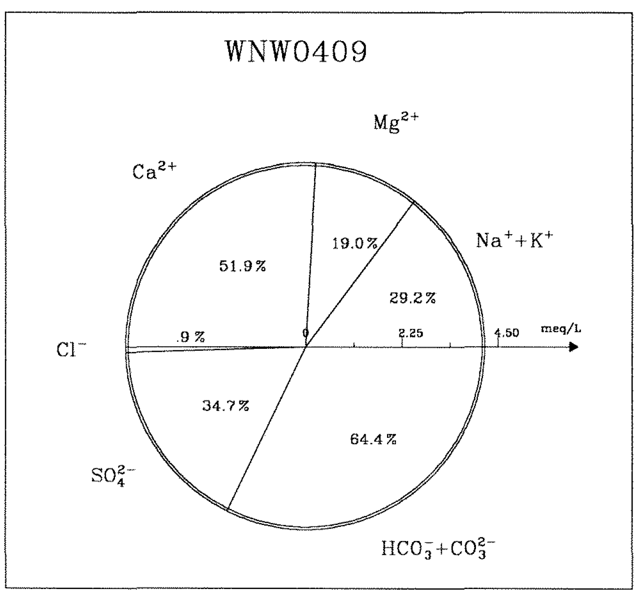
1992 Groundwater Quality Plots for the Unweathered Lavery Till Unit Wells











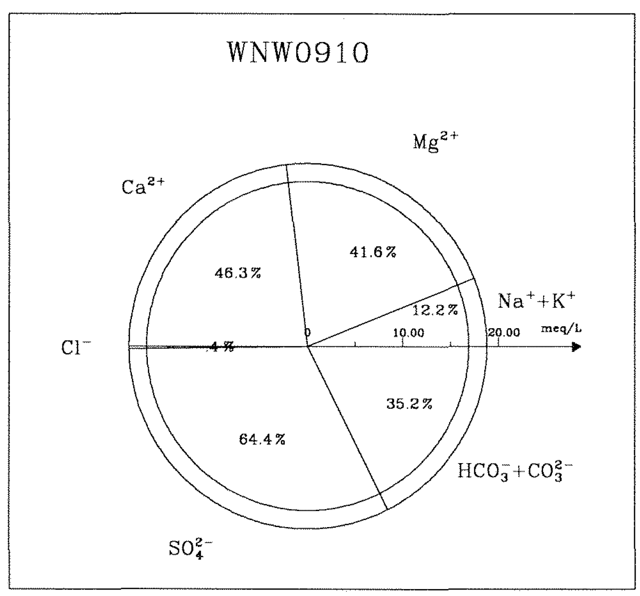


Figure E - 3 (concluded)

