1986 ANNUAL ENVIRONMENTAL REPORT
RADIOLOGICAL - VOLUME #2

DUQUESNE LIGHT COMPANY
BEAVER VALLEY POWER STATION

DUQUESNE LIGHT COMPANY
1986 Annual Radiological Environmental Report

EXECUTIVE SUMMARY

This report describes the Radiological Environmental Monitoring Program conducted during 1986 in the vicinity of the Beaver Valley Power Station. The Radiological Environmental Program consists of off-site monitoring of water, air, river sediments, soils, food pathway samples, and radiation levels in the vicinity of the site. This report discusses the results of this monitoring during 1986.

Duquesne Light Company operates the Beaver Valley Power Station Unit 1 pressurized water reactor as part of the Central Area Power Coordination Group. Beaver Valley Power Station Unit 2 was under construction in 1986 and is scheduled to start up in 1987.

The Beaver Valley Power Station Unit 1 operated throughout 1986 except for May 17 - August 26, 1986, when the unit was shutdown for the Fifth Refueling and Ten-Year Inservice Inspection Outage. The highest average daily output generated during the year was 838 megawatts net in November, 1986, and the total gross electrical generation during the year was 5,091,830 megawatt-hours.

In prior years, Duquesne Light Company conducted a joint environmental monitoring program for the Beaver Valley Power Station and the Shippingport Atomic Power Station. However, following issuance of the 1985 Annual Radiological Environmental Report, the joint program was discontinued, thus reference to the Shippingport Station has been deleted. See Section I, page 1 for specific detail.

EXECUTIVE SUMMARY (continued)

On April 25, 1986, a serious accident occurred at the Chernobyl Nuclear Plant in the Soviet Union resulting in a release of radioactive materials to the atmosphere. Subsequently measurable levels of activity attributable to the accident were detected in the environment throughout the Northern Hemisphere. See Section V for details on fallout data in the Beaver Valley Power Station area and pages 69, 70, 87 and 107 for graphical depictions on selected radionuclides.

During the year, the radioactive releases from BVPS Unit 1 were below the limits of 10 CFR Part 50, Appendix I and did not exceed the Limiting Conditions for Operation identified in the Beaver Valley Power Station Unit 1 Operating License Technical Specifications. The maximum total body dose calculated for an individual from the Beaver Valley Power Station Unit 1 releases in 1986 was less than 0.05 mrem which is less than 1% of the BVPS Unit 1 Technical Specifications and 10 CFR Part 50, Appendix I annual limits. See Section I for specific details. The National Academy of Sciences 1980 BEIR Report shows that the typical dose to an individual from natural radiation exposure is 101 mrem per year.

EXECUTIVE SUMMARY (continued)

The environmental monitoring program outlined in the Beaver Valley Power Station Unit 1 Technical Specifications was followed throughout 1986. The results of the program are consistent with those of previous years with the exception of the observed fallout from the Chernobyl Nuclear Plant accident. Examination of effluents and environmental media show that the Beaver Valley Power Station Unit 1 operations have not adversely affected the surrounding environment.

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I. INTRODUCTION

The 1986 Annual Radiological Environmental Report for the Beaver Valley Power Station summarizes the radiological environmental program conducted by the Duquesne Light Company in 1986.

In prior years Duquesne Light Company conducted a joint environmental monitoring program for Beaver Valley Power Station and the Shippingport Atomic Power Station.

The Shippingport Atomic Power Station was permanently shutdown on October 1, 1982. Responsibility for the decommissioning of the Shippingport Atomic Power Station rests with the U.S. Department of Energy, Richland Operations Office. General Electric was awarded the contract to conduct the decommissioning activity. General Electric preselected Morrison-Knudsen as its integrated subcontractor. General Electric assumed custody of the plant on September 6, 1984 and received permission to begin physical decommissioning on September 17, 1985. Following issue of the 1985 Annual Radiological Report, the joint environmental monitoring program was discontinued. General Electric now conducts its own environmental monitoring program consistent with decommissioning requirements. Therefore, reference to the Shippingport Atomic Power Station has been deleted from the 1986 annual report. The Duquesne Light Company environmental monitoring program for Beaver Valley Power Station will remain otherwise unchanged.

I. INTRODUCTION

A. Scope and Objectives of the Program

The environmental program consists of environmental monitoring for radioactivity in the vicinity of the Beaver Valley Power Station. Environmental sampling and analyses included air, water, milk, soil, vegetation, river sediments, fish, and ambient radiation levels in areas surrounding the site.

B. Description of the Beaver Valley Site

The Beaver Valley Power Station is located on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania, on a 501 acre tract of land. Figure 1.0 is a view of the Beaver Valley Power Station. The site is approximately one mile from Midland, Pennsylvania; 5 miles from East Liverpool, Ohio; and 25 miles from Pittsburgh, Pennsylvania. Figure 1.1 shows the site location in relation to the principal population centers. Population density in the immediate vicinity of the site is relatively low. The population within a 5 mile radius of the plant is approximately 18,000 and the only area within that radius of concentrated population is the Borough of Midland, Pennsylvania, with a population of approximately 4,300.

The site lies in a valley along the Ohio River. It extends from the river (elevation 665 feet above sea level) to a ridge along the border south of the Beaver Valley Power Station at an elevation of 1,160 feet. Plant ground level is approximately 735 feet above sea level.

The Beaver Valley Power Station is on the Ohio River at river mile 34.8, at a location on the New Cumberland Pool that is 3.3 river miles downstream from Montgomery Lock and Dam, and 19.4 miles upstream from New Cumberland Lock and Dam. The Pennsylvania-Ohio-West Virginia border is located 5.2 river miles downstream from the site. The river flow is regulated by a series of dams and reservoirs on the Beaver, Allegheny, Monongahela and Ohio Rivers and their tributaries. Flow ranges from a minimum of 5000 cubic feet per second (CFS) to a maximum of 100,000 CFS. The mean annual flow is approximately 25,000 CFS.

I. INTRODUCTION

B. Description of the Beaver Valley Site (continued)

Water temperature of the Ohio River varies from 32°F to 84°F, the minimum temperatures occur in January and/or February and maximum temperatures in July and August. Water quality in the Ohio River at the site location is affected primarily by the water quality of the Allegheny, Monongahela, and Beaver rivers.

The climate of the area may be classified as humid continental. Annual precipitation is approximately 36 inches, typical yearly temperatures vary from approximately -3°F to 95°F with an annual average temperature of 52.8°F. The predominant wind direction is typically from the southwest in summer and from the northwest in winter.

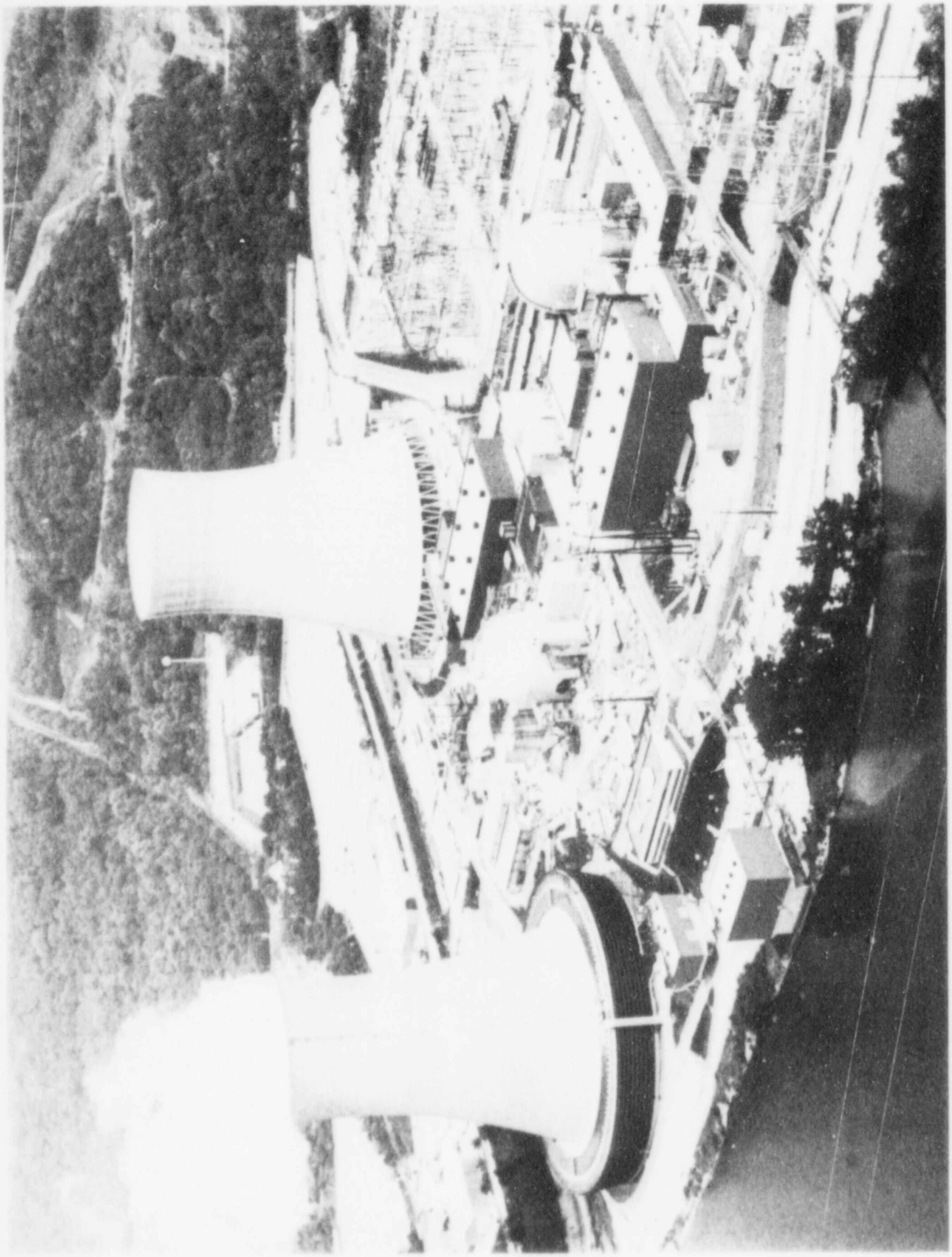

FIGURE 1.0

VIEW OF THE BEAVER VALLEY POWER STATION
BVPS

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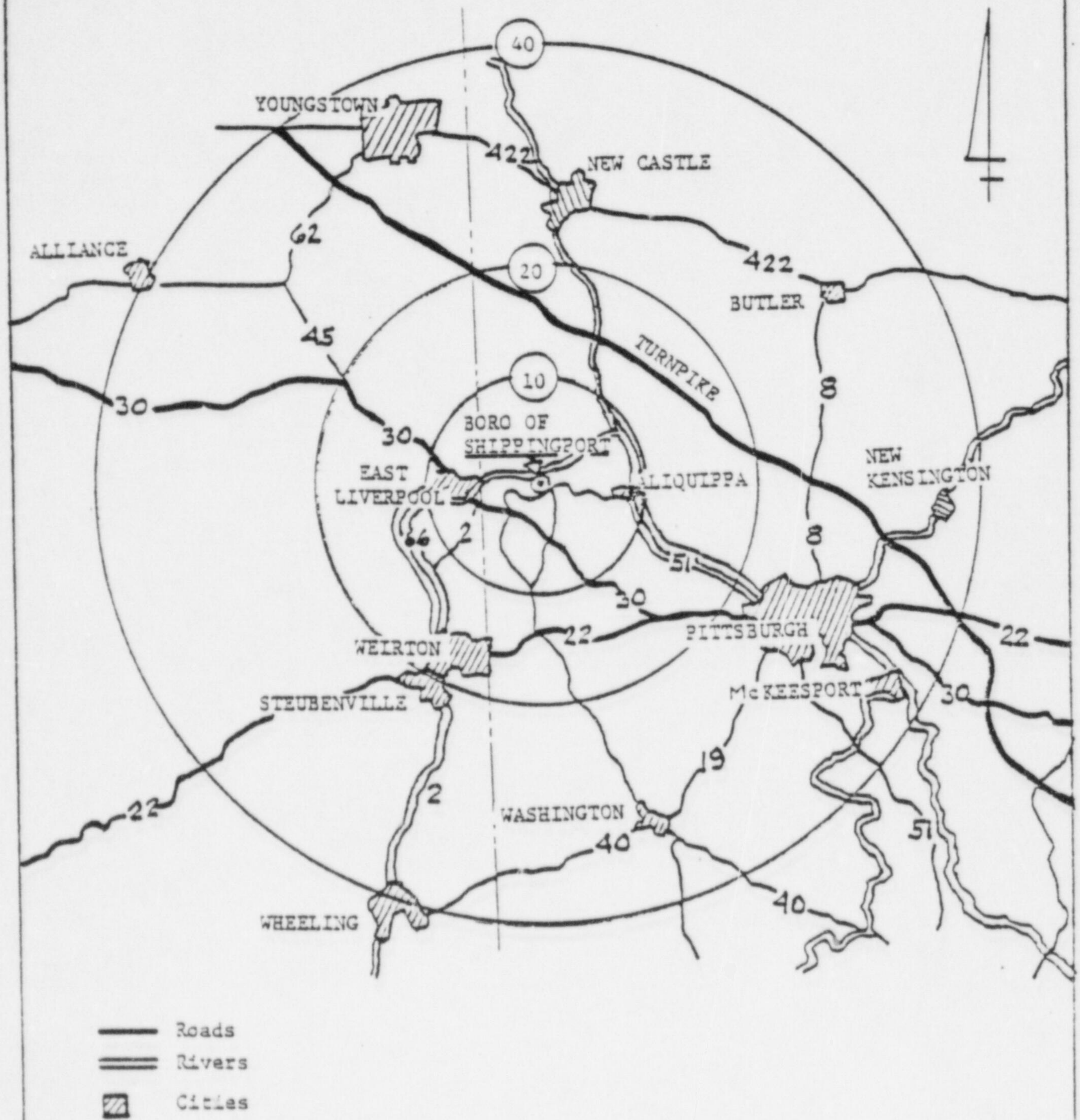

GEOGRAPHICAL MAP AND PRINCIPAL COMMUNITIES IN 40-MILE RADIUS OF THE BEAVER VALLEY POWER STATION

FIGURE 1.1

I. INTRODUCTION

B. Description of the Beaver Valley Site (continued)

The design ratings and basic features of the Beaver Valley Power Station are tabulated below:

	Beaver Valley
Thermal & Elec. Rating (Net MW_e)	2660 MW_t 835 MW_e
Type of Reactor	PWR
Number of Reactor Coolant Loops	3
Number of Steam Generators and Type	3 - Vertical
Steam Used by Main Turbine	Saturated

The station utilizes two separate systems (primary and secondary) for transferring heat from the source (the reactor) to the receiving component (turbine-generator). Because the two systems are isolated from each other, primary and secondary waters do not mix; therefore, radioactivity in the primary system water is normally isolated from the secondary system. Reactor coolant in the primary system is pumped through the reactor core and steam generators by means of reactor coolant pumps. Heat is given up from the primary system to the secondary system in the steam generators, where steam is formed and delivered to the main unit turbine, which drives the electrical generator. The steam is condensed after passing through the turbine, and returned to the steam generators to begin another steam/water cycle.

NOTE: MW_t - megawatts thermal

MW_e - megawatts electrical

II. RESULTS AND CONCLUSIONS

Plant operations at the Beaver Valley Power Station had no adverse effects on the environment as a result of activity at the station during 1986. Comparisons of pre-operational data with operational data indicates the ranges of values are in good agreement for both periods of time.

The Beaver Valley Power Station operated throughout 1986 except for May 17 - August 26, 1986 when the station was shutdown for the Fifth Refueling and Ten-Year Inservice Inspection. During the year, the radioactive releases were below the limits of 10 CFR Part 50, Appendix`I. The releases at Beaver Valley Power Station did not exceed the limiting conditions identified in the Beaver Valley Power Station Operating License Technical Specifications.

The environmental program for 1986 was the same as in 1985 except for several changes in dairy locations which were revised as required by the Beaver Valley Technical Specifications. (Refer to Table V.A.1 for the 1986 Radiological Monitoring Program Outline).

The Beaver Valley Power Station Technical Specifications require sampling of three (3) dairies which have the highest calculated milk pathway potential and one large local dairy. The three dairies are determined from calculations based on the meteorological data and the latest milch animal survey. However, these dairies are frequently small, consisting of as few as one cow or goat. The availability of milk from single cow dairies and revisions due to updated calculations and surveys normally result in sampling of several additional dairies during the year in different sampling periods.

The Environmental Monitoring Program also includes two larger dairies in order to provide continuity in the sampling/analyses program and a control location. Samples from each of these dairies are obtained in addition to the four dairies required by the Environmental Technical Specifications. The collection periods associated with each of the locations are provided in the detailed summary of the milk monitoring program of this report (Section V-E).

II. RESULTS AND CONCLUSIONS (continued)

On April 25, 1986 a serious accident occurred at the Chernobyl Nuclear Plant in the Soviet Union resulting in a release of radioactive materials to the atmosphere. The radioactive plume dispersed throughout the Northern Hemisphere and subsequently measurable levels of radioactivity were detected in environmental media across the United States. Those levels of radioactivity attributable to the Chernobyl accident around the Beaver Valley Power Station were reported to the NRC in accordance with IE Information Notice No. 86-32, "Request for Collection of Licensee Radioactivity Measurements Attributed to the Chernobyl Nuclear Plant Accident" and are discussed in Section V of this report.

The results of the 1986 Radiological Environmental Monitoring Program are consistent with those of previous years. The only radioactivity above normal ambient levels in the environs other than world-wide fallout from previous Nuclear weapons tests and the April 25, 1986 Chernobyl Nuclear Plant accident was detected in the Beaver Valley Power Station discharge area and resulted in negligible exposure to members of the public. A summary of the 1986 operational environmental data (ranges and means) for each sampling media is found in Table V.A.2. A summary of preoperational (1974 - 1975) environmental data is found in Table V.A.3.

Examination of effluents from the Beaver Valley Power Station and environmental media demonstrated compliance with regulations and Station Technical Specifications.

III. ENVIRONMENTAL MONITORING CONSIDERATIONS

A. Environmental Quality Control Programs

The Quality Control (QC) Program used for the Beaver Valley Environmental Radioactivity Monitoring Program consisted of seven (7) elements. It should be noted that the comparisons made were at very low levels of radioactivity and consequently, the activities at these levels are difficult to measure. However, acceptable correlation was achieved in most instances as outlined in the discussions and tables which follow.

1. TLD Monitoring (Duquesne Light Company (DLC) Contractor Laboratory and QC Laboratory)

Thirteen (13) TLDs from the Contractor Laboratory and QC Laboratory are co-located, replaced quarterly and results compared. The arithmetic mean of these two systems agrees within ± 7%. This is well within the precision of typical TLD Systems. Summary data of the TLD Monitoring Program is provided in Table III.1.

2. Split Sample Program (DLC Contractor Laboratory - DLC QC Laboratory)

Samples of surface (river) water and drinking water were routinely split and analyzed by the DLC Contractor Laboratory and the DLC QC Laboratory. In addition, samples of other media, such as milk, soil, sediment and feedcrop were also split with the DLC QC Laboratory.

A summary of results of split water samples is provided in Table III.2. A summary of milk, sediment and feed/food crop split samples is provided in Table III.3. Some variation is expected due to small variations in duplicate samples, variations in analytical procedures, and in calibration, source type, etc.

There was one poor gross beta comparison for a March drinking water sample shown on Table III.2. The reason is not known; however, the June, August and November samples were in good agreement as were the June and December spiked gross beta water samples shown on Table III.4. Because of the overall uniformity of comparable results, it is concluded that the two laboratories are consistent and in agreement.

TABLE III.1
QUALITY CONTROL RESULTS
TLD MONITORING
mR/Day

1ST QUARTER

Location No.	DLC Contractor ($CaSO_4$:Dy)	DLC QC Lab ($CaSO_4$:Dy)
10	0.17	0.20
13	0.15	0.18
14	0.17	0.17
15	0.13	0.13
27	0.16	0.17
28	0.18	0.19
29	0.21	0.23
32	0.20	0.21
45	0.18	0.21
46	0.15	0.16
47	0.18	0.20
48	0.18	0.18
51	0.18	0.20

2ND QUARTER

Location No.	DLC Contractor ($CaSO_4$:Dy)	DLC QC Lab ($CaSO_4$:Dy)
10	0.17	0.21
13	0.16	0.18
14	0.15	0.18
15	0.12	0.15
27	0.18	0.20
28	0.17	0.20
29	0.20	0.22
32	0.17	0.23
45	0.17	0.23
46	*	*
47	0.18	0.23
48	0.17	0.21
51	0.16	0.21

3RD QUARTER

Location No.	DLC Contractor ($CaSO_4$:Dy)	DLC QC Lab ($CaSO_4$:Dy)
10	0.16	0.21
13	0.16	0.19
14	0.17	0.20
15	0.14	0.15
27	0.16	0.19
28	0.18	0.22
29	0.21	0.25
32	0.18	0.22
45	0.18	0.21
46	*	*
47	0.18	0.22
48	0.18	0.21
51	0.18	0.21

4TH QUARTER

Location No.	DLC Contractor ($CaSO_4$:Dy)	DLC QC Lab ($CaSO_4$:Dy)
10	0.16	0.20
13	0.16	0.17
14	0.15	0.17
15	0.13	0.14
27	0.17	0.18
28	0.16	0.19
29	0.19	0.21
32	0.18	0.20
45	0.15	0.21
46	0.16	0.14
47	0.17	0.21
48	0.18	0.20
51	0.17	0.19

* TLD Missing

TABLE III.2
QUALITY CONTROL RESULTS
SPLIT SAMPLE ANALYSIS RESULTS

Comparison of Contractor and DLC-QC Labs

Media	Analysis	Sampling Period	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
Surface Water	Gross Alpha	January	≤ 1.7	≤ 0.9	pCi/l
		April	≤ 1.9	1.3 ± 0.8	pCi/l
		July	≤ 1.6	≤ 0.6	pCi/l
		October	≤ 1.7	0.9 ± 0.9	pCi/l
Surface Water	Gross Beta	January	3.4 ± 1.1	3.2 ± 0.8	pCi/l
		April	9.4 ± 0.8	6.0 ± 0.9	pCi/l
		July	3.7 ± 1.1	2.5 ± 0.8	pCi/l
		October	7.1 ± 1.6	3.3 ± 0.7	pCi/l
Surface Water	Co-60	January	≤ 4.0	≤ 0.8	pCi/l
		April	≤ 5.0	≤ 1.2	pCi/l
		July	≤ 4.0	≤ 1.8	pCi/l
		October	≤ 4.0	≤ 1.9	pCi/l
Surface Water	Cs-134	January	≤ 4.0	≤ 0.7	pCi/l
		April	≤ 4.0	≤ 1.2	pCi/l
		July	≤ 3.0	≤ 1.6	pCi/l
		October	≤ 3.0	≤ 1.7	pCi/l
Surface Water	Cs-137	January	≤ 3.0	≤ 0.7	pCi/l
		April	≤ 4.0	≤ 1.2	pCi/l
		July	≤ 3.0	≤ 1.8	pCi/l
		October	≤ 3.0	≤ 1.8	pCi/l
Surface Water	Tritium	1st Quarter Composite	160 ± 80	162 ± 89	pCi/l
		3rd Quarter Composite	670 ± 70	538 ± 114	pCi/l
Surface Water	Sr-89	2nd Quarter Composite	≤ 2.0	≤ 0.4	pCi/l
		4th Quarter Composite	≤ 2.0	≤ 0.8	pCi/l
Surface Water	Sr-90	2nd Quarter Composite	≤ 0.36	≤ 0.5	pCi/l
		4th Quarter Composite	≤ 0.5	≤ 0.7	pCi/l
Surface Water	Co-60 (high sensitivity analysis)	2nd Quarter Composite	8.85 ± 2.31	7.2 ± 2.0	pCi/l
		4th Quarter Composite	≤ 1.0	≤ 0.7	

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.2 (Continued)
QUALITY CONTROL RESULTS
SPLIT SAMPLE ANALYSIS RESULTS

Comparison of Contractor and DLC-QC Labs

Media	Analysis	Sampling Period	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
Drinking Water (Weekly Split)	Cs-137	February	≤ 4.0	≤ 0.9	pCi/l
		May	≤ 5.0	≤ 0.7	pCi/l
		August	≤ 4.0	≤ 0.9	pCi/l
		November	≤ 3.0	≤ 0.6	pCi/l
Drinking Water (Weekly Split)	Cs-134	February	≤ 4.0	≤ 0.8	pCi/l
		May	≤ 5.0	≤ 0.8	pCi/l
		August	≤ 3.0	≤ 0.9	pCi/l
		November	≤ 3.0	≤ 0.7	pCi/l
Drinking Water (Weekly Split)	Co-60	February	≤ 4.0	≤ 0.9	pCi/l
		May	≤ 4.0	≤ 0.8	pCi/l
		August	≤ 4.0	≤ 0.8	pCi/l
		November	≤ 3.0	≤ 0.6	pCi/l
Drinking Water (Monthly Composite)	Gross Alpha	March	≤ 1.5	≤ 0.5	pCi/l
		June	≤ 1.6	≤ 1.0	pCi/l
		August	≤ 1.6	≤ 0.9	pCi/l
		November	≤ 2.0	≤ 0.8	pCi/l
Drinking Water (Monthly Composite)	Gross Beta	March	3.5 ± 0.5*	1.1 ± 0.9	pCi/l
		June	3.6 ± 1.2	3.6 ± 1.4	pCi/l
		August	4.9 ± 1.7	1.9 ± 1.0	pCi/l
		November	4.6 ± 1.3	2.1 ± 1.1	pCi/l
Drinking Water (Quarterly Composite)	Tritium	2nd Quarter	160 ± 10	120 ± 111	pCi/l
		4th Quarter	≤ 200	115 ± 90	pCi/l

* Refer to Section III.A.2.

