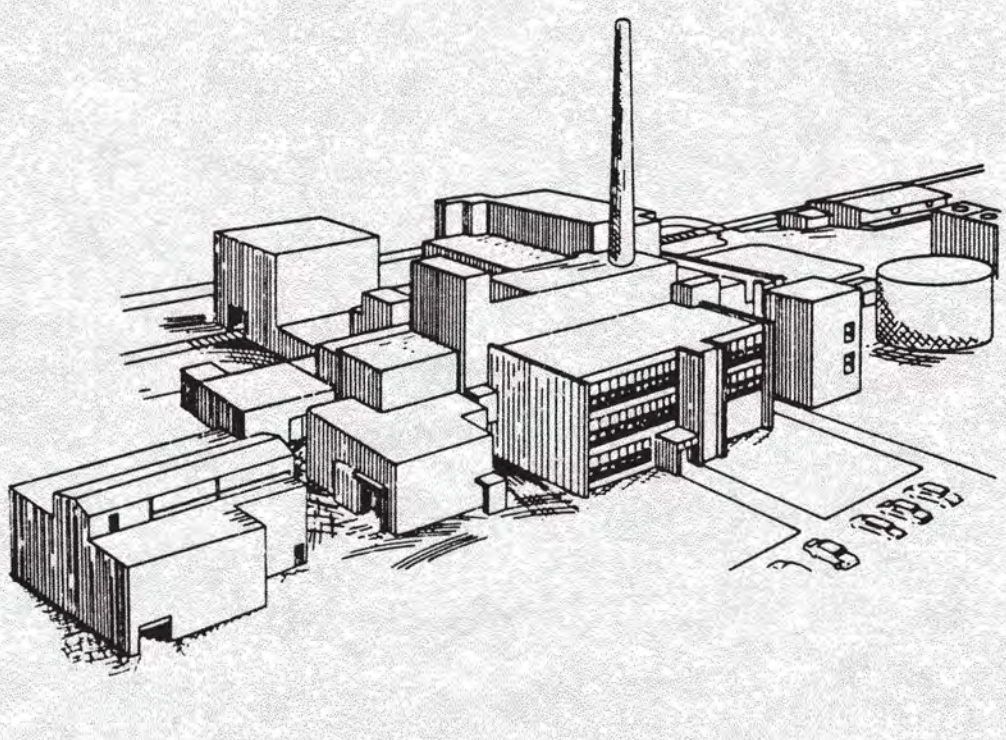
WVDP-040

1985 ENVIRONMENTAL MONITORING REPORT WEST VALLEY DEMONSTRATION PROJECT

March 1986

West Valley Nuclear Services Company, Inc.



1985

ENVIRONMENTAL MONITORING REPORT

WEST VALLEY DEMONSTRATION PROJECT

March, 1986

Operated for the U.S. Department of Energy

by

West Valley Nuclear Services Company, Inc.

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West Valley, New York 14171-0191

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1.0 INTRODUCTION

This report is submitted in accordance with DOE Order 5484.1 and presents a summary of environmental monitoring data collected at the West Valley Demonstration Project (WVDP) from January 1, 1985 through December 31, 1985 to meet the requirements of Technical Specification 5.1. The program implemented by West Valley Nuclear Services Company provided data in compliance with DOE guidelines and recommendations for calendar year 1985.

On February 26, 1982, the responsibility for operation and maintenance of the former Nuclear Fuel Services, Inc. (NFS) reactor fuel reprocessing facility was transferred to the Department of Energy (DOE). Public Law No. 96-368, enacted in 1980, mandated the demonstration of technology for solidification of the 2.2 million litres (580,000 gallons) of liquid high-level radioactive waste that were produced by commercial fuel reprocessing at the West Valley plant and are now held in underground storage tanks at the facility. The DOE selected West Valley Nuclear Services Company (WVNS) as the contractor to implement the provisions of this law.

When WVNS assumed operational control, NFS was conducting an environmental monitoring program appropriate to the shutdown maintenance operating status of the facility in accordance with Technical Specification 5.1 under NRC License CSF-1. WVNS recognized that the NFS program required substantial change in order to prepare for the high-level waste solidification operations currently scheduled for start-up in September 1988. Accordingly in 1982, WVNS began to implement a full-scale environmental surveillance program in support of these planned operations and by early 1985 had fully implemented this program. As recommended in DOE Order 5484.1, Chapter III, Paragraph 1, this program to date has provided more than two years of preoperational environmental baseline data before solidification operations begin.

A comprehensive Environmental Evaluation (EE) was published in June, 1984 to initiate the decision-making process for disposal of Project low-level radioactive waste (LLW). The intent of the Project is to phase out the methods used by NFS and replace them with state-of-the-art engineered disposal technology. Based on the review of the EE by the Department of Energy Headquarters and the Idaho Operations Office, the Project staff was directed to assist the DOE with the preparation of an Environmental Assessment which analyzed alternative disposal options more thoroughly than was appropriate in the EE. The review draft of the EA was published in September 1985, and finally issued in February 1986. A decision is expected in April 1986.

Although the reprocessing plant is not now being used for its original purpose, it is being maintained in shutdown status. This requires continual operation of basic services, including low-level radioactive waste management. The facility operation includes periodic disposal of solid radioactive waste from decontamination and maintenance activity (plant wastes) in the formerly licensed disposal area. Liquid wastes resulting from plant activities are processed on-site at the low-level waste treatment facility (LLWT) prior to discharge.

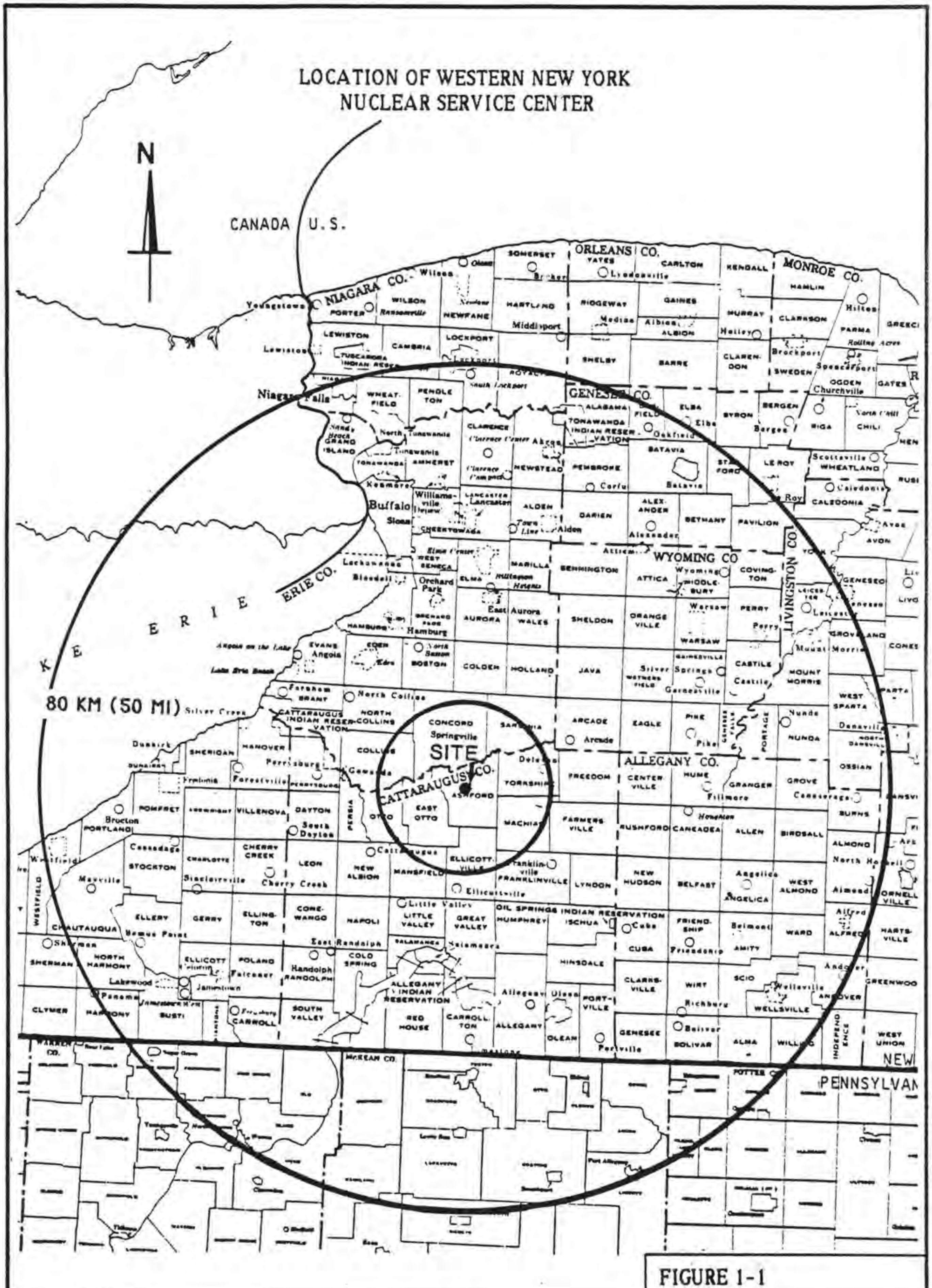
The WVDP site is located in a rural setting approximately 50 km (30 mi) south of Buffalo, New York (Figure 1-1), at an average elevation of 400 m (1,300 ft) on New York State's western plateau. The plant facilities used by the Project occupy approximately 63 hectares (156 acres) of chain-link fenced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

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

The average annual temperature in the region is 7.2°C (45.0°F) with recorded extremes of 37°C (98.6°F) and -42°C (-43.6°F). Rainfall is relatively high, averaging about 104 cm (41 in) per year. Precipitation is evenly distributed throughout the year and is markedly influenced by Lake Erie to the west and Lake Ontario to the north. All surface drainage from the WNYNSC is to Buttermilk Creek which flows into Cattaraugus Creek and ultimately into Lake Erie. Regional winds are predominantly from the west and south at over 4 m/sec (9 mi/hr) during most of the year.

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

The geology of the site is characterized by glacial deposits of varying thickness in the valley areas, underlain by sedimentary rocks which are exposed in the upper drainage channels in hillsides. The soil is principally silty till consisting of unconsolidated rock fragments, pebbles, sand, and clays. There is an aquifer in the upper 6 m (20 ft) of granular fluvial materials concentrated near the western edge of the site; high ground to the west and the Buttermilk Creek drainage to the east intersect this aquifer, precluding off-site continuity. Several shallow, isolated, water-bearing strata also occur at various other locations within the site boundary but do not appear to be continuous. The zone at which the till meets bedrock forms another aquifer that ranges in depth from 2 m (6 ft) underground on the hillsides to 170 m (560 ft) deep just east of the boundary of the facility exclusion area.



LOCATION OF WESTERN NEW YORK NUCLEAR SERVICE CENTER

FIGURE 1-1

2.0 SUMMARY

In most environmental media collected from the Project environs, radionuclide concentrations could not be distinguished from radioactivity which occurs naturally or has been deposited from weapons testing. Radioactivity levels in surface water and in fish directly downstream of the Project appeared slightly lower relative to background concentrations than those of previous years. The content of radioactivity in venison from a deer collected near the plant (inside the WNYNSC) was comparable to levels in samples from the past several years. Although small amounts of radioactivity were discharged during the course of Project activities, radioactivity levels in air and water effluents were well within the concentration guides of DOE Order 5480.1, Chapter XI. A total of 0.00082 curies of particulate radioactivity was discharged to the air, and 0.044 curies of radioactivity (excluding 3.7 curies of tritium as tritiated water) were released to Buttermilk Creek. The resultant collective and individual dose estimates to the surrounding population from these releases imply negligible consequences with regard to impacts on human health.

The maximum hypothetical effective dose equivalent an off-site individual at the nearest residence could have received via the air pathway in 1985 from WVDP activities is about 0.01% of the 40 CFR 61 protection standard of 25 mrem/year. The collective population dose to persons living within 80 km (50 mi) of the site was estimated to be 0.15 person-rem. This is equivalent to an average individual dose of 0.00009 millirem as compared to approximately 100 millirem received from natural sources.

Concentrations of particulate radioactivity in air measured at the site boundary were no different than those reported from New York State Department of Health background samples for 1982 and 1983 (the 1984 NYS data were not available), or from background samples collected by the Project in 1985. Samples of water obtained off-site from Cattaraugus Creek (which receives Buttermilk Creek drainage from the entire site) contained three detectable man-made isotopes: tritium, cesium-137 and strontium-90. Buttermilk Creek is not used as a drinking water supply for humans, but the water is accessible to dairy cattle at one location on the creek downstream of the site. Radionuclide concentrations in milk samples from this herd were at or below background levels for all fuel-cycle isotopes. Thermoluminescent dosimeters placed around the WNYNSC perimeter indicated that direct external radiation exposure was within the range expected from natural background in this region and was statistically the same as background measurements at remote locations.

With one exception, no significant increase in radioactivity over previous years' levels was observed in groundwater monitoring wells on-site and off-site around the perimeter of the site. Special surface and groundwater monitoring initiated in December 1983 demonstrated that radioactivity associated with organic material (kerosene/tributyl phosphate) which had migrated to a disposal area monitoring well was confined to that immediate area and did not appear in surface water. Continued monitoring in 1985 confirmed that both the source of this groundwater contamination and effluents from activities designed to eliminate the source remained within the controlled area, and were not identified in adjacent wells or surface runoff water.

Chemical water quality measurements indicated no discharges which would have adversely affected the receiving waters. During 1985, several water quality measurements exceeded the permit limits at the discharge point, but upgraded waste treatment facilities are now in place and new permit conditions have been imposed. This has resulted in a marked decline in the number of excursions for parameters controlled by these systems.

3.0 ENVIRONMENTAL MONITORING PROGRAM - DESCRIPTION AND RESULTS

This report reflects some of the changes in the environmental monitoring network which have been implemented in the past three years to provide an enhanced level of environmental surveillance in anticipation of high-level waste solidification activities. The surveillance program as implemented in 1984 was operated throughout 1985 (including effluent, on-site, and off-site monitoring). This program is summarized in tabular form in Appendix A-1. A number of monitoring points have been added to the projected 1986 program to define more clearly the effects, if any, of several new project activities scheduled for the near future (see Appendix A-2).

The major pathways for off-site movement of radionuclides are by surface runoff and airborne transport. The environmental monitoring program therefore emphasizes the collection of air and surface water samples. The ingestion and assimilation of radionuclides by game animals and fish that include the WNYNSC in their range is another potentially significant pathway which is monitored by collection and analyses of appropriate specimens.

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 3.2 summarizes nonradiological monitoring in 1985 and Appendix C-5 provides greater detail on these activities.

3.1 Radiological Monitoring

Air, water, and selected biological media were sampled and analyzed to meet Department of Energy and plant Technical Specification monitoring requirements. To provide appropriate reference parameters, several additional sampling points were added in 1985 in support of project activities as they became operational (see Appendix A-1).

3.1.1 Radioactivity in Air

In 1985, airborne particulate radioactivity was collected continuously by four perimeter air samplers at locations shown in Figure 3-1 and by three remote samplers. The concentrations measured at each of these stations are given in Tables C-2.2.1 through -2.2.7. Three of the perimeter air samplers, mounted on 4-metre high towers, maintain an average air flow of about 40 litres/min (1.5 ft^3/min) through a 47 mm glass fiber filter. During 1984 the fourth perimeter air sampler was added on Rock Springs Road 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 3-1), and the three remote samplers were located in Great Valley, Springville, and West Valley (Figure 3-2). Concentrations measured at Great Valley (AFGRVAL) are considered to be representative of natural background. These four new samplers operate with the same air flow rate as the three mounted on towers, but the sampler head is at 1.7 metres above the ground (the height of the average human breathing zone). 1985 was the first full year of operation for the four samplers sited in 1984.

The filters 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 concentrations ranged from 9.1 E-15 to 5.9 E-14 microcuries per millilitre (uCi/ml) of beta activity, and 3.8 E-16 to 3.2 E-15 uCi/ml of alpha activity. Additionally, quarterly composites consisting of 13 weekly filters from each sample station were analyzed. Cs-137 was detected in 5 samples, including two from the background station at Great Valley. Sr-90 was detected in 18 of the 28 samples, including 2 of 4 from the background station. The highest concentrations measured were 0.0002% and 0.002% of the concentration guides listed in DOE Order 5480.1 for releases to uncontrolled areas for Cs-137 and

Sr-90 respectively. None of the measured concentrations were statistically larger than background at the 99% confidence level.

In all cases, the measured monthly gross activities were below 2 E-12 uCi/ml beta, and 2 E-14 uCi/ml alpha, the most limiting DOE concentration guides for any of the isotopes present at WVDP. (The standards and concentration guides for radionuclides of interest at West Valley from DOE Order 5480.1 are reproduced as Appendix B.) Results of the analyses of perimeter air sample filters are presented in Appendix C-2. For comparison, the 1982 and 1983 data from the New York State Department of Health indicated a normal background concentration of gross beta activity in air which averaged 2 E-14 uCi/ml in Albany, New York (Huang, 1984). Annual data for the three samplers which have been in operation since 1983 are compared in Figure C-2.2. The values average about 1.8 E-14 uCi/ml of gross beta activity in air, with no apparent trend. The annual average gross beta concentration at the Great Valley background station was 1.9 E-14 uCi/ml in 1985.

At four perimeter locations, three of which coincide with air samplers, fallout is collected in open pots. The data from these collections also are presented in Appendix C-2, Table C-2.3.

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 of Appendix C-2. The results of analyses for specific radionuclides in the four quarterly composites of stack effluent samples are also listed in Table C-2.1.

The main ventilation stack (ANSTACK) sampling system was modified in mid-1984 by adding an alpha monitor and a new isokinetic sampling head. 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 in-cell decontamination activities within the facility (Figure C-2.1). Even at this point of discharge, average radioactivity levels were still below the concentration guides for airborne radioactivity in an unrestricted area.

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.

In November of 1985 a sampling system similar to the main stack system was put on-line to monitor the cement solidification system ventilation stack (ANCSSTK). Based on analyses of the weekly samples, no detectable radioactivity was discharged from this point in 1985. Two other facilities are routinely monitored for airborne radioactivity releases. These are the Low-Level Waste Treatment (LLWT) facility for radioactive water treatment, and the contaminated clothing laundry. The total amount of radioactivity discharged from both of these facilities is 1% of the airborne radioactivity released from the site, and is not significant in dose calculations.

3.1.2 Radioactivity in Surface Water and Sediment

Four automatic samplers collect surface water at points along the site drainage channels. One of these is located off-site, beside Cattaraugus Creek at Felton Bridge just downstream of the confluence with Buttermilk Creek, the major surface drainage from the WNYNSC (Figure 3-1). This sampler (WFFELBR) continuously removes a small volume of water (approximately 400 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. A grab sample taken monthly from a background location at Cattaraugus Creek upstream of the Buttermilk Creek confluence (WFBIGBR) is analyzed for gross alpha, beta, and tritium. The most elevated concentrations in samples from Cattaraugus Creek during 1985 show Sr-90 to be less than

2.5 percent of the concentration guide for release to an unrestricted area. Gross alpha and gamma emitting isotopes were so low as to be below the detection limit in Cattaraugus Creek water for 7 of 12 and 11 of 12 months respectively (Table C-1.6) On the average, however, the concentration of gross beta radioactivity in Cattaraugus Creek increases detectably after Buttermilk Creek joins it. A comparison of monthly gross beta activities for three years is presented in Figure C-1.2.

Three surface water monitoring stations in addition to the Cattaraugus Creek sampler are in service upstream of the Buttermilk Creek/Cattaraugus Creek confluence. These samplers currently operate in a time composite mode, collecting a 2.5 ml aliquot every half-hour. At each station the composite samples are collected biweekly, composited monthly, and analyzed for tritium, gross alpha, and gross beta radioactivity. A quarterly composite of the biweekly collection is analyzed for gamma-emitting isotopes and Sr-90. These installations collect water from an upstream background location on Buttermilk Creek (WFBCBKG) and a downstream location at Thomas Corners Road near the confluence of Cattaraugus Creek (WFBCTCB). The third station (WNSP006) is on Franks Creek (also known as Erdman Brook) just upstream of the point where Project site drainage leaves the security area (Figure 3-3). Radiological concentration data from these sample points show that average gross radioactivity concentrations are generally higher in Buttermilk Creek below the WVDP site than above, presumably because of the small amount of activity from the site which enters via Franks Creek. The range of gross beta activity, for example, was <9.4 E-10 to 6.3 E-9 uCi/ml upstream in Buttermilk Creek at Fox Valley (WFBCBKG) and from 4.3 E-9 to 1.7 E-8 uCi/ml in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB).

Sediments from Buttermilk Creek and Cattaraugus Creek were analyzed for gross activity, Sr-90, and for gamma-emitting isotopes. The results are comparable to previous analyses during 1983 and 1984. Data for 1985 are presented in Table C-1.10. A comparison of 1983 and

1985 gross beta activity in sediment from Buttermilk Creek is presented in Figure C-1.3. Data for 1984 were not available.

The largest single source of radioactivity released to surface waters is the discharge from the low-level waste treatment system through the Lagoon 3 weir (WNSP001, Figure 3-3) and into Erdman Brook. There were four batch releases (a total of about 34.8 million litres) from Lagoon 3 in 1985. The effluent was grab sampled daily during the 22 days of release and analyzed. The total amounts of activity in the effluent are listed in Table C-1.1. Of the activity released from Lagoon 3, 3.6% of tritium and 4.2% of other gross radioactivity originated in the New York State disposal area (based on measurements of water transferred in 1985 from the state area to the LLWT) and not from previous or current Project operations (see Table C-1.11).

3.1.3 Radioactivity in the Food Chain

Samples of fish and game animals 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 1985. The results of these analyses are presented in Appendix C-3.

Fish samples were taken semiannually during 1985 above the Springville dam from the portion of Cattaraugus Creek which receives WNYNSC drainage (BFFCATC, see Table C-3.4). Nine fish were collected from this section of the stream during each period. The Sr-90 content in flesh and skeleton, and gamma emitting isotopes in flesh were determined for each specimen.

Control data (BFFCTRL and BFFBCFV) are included in this report to permit comparison 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 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. The concentrations of strontium-90 in the edible flesh in 1985 show a slight decrease compared to 1984 data (WVNS, 1984). The Sr-90 content in the skeleton continued the downward trend from previous measurements during recent years (Figure C-3.2). The log-normal statistical treatment of the fish data presented in Table C-3.4 is specified by the site reporting requirements.

Portions of a single deer from a resident herd on the east side of the WNYNSC were analyzed. The concentration of cesium-137 and Sr-90 in deer flesh was a bit lower than the concentration in the previous year's sample (Figure C-3.3). Data from a control, or background, deer sample collected in 1985 from an Alleghany County location 40 km from the site 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).

Although the dairy cattle sampled monthly in 1985 reside adjacent to the site and receive the maximum exposure of any dairy herd, the concentration of Sr-90 in quarterly composites of milk ranged only from 1.7 to 3.3 pCi/l (see Table C-3.1). Sr-90 in single milk samples collected in 1985 from two other dairy farms near the site measured 4.35 and 3.19 pCi/l. Iodine-129 and gamma emitting isotopes were not detectable in any milk samples. The annual control milk sample from the Albany, New York area, provided under a cooperative agreement by the New York State Department of Health laboratory and analyzed by WVDP, showed a concentration of 2.9 pCi/l of Sr-90 in 1984, and 0.7 pCi/l in 1985.

Based on the samples analyzed in 1985 (Table C-3.3), there was no detectable difference in the radioactivity of corn grown at near-site and remote locations. The near-site sample was collected at the

AFTCORD site (Figure 3-1). The background sample was collected at the BFBCTRL point (Figure 3-2).

In Section 4 of this report, radionuclides present in the human food chain are discussed and their contribution to the radiation exposure of the public is assessed. Although the maximum concentrations of radioactivity found in some biological samples were above background levels, the dose associated with consumption of these samples would be far below the protection standards.

3.1.4 Direct Environmental Radiation

1985 was the second complete year in which direct penetrating radiation monitoring at WVDP relied solely on TL-700 LiF thermoluminescent dosimeters (TLDs). The uncertainty of individual results and averages were acceptable and measured exposure rates were comparable to those of 1983. Exposure rates measured during 1984 tended to be somewhat lower on the average than the 1983 or 1985 values (see Figure C-4.3). There were no significant differences in 1985 readings from the background TLDs (locations 17 and 23) and those on the WNYNSC perimeter (see Figure 3-1 for TLD perimeter locations).

Dosimeters used to measure ambient penetrating radiation during 1985 were processed on-site. The system used Harshaw TL-700 lithium fluoride chips which are maintained apart from the occupational dosimetry TLDs as a select group solely for environmental monitoring. The environmental TLD package consists of five TLD chips laminated in a thick card bearing the I.D. 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, as shown on Figures 3-1 and 3-2, around the site perimeter and access road, at the waste disposal area, and at background locations remote from the WVDP site. Appendix C-4 provides a summary of the results for each of the 25 locations by calendar quarter along with averages for comparison.

The quarterly averages and individual location results show differences due to seasonal variation in snow cover. During the first quarter (January through March) of 1985 the average quarterly exposure decreased due to snow cover. The second quarter (April to June) average was also low due to snow cover and spring rains. The third quarter of 1985 (July to September), with no snow cover and low rainfall, had the highest quarterly average. Moderate rainfall and snow cover in the fourth quarter (October to December) decreased the quarterly average to a level comparable to the second quarter. These data indicate that seasonal variation due to rainfall and snow cover has a significant effect on ambient penetrating radiation measurements around the WVDP site, as was noted in 1984 (Figure C-4.3).

Presumably because of their proximity to the LLW disposal area, the dosimeters at two locations which are not part of the off-site monitoring program (18 and 19 on Figure 3-1) showed a small increase 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 increase due to the storage of decontamination wastes near location 24 later in the year.

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-1.4). This point received an average exposure of 0.75 milliroentgen per hour during the last quarter of 1985. This exposure is primarily attributable to the nearby storage of sealed containers of radioactive components and debris from plant decontamination efforts. This point is well within the WNYNSC boundary (as are 18 and 19) and not readily accessible to the public.

3.2 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.

3.2.1 Air Discharges

The WVDP presently holds 5 certificates to operate stationary sources and 2 permits to construct new sources 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.

3.2.2 Aqueous Discharges

The WVDP holds a SPDES permit which identifies the outfalls where liquid effluents are released (shown in Figure C-5.1) to Erdman Brook and specifies the sampling and analytical requirements for each outfall. During 1985, this permit was renewed in a substantially modified form. Prior to September 1, 1985 the permit listed six outfalls, each with specific monitoring requirements. These permit conditions are described in Table C-5.2.

The new SPDES permit became effective on September 1, 1985. This permit eliminated two in-process monitoring points and the outfall where Erdman Brook leaves the controlled area of the site (WNSP006). Added to the permit is the french drain outfall near the low-level waste treatment lagoons. These changes were made to include only outfalls discharging to Erdman Brook.

The new permit also includes initial and final requirements. The initial requirements identify monitoring requirements and limits for separate outfalls from the sewage treatment plant and utility room, whereas the final requirements allow for combining these waste streams into a new outfall. The conditions and requirements of the new SPDES permit are summarized in Table C-5.3.

The most significant features of the new SPDES permit are a requirement to report data as flow weighted concentrations and the application of 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.

3.2.3 Results

The SPDES monitoring data are displayed in Figures C-5.2 through C-5.15. Generally, these data indicate that Project effluents were within permit limits. However, the WVDP reported a total of 21 noncompliance episodes. These are discussed in Appendix C-5.

3.2.4 Pollution Abatement Projects

During 1985 the WVDP completed construction of two pollution abatement projects, a new sewage treatment plant and an effluent mixing basin. These projects were necessary to bring WVDP effluents within the SPDES permit limits as mandated by a NYSDEC consent order.

The sewage treatment facility provides extended aeration (biological) treatment for an average flow of 10,000 gallons of raw sewage per day. This plant is sized to accommodate the increased work force at the WVDP and produce an effluent of acceptable pH and BOD concentration.

The second project is the utility room (SPDES outfall 005) and sewage treatment plant (SPDES outfall 004) effluent mixing basin, which is now identified as SPDES outfall 007. This mixing basin eliminates slug discharge of particulate laden backflush water from the plant's intake water clarifier, and mixes pure clarifier overflow water with effluent from the sewage treatment plant. The resulting effluent has less impact on Erdman Brook because it is continuous, thereby preserving the stream bed during periods of low flow, and is lower in concentration of iron, suspended solids and BOD.

3.3 Groundwater Monitoring

3.3.1 Hydrology of the Site

The hydrogeology of the WVDP site has been and continues to be extensively investigated. Appendix E provides a simplified but accurate synopsis of the site geology and the pathways for contaminant migration through this geologic system. A generalized east-west cross-section through the site is depicted in Figure 3-5.

3.3.2 Groundwater Monitoring

A program of sampling groundwater both on the Project site as well as from wells at residences around its perimeter was carried out in 1985. The shallow wells in this program fall into four groups:

1. A group of dug shallow wells installed north of and immediately surrounding the main plant building were monitored for several years before Project start-up and are therefore used for reference to examine long-term trends.

2. The U.S. Geological Survey (USGS) series 80 wells form an outer ring around the facility dug wells.

3. The USGS series 82 wells are grouped around the formerly-licensed disposal area. Selected series 75 wells also fall into this category.

4. Private wells around the perimeter are used for drinking water by site neighbors (half of these are sampled each year).

Appendix A gives more information on sampling requirements and on the location of these wells (shown in Figures A-3, A-5 and A-6). Appendix C-1 summarizes results of the radiological analyses of samples from the wells (Tables C-1.7, -1.8, and -1.9). Except for those on-site wells that historically show localized contamination, there was no indication of fuel-cycle isotopes in these wells. One well, WNW824A1, (see Figure A-3 for location near west corner of disposal area), has demonstrated a rise in tritium concentration over the past two years. During well construction it was thought that this well was in an area of permeable backfill near a disposal trench, and the increasing tritium concentrations support this hypothesis. Increases in the gross activity in shallow wells near the now-closed Lagoon 1 (wells B, D and G, Figure A-3) are thought to be transient and are attributed to the localized disturbances from excavation and movement of heavy machinery while Lagoon 1 was being closed. The tritium concentration in well J-5 appears to have peaked in the spring of 1985 and is within the range of past measurements. A small increase in tritium concentration in wells WNW821A and B in the fall of 1985 was noted and will be compared to future measurements to determine if a trend is developing.

In order to monitor more effectively several specific on-site areas which have the potential for radiological and nonradiological ground water contamination, a more comprehensive ground water monitoring program has been approved by DOE for implementation in 1986. The intent of the program is to add to the existing network those parameters and locations which would demonstrate full compliance with the technical requirements of RCRA (Resource Conservation and

Recovery Act) as called for by DOE Order 5480.2. Procedural compliance with techniques designed for nonradiological contaminant evaluation will be a major consideration in sample collection, analysis and quality control for the nonradiological as well as the radiological aspects of the proposed, expanded ground water monitoring plan.

3.4 Special Monitoring

In November of 1983, contamination was encountered in a recently drilled USGS series 82 ground water monitoring well near the formerly licensed NFS solid radioactive waste disposal area. In the samples analyzed, the organic contaminant contained concentrations of alpha emitters on the order of 10^{-5} uCi/ml and beta/gamma emitters at about 10^{-4} uCi/ml. This led to an extensive examination of ground and surface water near that location. Samples were collected from closely spaced sampling wells and surface streams adjacent to the suspect area. Although subsequent evaluations and test borings did confirm the subsurface presence of a contaminated organic fluid, monitoring of surface water and wells adjacent to surface waters failed to show any transport away from the immediate vicinity of the disposal area. In 1985, continued monitoring of all downstream points (including more frequent sampling of drainage water immediately below the suspect area) indicated no detectable increase in radioactive contaminants. A decontamination effort initiated in 1984 continued to remove and isolate the fluid from the subsurface disposal area.

During the summer and fall of 1984, a comprehensive aerial survey of the WNYNSC including the West Valley Demonstration Project site was performed by EG&G under DOE sponsorship. Measurements utilized not only state-of-the-art gamma radiation instruments but also high resolution photography and multi-spectral scanning data. The final report is in preparation by EG&G and careful attention is being given to comparisons with previously acquired data from the same area.

Although preliminary data indicate a general reduction in overall gamma radiation around the WNYNSC, a final evaluation has not been completed, and a definitive analysis is not yet available.

A limited spill of tritiated condensate water from a tank in the waste tank farm in March of 1985 was contained within the immediate area of the incident. Samples of the spilled water contained tritium at one-tenth of the concentration allowable in restricted areas. Environmental surveillance of the spill area drainage pathways at the site security fence over several days detected a small rise in the concentration of tritium in surface water to about 0.1% of the concentration guide for unrestricted water use. This level is approximately the same as tritium concentrations in normal runoff from nearby areas not affected by the spill. Water, air and soil samples from the spill drainage area were analyzed for other nuclides and found to be indistinguishable from background samples taken previously.

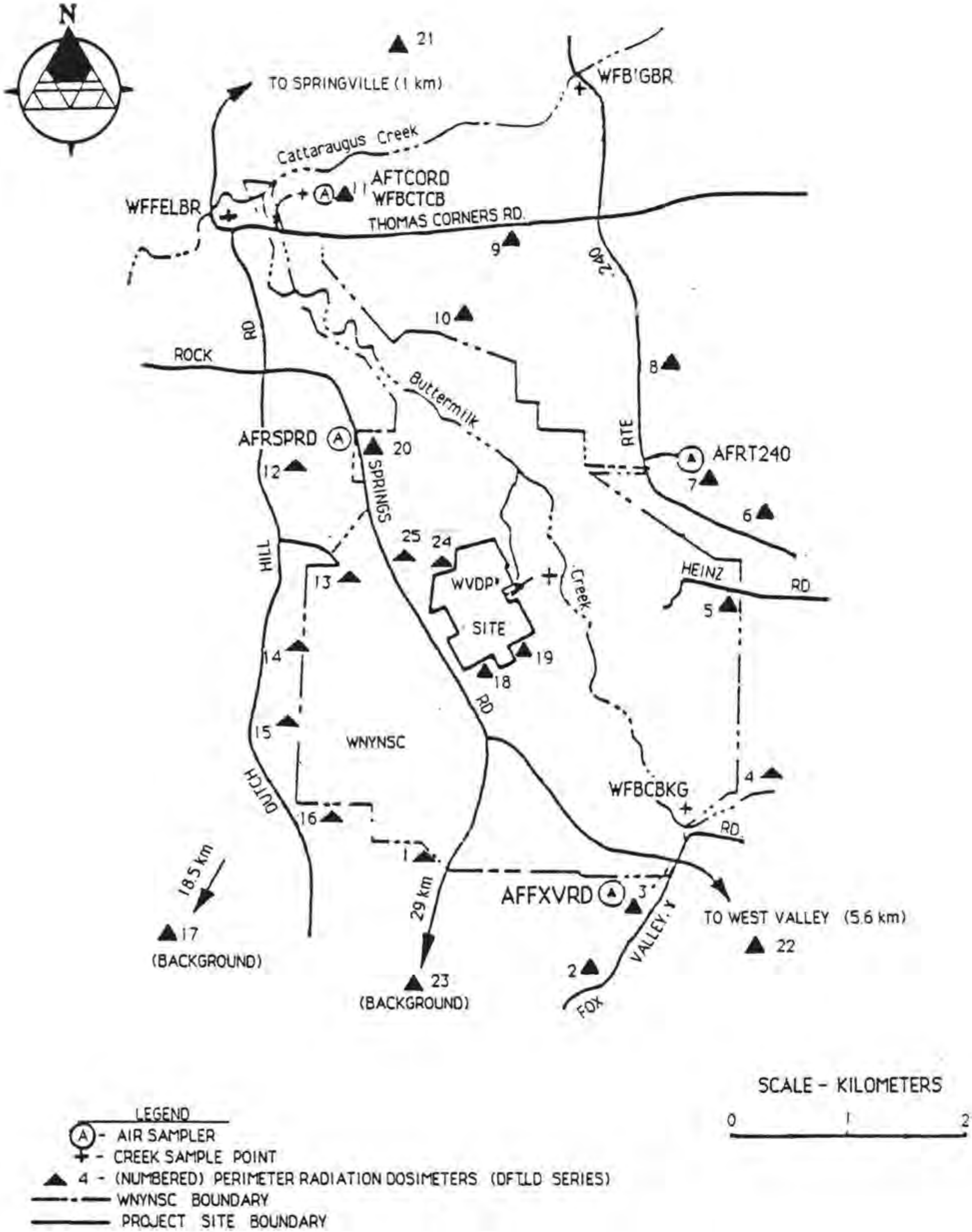
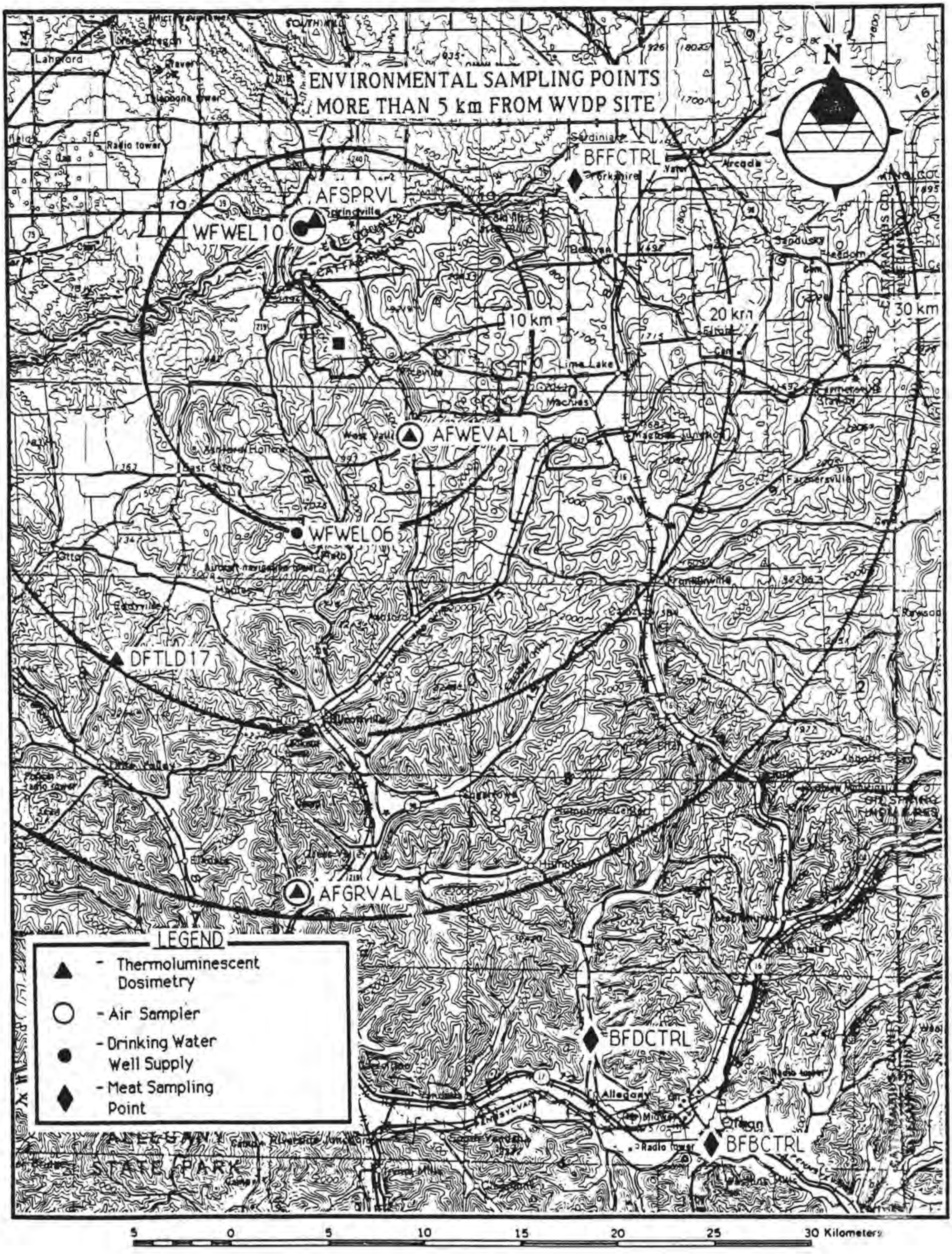


FIGURE 3-1
Locations of Perimeter Environmental Monitoring Stations



ENVIRONMENTAL SAMPLING POINTS
MORE THAN 5 km FROM WVDP SITE
N
BFFCTRL
AFSPRVL
WFWEL10
10 km
20 km
30 km
AFWEVAL
WFWEL06
DFTLD17
AFGRVAL
BFDCTRL
BFBCTRL
LEGEND
- Thermoluminescent Dosimetry
- Air Sampler
- Drinking Water Well Supply
- Meat Sampling Point
5
0
5
10
15
20
25
30 Kilometers