1992 Groundwater Quality Plots for the Unweathered Lavery Till Unit Wells

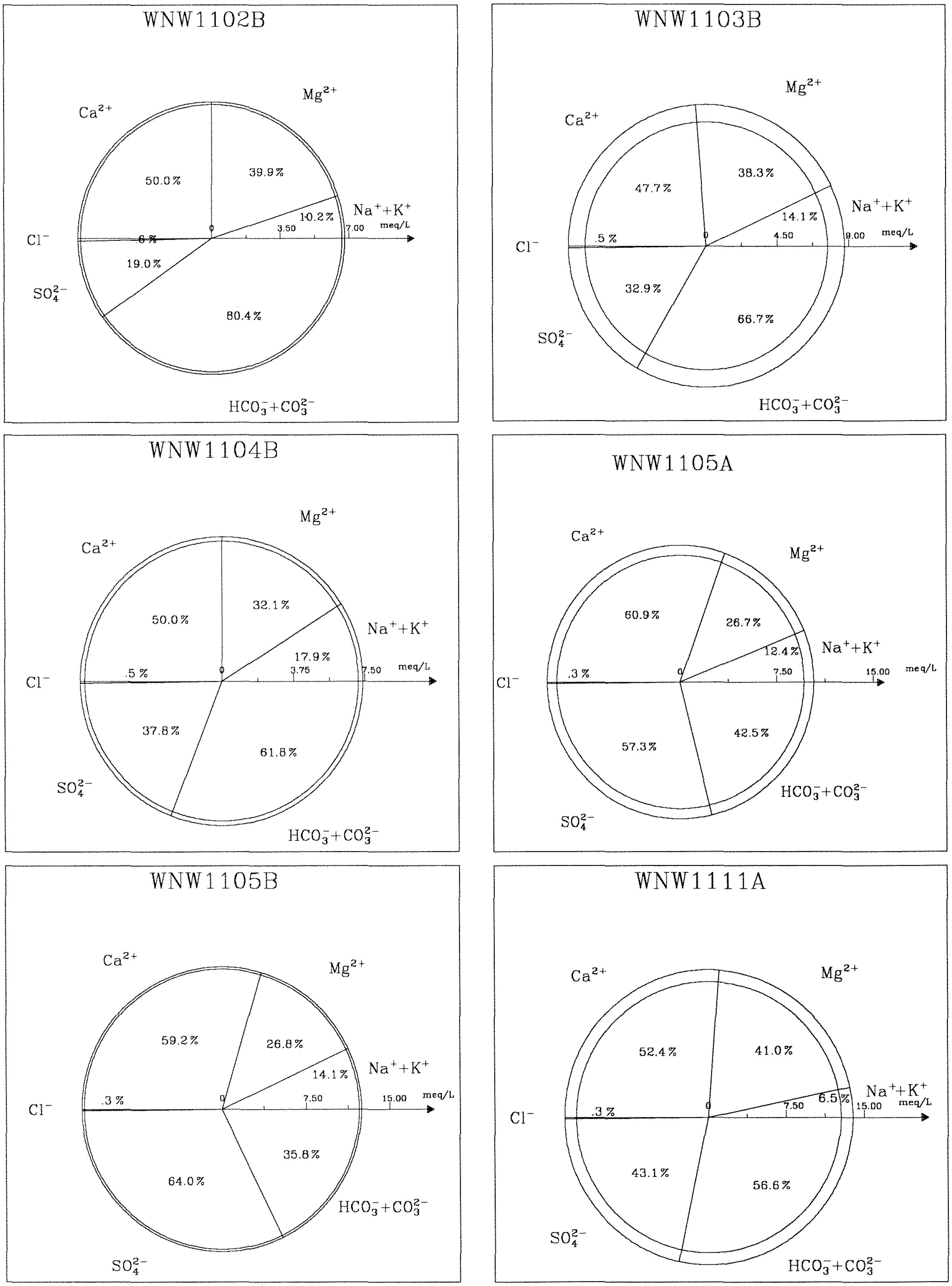


Figure E - 4
1992 Groundwater Quality Plots for the Lacustrine Unit Wells

