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

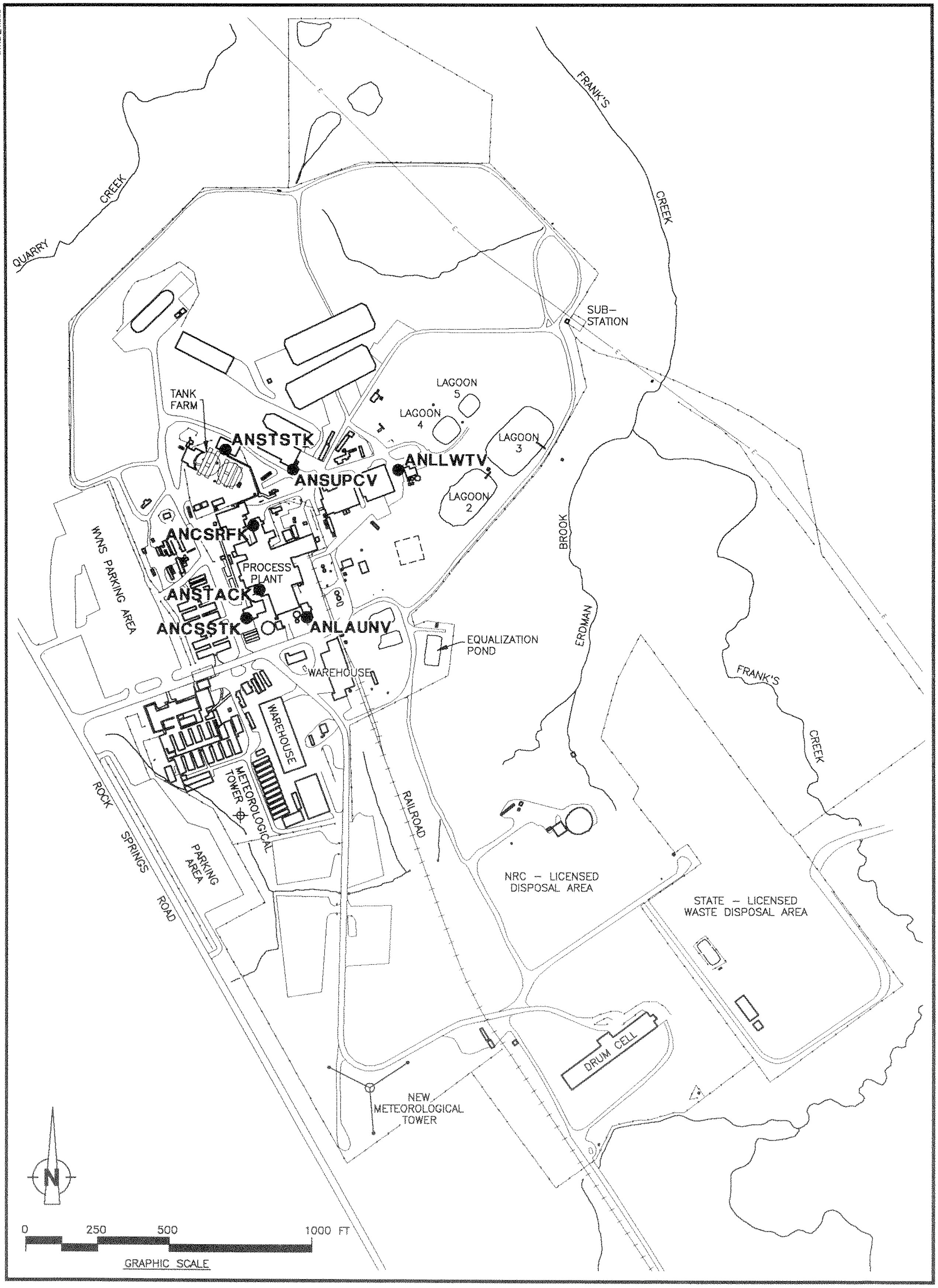


Figure 2-1. Location of On-Site Air Effluent Points.