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.3
QUALITY CONTROL RESULTS
SPLIT SAMPLE ANALYSIS RESULTS

Comparison of Contractor and DLC-QC Labs

Media	Analysis	Sampling Period	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
Milk (Location 25)	I-131	3-18-86	≤ 0.18	≤ 0.16	pCi/l
	Sr-89	3-18-86	≤ 1.7	≤ 0.17	pCi/l
	Sr-90	3-18-86	3.0 ± 0.8	2.66 ± 0.50	pCi/l
	Cs-134	3-18-86	≤ 4.0	≤ 1.3	pCi/l
	Cs-137	3-18-86	≤ 4.0	≤ 1.4	pCi/l
	Co-60	3-18-86	≤ 5.0	≤ 1.3	pCi/l
	K-40	3-18-86	1430 ± 140	1370 ± 70	pCi/l
Milk (Location 25)	Cs-134	6-24-86	≤ 8.0	≤ 2.1	pCi/l
	Cs-137	6-24-86	≤ 7.0	≤ 2.6	pCi/l
	Co-60	6-24-86	≤ 7.0	≤ 3.3	pCi/l
	K-40	6-24-86	1280 ± 130	1340 ± 130	pCi/l
Feed (Location 25)	Be-7	6-24-86	1.56 ± 0.28	0.87 ± 0.31	pCi/gm Dry
	K-40	6-24-86	15.2 ± 1.5	10.9 ± 0.6	pCi/gm Dry
	I-131	6-24-86	0.012 ± 0.003	≤ 0.015	pCi/gm Dry
	Co-60	6-24-86	≤ 0.03	≤ 0.008	pCi/gm Dry
	Cs-134	6-24-86	≤ 0.03	≤ 0.010	pCi/gm Dry
	Cs-137	6-24-86	0.073 ± 0.023	0.050 ± 0.040	pCi/gm Dry
	Ru-103	6-24-86	≤ 0.05	0.042 ± 0.013	pCi/gm Dry
Feed (Location 25)	Sr-90	4-21-86 to 6-24-86	0.12 ± 0.01	0.16 ± 0.03	pCi/gm Dry
Food (Location 25)	I-131	9-03-86	≤ 0.011	≤ 0.018	pCi/gm Wet
	K-40	9-03-86	2.12 ± 0.21	1.80 ± 0.23	pCi/gm Wet
	Co-60	9-03-86	≤ 0.005	≤ 0.006	pCi/gm Wet
	Cs-134	9-03-86	≤ 0.005	≤ 0.006	pCi/gm Wet
	Cs-137	9-03-86	≤ 0.005	≤ 0.006	pCi/gm Wet

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.3 (Continued)
QUALITY CONTROL RESULTS
SPLIT SAMPLE ANALYSIS RESULTS

Comparison of Contractor and DLC-QC Labs

Media	Analysis	Sampling Period	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
Milk (Location 25)	I-131	9-22-86	≤ 0.28	≤ 0.27	pCi/l
	Sr-89	9-22-86	≤ 1.3	≤ 0.28	pCi/l
	Sr-90	9-22-86	2.5 ± 0.8	2.3 ± 0.64	pCi/l
	Cs-134	9-22-86	≤ 0.4	≤ 3.2	pCi/l
	Cs-137	9-22-86	≤ 0.5	≤ 4.3	pCi/l
	Co-60	9-22-86	≤ 0.4	≤ 3.6	pCi/l
	K-40	9-22-86	1230 ± 120	1350 ± 90	pCi/l
Sediment (Location 2)	Gross Alpha	10-30-86	22 ± 8	16.3 ± 4.7	pCi/gm Dry
	Gross Beta	10-30-86	35 ± 3	23.5 ± 3.1	pCi/gm Dry
	U-235	10-30-86	0.04 ± 0.02	≤ 0.02	pCi/gm Dry
	U-234	10-30-86	0.68 ± 0.07	0.83 ± 0.16	pCi/gm Dry
	U-238	10-30-86	0.53 ± 0.06	0.48 ± 0.12	pCi/gm Dry
	Sr-89	10-30-86	≤ 0.16	≤ 0.005	pCi/gm Dry
	Sr-90	10-30-86	≤ 0.054	0.021 ± 0.006	pCi/gm Dry
	Co-58	10-30-86	0.09 ± 0.03	0.17 ± 0.01	pCi/gm Dry
	Co-60	10-30-86	1.24 ± 0.12	2.89 ± 0.04	pCi/gm Dry
	Cs-134	10-30-86	0.11 ± 0.03	≤ 0.008	pCi/gm Dry
	Cs-137	10-30-86	0.44 ± 0.04	0.42 ± 0.02	pCi/gm Dry
	Mn-54	10-30-86	≤ 0.03	≤ 0.03	pCi/gm Dry
	K-40	10-30-86	15.7 ± 1.6	12.6 ± 0.3	pCi/gm Dry
Milk (Location 25)	I-131	12-15-86	≤ 0.26	≤ 0.15	pCi/l
	Cs-134	12-15-86	≤ 5	≤ 2.0	pCi/l
	Cs-137	12-15-86	6.41 ± 3.67	≤ 2.3	pCi/l
	Co-60	12-15-86	≤ 4	≤ 2.4	pCi/l
	K-40	12-15-86	1330 ± 130	1250 ± 120	pCi/l

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

III. ENVIRONMENTAL MONITORING PROGRAMS

A. Environmental Quality Control Programs (continued)

3. DLC QC Laboratory Program

Spiked samples prepared by DLC QC Laboratory were routinely submitted to the Contractor Laboratory for analysis. Tables III.4 (water) and III.5 (milk) provide data from this portion of the QC Program. The overall results demonstrate that the contractor performed acceptably in the program.

4. Comparisons of Similar Samples (DLC Contractor Laboratory - DLC QC Laboratory)

Duplicate air particulate and charcoal filters (radioiodine) samples were collected at Location #30 and compared during the year on a weekly basis. Comparison of particulate and charcoal samples alternated from week to week. Duplicate monthly air particulate filters, composited from the weekly air particulate filters, were analyzed 6 months out of the year for gamma activity. Duplicate quarterly air particulate filters, composited from the weekly air particulate filters, were analyzed for Sr-89 and Sr-90 activity for each quarter of the year. Table III.6 provides data for this portion of the QC program. The results show generally good agreement between the laboratories and demonstrate that the contractor performed acceptably in the program.

5. Contractor Internal QC Program

The Contractor Laboratory maintained its own QC Program which included participation in the Environmental Protection Agency - Environmental Monitoring Safety Laboratory (EPA - EMSL) Interlaboratory Cross Check Program. This cross check program indicated that the Contractor results were in agreement with EPA EMSL. DLC also audited the Contractor Laboratory and determined that internal QC practices were in effect and that procedures and laboratory analytical techniques conformed to approved DLC procedures.

III. ENVIRONMENTAL MONITORING CONSIDERATIONS

A. Environmental Quality Control Programs (continued)

6. Special QC Program (DLC Contractor Laboratory - Independent Laboratory - DLC QC Laboratory)

Milk and water samples were prepared quarterly by an Independent Laboratory. This included low level spiking of specified nuclides. The prepared samples were split three ways and analyzed by the DLC-QC Laboratory and Independent Laboratory as well as the Contractor Laboratory.

A summary of results of this portion of the QC program is provided in Table III.7. The results show generally good agreement between the laboratories and demonstrate that the contractor performed acceptably in the program.

TABLE III.4
QUALITY CONTROL RESULTS
SPIKE SAMPLE ANALYSIS RESULTS

Sample Date	Ident. No.	Sample Type and Analysis	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
12-31-85	W-13	Water: Gross Alpha	15 ± 1	10.6 ± 0.6	pCi/l
		Gross Beta	14 ± 1	12.0 ± 1.4	pCi/l
3-01-86	W-14	Water: Sr-89	≤ 1.9	1.6 ± 0.4	pCi/l
		Sr-90	3.1 ± 0.4	2.4 ± 0.2	pCi/l
4-28-86	W-15	Water: I-131	40 ± 1	44.9 ± 2.4	pCi/l
		K-40	≤ 60	100 ± 14	pCi/l
		Co-60	9.22 ± 3.24	10.6 ± 1.7	pCi/l
		Cs-134	24.9 ± 5.5	30.2 ± 2.4	pCi/l
		Cs-137	24.4 ± 4.1	21.9 ± 1.9	pCi/l
6-11-86	W-16	Water: Gross Alpha	20 ± 3	16.2 ± 0.7	pCi/l
		Gross Beta	35 ± 2	38.4 ± 3.5	pCi/l
9-30-86	W-18	Water: Cs-134	42.2 ± 5.7	34.7 ± 5.6	pCi/l
		Cs-137	46.0 ± 4.9	51.1 ± 7.0	pCi/l
10-28-86	W-19	Water: Sr-89	13.0 ± 1	13.6 ± 4.1	pCi/l
		Sr-90	5.2 ± 0.5	6.4 ± 1.6	pCi/l
11-18-86	W-20	Water: H-3	3500 ± 100	3855 ± 180	pCi/l
10-31-86	W-21	Water: Co-60	19.4 ± 4.8	19.2 ± 2.2	pCi/l
		Cs-134	32.1 ± 4.7	31.7 ± 5.2	pCi/l
		Cs-137	23.4 ± 4.1	23.8 ± 1.0	pCi/l

Note - W-17 was an internal spike used only by the DLC-QC Lab.

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.5
QUALITY CONTROL RESULTS
SPIKE SAMPLE ANALYSIS

Sample Date	Ident. No.	Sample Type and Analysis	DLC Contractor Lab (1)	DLC - QC Lab (1)	Units
2-26-86	MI-6	Milk: Sr-89	4.3	6.0 ± 1.9	pCi/l
		Sr-90	11 ± 1	14.2 ± 1.7	pCi/l
		I-131	30 ± 1.0	34.2 ± 3.8	pCi/l
		Cs-134	33.9 ± 5.4	32.0 ± 1.8	pCi/l
		Cs-137	40.7 ± 5.2	35.8 ± 2.1	pCi/l
		K-40	1320 ± 130	1260 ± 110	pCi/l
4-28-86	MI-7	Milk: I-131	40 ± 1	39.7 ± 3.3	pCi/l
		K-40	1320 ± 130	1350 ± 70	pCi/l
		Cs-134	23.1 ± 7.2	28.7 ± 2.8	pCi/l
		Cs-137	27.7 ± 2.8	21.2 ± 2.8	pCi/l
6-30-86	MI-9	Milk: Sr-89	≤ 1.9	≤ 1.0	pCi/l
		Sr-90	13 ± 1	12.6 ± 1.8	pCi/l
		I-131	38 ± 2	38.9 ± 7.0	pCi/l
		Cs-134	35.3 ± 4.5	33.0 ± 3.4	pCi/l
		Cs-137	40.2 ± 4.8	38.5 ± 2.8	pCi/l
		K-40	369 ± 48	380 ± 30	pCi/l
10-28-86	MI-10	Milk: Sr-89	*	12.3 ± 1.8	pCi/l
10-28-86	MI-11	Milk: Sr-90	15.0 ± 2	12.3 ± 1.8	pCi/l

NOTE - MI-8 was an internal spike used only by the DLC-QC Lab.

* MI-10 - Sample was not analyzed, MI-11 replaced MI-10

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.6
QUALITY CONTROL RESULTS
AIR PARTICULATES AND CHARCOAL FILTER: COMPARABLE SAMPLES

Air Beta (pCi/m^3)			Air Iodine (pCi/m^3)		
Sample Date	DLC Contractor Lab (1)	DLC - QC Lab (1)	Sample Date	DLC Contractor Lab (1)	DLC - QC Lab (1)
12-30-85 to 1-06-86	0.017 ± 0.003	0.023 ± 0.004	1-06-86 to 1-13-86	≤ 0.02	≤ 0.03
1-13-86 to 1-20-86	0.016 ± 0.004	0.020 ± 0.003	1-20-86 to 1-27-86	≤ 0.01	≤ 0.03
1-27-86 to 2-03-86	0.018 ± 0.004	0.018 ± 0.003	2-03-86 to 2-10-86	≤ 0.01	≤ 0.03
2-10-86 to 2-18-86	0.022 ± 0.003	0.021 ± 0.003	2-18-86 to 2-24-86	≤ 0.01	≤ 0.03
2-24-86 to 3-03-86	0.018 ± 0.004	0.018 ± 0.003	3-03-86 to 3-10-86	≤ 0.01	≤ 0.03
3-10-86 to 3-17-86	0.014 ± 0.003	0.015 ± 0.002	3-17-86 to 3-24-86	≤ 0.01	≤ 0.03
3-24-86 to 3-31-86	0.022 ± 0.004	0.023 ± 0.004	3-31-86 to 4-07-86	≤ 0.02	≤ 0.03
4-07-86 to 4-14-86	0.009 ± 0.003	0.008 ± 0.002	4-14-86 to 4-21-86	≤ 0.02	≤ 0.03
4-21-86 to 4-28-86	0.019 ± 0.003	0.025 ± 0.004	4-28-86 to 5-05-86	≤ 0.02	≤ 0.03
5-05-86 to 5-12-86	0.12 ± 0.01	0.100 ± 0.006	5-12-86 to 5-19-86	0.346 ± 0.035	0.46 ± 0.09
5-19-86 to 5-27-86	0.10 ± 0.01	0.136 ± 0.007	5-27-86 to 6-02-86	≤ 0.06	≤ 0.04
6-02-86 to 6-09-86	0.095 ± 0.006	0.099 ± 0.006	6-09-86 to 6-16-86	≤ 0.03	≤ 0.03

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.6 (Continued)
QUALITY CONTROL RESULTS
AIR PARTICULATES AND CHARCOAL FILTER: COMPARABLE SAMPLES

Air Beta (pCi/m^3)			Air Iodine (pCi/m^3)		
Sample Date	DLC Contractor Lab (1)	DLC - QC Lab (1)	Sample Date	DLC Contractor Lab (1)	DLC - QC Lab (1)
6-16-86 to 6-23-86	0.027 ± 0.004	0.025 ± 0.004	6-23-86 to 6-30-86	≤ 0.02	≤ 0.03
6-30-86 to 7-08-86	0.022 ± 0.003	0.022 ± 0.003	7-08-86 to 7-14-86	≤ 0.02	≤ 0.03
7-14-86 to 7-21-86	0.029 ± 0.004	0.023 ± 0.003	7-21-86 to 7-28-86	≤ 0.02	≤ 0.03
7-28-86 to 8-04-86	0.023 ± 0.004	0.019 ± 0.003	8-04-86 to 8-11-86	≤ 0.02	≤ 0.03
8-11-86 to 8-18-86	0.026 ± 0.004	0.024 ± 0.004	8-18-86 to 8-25-86	≤ 0.02	≤ 0.03
8-25-86 to 9-02-86	0.021 ± 0.003	0.020 ± 0.003	9-02-86 to 9-08-86	≤ 0.02	≤ 0.03
9-08-86 to 9-15-86	0.027 ± 0.003	0.029 ± 0.004	9-15-86 to 9-22-86	≤ 0.02	≤ 0.03
9-22-86 to 9-29-86	0.020 ± 0.003	0.018 ± 0.003	9-29-86 to 10-06-86	≤ 0.02	≤ 0.03
10-06-86 to 10-13-86	0.018 ± 0.003	0.019 ± 0.003	10-13-86 to 10-20-86	≤ 0.02	≤ 0.03
10-20-86 to 10-27-86	0.032 ± 0.004	0.043 ± 0.004	10-27-86 to 11-03-86	≤ 0.02	≤ 0.03
11-03-86 to 11-10-86	0.019 ± 0.003	0.017 ± 0.003	11-10-86 to 11-17-86	≤ 0.02	≤ 0.03
11-17-86 to 11-24-86	0.026 ± 0.004	0.026 ± 0.004	11-24-86 to 12-01-86	≤ 0.02	≤ 0.03
12-01-86 12-08-86	0.015 ± 0.003	0.019 ± 0.003	12-08-86 to 12-15-86	≤ 0.02	≤ 0.03
12-15-86 12-22-86	0.027 ± 0.004	0.036 ± 0.004	12-22-86 to 12-29-86	≤ 0.01	≤ 0.03

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.6
QUALITY CONTROL
AIR PARTICULATES (pCi/m^3)

Sample Date	Nuclide	DLC Contractor Lab (1)	DLC - QC Lab (1)
January	Be-7	0.102 ± 0.019	0.112 ± 0.011
	Others	LLD	LLD
March	Be-7	0.121 ± 0.018	0.104 ± 0.013
	Others	LLD	LLD
May	Be-7	0.140 ± 0.020	0.121 ± 0.024
	Cs-134	0.014 ± 0.002	0.013 ± 0.003
	Cs-137	0.027 ± 0.003	0.028 ± 0.004
	Ru-103	0.027 ± 0.003	0.021 ± 0.003
	Others	LLD	LLD
July	Be-7	0.148 ± 0.026	0.168 ± 0.027
	Others	LLD	LLD
September	Be-7	0.079 ± 0.013	0.085 ± 0.028
	Others	LLD	LLD
November	Be-7	0.092 ± 0.018	0.118 ± 0.045
		LLD	LLD

LLD - Lower Limit of Detection

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.6
QUALITY CONTROL

AIR PARTICULATE AND CHARCOAL FILTER - COMPARABLE SAMPLES
LOCATION 30 - (pCi/m^3)

Sample Date	Nuclide	DLC Contractor Lab (1)	DLC - QC Lab (1)
1st Quarter Composite	Sr-89	≤ 0.0012	≤ 0.0001
	Sr-90	≤ 0.0001	≤ 0.0001
2nd Quarter Composite	Sr-89	≤ 0.0009	0.0003 ± 0.0003
	Sr-90	≤ 0.0002	0.0002 ± 0.0001
3rd Quarter Composite	Sr-89	≤ 0.0014	≤ 0.0002
	Sr-90	≤ 0.0001	≤ 0.0001
4th Quarter Composite	Sr-89	≤ 0.0008	≤ 0.0003
	Sr-80	≤ 0.0001	≤ 0.0002

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.7
QUALITY CONTROL DATA

QC Sample Comparisons
(All Analyses in pCi/l)

Sample Date	Ident. No.	Sample Type and Analyses	Independent Lab (1)	DLC Contractor Lab (1)	DLC - OC Lab (1)
2-05-86	53-271	Water: Sr-90	9.8 + 0.4	11 + 1	8.5 + 0.9
		I-131	8.4 + 0.2	9.0 + 0.2	7.0 + 2.2
		Mn-54	19 + 7	30.9 + 4.2	30.1 + 6.8
		Cs-134	19 + 6	20.2 + 3.3	21.2 + 4.4
		Cs-137	27 + 7	30 + 6.1	31.4 + 3.3
2-05-86	53-272	Water: H-3	1000 + 112	1200 + 100	1050 + 120
5-07-86	53-273	Water: Sr-89	15 + 2	13 + 2	7.8 + 3.9
		Sr-90	13.7 + 1.0	14 + 1	14.0 + 2.4
		I-131	17.2 + 0.3	17 + 1	17.1 + 2.3
		Co-58	20 + 3	25 + 5.2	29.4 + 8.8
		Z-65	18 + 6	25.2 + 7.9	20.6 + 6.4
5-07-86	53-274	Water: H-3	1533 + 100	1500 + 200	1450 + 150
6-05-86	53-A	Water: I-131	7.4 + 0.2	7.2 + 0.3	6.9 + 1.2
	53-B	I-131	13.2 + 0.2	12 + 1	13.7 + 1.9
	53-C	I-131	25.1 + 0.3	22 + 1	22.9 + 2.4
8-21-86	53-275	Water: Sr-89	14 + 2	13 + 2	6.9 + 3.8
		Sr-90	14.8 + 0.4	12 + 1	14.0 + 1.0
		I-131	8.5 + 0.3	7.9 + 0.3	10.5 + 1.0
		Cs-134	18 + 5	18.8 + 3.2	14.9 + 4.6
		Cs-137	24 + 6	34.0 + 4.3	27.2 + 3.8
8-21-86	53-276	Water: H-3	2027 + 130	2100 + 100	2120 + 100
11-19-86	53-277	Water: Sr-89	7 + 2	5.8 + 1.6	6.6 + 6.1
		Sr-90	12.1 + 0.5	10 + 1	8.7 + 2.8
		I-131	11 + 0.4	14 + 1	16.4 + 2.2
		Co-58	17 + 3	21.4 + 4.6	20.7 + 2.5
		Co-60	64 + 5	70.2 + 7.0	64.9 + 0.5
11-19-86	53-278	H-3	880 + 150	1100 + 100	1047 + 30

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

TABLE III.7
QUALITY CONTROL DATA

QC Sample Comparisons
(All Analyses in pCi/l)

Sample Date	Ident. No.	Sample Type and Analyses	Independent Lab (1)	DLC Contractor Lab (1)	DLC - QC Lab (1)
2-05-86	52-238	Milk: Sr-89	10 ± 2	10 ± 3	8.4 ± 3.6
		Sr-90	17 ± 2	17 ± 1	15.2 ± 1.6
		I-131	17.3 ± 3	21 ± 1	14.1 ± 1.9
		Cs-134	14 ± 3	16.8 ± 3.5	12.8 ± 3.6
		Cs-137	23 ± 4	28.1 ± 6.4	26.9 ± 2.8
		K-40	-- --	1400 ± 140	1300 ± 140
5-07-86	52-239	Milk: Sr-89	5.2 ± 1.0	2.3	4.1 ± 1.7
		Sr-90	11.6 ± 0.4	12 ± 1	11.7 ± 1.1
		I-131	14.5 ± 0.2	17 ± 1	12.5 ± 3.2
		Cs-134	17 ± 10	13.9 ± 3.7	12.5 ± 3.4
		Cs-137	38 ± 12	34.2 ± 4.6	30.1 ± 3.4
		K-40	-- --	1290 ± 130	1250 ± 100
6-05-86	52-A	Milk: I-131	10.9 ± 0.2	13 ± 1	9.1 ± 1.0
	52-B	I-131	16.9 ± 0.3	18 ± 1	14.7 ± 2.2
	52-C	I-131	35.0 ± 0.5	31 ± 1	24.6 ± 2.8
8-21-86	52-240	Milk: Sr-89	2.8 ± 0.7	1.4	5.1 ± 2.3
		Sr-90	12.2 ± 0.4	13 ± 1	12.4 ± 1.4
		I-131	14.8 ± 0.5	17 ± 1	19.6 ± 1.0
		Cs-134	19 ± 6	25.5 ± 4.9	18.7 ± 0.6
		Cs-137	24 ± 7	29.3 ± 4.8	24.4 ± 3.8
		K-40	-- --	1440 ± 140	1180 ± 140
11-19-86	52-241	Milk: Sr-89	23 ± 3	14 ± 2	13.2 ± 5.5
		Sr-90	20.6 ± 0.6	16 ± 1	15.9 ± 2.1
		I-131	8.0 ± 0.5	13 ± 1	11.1 ± 4.6
		Cs-134	17 ± 6	15.6 ± 4.3	14.2 ± 4.2
		Cs-137	31 ± 7	35.9 ± 4.4	32.5 ± 3.3
		K-40	1300 ± 200	1390 ± 140	1260 ± 20

-- -- Analysis not performed nor required.

(1) Uncertainties are based on counting statistics and are specified at the 95% confidence interval.

III. ENVIRONMENTAL MONITORING PROGRAM

A. Environmental Quality Control Programs (continued)

7. Pennsylvania Department of Environmental Resources Program

The Pennsylvania Department of Environmental Resources (PDER) also conducted a surveillance program in the vicinity of the site. Samples of air, river water, drinking water, sediment, milk, vegetation, fish and radiation monitoring are included in their program. Comparison of results also indicated agreement between the PDER Laboratory and the Duquesne Light Company Contractor Laboratory.

B. Evaluation of the Quality Control (QC) Program Data

The split and spiked sample program indicates that the Contractor and QC Laboratory are performing satisfactorily. In addition, an independent laboratory is used to supplement the regular program. Comparisons between the independent, QC and Contractor laboratories are acceptable and demonstrate a satisfactory performance by the DLC contractor.

Based on all available QC data and the data from the Contractor's internal EPA Interlaboratory Cross Check Program, the Environmental Monitoring Program for 1986 is acceptable with respect to both accuracy and measurement.

C. Standard Requirements and Limitations for Radiological and Other Effluents

The Beaver Valley Power Station is governed by rules and regulations of the Federal Government and the Commonwealth of Pennsylvania. Effluent releases are controlled to ensure that limits set by Federal or State governments are not exceeded. In addition, self-imposed limits have been established to further limit discharges to the environment.

III. ENVIRONMENTAL MONITORING PROGRAM

C. Standard Requirements and Limitations for Radiological and Other Effluents (continued)

Beaver Valley Power Station is subject to regulations which include the Code of Federal Regulations 10 CFR (Energy), Pennsylvania Department of Environmental Resources (PDER) Industrial Waste Permit #0473211, Gaseous Discharge Permit #04-306-001, PA Code - Title 24, Part I, Ohio River Valley Water Sanitation Commission (ORSANCO) Standards No. 1-70 and 2-70, Environmental Protection Agency (EPA), National Pollution Discharge Elimination (NPDES) Permit #0025615, and the Beaver Valley Power Station Technical Specifications.

D. Reporting Levels

A report is required to be submitted to the Nuclear Regulatory Commission when the level of radioactivity in an environmental sampling medium exceeds the limits specified in the Beaver Valley Power Station Technical Specifications when averaged over any calendar quarter. Also, when more than one of the radionuclides are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{Concentration (1)}}{\text{Limit Level (1)}} + \frac{\text{Concentration (2)}}{\text{Limit Level (2)}} + \ldots \geq 1.0$$

There were no analytical results of environmental samples during 1986 which exceeded Beaver Valley Power Station reporting levels.

IV. MONITORING EFFLUENTS

A. Monitoring of Liquid Effluents

Description of Liquid Effluents at the Beaver Valley Power Station.

