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 West Valley Demonstration Project (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 from 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 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 Western New York Nuclear Service Center (WNYNSC) 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*. For example, a sample location code such as AFGRVAL indicates an air sample (A), off-site (F), at the Great Valley (GRVAL) sampling station.

These codes are used throughout this report for ease of reference and to be consistent with the data reported in the appendices.

Air Sampler Location and Operation

Air samplers are located at points remote from the WVDP site, at the perimeter of the site, and on the site itself. Figure 2-1 shows the locations of the on-site air effluent monitors and 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, Great Valley, and New York State-licensed disposal area (SDA) locations samples are also collected for iodine-129 and tritium analyses. (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. (Grab samples are collected at several other surface water locations both on- and off-site.) Figure 2-3 shows the location of the on-site surface water monitoring points. (In the past, on-site automatic samplers have operated at locations WNSP006, WNNDADR, and WNSW74A. In 1994, a fourth automated sampler was added at location WNSWAMP.) 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 the U.S. Environmental Protection Agency (EPA) allow air to be released from plant ventilation stacks during normal operations. The air released must meet 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. When comparing concentrations with dose limits for screening purposes, gross alpha and beta radioactivities are assumed to come from americium-241 and strontium-90, respectively, because the derived concentration guides (DCGs) for these isotopes are the most stringent. (U.S. Department of En-

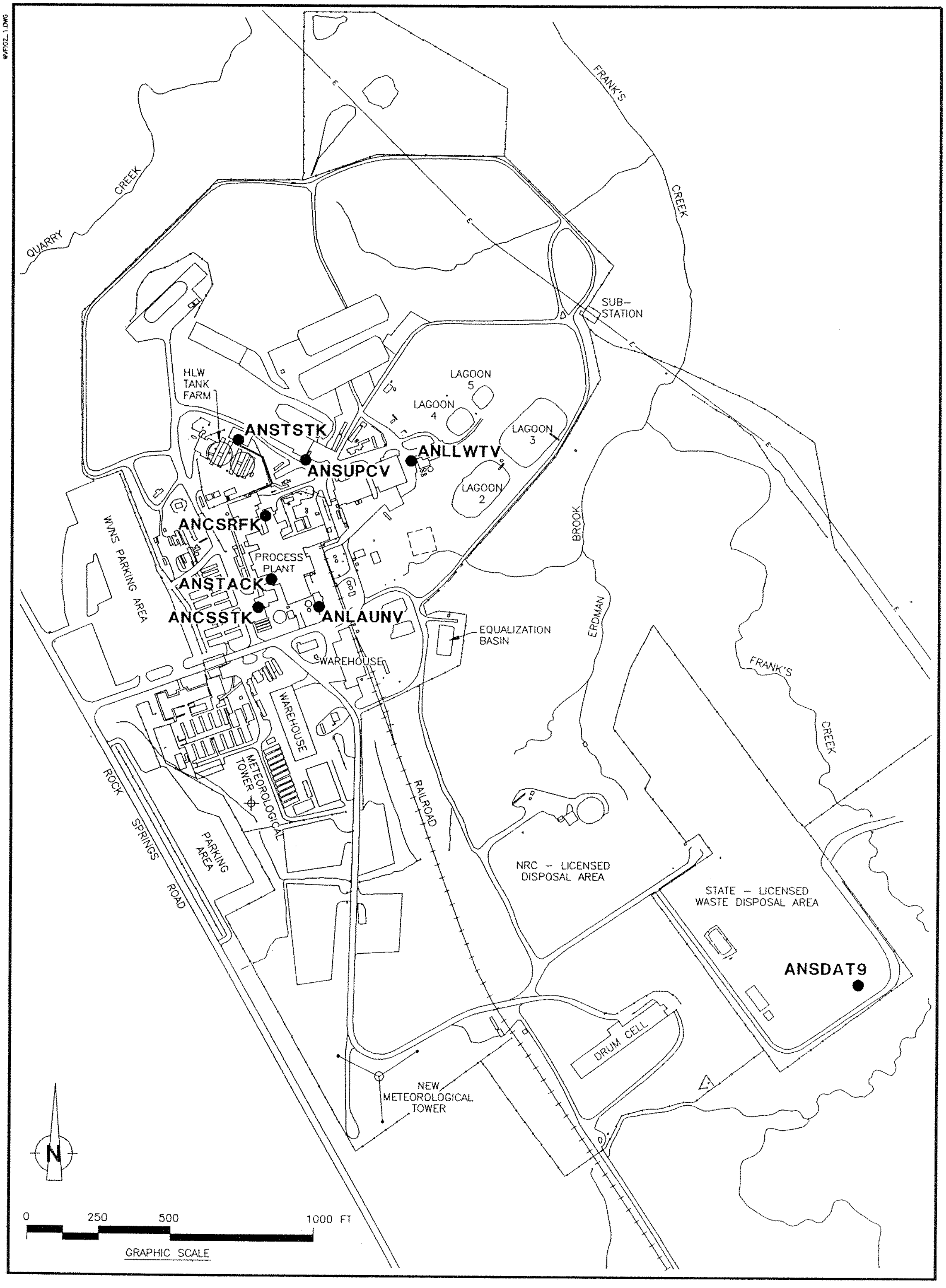


Figure 2-1. Location of On-site Air Monitoring Points.

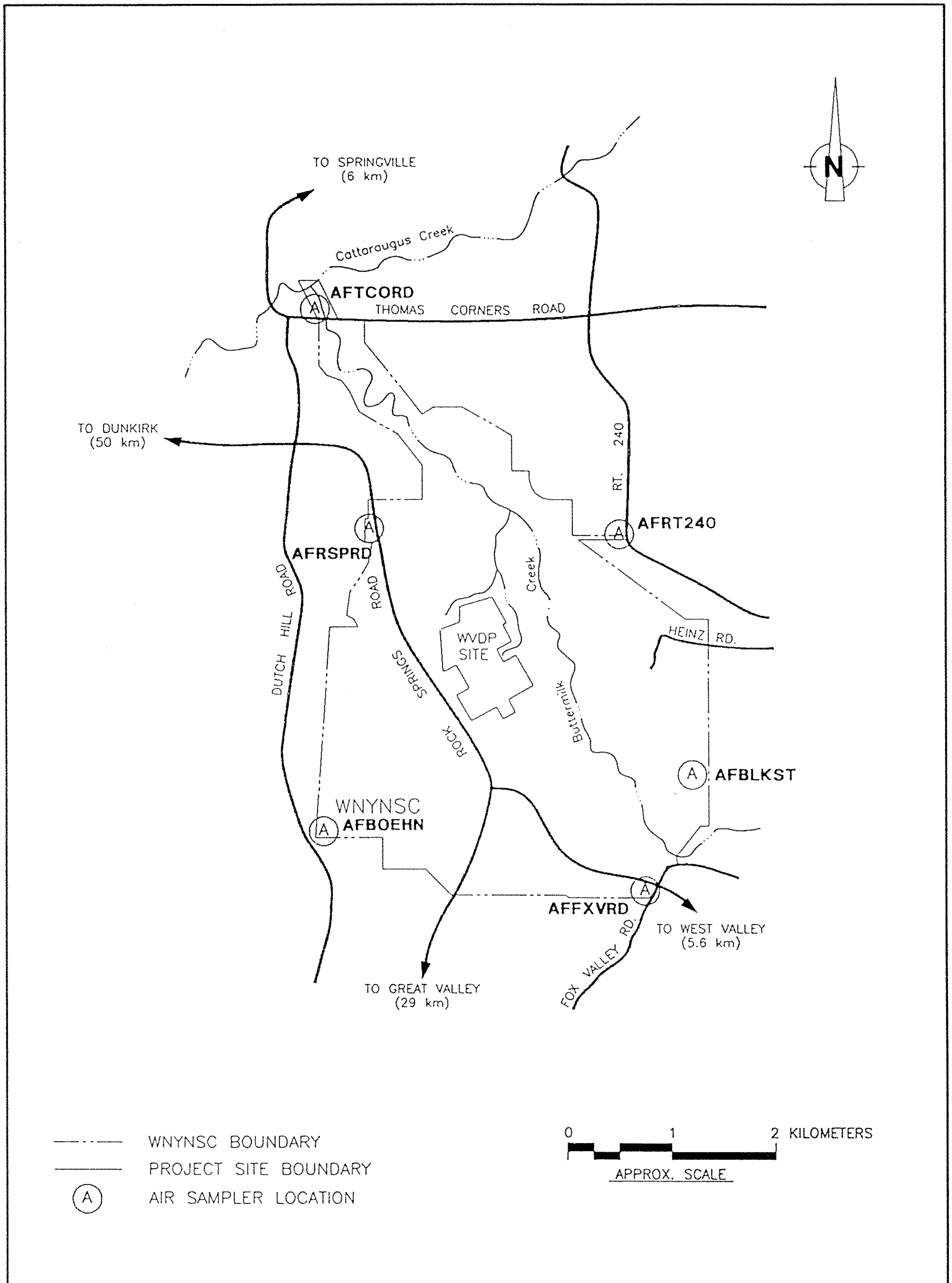


Figure 2-2. Location of Perimeter Air Samplers.

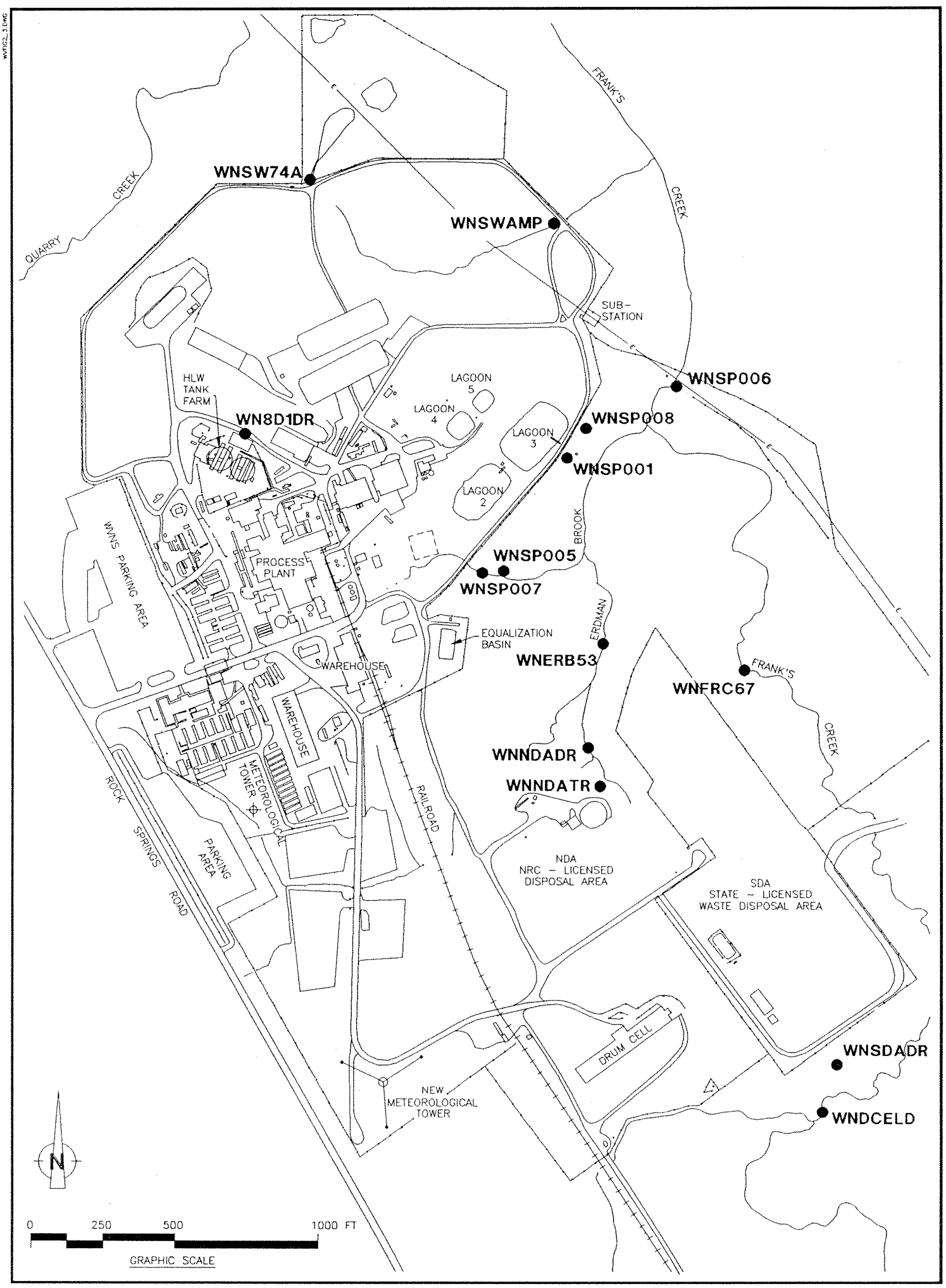


Figure 2-3. Sampling Locations for On-site Surface Water.