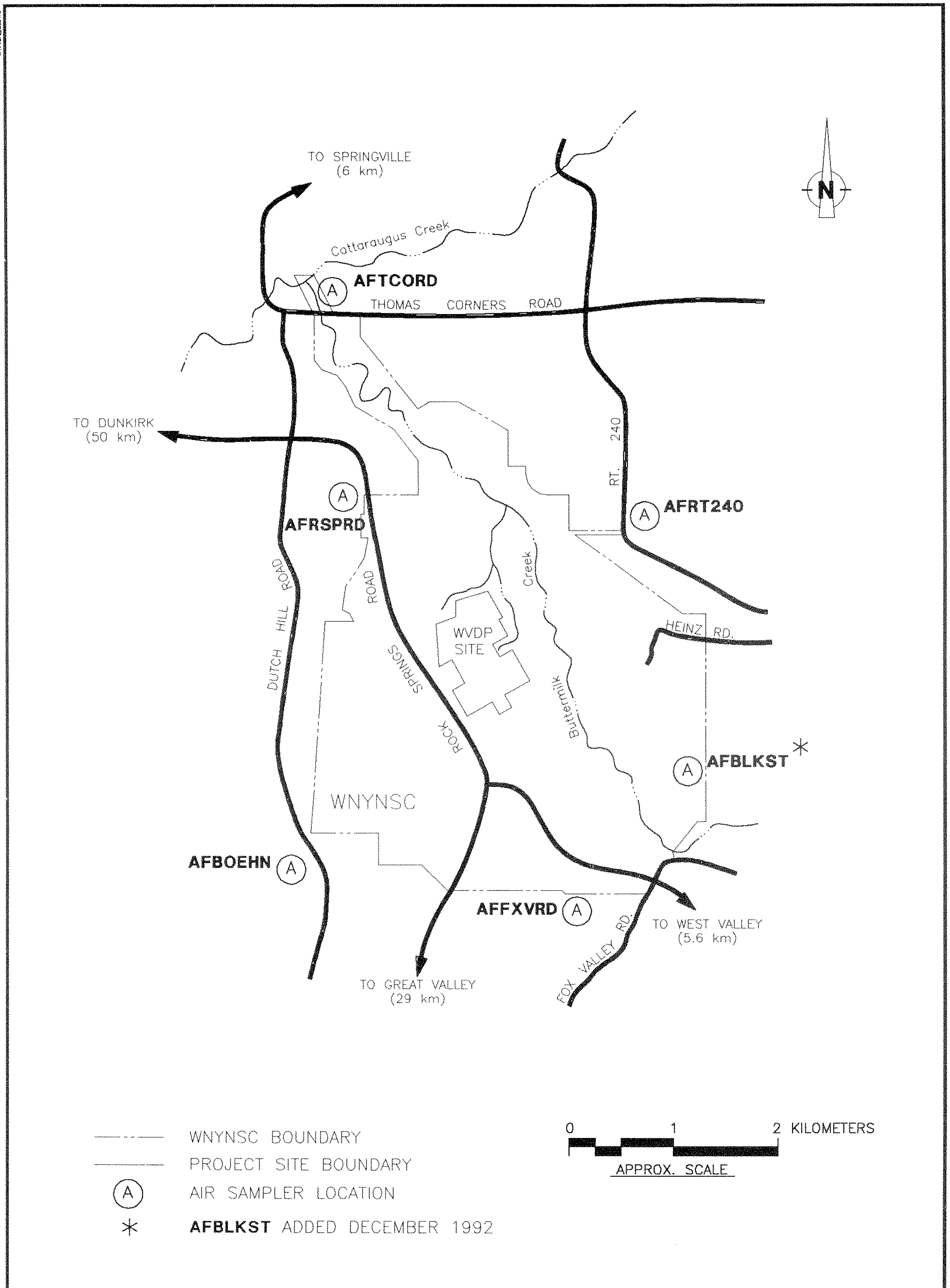


Figure 2-2. Location of Perimeter Air Samplers.

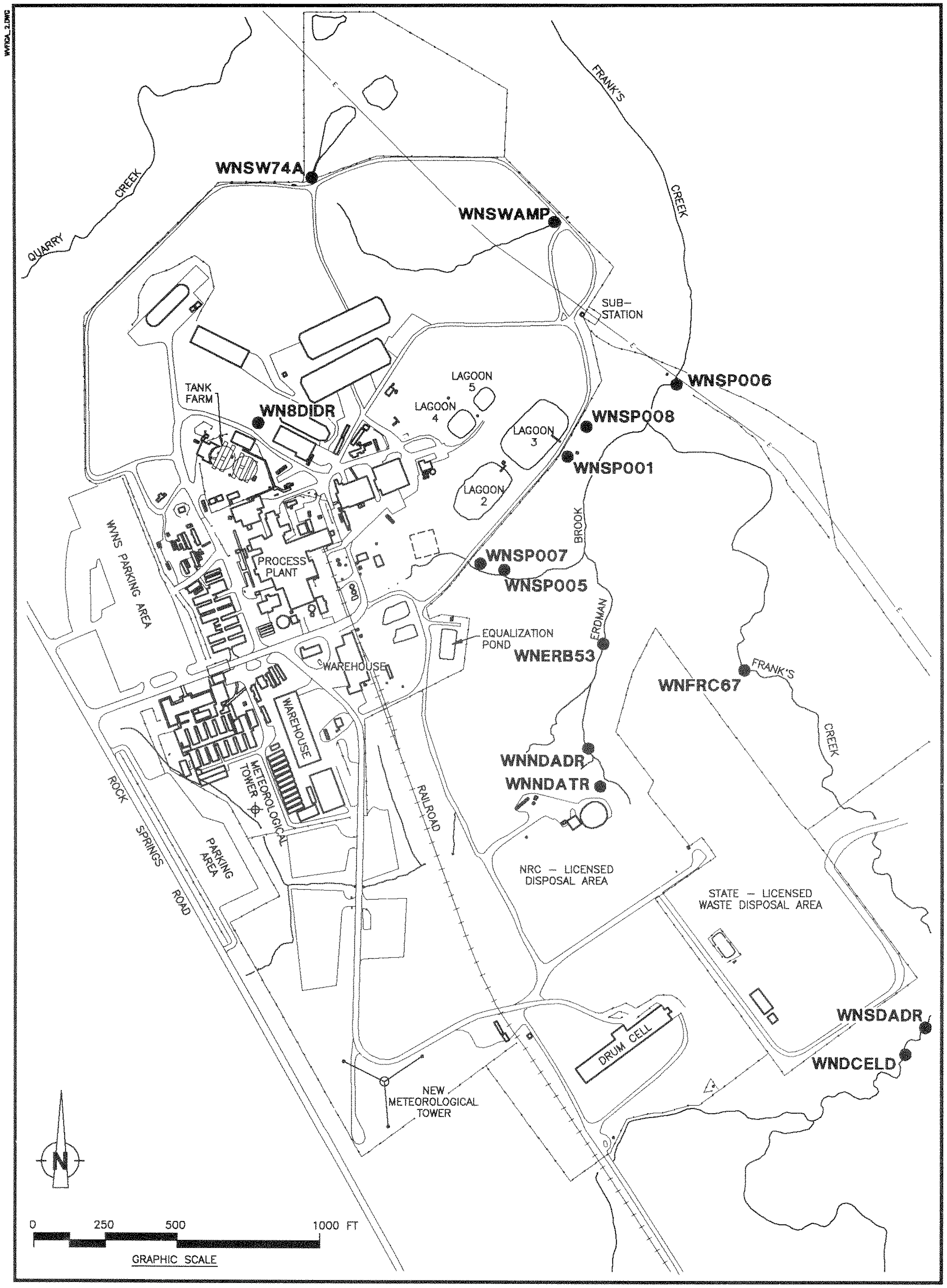


Figure 2-3. Sampling Locations for On–Site Surface Water.