FIGURE 3-2

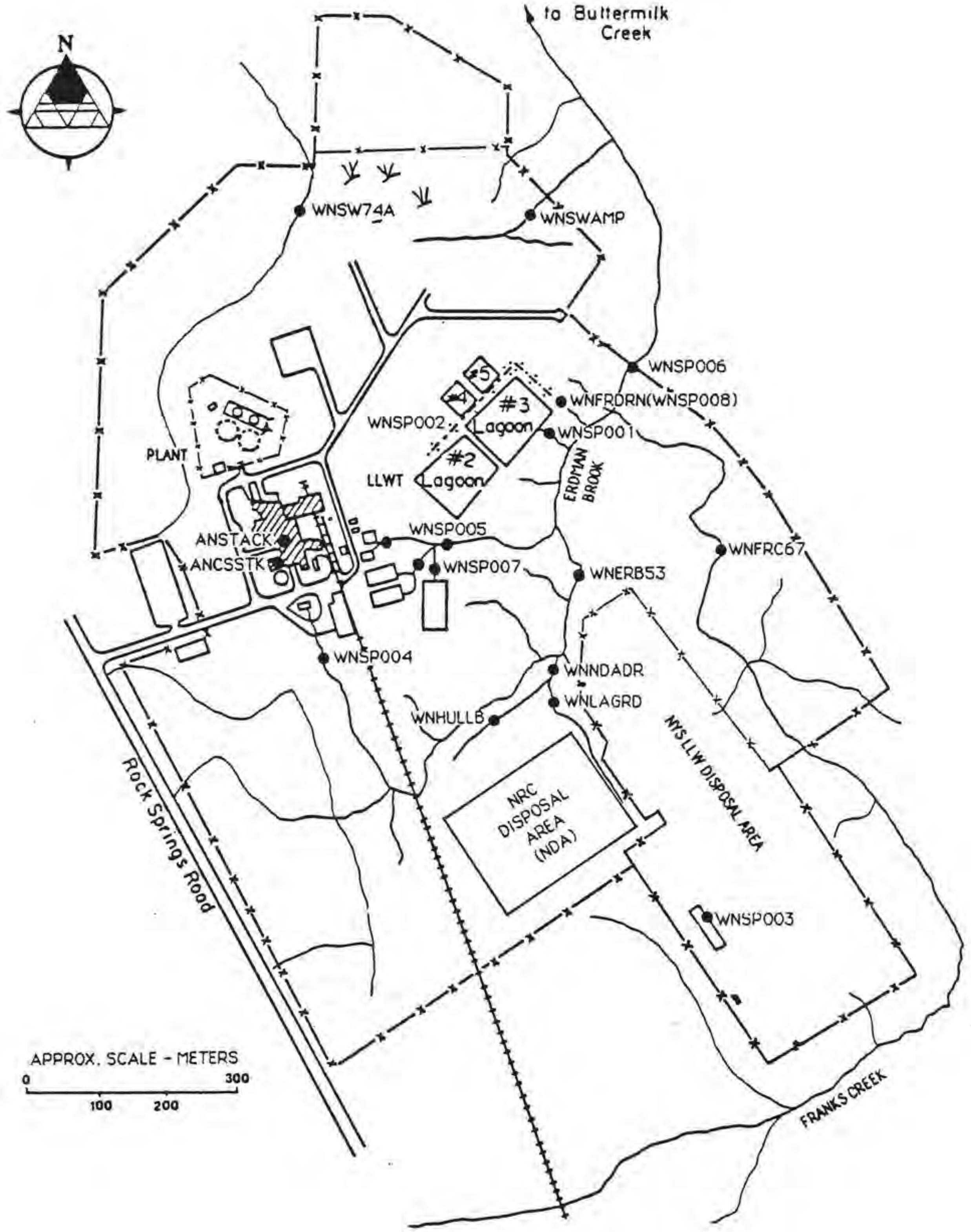


FIGURE 3-3
Location of Effluent
Radiological Monitoring Points On-site

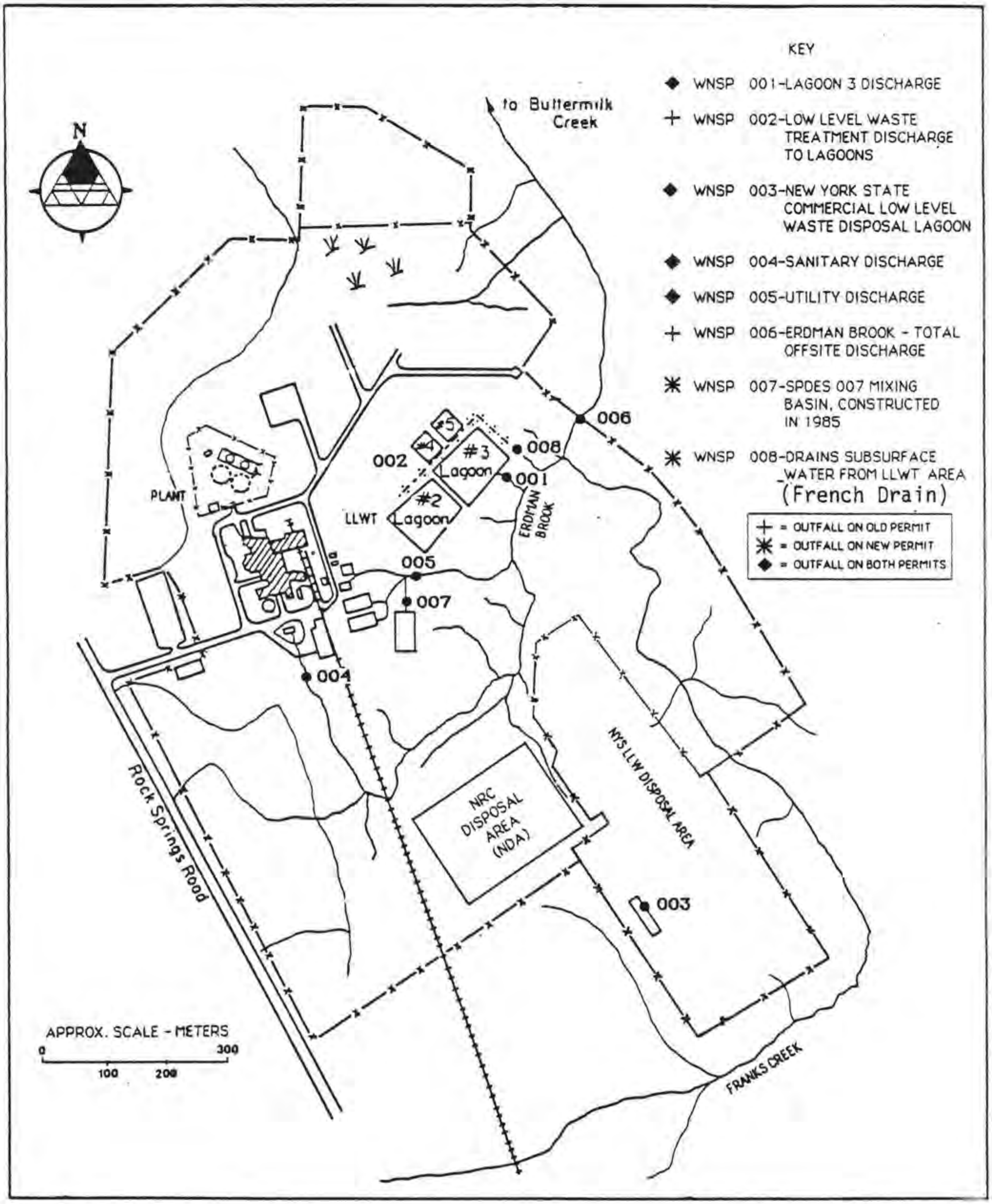
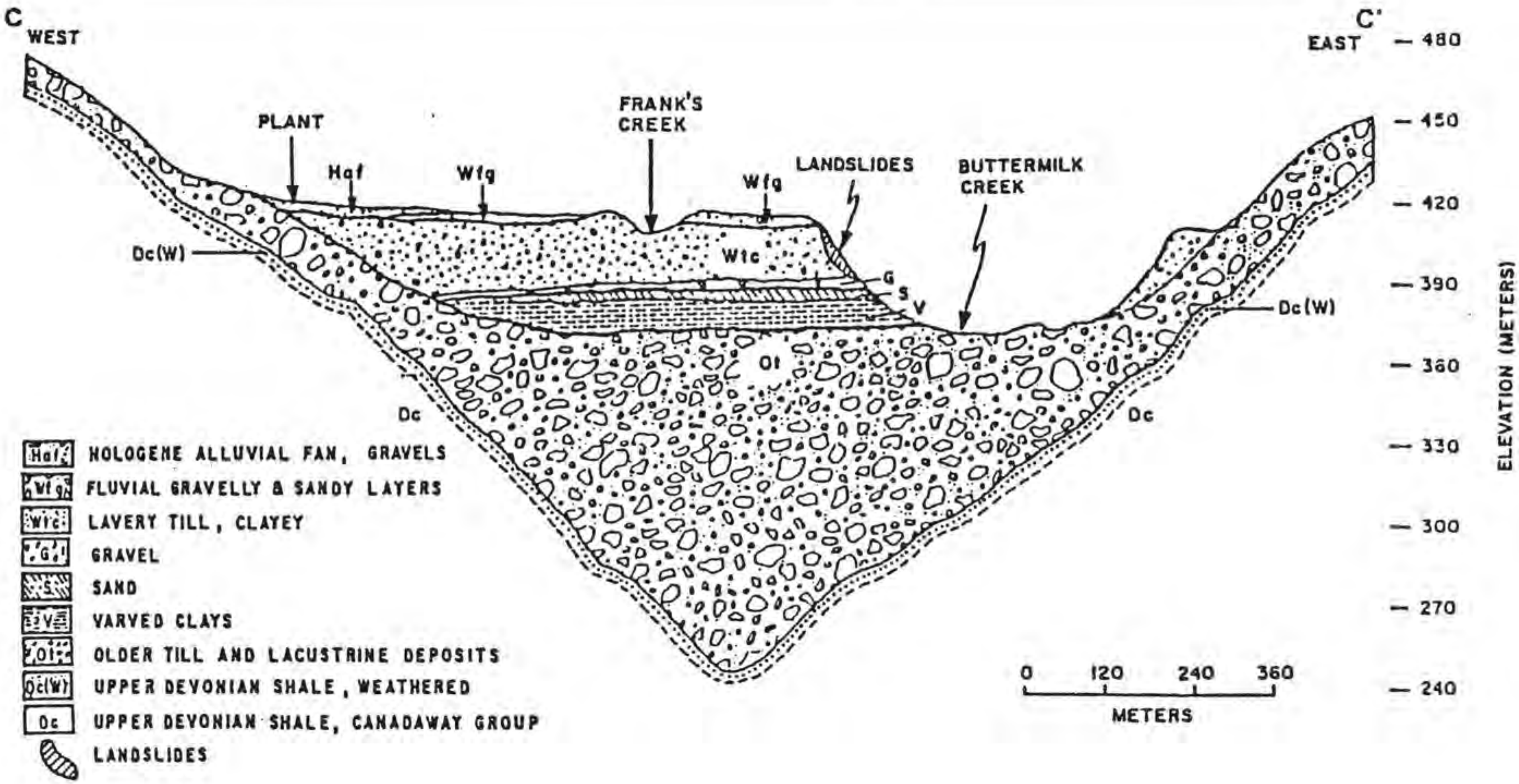


FIGURE 3-4
Locations of SPDES Monitoring Points On-site



NOTE:
Vertical scale = 1/4 horizontal scale.
Adapted from Dana et al. (1979a).

GENERALIZED EAST-WEST GEOLOGIC CROSS SECTION AT THE WEST VALLEY DEMONSTRATION PROJECT

FIGURE 3-5

4.0 RADIOLOGICAL DOSE ASSESSMENT

4.1 Methodology

The potential radiological impacts resulting from the release of radioactivity during 1985 have been estimated by calculating radiation doses received by the maximally exposed off-site individual and the population within an 80 km radius of the WVDP facility. The potential pathways of exposure to the general public from radioactive effluents released by the WVDP operations are shown in Figure 4-1. The exposure modes considered in the dose calculations are:

- o Direct exposure from immersion in air containing radionuclides,
- o Direct radiation from ground surfaces contaminated by deposited radionuclides,
- o Immersion in contaminated water,
- o Inhalation of airborne radionuclides, and
- o Ingestion of contaminated water and food produced from the land and surface waters in the area.

Because the ridges and hills in the vicinity of the WVDP frequently channel the winds, strong systematic deviations from straight-line air flow over long distance are expected. To realistically account for the terrain effects on wind flow, a fine grid, two-dimensional wind field was developed using the WNDSRF3 code and meteorological data measured hourly at seven stations around the WVDP and the three nearest National Weather Service stations. The wind field data were then input to the EPM3 code, a variable-trajectory Gaussian puff dispersion code for calculating the relative concentrations of radioactivity from routine operational releases. The EPM3 code is formulated according to the guidelines described by NRC in Regulatory Guide 1.111. The assumption underlying the code is that a number of discrete puffs are serially released from the source to simulate a continuous plume. Each puff is assumed to have a Gaussian concentration distribution in three dimensions. Puffs expand in size as they move downwind from the source in response to spatial and temporal wind and stability conditions. Each puff is transported independently by the nonuniform wind field and is tracked until it leaves the grid region. Relative concentration and deposition are computed at each grid receptor location.

The output of the EPM3 code is then input into AIRDOS-EPA (Moore, et al., 1979) which calculates the radiation doses to receptors of interest. A detailed discussion of the computer codes WNDSRF3 and EPM3 and AIRDOS-EPA is given in the WVDP Safety Analysis Report, Supplements Volume, Section A.3.3-C.

Results quoted in this section of the 1985 Environmental Monitoring Report are based on analyses that use relative concentration values calculated for gaseous effluents released from the WVDP plant at a height of 60 metres and at ground level. Twelve-month meteorological data (August 1983 through July 1984) are used as a basis for the dispersion calculations.

The calculated annual average relative concentration values for 60 metre and ground level releases are given in Tables 4-1 and 4-2 respectively, for each of the sixteen 22.5 degree wind sectors in an 80 km radius circle centered at the WVDP main plant stack. The maximum mean annual relative concentration values at actual residences in the vicinity of the site are 1.5 E-7 sec/m^3 (at 2.1 km WSW) and 9.5 E-7 sec/m^3 (at 1.4 km NW) for stack and ground level releases, respectively.

To calculate the radiation doses to the maximally exposed individual and the population within 80 km from the plant, relative concentration values are used as input to the AIRDOS-EPA code. The radiation dose commitment to the maximally exposed individual and the collective dose to the population within 80 km of the WVDP from the water pathway were calculated using the computer code LADTAP II (Simpton and McGill, n.d.). Both LADTAP II and AIRDOS-EPA implement the NRC Regulatory Guide 1.109 recommendations for terrestrial food chains.

The dose estimates were made by calculating radionuclide concentrations in air, rates of deposition on ground surfaces, ground surface concentrations, intake rates via inhalation, and ingestion of meat, milk, and fresh vegetables. Site specific data on production and consumption of milk, meat, and agricultural products were used in computing the collective population dose.

A map of the area surrounding the WVDP is shown in Figure 1-1. It was overlaid with an 80 km radius grid system with the facility at its center. The grid system was further divided into 10 concentric regions and 16 compass directions. For each sector formed by the grid system, the specific human populations, beef and dairy cattle populations, and agricultural areas were determined by a 1983 survey to be as described in Figures 4-2 through 4-9.

For each radionuclide of concern, the inhalation dose conversion factors used are for an activity median aerodynamic diameter (AMAD) of 0.3 micrometer. For alpha emitters, the dose conversion factors are derived by using a quality factor of 20 as per International Commission of Radiological Protection (ICRP) recommendations (Dunning, n.d.). All of the doses from internal exposure are committed dose equivalents and are calculated for the 50-year period following inhalation or ingestion. The internal dose conversion factors used in this report are from Dunning (n.d).

For this report, the effective dose equivalent, as well as the dose equivalent to the thyroid, lungs, bone, liver, kidneys, and gastrointestinal tract were calculated in order to determine the critical organs for various potential pathways of exposure. These estimates were based on parameters applicable to an average adult. The collective population dose estimate in person-rem is the effective dose equivalent commitment as calculated in accordance with the recommendations of the ICRP (ICRP, 1977).

In addition to these estimates of dose commitments based on dispersion modeling, the dose to a hypothetical maximally exposed individual who consumed locally produced milk, fish, and venison (deer) was estimated. Measured radionuclide concentrations from local and control samples of milk, fish, and venison were used in these calculations. Although state-of-the-art methods and instrumentation were used to determine concentrations, certain nuclides, if present in these samples, are often below the minimum detectable concentration (MDC). In cases where both the sample and its control were below the MDC for a specific nuclide, it was assumed that the nuclide was not present at a concentration greater than natural background.

4.2 Source Term Estimates

4.2.1 Airborne Radioactive Effluents

There are four points on the plant site from which ventilation systems release low concentrations of airborne radioactivity. These four locations are:

1. Main plant process stack,
2. Laundry exhaust vent,
3. Low-level waste treatment system (LLWT) ventilation exhaust, and
4. Cement solidification system (CSS) exhaust stack.

The air released from these vents is sampled routinely and the collected particulates are periodically analyzed. For the main plant and CSS stacks, the sampling is continuous. The results of measurements during 1985 are summarized in Table 4-3. A total of

2.3 E-5 Ci of gross alpha activity and 8.7 E-4 Ci of gross beta/gamma was released from these vents during the year. Ninety-nine percent of the activity released to the atmosphere was discharged through the main plant stack.

The Cement Solidification System (CSS) began operation in December of 1985. Its exhaust is continuously monitored for radioactivity, but no measurable activity was released from the very limited operations conducted during 1985. Airborne radioactive effluent from this new source will be reported in the 1986 Environmental Monitoring Report.

4.2.2 Liquid Radioactive Effluents

There were three sources of liquid effluents from WVDP operations in 1985:

1. Lagoon 3 discharges (four planned releases),
2. Sewage treatment outfall, and
3. Surface water releases from the swamp drain and french drain.

The volumes of the liquid effluents and the radioactivity they contained (reported in WVDP 1985 Effluent and On-Site Discharge Report, March, 1986) are summarized in Table 4-4. All liquids were discharged via Buttermilk Creek. Relevant release standards and concentration guides (DOE Order 5480.1) are presented in Appendix B. Collective population doses from these liquid effluents are based on the number of curies released for each identified nuclide in Table 4-4 (see Section 4.3.2).

4.3 Potential Radiation Doses to the Public

4.3.1 Maximum Hypothetical Individual Doses

The point of maximum potential long-term radiation exposure in the vicinity of the site from radioactivity released from the plant stack is a private residence about 2.1 km WSW of the WVDP plant. A hypothetical maximum effective dose equivalent of 0.0026 mrem was calculated as a result of WVDP airborne releases during 1985 when all possible pathways were considered. The calculated dose commitment to bone surface (the critical organ) at this location was 0.02 mrem. These maximum hypothetical exposures are about 0.01 percent for whole body and 0.03 percent for the critical organ of the applicable standards for airborne releases promulgated by the U. S. Environmental Protection Agency (EPA) in 40 CFR 61.

An important potential contributor to the dose commitment from radioactivity in the terrestrial food-chain is the airborne pathway to the pasture and then to cow and to milk. Measurements of radioactivity in the milk produced at the nearest dairy farm to the WVDP facility (see Table C-3.1) indicated that no I-129, Cs-134, or Cs-137 were present in concentrations above the limits of detection. The maximum dose to an individual from ingestion of about 1 litre of this milk per day was estimated from the strontium-90 concentrations in excess of the control sample. This calculation predicts a dose commitment of 0.9 mrem to bone surfaces, 0.0003 mrem to the thyroid and an effective dose equivalent of 0.08 mrem. These calculated maximum potential doses are less than 1.2 percent of the allowable 40 CFR 61 standards.

Estimates were made of the hypothetical maximum dose commitments to an adult from consumption of 21 kg per year of fish (the maximum value recommended in NRC Regulatory Guide 1.109) caught in Cattaraugus Creek. From the measured concentrations of radionuclides in the edible parts of the fish (see Table C-3.4), the maximum organ dose commitment to an individual was estimated to be 0.42 mrem to bone surfaces. The maximum effective dose equivalent commitment to an individual was calculated to be 0.32 mrem from consumption of 21 kg of fish.

If I-129 were assumed to be present in the milk at a net concentration equal to the MDC (1.6 pCi/l) the predicted, hypothetical maximum thyroid dose would be approximately 5 mrem/year. However, this is not considered to be a realistic assumption. It does indicate that an extremely conservative assumption still yields a dose estimate well within regulatory limits.

The hypothetical dose commitment also was estimated for an individual who consumed 45 kg of venison. The measured radionuclide concentrations (Table C-3.2) in the flesh of a deer taken about a kilometre away from the WVDP in the fourth quarter of 1985 was used as the basis for this estimate. The dose commitment was calculated to be 0.14 mrem to the bone surface and 0.14 mrem for an effective dose equivalent commitment. Table 4-5 summarizes the potential radiation doses to individual adult members of the general public at the points of highest potential exposure from gaseous and liquid effluents from the WVDP facility operations during 1985. Although no direct pathway to drinking water from airborne or liquid effluents was found or evaluated for committed dose, drinking well water data are presented in Appendix C (Table C-1.9). Additionally, the results of the radionuclide measurements in stream sediments (Table C-1.10), surface waters (Tables C-1.2 through C-1.6) and in shallow wells (C-1.7 and C-1.8) are presented in Appendix C.

4.3.2 Collective Dose to the Population

The collective effective dose equivalent commitment to the population within an 80 km radius of the WVDP from operations during 1985 was estimated to be 0.02 person-rem from gaseous effluents and 0.09 person-rem from liquid effluents. These estimates are based on the releases summarized in Tables 4-3 and 4-4 and the use of the AIRDOS-EPA and LADTAP II codes as described in Section 4.1.

These collective doses may be compared to an estimated annual 170,000 person-rem to the same population resulting from natural background radiation. Based on the collective dose given above and a total population of 1.7 million in the region, the average effective dose equivalent to an individual residing within 80 km of the WVDP was about 0.000065 mrem during 1985--insignificant when compared to the average dose to each individual of approximately 100 mrem per year from natural sources.

Recent recommendations of the National Council on Radiation Protection and Measurements (NCRP, 1985) and the proposed revisions to the Code of Federal Regulations, Chapter 10, Part 20 (USNRC, 1985) define a risk level which is below regulatory concern for purposes of determining collective population doses. These agencies recommend that doses of $\leq$ 1 mrem/yr incurred by individual members of the public be excluded for purposes of assessing the collective dose to a population. Despite the conservatisms used in assessing the dose to the maximum hypothetical individual from environmental releases of radioactivity in 1985 from the WVDP, no individual member of the public was predicted to receive a dose in excess of 1 mrem/yr above background. Accordingly, within the framework of the NCRP and NRC methodology, the collective population dose in excess of natural background within an 80 km radius of the WVDP would, in fact, be reported as zero as a result of radionuclide releases in 1985.

4.3.4 Dose Assessment Model Prediction Versus/Actual Release Data

Dose assessment models used at WVDP for liquid and airborne effluents have been used to compare model predictions with actual sample analysis. In the case of liquid effluents, LADTAP II predicts the maximum individual dose from consumption of 21 kg of fish to be 0.16 mrem. This is in good agreement with the predicted dose of 0.32 mrem calculated from actual measured radionuclide concentrations in fish flesh, given the statistical error associated with the sample analyses.

The predicted maximum individual dose based on actual air sampling data collected at a nearby residence (Table C-2.2.2) turns out to be zero when the background air sample data from Great Valley (Table

C-2.2.7) at 42 km from the site is subtracted. This agrees with the 0.0026 mrem predicted by AIRDOS-EPA from the measured quantity of radioactivity actually discharged from the plant, in that this dose can be considered as essentially zero.

A comparison was also made of the radioactive particulate concentrations (uCi/ml) based upon air sampler data from a nearby residence (Table C-2.2.2) with those calculated from the measured release data (Table C-2.1) and the site specific annual average relative concentrations (Tables 4-1 and -2). The concentrations predicted using the stack discharge data are two orders of magnitude below those measured at the perimeter air monitoring stations. This finding reenforces the observation that the air sampler at the nearby residence is essentially measuring background particulate radioactivity with <1% of the collected activity being provided by airborne releases from the WVDP.

TABLE 4 - 1

Relative Concentration Values (sec/m^3) by Sector From 60 Metre Stack Release

RECEPTOR AZIMUTH (DEGREES)	Distance (metres) 805.0	2414.0	4023.0	5633.0	7242.0
22.50	1.34865E-08	1.71927E-08	1.53659E-08	1.16008E-08	1.00686E-08
45.00	3.03278E-08	6.62833E-08	1.19462E-07	2.28011E-08	1.79982E-08
67.50	3.64481E-08	7.69928E-08	1.02821E-07	9.41885E-08	5.77431E-08
90.00	3.74919E-08	6.31151E-08	5.99791E-08	5.94198E-08	3.82357E-08
112.50	5.66527E-08	6.61298E-08	1.00890E-07	6.25578E-08	5.45213E-08
135.00	6.47129E-08	4.14320E-08	4.15299E-08	5.34836E-08	5.67103E-08
157.50	3.90271E-08	4.05824E-08	6.03020E-08	4.09102E-08	2.77476E-08
180.00	3.81781E-08	1.22124E-07	5.71550E-08	3.28513E-08	1.65135E-08
202.50	3.39626E-08	1.18178E-07	3.81683E-08	2.06887E-08	1.37497E-08
225.00	2.65459E-08	1.33789E-07	1.40559E-08	1.47592E-08	2.14601E-08
247.50	2.28710E-08	1.40234E-07	9.92964E-09	9.23873E-09	1.20779E-08
270.00	1.89206E-08	5.87795E-08	8.15801E-09	4.43197E-09	3.40148E-09
292.50	1.80572E-08	2.08576E-08	7.37967E-09	7.54285E-09	6.41255E-09
315.00	1.61857E-08	1.12181E-08	5.58730E-09	3.48013E-09	4.18897E-09
337.50	1.37407E-08	8.56651E-09	6.98284E-09	6.43618E-09	1.03046E-08
360.00	1.63022E-08	1.86618E-08	1.33696E-08	1.43328E-08	1.57260E-08

RECEPTOR AZIMUTH (DEGREES)	12070.0	24140.0	40234.0	56327.0	72420.0
22.50	3.76277E-08	4.60131E-09	1.47900E-09	4.16372E-10	2.13197E-10
45.00	1.14274E-08	1.28140E-08	3.44087E-09	8.05384E-10	3.94584E-10
67.50	1.83720E-08	9.47802E-09	2.61500E-09	8.27191E-10	4.15068E-10
90.00	1.31074E-08	4.10035E-09	1.79761E-09	9.47011E-10	5.42868E-10
112.50	1.79356E-08	3.37901E-09	1.27255E-09	7.68376E-10	4.88769E-10
135.00	2.17244E-08	4.63600E-09	1.59818E-09	9.12074E-10	6.59780E-10
157.50	1.22420E-08	3.63091E-09	1.25836E-09	7.59553E-10	3.65875E-10
180.00	5.12675E-09	1.39954E-09	7.05623E-10	3.11794E-10	1.85159E-10
202.50	4.33084E-09	1.20774E-09	4.61639E-10	3.76650E-10	2.20628E-10
225.00	4.05277E-09	9.84525E-10	3.82512E-10	2.98694E-10	2.65110E-10
247.50	5.01156E-09	8.45959E-10	3.45917E-10	2.67128E-10	1.89775E-10
270.00	2.40747E-09	1.31323E-09	4.71842E-10	2.33383E-10	1.46546E-10
292.50	3.13835E-09	8.59511E-10	3.11297E-10	1.78562E-10	1.59762E-10
315.00	3.96969E-09	8.39388E-10	3.62375E-10	1.98663E-10	1.45786E-10
337.50	3.50730E-08	1.98774E-09	5.05830E-10	2.95021E-10	2.01301E-10
360.00	1.08030E-08	3.05156E-09	8.97284E-10	4.01882E-10	2.13954E-10

TABLE 4 - 2

Relative Concentration Values (sec/m^3) by Sector From Ground Level Release

RECEPTOR AZIMUTH (DEGREES)	Distance (metres) 805.0	2414.0	4023.0	5633.0	7242.0
22.50	1.49512E-06	3.97532E-07	1.47083E-07	8.42645E-08	5.33960E-08
45.00	1.64903E-06	3.53979E-07	1.37949E-07	4.90462E-08	3.72500E-08
67.50	1.03193E-06	8.08443E-07	9.76874E-08	6.06793E-08	4.09640E-08
90.00	1.12677E-06	1.93299E-07	7.68176E-08	4.17450E-08	2.62357E-08
112.50	1.85268E-06	2.85787E-07	1.13283E-07	5.70845E-08	3.65770E-08
135.00	2.07273E-06	2.98862E-07	1.13469E-07	6.26892E-08	4.29658E-08
157.50	1.23256E-06	1.83867E-07	7.48610E-08	3.87072E-08	2.45899E-08
180.00	9.11350E-07	1.21526E-07	4.68202E-08	2.12329E-08	1.26233E-08
202.50	5.43176E-07	8.27004E-08	3.14103E-08	1.62575E-08	1.01974E-08
225.00	6.51885E-07	7.38846E-08	2.38500E-08	1.47004E-08	1.10149E-08
247.50	4.49106E-07	8.76961E-08	1.99028E-08	1.24286E-08	1.17705E-08
270.00	8.33984E-07	9.80329E-08	2.08584E-08	9.69459E-09	6.35376E-09
292.50	1.51654E-06	2.19763E-07	3.25829E-08	3.23126E-08	2.15832E-08
315.00	3.09325E-06	6.30377E-07	7.04640E-08	2.02217E-08	2.77029E-08
337.50	6.43818E-06	1.39608E-07	5.78384E-08	6.06062E-08	1.03569E-07
360.00	3.61907E-06	4.15637E-07	9.97603E-08	1.26180E-07	1.51884E-07

RECEPTOR AZIMUTH (DEGREES)	12070.0	24140.0	40234.0	56327.0	72420.0
22.50	3.04523E-08	2.98528E-09	8.55379E-10	3.03205E-10	1.46205E-10
45.00	2.15690E-08	5.14011E-09	1.73757E-09	6.37543E-10	3.64292E-10
67.50	1.54270E-08	5.34287E-09	1.92672E-09	8.74415E-10	5.08823E-10
90.00	9.70648E-09	3.01629E-09	1.45596E-09	8.22257E-10	4.93815E-10
112.50	1.29208E-08	3.20793E-09	1.16046E-09	7.54841E-10	4.73182E-10
135.00	1.64306E-08	3.86002E-09	1.31326E-09	7.71110E-10	5.18604E-10
157.50	1.02799E-08	2.75939E-09	9.61845E-10	5.49548E-10	2.85193E-10
180.00	4.31490E-09	1.06545E-09	4.04546E-10	1.98032E-10	1.31576E-10
202.50	3.84823E-09	9.15400E-10	3.95853E-10	2.51647E-10	1.43985E-10
225.00	3.37117E-09	8.69089E-10	3.30965E-10	2.44201E-10	1.30591E-10
247.50	3.00494E-09	7.52568E-10	3.28716E-10	2.37072E-10	1.50662E-10
270.00	2.83375E-09	1.13770E-09	4.49876E-10	2.20808E-10	1.51995E-10
292.50	7.62140E-09	1.26463E-09	3.63726E-10	1.88658E-10	1.46872E-10
315.00	2.43399E-08	8.55431E-10	4.37296E-10	2.11385E-10	1.16099E-10
337.50	2.36564E-08	1.78745E-09	5.95391E-10	3.21227E-10	2.20000E-10
360.00	2.55674E-08	3.41404E-09	9.24519E-10	3.80997E-10	1.83592E-10

TABLE 4-3

RADIOACTIVITY RELEASED TO THE ATMOSPHERE DURING 1985

Release Point	Total Volume (m^3)	Total Curies Released			
		Gross Alpha	Gross Beta	Specific Nuclides	
Main Plant Stack	8.9 E+08	2.3 E-05	8.7 E-04	Sr-90	1.9 E-04
				I-129	5.7 E-05
				Cs-134	1.8 E-06
				Cs-137	3.7 E-04
Laundry Vent	1.4 E+07	8.6 E-08	1.2 E-06	None Identified	
LLWT Vent	1.1 E+08	1.6 E-07	1.7 E-06	None Identified	

TABLE 4-4
RADIOACTIVITY RELEASED IN LIQUID
EFFLUENTS DURING 1985

Release Point	Volume Released (Litres)	Released Radioactivity (Ci)					
		Gross Alpha	Gross Beta	H-3	Sr-90	I-129	Cs-137
Lagoon 3	3.5 E+07	1.2 E-02	3.3 E-02	3.4	7.0 E-03	5.5 E-04	1.9 E-02
Sewage Treatment Outfall	1.2 E+07	1.6 E-05	3.6 E-04	2.8 E-03	1.7 E-04	1.6 E-05	-------
Swamp Drain	6.0 E+07	-------	-------	9.3 E-02	-------	-------	-------
French Drain	6.9 E+06	-------	-------	1.2 E-01	-------	-------	-------
TOTAL:	1.1 E+08	1.2 E-02	3.3 E-02	3.6	7.2 E-03	5.7 E-04	1.9 E-02

	U-234	U-235	U-238	Pu-238	Pu-239
Lagoon 3	7.8 E-03	1.7 E-04	1.7 E-03	5.2 E-05	1.2 E-05
Sewage Treatment Outfall	-------	-------	-------	-------	-------
Swamp Drain	-------	-------	-------	-------	-------
French Drain	--------	-------	-------	-------	--------
TOTAL:	7.8 E-03	1.7 E-04	1.7 E-03	5.2 E-05	1.2 E-05

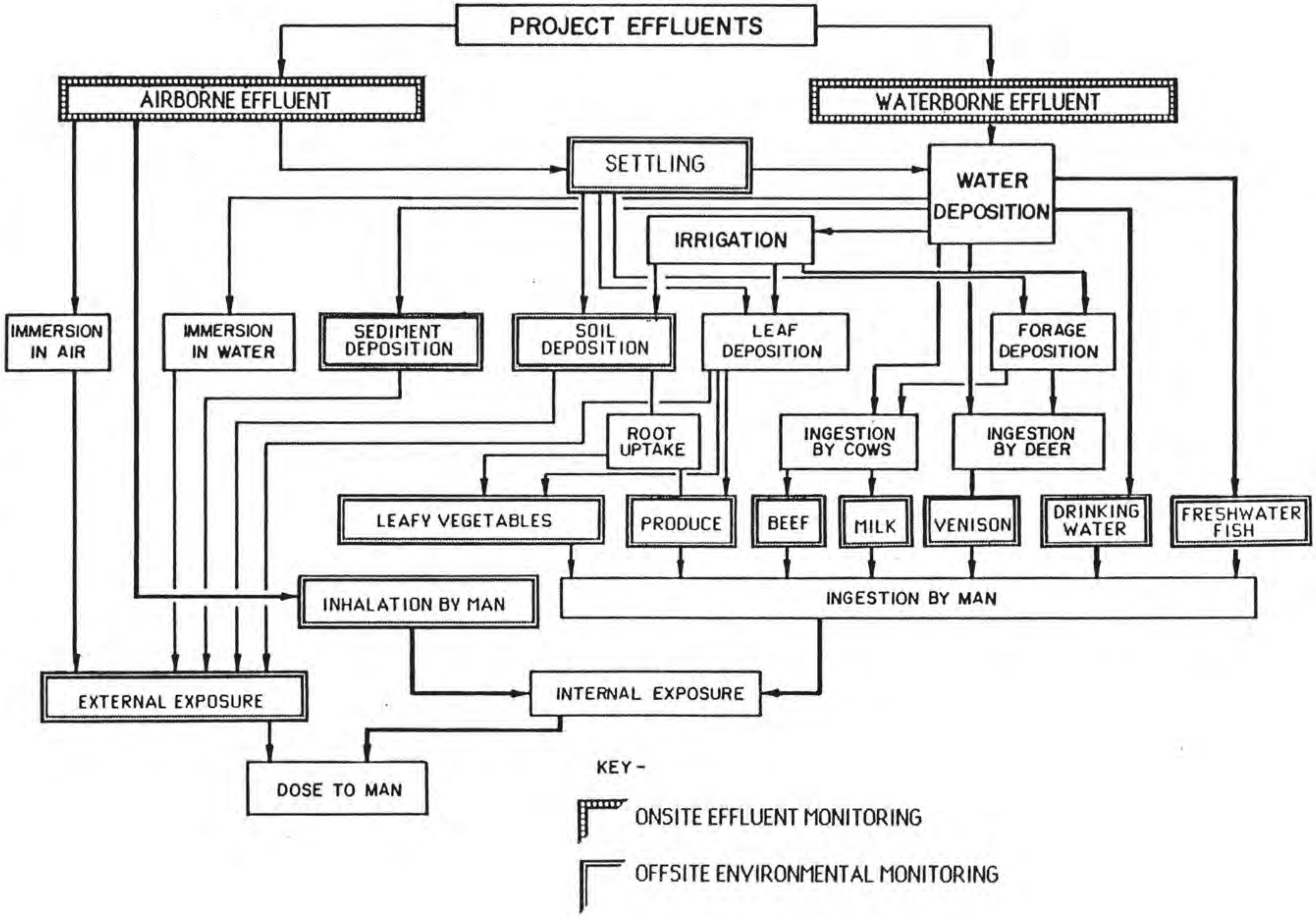
TABLE 4-5

SUMMARY OF HYPOTHETICAL ESTIMATED DOSE COMMITMENTS
TO AN ADULT INDIVIDUAL AT LOCATIONS OF MAXIMUM EXPOSURE DURING 1985

		Committed Dose Equivalent (mrem)	
Pathway	Location	Effective	Critical Organ
Gaseous Effluents			
All Pathways*	Nearby residence (2.1 km WSW)	0.0026	0.02 Bone Surface
Milk	Produced 4 km NE	0.08	0.9 Bone Surface
Venison	Deer taken within 1 km of WVDP	0.14	0.14 Whole Body
Liquid Effluents			
Fish	Collected in Cattaraugus Creek below WVDP	0.32	0.42 Bone Surface

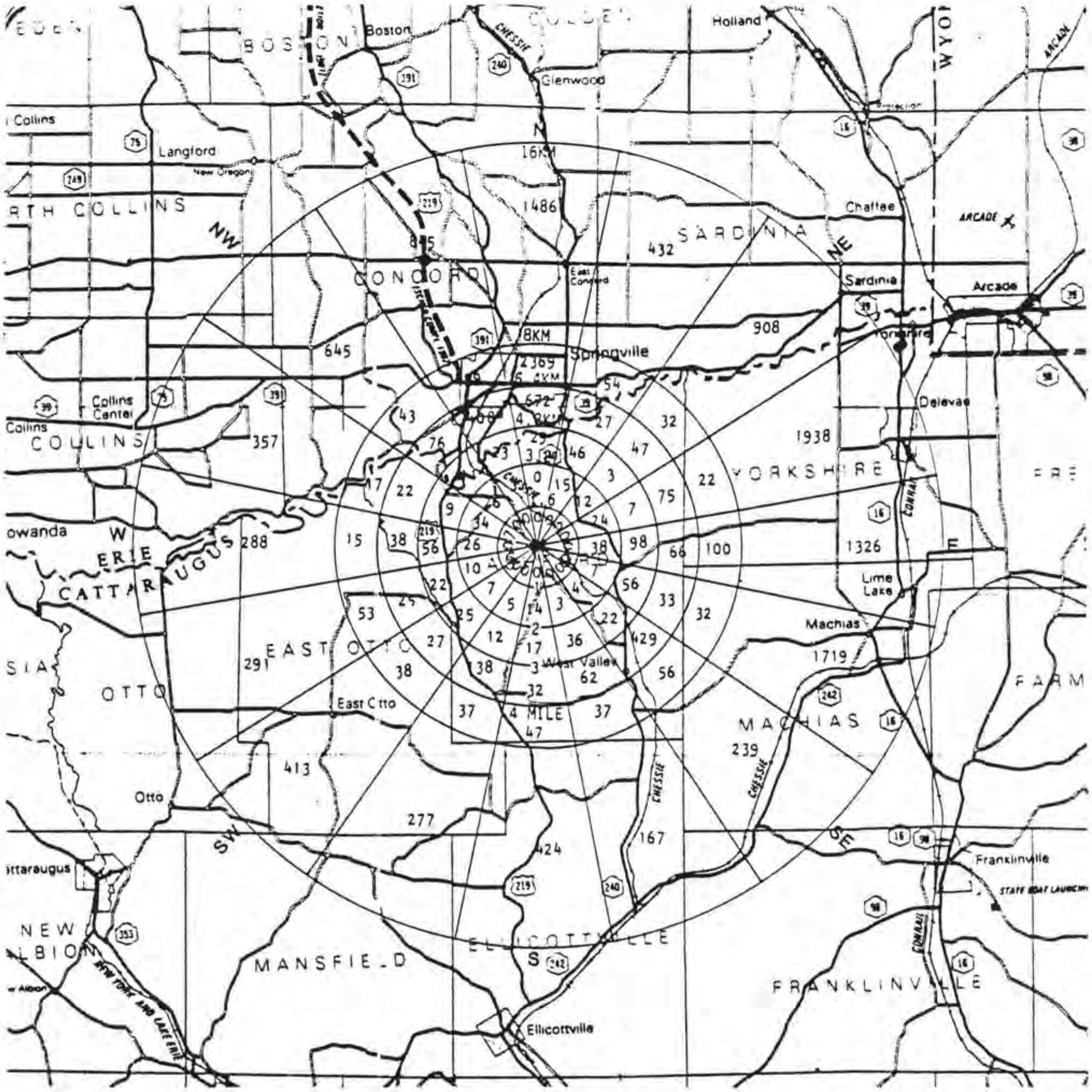
*Estimates based on measured radioactivity in airborne effluents (Table 4-3) and dispersion and radiological dose calculations described in Section 4.1. All other values based on measured concentrations in food and consumption rates for maximally exposed individuals recommended in U.S. NRC Regulatory Guide 1.109.

Note: Annual average whole body dose from natural background sources in the U.S. is about 100 mrem.



