2.0 ENVIRONMENTAL MONITORING PROGRAM - DESCRIPTION AND RESULTS

This report reflects the changes in the environmental monitoring network which have been implemented in the past five years to provide an enhanced level of environmental surveillance in anticipation of high-level waste processing activities.

The surveillance program as outlined for 1986 was implemented in 1987 (including effluent, on-site, and off-site monitoring). Several new monitoring points not identified in the 1986 program plan were implemented during the year, most of them addressing specific effluent monitoring requirements for new Project facilities completed in 1987.

The major pathways for off-site movement of radionuclides are by surface water drainage and airborne transport. For that reason, the environmental monitoring program emphasizes the collection of air and surface water samples. Another potentially significant pathway is the ingestion and assimilation of radionuclides by game animals and fish that include the WNYNSC in their range. Appropriate animal, soil and vegetation specimens are gathered and analyzed for radionuclide content in order to reveal any long-term trends.

In addition to the radiological environmental monitoring program, WVNS participates in the State Pollution Discharge Elimination System (SPDES) and operates under state-issued air and water discharge permits for nonradiological plant effluents. Section 2.2 summarizes nonradiological monitoring in 1987, and Appendix C-5 provides greater detail on these activities. Groundwater monitoring is covered in Section 3.0.

2.1 Radiological Monitoring

Air, water, and selected biological media were sampled and analyzed to meet Department of Energy and plant Technical Specification (also referred to as Operational Safety Requirements or OSRs) monitoring requirements. To provide appropriate reference parameters, several additional sampling points were added in 1987 in support of Project facilities which became operational (see Appendix A). There were no abnormal radiological releases or special investigations of environmental radiological conditions in 1987. Although several new effluent points were activated, all functioned as expected.

2.1.1 Radioactivity in Air

In 1987 airborne particulate radioactivity was collected continuously by four perimeter air samplers and by three remote samplers at locations shown in Figures 2-1 and 2-2. (A complete tabulation of the concentrations measured at each of these stations is given in Appendix C-2, Tables C-2.2.1 through C-2.2.7.) Three of the perimeter air samplers, mounted on 4-m high towers, maintain an average air flow of about 40 L/min (1.5 ft^3/min) through a 47-mm glass fiber filter. The fourth perimeter air sampler, located on Rock Springs Road, is near the residence which would be subject to the highest average relative concentration of airborne effluent from a long-term, ground-level release from the plant (AFRSPRD, see Figure 2-1). The fourth perimeter sampler and the three remote samplers operate with the same air flow rate as the three mounted on towers, but the sampler head is set at 1.7 m above the ground (the height of the average human breathing zone). The three remote samplers are located in Great Valley, Springville, and West Valley (Figure 2-2).

Concentrations measured at Great Valley (AFGRVAL), 28 km south of the site, are considered to be representative of natural background. A second background monitoring station was put into operation for the fourth

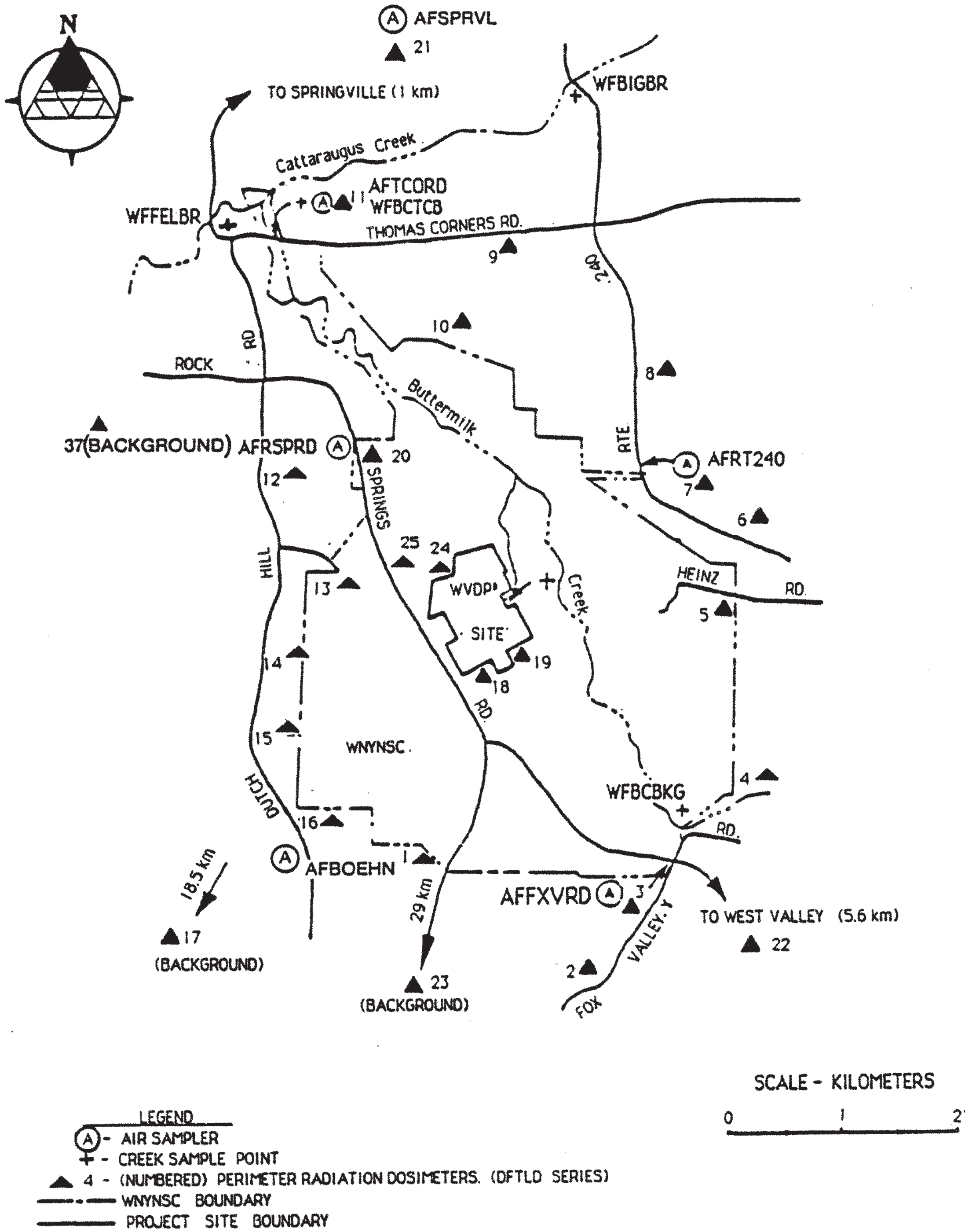

Figure 2-1. Locations of Perimeter Environmental Monitoring Stations.