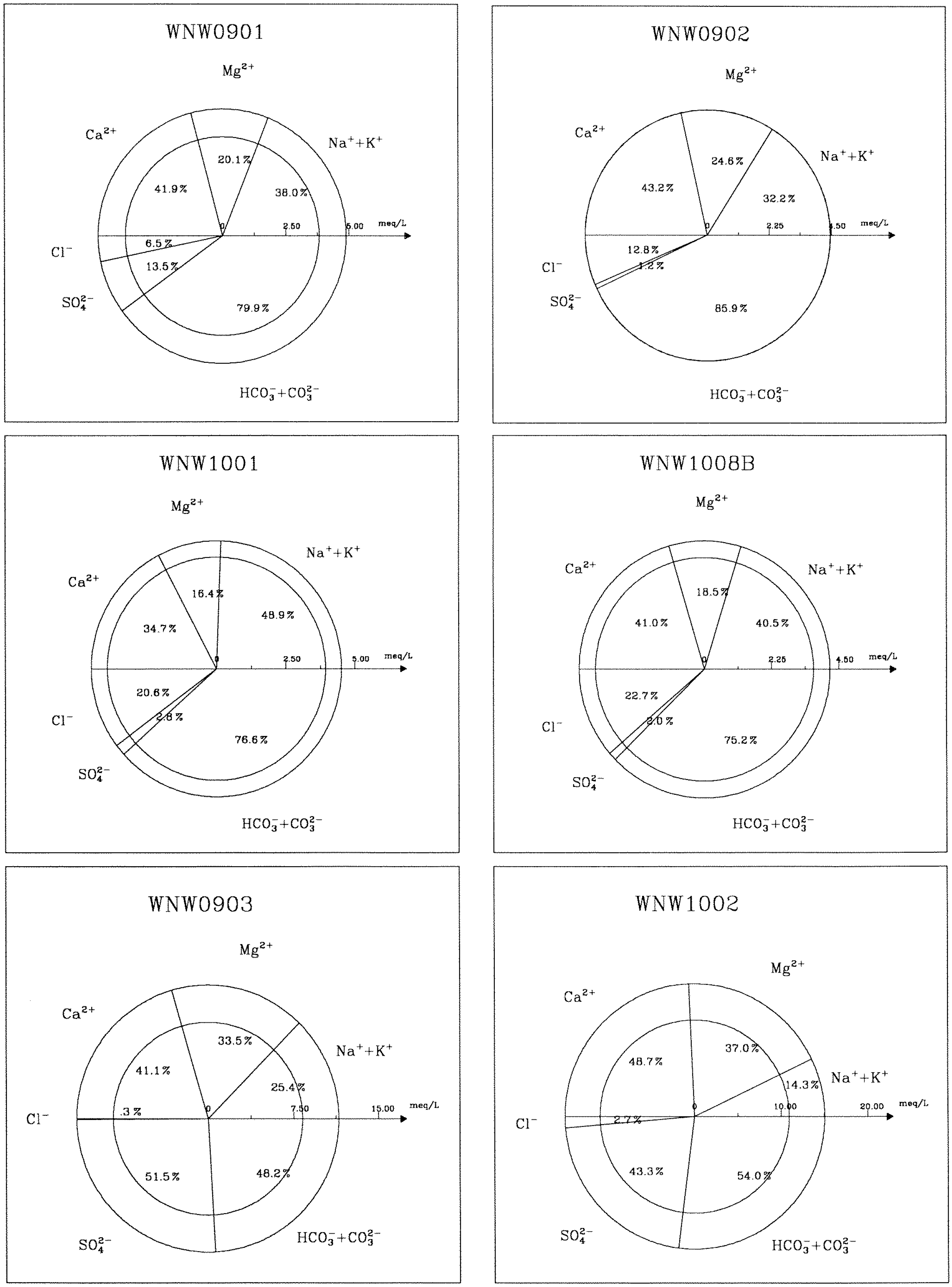
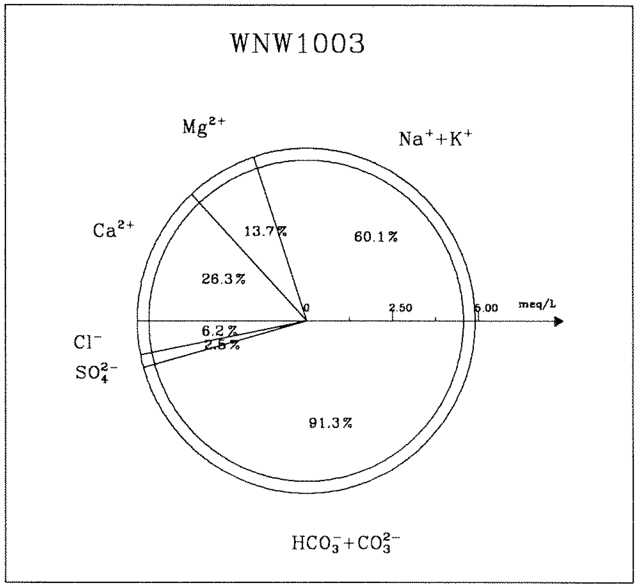
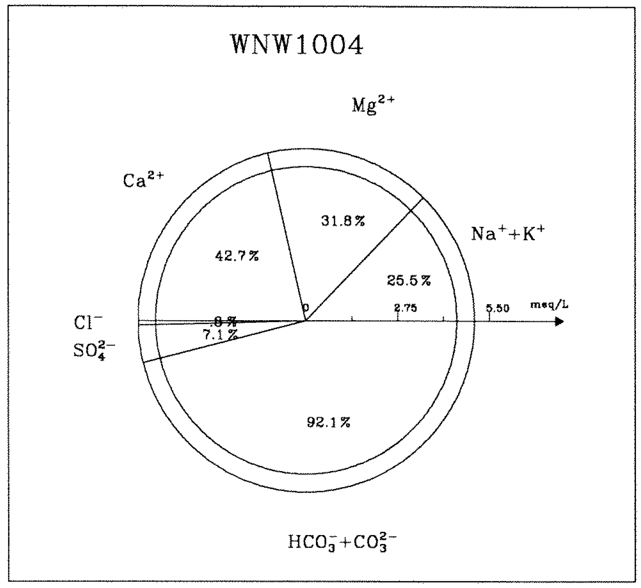
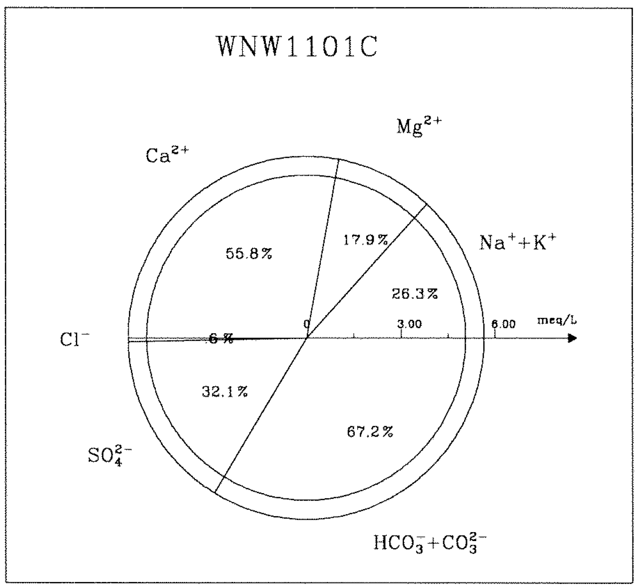
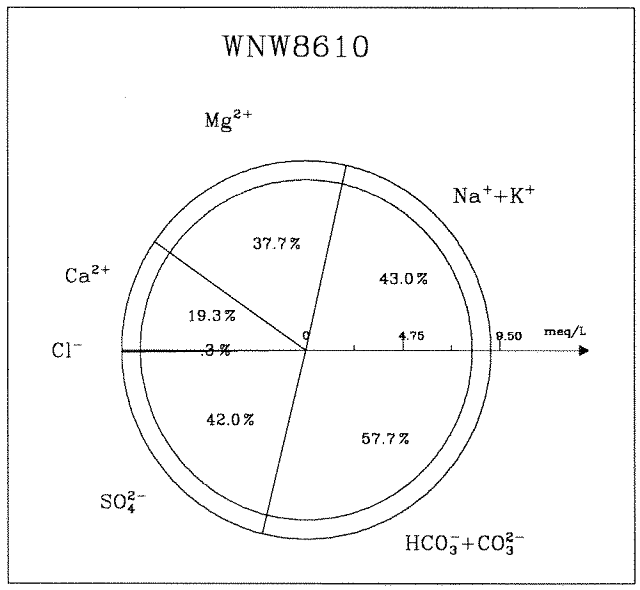


