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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Beaver Valley Power Station Annual Environmental Report, Radiological

The 1999 Annual Environmental Report, Radiological (Attachment 1) for Beaver Valley Power Station Units 1 and 2 is being forwarded, in accordance with Beaver Valley Power Station Technical Specification 6.9.2.

If you have any questions regarding this submittal, please contact Mr. Tom Cosgrove, Manager, Licensing at (724) 682-5203.

Sincerely,

Lew W. Myers

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BEAVER VALLEY POWER STATION
UNITS 1 AND 2
LICENSES DPR-66 AND NPF-73
1999 ANNUAL ENVIRONMENTAL REPORT
RADIOLOGICAL

EXECUTIVE SUMMARY

This document is a detailed report of the 1999 Beaver Valley Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels in the vicinity of Unit 1 and Unit 2 from January 1 through December 31, 1999 in air, water, shoreline sediment, milk, fish, food crops, vegetation, and direct radiation measurement have been analyzed, evaluated, and summarized. The results of the REMP are intended to supplement the results of the radiological effluent monitoring by verifying that the measurable concentration of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurement and modeling of the environmental exposure pathways.

Radiation and radioactivity in the environment is monitored within a 10 mile radius of the site. Two types of samples are taken. The first type, control samples, are collected from areas that are beyond measurable influence of Beaver Valley Power Station. These samples are used as reference data. Normal background radiation levels, or radiation present due to causes other than Beaver Valley Power Station, can thus be compared to the environment surrounding the nuclear power station. Indicator samples are the second sample type obtained. These samples show how much radiation is contributed to the environment by the site. Indicator samples are taken from areas close to the station where any plant contribution will be at the highest concentration. In 1999, samples were taken from over 60 sites around Beaver Valley Power Station that included the aquatic, atmospheric and terrestrial environments. More than 2300 analyses were performed on these samples. The environmental program for 1999 is outlined in Table 3-1.

In 1974 and 1975, prior to station operation, samples were collected and analyzed to determine the amount of radioactivity present in the area. The resulting values are used as a "pre-operational baseline". Current analysis results from the indicator samples are compared to both current control sample values and the pre-operational baseline to determine if changes in radioactivity levels are attributable to station operations. The 1999 analytical results and pre-operational baseline results are summarized in Table 3-2 and Table 3-3.

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 Offsite Dose Calculation Manual (ODCM) 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:

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

Based on the analytical results of environmental samples during 1999, the Beaver Valley Power Station reporting levels were not exceeded.

Positive results attributable to the Beaver Valley Power Station were consistent with station data of authorized radioactive discharges and were within limits permitted by the NRC license. Other radioactivity detected was attributable to naturally occurring radionuclides, previous nuclear weapons tests, other man-made sources, and to the normal statistical fluctuation for activities near the lower limit of detection (LLD).

In 1999, the radioactivity releases from BVPS Units 1 and 2 did not exceed the effluent limits identified in the Beaver Valley Power Station Operating License Technical Specification/Offsite Dose Calculation Manual (ODCM). Based on the estimated dose to individuals from the natural background radiation exposure, the incremental increase in total body dose to the 50 mile population (approximately 4 million), from the operation of Beaver Valley Power Station Units 1 and 2, is less than 0.0001% of the annual background dose. The National Academy of Sciences 1990 BEIR Report shows that the typical dose to an individual from background (natural radiation exposure including radon) is 296 mrem per year.

Analytical results are divided into four ODCM required categories based on exposure pathways: Airborne, direct radiation, ingestion and waterborne. Each of these pathways is described below:

- The airborne exposure pathway includes airborne iodine and airborne particulates. The 1999 results were similar to previous years. There was no notable increase in natural products and no detectable fission products or other radionuclides in the airborne particulate media during the year.

- The direct exposure pathway measures environmental radiation doses by use of thermoluminescent dosimeters (TLDs). TLD results have indicated a stable trend and compare well with previous years.

- The ingestion exposure pathway includes milk, fish, and food product (leafy vegetable) samples. For milk samples, strontium-90, attributable to past atmospheric nuclear weapons testing, was detected at levels similar to the past five years. The gamma spectroscopy counting only indicated positive results for potassium-40 at average environmental levels. Seven of the 152 results for iodine-131 in milk were positive. These were all from one dairy. An investigation into the positive iodine-131 results revealed that the cows were consuming water obtained from the Midland Water Treatment Plant because of the severe drought in the area in 1999. Small amounts of iodine-131 have historically been detected in the river water. The investigation provides evidence that the positive results are not from station operation. The complete investigation is documented in Section 3-E.

  The fish samples taken indicated naturally occurring potassium-40 in each of the samples at average environmental levels. One of the eight fish samples indicated trace amounts of cesium-137 near the typical detection sensitivities for gamma spectroscopy. Vegetation samples revealed naturally occurring potassium-40 and beryllium-7 at average environmental levels.

- The waterborne exposure pathway includes drinking water, surface (river) water, and river sediment. Water samples were analyzed for tritium and gamma-emitting radionuclides. Tritium was identified in five of 20 samples, two upstream of the plant and three downstream. All five positive results were below or near typical lower limit of detection for tritium-3 analysis. Gamma analysis of samples indicated no gamma-emitting radionuclides above detection limits. Iodine-131 analysis of weekly samples (156 total) indicated 121 positive results. Fourteen were above the required Lower Limit of Detection (LLD) and none exceeded the reporting level. It was also noted that the surface water samples, which are upstream of the plant and considered outside the influence of the site had similar results to the downstream drinking water samples.

Sediment samples are taken from three locations, upstream of the site, at the discharge point of liquid releases and downstream of the site. Analysis of samples indicated naturally occurring radionuclides potassium-40, radium-226 and thorium-228 in all results. Small amounts of cesium-137 from previous nuclear weapons tests was also detected in five of the six samples at levels consistent with previous years. The samples from the discharge point of the site also indicated small amounts of cobalt-58 and cobalt-60 which are consistent with authorized station liquid discharges.

- In addition to the required samples discussed above, groundwater, precipitation, and feedcrops were also taken. Results were consistent with previous years and no degrading trends were identified.

The environmental monitoring program outlined in the Beaver Valley Power Station ODCM for Units 1 and 2 was followed throughout 1999. The REMP results demonstrate the adequacy of radioactive effluent control at the Beaver Valley Power Station and that the operations of Units 1 and 2 did not adversely affect the surrounding environment.

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SECTION 1 - 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, vegetation, river sediments, fish, and ambient radiation levels in areas surrounding the site. The results of these media are assessed to determine impacts of the plant operation on the environment. The Annual Radiological Environmental Report for the Beaver Valley Power Station summarizes the radiological environmental program conducted by the Duquesne Light Company and the FirstEnergy Nuclear Operating Company in 1999.

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 1-1 is a view of the Beaver Valley Power Station. The site is approximately one mile from Midland, Pennsylvania; five miles from East Liverpool, Ohio; and twenty-five miles from Pittsburgh, Pennsylvania. Figure 1-2 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 five mile radius of the plant is approximately 18,000 and the only area within the radius of concentrated population is the Borough of Midland, Pennsylvania, with a population of approximately 3,320.

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. For 1999, the flow ranged from a minimum monthly average of 6,300 cubic feet per second (CFS) to a maximum monthly average of 70,500 CFS. The mean flow for 1999 was 32,075 CFS.

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 52.3°F. The predominant wind direction is typically from the southwest in summer and from the northwest in winter.

The basic features of the Beaver Valley Power Station Units 1 and 2 are tabulated below:

	Beaver Valley Unit 1	Beaver Valley Unit 2
Maximum Power Level	2652 - megawatts thermal	2652 - megawatts thermal
Type of Power	PWR	PWR
No. of Reactor Coolant Loops	3	3
No. of Steam Generators & Type	3 - Vertical	3 - Vertical
Steam Used by Main Turbine	Saturated	Saturated

The units utilize 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.

C. 1999 Operation

The Beaver Valley Power Station Unit 1 operated throughout 1999 except for forced/scheduled outages as follows: January 23 to 25, February 14 to 25, April 13 to May 7, September 6 to 11, and November 13. Unit 2 operated throughout 1999 except for a scheduled outage from February 26 to April 13. Unit 2 forced outages were July 18 to 27 and October 22 to November 3.

The maximum dependable capacity factor for 1999 were as follows: Unit 1 – 86.1% and Unit 2 – 80.1%.

Figure 1-1

View of the Beaver Valley Power Station

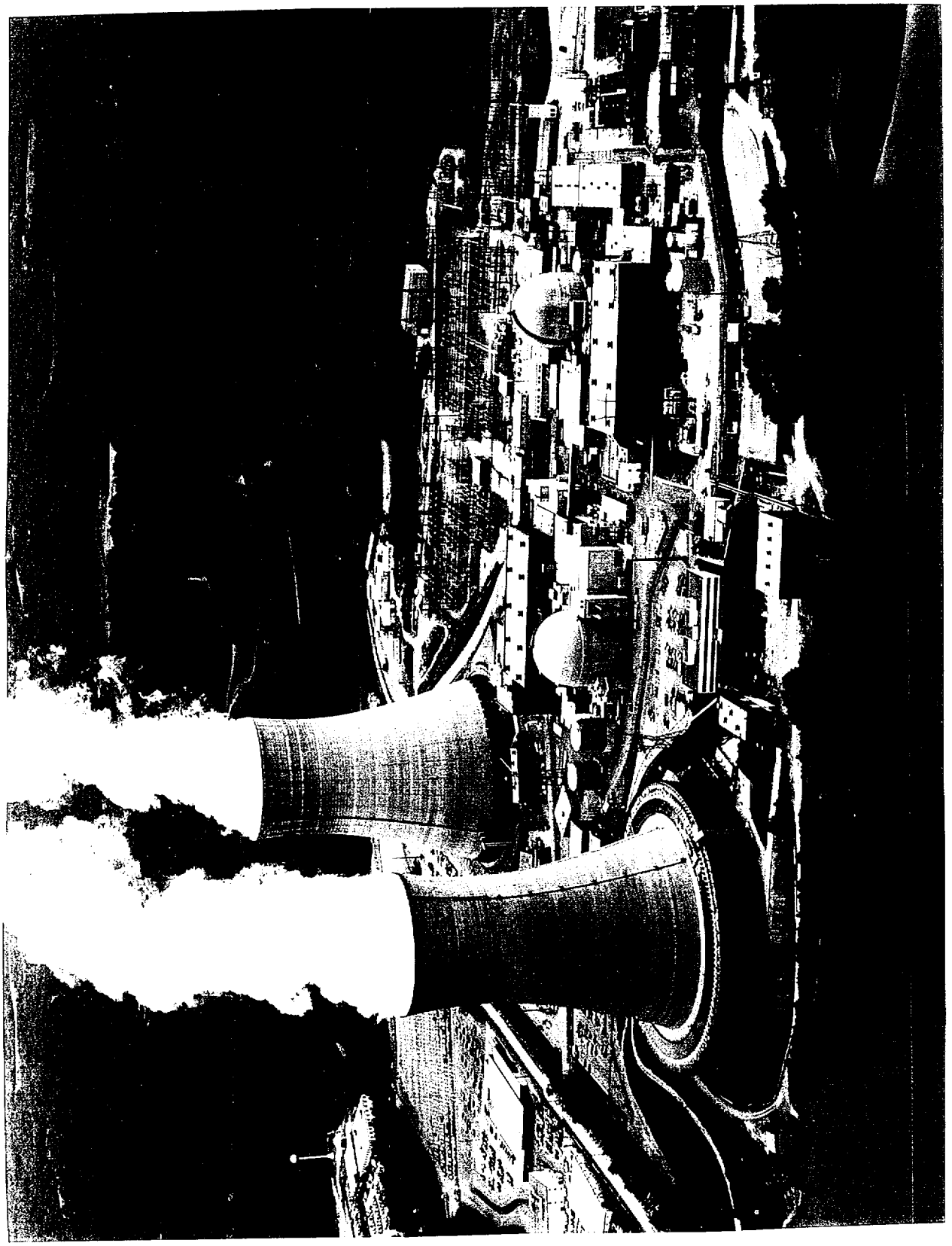
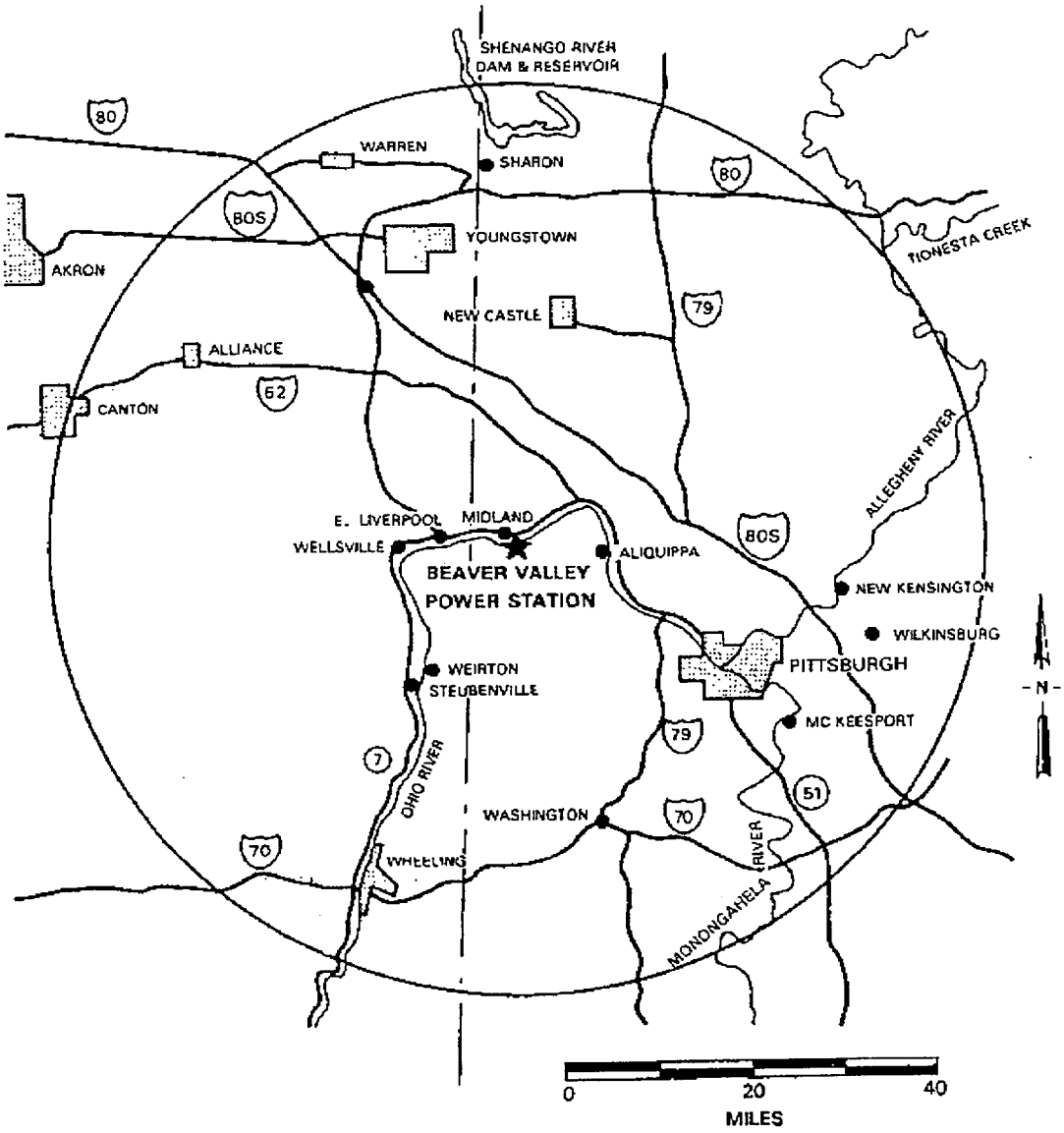


Figure 1-2

Geographical Map and Principal Communities in 50-mile Radius of the Beaver Valley Power Station



SECTION 2 - MONITORING 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 goals have been established to further limit discharges to the environment.

A. Monitoring of Liquid Effluents

1. 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, or discharged via a sanitary waste system. In addition, liquid effluents are discharged to the Ohio River using discharge points shown in Figure 2-1. Schematic diagrams of liquid flow paths for the Beaver Valley Power Station are shown in Figure 2-2, Figure 2-3, Figure 2-4 and Figure 2-5.

2. Radioactive Liquid Waste Sampling and Analysis Program

   See Table 2-1.

3. Results of Liquid Effluent Discharge to the Environment

   See Table 2-2.