COMPARTMENT MODEL OF PATHWAYS AND MONITORING INTERCEPT POINTS

FIGURE 4-1



5 0 5 MILES

8 0 8 KILOMETERS

1990 POPULATION PROJECTIONS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-2

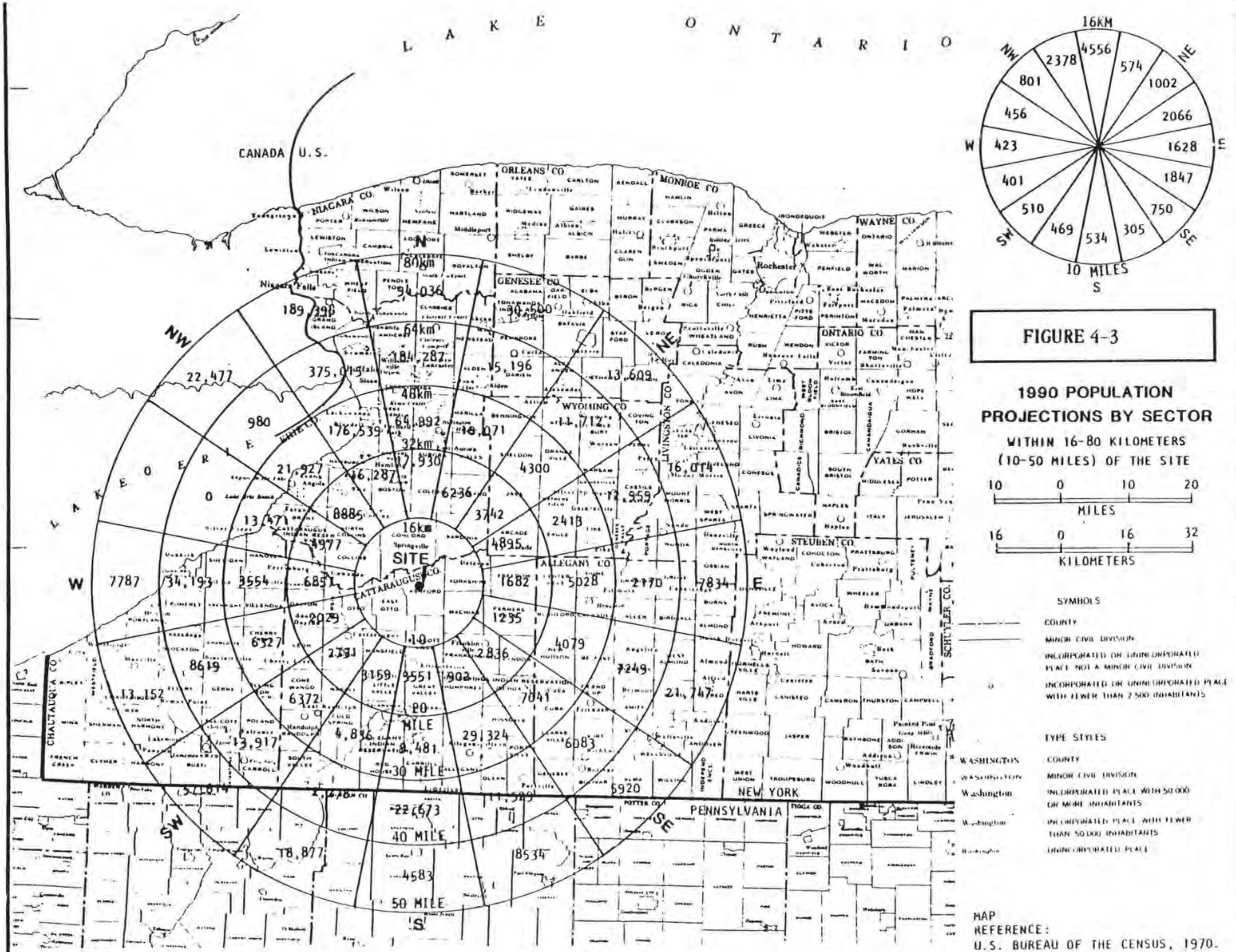
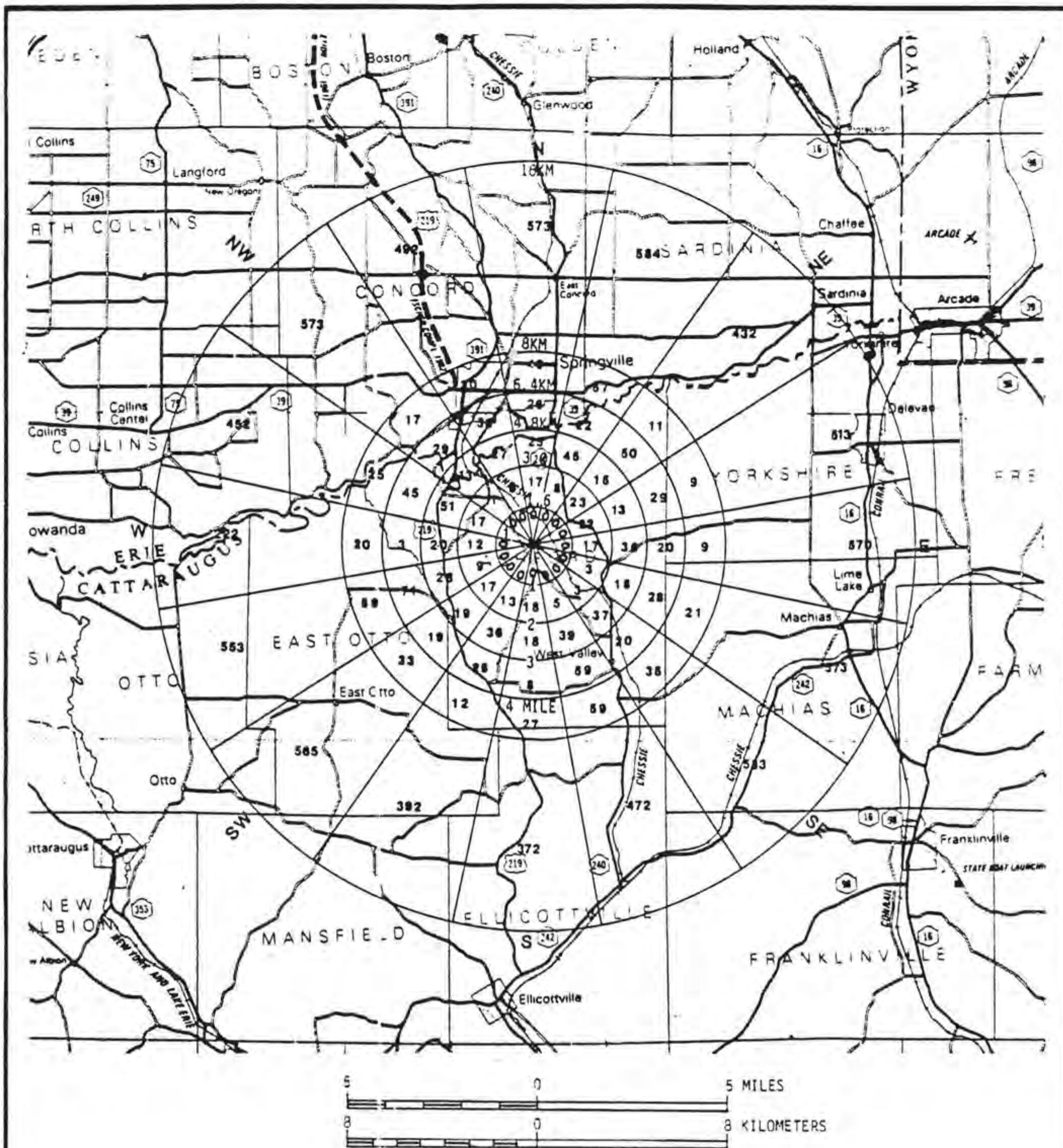


FIGURE 4-3

1990 POPULATION PROJECTIONS BY SECTOR WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE



NUMBER OF DAIRY COWS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-4

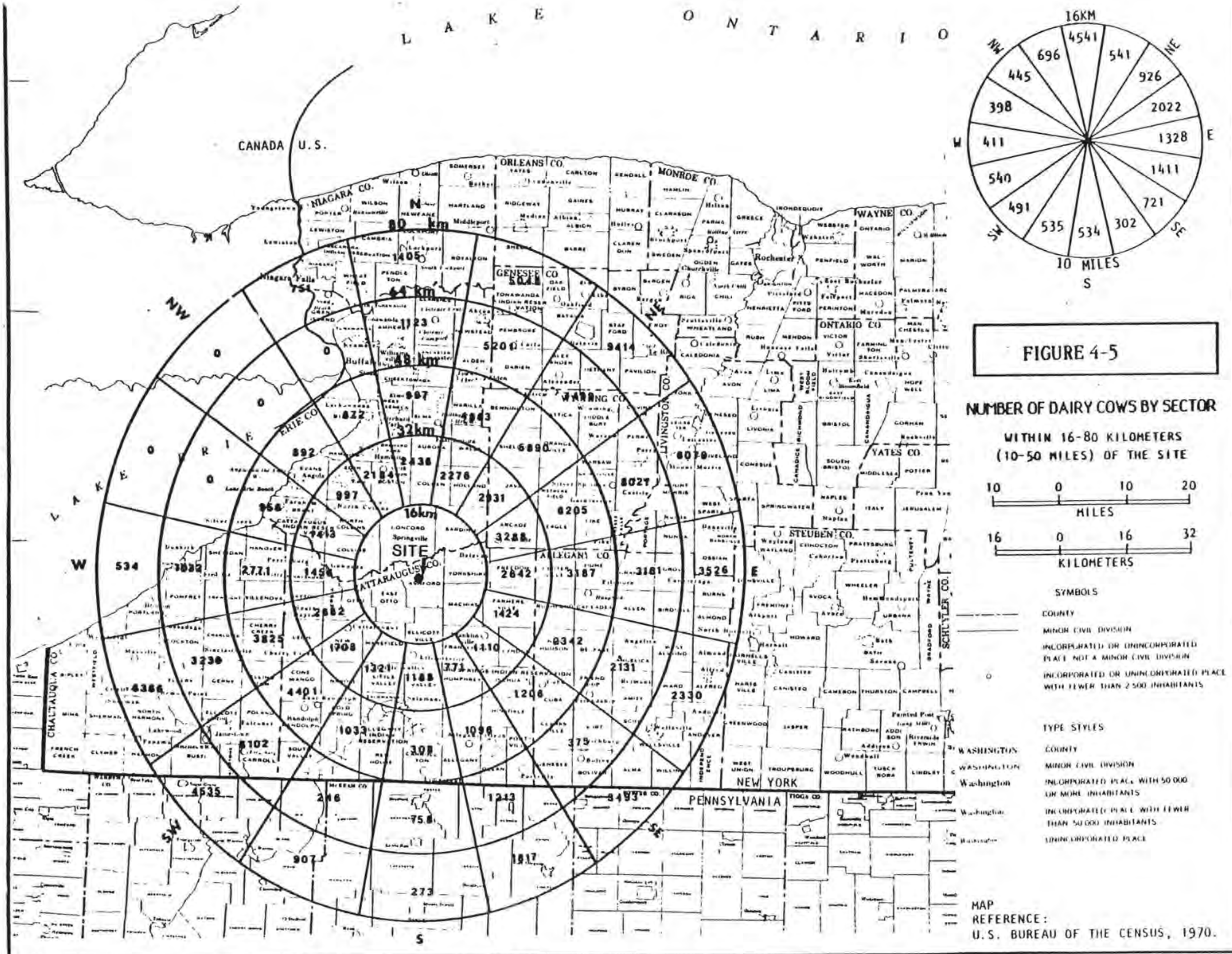
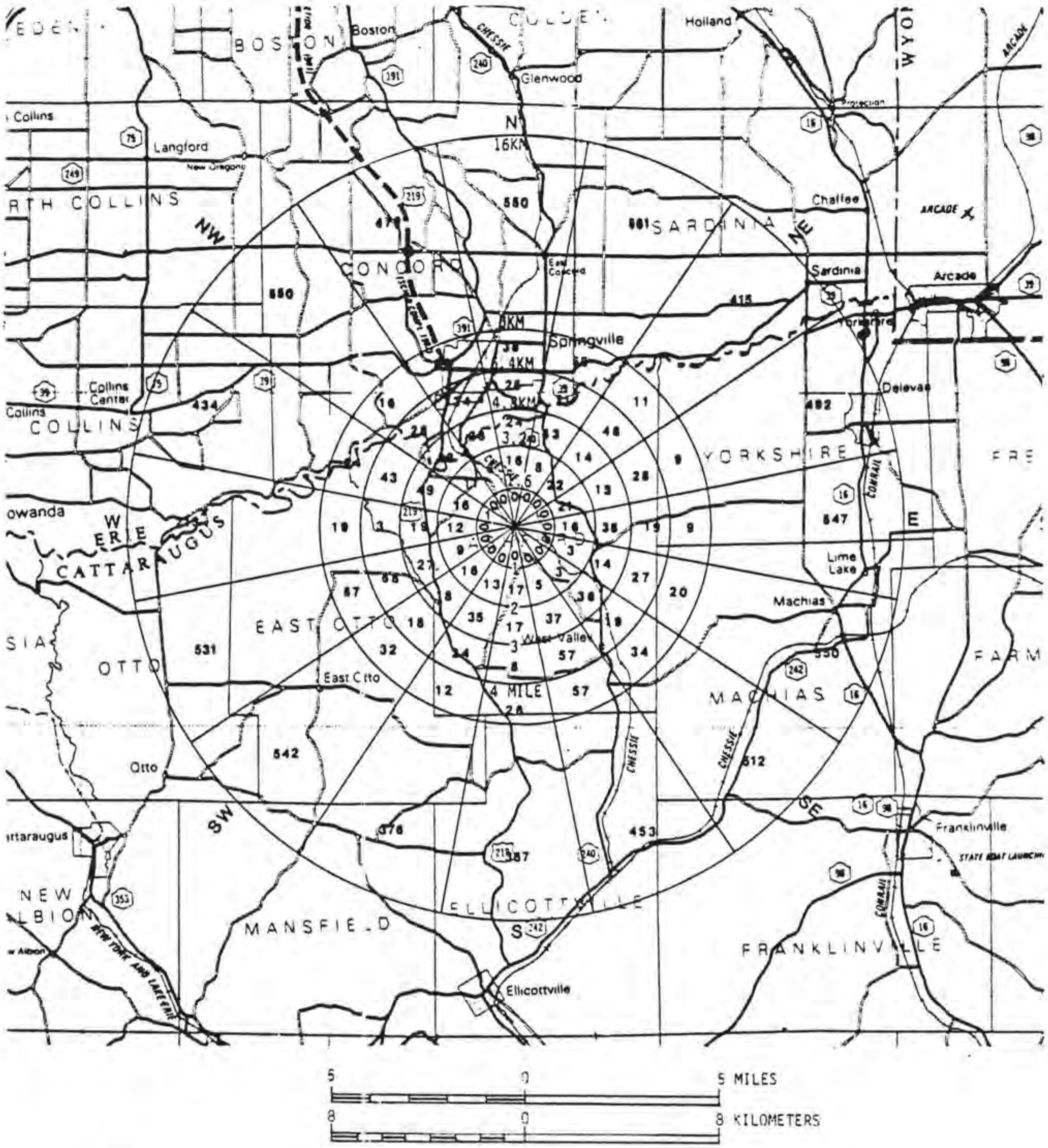


FIGURE 4-5

NUMBER OF DAIRY COWS BY SECTOR



NUMBER OF MEAT-PRODUCING ANIMALS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-6

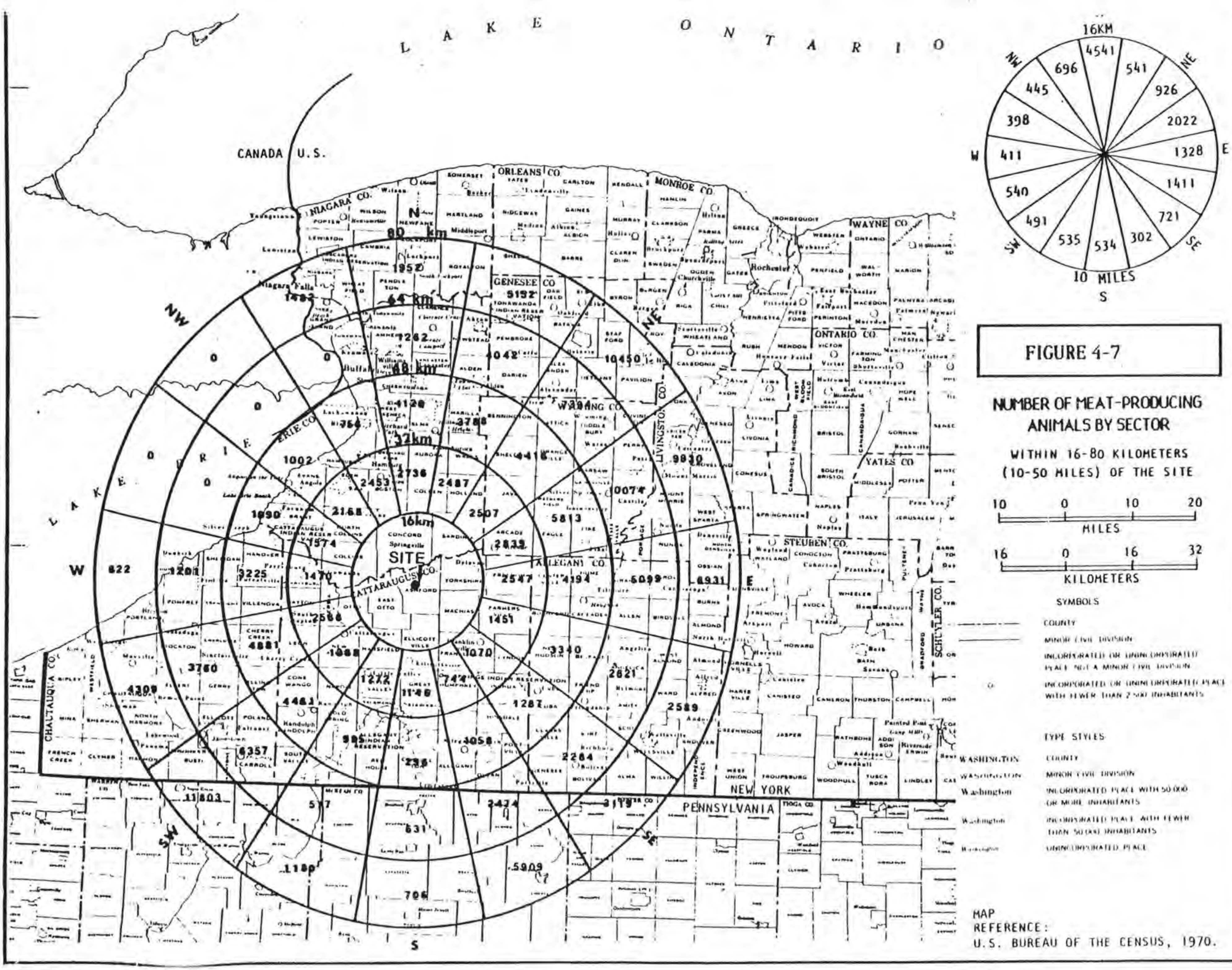


FIGURE 4-7

NUMBER OF MEAT-PRODUCING ANIMALS BY SECTOR

WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE

MILES: 10 0 10 20

KILOMETERS: 16 0 16 32

SYMBOLS

COUNTY

MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE NOT A MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE WITH FEWER THAN 2,500 INHABITANTS

TYPE STYLES

WASHINGTON — COUNTY

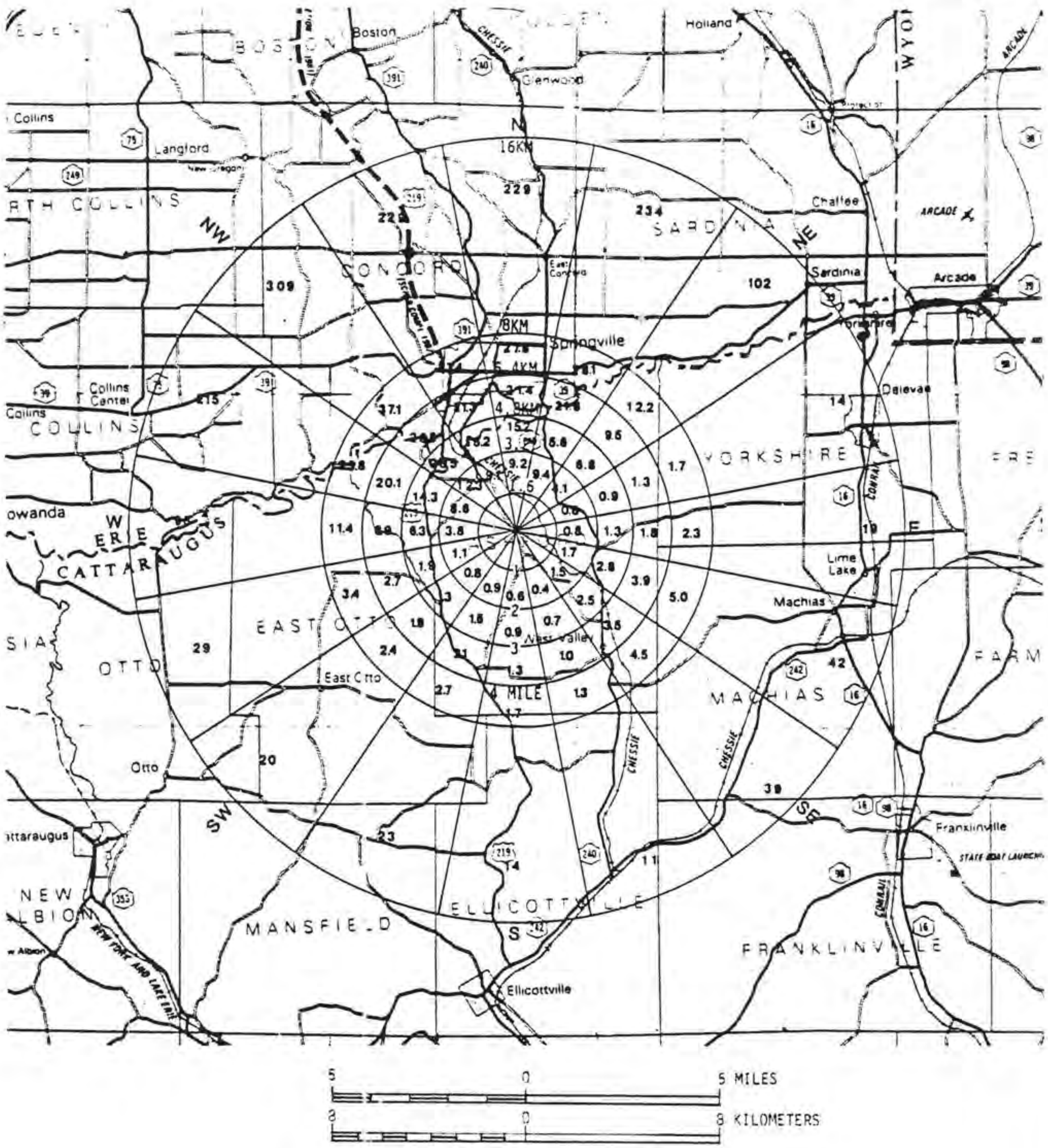
WASHINGTON — MINOR CIVIL DIVISION

Washington — INCORPORATED PLACE WITH 50,000 OR MORE INHABITANTS

Washington — INCORPORATED PLACE WITH FEWER THAN 50,000 INHABITANTS

Washington — UNINCORPORATED PLACE

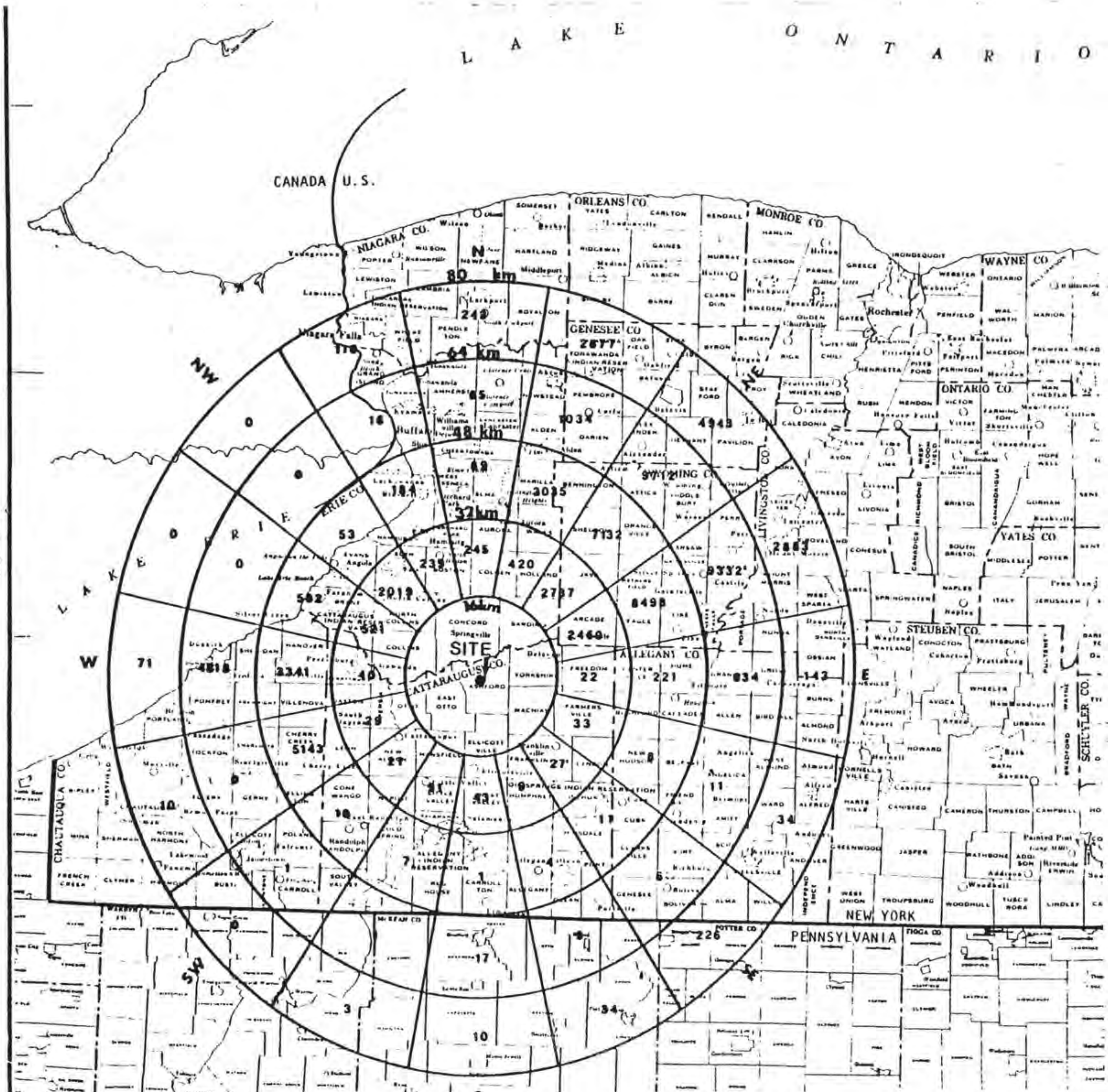
MAP REFERENCE: U.S. BUREAU OF THE CENSUS, 1970.



AGRICULTURAL PRODUCE LAND AREA (ha) BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-8



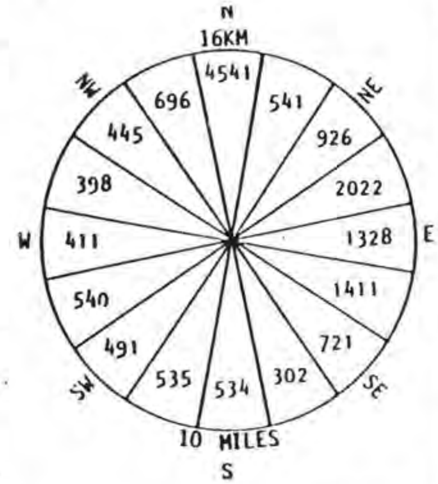


FIGURE 4-9

AGRICULTURAL PRODUCE LAND AREA (ha)

WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE

10 0 10 20
MILES

16 0 16 32
KILOMETERS

SYMBOLS

COUNTY

MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE NOT A MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE WITH FEWER THAN 2,500 INHABITANTS

TYPE STYLES

WASHINGTON — COUNTY

WASHINGTON — MINOR CIVIL DIVISION

Washington — INCORPORATED PLACE WITH 50,000 OR MORE INHABITANTS

Washington — INCORPORATED PLACE WITH FEWER THAN 50,000 INHABITANTS

Washington — UNINCORPORATED PLACE

MAP REFERENCE:
U.S. BUREAU OF THE CENSUS, 1970.

5.0 STANDARDS AND QUALITY ASSURANCE

5.1 Environmental Standards and Regulations

The following environmental standards and laws are applicable to the WVDP:

- o DOE Orders including 5480.1, "Requirements for Radiation Protection," August 1981 and 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements", February 1981.
- o Clean Air Act 42 USC 1857 et. seq., as amended.
- o Federal Water Pollution Control Act (Clean Water Act), 33 USC 1251, as amended.
- o Resource Conservation and Recovery Act, 42 USC 6905 as amended.
- o Comprehensive Environmental Response, Compensation and Liability Act, 42 USC 960.
- o Toxic Substances Control Act, 15 USC 2601, as amended.
- o Environmental Conservation Law of New York State.

The standards and guides applicable to releases of radionuclides from the WVDP are those of DOE Order 5480.1 Chapter XI, dated August 13, 1981, entitled, "Requirements for Radiation Protection." Radiation protection standards and selected radioactivity concentration guides from Chapter XI are listed in Appendix B. When there is a difference between soluble and insoluble chemical forms, the most restrictive guide is listed.

These listed guides are virtually identical to those in the Code of Federal Regulations (CFR), Title 10, Part 20. Ambient water quality standards contained in the SPDES permit issued for the facility are listed in Table C-5.2. Airborne discharges also are regulated by the U.S. Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants, 40 CFR 61, 1984.

5.2 Quality Assurance

Off-site laboratories performed the majority of the analyses requiring radiochemical separation for the environmental samples collected during 1985. The documented quality assurance plan used by these laboratories includes periodic interlaboratory cross-checks, prepared standard and blank analyses, routine instrument calibration, and use of standardized procedures. Off-site laboratories analyze blind duplicates of approximately 10% of the samples analyzed on-site for the same parameters in addition to unknown cross-check samples.

Sample collection, preparation, and most direct radiometric analyses were performed at the WVDP Environmental Laboratory for all media collected. Additionally, determination of Sr-90 in water is a routine radiochemical measurement performed in the Environmental Laboratory. For all continuous sampling equipment, measurement devices, and counting instruments, periodic calibration was maintained using standards traceable to the National Bureau of Standards.

Formal cross-check programs between the WVDP Environmental Laboratory and the DOE Radiological and Environmental Science Laboratory (RESL), Idaho National Engineering Laboratory (INEL) and Environmental Measurements Laboratory (EML), New York City, included the entire range of media monitored in 1985. A comparison of water analyses at WVDP and INEL is presented in Table D-1.1. Comparative analyses of a variety of media at WVDP and EML are summarized in Tables D-1.2 and D-1.3. The U.S. Environmental Protection Agency (EPA) cross-check programs for nonradiological water quality parameters also provided audit samples in 1985. In addition, the routine program of splitting samples between WVDP and the New York Department of Health, and a special sample split with the U.S. NRC provided additional quality assurance data.

As a result of the RESL cross-checks, one gamma standard was found to have been degraded and was replaced. A review of data which might have been impacted was performed, but no results were found to be affected substantially since the problem was limited to radionuclides not normally present in project effluents. Recalibration with a fresh standard has resulted in satisfactory performance. Two series of cross-checks in 1985 between WVDP and EML included soil, tissue, vegetation, air filters, and water. Results were satisfactory for all media routinely analyzed by WVDP. The several unsatisfactory results were for samples which required radiochemical separations or counting geometries not routinely used at WVDP in 1985. Procedures for analyzing these media are being carefully evaluated since they will be required on a routine basis in the immediate future.

The samples split with the U.S. NRC yielded several analyses which did not agree. The maximum discrepancy was a factor of 2.75, but the majority of the results were statistically equivalent. The analyses which were not in close agreement are being followed-up in accordance with the WVDP environmental monitoring procedures in order to resolve the discrepancies.

Given the slight differences in sample composition and collection schedule, the results for environmental media split with the NYSDOH through the first half of 1985 agreed quite well.

Review of 1984 TLD data identified the need for verification of the measurements using accurate exposure rate instruments. Individual exposure rate measurements at each of the TLD locations showed quite good agreement with the integrated measurements during the third quarter of 1985. Results of an intercomparison between TLD measurements by NRC and WVDP which was begun in the fourth quarter of 1985 are summarized in Table D-1.4. Despite the fact that the periods of measurement are offset by one full month, these data are in good agreement at all locations where the dose rate is assumed to have been constant for the entire period. Additionally, WVDP is participating in the 1985-86 environmental dosimetry intercomparison program sponsored by EML. Based on the various audit and cross-check results, the WVDP Environmental Monitoring Program is functioning well, and the areas needing improvement have been identified and are receiving appropriate attention.

5.3 Statistical Reporting Of Data

Except where noted, individual analytical results are reported with plus or minus (±) two standard deviations (2 σ) giving a value with an uncertainty band at the 95% confidence level. The arithmetic averages were calculated using actual results, including zero and negative values. In the final results, if the uncertainty (±) was equal to or greater than the value, the measurement was considered to be below the Minimum Detectable Concentration (MDC) for that measurement (see Section 5.4). Less than (<) values indicate the value below which activity could not be measured at the 95% confidence level. These MDC values will vary among samples, especially in biological media where sample size cannot be easily standardized.

The total statistical uncertainty for radiological measurements, including systematic (processing and physical measurement) uncertainty plus the random radioactivity counting uncertainty, is reported as one value for the 1985 data. In most cases, systematic uncertainties (e.g., due to laboratory glassware or analytical balance variation) are a small percentage of the larger counting uncertainties at typical environmental levels of radioactivity. The notation normally used in reporting of raw laboratory data to convey the total uncertainty is in the form: (V.00 ± R.0; T.0) E-00 where "V.00" is the analytical value to three significant figures, "± R.0" is the random uncertainty to two significant figures, "T.0" is the total of random plus systematic uncertainties, and "E-00" is the exponent of 10 used to signify the magnitude of the parenthetical expression.

5.4 Analytical Detection Limits

For unique or individual samples analyzed on an infrequent basis, generic minimum detection limits for the entire analytical measurement protocol have not been developed, although a Lower Limit of Detection (LLD) based solely on the counting uncertainty is calculated for each sample. For routine measurements using standardized sample sizes, equipment, and preparation techniques, an average Minimum Detectable Concentration (MDC) has been calculated for WVDP environmental samples. These are listed in Table 5-1.

Specific sample media were analyzed for radionuclides from multiple split samples, using routine procedures, normal techniques and labware, and standard counting parameters. The counting statistics determined the estimated LLD above which there was 95% probability that radioactivity was present. This LLD is derived from the detection efficiency of the measuring instrument for the type of activity being measured, the level of normal background signal with no sample present (determined by counting a "background" of the same material as the sample) and the length of time the background and sample were counted. For radioactive decay, these factors can be used to accurately predict what value is the lowest which can be measured at a given confidence level. A separate calculation for systematic uncertainty, including the variation between duplicate samples, labware differences, and physical measurements was made and added to the statistical counting LLD to obtain the minimum analytical detection limit or MDC for the entire process. Volumetric measurement of sample flow rates, calibration standard uncertainties, and pipetting device accuracy were some of the factors included in this calculation. The overall result is the average Minimum Detectable Concentration (MDC) (at the 95% confidence level) for that type of sample treated in a uniform manner. For most samples, there is little or no significant difference between the LLD and the MDC.

TABLE 5-1

MINIMUM DETECTABLE CONCENTRATIONS FOR ROUTINE SAMPLES

Measurement	Medium	Sample Size	MDC
gross alpha	water	1 litre	8.1 E-10 uCi/ml
gross beta	water	1 litre	7.7 E-10 uCi/ml
Cs-137	water	250 ml	2.1 E-08 uCi/ml
H-3	water	5 ml	1.0 E-07 uCi/ml
Sr-90	water	1 litre	1.6 E-09 uCi/ml
gross alpha	air	400 m^3	1.1 E-15 uCi/ml
gross beta	air	400 m^3	1.9 E-15 uCi/ml
Cs-137	air	400 m^3	1.4 E-14 uCi/ml
gross alpha	soil	150 mg	5.5 E-06 uCi/g
gross beta	soil	150 mg	5.3 E-06 uCi/g
Cs-137	soil	350 g	6.3 E-08 uCi/g

6.0 REFERENCES

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7.0 DISTRIBUTION

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APPENDIX A-1

1985 EFFLUENT, ON-SITE AND OFF-SITE RADIOLOGICAL MONITORING PROGRAM

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Main plant ventilation exhaust stack **ANSTACK** Cement Solidification system ventilation exhaust **ANCSSTK** (Added November 1985)	Release point for airborne radioactive exhaust Required by: DOE 5484.1, Tech Spec 5.1.2, 5.1.4, 4.1.1 Reported: Internal Monthly Summary Annual Effluent Report Annual Environmental Report	Continuous off-line air particulate monitor[a] Continuous off-line air particulate and iodine sampler[a]	Continuous measurement of fixed filter, replaced weekly Weekly collection of filter paper and charcoal absorber	118 118	Real time alpha and beta monitoring Filters for gross alpha/ beta Quarterly composites: filters for Sr-90, gamma isotopic; Charcoal for I-129
Lagoon 3 discharge Weir **WNSP001**	Primary point of liquid effluent batch release Required by: DOE 5484.1 Tech Spec 5.1.1 5.1.4, 4.2 SPDES Reported: NYSDEC Monthly DMR Annual Effluent Report Annual Environmental Report	Grab Liquid	Daily, during Lagoon 3 discharge	40-80	Daily: Gross beta, pH. Every sixth daily sample: gross alpha/ beta, H-3, Sr-90, gamma isotopic; 24 hour composite for metals, NH_3 (new SPDES permit in effect Sept. 1985) Weighted monthly composite of daily samples, and 24 hour composite: gross alpha/ beta, H-3, Sr-90, I-129, gamma isotopic Quarterly weighted composite of daily samples: U isotopic, Pu isotopic

[a]Isokinetic sampling probe placed at the 231 foot level (plant elevation) within the main stack; at the 168 foot level within the CSS vent stack.

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Erdman Brook at security fence **WNSP006**	Combined facility liquid discharge Required by: DOE 5484.1	Continuous proportional sample liquid	Monthly* (Composite of biweekly collections)	12	Gross alpha/beta, H-3 (Total Fe biweekly) Quarterly composite: gamma isotopic, Sr-90
	Reported: Internal Monthly Summary NYSDEC Monthly DMR Annual Environmental Report	Grab liquid	biweekly	26	NH_3, pH
Plant Effluent Interceptors **WNINTER**	Untreated liquid to LLWT plant input lagoon Required by: Tech Spec 4.2 Reported: Internal Review	Grab Liquid	Once per transfer	150-250	Quarterly composite: gross alpha/beta, H-3, Sr-90
(33) Onsite Ground water (wells) **WNWNF-series** **WNW80-series** **WNW82-series**	Ground water monitoring wells around site facilities Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Semiannual*	66	Gross alpha/beta, H-3, pH

*Samples to be split (shared with NYSDOH)

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Sanitary Waste Discharge **WNSP004** (New SPDES permit changes sample point to WNSP007)	Liquid effluent point for sewage treatment plant Required by: DOE 5484.1 SPDES Reported: NYSDEC Monthly DMR Annual Effluent Report Annual Environmental Report	Grab liquid	Weekly Semiannually	52 2	Gross beta, pH, settleable solids Monthly composite: gross alpha/beta, H-3, and Sr-90 Quarterly composite: BOD, suspended solids Gross alpha/beta, H-3, gamma isotopic Sr-90, I-129
N.E. Swamp drainage **WNSWAMP**	Site surface drainage Required by: DOE 5484.1 Reported: Annual Effluent Report	Grab liquid	Weekly Monthly*	52	H-3 Gross alpha/beta, H-3

*Samples to be split (shared with NYSDOH)

BLC0465:SEA33

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
French Drain **WNFRDRN** (New SPDES permit changes sample point ID to WNSP008)	Drains subsurface water from LLWT lagoon area Required by: DOE 5484.1	Grab liquid	Weekly	52	H-3
	Reported: Annual Effluent Report		Monthly	12	Gross alpha/beta
Franks Creek E of NYSLLWB **WNFRC67**	Drains NYS Low Level Waste Burial area	Grab liquid	Monthly	12	Gross alpha/beta, H-3
	Required by: DOE 5484.1 Reported: Internal review NYSERDA		Weekly*		
Erdman Brook N of burial areas **WNERB53**	Drains NYS and WVDP disposal areas Required by: DOE 5484.1 Reported: Internal Review NYSERDA	Grab liquid	Weekly*	52	Gross alpha/beta, H-3

*Samples to be split (shared with NYSDOH).

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Ditch N of WVDP NDA **WNHULLB**	Drains WVDP disposal area Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Weekly (when flowing)	30	Gross beta and H-3
Cooling water pipe **WNSFILT** (WNSP007 includes this point on new SPDES permit)	Discharges sand filter backwash liquid Required by: DOE 5484.1 Reported by: Internal Review	Grab liquid	Monthly	12	Gross beta
Condensate Pipe **WNCONDP** (WVNSP007 includes this	Discharges drainage water from utility ditch[b] Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross beta

*Samples to be split (shared with NYSDOH)

[b]Utility ditch drains steam condensate from traps along the side of the utility room.

1985 EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Condensate and Cooling Water Ditch **WNSP005**	Combined drainage from pipes.and settling ponds Required by: DOE 5484.1 SPDES Reported: Internal Review NYSDEC Monthly DMR	Grab liquid	Monthly	12 12	Gross beta Suspended solids, pH on 24 hr. composite
Settling Basin Outfall **WNSETLB**	Drains settling basins that receive discharge water from demineralizer backwash Required by: DOE5484.1 Reported: Internal Review.	Grab liquid	Monthly	12	Gross alpha/beta, H-3
Cooling Tower Basin **WNCOOLW**	Cools plant utility steam system water Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Weekly	52	Gross beta

*Samples to be split (shared with NYSDOH)

BLC0465:SEA33

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(9) Onsite Standing water (ponds not receiving effluent) **WNSTAW-series**	Water within vicinity of plant airborne or ground water effluents Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Annually	9	Gross alpha/beta, H-3, pH
Site Potable Water **WNDRNKW**	Source of water within site perimeter Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross alpha/beta, H-3

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek at Felton Bridge location **WFFELBR**	Unrestricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.1, 5.1.4 Reported: Internal Monthly Summary Annual Environmental Report	Flow weighted continuous liquid	Weekly*	52	Weekly for gross alpha/beta, H-3; Monthly composite for gamma isotopic and Sr-90

*Samples to be split (shared with NYSDOH)

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek upstream of Buttermilk Creek confluence at Bigelow Bridge **WFBIGBR**	Unrestricted surface water background Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Monthly	12	Gross alpha/beta, H-3
Buttermilk Creek, just upstream of Cattaraugus Creek confluence at Thomas Corners Road **WFBCTCB**	Restricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Composite continuous liquid	Biweekly	26	Monthly for gross alpha/beta, H-3; Quarterly composite for gamma isotopic and Sr-90
Buttermilk Creek control location near Fox Valley **WFBCBKG**	Restricted surface water background Required by: DOE 5484.1 Reported: Internal Monthly Summary Annual Environmental Report	Composite continuous liquid	Biweekly	26	Monthly for gross alpha/beta, H-3; Quarterly composite for gamma isotopic and SR-90

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Wells near WVDP outside WNYNSC Perimeter	Drinking supply ground water near facility.	Grab liquid	Biennially	10 (year of collection)	Gross alpha/beta, H-3, gamma isotopic
3.0 Km WNW **WFWEL01**	Required by: DOE 5484.1				
1.5 Km NW **WFWEL02***	Reported: Annual Environmental Report				
4.0 Km NW **WFWEL03**					
3.0 Km NW **WFWEL04**					
2.5 Km SW **WFWEL05***					
11.0 Km SSW **WFWEL06***					
4.0 Km NNE **WFWEL07**					
2.5 Km ENE **WFWEL08***					
3.0 Km SE **WFWEL09***					
7.0 Km N **WFWEL10***					

* These wells sampled 1985

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
3.0 Km SSE at Fox Valley **AFFXVRD** 3.7 Km NNW at Thomas Corners Road **AFTCORD** 2.0 Km NE of Route 240 **AFRT240** 1.5 Km NW on Rock Springs Road (added in 1984) **AFRSPRD** 29 Km S at Great Valley (background added in 1984) **AFGRVAL** 7 Km at Springville (added in 1984) **AFSPRVL** 6 Km SSE at West Valley (added in 1984) **AFWEVAL**	Particulate air samples around WNYNSC perimeter Required by: DOE 5484.1 Tech. Spec 5.4.1 Reported: Annual Environmental Report	Continuous air particulate	Weekly	364	Weekly (each filter) gross alpha/beta Quarterly: (Each station) composite filters for Sr-90, gamma isotopic.

BLC0465:SEA33

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES REFORMED/ COMPOSITE FREQUENCY
2.5 Km Sw **AFDHFOP** 3.0 Km SSE **AFFXFOP** 3.7 Km NNW **AFTCFOP** 2.0 Km NE **AF24FOP**	Fallout particulate and fluid collection around WNYNSC perimeter Required by: DOE 5484.1 Reported:, Annual Environmental Report	Integrating liquid	Monthly	48	Gross alpha/beta, H-3
(7) Surface soil (at each air particulate sampler) 47 Km W at Dunkirk 26 Km SSW at Little Valley **SF-series**	Long-term fallout accumulation Required by: DOE 5484.1 Reported: Annual Environmental Report	Surface plug composite soil	Triennially*	9 (year of collection)	Gamma isotopic, Sr-90, and Pu

*Samples to be split (shared with NYSDOH)

BLC0465:SEA33

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Buttermilk Creek at Thomas Corners Road **SFTCSED** Buttermilk Creek at Fox Valley Road (background)* **SFBCSED** Cattaraugus Creek at Felton Bridge **SFCCSED** Cattaraugus Creek at Springville Dam* **SFSDSED** Cattaraugus Creek at Bigelow Bridge (background) **SFBISED**	Deposition in sediment downstream of facility effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Grab steam sediment	Semiannually * (split two only)	10	Gross alpha/beta, isotopic gamma and Sr-90

*Samples to be split (shared with NYSDOH)

BLC0465:SEA33

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek downstream of the Buttermilk Creek confluence BFFCATC Control sample from nearby stream not affected by WVDP (7 Km or more upstream of site effluent point) BFFCTRL	Fish in waters downstream of facility effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection, biological	Semiannually*	36 (each sample point is 9 fish)	Isotopic gamma and Sr-90 in edible portions; Sr-90 in skeleton (down stream only)

*Samples to be split (shared with NYSDOH)

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Dairy farm, 3.8* Km NNW **BFMREED**	Milk from animals foraging around facility perimeter	Grab biological	Monthly* (BFMREED)	12	Gamma isotopic, Sr-90, and I-129 on annual samples and quarterly composites of monthly samples
Dairy farm, 2.5* Km ENE **BFMZIMM**	Required by: DOE 5484.1 Tech Spec 5.1.4		Annual (others)* (split 2 only)	3	
Dairy farm, 1.9 Km WNW **BFMCOBO**	Reported: Annual Environmental Report				
Control location* (central NY State sample to be provided by NYSDOH) **BFMCTRL**					

*Samples to be split (shared with NYSDOH)

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(3) Nearby downwind location **BFVNEAR** (3) Remote locations (16 Km or more from facility) **BFVCTRL**	Fruit and vegetables grown near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab Biological	Annually,* at harvest	6	Gamma isotopic and Sr-90 analyses of edible portions
Beef animal from nearby farm in downwind direction **BFBNEAR** Beef animal from control location (16 Km or more from facility) **BFBCTRL**	Meet-Beef foraging near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab biological	Semiannually*	4	Gamma isotopic analysis of meat.