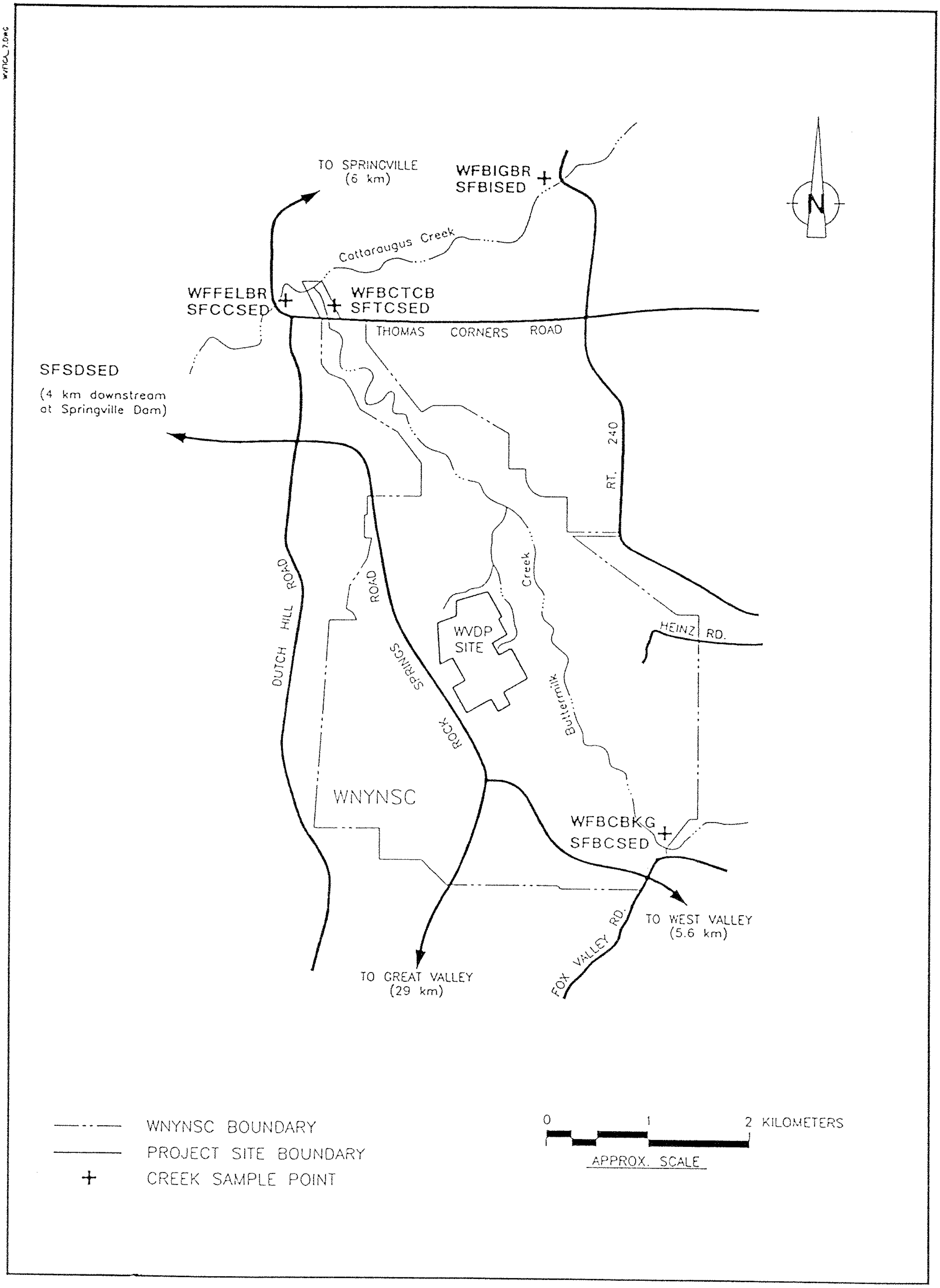


Figure 2-4. Location of Off-site Surface Water Samplers and Sediment Collection.

ergy [DOE] standards and DCGs for radionuclides of interest at the WVDP are found in *Appendix B*.)

The exhaust from each permitted fixed ventilation system on-site 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 continuously monitor the radioactivity on these filters and provide readouts of alpha and beta radioactivity levels.

A separate sampling unit on the ventilation stack of continuously operated systems 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 in 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. In addition to scheduled sampling and analysis of ANSTACK filters for those parameters defined in *Appendix A* of this report, filters are routinely analyzed for strontium-89 and cesium-137 as part of operational monitoring.

Permitted portable outdoor ventilation enclosures (OVEs) are used occasionally to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities. Air samples from OVEs are collected continuously while those emission points are discharging and data from these units are included in annual airborne emission evaluations.

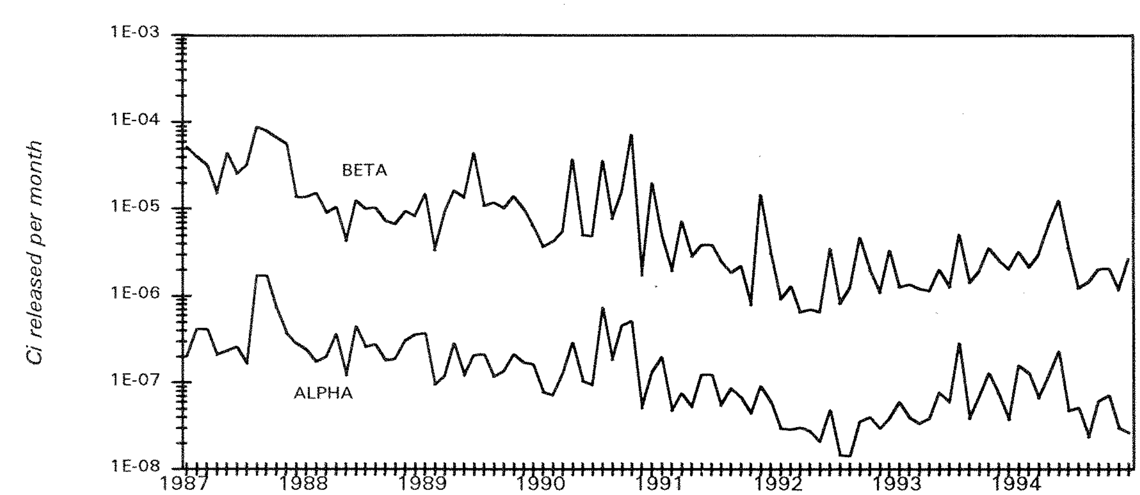


Figure 2-5. Eight-Year Trends of Gross Alpha and Gross Beta Concentrations at the Main Stack Sampling Location (ANSTACK)

- The Main Plant Ventilation Stack

The main ventilation stack 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 (H-3) 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 eight-year trends for the main stack samples analyzed for gross alpha and gross beta activity. The figure indicates a steady five-year downward trend in activity observed for both gross alpha and gross beta from 1987 to mid-1992. Since then and throughout 1994 both gross alpha and beta activities appear to have risen slightly then leveled off.

Silica Gel Columns from the Main Ventilation Stack Sampler

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 DCGs in Table C-2.3 shows that at the point of stack discharge, average radioactivity levels were already below concentration guidelines for airborne radioactivity in an unrestricted environment. Additionally, 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 1994 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 quarterly total radioactivity released for specific radionuclides for each of these sampling locations.

Three other operations are routinely monitored for airborne radioactive releases: the supercompactor volume-reduction ventilation system (ANSUPCV), the low-level waste treatment facility ventilation system (ANLLWTF), and the contaminated clothing laundry ventilation system (ANLAUNV). Results for samples collected in 1994 from the supercompactor ventilation (ANSUPCV) are presented in

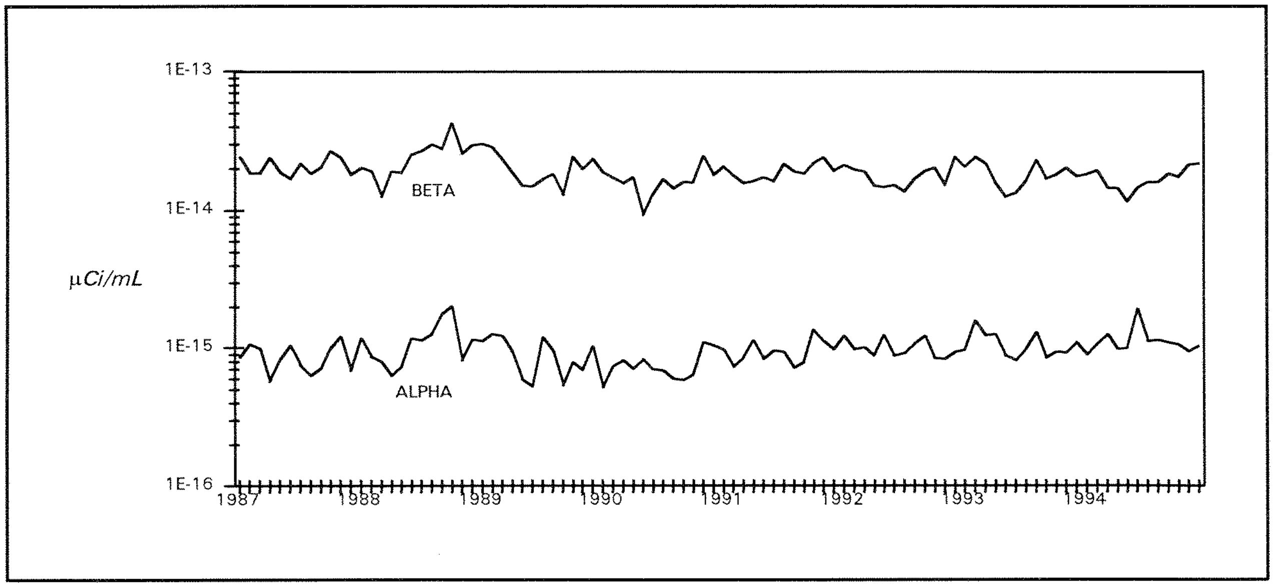


Figure 2-6. Eight-Year Trends of Gross Alpha and Gross Beta Concentrations at the Rock Springs Road Sampling Location (AFRSPRD)

Tables C-2.10 and C-2.11 in *Appendix C-2*. The supercompactor system was shut down in April 1994 due to reduced operational needs. Since then, it has operated only for short periods of one day to one week. While in operation the supercompactor stack is monitored continuously. ANLLWTF and ANLAUNV sampling points are sampled for gross alpha and gross beta radioactivity. In October 1994, new sampling equipment was brought on-line to upgrade the existing equipment to current new-equipment standards. This will also augment the site's ability to periodically confirm the low level of releases from these facilities. Data for these two facilities are presented in Tables C-2.25 through C-2.27 in *Appendix C-2.*

In 1994 average discharges at the point of release from portable outdoor ventilation units were well below DOE guidelines for alpha and beta radioactivity in an unrestricted environment. Dilution from the point of release to the site boundary would further reduce these concentrations.