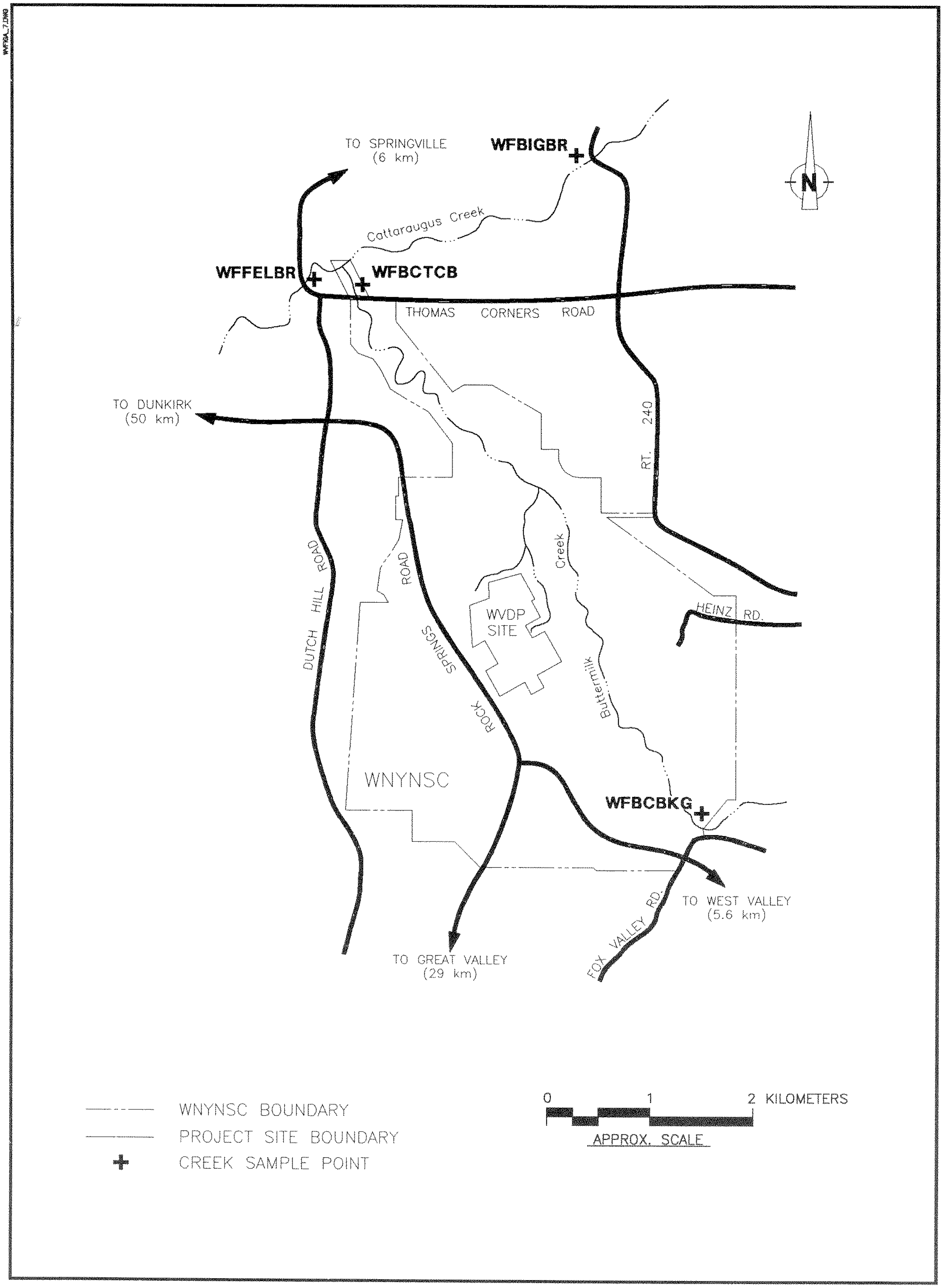


Figure 2-4. Location of Off–Site Surface Water Samplers.

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

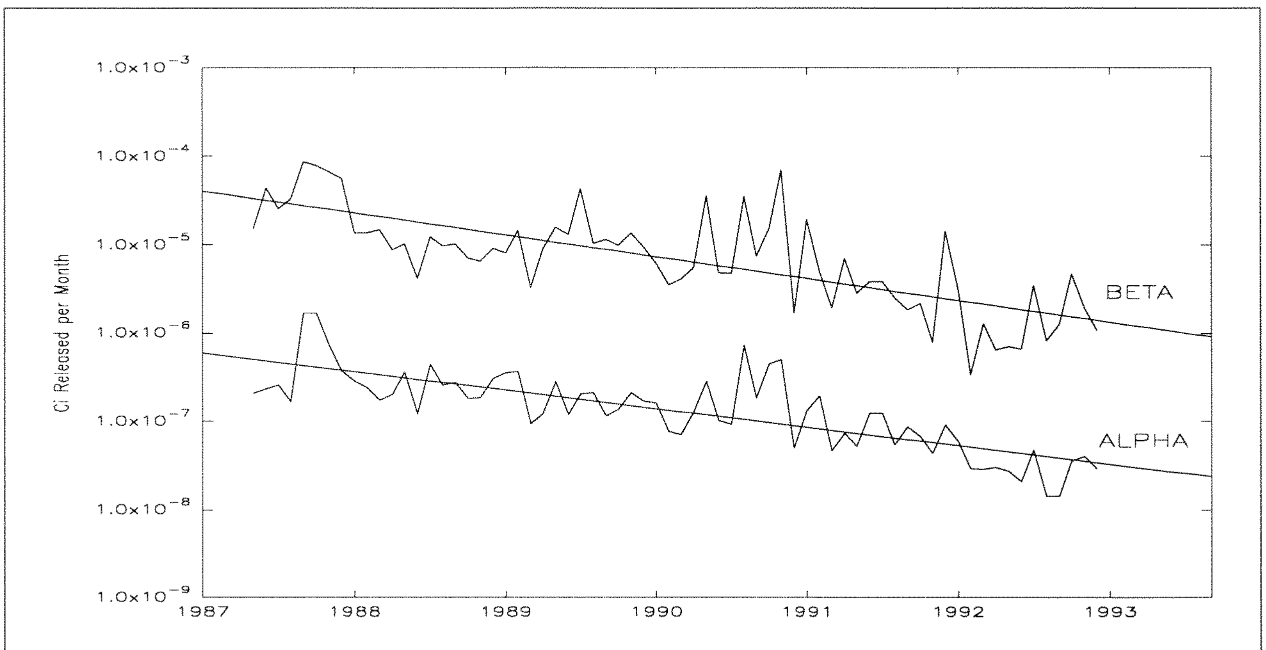


Figure 2-5. Five-Year Trends of Gross Alpha and Gross Beta at the Main Stack Sampling Location (ANSTACK)

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.

Silica Gel Columns from the Main Ventilation Stack Sampler

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.

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.