Figure 2-1

Liquid Discharge Points to Ohio River

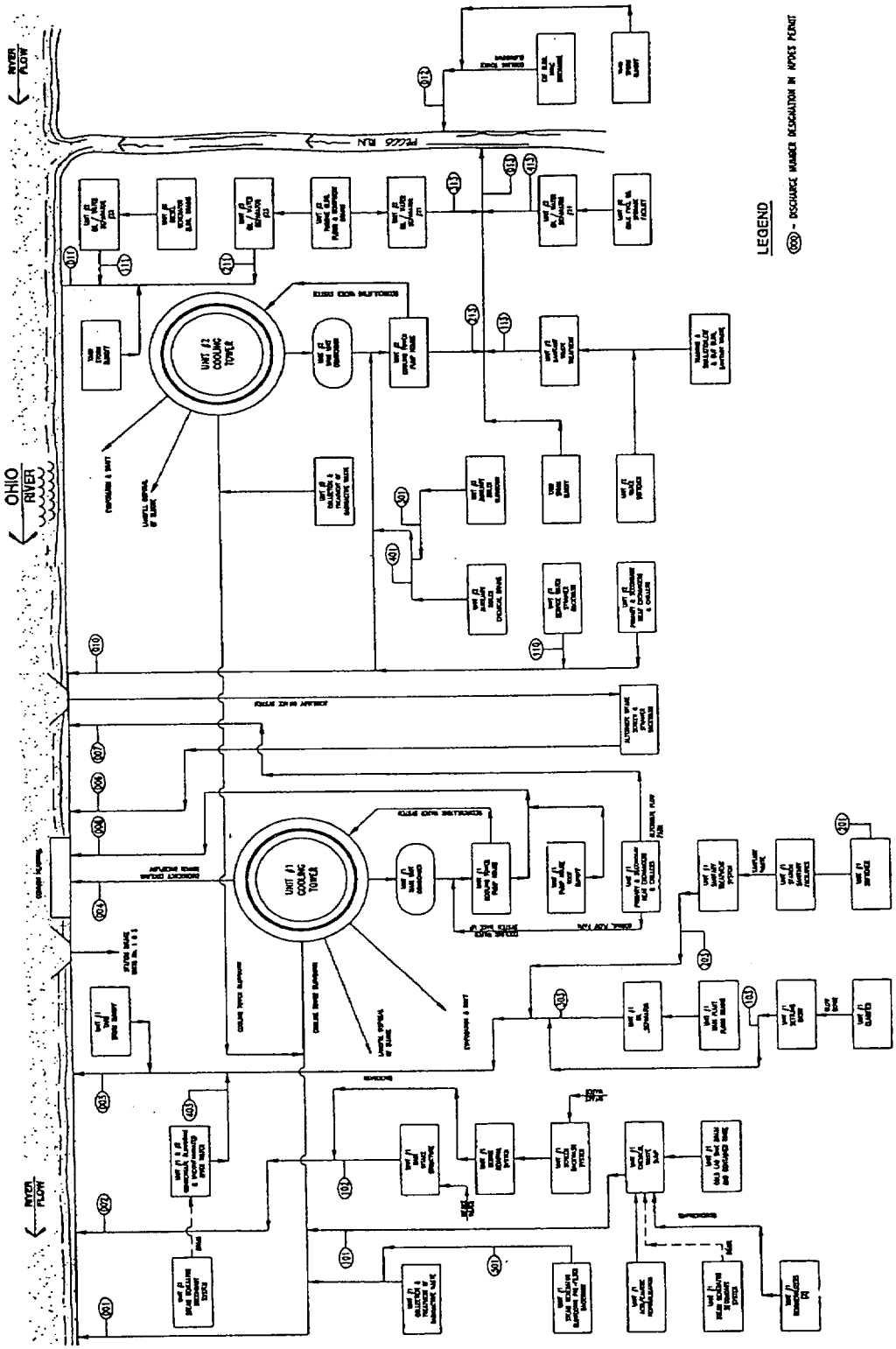


Figure 2-2

Unit 1 Water Flow Schematic

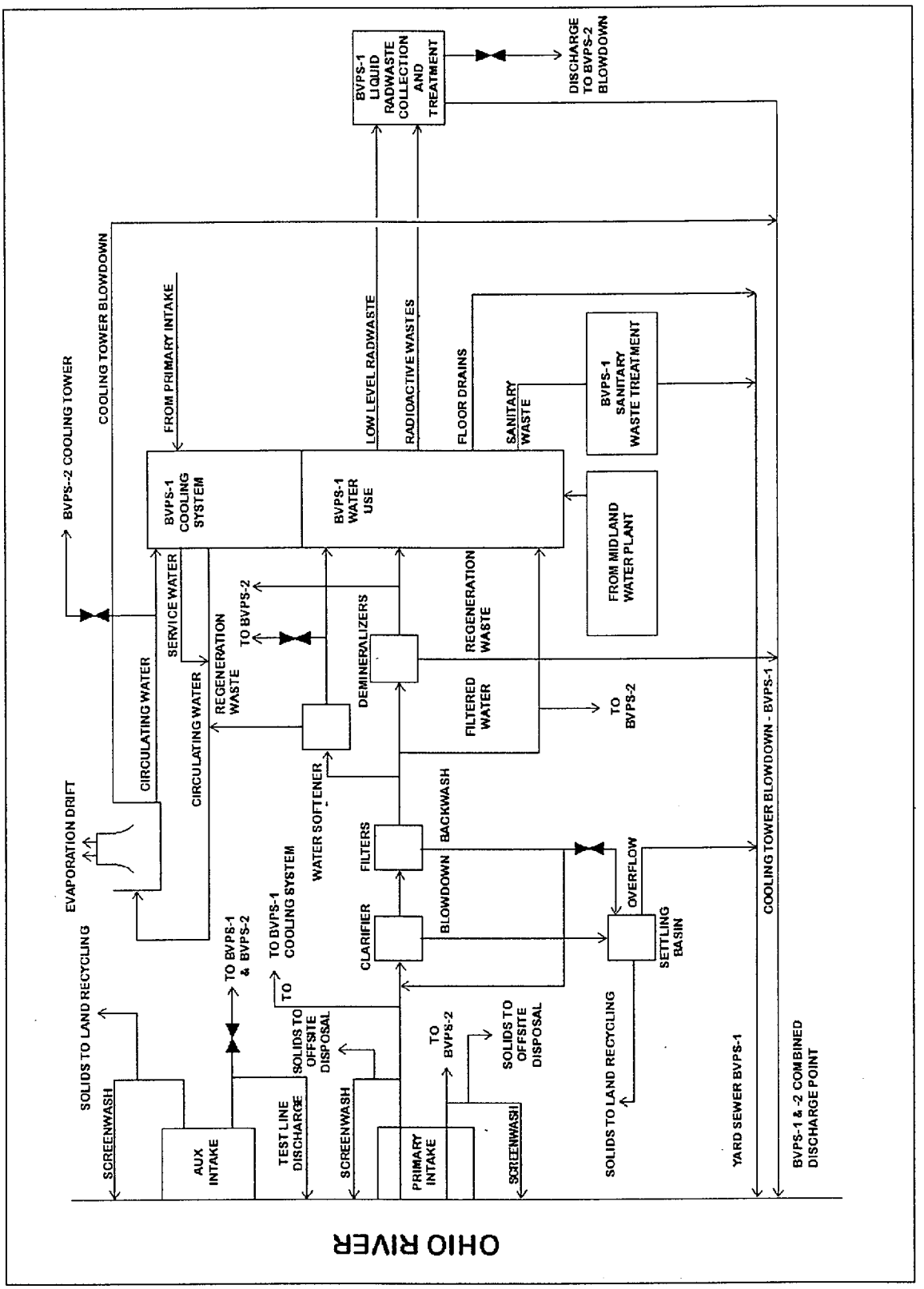


Figure 2-3

Unit 2 Water Flow Schematic

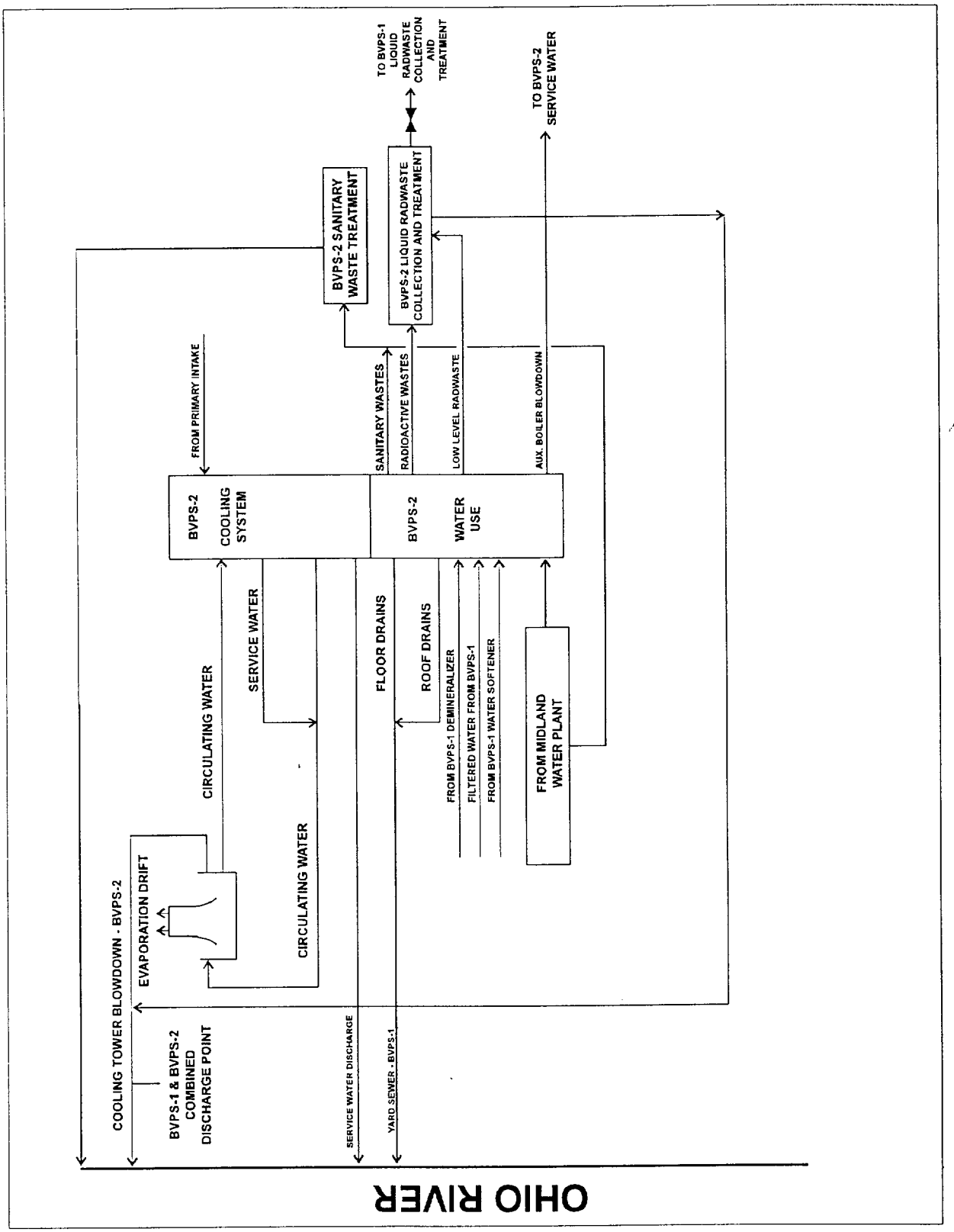


Figure 2-4

Unit 1 Liquid Waste System

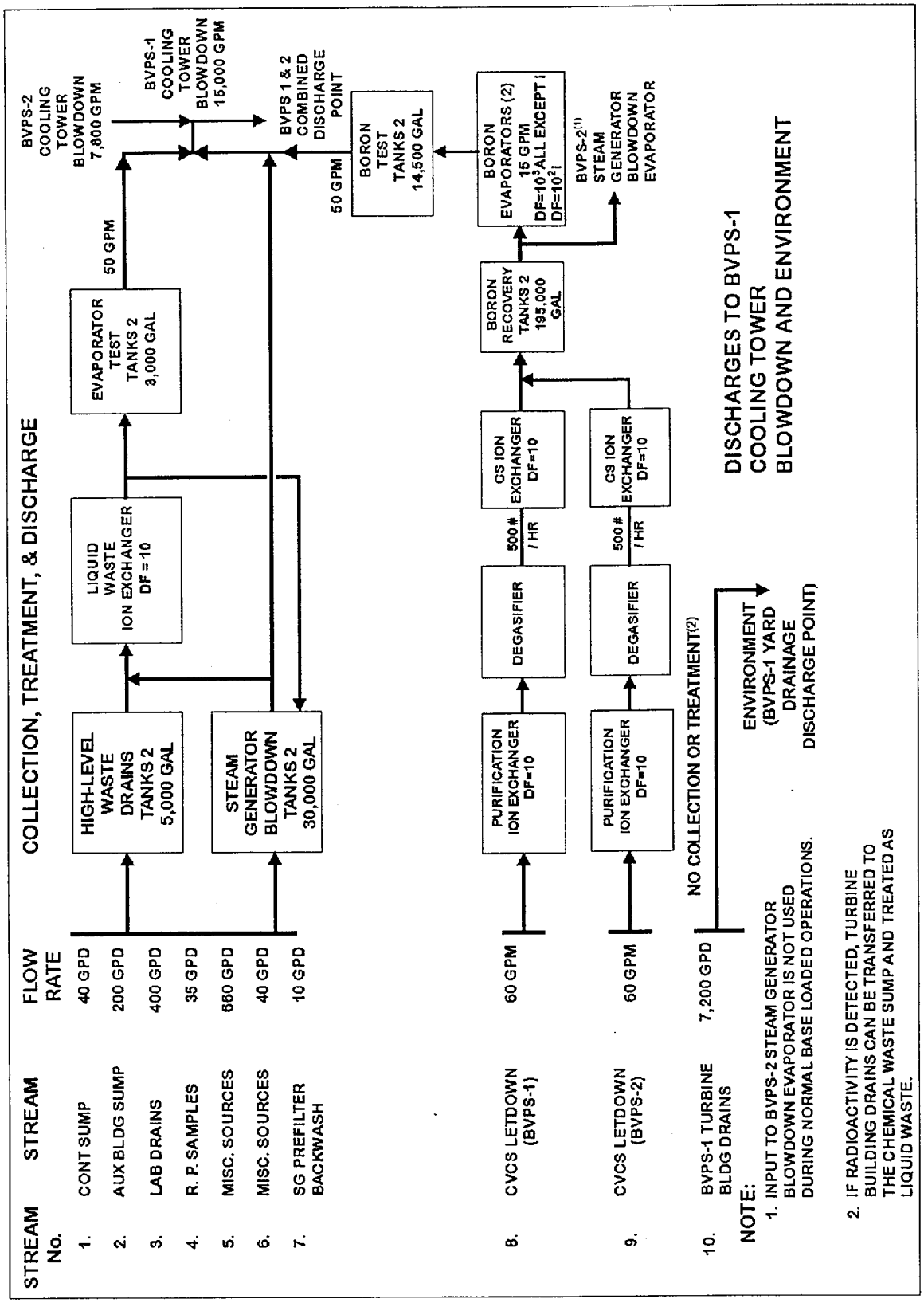


Figure 2-5

Unit 2 Liquid Waste System

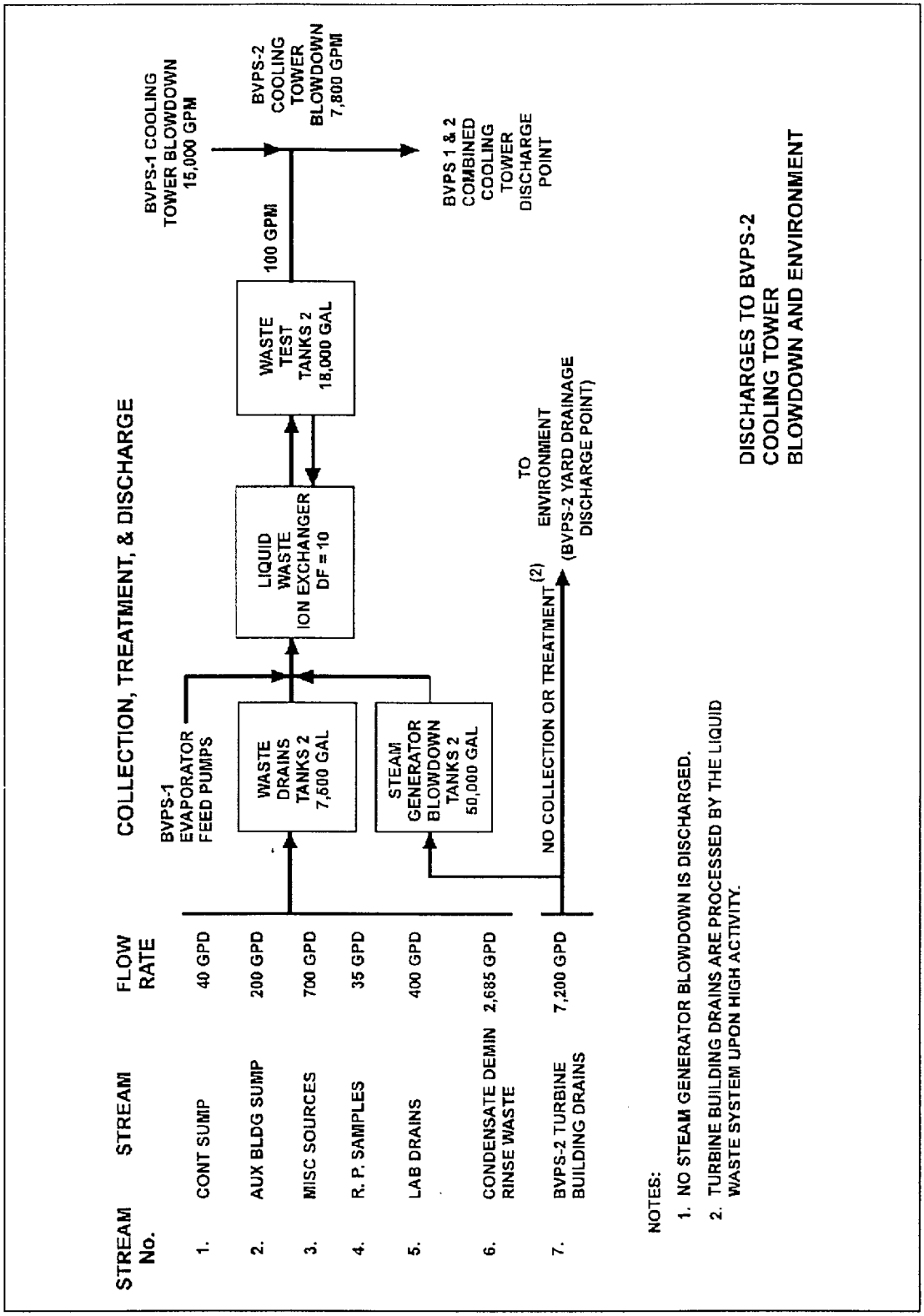


Table 2-1

Radioactive Liquid Waste Sampling and Analysis Program

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (μCi/ml)[a]
Batch Waste Release Tanks[d]	P Each Batch[h]	P Each Batch[h]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	P One Batch/M[h]	M	Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch[h]	M Composite[b]	H-3	1E-5
			Gross Alpha	1E-7
	P Each Batch[h]	Q Composite[b]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Continuous Releases[e,g]	Grab Sample[g]	W Composite[c]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	Grab Sample[g]	M	Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	Grab Sample[g]	M Composite[c]	H-3	1E-5
			Gross Alpha	1E-7
	Grab Sample[g]	Q Composite[c]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6

W - At least once per 7 days
M - At least once per 31 days
Q - At least once per 92 days
P - Completed prior to each release

Table 2-1 Notation

a. The Lower Limit of Detection (LLD).

b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

d. A batch release exists when the discharge of liquid wastes is from a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

e. A continuous release exists when the discharge of liquid wastes is from a non-discrete volume; e.g., from a volume of a system having an input flow during the continuous release. Releases from the Turbine Building drains and the Auxiliary Feedwater Pump Bay Drain System and Chemical Waste Sump are considered continuous when the primary to secondary leak rate exceeds 0.1 gpm (142 gpd).

f. The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144. 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 be reported as "less than" the nuclide's LLD, and should not be reported as being present at the LLD level for that nuclide. The "less than" values should not be used in the required dose calculations. When unusual circumstances result in LLDs higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

g. When radioactivity is identified in the secondary system, a Radioactive Waste Discharge Authorization--Liquid should be prepared on a monthly basis to account for the radioactivity that will eventually be discharged to the Ohio River.

h. Whenever the BV-2 Recirculation Drain Pump(s) are discharging to Catch Basin 16, sampling will be performed by means of a grab sample taken every 4 hours during pump operation.

Table 2-2

Results of Liquid Effluent Discharges to the Environment

Effluent Type	Results for 1999
Steam System Blowdown	The Steam System Blowdown was recycled.
Batch Radioactive Waste Liquids	Routine planned releases of liquid effluents from the Beaver Valley Power Station were released in accordance with conditions noted in Section 6.8.6a of the Technical Specifications and Appendix C of the ODCM. No limits were exceeded. Values for all liquid releases have been reported in the Beaver Valley Power Station Annual Radioactive Effluent Release Report for 1999.
Continuous Radioactive Waste Liquids	Radioactive waste liquids were not discharged in a continuous mode during 1999.

B. Monitoring of Atmospheric Effluents

1. Description of Atmospheric Effluent Sources

Beaver Valley Power Station (Units 1 and 2)

The Beaver Valley Power Station identifies radionuclides according to Section 6.8.6a of the Technical Specifications, Appendix C of the ODCM 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. Tritium concentrations are estimated prior to release and followed up with a grab sample from the ventilation system used during release. Figure 2-6 shows the gaseous radwaste system at Beaver Valley Power Station.

The environmental continuous gaseous release points also require specific nuclide identification. These points include:

a. Unit 1 Release Points:

   1) The Ventilation Vent located on top of the Unit 1 Primary Auxiliary Building.

   2) The Supplementary Leak Collection and Release System (SLCRS Filtered Pathway) Vent located on top of the Unit 1 Containment Building.

b. Unit 2 Release Points:

   1) The Ventilation Vent (also called the SLCRS Unfiltered Pathway) located on top of the Unit 2 Primary Auxiliary Building.

   2) The Supplementary Leak Collection and Release System (SLCRS Filtered Pathway) Vent located on top of the Unit 2 Containment Building.

   3) The Decontamination Building Vent located on top of the Unit 2 Decontamination Building.

   4) The Waste Gas Storage Vault Vent located on top of the Unit 2 Decontamination Building.

   5) The Condensate Polishing Building Vent located on top of the Unit 2 Condensate Polishing Building.

c. Unit 1 and Unit 2 shared Release Point:

1) The Process Vent located near the top of the Unit 1 Cooling Tower.

2) The Turbine Building vent located on top of Unit 2 Turbine Building.

These points are continuously monitored for particulates iodines and noble gases. Grab samples are obtained on a weekly basis and are analyzed for noble gas gamma-emitting isotopes. Grab samples are obtained on a weekly basis for the two SLCRS filtered release points and on a monthly basis for the other six release points and analyzed for tritium. Continuous filter paper and charcoal cartridge samples are changed on a weekly basis. The filter papers are analyzed for particulate gamma-emitting radionuclides and gross alpha. Composites of the filter papers are analyzed monthly for Sr-89 and Sr-90. The charcoal cartridges are analyzed for radioactive iodine.

Figure 2-7 shows these gaseous release points.