Perimeter and Remote Air Sampling

As in previous years, airborne particulate samples for radiological analysis were collected continuously at six 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*.)

Perimeter locations — on Fox Valley Road, Rock Springs Road, Route 240, Thomas Corners Road, Dutch Hill Road, and at the site's bulk storage warehouse — were chosen to provide historical continuity or because the location would probably represent the highest potential airborne concentration of radioactivity. The eight-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, 50 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-millimeter glass

Global Fallout Sampling

Global fallout is sampled at four of the perimeter air sampler locations and at the base of the original 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 1994 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. Long-term deposition is measured by surface soil samples collected annually near each air sampling station. Soil sample data are found in Table C-1.10 of Appendix C-1.

The measured concentrations are typical of normal background in the region, with one exception. Soil from the Rock Springs Road air sampler has consistently shown a higher-than-background cesium-137 concentration. This sampler is known to be within an extended area of elevated cesium activity that was identified by a 1979 survey, well before the Project was initiated.

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. The concentration ranges observed are similar to those seen in 1993. Near-site sample concentrations are indistinguishable from background and they all reflect normal seasonal variations.

In addition, quarterly composites, each 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 and C-2.23. Although tritium (as hydrogen-tritium oxide [HTO]) was positively detected at the Rock Springs Road location near the site, its concentration was identical to concentrations observed at the Great Valley background location. A positive strontium-90 value at location AFSPRVL in the first quarter of 1994 may be an anomaly (an unexplained isolated value that does not fit the expected pattern). Similar concentrations have not been observed at any other sample location closer to the site.

The 1994 data for the three samplers that have been in operation since 1982 — Fox Valley, Thomas Corners, and Route 240 — averaged about 1.56E-14 µCi/mL (5.77E-04 Bq/m^3) of gross beta activity in air. This average is comparable to 1993 data. The average gross beta concentration at the Great Valley background station was 1.82E-14 µCi/mL (6.73E-04 Bq/m^3) in 1993, and in 1994 averaged 4.02E-14 µCi/mL (1.49E-03 Bq/m^3).

During the first ten months of 1994, four ambient air samplers at locations AFBOEHN, AFDNKRK, AFGRVAL, and AFWEVAL were operated in parallel with identical samplers located within one mile of their original positions in order to study the effects of relocating these sampling points to more open areas, where trees and other obstructions would not interfere with sample collection. The results of this study indicate that there is no appreciable difference in the data obtained from the analysis of the air filters collected from the original and the new samplers.

Table 2-1

1994 Gross Alpha Activity at Off-site and Perimeter Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/m^3	μCi/mL	Bq/m^3
AFFXVRD	52	<7.22E-16 — 3.26E-15	<2.67E-05 — 1.21E-04	1.15±1.15E-15	4.24±4.25E-05
AFRSPRD	52	<5.00E-16 — 4.06E-15	<1.85E-05 — 1.50E-04	0.82±1.13E-15	3.03±4.17E-05
AFRT240	52	<7.67E-16 — 2.26E-15	<2.84E-05 — 8.36E-05	0.94±1.08E-15	3.48±4.01E-05
AFSPRVL	52	<6.55E-16 — 2.96E-15	<2.42E-05 — 1.10E-04	0.86±1.08E-15	3.17±3.98E-05
AFTCORD	52	<7.17E-16 — <2.48E-12	<2.65E-05 — <9.18E-02	-0.51±3.44E-13	-0.19±1.27E-02
AFWEVAL	52	<7.50E-16 — 2.30E-15	<2.78E-05 — 8.51E-05	1.09±1.10E-15	4.02±4.07E-05
AFGRVAL	52	<6.74E-16 — <1.50E-13	<2.49E-05 — <5.55E-03	0.30±2.14E-14	1.09±7.91E-04
AFBOEHN	52	<6.83E-16 — <5.93E-15	<2.53E-05 — <2.19E-04	0.91±1.55E-15	3.37±5.74E-05
AFDNKRK	52	<7.00E-16 — 2.36E-15	<2.59E-05 — 8.73E-05	1.05±1.11E-15	3.89±4.09E-05
AFBLKST	52	<7.33E-16 — <1.94E-15	<2.71E-05 — <7.18E-05	0.79±1.09E-15	2.93±4.02E-05

Table 2-2

1994 Gross Beta Activity at Off-site and Perimeter Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/m^3	μCi/mL	Bq/m^3
AFFXVRD	52	1.03E-14 — 3.32E-14	3.81E-04 — 1.23E-03	1.89±0.34E-14	7.01±1.26E-04
AFRSPRD	52	7.19E-15 — 2.90E-14	2.66E-04 — 1.07E-03	1.68±0.34E-14	6.22±1.24E-04
AFRT240	52	7.05E-15 — 3.52E-14	2.61E-04 — 1.30E-03	1.70±0.33E-14	6.29±1.20E-04
AFSPRVL	52	5.77E-15 — 2.68E-14	2.13E-04 — 9.92E-04	1.45±0.31E-14	5.38±1.16E-04
AFTCORD	52	5.88E-15 — <5.42E-12	2.18E-04 — <2.01E-01	0.11±7.52E-13	0.04±2.78E-02
AFWEVAL	52	1.01E-14 — 3.93E-14	3.74E-04 — 1.45E-03	2.06±0.34E-14	7.61±1.26E-04
AFGRVAL	52	9.82E-15 — 8.26E-13	3.63E-04 — 3.06E-02	4.02±6.10E-14	1.49±2.26E-03
AFBOEHN	52	7.37E-15 — 2.97E-14	2.73E-04 — 1.10E-03	1.78±0.41E-14	6.59±1.50E-04
AFDNKRK	52	6.07E-15 — 3.71E-14	2.25E-04 — 1.37E-03	1.70±0.32E-14	6.27±1.20E-04
AFBLKST	52	8.87E-15 — 2.88E-14	3.28E-04 — 1.07E-03	1.76±0.34E-14	6.50±1.26E-04

In October 1994, the original samplers at AFBOEHN, AFGRVAL, and AFWEVAL were removed from service. The original AFDNKRK air sampler remains in service. The new AFDNKRK sampler was removed because of difficulties in maintaining a lease agreement for the property on which it was placed. Another suitable siting location is being considered. A new sampler (ANSDAT9) that monitors diffuse releases of radioactivity associated with the New York State Energy and Research Development Authority's (NYSERDA's) SDA was put in place in late 1993. Results of this monitoring are presented in *Appendix C-2*, Table C-2.24.

Off-site Surface Soil Sampling

Soil from the upper two inches of the ground near the perimeter air samplers is collected annually to measure the radioactivity deposited by worldwide fallout. Samples were collected in 1994 from ten locations: six points on the perimeter of the retained premises (WNYNSC), two in nearby communities, and two in locations 30 to 50 kilometers distant from the Project. Analyses for cesium-137, strontium-90, plutonium-239, and americium-241 at all ten locations and analyses for uranium isotopes at three points were compared among the sample locations and with results from the four previous years.

Springville Dam on Cattaraugus Creek

The 1994 results (Table C -1.10) show that with the exception of two cesium-137 results from the southeast and northwest perimeter sampler locations, detectable concentrations of potassium-40 (a naturally occurring radionuclide), strontium-90 and cesium-137 (both present in worldwide fallout), and natural uranium isotopes were within the same range of uncertainty as background samples. All values remain within the range observed at background locations during the past five years.

Surface Water and Sediment Monitoring

On-site Surface Water Sampling

The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 weir (WNSP001, Fig. 2-3) into Erdman Brook, a tributary of Frank's Creek. There were eight batch releases totaling about 44.7 million liters (11.8 million gal) in 1994. In addition to composite samples collected near the beginning and end of each discharge, forty-three daily effluent grab samples were collected and analyzed.

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

The north and northeast swamp drainages on the site's north plateau are two major channels for surface water and emergent groundwater to collect. Samples from the north swamp drainage are collected by an automated sampler at location WNSW74A every week. (See Fig. 2-3.) Grab samples were collected weekly from the northeast swamp drainage at sampling point WNSWAMP until March 1994, when an automatic sampler was installed at this location. (See Fig. 2-3.) Samples from both locations are analyzed weekly for gross alpha, gross beta, tritium, pH, and conductivity. Composites of weekly samples are also analyzed for a full range of specific isotopes. Semiannual grab samples from these locations are analyzed for important chemical parameters.

Sampling point WNSP005, which monitors drainage from behind and to the east of the main plant, and WNFRC67, which monitors surface waters draining from the east side of the SDA, are both grab-sampled on a monthly basis. Samples are analyzed for pH, gross alpha, gross beta, and tritium.

Another sampling point, WN8D1DR, is used to monitor surface and groundwater flow from the high-level waste tank farm area. The sample is collected from a storm sewer manhole access and is analyzed weekly for gross alpha and beta, tritium, and pH. A monthly composite is analyzed for gamma isotopes and strontium-90. (See **Special Monitoring**.)

The surface water drainage path downstream of the Nuclear Regulatory Commission-licensed disposal area (NDA) is monitored at location WNNDADR using an automated sampler. Weekly samples are composited and analyzed on a monthly basis for gross alpha, gross beta, tritium, and gamma-emitting isotopes. Quarterly composites analyzed for strontium-90 and iodine-129 and semiannual grab samples analyzed for chemical parameters provide data useful for confirming the effectiveness of NDA remediation efforts.

Downstream of WNNDADR, on Erdman Brook and to the west of the SDA, is sampling point WNERB53. Weekly samples collected from this point are analyzed for pH, gross alpha, gross beta, and tritium. In addition to samples collected by the WVDP, independent samples are collected and analyzed by the New York State Department of Health (NYSDOH) at this location and at WNFRC67, which monitors waters draining from the east side of the SDA.

Near-site Standing Water

In addition to sampling water from flowing streams, water from ponds and lakes within the retained premises also is sampled. Tests for gross alpha and beta radioactivity, tritium, pH, and various other water quality parameters are performed annually to verify that no major changes are occurring in standing water within the Project facility environs.

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 WNYNSC. (See Fig. 2-4.) The sampler collects a 50-mL aliquot every half-hour 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. The weekly samples are analyzed for gross alpha, gross beta, tritium, and pH each week, and the sample 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. (See Fig. 2-4.) 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).

These 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. Quarterly composite samples from WFBCBKG also are analyzed for carbon-14, iodine-129, alpha isotopes, and total uranium. (Table C-1.3 shows monthly and quarterly radioactivity concentrations upstream of the site at Fox Valley; Table C-1.4 shows monthly and quarterly radioactivity concentrations downstream of the site at Thomas Corners.)

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 observed annual average concentration of each radionuclide released is divided by its corresponding Department of Energy DCG in order to determine what percentage of the DCG was released. As a DOE policy, the sum of the percentages calculated for all radionuclides released must not exceed 100%. In 1994 the annual average isotopic concentrations from the lagoon 3 effluent discharge weir combined to be less than 44% of the DCGs, down from about 47% in 1993. (See Table C-1.2.)

In the course of preparing existing facility spaces to support vitrification, cleanup water from these spaces was processed in the low-level waste treatment facility (LLWTF). Waste stream transients (variations in waste stream constituents) noted within the last calendar year could have contributed to a shift in final liquid effluent isotopic ratios. Possibly related to these waste stream transients, higher concentrations of strontium-90 and uranium-232 have been observed in the lagoon 3 effluent during 1993 and 1994. Improved LLWTF operation has reduced cesium-137 concentrations in the final effluent since 1992.