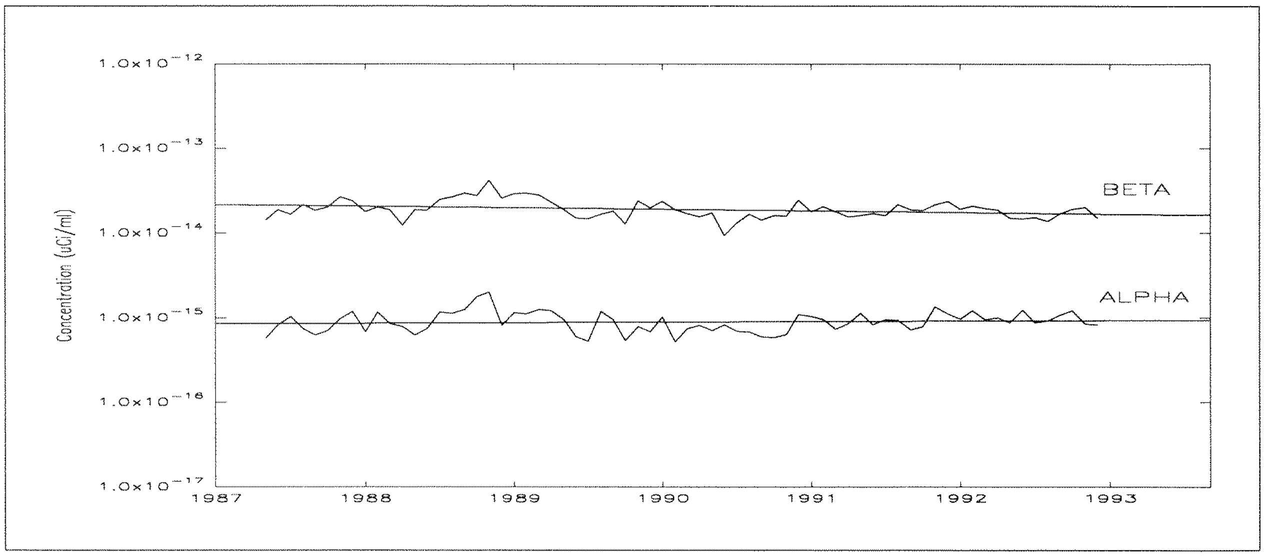


Figure 2-6. Five-Year Trends of Gross Alpha and Gross Beta at the Rock Springs Road Sampling Location (AFRSPRD)

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.

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		Annual Average	
		μCi/mL	Bq/m³	μCi/mL	Bq/m³
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/m³ is 2.3E-05 to 9.2E-05
DCG limit (gross alpha as Am-241) is 2E-14 μCi/mL, 7.4E-4 Bq/m³

** 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		Annual Average	
		μCi/mL	Bq/m³	μCi/mL	Bq/m³
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/m³ is 3.8E-04 to 1.1E-03
DCG limit (gross beta as Sr-90) is 9E-12 μCi/mL, 3.31E-01 Bq/m³

** 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

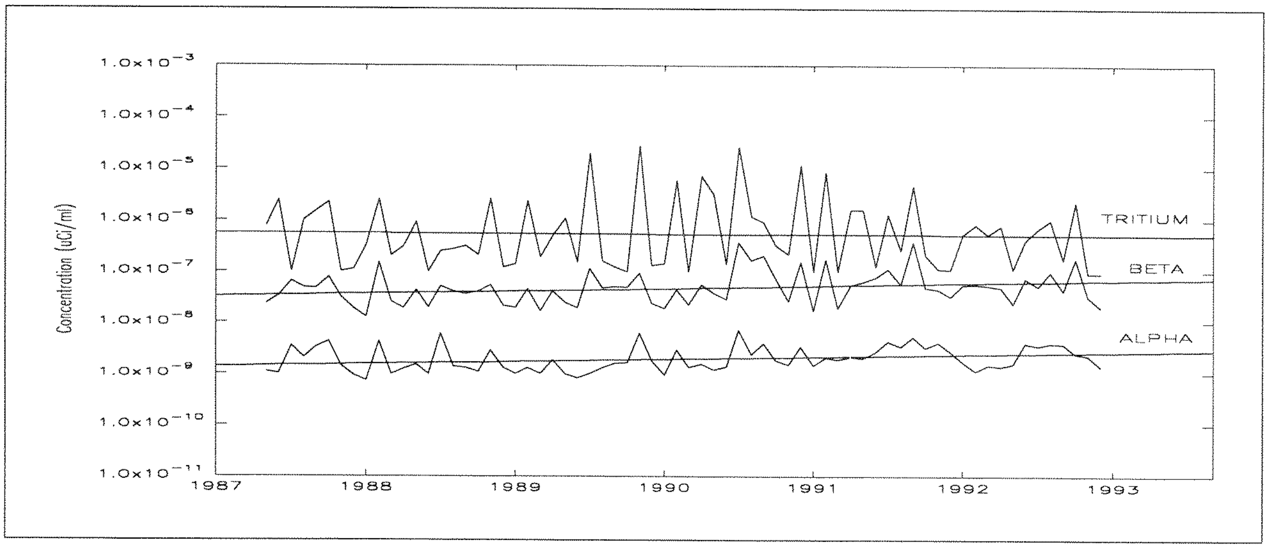


Figure 2-7. Five-Year Trends of Gross Alpha, Gross Beta, and Tritium at Sampling Location WNSP006

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.