*Samples to be split (shared with NYSDOH)

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
In vicinity of the site **BFDNEAR** Control animal (16 Km or more from facility) **BFDCTRL**	Meat-Deer foraging near facility perimeter Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection biological	Annually, during hunting season* During year as available*	2	Gamma isotopic analyses of meat, Sr-90 in meat. Sr-89/90 in bone (BFDNEAR only).

*Samples to be split (shared with NYSDOH)

BLC0465:SEA33

1985 OFF-SITE RADIOLOGICAL MONITORING PROGRAM

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Thermoluminescent Dosimetry (TLD) (16) at each of 16 compass sectors, at nearest accessible perimeter point (2) at corners of NYS LLW burial area 1500 m NW (nearest downwind receptor) "5 Points" landfill, 19 Km SW (background) Great Valley, 29 Km S (background) Springville 7 Km N West Valley 6 Km SSE North Security Fence (added in 1985) Rock Springs Road, 0.5 km N (added in 1985) DFTLD-series	Direct Radiation around facility Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Integrating LiF TLD	Quarterly* (data shared from overlap locations)	100	Quarterly gamma dose

*Samples to be split (shared with NYSDOH)

APPENDIX A-2

EFFLUENT, ON-SITE AND OFF-SITE RADIOLOGICAL MONITORING PROGRAM

FOR IMPLEMENTATION DURING 1986

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Main plant ventilation exhaust stack **ANSTACK** Cement Solidification (CSS) facility ventilation exhaust. **ANCSSTK**	Release point for airborne radioactive exhaust Required by: DOE 5484.1, Tech Spec 5.1.2, 5.1.4, 4.1.1 Reported: Internal Monthly Summary Annual Effluent Report Annual Environmental Report	Continuous off-line air particulate monitor Continuous off-line air particulate and iodine sampler[a] Continuous off-line tritium (as water vapor) sampler (ANSTACK ONLY)	Continuous measurement of fixed filter, replaced weekly Weekly collection of filter paper, charcoal absorber, and dessicant for collection	208 260	Real time alpha and beta monitoring Filters for gross alpha/ beta, gamma isotopic upon collection, H-3 weekly. Quarterly composites: filters for Sr-90, Pu/U isotopic, Am-241; gamma isotopic; Charcoal for I-129
Lagoon 3 discharge Weir **WNSP001**	Primary point of liquid effluent batch release Required by: DOE 5484.1 Tech Spec 5.1.1 5.1.4, 4.2 SPDES Reported: NYSDEC Monthly DMR Annual Effluent Report Annual Environmental Report	Grab Liquid	Daily, during Lagoon 3 discharge	40-80	Daily: Gross beta, conductivity, pH. Every sixth daily sample: gross alpha/ beta, H-3, Sr-90, gamma isotopic; two 24 hour composites for Al, NH_3, As, BOD-5, Fe, Zn, Cn, pH, suspended and settleable solids. Weighted monthly composite of daily samples: gross alpha/ beta, H-3, Sr-90, I-129, gamma isotopic Quarterly weighted composite of daily samples: U isotopic, Pu isotopic, Am-241 Annually, a 24 hour composite for: Cd, Cr, Cu, Pb, Ni, Se.

[a] Isokinetic sampling probes placed at 231' (plant elevation) within the main stack, at the 168' level within the CSS vent stack.

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Erdman Brook at security fence **WNSP006**	Combined facility liquid discharge Required by: DOE 5484.1	Continuous proportional sample liquid	Monthly* (Composite of biweekly collections)	12	Gross alpha/beta, H-3, pH, conductivity ~~(Total Fe biweekly)~~ Quarterly composite: gamma isotopic, Sr-90, I-129
	Reported: Internal Monthly Summary ~~NYSDEC/Monthly DMR~~ Annual Environmental Report NH_3 & Fe deleted from schedule	~~Grab liquid~~	~~biweekly~~	~~26~~	~~NH_3/pH~~
~~Plant/Effluent Interceptors WNINTER~~	~~Untreated liquid to LLWT plant input lagoon~~ ~~Required by: Tech Spec 4.2~~ ~~Reported: Internal Review~~ DELETED	~~Grab liquid~~	~~Once per transfer~~	~~150-250~~	~~Quarterly composite: gross alpha/beta, H-3, Sr-90~~
Onsite Ground water (wells) **WNW80-series** **WNW82-series**	Ground water monitoring wells around site facilities Required by: DOE 5484.1	Grab liquid	Quarterly*	132	Gross alpha/beta, H-3, pH, conductivity, chloride, Fe, Mn, Na, sulfate, phenols, TOC, TOH
	Reported: Annual Environmental Report WNWNF series wells to be phased out by 1987 except for periodic tritium/pH measurements		Annually		gamma scan

*Samples to be split (shared with NYSDOH)

[illegible]

FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Sanitary Waste Discharge **WNSP007**	Liquid effluent point for sanitary and utility plant combined discharge Required by: DOE 5484.1 SPDES	24 hr liquid	3/month	36	Gross alpha/beta, pH, H-3, settleable solids, suspended solids, NH_3, BOD-5, Fe
	Reported: NYSDEC Monthly DMR Internal Monthly Summary Annual Effluent Report Annual Environmental Report	Grab	Annually	1	Chloroform
N.E. Swamp drainage **WNSWAMP**	Site surface drainage Required by: DOE 5484.1 Reported: Annual Effluent Report	Grab liquid	Monthly*	24	Gross alpha/beta, H-3, pH
North Swamp drainage **WNSW74A**					

*Samples to be split (WNSWAMP only) with NYSDOH

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
French Drain **WNSP008**	Drains subsurface water from LLWT lagoon area	Grab liquid	3/month	36	pH, conductivity, BOD-5 Fe
	Required by: DOE 5484.1				
	Reported: NYSDEC Monthly DMR		Monthly	12	Gross alpha/beta, H-3
	Annual Effluent Report		Annually	1	Ag, Zn
Franks Creek E of NYSLLWB **WNFRC67**	Drains NYS Low Level Waste Burial area	Grab liquid	Monthly	12	Gross alpha/beta, H-3, pH
	Required by: DOE 5484.1		Weekly*		
	Reported: Internal review NYSERDA				
Erdman Brook N of burial areas **WNERB53**	Drains NYS and WVDP disposal areas	Grab liquid	Weekly*	52	Gross alpha/beta, H-3 pH
	Required by: DOE 5484.1				
	Reported: Internal Review NYSERDA				

*Samples to be split (shared with NYSDOH).

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Ditch N of WVDP NDA & LLWB **WNNDADR**	Drains WVDP disposal area Required by: DOE 5484.1 Reported: Internal Review	Composite Continuous Liquid	Weekly	52	Weekly gamma isotopic, pH, conductivity, monthly: gross alpha/beta, quarterly composite: Sr-90, I-129
~~Cooling water pipe~~ ~~**WNSFILT**~~	~~Discharges sand filter backwash liquid~~ ~~Required by:~~ ~~DOE 5484.1~~ ~~Reported by:~~ ~~Internal Review~~ DELETED	~~Grab liquid~~	~~Monthly~~	~~12~~	~~Gross beta~~
~~Condensate Pipe~~ ~~**WNCONDP**~~	~~Discharges drainage water from utility ditch~~[b] ~~Required by:~~ ~~DOE 5484.1~~ ~~Reported:~~ ~~Internal Review~~ DELETED	~~Grab liquid~~	~~Monthly~~	~~12~~	~~Gross beta~~

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Condensate and Cooling Water Ditch **WNSP005**	Combined drainage from facility yard area Required by: DOE 5484.1 SPDES Reported: Internal Review	Grab liquid	Monthly	12	Gross alpha/beta, H-3 pH
~~Settling Basin Outfall~~ ~~**WNSETLB**~~	~~Drains settling basins that receive discharge water from demineralizer backwash~~ ~~Required by:~~ ~~DOE 5484.1~~ ~~Reported:~~ ~~Internal Review~~ DELETED	~~Grab liquid~~	~~Monthly~~	~~12~~	~~Gross alpha/beta, H-3~~
Cooling Tower Basin **WNCOOLW**	Cools plant utility steam system water Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross alpha/beta, H-3, pH

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(7) Onsite Standing water (ponds not receiving effluent) **WNSTAW-series**	Water within vicinity of plant airborne or ground water effluents Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Annually	7	Gross alpha/beta, H-3, pH, conductivity, chloride, Fe, Mn, Na, phenols, sulfate
Site Potable Water **WNDRNKW**	Source of water within site perimeter Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly Annually	12 2	Gross alpha/beta, H-3, pH, conductivity Toxic metals, pesticides chemical pollutants

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek at Felton Bridge location WFFELBR	Unrestricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.1, 5.1.4 Reported: Internal Monthly Summary Annual Environmental Report	Flow weighted continuous liquid	Weekly*	52	Weekly for gross alpha/beta, H-3, pH; Monthly composite for gamma isotopic and Sr-90

*Samples to be split (shared with NYSDOH)

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
~~Cattaraugus Creek upstream of Buttermilk Creek confluence at Bigelow Bridge WFBIGBR~~	~~Unrestricted surface water background~~ ~~Required by: DOE 5484.1~~ ~~Reported: Annual Environmental Report~~ DELETE	~~Grab liquid~~	~~Monthly~~	~~12~~	~~Gross alpha/beta, H-3~~
Buttermilk Creek, just upstream of Cattaraugus Creek confluence at Thomas Corners Road **WFBCTCB**	Restricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Composite continuous liquid	Biweekly	26	Monthly for gross alpha/beta, H-3, pH; Quarterly composite for gamma isotopic and Sr-90
Buttermilk Creek control location near Fox Valley **WFBCBKG**	Restricted surface water background Required by: DOE 5484.1 Reported: Internal Monthly Summary Annual Environmental Report	Composite continuous liquid	Biweekly	26	Monthly for gross alpha/beta, H-3; Quarterly composite for gamma isotopic and SR-90

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Wells near WVDP outside WNYNSC Perimeter 3.0 Km WNW WFWEL01 1.5 Km NW WFWEL02 4.0 Km NW WFWEL03 3.0 Km NW WFWEL04 2.5 Km SW WFWEL05 11.0 Km SSW WFWEL06 4.0 Km NNE WFWEL07 2.5 Km ENE WFWEL08 3.0 Km SE WFWEL09 7.0 Km N WFWEL10	Drinking supply ground water near facility. Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Biennially	10 (year of collection)	Gross alpha/beta, H-3, gamma isotopic, pH, conductivity

OFF-SITE RADIOLOGICAL MONITORING PROGRAM FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
3.0 Km SSE at Fox Valley **AFFXVRD** 3.7 Km NNW at Thomas Corners Road **AFTCORD** 2.0 Km NE of Route 240 **AFRT240*†** 1.5 Km NW on Rock Springs Road (added in 1984) **AFRSPRD*†** 29 Km S at Great Valley (back-ground added in 1984) **AFGRVAL*†** 7 Km at Springville (added in 1984) **AFSPRVL** 6 Km SSE at West Valley (added in 1984) **AFWEVAL** 50 Km W at Dunkirk **AFDNKRK** 1.1 Km W on Boberg Road **AFBOBRG**	Particulate air samples around WNYNSC perimeter Required by: DOE 5484.1 Tech Spec 5.4.1 Reported: Annual Environmental Report *Monthly Internal Summary	Continuous air particulate Continuous H-3, charcoal†	Weekly	780	Weekly (each filter) gross alpha/beta, H-3 Quarterly: (Each station) composite filters for Sr-90, gamma isotopic; I-129 (on 3 stations)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES RFORMED/ COMPOSITE FREQUENCY
2.5 Km Sw **AFDHFOP** 3.0 Km SSE **AFFXFOP** 3.7 Km NNW **AFTCFOP** 2.0 Km NE **AF24FOP**	Fallout particulate and fluid collection around WNYNSC perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Integrating liquid	Monthly	48	Gross alpha/beta, H-3, pH
(9) Surface soil (at each air particulate sampler) 26 Km SSW at Little Valley **SF-series**	Long-term fallout accumulation Required by: DOE 5484.1 Reported: Annual Environmental Report	Surface plug composite soil	Triennially*	10 (year of collection)	Gamma isotopic, Sr-90, Pu, Am-241

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Buttermilk Creek at Thomas Corners Road SFTCSED†	Deposition in sediment downstream of facility effluents	Grab stream sediment	Semiannually * (split two only)	10	Gross alpha/beta, isotopic gamma and Sr-90
			Annually†	2	U/Pu isotopic, Am-241
Buttermilk Creek at Fox Valley Road (background)*† SFBCSED	Required by: DOE 5484.1 Tech Spec 5.1.4				
	Reported: Annual Environmental Report				
Cattaraugus Creek at Felton Bridge SFCCSED					
Cattaraugus Creek at Springville Dam* SFSDSED					
Cattaraugus Creek at Bigelow Bridge (background) SFBISED					

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek downstream of the Buttermilk Creek confluence **BFFCATC** Cattaraugus Creek downstream of Springville Dam **BFFCATD** Control sample from nearby stream not affected by WVDP (7 Km or more upstream of site effluent point) **BFFCTRL**	Fish in waters downstream of facility effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection, biological	Semiannually*	52 (each sample point is 9 fish)	Isotopic gamma and Sr-90 in edible portions; Sr-90 in skeleton (down stream BFFCATC only)

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Dairy farm, 3.8* Km NNW **BFMREED**	Milk from animals foraging around facility perimeter	Grab biological	Monthly* (BFMREED)	12	Gamma isotopic, Sr-90, H-3 and I-129 on annual samples and quarterly composites of monthly samples
Dairy farm, 2.5* Km ENE **BFMZIMM**	Required by: DOE 5484.1 Tech Spec 5.1.4		Annual (others)* (split 2 only)	3	
Dairy farm, 1.9 Km WNW **BFMCOBO**	Reported: Annual Environmental Report				
Control location* (central NY State sample to be provided by NYSDOH) **BFMCTRL**					
Dairy Farm NE of site **BFMXXXX**					
Dairy Farm 2.5 Km SSW **BFMWIDR**					

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(3) Nearby downwind location **BFVNEAR** (3) Remote location (16 Km or more from facility) **BFVCTRL**	Fruit and vegetables grown near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab Biological	Annually,* at harvest	6	Gamma isotopic and Sr-90 analyses of edible portions, H-3 in free moisture
Beef animal from nearby farm in downwind direction **BFBNEAR** Beef animal from control location (16 Km or more from facility) **BFBCTRL**	Meat-Beef foraging near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab biological	Semiannually*	4	Gamma isotopic analysis of meat.

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
In vicinity of the site **BFDNEAR** Control animal (16 Km or more from facility) **BFDCTRL**	Meat-Deer foraging near facility perimeter Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection biological	Annually, during hunting season* During year as available*	2	Gamma isotopic analyses of meat, Sr-90 in meat, Sr-89/90 in bone (BFDNEAR only)

*Samples to be split (shared with NYSDOH)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
FOR IMPLEMENTATION DURING 1986

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Thermoluminescent Dosimetry (TLD) (16) at each of 16 compass sectors, at nearest accessible perimeter point (2) at corners of NYS LLW burial area (5) at security fence around site. Rock Springs Road 500 m NNW of plant. 1500 m NW (nearest downwind receptor) "5 Points" landfill, 19 Km SW (background) Great Valley, 29 Km S (background) Springville 7 Km N West Valley 6 Km SSE Dunkirk, 50 Km W (background) **DFTLD-series**	Direct Radiation around facility Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Integrating LiF TLD	Quarterly* (data shared from overlap locations)	116	Quarterly gamma dose

*Samples to be split (shared with NYSDOH)

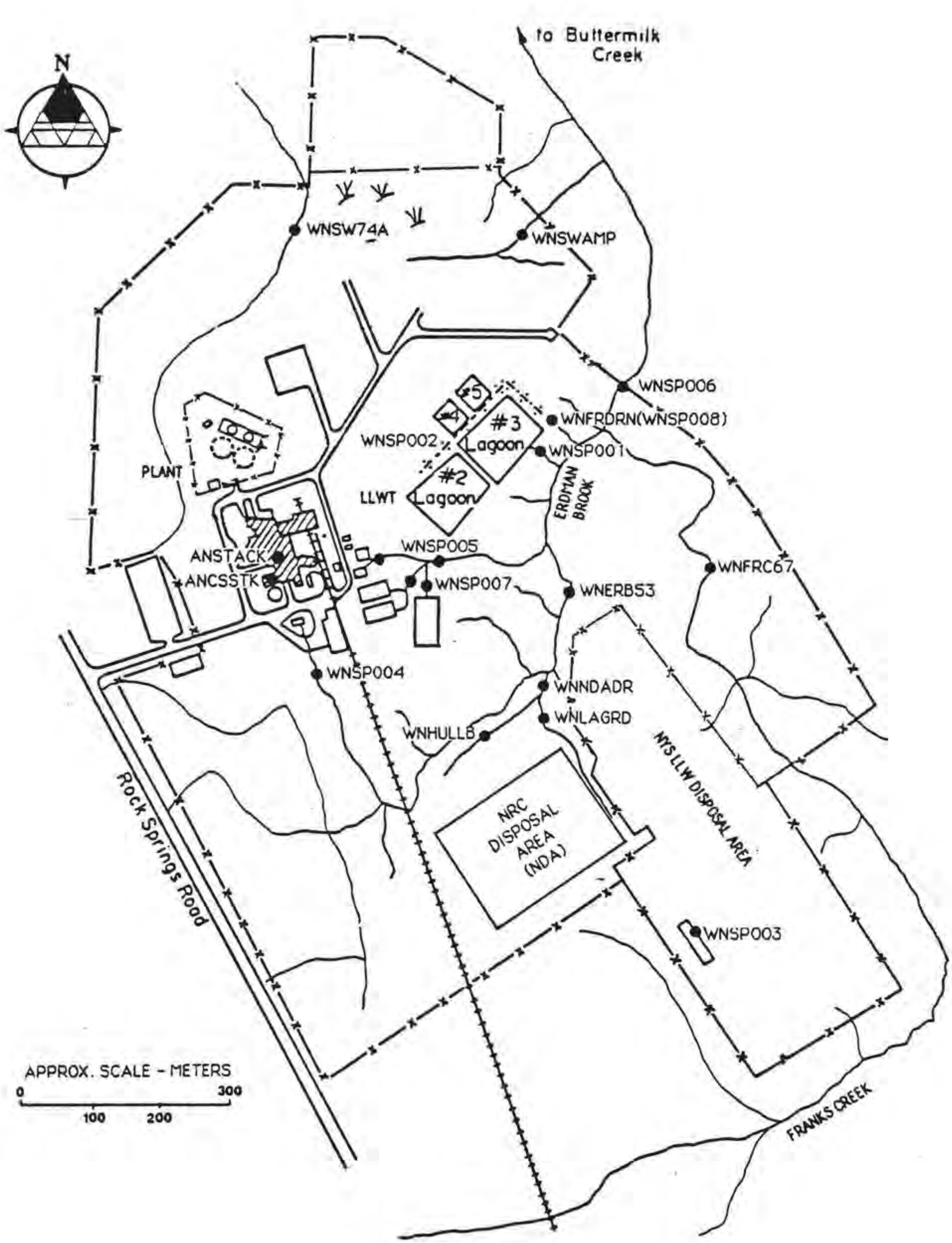


FIGURE A-1
Location of Effluent
Radiological Monitoring Points On-site

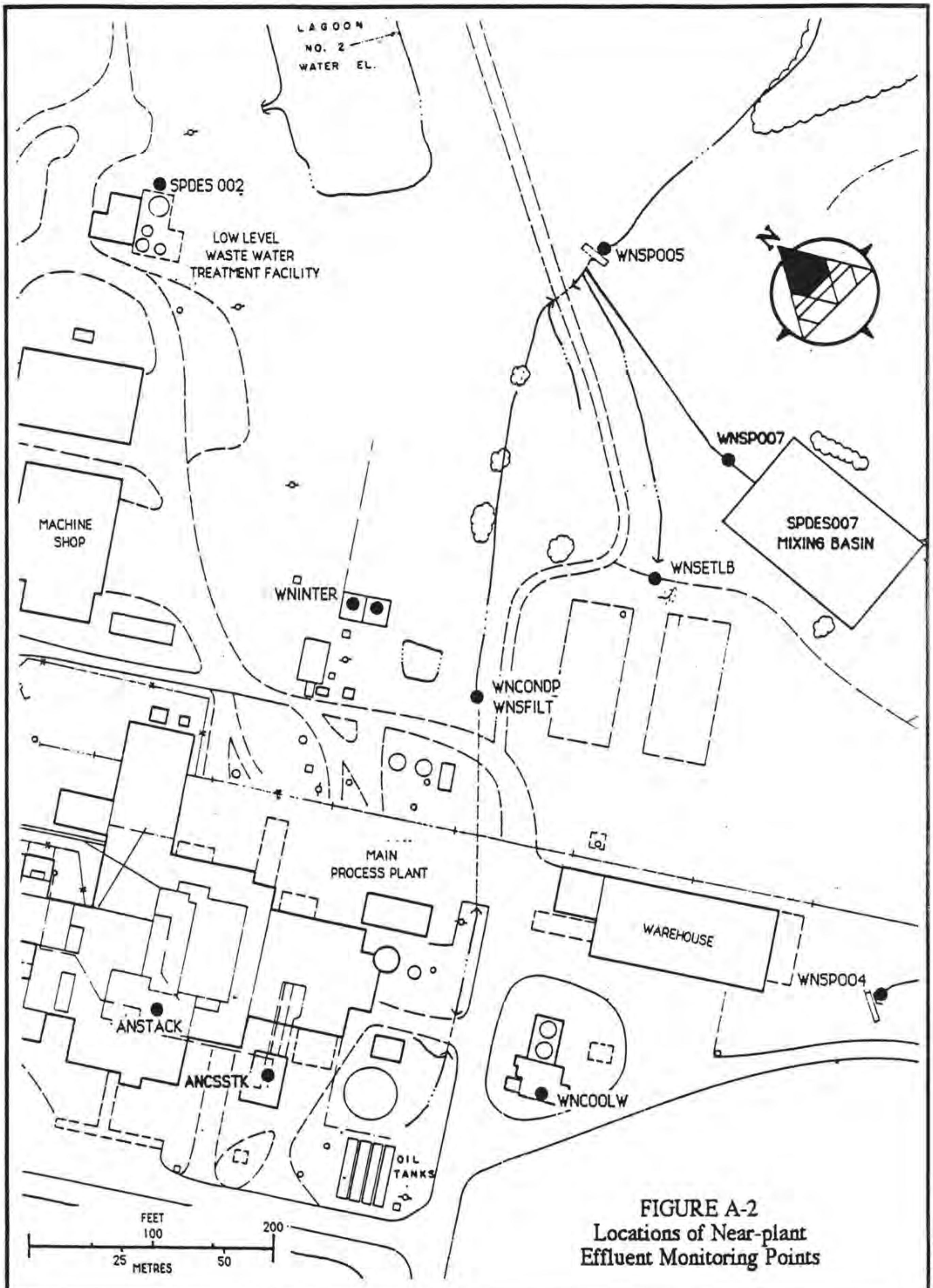


FIGURE A-2
Locations of Near-plant
Effluent Monitoring Points

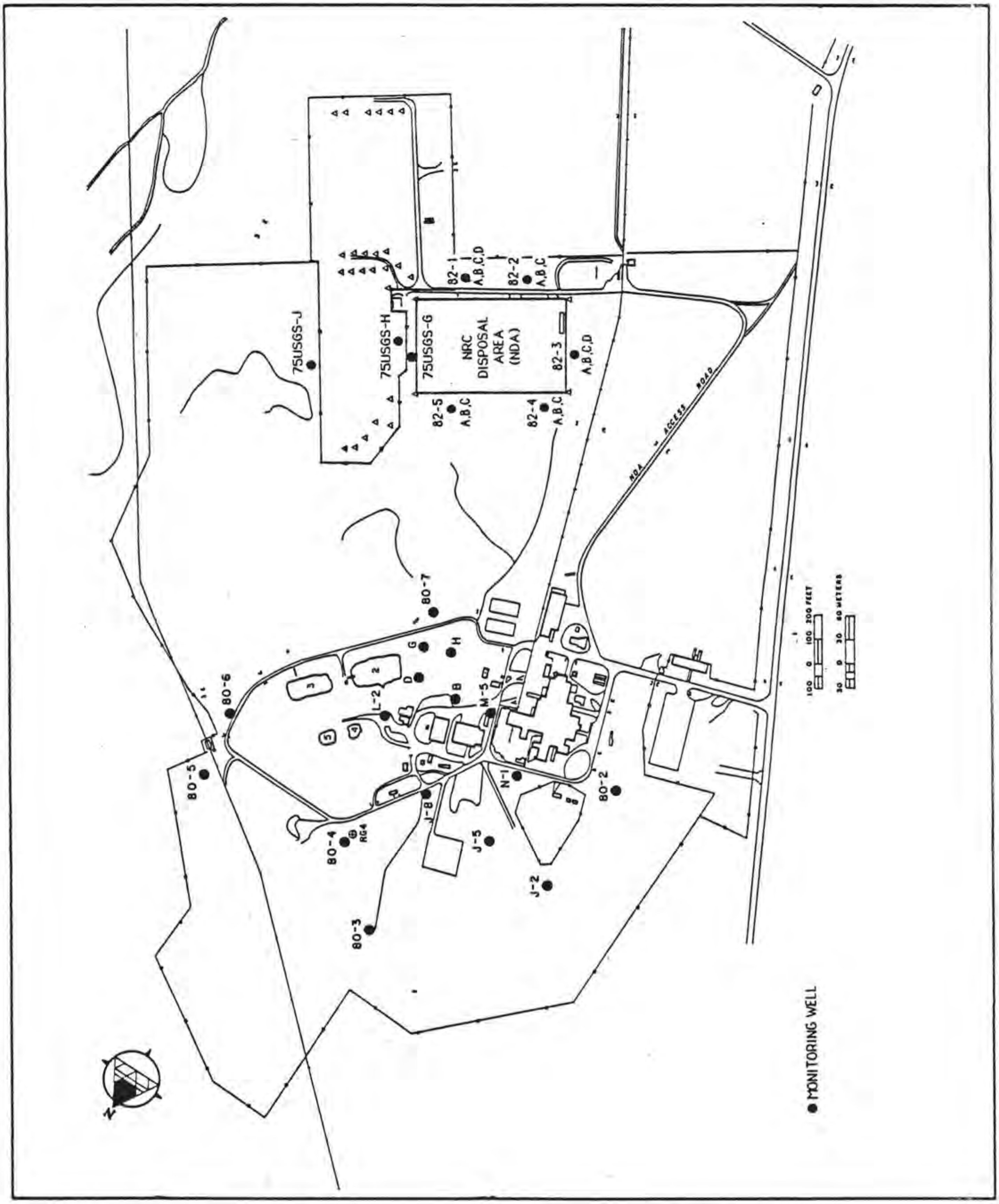


FIGURE A-3
Location of On-site Wells
Monitored in 1985

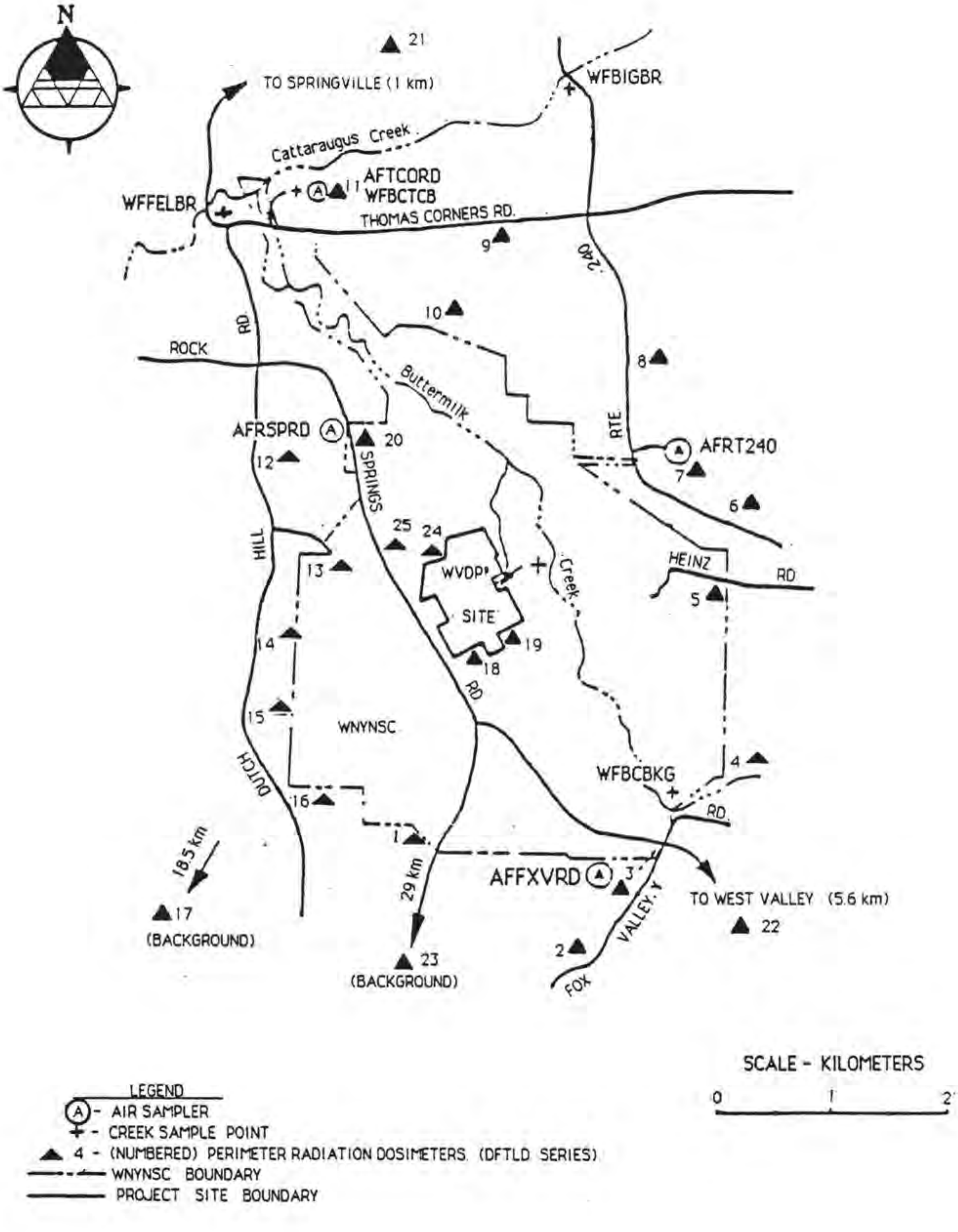


FIGURE A-4
Locations of Perimeter Environmental Monitoring Stations

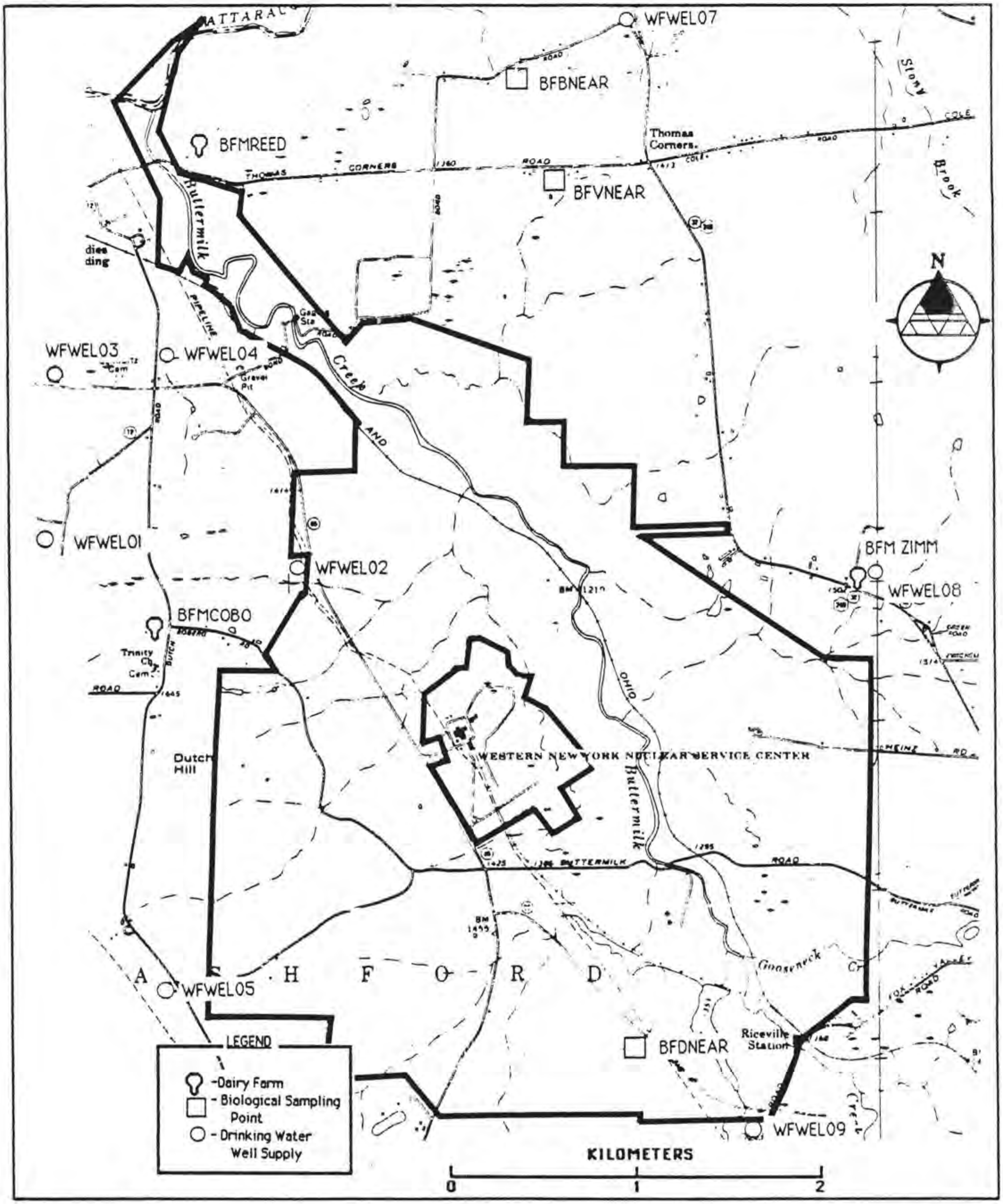
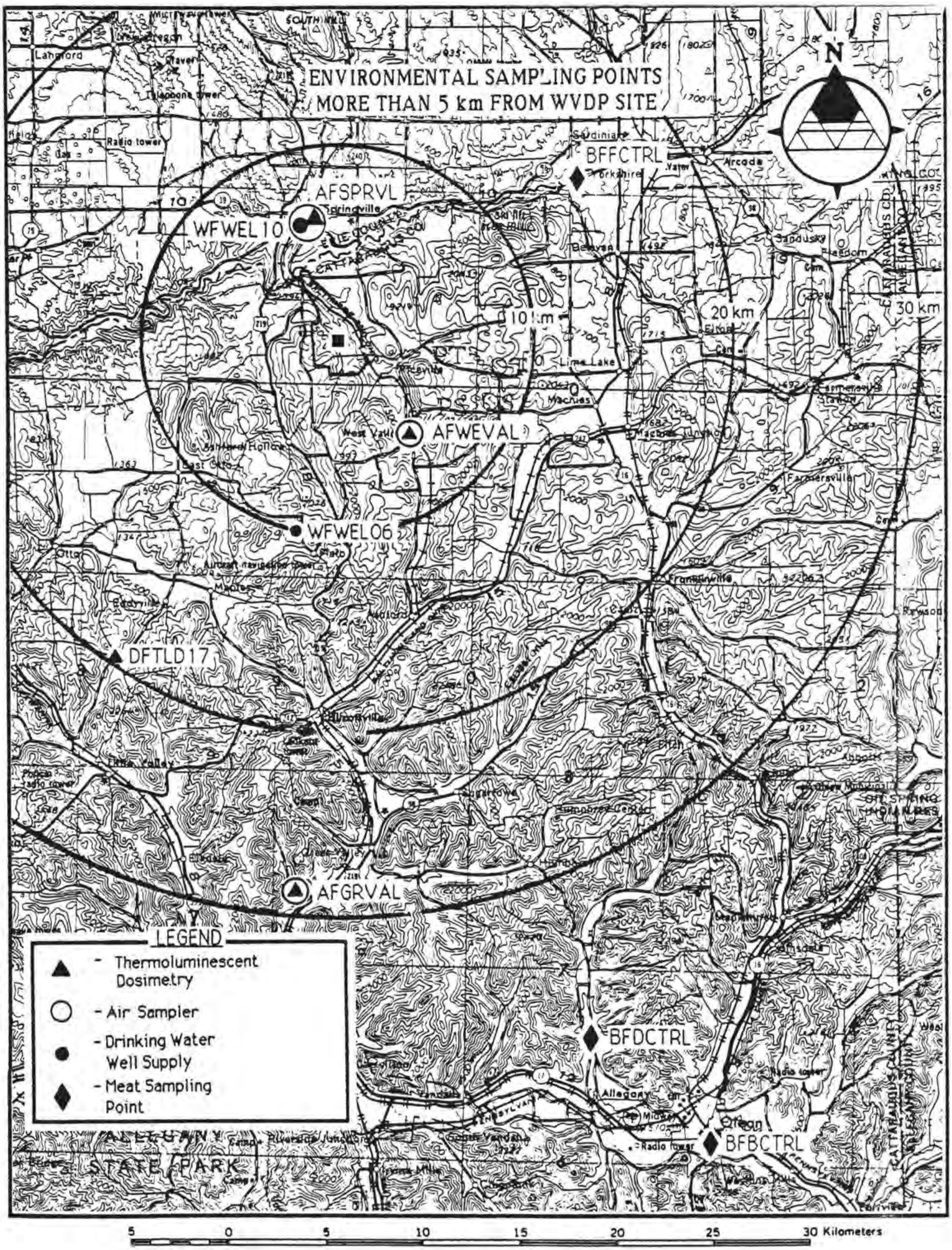


FIGURE A-5
Nearsite Drinking Water
and Biological Sample Points - 1985



ENVIRONMENTAL SAMPLING POINTS
MORE THAN 5 km FROM WVDP SITE
N
AFSPRVL
WFWEL10
BFFCTRL
10 km
20 km
30 km
AFWEVAL
WFWEL06
DFTLD17
AFGRVAL
BFDCTRL
BFBCTRL
LEGEND
- Thermoluminescent Dosimetry
- Air Sampler
- Drinking Water Well Supply
- Meat Sampling Point
5
0
5
10
15
20
25
30 Kilometers

FIGURE A-6

APPENDIX B

STANDARDS AND CONCENTRATION GUIDES

TABLE B-1
STANDARDS AND CONCENTRATION GUIDES
(DOE Order 5480.1, Chapter XI)

Radiation Protection Standards

Annual Effective Dose Equivalent (mrem/year)

Continuous Exposure of Any Member of the Public	100
Occasional Annual (less than 5 years duration) Exposure	500

Concentration Guides for Effluent Releases to Uncontrolled Areas (uCi/ml)

Radionuclide	In Air	In Water
H-3	2 E-07	3 E-03
C-14	1 E-07	8 E-04
Fe-55	3 E-08	8 E-04
Co-60	3 E-10	5 E-05
Ni-63	2 E-09	3 E-05
Sr-90	3 E-11	3 E-07
Zr-93	4 E-09	8 E-04
Nb-93m	4 E-09	4 E-04
Tc-99	2 E-09	2 E-04
Ru-106	2 E-10	1 E-05
Rh-106	1 E-10	3 E-06
Sb-125	9 E-10	1 E-04
Te-125m	4 E-09	1 E-04
I-129	2 E-11	6 E-08
Cs-134	4 E-10	9 E-06
Cs-135	3 E-09	1 E-04
Cs-137	5 E-10	2 E-05
Pm-147	2 E-09	2 E-04
Sm-151	2 E-09	4 E-04
Eu-152	4 E-10	8 E-05
Eu-154	1 E-10	2 E-05
Eu-155	3 E-09	2 E-04
U-233	4 E-12	4 E-06
U-234	4 E-12	4 E-06
U-235	4 E-12	4 E-06
U-236	4 E-12	5 E-06
U-238	5 E-12	6 E-07
Np-239	2 E-08	1 E-04
Pu-238	7 E-14	5 E-06
Pu-239	6 E-14	5 E-06
Pu-240	6 E-14	5 E-06
Pu-241	3 E-12	2 E-04
Am-241	2 E-13	4 E-06
Am-243	2 E-13	4 E-06
Cm-243	2 E-13	5 E-06
Cm-244	3 E-13	7 E-06
Gross alpha	2 E-14	3 E-08
Gross beta[a]	2 E-12	3 E-08
Th-natural	1 E-12	1 E-06

[a] Based on the most restrictive beta emitter (Ra-228)

APPENDIX D

SUMMARY OF QUALITY ASSURANCE ANALYSES

TABLE D - 1.1

COMPARISON OF RADIOLOGICAL CONCENTRATIONS IN QUALITY ASSURANCE SAMPLES BETWEEN WVNS LAB (WV) AND IDAHO NATIONAL ENGINEERING LABORATORY (INEL) JANUARY 1985

DATE	TYPE	LAB	ISOTOPE	REPORTED VALUE	% ERROR	INEL VALUE	RATIO WVDP/INEL	±
85 01	Water	WV	Co-57	0.146 E-01	10	0.147 E-01	0.99	0.10
85 01	Water	WV	Co-60	0.853 E-01	7	0.874 E-01	0.98	0.07
85 01	Water	WV	Sr-85	0.395 E-01	10	0.406 E-01	0.97	0.10
85 01	Water	WV	Y-88	0.946 E-01	8	0.989 E-01	0.96	0.08
85 01	Water	WV	Cd-109	0.371 E+00	9	0.400 E+00	0.93	0.08
85 01	Water	WV	Sn-113	0.540 E-01	8	0.538 E-01	1.00	0.09
85 01	Water	WV	Cs-137	0.772 E-01	7	0.787 E-01	0.98	0.07
85 01	Water	WV	Ce-139	0.132 E-01	15	0.134 E-01	0.98	0.12
85 01	Water	WV	Hg-203	0.194 E-01	16	0.190 E-01	1.02	0.15

TABLE D-1.2

COMPARISON OF RADIOLOGICAL CONCENTRATIONS IN QUALITY ASSURANCE SAMPLES BETWEEN WVNS LAB (WV) AND ENVIRONMENTAL MEASUREMENTS LABORATORY (EML) MAY, 1985