***Figure E - 4** (concluded)*
1992 Groundwater Quality Plots for the Lacustrine Unit Wells









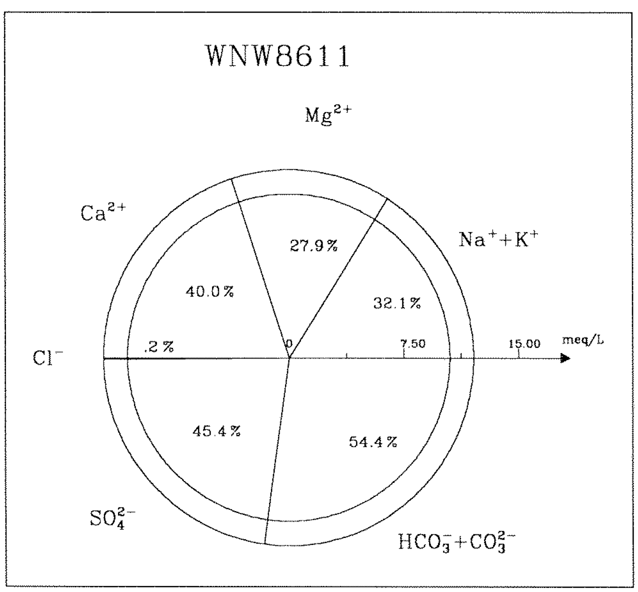


Figure E - 5

1992 Groundwater Quality Plots for the Weathered Lavery Till Unit Wells

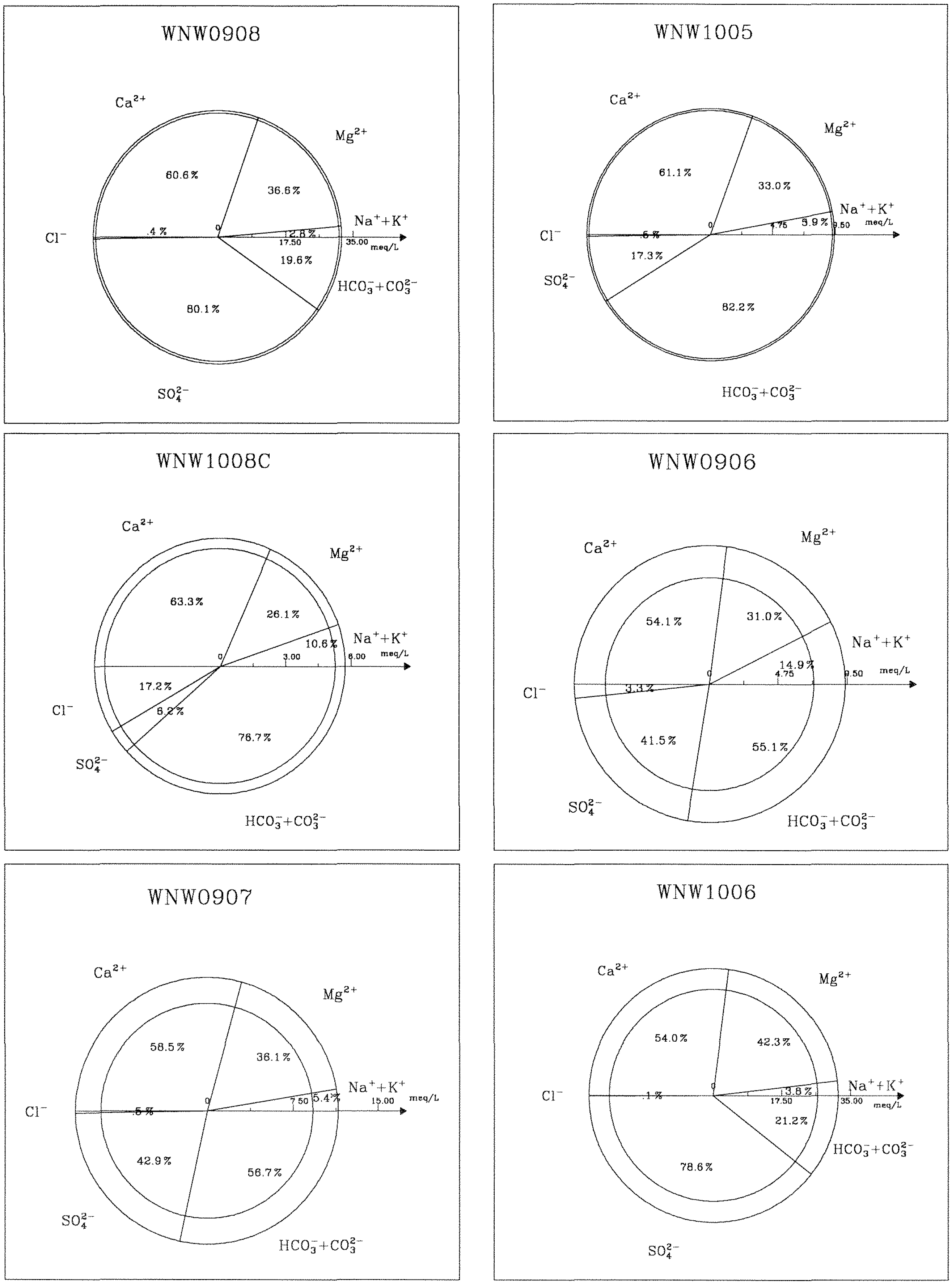


Figure E - 5 (continued)