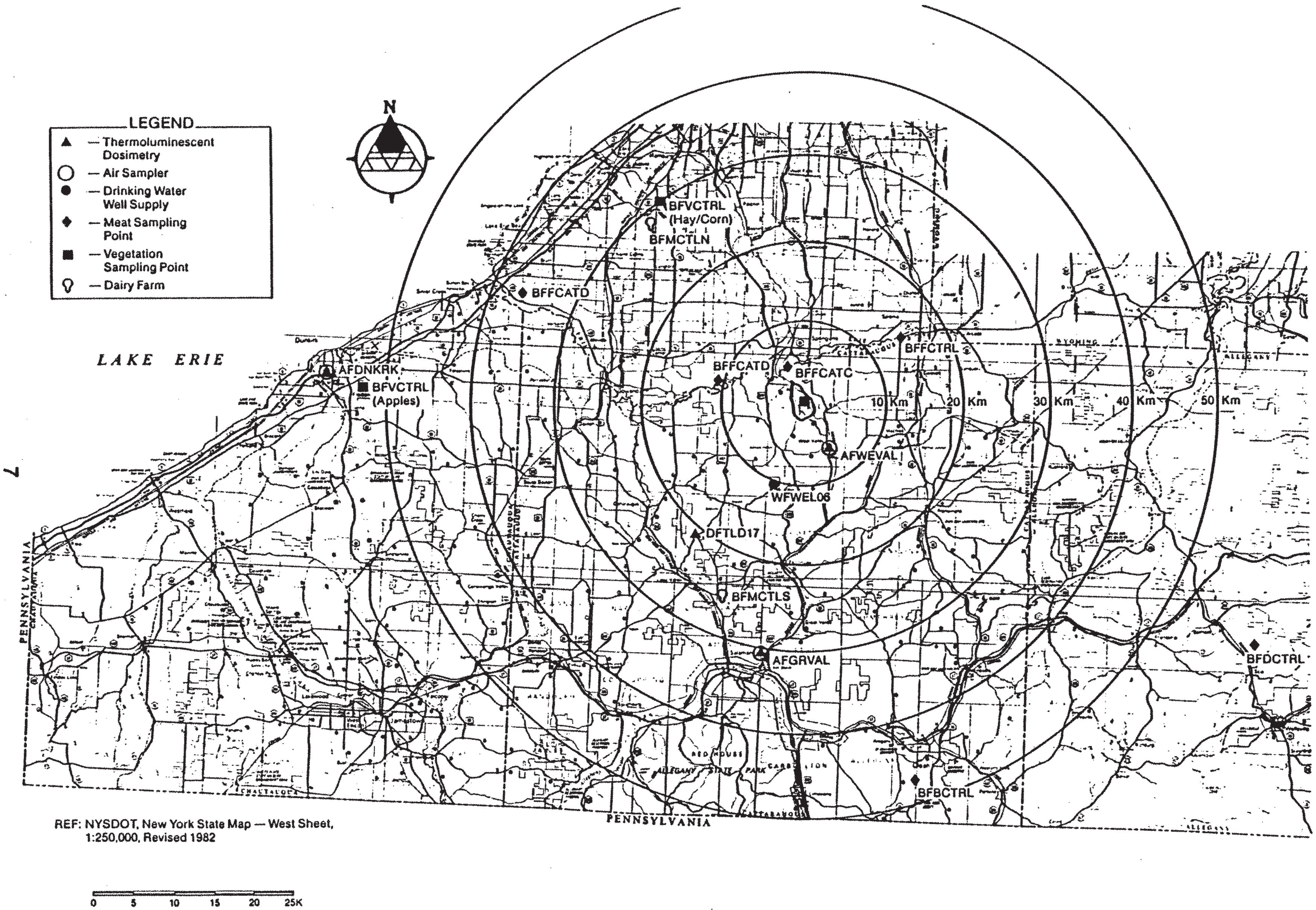

Figure 2-2. Environmental Sampling Points More than 5 km from the WVDP Site.

quarter of 1987 at Dunkirk 50 km to the west of the site. Data from this sampler are provided in Table C-2.2.8. A fifth perimeter station (AF-BOEHN on Dutch Hill Road, Figure 2-1) began operation too late in 1987 to provide any reportable data.

Filters from all samplers were 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 were made using a low-background gas proportional counter. The average monthly concentrations ranged from 1.1 to 3.6 E-14 μCi/mL (4.07 E-4 to 1.3 E-3 Bq/m^3) of beta activity and 7.3 E-16 to 2.2 E-15 μCi/mL (2.7 E-5 to 8.14 E-5 Bq/m^3) of alpha activity. Additionally, quarterly composites consisting of 13 weekly filters from each sample station were analyzed.

In all cases, the measured monthly gross activities were below 3 E-12 μCi/mL (1.1 E-1 Bq/m^3) beta, and 2 E-14 μCi/mL (7.4 E-4 Bq/m^3) alpha, the most limiting DOE Derived Concentration Guides (DCG) for any of the isotopes present at WVDP. (The standards and concentration guides for radionuclides of interest at West Valley are reproduced from the DOE orders in Appendix B.) Results of the analyses of perimeter air sample filters are presented in Appendix C-2.

For comparison, the 1986 data from the New York State Department of Health (NYSDOH) indicated a normal background concentration of gross beta activity in air which averaged 2.6 E-14 μCi/mL (9.6 E-4 Bq/m^3) in Albany, New York (Huang, 1987). Annual data for the three samplers which have been in operation since 1983 are compared in Figure 2.3. The values average about 2.4 E-14 μCi/mL (8.9 E-4 Bq/m^3) of gross beta activity in air, with a temporary rise in 1986 after the Chernobyl incident. The annual average gross beta concentration at the Great Valley background station was 1.9 E-14 μCi/mL (7.0 E-4 Bq/m^3) in 1986, but averaged 2.1 E-14 μCi/mL (7.8 E-4 Bq/m^3) in 1987.

At four perimeter sampler locations, open pots are used to collect fallout. The data from these analyses also are presented in Appendix C-2, Tables C-2.3.1 and C-2.3.2. These collections represent an indication of short-term effects. Long-term deposition is measured by surface soil samples collected near each air sampling

uCi/ml

	AFFXVRD	AFRT240	AFTCORD
1983	1.61 E-14	1.82 E-14	1.82 E-14
1984	1.78 E-14	2.07 E-14	1.96 E-14
1985	1.75 E-14	1.80 E-14	1.97 E-14
1986	4.38 E-14	2.86 E-14	3.08 E-14
1987	2.32 E-14	2.36 E-14	2.39 E-14

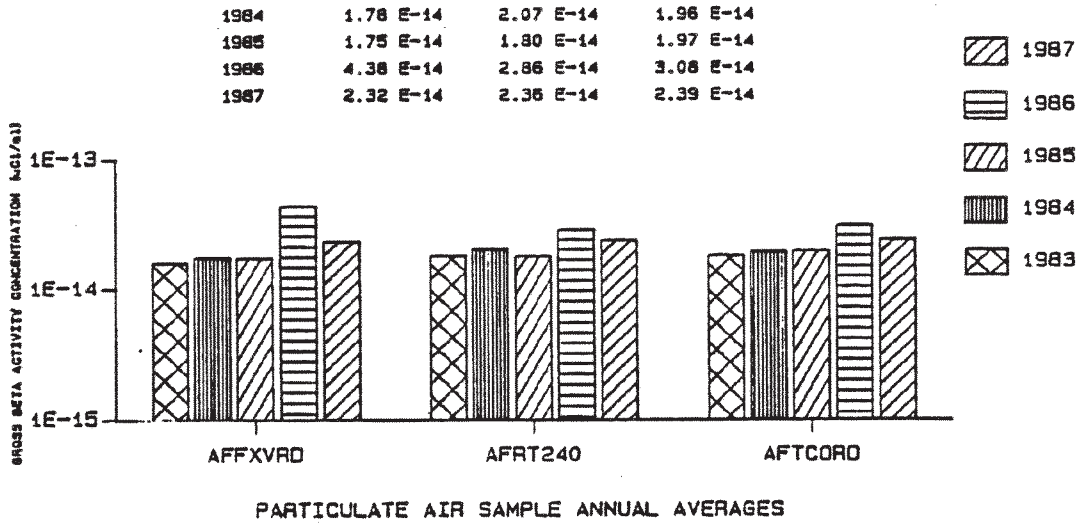

Figure 2-3. Trends of Gross Beta Activity in Perimeter Air Samplers (AFFXVRD, AFRT240, and AFTCORD) 1983 - 1987.

station. The triennial collections were performed in 1985 and are next scheduled for 1988.

The main ventilation stack (ANSTACK) sampling system was the most significant airborne effluent point again in 1987. A high flow rate and multiple nozzles assure a representative sample for both the long-term collection filter and the on-line monitoring system. Variations in concentrations of airborne radioactivity reflect the level of decontamination activities within the facility (Figure 2.4). However, at the point of discharge, average radioactivity levels were below the concentration guides for airborne radioactivity in an unrestricted environment (see Table C-2.1.3).

Because of the low concentrations, the large volume samples from the plant stack provide the only practical means of determining the amount of specific radionuclides released from the facility.

The total quantity of gross alpha and beta radioactivity released each month from the main stack, based on the weekly filter measurements, is shown in Table C-2.1.1. The results of analyses for specific radionuclides in the four quarterly composites of stack effluent samples are listed in Table C-2.1.2.