Figure 2-6

Units 1 and 2 Gaseous Radwaste System

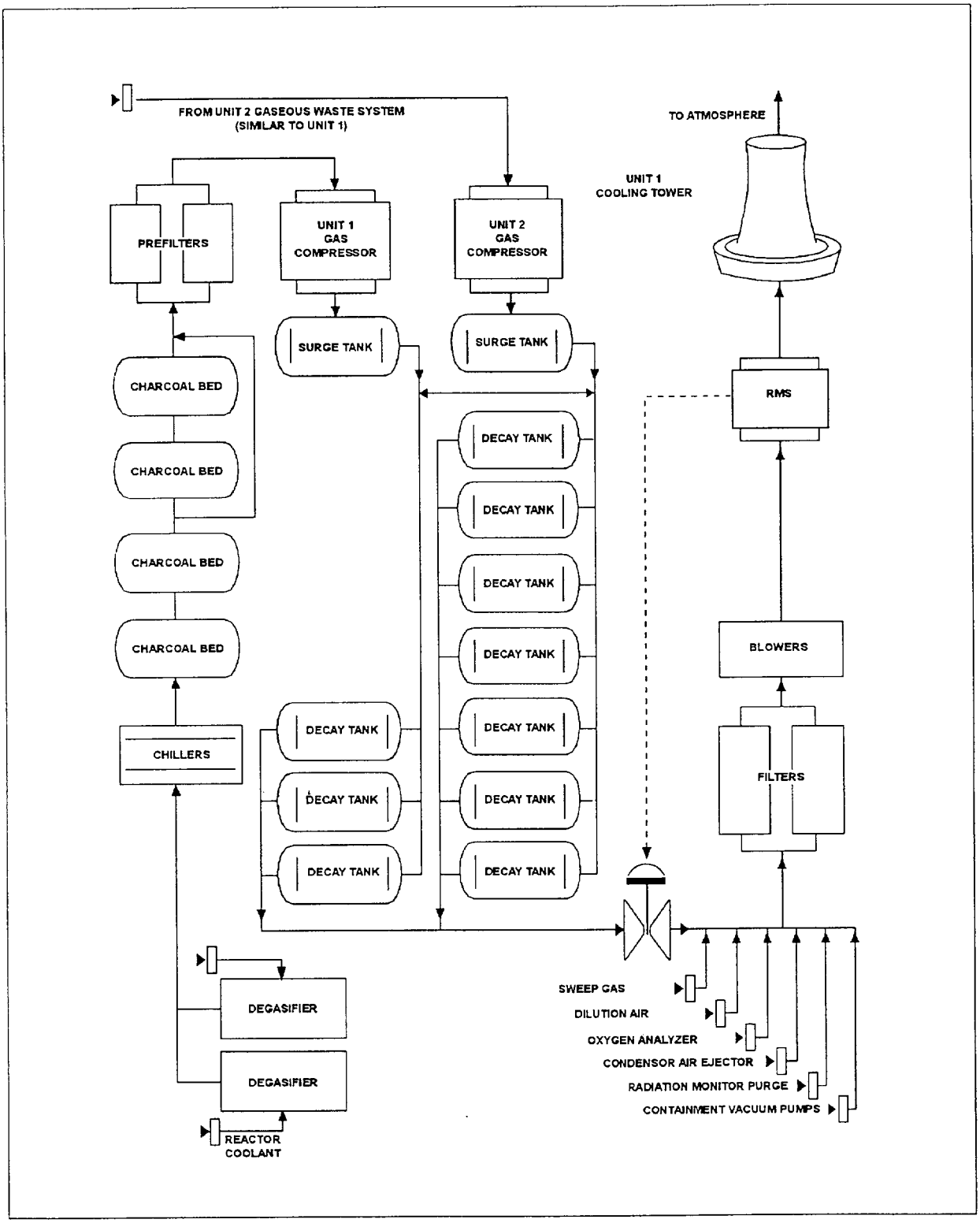
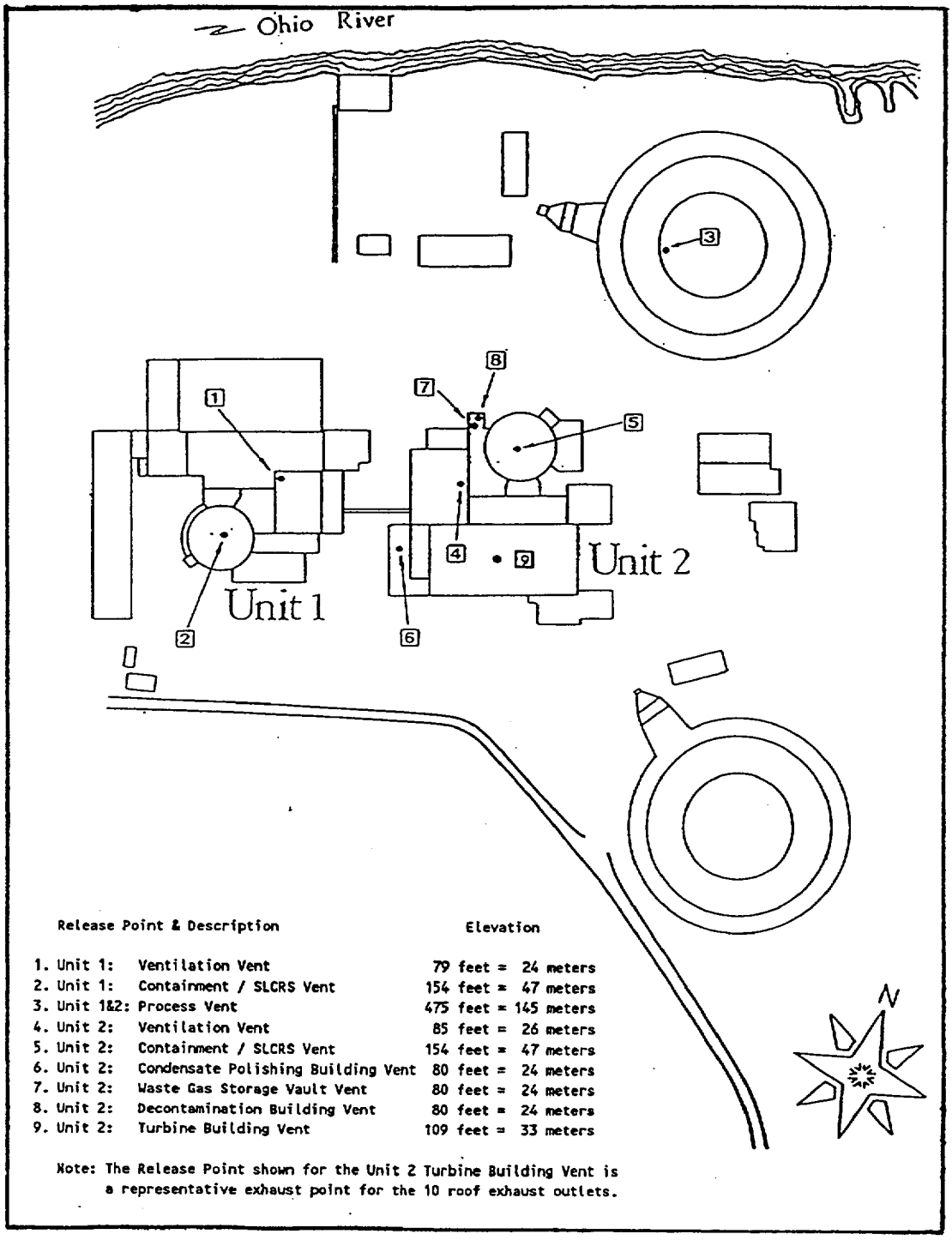


Figure 2-7

Units 1 and 2 Gaseous Release Points



Release Point & Description		Elevation
1. Unit 1:	Ventilation Vent	79 feet = 24 meters
2. Unit 1:	Containment / SLCRS Vent	154 feet = 47 meters
3. Unit 1&2:	Process Vent	475 feet = 145 meters
4. Unit 2:	Ventilation Vent	85 feet = 26 meters
5. Unit 2:	Containment / SLCRS Vent	154 feet = 47 meters
6. Unit 2:	Condensate Polishing Building Vent	80 feet = 24 meters
7. Unit 2:	Waste Gas Storage Vault Vent	80 feet = 24 meters
8. Unit 2:	Decontamination Building Vent	80 feet = 24 meters
9. Unit 2:	Turbine Building Vent	109 feet = 33 meters

Note: The Release Point shown for the Unit 2 Turbine Building Vent is a representative exhaust point for the 10 roof exhaust outlets.

2. Atmospheric Effluent Treatment and Sampling

Gaseous Waste Disposal System (Units 1 and 2)

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 consisting of noble gases, particulates and radioiodines are also present in this system.

The overhead gas compressor directs the radioactive gas stream to a gas surge tank. Gas is periodically transferred from the Unit 1 or Unit 2 surge tank to one of the three (3) decay tanks at Unit 1 or to the seven (7) storage tanks at Unit 2. The tanks are then sampled and authorization obtained for discharge in accordance with the ODCM. The discharge of the waste gases from the decay tanks or the storage tanks (2 scfm) is then diluted with about 1000 scfm of air. The gases are then combined with nitrogen purge from the oxygen analyzers, calibration gas from the oxygen analyzers, the main condenser air ejector exhaust, the containment vacuum system exhaust, aerated vents of the sweep gas system, discharge of the overhead gas compressor and the purge from the applicable multi sample point radiation monitor. The mixture is normally 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 Unit 1 cooling tower. The radioactivity levels of the stream are continuously monitored in accordance with the ODCM.

Should the radioactivity release concentration of the stream exceed the allowable setpoint, a signal from the radiation monitor will stop the discharge from the applicable Unit 1 decay tanks or the Unit 2 storage tanks.

Reactor Containment Purge (Units 1 and 2)

During a shutdown period the Unit 1 or Unit 2 containment is sampled and authorized for discharge in accordance with the ODCM. Purging may commence 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 Unit 1 Cooling Tower.

Building Ventilation Systems (Units 1 and 2)

Most areas in the Unit 1 Auxiliary Building are monitored for radioactivity by individual radiation monitors which aid in identifying any sources of contaminated air. The normal exhaust is through the Ventilation Vent effluent pathway. This pathway is monitored continuously by several redundant channels of the Radiation Monitoring System (RMS) in accordance with the ODCM. Particulate and iodine samples are obtained continuously while grab noble gas samples are obtained weekly in accordance with the ODCM. When activity alarm setpoints are reached, 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) which exhausts through the SLCRS Vent effluent pathway.

Areas in the Unit 2 Auxiliary Building (subject to radioactive contamination) are monitored for radioactivity prior to entering the filter banks in the Supplementary Leak Collection and Release System (SLCRS). This system is sampled continuously for particulates and iodines and is sampled weekly for noble gases, in accordance with the ODCM. This system is monitored continuously by the Digital Radiation Monitoring System (DRMS) in accordance with the ODCM.

Each Unit 1 and Unit 2 SLCRS 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 due to 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.

Some of these release points discharge small amounts of radioisotopes consisting of noble gases, particulates and radioiodines.

See Table 2-3 for the Radioactive Gaseous Waste Sampling and Analysis Program. This program is an excerpt of the requirements contained in the ODCM.

3. Results

Gaseous effluents from the Beaver Valley Power Station were released in accordance with conditions noted in Section 6.8.6a of the Technical Specifications and Appendix C of the ODCM. No limits were exceeded. These values have been reported in the Beaver Valley Power Station Annual Radioactive Effluent Release Report for 1999.

Table 2-3

Radioactive Gaseous Waste Sampling and Analysis Program

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE PF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (µCi/cc)[a]
A. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1E-4
	Each Tank* Grab Sample	Each Tank*	H-3*	1E-6
B. Containment Purge	P Each Purge[b] Grab Sample	P Each Purge[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6
C. Ventilation Systems[h] 1. Unit 1 Ventilation Vent 2. Unit 1 Containment/SLCRS Vent 3. Unit 1/2 Process Vent 4. Unit 2 Ventilation Vent 5. Unit 2 Containment/SLCRS Vent 6. Unit 2 Decon. Bldg. Vent 7. Unit 2 Waste Gas Storage Vault Vent 8. Unit 2 Condensate Polishing Bldg. Vent	M[b, c, e] Grab Sample	M[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6
D. All Systems Listed Above Which Produce Continuous Release	Continuous[f]	W[d] Charcoal Sample	I-131	1E-12
			I-133	1E-10
	Continuous[f]	W[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1E-11
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1E-11
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1E-11
	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta and Gamma	1E-6

W - At least once per 7 days
M - At least once per 31 days
Q - At least once per 92 days
P - Completed prior to each release

* The H-3 concentration shall be estimated prior to release and followed up with an H-3 grab sample from the Ventilation System during release.

Table 2-3 Notation

a. The Lower Limit of Detection (LLD).

b. Sampling and analysis shall also be performed following SHUTDOWN, STARTUP, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period. This requirement does not apply if (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

   All samples or surveillances used to satisfy note[b] above shall be obtained within 24 hours of reaching the intended steady state power level, and analyzed within 48 hours of reaching the intended steady state power level.

c. Tritium grab samples shall be taken at least once per 24 hours (from the appropriate ventilation release path) 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 shall also be performed at least once per 24 hours for at least 7 days following each SHUTDOWN, STARTUP, or THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

e. Tritium grab samples shall be taken at least once per 7 days (from the appropriate ventilation release path of 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 ODCM Appendix C CONTROLS 3.11.2.1, 3.11.2.2 and 3.11.2.3.

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 LLDs higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

h. Only when release path is in use.

SECTION 3 - ENVIRONMENTAL MONITORING PROGRAM

A. Environmental Radioactivity Monitoring Program

1. Program Description

The program consists of monitoring water, air, soil, river bottoms, vegetation and foodcrops, cows milk, ambient radiation levels in areas surrounding the site, and aquatic life as summarized in Table 3-1. Further description of each portion of the program (Sampling Methods, Sample Analysis, Discussion and Results) are included in Sections 3-B through 3-I of this report.

3-B - Air Monitoring

3-C - Monitoring of Sediments and Soils

3-D - Monitoring of Feedcrops and Food Products

3-E - Monitoring of Local Cows Milk

3-F - Environmental Radiation Monitoring

3-G - Monitoring of Fish

3-H - Monitoring of Surface, Drinking, Ground Waters and Precipitation

3-I - Estimates of Radiation Dose to Man

Table 3-1

Operational Radiological Environmental Monitoring Program

	Type of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis (b)
1	Air Particulate and Radioiodine	13	11	1.4	Meyer's Farm	Continuous sampling with sample collection at least weekly	Weekly AP	Gross Beta (c)
		30	4	0.5	Shippingport (S.S.)		Weekly Charcoal	I-131
		46.1	3	2 3	Industry, Rt. 68 – Garage		Quarterly Composite (d)	Gamma - scan
		32	15	0.8	Midland (S.S.)			
		48(a)	10	16.3	Weirton, W.Va., - Weirton Water Tower, Collier Way			
		51	5	8.0	Aliquippa (S.S.)			
		47	14	4.9	East Liverpool, Oh. - Water Treatment Plant			
		27	7	6.1	Brunton's Farm			
		28	1	8.6	Sherman's Farm			
		29B	3	8.0	Beaver Valley Geriatric Center			
2	Direct Radiation	30	4	0.5	Shippingport (S.S.)	Continuous (TLD)	Quarterly (j)	Gamma Dose
		13	11	1.4	Meyer's Farm			
		46	3	2.5	Industry, Midway Dr.			
		32	15	0.8	Midland (S.S.)			
		48(a)	10	16.3	Weirton, W.Va. - Weirton Water Tower, Collier Way			
		45.1	6	1.9	Raccoon Twp., Kennedy's Corners			
		51	5	8.0	Aliquippa (S.S.)			
		47	14	4.9	East Liverpool, Oh. - Water Treatment Plant			
		70	1	3.4	North of Western Beaver School – Engle Rd.			
		80	9	8.2	Raccoon Park Office (Rt. 18)			
		81	9	3.6	Millcreek United Pres. Church			
		82	9	6.9	Hanover Municipal Bldg.			
		83	10	4.2	735 Mill Creek Rd.			
		14	11	2.5	Hookstown			
		84	11	8.3	Hancock Parks & Recreation Complex			
		85	12	5.7	Rts. 8 & 30 Intersection			
		86	13	6.2	E. Liverpool, Oh. 1090 Ohio Ave.			
		92	12	2.8	Georgetown Rd. (S.S.)			

Table 3-1 (Continued)
Operational Radiological Environmental Monitoring Program

	Types of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis (b)
2	Direct Radiation (continued)	87	14	7.0	Calcutta, Oh. – Calcutta Smith's Ferry Rd. & Valley Dr.	Continuous (TLD)	Quarterly (j)	Gamma-Dose
		88	15	2.8	Midland Heights – 110 Summit Rd.			
		89	15	4.8	Ohioville, 488 Smith's Ferry Rd.			
		90	16	5.2	Opposite Fairview School			
		10	3	1.0	Shippingport Boro			
		45	5	2.2	Rt. 18 & Anderson St.			
		60	13	2.5	444 Hill Rd.			
		93	16	1.1	Midland, Sunrise Hills			
		95	10	2.3	832 McCleary Rd.			
		28	1	8.6	Sherman's Farm			
		71	2	6.0	Brighton Twp. First West. Bank			
		72	3	3.3	Industry, Logan Park			
		29B	3	8.0	Beaver Valley Geriatric Center			
		73	4	2.5	618 Squirrel Run Rd.			
		74	4	7.0	CCBC – 137 Poplar Ave.			
		75	5	4.1	117 Holt Road			
		76	6	3.8	Raccoon Elementary School			
		77	6	5.6	3614 Green Garden Rd			
		59	6	1.0	236 Green Hill Rd.			
		78	7	2.7	Raccoon Mun. Bldg.			
		27	7	6.1	Brunton's Farm			
		79	8	4.4	Rt. 151 & Pross Ln.			
		15	14	3.7	Georgetown Post Office			
		46.1	3	2.3	Industry, Rt. 168 – Garage			
		91	2	3.9	Pine Grove Rd and Doyle Rd			
		94	8	2.2	McCleary Rd. & Pole Cat Hollow Rd.			
3	Surface Water	49(a)	3	5.0	Upstream Side of Montgomery Dam	Weekly Grab Sample (i)	Weekly Sample from Site 49	I-131
		2.1	14	1.5	Downstream (Midland) J&L	Weekly, Intermittent Composite Sample (i)	Monthly composite of Weekly Sample	Gamma-scan
		5	14	4.9	East Liverpool, Oh. - Water Treatment Plant (raw water)	Daily Grab Sample Only - Collected Weekly (i)		
							Quarterly Composite	H-3

Table 3-1 (Continued)

Operational Radiological Environmental Monitoring Program

	Type of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis (b)
4	Groundwater	14 15 11	11 14 3	2.5 3.7 0.8	Hookstown Georgetown Shippingport Boro	Semi-Annual	Semi-Annual	Gamma-scan H-3
5	Drinking	4 5	15 14	1.3 4.9	Midland, Water Treatment Plant East Liverpool, Oh. - Water Treatment Plant	Intermittent (e) Sample Collected Weekly	Weekly Composite Monthly Composite Quarterly Composite	I-131 Gamma-scan H-3
6	Shoreline Sediment	2A 49(a) 50	13 3 12	0.2 5.0 11.8	BVPS Outfall Discharge Upstream side of Montgomery Dam Upstream side of New Cumberland Dam	Semi-Annual	Semi-Annual	Gamma-scan
7	Milk	25 * * * 96(a) 27	10 10 7	2.1 10.4 6.1	Searight's Farm Windsheimer's Farm Brunton's Farm	Weekly (f) Biweekly (g) when animals are on pasture; monthly at other times.	Weekly sample from Searight's only Biweekly (grazing) Monthly (indoors)	I-131 Gamma-scan Sr-89, Sr-90, I-131

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

Table 3-1 (Continued)

Operational Radiological Environmental Monitoring Program

	Type of Sample	Sample Points	Sector	Miles	Sample Point Description	Sample Frequency	Sample Preparation	Analysis (b)
8	Fish	2A 49(a)	13 3	0.2 5.0	BVPS Outfall Discharge Upstream side of Montgomery Dam	Semi-Annual	Composite of edible parts by species (h)	Gamma-scan
9	Food Crops (Shippingport) (Georgetown) (Industry)	 10 15 46 48(a)	 3 14 3 10	 1.0 3.7 2.5 16.3	 Three locations within 5 miles selected by BVPS. (k) Weirton, W.Va. (k)	Annual at harvest if available	Composite of each sample species	Gamma-scan I-131 on green leafy vegetables
10	Feedstuff and Summer Forage	25	10	2.1	Searight's Farm	Monthly	Monthly	Gamma-scan
11	Soil	13 30 46 32 48A(a) 51 47 27 22 29A	11 4 3 15 10 5 14 7 8 3	1.4 0.5 2.5 0.8 15.6 8.0 4.9 6.1 0.3 8.3	Meyer's Farm Shippingport (S.S.) Industry, Midway Dr. Midland (S.S.) Weirton, W.Va. – Weirton Water Tower, E. Belleview Dr. Aliquippa (S.S.) E. Liverpool, Oh. - Water Treatment Plant Brunton's Farm South of BVPS Transmission Line Nicol's Farm	Every 3 years (1994, 1997, etc.)	12 Core Samples 3" Deep (2" Dia. at each location) (approx. 10' radius)	Gamma-scan
12	Precipitation	30 47 48	4 14 10	0.5 4.9 16.3	Shippingport (S.S.) East Liverpool, Oh. - Water Treatment Plant Weirton, W.Va. - Weirton Water Tower, Collier Way	Weekly grab samples when available	Quarterly Composite	Gamma-scan, H-3

Table 3-1 - Notations

Operational 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 detection sensitivities for gamma spectrometry are shown in Table 3-4.

(c) Particulate samples are not counted within 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.

(h) 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.

(i) Composite samples are obtained by collecting an aliquot at intervals not exceeding 2 hours at location 2.1. A weekly grab sample is obtained from daily composited grab samples obtained by the water treatment plant operator at location 5. For location 49, a weekly grab sample is obtained by a field technician.

(j) Two (2) TLDs are collected quarterly from each monitoring location.

