VERMONT YANKEE NUCLEAR POWER CORPORATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL

SURVEILLANCE REPORT

January - December 1987

April 1988

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1.0 INTRODUCTION

The radiological environmental surveillance program at Vermont Yankee has been designed and carried out with specific objectives in mind. They are as follows:

- To provide an early indication of the appearance or accumulation of any radioactive material in the environment caused by the operation of the nuclear power station.

- To provide assurance to regulatory agencies and the public that the station's environmental impact is known and within anticipated limits.

- To verify the adequacy and proper functioning of station effluent controls and monitoring systems.

- To provide standby monitoring capability for rapid assessment of risk to the general public in the event of unanticipated or accidental releases of radioactive material.

During 1987, as in the past, Aquatec, Inc., collected all of the aquatic environmental samples, while the Chemistry staff collected the bulk of the terrestrial environmental samples (including ground water) and processed all environmental thermoluminescent dosimeters (TLDs) for direct radiation measurements. After the initial processing, all non-TLD samples were sent to the Yankee Atomic Environmental Laboratory in Westborough, Massachusetts for further processing and radionuclide analysis.

2.0 ENVIRONMENTAL SURVEILLANCE PROGRAM

In this section, Table 2.1 summarizes the surveillance program as required by the plant Radiological Effluent Technical Specifications (RETS). Table 2.2 lists the sampling stations and their specific locations with distances measured from the plant stack. Given in Table 2.3 are distances and directions relative to the center of the Turbine Building for all TLD locations. The sampling locations are shown on maps in Figures 2.1 through 2.3 and the TLD locations are shown on the maps in Figures 2.4 through 2.6.

Table 2.1

Vermont Yankee
Radiological Environmental Surveillance Program

Media	Sampling Frequency	Required Analyses
Air Particulate (AP)	- Semimonthly (2) - Quarterly Composite	Gross beta Gamma spectroscopy
Charcoal Filter (CF)	- Semimonthly (2)	Iodine-131
Milk (TM)	- Monthly (6)	Gamma spectroscopy, Iodine-131
Mixed Vegetation (TG)	- Quarterly (1)	Gamma spectroscopy
Silage (TC)	- Annually (3)	Gamma spectroscopy
Groundwater (WG)	- Quarterly	Gamma spectroscopy, H-3
River Water (WR)	- Monthly (1) (5) - Quarterly Composite	Gamma spectroscopy H-3
Sediment (SE)	- Semiannually	Gamma spectroscopy
Finfish (FH)	- Semiannually (1)	Gamma spectroscopy
Direct Radiation (DR)	- Quarterly	Integrated gamma dose(4)

(1) Collection frequency dependent upon availability of samples during winter.
(2) Weekly, when main plant stack effluent release rate of Iodine-131 is equal to or greater than 0.1 uCi/sec.
(3) Collected at harvest time in reasonable proximity to specified location; subject to availability.
(4) Outer ring TLDs - De-dose quarterly unless gaseous release LCO was exceeded in period.
(5) Composite sample collected over month at downst[illegible]ocation.
(6) Semimonthly when milk animals are identified as [illegible]ng on pasture.

Table 2.2

Vermont Yankee
Radiological Environmental Surveillance Locations

Station Code (Media - Sta. No.)	Station Description	Zone*	Distance From Plant Stack (km)	Direction From Plant Stack
AP/CF/TG-11	River Station No. 3.3	1	1.9	SSE
AP/CF/TG-12	N. Hinsdale, NH	1	3.6	NNW
AP/CF/TG-13	Hinsdale Substation	1	3.1	E
AP/CF/TG-14	Northfield, MA	1	11.3	SSE
AP/CF/TG-15	Tyler Hill Road	1	3.2	WNW
AP/CF/TG-21	Spofford Lake, NH	2	16.1	NNE
TM-11	Miller Farm	1	0.8	WNW
TM-13	Newton Farm	1	5.1	SSE
TM-14	Brown Farm	1	2.6	S
TM-15	Coombs Farm	1	4.5	NW
TM-16	Tall Oaks Farm	1	4.7	WNW
TM-21	Moore Farm	2	15.9	N
WG-11	VY Plant Well	1	--	On-Site
WG-12	Vernon Nursing Well	1	2.0	SSE
WG-21	Brattleboro C. C.	2	12.1	NNW
WR-11	River Station No. 3.3	1	1.9	Downriver
WR-21	Rt. 9 Bridge	2	12.8	Upriver
FH-11	Vernon Pond	1	--	On-Site
FH-21	Rt. 9 Bridge	2	12.8	Upriver
SE-11	Shoreline Downriver	1	0.8	On-Site
SE-12	N. Storm Drain Outfall	1	0.15	On-Site
TC-11	Miller Farm	1	0.8	WNW
TC-13	Newton Farm	1	5.1	SSE
TC-14	Brown Farm	1	2.6	S
TC-15	Coombs Farm	1	4.5	NW
TC-16	Tall Oaks Farm	1	4.7	WNW
TC-21	Moore Farm	2	15.9	N

* 1 = Indicator Station; 2 = Control Station.

Table 2.3

Vermont Yankee
Environmental Direction Radiation Monitoring Locations

Station Code (Media - Sta. No.)	Station Description	Zone*	Distance From Center of Turbine Building (km)	Direction From Center of Turbine Building
DR-1	River Station No. 3.3	I	1.6	SSE
DR-2	N. Hinsdale, NH	I	3.9	NNW
DR-3	Hinsdale Substation	I	3.0	E
DR-4	Northfield, MA	I	11.0	SSE
DR-5	Spofford Lake, NH	O	16.3	NNE
DR-6	Vernon School	I	0.46	WSW
DR-7	Site Boundary	SB	0.27	W
DR-8	Site Boundary	SB	0.25	SW
DR-9	Inner Ring	I	2.1	N
DR-10	Outer Ring	O	4.6	N
DR-11	Inner Ring	I	2.0	NNE
DR-12	Outer Ring	O	3.6	NNE
DR-13	Inner Ring	I	1.4	NE
DR-14	Outer Ring	O	4.3	NE
DR-15	Inner Ring	I	1.4	ENE
DR-16	Outer Ring	O	2.9	ENE
DR-17	Inner Ring	I	1.2	E
DR-18	Outer Ring	O	3.0	E
DR-19	Inner Ring	I	3.5	ESE
DR-20	Outer Ring	O	5.3	ESE
DR-21	Inner Ring	I	1.8	SE
DR-22	Outer Ring	O	3.2	SE
DR-23	Inner Ring	I	1.8	SSE
DR-24	Outer Ring	O	3.9	SSE
DR-25	Inner Ring	I	2.0	S
DR-26	Outer Ring	O	3.7	S
DR-27	Inner Ring	I	1.0	SSW
DR-28	Outer Ring	O	2.2	SSW
DR-29	Inner Ring	I	0.7	WSW
DR-30	Outer Ring	O	2.3	SW
DR-31	Inner Ring	I	0.8	W
DR-32	Outer Ring	O	5.0	WSW
DR-33	Inner Ring	I	0.9	WNW
DR-34	Outer Ring	O	4.9	W
DR-35	Inner Ring	I	1.4	WNW
DR-36	Outer Ring	O	4.7	WNW

Table 2.3
(Continued)

Vermont Yankee
Environmental Direction Radiation Monitoring Locations

Station Code (Media - Sta. No.)	Station Description	Zone*	Distance From Center of Turbine Building (km)	Direction From Center of Turbine Building
DR-37	Inner Ring	I	3.0	NW
DR-38	Outer Ring	O	7.7	NW
DR-39	Inner Ring	I	3.2	NNW
DR-40	Outer Ring	O	5.8	NNW
DR-41	Site Boundary	SB	0.38	SSW
DR-42	Site Boundary	SB	0.60	S
DR-43	Site Boundary	SB	0.42	SSE
DR-44	Site Boundary	SB	0.21	SE
DR-45	Site Boundary	SB	0.12	NE
DR-46	Site Boundary	SB	0.29	NNW
DR-47	Site Boundary	SB	0.51	NNW
DR-48	Site Boundary	SB	0.82	NW
DR-49	Site Boundary	SB	0.27	WNW
DR-50	Governor Hunt House	I	0.34	SSW
DR-51	Site Boundary	SB	0.27	W

I = Inner Ring; O = Outer Ring; SB = Site Boundary.

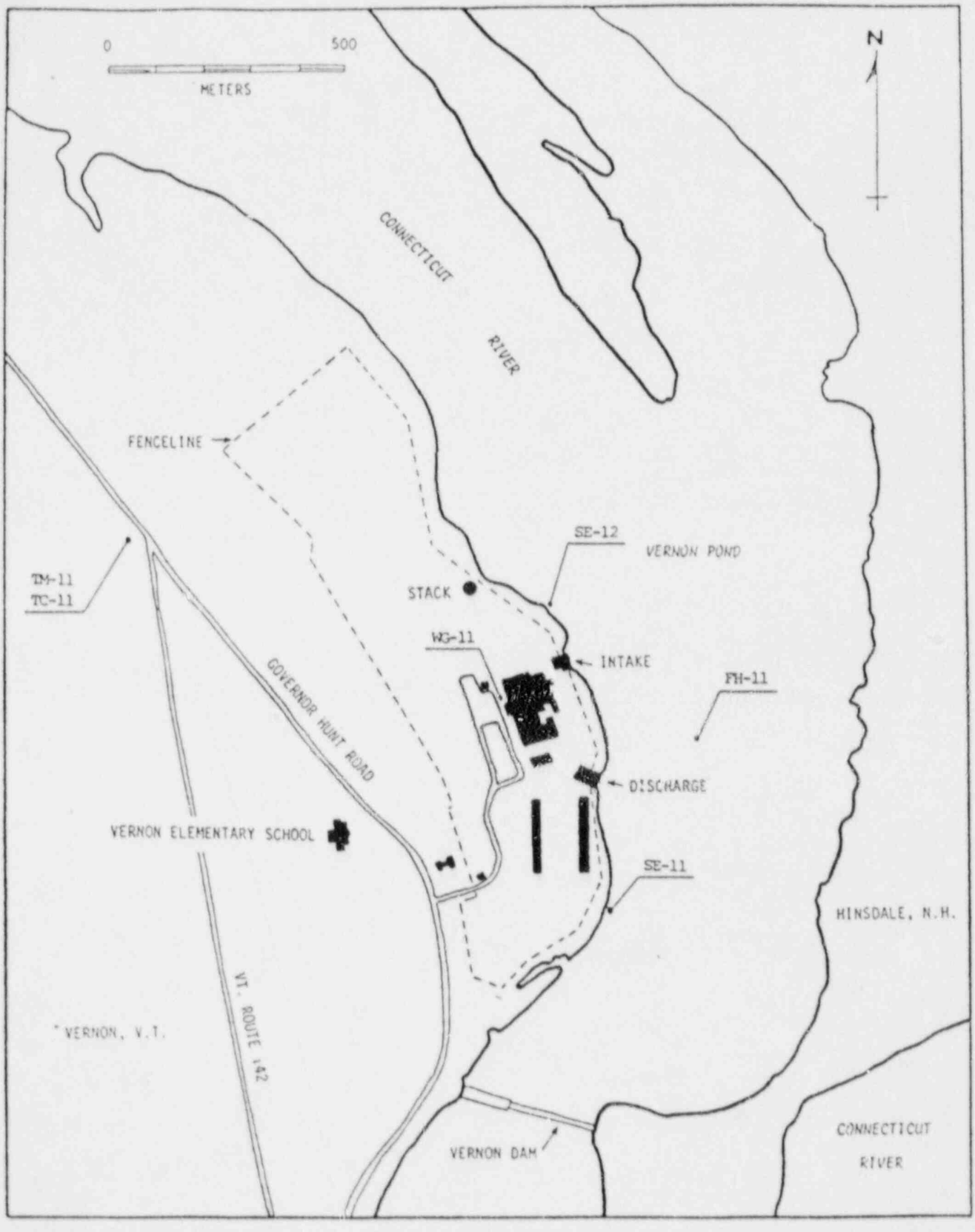

Figure 2.1 Environmental Radiological Monitoring Locations in Close Proximity to Plant

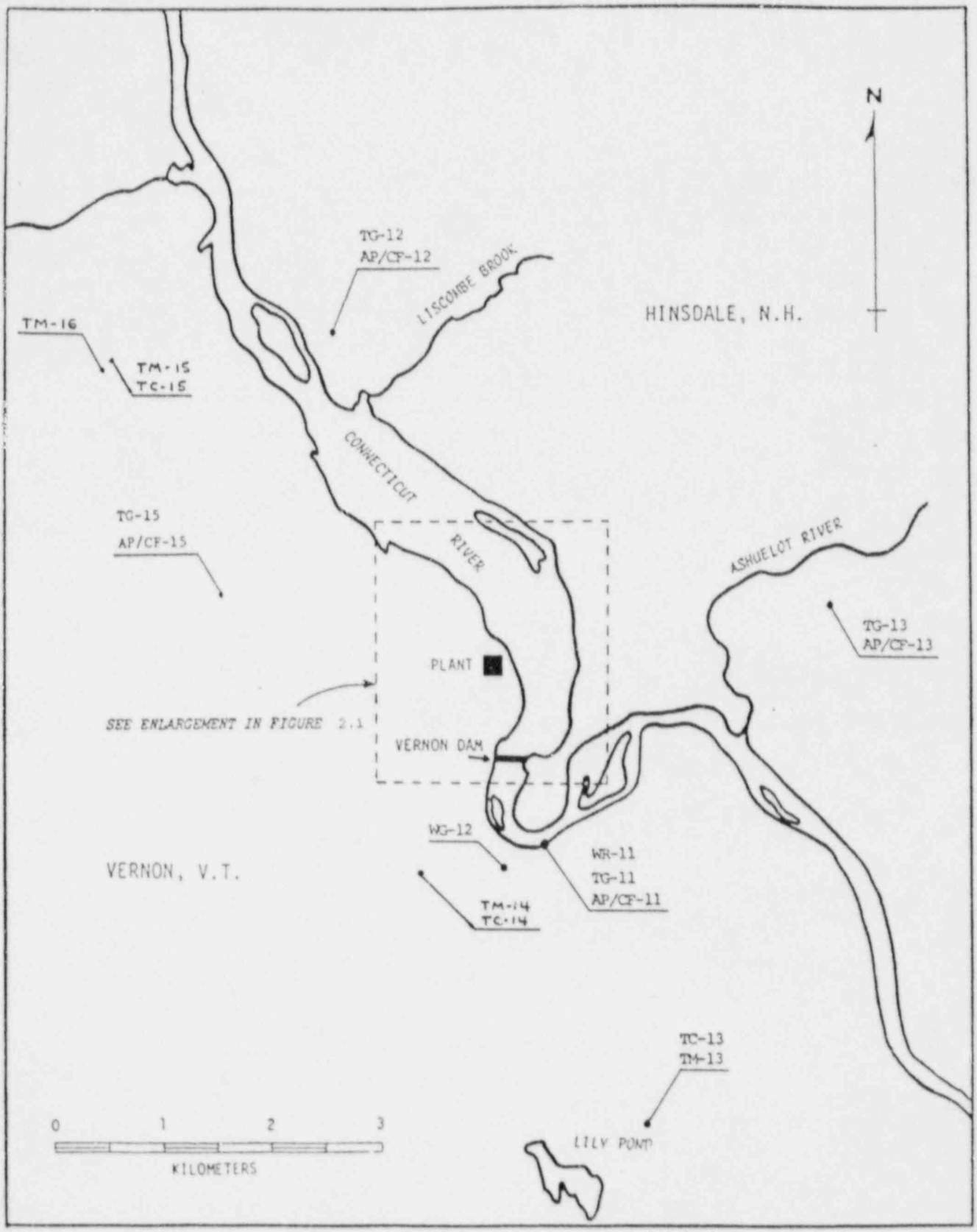

Figure 2.2 Environmental Radiological Monitoring Locations Within 5 Kilometers of Plant