A sampling system similar to the main stack system monitors airborne effluents from the Cement Solidification System ventilation stack (ANCSSTK). The 1987 samples showed detectable gross radioactivity and beta- and alpha-emitting isotopes, but did not approach any DOE effluent limitations (Tables C-2.1.4 and C-2.1.5).

Three significant effluent points were added in 1987. The Supernatant Treatment System ventilation required monitoring while operating periodically for testing and sampling. The Supercompaction Volume Reduction System also operated intermittently. The Contact Size Reduction Facility ventilation began operation in October 1987. Only the last facility operated long enough in 1987 to provide statistically valid

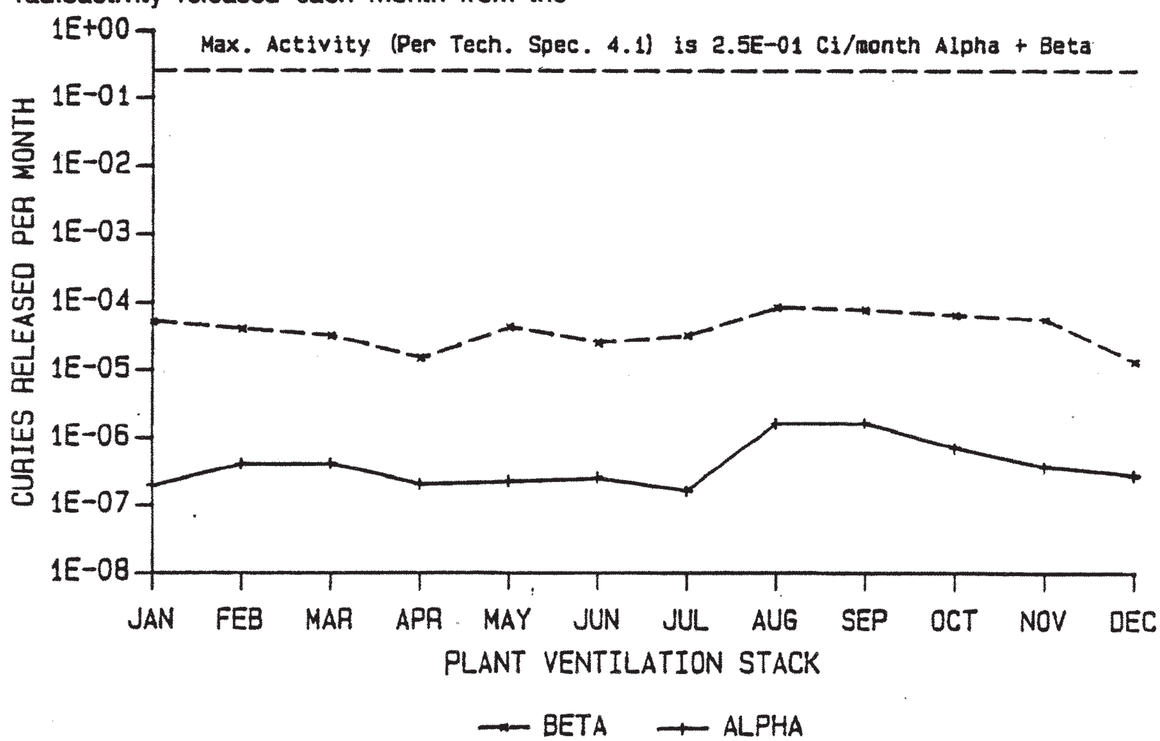

Figure 2-4. 1987 Sampling Data for Station ANSTACK.

effluent measurement (Tables C-2.1.6 and C-2.1.7).

Two other facilities are routinely monitored for airborne radioactivity releases: the Low-Level Waste Treatment Facility (LLWTF) and the contaminated clothing laundry.

The total amount of radioactivity discharged from the last five facilities is less than 2 percent of the airborne radioactivity released from the site, and was not a significant factor in the airborne pathway in 1987.

2.1.2 Radioactivity in Surface Water and Sediment

Four automatic samplers collect surface water at points along the site drainage channels. An off-site sampler is located on Cattaraugus Creek (at Felton Bridge) just downstream of the confluence with Buttermilk Creek, the major surface drainage from the WNYNSC (Figure 2-1). This sampler (WFFELBR) periodically collects a small volume of water (approximately 100 mL/hr) from the creek. A stream stage-level chart recorder provides a means of flow-weighting the weekly composite based on relative stream depth. Gross alpha, beta, and tritium analyses are performed each week, and a weighted monthly composite is analyzed for Sr-90 and gamma-emitting isotopes.

In addition to the Cattaraugus Creek sampler, three surface water monitoring stations are located upstream of the Buttermilk Creek/Cattaraugus Creek confluence. Samplers collect water from a background location on Buttermilk Creek upstream of the Project (WFBCBKG) and from a location at Thomas Corners Road downstream of the plant and upstream of the confluence with Cattaraugus Creek (WFBCTCB). The third station (WNSP006) is located on Frank's Creek (also known as Erdman Brook) just upstream of the point where Project site drainage leaves the security area (Figure 2-1).

These samplers currently operate in a time composite mode, collecting a 25-mL aliquot every half-hour. The samples are collected 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 Sr-90. Quarterly composites from WNSP006 also are analyzed for I-129. The schedule for analysis of samples from WNSP006 will be modified in 1988 as indicated in Appendix A.

Radiological concentration data from these sample points show that average gross radioactivity concentrations generally tend to be higher in Buttermilk Creek below the WVDP site, presumably because of the small amount of activity from the site which enters via Frank's Creek. However, the average concentrations below the site in Cattaraugus Creek are not statistically significantly higher than the background (upstream) concentrations. The range of gross beta activity, for example, was 2.01 E-9 to 5.02 E-9 μCi/mL (7.4 E-2 to 1.9 E-1 Bq/L) upstream in Buttermilk Creek at Fox Valley (WFBCBKG), and from 3.1 E-9 to 7.4 E-9 μCi/mL (1.1 E-1 to 2.7 E-1 Bq/L) in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB). (See Figure 2-5.)

In comparison, if the most restrictive beta-emitting radionuclide is used (Ra-228), the maximum concentration measured in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB) where dairy cattle have access is 7 percent of the DOE concentration guide for unrestricted use (Appendix B). At the Project Security Fence (WNSP006), over 4 km from the nearest public access point, the most significant beta-emitting nuclides were measured at 4.0 E-7 μCi/mL (14.8 Bq/L) for Cs-137 and 3.5 E-08 (1.3 Bq/L) for Sr-90 during the period of highest concentration. This corresponds to 13.3 and 3.5 percent of the DCGs for Cs-137 and Sr-90, respectively. The annual average was 6.5 percent for Cs-137 and 2.2 percent for Sr-90. Tritium, at an annual average of 1.0 E-6 μCi/mL (37 Bq/L), was 0.05 percent of the DCG values. Except for two months of the year when positive values were