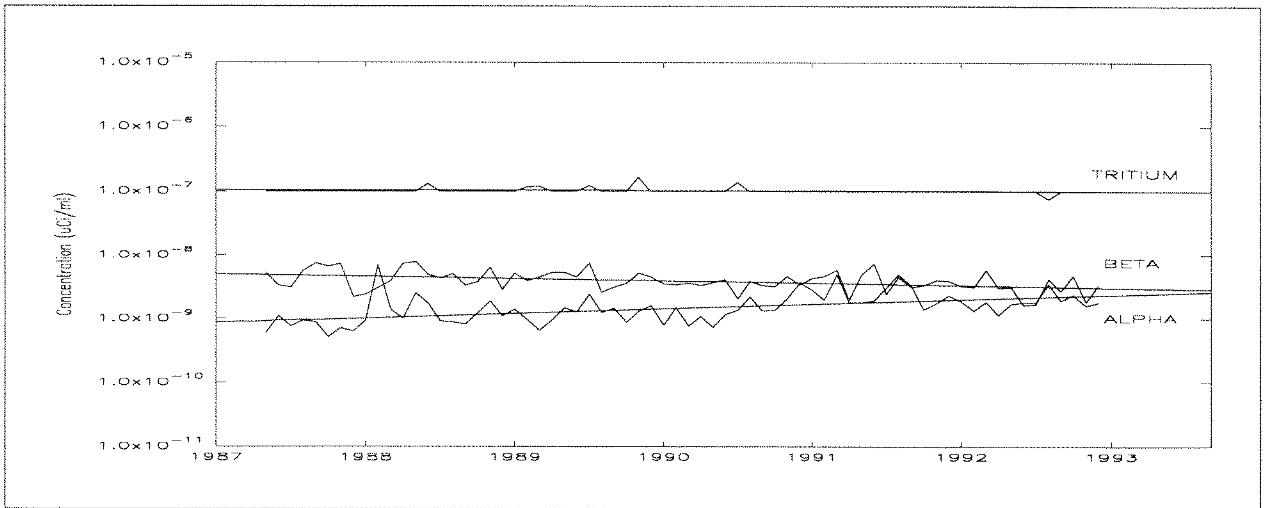


Figure 2-8. Five-Year Trends of Gross Alpha, Gross Beta, and Tritium at Sampling Location WFFELBR

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.

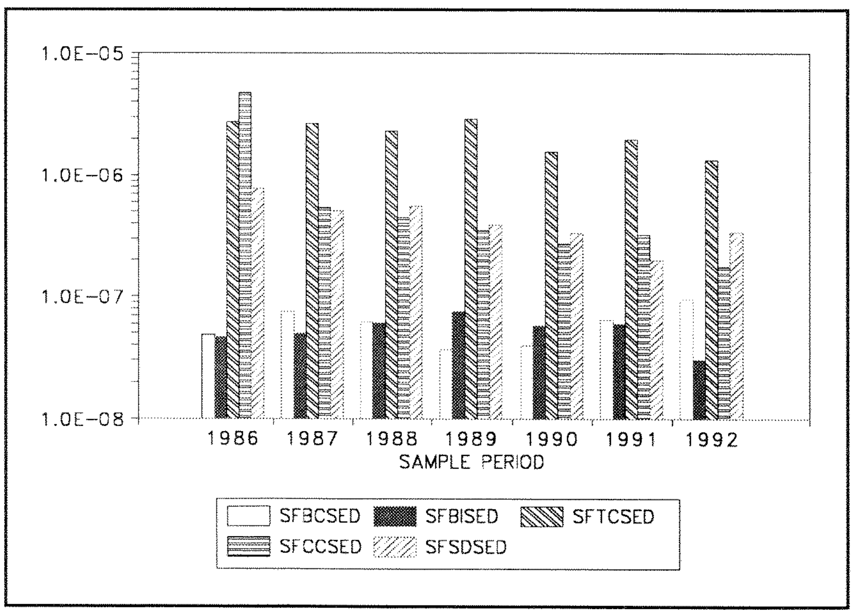


Figure 2-9. Annual Averages of Cs-137 (μCi/g dry) in Stream Sediment for Two Locations Upstream and Three Locations Downstream of the WVDP

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.

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.

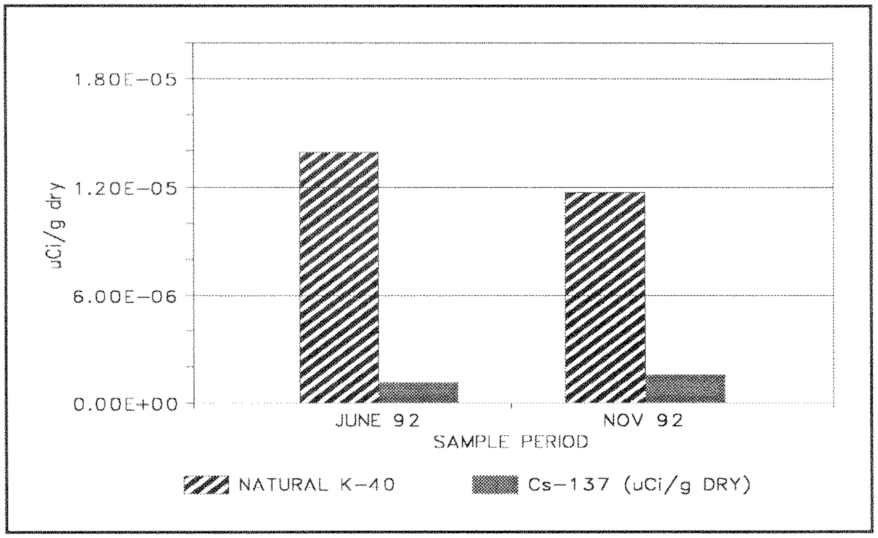


Figure 2-10. Comparison of Cs-137 with Naturally Occurring K-40 Concentrations at Downstream Sampling Location SFTCSED

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.