(k) Exact location may vary due to availability of food products.

2. Summary of Results

All results of this monitoring program are summarized in Table 3-2. This table is prepared in the format specified by NRC Regulatory Guide 4.8 and in accordance with Beaver Valley Power Station Offsite Dose Calculation Manual. Summaries of results of analysis of each media are discussed in Sections 3-B through 3-H and an assessment of radiation doses are given in Section 3-I. Table 3-3 summarizes Beaver Valley Power Station preoperational ranges for the various sampling media during the years 1974 and 1975. Comparisons of preoperational data with operational data indicate the ranges of values are generally in good agreement for both periods of time.

Activity detected was attributed to naturally occurring radionuclides, BVPS effluents, previous nuclear weapons tests or to the normal statistical fluctuation for activities near the lower limit of detection (LLD). Table 3-4 shows typical detection sensitivities for gamma spectroscopy detection by high resolution germanium detectors.

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 the Beaver Valley Power Station to assure reliable performance by the contractor and the supporting QC data are presented and discussed in Section 5 of this report.

4. Program Changes

The following changes were implemented in the 1999 sampling program.

- Surface water site 49.1, located in sector four 5.3 miles from plant, was replaced with site 49, which is located in sector three 5.0 miles from plant. Site 49.1 was located at NOVA Chemicals, however, NOVA Chemicals asked BVPS to remove sampling station on 12/31/98 due to liability concerns.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999
(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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)	Gamma (12) Be-7	(a)	50.3 (2/12) (39.0-61.6)	30, Shippingport, (S.S.) 0.5 mi ENE	50.3 (2/4) (39.0-61.6)	LLD	0
	Mn-54	5	LLD	--	--	--	0
	Fe-59	10	LLD	--	--	--	0
	Co-58	5	LLD	--	--	--	0
	Co-60	5	LLD	--	--	--	0
	Zn-65	10	LLD	--	--	--	0
	Zr/Nb-95	5	LLD	--	--	--	0
	Cs-134	5	LLD	--	--	--	0
	Cs-137	5	LLD	--	--	--	0
	Ba/La-140	10	LLD	--	--	--	0
	H-3 (12)	200	232 (6/12) (140-320)	30, Shippingport, (S.S.) 0.5 mi ENE	232 (4/4) (140-320)	LLD	0

(a) LLD for this nuclide for Water Precipitation not required by ODCM

* **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).**

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999
(County, State)

Table 3-2 (Continued)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
						Georgetown, PA No. 15	
Groundwater (pCi/l)	H-3 (6)	200	200 (1/6)	15, Georgetown 3.7 mi WNW	200 (1/6) --	LLD	0
	Gamma (6)						
	Mn-54	5	LLD	--	--	--	0
	Fe-59	10	LLD	--	--	--	0
	Co-58	5	LLD	--	--	--	0
	Co-60	5	LLD	--	--	--	0
	Zn-65	10	LLD	--	--	--	0
	Zr/Nb-95	5	LLD	--	--	--	0
	Cs-134	5	LLD	--	--	--	0
	Cs-137	5	LLD	--	--	--	0
	Ba/La-140	10	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).

Table 3-2 (Continued)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
Drinking Water (pCi/l)	I-131 (104)	0.5	0.71(79/104) (0.24-1.30)	4, Midland Water Treatment Plant 1.3 mi NW	0.74 (40/52) (0.24-1.30)	--	0
	H-3 (8)	200	190(1/8)	5, E. Liverpool, Oh Water Treatment Plant 4.9 mi WNW	190(1/4)	--	0
	Gamma (24)						
	Mn-54	5	LLD	--	--	--	0
	Fe-59	10	LLD	--	--	--	0
	Co-58	5	LLD	--	--	--	0
	Co-60	5	LLD	--	--	--	0
	Zn-65	10	LLD	--	--	--	0
	Zr/Nb-95	5	LLD	--	--	--	0
	Cs-134	5	LLD	--	--	--	0
	Cs-137	5	LLD	--	--	--	0
	Ba/La-140	10	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).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Table 3-2 (Continued)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
						49, Upstream side of Montgomery Dam	
Surface Water (pCi/l)	I-131 (52)	0.5	0.90 (42/52) (0.30-2.40)	One Sample Location		One sample location	0
	H-3 (12)	200	218 (4/14) (210-240)	49, Upstream side of Montgomery Dam 5.0 mi NE	225(2/4) (210-240)	Same as High location	0
	Gamma (36)						
	Mn-54	5	LLD	--	--	--	0
	Fe-59	10	LLD	--	--	--	0
	Co-58	5	LLD	--	--	--	0
	Co-60	5	LLD	--	--	--	0
	Zn-65	10	LLD	--	--	--	0
	Zr/Nb-95	5	LLD	--	--	--	0
	Cs-134	5	LLD	--	--	--	0
	Cs-137	5	LLD	--	--	--	0
	Ba/La-140	10	LLD	--	--	--	0
	K-40	(a)	60.4 (1/36)	49, Upstream side of Montgomery Dam	60.4(1/12) 5.0 mi NE	Same as High location	0

(a) LLD for this nuclide for water not required by ODCM.

* **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).**

Table 3-2 (Continued)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
						Montgomery Dam No. 49	
Sediment (pCi/g) (dry weight)	Gamma (6)						
	Be-7	(a)	1.40(3/6) (1.30-1.58)	49, Upstream side of Montgomery Dam 5.0 mi NE	1.58(1/2)	Same as High Location	0
	K-40	(a)	11.18(6/6) (7.91-13.90)	49, Upstream side of Montgomery Dam 5.0 mi NE	11.95(2/2) (10.80-13.10)	Same as High Location	0
	Co-58	(a)	0.27(1/6)	2A, BVPS Outfall 0.2 mi W	0.27(1/6)	None Detected	0
	Co-60	(a)	0.20(2/6) (0.11-0.29)	2A, BVPS Outfall 0.2 mi W	0.20(2/2) (0.11-0.29)	None Detected	0
	Cs-134	0.06	LLD	-	-	-	0
	Cs-137	0.08	0.13(5/6) (0.11-0.16)	49, Upstream side of Montgomery Dam 5.0 mi NE	0.14(2/2) (0.13-0.14)	Same as High Location	0
	Ra-226	(a)	2.05(6/6) (1.47-2.86)	49, Upstream side of Montgomery Dam 5.0 mi NE	2.44(2/2) (2.02-2.86)	Same as High Location	0
	Th-228	(a)	1.10(6/6) (0.75-1.62)	2A, BVPS Outfall 0.2 mi W	1.36(2/2) (1.09-1.62)	1.04(2/2) (1.00-1.09)	0

(a) LLD for this nuclide for Sediment not required by ODCM

* **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).**

Table 3-2 (Continued)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
						Windsheimer No. 96	
Milk (pCi/l)	I-131 (155)	0.5	0.58 (7-152) (0.33-0.88)	27 Brunton's Farm 6.1 mi SE	0.58 (7/31) (0.33-0.88)	LLD	0
	Sr-89 (120)	2.0	LLD				
	Sr-90 (120)	0.7	2.1 (120/120) (0.7-6.0)	69 Collins 3.5 mi SE	1.2 (16/16) (2.1-6.0)	1.2 (20/20) (0.8-1.7)	0
	Gamma (120)						
	K-40	(a)	1382 (120/120) (1150-2330)	69 Collins 3.5 mi SE	1586 (16/16) (1250-1750)	1453 (20/20) (1320-1600)	0
	Cs-134	5	LLD	--	--	--	0
	Cs-137	5	LLD	--	--	--	0
	Ba/La-140	10	LLD	--	--	--	0

(a) LLD for this nuclide for Milk not required by ODCM

* 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).

Table 3-2 (Continued)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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	
Food and Garden Crops (pCi/g) (wet weight)	I-131 (4)	0.06	LLD	--	--	--	0
	Gamma (4)						
	K-40	(a)	2.3(4/4) (2.0-2.5)	48, Weirton, WV 16.3 mi SSW	2.5(1/1)	Same as High Location	0
	Cs-134	0.04	LLD	--	--	--	0
	Cs-137	0.06	LLD	--	--	--	0

(a) LLD for this nuclide for Food and Garden Crops not required by ODCM

* **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).**

Table 3-2 (Continued)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
				Upstream Montgomery Dam No. 49			
Fish (pCi/g) (wet weight)	Gamma (8)						
	K-40	(a)	2.88 (8/8) (1.35-3.44)	49 Upstream side of Montgomery Dam 5.0 mi NE	3.20 (4/4) (3.07-3.35)	Same as High Location	0
	Mn-54	0.05	LLD	--	--	--	0
	Fe-59	0.10	LLD	--	--	--	0
	Co-58	0.05	LLD	--	--	--	0
	Co-60	0.05	LLD	--	--	--	0
	Zn-65	0.10	LLD	--	--	--	0
	Cs-134	0.05	LLD	--	--	--	0
	Cs-137	0.06	0.02(1/8)	2A BVPS Outfall Discharge 0.2 mi W	0.02(1/8)	LLD	0

(a) LLD for this nuclide for Fish not required by ODCM

* 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).

Table 3-2 (Continued)

Environmental Monitoring Program Results

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility **Beaver Valley Power Station Unit 1 and 2** **Docket No. 50-334/50-412**

Location of Facility **Beaver, Pennsylvania** **Reporting Period** **Annual 1999**

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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***
External Radiation (mR/day)	Gamma (171)	0.05	0.17 (171/171) (0.12-0.24)	84, Hancock Co., Parks & Recreation Complex 8.3 mi SW	0.22 (3/3) (0.20-0.24)	Weirton, WV No. 48 0.19 (4/4) (0.18-0.20)	0
Feed and Forage (pCi/g) (dry weight)	Gamma (12)						
	Be-7	(a)	2.30 (5/12) (0.27-8.74)	One sample location	--	One sample location	0
	K-40	(a)	14.28 (12/12) (7.71-19.30)	One sample location	--	One sample location	0
	Th-228	(a)	0.15 (2/12) (0.11-0.20)	One sample location	--	One sample location	0
	I-131	(a)	None Detected	One sample location	--	One sample location	0
	Cs-134	(a)	None Detected	One sample location	--	One sample location	0
	Cs-137	(a)	None Detected	One sample location	--	One sample location	0

(a) LLD for this nuclide for Feed and Forage not required by ODCM

* 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).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Beaver Valley Power Station Unit 1 and 2 **Docket No.** 50-334/50-412

Location of Facility Beaver, Pennsylvania **Reporting Period** Annual 1999

(County, State)

Medium of Pathway Sampled (Unit of Measurement)	Type 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	
Air Particulate and Radioiodine	Gross Beta (529)	2	17 (529/529) (6-49)	47, E. Liverpool, Oh. Water Treatment Plant 4.9 mi. WNW	18 (53/53) (7-49)	16 (53/53) (6-43)	0
(X10-3 pCi/Cu.M.)	I-131(529)	40	LLD	--	--	--	0
	Gamma (40)						
	Be-7	(a)	136 (40/40) (105-172)	27, Brunton's Farm 6.1 mi SE	151 (4/4) (122-172)	135 (4/4) (117-162)	0
	K-40	(a)	4 (9/40) (2-10)	51, Aliquippa (S.S.) 8.0 mi. E	10 (1/4)	LLD	0
	Cs-134	0.5	LLD	--	--	--	0
	Cs-137	0.5	LLD	--	--	--	0

(a) LLD for this nuclide for Air Particulate not required by ODCM

* 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).

Table 3-3

Pre-Operational Environmental Radiological Monitoring Program Summary

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

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

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
	Zr/Nb-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(a)		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)	--
	Zr/Nb-95		0.05	0.2	(1/8)	--
	Ru-106(a)		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
	Zr/Nb-95		0.05	0.8	(13/81)	0.2 - 1.8
	Ru-106(a)		0.3	1.4	(12/81)	0.6 - 2.3
	Others		--		< LLD	
Soil pCi/g (dry) (Template Samples)	Gross Alpha	(0)	--		--	
	Gross Beta	(64)	1	22	(64/64)	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
	Zr/Nb-95		0.05	0.3	(13/64)	0.1 - 2
	Ru-106(a)		0.3	1.1	(3/64)	0.5 - 2
	Others		--		< LLD	

(f) Fraction of detectable measurements at specified location.

Table 3-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

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

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

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	Gross Alpha	(0)	--		--	
pCi/g (dry)	Gross Beta	(8)	1	21	(8/8)	16 - 28
(Core Samples)	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	
Surface Water	Gross Alpha	(40)	0.3	0.75	(5/40)	0.6 - 1.1
pCi/l	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	I-131	(0)	--		--	
pCi/l	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	Gross Alpha	(19)	0.3		< LLD	
pCi/l	Gross Beta	(76)	0.6	2.9	(73/75)(b)	1.3 - 8.0
	Tritium	(81)	100	440	(77/81)	80 - 800
	Gamma	(1)	10 - 60		< LLD	
Air Particulates	Gross Alpha	(188)	0.001	0.003	(35/188)	0.002 - 0.004
and Gaseous	Gross Beta	(927)	0.006	0.07	(927/927)	0.02 - 0.32
pCi/m^3	Sr-89	(0)	--		--	
	Sr-90	(0)	--		--	
	I-131	(816)	0.04	0.08	(2/816)	0.07 - 0.08
	Gamma	(197)	--		--	
	Zr/Nb-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	

(f) Fraction of detectable measurements at specified location.

Table 3-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

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

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

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 Sr-89 Sr-90 Gamma Cs-137 Others	(91) (134) (134) (134)	0.25 5 1 -- 10	0.6 7 5.3 13	(4/91) (4/134) (132/134) -- (19/134) < LLD	0.3 - 0.8 6 - 11 1.5 - 12.8 11 - 16
External Radiation mR/day	γ - Monthly γ - Quarterly γ - Annual	(599) (195) (48)	0.5 mR* 0.5 mR* 0.5 mR*	0.20 0.20 0.19	(599/599) (195/195) (48/48)	0.08 - 0.51 0.11 - 0.38 0.11 - 0.30
Fish pCi/g (wet)	Gross Beta Sr-90 Gamma K-40 Others	(17) (17) (17)	0.01 0.005 0.5 -- --	1.9 0.14 2.4 	(15/17) (17/17) (17/17) < LLD	1.0 - 3.2 0.02 - 0.50 1.0 - 3.7

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

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

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

(f) Fraction of detectable measurements at specified location.

Table 3-4

Typical Detection Limits for Gamma Spectroscopy Detection by High Resolution Germanium

Nuclide	Milk Water (pCi/liter)	Air Particulates (pCi)	Vegetation (pCi/kg wet)	Sediment and Soil (pCi/g wet)	Fish (pCi/g wet)
Be-7	50	20	200	0.2	0.2
K-40	80	50	400	0.4	0.4
Mn-54	5	2	20	0.02	0.02
Co-58	5	2	20	0.02	0.02
Fe-59	10	3	40	0.04	0.04
Co-60	5	2	20	0.02	0.02
Zn-65	10	5	40	0.04	0.04
Zr/Nb-95	5	3	40	0.04	0.04
Ru-103	5	2	30	0.03	0.03
Ru-106	50	20	200	0.2	0.2
I-131	15	4	100	0.1	0.1
Cs-134	5	2	20	0.02	0.02
Cs-137	5	2	20	0.02	0.02
Ba/La-140	10	3	200	0.2	0.2
Ce-141	10	3	100	0.1	0.1
Ce-144	40	20	200	0.2	0.2
Ra-226	80	10	100	0.1	0.1
Th-228	10	10	20	0.02	0.02

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) offsite air sampling stations. The locations of these stations are listed in Table 3-1 and shown on a map in Figure 3-1.

Samples are collected at each of these stations by continuously drawing 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 quarterly analysis by gamma spectrometry. 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

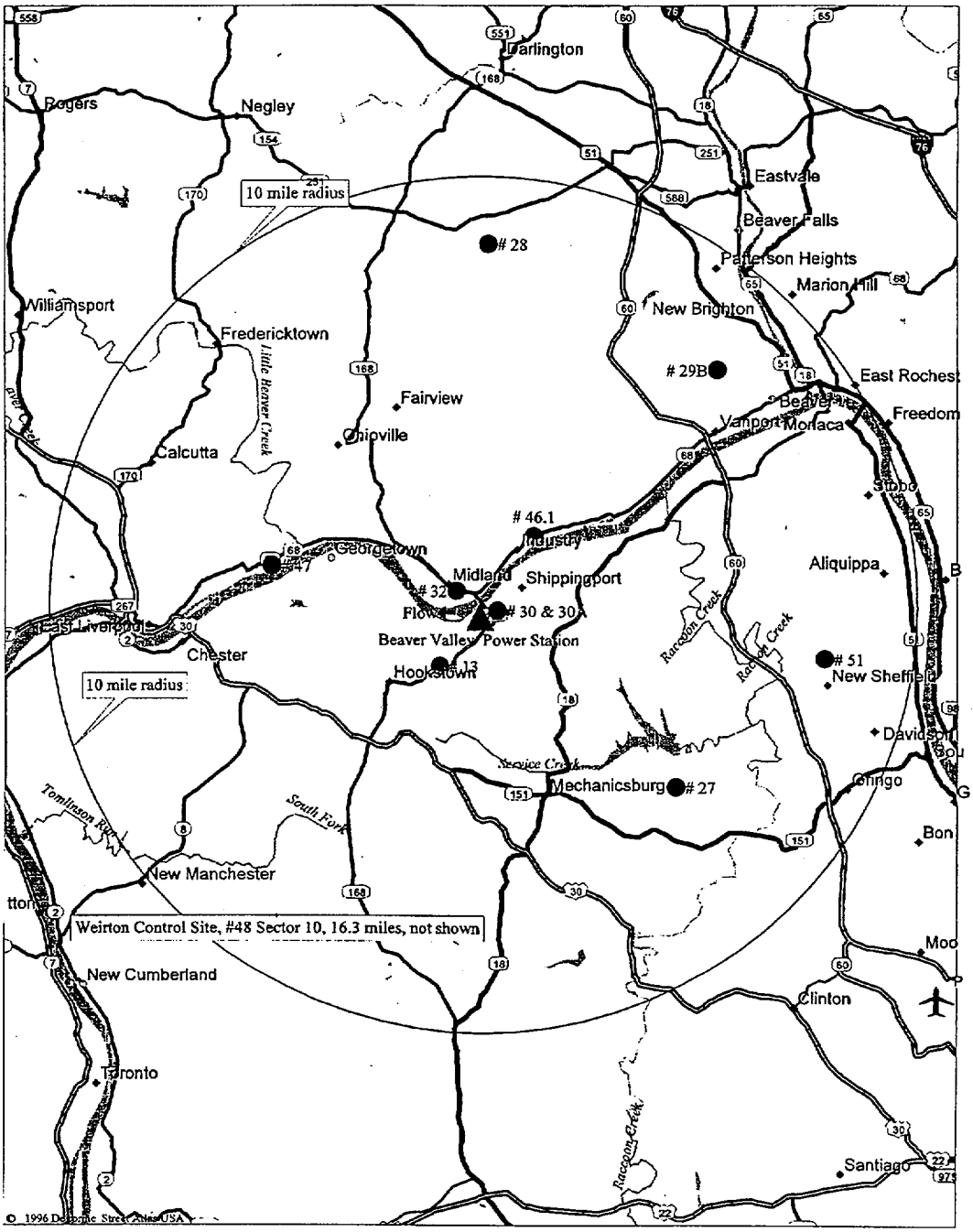
Gross beta analysis is performed by placing the filter paper from the weekly air sample in a 2" planchet and counting it in a low background, gas flow proportional counter.

Gamma emitters are determined by stacking all the filter papers from each monitoring station collected during the quarter and scanning this composite on a high resolution germanium 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.

Figure 3-1

Air Sampling Stations



Site No.	Sector	Distance (miles)	Location
13	11	1.4	Meyer's Farm
27	7	6.1	Brunton's Farm
28	1	8.6	Sherman's Farm
29B	3	8.0	Beaver Valley Geriatric Center
30	4	0.5	Shippingport (S.S.)
30A	4	0.5	Shippingport (S.S.)

Site No.	Sector	Distance (miles)	Location
32	15	0.8	Midland (S.S.)
46.1	3	2.3	Industry Rt. 68 – Garage
47	14	4.9	East Liverpool, Oh. - Water Treatment Plant
48	10	16.3	Weirton, W.Va. – Weirton Water Tower, Collier Way
51	5	8.0	Aliquippa (S.S.)

3. Results and Conclusions

A summary of data is presented in Table 3-2.

a. Airborne Radioactive Particulates

A total of five hundred twenty-nine (529) weekly samples from ten (10) locations were analyzed for gross beta. Results were comparable to previous years. Figure 3-2 illustrates the weekly average concentration of gross beta in air particulates.