Most of the water required for the operation of the Beaver Valley station is taken from the Ohio River, and returned to the river, used for makeup to various plant systems, consumed by station personnel, or discharged via a sanitary waste system. In addition, small amounts of well water and liquid effluents are discharged to the Ohio River using discharge points shown in Figure 4.1. Figures 4.2 and 4.3 are schematic diagrams of liquid flow paths for the Beaver Valley Power Station. The following two (2) tables summarize radioactive liquid effluents at the Beaver Valley Power Station:

Table IV.A.1 - Effluent Treatment, Sampling, and Analytical Procedures - Beaver Valley

Table IV.A.2 - Results of Liquid Effluent Discharges to the Environment - Beaver Valley

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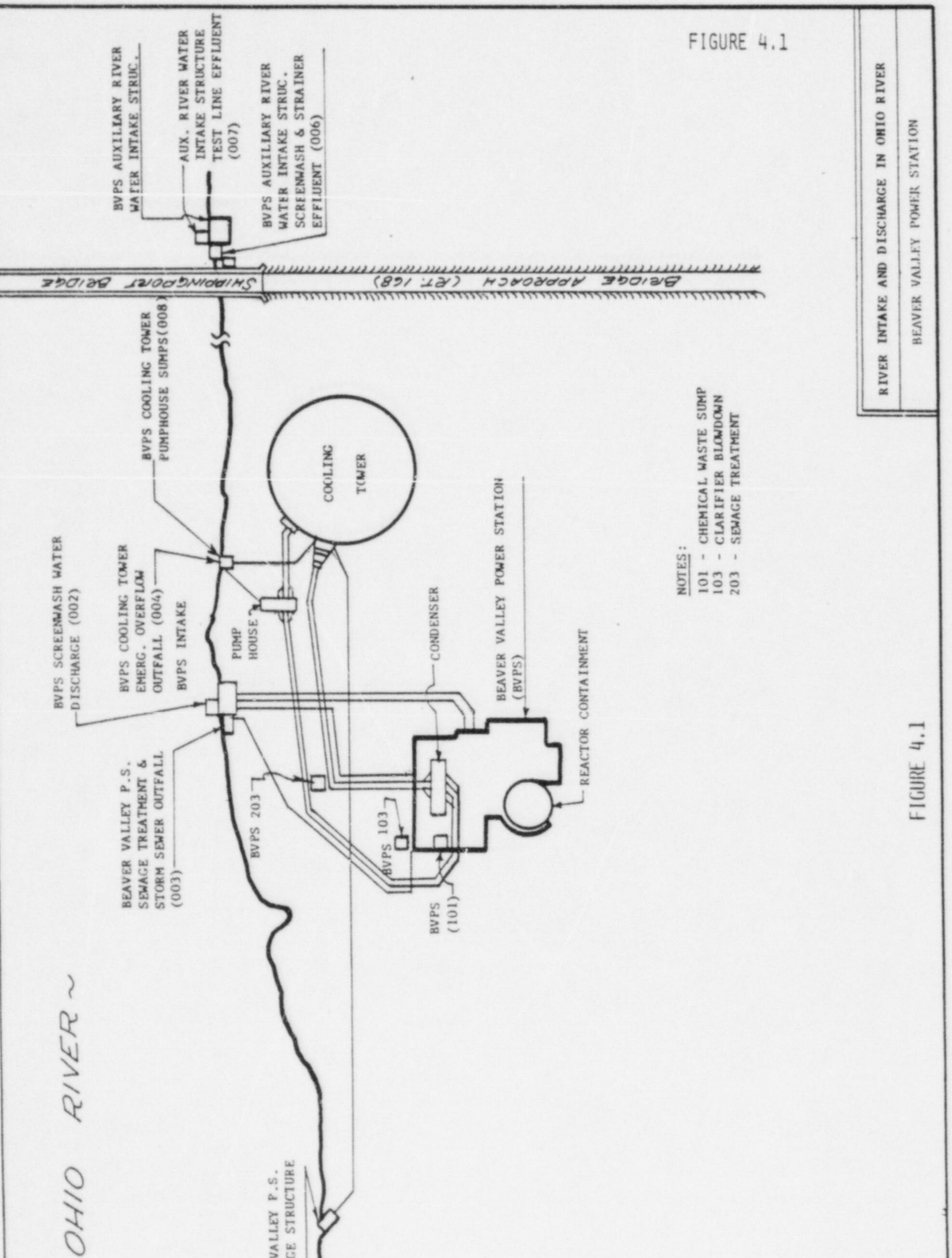

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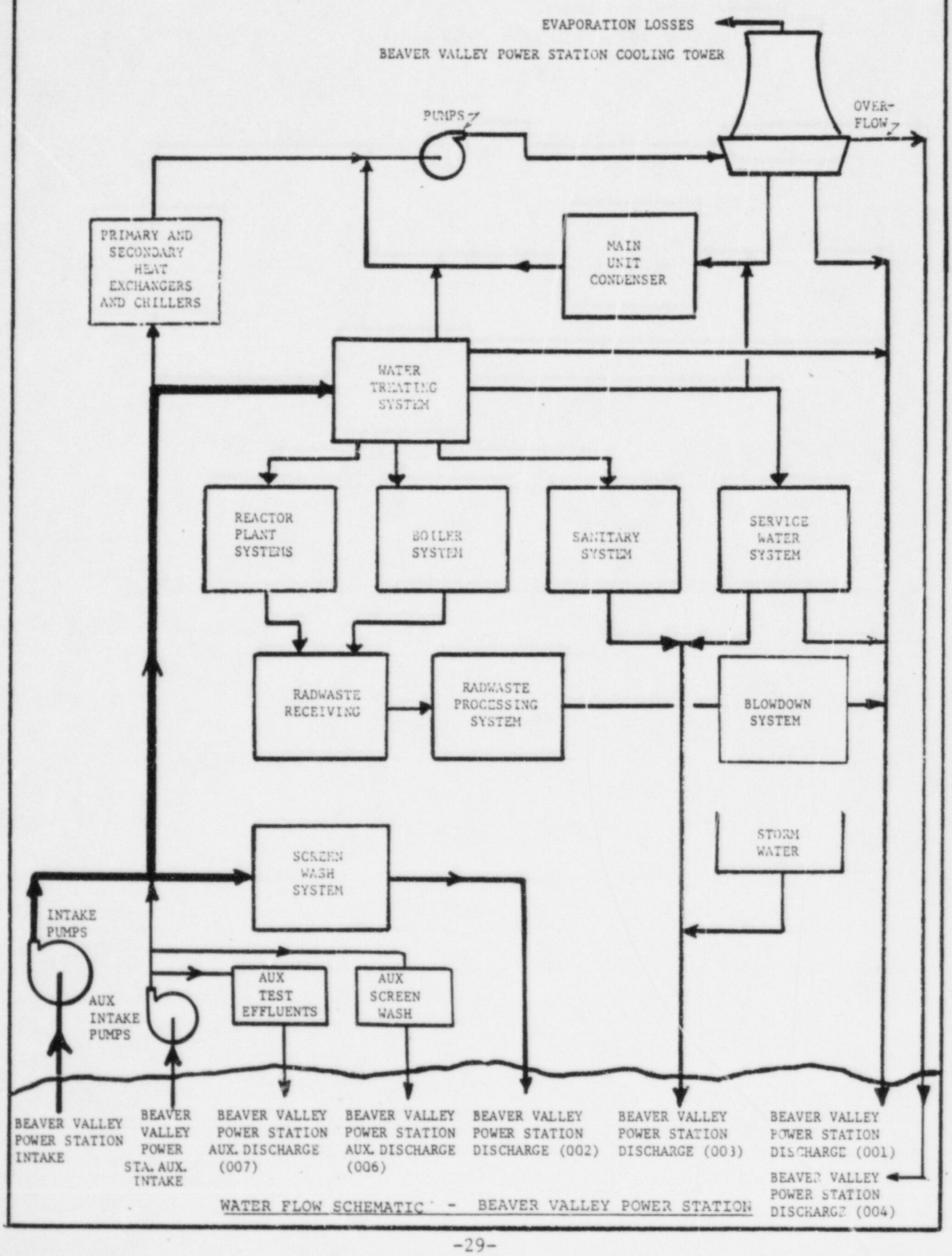
SECTION IV

FIGURE 4.2



WATER FLOW SCHEMATIC - BEAVER VALLEY POWER STATION

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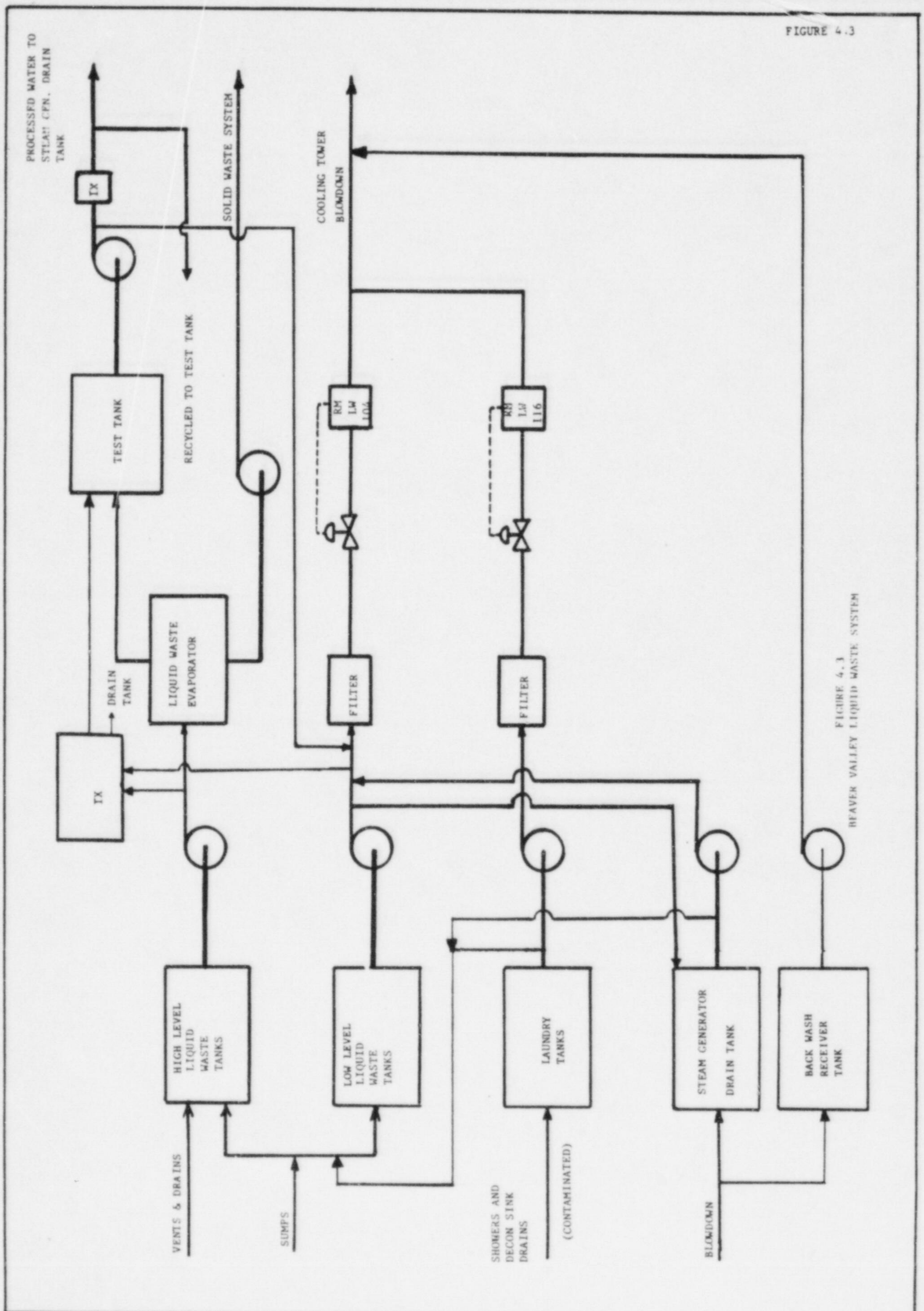

FIGURE 4.3
BEAVER VALLEY LIQUID WASTE SYSTEM

TABLE IV.A.1

1. Effluent Treatment, Sampling and Analytical Procedures - Beaver Valley

	Effluent Type	Treatment, Sampling and/or Monitoring	Standard and/or Analytical Procedures
(a)	Steam System Blowdown	Recycled or directed to Radwaste System for discharge.	If discharged, procedures adhere to Technical Specifications.
(b)	Radioactive Waste	Effluents shall not exceed values specified in the Technical Specifications. All discharges are performed in accordance with the Offsite Dose Calculation Manual (ODCM).	Procedures adhere to requirements of Technical Specifications.

TABLE IV.A.2

2. Results of Liquid Effluent Discharges to the Environment - Beaver Valley

	Effluent Type	Results for 1986
(a)	Steam System Blowdown	The Steam System Blowdown was recycled or directed to the Radwaste System where it was monitored and discharged in accordance with conditions noted in Section 3/4.11.1 of the Technical Specifications
(b)	Radioactive Waste Liquids	Routine planned releases of liquid effluents from the Beaver Valley Power Station were released in accordance with conditions noted in the Section 3/4.11.1 of the Technical Specifications and no limits were exceeded. These values have been reported in the Beaver Valley Power Station Semiannual Effluent Reports for 1986.

IV. MONITORING EFFLUENTS

B. Monitoring of Airborne Effluents

1. Description of Airborne Effluent Sources

Beaver Valley Power Station (BVPS)

The Beaver Valley Power Station identifies isotopes according to the Environmental Technical Specifications and Regulatory Guide 1.21. Prior to waste gas decay tank batch releases and containment purge releases, an analysis of the principal gamma emitters is performed. The principal gamma emitters include noble gases, iodines, and particulates. Figure 4.4 shows the gaseous radwaste system at Beaver Valley Power Station.

The environmental gaseous release points also require specific nuclide identification. These points include the Process Vent located on top of the Unit 1 Cooling Tower, the Ventilation Vent located on the top of the Auxiliary Building, and Supplementary Leak Collection and Release System (SLCRS) Vent located on top of the Containment. These points are continuously monitored. Principal gamma emitters and tritium are analyzed on a monthly basis. Analysis is also done on charcoal cartridges for I-131, I-133, and I-135 that have continuously sampled the gas stream for a week.

Weekly continuous samples are also obtained on filter paper for gross alpha determinations and to identify particulate gamma emitting isotopes. Composites of the particulate samples are analyzed monthly for Sr-89 and Sr-90.

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BEAVER VALLEY POWER STATION GASEOUS RADIOACTIVE WASTE PROCESSING SYSTEM

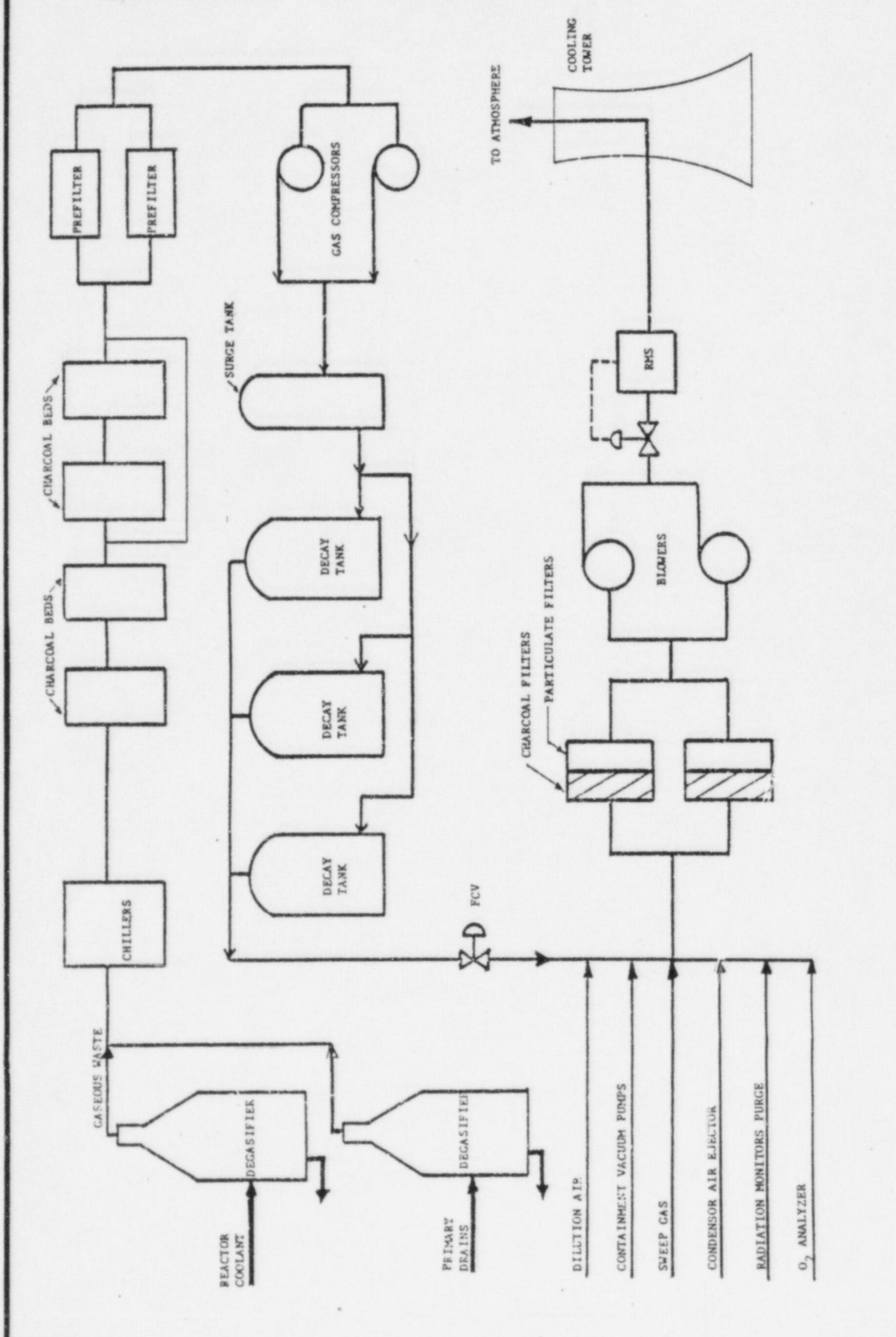

FIGURE 4.4
BEAVER VALLEY POWER STATION GASEOUS RADIOACTIVE WASTE PROCESSING SYSTEM

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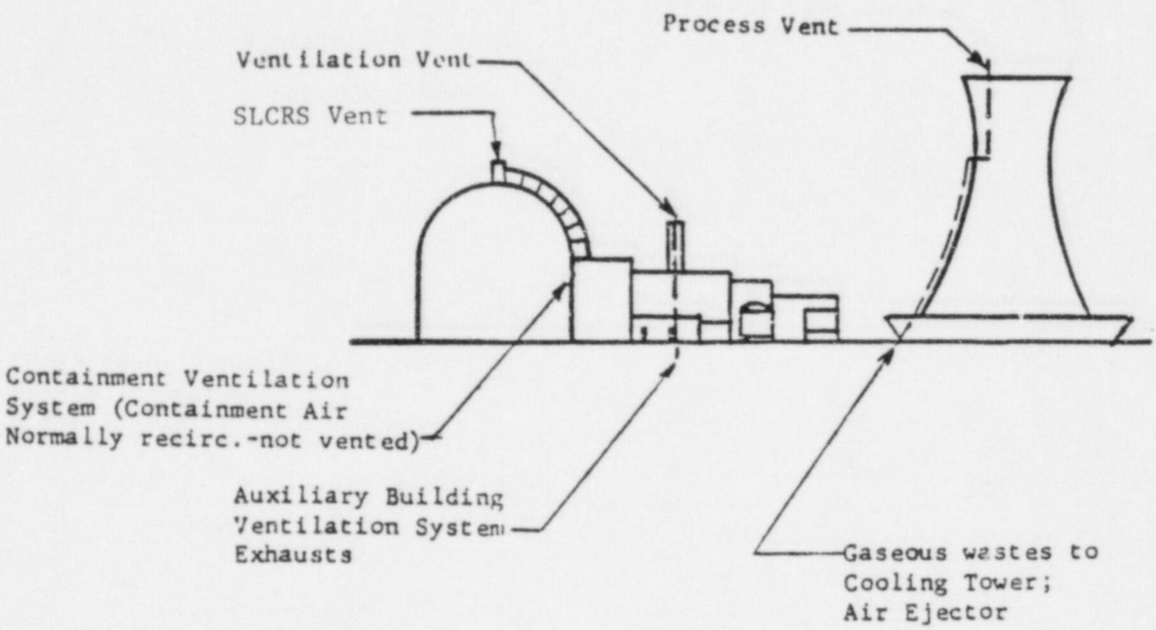
FIGURE 4.5

SECTION IV

DISCHARGE POINTS - GASEOUS WASTES

FIGURE 4.5



GASEOUS RELEASE POINTS - BEAVER VALLEY POWER STATION

IV. MONITORING EFFLUENTS

B. Monitoring of Airborne Effluents (continued)

2. Airborne Effluent Treatment and Sampling

Beaver Valley Power Station

Radioactive gases enter the gaseous waste disposal system from the degasifier vent chiller of the boron recovery system, and are directed to the gaseous waste charcoal delay subsystem upstream of the overhead gas compressor where the gas is chilled to condense most of the water vapor. Gases from the degasifier vent chillers contain primarily hydrogen and water vapor. A small amount of nitrogen and radioisotopes of xenon, krypton, tritium, cobalt, cesium, manganese, iodine, chromium and strontium are also present in the three continuous ventilation system pathways.

The overhead gas compressor directs the radioactive gas stream to a gas surge tank. Gas is periodically discharged from the surge tank to one of the three (3) decay tanks for eventual release to the atmosphere via the process vent on top of the cooling tower. After the decay tanks are sampled and authorization obtained for discharge, the flow of the waste gases from the decay tanks (2 scfm) is recorded and rapidly diluted with about 1000 scfm of air in order to dilute hydrogen and radioactive effluent concentration. The gases are then combined with nitrogen purge from the decay tank radiation monitor and oxygen analyzers, calibration gas from the oxygen analyzers, the main condenser air ejector exhaust, the containment vacuum system exhaust, aerated vents of the vent and drain system, discharge of the overhead gas compressor and the purge from the multi sample point radiation monitor. The mixture is then filtered through one of the gaseous waste disposal filters, each of which consists of a charcoal bed and a high efficiency filter. The filtered gases are then discharged by one of the gaseous waste disposal blowers to the atmosphere via the process vent on the top of the cooling tower. The radioactivity levels of the stream are monitored continuously.

IV. MONITORING EFFLUENTS

B. Monitoring of Airborne Effluents (continued)

2. Airborne Effluent Treatment and Sampling (continued)

Beaver Valley Power Station (continued)

Should the radioactivity release concentration of the stream go above the allowable setpoint, a signal from the radiation monitor will stop all flow from the decay tanks.

During a shutdown period after the containment has been sampled and the activity levels determined, the containment may be purged through the Ventilation Vent located on top of the Auxiliary Building or the Supplementary Leak Collection and Release System (SLCRS) Vent located on top of the Reactor Containment Building or the Process Vent located on top of the Cooling Tower.

Areas in the Auxiliary Building subject to radioactive contamination are monitored for radioactivity prior to entering the common Ventilation Vent. These individual radiation monitors aid in identifying any sources of contaminated air. The Ventilation Vent is also monitored continuously by several redundant systems and sampled periodically. Upon a high activity alarm, automatic dampers divert the system's exhaust air stream through one of the main filter banks in the Supplementary Leak Collection and Release System (SLCRS) and to the SLCRS Vent. Release points are shown in Figure 4.5 for the Beaver Valley Power Station.

Each filter bank consists of roughing filters, charcoal filters, and pleated glass fiber type HEPA filters. The roughing filters remove large particulates to prevent excessive pressure drop buildup on the charcoal and HEPA filters. The charcoal filters are effective for radioactive iodine removal and the HEPA filters remove particulates and charcoal fines.

IV. MONITORING EFFLUENTS

3. Analytical Procedures for Sampling Airborne Effluents

Beaver Valley Power Station

The following tabulates the gaseous sampling and analysis schedule:

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml)[a]
A. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1×10^{-4}
			H-3	1×10^{-6}
B. Containment Purge	P Each Purge[b] Grab Sample	P Each Purge[b]	Principal Gamma Emitters[g]	1×10^{-4}
			H-3	1×10^{-6}
C. Ventilation Systems 1. Process Vent 2. Containment Vent 3. Aux. Bldg. Vent	M[b,c,e] Grab Sample	M[b]	Principal Gamma Emitters[g]	1×10^{-4}
			H-3	1×10^{-6}
	Continuous[f]	W[d] Charcoal Sample	I-131	1×10^{-12}
			I-133	1×10^{-10}
Release from Radioiodine and Particulates (Airborne) may be limited to the Inhalation Pathway only.	Continuous[f]	W[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1×10^{-11}
	Continuous[f]	M Composite Particulate Sample	Gross alpha	1×10^{-11}
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta and Gamma	1×10^{-6}

IV. MONITORING EFFLUENTS

B. Monitoring of Airborne Effluents (continued)

3. Analytical Procedures for Sampling Airborne Effluents (continued)

TABLE NOTATION

a. The Lower Limit of Detection (LLD).

b. When reactor coolant system activity exceeds the limits stated in the BVPS Technical Specification, analyses shall be performed once every 24 hours during startup, shutdown and 25% load changes and 72 hours after achieving the maximum steady state power operation unless continuous monitoring is provided.

c. Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

d. Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler). Sampling and analyses shall also be performed at least once per 24 hours, during startup, shutdown and 25% load changes and 72 hours after achieving the maximum steady state power operation when RCS activity exceeds the limits stated in the Technical Specification unless continuous monitoring is provided. When samples collected for 24 hours are analyzed, the corresponding LLD's may be increased by a factor of 10.

e. Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

f. The average ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with the BVPS Technical Specification.

IV. MONITORING EFFLUENTS

B. Monitoring of Airborne Effluents (continued)

3. Analytical Procedures for Sampling Airborne Effluents (continued)

g. The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD level for that nuclide. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the semi-annual effluent report.

4. Results

Beaver Valley Power Station

Gaseous effluents from the Beaver Valley Power Station were released in accordance with conditions noted in Section 3/4.11.2 of the Technical Specifications. No limits were exceeded. These values have been reported in the Beaver Valley Power Station Semi-Annual Effluent Reports for 1986.

IV. MONITORING EFFLUENTS

C. Solid Waste Disposal at the Beaver Valley Power Station

During Beaver Valley Power Station normal operations and periodic maintenance, small quantities of solid radioactive waste materials were generated such as evaporator concentrates, contaminated rags, paper, plastics, filters, spent ion-exchange resins, and miscellaneous tools and equipment. These were disposed of as solid radioactive waste.

At the Beaver Valley Power Station, the compactable wastes are segregated and compressed in 55-gallon drums to minimize disposal volumes. The compressed waste, plus other drums of noncompactable waste, were then shipped offsite for disposal at a commercial radioactive material burial site licensed by the Nuclear Regulatory Commission (NRC) or a state under agreement with the NRC. No radioactive waste material was buried at the Beaver Valley Power Station site.

All containers used for packaging, transport, and disposal of radioactive materials met the requirements of the United States Department of Transportation (DOT) and the Nuclear Regulatory Commission (NRC). Shipments offsite were made in accordance with DOT and NRC regulations. Figure 4.6 depicts solid waste handling at the site.

At Beaver Valley Power Station approximately 3,347 cubic feet of radioactive solid waste was shipped offsite in 1986. This is the actual burial volume. The eleven (11) shipments contained a total activity of 445.5 curies.

Industrial solid wastes were collected in portable bins, and removed to an approved offsite burial ground. No burning or burial of wastes was conducted at the Beaver Valley Power Station site.

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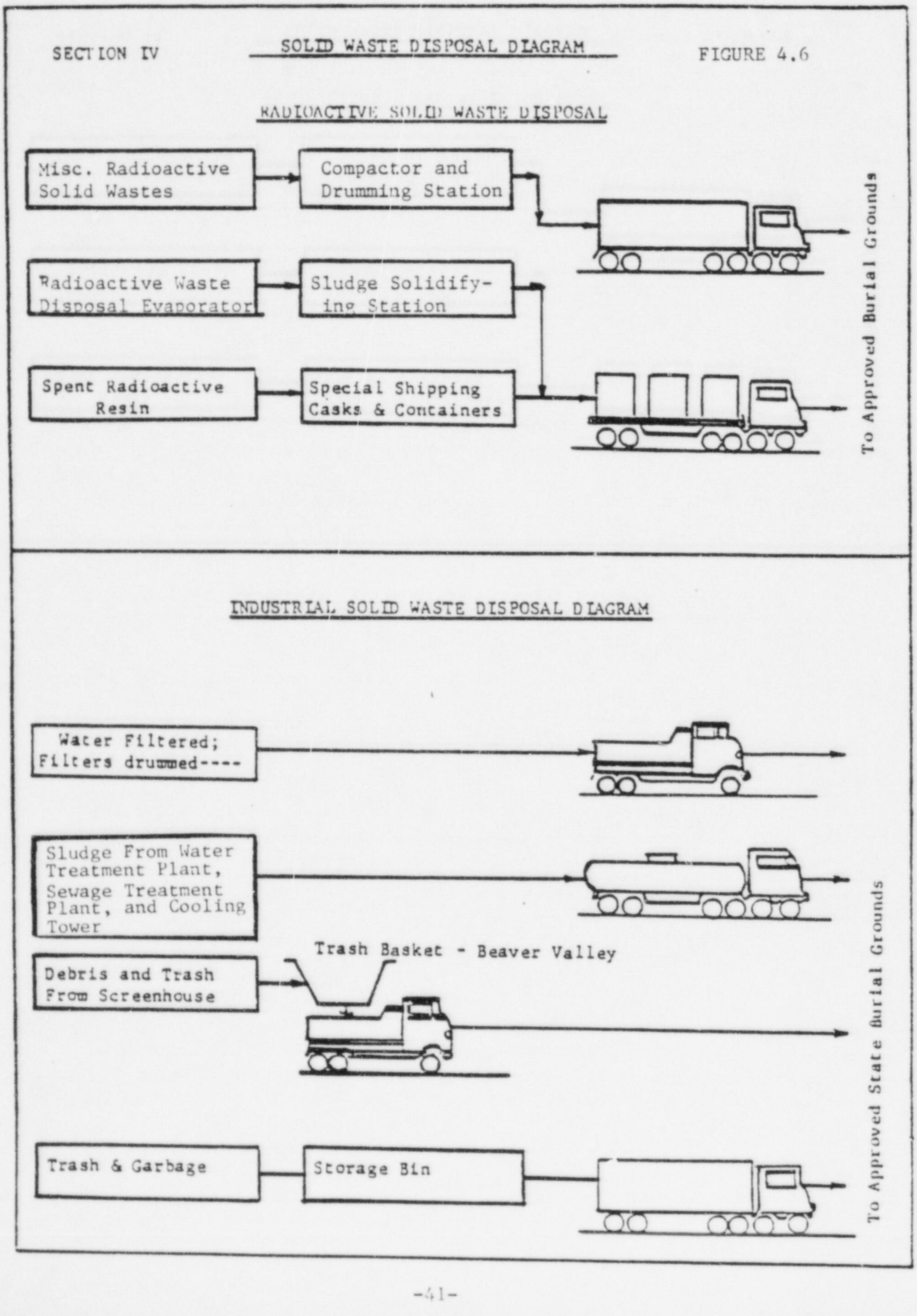

V. ENVIRONMENTAL MONITORING

A. Environmental Radioactivity Monitoring Program

1. Program Description

The program consists of monitoring water, air, soil, river bottoms, vegetation and foodcrops, cow's milk, ambient radiation levels in areas surrounding the site, and aquatic life as summarized in Table V.A.1. Further description of each portion of the program (Sampling Methods of Sample Analysis, Discussion and Results) are included in parts V-B through V-I of this report.