Date	Type	Lab	Isotope	Ser	Reported Value	Reported % Error	EML Value	Ratio Rp/EML	Ratio +/-
85 05	AIR	WV	BE 7	1	0.552E+04	1	0.572E+04	0.97	0.04
85 05	AIR	WV	BE 7	2	0.639E+03	2	0.572E+04	0.11	0.00
85 05	AIR	WV	MN 54	1	0.454E+03	1	0.450E+03	1.01	0.04
85 05	AIR	WV	MN 54	2	0.487E+03	1	0.450E+03	1.08	0.04
85 05	AIR	WV	CO 60	1	0.491E+03	2	0.500E+03	0.98	0.04
85 05	AIR	WV	CO 60	2	0.532E+03	0	0.500E+03	1.06	0.04
85 05	AIR	WV	SR 90	1	<0.333E+00		0.582E+01		
85 05	AIR	WV	SR 90	2	<0.300E+00		0.582E+01		
85 05	AIR	WV	SB 125	1	0.275E+03	2	0.394E+03	0.70	0.06
85 05	AIR	WV	SB 125	2	0.196E+03	4	0.394E+03	0.50	0.05
85 05	AIR	WV	CS 137	1	0.520E+03	0	0.527E+03	0.99	0.03
85 05	AIR	WV	CS 137	2	0.605E+03	0	0.527E+03	1.15	0.03
85 05	AIR	WV	PU 239	1	0.433E+01	4	0.431E+01	1.00	0.05
85 05	AIR	WV	PU 239	2	0.436E+01	5	0.431E+01	1.01	0.06
85 05	AIR	WV	AM 241	1	0.541E+01	5	0.500E+01	1.08	0.06
85 05	AIR	WV	AM 241	2	0.488E+01	4	0.500E+01	0.98	0.05
85 05	SOIL	WV	K 40	1	0.184E+02	3	0.203E+02	0.91	0.05
85 05	SOIL	WV	SR 90	1	0.880E-01	67	0.230E-01	3.83	2.58
85 05	SOIL	WV	CS 137	1	0.723E+00	5	0.760E+00	0.95	0.07
85 05	SOIL	WV	RA 226	1	0.523E+00	12	0.640E+00	0.82	0.11
85 05	SOIL	WV	PU 238	1	0.155E-02	100	0.400E-02	0.39	0.43
85 05	SOIL	WV	PU 239	1	0.310E-01	13	0.350E-01	0.89	0.14
85 05	SOIL	WV	AM 241	1	0.480E-02	33	0.240E-02	2.00	0.67
85 05	TISSUE	WV	K 40	1	0.426E+01	7	0.386E+01	1.10	0.11
85 05	TISSUE	WV	CO 60	1	0.241E+00	14	0.360E+00	0.67	0.11
85 05	TISSUE	WV	SR 90	1	0.166E+02	6	0.171E+02	0.97	0.08
85 05	TISSUE	WV	CS 137	1	0.881E+00	3	0.810E+00	1.09	0.05
85 05	TISSUE	WV	RA 226	1	0.416E+00	12	0.470E+00	0.89	0.14
85 05	TISSUE	WV	PU 239	1	0.715E-02	11	0.810E-02	0.88	0.12
85 05	TISSUE	WV	AM 241	1	0.596E-02	16	0.500E-02	1.19	0.29
85 05	VEGETN	WV	K 40	1	0.453E+01	1	0.431E+02	0.11	0.01
85 05	VEGETN	WV	CO 60	1	0.101E+01	4	0.109E+01	0.93	0.09
85 05	VEGETN	WV	SR 90	1	0.853E+01	6	0.109E+02	0.78	0.06
85 05	VEGETN	WV	CS 137	1	0.537E+01	9	0.526E+01	1.02	0.11
85 05	VEGETN	WV	PU 239	1	0.596E-01	6	0.440E-01	1.35	0.15
85 05	WATER	WV	H 3	1	0.171E+02	6	0.185E+02	0.92	0.06
85 05	WATER	WV	MN 54	1	0.367E+01	3	0.342E+01	1.07	0.07
85 05	WATER	WV	CO 60	1	0.538E+01	3	0.491E+01	1.10	0.05
85 05	WATER	WV	SR 90	1	0.982E+00	2	0.102E+01	0.96	0.06
85 05	WATER	WV	CS 137	1	0.592E+01	2	0.536E+01	1.10	0.05
85 05	WATER	WV	CE 144	1	0.450E+02	1	0.406E+02	1.11	0.03
85 05	WATER	WV	PU 239	1	0.439E-01	4	0.428E-01	1.03	0.05
85 05	WATER	WV	AM 241	1	0.851E-01	3	0.640E-01	1.33	0.10
85 05	WATER	WV	U 238	1	0.235E-01	5	0.220E-01	1.07	0.12
85 05	WATER	WV	U UG	1	0.616E-01	6	0.640E-01	0.96	0.10
85 05	DION W.	WV	CO UG	1	0.233E+01	0	0.224E+01	1.04	0.04
85 05	DION W	WV	MN UG	1	0.193E+01	0	0.193E+01	1.00	0.01
85 05	DION W	WV	PB UG	1	0.164E+01	0	0.158E+01	1.04	0.03
85 05	DION W	WV	ZN UG	1	0.300E+01	0	0.315E+01	0.95	0.02

TABLE D-1.3

COMPARISON OF RADIOLOGICAL CONCENTRATIONS IN
QUALITY ASSURANCE SAMPLES BETWEEN WVNS LAB (WV) AND
ENVIRONMENTAL MEASUREMENTS LABORATORY (EML) NOVEMBER, 1985

Date		Type	Lab	Isotope		Ser	Reported Value	Reported % Error	EML Value	Ratio Rp/EML	Ratio +/-
85	11	AIR	WV	BE	7	1	0.654E+04	2	0.442E+04	1.48	0.07
85	11	AIR	WV	BE	7	2	0.615E+04	2	0.442E+04	1.39	0.06
85	11	AIR	WV	MN	54	1	0.632E+03	2	0.430E+03	1.42	0.07
85	11	AIR	WV	MN	54	2	0.655E+03	2	0.460E+03	1.36	0.06
85	11	AIR	WV	CO	60	1	0.655E+03	2	0.454E+03	1.44	0.06
85	11	AIR	WV	CO	60	2	0.605E+03	1	0.454E+03	1.33	0.06
85	11	AIR	WV	SR	90	1	0.227E+01	41	0.460E+01	0.49	0.21
85	11	AIR	WV	SR	90	2	0.409E+01	16	0.460E+01	0.89	0.15
85	11	AIR	WV	SB	125	1	0.523E+03	3	0.562E+03	0.93	0.06
85	11	AIR	WV	SB	125	2	0.647E+03	3	0.562E+03	1.15	0.09
85	11	AIR	WV	CS	137	1	0.695E+03	2	0.475E+03	1.46	0.06
85	11	AIR	WV	CS	137	2	0.625E+03	1	0.475E+03	1.32	0.06
85	11	AIR	WV	PU	239	1	0.433E+01	9	0.491E+01	0.98	0.09
85	11	AIR	WV	PU	239	2	0.514E+01	8	0.491E+01	1.05	0.10
85	11	AIR	WV	AM	241	1	0.657E+01	14	0.532E+01	1.23	0.19
85	11	AIR	WV	AM	241	2	0.523E+01	18	0.532E+01	0.98	0.19
85	11	SOIL	WV	K	40	1	0.219E+02	10	0.194E+02	1.13	0.13
85	11	SOIL	WV	SR	90	1	0.203E+00	17	0.230E+00	0.88	0.16
85	11	SOIL	WV	CS	137	1	0.193E+00	63	0.270E+00	0.71	0.45
85	11	SOIL	WV	RA	226	1	0.725E+00	25	0.770E+00	0.94	0.25
85	11	SOIL	WV	PU	239	1	0.378E+00	9	0.240E+00	1.58	0.17
85	11	SOIL	WV	AM	241	1	0.247E+00	8	0.220E+00	1.12	0.14
85	11	TISSUE	WV	K	40	1	0.199E+01	47	0.176E+01	1.13	0.57
85	11	TISSUE	WV	SR	90	1	0.243E+01	10	0.261E+01	0.93	0.10
85	11	TISSUE	WV	CS	137	1	0.473E+00	22	0.440E+00	1.07	0.26
85	11	TISSUE	WV	RA	226	1	0.609E+00	25	0.710E+00	0.86	0.24
85	11	TISSUE	WV	PU	239	1	0.239E+00	3	0.410E+00	0.58	0.06
85	11	TISSUE	WV	AM	241	1	0.405E+00	8	0.370E+00	1.09	0.09
85	11	VEGETN	WV	K	40	1	0.226E+02	8	0.200E+02	1.13	0.13
85	11	VEGETN	WV	SR	90	1	0.302E+00	16	0.380E+00	0.79	0.17
85	11	VEGETN	WV	CS	137	1	0.355E+00	24	0.400E+00	0.89	0.23
85	11	VEGETN	WV	RA	226	1	0.261E+00	57	0.320E+00	0.82	0.47
85	11	VEGETN	WV	PU	239	1	0.310E+00	11	0.370E+00	0.84	0.12
85	11	VEGETN	WV	AM	241	1	0.383E+00	9	0.320E+00	1.20	0.12
85	11	WATER	WV	H	3	1	0.164E+02	6	0.195E+02	0.84	0.07
85	11	WATER	WV	MN	54	1	0.434E+01	2	0.443E+01	0.98	0.06
85	11	WATER	WV	FE	59	1	0.346E+00	63	0.453E+00	0.76	0.49
85	11	WATER	WV	CO	60	1	0.478E+01	2	0.482E+01	0.99	0.07
85	11	WATER	WV	SR	90	1	0.502E+00	3	0.440E+00	1.14	0.09
85	11	WATER	WV	CS	137	1	0.448E+01	2	0.462E+01	0.97	0.05
85	11	WATER	WV	CE	141	1	0.451E+01	4	0.445E+01	1.01	0.07
85	11	WATER	WV	PU	239	1	0.470E-01	7	0.400E-01	1.17	0.09
85	11	WATER	WV	AM	241	1	0.406E-01	7	0.410E-01	0.99	0.10
85	11	WATER	WV	U	234	1	0.227E-01	7	0.230E-01	0.99	0.15
85	11	WATER	WV	U	238	1	0.228E-01	7	0.220E-01	1.04	0.09
85	11	WATER	WV	U	UG	1	0.685E-01	19	0.653E-01	1.05	0.23
85	11	DION W	WV	CO	UG	1	0.600E-01	0	0.770E-01	0.78	0.01
85	11	DION W	WV	MN	UG	1	0.100E+00	0	0.110E+00	0.91	0.11
85	11	DION W	WV	PB	UG	1	0.140E+00	0	0.267E+00	0.52	0.00
85	11	DION W	WV	ZN	UG	1	0.190E+00	0	0.185E+00	1.03	0.01
85	11	LAKE W	WV	CO	UG	1	0.150E+00	0	0.151E+00	0.99	0.01
85	11	LAKE W	WV	MN	UG	1	0.450E+00	0	0.521E+00	0.86	0.06
85	11	LAKE W	WV	PB	UG	1	0.400E+00	0	0.443E+00	0.90	0.02
85	11	LAKE W	WV	ZN	UG	1	0.270E+00	0	0.315E+00	0.86	0.04

TABLE D - 1.4

COMPARISON OF WVNS TO USNRC CO-LOCATED
ENVIRONMENTAL TLD DOSIMETERS - 4th QUARTER 1985

Period: 9/26/85 to 1/22/86		Period: 9/20/85 to 12/20/85		
US NRC TLD No.	Dose Rate (uR/hr)	WVNS TLD I.D.*	Dose Rate (uR/hr)	Ratio NRC/WVNS
2	7.6	DFTLD22	7.3	1.04
3	9.5	DFTLD05	9.2	1.03
4	7.2	DFTLD07	9.3	0.77
5	9.0	DFTLD09	8.2	1.10
7	7.8	DFTLD14	9.5	0.82
8	8.0	DFTLD15	8.9	0.90
9	23.3	DFTLD25	15.1	1.54**
11	981.	DFTLD24	750.	1.31**

* See Figure A-4 and A-6

** A dose rate increase beginning in November near the DFTLD24 location caused the average USNRC TLD dose rate to be higher than the WVNS measurement which concluded a month earlier.

APPENDIX E

HYDROGEOLOGY OF THE WVDP SITE

The WVDP site lies within the Glaciated Alleghany Plateau section of the Appalachian Plateau Physiographic Province. The section is a maturely dissected plateau with surficial bedrock units of Devonian shales and sandstones. Bedding dips gently (4 to 7.5 metres per km) and uniformly to the south. The plateau has been subjected to the erosional and depositional actions of repeated glaciations, resulting in accumulation of till, outwash, and lacustrine deposits over the area.

The site is underlain by a thick sequence of silty clay tills and more granular deposits overlying a bedrock valley that has been carved through Devonian shales by Cattaraugus Creek and its tributaries. Figure 3-5 shows a generalized east-west cross section through the site. The uppermost till unit is the Lavery, a very compact gray silty clay. The Lavery is approximately 6 m thick at the western boundary of the WVDP and thickens to the east. At the western edge of the developed portion of the WVDP, the Lavery is approximately 30 m thick. In situ measurements of the hydraulic conductivity in the Lavery have generally ranged between 10^{-9} and 10^{-7} cm/sec.

The upper 3 m (approximately) of the Lavery have been chemically weathered by leaching and oxidation and mechanically weathered by bioturbation. The hydraulic conductivity of the weathered till is much higher than that of the underlying unweathered parent material, probably as a result of increased fracture flow.

The northern portion of the WVDP site is blanketed by a layer of alluvial gravels up to 6 m thick. These gravels extend from the plant area northward; they are not encountered in the disposal areas in the southern part of the WVDP site.

Below the Lavery till is a more granular unit. Referred to locally as the Lacustrine Unit, it comprises silts, sands and, in some areas, gravels which overlie a varved clay. The Lacustrine is believed to be more permeable than the Lavery, but little permeability testing has been performed in this unit.

Prior modelers of site hydrogeology have generally assumed hydraulic conductivities on the order of 10^{-5} to 10^{-4} cm/sec-- conservative in consideration of the gradation of the Lacustrine Unit materials.

Free field groundwater flow through the described geosystem occurs in two aquifers and to a considerably lesser extent in the aquaclude between them. The upper aquifer is a transient water table aquifer in the weathered till and, where it is encountered, the alluvial gravels. To a lesser extent, the highly fractured upper metre of the unweathered till is also part of this aquifer. This unit is generally unsaturated, but immediately after periods of intensive runoff, such as a spring thaw, significant quantities of groundwater are believed to flow through this unit. The primary flow occurs through the extensive system of fractures which dissects this unit.

The lower aquifer is an unconfined aquifer in the Lacustrine Unit. The piezometers embedded in this unit all exhibit phreatic heads below the top of this unit. The total recharge mechanism for the unit is not well defined because of a paucity of data, but it is reasonable to conclude from available data that the unit is recharged from the fractured bedrock and downward seepage through the overlying Lavery till. The bedrock recharge zone to the west is recharged at outcrops in the uplands to the west of the site. Flow through this unit appears to be to the east toward Buttermilk Creek.

The aquaclude that separates these two aquifers is the Lavery. Its mass permeability is extremely low but it does permit seepage. When the weathered till is acting as a transient aquifer, a vertical gradient of unity exists in the till and causes water to move downward, but at a very low rate.

The USGS and NYSGS have performed extensive hydrogeologic investigations in and around the area once used by NFS for solid waste disposals and now contemplated as a potential site for disposal of Project wastes. All of these studies assumed that the groundwater pathway from the disposal trenches was one-dimensional downward seepage through the unweathered till. This was based on observations of water levels in well screen piezometers and some simplifying assumptions. No measurements were made to characterize unsaturated flow in the weathered till.

The observation of solvent in the shallow weathered till some 60 ft (18 m) away from its point of disposal casts considerable doubt on some of the assumptions which neglected flow in the unsaturated zone. Therefore, as part of the preparation of the Environmental Assessment for low-level waste disposal, WVNS has implemented extensive explorations and an instrumentation network to characterize and monitor flow in the unsaturated weathered till. Because data from the solvent seepage explorations indicated rapid fluctuations in the level of the transient perched water table, the instrumentation network uses real-time data loggers that record water levels at hourly intervals.

The hypothesis of one-dimensional downward flow is also being tested as part of this exploration program. The well screen piezometers all have significant time lags. (For example if the piezometric level rose one foot, it might take more than a year before the rise was evident in a well screen piezometer. This could mask a lateral flow component, particularly a transient one.) WVNS has therefore installed pneumatic pore pressure transducers which have a time lag of less than one minute.

The results of this investigation were reported in the Environmental Assessment published in February 1986.

APPENDIX C-1

SUMMARY OF WATER AND SEDIMENT MONITORING DATA

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TABLE C - 1.1
TOTAL RADIOACTIVITY OF LIQUID EFFLUENTS RELEASED
FROM WVDP LAGOON 3 IN 1985* (CURIES)

	ALPHA	BETA	H-3	CS-137	SR-90	I-129
1ST QTR.	6.87 ± 1.1 E-03	1.07 ± 0.1 E-02	2.20 ± .04 E+00	4.75 ± 1.3 E-03	2.28 ± 0.1 E-03	3.24 ± 0.7 E-04
2ND QTR.	1.25 ± 0.5 E-03	7.43 ± 1.3 E-03	5.99 ± 0.2 E-01	2.55 ± 1.6 E-03	2.03 ± 0.1 E-03	7.55 ± 0.9 E-05
3RD QTR.	1.59 ± 0.5 E-03	5.23 ± 0.9 E-03	3.36 ± 0.1 E-01	1.78 ± 0.9 E-03	1.43 ± 0.1 E-03	6.73 ± 0.7 E-05
4TH QTR.	2.40 ± 0.7 E-03	9.83 ± 1.6 E-03	3.08 ± 0.1 E-01	9.26 ± 1.6 E-03	1.26 ± 0.1 E-03	8.22 ± 0.8 E-05
1985 TOTALS	1.21 ± 0.3 E-02	3.32 ± 0.5 E-02	3.44 ± 0.8	1.93 ± 0.5 E-02	7.00 ± 0.4 E-03	5.49 ± 0.9 E-04
AVERAGE(uCi/ml) CONCENTRATION	3.47 E-07	9.57 E-07	9.88 E-05	5.54 E-07	2.01 E-07	1.58 E-08
PERCENT OF RCG**	NOT APPLICABLE	ISOTOPES IDENTIFIED	3.3%	2.8%	67.0%	26.3%

	U-238	U-234	U-235	PU-238	PU-239
1ST QTR.	7.22 ± 2.3 E-04	3.60 ± 1.1 E-03	7.19 ± 3.8 E-05	6.25 ± 1.6 E-06	5.81 ± 1.5 E-06
2ND QTR.	1.05 ± 0.3 E-04	5.14 ± 1.5 E-04	9.44 ± 4.4 E-06	1.46 ± 0.2 E-05	1.71 ± 0.6 E-06
3RD QTR.	2.46 ± 0.4 E-04	1.09 ± 0.2 E-03	3.24 ± 0.6 E-05	2.68 ± 1.6 E-05	4.24 ± 2.8 E-07
4TH QTR.	6.07 ± 2.4 E-04	2.55 ± 1.0 E-03	5.98 ± 2.5 E-05	4.26 ± 1.0 E-06	4.04 ± 1.0 E-06
1985 TOTALS	1.68 ± 0.5 E-03	7.75 ± 2.5 E-03	1.74 ± 0.7 E-04	5.19 ± 2.1 E-05	1.20 ± 0.3 E-05
AVERAGE(uCi/ml) CONCENTRATION	4.82 E-08	2.22 E-07	5.00 E-09	1.49 E-09	3.44 E-10
PERCENT OF RCG**	8.0 %	5.6%	0.1%	0.03%	0.01%

*Includes radioactivity from New York State low level waste disposal area (Table C - 1.11)
Total volume released as treated effluent - 3.5 E7 litres.

**Recommended Concentration Guides per DOE Order 5480.1, Attachment XI-1, for uncontrolled releases at site boundary. Concentrations listed above for Lagoon 3 effluents are substantially higher than concentrations at boundary where RCGs actually apply.

TABLE C - 1.2
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER UPSTREAM OF WVDP
AT FOX VALLEY (WFBCBKG) μCi/ml

1985	ALPHA	BETA	H-3	SR-90	CS-137
JAN	5.15 ± 3.5 E-10	2.10 ± 0.9 E-09	< 1.62 E-07		
FEB	4.83 ± 3.5 E-10	5.85 ± 1.2 E-09	2.14 ± 1.1 E-07		
MAR	3.90 ± 3.1 E-10	6.30 ± 1.2 E-09	< 1.08 E-07		
1ST QTR				5.18 ± 2.2 E-09	< 7.0 E-08
APR	< 1.94 E-10	2.72 ± 0.9 E-09	9.80 ± 9.7 E-08		
MAY	< 1.69 E-10	2.15 ± 0.9 E-09	1.34 ± 1.0 E-07		
JUN	< 4.68 E-10	3.53 ± 1.1 E-09	< 1.01 E-07		
2ND QTR				4.68 ± 2.1 E-09	< 2.1 E-08
JUL	< 5.43 E-10	2.91 ± 1.0 E-09	< 1.00 E-07		
AUG	< 8.45 E-10	3.78 ± 1.1 E-09	< 1.00 E-07		
SEP	< 9.63 E-10	3.92 ± 1.1 E-09	< 1.00 E-07		
3RD QTR				4.48 ± 2.2 E-09	< 2.1 E-08
OCT	< 6.17 E-10	< 9.43 E-10	< 1.00 E-07		
NOV	< 7.00 E-10	3.25 ± 1.1 E-09	2.27 ± 0.9 E-07		
DEC	< 4.38 E-10	1.77 ± 1.0 E-09	< 1.00 E-07		
4TH QTR				4.03 ± 2.2 E-09	< 2.1 E-08

TABLE C - 1.3
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER DOWNSTREAM OF WVDP
AT THOMAS CORNERS (WFBCTCB) μCi/ml

1985	ALPHA	BETA	H-3	SR-90	CS-137
JAN	1.02 ± 0.5 E-09	6.80 ± 1.3 E-09	1.23 ± 0.1 E-06		
FEB	5.93 ± 3.8 E-10	1.56 ± 0.2 E-08	3.05 ± 1.1 E-07		
MAR	4.45 ± 4.2 E-10	1.24 ± 0.2 E-08	4.22 ± 1.1 E-07		
1ST QTR				2.24 ± 1.6 E-09	< 7.0 E-08
APR	1.16 ± 0.5 E-09	1.06 ± 0.2 E-08	6.10 ± 1.1 E-07		
MAY	4.39 ± 3.3 E-10	7.81 ± 1.4 E-09	1.16 ± 1.0 E-07		
JUN	3.48 ± 2.3 E-09	1.29 ± 0.2 E-08	1.60 ± 1.1 E-07		
2ND QTR				5.47 ± 1.9 E-09	< 2.1 E-08
JUL	< 6.3 E-10	6.49 ± 1.3 E-09	< 1.0 E-07		
AUG	< 6.8 E-10	7.13 ± 1.4 E-09	< 1.0 E-07		
SEP	< 1.1 E-09	1.32 ± 0.2 E-08	1.05 ± 1.0 E-07		
3RD QTR				5.75 ± 2.2 E-09	< 2.1 E-08
OCT	1.23 ± 1.2 E-09	7.79 ± 1.5 E-09	1.80 ± 0.9 E-07		
NOV	6.84 ± 3.5 E-09	1.69 ± 0.2 E-08	2.41 ± 0.9 E-07		
DEC	< 8.2 E-10	4.26 ± 1.2 E-09	< 1.0 E-07		
4TH QTR				4.30 ± 2.1 E-09	< 2.1 E-08

TABLE C - 1.4
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER DOWNSTREAM OF WVDP
AT FRANKS CREEK (WNSP006) μCi/ml

1985	ALPHA	BETA	H-3	SR-90	CS-137
JAN	1.13 ± 0.2 E-08	9.81 ± 0.4 E-08	3.33 ± 0.1 E-05		
FEB	3.72 ± 0.9 E-09	4.13 ± 0.3 E-08	2.57 ± 0.1 E-06		
MAR	8.28 ± 4.4 E-10	2.34 ± 0.2 E-08	6.40 ± 1.2 E-07		
1ST QTR				1.70 ± 0.3 E-08	< 7.0 E-08
APR	1.05 ± 0.5 E-09	4.84 ± 0.3 E-08	3.97 ± 0.2 E-06		
MAY	3.26 ± 3.0 E-10	3.98 ± 0.3 E-08	8.85 ± 1.1 E-07		
JUN	2.42 ± 1.8 E-09	4.39 ± 0.3 E-08	4.77 ± 1.1 E-07		
2ND QTR				1.86 ± 0.3 E-08	< 2.1 E-08
JUL	< 1.4 E-09	4.12 ± 0.3 E-08	4.16 ± 1.1 E-07		
AUG	2.10 ± 0.7 E-08	8.76 ± 0.5 E-08	6.20 ± 0.3 E-06		
SEP	7.23 ± 2.8 E-09	5.81 ± 0.4 E-08	1.75 ± 0.1 E-06		
3RD QTR				3.48 ± 0.5 E-08	< 2.1 E-08
OCT	3.18 ± 2.0 E-09	4.19 ± 0.3 E-08	5.07 ± 1.0 E-07		
NOV	8.87 ± 3.3 E-09	4.15 ± 0.3 E-08	8.47 ± 1.1 E-07		
DEC	< 7.2 E-10	2.02 ± 0.2 E-08	1.63 ± 0.9 E-07		
4TH QTR				2.00 ± 0.4 E-08	< 2.1 E-08

TABLE C - 1.5
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER UPSTREAM OF BUTTERMILK
CREEK AT BIGELOW BRIDGE (WFBIGBR) uCi/ml

1985	ALPHA	BETA	TRITIUM
JAN	<2.6 E-10	3.81 ± 1.1 E-09	<1.7 E-07
FEB	3.28 ± 3.0 E-10	3.30 ± 1.0 E-09	3.86 ± 1.1 E-07
MAR	7.96 ± 4.4 E-10	8.55 ± 1.4 E-09	3.22 ± 1.0 E-07
APR	2.80 ± 2.7 E-10	2.49 ± 0.9 E-09	<1.0 E-07
MAY	<2.3 E-10	3.29 ± 1.0 E-09	1.86 ± 1.0 E-07
JUN	<7.3 E-10	2.95 ± 1.0 E-09	1.91 ± 1.0 E-07
JUL	<1.2 E-09	4.23 ± 1.2 E-09	1.11 ± 1.0 E-07
AUG	<8.9 E-10	2.78 ± 1.0 E-09	<1.0 E-07
SEP	<7.7 E-10	4.29 ± 1.2 E-09	<1.0 E-07
OCT	<5.4 E-10	4.09 ± 1.2 E-09	<1.0 E-07
NOV	<6.0 E-10	2.32 ± 1.1 E-09	<1.0 E-07
DEC	<1.3 E-09	4.15 ± 1.2 E-09	1.76 ± 0.9 E-07

TABLE C - 1.6
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER DOWNSTREAM OF
BUTTERMILK CREEK AT FELTON BRIDGE (WFFELBR) uCi/ml

1985	ALPHA	BETA	TRITIUM	SR-90	CS-137
JAN	<2.8 E-10	4.34 ± 1.1 E-09	5.33 ± 1.1 E-07	5.59 ± 2.0 E-09	<7.0 E-08
FEB	3.18 ± 2.9 E-10	4.62 ± 1.1 E-09	1.07 ± 1.1 E-07	2.62 ± 1.6 E-09	1.56 ± 1.1 E-07
MAR	8.28 ± 4.4 E-10	1.24 ± 0.2 E-08	<1.0 E-07	2.46 ± 1.7 E-09	<2.1 E-08
APR	3.34 ± 2.9 E-10	5.63 ± 1.2 E-09	<1.3 E-07	3.64 ± 1.8 E-09	<2.1 E-08
MAY	<5.6 E-10	2.84 ± 1.0 E-09	<1.0 E-07	4.68 ± 2.0 E-09	<2.1 E-08
JUN	<6.1 E-10	4.66 ± 1.2 E-09	<1.0 E-07	3.09 ± 1.9 E-09	<2.1 E-08
JUL	<7.0 E-10	8.85 ± 1.5 E-09	<1.1 E-07	3.83 ± 1.8 E-09	<2.1 E-08
AUG	<8.2 E-10	5.05 ± 1.2 E-09	<1.0 E-07	7.15 ± 2.3 E-09	<2.1 E-08
SEP	<9.8 E-10	6.03 ± 1.3 E-09	<1.0 E-07	2.63 ± 1.8 E-09	<2.1 E-08
OCT	1.68 ± 1.6 E-09	7.68 ± 1.6 E-09	<1.0 E-07	2.94 ± 1.8 E-09	<2.1 E-08
NOV	4.69 ± 3.3 E-09	1.64 ± 0.2 E-08	1.52 ± 0.9 E-07	5.25 ± 2.1 E-09	<2.1 E-08
DEC	<7.3 E-10	3.94 ± 1.2 E-09	1.59 ± 0.9 E-07	2.92 ± 1.8 E-09	<2.1 E-08

TABLE C - 1.7
RADIOACTIVITY CONCENTRATIONS IN SHALLOW WELLS
NEAR SITE FACILITIES

LOCATION CODE	SPRING 1985 (uCi/ml) ALPHA	SPRING 1985 (uCi/ml) BETA	SPRING 1985 (uCi/ml) TRITIUM	FALL 1985 (uCi/ml) ALPHA	FALL 1985 (uCi/ml) BETA	FALL 1985 (uCi/ml) TRITIUM
WNWNFSB	6.60 ± 1.2 E-08	9.38 ± 0.1 E-06	6.83 ± 0.3 E-06	6.85 ± 1.0 E-08	1.55 ± .01 E-05	9.85 ± 0.4 E-06
WNWNFSD	3.63 ± 0.8 E-08	5.72 ± .04 E-06	1.35 ± .04 E-04	4.55 ± 1.1 E-08	2.00 ± .01 E-05	1.06 ± .03 E-04
WNWNFSG	1.66 ± 0.6 E-08	1.66 ± .01 E-05	9.35 ± 0.3 E-05	4.75 ± 1.0 E-08	2.86 ± .01 E-05	6.51 ± 0.2 E-05
WNWNFSH	1.95 ± 1.8 E-09	6.58 ± 0.1 E-07	9.42 ± 1.2 E-07	<1.9 E-09	1.15 ± .02 E-06	<1.8 E-07
WNWNFL2	<1.6 E-09	3.24 ± 0.3 E-08	1.69 ± 0.1 E-05	<1.8 E-09	6.46 ± 0.4 E-08	2.35 ± 0.2 E-06
WNWNFM5*	<9.7 E-10	5.68 ± 0.1 E-07	1.99 ± 0.1 E-06	2.98 ± 2.5 E-09	2.14 ± .02 E-06	2.37 ± 0.1 E-06
WNWNFJ2	<2.1 E-09	1.89 ± 0.2 E-08	3.28 ± 1.1 E-07	<1.4 E-09	1.90 ± 0.2 E-08	3.15 ± 1.0 E-07
WNWNFJ5	<6.3 E-10	1.11 ± 0.2 E-08	7.52 ± 1.1 E-07	2.01 ± 1.6 E-09	1.74 ± 0.2 E-08	2.56 ± 0.9 E-07
WNWNFJ8	<9.8 E-10	7.34 ± 1.4 E-09	1.64 ± 0.1 E-05	<9.8 E-10	1.00 ± 0.2 E-08	1.41 ± .05 E-05
WNW80 2	<5.9 E-10	3.57 ± 1.1 E-09	1.83 ± 1.0 E-07	<1.3 E-09	7.40 ± 1.5 E-09	1.09 ± 0.9 E-07
WNW80 3	1.80 ± 0.7 E-08	2.69 ± 0.2 E-07	4.24 ± 1.1 E-07	2.54 ± 1.8 E-09	3.50 ± 0.1 E-07	2.03 ± 0.9 E-07
WNW80 4	<7.5 E-10	2.41 ± 1.0 E-09	5.18 ± 1.1 E-07	<1.5 E-09	3.28 ± 0.2 E-08	2.24 ± 0.9 E-07
WNW80 5	<6.3 E-10	4.08 ± 1.1 E-09	7.53 ± 1.1 E-07	<1.1 E-09	1.31 ± 1.0 E-09	1.18 ± 0.9 E-07
WNW80 6	<2.3 E-09	1.15 ± 0.6 E-08	4.63 ± 0.2 E-06	<3.1 E-09	5.09 ± 1.5 E-09	1.30 ± 0.1 E-06
WNW80 7	1.37 ± 1.1 E-09	5.99 ± 1.3 E-09	2.80 ± 1.0 E-07	1.36 ± 0.7 E-08	5.10 ± 0.5 E-08	<1.0 E-07

*Returned to service in 1985.

Note: See Figure A-3 for well locations.

TABLE C - 1.8
RADIOACTIVITY CONCENTRATIONS IN SHALLOW WELLS
NEAR THE NRC DISPOSAL AREA

LOCATION CODE	SPRING 1985 (uCi/ml) ALPHA	SPRING 1985 (uCi/ml) BETA	SPRING 1985 (uCi/ml) TRITIUM	FALL 1985 (uCi/ml) ALPHA	FALL 1985 (uCi/ml) BETA	FALL 1985 (uCi/ml) TRITIUM
WNW75G1	<5.3 E-10	2.98 ± 0.3 E-08	<1.1 E-07	<2.0 E-09	3.90 ± 1.1 E-08	3.36 ± 0.9 E-07
WNW75G2	<9.1 E-10	8.36 ± 2.9 E-09	<1.0 E-07	<7.3 E-10	9.21 ± 2.4 E-09	1.45 ± 0.9 E-07
WNW75G3	<2.2 E-09	1.58 ± 0.6 E-08	<1.0 E-07	<2.6 E-09	<7.8 E-09	<1.0 E-07
WNW75 H	NOT SAMPLED			<1.1 E-09	4.23 ± 2.0 E-09	5.51 ± 0.2 E-06
WNW75J1	NOT SAMPLED			<3.5 E-09	1.33 ± 0.1 E-07	5.13 ± 1.0 E-07
WNW821A	<2.2 E-09	4.77 ± 1.3 E-09	1.79 ± 1.0 E-07	<2.8 E-09	1.19 ± 0.2 E-08	5.92 ± 1.0 E-07
WNW821B	<1.0 E-09	1.00 ± 0.2 E-08	1.03 ± 1.0 E-07	5.4 ± 5.2 E-09	1.92 ± 0.2 E-08	6.06 ± 1.0 E-07
WNW821C	<2.2 E-09	7.57 ± 2.5 E-09	1.96 ± 1.0 E-07	<1.7 E-09	7.96 ± 3.0 E-09	<1.0 E-07
WNW822A	6.68 ± 4.1 E-09	9.47 ± 2.8 E-09	<1.0 E-07	<2.4 E-09	6.51 ± 1.5 E-09	1.40 ± 0.9 E-07
WNW822B	<2.0 E-09	1.90 ± 0.3 E-08	<1.0 E-07	1.34 ± 0.7 E-08	1.38 ± 0.4 E-08	2.16 ± 0.9 E-07
WNW822C	DRY			DRY		
WNW823A	DRY			<1.8 E-09	6.88 ± 1.5 E-09	2.00 ± 0.9 E-07
WNW823B	DRY			DRY		
WNW823C	DRY			DRY		
WNW823D	DRY			DRY		
WNW824A1	<1.6 E-09	5.76 ± 1.4 E-09	4.10 ± 0.1 E-05	5.02 ± 4.3 E-09	7.23 ± 1.7 E-09	1.27 ± .04 E-04
WNW824A2	6.48 ± 3.6 E-09	1.14 ± 0.2 E-08	4.36 ± 1.1 E-07	<1.5 E-09	2.98 ± 2.1 E-09	8.55 ± 1.1 E-07
WNW824A3	<8.6 E-10	2.16 ± 1.0 E-09	4.47 ± 1.1 E-07	<2.6 E-09	2.20 ± 1.7 E-09	6.62 ± 1.0 E-07
WNW824B	DRY			DRY		
WNW824C	DRY			DRY		
WNW825A	NOT ACCESSIBLE			NOT ACCESSIBLE		
WNW825B	8.92 ± 7.4 E-09	5.77 ± 1.0 E-08	1.03 ± 1.0 E-07	NOT ACCESSIBLE		
WNW825C	<1.3 E-09	2.20 ± 0.7 E-08	<1.0 E-07	NOT ACCESSIBLE		

Note: See Figure A-3 for well locations.

TABLE C - 1.9
RADIOACTIVITY CONCENTRATIONS IN POTABLE WELL WATER AROUND THE WVDP SITE - 1985
(uCi/ml)

SAMPLE I.D.	ALPHA		BETA		TRITIUM		CS-137	
WFWEL02	<8.5	E-10	<8.7	E-10	<1.0	E-07	<2.1	E-08
WFWEL05	<5.7	E-10	2.58 ± 1.1	E-09	<1.0	E-07	<2.1	E-08
WFWEL06	<7.0	E-10	1.39 ± 1.0	E-09	1.22 ± 1.0	E-07	<2.1	E-08
WFWEL08	<1.4	E-09	<1.1	E-09	<1.0	E-07	<2.1	E-08
WFWEL09	<1.2	E-09	2.46 ± 1.2	E-09	1.90 ± 1.0	E-07	<2.1	E-08
WFWEL10	<9.0	E-10	<9.4	E-10	1.79 ± 1.0	E-07	<2.1	E-08

Note: See Figures A-5 and A-6 for well locations.