Weeks 44 and 46 indicated a weekly average that was higher than the other weeks. All stations showed elevated readings these weeks including the Control station in Weirton, W. Va. The Control station is considered to be outside the influence of plant operations. Week 44 (10/25/00 to 11/1/00) was the highest (0.046 pCi/m3). This is approximately three times higher than the yearly average. Perry Nuclear Power Station, Davis-Besse Nuclear Power Station, and the Pa. Department of Environmental Protection (PDEP) reported they also saw elevated results that week. The PDEP results were elevated around BVPS and at other locations around the state of Pennsylvania. Effluent releases from BVPS during these two weeks were reviewed and there were not any releases that would account for the higher results. When the quarterly gamma spec analysis was performed, only naturally occurring isotopes were identified (see below). Also, all air particulate samples are required to be counted by gamma spectroscopy if any gross beta result is greater than ten times the yearly control location average (10 x 0.0163 pCi/m^3 = 0.163 pCi/m^3). For these two weeks, none of the samples exceeded 0.050 pCi/m^3 and individual samples were not required to be counted for gamma spectroscopy because their gross beta results were not high enough to meet the gamma spectroscopy counting requirement.

The weekly air particulate samples were composited to forty (40) quarterly samples which were analyzed by gamma spectrometry. Naturally occurring Be-7 was present in all samples. Naturally occurring K-40 was detected in nine (9) of the forty (40) monthly samples. No other radionuclides were detected. Results are listed in the summary Table 3-2.

Based on the analytical results, the operation of Beaver Valley Power Station did not contribute any measurable increase in air particulate radioactivity during 1999.

b. Radioiodine

A total of five hundred twenty-nine (529) weekly charcoal filter samples were analyzed for I-131. No detectable concentrations were present at any locations.

Based on analytical results, the operation of Beaver Valley Power Station did not contribute any measurable increase in airborne radioiodine during 1999.

c. Deviations from required sampling/analysis schedule

ODCM required sites

Site 32, Midland SS air sampling station was out of service from 0440 1/19/99 to 1305 1/27/99 due to fire in the Midland substation north yard control house. The fire was caused by a tree uprooting and falling across the Midland-Valley #22857 line. Duquesne Light Company crews restored power to the air sampling station on 1/27/99 and it was returned to service.

Site 13, Meyers Farm air sampling station was found out of service on 10/7/99 due to a burned out on/off switch. It was determined that the station had been out of service for fifty-eight hours. The switch was replaced and the station was returned to service.

The air sampling pumps at six-offsite air sampling stations had sporadic thermal overload shutdown on ten different occasions from July 6 to November 1. It was discovered that the muffler/filters on these new style pumps were clogging causing the pumps to overheat. The muffler/filters were replaced on all air sampling pumps. No further incidents occurred this year. The sites and down times are listed below [Ref: Condition Report #993108]

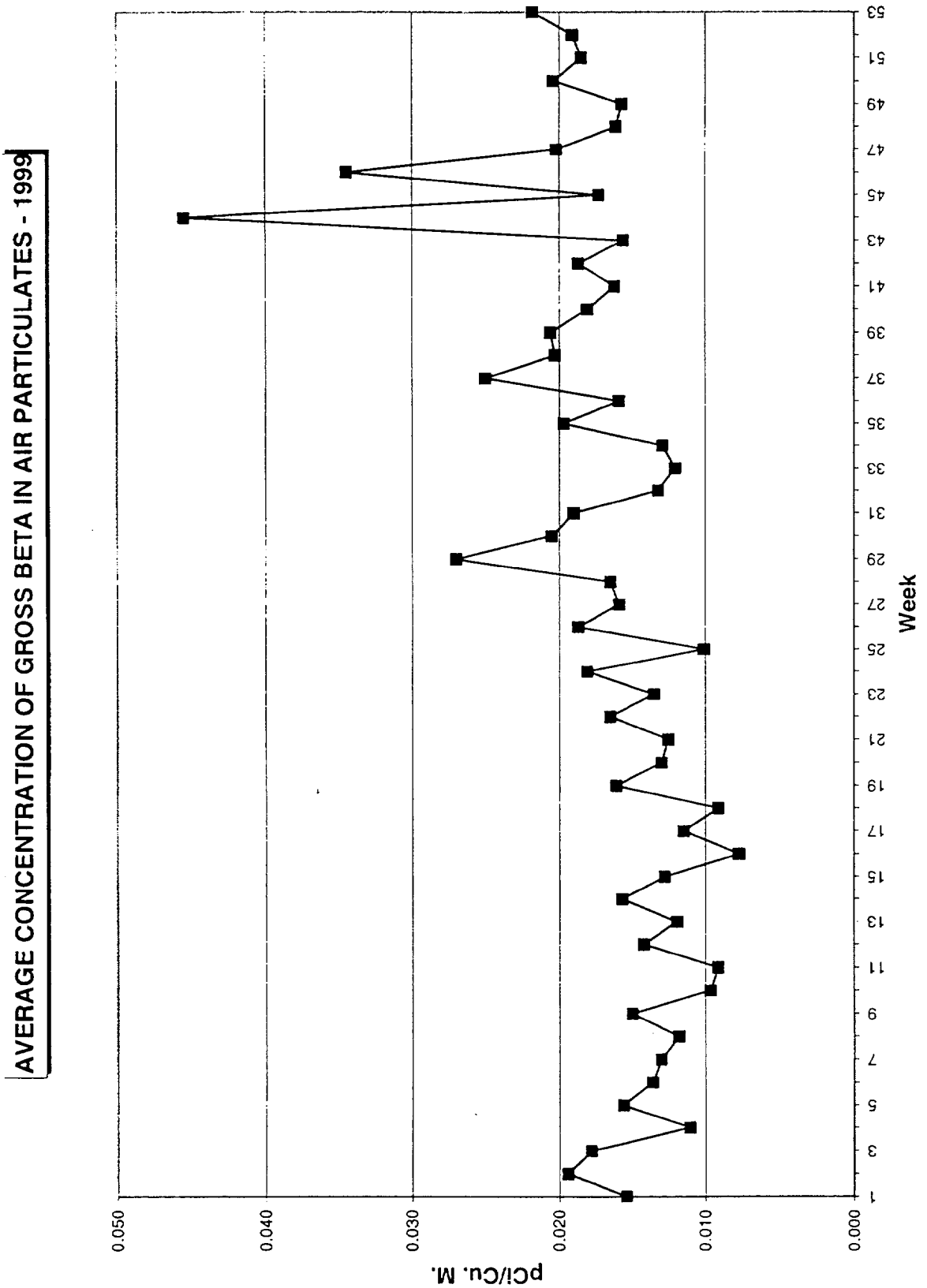
- Site 48 - 4 hours
- Site 48 - 26 hours
- Site 13 - 11.8 hours
- Site 13 - 46.3 hours
- Site 32 - 10 hours
- Site 51 - 17.8 hours (non ODCM site)
- Site 51 - 48.5 hours (non ODCM site)
- Site 47 - 53 hours (non ODCM site)
- Site 47 - 6.6 hours (non ODCM site)
- Site 28 - 15.6 hours (non ODCM site)

Non-ODCM required sites

See above.

Figure 3-2

Average Concentration of Gross Beta in Air Particulates



C. Monitoring of Sediments and Soils

(Soil Monitoring is required every 3 years and was not required in 1999)

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 above the New Cumberland Dam. A Ponar or Eckman dredge is used to collect the sample. The sampling locations are also listed in Table 3-1 and are shown in Figure 3-3.

      Soil samples were not required in 1999. Next year of sampling will be 2000. Sampling locations are listed in Table 3-1 and are shown in Figure 3-3.

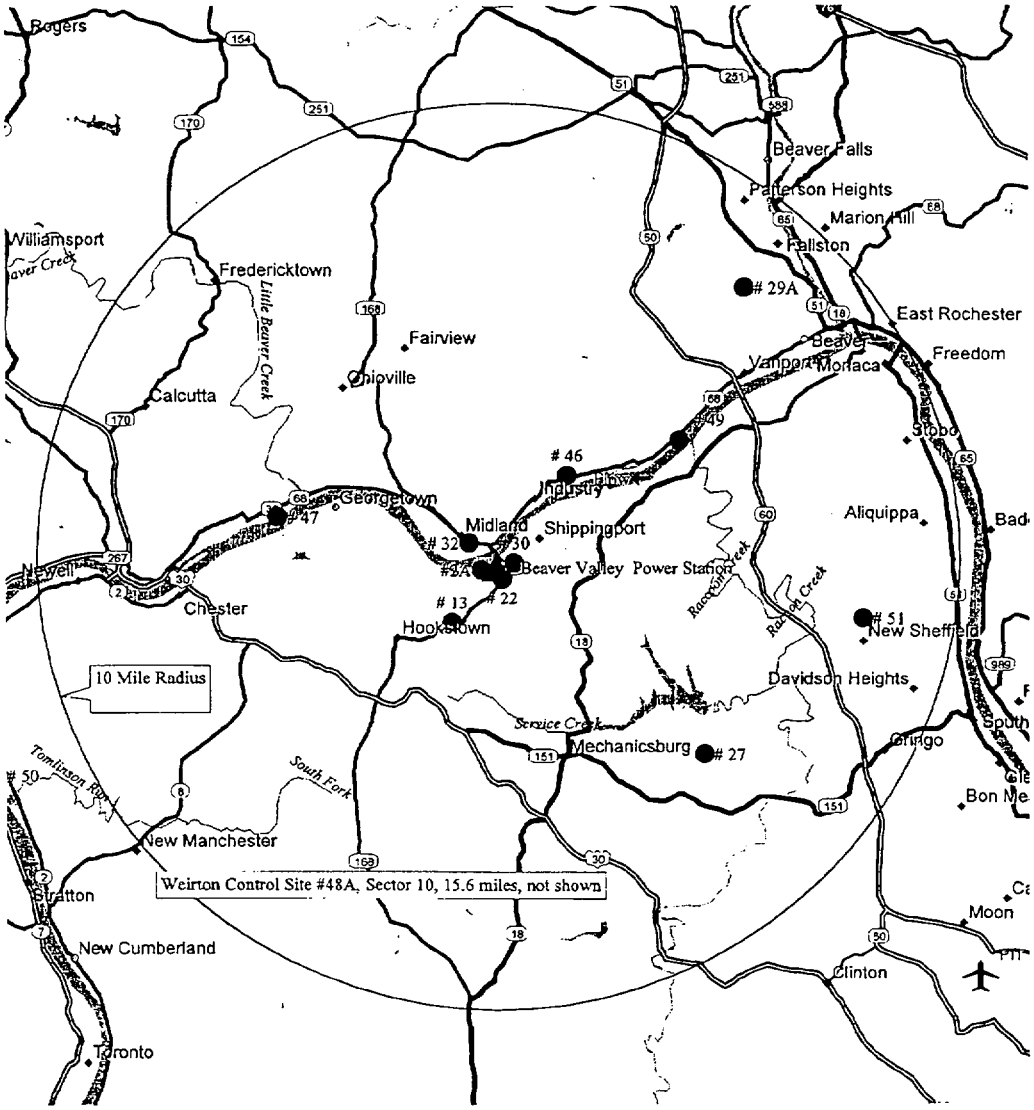
      Bottom sediments and soils are analyzed for gamma-emitting radionuclides.

   b. Analytical Procedures

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

Figure 3-3

Environmental Monitoring Locations - Shoreline Sediments and Soil



SOIL SAMPLING LOCATIONS							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
13	11	1.4	Meyer's Farm	32	15	0.8	Midland (S.S.)
22	8	0.3	South of BVPS Transmission Line	46	3	2.5	Industry, Midway Dr.
27	7	6.1	Brunton's Farm	47	14	4.9	East Liverpool, Oh. - Water Treatment Plant
29A	3	8.3	Nicols Farm	48A	10	15.6	Weirton, W.Va. - Weirton Water Tower, E. Belleview Dr.
30	4	0.5	Shippingport (S.S.)	51	5	8.0	Aliquippa (S.S.)

SEDIMENT SAMPLING LOCATIONS							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
2A	13	0.2	BVPS Outfall Discharge	50	12	11.8	Upstream Side of New Cumberland Dam
49	3	5.0	Upstream Side of Montgomery Dam				

3. Results and Conclusions

A summary of sediment analysis is presented in Table 3-2.

a. Sediment

A total of six (6) samples were analyzed by gamma spectrometry. Naturally occurring K-40, Ra-226 and Th-228 was detected in every sample. Be-7 was detected in three samples. Small amounts of Cs-137 from previous nuclear weapons tests were detected in five of the six river sediment samples, including two upstream above Montgomery Dam, which is unaffected by plant effluents. Small amounts of Co-58 and Co-60 were detected in the Beaver Valley Power Station discharge area and are attributable to station releases. The activity detected in the station discharge area is consistent with station data of authorized radioactive discharges which were within limits permitted by the NRC license.

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.

D. Monitoring of Feedcrops and Food Products

1. Characterization of Farm Products

According to the latest data from the 1998-1999 Statistical Summary and Pennsylvania Department of Agriculture Annual Report, there were approximately 660 farms in Beaver County. The total value from the sale of agricultural crops and livestock was $17,088,000. The principal source of revenue was in dairy products which was estimated at $6,623,000. Revenues from other farm products were estimated as follows:

Field Crops	$2,240,000
Fruits	$265,000
Horticulture and Mushrooms	$4,432,000
Vegetables and Potatoes	$463,000
Poultry and Meat Products	$3,065,000

2. Sampling Program and Analytical Techniques

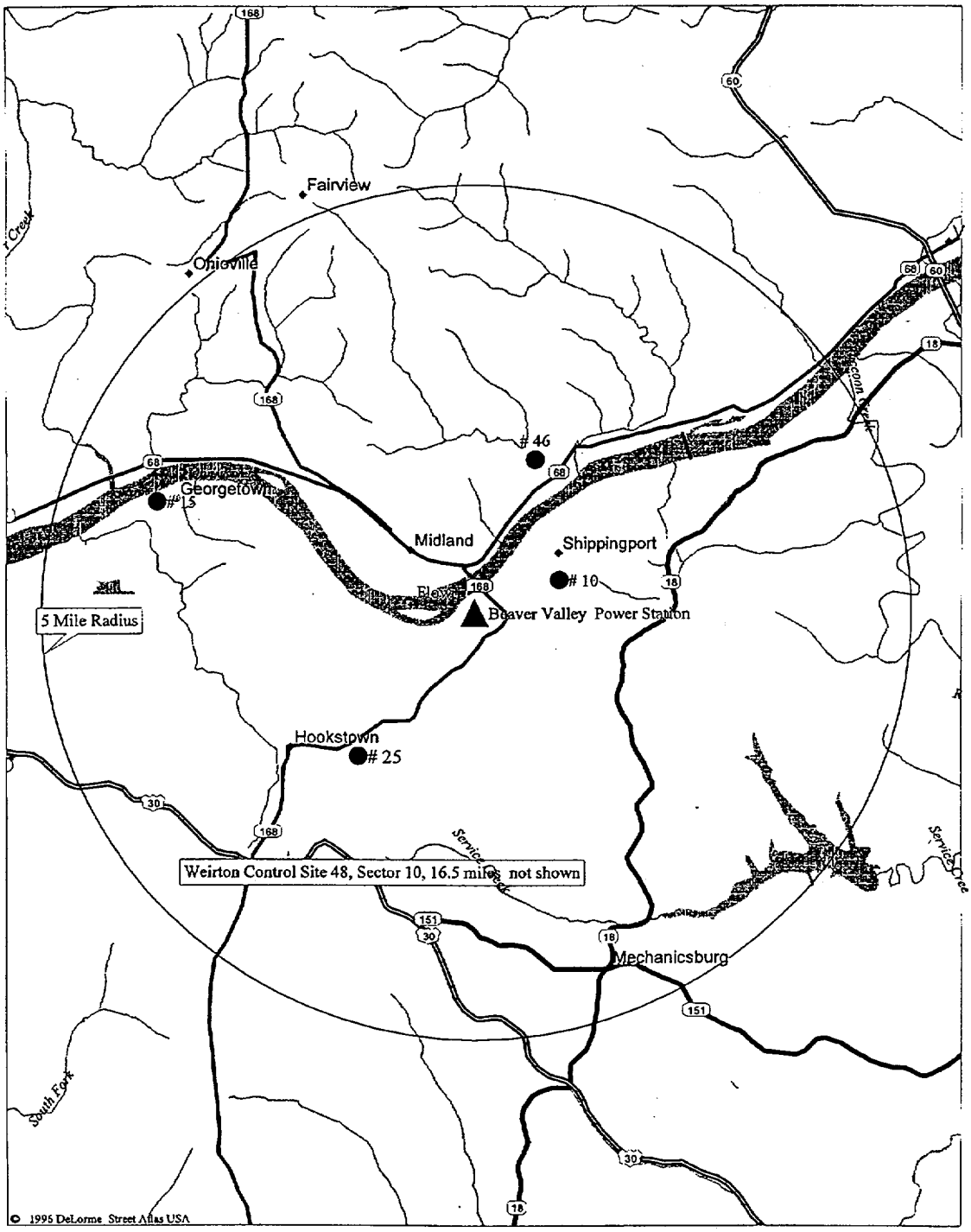
a. Program

Representative samples of cattle feed are collected monthly from the nearest dairy (Searight). See Figure 3-4. Each sample is analyzed by gamma spectrometry.

Food products (vegetables) were collected at garden locations during the summer of 1999. Leafy vegetables, i.e., cabbage, were obtained from Shippingport, Georgetown, and Industry, PA, and Weirton, W.Va. All samples were analyzed for gamma emitters by gamma spectroscopy. Samples were also analyzed by radiochemical analysis for I-131.

Figure 3-4

Environmental Monitoring Program - Feedcrop and Food Product Locations



Sample Type	Site No.	Location
Food	10	Shippingport
Food	15	Georgetown
Food	46	Industry
Food	48	Weirton, W.Va.
Feed	25	Searight's Dairy

b. Procedures

Gamma emitters in feed are determined by scanning a dried, homogenized sample with the gamma spectroscopy system. A high resolution germanium detector is utilized with this system. Food samples are loaded into tared 300 or 150 ml plastic bottles or 1-liter Marinelli containers, weighed and the net weight of the sample is determined prior to scanning for gamma emitters.

Radioiodine (I-131) in food crops 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 toluene. 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 planchet for low level beta counting.

3. Results and Conclusions

A summary of data is presented in Table 3-2.

a. Feed

A total of twelve (12) samples were analyzed by gamma spectroscopy. Only naturally occurring nuclides were identified including: K-40 in all twelve (12) samples, Th-228 in two (2), and Be-7 in five (5).

b. Food

A total of four (4) samples were analyzed for I-131. No detectable concentrations were present.

A total of four (4) samples were analyzed by gamma spectrometry. Naturally occurring K-40 was present in all samples. No other nuclides were identified.

c. The data from food and feed analyses were consistent with previous data. Based on the analytical results, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the foods and feeds in the vicinity of the site.

E. Monitoring of Local Cows Milk

1. Description - Milch Animal Locations

Samples of fresh milk are obtained from milch animals at locations and frequencies noted in Table 3-1. This milk is analyzed for its radioiodine content, calculated as iodine-131, gamma emitters, and strontuim-89 and strontuim-90.

Detailed field surveys are performed during the grazing season to locate and enumerate milch animals within a five (5) mile radius of the site. Survey data for the most recent survey conducted is shown in Section 4, Land Use Census.