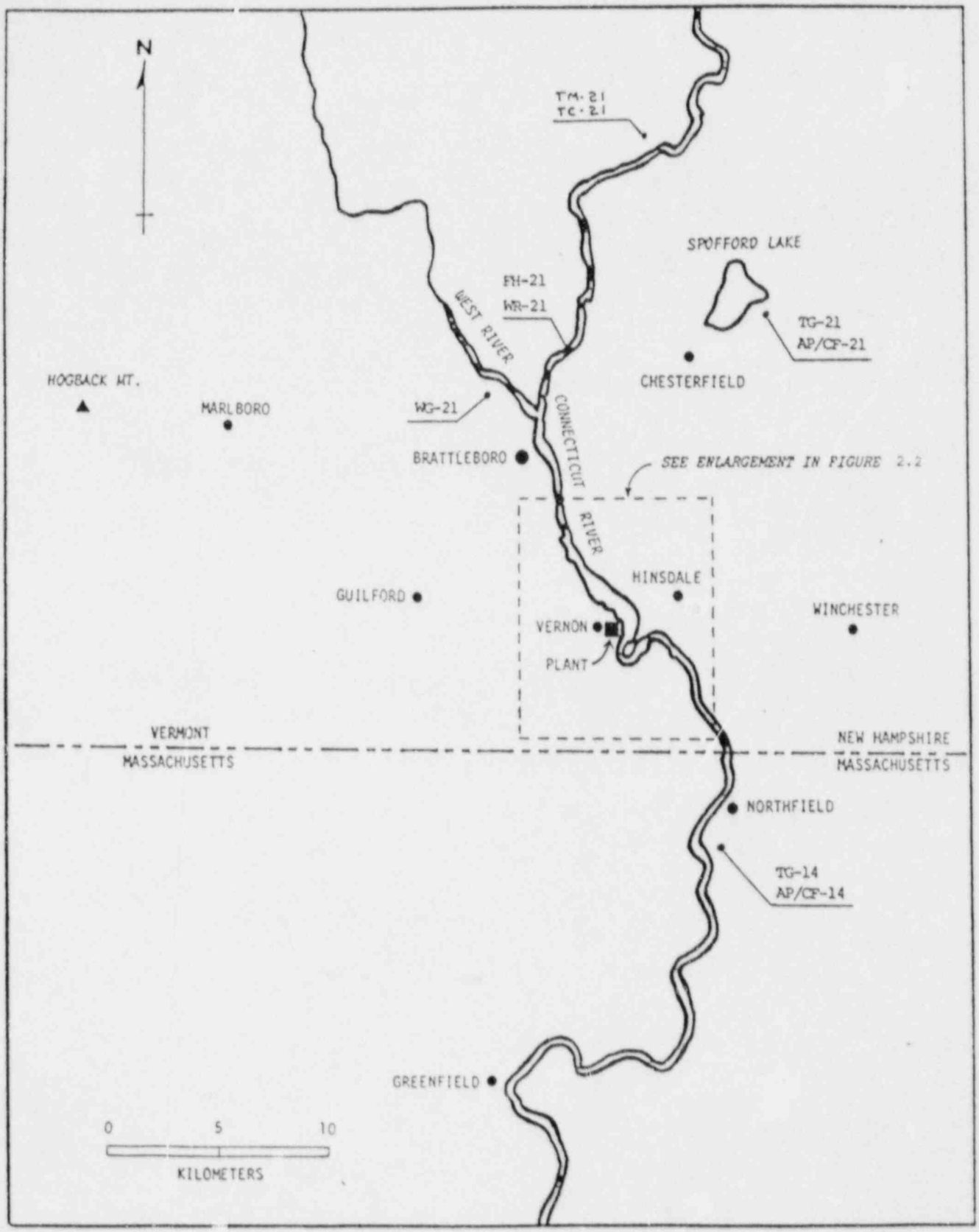

Figure 2.3 Environmental Radiological Monitoring Locations
Greater Than 5 Kilometers from Plant

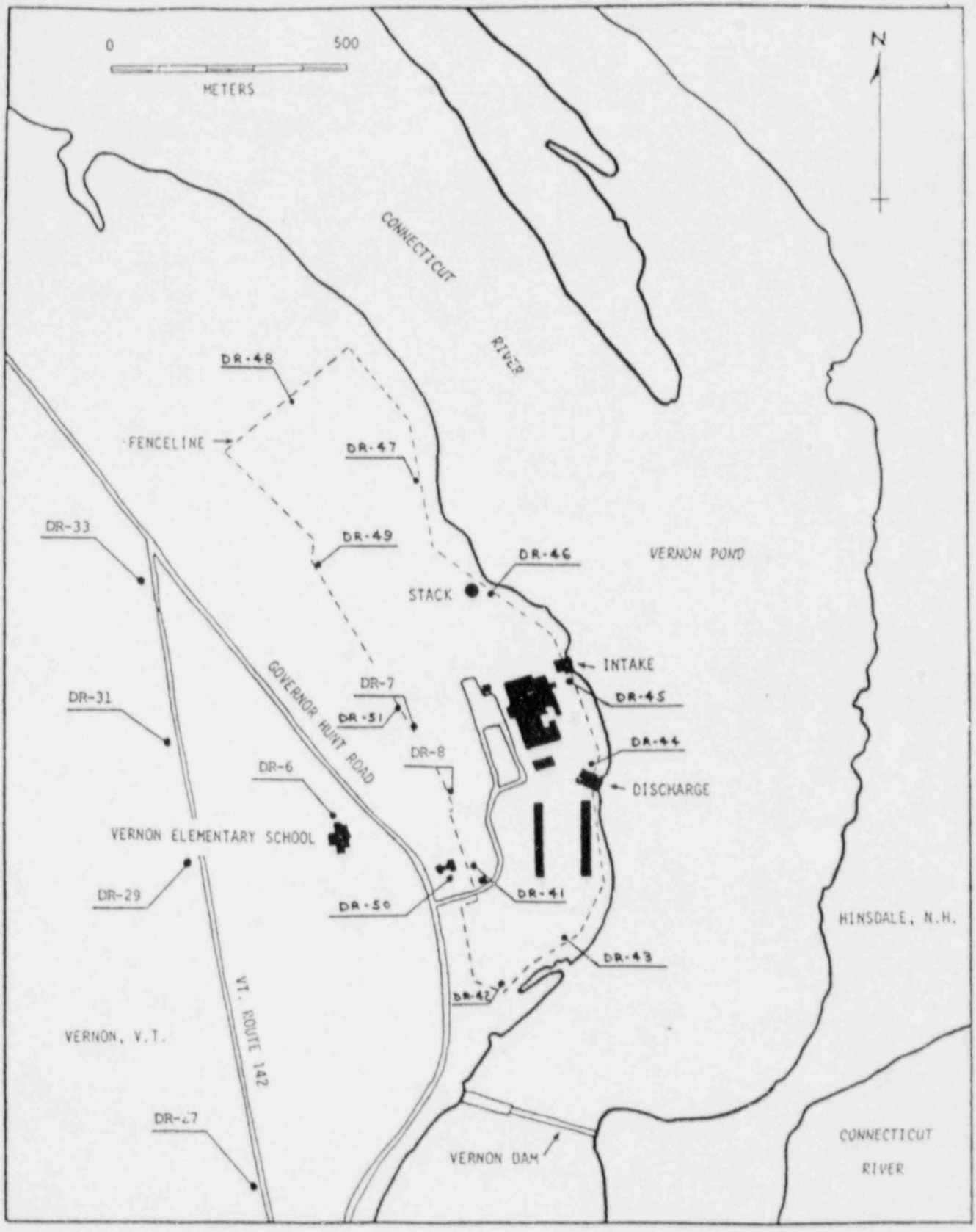

Figure 2.4 TLD Locations in Close Proximity to Plant

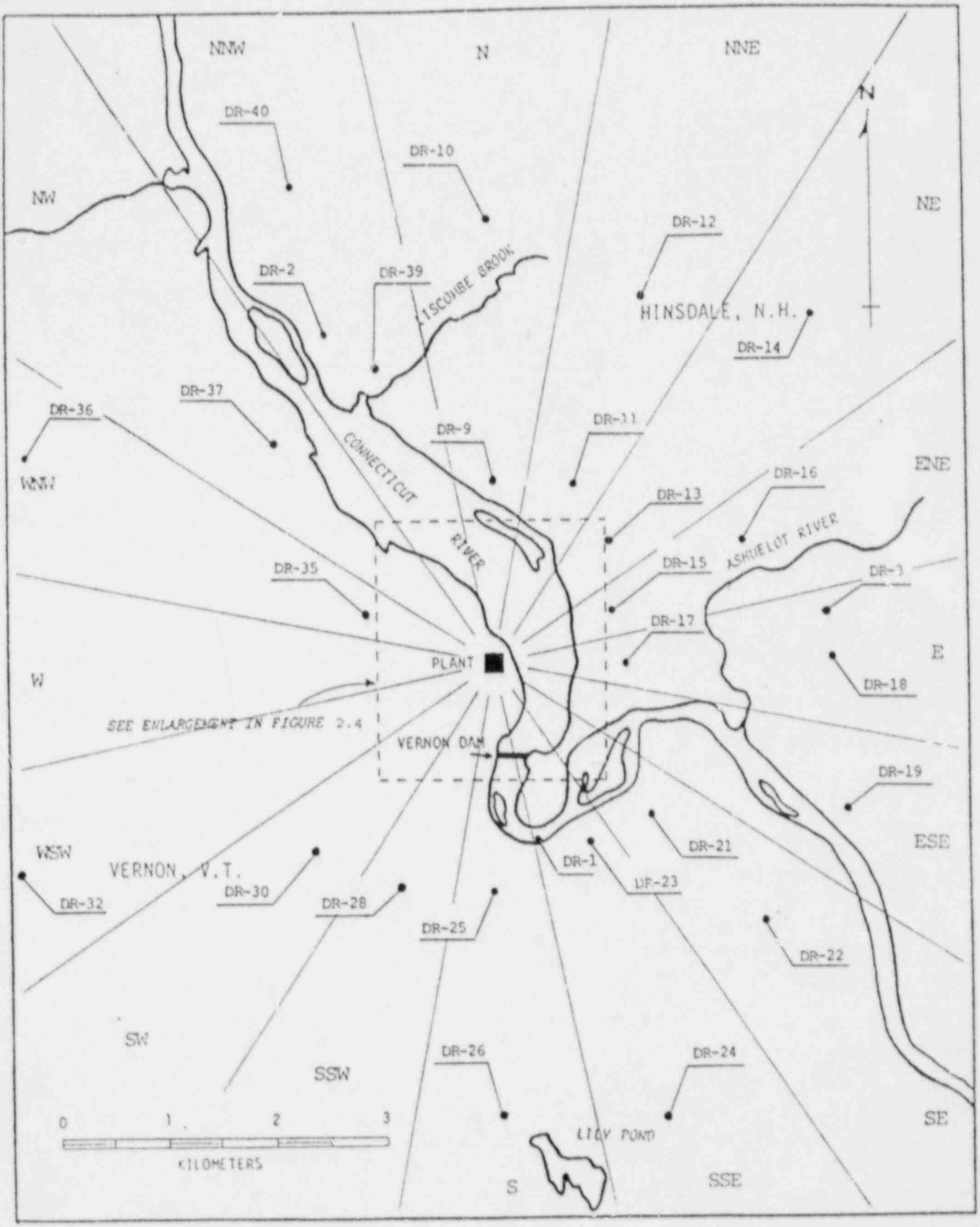

Figure 2.5 TLD Locations Within 5 Kilometers of Plant

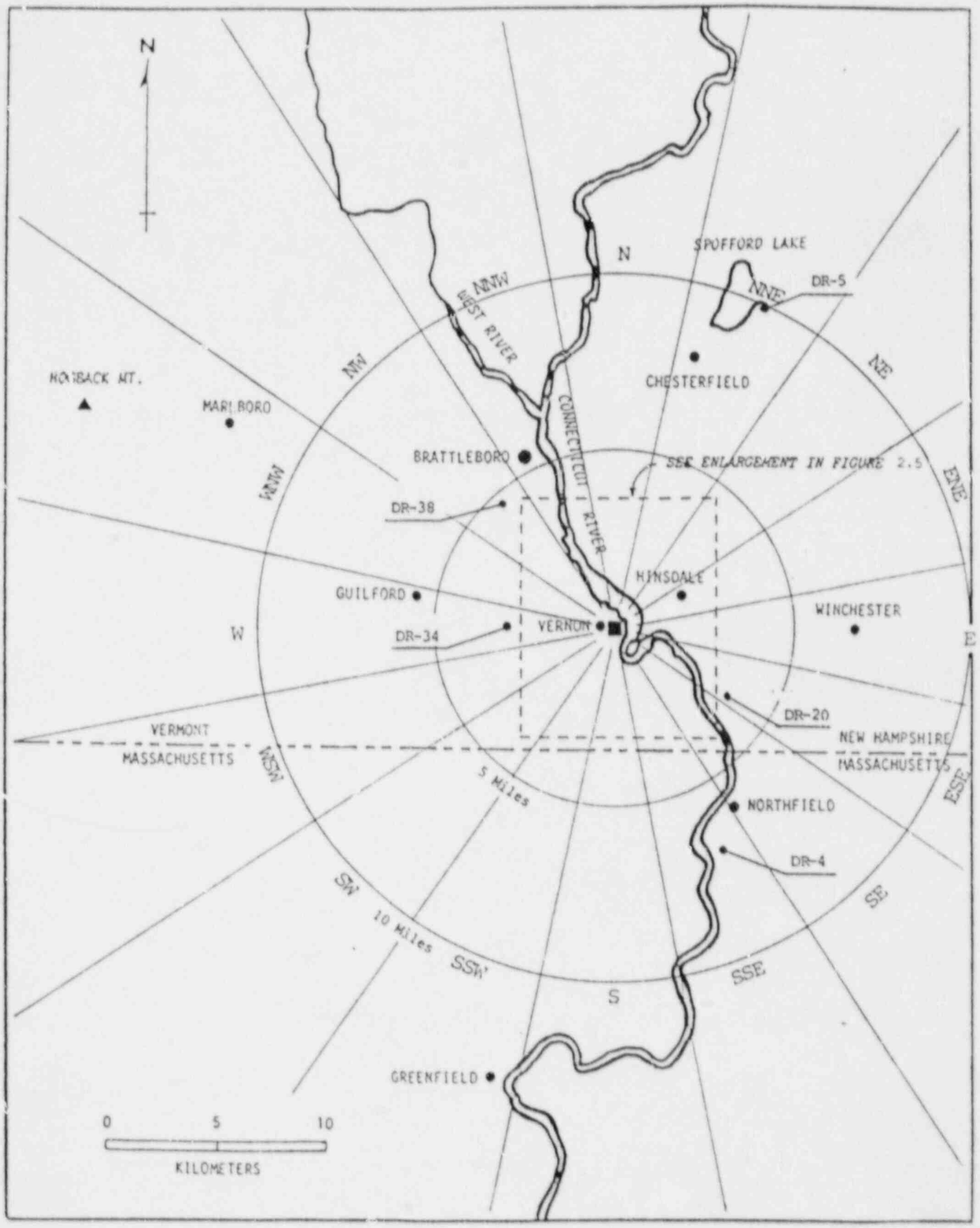

Figure 2.6 TLD Locations Greater Than 5 Kilometers from Plant

3.0 SUMMARY OF 1987 ENVIRONMENTAL DATA

The following pages summarize the analytical results of all the environmental samples which were collected during 1987. Each environmental media category is presented as a separate subsection. A discussion of the sampling program and results is followed by a table which summarizes the year's data for each category. The tables, for all media but Direct Radiation, were generated by the computer program, ERMAP. At the top of each table, ERMAP lists the units of measurement for each medium. The left hand column contains the radionuclide which is being reported, total number of analyses of that radionuclide, and the number of measurements which exceeds ten times the yearly average of control measurements. The latter are classified as "non-routine" measurements. The next column lists the Lower Limit of Detection (LLD) for those radionuclides which have detection capability requirements as specified in the RETS.