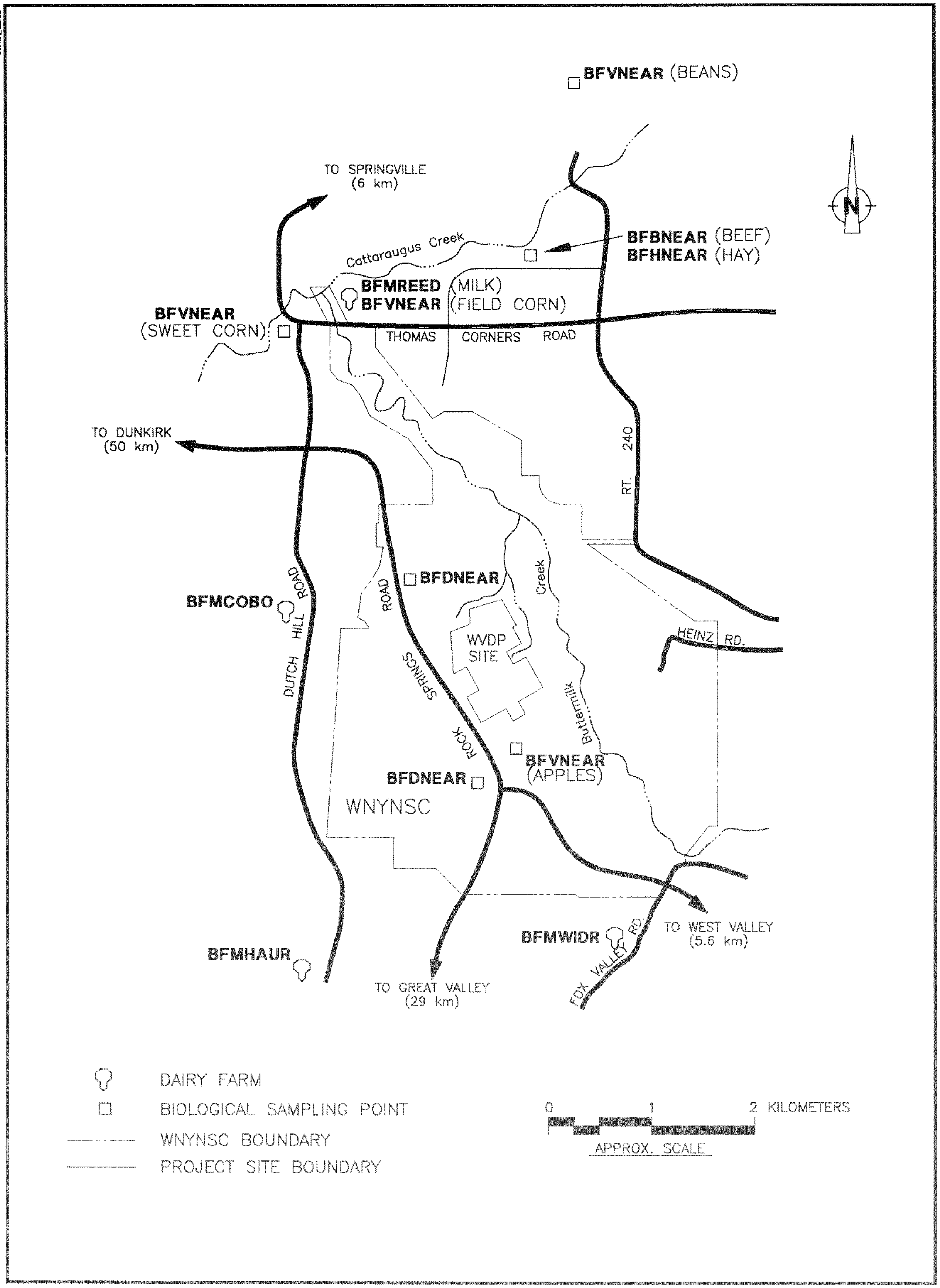


Figure 2-11. Near–Site Biological Sampling Points.

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

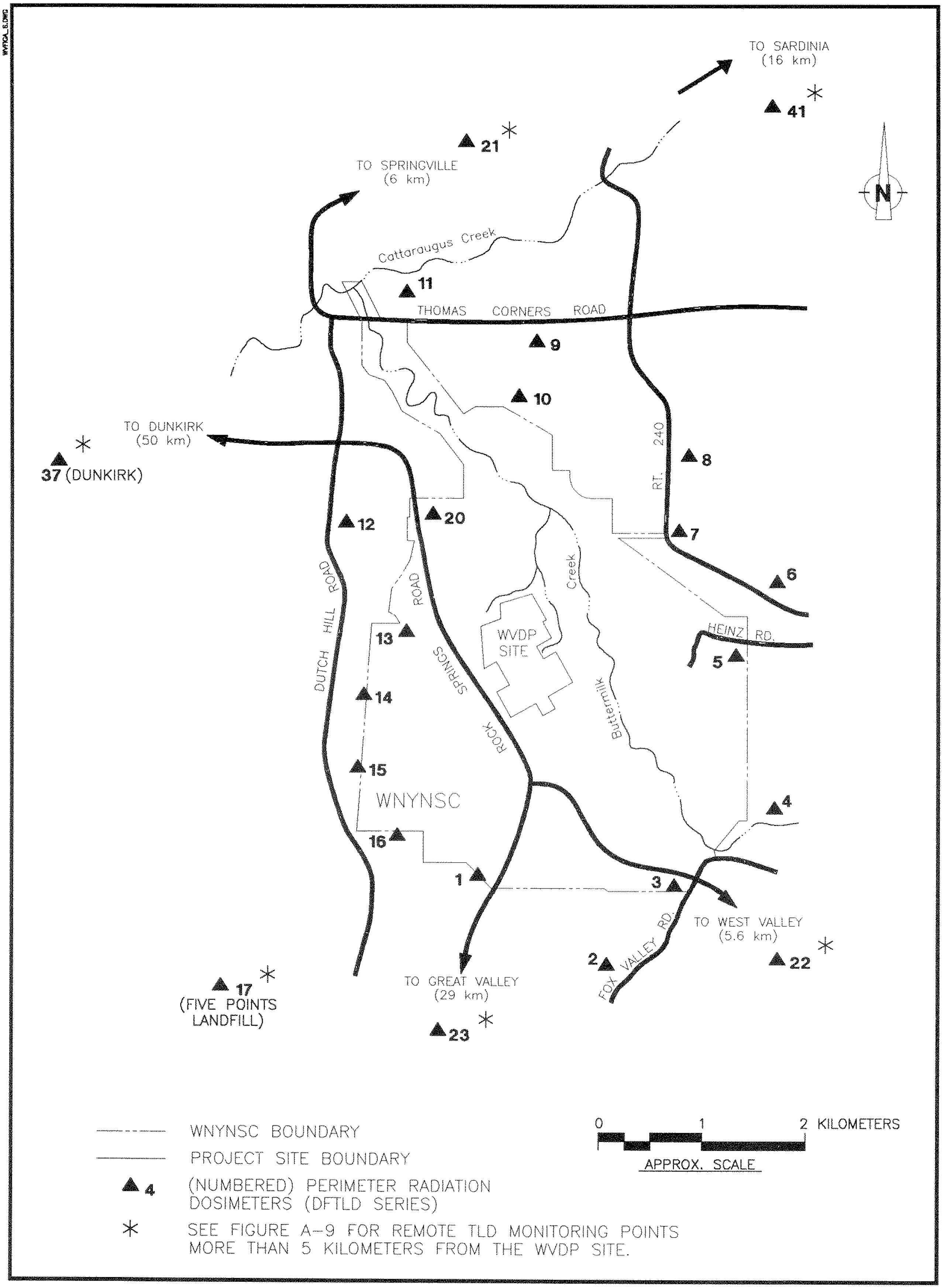


Figure 2-12. Location of Off-Site Thermoluminescent Dosimetry (TLD).