2. Sampling Program and Analytical Techniques

a. Program

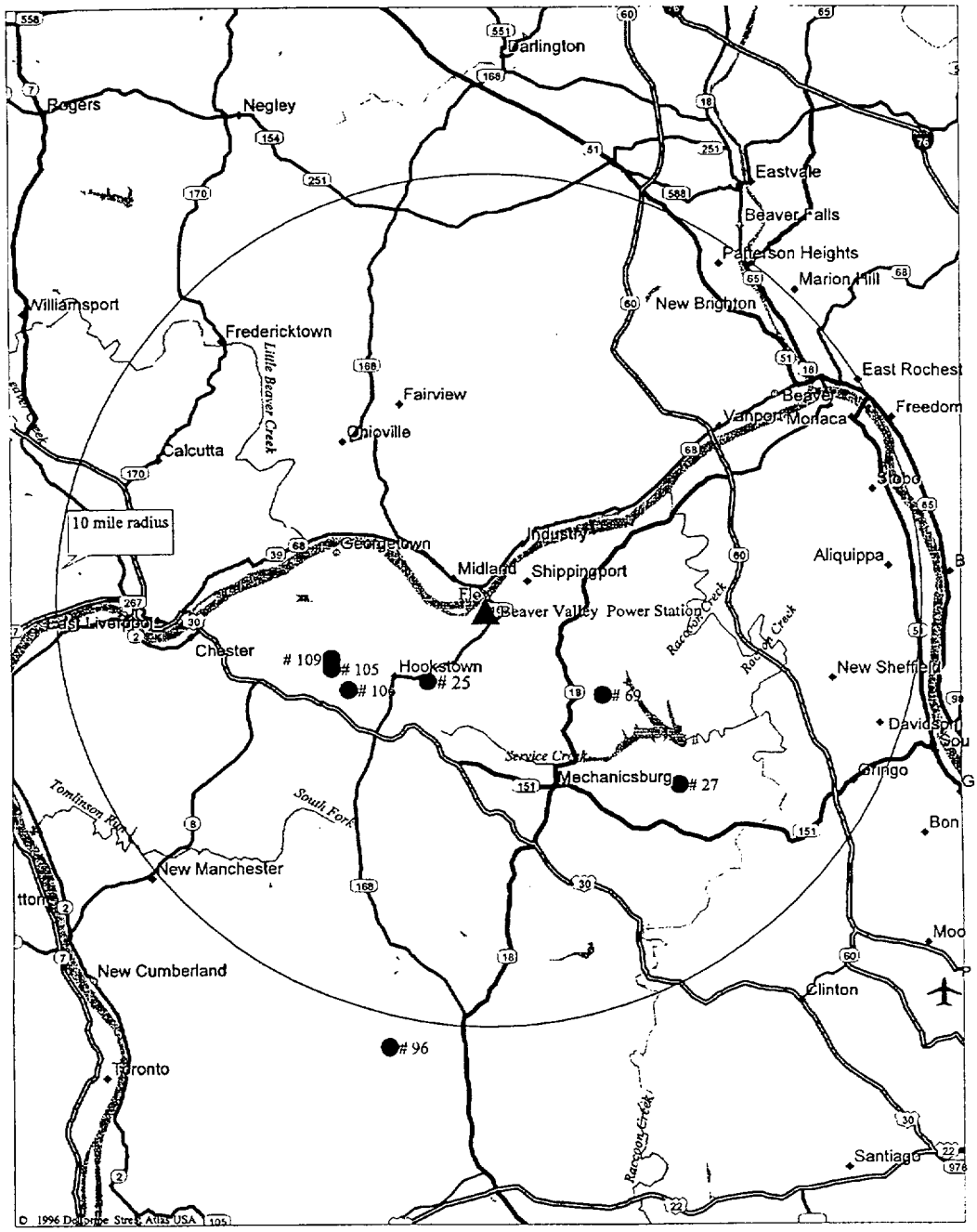
Milk was collected from two (2) reference dairy farms (Searight's and Brunton's) within a 10-mile radius of the site and from one (1) control location (Windsheimer's) outside of the 10-mile radius. Additional dairies, which represent the highest potential milk pathway for radioiodine based on milch animal 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 3-5 and described below.

Site	Dairy	Approximate Number of Animals being Milked	Direction and Distance from Midpoint of Unit 1 Reactor	Collection Period
25	Searight	46 Cows	2.1 miles SSW	Jan. - Dec.
27	Brunton	93 Cows	6.1 miles SE	Jan. - Dec.
69*	Collins	4 Goats	3.5 miles SE	April - Dec.
96	Windsheimer	53 Cows	10.4 miles SSW	Jan. - Dec.
103*	Halstead	58 Cows	5.2 miles SSW	Jan. - March
105*	Ambrose	35 Cows	3.9 miles WSW	Jan. - Dec.
106*	Conkle	31 Cows	3.7 miles WSW	Jan. - Dec.
* Highest potential pathway dairies				

The sample from Searight Dairy is collected and analyzed weekly for radioiodine using a procedure with a high sensitivity. Samples from each of the other selected dairies are 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 high resolution germanium gamma spectroscopy) and I-131 (high sensitivity analysis).

Figure 3-5

Environmental Monitoring Locations - Milk



Site No.	Sector	Distance (miles)	Location		Site No.	Sector	Distance (miles)	Location
25	10	2.1	Searight's Farm		103*	10	5.2	Halstead Farm
27	7	6.1	Brunton's Farm		105*	12	3.8	Ambrose Farm
69*	7	3.4	Collins		106*	12	3.7	Conkle Farm
96	10	10.4	Windsheimer's Farm		109*	12	3.7	Soisson Farm
* Dairies selected based on highest deposition factors.								

b. Procedure

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

Gamma emitters are determined by gamma spectroscopy of a 1 liter Marinelli container of milk.

Strontium milk samples are prepared by adding stable strontium carrier and evaporating to dryness, then ashing in a muffle furnace, followed by precipitating phosphates. Strontium is purified in all samples by the Argonne method using 3 grams of extraction material in a chromatographic column. Stable yttrium carrier is added and the sample is allowed to stand for a minimum of 5 days for the ingrowth of Y-90. 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. Strontium-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 an 80 mg/cm^2 aluminum absorber for low level beta counting. Chemical yields of strontium and yttrium are determined gravimetrically.

3. Results and Conclusions

A summary of data is presented in Table 3-2.

a. A total of one hundred twenty (120) samples were analyzed for Sr-89 and Sr-90. No Sr-89 was detected. Sr-90 levels attributable to previous nuclear weapons tests were detected in all of the samples and were within the normally expected range.

b. At total of one hundred twenty (120) samples were analyzed by gamma spectroscopy. Naturally occurring K-40 was present in all samples. No other radionuclides were identified.

c. At six of the seven dairies that milk was collected, there were one hundred and twenty-one (121) samples analyzed for I-131. For these samples, all I-131 activities were below the LLD. The seventh dairy, Site 27, had seven positive I-131 results of a total of thirty-one samples taken. The positive results were from July 12, 1999 through November 1, 1999. After the first two positives, the initial investigation focused on reviewing the gaseous releases and meteorological data. It was not known at that time that Site 27 dairy had started using water from the Midland Water Treatment Plant due to the drought in the area. The investigation and conclusion drawn at that time was that the positive I-131 results were not as a result of operation of the Beaver Valley Power Station. It was later discovered in an interview with the owner that the dairy had indeed been getting water from the Midland Water Treatment Plant "since some time in June". The following is information pertinent to this situation:

- Site 27 dairy is located 6.1 miles Southeast from BVPS.
- Site 27 dairy is the farthest dairy sampled by BVPS other than the control location.
- Positive results were received from samples collected on 7/12/99 (0.33 pCi/l), 7/26/99 (0.45 pCi/l), 9/6/99 (0.88 pCi/l), 9/20/99 (0.63 pCi/l), 10/4/99 (0.51 pCi/l), 10/18/99 (0.56 pCi/l), and 11/1/99 (0.73 pCi/l).
- Six other dairies had <LLD for I-131 for the entire year.
- Required lower level of detection for I-131 in milk is 1 pCi/l.
- Required reporting level for I-131 in milk, *when averaged over a quarter*, is 3.0 pCi/l.
- According to the dairy owner, the cows are not pastured. They are fed in the barn from cut stored feed. The feed is grown on the farm but is stored from two months to ten months prior to feeding it to the cows (two months is greater than seven half-lifes for I-131).
- Site 27 dairy have been getting water from the Midland Water Treatment Plant since "some time in June" due to the drought.
- All ten air sampling stations, including the one located at Site 27, have shown <LLD values for I-131 analysis for the entire year.
- The field technician and the farm workers had not received any medical treatment involving I-131.
- Deposition values were determined for the six dairies being sampled based on meteorological data from 5/10/99 (last release of I-131 prior to first positive) to 9/31/99 (end of normal grazing season). Of the six, Site 27 had the fifth lowest potential deposition. The dairies with higher calculated deposition potential had no positive I-131 results.

Using Reg. Guide 1.109 equation A-11 and information concerning cow consumption rates for drinking water (which was provided by the Site 27 owner during an interview), the milk concentration from cows drinking the Midland Water Treatment Plant water was estimated. The results indicate a good ratio (1.28) of real analytical concentrations with the estimated concentrations.

Evidence indicates that the positive milk results are likely from the cows drinking water from the Midland Water Treatment Plant. BVPS has for many years seen positive I-131 results both upstream and downstream of the plant at low levels (including the Midland Water Treatment Plant). The I-131 activity in the river is believed to be from a source upstream of the Beaver Valley Power Station. This is based on several reasons including: the results of the upstream river water samples and the Midland Water Treatment Plant samples are approximately the same values, that during 1998 when both plants were shut down for extended periods, positive I-131 results were still seen in the river water samples, and all liquid effluent releases were done within the controls established by the Offsite Dose Calculation Manual Therefore, based on this information, it is concluded that the positive I-131 results in the milk were not due to the operation of the Beaver Valley Power Station.

d. Based on all the analytical results and the above investigation, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the milk in the vicinity of the site.

F. Environmental Radiation Monitoring

1. Description of Regional Background Radiation 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 1999 indicated that background radiation continued in this range.

2. Locations and Analytical Procedures

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

In 1999 there were a total of forty-four (44) offsite environmental TLD locations. The locations of the TLDs are shown in Figure 3-6. Thirteen (13) locations also have QC Laboratory TLDs. Both laboratories use calcium sulfate dysprosium, ($CaSO_4$:Dy) in Teflon matrix.

The calcium sulfate dysprosium ($CaSO_4$:Dy) TLDs were annealed at the Contractor Central Laboratory shortly before placing the TLDs in their field locations. The radiation dose accumulated in-transit between the Central Laboratory, the field location, and the Central Laboratory was corrected by transit controls maintained in lead shields at both the Central Laboratory and the field office. 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.

3. Results and Conclusions

Data obtained with the contractor TLD ($CaSO_4$:Dy in Teflon) during 1999 are summarized in Table 3-2.

The annual exposure rate of all offsite TLDs averaged 0.17 mR/day in 1999. As in previous years, there was some variation among locations and seasons as would be expected. In 1999, ionizing radiation dose determinations from TLDs averaged 63.1 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 negligible.

In 1999, five TLD results were lost due to vandalism:

- Site No. 60 - 1st quarter
- Site No. 72 - 4th quarter
- Site No. 81 - 1st quarter
- Site No. 84 - 2nd quarter
- Site No. 94 - 1st quarter

Figure 3-6

TLD Locations

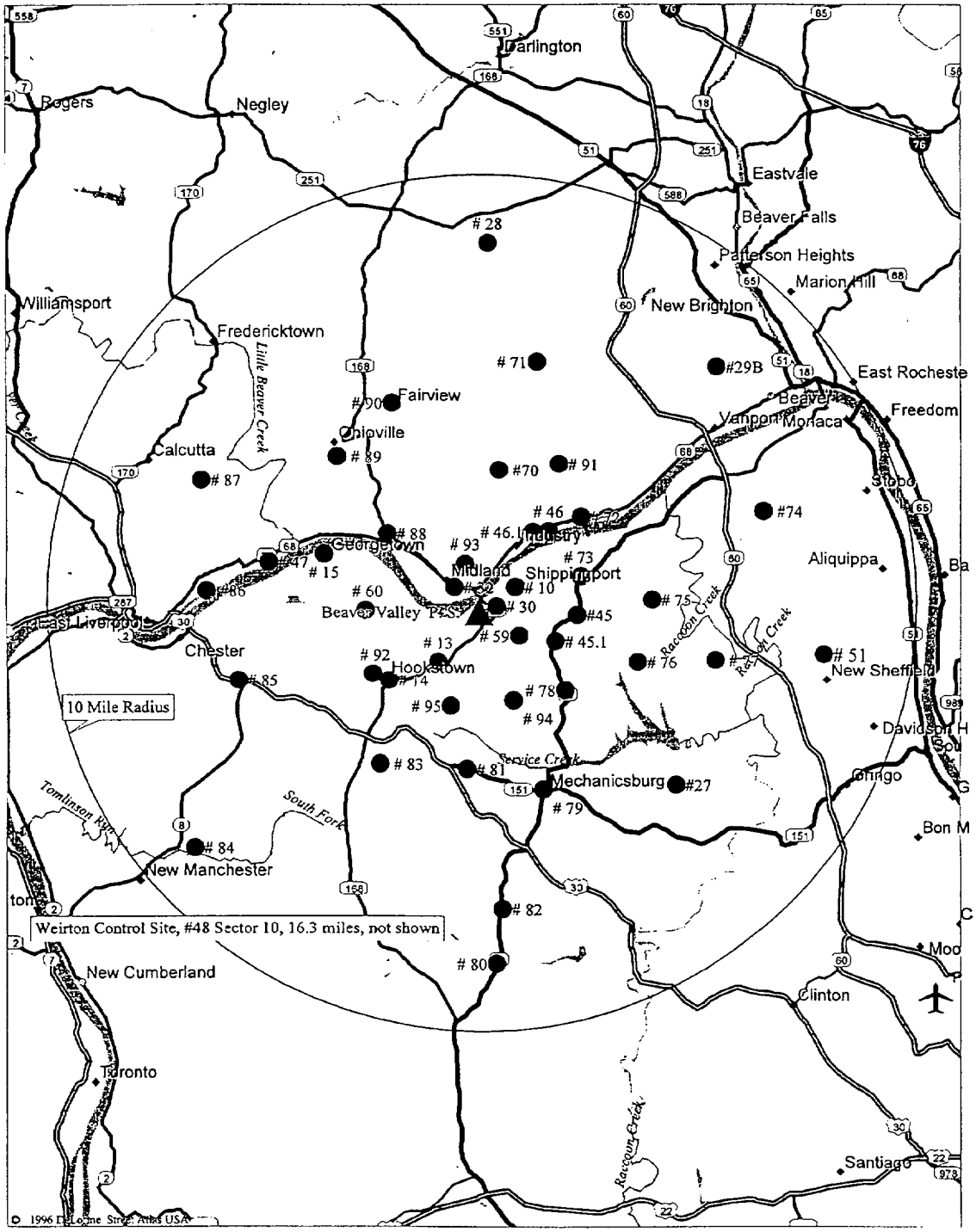


Figure 3-6 (Continued)

TLD Locations

SOUTHEAST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
27	7	6.1	Brunton's Farm	78	7	2.7	Raccoon Municipal Bldg
45.1	6	1.9	Raccoon Twp., Kennedy's Corners	79	8	4.4	Rt. 151 and Pross Ln.
51	5	8.0	Aliquippa (S.S.)	80	9	8.2	Raccoon Park
59	6	1.0	236 Green Hill Rd.	82	9	6.9	Hanover Municipal Building
76	6	3.8	Raccoon Elementary School	94	8	2.2	McCleary Road & Pole Cat Hollow Rd.
77	6	5.6	Raccoon Twp. (Green Garden Road)				

NORTHWEST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
15	14	3.7	Georgetown Post Office	87	14	7.0	Calcutta, Oh. – Calcutta Smiths Ferry Rd. & Valley Dr.
32	15	0.8	Midland (S.S.)	88	15	2.8	Midland Heights – 110 Summit Rd.
47	14	4.9	E. Liverpool, Oh. - Water Treatment Plant	89	15	4.8	Ohioville, 488 Smith Ferry Rd.
60	13	2.5	444 Hill Rd.	90	16	5.2	Opposite Fairview School
86	13	6.2	E. Liverpool, Oh. - 1090 Ohio Ave.	93	16	1.1	Midland Sunrise Hills

NORTHEAST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
10	3	1.0	Shippingport Boro	70	1	3.4	North of Western Beaver School – Engle Rd.
28	1	8.6	Sherman's Farm	71	2	6.0	Brighton Twp., First Western Bank
29B	3	8.0	Beaver Valley Geriatric Center	72	3	3.3	Industry, Logan Park
30	4	0.5	Shippingport (S.S.)	73	4	2.5	618 Squirrel Run Rd.
45	5	2.2	Rt. 18 & Anderson St.	74	4	7.0	CCBC, 137 Poplar Ave.
46	3	2.5	Industry Midway Dr.	75	5	4.1	117 Holt Road
46.1	3	2.3	Industry, Rt. 68 & Garage	91	2	3.9	Pine Grove Road & Doyle Road

SOUTHWEST							
Site No.	Sector	Distance (miles)	Location	Site No.	Sector	Distance (miles)	Location
13	11	1.4	Meyer's Farm	84	11	8.3	Hancock Co. Parks & Recreation Complex
14	11	2.5	Hookstown	85	12	5.7	Routes 8 & 30 Intersection
48	10	16.3	Weirton, W.Va. - Weirton Water Tower, Collier Way	92	12	2.8	Georgetown Road (S.S.)
81	9	3.6	Millcreek United Pres. Church	95	10	2.3	832 McCleary Road
83	10	4.2	735 Mill Creek Road				

G. Monitoring of Fish

1. Description

   During 1999, fish collected for the radiological monitoring program included carp, smallmouth bass, sauger, and catfish.

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 spectroscopy. Fish sampling locations are shown in Figure 3-7.

   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 high resolution germanium detector.

3. Results and Conclusions

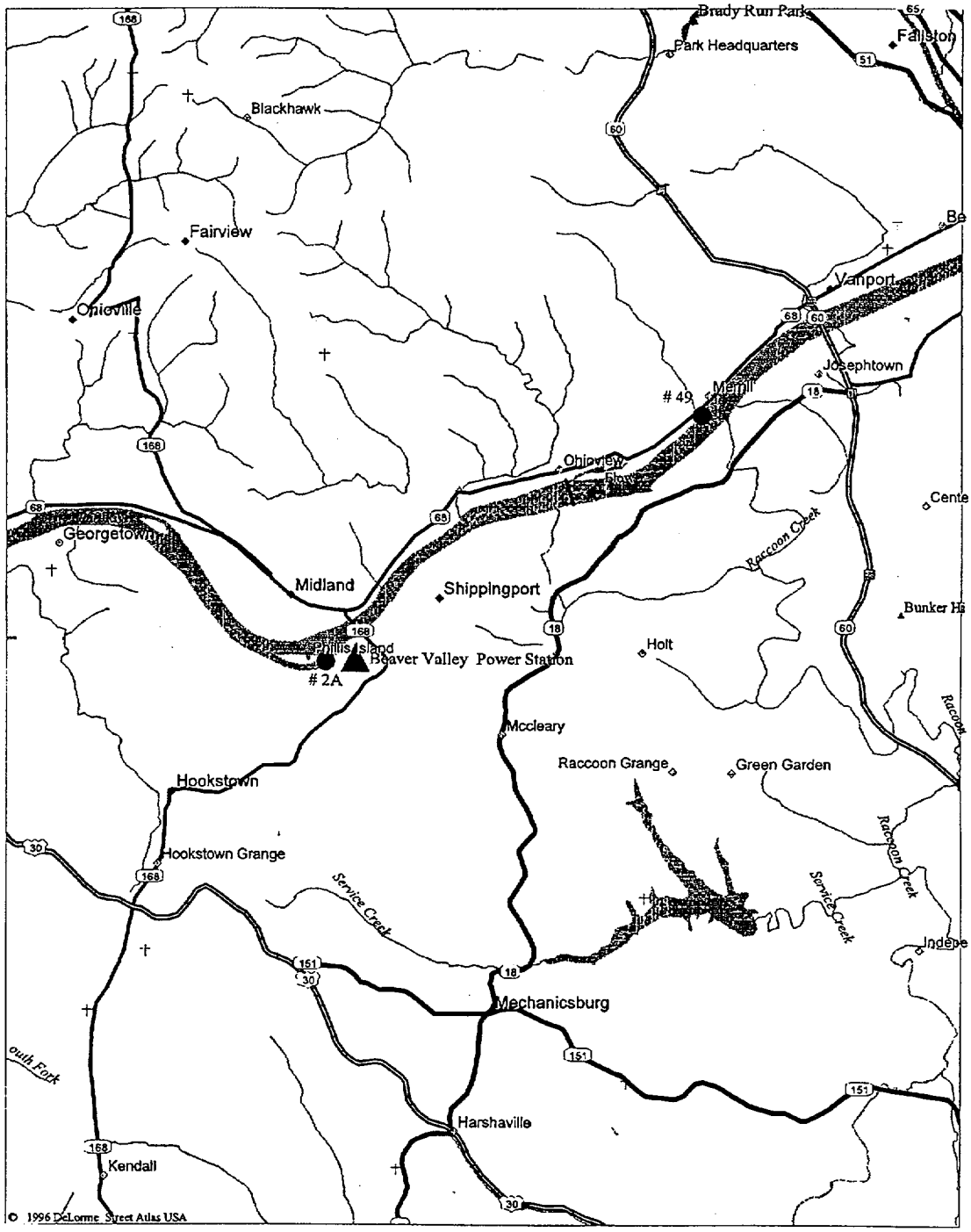
   A summary of the results of the fish monitoring data is provided in Table 3-2.

   A total of eight (8) samples were analyzed by gamma spectroscopy. Naturally occurring K-40 was detected in all samples. One of the eight samples indicated trace amounts of Cs-137 near the typical detection sensitivities for gamma spectroscopy. This sample was one of the four samples taken at the BVPS outfall discharge site. No other gamma emitting radionuclides were detected.

   Based on the analytical results, the operation of the Beaver Valley Power Station did not contribute any measurable increase in radioactivity in the Ohio River fish population.