Those sampling stations which are adjacent to the plant and which could conceivably be affected by the operation of Vermont Yankee are called "indicator" or "Zone 1" stations. Distant stations, which are beyond plant influence are called "Control" or "Zone 2" stations. Direct radiation (TLD) monitoring locations are subdivided into site boundary, inner ring, and outer ring (emergency response) stations.

ERMAP calculates a set of statistical parameters for each radionuclide. This set of statistical parameters includes separate analyses for (1) the indicator stations, (2) the control stations, and (3) the station having the highest annual mean concentration. For each of these three groups of data, ERMAP calculates:

- The mean value of all concentrations.
- The standard error of the mean.
- The lowest and highest concentration.

3.0 SUMMARY OF 1987 ENVIRONMENTAL DATA

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- The mean value of all concentrations.
- The standard error of the mean.
- The lowest and highest concentration.

- The number of positive measurements (a concentration which is greater than the a posteriori LLD for that analysis) divided by the total number of measurements.

Each single radioactivity measurement datum in this report is based on a single measurement and is reported as a concentration plus or minus a one standard deviation uncertainty. The quoted uncertainty term represents only the random uncertainty associated with the radioactive decay process (counting statistics), and not the propagation of all possible uncertainties in the analytical procedure.

Pursuant to Technical Specification Table 4.9.3 (Footnote f), any concentration below the LLD for its analysis is reported as "not detected." These values are set to zero for averaging purposes. Where a range of values is reported in the tables of this section, values less than the a posteriori LLD for the analysis are reported as zero.

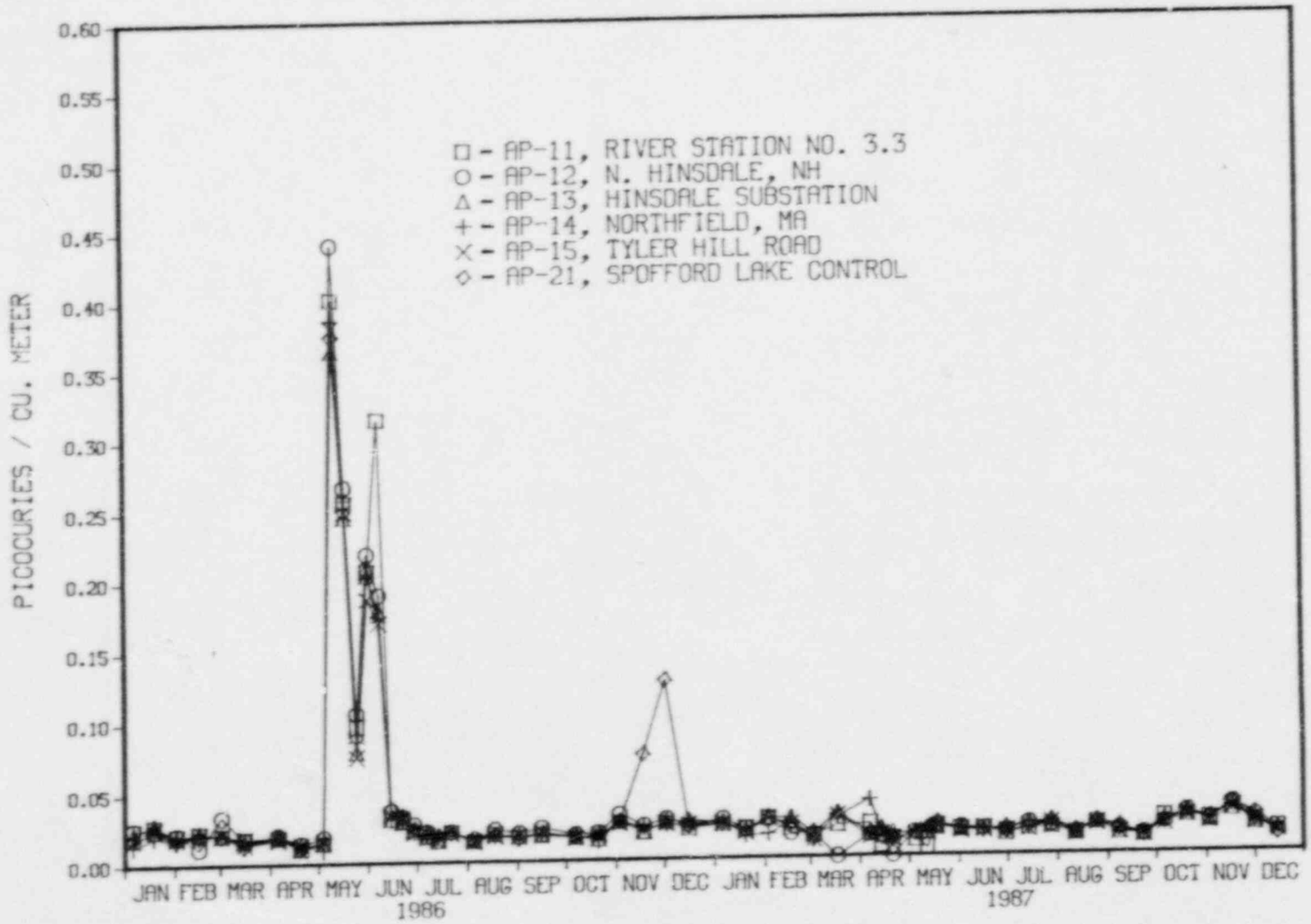
A) Air Particulate

Air monitoring stations were established at a total of six locations (five are required by Technical Specifications). Five of these locations are indicators, while the remaining one is a control station. Airborne particulates are collected by passing the air through a glass-fiber filter. These filters are collected semimonthly and held for at least 100 hours before being analyzed for gross-beta activity (indicated as GR-B in tables) to allow for the decay of radon daughter products. Quarterly composite air filters from each location are analyzed for gamma emitting radionuclides.

Gross-beta counts (Figure 3.1) showed random fluctuation throughout 1987 at indicator stations and controls, thereby indicating that any plant contribution was negligible.

The increase in gross-beta measurements during May and June of 1986 can be attributed to fallout from the Chernobyl accident and is discussed in Reference 1. A pump malfunction and a loss of power may have caused the high concentrations seen in Figure 3.1 at Station AP-11 in June 1986 and at Station AP-21 in November 1986. This is discussed more fully in Reference 1. Naturally-occurring K-40 and Be-7 were also detected in many samples.

FIGURE 3.1
GROSS BETA MEASUREMENTS OF AIR PARTICULATE FILTERS
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: AIR PARTICULATE

UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	STATION WITH HIGHEST MEAN MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
GR-B (162)	.01	(2.0± .1)E -2	13	(2.1 ± .1)E -2	(2.0 ± .1)E -2
(0)		(.0 - 4.0)E -2		(1.3 - 3.1)E -2	(1.1 - 3.5)E -2
		(133/135)		*(27/ 27)*	*(27/ 27)*
BE-7 (24)		(5.4± .3)E -2	14	(5.8 ± .7)E -2	(5.6 ± .8)E -2
(0)		(3.2 - 7.8)E -2		(5.0 - 7.8)E -2	(3.8 - 7.3)E -2
		(20/ 20)		*(4/ 4)*	*(4/ 4)*
K-40 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
MN-54 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
CO-58 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
FE-59 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
CO-60 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
ZN-65 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
ZR-95 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: AIR PARTICULATE

UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
AG-110M(24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
RU-103 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
RU-106 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CS-134 (24) (0)	.05	(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CS-137 (24) (0)	.06	(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
BA-140 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CE-141 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CE-144 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
TH-232 (24) (0)		(.0± .0)E 0 *(0/ 20)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

B) Charcoal Filters

Charcoal filter cartridges are situated in series with the air particulate glass-fiber filters. Monitoring stations were established at a total of six locations (five are required by Technical Specifications). Five of these are indicators and one is a control. Charcoal filters from the air sampling stations were collected and analyzed semimonthly for I-131 activity.

During 1987, no I-131 was detected on charcoal filters.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: CHARCOAL FILTER UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS ********** MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN ********** STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS ********** MEAN RANGE NO. DETECTED**
I-131 (162) (0)	.0/	(.0± .0)E 0 *(0/135)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 27)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. A POSTERIORI LLD) IS INDICATED WITH *( )*.

C) Milk

Milk samples were collected and analyzed monthly for low level I-131 and gamma-emitting radionuclides. Monthly samples were composited quarterly and analyzed for Sr-89 and Sr-90 (this is not a Technical Specification requirement). Semi-monthly sampling was done at Stations TM-14, TM-16, and TM-21 when the cows were on pasture.

Detectable concentrations of Cs-137 and Sr-90 were measured in milk samples submitted from the indicator and control locations. As shown in Figures 3.2 and 3.3, concentrations were similar to those detected in previous years. The detected levels are consistent with those measured in cow milk at other New England locations. Such levels have been well documented and are attributed to fallout from nuclear weapons tests, although Cs-137 levels after May 1986 were elevated somewhat due to Chernobyl-related fallout. Differences between dairy farms can be attributed to differences in feeding practices (i.e., what the cow eats).

Cesium-134 was detected in the winter and spring samples (five samples total) at Station TM-14. Since the cows are fed only stored feed during this time, and since Cs-134 was detected in milk and other environmental media throughout the northeastern U.S. following the 1986 Chernobyl accident, it can be said that the Cs-134 in milk was due to contaminated feed from the Chernobyl fallout.

In addition to these radionuclides, naturally occurring K-40 was detected in all samples.

FIGURE 3.2
CESIUM-137 IN MILK
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

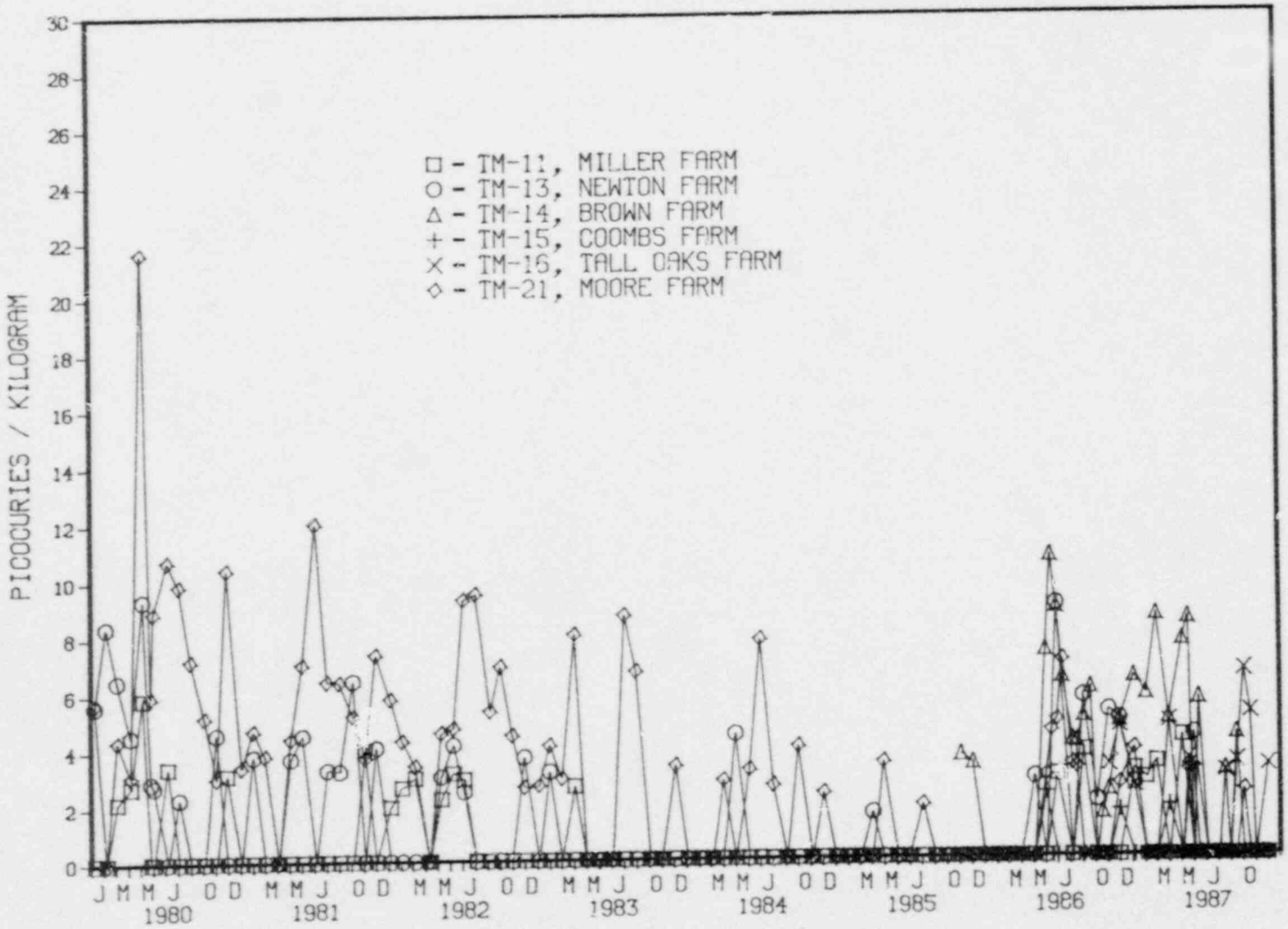
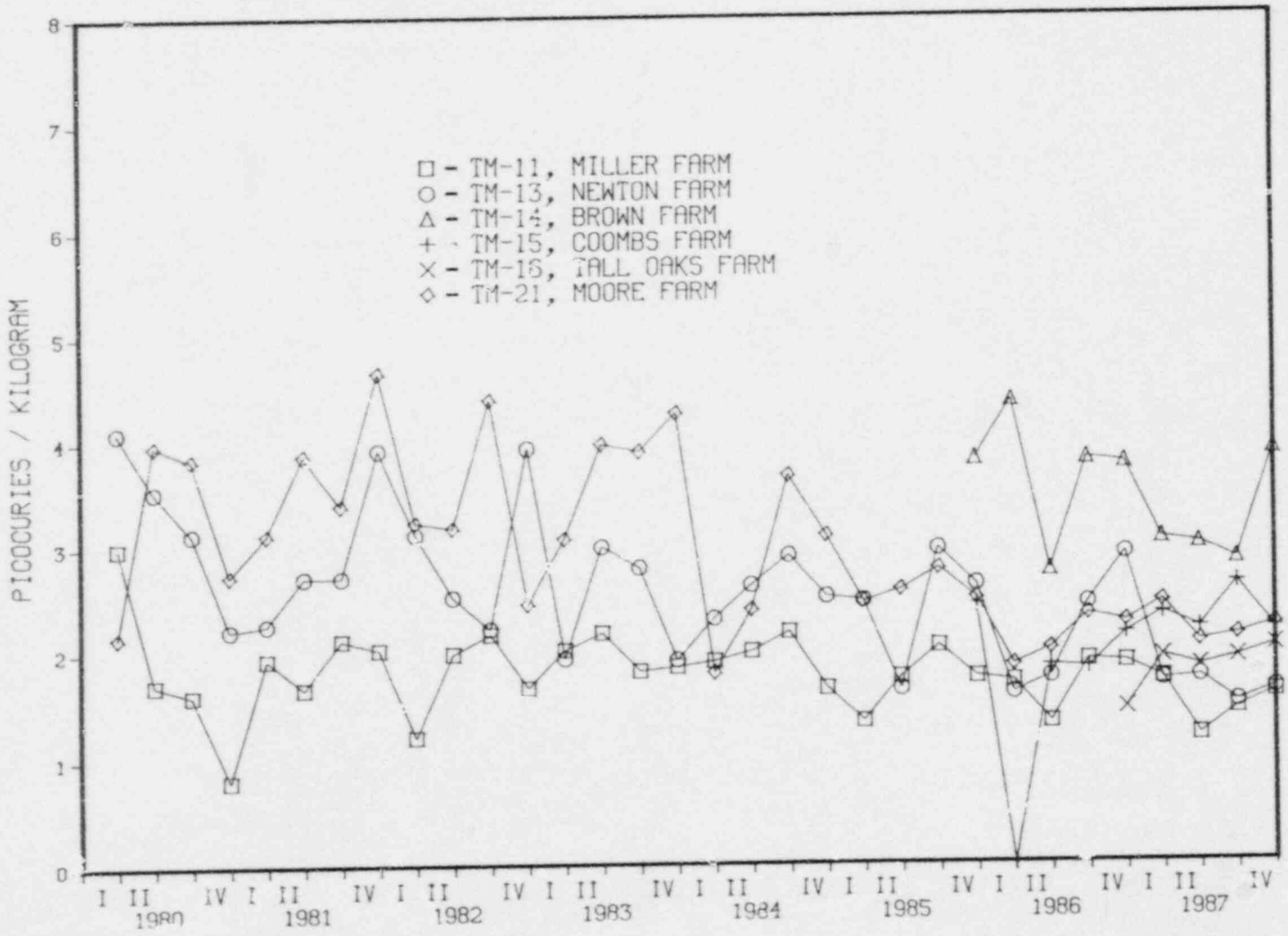