1992 Groundwater Quality Plots for the Weathered Lavery Till Unit Wells

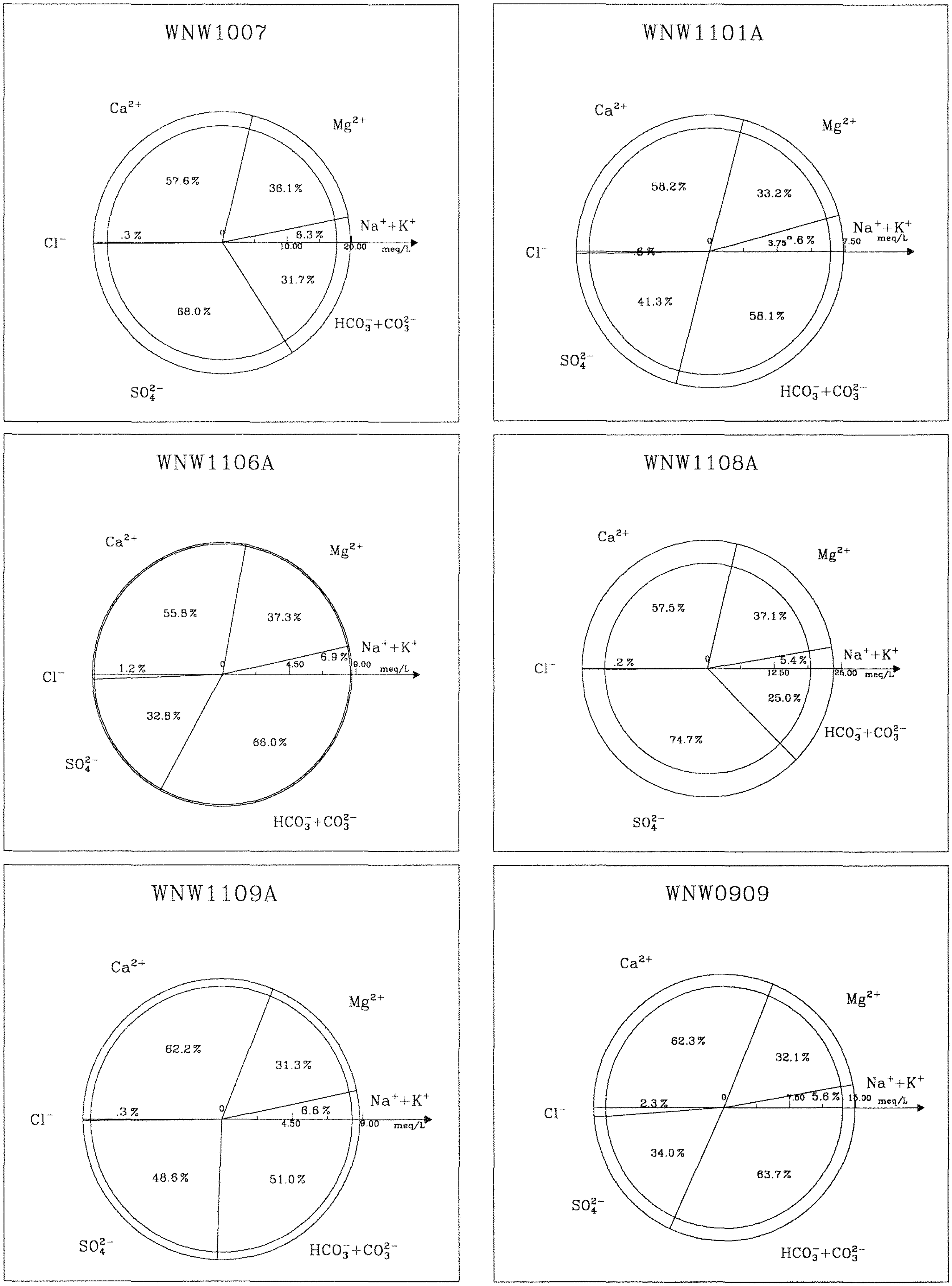
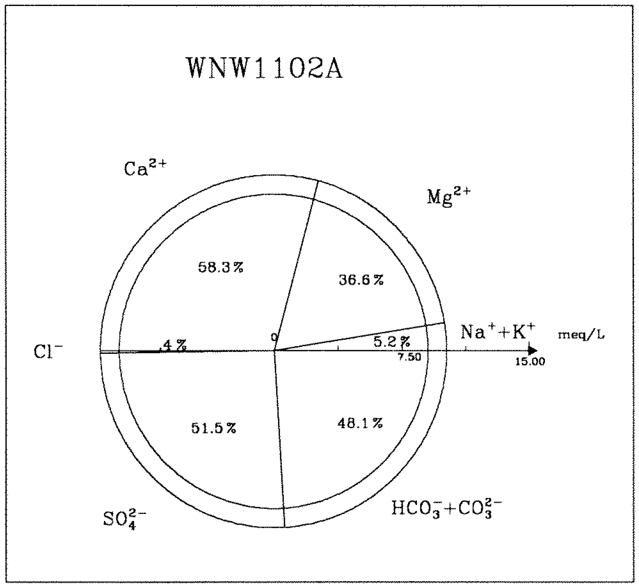
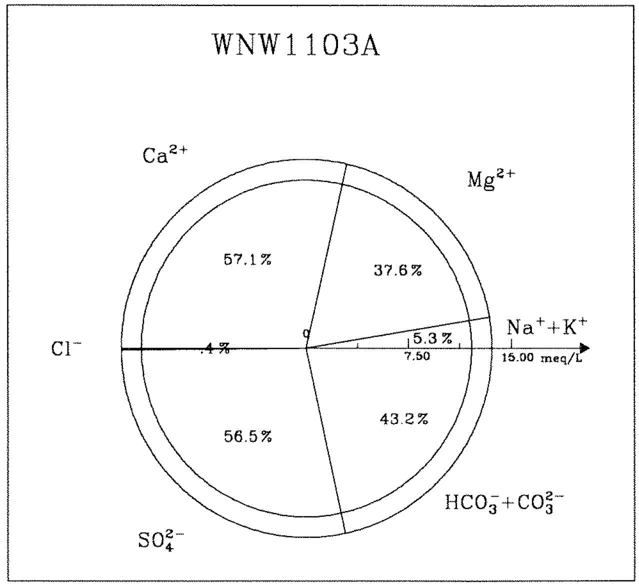
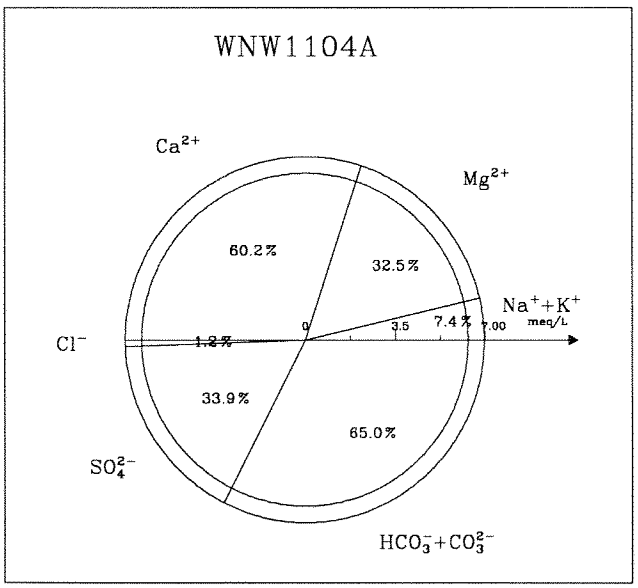