Radioactivity Concentrations On-site: Surface Water Sampling Locations

North Swamp Sampling Location

Results for samples collected at location WNSW74A, which monitors drainage from the northern end of the site to Quarry Creek, are summarized in *Appendix C-1*, Tables C-1.14 and C-1.15. Gross beta concentrations at this location are three to four times higher than the average value observed at background location WFBCBKG but still are sixty times lower than the DCG for strontium-90. Tritium at this location is below the detection limit. The highest quarterly strontium-90 result at WNSW74A was less than 1.2% of its DCG.

Northeast Swamp Sampling Location

Sampling point WNSWAMP also monitors surface water drainage from the site's north plateau. (See Tables 2-3 and 2-4 and *Appendix C-1*, Tables C-1.12 and C-1.13.) Waters from this drainage run into Frank's Creek downstream of location WNSP006. Together with location WNDMPNE, results from this location also indicate the quality of emergent groundwaters in the area. An upward trend in gross beta concentration during 1993 and 1994 at location WNSWAMP is discussed in *Chapter 3, Groundwater Monitoring,* **Long-term Trends of Gross Beta and Tritium at Selected Groundwater Monitoring Locations** and **Subsurface Investigation of Gross Beta on the North Plateau**. The average tritium concentration at this location in 1994 was 4.04E-07 µCi/mL, which is above that observed at the background location WFBCBKG but well below the DCG for tritium of 2E-03 µCi/mL.

NDA Sampling Locations

Gross beta concentrations at location WNNDADR averaged 2.42E-07 µCi/mL in 1994. (See Table 2-4 and Table C-1.22 in *Appendix C-1*.) Concentrations at this location were above the average seen at background location WFBCBKG but are all well below the DCG for strontium-90 (1E-06 µCi/mL). In fact, the highest quarterly composite isotopic strontium-90 result was only 14% of its DCG. The overall trend for gross beta concentrations at this location has remained relatively

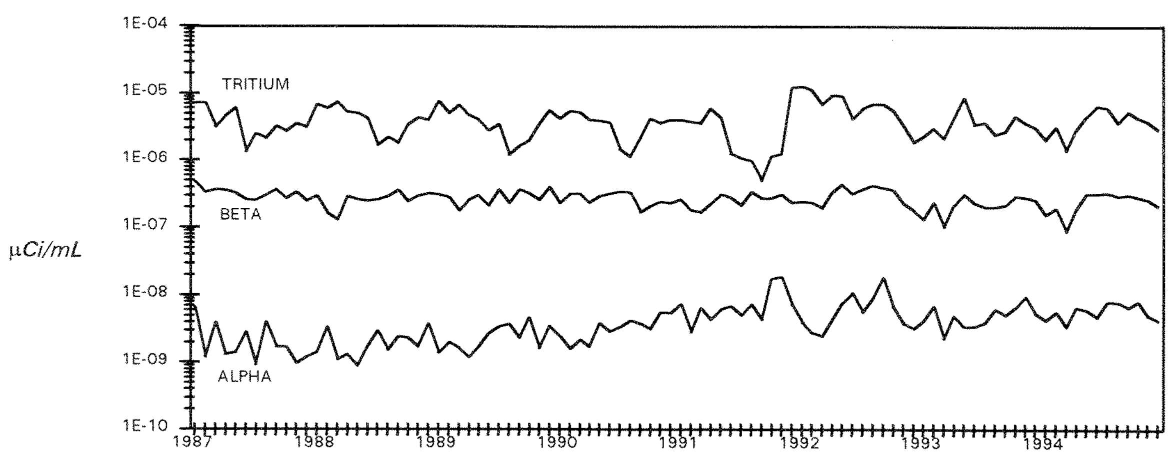


Figure 2-7. Eight-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNNDADR

Table 2-3

1994 Gross Alpha Activity at Surface Water Sampling Locations

Location	Number of Samples Analyzed	Range		Annual Average	
		µCi/mL	Bq/L	µCi/mL	Bq/L
OFF-SITE					
WFBIGBR	12	<1.63E-09 — <3.92E-09	<6.02E-02 — <1.45E-01	-0.16±2.91E-09	-0.06±1.08E-01
WFBCBKG	12	<1.23E-09 — 5.79E-09	<4.55E-02 — 2.02E-01	0.61±2.48E-09	2.27±9.21E-02
WFBCTCB	12	<1.40E-09 — <3.76E-09	<5.18E-02 — <1.39E-01	0.13±2.48E-09	0.47±9.18E-02
WFFELBR	52	<1.36E-09 — <5.67E-09	<4.85E-02 — <2.10E-01	0.57±2.95E-09	0.21±1.09E-01
ON-SITE					
WNNDADR	12	<2.43E-09 — <7.90E-09	<9.00E-02 — <2.92E-01	-0.70±5.41E-09	-0.26±2.00E-01
WNSWAMP	52	<2.21E-09 — 1.76E-08	<8.18E-02 — 6.51E-01	3.04±6.87E-09	1.12±2.54E-01
WNSW74A	52	<1.13E-09 — <8.64E-09	<4.18E-02 — <3.20E-01	-0.21±5.28E-09	-0.08±1.94E-01
WNSP006	52	<1.44E-09 — <1.44E-08	<5.73E-02 — <5.33E-01	1.65±5.98E-09	0.61±2.21E-01

Table 2-4

1994 Gross Beta Activity at Surface Water Sampling Locations

Location	Number of Samples Analyzed	Range		Annual Average	
		µCi/mL	Bq/L	µCi/mL	Bq/L
OFF-SITE					
WFBIGBR	12	<2.02E-09 — 5.44E-09	<7.47E-02 — 2.01E-01	2.75±2.07E-09	1.02±0.77E-01
WFBCBKG	12	<1.88E-09 — 1.41E-08	<6.96E-02 — 5.22E-01	3.62±1.88E-09	1.34±0.68E-01
WFBCTCB	12	5.81E-09 — 1.45E-08	2.15E-01 — 5.37E-01	9.20±2.35E-09	3.40±0.87E-01
WFFELBR	52	<1.57E-09 — 1.08E-08	<5.81E-02 — 4.00E-01	3.70±2.18E-09	1.37±0.81E-01
ON-SITE					
WNNDADR	12	8.81E-08 — 3.22E-07	3.26E+00 — 1.19E+01	2.42±0.13E-07	8.97±0.48E+00
WNSWAMP	52	7.46E-07 — 3.58E-06	2.76E+01 — 1.32E+02	1.59±0.04E-06	5.89±0.14E+01
WNSW74A	52	<4.96E-09 — 1.92E-08	<1.84E-01 — 7.10E-01	1.30±0.54E-08	4.82±2.00E-01
WNSP006	52	1.70E-08 — 6.52E-07	6.29E-01 — 2.41E+01	9.75±0.96E-08	3.61±0.36E+00

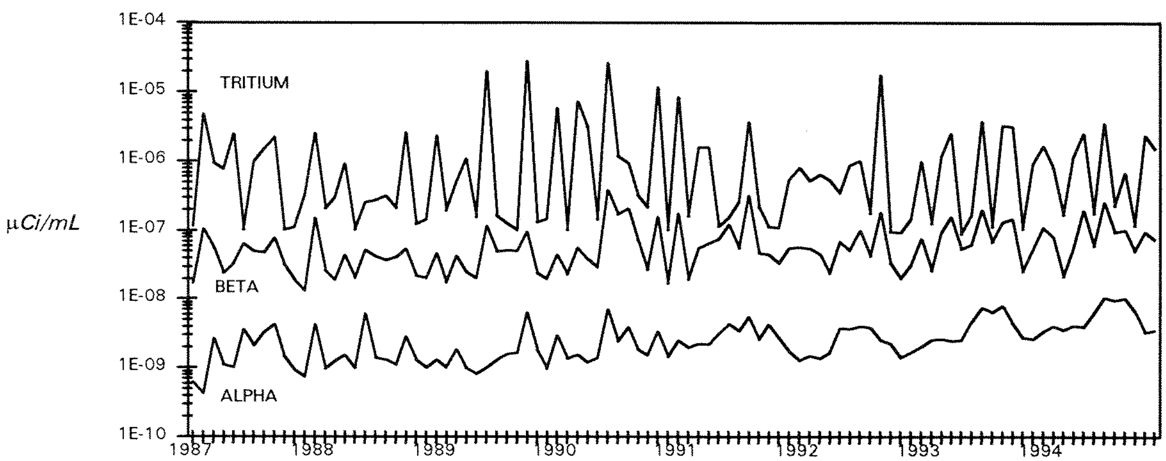


Figure 2-8. Eight-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNSP006

constant over time (Fig. 2-7). Except for seasonal variation, the same is true of tritium.

A key indicator of any possible migration of solvent from the NDA would be the presence of significant iodine-129 in samples from WNNDADR. (See **Special Monitoring** below.) The second, third, and fourth quarter 1994 iodine-129 values at WNNDADR were marginally positive, yet they were not significantly higher than the analytical detection limit. Iodine-129 values obtained from waters collected from the NDA interceptor trench, closer to the NDA, were all below the analytical detection limit.(See *Appendix C-1*, Table C-1.22.) It should be noted that while tritium activity in trench waters is higher than that seen at WNNDADR farther downstream, gross beta activity is actually higher downstream at WNNDADR than in waters from the interceptor trench. One possible explanation for this is that while the source of elevated tritium in the drainage may be the NDA, the major source of elevated gross beta activity may be contaminated soils outside and around the NDA.

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 2.36E-08 µCi/mL (0.87 Bq/L) for cesium-137 and 5.30E-08 µCi/mL (1.96 Bq/L) for strontium-90 during the month of highest concentration. This corresponds to 0.8% of the DCG for cesium-137 and 5.3% of the DCG for strontium-90. The annual average concentration of cesium at WNSP006 was less than 0.5% of the DCG and the strontium concentration was 3.2% of the strontium DCG. Tritium, at an annual average of 1.22E-06 µCi/mL (4.51E+01 Bq/L), was 0.06% of the DCG value. Of the fifty-two samples collected and analyzed for gross alpha during 1994, five were above the detection limit. The annual average was less than 6.27E-09 µCi/mL (2.32E-01 Bq/L) gross alpha or less than 20.9% of the DCG for americium-241. The eight-year trends of gross alpha, gross beta, and tritium concentrations at location WNSP006 are shown in Figure 2-8. The trend of baseline gross beta activity seems to be increasing slightly over time and possibly is related to either increases in direct

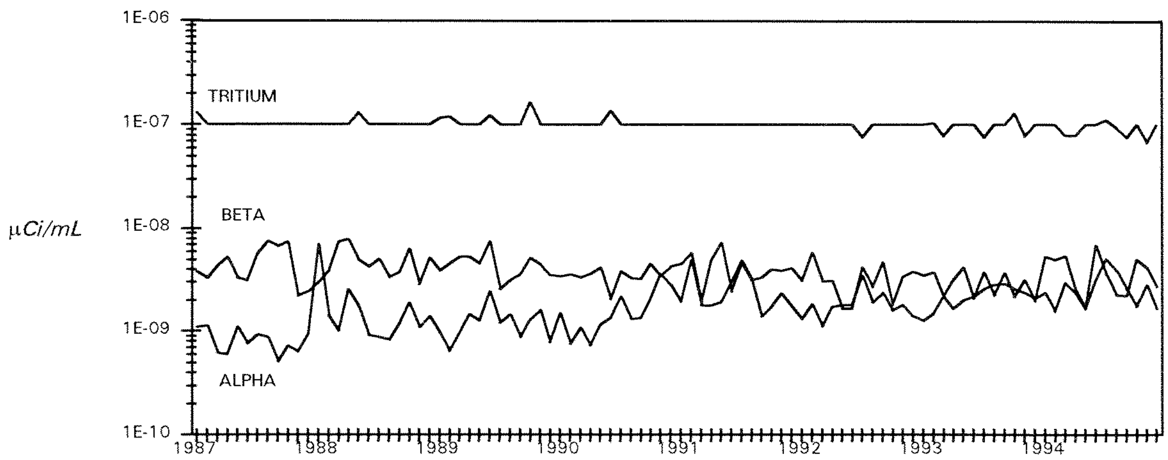


Figure 2-9. Eight-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WFFELBR

effluent discharged or to the migration of historical site contamination. This trend is reflected in radiological measurements of stream flow during periods when lagoon 3 is not discharged and there is less surface runoff. This trend is not observed farther downstream at the Felton Bridge sampling location, the first point of public access.