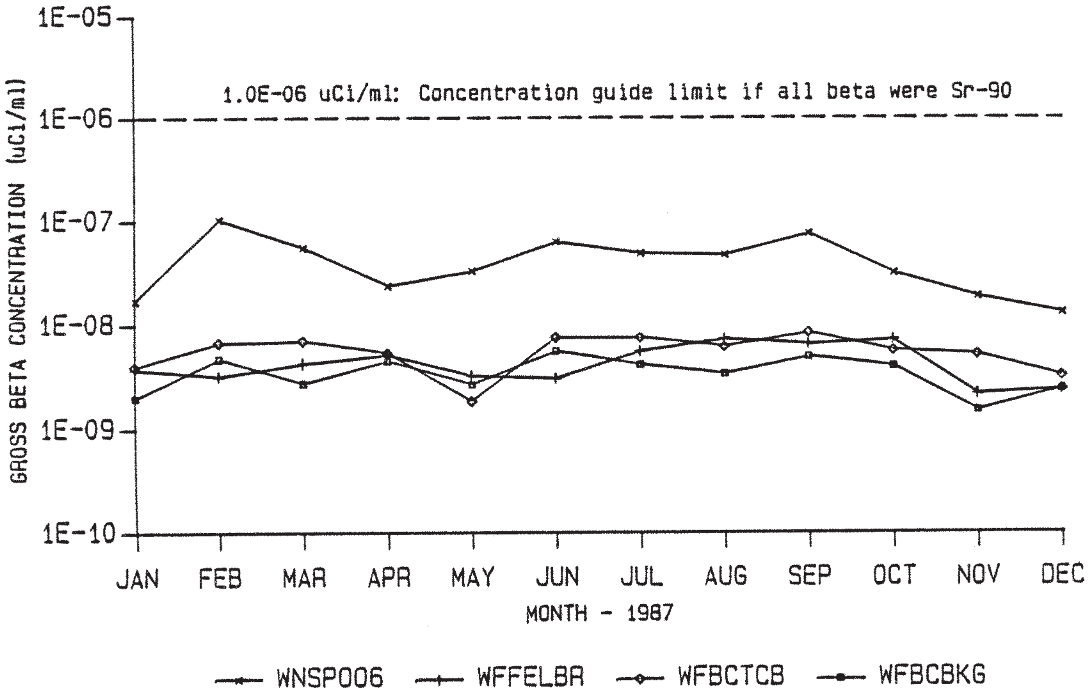

Figure 2-5. Gross beta concentrations in surface water downstream of WVDP - 1987.

noted, the gross alpha was below the average detection limits of 2 E-09 μCi/mL (7.4 E-02 Bq/L), or less than 7 percent of the DCG for Am-241. The positive values were 9 and 12 percent of the DCGs in March and June, respectively, assuming that all alpha-emitting isotopes were Am-241.

The most elevated concentrations in monthly composite water samples from Cattaraugus Creek during 1987 show Sr-90 to be less than 0.9 percent of the DCG for drinking water. Gross alpha and tritium were detected one month each in Cattaraugus Creek water during 1987. No gamma-emitting fuel cycle isotopes were detected in Cattaraugus Creek water during 1987 (Table C-1.5). A plot of monthly gross beta activity in Cattaraugus Creek for five years is presented in Figure 2-6. No trend is apparent over this extended period.

Sediments from Buttermilk Creek and Cattaraugus Creek were analyzed for gross activity, Sr-90, gamma-emitting isotopes and transuranic nuclides. The results are comparable to previous analyses during the past four years, indicating that there has been no measurable change attributable to Project activities. Data for 1987 are presented in Table C-1.7. A comparison of 1983-1987 gross beta activity in sediment from Buttermilk Creek is presented in Figure 2-7. Data for 1984 were not available for this parameter.

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, Figure 2-8) into Erdman Brook. There were five batch releases (a total of about 36 million litres) from Lagoon 3 in 1987. The effluent was grab sampled daily during the 39 days of release and analyzed. The total amounts of activity in the effluent are listed in Table C-1.1.1. Of the activity released, 10.7 percent of the tritium and 2.0 percent of the other gross radioactivity originated in the New York State disposal area (based on measurements of water transferred in 1987 from the state area to the LLWTF) and not from previous or current Project operations (see Table C-1.8). The annual average release concentrations from the Lagoon 3 effluent discharge weir, including all measured isotope fractions, was less than 50 percent of the DCGs (Appendix B and Table C-1.1.2).

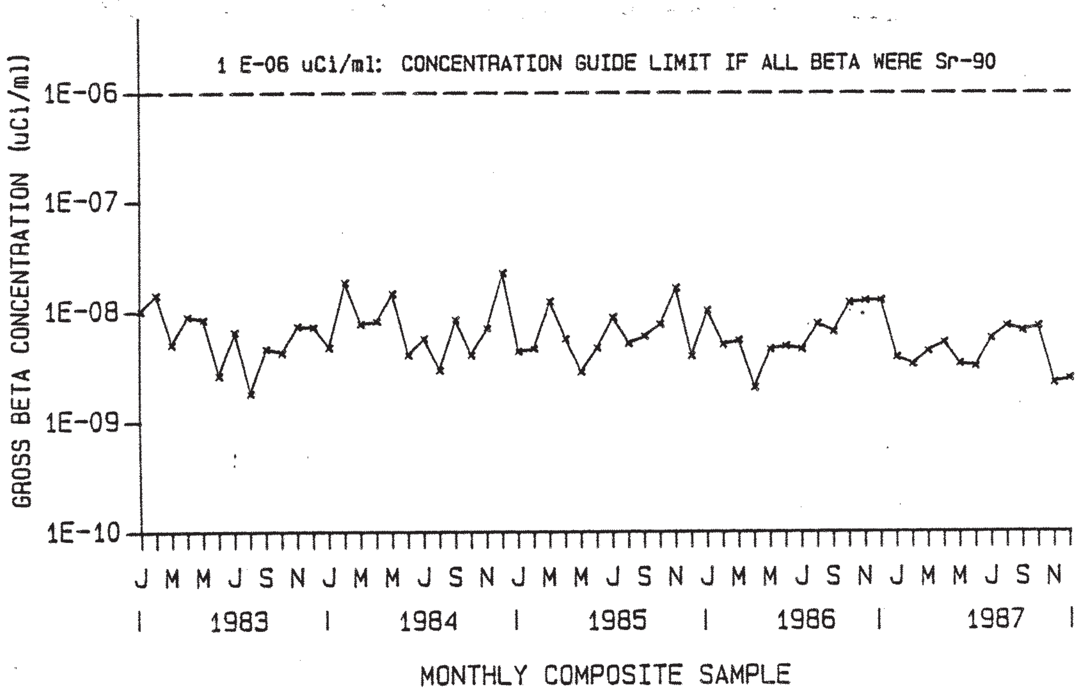

Figure 2-6. Trends of gross beta activity in surface water from Cattaraugus Creek, 1983-1987.

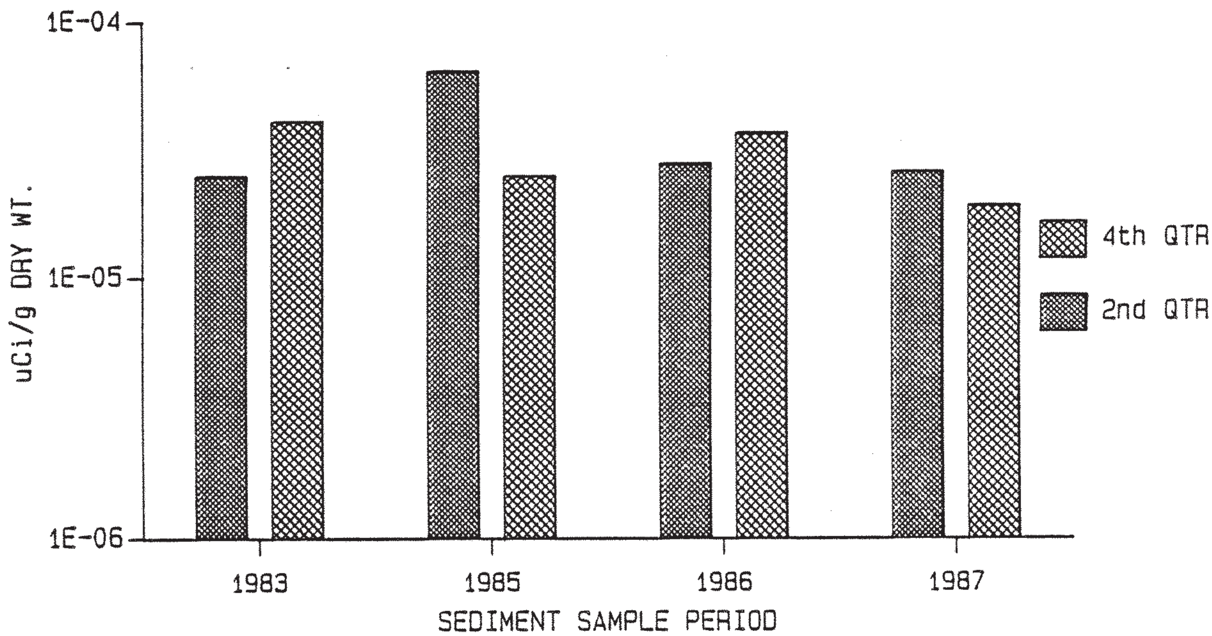

Figure 2-7. Trends of gross beta activity in sediment from Buttermilk Creek, 1983, 1985, 1986 and 1987.