TABLE C - 1.10

Radioactivity of Stream Sediment Around WVDP Site in 1985

		Concentration (uCi/g) (dry weight from upper 6 inches)				
		Gross Alpha	Gross Beta	K-40	Sr-90	Cs-137
SFBCSED	June 1985	8.8 ± 7.9 E-06	5.33 ± 0.8 E-05	1.50 ± 0.1 E-05	<5.9 E-08	9.06 ± 6.4 E-08
SFTCSED	June 1985	1.2 ± 0.7 E-05	6.38 ± 1.0 E-05	1.94 ± 0.2 E-05	3.76 ± 3.8 E-08	1.54 ± 0.1 E-06
SFBISED	June 1985	<1.6 E-05	3.20 ± 0.4 E-05	1.39 ± 0.1 E-05	<5.9 E-08	4.73 ± 6.4 E-08
SFCCSED	June 1985	<3.1 E-05	<1.2 E-05	1.18 ± 0.1 E-05	1.12 ± 1.1 E-08	8.99 ± 0.9 E-07
SFSDSED	June 1985	<2.7 E-05	7.11 ± 2.4 E-05	1.60 ± 0.2 E-05	1.93 ± 1.5 E-08	3.12 ± 0.8 E-07
SFBCSED	Oct. 1985	9.9 ± 7.8 E-06	2.91 ± 0.6 E-05	2.00 ± 0.2 E-05	3.0 ± 5.4 E-08	1.28 ± 1.2 E-07
SFTCSED	Oct. 1985	0.7 ± 1.1 E-05	2.55 ± 0.7 E-05	1.43 ± 0.1 E-05	3.21 ± 0.5 E-07	2.53 ± 0.1 E-06
SFBISED	Oct. 1985	2.4 ± 3.4 E-06	1.62 ± 0.5 E-05	1.13 ± 0.1 E-05	<7.8 E-08	<1.2 E-07
SFCCSED	Oct. 1985	3.9 ± 4.3 E-06	2.44 ± 0.7 E-05	1.11 ± 0.1 E-05	2.42 ± 1.6 E-08	7.51 ± 0.6 E-07
SFSDSED	Oct. 1985	1.4 ± 0.9 E-05	2.99 ± 0.9 E-05	1.16 ± 0.1 E-05	1.41 ± 1.7 E-08	3.59 ± 0.7 E-07

TABLE C - 1.11

1985 Contribution by New York State Low Level Waste Disposal Area to Radioactivity in WVDP Liquid Effluents (Ci)

	Gross Alpha	Gross Beta	Tritium	Sr-90	I-129	Cs-137
1985 Totals	1.13 ± 1.2 E-06	1.92 ± 0.04 E-03	1.25 ± 0.03 E-01	1.21 ± 0.02 E-03	1.52 ± 0.3 E-06	2.10 ± 2.5 E-05

FIGURE C-1.1
GROSS BETA CONCENTRATION IN SURFACE WATER DOWNSTREAM OF WVDP-1985

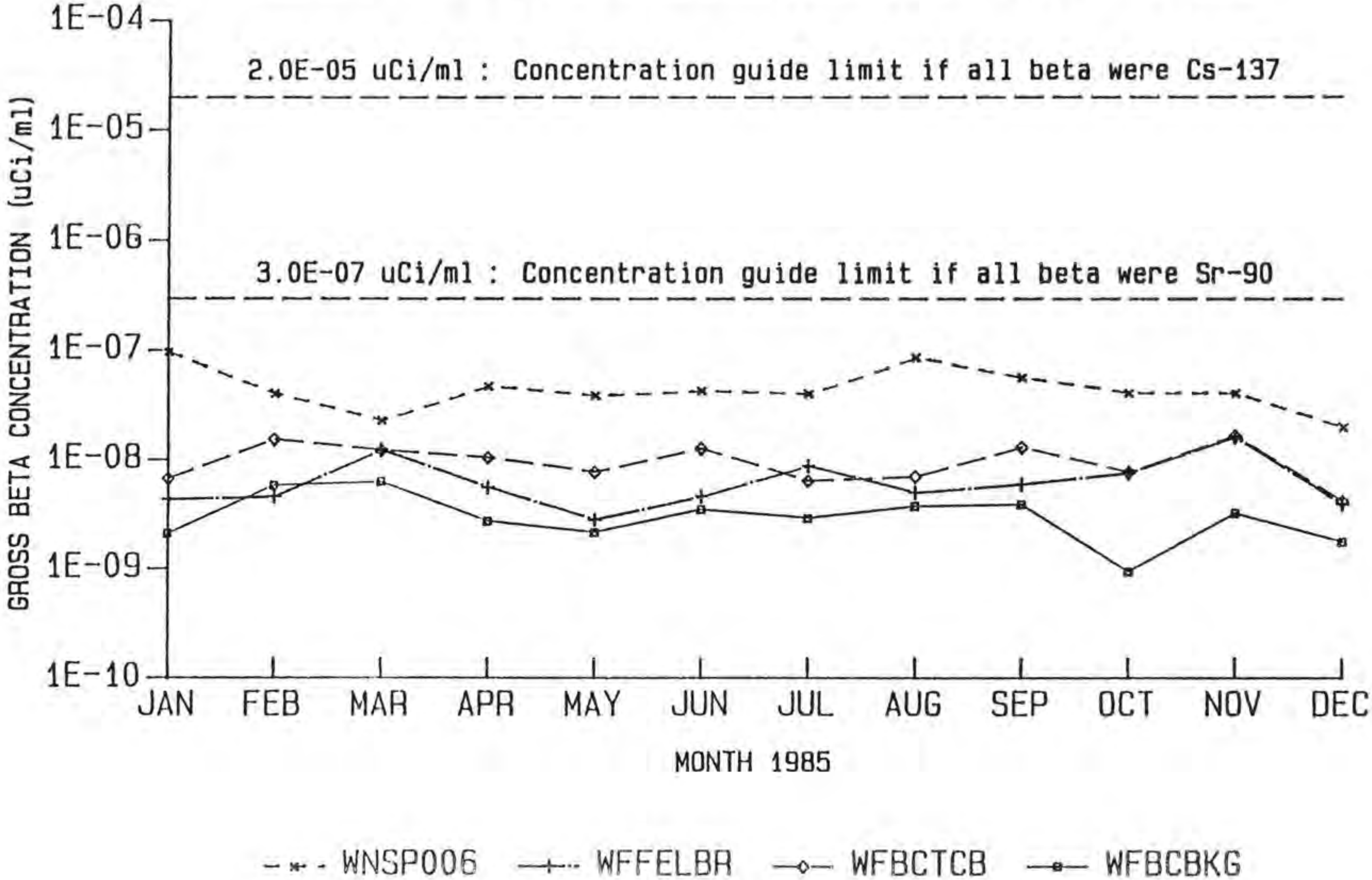


FIGURE C-1.2
TRENDS OF GROSS BETA ACTIVITY IN SURFACE WATER FROM CATTARAUGUS CREEK (WFFELBR) 1983-1985

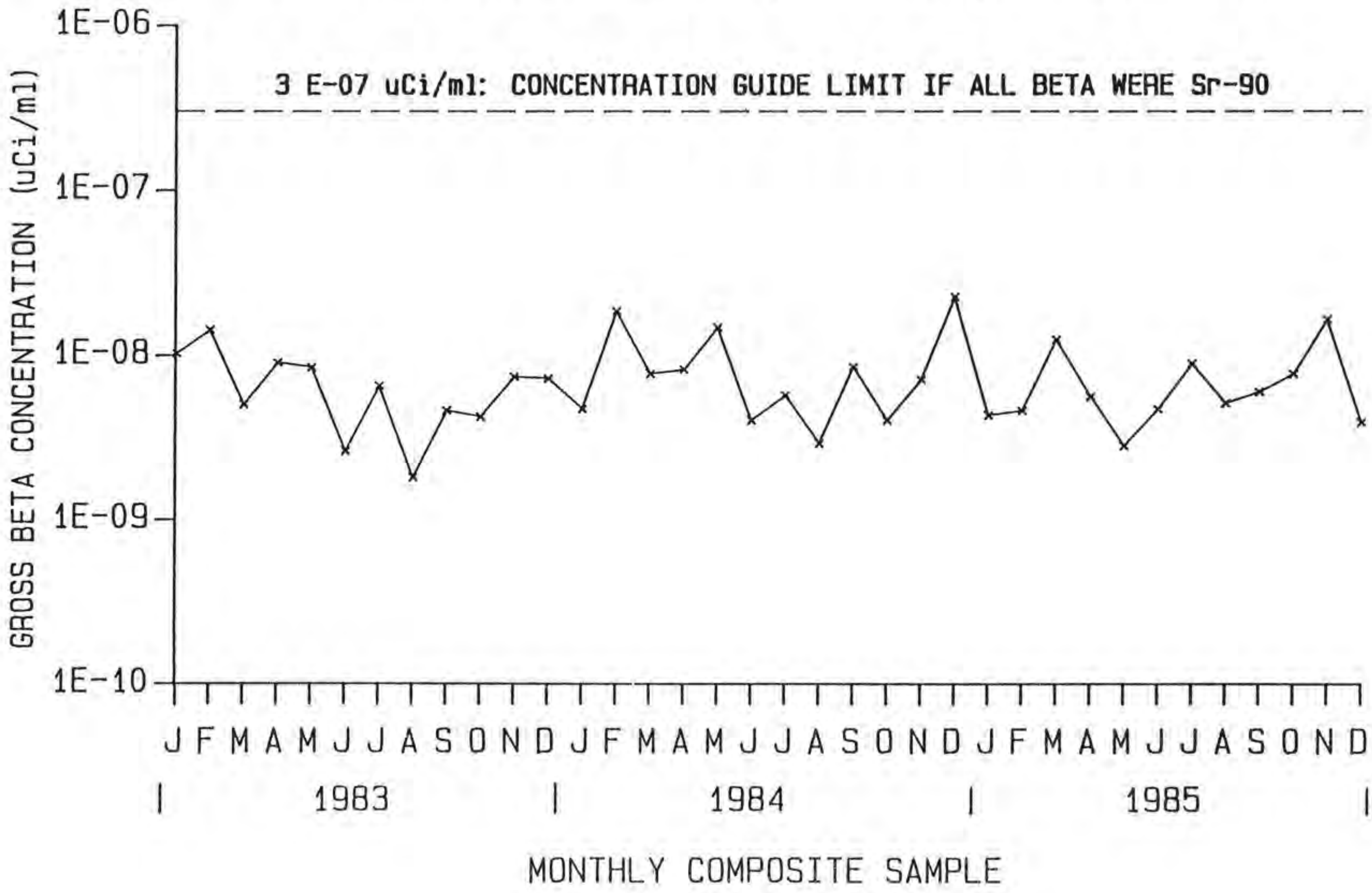
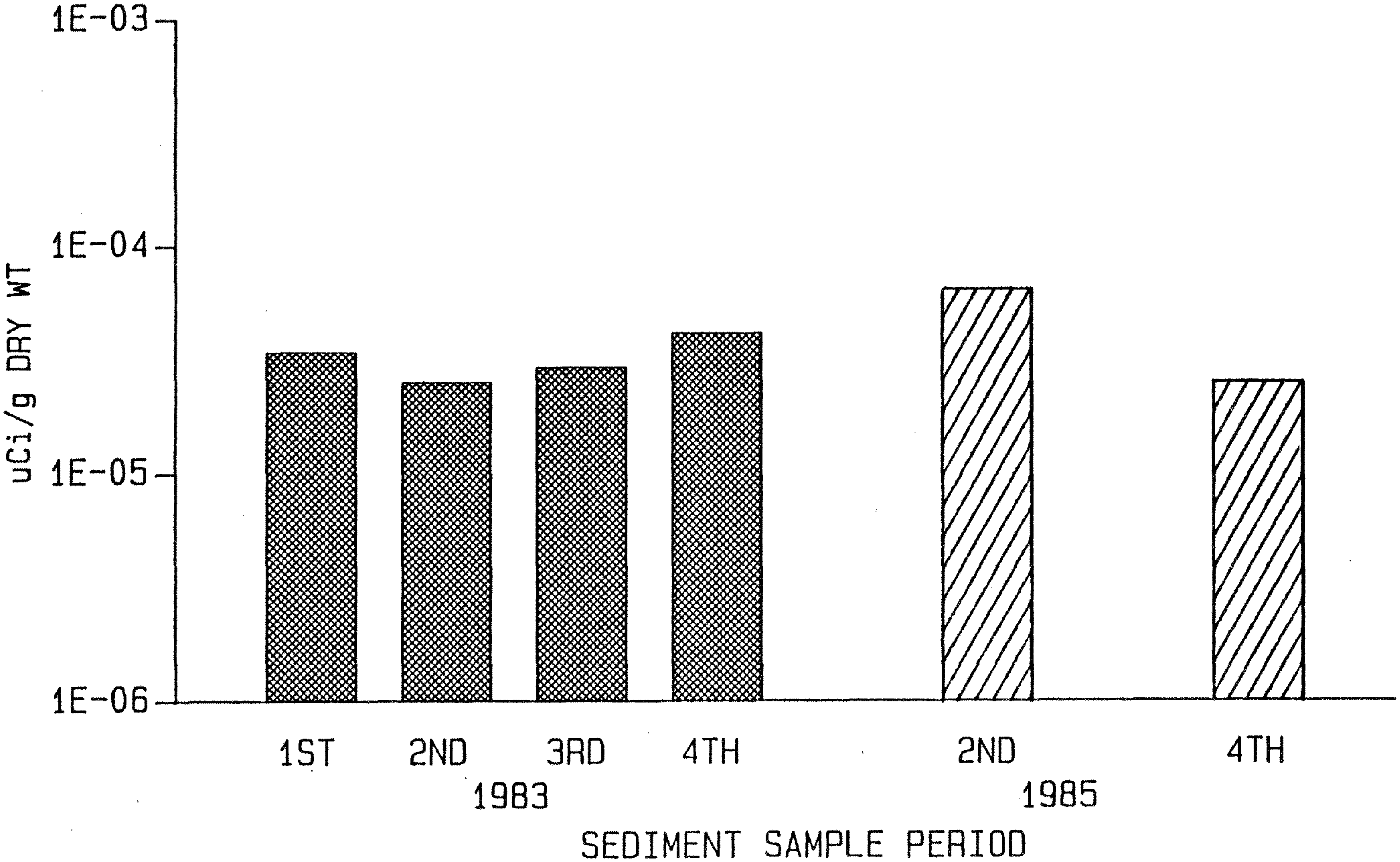


FIGURE C-1.3

TRENDS OF GROSS BETA ACTIVITY IN SEDIMENT FROM BUTTERMILK CREEK (SFTCSED) 1983 & 1985



APPENDIX C-2

SUMMARY OF AIR MONITORING DATA

TABLE C - 2.1
1985 AIRBORNE RADIOACTIVE EFFLUENT ACTIVITY TOTALS
FROM MAIN VENTILATION STACK (ANSTACK) CURIES

	ALPHA	BETA	SR-90	I-129	CS-134	CS-137
JAN	1.16+/-0.05 E-07	3.56+/-0.14 E-06				
FEB	2.35+/-0.09 E-07	1.10+/-0.04 E-05				
MAR	1.81+/-0.05 E-05	6.30+/-0.25 E-04				
1st QTR.			1.50+/-0.3 E-04	4.81+/-0.7 E-06	1.35+/-0.3 E-06	2.40+/-0.1 E-04
APR	3.06+/-0.12 E-07	1.08+/-0.04 E-05				
MAY	1.92+/-0.08 E-07	1.01+/-0.04 E-05				
JUN	2.00+/-0.08 E-07	5.88+/-0.24 E-05				
2nd QTR.			7.72+/-0.9 E-06	2.10+/-0.3 E-05	1.81+/-1.4 E-07	6.18+/-0.3 E-05
JUL	2.23+/-0.09 E-07	7.16+/-0.29 E-06				
AUG	4.01+/-0.16 E-07	9.08+/-0.36 E-06				
SEP	1.21+/-0.05 E-07	2.16+/-0.09 E-05				
3rd QTR.			2.59+/-0.4 E-06	1.70+/-0.2 E-05	1.02+/-0.7 E-07	2.80+/-0.1 E-05
OCT	1.37+/-0.05 E-06	2.70+/-0.11 E-05				
NOV	6.69+/-0.27 E-07	2.58+/-0.10 E-05				
DEC	6.42+/-0.27 E-07	5.21+/-0.21 E-05				
4th QTR.			3.09+/-0.4 E-05	1.42+/-0.1 E-05	1.43+/-0.7 E-07	4.19+/-0.1 E-05
Total for 1985	2.26 E-05	8.67 E-04	1.91 E-04	5.70 E-05	1.78 E-06	3.72 E-04

Note: Total volume of air discharged at point ANSTACK in 1985 equals 8.9 E+08 cubic metres @ 28.3 cubic metres per second

TABLE C - 2.2.1
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT FOX VALLEY (AFFXVRD)
μCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	8.12 ± 6.7 E-16	1.77 ± 0.4 E-14		
FEB	1.25 ± 0.9 E-15	1.88 ± 0.4 E-14		
MAR	1.01 ± 0.7 E-15	2.05 ± 0.4 E-14		
1ST QTR			2.28 ± 7.0 E-17	< 9.8 E-16
APR	1.24 ± 0.8 E-15	1.75 ± 0.4 E-14		
MAY	5.87 ± 9.3 E-16	1.85 ± 0.6 E-14		
JUN	6.24 ± 6.7 E-16	1.02 ± 0.3 E-14		
2ND QTR			5.84 ± 1.1 E-16	9.73 ± 4.3 E-16
JUL	4.49 ± 5.5 E-16	1.37 ± 0.4 E-14		
AUG	1.17 ± 1.0 E-15	2.25 ± 0.5 E-14		
SEP	5.48 ± 7.1 E-16	2.07 ± 0.5 E-14		
3RD QTR			1.38 ± 0.7 E-16	< 9.6 E-16
OCT	9.30 ± 8.4 E-16	1.37 ± 0.4 E-14		
NOV	5.22 ± 6.7 E-16	1.20 ± 0.3 E-14		
DEC	1.50 ± 1.3 E-15	2.36 ± 0.5 E-14		
4TH QTR			3.87 ± 0.7 E-16	< 1.3 E-15

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TABLE C - 2.2.2
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT ROCK SPRINGS ROAD (AFRSPRD)
μCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	1.28 ± 1.0 E-15	1.89 ± 0.6 E-14		
FEB	1.56 ± 1.2 E-15	2.30 ± 0.5 E-14		
MAR	9.31 ± 7.5 E-16	2.24 ± 0.4 E-14		
1ST QTR			< 2.0 E-16	< 1.2 E-15
APR	1.32 ± 0.8 E-15	2.02 ± 0.4 E-14		
MAY	8.42 ± 7.0 E-16	1.72 ± 0.4 E-14		
JUN	6.25 ± 6.3 E-16	1.31 ± 0.3 E-14		
2ND QTR			2.75 ± 0.5 E-16	5.23 ± 3.6 E-16
JUL	5.32 ± 5.4 E-16	1.74 ± 0.4 E-14		
AUG	1.10 ± 0.9 E-15	2.07 ± 0.5 E-14		
SEP	6.41 ± 5.9 E-16	1.86 ± 0.4 E-14		
3RD QTR			< 1.1 E-16	< 1.0 E-15
OCT	5.53 ± 6.5 E-16	1.29 ± 0.3 E-14		
NOV	3.80 ± 5.3 E-16	1.48 ± 0.4 E-14		
DEC	1.07 ± 0.9 E-15	2.15 ± 0.5 E-14		
4TH QTR			2.31 ± 0.9 E-16	< 8.4 E-16

TABLE C - 2.2.3
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT ROUTE 240 (AFRT240)
μCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	1.03 ± 0.9 E-15	1.90 ± 0.4 E-14		
FEB	8.87 ± 9.2 E-16	2.00 ± 0.5 E-14		
MAR	8.95 ± 9.2 E-16	1.91 ± 0.5 E-14		
1ST QTR			2.22 ± 0.5 E-16	< 1.5 E-15
APR	1.32 ± 1.1 E-15	2.19 ± 0.5 E-14		
MAY	1.04 ± 1.0 E-15	1.85 ± 0.5 E-14		
JUN	7.70 ± 9.2 E-16	1.54 ± 0.5 E-14		
2ND QTR			7.77 ± 6.4 E-17	< 1.4 E-15
JUL	1.15 ± 1.1 E-15	1.88 ± 0.5 E-14		
AUG	9.68 ± 9.1 E-16	2.10 ± 0.5 E-14		
SEP	1.35 ± 1.1 E-15	1.84 ± 0.5 E-14		
3RD QTR			< 1.1 E-16	< 1.3 E-15
OCT	1.06 ± 1.0 E-15	1.28 ± 0.4 E-14		
NOV	9.07 ± 9.7 E-16	1.24 ± 0.4 E-14		
DEC	1.24 ± 1.2 E-15	1.91 ± 0.6 E-14		
4TH QTR			9.75 ± 8.4 E-17	< 9.6 E-16

TABLE C - 2.2.4
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT SPRINGVILLE (AFSPRVL)
μCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	1.01 ± 0.6 E-15	1.84 ± 0.3 E-14		
FEB	1.31 ± 0.8 E-15	1.90 ± 0.4 E-14		
MAR	1.09 ± 0.7 E-15	1.67 ± 0.4 E-14		
1ST QTR			4.17 ± 1.8 E-17	< 8.6 E-16
APR	6.91 ± 5.8 E-16	2.01 ± 0.4 E-14		
MAY	6.19 ± 5.5 E-16	1.64 ± 0.4 E-14		
JUN	6.59 ± 5.7 E-16	1.32 ± 0.2 E-14		
2ND QTR			3.86 ± 2.1 E-17	< 5.2 E-16
JUL	8.01 ± 6.3 E-16	1.74 ± 0.4 E-14		
AUG	6.78 ± 6.9 E-16	2.07 ± 0.4 E-14		
SEP	5.53 ± 5.8 E-16	2.08 ± 0.4 E-14		
3RD QTR			2.24 ± 4.8 E-17	< 7.1 E-16
OCT	5.75 ± 6.2 E-16	1.49 ± 0.4 E-14		
NOV	5.26 ± 6.1 E.16	1.37 ± 0.4 E-14		
DEC	1.19 ± 0.9 E-15	2.12 ± 0.5 E-14		
4TH QTR			2.47 ± 1.7 E-17	< 4.2 E-16

TABLE C - 2.2.5
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT THOMAS CORNERS (AFTCORD)
µCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN *	3.22 ± 7.7 E-15	5.93 ± 3.7 E-14		
FEB	9.19 ± 9.3 E-16	2.27 ± 0.5 E-14		
MAR	6.87 ± 7.9 E-16	1.60 ± 0.4 E-14		
1ST QTR			5.12 ± 3.9 E-17	< 1.1 E-15
APR	1.32 ± 1.1 E-15	1.93 ± 0.5 E-14		
MAY	1.21 ± 1.0 E-15	1.48 ± 0.4 E-14		
JUN	9.05 ± 8.6 E-16	1.40 ± 0.4 E-14		
2ND QTR			2.35 ± 3.1 E-17	< 1.4 E-15
JUL	5.60 ± 7.7 E-16	1.67 ± 0.5 E-14		
AUG	9.43 ± 9.2 E-16	2.01 ± 0.5 E-14		
SEP	8.33 ± 7.7 E-16	1.50 ± 0.4 E-14		
3RD QTR			< 9.0 E-17	< 9.9 E-16
OCT	5.23 ± 7.1 E-16	9.83 ± 3.7 E-15		
NOV	6.86 ± 7.0 E-16	9.07 ± 3.2 E-15		
DEC	8.18 ± 9.3 E-16	1.99 ± 0.5 E-14		
4TH QTR			1.60 ± 0.4 E-16	2.82 ± 2.6 E-16

* Poor sensitivity due to low sample volume.

TABLE C - 2.2.6
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT WEST VALLEY (AFWEVAL)
µCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	Sampler Not Operating			
FEB	Sampler Not Operating			
MAR	9.27 ± 6.9 E-16	1.67 ± 0.4 E-14		
1ST QTR			< 1.0 E-16	< 1.6 E-15
APR	6.45 ± 6.3 E-16	1.87 ± 0.4 E-14		
MAY	1.09 ± 0.7 E-15	1.77 ± 0.4 E-14		
JUN	1.15 ± 1.3 E-15	2.36 ± 0.8 E-14		
2ND QTR			< 9.3 E-17	< 1.0 E-15
JUL	8.73 ± 6.6 E-16	1.71 ± 0.4 E-14		
AUG	9.51 ± 7.7 E-16	2.01 ± 0.4 E-14		
SEP	1.17 ± 0.8 E-15	1.99 ± 0.4 E-14		
3RD QTR			< 6.3 E-17	2.51 ± 2.8 E-16
OCT	5.92 ± 6.5 E-16	1.61 ± 0.4 E-14		
NOV	6.97 ± 6.7 E-16	1.26 ± 0.3 E-14		
DEC	1.13 ± 0.9 E-15	2.09 ± 0.4 E-14		
4TH QTR			5.17 ± 2.0 E-17	< 1.1 E-15

TABLE C - 2.2.7
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS - 1985

AIR SAMPLER AT GREAT VALLEY (AFGRVAL)
µCi/ml

	ALPHA	BETA	SR-90	CS-137
JAN	1.28 ± 0.8 E-15	2.05 ± 0.4 E-14		
FEB	Sampler Not Operating			
MAR	1.37 ± 0.9 E-15	2.27 ± 0.4 E-14		
1ST QTR			1.96 ± 0.8 E-16	3.31 ± 4.5 E-16
APR	1.28 ± 0.8 E-15	2.83 ± 0.5 E-14		
MAY	1.12 ± 1.0 E-15	2.35 ± 0.7 E-14		
JUN	1.18 ± 0.8 E-15	1.78 ± 0.4 E-14		
2ND QTR			< 6.7 E-17	< 9.2 E-16
JUL	1.40 ± 1.0 E-15	2.22 ± 0.5 E-14		
AUG	7.85 ± 7.1 E-16	2.11 ± 0.4 E-14		
SEP	6.22 ± 5.3 E-16	1.81 ± 0.4 E-14		
3RD QTR			< 6.7 E-17	< 8.7 E-16
OCT	4.93 ± 4.9 E-16	1.22 ± 0.2 E-14		
NOV	4.87 ± 4.8 E-16	1.10 ± 0.2 E-14		
DEC	1.11 ± 0.6 E-15	1.52 ± 0.3 E-14		
4TH QTR			5.89 ± 1.7 E-17	3.31 ± 2.3 E-16

TABLE C - 2.3
RADIOACTIVITY IN FALLOUT (nCi/square metre/mo)

	DUTCH HILL (AFDHFOP)			FOX VALLEY ROAD (AFFXFOP)		
MONTH - 1985	GROSS ALPHA	GROSS BETA	H-3 (uCi/ml)	GROSS ALPHA	GROSS BETA	H-3 (uCi/ml)
JANUARY	2.26 E-02	0.10 ± 0.02	2.14 ± 0.9 E-07	3.59 E-02	0.26 ± 0.03	4.26 ± 0.9 E-07
FEBRUARY	9.63 E-03	0.08 ± 0.02	1.11 ± 1.0 E-07	1.04 E-02	0.15 ± 0.02	2.26 ± 1.1 E-07
MARCH	2.48 E-02	0.35 ± 0.03	<1.0 E-07	2.48 E-02	0.48 ± 0.04	<1.0 E-07
APRIL	5.34 E-02	0.41 ± 0.03	<1.0 E-07	4.15 E-02	0.50 ± 0.04	<1.0 E-07
MAY	SAMPLE	CONTAINER	MISSING	1.29 E-02	0.34 ± 0.03	1.28 ± 1.0 E-07
JUNE	4.22 E-02	0.29 ± 0.03	<1.0 E-07	2.30 E-02	0.27 ± 0.03	<1.0 E-07
JULY	2.18 E-02	0.20 ± 0.02	<1.0 E-07	2.42 E-02	0.24 ± 0.03	<1.0 E-07
AUGUST	1.53 E-02	0.24 ± 0.03	<1.0 E-07	1.02 E-02	0.21 ± 0.03	<1.0 E-07
SEPTEMBER	2.38 E-02	0.18 ± 0.02	<1.0 E-07	3.08 E-02	0.21 ± 0.02	<1.0 E-07
OCTOBER	2.45 E-02	0.61 ± 0.04	1.28 ± 0.9 E-07	9.30 E-03	0.27 ± 0.03	1.93 ± 0.9 E-07
NOVEMBER	3.16 E-02	0.37 ± 0.03	<1.0 E-07	3.15 E-02	0.39 ± 0.03	<1.0 E-07
DECEMBER	2.99 E-02	0.31 ± 0.03	<1.0 E-07	5.71 E-02	0.38 ± 0.03	2.59 ± 0.9 E-07

	ROUTE 240 (AF24FOP)			THOMAS CORNERS ROAD (AFTCFOP)		
MONTH - 1985	GROSS ALPHA	GROSS BETA	H-3 (uCi/ml)	GROSS ALPHA	GROSS BETA	H-3 (uCi/ml)
JANUARY	2.10 E-02	0.13 ± 0.02	4.15 ± 0.9 E-07	2.89 E-02	0.22 ± 0.02	5.26 ± 0.9 E-07
FEBRUARY	5.86 E-03	0.10 ± 0.02	1.69 ± 1.1 E-07	1.26 E-02	0.16 ± 0.02	1.16 ± 1.1 E-07
MARCH	2.58 E-02	0.42 ± 0.03	<1.0 E-07	2.19 E-02	0.48 ± 0.04	3.24 ± 1.1 E-07
APRIL	3.93 E-02	0.45 ± 0.03	<1.0 E-07	2.48 E-02	0.48 ± 0.04	<1.0 E-07
MAY	1.69 E-02	0.35 ± 0.03	<1.0 E-07	1.69 E-02	0.38 ± 0.03	<1.0 E-07
JUNE	1.62 E-02	0.29 ± 0.03	<1.0 E-07	8.89 E-02	0.38 ± 0.04	<1.0 E-07
JULY	3.16 E-02	0.21 ± 0.02	1.08 ± 1.0 E-07	5.32 E-02	0.43 ± 0.04	<1.0 E-07
AUGUST	1.95 E-02	0.29 ± 0.03	<1.0 E-07	2.67 E-02	0.24 ± 0.02	<1.0 E-07
SEPTEMBER	4.49 E-02	0.22 ± 0.03	1.20 ± 1.0 E-07	4.06 E-02	0.30 ± 0.03	<1.0 E-07
OCTOBER	1.75 E-02	0.70 ± 0.05	<1.0 E-07	3.97 E-02	0.39 ± 0.03	1.04 ± 0.9 E-07
NOVEMBER	2.88 E-02	0.43 ± 0.03	1.60 ± 0.9 E-07	3.25 E-02	0.36 ± 0.03	1.53 ± 0.9 E-07
DECEMBER	5.03 E-02	0.33 ± 0.03	3.28 ± 0.9 E-07	2.51 E-02	0.24 ± 0.03	1.47 ± 0.9 E-07

TABLE C - 2.4

TOTAL PRECIPITATION AT WVDP - 1985

1985	# RAINFALL	CUMULATIVE TOTAL
*JAN	0.98 INCHES	0.98 INCHES
*FEB	0.50 INCHES	1.48 INCHES
*MAR	1.79 INCHES	3.27 INCHES
APR	1.12 INCHES	4.39 INCHES
MAY	2.01 INCHES	6.40 INCHES
JUN	3.73 inches	10.13 inches
JUL	3.61 inches	13.74 inches
AUG	2.98 inches	16.72 inches
SEP	2.54 inches	19.26 inches
OCT	5.21 inches	24.47 inches
NOV	7.72 inches	32.21 inches
DEC	2.81 inches	35.02 inches

Includes snow as equivalent rainfall
* Incomplete record

FIGURE C-2.1
1985 SAMPLING DATA FOR STATION ANSTACK
CURIES RELEASED PER MONTH

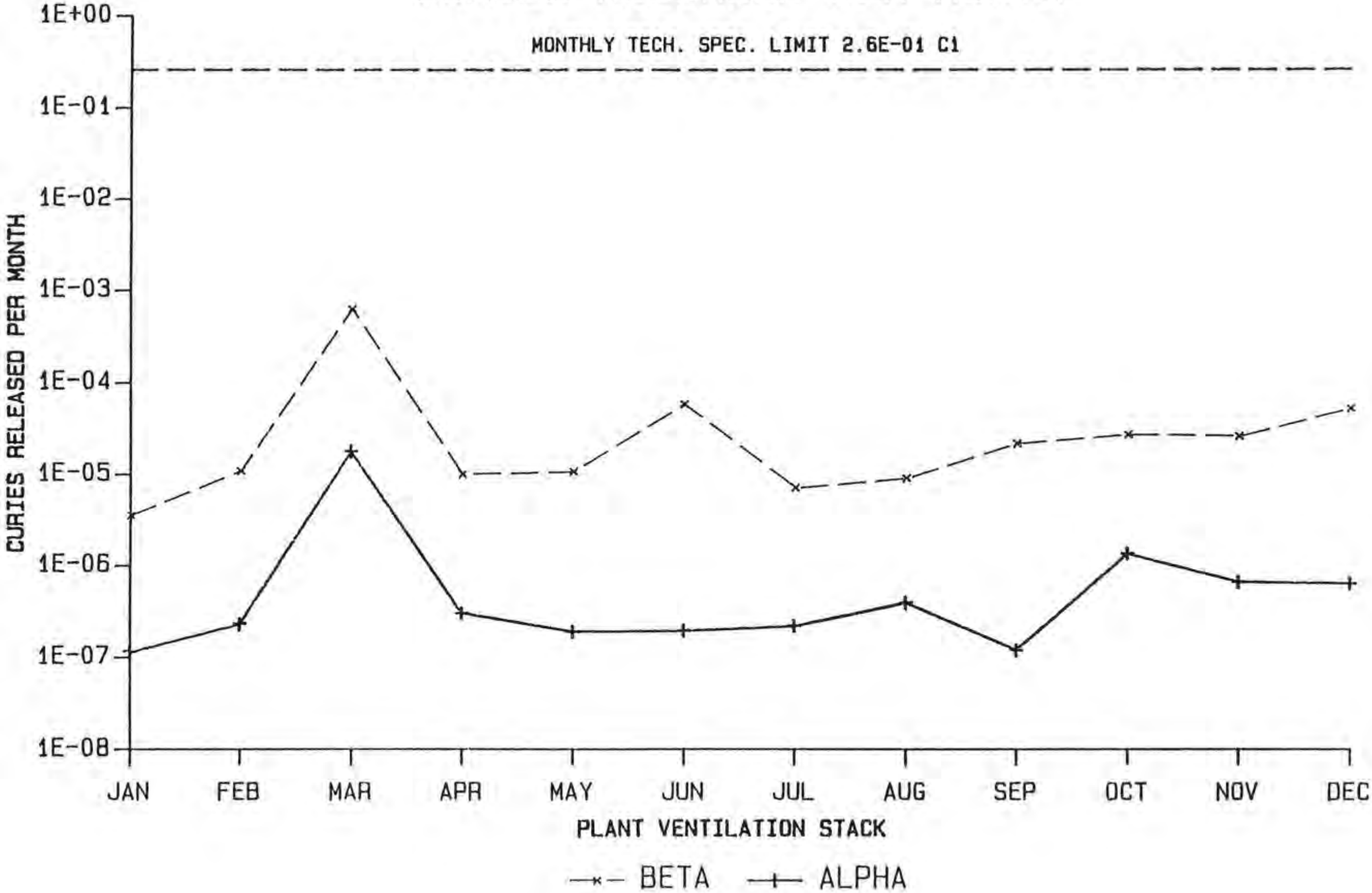
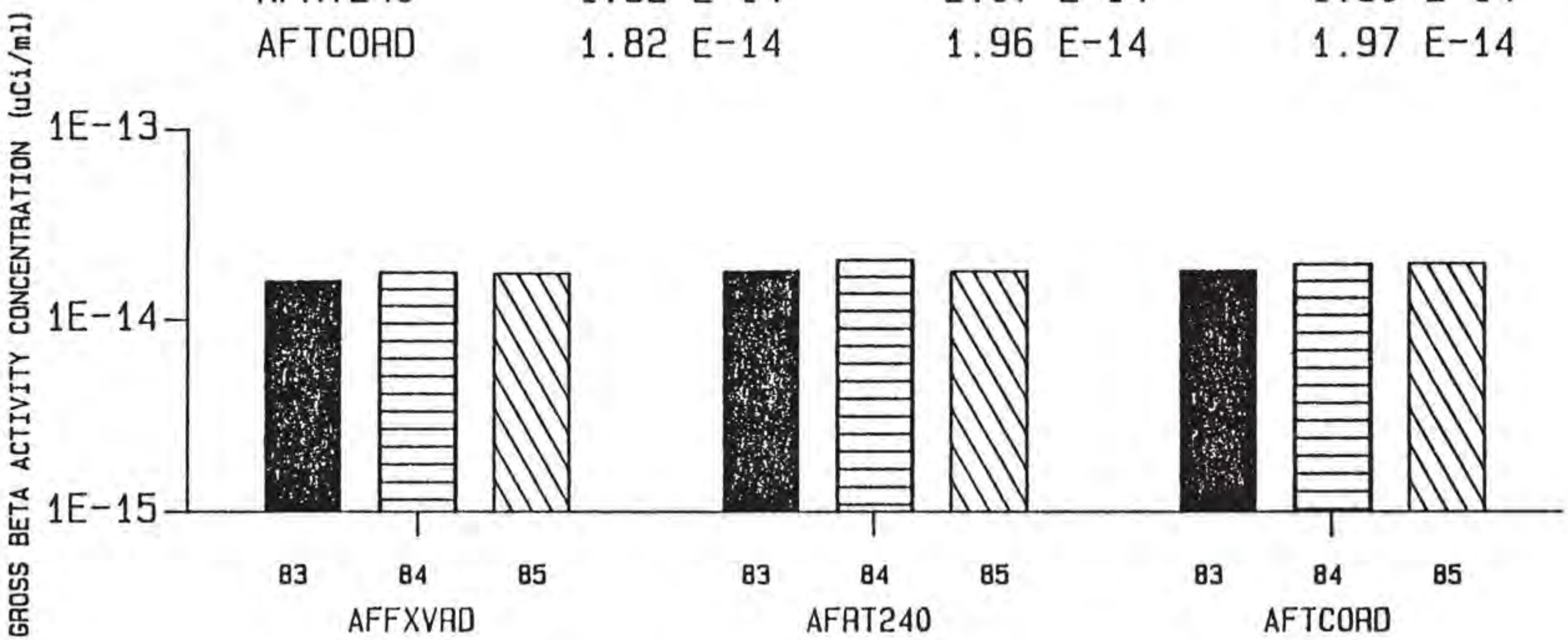


FIGURE C-2.2
TRENDS OF GROSS BETA ACTIVITY IN PERIMETER AIR SAMPLERS (AFFXVRD, AFRT240, AFTCORD) 1983-1985

uCi/ml

	1983	1984	1985
AFFXVRD	1.61 E-14	1.78 E-14	1.75 E-14
AFRT240	1.82 E-14	2.07 E-14	1.80 E-14
AFTCORD	1.82 E-14	1.96 E-14	1.97 E-14



PARTICULATE AIR SAMPLE ANNUAL AVERAGES

APPENDIX C-3

SUMMARY OF BIOLOGICAL SAMPLE DATA

TABLE C - 3.1
RADIOACTIVITY CONCENTRATIONS IN MILK - 1985
(uCi/ml)

	SR-90	I-129	CS-134	CS-137
NNW Farm (BFMREED) 1st Quarter 1985	3.32 ± 0.5 E-09	<1.8 E-09	<2.3 E-08	<1.8 E-08
NNW Farm (BFMREED) 2nd Quarter 1985	2.30 ± 0.5 E-09	<2.2 E-09	<2.0 E-08	<2.3 E-08
NNW Farm (BFMREED) 3rd Quarter 1985	2.25 ± 0.6 E-09	<1.3 E-09	<2.1 E-08	<2.5 E-08
ENE Farm (BFMZIMM) August 1985	4.35 ± 0.7 E-09	<1.4 E-08*	<2.1 E-08	<2.2 E-08
WNW Farm (BFMCOBO) 3rd Quarter 1985	3.19 ± 0.6 E-09	<1.5 E-09	<1.9 E-08	<1.7 E-08
NNW Farm (BFMREED) 4th Quarter 1985	1.74 ± 0.2 E-09	<7.8 E-10	<1.6 E-08	<1.7 E-08
Control (BFMCTRL) 4th Quarter 1985	6.63 ± 3.2 E-10	<1.4 E-09	<1.7 E-08	<2.0 E-08

*Laboratory accident caused loss of sample and decreased sensitivity.

TABLE C - 3.2
RADIOACTIVITY CONCENTRATIONS IN MEAT - 1985
(uCi/kg)

	Sr-89	Sr-90	Cs-134	Cs-137
Deer Flesh - Near site (BFDNEAR) December 1985	----------	2.62 ± 0.4 E-06	<4.0 E-05	1.75 ± 0.3 E-04
Deer Skeleton - Near site (BFDNEAR) December 1985	<1.6 E-03	3.54 ± 0.4 E-03	----------	----------
Deer Flesh - Background (BFDCTRL) December 1985	----------	6.16 ± 1.6 E-06	<4.9 E-05	1.08 ± 0.3 E-04
Beef Flesh - Near site (BFBNEAR) June 1985	----------	----------	<2.7 E-05	1.44 ± 1.4 E-05
Beef Flesh - Background (BFBCTRL) June 1985	----------	----------	<1.7 E-05	<1.8 E-05
Beef Flesh - Near site (BFBNEAR) December 1985	----------	----------	<4.5 E-05	<5.9 E-05
Beef Flesh - Background (BFBCTRL) August 1985	----------	----------	<5.8 E-05	2.66 ± 2.7 E-05

TABLE C - 3.3
RADIOACTIVITY CONCENTRATIONS IN FOOD CROPS - 1985
(uCi/g) DRY

	SR-90	K-40	CO-60	CS-137
CORN - BACKGROUND (BFVCTRL) AUG. 1985	6.25 ± 1.7 E-09	1.10 ± 0.1 E-05	<6.5 E-08	<5.7 E-08
CORN - NEAR SITE (BFVNEAR) OCT. 1985	1.67 ± 0.5 E-09	5.53 ± 0.6 E-06	<5.0 E-08	<5.0 E-08
APPLES - NEAR SITE (BFVNEAR) OCT. 1985	3.96 ± 0.9 E-09	1.05 ± 0.1 E-05	<6.3 E-08	2.03 ± 2.0 E-08
POTATOES - NEAR SITE (BFVNEAR) OCT. 1985	1.09 ± 0.2 E-08	1.76 ± 0.1 E-05	<5.7 E-08	<4.3 E-08

TABLE C - 3.4
RADIOACTIVITY CONCENTRATIONS IN FISH FROM STREAMS AROUND WVDP - 1985

CATTARAUGUS CREEK FISH - SECOND QUARTER 1985
CONCENTRATION (uCi/kg) DRY

(BFFCATC)

	FLESH SR-90	FLESH CS-134	FLESH CS-137	SKELETON SR-90
MEDIAN	1.28 E-05	<2.19 E-04	<2.00 E-04	1.38 E-04
AVERAGE GEOMETRIC DEVIATION	2.10	2.13	2.39	1.82
MAXIMUM	4.26 ± 0.8 E-05	<5.1 E-04	<5.4 E-04	2.63 ± 0.4 E-04
MINIMUM	3.76 ± 1.3 E-06	<6.5 E-05	<8.6 E-05	6.60 ± 1.6 E-05

CATTARAUGUS CREEK FISH - THIRD QUARTER 1985
CONCENTRATION (uCi/kg) DRY

	FLESH SR-90	FLESH CS-134	FLESH CS-137	SKELETON SR-90
MEDIAN	5.00 E-05	<4.91 E-04	<5.83 E-04	2.69 E-04
AVERAGE GEOMETRIC DEVIATION	1.96	1.68	1.62	1.44
*MAXIMUM	<1.9 E-04	<9.1 E-04	<1.1 E-03	3.46 ± 0.6 E-04
MINIMUM	2.17 ± 0.5 E-05	<1.5 E-04	<1.8 E-04	1.58 ± 0.6 E-04

CATTARAUGUS CREEK BACKGROUND FISH - SECOND QUARTER 1985
(BFFCTRL)
CONCENTRATION (uCi/kg) DRY

	FLESH SR-90	FLESH CS-134	FLESH CS-137
MEDIAN	1.22 E-05	<1.97 E-04	<2.03 E-04
AVERAGE GEOMETRIC DEVIATION	1.74	1.44	1.47
*MAXIMUM	6.30 ± 5.8 E-05	<2.8 E-04	<3.2 E-04
MINIMUM	6.39 ± 2.6 E-06	<1.3 E-04	<1.1 E-04

CATTARAUGUS CREEK BACKGROUND FISH - THIRD QUARTER 1985
(BFFCTRL)
CONCENTRATION (uCi/kg) DRY

	FLESH SR-90	FLESH CS-134	FLESH CS-137
MEDIAN	<3.27 E-05	<3.10 E-04	<3.20 E-04
AVERAGE GEOMETRIC DEVIATION	3.28	1.80	1.72
*MAXIMUM	<1.6 E-04	<5.3 E-04	<5.5 E-04
MINIMUM	<1.3 E-05	<1.4 E-04	<1.3 E-04

BUTTERMILK CREEK BACKGROUND FISH - THIRD QUARTER 1985
(BFFBCFV)
CONCENTRATION (uCi/kg) DRY

	FLESH SR-90	FLESH CS-134	FLESH CS-137
MEDIAN	4.20 E-05	<4.0 E-04	4.46 E-04
AVERAGE GEOMETRIC DEVIATION	2.20	1.45	1.54
*MAXIMUM	8.15 ± 2.2 E-05	<6.8 E-04	<8.0 E-04
MINIMUM	1.20 ± 1.0 E-05	<3.1 E-04	3.12 ± 1.7 E-04