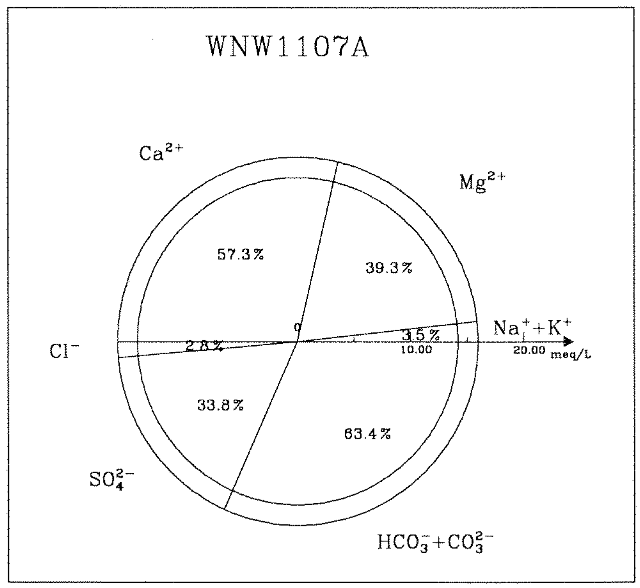
Figure E - 5 (concluded)

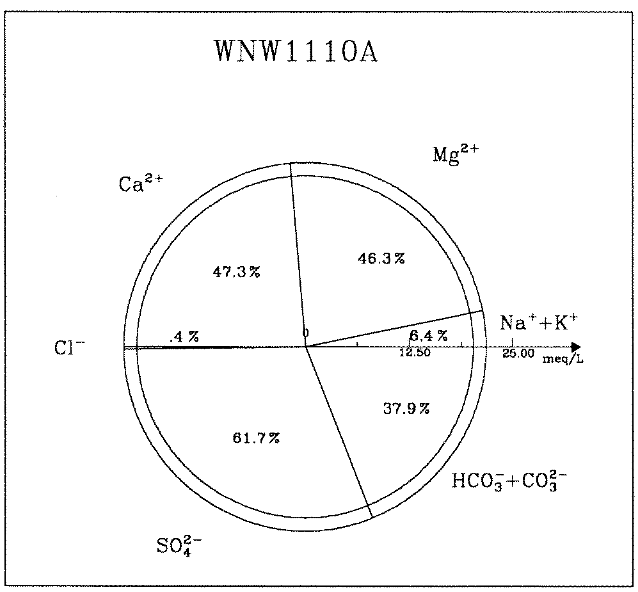
1992 Groundwater Quality Plots for the Weathered Lavery Till Unit Wells











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Glossary

ALLUVIUM. Sedimentary material deposited by flowing water such as a river.

ALLUVIAL FAN. A cone-shaped deposit of alluvium made by a stream where it runs out onto a level plain.

AQUIFER. A water-bearing unit of permeable rock or soil that will yield water in usable quantities to wells. *Confined aquifers* are bounded above and below by less permeable layers. Groundwater in a confined aquifer is 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 in an unconfined aquifer at the top of the aquifer is equal to that of the atmosphere.

BACKGROUND RADIATION. Includes both natural and manmade radiation such as cosmic radiation and radiation from naturally radioactive elements and from commercial sources and medical procedures.

BECQUEREL (Bq). A unit of radioactivity equal to one nuclear transformation per second.

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. Greater concentration limits are set for the same isotopes in Class C waste, which also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

CLASS "GA" GROUNDWATERS. Class GA waters are fresh groundwaters that can be used as a source of potable water supply. The New York Code of Rules and Regulations, Title 6, Part 703.5, "Water quality standards for taste-, color-, and odor-producing toxic and other deleterious substances" specifies the standards for specific substances or groups of substances in Table 1 of subdivision (f).

CONFIDENCE COEFFICIENT OR FACTOR. The chance or probability, usually expressed as a percentage, that a confidence interval includes some defined parameter of a population. The confidence coefficients usually associated with confidence intervals are 90%, 95%, and 99%.

COSMIC RADIATION. High-energy subatomic particles from outer space that bombard the earth's atmosphere. Cosmic radiation is part of natural background radiation.

COUNTING ERROR. The variability caused by the inherent random nature of radioactive disintegration and the detection process.

CURIE (Ci). A unit of radioactivity equal to 37 billion (3.7×10^{10}) nuclear transformations per second.