V-B - Air Monitoring

V-C - Sediments and Soils Monitoring

V-D - Vegetation and Foodcrops

V-E - Cow's Milk

V-F - Environmental Radiation Monitoring

V-G - Fish

V-H - Surface, Drinking, Well Waters and Precipitation

V-I - Estimates of Radiation Dose to Man

TABLE V.A.1

CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Type of Sample	DLC Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis Frequency	Analysis(b)
1. Air Particulate and Radioiodine	13.	11	1.6	Meyer's Farm	Continuous Sampling with sample collection at least weekly	Weekly Composite (d)		Gross Beta, (c) I-131
	30	4	0.6	Shippingport, PA. (S.S.)		Monthly Composite (d)		Gamma -scan
	46.1	3	2.4	Industry, PA				
	32	15	0.8	Midland, PA (S.S.)		Quarterly Composite (d)		Sr-89,90
	48(a)	10	16.5	Weirton, WV (a)				
	51	5	8.0	Aliquippa, PA (S.S.)				
	47	14	4.8	East Liverpool, OH				
	27	7	6.2	Brunton's Farm				
	28	1	8.7	Sherman's Farm				
	29B	3	8.1	Beaver County Hospital				
2. Direct Radiation	30	4	0.6	Shippingport, PA (S.S.)	Continuous (TLD)	Quarterly (k) Annually (k)		Gamma-Dose
	13	11	1.6	Meyer's Farm				
	46	3	2.5	Industry, PA(Church)				
	32	15	0.8	Midland, PA (S.S.)				
	48 (a)	10	16.5	Weirton, WV (a)				
	45.1	6	2.0	Raccoon Twp, PA Kennedy's crnrs.				
	51	5	8.0	Aliquippa, PA (S.S.)				
	47	14	4.8	East Liverpool, OH				
	70	1	3.0	West. Bvr. School				
	80	9	8.4	Raccoon Park				
	81	9	3.9	Southside School				
	82	9	7.1	Hanover Municipal Bldg.				
	83	10	4.5	Mill Creek Rd				
	14	11	2.6	Hookstown				
	84	11	8.5	Hancock Co. Children Home				
	85	12	5.8	Rts. 8 & 30 Intersection				
	86	13	6.5	E. Liverpool Cahills House				
	92	12	3.0	Georgetown Rd.				
	87	14	7.0	Calcutta Road				
	88	15	3.1	Midland Heights				
	89	15	4.7	Ohioville				
	90	16	5.2	Fairview School				
	10	4	0.8	Shippingport Boro, PA				
	45	5	2.2	Mt. Pleasant Church				
	60	13	3.7	Haney's Farm				
	93	16	1.3	Sunset Hills, Midland				
	95	10	2.4	McCleary Rd, Hollie Williams				

S.S. - Substation

TABLE V.A.1

CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Continued)

Type of Sample	DLC Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis Frequency	Analysis [b]
2. Direct Radiation (Continued)	28	1	8.7	Sherman's Farm	Continuous (TLD)	Quarterly [k] Annually [k]		Gamma-Dose
	71	2	5.6	Brighton Twp. School				
	72	3	3.2	Logan School				
	29B	3	8.1	Beaver County Hospital				
	73	4	2.2	Potter Twp. School				
	74	4	6.8	Comm. Col-Center Twp.				
	75	5	4.3	Holt Road				
	76	6	3.8	Raccoon Twp. School				
	77	6	5.8	Green Garden Rd (Wayne's)				
	59	7	1.1	Irons				
	78	7	2.3	Raccoon Mun. Bldg.				
	27	7	6.2	Brunton's Farm				
	79	8	4.6	Rt. 18 & Rt. 151				
	15	14	3.3	Georgetown				
	46.1	3	2.1	Industry PA				
	91	2	3.7	Pine Grove Rd and Doyle Rd				
	94	8	2.4	McCleary Rd, Wilson				
3. Surface Water	49.1	4	5.0	Arco Polymers (a)	Intermittent Composite Samples (j) Collected Weekly	Monthly Composite of Weekly Sample (d)		Gross Beta Gross Alpha Gamma-scan
	2.1	14	1.3	Downstream (Midland) J & L				
	3	13	0.2	Shippingport Atomic Power Station Discharge	Weekly Grab Samples Only	Quarterly Composite		Co-60, H-3 Sr-89, Sr-90
	49 (a)	[illegible]	3.[illegible]	Montgomery Dam (Upstream)				
	2A	13	0.2	Downstream BVPS Outfall				
	5	14	4.8	East Liverpool (raw water)	Daily Grab Sample Only - Collected Weekly (j)			
4. Groundwater	13	11	1.6	Meyer's Farm				
	14	11	2.6	Hookstown, PA				
	15	15	[illegible]	Georgetown, PA				
	11	3	0.8	Shippingport Boro	Quarterly	Quarterly		Gamma-scan, Gross Beta, Gross Alpha, H-3
5. Drinking	4	14	1.3	Midland, PA (Midland Water Treatment Plant)	Intermittent [e] Sample Collected Weekly	Weekly Composite of Daily Sample (d)		Gamma-scan, I-131
						Monthly Composite (d)		Gross Alpha, Gross Beta
	5	14	4.8	East Liverpool, OH (East Liverpool Water Treatment Plant)		Quarterly Composite (d)		H-3, Co-60, Sr-89, 90
	6	[illegible]	0.5	DLC New Training Bldg.	Weekly Grab Sample			

TABLE V.A.1

CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Continued)

Type of Sample	DLC Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis Frequency	Analysis(b)
6. Shoreline Sediment	2A	13	0.2	Downstream BVPS Outfall	Semiannual	Semiannual		Gamma-scan, Gross Beta Gross Alpha Uranium Isotopic Sr-89, 90
	3	13	0.2	Vicinity SAPS Discharge				
	49	3	3.2	Upstream Side of Montgomery Dam (a)				
	50	13	8.2	Upstream side of New Cumberland Dam				
7. Milk	25	10	2.1	Searight's Dairy	Weekly (f)	Weekly sample from Searight's only		I-131
	* * *				Biweekly (g) When animals are on pasture; monthly at other times.	Biweekly (grazing) Monthly (indoors)		Gamma-scan Sr-89, 90 I-131, Cs-137
	96(a)	10	10.3	Windsheimer				
	27	7	6.2	Brunton's Dairy (h)				
	29	3	8.3	Nicol's Dairy (h)	Monthly	Monthly		Gamma-scan Sr-89, 90 I-131, Cs-137
8. Fish	2A	13	0.2	Vicinity of BVPS #1 Station Discharge and Shippingport Dis. Sta.	Semiannual	Composite of edible parts by species (i)		Gamma-scan on edible portions
	49(a)	3	4.7	Upstream Side of Montgomery Dam				
9. Food Crops (Shipp.)	10	4	0.8	(Three locations within 5 miles Selected by Company)	Annual at harvest if available	Composite of each sample species		Gamma-scan I-131 on green leafy vegetables
(Georg.)	15	14	3.3					
(Indus.)	46	3	2.5					
	48(a)	10	16.5	Weirton, WV				
10. Feedstuff and Summer Forage	25	10	2.1	Searight's Dairy Farm	Monthly	Monthly		Gamma-scan
					Quarterly	Quarterly Composite		Sr-90
11. Soil	13	11	1.6	Meyer's Farm	Every 3 years (1982, 1985, etc.)	12 Core Samples 3" Deep (3" Dia. at each location (approx. 10' radius)		Gamma-scan Sr-90 Gross Beta Gross Alpha Uranium Isotopic
	30	4	0.6	Shippingport, Pa.				
	46	3	2.6	Industry, Pa.				
	32	15	0.8	(North of Site) Midland				
	48(a)	10	16.5	Weirton, W. Va.				
	51	5	8.0	Aliquippa, Pa.				
	47	14	4.8	E. Liverpool, Oh.				
	27	7	6.2	Brunton's Dairy				
	22	8	0.3	South of BVPS Site				
	29A	3	8.3	Nichol's Dairy				

* BVPS Technical Specification Table 3.12-1 requires three(3) dairies be selected on basis of highest potential thyroid dose using milch census data. See Section V.E. for specific locations sampled.

TABLE V.A.1

CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Continued)

Type of Sample	DLC Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis Frequency	Analysis (b)
12. Precipitation	30	4	0.6	Shippingport, PA	Weekly grab samples when available	Monthly Composite of grab samples		Gross β γ-scan
	47	14	4.8	East Liverpool, OH		Quarterly Composite		H-3, Sr-89, Sr-90
	48	10	16.5	Weirton, WV				

TABLE V.A.1
CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Continued)

Notes:

(a) Control sample station: These are locations which are presumed to be outside the influence of plant effluents.

(b) Typical LLD's for Gamma Spectrometry are shown in Table V.A.4.

(c) Particulate samples are not counted for ≥ 24 hours after filter change. Perform gamma isotopic analysis on each sample when gross beta is > 10 times the yearly mean of control samples.

(d) Analysis composites are well mixed actual samples prepared of equal portions from each shorter term samples from each location.

(e) Composite samples are collected at intervals not exceeding 2 hours.

(f) Weekly milk sample from Searight's Dairy is analyzed for I-131 only.

(g) Milk samples are collected bi-weekly when animals are in pasture and monthly at other times. [Assume April - October for grazing season (pasture).]

(h) The milk samples from Brunton's and Nicol's are collected once per month.

(i) The fish samples will contain whatever species are available. If the available sample size permits, then the sample will be separated according to species and compositing will provide one sample of each species. If the available size is too small to make separation by species practical, then edible parts of all fish in the sample will be mixed to give one sample.

(j) Composite samples are collected at intervals not exceeding 2 hours at locations 49.1 and 2.1. Weekly grab samples are obtained at location 3, 49 and 2A. A weekly grab sample is also obtained from daily composited grab samples obtained by the water treatment plant operator at location 5.

(k) Two (2) TLDs are collected quarterly and annually from each monitoring location.

TABLE V.A.1
CONSOLIDATED RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Continued)

Additional Notes:

-- Sample points correspond to site numbers shown on maps.

-- All Iodine I-131 analyses are performed within 40 hours of sample collection if possible.

-- All Air samples are decayed for 72 hours before analyzing for Gross Beta.

TABLE V.A.2

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean: Name, Distance and Directions	Location with Highest Annual Mean: **Mean (f) **Range	Control Locations **Mean (f) **Range (Weirton, WV No. 48)	Number of Nonroutine Reported Measurements***
Air Particulate and Radioiodine ($X10^{-3}$pCi/Cu. M.)	Gross (520) Beta	2.5	27(520/520) (6.9-170)	Shippingport, PA No. 30	29(52/52) (9.1-170)	26(52/52) (9.4-130)	0
	Sr-89 (40)	5	LLD	--	--	--	-
	Sr-90 (40)	0.2	LLD	--	--	--	-
	I-131 (520)	40	249(37/520) (39-561)	Weirton, WV No. 48	296(4/52) (121-561)	Same as High Location	0
	Gamma (120) Be-7	40	124(120/120) (79-192)	Sherman Dairy No. 28	140(12/12) (88-176)	110(12/12) (89-172)	0
	K-40	20	37(10/120) (12-73)	Sherman Dairy No. 28	56(1/12) --	48(2/12) (23-73)	0
	Ru-103	2	16(20/120) (6.2-30)	Shippingport, PA No. 30	20(2/12) (12-28)	15(2/12) (10-20)	
	Cs-134	1	9.1(15/120) (2.4-14)	Industry, PA No. 46	13(1/12) --	8.5(2/12) (4.3-13)	0
	Cs-137	1	17(20/120) (4.7-32)	Industry, PA No. 46	20(2/12) (8.9-32)	17(2/12) (8.9-25)	0
	I-131	70	66(1/120) --	Aliquippa, PA No. 51	66(1/12) --	--	0
	Others	Table V.A. 3	LLD	--	--	--	-

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County,State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	**Mean (f) **Range	Control Locations **Mean (f) **Range Montgomery Dam No. 49	Number of Nonroutine Reported Measurements***
Sediment (pCi/g) (dry weight)	Gross (8) Alpha	0.3	15(8/8) (7.0-22)	SAPS Discharge No. 3 River Mile -- 34.8	20(2/2) (17-22)	13(2/2) (12-13)	0
	Gross (8) Beta	1.0	31(8/8) (17-40)	SAPS Discharge No. 3 River Mile --34.8	35(2/2) (30-40)	31(2/2) (29-32)	0
	Sr-89 (8)	0.2	LLD	--	--	--	-
	Sr-90 (8)	0.04	LLD	--	--	--	-
	Gamma (8)						
	Be-7	0.2	1.1(2/8) (0.85-1.4)	Cumberland Dam No. 50	1.4(1/2) --	LLD --	0
	K-40	0.5	13(8/8) (7.7-17)	SAPS Discharge No. 3 River Mile -- 34.8	15(2/2) (13-17)	13(2/2) (12-13)	0
	Co-58	0.2	0.091(1/8) --	BVPS Discharge No. 02A River Mile -- 35	0.16(1/2) --	LLD --	0
	Co-60	0.2	1.3(3/8) (0.12-2.5)	BVPS Discharge No. 02A River Mile -- 35	1.9(2/2) (1.2-2.5)	LLD --	0
	Cs-134	0.02	0.090(2/8) (0.073-0.11)	BVPS Discharge No. 02A River Mile -- 35	0.11(1/2) --	LLD --	0
	Cs-137	0.02	0.32(8/8) (0.095-0.46)	BVPS Discharge No. 02A River Mile -- 35	0.44(2/2) (0.43-0.44)	0.32(2/2) (0.28-0.36)	0
	Ra-226	0.1	2.5(8/8) (1.0-3.7)	SAPS Discharge No. 3 River Mile --34.8	3.4(2/2) (3.0-3.7)	2.4(2/2) (2.2-2.6)	0
	Th-228	0.02	1.4(8/8) (0.72-2.0)	SAPS Discharge No. 03 River Mile -- 34.8	1.7(2/2) (1.3-2.0)	1.2(2/2) (1.2-1.3)	0
	Others	Table V.A. 3	LLD	--	--	--	-

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	Location with Highest Annual Mean **Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Montgomery Dam No. 49	
Sediment (pCi/g) (dry weight)	U-233 (8) and U-234	0.01	0.52(8/8) (0.23-0.77)	BVPS Dicharge No. 02A River Mile -- 35	0.73(2/2) (0.68-0.77)	0.49(2/2) (0.43-0.54)	0
	U-235 (8)	0.01	0.022(7/8) (0.0046-0.038)	BVPS Discharge No. 02A River Mile -- 35	0.029(2/2) (0.019-0.038)	0.021(2/2) (0.015-0.026)	0
	U-238 (8)	0.01	0.51(8/8) (0.16-0.85)	SAPS Discharge No. 03 River Mile -- 34.8	0.71(2/2) (0.56-0.85)	0.55(2/2) (0.34-0.76)	0

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean: Name, Distance and Directions	Location with Highest Annual Mean: **Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Weirton, WV No. 48	
External Radiation (mR/day)	Gamma (170 quarterly)	0.05	0.17(170/170) (0.11-0.22)	Beaver County Hosp. No. 298	0.20(4/4) (0.19-0.21)	0.18(4/4) (0.17-0.18)	0
	Gamma (42 annual)	0.05	0.17(42/42) (0.13-0.23)	Calcutta, OH No. 87	0.23(1/1) --	0.17(1/1) --	0
Feed and Forage (pCi/g) (dry weight)	I-131 (12)	0.01	0.1(2/12) (0.01-0.27)	Searight Dairy No. 25	--	One Sample Location	0
	Sr-90 (4)	0.003	0.15(4/4) (0.09-0.2)	--	--	--	-
	Gamma (12) Be-7	0.3	1.5(8/12) (0.6-4.3)	--	--	--	0
	K-40	0.5	21(12/12) (10.1-40.6)	--	--	--	0
	Ru-103	0.05	0.22(1/12) --	--	--	--	0
	I-131	0.1	0.64(1/12) --	--	--	--	0
	Cs-134	0.06	0.08(1/12) --	--	--	--	0
	Cs-137	0.04	0.13(7/12) (0.07-0.22)	-- --	-- --	-- --	0
	Others	Table V.A. 3	LLD	--	--	--	0

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	Location with Highest Annual Mean **Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Montgomery Dam No. 49	
Fish (pCi/g) (wet weight)	Gamma (9) K-40	0.5	3.3(9/9) (2.4-4.9)	Montgomery Dam No. 49	3.6(4/4) (3.2-4.0)	Same as High Location	0
	Others	Table V.A. 3	LLD	--	--	--	-
						Weirton, WV No. 48	
Food and Garden Crops (pCi/g) (wet weight)	I-131 (5)	0.006	LLD	--	--	--	-
	Gamma (5) Be-7	0.1	0.66(1/5) --	Industry, PA No. 46	0.66(1/2) --	LLD	0
	K-40	0.5	3.4(5/5) (2.0-6.8)	Industry, PA No. 46	4.9(2/2) (3.1-6.8)	3.1(1/1) --	0
	Cs-137	0.08	0.016(1/5) --	Industry, PA No. 46	0.016(1/2) --	LLD --	0
	Others	Table V.A. 3	LLD		--	--	-

* Nominal Lower Limit of Detection (LLD)

** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)

*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean: Name, Distance and Directions	Location with Highest Annual Mean: **Mean (f) **Range	Control Locations **Mean (f) **Range (Brunton Dairy No. 27)	Number of Nonroutine Reported Measurements***
Milk (pCi/ℓ)	I-131 (174)	0.5	11.5(34/174) (0.4-48)	Nichols Dairy No. 29A	18.9(5/20) (1.3-45)	0.9(3/20) (0.4-1.3)	0
	Sr-89 (138)	2	LLD	--	--	--	-
	Sr-90 (138)	1	3.1(138/138) (1.1-12)	Telesz No. 101	7.2(3/3) (4.4-12)	2.3(19/19) (1.4-3.2)	0
	Gamma (145)						
	K-40	100	1412(145/145) (994-1950)	Telesz No. 101	1753(3/3) (1540-1950)	1324(20/20) (1210-1540)	0
	I-131	10	31(15/145) (1.2-95)	Collins Dairy No. 69	66(2/7) (37-95)	LLD	0
	Cs-137	5	8.9(24/145) (5.5-19.9)	Collins Dairy No. 69	14(2/13) (8.7-19.9)	9.0(2/20) (8-10)	0
	Others	Table V.A. 3	LLD	--	--	--	-

* Nominal Lower Limit of Detection (LLD)

** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)

*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	Location with Highest Annual Mean **Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Montgomery Dam No. 49	
Surface Water (pCi/ℓ)	Gross (72) Alpha	2	LLD --	--	-- --	--	-
	Gross (72) Beta	1	5.5(71/72) (1.5-17)	SAPS Discharge No. 03	7.1(12/12) (2.7-16)	4.8(12/12) (2.3-6.1)	0
	Gamma (72)						
	Co-60	5	15(1/72) --	SAPS Discharge No. 03	15(1/72) --	LLD --	0
	Sb-125	10	44(1/72) --	SAPS Discharge No. 03	44(1/12) --	LLD --	0 -
	Others	Table V.A. 3	LLD	--	--	--	-
	Sr-89 (24)	2	LLD	--	--	--	-
	Sr-90 (24)	0.5	LLD	--	--	--	-
	Co-60 (24)(a)	2	LLD	--	--	--	-
	Tritium (24)	100	2012(14/24) (84-17000)	BVPS Discharge No. 02A	6364(4/4) (84-17000)	208(2/4) (86-330)	0

(a) Co-60 analyzed by high sensitivity method.

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean: Name, Distance and Directions	Location with Highest Annual Mean: **Mean (f) **Range	Control Locations * Mean (f) **Range	Number of Nonroutine Reported Measurements***
Drinking Water (pCi/ℓ)	I-131 (156)	0.5	0.5(4/156) (0.3-0.6)	Midland, PA No. 04 River Mile -- 36.3	0.5(4/156) (0.3-0.6)	--	0
	Gross (36) Alpha	0.6	LLD	--	--	--	-
	Gross (36) Beta	1	3.7(35/36) (1.4-6.1)	E. Liverpool, OH No. 05 River Mile -- 41.2	4.1(12/12) (2.2-6.1)	--	-
	Gamma (156)	Table V.A. 3	LLD	--	--	--	-
	Sr-89 (12)	1.5	LLD	--	--	--	-
	Sr-90 (12)	0.5	LLD	--	--	--	-
	Co-60 (12)(a)	2	LLD	--	--	--	-
	Tritium (12)	100	171(7/12) (130-310)	DLC Training Bldg. No. 6	207(3/4) (150-310)	--	-

(a) Co-60 analyzed by high sensitivity method.

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

TABLE V.A.2

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	Location with Highest Annual Mean **Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Georgetown, Pa. No. 15	
Ground Water (pCi/liter)	Gross (16) Alpha	2	LLD	--	--	--	-
	Gross (16) Beta	1	4.0(11/16) (1.7-6.6)	Shippingport, PA No. 11	4.6(3/4) (3.2-5.9)	2.8(3/4) (1.8-3.8)	0 -
	Gamma (16)	Table V.A. 3	LLD	--	--	--	-
	Tritium (16)	90	187(11/16) (130-280)	Meyer Farm No. 13	220(2/4) (160-280)	183(3/4) (130-250)	0

* Nominal Lower Limit of Detection (LLD)

** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)

*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (December 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Duquesne Light Company Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County,State) Reporting Period Annual 1986

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations ** Mean (f) **Range	Location with Highest Annual Mean Name Distance and Directions	**Mean (f) **Range	Control Locations **Mean (f) **Range	Number of Nonroutine Reported Measurements***
						Weirton, WV No. 48	
Water Precipitation (pCi/ℓ)	Gross (40) Beta	2	8.2(38/40) (0.7-31)	Weirton, WV No. 48	10(12/12) (1.7-31)	Same as High Location	0
	Gamma (49)						
	Be-7	40	111(19/49) (59-269)	E. Liverpool, OH No. 47	134(5/16) (87-269)	109(12/15) (66-230)	0
	K-40	20	72(1/49) --	E. Liverpool, OH No. 47	72(1/16) --	-- --	0
	Ru-103	2	8.5(3/49) (7.38-9.15)	Shippingport, PA No. 30	8.9(1/18) --	8.3(2/15) (7.4-9.2)	0
	I-131	10	48(10/49) (8.8-95)	Shippingport, PA No. 30	59(4/18) (13-95)	43(3/15) (14.62)	0
	Cs-137	1	8.8(4/49) (6.8-13.6)	Weirton, WV No. 48	10(4/15) (6.8-13.6)	Same as High Location	
	Others	Table V.A. 3	LLD	--	--	--	-
	Sr-89 (3)	2	LLD	--	--	--	-
	Sr-90 (3)	0.5	LLD	--	--	--	-
	H-3	100	130(1/3) --	Shippingport, PA No. 30	130(1/1) --	LLD	0

* Nominal Lower Limit of Detection (LLD)
** Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f)
*** Nonroutine reported measurements are defined in Regulatory Guide 4.8 (MARCH 1975) and the Beaver Valley Power Station Technical Specifications (Appendix B)

V. ENVIRONMENTAL MONITORING

A. Environmental Radioactivity Monitoring Program (continued)

2. Summary of Results

All results of this monitoring program are summarized in Table V.A.2. This table is prepared in the format specified by NRC Regulatory Guide 4.8 and in accordance with Beaver Valley Power Station Operating License, (Appendix A, Technical Specifications). Summaries of results of analysis of each media are discussed in Sections V-B through V-H and an assessment of radiation doses are found in Section V-I. Table V.A.3 summarizes Beaver Valley Power Station pre-operational ranges for the various sampling media during the years 1974 and 1975. Comparisons of pre-operational data with operational data indicate the ranges of values are in good agreement for both periods of time.

Activity detected was attributed to naturally occurring radionuclides, BVPS effluents, previous nuclear weapons tests and the Chernobyl Nuclear Plant accident in the Soviet Union on April 25, 1986. Remaining detected activities were near the lower limit of their detection (LLD) and are attributable to the normal statistical fluctuation near the LLD level.

The conclusion from all program data is that the operation of the Beaver Valley Power Station has resulted in insignificant changes to the environment.

3. Quality Control Program

The Quality Control Program implemented by Duquesne Light Company to assure reliable performance by the DLC contractor and the supporting QC data are presented and discussed in Section III of this report. The lower limits of detection for various analysis for each media monitored by this program by the DLC Contractor Laboratory are provided in Table V.A.4.