FIGURE 3.3
STRONTIUM-90 IN MILK
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: MILK

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
SR-89 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
SR-90 (24) (0)		(2.0± .2)E 0 (.0 - 3.9)E 0 *(20/ 20)*	14	(3.2 ± .2)E 0 (2.8 - 3.9)E 0 *(4/ 4)*	(2.2 ± .1)E 0 (2.1 - 2.4)E 0 *(4/ 4)*
BE-7 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
K-40 (90) (0)		(1.4± .0)E 3 (1.2 - 1.6)E 3 *(72/ 72)*	15	(1.4 ± .0)E 3 (1.3 - 1.4)E 3 *(12/ 12)*	(1.4 ± .0)E 3 (1.3 - 1.5)E 3 *(18/ 18)*
MN-54 (90) (0)		(.0± 0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
CO-58 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
FE-59 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
CO-60 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
ZN-65 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

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JANUARY - DECEMBER 1987

MEDIUM: MILK

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA NO.	STATION WITH HIGHEST MEAN MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
ZR-95 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
RU-103 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
RU-106 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
I-131 (90) (0)	1.	(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
CS-134 (90) (0)	15.	(1.6± .7)E -1 (.0 - 3.2)E 0 *(5/ 72)*	14	(6.4 ± 2.6)E -1 (.0 - 3.2)E 0 *(5/ 18)*	(.0 ± .0)E 0 *(0/ 18)*
CS-137 (90) (3)	18.	(1.5± .3)E 0 (.0 - 8.6)E 0 *(24/ 72)*	14	(3.0 ± .8)E 0 (.0 - 8.6)E 0 *(9/ 18)*	(6.9 ± 3.2)E -1 (.0 - 3.8)E 0 *(4/ 18)*
BA-140 (90) (0)	15.	(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
CE-141 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*
CE-144 (90) (0)		(.0± .0)E 0 *(0/ 72)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 18)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

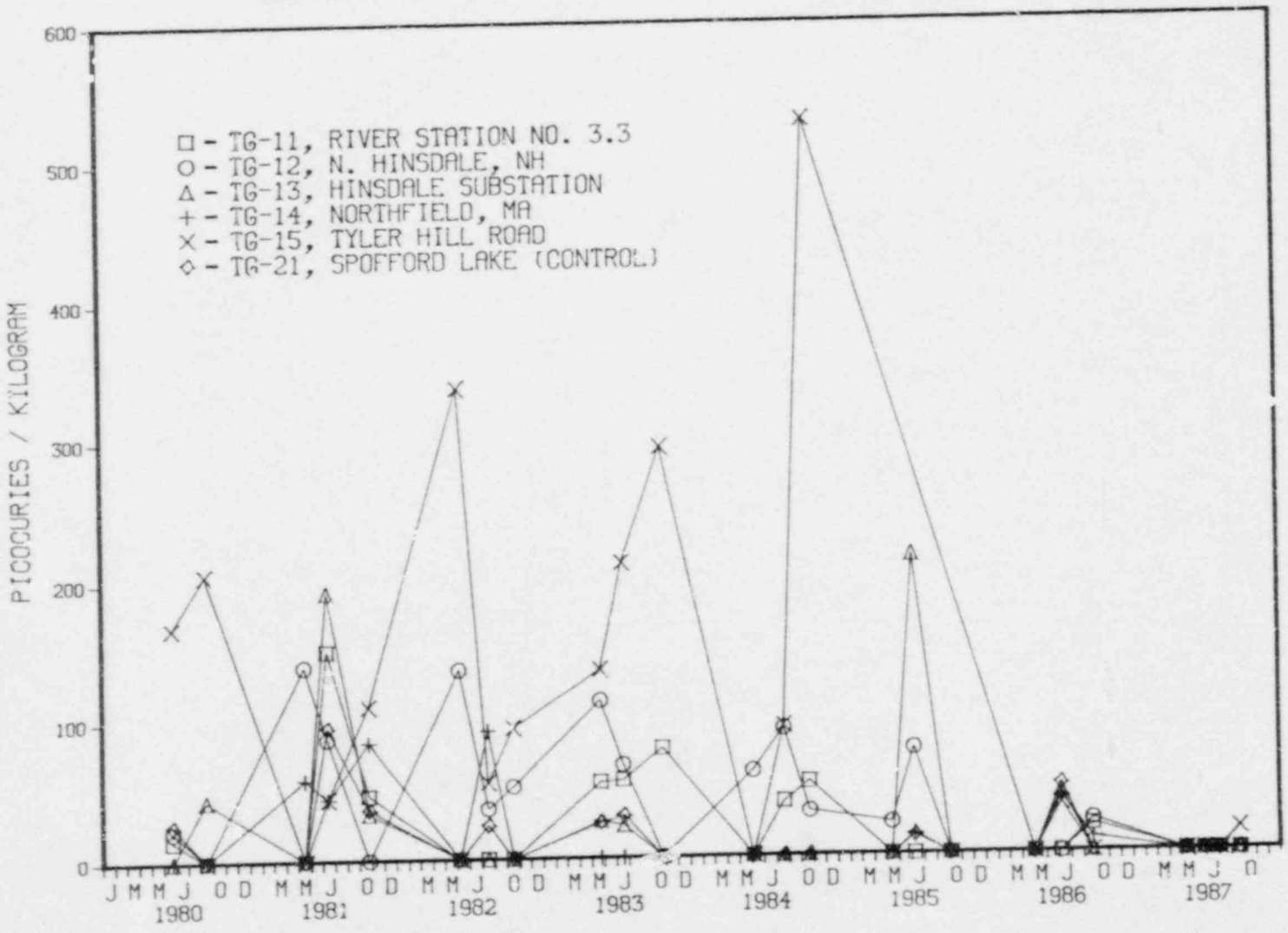
D) Mixed Vegetation

Mixed vegetation samples were collected during May, June, August, and September from the six air sampling locations. The vegetation consisted of various types of grasses and were analyzed for gamma emitting nuclides. The results of the gamma spectroscopy analysis on each sample showed that, in addition to naturally occurring Be-7 and K-40, Cs-137 was detected on one sample. The level detected in 1987 is less than those measured in previous years, which were shown to have originated from nuclear weapons testing fallout.

FIGURE 3.4

CESIUM-137 IN MIXED GRASSES

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: MIXED VEGETATION

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
BE-7 (24)		(7.2± 1.6)E 2	14	(1.1 ± .5)E 3	(6.1 ± 1.0)E 2
(0)		(.0 - 2.5)E 3		(3.6 - 25.3)E 2	(3.9 - 8.9)E 2
		(16/ 20)		*(4/ 4)*	*(4/ 4)*
K-40 (24)		(5.1± .3)E 3	15	(6.1 ± .9)E 3	(5.8 ± .7)E 3
(0)		(3.1 - 8.9)E 3		(4.9 - 8.9)E 3	(4.5 - 7.6)E 3
		(20/ 20)		*(4/ 4)*	*(4/ 4)*
MN-54 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
CO-58 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
FE-59 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
CO-60 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
ZN-65 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
ZR-95 (24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*
AG-110M(24)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 20)*			*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: MIXED VEGETATION UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
RU-103 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
RU-106 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
I-131 (24) (0)	60.	(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
CS-134 (24) (0)	60.	(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
CS-137 (24) (1)	80.	(7.7± 7.7)E -1 (.0 - 1.5)E 1 *(1/ 20)*	15	(3.8 ± 3.9)E 0 (.0 - 1.5)E 1 *(1/ 4)*	(.0 ± .0)E 0 *(0/ 4)*
BA-140 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
CE-141 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
CE-144 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*
TH-232 (24) (0)		(.0± .0)E 0 *(0/ 20)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

E) Silage

Silage samples were collected at the milk sampling stations during October of 1987. Each sample was analyzed for gamma-emitting radionuclides and I-131. Local, fresh silage was not available for collection during 1987 at Station TM-15. The owner of the farm purchases already-cured silage which is from a previous growing cycle.

Naturally-occurring Be-7 and K-40 were detected in most silage samples. No man-made radionuclides were detected in any of them.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: CATTLE FEED

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
BE-7 (5)		(5.3± 1.2)E 2	21	(7.5 ± 1.1)E 2	(7.5 ± 1.1)E 2
(0)		(2.0 - 7.4)E 2			
		(4/ 4)		*(1/ 1)*	*(1/ 1)*
K-40 (5)		(2.9± .3)E 3	16	(3.4 ± .2)E 3	(1.8 ± .2)E 3
(0)		(2.1 - 3.4)E 3			
		(4/ 4)		*(1/ 1)*	*(1/ 1)*
MN-54 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
CO-58 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
FE-59 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
CO-60 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
ZN-65 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
ZR-95 (5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*
AG-110M(5)		(.0± .0)E 0		NO DATA	(.0 ± .0)E 0
(0)					
		(0/ 4)			*(0/ 1)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: CATTLE FEED — UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS ++++++++++++++++++ MEAN RANGE NO. DETECTED++	STATION WITH HIGHEST MEAN ++++++++++++++++++++++++ STA. NO.	MEAN RANGE NO. DETECTED++	CONTROL STATIONS ++++++++++++++++ MEAN RANGE NO. DETECTED++
RU-103 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
RU-106 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
I-131 (5) (0)	60.	(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
CS-134 (5) (0)	60.	(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
CS-137 (5) (0)	80.	(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
BA-140 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
CE-141 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
CE-144 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*
TH-232 (5) (0)		(.0± .0)E 0 *(0/ 4)*		NO DATA	(.0 ± .0)E 0 *(0/ 1)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

F) Groundwater

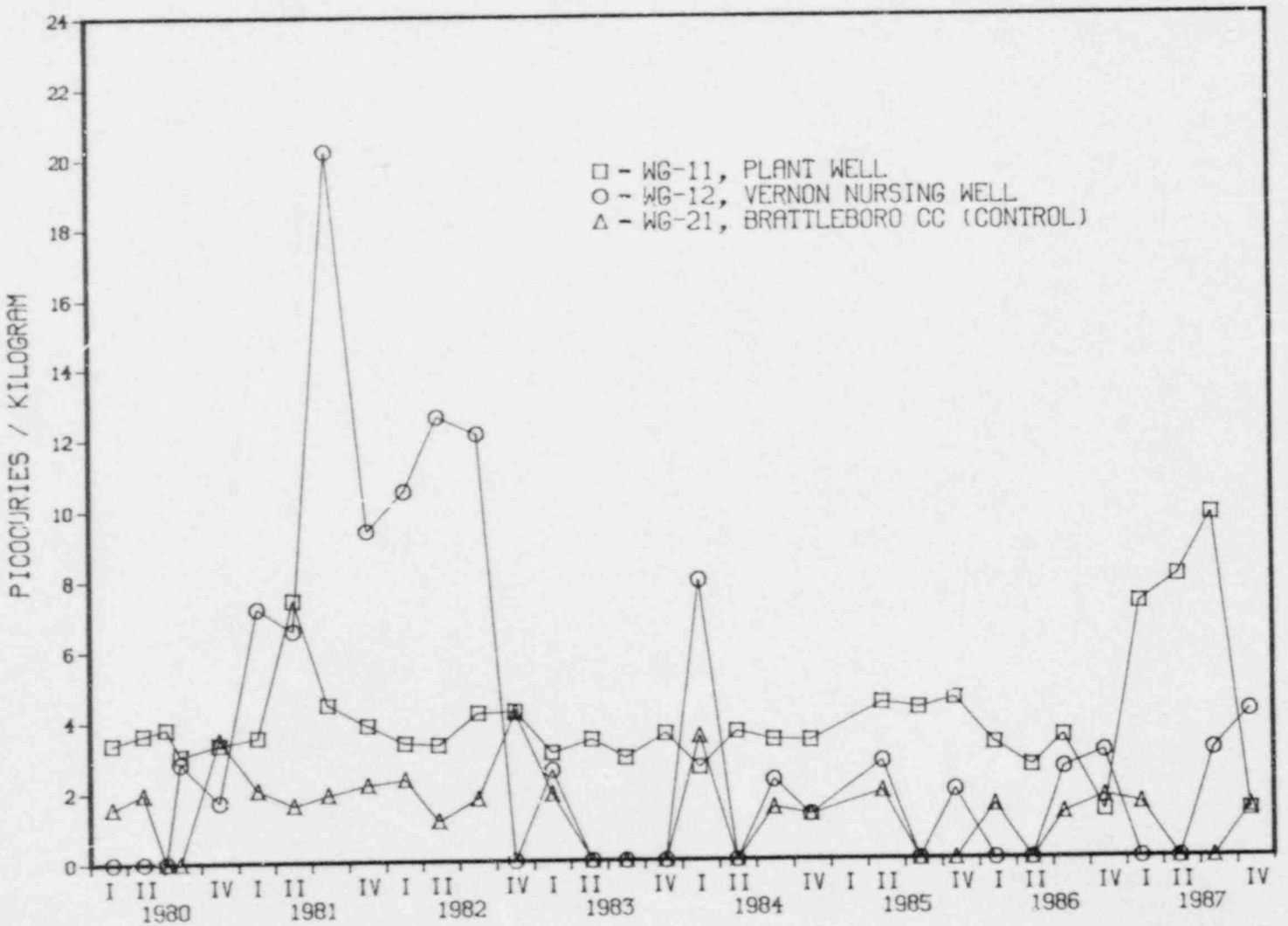
Groundwater grab samples were collected from two indicator (only one is required by Technical Specifications) and one control station on a quarterly basis. These samples were analyzed for H-3 and gamma-emitting radionuclides. Additionally, gross-beta analyses were performed, although they are not required.

The gross-beta concentrations at WG-11 were elevated for the first three quarters of 1987. No explanation for these levels has been found, although a problem with low well-water levels may have caused raised levels of radon or its daughters. No gamma-emitting radionuclides, plant-related or naturally-occurring, were detected in groundwater during 1987.