Figure 3-7

Environmental Monitoring Program - Fish Sampling Locations



Site No.	Sector	Distance (miles)	Location
2A	13	0.2	BVPS Outfall Discharge
49	3	5.0	Upstream side of Montgomery Dam

H. Monitoring of Surface, Drinking, Ground 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.

Groundwater 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. The average annual precipitation for the area is 36.23 inches based on 1941 to 1970 data collected at the Pittsburgh International Airport.

2. Sampling and Analytical Techniques

a. Surface (Raw River) Water

The sampling program of river water includes three (3) 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 weekly sample. One automatic river water sampler is located 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 samples are collected on a weekly basis. A weekly grab sample is taken upstream of the Montgomery Dam [River Mile 29.6]. The weekly grab sample and automatic water sample are composited into monthly samples from each location. In addition, a quarterly composite sample is prepared for each sample point.

The weekly grab samples upstream of the Montgomery Dam are analyzed for I-131.

The monthly composites are analyzed for gamma emitters. The quarterly composites are analyzed for H-3.

Locations of each sample point are shown in Figure 3-8.

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 which is composited into a weekly sample. The weekly sample from each location is analyzed for I-131.

Monthly composites of the weekly samples are analyzed by gamma spectrometry. Quarterly composites are analyzed for H-3. Locations of each sample point are shown in Figure 3-8.

c. Groundwater

Semi-annual grab samples were collected from three (3) locations (see Figure 3-8) within four (4) miles of the site. These locations are:

One (1) well in Shippingport, PA

One (1) well in Hookstown, PA

One (1) well in Georgetown, PA

Each ground water sample is analyzed for tritium and by gamma spectroscopy.

d. Precipitation

Precipitation is collected at Shippingport, Pa., East Liverpool, Oh. and Weirton, W.Va. Precipitation, when available, is collected each week and then composited into quarterly samples. The quarterly composites are analyzed for H-3 and gamma emitters. Locations of each sample point are shown in Figure 3-8.

e. Procedures

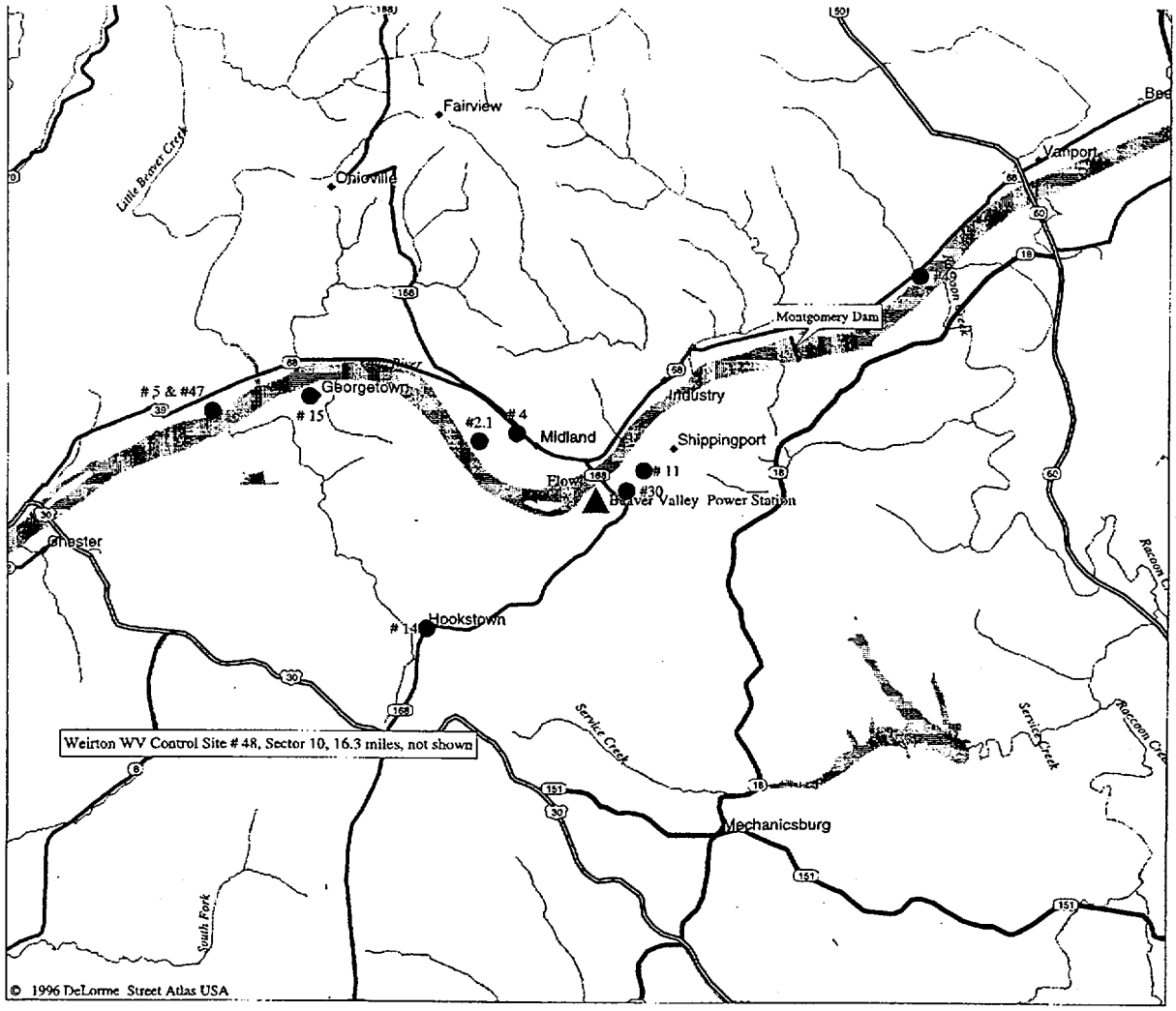
Gamma analysis is performed on water samples by placing one liter of the sample into a Marinelli container and counting the sample on a high resolution germanium gamma spectrometry system.

Tritium is determined in water samples by liquid scintillation counting.

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

Figure 3-8

Environmental Monitoring Stations Locations - Ground, Surface Water, Drinking Water and Precipitation



Sample Type	Site No.	Sector	Distance (miles)	Description
Surface	2.1	14	1.5	Downstream Midland - J&L
Surface	5	14	4.9	E. Liverpool, Oh. – Water Treatment Plant
Surface	49	3	5.0	Upstream side of Montgomery Dam
Drinking	4	15	1.3	Midland - Water Treatment Plant
Drinking	5	14	4.9	E. Liverpool, Oh. - Water Treatment Plant
Ground	11	3	0.8	Shippingport Boro

Sample Type	Site No.	Sector	Distrance (miles)	Description
Ground	14	11	2.5	Hookstown
Ground	15	14	3.7	Georgetown
Precipitation	30	4	0.5	Shippingport (S.S.)
Precipitation	47	14	4.9	E. Liverpool, Oh., - Water Treatment Plant
Precipitation	48	10	16.3	Weirton, W.Va. – Weirton Water Tower, Collier Way

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 3-2. These are discussed below.

a. Surface Water

A total of twelve (12) samples were analyzed quarterly for H-3. Four of the twelve were positive for H-3, ranging from 210 to 240 pCi/liter (the normal LLD is 200 pCi/liter). Three of the four positive results occurred in the 3rd quarter, including site 49 which is upstream of the plant. The 3rd quarter results ranged from 210 to 240 pCi/l. The other positive was from the 4th quarter and it was from the upstream site.

A total of thirty-six (36) samples were analyzed by gamma spectrometry. One of thirty-six indicated naturally occurring K-40. No other gamma-emitting radionuclides were detected. All thirty-six samples reported results that showed no detectable activity for Ba-140; however, three of the Ba-140 values were above the expected LLD of 10 pCi/l. All the values reported were below the NRC required LLD of 15 pCi/l. Because of the relatively short half-life (12.8 days) and the count date, the expected LLD was not obtained.

A total of fifty-two (52) samples were analyzed for I-131 using a highly sensitive technique. Positive levels of I-131 were measured in forty-two (42) of the weekly samples. All the positive results but one were below the required LLD. The one above the required LLD was below reportable levels. These positive results were detected at a control location above the BVPS discharge and could not be attributed to plant releases.

b. Drinking Water

A total of eight (8) samples were analyzed for H-3. One of the samples was positive, indicating 190 pCi/liter (the normal LLD is 200 pCi/liter).

A total of twenty-four (24) samples were analyzed by gamma spectrometry. No gamma-emitting radionuclides were detected.

A total of one hundred four (104) samples were analyzed for I-131 using a highly sensitive technique. Positive levels of I-131 were measured in seventy-nine (79) of the weekly samples. All the positive results except thirteen were below the required LLD. The thirteen above the required LLD were below reportable levels. The positive results were detected at both the Midland and East Liverpool plants as similar concentrations. Also, calculations were performed to predict the I-131 concentrations at the Midland Water Treatment Plant from liquid effluent releases at the Beaver Valley Power Station during 1999. These calculations show that the predicted concentrations (less than detectable level) at the Midland Water Treatment Plant are well below the values being detected. This calculation and the fact that I-131 is also being detected at the upstream surface water station at similar concentrations indicates that the positive results detected at the Midland Water Treatment Plant are not a result of plant releases.

c. Groundwater

A total of six (6) samples were each analyzed for H-3 and by gamma spectrometry. No gamma-emitting radionuclides were detected. One of the six samples indicated a positive H-3 value of 200 pCi/liter. This result was at the calculated Lower Limit of Detection (LLD) for water samples (200 pCi/liter). It should be noted that the required LLD for H-3 in water is 2000 pCi/liter.

d. Precipitation

A total of twelve (12) samples were analyzed for H-3 and by gamma spectrometry. Six (6) positive tritium results detected were within normal levels. Naturally occurring Be-7 was detected in two (2) samples. No other gamma emitting radionuclides were detected.

All twelve samples reported results that showed no detectable activity for Ba-140 and Fe-59; however, six of the Ba-140 results and one of the Fe-59 results were above the expected LLD of 10 pCi/l. The less than values that exceeded the expected LLD for the Ba-140 ranged from 10.8 to 13.4 pCi/l. The less than value for Fe-59 was 11.0 pCi/l. All the values reported were below the required LLD of 15 pCi/l (Ba-140) and 30 pCi/l (Fe-59). These samples are quarterly samples; however, the end dates were prior to the end of the quarter because the samples are collected weekly and it didn't rain up to the end of the quarter. Because of the sample end date and the relatively short half-life, the expected LLD was not obtained.

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 analytical 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 the total batch discharge period during the year) attributable to Beaver Valley Power Station, was only 0.082% of the limits set forth in Appendix C of the ODCM for water discharged to the Ohio River. The Ohio River further reduced this concentration by a factor of approximately 600 prior to its potential use.

f. Deviations from ODCM required sampling schedule

Site 5, East Liverpool Oh Water Treatment Plant was found with the "on/off" switch on the timer in the off position during the weekly collection on 10/5/99. The normal amount of water in the collection vessel is approximately 4.2 gallons instead of the 1.25 gallons found on 10/5/99. The amount of water indicates that the sampler quit sampling around the same time a mid week inspection was done on 9/30/99. An investigation was performed and the cause of the condition could not be confirmed. Personnel involved with sampling and inspection of water sampling stations received additional training concerning returning sampling stations to NSA after sampling or inspections. No further incidents occurred this year. [Ref: Condition Report #992653]

Site 2.1, Downstream, Midland-J&L. The surface water station was placed out of service from 7/29/99 0800 to 8/10/99 1615 due to planned maintenance being performed by J&L Steel personnel on a raw water supply line. This supply line also supplies the BVPS sampling station for Site 2.1. Site 2.1 was returned to service on 8/10/99 upon completion of scheduled maintenance.

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 codes for the ARERAS/MIDAS computer system equivalent to 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 Tables 2-1 and 2-3, were used as the radionuclide activity input.

Radionuclides contained in the 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 ODCM.

All gaseous effluent releases, including Auxiliary Building Ventilation, were included in dose assessments. The release activities are based on laboratory analysis. Meteorological data collected by the Beaver Valley Power Station Meteorology System was used as input to code equivalent to XOQDOQ2 which in turn provided input for the GASPAR equivalent. 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.

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 code equivalent to 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 are obtained from the Beaver Valley Power Station Environmental Statement or Regulatory Guide 1.109. Pathways, which were evaluated, are drinking water, fish consumption, and shoreline recreation.

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 the likely most exposed real individual located at Midland since this is the nearest location where significant exposure of a member of the general population could potentially occur. A breakdown of doses by total body by age group and highest organ by age group is provided in Table 3-5 for the likely most exposed individual. Included in this table is a breakdown of a typical dose to individuals from natural radiation exposure.

b. Population Dose

The 1999 calculated dose to the entire population of almost 4 million people within 50 miles of the plant is presented in Table 3-5.

c. Adjustments to 1992 through 1998 doses [Ref: Condition Report 992560]

During testing of a new version of the MIDAS software used in calculating doses to the public from liquid effluents, it was determined that the previous version of the software had incorrectly applied a building shielding factor to the shoreline dose calculations. Calculations from liquid effluent releases for the years 1992 through 1998 were performed using the corrected version of the MIDAS software. For all years, the individual shoreline dose was higher using the new MIDAS software version. Values reported for individual skin dose in Table 5-6 for years 1992 through 1996 and Table 3-5 for years 1997 through 1998 should have read on average about 0.00002 mrem/year higher. For reference, for the years 1992 through 1998, 96.4% of the Total Body individual dose came from drinking water and fish consumption and only 3.6% from shoreline activity (Teen age group was used since teens shoreline activity doses were the highest for all age groups). Total population dose changes of ± 0 to 5 mrem/year for the approximately 4 million people were also seen in the new calculations. This difference is attributed to the fact that the new MIDAS system has one less significant digit and not the building shielding factor (shoreline dose contributed < 0.3% to the total population dose).

Table 3-5

Results of Calculated Individual and Population Radiation Dose to Man - Liquid Releases

Organ	Individual Exposure (a) mrem
TOTAL BODY	
Adult	0.0017
Teen	0.0011
Child	0.0015
Infant	0.0013
ANY ORGAN	
Adult	0.0019 (Liver)
Teen	0.0017 (Liver)
Child	0.0027 (Liver)
Infant	0.0015 (Thyroid)

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE(b)		
Ambient Gamma Radiation	:	58
Radionuclides in Body	:	40
Global Fallout	:	< 1
Radon	:	198
TOTAL mRem/year	:	296

(a) Likely most exposed member of general population - located at Midland drinking water intake.

(b) National Academy of Sciences, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," BEIR Report, 1990

Population		
Organ	Man-Millirems	Largest Isotope Contributor
Total Body	98	H-3 93 Man-Millirems
Thyroid	100	H-3 93 Man-Millirems

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

The results of calculated radiation dose to the maximum exposed individuals for BVPS airborne radioactive effluents during 1999 are provided in Table 3-6. The doses include the contribution of all pathways. A 50-mile population dose was also calculated and is provided.

Table 3-6

Results of Calculated Radiation Dose to Man - Atmospheric Releases

Organ	Maximum Exposed Individual mrem
TOTAL BODY	0.263
SKIN	0.263
LUNG	0.263
THYROID	0.265

Organ	50-Mile Population Dose man-rem
TOTAL BODY	0.820
THYROID	0.820

4. Conclusions

Based upon the estimated dose to individuals from the natural background radiation exposure in Table 3-5, the incremental increase in total body dose to the 50-mile population (approximately 4 million people), from the operation of Beaver Valley Power Station - Unit 1 and 2, is less than 0.0001% of the annual background dose.

The calculated doses to the public from the operation of Beaver Valley Power Station - Unit 1 and 2, are below BVPS annual 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.

SECTION 4 - LAND USE CENSUS

A land use census was conducted July 26 through July 30, 1999 to comply with BV-1 and BV-2 Technical Specification 6.8.6b Item 2 and the ODCM Appendix C CONTROL 3.12.2. The census results are summarized in Table 4-1. The locations of the milch animals are shown on Figure 4-1.

Table 4-1

Location of Nearest Residence, Garden, and Milch Animal

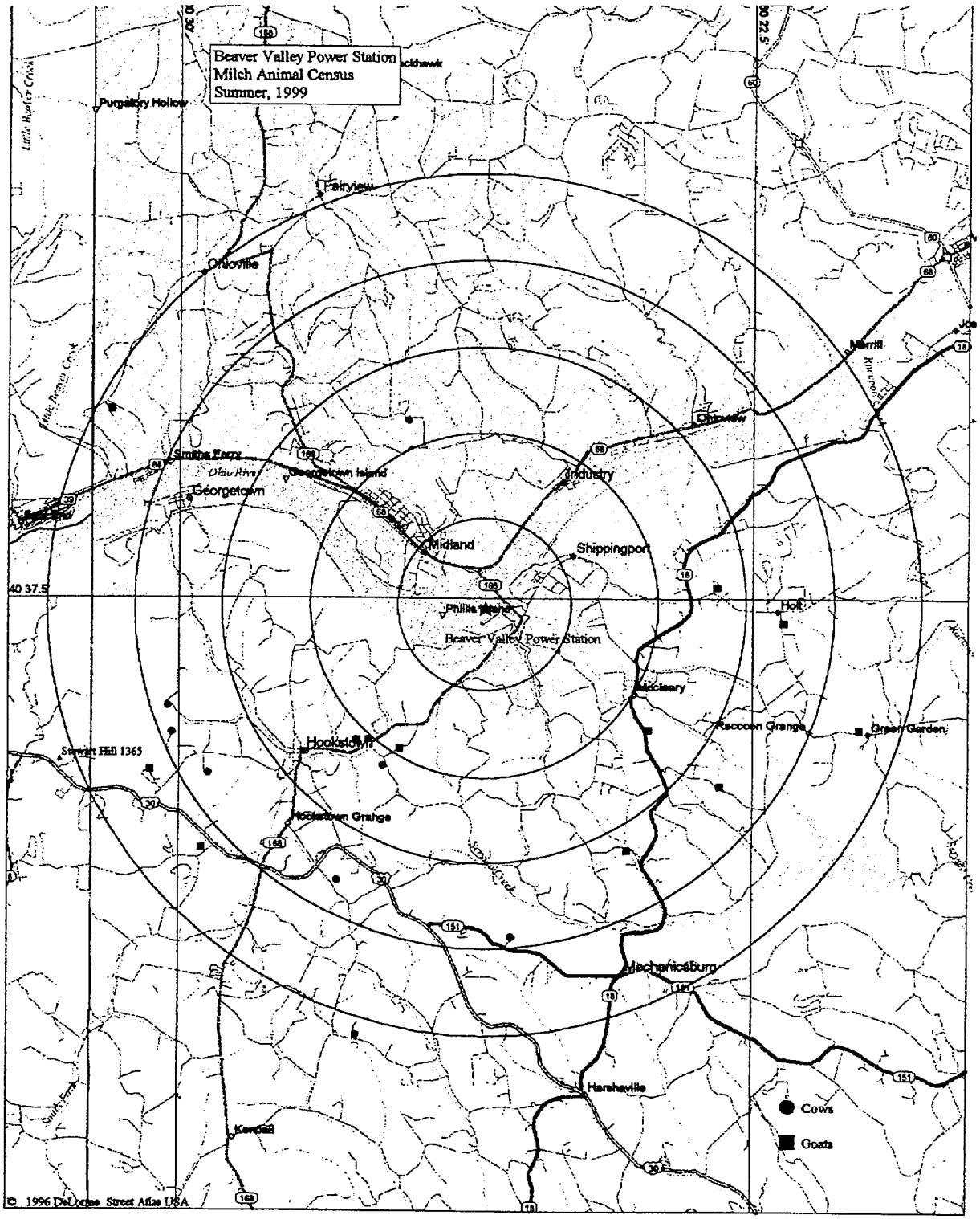
SECTOR	RESIDENCE (miles)	GARDEN (miles) [1]	MILCH ANIMALS (miles) [2]
N	1.58	1.73	None
NNE	1.62	1.62	None
NE	0.37	2.66	None
ENE	0.54	0.98	None
E	0.40	1.16	2.62
ESE	0.89	1.56	4.51
SE	1.10	2.46	2.31
SSE	1.12	2.22	3.16
S	1.42	2.29	3.83
SSW	0.81	1.55	1.93
SW	1.50	1.72	2.16
WSW	1.44	2.56	3.72
W	2.25	2.25	None
WNW	2.75	2.75	4.83
NW	0.89	0.92	None
NNW	0.91	1.19	2.38

(1) Gardens greater than 500 square feet producing fresh leafy vegetables

(2) Within five miles

Figure 4-1

Milch Animal Census



SECTION 5 - QUALITY CONTROL PROGRAM / INTERLABORATORY COMPARISON PROGRAM

A. Quality Control Program

The Quality Control (QC) Program for the Beaver Valley Radiological Environmental Monitoring Program involves the analysis of split and duplicate samples at a QC laboratory and the analysis of high quality (NIST traceable) spiked samples (results are discussed in the Interlaboratory Comparison Program section). This testing provides a means to ensure independent checks are performed on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices. It should be noted that the comparisons for split and duplicate samples were at very low levels of radioactivity and consequently, the activities at these levels are difficult to measure.