TABLE V.A.3 (Page 1 of 4)
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Docket No. 50-334

Location of Facility Beaver, Pennsylvania (County, State) Reporting Period CY 1974 - 1975

PRE-OPERATIONAL PROGRAM SUMMARY (COMBINED 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection LLD	All Indicator Locations Mean, (f) Range		
Surface Water pCi/l	Gross Alpha	(40)	0.3	0.75	5/40	0.6 - 1.1
	Gross Beta	(120)	0.6	4.4	120/120	2.5 - 11.4
	Gamma	(1)	10 - 60		< LLD	
	Tritium	(121)	100	300	120/121	180 - 800
	Sr-89	(0)	—		—	
	Sr-90	(0)	—		—	
	C-14	(0)	—		—	
Drinking Water pCi/l	I-131	(0)	—			
	Gross Alpha	(50)	0.3	0.6	4/50	0.4 - 0.8
	Gross Beta	(208)	0.6	3.8	208/208	2.3 - 6.4
	Gamma	(0)	—		—	
	Tritium	(211)	100	310	211/211	130 - 1000
	C-14	(0)	—		—	
	Sr-89	(0)	—		—	
	Sr-90	(0)	—		—	
Ground Water pCi/l	Gross Alpha	(19)	0.3		< LLD	
	Gross Beta	(76)	0.6	2.9	73/75 (a)	1.3 - 8.0
	Tritium	(81)	100	440	77/81	80 - 800
	Gamma	(1)	10 - 60		< LLD	
Air Particulates and Gaseous pCi/m^3	Gross Alpha	(188)	0.001	0.003	35/188	0.002 - 0.004
	Gross Beta	(927)	0.006	0.07	927/927	0.02 - 0.32
	Sr-89	(0)			—	
	Sr-90	(0)			—	
	I-131	(816)	0.04	0.08	2/816	0.07 - 0.08
	Gamma	(197)				
	ZrNb-95		0.005	0.04	122/197	0.01 - 0.16
	Ru-106		0.010	0.04	50/197	0.02 - 0.09
	Ce-141		0.010	0.02	3/197	0.01 - 0.04
	Ce-144		0.010	0.02	44/197	0.01 - 0.04
	Others				< LLD	

TABLE V.A.3 (Page 2 of 4)
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Docket No. 50-334
Location of Facility Beaver, Pennsylvania (County, State) Reporting Period CY 1974 - 1975

PRE-OPERATIONAL PROGRAM SUMMARY (COMBINED 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection LLD	All Indicator Locations Mean, (f) Range		
Soil pCi/g (dry) (Template Samples)	Gross Alpha	(0)	—		—	
	Gross Beta	(64)	1	22	64/[illegible]	14 - 32
	Sr-89	(64)	0.25	0.4	1/64	—
	Sr-90	(64)	0.05	0.3	48/64	0.1 - 1.3
	U-234,235,238	(0)	—		—	
	Gamma	(64)				
	K-40		1.5	13	63/64	5 - 24
	Cs-137		0.1	1.5	56/64	0.1 - 6.8
	Ce-144		0.3	1.1	7/64	0.2 - 3
	ZrNb-95		0.05	0.3	13/64	0.1 - 2
	Ru-106 (b)		0.3	1.1	3/64	0.5 - 2
	Others				< LLD	
Soil pCi/g (dry) (Core Samples)	Gross Alpha	(0)	—		—	
	Gross Beta	(8)	1	21	8/8	16 - 28
	Sr-89	(8)	0.25		< LLD	
	Sr-90	(8)	0.05	0.2	5/8	0.08 - 0.5
	Gamma	(8)				
	K-40		1.5	13	8/8	7 - 20
	Cs-137		0.1	1.2	7/8	0.2 - 2.4
	Co-60		0.1	0.2	1/8	—
	Others				< LLD	

TABLE V.A.3 (Page 3 of 4)
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Docket No. 50-334
Location of Facility Beaver, Pennsylvania (County, State) Reporting Level CY 1974 - 1975

PRE-OPERATIONAL PROGRAM SUMMARY (COMBINED 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection LLD	All Indicator Locations Mean, (f) Range		
Sediments pCi/g (dry)	Gross Alpha	(0)	—			
	Gross Beta	(33)	1	18	33/33	5 - 30
	Sr-90	(0)	—		—	
	U-234,235, 238	(0)	—		—	
	Gamma	(33)		13	33/33	2 - 30
	K-40		1.5	13	33/33	2 - 30
	Cs-137		0.1	0.4	21/33	0.1 - 0.6
	ZrNb-95		0.05	0.8	12/33	0.2 - 3.2
	Ce-144		0.3	0.5	3/33	0.4 - 0.7
	Ru-106(b)		0.3	1.5	3/33	1.3 - 1.8
	Others				< LLD	
Foodstuff pCi/g (dry)	Gamma	(8)				
	K-40		1	33	8/8	10 - 53
	Cs-137		0.1	0.2	1/8	—
	ZrNb-95		0.05	0.2	1/8	—
	Ru-106(b)		0.3	0.8	1/8	—
	Others				< LLD	
Feedstuff pCi/g (dry)	Gross Beta	(80)	0.05	19	80/80	8 - 50
	Sr-89	(81)	0.025	0.2	33/81	0.04 - 0.93
	Sr-90	(81)	0.005	0.4	78/81	0.02 - 0.81
	Gamma	(81)				
	K-40		1	19	75/81	5 - 46
	Cs-137		0.1	0.5	6/81	0.2 - 1.6
	Ce-144		0.3	1.5	5/81	0.9 - 2.6
	ZrNb-95		0.05	0.8	13/81	0.2 - 1.8
	Ru-106(b)		0.3	1.4	12/81	0.6 - 2.3
	Others				< LLD	

TABLE V.A.3 (Page 4 of 4)
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Docket No. 50-334
Location of Facility Beaver, Pennsylvania (County, State) Reporting Level CY 1974 - 1975

PRE-OPERATIONAL PROGRAM SUMMARY (COMBINED 1974 - 1975)

Medium or Pathway Sampled (Unit of Measurement)	Analysis and Total Number of Analysis Performed		Lower Limit of Detection LLD	All Indicator Locations Mean,	(f)	Range
Milk pCi/l	I-131	(91)	0.25	0.6	4/91	0.3 - 0.8
	Sr-89	(134)	5	7	4/134	6 - 11
	Sr-90	(134)	1	5.3	132/134	1.5 - 12.8
	Gamma	(134)				
	Cs-137		10	13	19/134	11 - 16
	Others					< LLD
External Radiation mR/day	γ - Monthly	(599)	0.5 mR *	0.20	599/599	0.08 - 0.51
	γ - Quarterly	(195)	0.5 mR *	0.20	195/195	0.11 - 0.38
	γ - Annual	(48)	0.5 mR *	0.19	48/48	0.11 - 0.30
Fish pCi/g (wet)	Gross Beta	(17)	0.01	1.9	15/17	1.0 - 3.2
	Sr-90	(17)	0.005	0.14	17/17	0.02 - 0.50
	Gamma	(17)				
	K-40		0.5	2.4	17/17	1.0 - 3.7
	Other					< LLD

* LLD in units of MR - Lower end of useful integrated exposure detectability range for a passive radiation detector (TLD).

(a) One outlier not included in mean. (Water taken from dried-up spring with high sediment and potassium content. Not considered typical groundwater sample.)

(b) May include Ru-106, Ru-103, Be-7.

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TABLE V.A.4

TYPICAL LLDs * FOR GAMMA SPECTROMETRY

Nuclide	Milk Water (pCi/liter)	Air Particulates (10^{-3} pCi/m^3)	Vegetation (pCi/kg dry)	Sediment & Soil (pCi/g dry)	Fish (pCi/g wet)
Be-7	30	20	50	0.03	0.05
K-40	60	20	**	**	**
Cr-51	40	10	100	0.05	0.1
Mn-54	3	0.5	30	0.02	0.03
Co-58	3	0.6	30	0.02	0.03
Fe-59	6	1	60	0.03	0.06
Co-60	3	0.6	30	0.02	0.03
Zn-65	8	1	70	0.04	0.07
Zr/Nb-95	5	2	50	0.03	0.05
Ru-103	3	2	40	0.03	0.04
Ru-106	30	5	30	0.02	0.03
Ag-110M	5	3	30	0.02	0.03
I-131	4	2	30	0.02	0.03
Te-132	4	2	20	0.01	0.02
I-133	4	2	20	0.01	0.02
Cs-134	4	0.6	30	0.02	0.03
Cs-136	6	0.6	50	0.03	0.05
Cs-137	4	0.6	20	0.02	0.03
Ba/La-140	10	6	40	0.02	0.04
Ce-141	6	2	60	0.03	0.06
Ce-144	30	5	200	0.1	0.2
Ra-226	60	6	600	0.3	0.6
Th-228	10	1	60	0.03	0.06

* At time of analysis (DLC Contractor Lab).
** Activity detected in all samples.
NOTE Lower Level of Detection is defined in Beaver Valley Power Station Technical Specifications.

V. ENVIRONMENTAL MONITORING

B. Air Monitoring

1. Characterization of Air and Meteorology

The air in the vicinity of the site contains pollutants typical for an industrial area. Air flow is generally from the Southwest in summer and from the Northwest in the winter.

2. Air Sampling Program and Analytical Techniques

a. Program

The air is sampled for gaseous radioiodine and radioactive particulates at each of ten (10) off-site air sampling stations. The locations of these stations are listed in Table V.A.1 and shown on a map in Figure 5.B.1.

Samples are collected at each of these stations by continuously drawing about one cubic foot per minute of atmosphere air through a glass fiber filter and through a charcoal cartridge. The former collects airborne particulates; the latter is for radioiodine sampling. Samples are collected for analysis on a weekly basis.

The charcoal is used in the weekly analysis of airborne I-131. The filters are analyzed each week for gross beta, then composited by station for monthly analysis by gamma spectrometry. They are further composited in a quarterly sample from each station for Sr-89 and Sr-90 analysis. In order to reduce interference from natural radon and thoron radioactivities, all filters are allowed to decay for a few days after collection prior to counting for beta in a low background counting system.

b. Procedures

Gross Beta analysis is performed by placing the filter paper from the weekly air sample in a 2" x 1/4" planchet and counting it in a low background, gas flow proportional counter.

V. ENVIRONMENTAL MONITORING

B. Air Monitoring (continued)

2. Air Sampling Program and Analytical Techniques (continued)

b. Procedures (continued)

Gamma emitters are determined by stacking all the filter papers from each monitoring station collected during the month and scanning this composite on a lithium drifted germanium (Ge(Li)) gamma spectrometer.

Radioiodine (I-131) analysis is performed by a gamma scan of the charcoal in a weekly charcoal cartridge. The activity is referenced to the mid-collection time.

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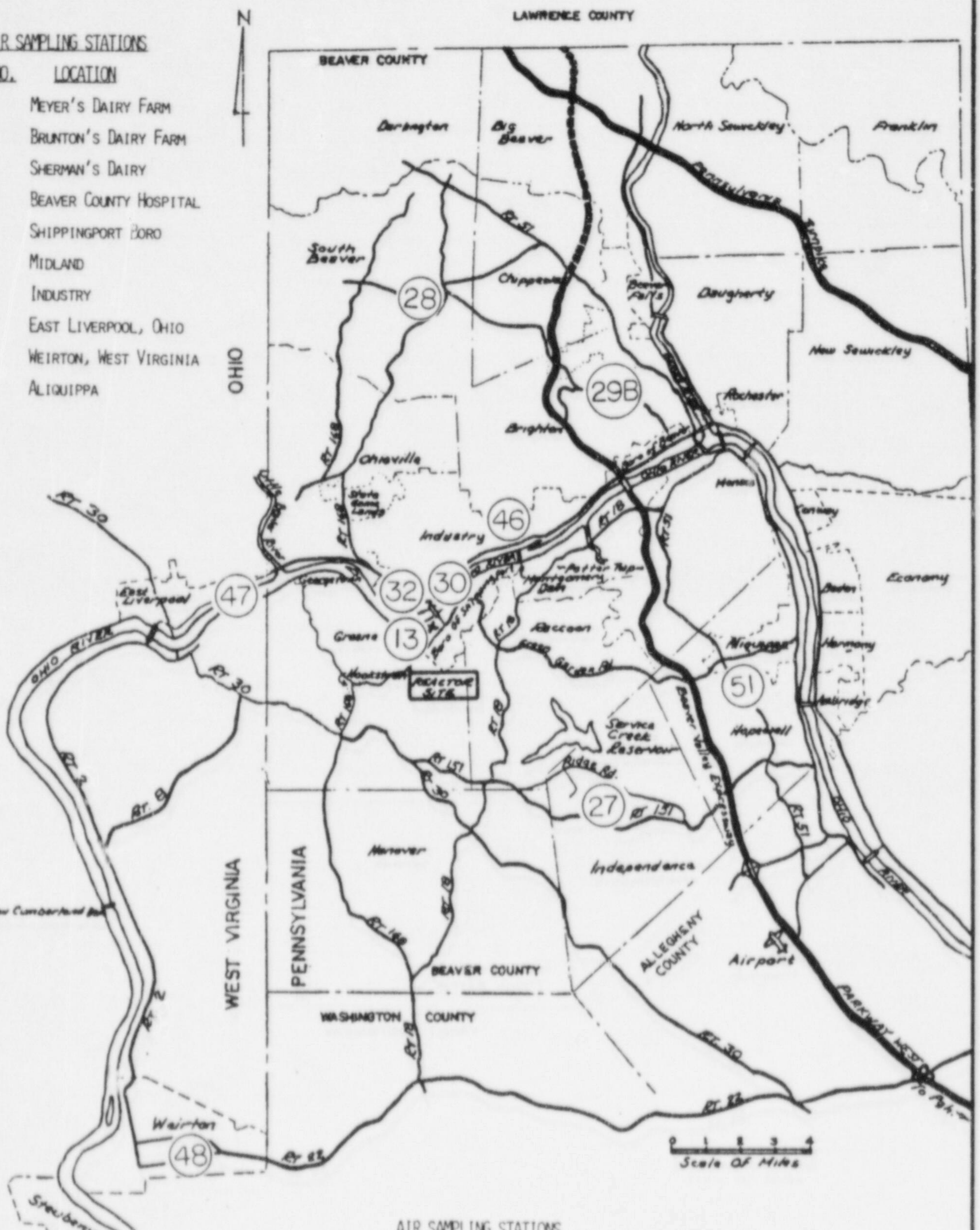
FIGURE 5.B.1

ENVIRONMENTAL MONITORING LOCATIONS— AIR SAMPLING LOCATIONS

AIR SAMPLING STATIONS

STA. NO.	LOCATION
13	Meyer's Dairy Farm
27	Brunton's Dairy Farm
28	Sherman's Dairy
29B	Beaver County Hospital
30	Shippingport Boro
32	Midland
46	Industry
47	East Liverpool, Ohio
48	Weirton, West Virginia
51	Aliquippa



AIR SAMPLING STATIONS

FIGURE 5.B.1

V. ENVIRONMENTAL MONITORING

B. Air Monitoring (continued)

2. Air Sampling Program and Analytical Techniques (continued)

b. Procedures (continued)

Strontium-89 and Strontium-90 activities are determined in quarterly composited air particulate filters. Stable strontium carrier is added to the sample and it is leached in nitric acid to bring deposits into solution. The mixture is then filtered. Half of the filtrate is taken for strontium analysis and is reduced in volume by evaporation. Strontium is precipitated as $Sr(NO_3)_2$ using fuming (90%) nitric acid. An iron (ferric hydroxide) scavenge is performed, followed by addition of stable yttrium carrier and a 5 to 7 day period for yttrium ingrowth. Yttrium is then precipitated as hydroxide, is dissolved and re-precipitated as oxalate. The yttrium oxalate is mounted on a nylon planchet and is counted in a low level beta counter to infer Sr-90 activity. Sr-89 activity is determined by precipitating $SrCO_3$ from the sample after yttrium separation. This precipitate is mounted on a nylon planchet and is covered with 80 mg/cm^2 aluminum absorber for level beta counting.

3. Results and Conclusions

A summary of data is presented in Table V.A.2.

a. Airborne Radioactive Particulates

A total of five hundred twenty (520) weekly samples from ten (10) locations were analyzed for gross beta. Results were comparable to previous years with the exception of short-term increases due to the Chernobyl Nuclear Plant accident in the Soviet Union on April 25, 1986. Figure 5.B.2 illustrates the average concentration of gross beta in air particulates.

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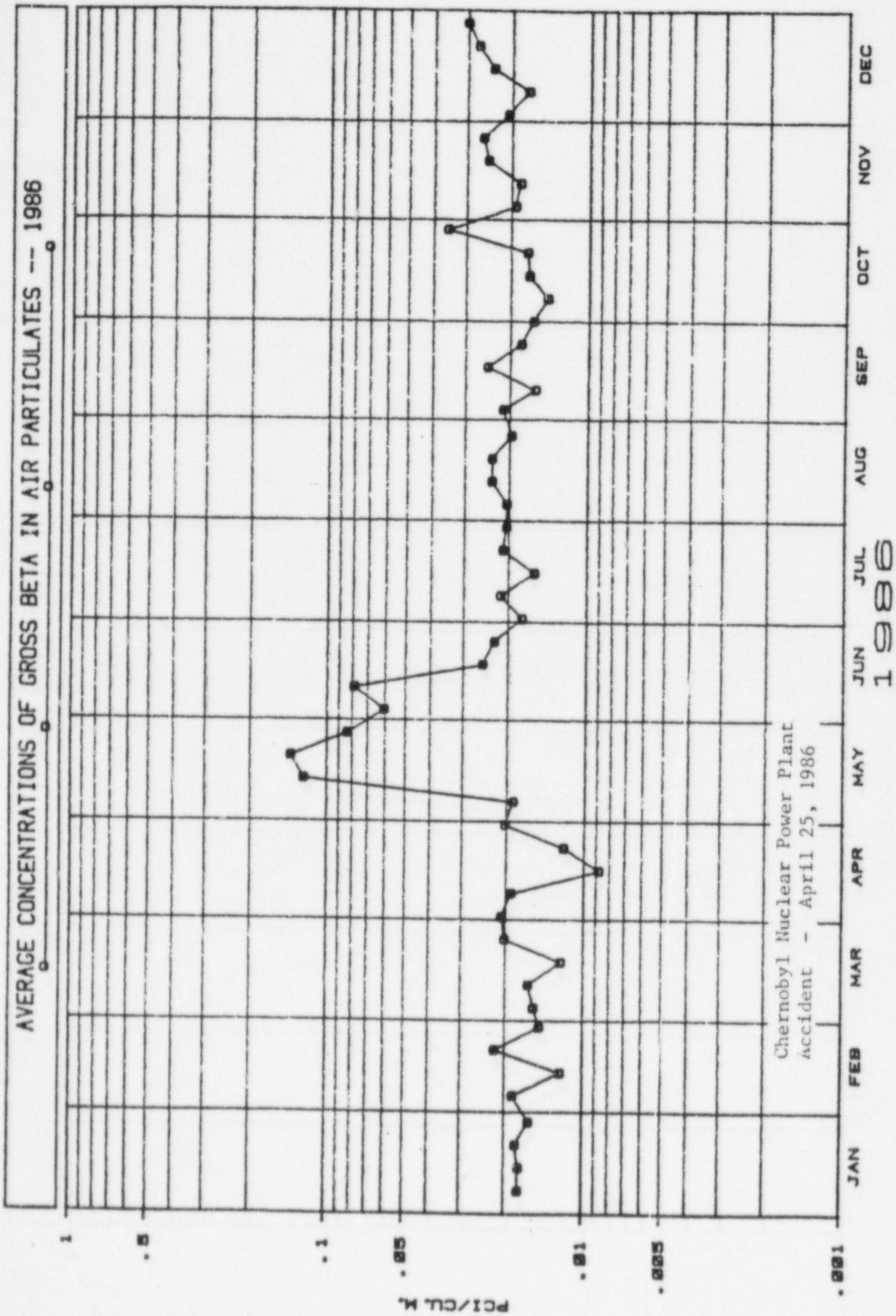

V. ENVIRONMENTAL MONITORING

B. Air Monitoring (continued)

3. Results and Conclusions (continued)

a. Airborne Radioactive Particulates (continued)

The weekly air particulate samples were composited to one hundred twenty (120) monthly samples which were analyzed by gamma spectrometry. Naturally occurring Be-7 was present in every sample. Occasional traces above detection levels of other naturally occurring nuclides such as K-40 were present. Radionuclides attributable to the Chernobyl Nuclear Plant accident are Cs-134, Cs-137 and Ru-103. These are listed in the summary Table V.A.2. Examination of effluent data from the Beaver Valley Power Station demonstrated that none of the slightly elevated results are attributable to the operation of the power station.

A total of forty (40) quarterly samples were each analyzed for Sr-89 and Sr-90. No Sr-89 or Sr-90 was detected.

Based on the analytical results, the operation of Beaver Valley Power Station did not contribute to any increase in air particulate radioactivity during CY 1986.

b. Radioiodine

A total of five hundred twenty (520) weekly charcoal filter samples were analyzed for I-131. No detectable concentrations were found at any locations with the exception of short-term increases due to the Chernobyl Nuclear Plant accident. Figure 5.B.3 illustrates the average concentration of I-131 in charcoal filter samples.

Based on analytical results, the operation of Beaver Valley Power Station did not contribute to any increase in airborne radioiodine during CY 1986.

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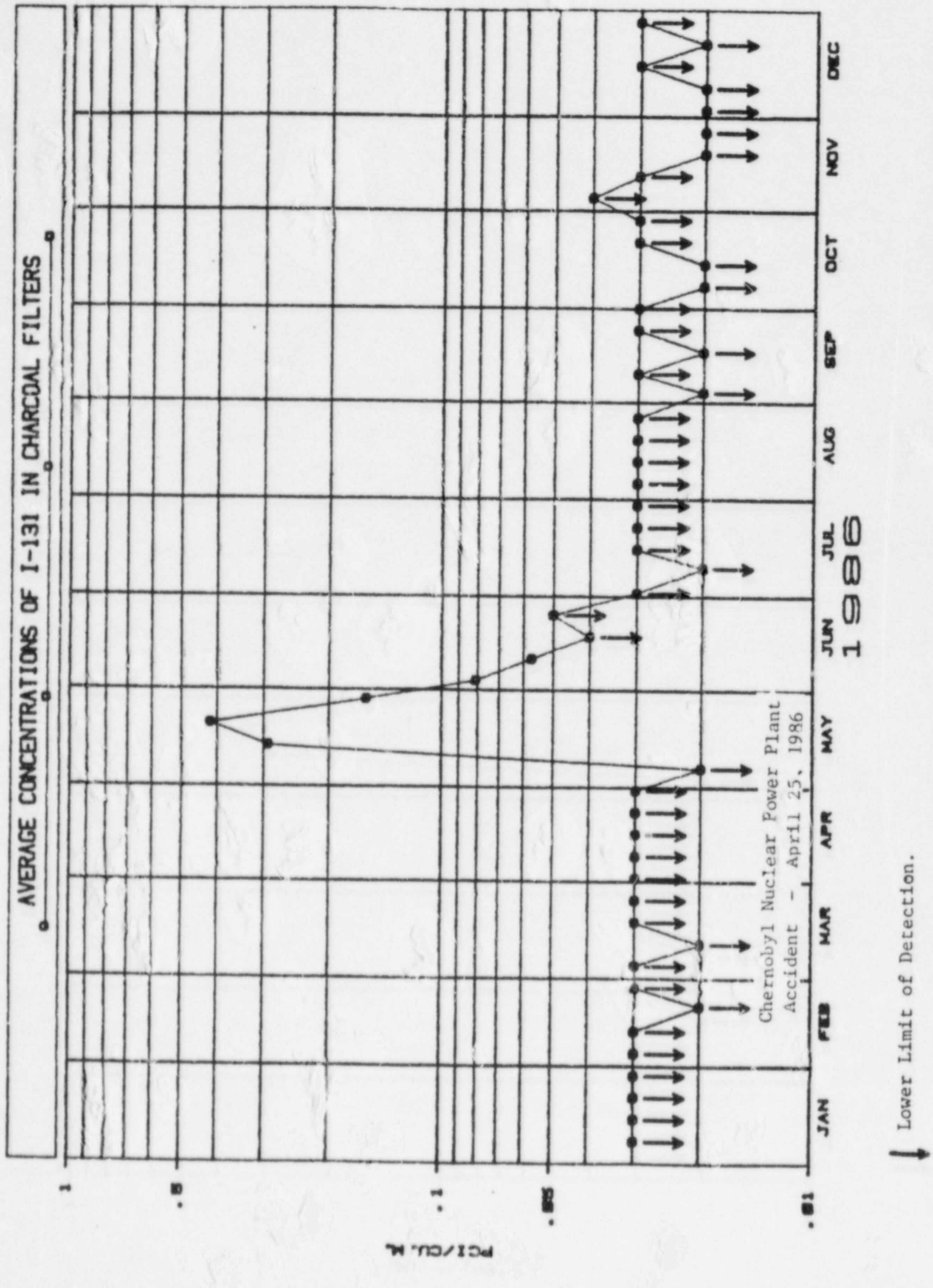

V. ENVIRONMENTAL MONITORING

C. Monitoring of Sediments and Soils (Soil Monitoring is required every 3 years was not required in 1986)

1. Characterization of Stream Sediments and Soils

The stream sediments consist largely of sand and silt. Soil samples may vary from sand and silt to a heavy clay with variable amounts of organic material.

2. Sampling Program and Analytical Techniques

a. Program.

River bottom sediments were collected semi-annually above the Montgomery Dam in the vicinities of the Beaver Valley discharge and Shippingport discharge and above the New Cumberland Dam. A Ponar or Eckman dredge is used to collect the sample. The sampling locations are also listed in Table V.A.1 and are shown in Figure 5.C.1.

Bottom sediments are analyzed for gross alpha and beta activity, strontium, uranium, and the gamma-emmitting radionuclides.

b. Analytical Procedures

Gross beta - sediments and soils are analyzed for gross beta by mounting a 1 gram portion of dried sediment in a 2" planchet. The sample is counted in a low background, gas flow proportional counter. Self absorption corrections are made on the basis of sample weight.

Gross alpha activity of sediment or soil is analyzed in the same manner as gross beta except that the counter is set up to count only alpha.

Gamma analysis of sediment or soil is performed in a 300 ml plastic bottle which is counted by a gamma spectrometer.

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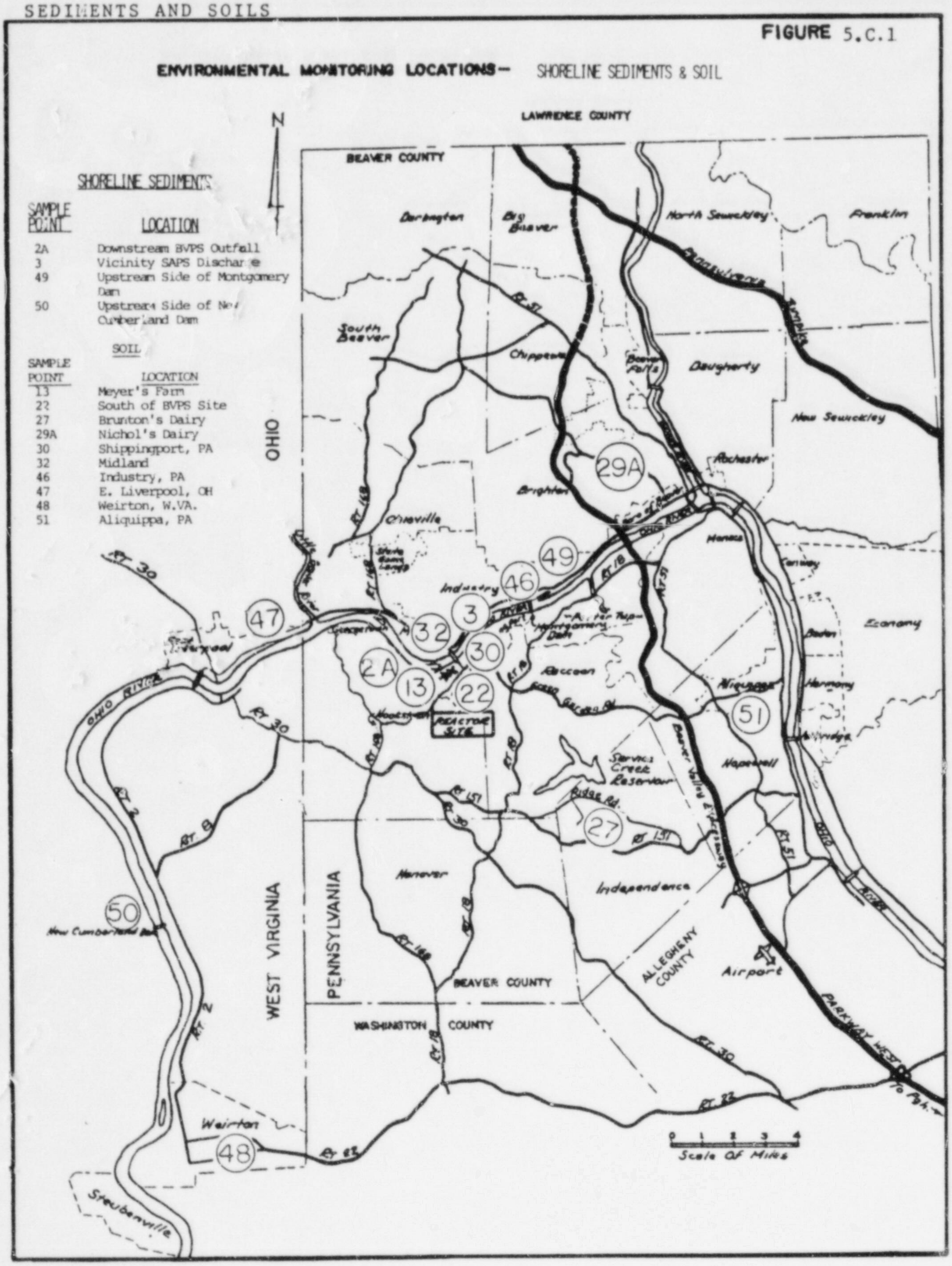
SEDIMENTS AND SOILS



V. ENVIRONMENTAL MONITORING

C. Monitoring of Sediments and Soils (Soil Monitoring is required every 3 years and was not required in 1986) (continued)

2. Sampling Program and Analytical Techniques (continued)

b. Analytical Procedures (continued)

Strontium 89 and 90 are determined by radiochemistry. A weighed sample of sediment or soil is leached with Nitric Acid HNO_3. A stable carrier is added for determination of recovery. Strontium concentration and purification is ultimately realized by precipitations of strontium nitrate in fuming nitric acid. Additional hydroxide precipitations and barium chromate separations are also used. The purified strontium is converted to a carbonate for weighing and counting. Samples are counted soon after separation (5 - 7 days is allowed for yttrium ingrowth). Activities are calculated on the basis of appropriate Sr-89 decay and Y-90. Separate mounts covered with a 80 mg/cm^2 aluminum absorber are used for counting in a low background beta counter.