FIGURE 3.5

GROSS-BETA MEASUREMENTS OF GROUND WATER

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: GROUND WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
GR-B (12)	4.	(4.3± 1.3)E 0	11	(6.6 ± 1.8)E 0	(7.5 ± 4.3)E -1
(2)		(.0 - 9.8)E 0		(1.3 - 9.8)E 0	(.0 - 1.6)E 0
		(7/ 8)		*(4/ 4)*	*(2/ 4)*
BE-7 (12)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
MN-54 (12)	15.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
CO-58 (12)	15.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
FE-59 (12)	30.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
CO-60 (12)	15.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
ZN-65 (12)	30.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
ZR-95 (12)	15.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*
AG-110M(12)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 8)*			*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: GROUND WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
RU-103 (12) (0)		(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
RU-106 (12) (0)		(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
I-131 (12) (0)		(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CS-134 (12) (0)	15.	(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CS-137 (12) (0)	18.	(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
BA-140 (12) (0)	15.	(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CE-141 (12) (0)		(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
CE-144 (12) (0)		(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*
H-3 (12) (0)	3000.	(.0± .0)E 0 *(0/ 8)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

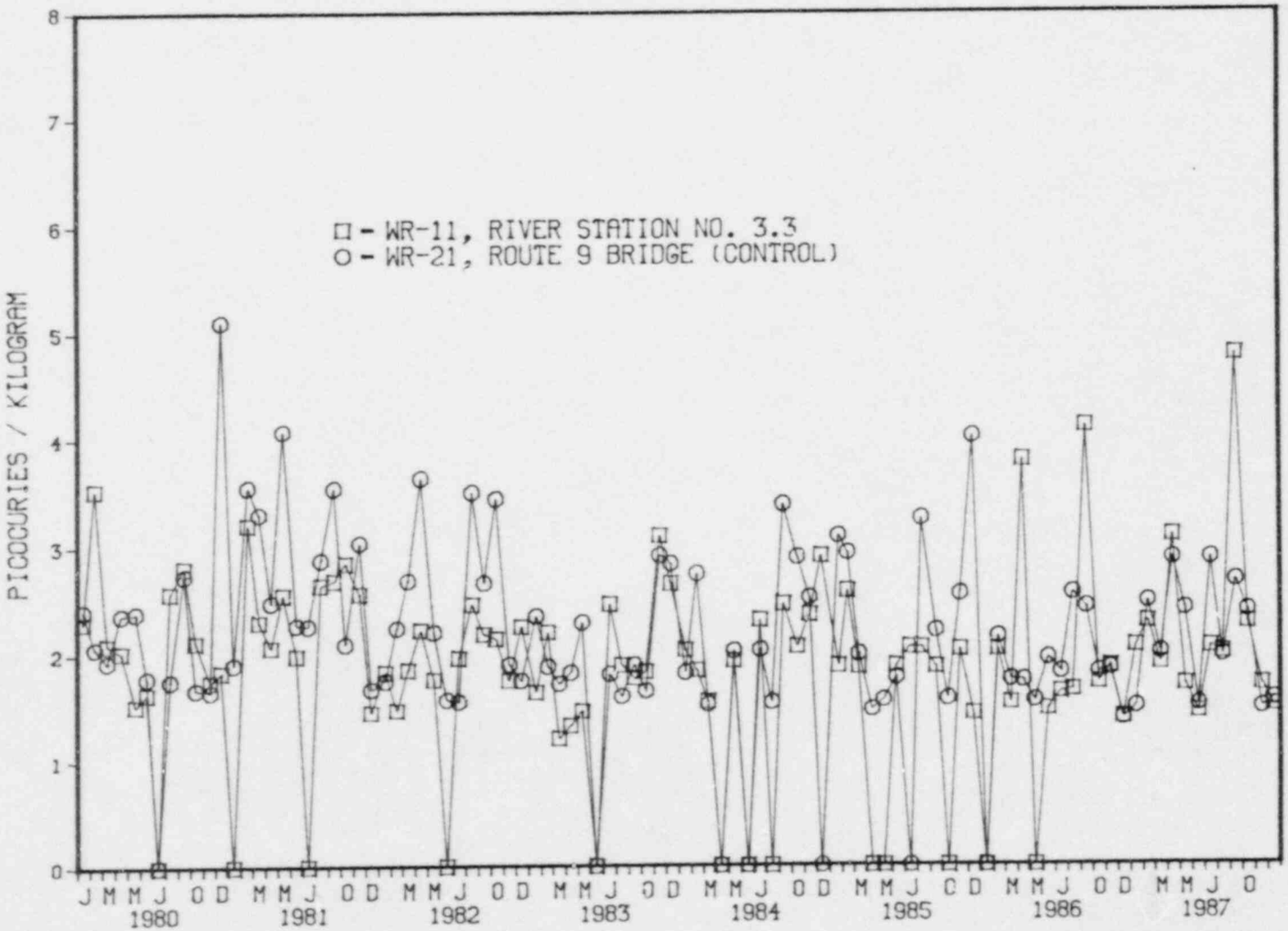
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

G) River Water

River water is analyzed monthly for gamma-emitting radionuclides and gross-beta (not required by RETS). The monthly samples are composited and analyzed for H-3 on a quarterly basis. A composite sampler is used at Station WR-11 and grab samples are taken at Station WR-21.

Gross-beta radioactivity was detected in all samples during 1987. Considerable fluctuation in gross-beta levels at both the indicator and control locations over the past nine years is evident in Figure 3.6. The mean value, however, for the indicator stations was similar to that of the control station and to that of previous years, indicating that those radionuclides detected are not due to plant operations.

FIGURE 3.6
GROSS BETA MEASUREMENTS OF RIVER WATER
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: RIVER WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED++	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED++	CONTROL STATIONS MEAN RANGE NO. DETECTED++
GR-B (24) (0)	4.	(2.2± .3)E 0 (1.4 - 4.8)E 0 *(12/ 12)*	11	(2.2 ± .3)E 0 (1.4 - 4.8)E 0 *(12/ 12)*	(2.1 ± .2)E 0 (1.5 - 2.9)E 0 *(12/ 12)*
BE-7 (24) (0)		(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
MN-54 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
CO-58 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
FE-59 (24) (0)	30.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
CO-60 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
ZN-65 (24) (0)	30.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
ZR-95 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*
AG-110M(24) (0)		(.0± .0)E 0 *(0/ 12)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 12)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: RIVER WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
RU-103 (24) (0)		(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
RU-106 (24) (0)		(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
I-131 (24) (0)		(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
CS-134 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
CS-137 (24) (0)	18.	(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
BA-140 (24) (0)	15.	(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
CE-141 (24) (0)		(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
CE-144 (24) (0)		(.0± .0)E 0 *(0/ 12)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 12)*
H-3 (8) (0)	3000.	(.0± .0)E 0 *(0/ 4)*	ALL EQUAL		(.0 ± .0)E 0 *(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

H) Sediment

During 1987, sediment samples were collected from two locations in May and October. Each sample was analyzed for gamma-emitting radionuclides. One grab sample was collected at Station SE-11 and fifteen grab samples at Station SE-12 during May. During October, one was again collected at SE-11 and nineteen at SE-12.

Cesium-137 was detected in all samples. As has been discussed in previous Vermont Yankee Radiological Environmental Surveillance Reports, this radioactivity has been due to nuclear weapons testing fallout. Since there were no liquid releases during 1982 through 1987, it can be concluded that the levels of Cs-137 in 1987 sediment samples were due also to nuclear weapons testing fallout. This is further supported by the fact that similar levels have in the past been detected at Station SE-21, a control station, and at control locations at other plants. Low levels of Co-60, as well as Zn-65 and Cs-134, have been detected in samples collected at Station 12 (N. Storm Drain Outfall). This subject was discussed in previous reports.

It should be noted here that the statistics given in the following table are heavily weighed toward Station SE-12, since 34 of the 36 samples were collected there. No Co-60, Zn-65, or Cs-134 was detected at Station SE-11.

Naturally-occurring Be-7, K-40, and Th-232 were also detected in many samples.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: SEDIMENT UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
BE-7 (36)		(1.8± .5)E 2	12	(1.8 ± .5)E 2	NO DATA
(11)		(.0 - 9.1)E 2		(.0 - 9.1)E 2	
		(11/ 36)		*(10/ 34)*	
K-40 (36)		(1.2± .0)E 4	12	(1.2 ± .0)E 4	NO DATA
(0)		(2.8 - 15.1)E 3		(8.8 - 15.1)E 3	
		(36/ 36)		*(34/ 34)*	
MN-54 (36)		(.0± .0)E 0		ALL EQUAL	NO DATA
(0)					
		(0/ 36)			
CO-58 (36)		(.0± .0)E 0		ALL EQUAL	NO DATA
(0)					
		(0/ 36)			
FE-59 (36)		(.0± .0)E 0		ALL EQUAL	NO DATA
(0)					
		(0/ 36)			
CO-60 (36)		(6.2± 1.4)E 1	12	(6.6 ± 1.5)E 1	NO DATA
(24)		(.0 - 4.4)E 2		(.0 - 4.4)E 2	
		(24/ 36)		*(24/ 34)*	
ZN-65 (36)		(4.1± 4.1)E 0	12	(4.3 ± 4.3)E 0	NO DATA
(0)		(.0 - 1.5)E 2		(.0 - 1.5)E 2	
		(1/ 36)		*(1/ 34)*	
ZR-95 (36)		(.0± .0)E 0		ALL EQUAL	NO DATA
(0)					
		(0/ 36)			
AG-110M(36)		(.0± .0)E 0		ALL EQUAL	NO DATA
(0)					
		(0/ 36)			

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: SEDIMENT — UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS ********** MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN ********** STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS ********** MEAN RANGE NO. DETECTED**
RU-103 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
RU-106 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
I-131 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
CS-134 (36) (1)	150.	(6.1± 6.1)E -1 (.0 - 2.2)E 1 *(1/ 36)*	12	(6.4 ± 6.4)E -1 (.0 - 2.2)E 1 *(1/ 34)*	NO DATA
CS-137 (36) (0)	180.	(2.0± .1)E 2 (5.3 - 38.7)E 1 *(36/ 36)*	12	(2.1 ± .1)E 2 (8.8 - 38.7)E 1 *(34/ 34)*	NO DATA
BA-140 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
CE-141 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
CE-144 (36) (0)		(.0± .0)E 0 *(0/ 36)*		ALL EQUAL	NO DATA
TH-232 (36) (0)		(7.9± .3)E 2 (3.7 - 12.0)E 2 *(36/ 36)*	12	(8.1 ± .3)E 2 (4.2 - 12.0)E 2 *(34/ 34)*	NO DATA

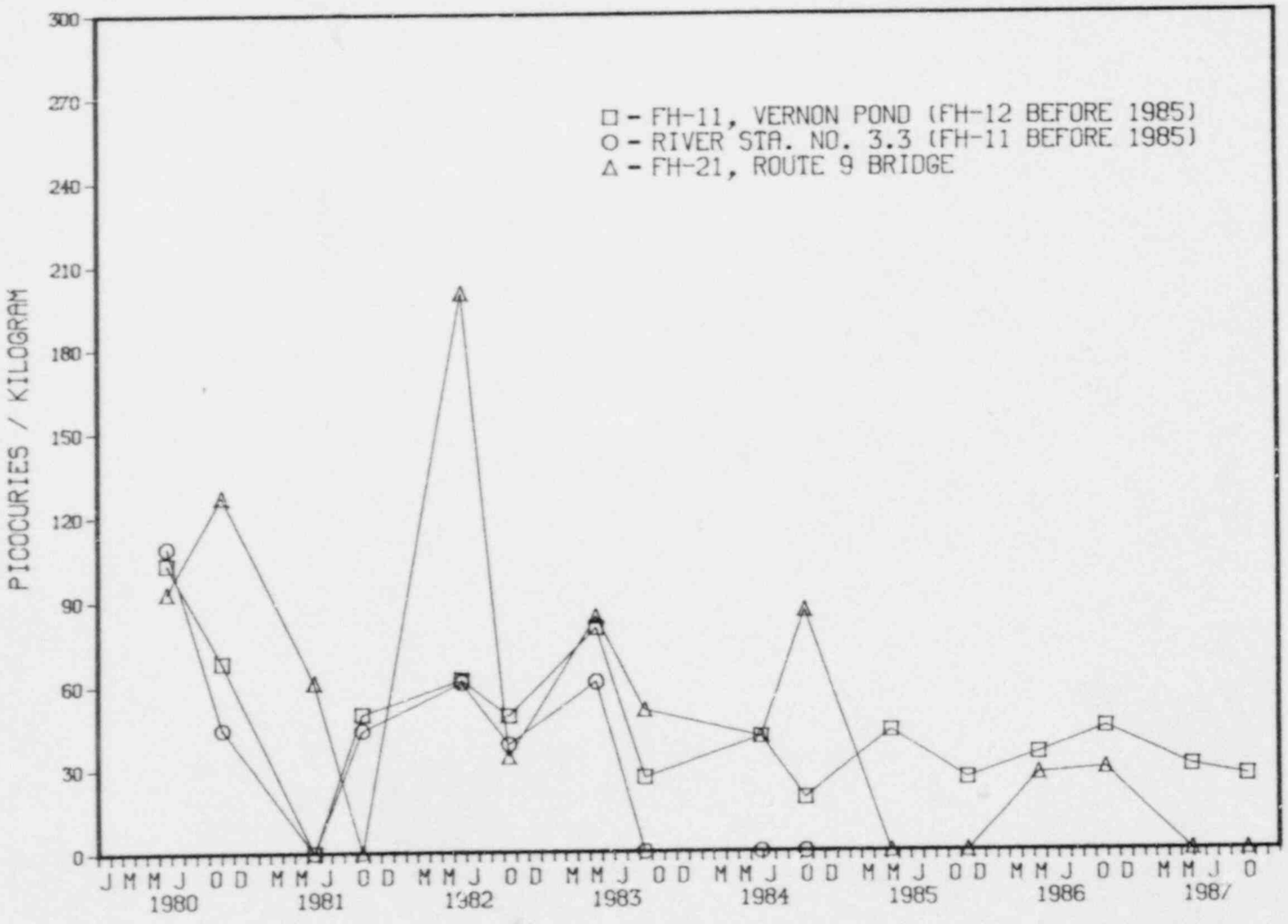
* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

I) Finfish

Finfish samples were collected from two locations during May and again in October of 1987. Each sample consisted of mixed fresh water species, generally perch and bass. All were analyzed for gamma-emitting radionuclides. Cesium-137 was detected in both of the samples collected at indicator Station FH-11. The levels are consistent with well-documented environmental levels caused by nuclear weapons testing fallout. The levels for the indicator station are similar to those of the control in 1986. No other radionuclides were detected except for naturally-occurring K-40.

FIGURE 3.7
CESIUM-137 IN FISH
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: FINFISH

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
BE-7 (4) (0)		(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
K-40 (4) (0)		(2.8± .1)E 3 (2.7 - 2.9)E 3 *(2/ 2)*	21	(2.8 ± .0)E 3 (2.8 - 2.9)E 3 *(2/ 2)*	(2.8 ± .0)E 3 (2.8 - 2.9)E 3 *(2/ 2)*
MN-54 (4) (0)	130.	(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
CO-58 (4) (0)	130.	(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
FE-59 (4) (0)	260.	(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
CO-60 (4) (0)	130.	(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
ZN-65 (4) (0)	260.	(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
ZR-95 (4) (0)		(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*
AG-110M(4) (0)		(.0± .0)E 0 *(0/ 2)*		ALL EQUAL	(.0 ± .0)E 0 *(0/ 2)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1987

MEDIUM: FINFISH

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)'	REQUIRED LLD	INDICATOR STATIONS MEAN RANGE NO. DETECTED**	STATION WITH HIGHEST MEAN STA. NO.	MEAN RANGE NO. DETECTED**	CONTROL STATIONS MEAN RANGE NO. DETECTED**
RU-103 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
RU-106 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
I-131 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
CS-134 (4)	130.	(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
CS-137 (4)	150.	(2.8± .2)E 1	11	(2.8 ± .2)E 1	(.0 ± .0)E 0
(2)		(2.6 - 3.0)E 1		(2.6 - 3.0)E 1	
		(2/ 2)		*(2/ 2)*	*(0/ 2)*
BA-140 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
CE-141 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
CE-144 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*
TH-232 (4)		(.0± .0)E 0		ALL EQUAL	(.0 ± .0)E 0
(0)		*(0/ 2)*			*(0/ 2)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT.