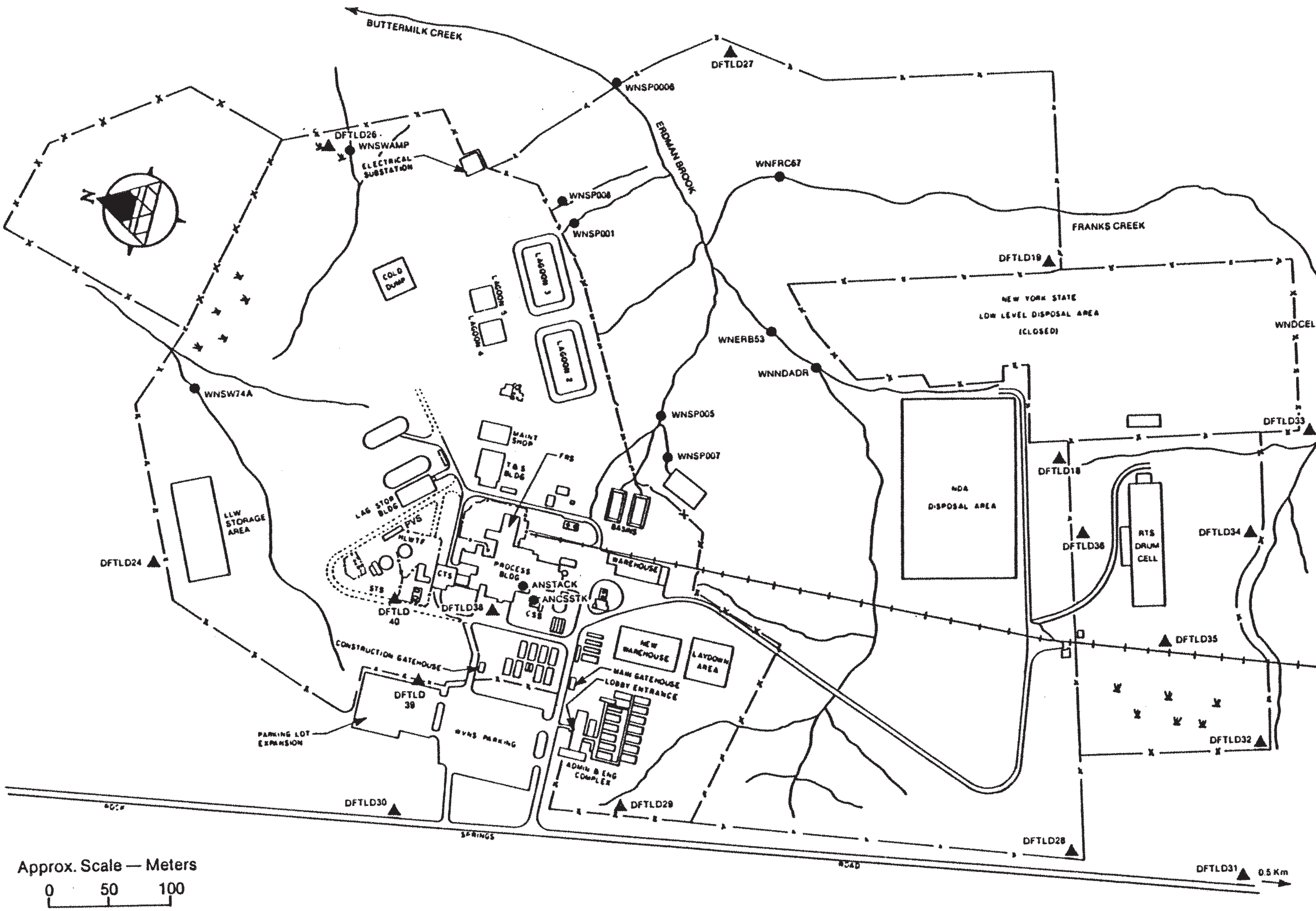

Figure 2-8. Location of Radiological Monitoring Points On-site.

2.1.3 Radioactivity in the Food Chain

Samples of fish and deer were collected both near and remote from the site during periods when they would normally be taken by sportsmen for consumption. Milk and beef from cows grazing near the site and at remote locations were also collected and analyzed during 1987. The results of these analyses are presented in Appendix C-3.

Fish samples were taken semiannually during 1987 above the Springville dam from the portion of Cattaraugus Creek which receives WNYNSC drainage (BFFCATC). Ten fish were collected from this section of the stream during each period. The Sr-90 content and gamma emitting isotopes in flesh were determined for each specimen. An equal number of fish samples (BFFCATD) were taken from Cattaraugus Creek below the dam, including species which migrate nearly 40 miles upstream from Lake Erie. These specimens were representative of sport fishing catches in the drainage downstream of the dam at Springville.

Control data provide comparisons with the concentrations found in fish taken from site-influenced drainage. For this purpose a similar number of fish were taken from waters that are not influenced by site runoff (BFFCTRL) and their edible portions were analyzed for the same isotopes. These control (natural background) samples were representative of the species collected in Cattaraugus Creek downstream from the WVDP. (Figure 2-9, Table C-3.4)

The Sr-90 concentrations in the edible flesh of all fish sampled in 1987 show a significant decrease compared to 1986 data (WVDP, 1986). At the same time, net concentrations compared to background each year since 1983 indicate a very slight, if any, trend downward for fish taken below the site drainage. The Sr-90 content in fish skeleton downstream of the site was analyzed for one sample period and appears to be the same as in the past three years (Figure 2-10). The log-normal statistical treatment of the fish data presented in Table C-3.4 is appropriate to the sample type being reported (DOE/EP-0023).

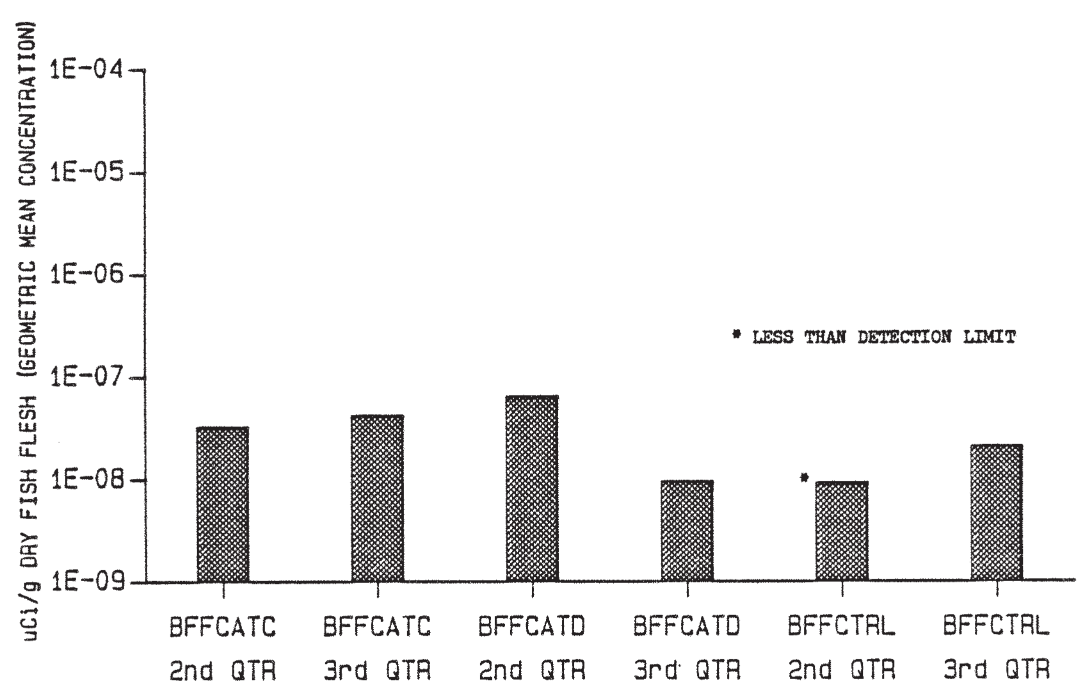

Figure 2-9. Comparison of Sr-90 in fish samples from WVDP vicinity - 1987.