Uranium isotopic analysis of sediment and soil samples were performed by alpha spectrometry after leaching and isolation of the uranium by an ion exchange chromatography plus mercury cathode electrolysis, then electroplated onto a planchet.

3. Results and Conclusions

A summary of data is presented in Table V.A.2.

a. Sediment

A total of (8) samples were analyzed for gross alpha and gross beta. Results were comparable to previous years.

A total of eight (8) samples were analyzed for Sr-89 and Sr-90. No Sr-89 or Sr-90 was detected.

V. ENVIRONMENTAL MONITORING

C. Monitoring of Sediments and Soils (Soil Monitoring is required every 3 years and was not required in 1986.) (continued)

3. Results and Conclusion (continued)

a. Sediment (continued)

A total of eight (8) samples were analyzed by gamma spectrometry. Naturally occurring K-40, Ra-226 and Th-228 was found in every sample and Be-7 was found in two samples. Small amounts of Cs-137 from previous nuclear weapons tests were found in all river sediment samples including upstream above Montgomery Dam which are unaffected by plant effluents. Small amounts of Co-58, Co-60, Cs-134 and Cs-137 were detected in the Beaver Valley Power Station discharge area and are attributable to station releases. The activity found in the station discharge area is consistent with station data of authorized radioactive discharges which were within limits permitted by the NRC license.

A total of eight (8) samples were analyzed by alpha spectroscopy for uranium. Naturally occurring uranium was found in all samples.

The analyses demonstrate that the Beaver Valley Power Station did not contribute a significant increase of radioactivity in the Ohio River sediment. The positive results detected are attributable to authorized releases from the Beaver Valley Power Station and are characteristic of the effluent. These results confirm that the station assessments, prior to authorizing radioactive discharges, are adequate and that the environmental monitoring program is sufficiently sensitive.

V. ENVIRONMENTAL MONITORING

D. Monitoring of Feedcrops and Foodcrops

1. Characterization of Vegetation and Foodcrops

According to a survey made in 1985, there were approximately 610 farms in Beaver County. The principal source of revenue for the farms was in dairy products which amounted to nearly $5,998,000. Revenues from other farm products were as follows:

Field Crops.	$2,013,000
Fruits	$ 169,000
Horticulture and Mushrooms	$ 994,000
Meat and Animal Products.	$1,638,000
Vegetables and Potatoes.	$ 266,000
Poultry Products	$ 426,000

The total land in Beaver County is 218,600 acres. Approximately 134,592 acres are forested land and 61,176 acres are pasture and crop land.

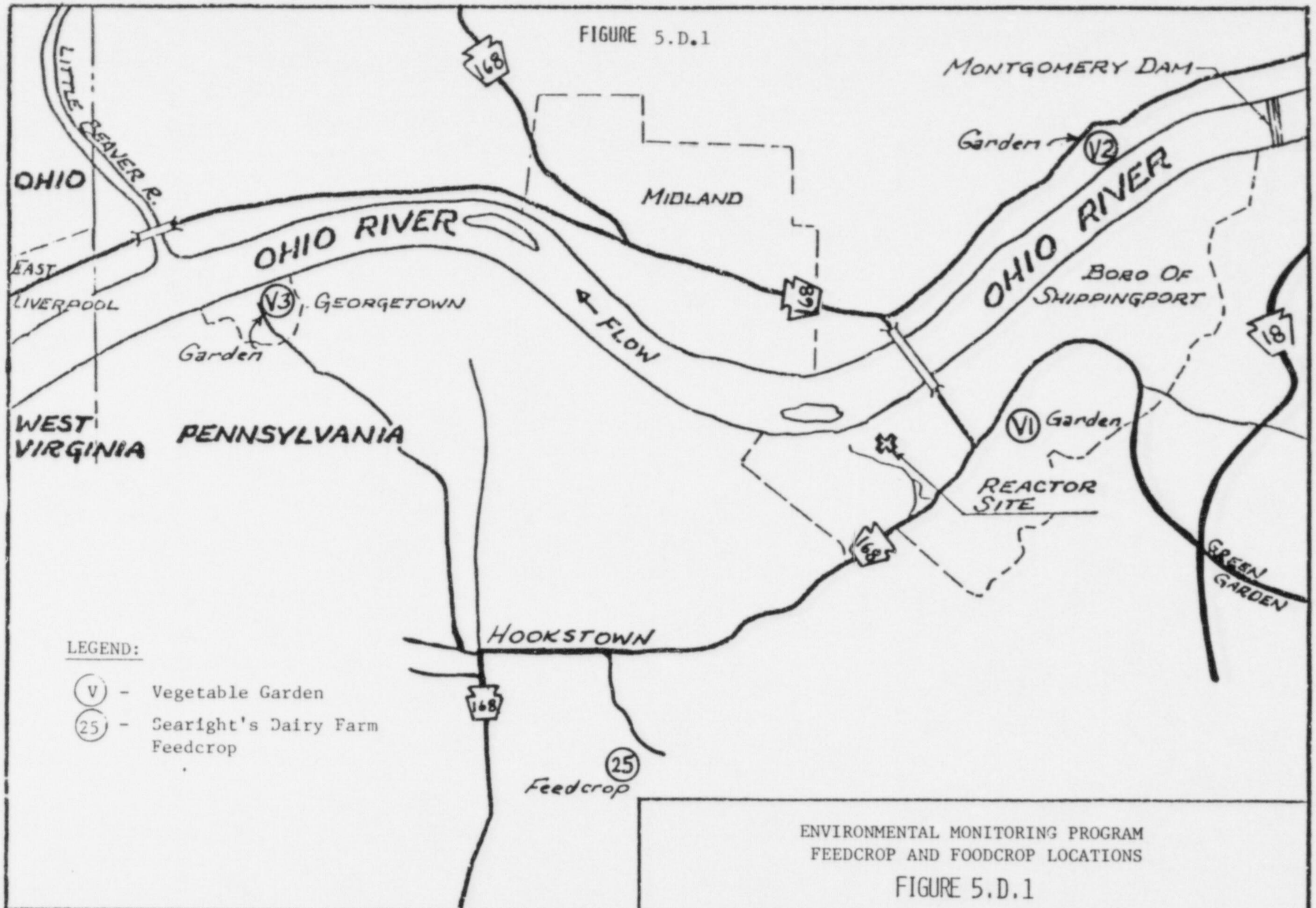
2. Sampling Program and Analytical Techniques

a. Program

Representative samples of cattle feed are collected monthly from the nearest dairy (Searight). See Figure 5.D.1. Each sample is analyzed by gamma spectrometry. The monthly samples are composited into a quarterly sample which is analyzed for Sr-90.

A land use census was performed August, 1986 to locate the nearest residence and nearest garden of greater than 500 square feet producing fresh leafy vegetables within a five (5) mile radius of the site. See Table V.D.1 for results.

Foodcrops (vegetables) were collected at garden locations during the summer of 1986. Leafy vegetables, i.e., cabbage were obtained from Shippingport, Georgetown, Industry, PA, and Weirton, WV. All samples were analyzed for gamma emitters (including I-131 by gamma spectrometry).



ENVIRONMENTAL MONITORING PROGRAM
FEEDCROP AND FOODCROP LOCATIONS
FIGURE 5.D.1

TABLE V.D.1

Closest Residence and Garden in Each Sector

Sector	Closest Residence*	Closest Garden*
1	1.59 mi N	1.63 mi N
2	1.64 mi NNE	1.68 mi NNE
3	0.45 mi NE	0.62 mi NE
4	0.44 mi ENE	1.04 mi ENE
5	0.47 mi E	1.90 mi E
6	0.98 mi ESE	1.04 mi ESE
7	1.14 mi SE	1.63 mi SE
8	1.08 mi SSE	1.08 mi SSE
9	1.36 mi S	1.93 mi S
10	0.76 mi SSW	1.48 mi SSW
11	1.38 mi SW	1.53 mi SW
12	1.42 mi WSW	2.25 mi WSW
13	2.21 mi W	2.21 mi W
14	2.24 mi WNW	2.24 mi WNW
15	0.89 mi NW	0.92 mi NW
16	0.71 mi NNW	1.02 mi NNW

*Distance and Direction from Reactor

V. ENVIRONMENTAL MONITORING

D. Monitoring of Feedcrops and Foodcrops (continued)

2. Sampling Program and Analytical Techniques (continued)

b. Procedures

Gamma emitters, including I-131, are determined by scanning a dried, homogenized sample with the gamma spectrometry system. A Ge(Li) detector is utilized with this system.

Strontium 90 analysis for feedstuff is performed by a procedure similar to that described in V.C.2.

Radioiodine (I-131) is determined by radiochemistry. Stable iodide carrier is first added to a chopped sample which is then leached with sodium hydroxide solution, evaporated to dryness and fused in a muffle furnace. The melt is dissolved in water, filtered and treated with sodium hypochlorite. The iodate is then reduced to iodine with hydroxylamine hydrochloride and is extracted into chloroform. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchette for low level beta counting.

3. Results and Conclusions

A summary of data is presented in Table V.A.2.

a. Feed

A total of twelve (12) samples were analyzed for I-131. Small amounts of I-131 were found in two samples and are attributable to the Chernobyl Nuclear Plant accident.

A total of four (4) samples were analyzed for Sr-90. Small amounts of Sr-90 from previous nuclear weapons tests were found in all samples.

V. ENVIRONMENTAL MONITORING

D. Monitoring of Feedcrops and Foodcrops (continued)

3. Results and Conclusions (continued)

a. Feed (continued)

A total of twelve (12) samples were analyzed by gamma spectrometry. Naturally occurring K-40 was found in all samples and Be-7 was detected in eight (8) samples. Small amounts of Ru-103, I-131, Cs-134 and Cs-137 were found in one (1) sample and are attributable to the Chernobyl Nuclear Plant accident. Cs-137 which was found in seven (7) samples is attributable to previous nuclear weapons tests.

b. Food

A total of five (5) samples were analyzed for I-131. No I-131 was detected.

A total of five (5) samples were analyzed by gamma spectrometry. Naturally occurring K-40 was found in all samples and Be-7 was detected in one (1) sample. Cs-137 was found in one (1) sample and is attributable to previous nuclear weapons tests.

c. The data from food and feed analyses with the exception of fallout from Chernobyl were consistent with (or lower than) those obtained in the pre-operational program. These data confirm that the Beaver Valley Power Station did not contribute to radioactivity in foods and feeds in the vicinity of the site.

V. ENVIRONMENTAL MONITORING

E. Monitoring of Local Cow's Milk

1. Description - Milch Animal Locations

During the seasons that animals producing milk (milch animals) for human consumption are on pasture, samples of fresh milk are obtained from these animals at locations and frequencies noted in Table V.A.1. This milk is analyzed for its radioiodine content calculated as Iodine-131. The analyses are performed within eight (8) days of sampling.

Detailed field surveys are performed during the grazing season to locate and enumerate milch animals within a five (5) mile radius of the site. Goat herd locations out to fifteen (15) miles are identified. Survey data for the most recent survey conducted in August, 1986 is shown in Figure 5.E 1.

2. Sampling Program and Analytical Techniques

a. Program

Milk was collected from three (3) reference dairy farms (Searights, Brunton and Nicol's) within a 10-mile radius of the site and from one (1) control location (Windshimer's) outside of the 10-mile radius. Additional dairies, which represent the highest potential milk pathway for radioiodine based on milch animal surveys and meteorological data were selected and sampled. These dairies are subject to change based upon availability of milk or when more recent data (milch animal census) indicate other locations are more appropriate. The location of each is shown in Figure 5.E.2 and described below.

Site	Dairy	Number of Milch Animals	Distance and Direction From Site	Collection Period
25	Searight	40 Cows	2.1 miles-south/sw.	Jan. - Dec.
27	Brunton	85 Cows	7.3 miles-southeast	Jan. - Dec.
29A	Nichol	50 Cows	8.0 miles-northeast	Jan. - Dec.
96	Windsheimer	50 Cows	10.3 miles-south/sw.	Jan. - Dec.
61**	Allison	36 Cows	3.2 miles-west/sw.	Jan. - Dec.

V. ENVIRONMENTAL MONITORING

E. Monitoring of Local Cow's Milk (continued)

2. Sampling Program and Analytical Techniques (continued)

a. Program (continued)

Site	Dairy	Number of Milch Animals	Distance and Direction From Site	Collection Period
69**	Collins	8 Goats, 1 Cow*	3.6 miles-southeast	Jan. - Dec.
62**	Lyon	16 Cows	3.3 miles-west/sw.	Jan. - June
98**	Foxall (Hammond)	1 Goat*	2.9 miles-east	June - Dec.
101**	Telesz	2 Goats*	2.7 miles-east	Aug. - Dec.
102**	Ferry	4 Goats*	3.2 miles-southeast	Aug. - Dec.

*Milk Usage - Home Only.
**Highest potential pathway dairies.

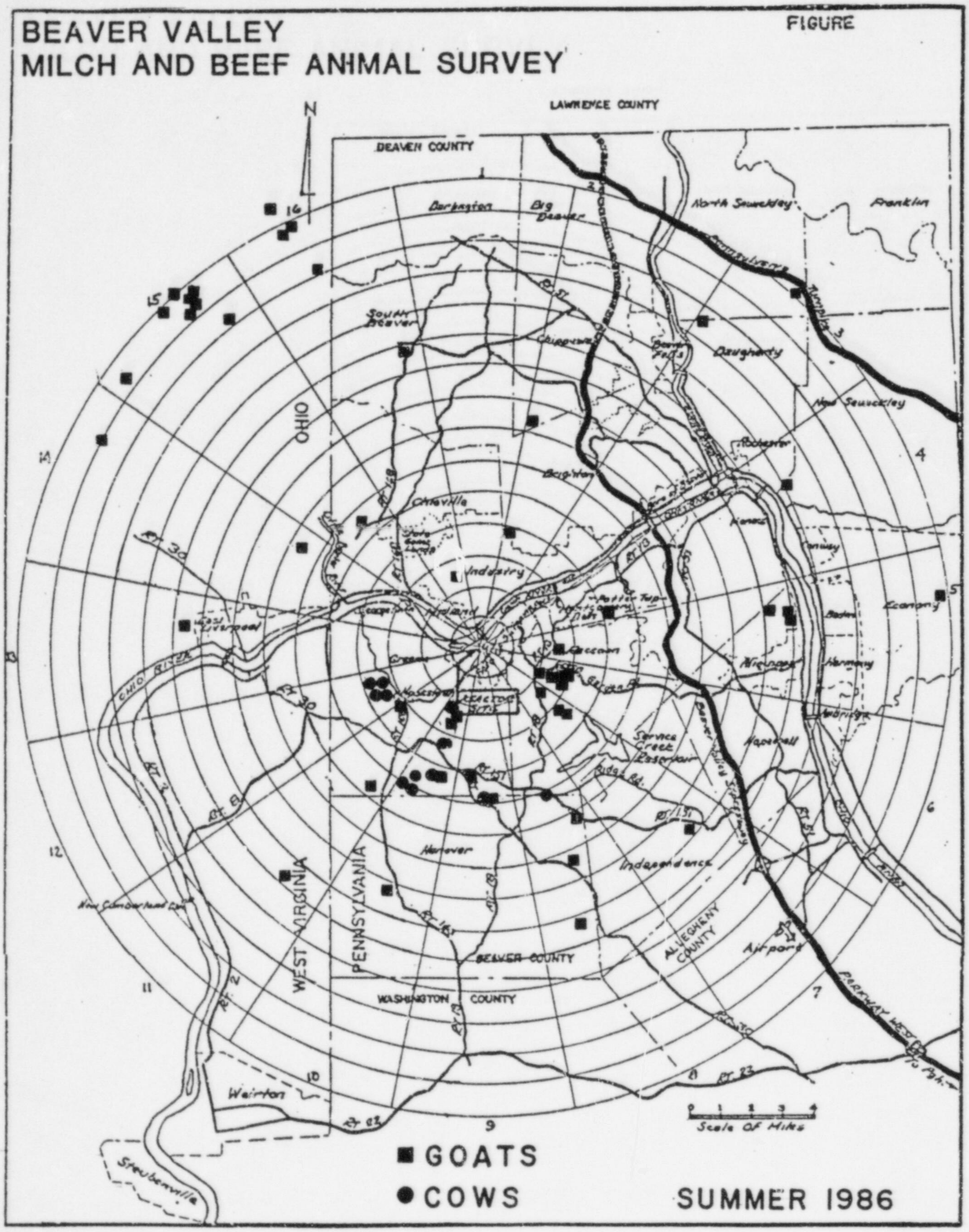

BEAVER VALLEY
MILCH AND BEEF ANIMAL SURVEY
FIGURE
LAWRENCE COUNTY
BEAVER COUNTY
N
North Sewickley
Franklin
Big Beaver
South Beaver
Chippewa
Daugherty
New Sewickley
Rochester
Brighton
Ohioville
Industry
OHIO
East Liverpool
Ohio River
Raccoon
Economy
Harmony
Hopewell
Service Creek Reservoir
Hanover
Independence
ALLEGHENY COUNTY
Airport
PARKWAY WEST
WEST VIRGINIA
PENNSYLVANIA
BEAVER COUNTY
WASHINGTON COUNTY
Weirton
Steubenville
Scale Of Miles
GOATS
COWS
SUMMER 1986

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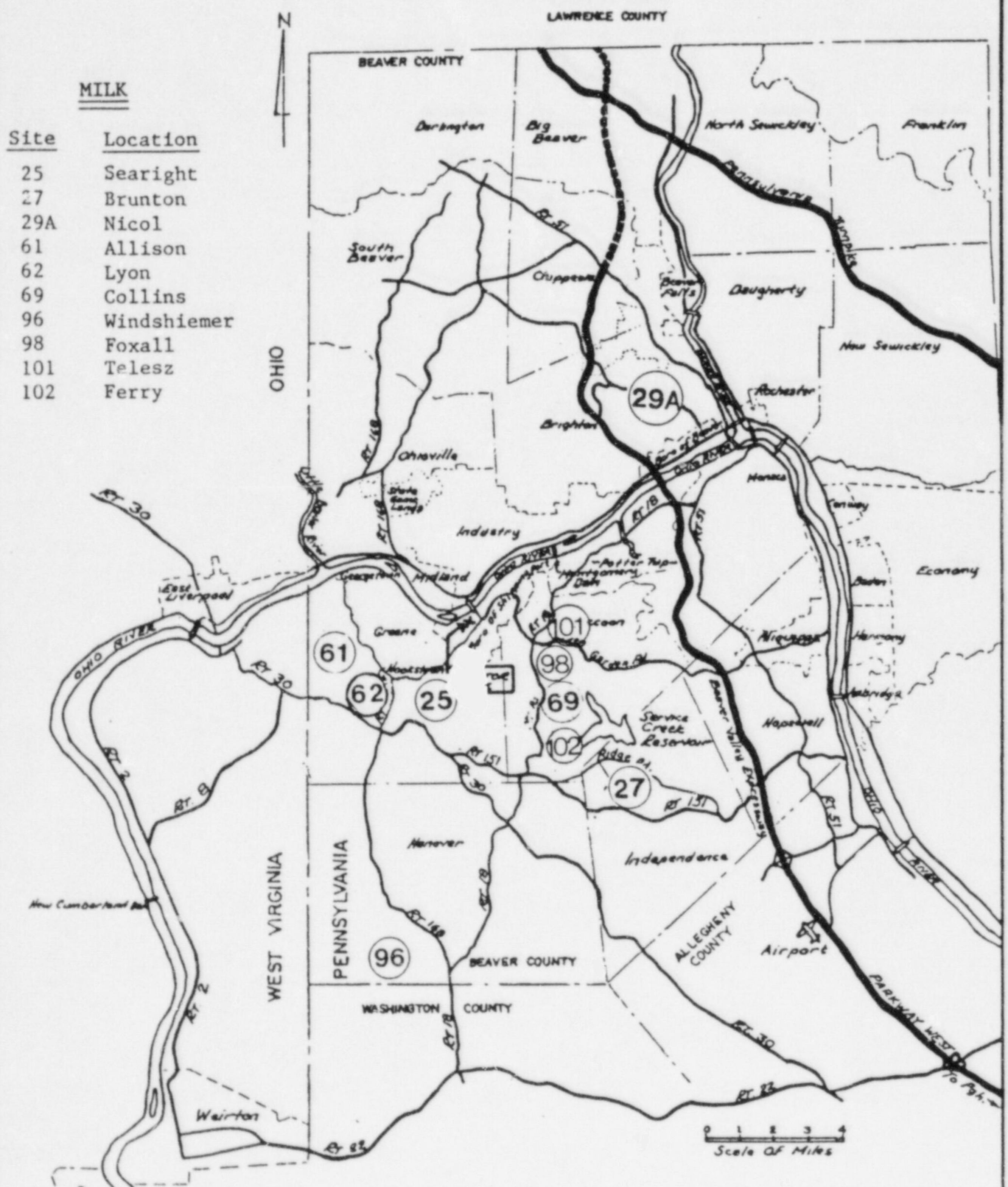
FIGURE 5.E.2

ENVIRONMENTAL MONITORING LOCATIONS— MILK



MILK LOCATIONS
FIGURE 5.E.2

V. ENVIRONMENTAL MONITORING

E. Monitoring of Local Cow's Milk (continued)

a. Program (continued)

The sample from Searight Dairy was collected and analyzed weekly for radioiodine using a procedure with a high sensitivity. Samples from each of the other selected dairies were collected monthly when cows are indoors, and bi-weekly when cows are grazing. This monthly or bi-weekly sample is analyzed for Sr-89, Sr-90, gamma emitters including Cs-137 . (by Spectrometry) and I-131 (high sensitivity analysis).

b. Procedure

Radioiodine (I-131) analysis in milk was normally performed using chemically prepared samples and analyzed with a low-level beta counting system.

Gamma emitters are determined by gamma spectrometry of a one liter Marinelli container of milk.

Strontium analysis of milk is similar to that of other foods (refer to V.C.2) except that milk samples are prepared by addition of Trichloracetic Acid (TCA) to produce a curd which is removed by filtration and discarded. An oxalate precipitate is ashed for counting.

3. Results and Conclusions

A summary of data is presented in Table V.A.2.

A total of one hundred seventy-four (174) samples were analyzed for I-131 during 1986. All I-131 activities in milk were below the minimum detectable level (0.5) with the exception of short-term increases due to the Chernobyl Nuclear Power accident. Figure 5.E.3 illustrates the average concentration of I-131 in the milk samples.

A total of one hundred thirty-eight (138) samples were analyzed for Sr-89 and Sr-90. Sr-90 levels attributable to previous nuclear weapons tests were detected in all samples and were within the normally expected range.

V. ENVIRONMENTAL MONITORING

E. Monitoring of Local Cow's Milk (continued)

3. Results and Conclusions (continued)

A total of one hundred forty-five (145) samples were analyzed by gamma spectrometry. The predominant isotope detected was naturally occurring K-40. Cs-137 and I-131 attributable to previous nuclear weapons tests and the Chernobyl Nuclear Plant accident were also detected.

All results with the exception of fallout from Chernobyl were consistent with (or lower than) those obtained in the preoperational program. These data confirm that the Beaver Valley Power Station did not contribute to radioactivity in milk in the vicinity of the site.

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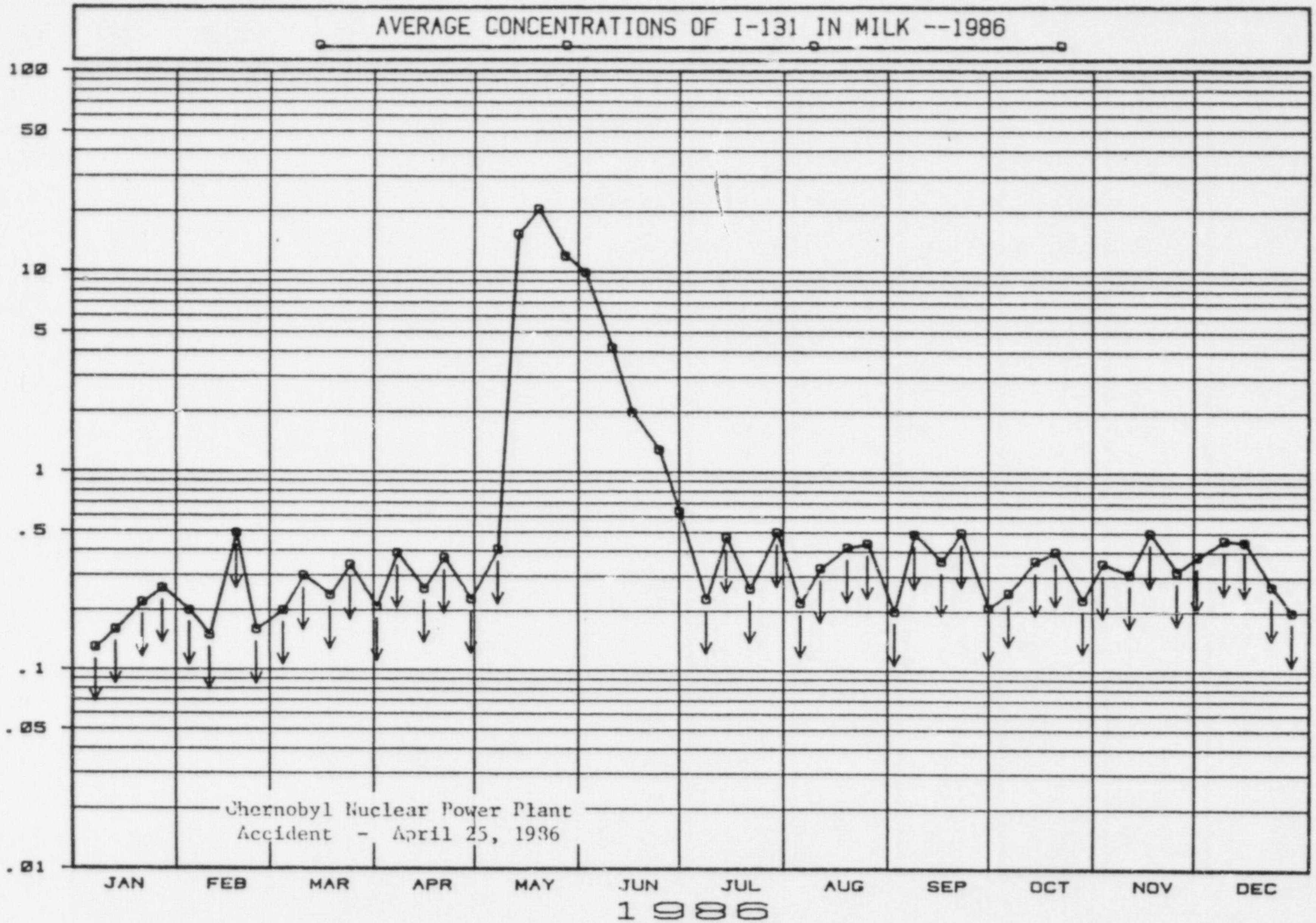
FIGURE 5.E.3



↓ Lower Limit of Detection

V. ENVIRONMENTAL MONITORING

F. Environmental Radiation Monitoring

1. Description of Regional Background Radiation Levels and Sources

The terrain in the vicinity of the Beaver Valley Power Station generally consists of rough hills with altitude variations of 300-400 feet. Most of the land is wooded.