DETECTION LEVEL. The minimum concentration of a substance that can be measured with a 99% confidence that the analytical concentration is greater than zero.

DERIVED CONCENTRATION GUIDE (DCG). Concentrations of radionuclides in air and water by which a person continuously exposed and inhaling 8,400 cubic meters of air or ingesting 730 liters of water per year would receive an annual effective dose equivalent of 100 mrem per year from either mode of exposure. The committed dose equivalent is included in the DCGs for radionuclides with long half-lives. (See *Appendix B*.)

Glossary

DISPERSION. The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through sediments.

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. (See GRADIENT.)

EFFECTIVE DOSE. See EFFECTIVE DOSE EQUIVALENT under RADIATION DOSE.

EFFLUENT. Flowing out or forth; an outflow of waste. In this report, effluent refers to the liquid or gaseous waste streams released into the environment from the facility.

EFFLUENT MONITORING. Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants.

ENVIRONMENTAL MONITORING. The collection and analysis of samples or the direct measurements 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 from DOE sites in order to determine compliance with applicable standards and permit requirements.

EXPOSURE. Subjecting a target (usually living tissue) to radiation.

FALLOUT. Radioactive materials mixed into the earth's atmosphere. Fallout constantly precipitates onto the earth.

GRADIENT. Change in value of one variable with respect to another variable, especially vertical or horizontal distance.

GRAY. A unit of absorbed dose.

GROUNDWATER. Subsurface water in the pore spaces of soil and geologic units.

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 thousands of years.

HIGH-LEVEL WASTE (HLW). The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation.

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.

ION. An atom or group of atoms with an electric charge.

Glossary

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 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.

KAME DELTA. A conical hill or short irregular ridge of gravel or sand deposited in contact with glacier ice.

LACUSTRINE SEDIMENTS. A sedimentary deposit consisting of material pertaining to, produced by, or formed in a lake or lakes.

LAND DISPOSAL RESTRICTIONS (LDR). Land disposal restrictions are regulations promulgated by the U.S. EPA 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.

LEACHED HULLS. Stainless steel cladding that remains after acid dissolution of spent fuel.

LOW-LEVEL WASTE. Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or uranium mill tailings. (See CLASS A,B, and C LOW-LEVEL WASTE.)

MAXIMALLY EXPOSED INDIVIDUAL. A hypothetical person who remains in an uncontrolled area who would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

MEAN. The average value of a series of measurements.

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 500 millirems per year according to DOE standards. This limit does not include radiation received for medical treatment or the 100 to 360 mrem that people receive annually from background radiation.

MINIMUM DETECTABLE CONCENTRATION. The smallest amount or concentration of a radioactive or nonradioactive element that can be reliably detected in a sample.

MIXED WASTE. A waste that is both radioactive and hazardous. Also referred to as RADIOACTIVE MIXED WASTE (RMW).

OUTFALL. The end of a drain or pipe that carries wastewater or other effluents into a ditch, pond, or river.

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.

Glossary

PROGLACIAL LAKE. A lake occupying a basin in front of a glacier; generally in direct contact with the ice.

QUALITY FACTOR. 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).

RAD. Radiation absorbed dose. One hundred ergs of energy absorbed per gram.

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 can be stopped by a sheet of paper or 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 stopped.

INTERNAL RADIATION. Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or manmade 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.
>
> **DOSE EQUIVALENT (DE).** Also known simply as "dose." A measure of external radiation, dose is the product of the absorbed dose, the quality factor, and any other modifying factors. Dose equivalent is used to compare the biological effects of different kinds of radiation on a common scale. The unit of dose equivalent is the rem or sievert.
>
> **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.
>
> **EFFECTIVE DOSE EQUIVALENT (EDE).** An expression of the health risk of doses of radiation to an individual. Since some organs are more sensitive than others, each organ is given a weighting factor. This tissue-specific weighting factor is multiplied by the organ dose for each organ and the numbers are added together to obtain the effective dose equivalent. The effective dose equivalent includes the COMMITTED EFFECTIVE DOSE EQUIVALENT (from internal deposition of radionuclides) and the dose equivalent (from penetrating radiation from external sources). Units of measurement are rems or sieverts.

Glossary

COLLECTIVE EFFECTIVE DOSE EQUIVALENT. The sum of the effective dose equivalents for the individuals comprising a defined population. Units of measurement are person-rems or person-sieverts. The per capita effective dose equivalent is obtained by dividing the collective dose equivalent by the population. Units of measurement are rems or sieverts.

COMMITTED DOSE EQUIVALENT. A measure of internal radiation. The predicted total dose equivalent to a tissue or organ over a fifty-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 rems or sieverts.

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 rems or sieverts.

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.

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 several hundred known nuclides, both manmade and naturally occurring.

REM. An acronym for Roentgen Equivalent Man. A unit of radiation exposure that indicates the potential effect of radiation on human cells.

SIEVERT. A unit of dose equivalent from the International System of Units. Equal to one joule per kilogram.

SPENT FUEL. Nuclear fuel that has been exposed in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

STANDARD DEVIATION. An indication of the dispersion of a set of results around their average.

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.

UPGRADIENT. Referring to the flow of water or air, it is analogous to upstream. A point that is "before" an area of study that is used as a baseline for comparison with downstream data. See GRADIENT and DOWNGRADIENT.

WATERSHED. The area contained within a drainage divide above a specified point on a stream.

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.