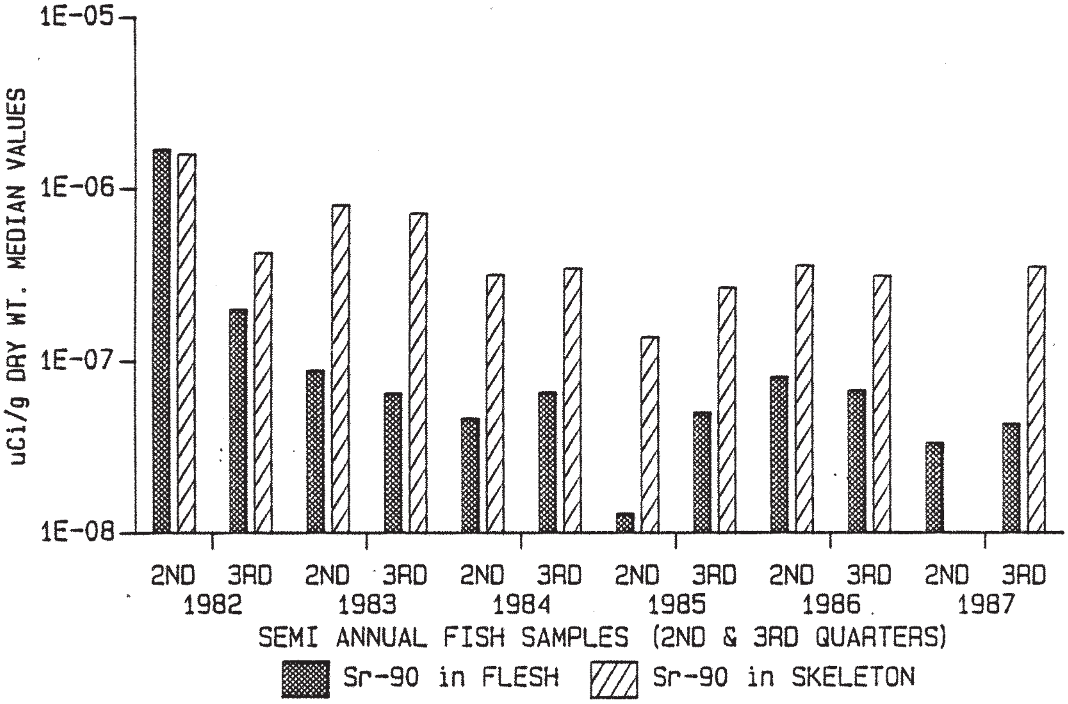

Figure 2-10. Trends of Sr-90 Concentrations in Fish from Cattaraugus Creek (BFFCATC) 1982 - 1987.

Portions were analyzed of a single deer from a resident herd on the southeast side of the WNYNSC. The concentration of Cs-137 and Sr-90 in deer flesh was a bit lower than the concentration in the previous year's sample (Figure 2-11). Data from a control, or background, deer sample collected in January 1988 from an Allegany County location 65 km southeast of the site also indicated a decrease in radioactivity, and are shown in Table C-3.2 for comparison.

The concentration of radioactivity in meat from semiannual samples of local beef animals was indistinguishable from the concentration in control samples (Table C-3.2), both showing a detectable level of isotopes associated with recent global fallout.

The dairy cattle milk sampling program continued in 1987. Besides the quarterly composite sample of the maximally exposed herd to the north (BFMREED), an additional quarterly composite of milk from a nearby herd to the northwest (BFMCOBO) and several single samples from the south (BFMWIDR), southwest (BFMHAUR), and two control herds (BFMCTRLN and BFMCTRLS) were collected. Each sample or composite was analyzed for Sr-90, H-3, I-129, and gamma-emitting isotopes (Table C-3.1). Strontium-90 in samples from near the site ranged from 1.8 to 3.0 E-9 µCi/mL (6.7 E-2 to 1.1 E-1 Bq/L) compared to the control samples at 1.5 E-9 µCi/mL (1.0 E-1 Bq/L) to 2.8 E-9 µCi/mL (5.6 E-02 Bq/L). Iodine-129 was not detected in any samples to the lower limit of detection (LLD) of 5 E-10 µCi/mL (1.9 E-2 Bq/L). Cesium-137 and other gamma-emitting fuel cycle isotopes were also not detected. Tritium was added to the analyses performed, with all results below the detection limit of 2 E-7 µCi/mL (7.4 Bq/L).

Based on the samples analyzed in 1987 (Table C-3.3), there was no detectable difference in the concentration of tritium or gamma-emitting isotopes in corn or apples grown near the site and at remote locations. Samples of apples and corn from both near the site and remote locations did not show an overall difference in Sr-90. However, hay from near the site contained Sr-90 at very low concentrations, but above those from remote samples.

Section 4 of this report discusses radionuclides present in the human food chain

	Sr-90 in FLESH	Cs-137 in FLESH
1982	4.00+/-3.0 E-09	<5.7 E-09
1983	3.60+/-0.7 E-09	2.90+/-2.1 E-08
1984	3.00+/-0.9 E-09	4.80+/-0.4 E-07
1985	2.60+/-0.4 E-09	1.80+/-0.3 E-07
1986	4.71+/-0.8 E-09	3.25+/-0.3 E-07
1987	2.73+/-0.4 E-09	6.28+/-2.7 E-08

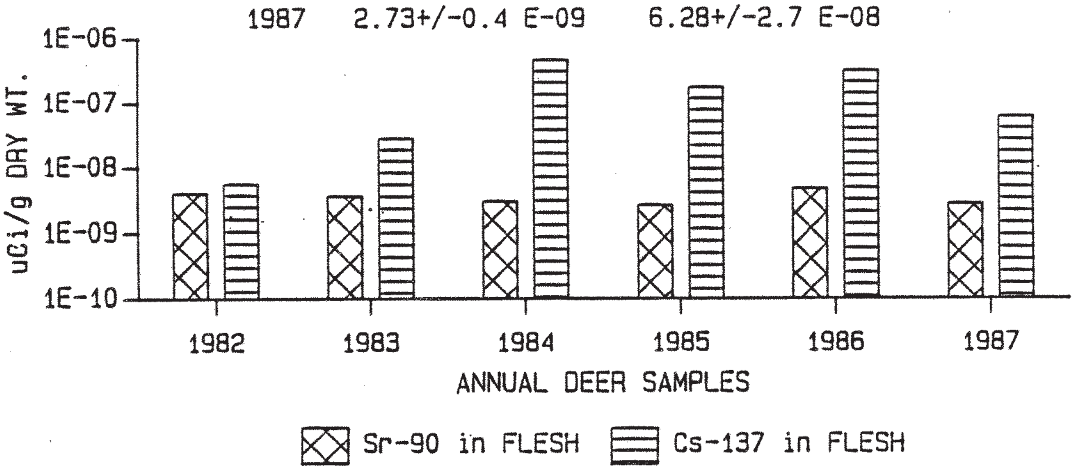

Figure 2-11. Trends of Radionuclides in Venison from Near WVDP Site (BFDNEAR) 1982 - 1987.

and assesses their contribution to the potential for radiation exposure of the public. Although the maximum concentrations of radioactivity found in some biological samples were above background levels, the potential dose associated with consumption of these samples is far below the protection standards.

2.1.4 Direct Environmental Radiation

The current monitoring year, 1987, was the fourth full year in which direct penetrating radiation was monitored at WVDP using TL-700 lithium fluoride (LiF) thermoluminescent dosimeters (TLDs) located as shown on Figures 2-1 and 2-2. The uncertainty of individual results and averages were acceptable and measured exposure rates were comparable to those of 1986. There were no significant differences in the data collected from the background TLDs (locations 17 and 23) and from those on the WNYNSC perimeter for the 1987 reporting period.