Standing Pond Water

Four ponds within the retained premises (WNYNSC) were tested in 1994 and found to be within the historical range observed at these locations for gross alpha, gross beta, and tritium. These results were also compared to a background sample from a pond 14 kilometers (8.7 mi) north of the Project and were found to be statistically the same. (See Table C - 1.28.)

Radioactivity Concentrations Off-site: Surface Water Sampling Locations

Radiological concentration data from off-site sample points show that average gross beta 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. This is particularly observable during periods of lagoon 3 discharge. Tables 2-3 and 2-4 list the ranges and annual averages for gross alpha and gross beta activity at surface water locations. Additional information is available in *Appendix C* tables for all off-site surface monitoring locations.

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. Because dairy cattle have access to waters at the Thomas Corners Bridge sampling point, this sample point represents a direct pathway to humans. In actuality, gross beta includes other isotopes from naturally occurring sources as well as man-made sources. If the maximum beta concentration in Buttermilk Creek downstream of the Project at Thomas Corners Bridge were attributable entirely to strontium-90, then the radioactivity would represent only 1.5% of the DCG.

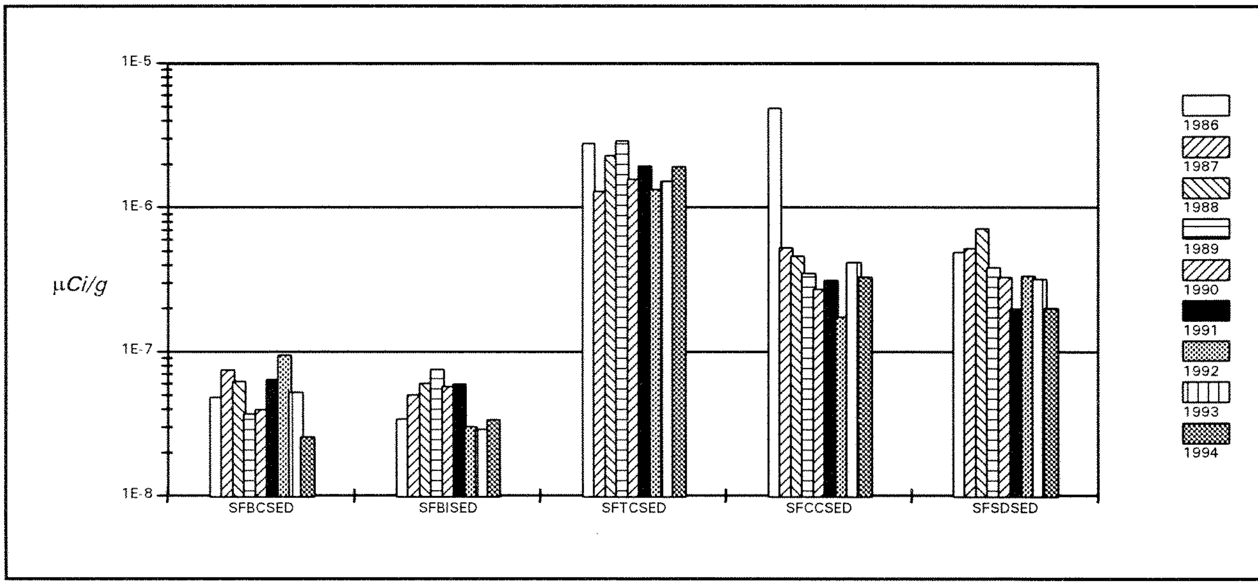


Figure 2-10. Nine-Year Trend of Cesium-137 (µCi/g dry) in Stream Sediment for Two Locations Upstream and Three Locations Downstream of the WVDP

Cattaraugus Creek at Felton Bridge Sampling Location

The highest concentrations in monthly composite water samples from Cattaraugus Creek during 1994 show strontium-90 to be only 0.7% of the DCG for water. There were no positive detections of cesium-137 in Cattaraugus Creek during 1994. (See Table C-1.7.) Yearly averages for Cattaraugus Creek gross beta activity at Felton Bridge are not significantly higher than background levels. Figure 2-9 shows the eight-year trends for Cattaraugus Creek samples analyzed for gross alpha, gross beta, and tritium. Note that for the most part, tritium concentrations represent method detection limits and not actually detected radioactivity. Gross beta activity appears to have declined at this location since 1987.

Sediment Sampling

Sediments are grab-sampled semiannually at or near three of the automatic water sampling locations and at two additional points. (See Fig. 2-4.) 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 (SFBCSED) and Cattaraugus Creek at Bigelow Bridge (SFBISED).

A comparison of annual averaged 1986 to 1994 cesium-137 concentrations for these five sampling locations is illustrated in Figure 2-10. As reported in previous years, cesium-137 concentrations in sediments collected downstream of the WVDP are higher than those observed in samples collected from background locations (SFBCSED or SFBISED). As the figure indicates, although the measured cesium-137 concentrations for 1994 generally were higher than previous years' values in a number of cases, overall the concentrations appear to be decreasing or staying constant with time at the downstream locations. While the cesium-137 activity in downstream Cattaraugus Creek sediments (at locations SFCCSED and SFSDSED) is elevated relative to upstream values, it is comparable to or less than normal background concentrations (as measured at SFGRVAL and SFDNKRK) in surface soil in Western New York. Use of these sediments in place of normal soil for farming or residential applications would result in a lower radiation

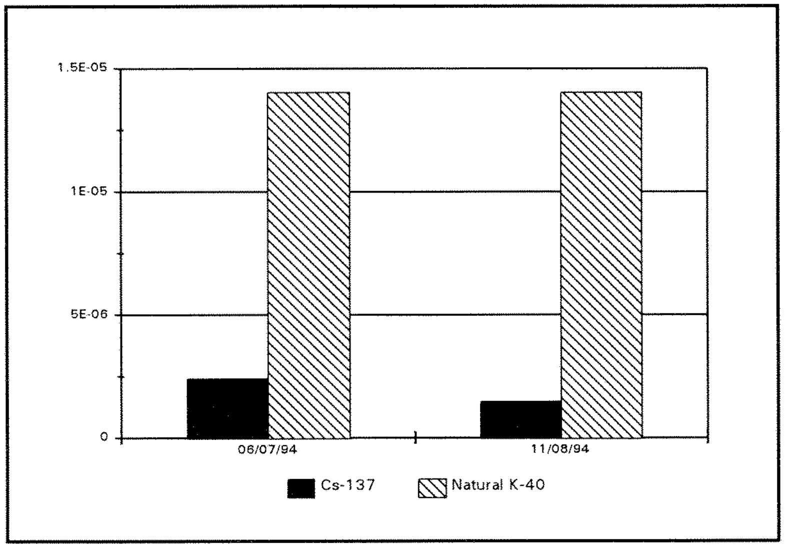


Figure 2-11. Comparison of Cesium-137 with Naturally Occurring Potassium-40 Concentrations in 1994 at Downstream Sampling Location SFTCSED

dose or a dose as small as that from the background cesium deposited by worldwide fallout. Although the concentration in Buttermilk Creek (at SFTCSED) below the Nuclear Fuel Services (NFS) plant site exceeds that of normal soil, these sediments would qualify for release for unrestricted use such as home building if typical regulatory criteria were applied.

A comparison of cesium-137 to the naturally occurring gamma-emitter potassium-40 (Fig. 2-11) 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. When alpha isotopic results for background location SFBCSED are compared to those for SFTCSED, downstream of the site, no significant differences are observed.

Radioactivity in the Food Chain

Each year food samples are collected from locations near the site and from remote locations (Fig. 2-12). 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.

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 no radioactivity from WVDP effluents, allow 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 obtained by electrofishing, a method that temporarily stuns the fish, allowing them to be netted for collection. This also allows a more varied selection as compared to sport fishing, with unwanted fish being 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

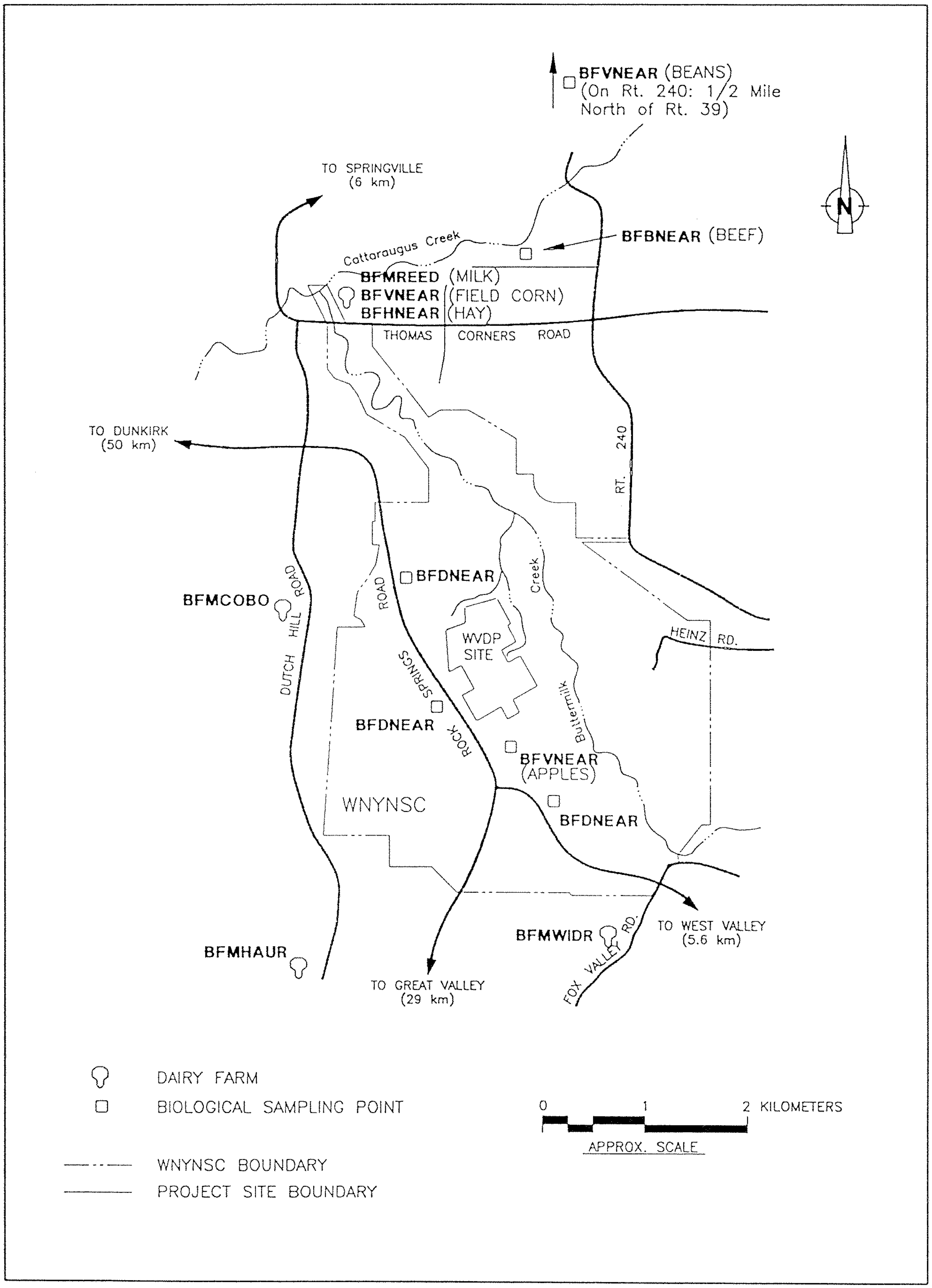


Figure 2-12. Near-site Biological Sampling Points.

the gamma-emitting isotopes cesium-134 and cesium-137. (See Table C-3.4 in *Appendix C-3* for a summary of the results.) Throughout the year concentrations of strontium-90 ranged from below the minimum detectable concentration (see *Glossary*) to a maximum of 3.40E-07 μCi/g at BFFCATC and from below the minimum detectable concentration to 1.10E-07 μCi/g at the control location (BFFCTRL). As discussed in *Chapter 4, Radiological Dose Assessment*, strontium-90 has been observed in marginally higher concentrations than background in the population of bottom-feeding fish downstream of the site but above the Springville dam. Despite this small difference, all downstream fish concentrations are still within the range of Project historical background values.