Acronyms

AEA. Atomic Energy Act

ANOVA. Analysis of Variance

BEIR. Committee on Biological Effects of Ionizing Radiation

BOD. Biochemical Oxygen Demand

CAA. Clean Air Act

CDDL. Construction and Demolition Debris Landfill

CEDE. Committed Effective Dose Equivalent

CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act

CSRF. Contact Size-Reduction Facility

CSS. Cement Solidification System

CWA. Clean Water Act

CX. Categorical Exclusion

DCG. Derived Concentration Guide

DE. Dose Equivalent

DOE. (U.S.) Department of Energy

DOE-HQ. Department of Energy, Headquarters Office

DOE-ID. Department of Energy, Idaho Field Office

EA. Environmental Assessment

EDE. Effective Dose Equivalent

EE. Environmental Evaluation

EID. Environmental Information Document

EIS. Environmental Impact Statement

ELAP. Environmental Laboratory Accreditation Program

EML. Environmental Measurements Laboratory

Acronyms

EMSL. Environmental Monitoring Systems Laboratory (Las Vegas)

EPA. (U.S.) Environmental Protection Agency

EPCRA. Emergency Preparedness and Community Right-to-Know Act

FFC Act. Federal Facility Compliance Act

FONSI. Finding of No Significant Impact

FSFCA. Federal and State Facility Compliance Agreement

FY. Fiscal Year

GC/MS. Gas Chromatograph/Mass Spectrometer

HLW. High-Level (Radioactive) Waste

HPIC. High-Pressure Ion Chamber

ICRP. International Commission on Radiological Protection

INEL. Idaho National Engineering Laboratory

IRTS. Integrated Radwaste Treatment System

LDR. Land Disposal Restriction

LIMS. Laboratory Information Management System

LLD. Lower Limit of Detection

LLW. Low-Level (Radioactive) Waste

LLWTF. Low-Level Liquid Waste Treatment Facility

LPS. Liquid Pretreatment System

LWTS. Liquid Waste Treatment System

MDC. Minimum Detectable Concentration

MDL. Method Detection Limit

NCRP. National Council on Radiation Protection and Measurements

NDA. Nuclear Regulatory Commission-Licensed Disposal Area

Acronyms

NEPA. National Environmental Policy Act

NESHAPs. National Emission Standards for Hazardous Air Pollutants

NFS. Nuclear Fuel Services, Inc.

NIST. National Institute of Standards and Technology

NOI. Notice of Intent

NPDES. National Pollutant Discharge Elimination System

NRC. Nuclear Regulatory Commission

NYCRR. New York Code of Rules and Regulations

NYSDEC. New York State Department of Environmental Conservation

NYSDOH. New York State Department of Health

NYSERDA. New York State Energy Research and Development Authority

NYSGS. New York State Geological Survey

OSHA. Occupational Safety and Health Act

OSR. Operational Safety Requirement

PCB. Polychlorinated Biphenyl

PQL. Practical Quantitation Limit

QA. Quality Assurance

QC. Quality Control

RCRA. Resource Conservation and Recovery Act

RESL. Radiological and Environmental Science Laboratory

RFI. RCRA Facility Investigation

RMW. Radioactive Mixed Waste

RTS. Radwaste Treatment System

SAIC. Science Applications International Corporation

Acronyms

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

SI. International System of Units

SPDES. State Pollutant Discharge Elimination System

STS. Supernatant Treatment System

SWMU. Solid Waste Management Unit

SSWMU. Super Solid Waste Management Unit

TI. Teledyne Isotopes

TIMS. Thermal Ionization Mass Spectrometry

TLD. Thermoluminescent Dosimetry

TOC. Total Organic Carbon

TOX. Total Organic Halogens

TPQ. Threshold Planning Quantity

TSCA. Toxic Substances and Control Act

USGS. U.S. Geological Survey

VOC. Volatile Organic Compound

WNYNSC. Western New York Nuclear Service Center

WVDP. West Valley Demonstration Project

WVNS. West Valley Nuclear Services Company, Inc.

WVPO. West Valley (DOE) Project Office

Units of Measure

Radioactivity

Symbol	*Name*
Ci	curie
mCi	millicurie (1E-03 Ci)
µCi	microcurie (1E-06 Ci)
nCi	nanocurie (1E-09 Ci)
pCi	picocurie (1E-12 Ci)
fCi	femtocurie (1E-15 Ci)
aCi	attocurie (1E-18 Ci)
Bq	becquerel (27 pCi)

Dose

Symbol	*Name*
Sv	sievert (100 rems)
Gy	gray (100 rads)

Length

Symbol	*Name*
m	meter
km	kilometer (1E+03 m)
cm	centimeter (1E-02 m)
mm	millimeter (1E-03 m)
µm	micrometer (1E-06 m)

Mass

Symbol	*Name*
g	gram
kg	kilogram (1E+03 g)
mg	milligram (1E-03 g)
µg	microgram (1E-06 g)
ng	nanogram (1E-09 g)
t	metric ton (1E+06 g)

Volume

Symbol	*Name*
cm^3	cubic centimeter
L	liter
mL	milliliter
m^3	cubic meter
gal	gallons
ft^3	cubic feet
ppm	parts per million
ppb	parts per billion

Time

Symbol	*Name*
y	year
d	day
h	hour
m	minute
s	second

Area

Symbol	*Name*
ha	hectare (10,000 m^2)

Concentration

Symbol	*Name*
µCi/mL	microcuries per milliliter
mL/L	milliliter per liter
µCi/g	microcuries per gram

Flow Rate

Symbol	*Name*
MGD	million gallons per day
CFM	cubic feet per minute
LPM	liters per minute

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