Dosimeters used to measure ambient penetrating radiation during 1987 were processed on-site. The system used Harshaw TL-700 LiF chips which are maintained solely for environmental monitoring apart from the occupational dosimetry TLDs. The environmental TLD package consists of five TLD chips laminated in a thick card bearing the location identification and other information. These cards are placed at each monitoring location for one calendar quarter (3 months) and then processed to obtain the integrated gamma radiation exposure.

Monitoring points are located around the site perimeter and access road, at the waste management units, at the inner facility fence, and at background locations remote from the WVDP site. 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 (Figures 2-12 and 2-13). During the first quarter (January through March) of 1987 the average quarterly exposure was decreased due to snow cover. The second (April to June), third (July to September), and fourth quarters (October to December) with no snow cover had a higher quarterly average. With below-average rainfall and little snow cover, the fourth quarter average was comparable to the second quarter. Therefore, seasonal variation from rainfall and snow cover did not affect ambient penetrating radiation measurements around the site as much as in 1984 and 1985 (Figure 2-14).

Presumably because of their proximity to the LLW disposal area, the dosimeters at locations 18 and 19 showed a small elevation in radiation exposure compared to the WNYNSC perimeter locations. Location 25, on the public access road through the site north of the facility, also showed a small elevation above background due to the storage of decontamination wastes near location 24 within the site security area.

Location 24 on the north security fence, like locations 18 and 19, is not included in the environmental monitoring program; however, it is a co-location site for a U.S. Nuclear Regulatory Commission (USNRC) TLD (Table D-1.7). This point received an average exposure of 0.83 milliroentgen per hour during 1987. This exposure is primarily attributable to the nearby storage of sealed containers of radioactive components and debris from plant decontamination efforts. The storage area is well within the WNYNSC boundary (as are locations 18 and 19) and not readily accessible to the public. TLD locations 26 through 36 are located along the Project Security Fence, forming an inner ring of monitoring around the facility area. TLDs 37 through 40 were added in 1987 to monitor a third background location and to cover waste management units and site sources more effectively.

2.2 Nonradiological Monitoring

West Valley Demonstration Project effluents are regulated for nonradiological parameters by the New York State Department of Environmental Conservation (NYSDEC). Stationary sources of atmospheric pollutants are authorized by either a permit to construct or a certificate to operate. Liquid effluents are monitored as a requirement of the State Pollution Discharge Elimination System (SPDES) permit issued and enforced by NYSDEC.

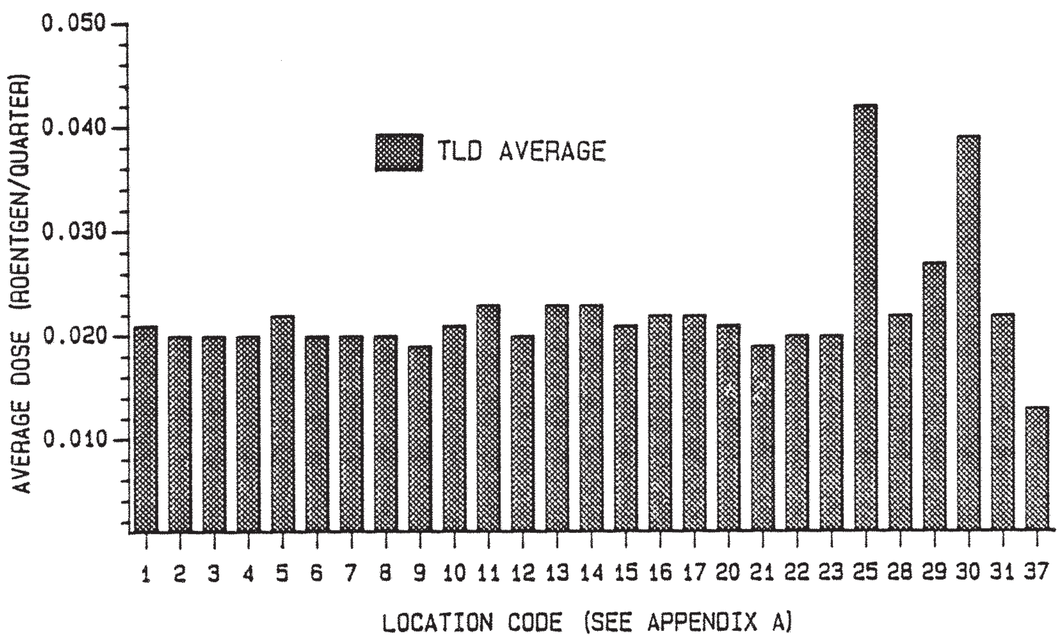

Figure 2-12. Average quarterly gamma exposure rates around WVDP - 1987.

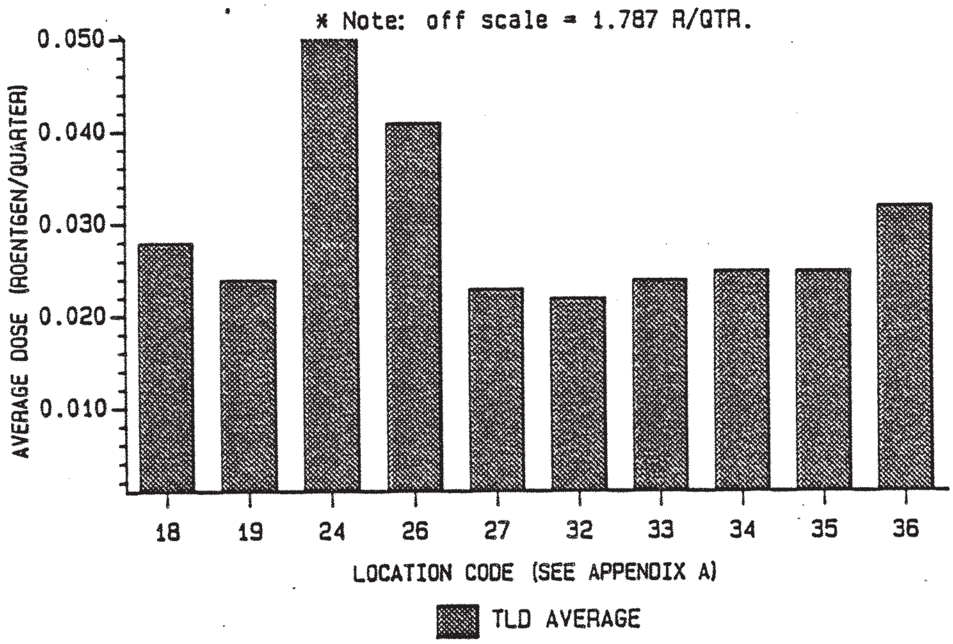

Figure 2-13. Average quarterly gamma exposure rates on-site - 1987.