* DUE TO SMALL SAMPLE SIZE, SOME DETECTION LIMITS WERE HIGH

FIGURE C-3.1
COMPARISON OF RADIOACTIVITY IN FISH
SAMPLES FROM AROUND WVDP-1985

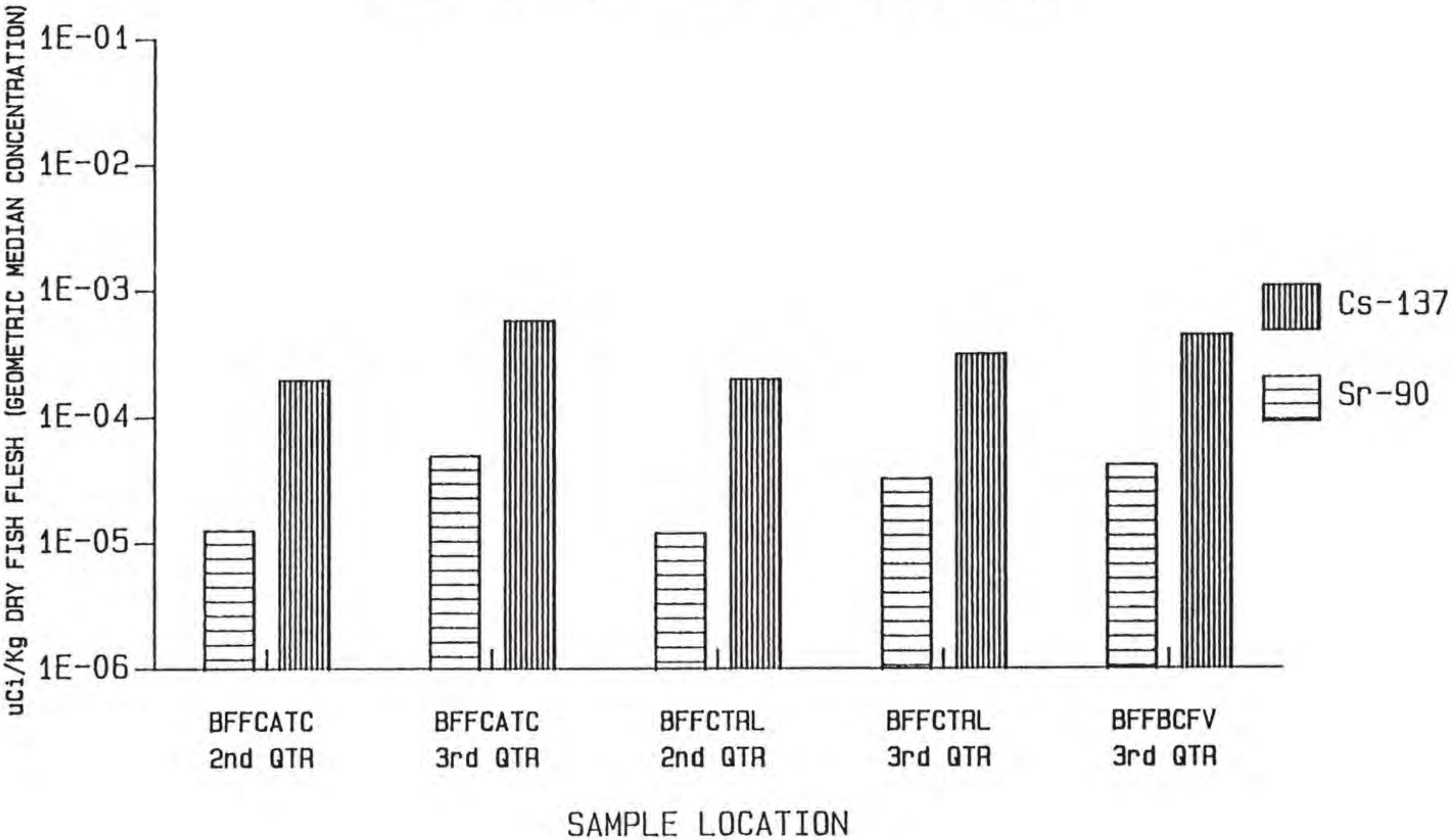


FIGURE C-3.2

TRENDS OF Sr-90 CONCENTRATIONS IN FISH FROM CATTARAUGUS CREEK (BFFCATC) 1982-1985

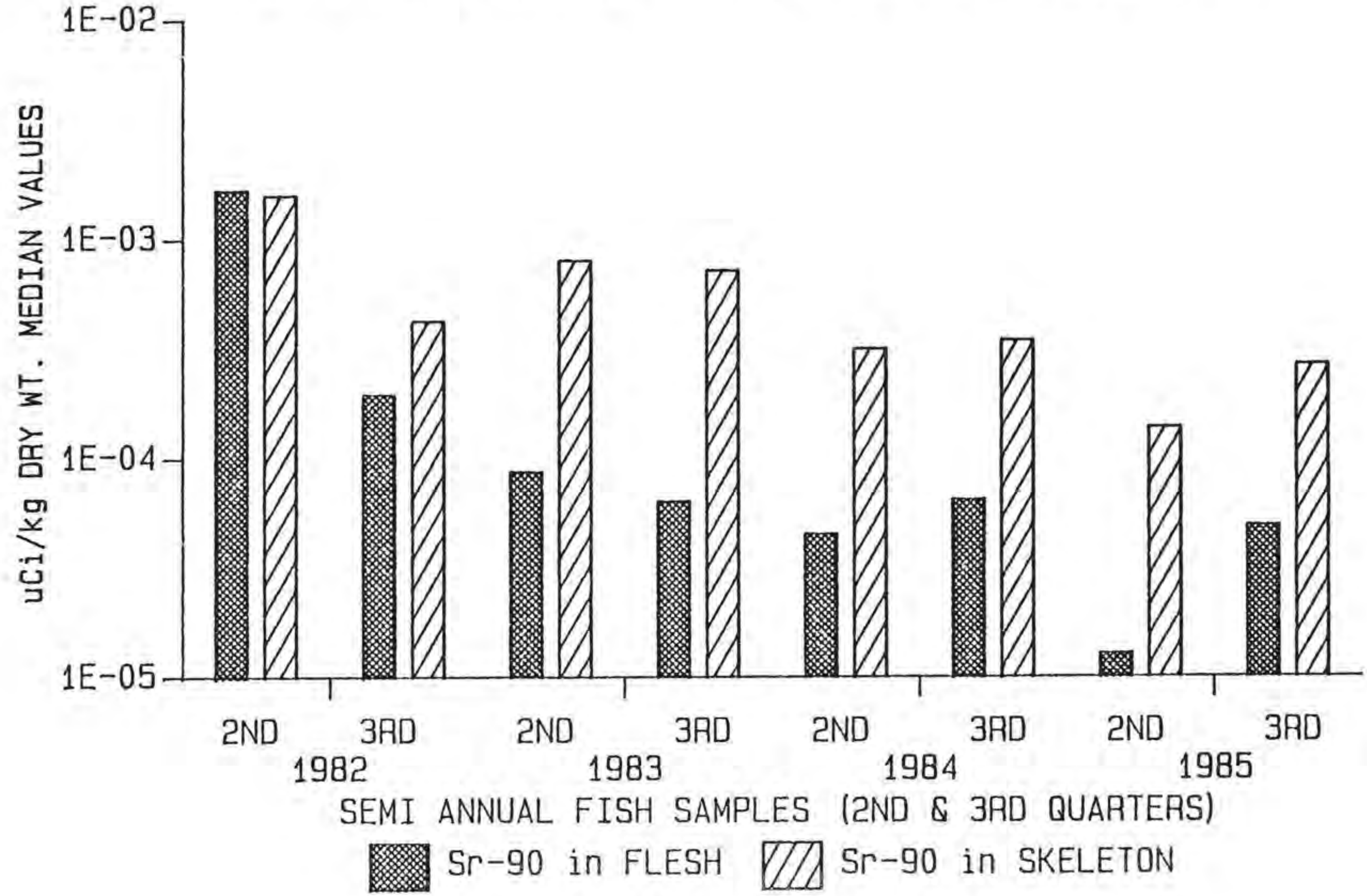
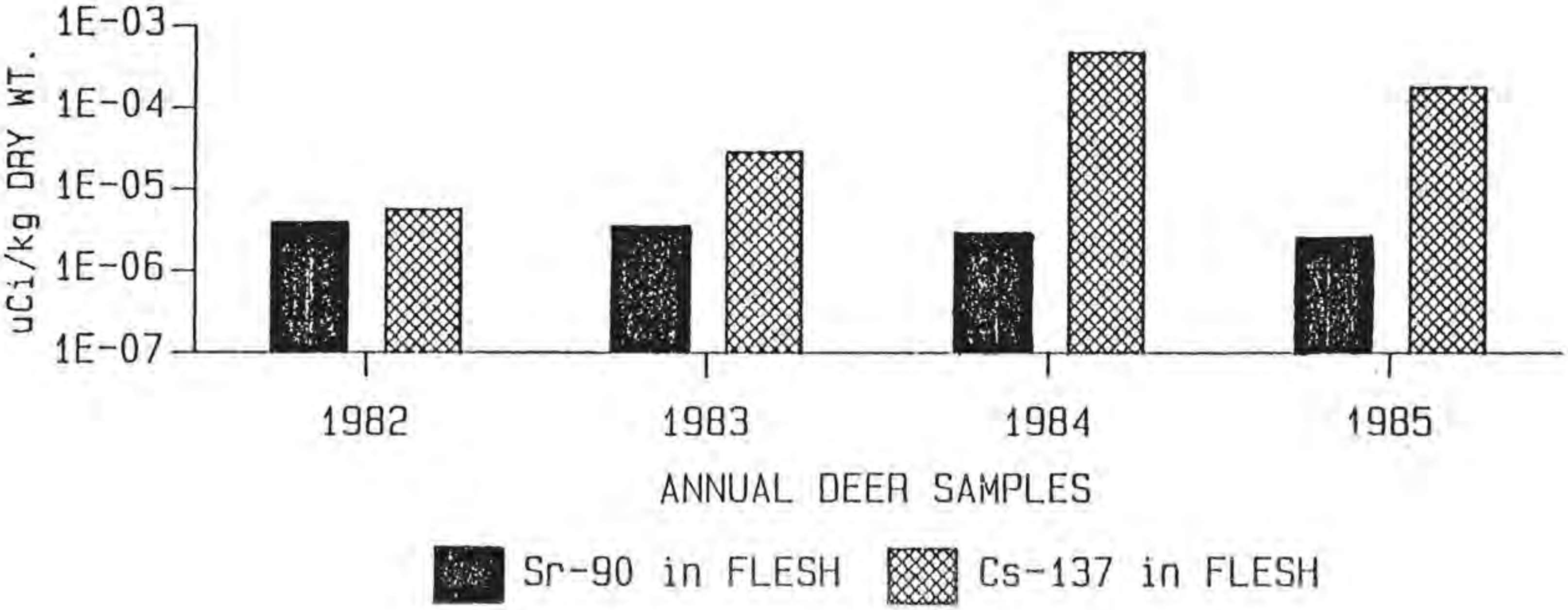


FIGURE C-3.3
TRENDS OF RADIONUCLIDES IN VENISON FROM NEAR WVDP SITE (BFDNEAR) 1982-1985

	Sr-90 in FLESH	Cs-137 in FLESH
1982	4.00+/-3.0 E-06	<5.7 E-06
1983	3.60+/-0.7 E-06	2.90+/-2.1 E-05
1984	3.00+/-0.9 E-06	4.80+/-0.4 E-04
1985	2.60+/-0.4 E-06	1.80+/-0.3 E-04



APPENDIX C-4

SUMMARY OF DIRECT RADIATION MONITORING

TABLE C-4.1

SUMMARY OF TLD MEASUREMENTS - 1985
(Roentgen ± 3SD)

Location #	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Location Average
1	0.017 ± 0.004	0.021 ± 0.004	0.023 ± 0.005	0.023 ± 0.012	0.021 ± 0.006
2	0.017 ± 0.002	0.019 ± 0.001	0.021 ± 0.006	0.019 ± 0.012	0.019 ± 0.005
3	0.015 ± 0.001	0.019 ± 0.005	0.021 ± 0.004	0.017 ± 0.005	0.018 ± 0.004
4	0.016 ± 0.004	0.019 ± 0.004	0.021 ± 0.006	0.018 ± 0.009	0.019 ± 0.006
5	0.016 ± 0.002	0.019 ± 0.003	0.022 ± 0.007	0.020 ± 0.011	0.019 ± 0.006
6	0.016 ± 0.004	0.019 ± 0.005	0.019 ± 0.006	0.020 ± 0.009	0.019 ± 0.006
7	0.016 ± 0.001	0.020 ± 0.007	0.019 ± 0.009	0.020 ± 0.015	0.019 ± 0.008
8	0.016 ± 0.002	0.019 ± 0.003	0.021 ± 0.005	0.018 ± 0.009	0.019 ± 0.005
9	0.016 ± 0.002	0.018 ± 0.001	0.020 ± 0.005	0.018 ± 0.010	0.018 ± 0.005
10	0.015 ± 0.003	*	0.020 ± 0.009	0.019 ± 0.010	0.018 ± 0.007
11	0.018 ± 0.004	0.021 ± 0.005	0.021 ± 0.010	0.021 ± 0.009	0.020 ± 0.007
12	0.016 ± 0.001	0.019 ± 0.002	0.021 ± 0.002	0.018 ± 0.010	0.019 ± 0.004
13	0.017 ± 0.003	0.022 ± 0.004	0.024 ± 0.006	0.020 ± 0.006	0.021 ± 0.005
14	0.017 ± 0.002	0.023 ± 0.008	0.023 ± 0.007	0.021 ± 0.014	0.021 ± 0.008
15	0.015 ± 0.003	0.021 ± 0.004	0.022 ± 0.007	0.020 ± 0.013	0.020 ± 0.007
16	0.014 ± 0.001	*	0.020 ± 0.004	0.018 ± 0.004	0.017 ± 0.003
17	0.017 ± 0.002	0.020 ± 0.003	0.020 ± 0.003	0.022 ± 0.015	0.020 ± 0.006
†18	0.019 ± 0.002	0.027 ± 0.004	0.030 ± 0.010	0.025 ± 0.012	0.025 ± 0.007
†19	0.017 ± 0.003	0.023 ± 0.005	0.023 ± 0.008	0.020 ± 0.003	0.021 ± 0.005
20	0.016 ± 0.002	0.019 ± 0.005	0.020 ± 0.005	0.017 ± 0.010	0.018 ± 0.006
21	0.018 ± 0.001	0.019 ± 0.005	0.019 ± 0.003	0.018 ± 0.010	0.019 ± 0.005
22	0.018 ± 0.002	0.019 ± 0.002	0.021 ± 0.005	0.016 ± 0.003	0.019 ± 0.003
23	0.018 ± 0.002	0.020 ± 0.005	0.018 ± 0.006	0.017 ± 0.009	0.018 ± 0.006
†24	**	**	0.331 ± 0.084	1.638 ± 0.677	0.985 ± 0.381
25	**	**	0.026 ± 0.007	0.033 ± 0.015	0.030 ± 0.011
†Quarterly Average	0.016 ± 0.002	0.020 ± 0.004	0.021 ± 0.006	0.020 ± 0.010	0.020 ± 0.006

* - TLD Package Missing
** - TLD Package Not Placed Until Third Quarter
# - See Figures A-4 and A-6 For Locations
† - TLDs 18, 19 and 24 are on-site at locations which are not accessible to the public.
They are not part of the off-site monitoring program and are not included in the Quarterly Averages.

FIGURE C-4.1
AVERAGE QUARTERLY GAMMA EXPOSURE RATES
AROUND WVDP - 1985

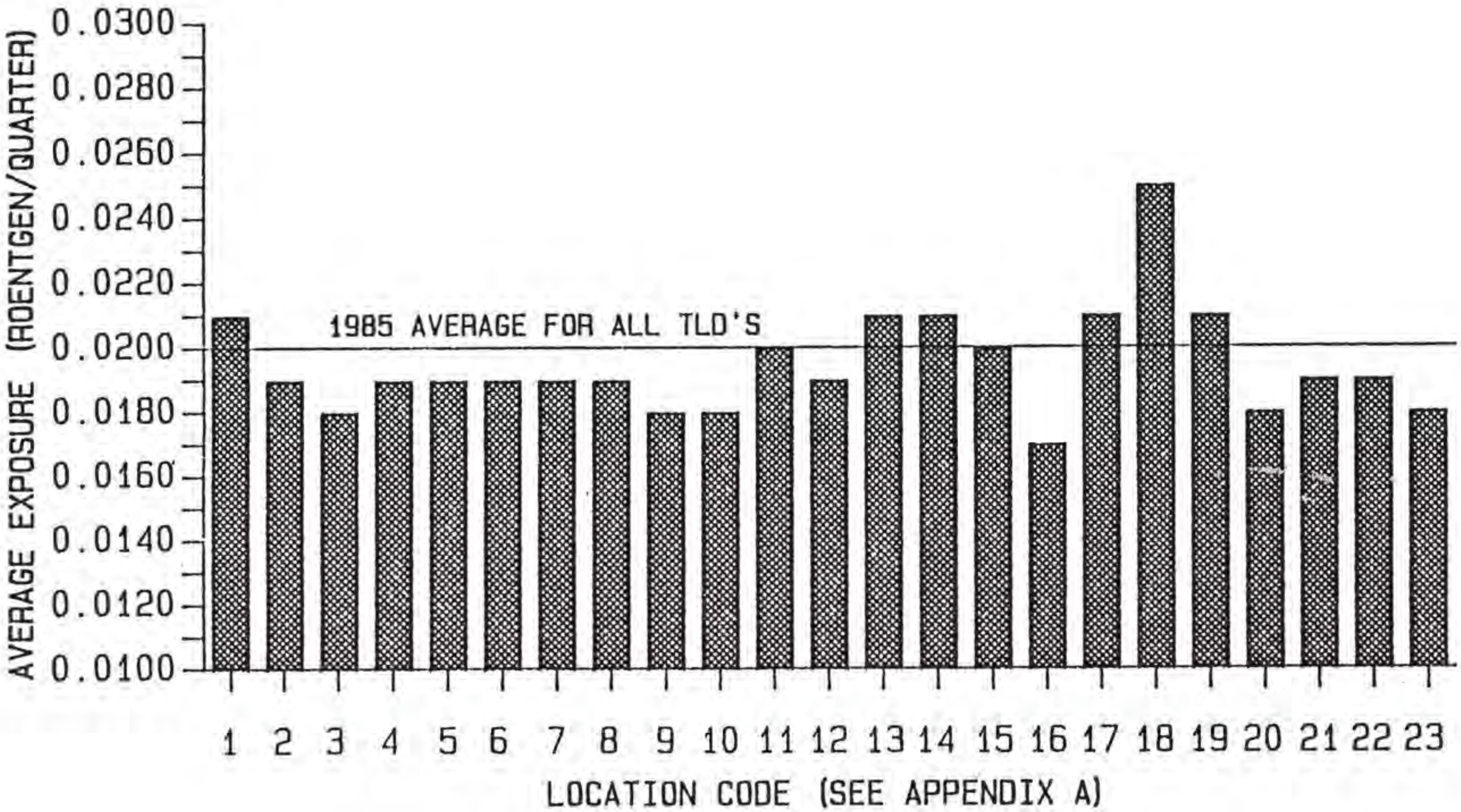


FIG C-4.2

COMPARISON OF TLD AND HPIC MEASUREMENTS OF EXPOSURE RATES 3RD QUARTER 1985

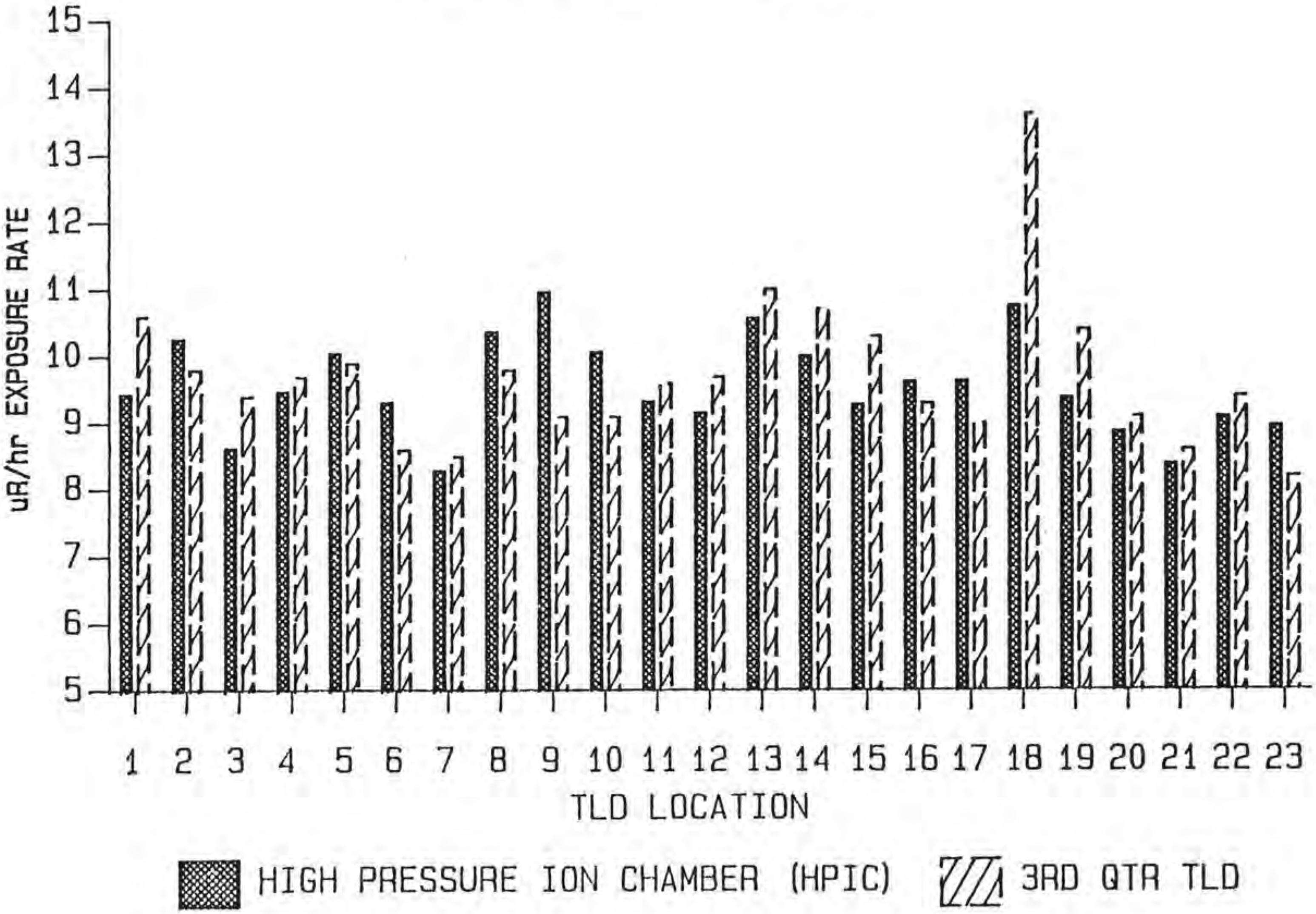
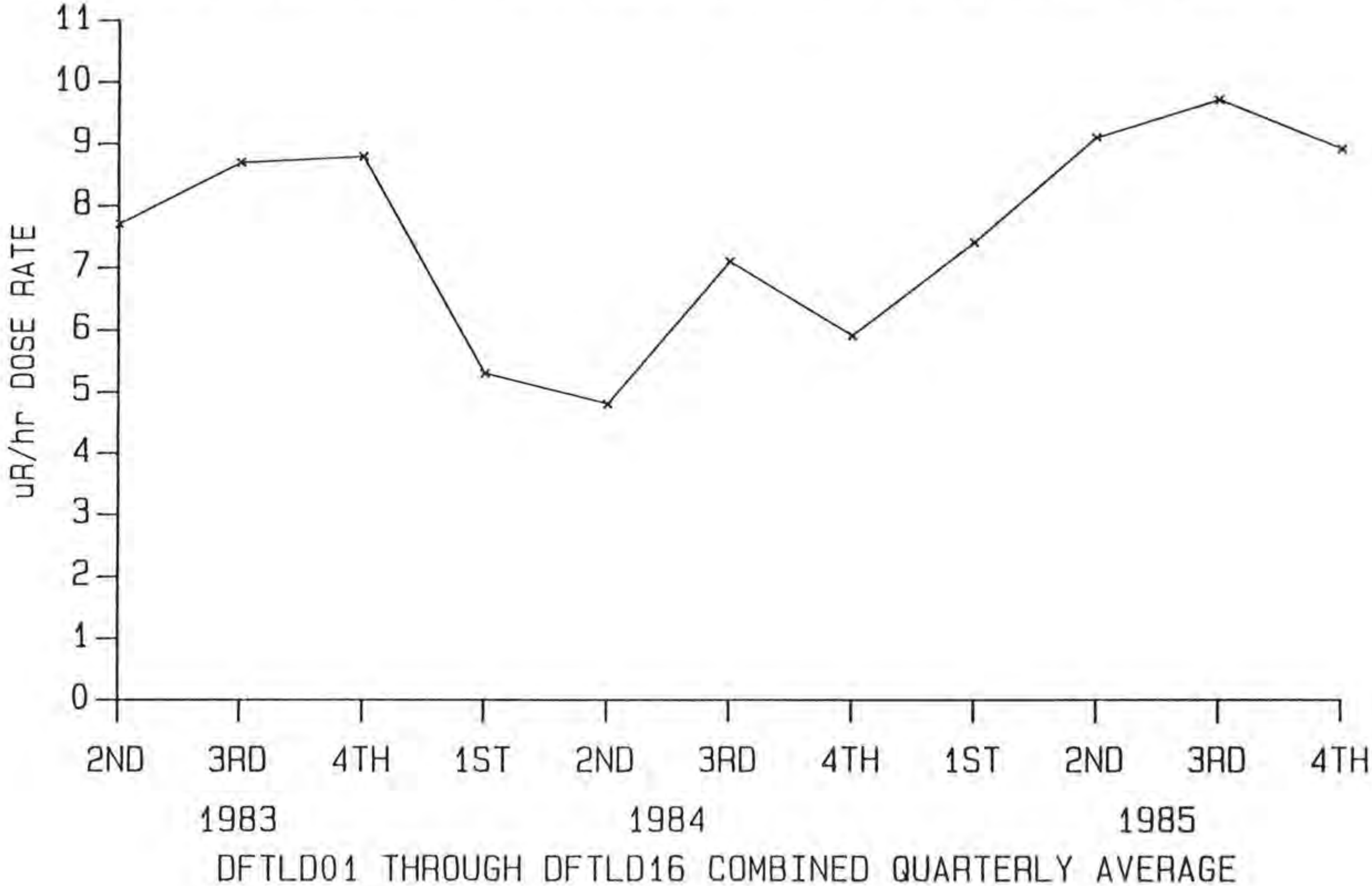


FIGURE C-4.3

TRENDS OF ENVIRONMENTAL GAMMA RADIATION LEVELS

QUARTERLY AVERAGES OF 16 PERIMETER TLD'S



APPENDIX C-5

SUMMARY OF NONRADIOLOGICAL MONITORING

APPENDIX C-5 - SUMMARY OF NONRADIOLOGICAL MONITORING

Nonradiological emissions and plant effluents are controlled and permitted under New York State and U.S. EPA regulations. Airborne emissions arise from seven sources, all of which are permitted by New York State Department of Environmental Conservation. These release points include two natural gas-fired boilers, two nitric acid tank vents, an office paper waste incinerator, a glass-melter off-gas system and a cement storage silo vent. The melter off-gas system and cement silo vent are currently being tested and operated under permits to construct. These permits are identified and described in Table C-5.1. Although there are periodic New York State inspections of the air emission points, routine sampling and analysis of nonradiological emissions from these points are not required. Discharges from these points are well below the levels requiring monitoring under the state permit system.

Liquid discharges are regulated under the State Pollution Discharge Elimination System (SPDES). The permit held by the WVDP pursuant to this program was renewed with revisions during 1985. The outfalls and monitoring requirements for the permit prior to renewal are presented in Table C-5.2. The new permit monitoring requirements are identified in Table C-5.3. The locations of the monitoring points are shown in Figure C-5.1.

The results of the SPDES nonradiological monitoring under both the old and new permits are presented in Figures C-5.2 through C-5.15. These data indicate Project effluents were generally within the permit limits during 1985. However, the WVDP reported a total of 21 noncompliance episodes. These noncompliances are summarized in Table C-5.4 and are described in the following paragraphs.

The majority of noncompliances were related to naturally high concentrations of regulated parameters. There were 14 occasions during nine separate months when the iron concentration exceeded permit levels. Twelve of these instances were at outfall 006, Erdman Brook, and are attributed to iron concentrations in the brook at or near the permit limit before discharge of Project effluents. This has also been determined to be the source of elevated zinc and lead in process water originating from this watershed and being discharged through outfall 001.

Three noncompliance episodes are related to start-up of new systems or implementing changes in the monitoring program to reflect new permit conditions. A new sewage treatment plant was started up in May 1985 and the initial settleable solids were high, but decreased as the plant approached operating equilibrium. In September, the new permit came into effect but background iron samples were not collected. This precluded calculation of the incoming mass of iron, which in turn is necessary to calculate the net discharge concentration. In November, the net discharge from iron was again in excess of permit limits, but was attributed to rapid discharge of outfall 001. The volume of effluent discharged from outfall 001 created a mass loading of iron to Erdman Brook in excess of that which could be accommodated within the permit limits, including the correction for background iron concentrations.

In October, the waste stream mixing and flow equalization basin became operational. The first discharge from this outfall was not completely mixed and had a pH value above the permit limits. Subsequent samples indicate a well mixed effluent within the permit limits.

An isolated excursion occurred in September for suspended solids in the sewage plant effluent. This was caused by a pump failure and was corrected within 24 hours.

The remaining two excursions occurred at outfall 001 during August and are directly related to each other. The liquid accumulated in Lagoon 3 for discharge through SPDES outfall 001 supported a dense algal population during this period. It is suspected that the algae photosynthetically induced an elevated pH by assimilating total inorganic carbon. This high pH value was used to calculate the unionized ammonia value, resulting in a value above the limit for this parameter.

These noncompliance episodes are summarized in Table C-5.4. The environmental impacts associated with these noncompliance episodes are negligible because of their generally small magnitude and short duration, the innocuous nature of the noncomplying parameters, and natural dilution by a factor of approximately 1000 between the point where Erdman Brook leaves the controlled area of the site (formerly outfall 006) and Cattaraugus Creek (the nearest point of public access).

Table C-5.1

West Valley Demonstration Project

Environmental Permits

Permit #	Issued by	Expiration Date	Type of Permit
042200-0114-00002 WC	NYSDEC	6/89	Certificate to operate air contamination source - boiler
042200-0114-00003 WC	NYSDEC	6/89	Certificate to operate air contamination source - boiler
042200-0114-00004 WR	NYSDEC	6/89	Certificate to operate air contamination source - incinerator
042200-0114-00010 WI	NYSDEC	6/89	Certificate to operate air contamination source - Low Level Waste Treatment Facility Nitric Acid Storage Tank
042200-0114-014D1 WI	NYSDEC	6/89	Certificate to operate air contamination source - Nitric Acid Bulk Storage Tank
NY-0000973	NYSDEC	7/83	State Pollution Discharge Elimination System (SPDES permit)
042200-0114 CSS01	NYSDEC	4/86	Permit to Construct Cement Storage Silo Ventilation System.
042200-0114 015F-1	NYSDEC	6/86	Permit to Construct Vitrification Off-Gas System

Table C-5.2

West Valley Demonstration Project

SPDES Sampling Program

Prior to September 1, 1985

Outfall #	Parameter	Limit	Sampling Frequency
001	Barium	1.0 mg/l	Monthly during discharge
	Chromium	0.05 mg/l	Monthly during discharge
	Copper	0.2 mg/l	Monthly during discharge
	Lead	0.03 mg/l	Monthly during discharge
	Manganese	1.0 mg/l	Monthly during discharge
	Nickel	0.3 mg/l	Monthly during discharge
	Zinc	0.3 mg/l	Monthly during discharge
	Unionized Ammonia	0.15 mg/l	Monthly during discharge
	Total Suspended Solids	No limit	Monthly during discharge
	Temperature	90° F	Monthly during discharge
	pH	6.0 - 9.0	Monthly during discharge
002	Total Suspended Solids	100 mg/l	Monthly
003	Flow volume	No limit	Per discharge
004	pH	6.0 - 9.0	Weekly
	BOD-5	45.0 mg/l	Quarterly
	Total Suspended Solids	45.0 mg/l	Quarterly
	Settleable Solids	0.3 ml/l	Weekly
005	pH	6.0 - 9.0	Monthly
	Total Suspended Solids	100.0 mg/l	Monthly
006	Iron	1.0 mg/l	Twice per month
	Ammonia	2.0 mg/l	Twice per month
	Unionized Ammonia	0.15 mg/l	Twice per month
	pH	6.0 - 9.0	Twice per month
	Temperature	32° C	Twice per month

TABLE C-5.3
West Valley Demonstration Project
SPDES Sampling Program
Effective September 1, 1985

Outfall #	Parameter	Limit	Sample Frequency
001 (Process and Storm waste waters)	Flow		2 per discharge event
	Aluminum	14.0 mg/l	2 per discharge event
	Ammonia	*	2 per discharge event
	Arsenic	0.01 mg/l	2 per discharge event
	BOD-5	**	2 per discharge event
	Iron	**	2 per discharge event
	Zinc	0.31 mg/l	2 per discharge event
	Suspended Solids	45.0 mg/l	2 per discharge event
	Cyanide	0.1 mg/l	2 per discharge event
	Settleable Solids	0.30 ml/l	2 per discharge event
	pH	6.0 - 9.0	2 per discharge event
	Cadmium	0.013 mg/l	annual
	Chromium	0.050 mg/l	annual
	Copper	0.050 mg/l	annual
	Lead	0.080 mg/l	annual
	Nickel	0.080 mg/l	annual
	Selenium	0.040 mg/l	annual
004† (Sanitary waste water)	Flow		3 per month
	Ammonia	*	3 per month
	BOD-5	**	3 per month
	Iron	**	3 per month
	Suspended Solids	45.0 mg/l	2 per month
	Settleable Solids	0.3 ml/l	Weekly
	pH	6.0 - 9.0	Weekly
005† (Utility waste water)	Same as 004		
	Chloroform	0.020 mg/l	annual
007† (Sanitary and Utility waste water)	Same as 005, including annual chloroform		
008 (French Drain waste water)	Flow		3 per month
	BOD-5	**	3 per month
	Iron	**	3 per month
	pH	6.0 - 9.0	3 per month
	Silver	0.008 mg/l	annual
	Zinc	0.100 mg/l	annual

† Outfalls 004 and 005 are to be combined into outfall 007 per the requirements of NYSDEC Consent Order.

* Reported as flow weighted average of Outfalls 001, 004 and 005 or 001 and 007.

** Reported as flow weighted average of Outfalls 001, 004, 005 and 008 or 001, 007 and 008. Iron data are net limits reported after background concentrations are subtracted.

TABLE C-5.4
West Valley Demonstration Project
1985 SPDES Noncompliance Episodes

Date	Outfall	Parameter	Limit	Value	Comments
Jan. 1985	001	Lead	0.03 mg/l	0.042	
		Zinc	0.30 mg/l	0.35	
	006	Iron	1.00 mg/l	2.14	
Feb. 1985	006	Iron	1.00 mg/l	1.36	
March 1985	006	Iron	1.00 mg/l	5.29	Three episodes reported.
April 1985	006	Iron		2.05	
May 1985	004	Settleable Solids	0.3 ml/l	1.0	Start up of new sewage treatment plant.
	006	Iron	1.00 mg/l	5.12	
June 1985	006	Iron	1.00 mg/l	6.77	Three episodes reported.
July 1985	006	Iron	1.00 mg/l	19.7	Two episodes reported.
Aug. 1985	001	pH	6.0 - 9.0	9.15	Algae Mediated.
		Unionized Ammonia	0.15 mg/l	0.25	Calculated based on pH
Sept. 1985	004	Suspended Solids	0.3 mg/l	393.0	Pump failure in treatment plant.
	Sum of 001, 004, 005, 008	Iron	0.31 (net) mg/l	0.82	Background sample not collected for calculation of net concentration.
Oct. 1985	007	pH	6.0 - 9.0	9.5	Start-up of new effluent mixing basin.
Nov. 1985	Sum of 001, 007, 008	Iron	0.31 (net) mg/l	0.97	Too rapid discharge from 001.