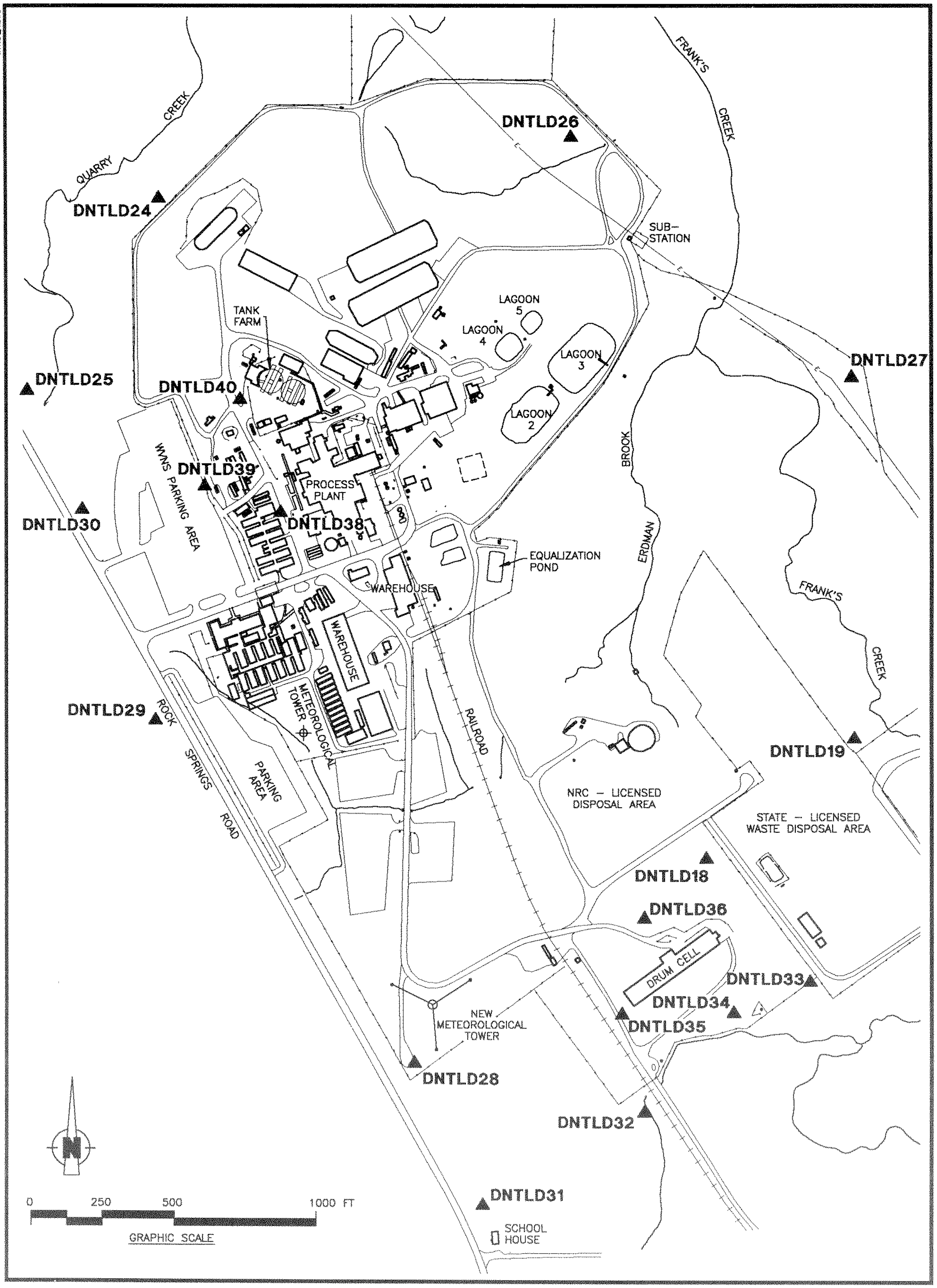


Figure 2-13. Location of On-Site Thermoluminescent Dosimetry (TLD).

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.