Although ten fish collected downstream of the site showed marginal positive detections for cesium-137, these cesium concentrations were all within the range of those seen at the background location. Two downstream fish samples had positive detections of cesium-134 but were not statistically different from concentrations in background fish.

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 Project activities have not been shown to affect the local herd.

Radioactivity Concentrations in Venison

Venison from three deer taken from the area around the WNYNSC were analyzed and the data compared with those from deer collected in the towns of Portville, Portland, and Salamanca, New York, far from the site. Low levels of radioactivity were detected for both near-site and control samples for cesium-137 and naturally occurring potassium-40. Results for these samples are shown in Table C-3.2 in *Appendix C-3*. Concentrations in near-site deer were at or below background levels for those radioisotopes in 1994. The range in concentrations observed was similar to previous years. Neither strontium-90 nor cesium-134 were detected in near-site or control deer during 1994. Tritium concentrations in near-site deer were lower or the same as those found in background deer.

During the 1994 large game hunting season, local hunters were allowed guided access to the easternmost side of the WVDP premises in a controlled hunting program established by NYSERDA. Five deer were collected during this pilot program.

Beef

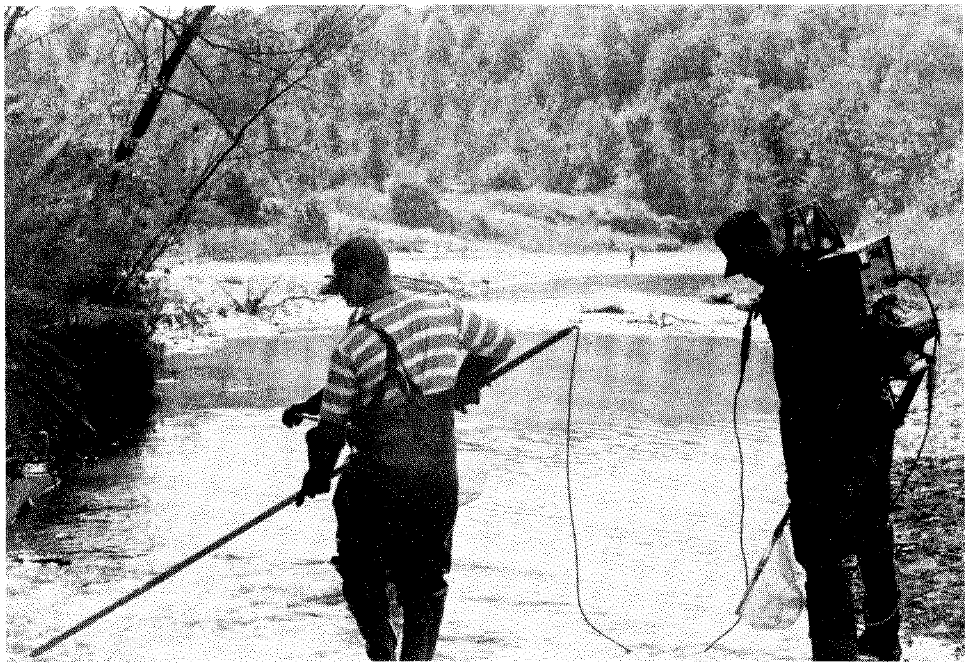
Again in 1994, as in previous years, very little difference in isotopic concentration has been observed between near-site and control herds. Beef samples taken semiannually from near-site and remote locations are analyzed for tritium, strontium-90, and gamma-emitting isotopes such as cesium-134 and cesium-137.

Radioactivity Concentrations in Beef Samples

In 1994 there was one marginally positive detection for both cesium-137 and strontium-90 in beef. In both cases these positive detections were in control samples. Results for all near-site and control samples were near or below the minimum detectable concentrations for tritium and cesium-134. These results are presented in Table C-3.2 in *Appendix C-3*.

Milk

Monthly milk samples were taken in 1994 from dairy farms near the site and from control farms at some distance from the site. (See Fig. 2-12.) Besides the quarterly composite of monthly samples from the maximally exposed herd to the north (BFMREED), a quarterly composite of milk from a nearby herd to the northwest (BFMCOBO) also was prepared. Single annual samples were taken from herds to the southeast (BFMWIDR) and the



Electrofishing in Cattaraugus Creek

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 strontium-90 results for near-site milk ranged from 1.3E-09 to 5.3E-09 μCi/mL (4.8E-02 to 2.0E-01 Bq/L), and the control milk samples ranged from 1.4E-09 to 3.10E-09 μCi/mL (5.2E-02 to 1.1E-01 Bq/L). Although the annual sample collected at near-site location BFMHAUR is higher than the highest control sample seen in 1994, it is statistically the same as the historical background values.

Three control samples and one near-site sample showed positive values for cesium-137. The positive detections were not statistically different. There were no positive detections of iodine-129 in any samples in 1994. Results for tritium analyses showed only one marginally positive result for near-site locations. The results of all of these analyses are shown in Table C-3.1 in *Appendix C-3*.

Fruit and Vegetables

Results from the analysis of beans, apples, sweet corn, and hay collected during 1994 are presented in Table C-3.3 in *Appendix C-3*. Tritium was detected in near-site corn, bean, and apple samples at levels that were not significantly higher than historical background samples.

Positive strontium-90 results were obtained in green bean and hay samples. Of these positive results, only the near-site bean sample indicated strontium at higher concentrations than its background in 1994. However, this value is statistically the same as historical background concentrations.

Cesium-137 was detected in near-site hay samples at concentrations statistically similar to background.

Cobalt-60 values were at or below minimum detectable concentrations in all samples collected. Overall results obtained for 1994 are comparable to previous years.

Direct Environmental Radiation Monitoring

The current monitoring year, 1994, was the eleventh full year in which direct penetrating radiation was monitored at the WVDP using TLD-700 lithium fluoride (LiF) thermoluminescent dosimeters (TLDs). The dosimeters are processed on-site and are used solely for environmental monitoring. The environmental TLD package consists of five TLD chips laminated on a 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.

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. 2-13 and 2-14 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, #19, #33, #42, and #43 (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). Locations #42 and #43 were added during the third calendar quarter of 1994.

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 uncertainties of individual results and averages of those results were acceptable, and measured exposure rates were comparable to those of 1993. There was no significant difference between the pooled quarterly average background TLDs (#17, #23, #37, and #41) and the pooled average for the WNYNSC perimeter locations for the 1994 reporting period.

Appendix C-4 provides a summary of the results by calendar quarter for each of the environmental monitoring locations 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 1993. The quarterly average of the seventeen WNYNSC perimeter TLDs was 19.2 milliroentgen (mR) per quarter (18.4 mrem/quarter) in 1994.

The perimeter TLD quarterly averages since 1987, expressed in microroentgen per hour (μR/hr), are shown in Figure 2-15.

On-site Radiation Monitoring

The dosimeter at location #19 near the SDA routinely shows radiation exposures slightly above those seen at WNYNSC perimeter locations. Locations #25, #29, and #30 on the public access road west of the facility and #26 at the east security fence also showed small elevations above background. Although above background, the readings are relatively stable from year to year. (See *Appendix C-4*, Table C-4.1.)

Location #24 on the north inner facility fence is a co-location site for one Nuclear Regulatory Commission (NRC) TLD. (See *Appendix D*,

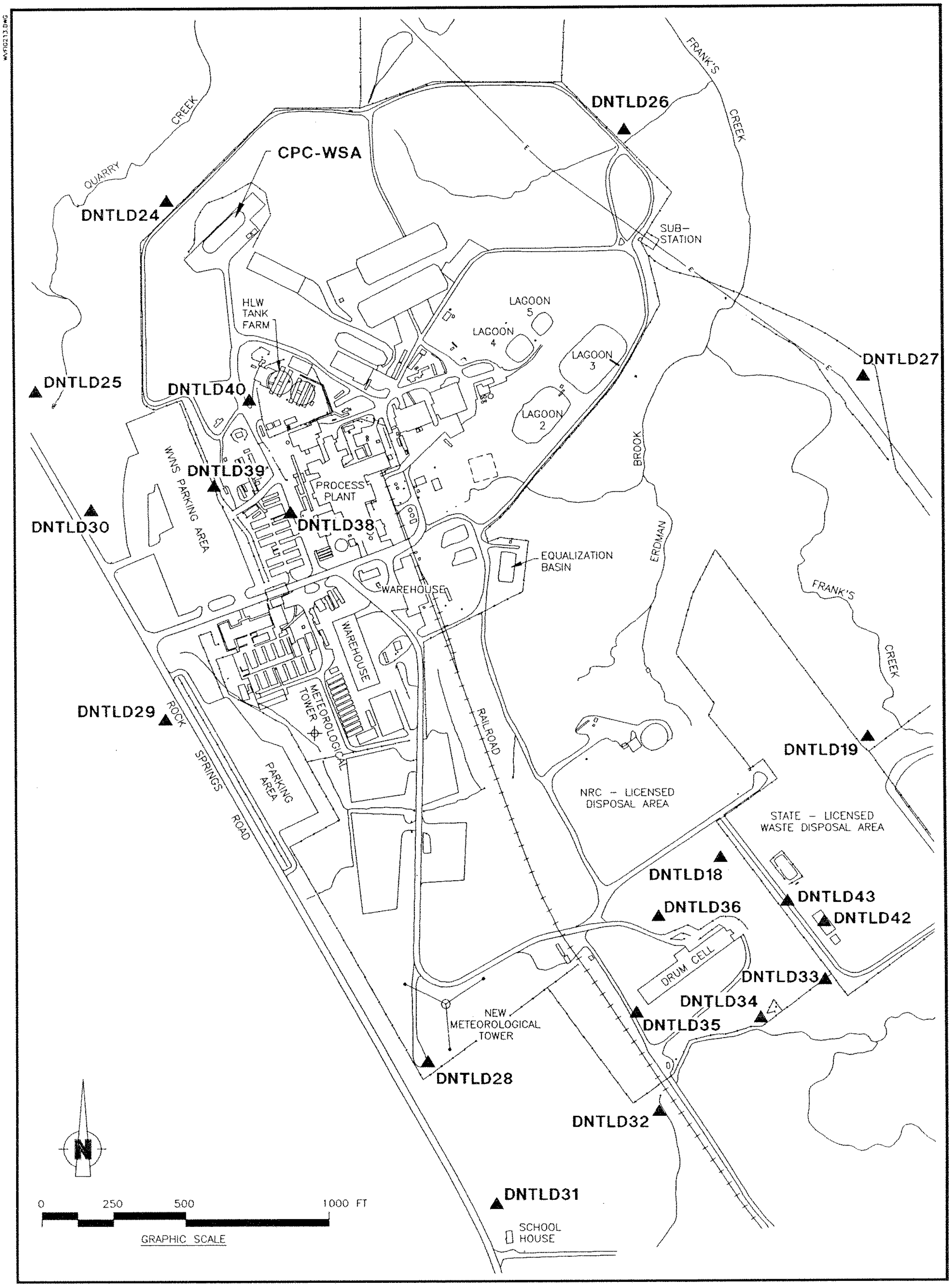


Figure 2-13. Location of On-site Thermoluminescent Dosimetry (TLD).