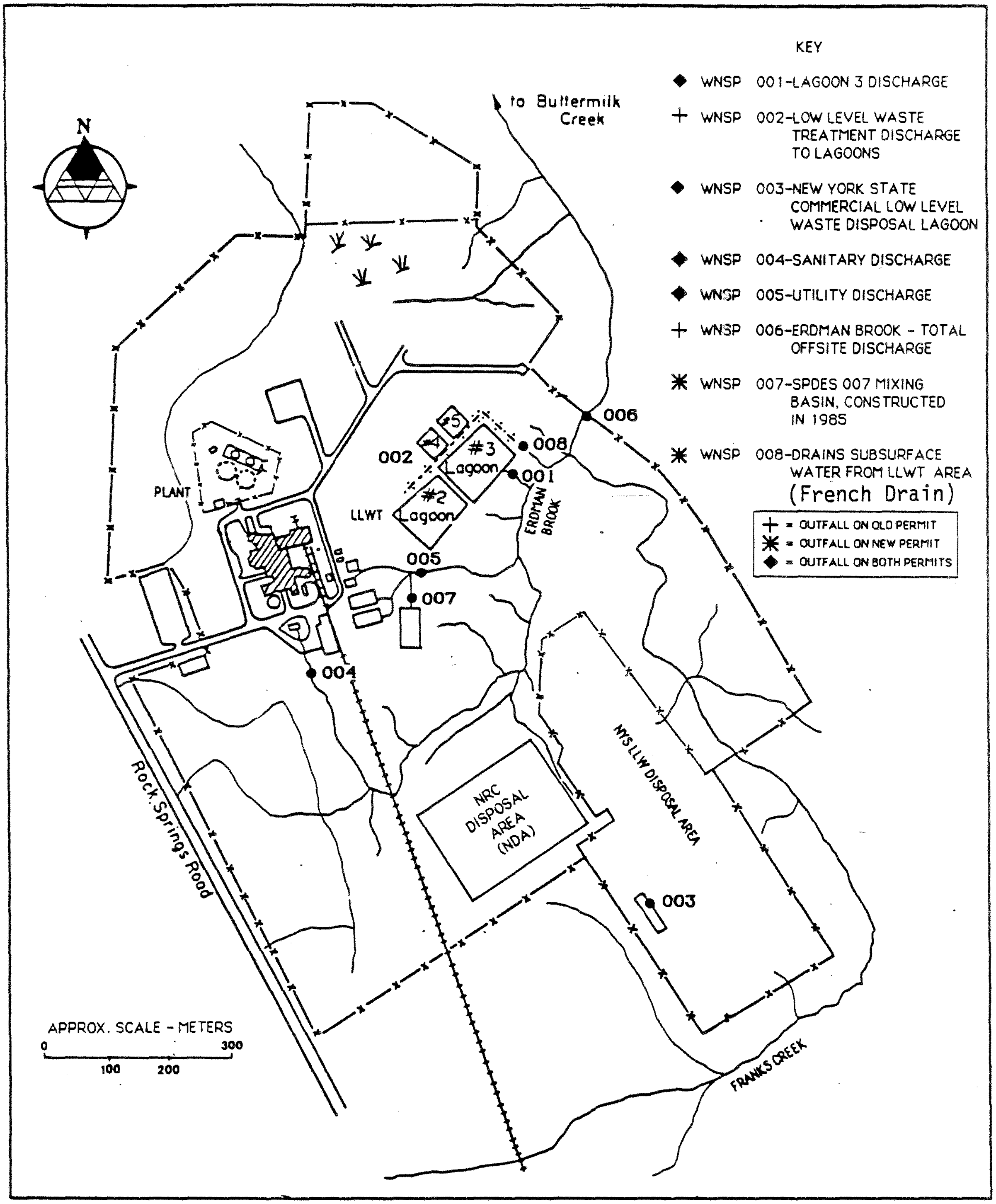


FIGURE C-5.1
Locations of SPDES Monitoring Points On-site

FIGURE C-5.2
TEMPERATURE
OUTFALLS 001, 006

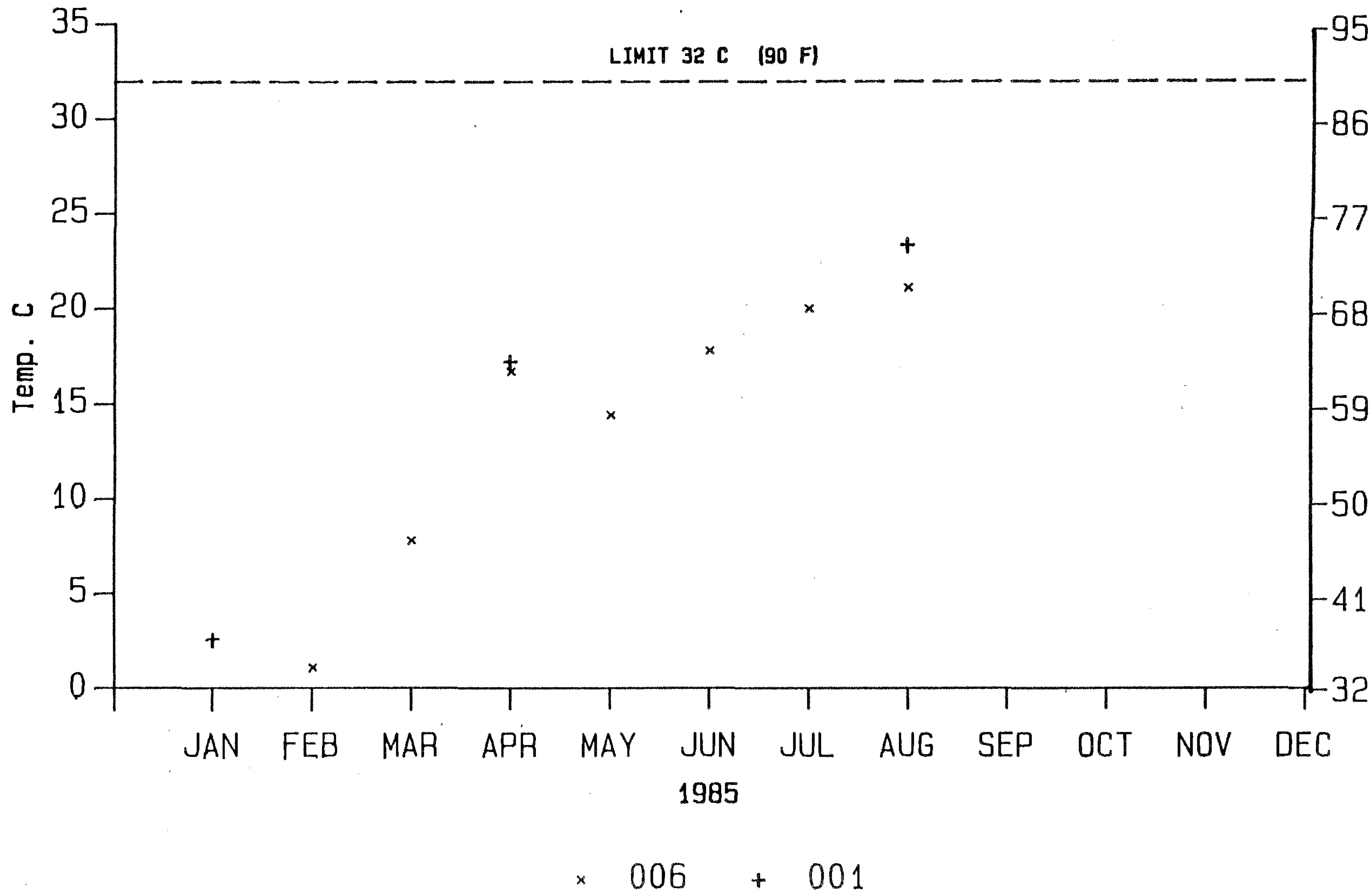


FIGURE C-5.3
BOD-5
OUTFALLS 001, 004, 005, 007, 008

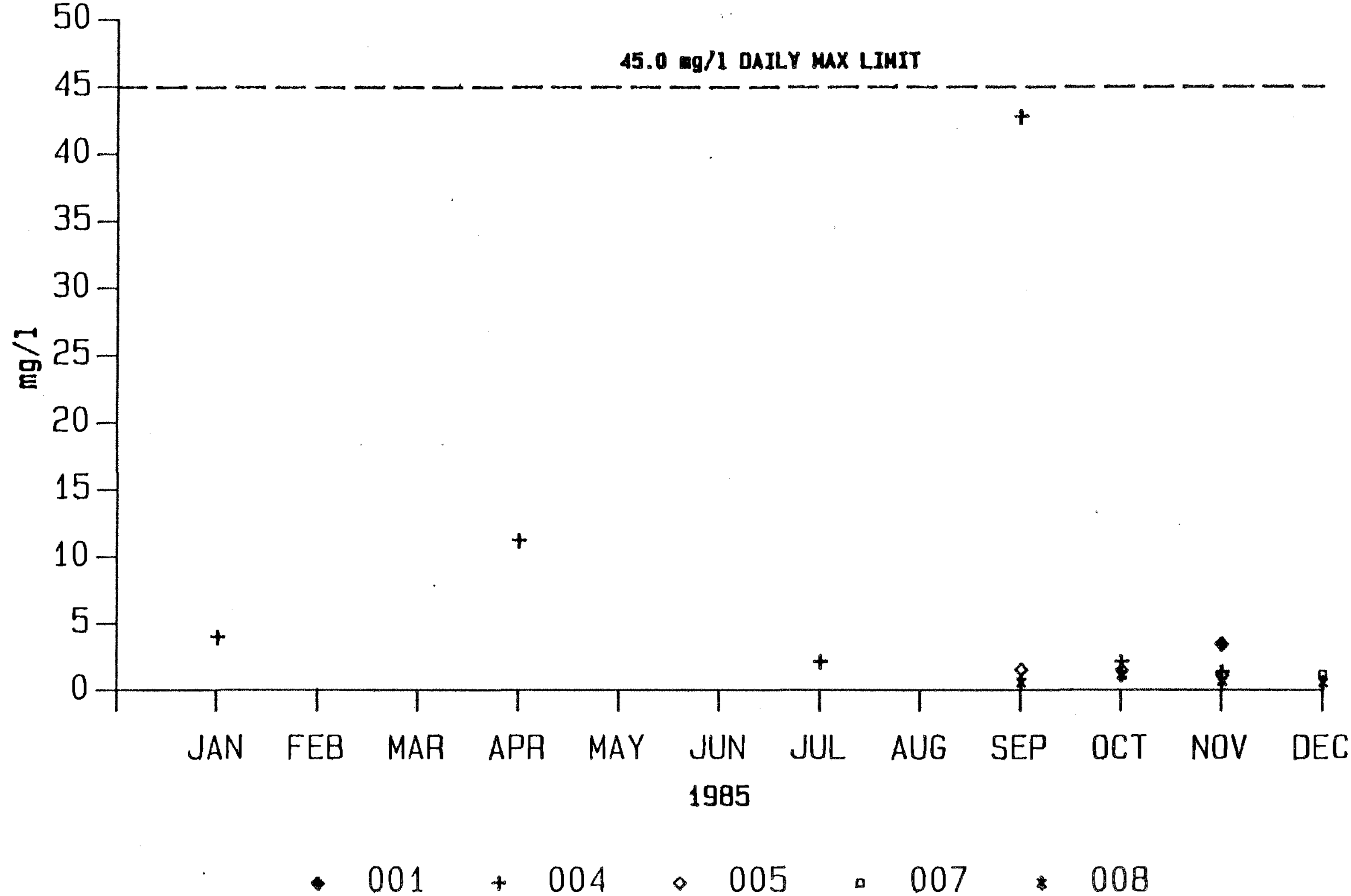


FIGURE C-5.4
SUSPENDED SOLIDS
OUTFALLS 001, 004, 007

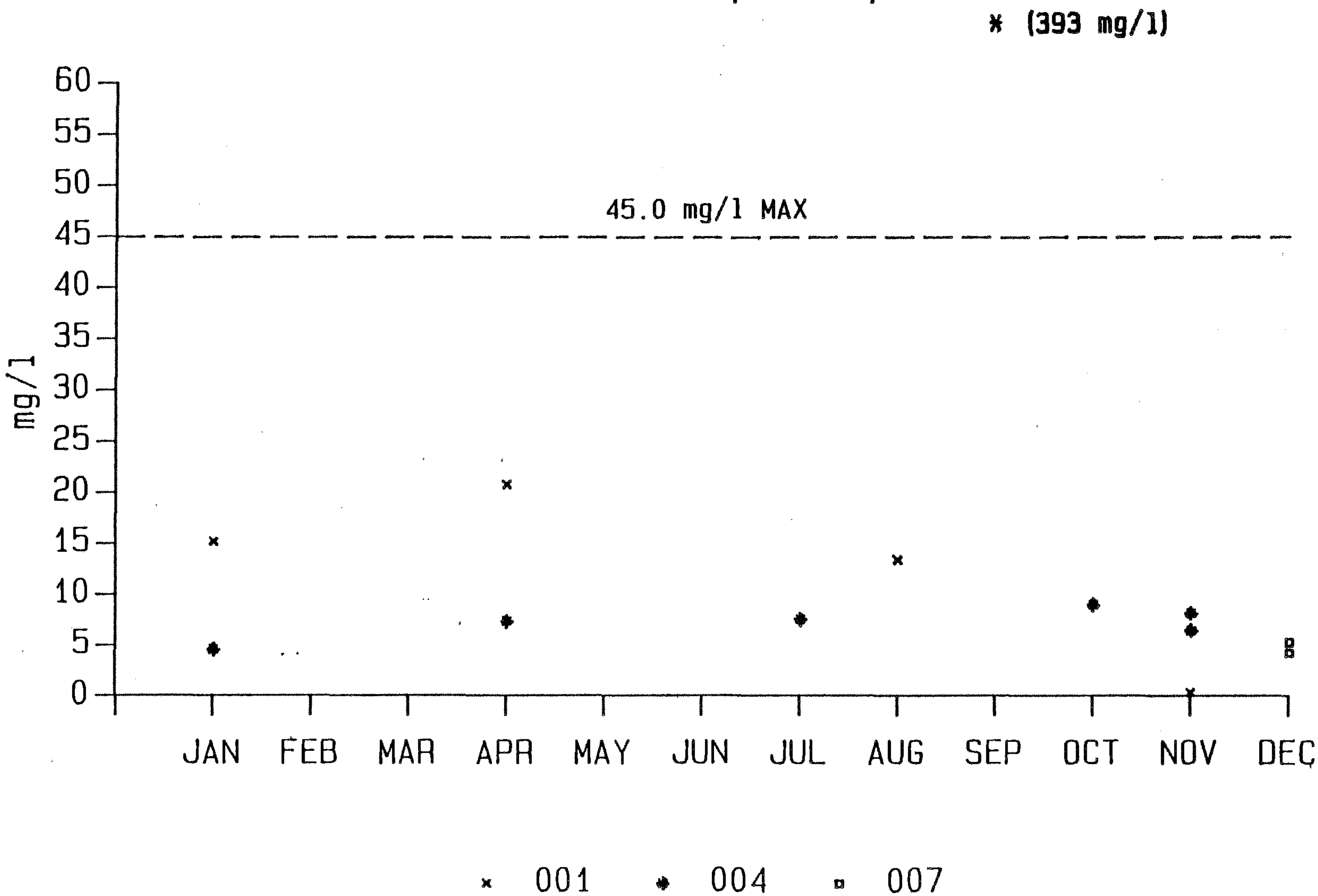


FIGURE C-5.5
SUSPENDED SOLIDS
OUTFALLS 002, 005

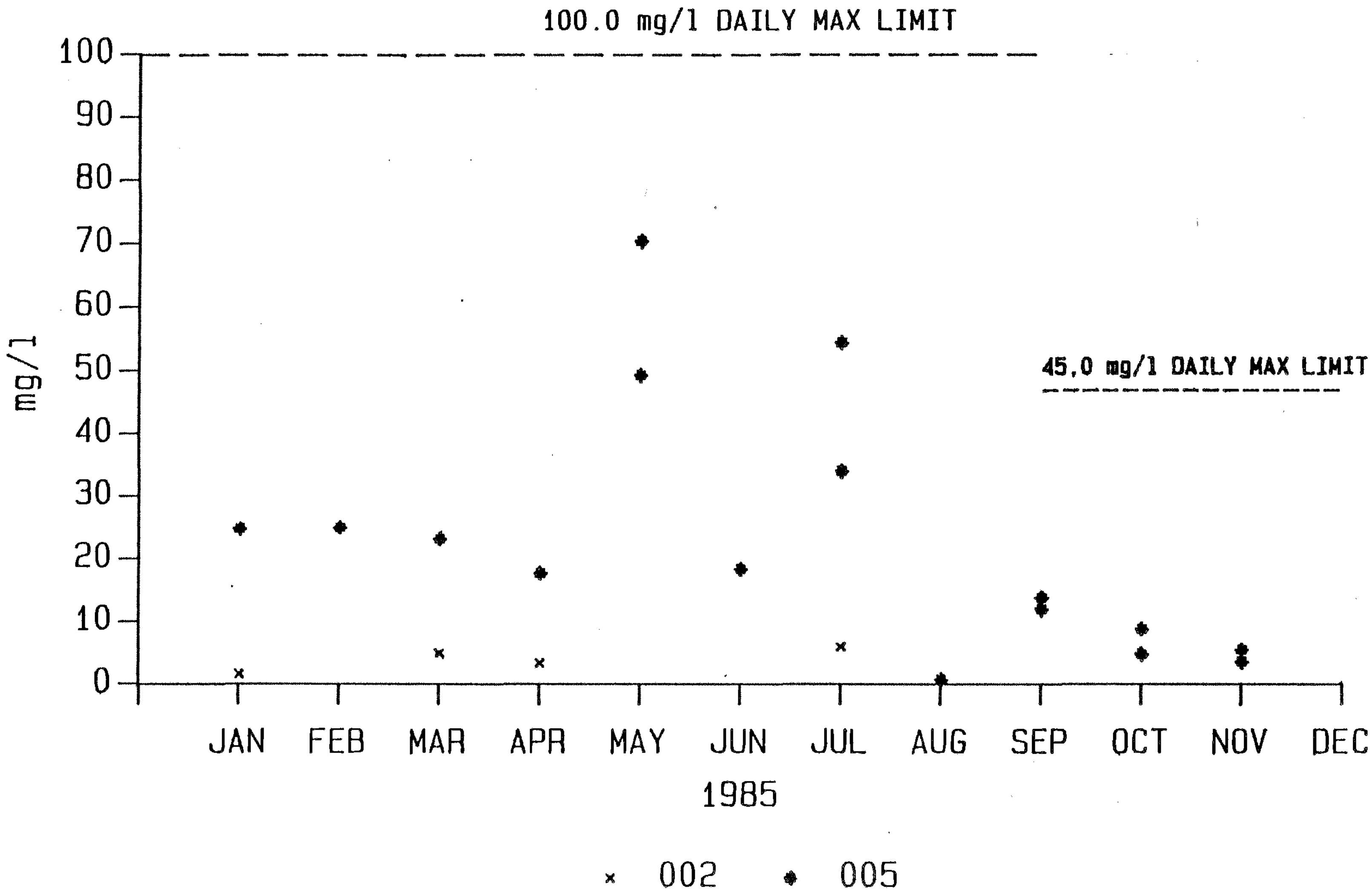


FIGURE C-5.6
SETTLEABLE SOLIDS
OUTFALLS 001, 004, 005, 007

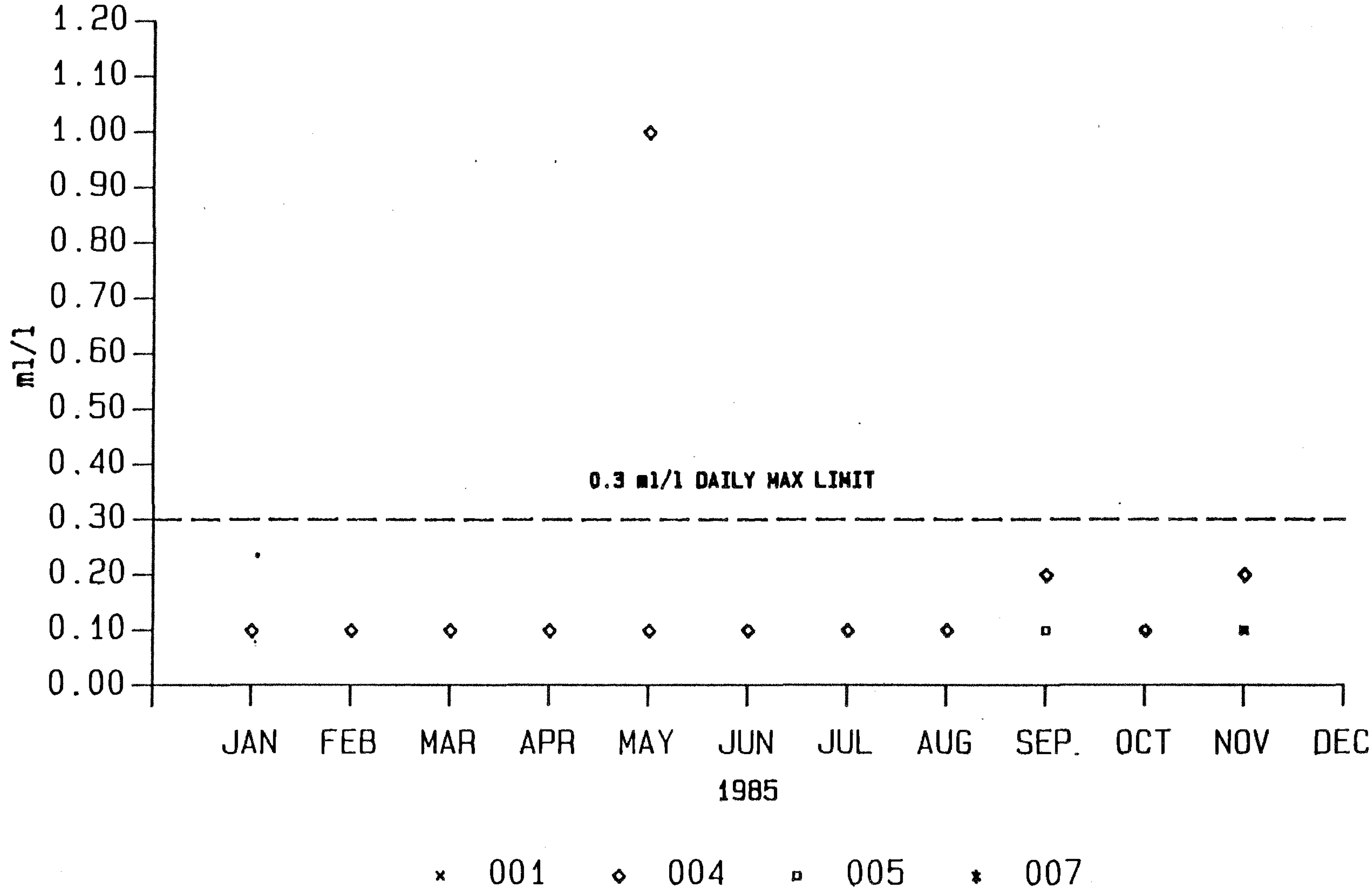


FIGURE C-5.7
NH3-N
OUTFALLS 001, 004, 005, 006, 007

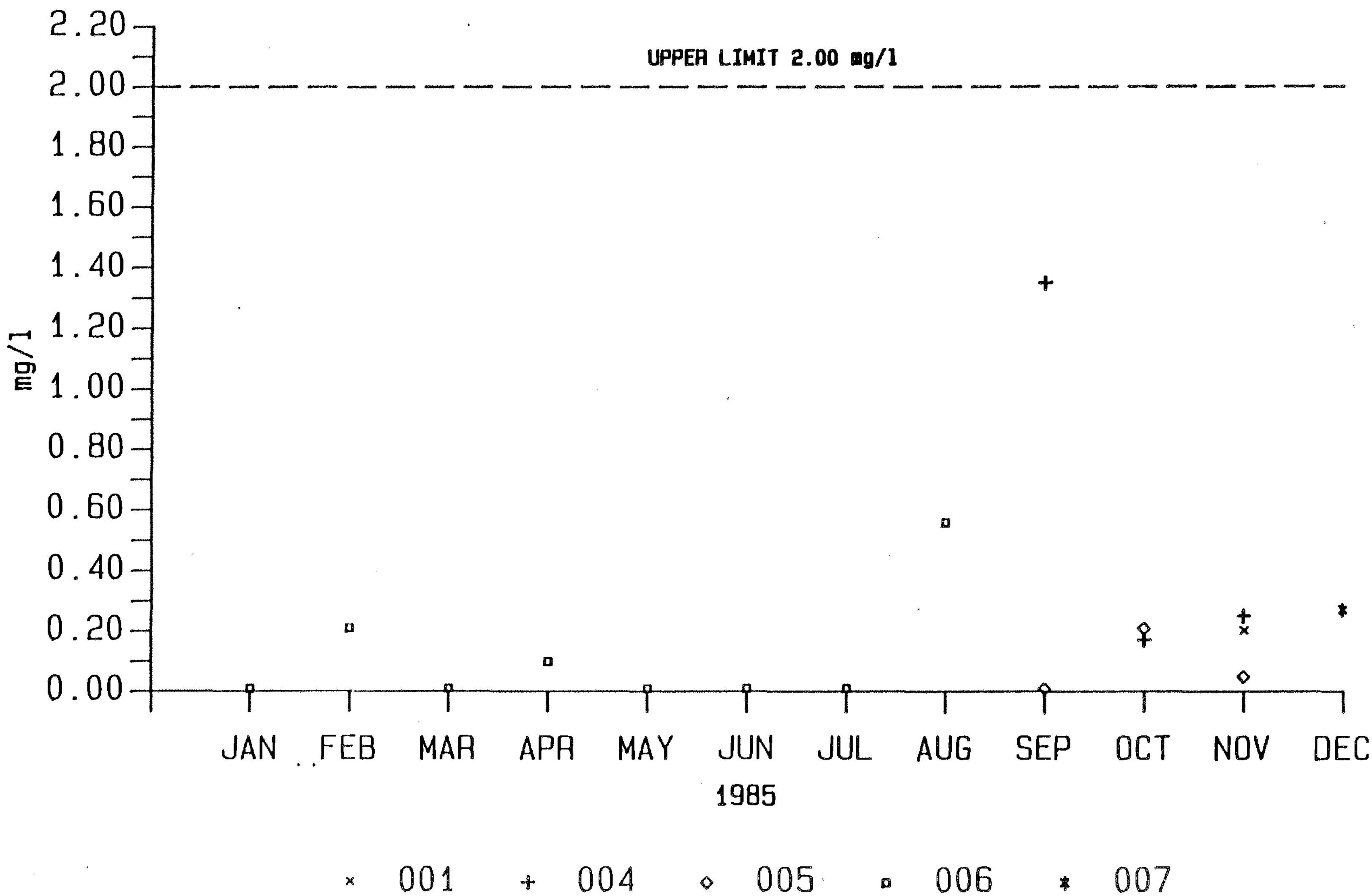


FIGURE C-5.8
UNIONIZED NH3
OUTFALLS 001, 006

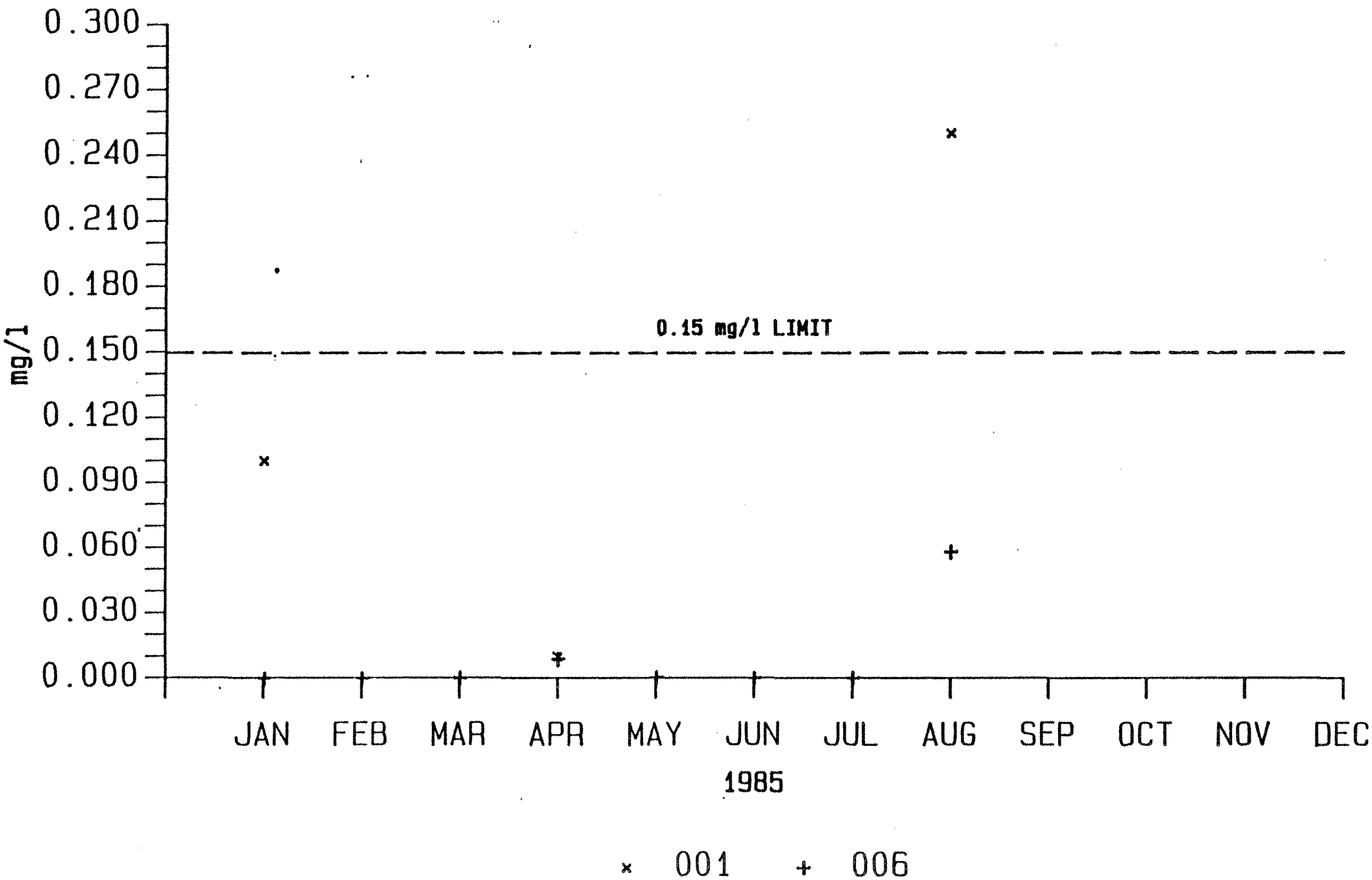


FIGURE C-5.9
METALS
OUTFALL 001

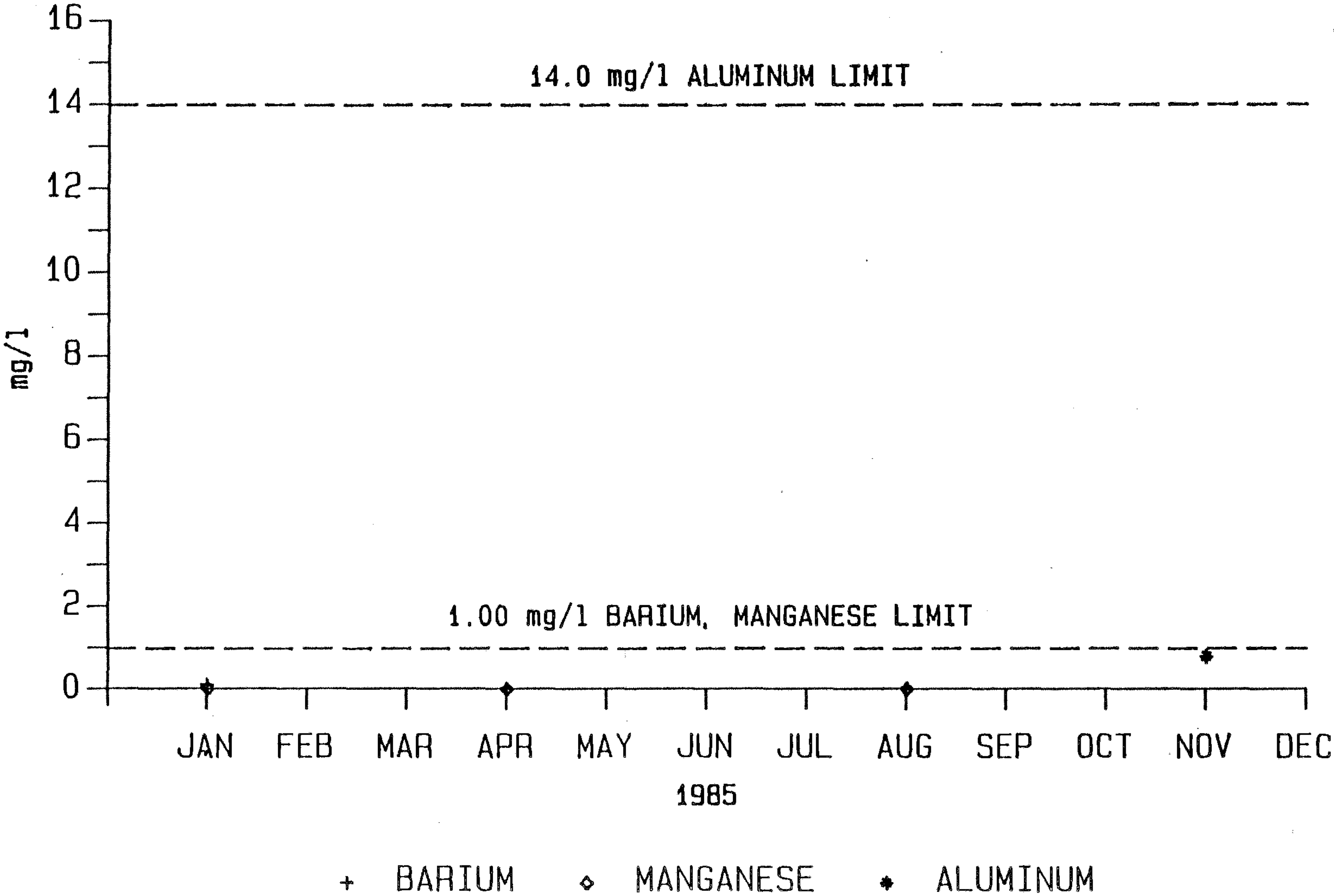


FIGURE C-5.10
METALS & CYANIDE
OUTFALL 001

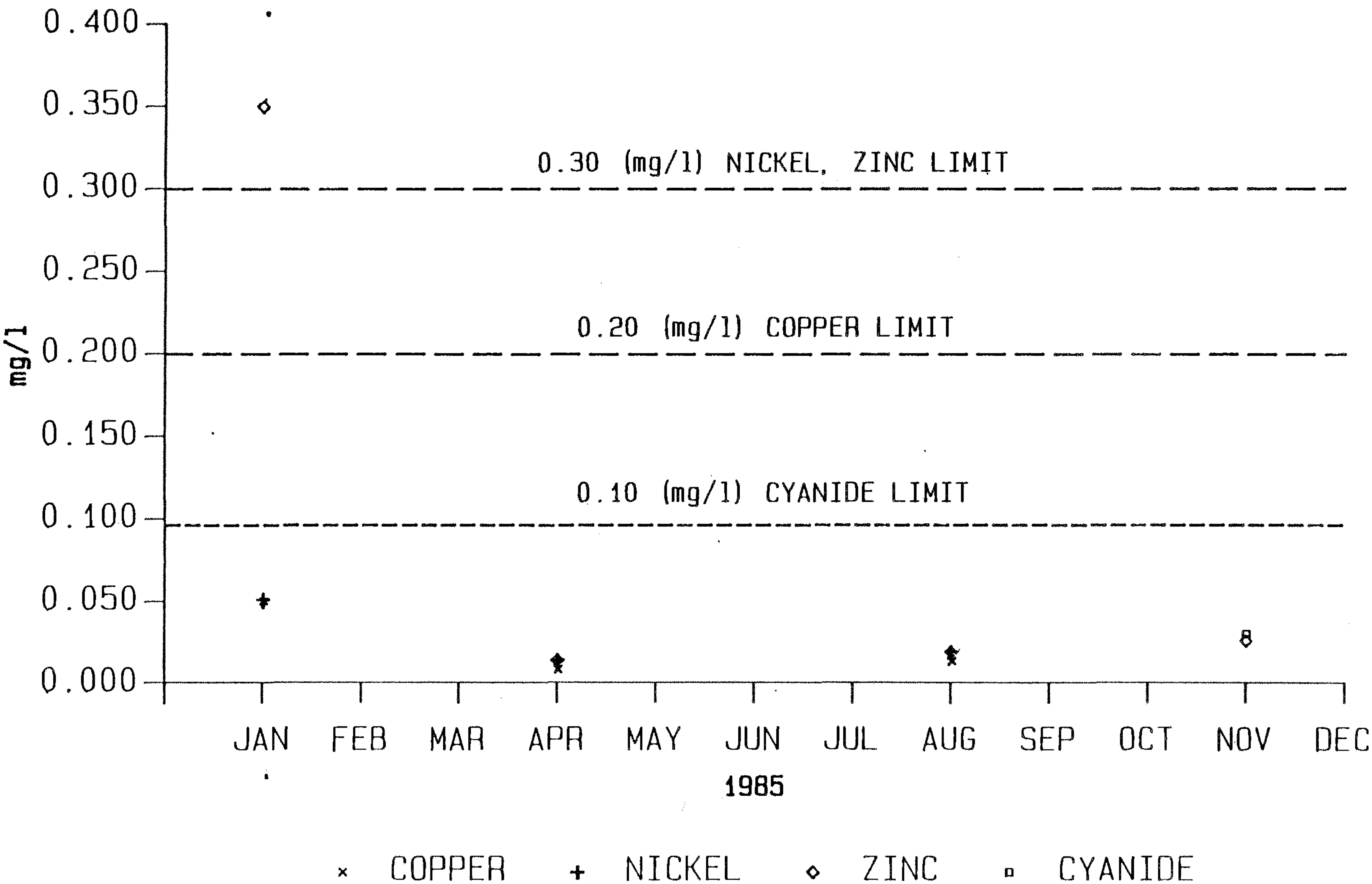


FIGURE C-5.11
METALS
OUTFALL 001

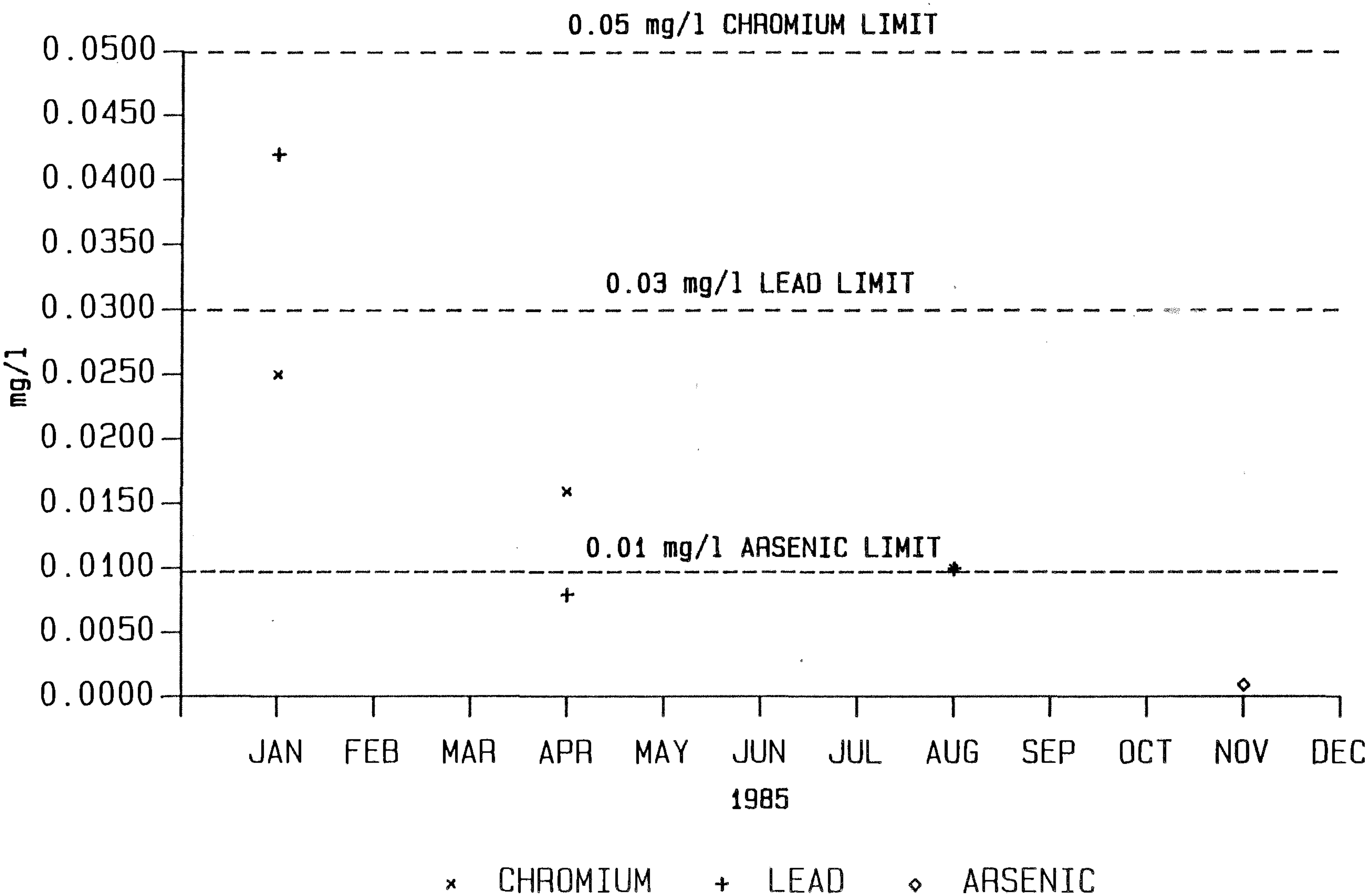


FIGURE C-5.12
DISCHARGE VOLUME
OUTFALLS 001, 003

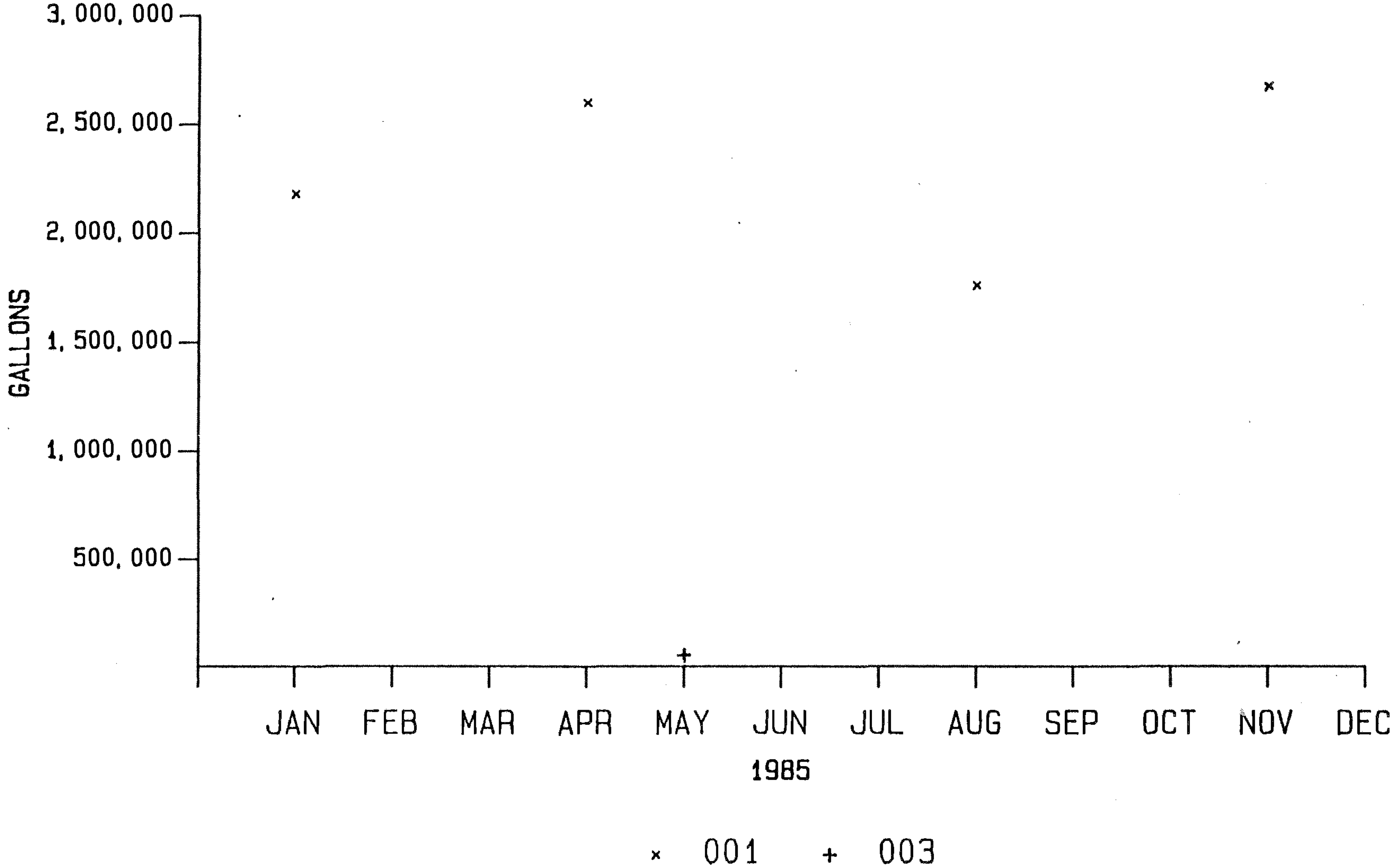


FIGURE C-5.13

Fe

OUTFALLS (001, 007, 008), (001, 004, 005, 008), 006

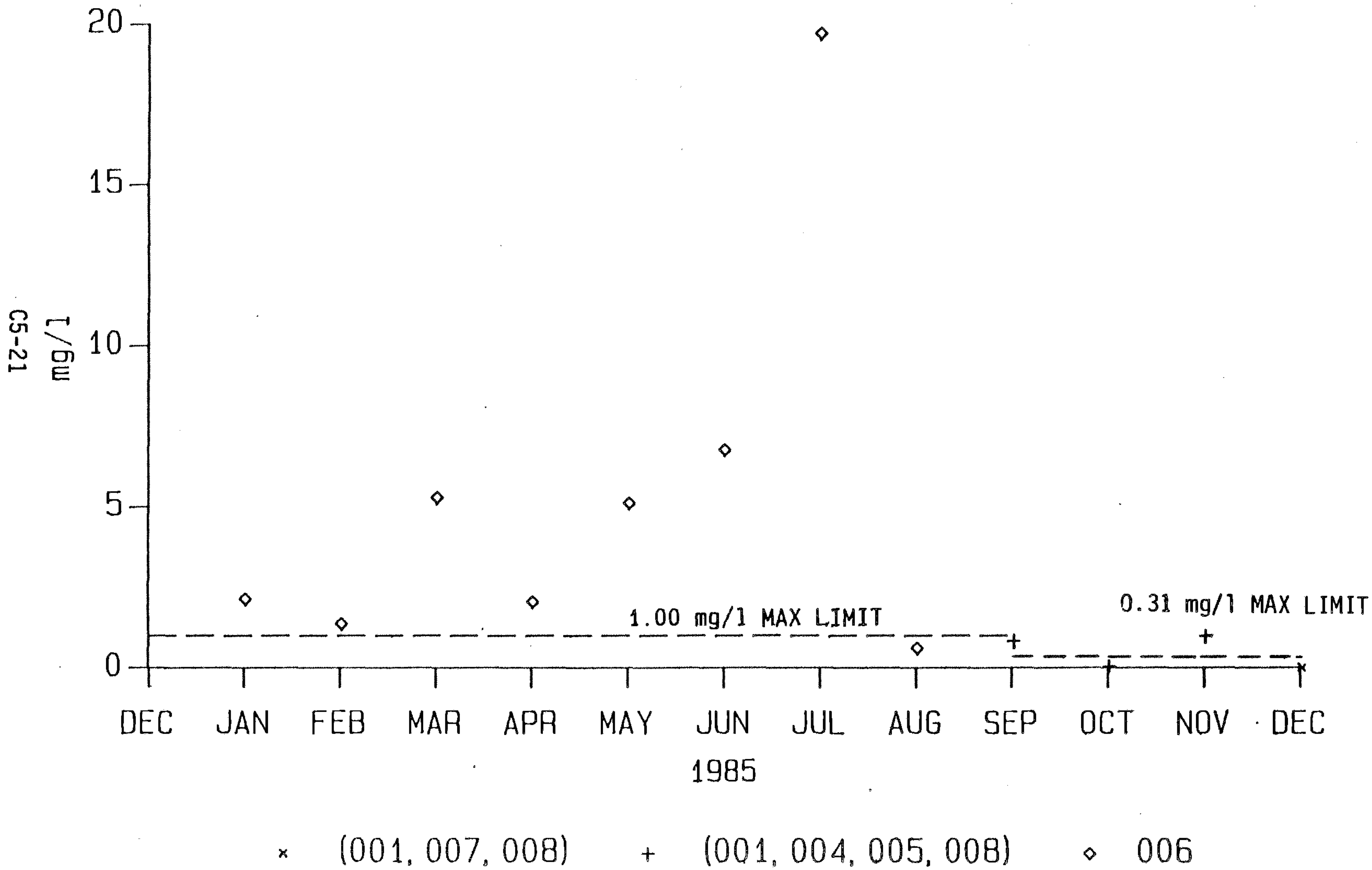


FIGURE C-5.14
pH FOR
OUTFALLS 004, 005, 006

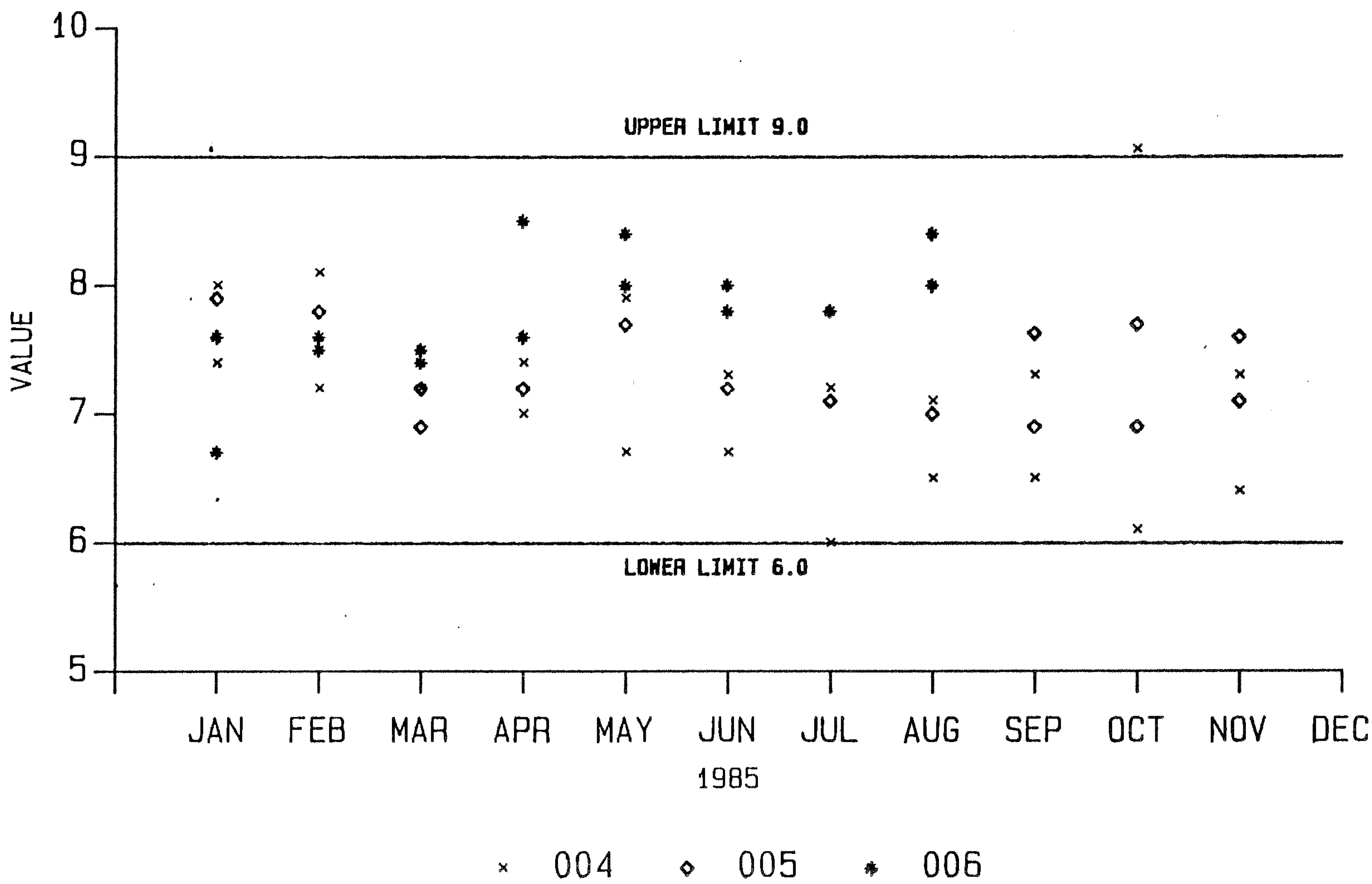


FIGURE C-5.15
pH FOR
OUTFALLS 001, 007, 008