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >A POSTERIORI LLD) IS INDICATED WITH *( )*.

J) Direct Radiation

Direct gamma radiation exposure was determined from the use of thermoluminescent dosimeters (TLDs). Two CaF_2:Mn TLDs were placed at each of the monitoring stations. Fifty-one sets of TLDs were read out on a quarterly schedule. Sixteen of these were located at inner ring stations and 16 at outer ring stations. Twelve were located at the site boundary, six were at special interest locations and one was a control.

Summaries of the results for 1987 can be seen in the table below. A complete station-by-station summary is given in Table 3.1.

In Table 3.1, the quarterly averages for inner ring stations (i.e., those locations that could possibly be influenced by plant operations) can be compared with those for the outer ring stations (i.e., those locations outside of the range of influence of the plant). Upon examining the quarterly exposure rates in the table, it is also evident that the inner ring exposure rates are not statistically different from those of the outer ring.

Upon examining Figure 3.10, it is evident that Station DR-45 has a higher average exposure rate than any other station. This is not surprising in that DR-45 is actually located on-site in close proximity to the plant (see Figure 2.4). Station DR-6 also had a high reading during the third quarter of 1987. Over-response of the TLDs is suspected. Panasonic TLDs from the Yankee Environmental Laboratory were co-located with the standard Victoreen during 1987. The Panasonic TLD at DR-6 during the third quarter gave a reading of 7.2 micro-R per hour. Additionally, two TLD stations (DR-7 and DR-8) located between the plant and DR-6 had readings of 11.36 and 10.81 micro-R per hour, which is substantially lower than the 24.04 micro-R per hour at DR-6.

Environmental Radiological Program Summary
Vermont Yankee Nuclear Power Station, Vernon, Vermont
January - December 1987

Medium: Direct Radiation Measurements (TLD)

Units: Micro-R per Hour

Inner Ring		Station With Highest Mean		Outer Ring	
Mean Range (No. Meas.)*	Station No.	Mean Range (No. Meas.)*		Mean Range (No. Meas.)*	
12.2		41.4		12.1	
7.9 - 24.0	45	26.2 - 66.8		6.4 - 17.0	
(88)		(4)		(68)	

* Most measurements based on readings from two TLDs.

Table 3.1

Summary of Direct Radiation Measurements - 1987
Vermont Yankee

Location	Type*	QTR 1	QTR 2	QTR 3	QTR 4	Yearly Mean
DR-1	I	11.78	12.77	10.94	12.84	12.08
DR-2	I	12.30	10.29	12.28	11.01	11.47
DR-3	I	12.39	11.81	10.79	13.50	12.12
DR-4	I	11.91	11.41	10.59	13.22	11.78
DR-5	O	11.12	11.31	9.21	12.73	11.09
DR-6	I	7.86	9.79	24.04	14.74	14.11
DR-7	SB	11.12	13.60	11.36	14.98	12.77
DR-8	SB	11.97	13.67	10.81	14.33	12.70
DR-9	I	10.80	9.44	12.40	11.12	10.94
DR-10	O	11.19	13.46	12.08	6.41	10.79
DR-11	I	10.72	11.82	10.32	9.32	10.55
DR-12	O	11.93	12.33	10.21	9.75	11.05
DR-13	I	14.29	10.65	9.92	11.67	11.63
DR-14	O	14.06	13.60	11.09	10.96	12.43
DR-15	I	10.77	14.36	10.58	12.59	12.08
DR-16	O	14.53	11.14	13.86	12.61	13.04
DR-17	I	13.13	8.46	10.90	18.34	12.71
DR-18	O	12.37	11.76	11.09	12.11	11.83
DR-19	I	12.71	8.33	12.46	17.21	12.68
DR-20	O	12.91	10.87	13.60	9.72	11.78
DR-21	I	11.67	14.81	15.91	12.12	13.63
DR-22	O	13.71	13.22	12.27	12.23	12.86
DR-23	I	9.67	11.09	13.57	11.50	11.46
DR-24	O	14.75	8.14	12.00	9.17	11.02
DR-25	I	11.77	12.05	17.51	12.94	13.57
DR-26	O	12.44	16.53	13.71	12.57	13.81
DR-27	I	13.41	13.06	12.52	13.49	13.12
DR-28	O	10.50	11.90	12.43	10.44	11.32
DR-29	I	11.57	13.10	17.20	11.31	13.30
DR-30	O	11.01	10.98	15.68	10.97	12.16
DR-31	I	12.94	14.71	12.83	12.62	13.28
DR-32	O	17.01	12.19	13.47	13.89	14.14
DR-33	I	12.85	10.04	11.43	11.91	11.56
DR-34	O	11.82	10.82	12.72	12.99	12.09
DR-35	I	10.77	10.06	10.89	13.17	11.22
DR-36	O	11.85	12.00	15.65	12.02	12.88
DR-37	I	12.16	13.[illegible]	13.63	9.86	12.10
DR-38	O	10.48	13.22	12.33	14.26	12.57
DR-39	I	11.74	13.32	10.40	12.64	12.03
DR-40	O	10.98	11.14	13.21	11.01	11.59
DR-41	SB	14.61	15.36	11.34	13.11	13.61
DR-42	SB	9.34	14.17	12.87	10.94	11.83
DR-43	SB	10.71	12.38	12.64	13.03	12.19
DR-44	SB	12.47	12.88	13.55	12.08	12.75

Table 3.1
(Continued)

Summary of Direct Radiation Measurements - 1987
Vermont Yankee

Location	Type*	QTR 1	QTR 2	QTR 3	QTR 4	Yearly Mean
DR-45	SB	26.18	27.82	44.96	66.78	41.43
DR-46	SB	11.48	17.32	17.58	16.08	15.62
DR-47	SB	12.10	10.71	13.86	16.47	13.29
DR-48	SB	9.61	11.36	14.28	13.05	12.08
DR-49	SB	10.41	10.49	11.28	10.52	10.68
DR-50	I	11.06	12.44	12.57	11.47	11.89
DR-51	SB	12.20	14.39	12.55	11.49	12.66
QTR Mean Inner Ring		11.74 ±1.37	11.66 ±1.89	12.89 ±3.28	12.21 ±3.09	
QTR Mean Outer Ring		12.51 ±1.79	12.04 ±1.75	12.62 ±1.70	11.40 ±1.94	
QTR Mean Site Boundary		12.68 ±4.48	14.51 ±4.62	15.59 ±9.43	17.74 ±15.56	

*I = Inner Ring; O = Outer Ring; SB = Site Boundary.