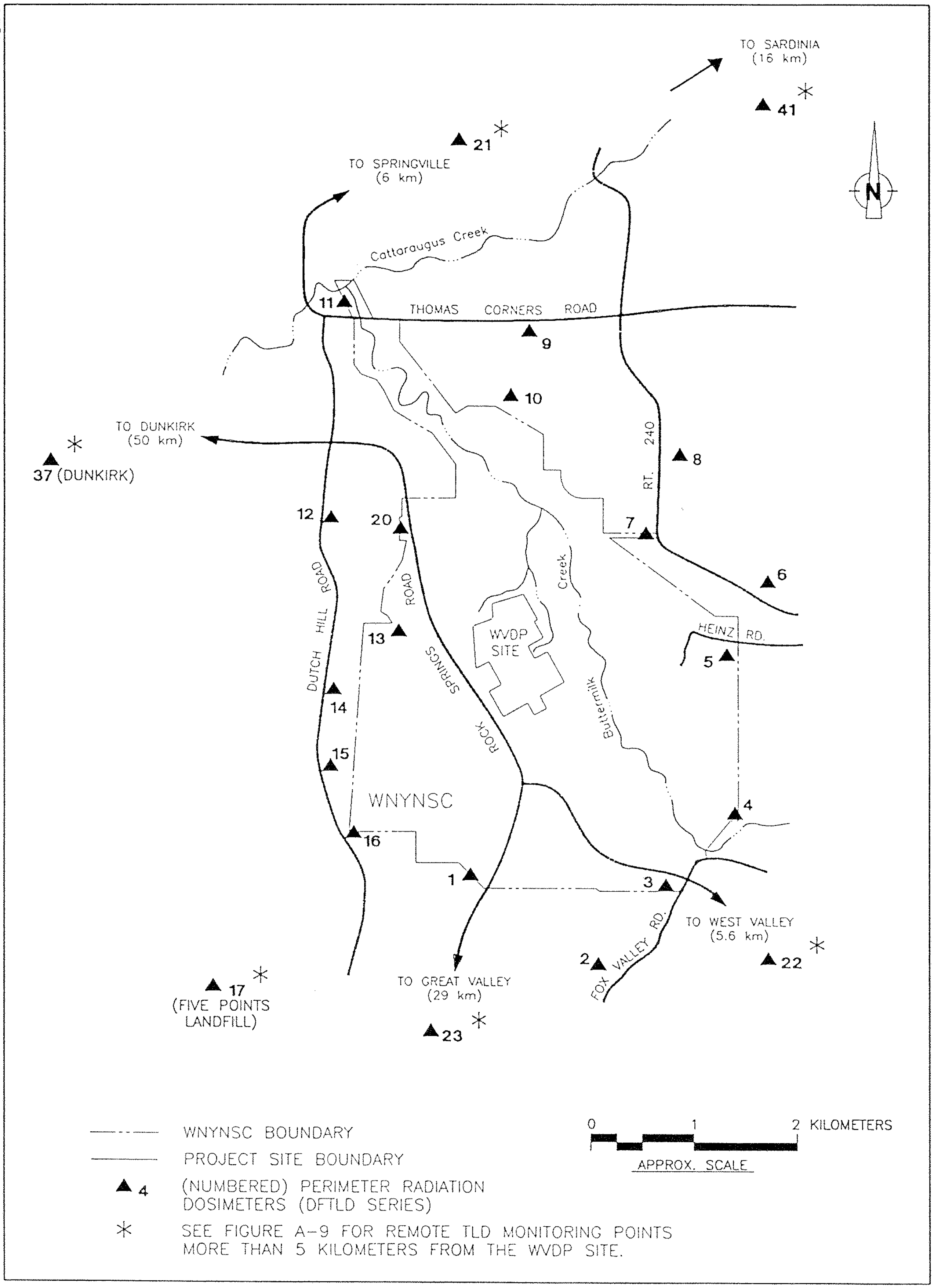


Figure 2-14. Location of Off–site Thermoluminescent Dosimetry (TLD).

Table D-8.) This point received an average exposure of 0.47 milliroentgens (mR) per hour during 1994, as opposed to 0.48 mR/hr in 1993 and 0.52 mR/hr in 1992. Sealed containers of radioactive components and debris from the plant decontamination work are stored nearby. The decline in exposure rate over time is due to radioactive decay of the materials stored within. The storage area is well within the WNYNSC boundary and is not accessible by the public.

Locations around the radwaste treatment storage (RTS) building – the drum cell – stayed the same or increased slightly during the 1994 calendar year. The average dose rate at these locations (TLDs #18, #32, #33, #34, #35, and #36) was 0.023 mR/hr in 1994, similar to the level observed in 1993. These exposure 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 accessible by the public.

Locations #27, #28, and #31 at the security fence are at levels near background. These locations are more distant from radioactive waste storage areas on-site.

Results for the new locations added in 1994, #42 and #43, are elevated above background locations, reflecting their positions near waste storage areas.

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. 2-15) 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.

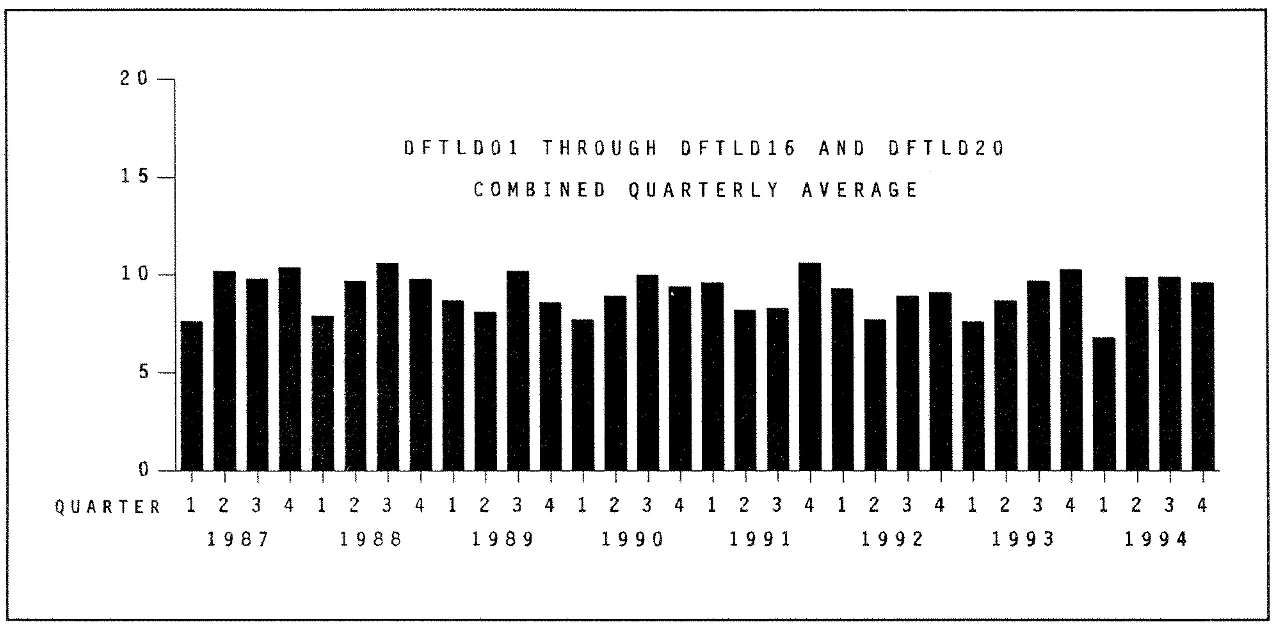


Figure 2-15. Trend of Environmental Radiation Levels (μR/hr)

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 primarily 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.

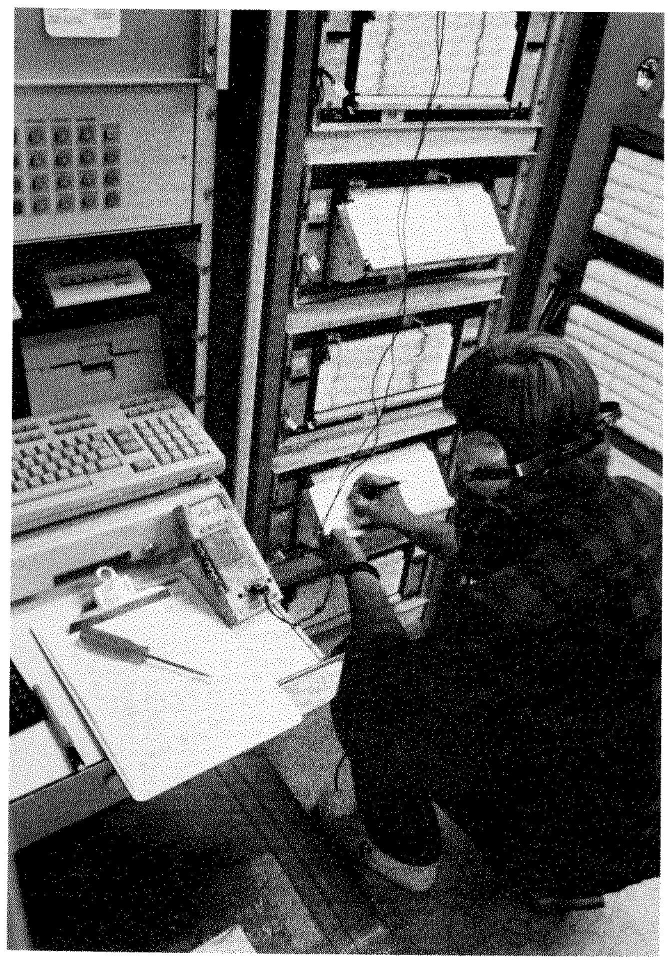
Since dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which is a function indicated by the difference in temperature between the 10-meter and 60-meter elevations), these parameters are closely monitored and are available to the emergency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

The on-site 60-meter meteorological tower continuously monitors wind speed and wind direction. (See Fig. 2-1.) 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. On-site systems are provided with either uninterruptible or standby power backup in case of site power failure. Figures C-6.1 and C-6.2 in *Appendix C-6* illustrate 1994 mean wind speed and wind direction at the 10-meter and 60-meter elevations. Regional data at the 10-meter elevation are shown in Figure C-6.3.

Weekly and cumulative total precipitation data are illustrated in Figures C-6.4 and C-6.5 in *Appendix C-6*. Precipitation in 1994 was approximately 40 inches (2% below 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 are calibrated semiannually and/or whenever instrument maintenance might affect calibration.



Checking Data from the Meteorological Tower

In 1994 the operational checkout of a new primary meteorological monitoring tower installed in 1993 was completed. This new tower was installed to replace the original 60-meter tower that had been encroached upon by essential on-site construction. Data collected during a six-month period of parallel operations were evaluated. It was concluded that there were no significant differences between the two monitoring locations. After this evaluation was completed, the instruments were removed from the old tower. The new tower's computerized data acquisition system is similar to the old one but has improved data-reporting features.