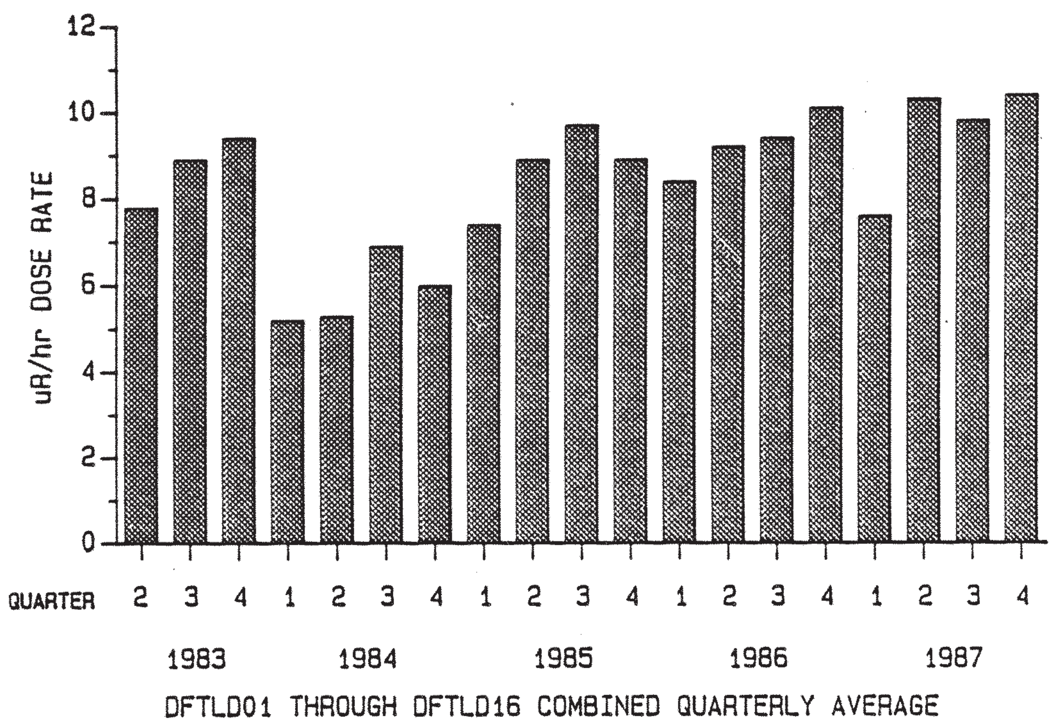

Figure 2-14. Trends of environmental gamma radiation levels, quarterly averages of 16 perimeter TLDs.

2.2.1 Air Discharges

The WVDP presently holds six certificates to operate stationary sources and one permit to construct a new source of airborne effluents. These permits are for minor sources of regulated pollutants such as particulates, nitric acid mist, and oxides of nitrogen. Monitoring these parameters is not required because of their insignificant concentrations and small mass discharge.

The individual air permits held by the WVDP are identified and described in Table C-5.1.

2.2.2 Liquid Discharges

The WVDP holds a SPDES permit which identifies the outfalls where liquid effluents are released to Erdman Brook (shown in Figures 2-15 and C-5.1) and which specifies the sampling and analytical requirements for each outfall. This permit was renewed in a substantially modified form in 1985 and 1987 is the second full year of operation under these requirements.

Three outfalls are identified on the permit: outfall 001, discharge from the low level waste treatment facility; outfall 007, discharge from the sanitary and utility effluent mixing basin; and outfall 008, effluent from the french drain on the perimeter of the low-level waste treatment facility storage lagoons. The conditions and requirements of the current new SPDES permit are summarized in Table C-5.2.

The most significant features of the SPDES permit are requirements to report data as flow-weighted concentrations and to apply a "net" discharge limit for iron. The net limit allows for subtraction of incoming (background) amounts of iron from the values reported in the Project effluent. The flow-weighted limits apply to the total discharge of Project effluents but allow maximum credit for dilute waste streams in determining compliance with effluent concentration limits specified in the permit.

2.2.3 Results

The SPDES monitoring data are displayed in Figures C-5.2 through C-5.23. Generally, these data indicate that Project effluents were within permit limits. However, the WVDP reported a total of 19 noncompliance episodes. These are discussed in Appendix C-5.

2.3 Pollution Abatement Projects

During 1987 the WVDP had four ongoing pollution control and abatement projects. Two of these continuing projects are preparation of a Preliminary Assessment and a Site Investigation of the WVDP premises under the requirements of RCRA and CERCLA. Revising and updating the WVDP Spill Prevention, Control and Countermeasures Plan is the third project and installation of a flow surge tank at the sewage treatment plant is the fourth. The latter project is scheduled for construction in spring 1988.

2.4 Closure of Landfill

Closure of the on-site nonradioactive construction and demolition debris landfill was accomplished in August 1986, although this facility had been removed from active service in 1985. The site was closed in accordance with New York State Department of Environmental Conservation (NYSDEC) requirements for construction and demolition debris landfills following a closure plan (Standish, 1985) approved by NYSDEC. Routine inspection and maintenance of the closed facility was performed in 1987 as specified by the closure requirements. These activities included checking areas for proper drainage (i.e., no obvious ponding or soil erosion) and cutting the grass planted on the soil and clay cap. Should more extensive maintenance or repair be necessary, it will be described in detail in future environmental reports.

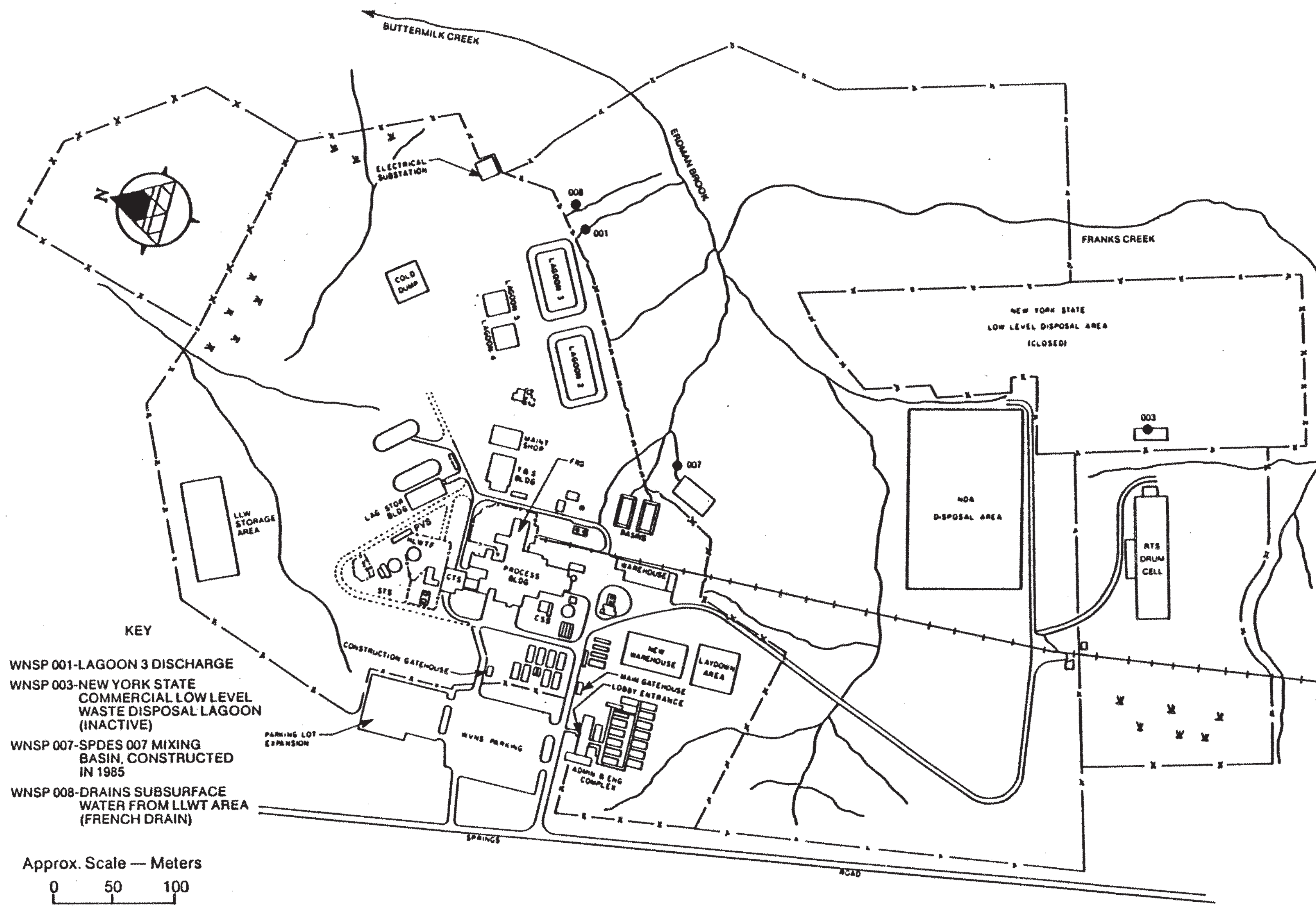

Figure 2-15. Locations of SPDES Monitoring Points On-site.