FIGURE 3.8

EXPOSURE RATE AT INDICATOR TLDS, DR 01-04,06,50

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

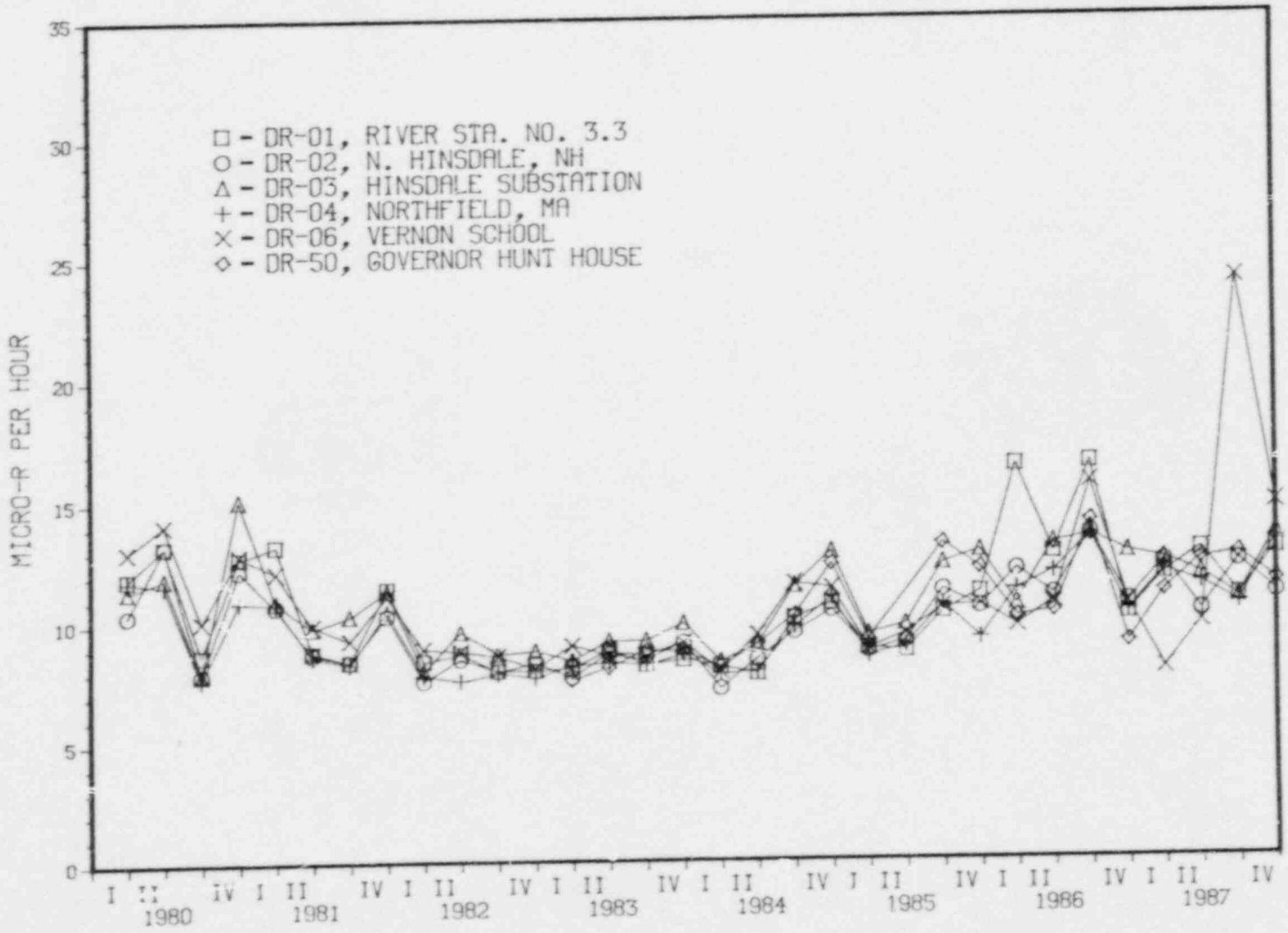


FIGURE 3.9

EXPOSURE RATE AT SITE BOUNDARY TLDS, DR 07-08,41-44

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

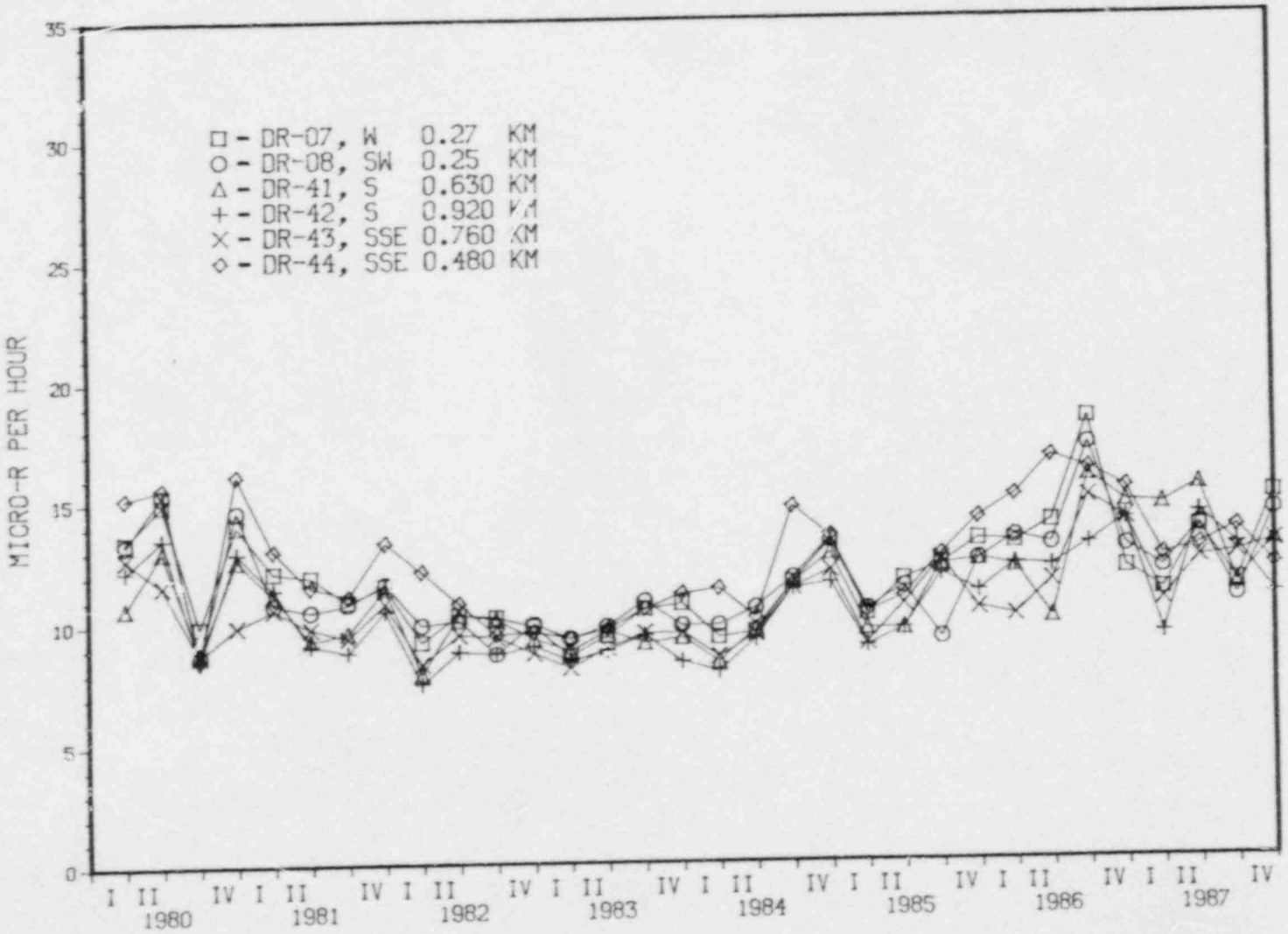


FIGURE 3.10

EXPOSURE RATE AT SITE BOUNDARY TLDS, DR 45-49,51

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

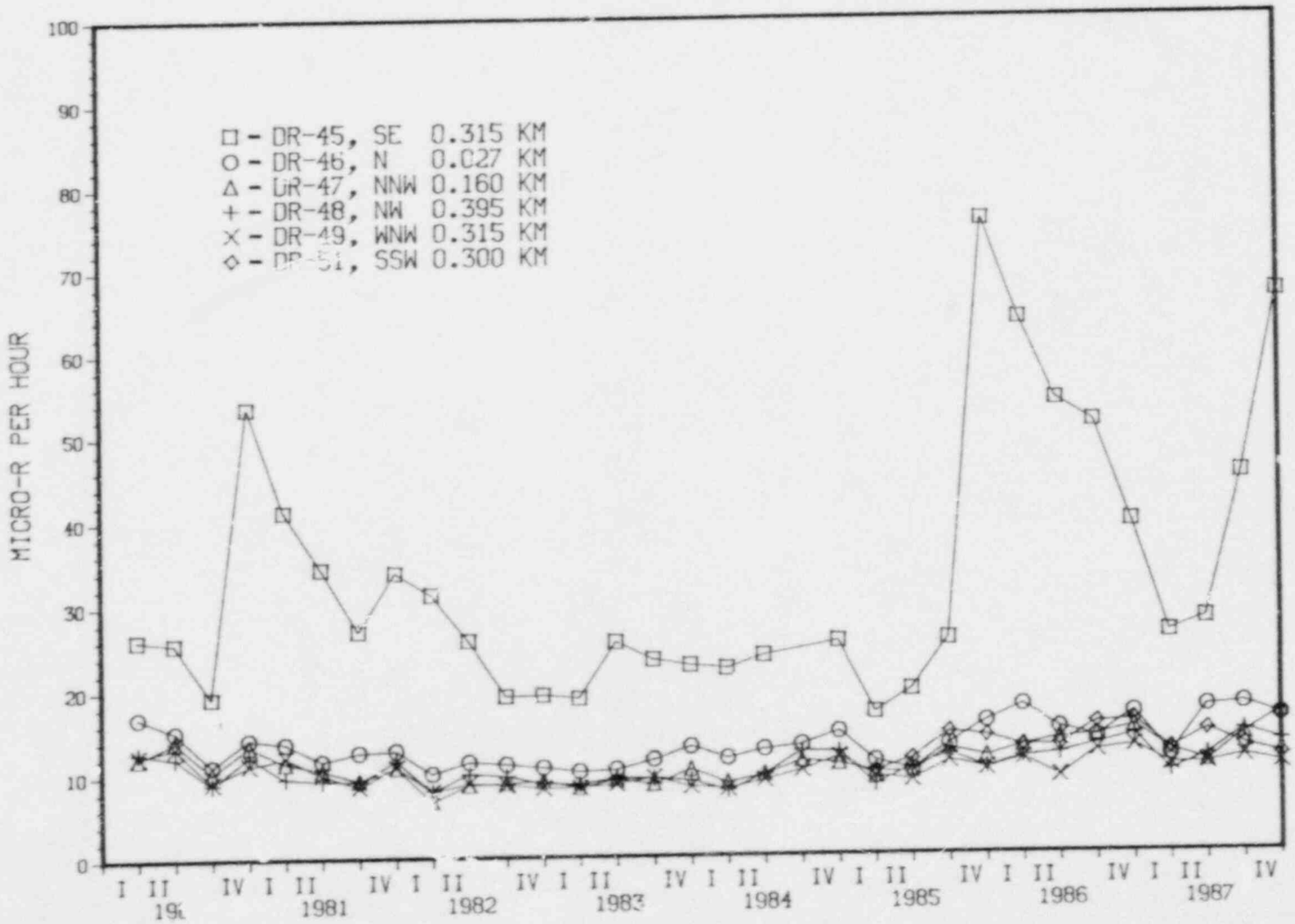


FIGURE 3.11

EXPOSURE RATE AT INNER RING TLDS, DR 09-23 (ODD NUMBERS)

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

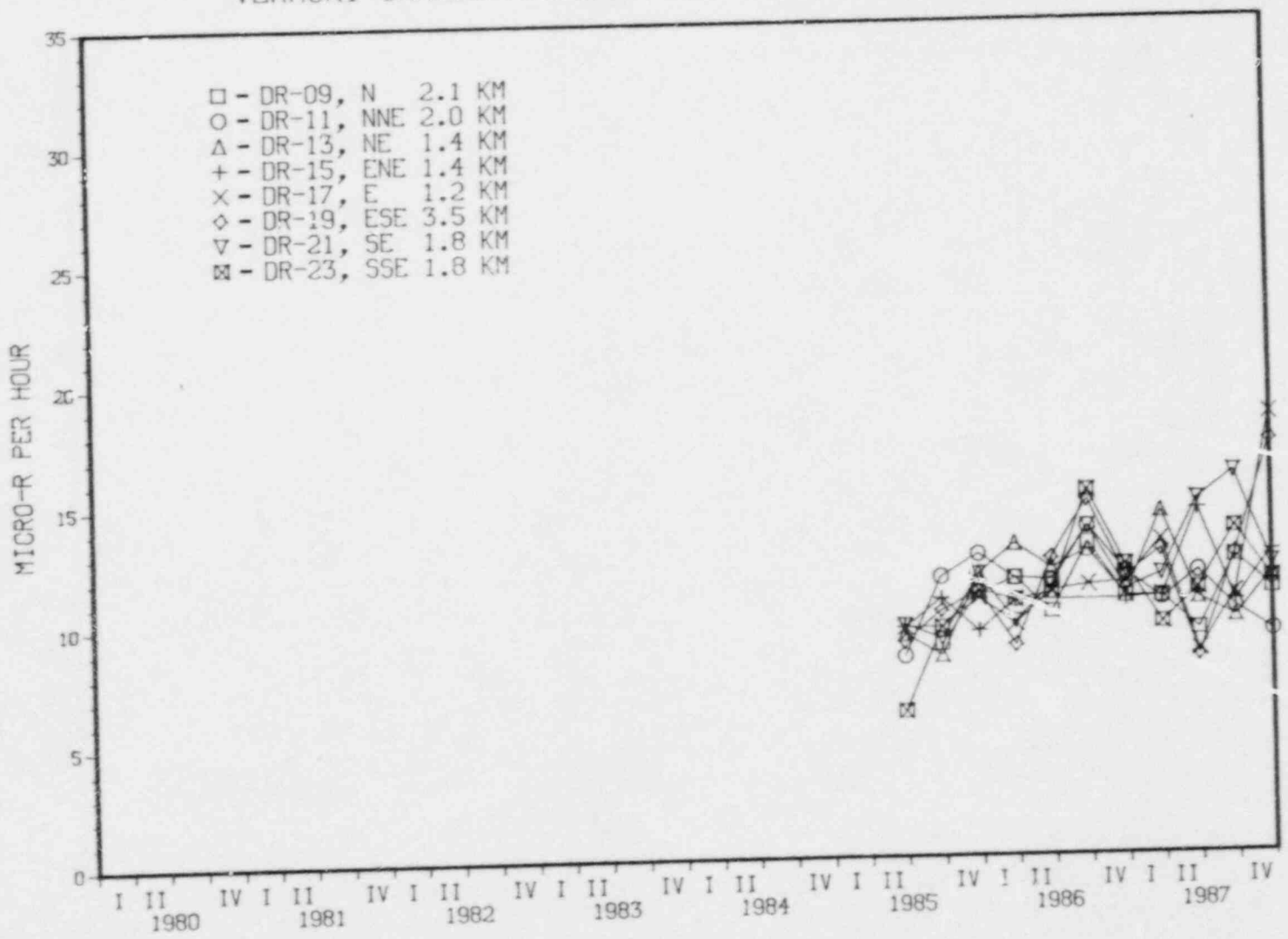


FIGURE 3.12

EXPOSURE RATE AT INNER RING TLDS, DR 25-39 (ODD NUMBERS)

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

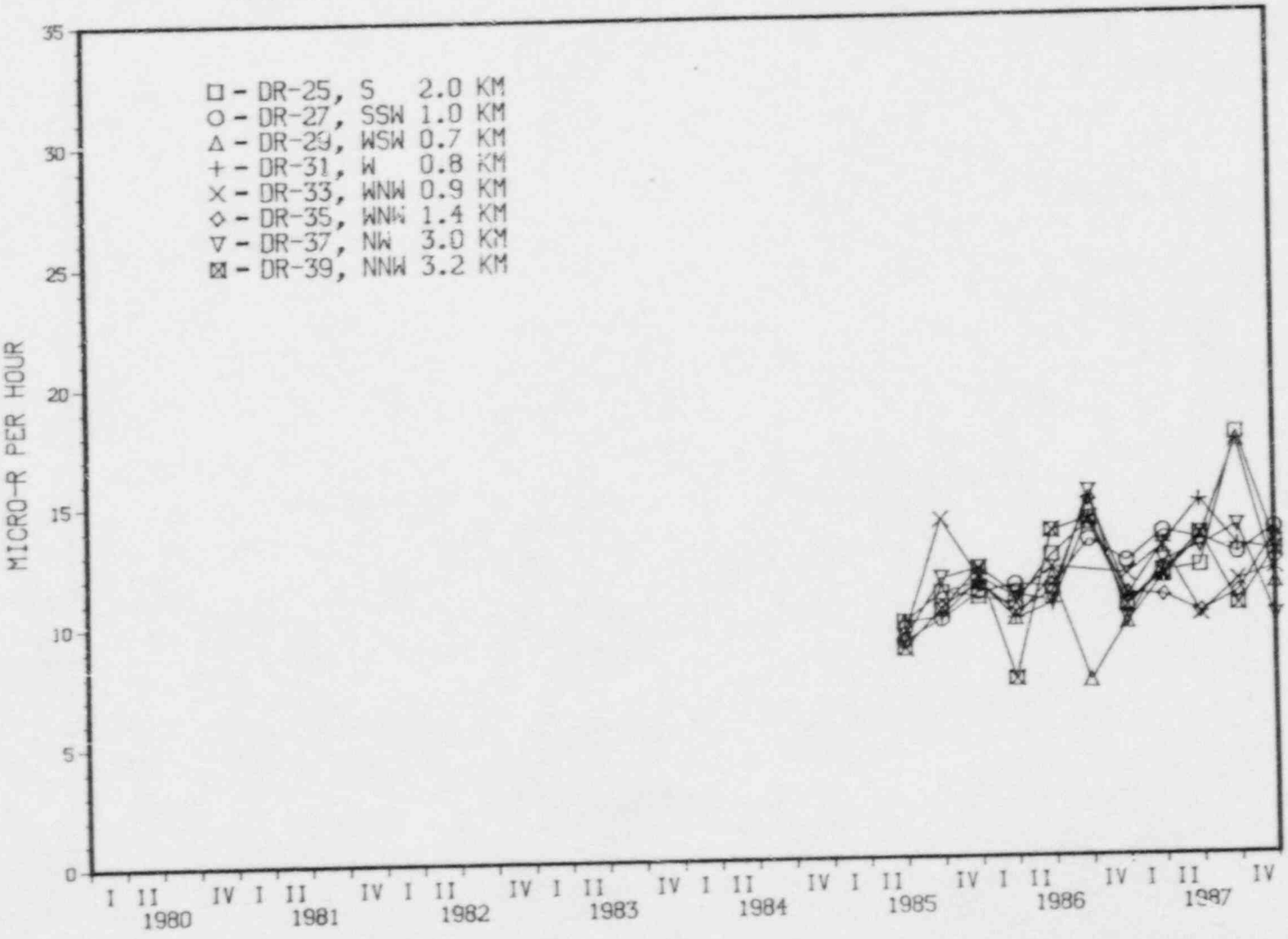


FIGURE 3.13

EXPOSURE RATE AT OUTER RING TLDS, DR 10-24 (EVEN NUMBERS)

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

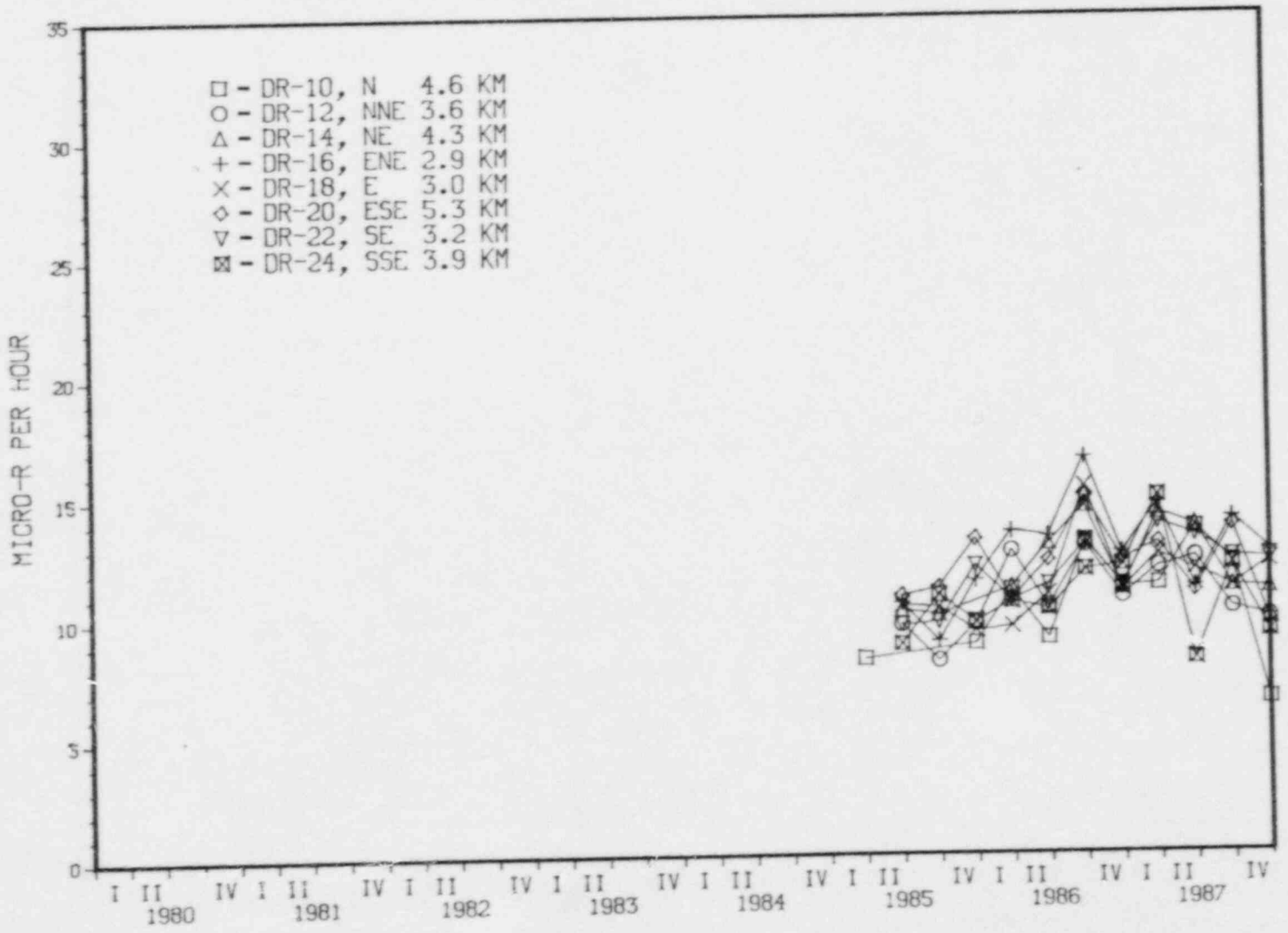


FIGURE 3.14

EXPOSURE RATE AT OUTER RING TLDS, DR 26-40 (EVEN NUMBERS)

VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT

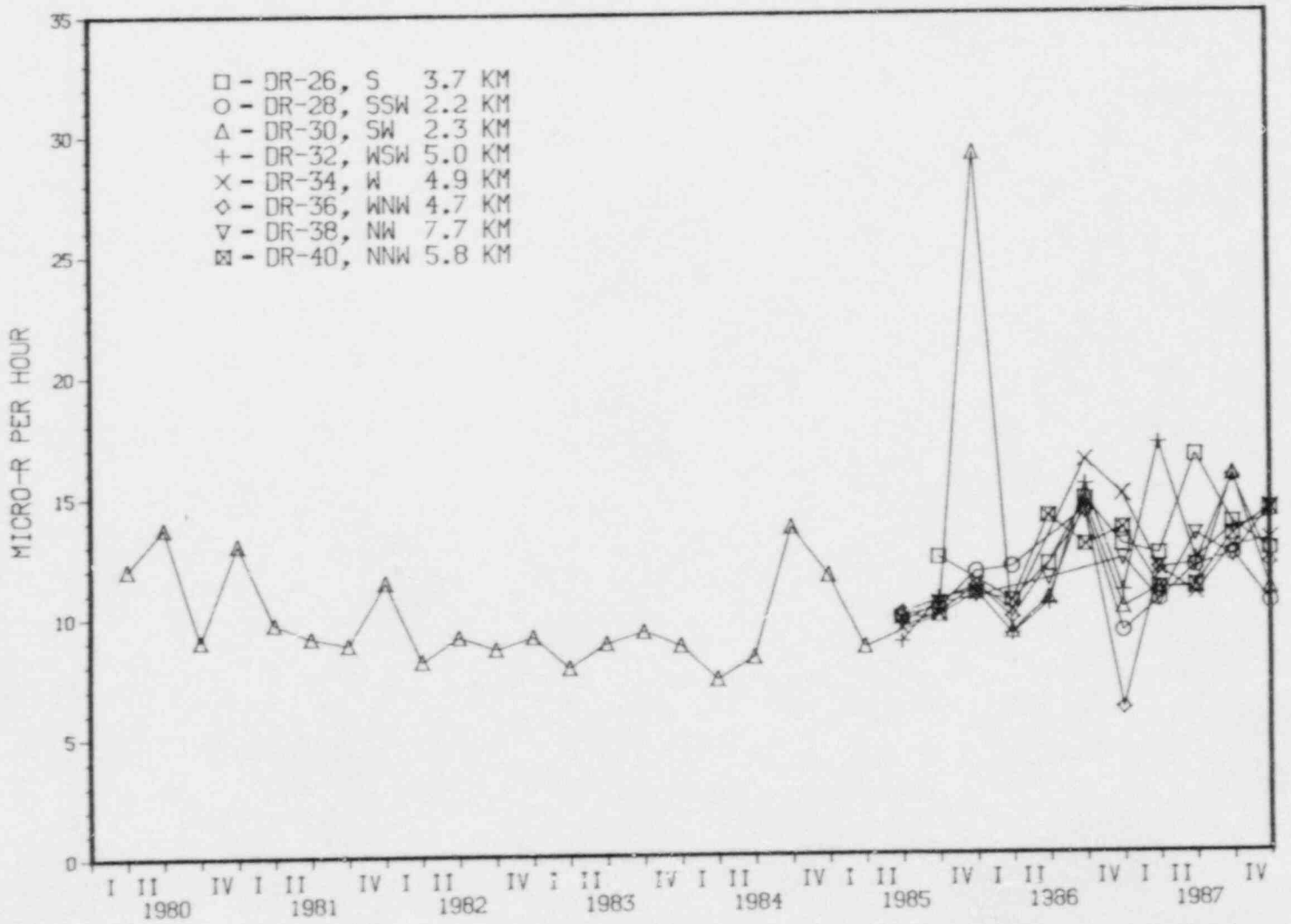
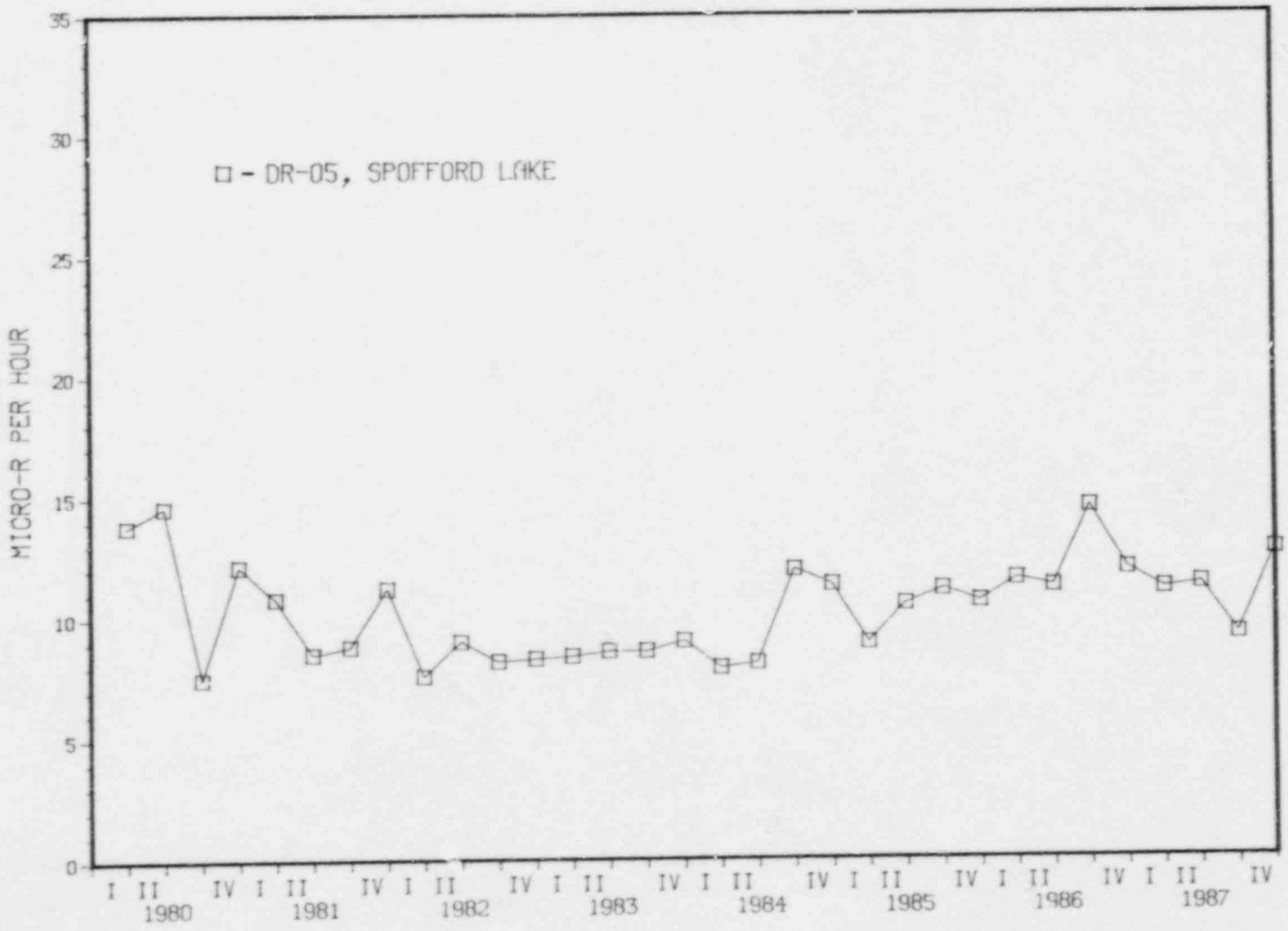


FIGURE 3.15
EXPOSURE RATE AT CONTROL TLD DR-05
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT



K) In Situ

In situ gamma spectrometry analyses were performed at nine locations from September 15 to 17, 1987. Gamma spectrometry measurements were performed by the Yankee Atomic Environmental Laboratory (YAEL) using a high purity germanium detector and multi-channel analyzer. Measurements were also taken with a high pressure ionization chamber (HPIC) for assessment of total exposure rates. Soil core samples were obtained at six of these nine locations and analyzed at the YAEL for comparison to the in situ analyses.

The naturally-occurring radionuclides K-40, Th-32, and U-238 were the predominant gamma-emitters, as can be seen in Table 3.2. These, along with Cs-137, were detected in all samples including controls. The Cs-137 levels are consistent with well-documented environmental levels, and can be attributed to fallout from atmospheric nuclear weapons tests.

Table 3.2

Summary of In Situ Soil Analyses

Exposure Rate (μR/hr) ± 1 Std. Dev.

Location	Cs-137	K-40	Th-232	U-238	Total*	HPIC
North Hinsdale	0.14±0.01	1.62±0.05	1.65±0.10	0.84±0.04	7.84±0.12	8.57±0.39
Vernon Nursing Well	0.09±0.01	1.64±0.05	1.09±0.07	0.81±0.04	7.22±0.10	8.08±0.37
Hinsdale Substation	0.18±0.01	1.49±0.05	1.98±0.08	1.21±0.05	8.45±0.11	8.79±0.48
Northfield	0.06±0.01	1.56±0.05	1.61±0.08	1.25±0.05	8.07±0.11	8.13±0.47
Tyler Hill	0.25±0.01	2.00±0.05	2.40±0.09	1.27±0.06	9.51±0.12	9.33±0.52
Hunt House	0.14±0.01	1.62±0.05	1.65±0.10	0.84±0.04	7.84±0.12	8.99±0.41
Brattleboro C. C.	0.28±0.01	1.48±0.04	1.40±0.07	1.04±0.05	7.79±0.09	7.81±0.46
Spofford Lake	0.08±0.01	2.04±0.05	2.19±0.09	0.97±0.05	8.87±0.11	8.90±0.43
River Station	0.04±0.01	1.68±0.05	1.54±0.08	0.97±0.05	7.82±0.11	7.90±0.45

* Total of portable germanium system plus 3.59 μR/h cosmic contribution.

4.0 QUALITY ASSURANCE PROGRAM

Three separate Quality Assurance programs were performed during 1987 to demonstrate the validity of laboratory analyses by the Yankee Atomic Environmental Laboratory (YAEL).

YAEL participates in the EPA Interlaboratory Comparison (cross-check) program for those species and matrices routinely analyzed by the laboratory. This provides an independent check of accuracy and precision of the laboratory analysis. When the results of the cross-check analysis fall outside of the control limit, an investigation is made to determine the cause of the problem and corrective measures are taken.

YAEL maintains an intralaboratory quality control program to assure the validity and reliability of the data. This program includes quality control of laboratory equipment, use of reference standards for calibration, and analysis of blank and spiked samples. The records of the quality control program are reviewed by the responsible cognizant individual, and corrective measures are taken whenever applicable.

A blind duplicate program is maintained in which paired samples from five nuclear plants, including Vermont Yankee, are prepared from homogenous media and sent to the laboratory for analysis. The results from this blind duplicate program are used to check for precision in laboratory analyses.

EPA Interlaboratory and Intralaboratory Results

The Quality Assurance Program implemented at the analytical laboratory indicated good precision and accuracy in reported values. Table 4.1 shows the results of accuracy and precision for laboratory analyses in 1987 for intralaboratory analyses, and EPA interlaboratory cross-check analyses. For accuracy, 61.7 and 87.4 percent of the results were within 5 and 10 percent of the known values, respectively, with 96.2 percent of all results falling within the laboratory criteria of 15 percent. For precision, 86.4 and 97.5 percent of the results were within 5 and 10 percent of the mean, respectively, with 99.6 percent of all results meeting the laboratory criteria of 15 percent.

The results of the EPA Interlaboratory Comparison program, when considered apart from the remainder of the Quality Assurance program, were satisfactory in 1987. One hundred and sixty-eight analyses were performed on air particulate filters, food, milk, urine, and water. Based upon this sample analysis total, 166 analyses (i.e., 99.0%) met the EPA's definition of mean value criteria. The sample analyses that did not meet the criteria were a Ru-106 analysis in a water sample and a gross beta analysis, also in a water sample. A recount of the beta samples yielded measurements that met the above criteria. (Details of this may be found in Reference 2.)

Blind Duplicate Program

A total of 49 paired samples were submitted by the five participating plants for analysis during 1987. The data base used for the duplicate analyses consisted of paired measurements of 26 gamma emitting nuclides, H-3, Sr-89, Sr-90, low level I-131 and gross beta. A dual level criteria for agreement was established. If the paired measurements fall within ± 15 percent of their average value, then agreement between the measurements has been met. If the value falls outside of the ± 15 percent, then a two standard deviation range (95 percent confidence level) is established for each of the analyses. If the ranges overlap, agreement is obtained.

One thousand two hundred and forty-two paired duplicate measurements were analyzed for 1987. A total of 99.5 percent of all measurements fell within the established criteria discussed above. The six measurements that did not meet the criteria were measurements of Ag-110m in milk, Mo-99 in milk, Fe-59 in ground water, Sb-124 in estuary water, Fe-59 in seawater, and Mo-99 in mussel bodies. In all of the above cases, the radionuclide in question was not detected in the sample and a three-standard deviation acceptance criteria was met. The six duplicate measurements represent 0.5 percent of all the blind duplicate paired measurements made during 1987. No trend was evident with respect to repeated failings of measurements for the above radionuclides.

Table 4.1

Intralaboratory and EPA Interlaboratory Results - 1987

Accuracy

Total Number of Measurements	0 to 5%	0 to 10%	0 to 15%*
729	450	637	701
	(61.7%)	(87.4%)	(96.2%)

Precision

Total Number of Measurements	0 to 5%	0 to 10%	0 to 15%*
721	623	703	718
	(86.4%)	(97.5%)	(99.6%)

* This category also contains those samples having a verified zero concentration which were analyzed and found not to contain the isotope of interest.

5.0 LAND USE CENSUS

The Vermont Yankee Technical Specifications require that a Land Use Census be conducted annually between June 1 and October 1 of each year. The census identifies the location of the nearest milk animal and the nearest residence in each of the 16 meteorological sectors within 5 miles of the plant. It also identifies the nearest milk animal (within 3 miles of the plant) to the point of predicted highest annual average D/Q value in each of the three major meteorological sectors due to elevated releases from the plant stack. Dosimetric analyses are then carried out to determine whether any identified milk animal represents a significantly better milk sampling location than those currently being used.

The 1987 Land Use Census at Vermont Yankee was carried out between the dates of June 1 and October 1, as required by Technical Specifications. The identified locations can be found in Table 5.1. As a result of the dosimetric comparisons, no changes were required or made in the milk sampling locations.

Table 5.1

Vermont Yankee
1987 Land Use Census Results

Sector	Nearest Residence (km)	Milk Animals	
		km	Cow or Goat
N	1.6	*	--
NNE	1.6	*	--
NE	1.3	4.2	Goats
ENE	1.0	*	--
E	1.0	2.4	Cows
ESE	2.8	*	--
SE	1.8	3.4	Cows
SE	--	4.3	Goats
SSE	2.0	5.1	Cows
S	0.5	*	--
SSW	0.5	2.1	Cows
SSW	--	2.4	Cows
SW	0.5	7.2	Cows
WSW	0.5	*	--
W	0.5	7.2	Goats
WNW	0.6	0.8	Cows
WNW	--	4.7	Cows
NW	1.2	4.7	Cows
NNW	2.1	*	--

* No milk animals found within 5 miles.

6.0 SUMMARY

During 1987, samples collected as a part of the radiological environmental monitoring program at Vermont Yankee showed detectable levels of man-made radionuclides in cow milk, mixed vegetation, fish, and sediment. As reported in the past for sediment, low levels of Co-60, Zn-65, and Cs-134 were detected in the immediate vicinity of the North Storm Drain Outfall. The radioactivity from this drain has been detected only at this location. In all other cases, the low levels detected were shown to originate from fallout from atmospheric nuclear weapons tests conducted during the 1970s and 1980, or from fallout from the Chernobyl nuclear plant accident in 1986. The radiological environmental monitoring program has therefore demonstrated that plant operations have had no significant impact on the environment.

7.0 REFERENCES

1. Annual Radiological Environmental Surveillance Report, 1986, Vermont Yankee Nuclear Power Corporation.

2. YAEL Quarterly Status Report, April-June 1987, Environmental Laboratory Group, Yankee Atomic Electric Company.

3. YAEL Quarterly Status Report, October-December 1987, Environmental Laboratory Group, Yankee Atomic Electric Company.

VERMONT YANKEE NUCLEAR POWER CORPORATION

VERMONT YANKEE NUCLEAR POWER STATION

VERNON, VERMONT