The principal geologic features of the region are nearly flat-laying sedimentary beds of the Pennsylvania Age. Beds of limestone alternate with sandstone and shale with abundant interbedded coal layers. Pleistocene glacial deposits partially cover the older sedimentary deposits in the northwest. Most of the region is underlain by shale, sandstone, and some coal beds of the Conemaugh Formation. Outcrops of sandstone, shale, and limestone of the Allegheny Formation exist within the Ohio River Valley and along major tributary streams.

Based on surveys reported in previous annual reports, exposure rates ranged from 6-12 μR/hr. Results for 1986 indicated that background radiation continued in this range.

2. Locations & Analytical Procedures

Ambient external radiation levels around the site were measured using thermoluminescent dosimeters (TLDs).

In 1986 there were a total of forty-four (44) off-site environmental TLD locations. The locations of the TLDs are shown in Figures 5.F.1 thru 4. Thirteen (13) locations also have QC Laboratory TLDs. Both laboratories use calcium sulphate dysprosium, $CaSO_4$ (Dy) in teflon matrix.

V. ENVIRONMENTAL MONITORING

F. Environmental Radiation Monitoring (continued)

2. Locations & Analytical Procedures (continued)

The calcium sulfate ($CaSO_4$:Dy) TLDs were annealed shortly before placing the TLDs in their field locations. The radiation dose accumulated in-transit between the field location and the laboratory was corrected by annealing control dosimeters shortly before the field dosimeters were removed from the field location, when shipping the freshly annealed control dosimeters with the exposed field dosimeters to the laboratory for readout at the same time. All dosimeters were exposed in the field in a special environmental holder. The dosimetry system was calibrated by reading calcium sulfate dosimeters which have been exposed in an accurately known gamma radiation field.

In addition to TLDs, Pressurized Ion Chambers (PIC) provide continuous integrating monitoring. Sixteen PICs (Sites 1-16) are part of the Sentri 1011 Radiation Monitoring System which is a microcomputer-based data acquisition system. Data from the stations are sent at regular intervals to the Central Processing Unit where integrated doses are calculated. In addition there are four PICs which are AC Radiation Monitors. These are inspected weekly for integrator readings. The locations of the PICs are shown in Figure 5.F.5.

3. Results and Conclusions

Data obtained with the contractor TLD ($CaSO_4$:Dy in teflon) during 1986 are summarized in Table V.A.2, and the quality control TLD results are listed in Table III.1. Results for the PICs are listed in Table V.F.1.

The annual exposure rate of all off-site TLDs averaged 0.17 mR/day in 1986. As in previous years, there was some variation among locations and seasons as would be expected.

In 1986, ionizing radiation dose determinations from TLDs averaged approximately 62 mR for the year. This is comparable to previous years. There was no evidence of anomalies that could be attributed to the operation of the Beaver Valley Power Station. The TLDs confirm that changes from natural radiation levels, if any, are neglible.

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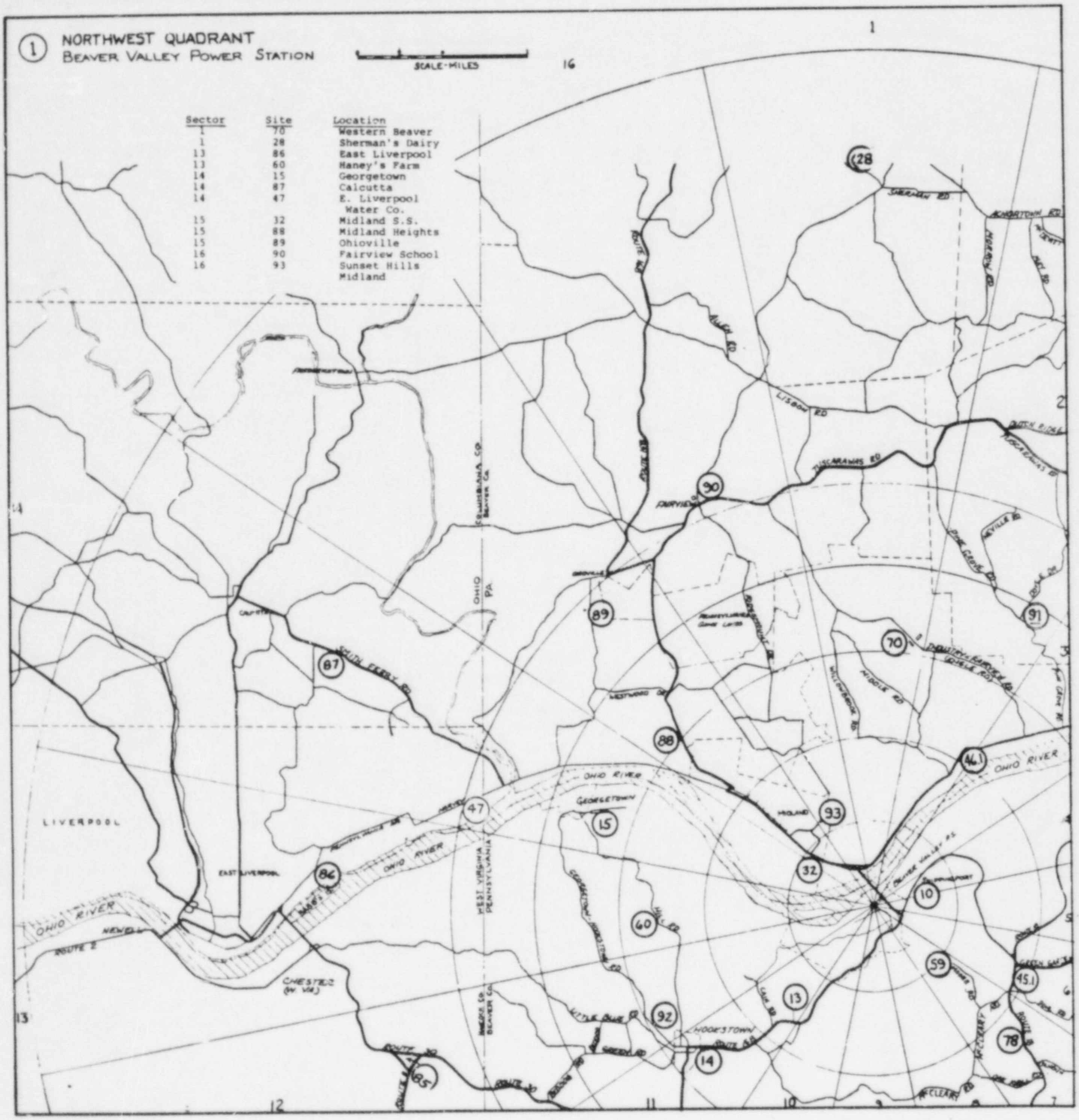

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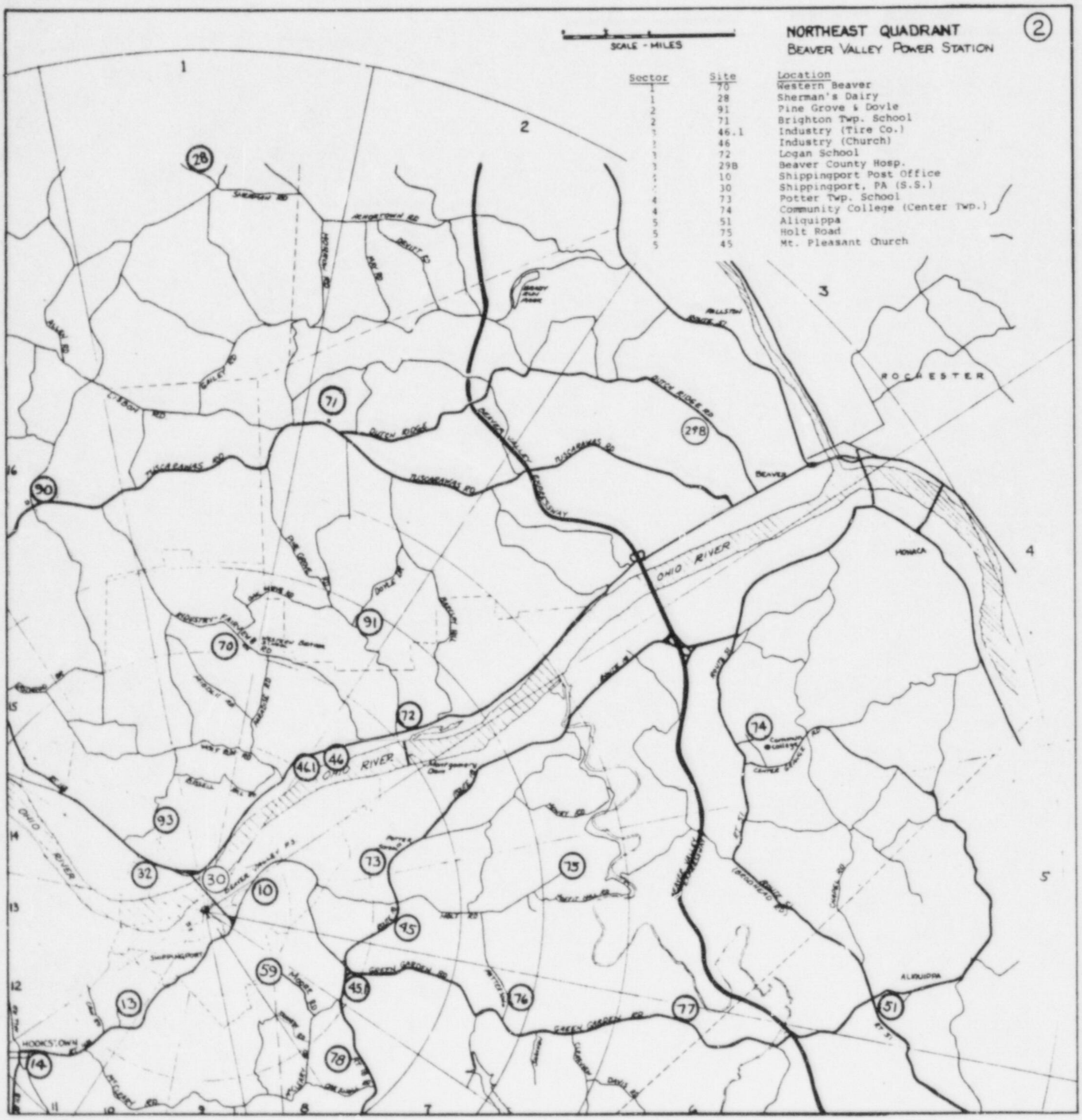

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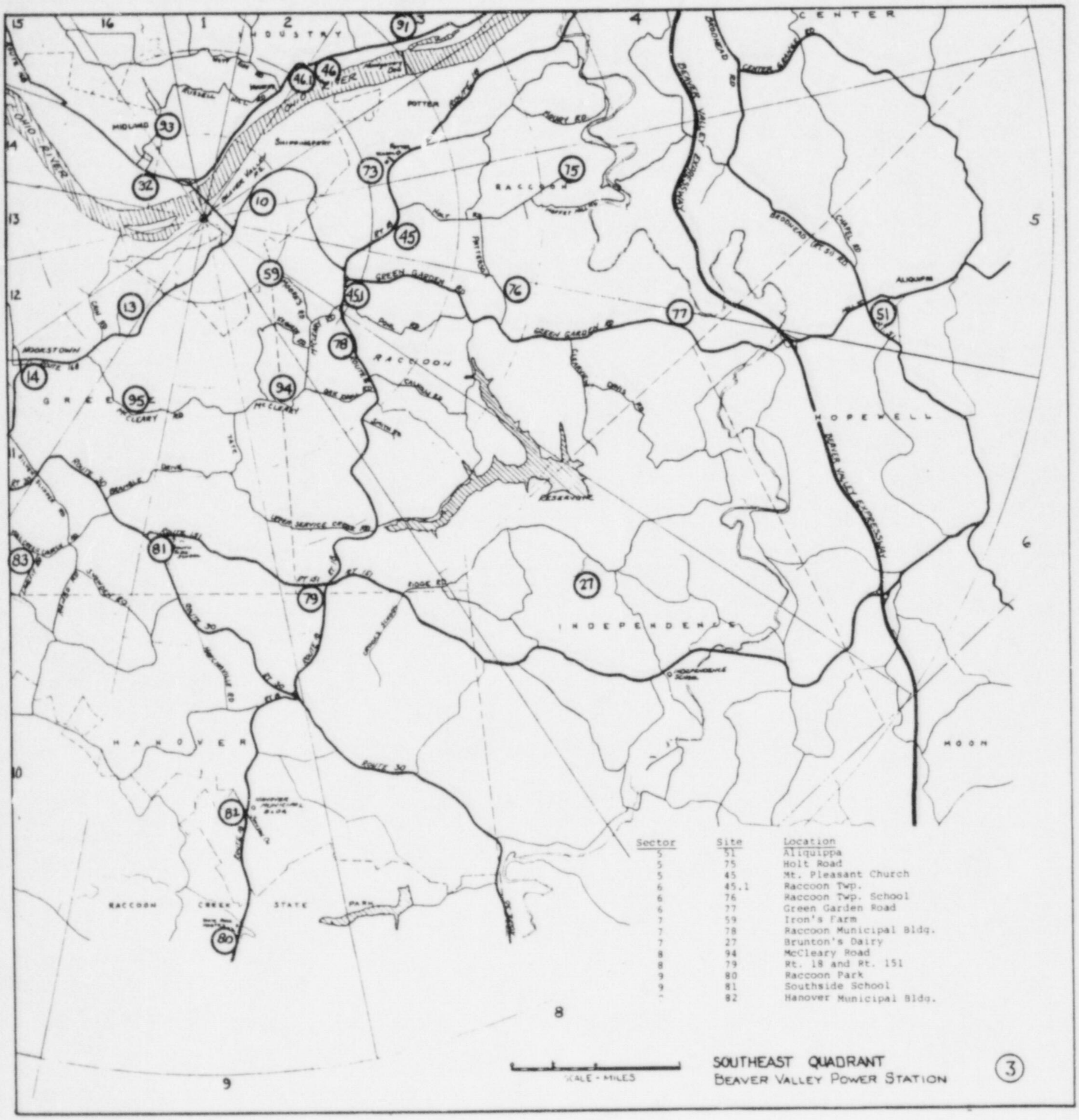

Sector	Site	Location
5	51	Aliquippa
5	75	Holt Road
5	45	Mt. Pleasant Church
6	45.1	Raccoon Twp.
6	76	Raccoon Twp. School
6	77	Green Garden Road
7	59	Iron's Farm
7	78	Raccoon Municipal Bldg.
7	27	Brunton's Dairy
8	94	McCleary Road
8	79	Rt. 18 and Rt. 151
9	80	Raccoon Park
9	81	Southside School
[illegible]	82	Hanover Municipal Bldg.

SOUTHEAST QUADRANT
BEAVER VALLEY POWER STATION
③

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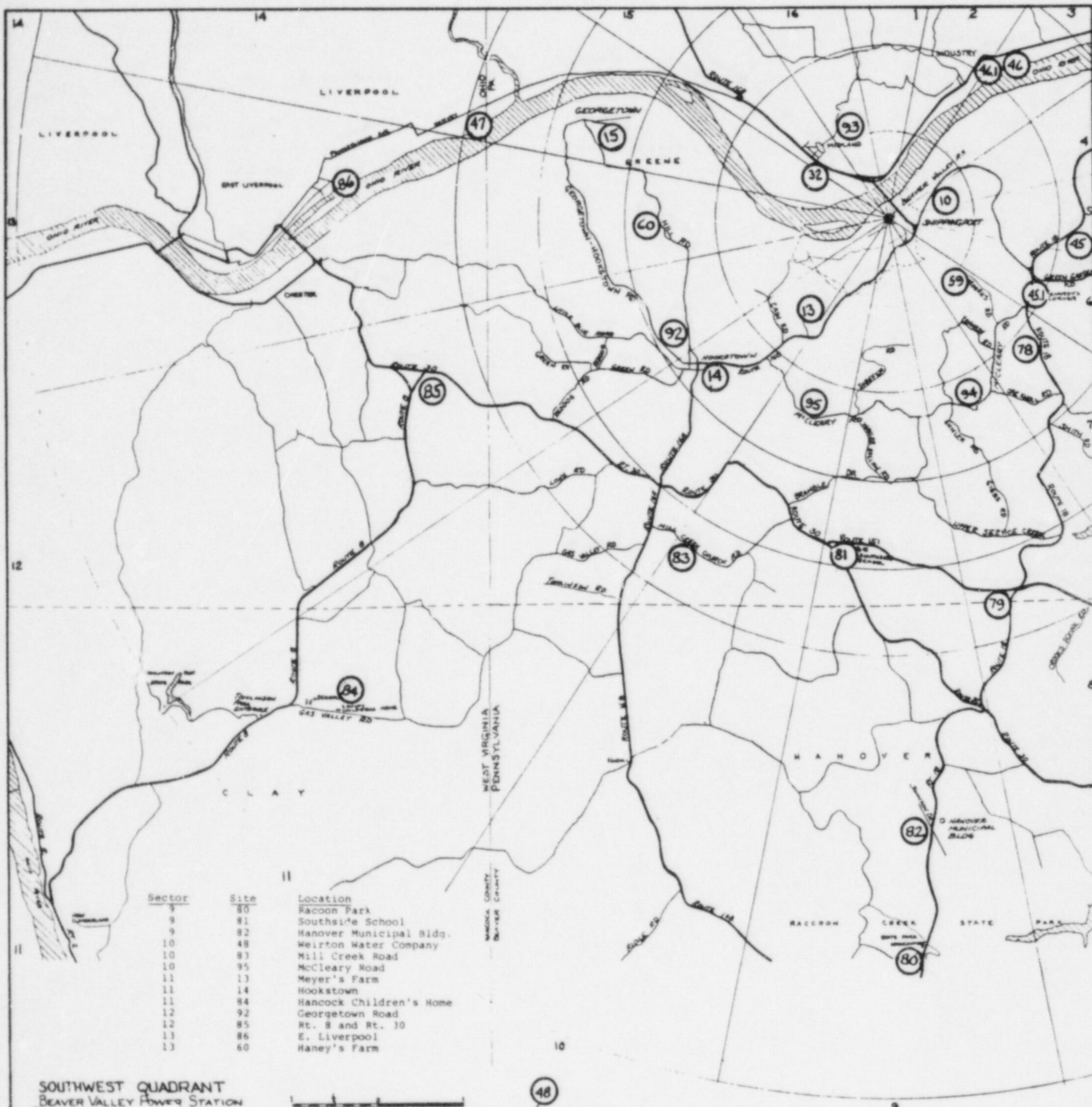

Sector	Site	Location
9	80	Racoon Park
9	81	Southside School
9	82	Hanover Municipal Bldg.
10	48	Weirton Water Company
10	83	Mill Creek Road
10	95	McCleary Road
11	13	Meyer's Farm
11	14	Hookstown
11	84	Hancock Children's Home
12	92	Georgetown Road
12	85	Rt. 8 and Rt. 30
13	86	E. Liverpool
13	60	Haney's Farm

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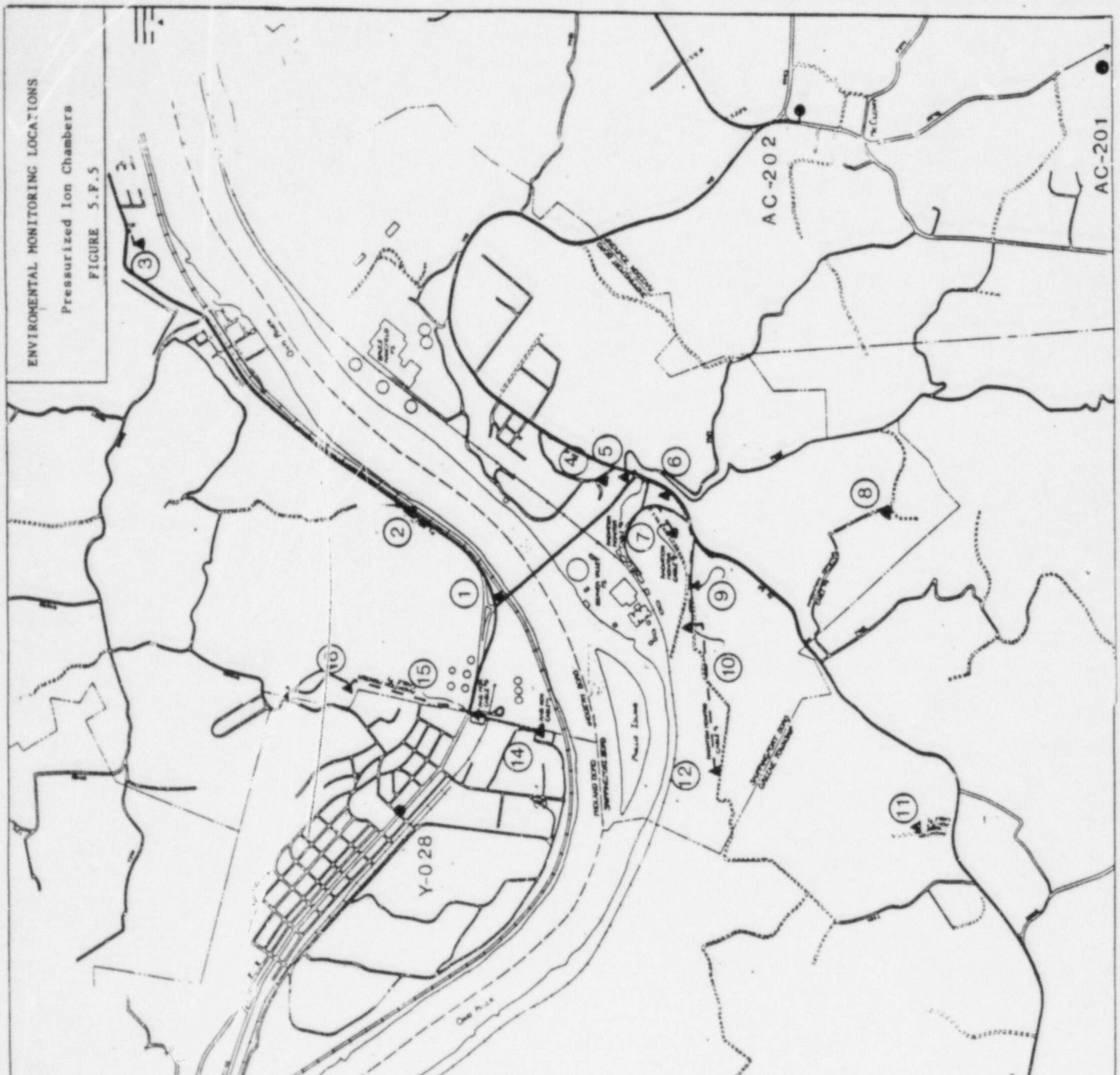

See Table V.F.1. for location identification and results.

TABLE V.F.1

Pressurized Ion Chambers - Results

Site	Location	Distance and Direction from Site	Average (mR/day)
1	Industry Hill	0.5 mi N	0.209
2	Industry - Rt. 68	0.9 mi NNE	0.228
3	Industry	2.25 mi NE	0.202
4	Cooks Ferry	0.5 mi ENE	0.218
5	Shippingport Bridge South	0.45 mi E	0.223
6	BVPS Entrance	0.4 mi ESE	0.240
7	Unit #2 Laydown	0.3 mi SE	0.218
8	Birdhill Road	0.9 mi SSE	0.250
9	Past DLCO Microwave	0.35 mi S	0.233
10	DLCO Microwave	0.35 mi SSW	0.216
11	Meyer's Farm	1.45 mi SW	0.240
12	J & L Steel Tie	0.75 mi WSW	0.223
13	F. P. Microwave	1.5 mi W	0.175
14	Midland Substation South	0.6 mi WNW	0.221
15	Midland Substation North	0.75 mi NW	0.233
16	Sunrise Hills	1.1 mi NNW	0.221
AC-201	Raccoon Municipal Building	2.4 mi SE	0.256
AC-202	Kennedy's Corners	2.0 mi NE	0.250
Z-054	Hookstown Substation	2.9 mi WSW	0.229
Y-028	LTV	1.3 mi NW	0.220

V. ENVIRONMENTAL MONITORING

G. Monitoring of Fish

1. Description

Fish collected near the site are generally scrap fish. During 1986, fish collected for the radiological monitoring program included carp, catfish and small mouth bass.

2. Sampling Program and Analytical Techniques

a. Program

Fish samples are collected semi-annually in the New Cumberland pool of the Ohio River at the Beaver Valley effluent discharge point and upstream of the Montgomery Dam. The edible portion of each different species caught is analyzed by gamma spectrometry. Fish sampling locations are shown in Figure 5.G.1.

b. Procedure

A sample is prepared in a standard tared 300 ml plastic bottle and scanned for gamma emitting nuclides with gamma spectrometry system which utilizes a Ge(Li) detector.

3. Results and Conclusions

A summary of the results of the fish monitoring data is provided in Table V.A.2.

A total of nine (9) samples were analyzed by gamma spectrometry. The only gamma emitter detected was the naturally occurring K-40 which was found in all samples. This indicates that the operation of the Beaver Valley Power Station has not resulted in radioactivity in fish in the Ohio River.

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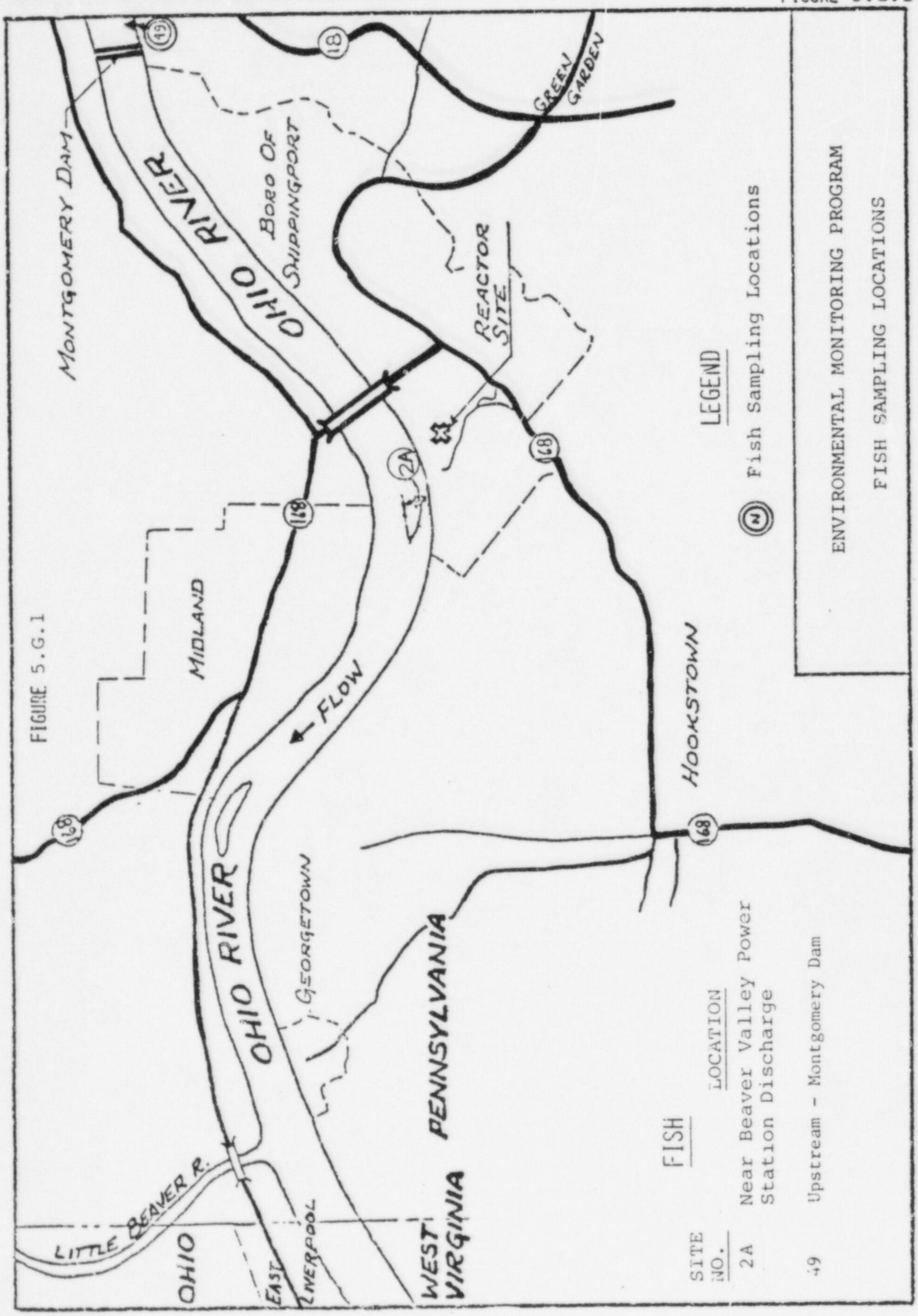
FIGURE 5.G.1



V. ENVIRONMENTAL MONITORING

H. Monitoring of Surface, Drinking, Well Waters and Precipitation

1. Description of Water Sources

The Ohio River is the main body of water in the area. It is used by the Beaver Valley Power Station for plant make-up for the cooling tower and for receiving plant liquid effluents.