Special Monitoring

NRC-licensed Disposal Area (NDA) Interceptor Trench and Pretreatment System

Radioactively contaminated solvent was first discovered at the northern boundary of the 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 trench was designed to intercept and collect subsurface water, which could be carrying solvent, in order to prevent the solvent from entering the surface water drainage ditch leading into Erdman Brook. The LPS was installed 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 1994 no water containing solvent was encountered in the trench and no water or solvent has been treated by the LPS.

It should be noted that although it does not by itself demonstrate the effectiveness of the interceptor trench, water containing solvent has never been detected in groundwater monitoring wells outside the NDA or in the surface water drainage downstream of the NDA. During 1994 a functional readiness test of the system was performed to ensure continuing operational readiness. Several opportunities for improving system performance were noted. Enhancements are planned for 1995.

Radiological and nonradiological monitoring data for waters collected from the trench (WNNDATR) and from the drainage just downstream (WNNDADR) have been discussed in this chapter under the on-site surface water section. Results of sampling of the NDA monitoring wells 909 and 910 are discussed in *Chapter 3, Groundwater Monitoring*.

Survey of Trees near the NDA

During a routine radiation survey by the Radiation and Safety Department in 1992, 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 the leaves could be blown off-site by the wind and the 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.

Results received in 1993 indicated that the concentrations of radionuclides in the apples and leaves were sufficiently low that there was no need for action.

Sampling and analysis were repeated in 1994 to determine if there were any changes in the conditions of the trees. Radionuclides that are known site contaminants were measured in leaves and fruit of several trees just north of the NDA boundary. The results from the fruit analyses, when compared to similar off-site samples, show positive levels of strontium-90 and cesium-137 in the on-site fruit. The fruit and leaf analyses are consistent with previous 1993 results: radioactivity is detectable but remains at concentrations that do not warrant further action.

Northeast Swamp Drainage Monitoring

Trend analyses of ground- and surface water monitoring results have indicated increasing gross beta concentrations in waters discharged through the northeast swamp drainage, as monitored at sampling points WNDMPNE and WNSWAMP. Additionally, a series of samples were collected throughout the north plateau area using a Geoprobe® unit. This truck-mounted unit drives a metal rod into the ground to a predetermined depth. Water samples are collected at desired depths and analyzed for radioactivity. Results are being evaluated and plotted on a site map to determine if there are any patterns to the migration of residual site contamination through the groundwater. Results of investigations into these increases are discussed in *Chapter 3, Groundwater Monitoring*, **Subsurface Investigation of Elevated Gross Beta on the North Plateau**.

Waste Tank Farm Underdrain Monitoring

Notable increases in gross beta and tritium activity at location WN8D1DR, attributable to surface contamination, were described in the 1993 annual Site Environmental Report. In the past, this location received subsurface drainage from the high-level waste tank farm area and channeled it to a nearby surface water drainage. Since July 1993, this collection point has been valved off (isolated) from the site's storm drain system and thus no longer discharges to the surface.

Drum Cell Monitoring

Liquid high-level waste (through supernatant treatment and sludge wash) processed by the integrated radwaste treatment system (IRTS) produced more than 18,000 drums of cement-solidified waste by the end of 1994. These drums are currently being stored aboveground in the IRTS drum cell.

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 occurring gamma-ray background.

Radiation exposure levels are monitored at various locations around the drum cell perimeter and at the closest location accessible by the public — approximately 300 meters (984 ft) west at the security fence at Rock Springs Road. Baseline measurements had been taken in 1987 and 1988 before the drums were placed. 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. Background radiation levels can vary annually depending 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 at the security fence at Rock Springs Road from the drums in the drum cell, HPIC measurements were compared with earlier studies. HPIC measurements made through mid-1994 indicate that the exposure rates at this location were only slightly above those from background readings obtained at the Environmental Laboratory, which is located about 500 meters away from the drum cell. The most recent data also show that exposure rates at Rock Springs Road are the same as or only slightly greater than those seen before any drums were placed in 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 the New York State Department of Environmental Conservation (NYSDEC) requirements for this type of landfill, following a closure plan (Standish 1985) approved by NYSDEC. To meet routine post-closure requirements, the CDDL cover was inspected in February and September 1994 and was found to be in proper condition. As required, adequate drainage is maintained to ensure that no obvious ponding or soil erosion is occurring and that the grass planted on the clay and soil cap is cut. Results of groundwater monitoring in the area of the closed landfill are presented in *Chapter 3, Groundwater Monitoring*.

Small Mammal Study

In the summer of 1994 a special study was conducted to determine the relative population and gamma-emitting contaminants present in small mammals (mice, voles, and shrews) around the Project premises. Traps were set at six locations: an office trailer complex, the east side of the main plant facility, the packaged radioactive materials storage area, the low-level waste treatment lagoon area, the closed landfill area, and an area on the north side of the NDA.

During twenty-one days in August 1994, 128 mammals were collected in 1,350 trap-nights (one trap set for one night). The sample population consisted mostly of voles (commonly known as "field mice") with other mouse and shrew species represented. The heaviest concentration of samples was collected near the main plant facility; not surprisingly, that population also had the highest number of samples (twenty-five) containing detectable cesium-137. There was also positive radionuclide detection in one specimen from each of two adjacent areas.

The study suggested that potential contaminant transport by small mammals is localized in restricted facility areas. Transport by small mammals was not observed in radioactive waste management or disposal areas. These mammals are not in a direct pathway to man and therefore do not represent a potential dose to humans.

Nonradiological Monitoring

Air Monitoring

Nonradiological emissions and plant effluents are controlled and permitted under NYSDEC and U.S. Environmental Protection Agency (EPA) 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 sources of regulated pollutants that include particulates, ammonia, nitric acid mist and oxides of nitrogen, and sulfur. However, monitoring of these parameters currently is not required.

Surface Water Monitoring

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

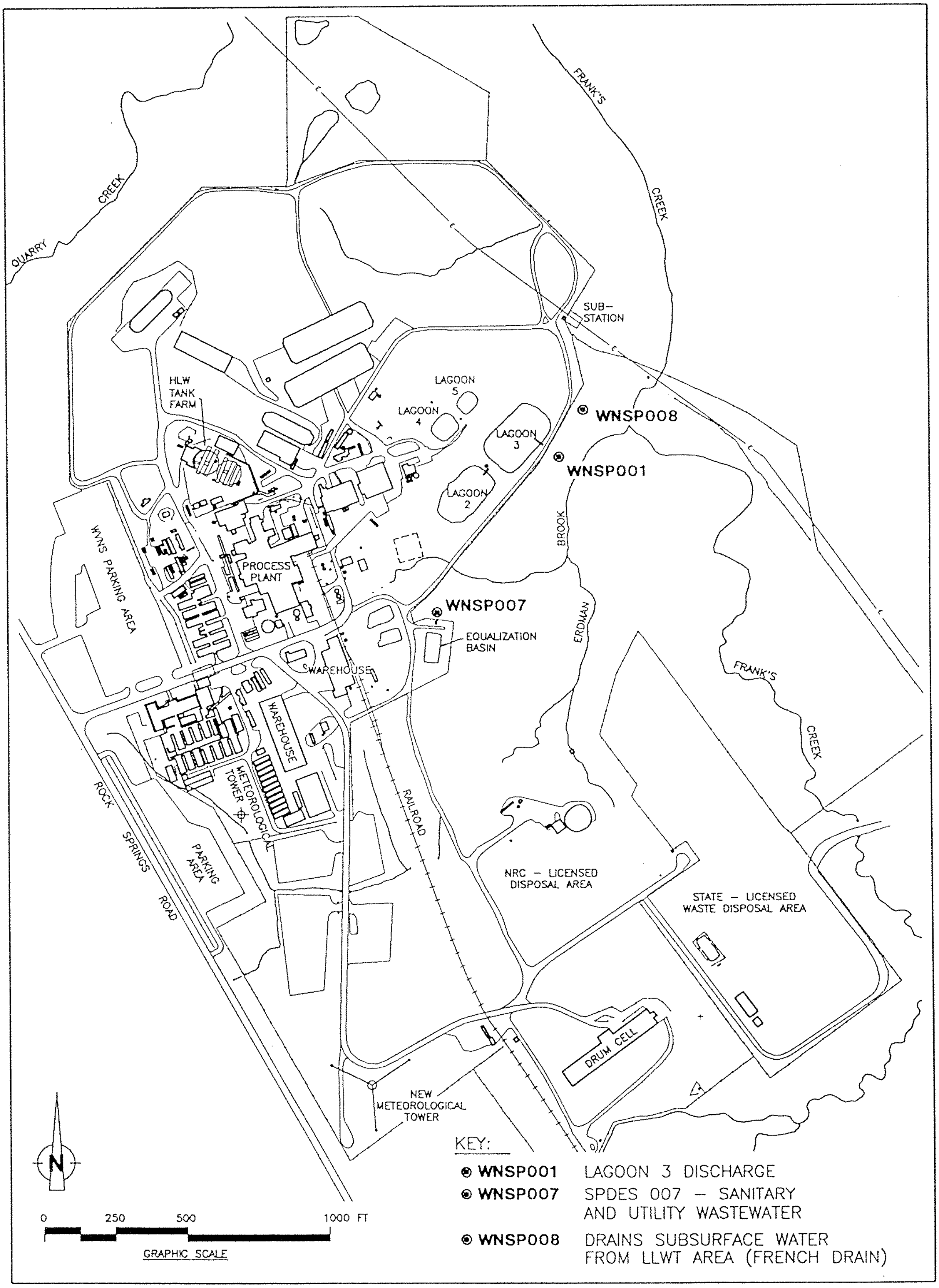


Figure 2-16. SPDES Monitoring Points.

The WVDP holds a SPDES permit that identifies the outfalls where liquid effluents are released to Erdman Brook (Fig. 2-16) and specifies the sampling and analytical requirements for each outfall. This permit was modified in 1990 to include additional monitoring requirements at outfall WNSP001. The WVDP applied for a renewed SPDES permit in 1992. It was received in early January 1994 and went into effect on February 1, 1994 with the expanded monitoring requirements and, in some cases, more stringent discharge limitations. The permit was again modified in April and November of 1994.

Three outfalls were identified in the 1994 permit:

- outfall WNSP001, discharge from the low-level waste treatment facility
- outfall WNSP007, discharge from the sanitary and industrial wastewater treatment facility
- 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*.

Some of the more 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 sum of the Project effluents but allow the more dilute effluents to be factored into the formula for determining compliance with permit conditions.

The SPDES monitoring data for 1994 are displayed in Figures C-5.2 through C-5.52 in *Appendix C-5*. The WVDP reported eighteen noncompliance episodes in 1994 (Table C-5.2). See the *Environmental Compliance Summary: Calendar Year 1994*.

Semiannual grab samples 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 taken in 1994. These samples are screened for organic constituents and selected anions, cations, and metals. Results of these measurements for all of these locations are found in Table C-1.11 in *Appendix C-1*.

Appendix C-1, Tables C-1.22 and C-1.23 present NPOC (nonpurgeable organic carbon), TOX, and pH data for two locations that help monitor the NDA, WNNDADR and WNNDATR. When NPOC and TOX values at both locations are compared, the data suggest that even with moderate fluctuation there is little if any significant difference.

Drinking Water Monitoring

As a result of changes in EPA and New York State monitoring requirements, a number of important drinking water monitoring activities were carried out at the site in 1994. (See Safe Drinking Water Act in the *Environmental Compliance Summary: Calendar Year 1994*.) Included was the sampling of the site drinking water for copper and lead concentrations. Additionally, samples were collected to be analyzed for nitrate and nitrite concentration. This sampling activity will be repeated annually as part of the site's drinking water monitoring effort.