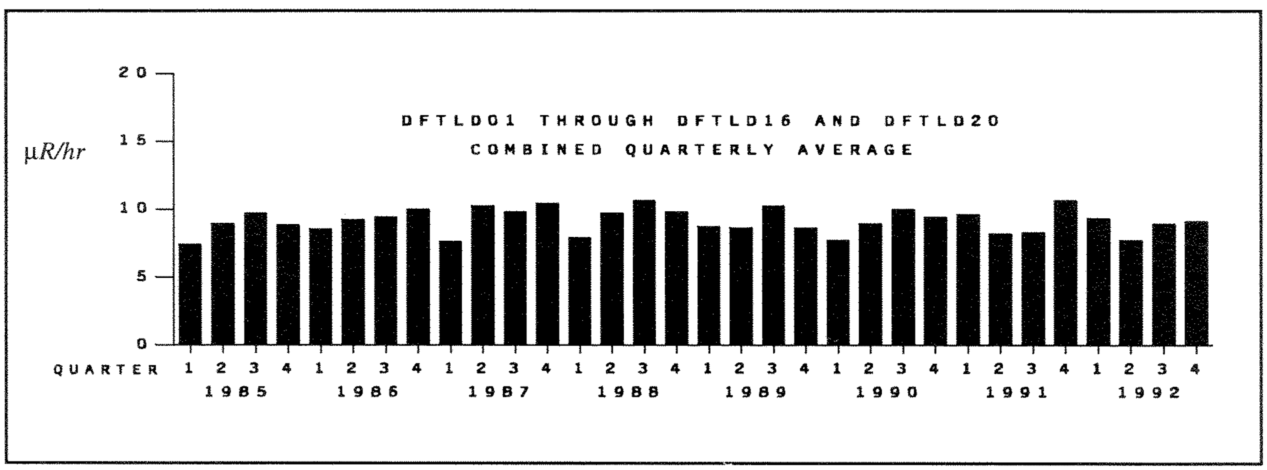
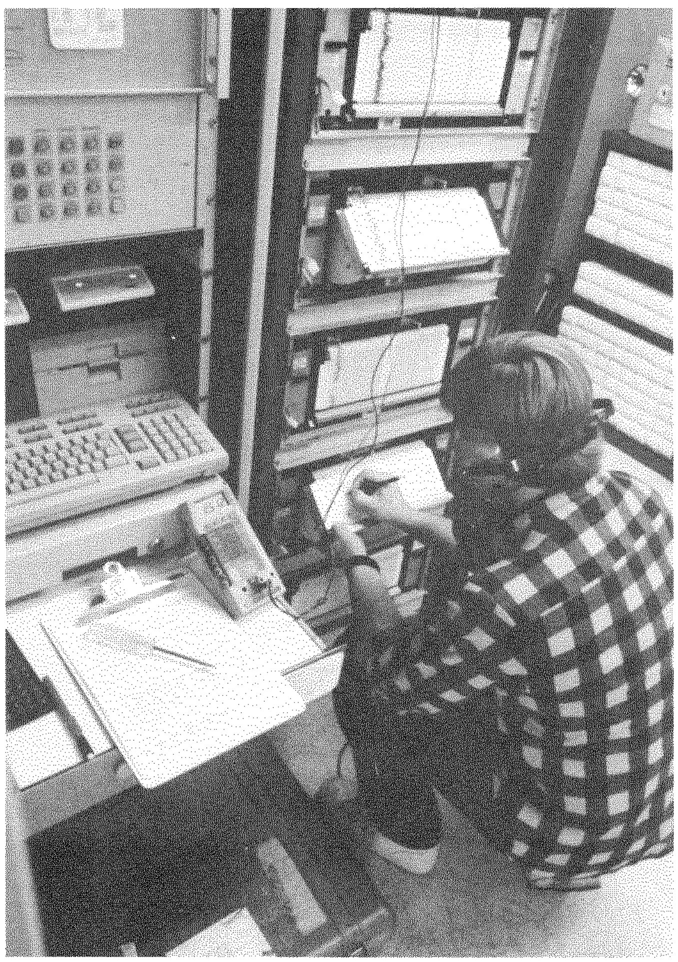


Figure 2-14. Trend of Environmental Radiation Levels (μR/hr)

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

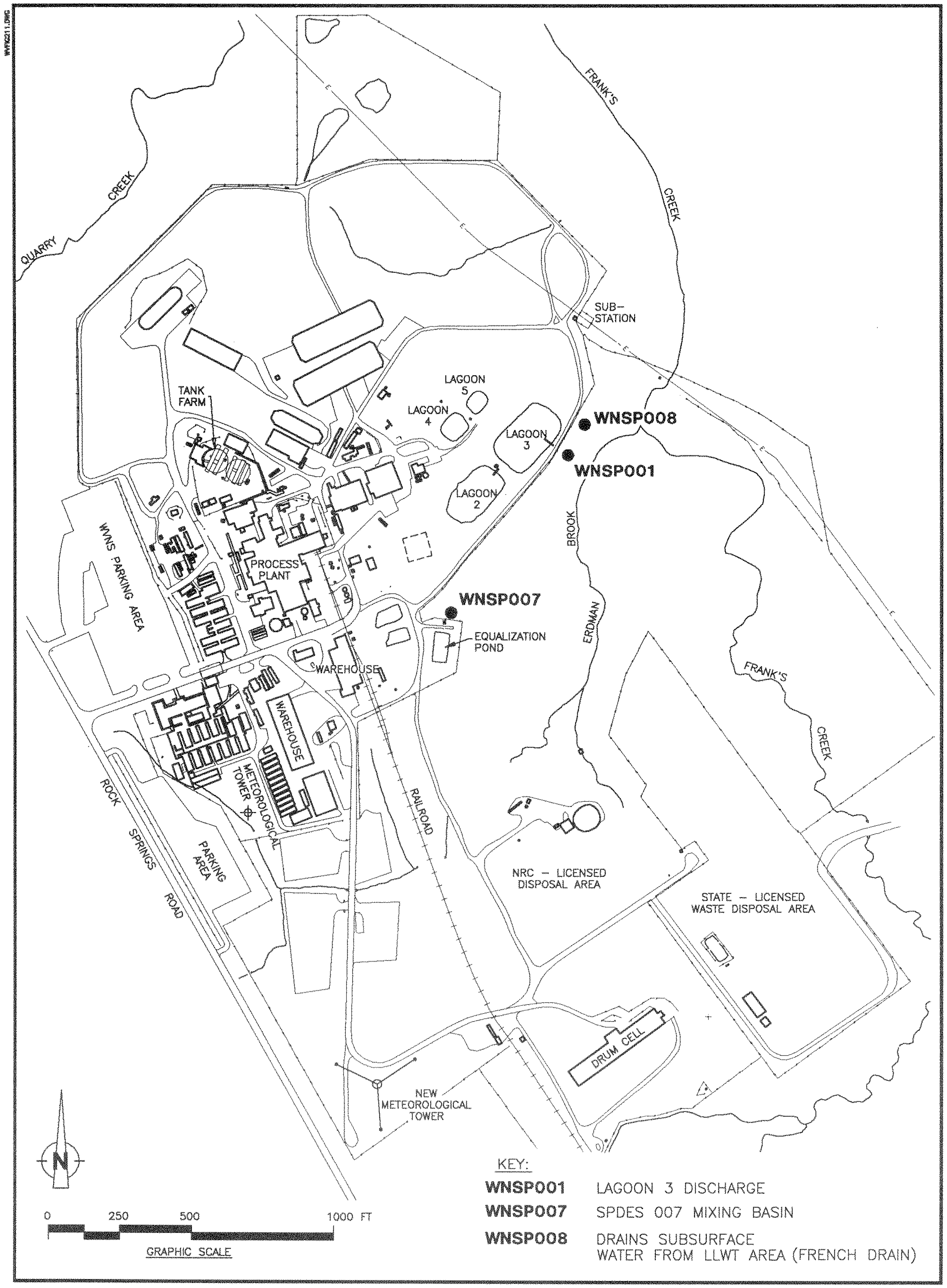


Figure 2-15. SPDES Monitoring Points.

- 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*.