Ohio River water is a source of water for some towns both upstream and downstream of the Beaver Valley Power Station site. It is used by several municipalities and industries downstream of the site. The nearest user of the Ohio River as a potable water source is Midland Borough Municipal Water Authority. The intake of the treatment plant is approximately 1.5 miles downstream and on the opposite side of the river. The next downstream user is East Liverpool, Ohio which is approximately 6 miles downstream. The heavy industries in Midland, as well as others downstream use river water for cooling purposes. Some of these plants also have private treatment facilities for plant sanitary water.

Ground water occurs in large volumes in the gravel terraces which lie along the river, and diminishes considerably in the bedrock underlying the site. Normal well yields in the bedrock are less than 10 gallons per minute (gpm) with occasional wells yielding up to 60 gpm.

In general, the BVPS site experiences cool winters and moderately warm summers with ample annual precipitation evenly distributed throughout the year. Normal annual precipitation for the area is 36.29 inches based on 1951 to 1980 data collected at the Pittsburgh International Airport.

V. ENVIRONMENTAL MONITORING (continued)

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

2. Sampling and Analytical Techniques

a. Surface (Raw River) Water

The sampling program of river water includes five (5) sampling points along the Ohio River. Raw water samples are normally collected at the East Liverpool (Ohio) Water Treatment Plant [River Mile 41.2] daily and composited into a monthly sample. Weekly grab samples are taken from the Ohio River at the discharge from Shippingport Station Decommissioning Project [River Mile 34.8]; and near the discharge from the Beaver Valley Power Station [River Mile 35.0]. Two automatic river water samplers are at the following locations: Upstream of Montgomery Dam [River Mile 29.6]; and at J&L Steel's river water intake [River Mile 36.2]. The automatic sampler takes a 20-40 ml sample every 15 minutes and is collected on a weekly basis. The weekly grab samples and automatic water samples are composited into monthly samples from each location. In addition, a quarterly composite sample is prepared for each sample point.

The monthly composites are analyzed for gross alpha, gross beta, and gamma emitters. The quarterly composites are analyzed for H-3, Sr-89, Sr-90, and Co-60 (high sensitivity).

Locations of each sample point are shown in Figure 5.H.1.

b. Drinking Water (Public Supplies)

Drinking (treated) water is collected at both Midland (PA) and East Liverpool (OH) Water Treating Plants. An automatic sampler at each location collects 20-40 ml every 20 minutes. These intermittent samples are then composited into a weekly sample. A weekly grab sample is also taken at the DLC Training Building in Shippingport, PA. The weekly sample from each location is analyzed by gamma spectrometry. The weekly samples are also analyzed for I-131.

V. ENVIRONMENTAL MONITORING

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

2. Sampling and Analytical Techniques (continued)

b. Drinking Water (Public Supplies) (continued)

Monthly composites of the weekly samples are analyzed for gross alpha, gross beta, and by gamma spectrometry. Quarterly composites are analyzed for H-3, Sr-89, Sr-90 and Co-60 (high sensitivity). Locations of each sample point are shown in Figure 5.H.1.

c. Ground Water

Grab samples were collected each quarter from each of four (4) well locations (see Figure 5.H.1) within four (4) miles of the site. These locations are:

One (1) well at Shippingport, PA

One (1) well at Meyer's Farm (Hookstown, PA)

One (1) well in Hookstown, PA

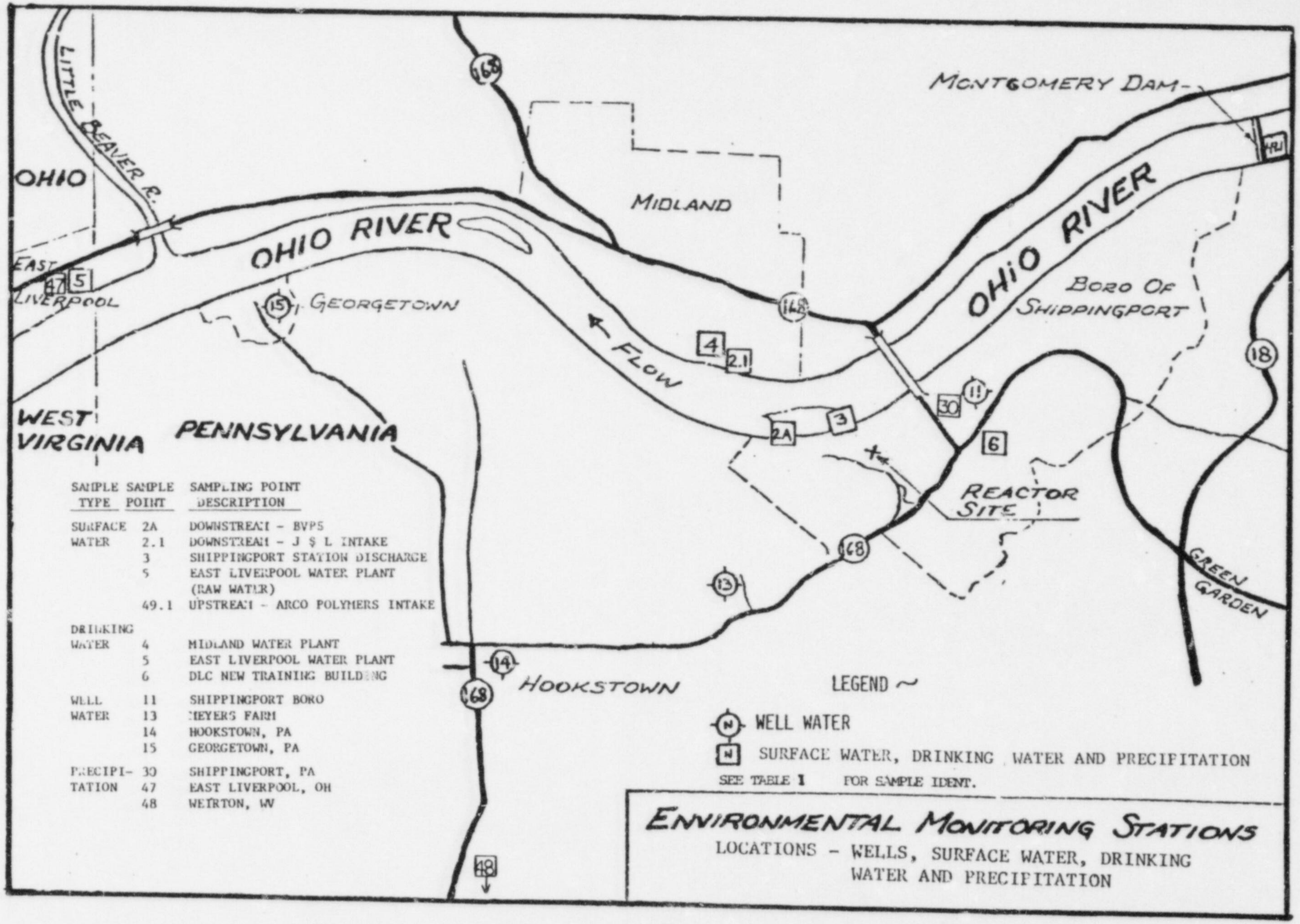
One (1) well in Georgetown, PA

Each ground water sample is analyzed for gross alpha, gross beta, tritium, and by gamma spectrometry.

d. Precipitation

Precipitation is collected at Shippingport (PA), East Liverpool (OH) and Weirton (WV). Precipitation when available is collected each week and then composited into monthly and quarterly samples. The monthly samples are analyzed for gross beta and gamma emitters and the quarterly composites are analyzed for H-3, Sr-89 and Sr-90. Locations of each sample point are shown in Figure 5.H.1.

FIGURE 5.H.1



SAMPLE TYPE	SAMPLE POINT	SAMPLING POINT DESCRIPTION
SURFACE WATER	2A	DOWNSTREAM - BVPS
	2.1	DOWNSTREAM - J $ L INTAKE
	3	SHIPPINGPORT STATION DISCHARGE
	5	EAST LIVERPOOL WATER PLANT (RAW WATER)
	49.1	UPSTREAM - ARCO POLYMERS INTAKE
DRINKING WATER	4	MIDLAND WATER PLANT
	5	EAST LIVERPOOL WATER PLANT
	6	DLC NEW TRAINING BUILDING
WELL WATER	11	SHIPPINGPORT BORO
	13	MEYERS FARM
	14	HOOKSTOWN, PA
	15	GEORGETOWN, PA
PRECIPITATION	30	SHIPPINGPORT, PA
	47	EAST LIVERPOOL, OH
	48	WEIRTON, WV

ENVIRONMENTAL MONITORING STATIONS

LOCATIONS - WELLS, SURFACE WATER, DRINKING WATER AND PRECIPITATION

V. ENVIRONMENTAL MONITORING

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

2. Sampling and Analytical Techniques (continued)

e. Procedures

Gross alpha and gross beta activities are determined first by evaporating one liter of the sample on a hotplate. The residue is mounted and dried on a 2-inch stainless steel planchet. The sample is counted in a low background, gas flow proportional counter. Self-absorption corrections are made on the basis of sample weight.

Gamma analysis is performed on water sample by loading one liter of sample into a one liter marinelli container and counting on a Ge(Li) gamma spectrometry system.

Strontium-89 and 90 are determined on water samples by a procedure similar to that described in V.C.2 except that the leaching step is eliminated.

Cobalt-60 is determined with a sensitivity of 1 pCi/l by evaporating 2 liters of sample on a hotplate and transferring the residue to a 2-inch planchet. The planchet is counted on a Ge(Li) spectrometry system.

Tritium is determined in water samples by converting 2 ml of the sample to hydrogen and counting the activity in a 1 liter low level gas counter which is operated in the proportional range in anti-coincidence mode.

Radioiodine (I-131) analysis in water was normally performed using chemically prepared samples and analyzed with a low-level beta counting system.

3. Results and Conclusions

A summary of results of all analyses of water samples (surface, drinking, ground and precipitation) are provided by sample type and analysis in Table V.A.2. These are discussed below.

V. ENVIRONMENTAL MONITORING

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

3. Results and Conclusions (continued)

a. Surface Water

A total of seventy-two (72) samples were analyzed for gross alpha and gross beta. All results were within the normal range.

A total of twenty-four (24) samples were analyzed for H-3, Sr-89 and Sr-90 as well as a high sensitivity analysis for Co-60. Positive tritium results were detected in the BVPS discharge area and are attributable to station releases. Tritium samples taken upstream and downstream were within pre-operational levels. No Sr-89, Sr-90 or Co-60 (analyzed by the high sensitivity method) were detected. The tritium activity found in the station discharge area is consistent with station data of authorized radioactive discharges and were within limits permitted by the NRC license.

A total of seventy-five (75) samples were analyzed by gamma spectrometry. Co-60 and Sb-125 were detected in one sample taken from the Shippingport Station Decommissioning discharge area. A review of the Beaver Valley Power Station discharge permits was made as the BVPS discharge area is adjacent to the Shippingport discharge area. The review showed no releases from the BVPS site were being conducted at the time of sampling. The concentrations seen are consistent with those reported by the Shippingport Station Decommissioning Project for 1986 and are hundreds of times below the concentrations permitted by DOE Orders. No other gamma emitting radionuclides were detected.

b. Drinking Water

A total of thirty-six (36) samples were analyzed for gross alpha and gross beta. All results were within a normal range.

V. ENVIRONMENTAL MONITORING

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

3. Results and Conclusions (continued)

b. Drinking Water (continued)

A total of twelve (12) samples were analyzed for H-3, Sr-89 and Sr-90 as well as a high sensitivity analysis for Co-60. No Sr-89, Sr-90, or Co-60 were detected. The H-3 data were within the preoperational range indicative of normal environmental levels.

A total of another one hundred fifty-six (156) samples were analyzed by gamma spectrometry. No gamma emitting radionuclides were detected by these analyses.

A total of one hundred fifty-six (156) samples were analyzed for I-131 using a highly sensitive technique. Trace levels of I-131 were measured in some of the weekly samples. The results were slightly above the minimum detectable activity of 0.5 pCi/liter. The positive results could not be attributed to station discharges. The results may be attributed to expected variability in the analyses results of very low levels of activity or other sources such as from medical.

c. Well Water

A total of sixteen (16) samples were each analyzed for gross alpha, gross beta, H-3 and by gamma spectrometry. No alpha activity was detected in any of the samples. The gross beta and H-3 data are within pre-operational ranges. No gamma emitting radionuclides were detected by these analyses.

V. ENVIRONMENTAL MONITORING (continued)

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

3. Results and Conclusions (continued)

d. Precipitation

In previous years precipitation was not normally sampled, however, following the Chernobyl Nuclear Plant accident in the Soviet Union on April 25, 1986 a sampling program was initiated to provide data to the Nuclear Regulatory Commission and appropriate agencies in Pennsylvania, West Virginia and Ohio. During the weeks immediately after the Chernobyl accident samples were analyzed as soon as possible following precipitation, however, as the level of fallout activity decreased to near background the samples were collected in accordance with the schedule described in Section H.2.d.

A total of forty (40) samples were analyzed for gross beta. Figure 5.H.2 illustrates the average concentration of gross beta in precipitation. Note the short-term increase due to the Chernobyl Nuclear Plant accident.

A total of three (3) samples were analyzed for H-3, Sr-89 and Sr-90. One positive tritium result was detected which was within normal levels and no Sr-89 or Sr-90 was detected.

A total of forty-nine (49) samples were analyzed by gamma spectrometry. Naturally occurring radionuclides detected were Be-7 and K-40. Radionuclides attributable to the Chernobyl Nuclear Plant accident are Ru-103, I-131 and Cs-137. Figure 5.H.2 illustrates the average concentration of Iodine-131 in precipitation. Note the short-term increase due to the Chernobyl Nuclear Plant accident.

Examination of effluent data from Beaver Valley Power Station demonstrated that none of the elevated results are attributable to the operation of the power station.

V. ENVIRONMENTAL MONITORING (continued)

H. Monitoring of Surface, Drinking, Well Waters, and Precipitation (continued)

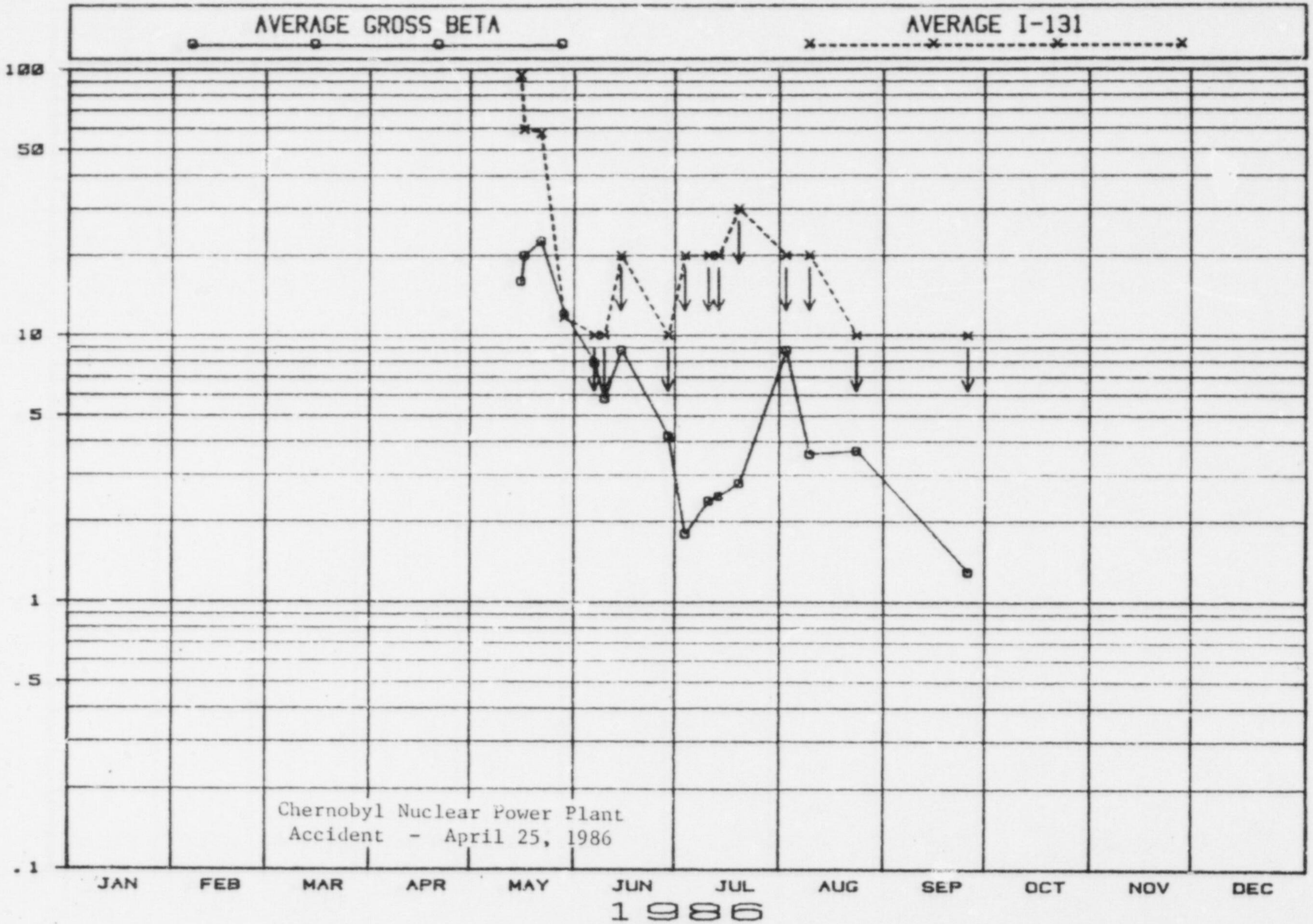
3. Results and Conclusions (continued)

e. Summary

The data from water analyses demonstrates that the Beaver Valley Power Station did not contribute a significant increase of radioactivity in local river, drinking, well waters or precipitation. The few positive results which could be attributable to authorized releases from the Beaver Valley Power Station are characteristic of the effluent. These results confirm that the station assessments, prior to authorizing radioactive discharges, are adequate and that the environmental monitoring program is sufficiently sensitive.

Further, the actual detected concentration (averaged over a year) attributable to Beaver Valley Power Station, was only 0.32% of the Maximum Permissible Concentration allowed by the Federal Regulations for water discharged to the Ohio River. The Ohio River further reduced this concentration by a factor of ~ 600 prior to its potential use by members of the public.

FIGURE 5.H.2



PRECIPITATION
AVERAGE CONCENTRATIONS OF GROSS BETA AND I-131

V. ENVIRONMENTAL MONITORING

I. Estimates of Radiation Dose to Man

1. Pathways to Man - Calculational Models

The radiation doses to man as a result of Beaver Valley operations were calculated for both gaseous and liquid effluent pathways using NRC computer codes XOQDOQ2, GASPAR, and LADTAP. Dose factors listed in the ODCM were used to calculate doses to maximum individuals from radioactive noble gases in discharge plumes. Beaver Valley effluent data, based on sample analysis in accordance with the schedule set forth in Appendix A of the BVPS license, were used as the radionuclide activity input.

Each radionuclide contained in the Semi-Annual Radioactive Effluent Release Report (noble gases, particulates, radioiodines and tritium) were included as source terms when they were detected above the LLD values. All LLD values reported by Beaver Valley Power Station are equal to or lower than those required by the Technical Specifications.

All gaseous effluent releases, including Auxiliary Building Ventilation, were included in dose assessments. The release activities are based on laboratory analysis. When the activity of noble gas was below detection sensitivity, either the inventory based on its MDL or an appropriate but conservative ratio to either measured activity of Kr-85 or Xe-133 was used. Meteorological data collected by the Beaver Valley Power Station Meteorology System was used as input to XOQDOQ2 which in turn provided input for GASPAR. Except when more recent or specific data was available, all inputs were the same as used in the Beaver Valley Power Station Environmental Statements or in Regulatory Guide 1.109. The airborne pathways evaluated were beta and gamma doses from noble gas plumes inhalation, the "cow-milk-child", and other ingestion pathways.

V. ENVIRONMENTAL MONITORING

I. Estimates of Radiation Dose to Man (continued)

1. Pathways to Man - Calculational Models (continued)

All potentially radioactive liquid effluents, including steam generator blowdown, are released by batch mode after analysis by gamma spectrometry using Intrinsic Germanium detectors. Each batch is diluted by cooling tower blowdown water prior to discharge into the Ohio River at the Beaver Valley Power Station outfall (River Mile 35.0) The actual data from these analyses are tabulated and used as the radionuclide activity input term in LADTAP. A hypothetical real individual for liquid pathways is located at Midland. Except when more recent or specific data for the period is available, all other input to LADTAP are obtained from the Beaver Valley Power Station Environmental Statement or Regulatory Guide 1.109. Pathways, which were evaluated, are drinking water, fish consumption, shoreline recreation, swimming, and boating.

2. Results of Calculated Radiation Dose to Man - Liquid Releases

a. Individual Dose

The doses which are calculated by the model described above are to a hypothetical real individual located at Midland since this is the nearest location where significant exposure of a member of the public could potentially occur; therefore, this location is used to calculate the maximum exposure. A breakdown of doses by pathway and organ is provided in Table V.I.1 for the maximum individual. Included in this table is a breakdown of a typical dose to individuals from natural radiation exposure. The results of calculated radiation dose to the hypothetical real individual are compared to the BVPS #1 annual Technical Specifications limits in Table V.I.2.

TABLE V.I.1
Radiation Dose to Maximum Individual[a], mrem/yr.
Beaver Valley Power Station - Liquid Releases

PATHWAY	MAXIMUM GROUP	USAGE FACTOR	SKIN	ORGAN	THYROID	BONE	WHOLE BODY
Fish Consumption[b]	Adult	21.0 kg	N/A	0.00107 (Liver)	0.0000409	0.000632	0.000703
Drinking Water	Infant	510 liter	N/A	0.00246 (Lung)	0.00235	0.000114	0.00238
Shoreline Activities	Teen	67 hr.	0.00014	--	--	--	0.00012
TOTAL	MREM MAXIMUM INDIVIDUAL		0.00014 (Teen)	0.00258 (Adult) (Liver)	0.00235 (Infant)	0.000676 (Adult)	0.00238 (Infant)

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE

Ambient Gamma Radiation:	69[c]
Radionuclides in Body :	28[d]
Global Fallout :	4[d]
TOTAL mrem	101

[a] Located at Midland Drinking Water Intake

[b] Child is the critical group for bone with a dose of 0.000759 mrem/yr.

[c] Pre-operational average ambient gamma radiation

[d] National Academy of Sciences, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," BEIR Report, 1980.

TABLE V.I.2

Results of Calculated Radiation Dose to Man
Beaver Valley Power Station - Liquid Releases

	Maximum Exposure Hypothetical Real Individual mrem	BVPS #1 Annual Tech. Spec. Limits mrem	Percent of Annual Tech. Spec. Limit
TOTAL BODY			
Adult	0.00218	3.0	0.073
Teen	0.00123	3.0	0.041
Child	0.00175	3.0	0.058
Infant	0.00238	3.0	0.079
ANY ORGAN			
Adult	0.00258 (Liver)	10.0	0.026
Teen	0.00187 (Liver)	10.0	0.019
Child	0.00245 (Liver)	10.0	0.025
Infant	0.00246 (Lung)	10.0	0.025

Maximum Total Body Dose - Capsule Summary

	mrem
1986 Calculated	0.00238
Final Environmental Statement	0.112

Thyroid Dose - (Largest Expected Organ Dose)

1986 Calculated	0.00235
Final Environmental Statement	0.96

V. ENVIRONMENTAL MONITORING

2. Results of Calculated Radiation Dose to Man - Liquid Releases (continued)

b. Population Dose

The 1986 calculated dose to the entire population of almost 4 million people within 50 miles of the plant was:

	Man-Millirem	Largest Isotope Contributors	
TOTAL BODY	81.6	H-3	79.8 mrem
		Fe-55	0.68 mrem
		Co-60	0.75 mrem
THYROID	79.7	H-3	79.2 mrem
		I-131	0.52 mrem

3. Results of Calculated Radiation Dose to Man - Airborne Releases

The results of calculated radiation dose to the maximum exposed individual for BVPS airborne radioactive effluents during 1986 are compared to the BVPS annual Technical Specifications limits in Table V.I.3. The doses include the contribution of all pathways. A 50-mile population dose is also calculated and provided in Table V.I.3. H-3 is the primary radionuclide contributions to these doses. The results show compliance with the BVPS #1 Technical Specifications limits.

4. Conclusions - (Beaver Valley Power Station)

Based upon the estimated dose to individuals from the natural background radiation exposure in Table V.I.1., the incremental increase in total body dose to the 50-mile population (4 million people), from the operation of Beaver Valley Power Station - Unit No. 1, is less than 0.0001% of the annual background.

The calculated doses to the public from the operation of Beaver Valley Power Station - Unit No. 1 are below BVPS #1 annual Technical Specifications limits and resulted in only a small incremental dose to that which area residents already received as a result of natural background. The doses constituted no meaningful risk to the public.

TABLE V.I.3

Results of Calculated Radiation Dose to Man (1986)
Beaver Valley Power Station - Airborne Radioactivity

ORGAN	MAXIMUM EXPOSURE INDIVIDUAL, mrem	BVPS #1 ANNUAL TECH. SPEC. LIMIT mrem	PERCENT OF ANNUAL TECH. SPEC. LIMIT	50-MILE POPULATION DOSE man rem
TOTAL BODY	0.0239	15	0.16	0.258
SKIN	0.0406	15	0.27	0.754
LUNG	0.0258	15	0.17	0.282
THYROID	0.0460	15	0.31	0.408

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April 23, 1987

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Reference: Beaver Valley Power Station Unit No. 1
Docket No. 50-334, License No. DRP-66
1986 Annual Environmental Report
Radiological - Volume #2

Gentlemen:

Under the Beaver Valley Power Station Unit No. 1 License DRP-66, and in accordance with the requirements of Specifications 6.9.1.10 of the Technical Specifications, the Annual Radiological Environmental Report is hereby sumbitted.

Very truly yours,

J.D. Seiber

J. D. Seiber
Vice President, Nuclear

JWM:mb

Enclosure

cc: United States Nuclear Regulatory Commission
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