The NRC criteria listed in NRC Inspection Procedure 84750, 12/4/90, Inspection Guidance 84750-03 is used as the acceptance criteria for comparisons of results of split and spike samples between the Contractor Lab and the QC Lab/Independent Lab. These comparisons are performed by dividing the comparison standard (the QC Lab or Independent Lab result) by its associated uncertainty to obtain the resolution. The comparison standard value is multiplied by the ratio values obtained from the following table to find the acceptance band for the result to be compared. Note that in the case where the counting precision of the standard yields a resolution of less than 4, a valid comparison cannot be made. Values identified with an '*' in Tables 5-1 through 5-10 do not meet acceptance criteria.

Resolution	Ratio
< 4	--
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.8 - 1.25
> 200	0.85 - 1.18

1. Split Sample Program (Contractor Laboratory - QC Laboratory)

Routine environmental samples of surface (river) water, drinking water, milk, sediment, food crops, and feed crops were routinely split and analyzed by the Contractor Laboratory and the QC Laboratory.

A summary of results of split water samples is provided in Table 5-1 and Table 5-2. There were no non-comparisons in all the surface water and drinking water analysis for gamma spec and tritium analysis. One of the five I-131 analysis was not in agreement. As noted above, some variation may be expected at these low levels of radioactivity.

Summaries of milk, sediment, and feed/food crop split samples are provided in Table 5-3 and Table 5-4. Good overall agreement was obtained with only feed having one non-comparison. This non-comparison was naturally occuring K-40, which was slightly above the comparison value. As noted above, some variation may be expected at these low levels of radioactivity.

2. Duplicate Sample Program (Contractor Laboratory - QC Laboratory)

Duplicate (co-located) air particulate and charcoal filters samples were collected at Location #30 and compared (gross beta for particulate filters and radioiodine for charcoal filters) during the year on a weekly basis. Comparison of particulate and charcoal samples alternated from week to week. For each quarter the particulate filters were composited and analyzed for gamma activity. Results are presented in Table 5-5 and Table 5-6. There was good agreement of both the air particulate (beta) and charcoal cartridge filters with only two air particulates showing non-comparison. Quarterly composites of the air particulate filters (gamma) showed good comparisons except for one Be-7 result in the fourth quarter.

Thirteen (13) duplicate (co-located) TLDs from the Contractor Laboratory and QC Laboratory are replaced quarterly, and the results are compared. The average of the Contractor Laboratory and the average of the QC Laboratory agree within $\pm$ 2% of the mean of all results. This is well within the precision of typical TLD systems. Summary data of the TLD monitoring program is provided in Table 5-7.

3. Blind Split Program (Contractor)

The blind split program consisted of unscheduled unannounced split samples of water, sediment and milk from normal environmental locations. The 'normal' and blind split samples were sent to the Contractor Lab along with other samples of the same media. The lab had no knowledge of the location of the blind split sample or that it was even a split.

A summary of the results are provided on Table 5-8. The sediment and milk samples showed good agreement. Overall good agreement was seen with the water I-131 analysis. One of the two I-131 comparison samples indicated a positive and a "less than". The positive value was statistically near the less than value and some variation may be expected at these low levels of radioactivity.

B. Interlaboratory Comparison Program

Participation in an Interlaboratory Comparison Program is required by BV-1 and BV-2 Technical Specification 6.8.6b, Item 3. In 1999 this requirement was fulfilled by the Contractor Lab (Teledyne Brown Engineering Environmental Services - Westwood N.J.) analyzing high quality (NIST traceable) spiked samples supplied by two Beaver Valley Power Station contracted vendors.

1. Contractor Lab

The high quality (NIST traceable) spiked samples include air particulate and charcoal filters (prepared by the QC Laboratory) and water and milk (prepared by the Independent Laboratory). The samples were submitted to the Contractor Lab for analysis. The "spiked to" values are used for calculating comparison acceptance criteria. Values identified with an '*' do not meet acceptance criteria explained above.

- Comparison of results of the spiked water and milk samples showed good results with one non-comparison of the eight samples analyzed for Fe-59 and four for Sr-89 [Ref: Condition Report 00-0681]. The Fe-59 result was biased high and is still under investigation. Results of the investigation will be reported in next year's report. An investigation was performed by the Contractor lab on the non-comparisons for the Sr-89. The sample from December was re-analyzed and the second result was within the acceptance band (see Table 5-10). The Contractor lab did a review of their in-house spike analysis for Sr-89. No bias or negative trend was noted by this review. Contractor corrective and preventive action for recurrence has been established.

- Comparison of results of the spiked air particulate filters and charcoal cartridge filters showed good results. Both results are reported in Table 5-11.

Starting in 1999, the Contractor Lab dropped its voluntary participation in the scaled down US EPA Interlaboratory Comparison Program and, therefore, there are no 1999 results to report. One result from a water sample dated 11/11/98, that was reported in last year's report, indicated a low bias for Ba-133. The Contractors investigation showed that the weekly efficiency counts for the counter used to count this sample were in compliance during the applicable time period. One possible cause for the low bias may be the branching intensity value used in the calculation. The EPA does not supply their values used to calculate activity. If the Brookhaven or RadDecay Data Tables are used to supply the branching intensity and half-life, the calculated results will fall within the acceptable range:

	Branching Intensity	Half-Life (years)	Contractor Calculated Activity (pCi/l)	EPA Reported Activity (pCi/l)
Contractor Lab	0.670	10.9	46.33	56.0 ± 6.0
Brookhaven Tables*	0.6205	10.52	50.04	56.0 ± 6.0
RadDecay Tables*	0.605	10.5	51.31	56.0 ± 6.0

* Atomic Data and Nuclear Data Tables Vol 13 Nos. 2-3 1974

C. Conclusions

Based on all available Quality Control data and Interlaboratory Comparison data the Environmental Monitoring Program for 1999 is acceptable with respect to both accuracy and measurement.

Table 5-1

Quality Control Data
Contractor/Quality Control Laboratory
Comparison Split Surface Water Samples

Site 2.1

Media	Analysis	Sampling Period	Contractor Lab (1)	QC Lab (1)	Units
Surface Water (Monthly Composite)	Co-60	January	< 4	< 3.7	pCi/l
		April	< 3	< 2.5	pCi/l
		July	< 3	< 1.1	pCi/l
		October	< 3	< 4.0	pCi/l
Surface Water (Monthly Composite)	Cs-134	January	< 3	< 3.5	pCi/l
		April	< 3	< 4.6	pCi/l
		July	< 3	< 3.6	pCi/l
		October	< 3	< 5.9	pCi/l
Surface Water (Monthly Composite)	Cs-137	January	< 4	< 6.7	pCi/l
		April	< 3	< 5.7	pCi/l
		July	< 3	< 2.9	pCi/l
		October	< 3	< 5.6	pCi/l
Surface Water (Quarterly Composite	Tritium	1st Quarter	< 110	< 165	pCi/l
		3rd Quarter	210 ± 120	< 192**	pCi/l

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

** Resolution < 4, see Section 5A.

Table 5-2

Quality Control Data
Contractor/Quality Control Laboratory
Comparison Split Drinking Water Samples

Site 4

Media	Analysis	Sampling Period	Contractor Lab (1)	QC Lab (1)	Units
Drinking Water (Monthly Composite)	Cs-137	February	< 4	< 2.9	pCi/l
		May	< 4	< 4.3	pCi/l
		August	< 4	< 4.4	pCi/l
		November	< 3	< 1.6	pCi/l
Drinking Water (Monthly Composite)	Cs-134	February	< 4	< 4.7	pCi/l
		May	< 3	< 2.5	pCi/l
		August	< 3	< 6.0	pCi/l
		November	< 3	< 2.1	pCi/l
Drinking Water (Monthly Composite)	Co-60	February	< 3	< 3.9	pCi/l
		May	< 3	< 1.7	pCi/l
		August	< 3	< 2.3	pCi/l
		November	< 3	< 1.8	pCi/l
Drinking Water (Weekly Split)	I-131	3/16 to 3/23	0.73 ± 0.15	< 0.7**	pCi/l
		6/8 to 6/15	< 0.34	< 0.3	pCi/l
		8/10 to 8/17	1.1 ± 0.2	< 0.4**	pCi/l
		10/26 to 11/02	0.70 ± 0.18	0.50 ± 0.10	pCi/l
		11/9 to 11/16	< 0.28	< 0.3	pCi/l
Drinking Water (Quarterly Composite	Tritium	2nd Quarter	< 110	< 177	pCi/l
		4th Quarter	< 200	< 173	pCi/l

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

** Resolution < 4, see Section 5A.

Table 5-3

Quality Control Data
Contractor/Quality Control Laboratory
Comparison Split Milk Samples

Site 25

Media	Sampling Period	Analysis	Contractor Lab (1)	QC Lab (1)	Units
Milk (Weekly Split)	3/15/99	Sr-89	< 0.94	< 0.7	pCi/l
		Sr-90	1.9 ± 0.2	2.4 ± 0.5	pCi/l
		I-131	< 0.22	< 0.3	pCi/l
		Co-60	< 3	< 8.1	pCi/l
		Cs-134	< 3	< 8.3	pCi/l
		Cs-137	< 3	< 7.5	pCi/l
		K-40	1320 ± 130	1308 ± 159	pCi/l
Milk (Weekly Split)	6/14/99	Co-60	< 4	< 4.1	pCi/l
		I-131	< 0.29	< 0.3	pCi/l
		Cs-134	< 3	< 5.5	pCi/l
		Cs-137	< 4	< 6.8	pCi/l
		K-40	1340 ± 130	1505 ± 184	pCi/l
Milk (Weekly Split)	9/21/99	Sr-89	< 0.85	< 0.6	pCi/l
		Sr-90	2.2 ± 0.2	1.8 ± 0.4	pCi/l
		I-131	< 0.24	< 0.4	pCi/l
		Co-60	< 4	< 6.7	pCi/l
		Cs-134	< 4	< 5.3	pCi/l
		Cs-137	< 4	< 5.8	pCi/l
		K-40	1370 ± 140	1233 ± 151	pCi/l
Milk (Weekly Split)	12/20/99	Co-60	< 3	< 7.4	pCi/l
		I-131	< 0.18	< 0.2	pCi/l
		Cs-134	< 3	< 3.7	pCi/l
		Cs-137	< 3	< 2.9	pCi/l
		K-40	1380 ± 140	1245 ± 162	pCi/l

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

Table 5-4

Quality Control Data
Contractor/Quality Control Laboratory
Comparison Split Feed, Food and Sediment Samples

Media	Sampling Period	Analysis	Contractor Lab (1)	QC Lab (1)	Units
Feed Site 25	10/18/99	Be-7	8.74 ± 0.87	6.86 ± 0.27	pCi/gm (dry)
		K-40	*13.7 ± 1.4	10.18 ± 0.42	pCi/gm (dry)
		Co-60	< 0.02	< 0.022	pCi/gm (dry)
		I-131	< 0.06	< 0.052	pCi/gm (dry)
		Cs-134	< 0.02	< 0.012	pCi/gm (dry)
		Cs-137	< 0.02	< 0.013	pCi/gm (dry)
Food Site 10	8/12/99	K-40	1.98 ± 0.20	2.42 ± 0.37	pCi/gm (wet)
		Co-60	< 0.008	< 0.013	pCi/gm (wet)
		I-131	< 0.015	< 0.018	pCi/gm (wet)
		Cs-134	< 0.007	< 0.016	pCi/gm (wet)*
		Cs-137	< 0.008	< 0.008	pCi/gm (wet)
Sediment Site 2A	10/15/99	Co-58	< 0.05	0.08 ± 0.02	pCi/gm (dry)
		Co-60	0.287 ± 0.041	0.31 ± 0.026	pCi/gm (dry)
		Cs-134	< 0.05	< 0.032	pCi/gm (dry)
		Cs-137	0.107 ± 0.039	0.14 ± 0.02	pCi/gm (dry)
		Ra-226	2.08 ± 0.66	2.09 ± 0.40	pCi/gm (dry)
		K-40	9.89 ± 0.99	11.09 ± 0.50	pCi/gm (dry)

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

* See Section 5-A.

Table 5-5
Quality Control Data
Contractor/Quality Control Laboratory Comparison
Duplicate (Co-located) Air Particulate and Charcoal Filter Samples

Sites 30 and 30A

Air Particulates pCi/Cu Meter (Beta)			Air Iodine pCi/Cu Meter		
Sample Date	Contractor Lab 1)	QC Lab (1)	Sample Date	Contractor Lab	QC Lab
12/28 - 1/4	0.016 ± 0.003	0.020 ± 0.002	1/4 - 1/11	< 0.01	< 0.011
1/11 - 1/18	0.018 ± 0.003	0.022 ± 0.003	1/18 - 1/25	< 0.01	< 0.010
1/25 - 2/1	*0.016 ± 0.003	0.027 ± 0.003	2/1 - 2/8	< 0.01	< 0.005
2/8 - 2/16	0.013 ± 0.002	0.018 ± 0.003	2/16 - 2/22	< 0.01	< 0.011
2/22 - 3/1	0.016 ± 0.003	0.023 ± 0.003	3/1 - 3/8	< 0.01	< 0.010
3/8 - 3/15	0.011 ± 0.003	0.014 ± 0.003	3/15 - 3/22	< 0.01	< 0.009
3/22 - 3/29	*0.008 ± 0.002	0.018 ± 0.003	3/29 - 4/5	< 0.01	< 0.008
4/5 - 4/12	0.013 ± 0.003	0.019 ± 0.003	4/12 - 4/19	< 0.01	< 0.012
4/19 - 4/26	0.011 ± 0.003	0.019 ± 0.003	4/26 - 5/3	< 0.01	< 0.012
5/3 - 5/10	0.017 ± 0.003	0.022 ± 0.002	5/10 - 5/17	< 0.01	< 0.008
5/17 - 5/24	0.012 ± 0.003	0.022 ± 0.003	6/1 - 6/7	< 0.01	< 0.024
6/1 - 6/7	0.011 ± 0.003	0.022 ± 0.004	6/7 - 6/14	< 0.01	< 0.008
6/14 - 6/21	0.013 ± 0.003	0.013 ± 0.002	6/22 - 6/28	< 0.01	< 0.010
6/28 - 7/6	0.014 ± 0.003	0.020 ± 0.003	7/6 - 7/12	< 0.01	< 0.008
7/12 - 7/19	0.026 ± 0.004	0.035 ± 0.004	7/19 - 7/26	< 0.01	< 0.007
7/26 - 8/2	0.019 ± 0.003	0.022 ± 0.004	8/2 - 8/9	< 0.01	< 0.015
8/9 - 8/16	0.013 ± 0.003	0.018 ± 0.003	8/16 - 8/23	< 0.01	< 0.005
8/23 – 8/30	0.020 ± 0.004	0.024 ± 0.002	8/30 - 9/7	< 0.01	< 0.003
9/7 - 9/13	0.023 ± 0.004	0.033 ± 0.004	9/14 - 9/20	< 0.01	< 0.005
9/20 - 9/27	0.019 ± 0.003	0.029 ± 0.004	9/27 - 10/4	< 0.01	< 0.007
10/4 - 10/11	0.018 ± 0.003	0.021 ± 0.004	10/11 - 10/18	< 0.01	< 0.012
10/18 - 10/25	0.016 ± 0.003	0.016 ± 0.003	10/25 - 11/1	< 0.01	< 0.011
11/1 - 11/8	0.017 ± 0.003	0.027 ± 0.004	11/8 - 11/15	< 0.01	< 0.005
11/15 - 11/22	0.021 ± 0.003	0.027 ± 0.003	11/22 - 11/29	< 0.01	< 0.011
11/29 - 12/6	0.015 ± 0.003	0.020 ± 0.003	12/6 - 12/13	< 0.01	< 0.007
12/13 - 12/20	0.027 ± 0.003	0.027 ± 0.004	12/20 - 12/27	< 0.01	< 0.007

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

* See Section 5-A.

Table 5-6

Quality Control Data
Contractor/Quality Control Laboratory
Comparison Duplicate (Co-located) Air Particulate Samples (Gamma) (pCi/Cu Meter)

Sample Period	Nuclide	Contractor Lab (1) – Site 30	QC Lab (1) – Site 30A
1st Quarter Composite	Be-7	0.121 ± 0.012	0.069 ± 0.011
	Co-60	< 0.0002	< 0.0003
	Cs-134	< 0.0002	< 0.0008
	Cs-137	< 0.0002	< 0.0006
	Ba-La-140	< 0.010	< 0.0016
	K-40	< 0.006	< 0.020
2nd Quarter Composite	Be-7	0.154 ± 0.015	0.089 ± 0.016
	Co-60	< 0.0002	< 0.0006
	Cs-134	< 0.0002	< 0.0007
	Cs-137	< 0.0002	< 0.0006
	Ba-La-140	< 0.009	< 0.0008
	K-40	0.004 ± 0.001	< 0.028
3rd Quarter Composite	Be-7	0.138 ± 0.014	0.092 ± 0.015
	Co-60	< 0.0003	< 0.0007
	Cs-134	< 0.0003	< 0.0021
	Cs-137	< 0.0003	< 0.0008
	Ba-La-140	< 0.010	< 0.0007
	K-40	< 0.005	< 0.020
4th Quarter Composite	Be-7	*0.121 ± 0.012	0.057 ± 0.009
	Co-60	< 0.0002	< 0.0007
	Cs-134	< 0.0002	< 0.0006
	Cs-137	< 0.0002	< 0.0005
	Ba-La-140	< 0.009	< 0.0007
	K-40	< 0.004	< 0.0164

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

* See Section 5A.

Table 5-7

Quality Control Data
Contractor/Quality Control Laboratory Comparison
Thermoluminescent Dosimeters - mR/day

1ST QUARTER		
Location No.	Contractor ($CaSO_4$:Dy)	QC Lab ($CaSo_4$:Dy)
10	0.166	0.147
13	0.157	0.144
14	0.152	0.167
15	0.157	0.167
27	0.157	0.145
28	0.162	0.153
29B	0.187	0.177
32	0.172	0.168
45	0.177	0.169
46	0.158	0.154
47	0.183	0.195
48	0.189	0.170
51	0.180	0.169

2ND QUARTER		
Location No.	Contractor ($CaSO_4$:Dy)	QC Lab ($CaSO_4$:Dy)
10	0.163	0.144
13	0.156	0.150
14	0.156	0.154
15	0.157	0.174
27	0.153	0.158
28	0.166	0.168
29B	0.186	0.182
32	0.170	0.156
45	0.171	0.173
46	0.154	0.140
47	0.189	0.188
48	0.177	0.168
51	0.169	0.158

3RD QUARTER		
Location No.	Contractor ($CaSO_4$:Dy)	QC Lab ($CaSo_4$:Dy)
10	0.171	0.157
13	0.170	0.173
14	0.167	0.171
15	0.161	0.182
27	0.169	0.158
28	0.179	0.169
29B	0.196	0.180
32	0.178	0.171
45	0.179	0.174
46	0.161	0.156
47	0.192	0.187
48	0.179	0.181
51	0.183	0.173

4TH QUARTER		
Location No.	Contractor ($CaSO_4$:Dy)	QC Lab ($CaSO_4$:Dy)
10	0.170	0.140
13	0.158	0.153
14	0.159	0.170
15	0.161	0.163
27	0.163	0.158
28	0.167	0.158
29B	0.190	0.185
32	0.171	0.167
45	0.191	0.176
46	0.166	0.140
47	0.203	0.186
48	0.197	0.169
51	0.183	0.163

Table 5-8

Quality Control Data
Contractor Comparison of Blind Split Samples

Media	Site	Sampling Period	Analysis	Contractor Lab Routine Result*	Contractor Lab Split Result	Units
Drinking Water	4	6/1 – 6/8	I-131	0.43 ± 0.26	< 0.35**	pCi/liter
Surface Water	49	9/28/99	I-131	0.55 ± 0.16	0.42 ± 0.15**	pCi/liter
Sediment	2A	10/15/99	Co-58	< 0.05	0.07 ± 0.02**	pCi/g (dry)
			Co-60	0.29 ± 0.04	0.28 ± 0.03	pCi/g (dry)
			Cs-134	< 0.05	< 0.04	pCi/g (dry)
			Cs-137	0.11 ± 0.04	0.13 ± 0.03	pCi/g (dry)
			Ra-226	2.08 ± 0.66	1.55 ± 0.38	pCi/g (dry)
			Th-228	1.09 ± 0.11	1.07 ± 0.11	pCi/g (dry)
			K-40	9.89 ± 0.99	9.73 ± 0.97	pCi/g (dry)
Milk	96	5/18/99	Sr-89	< 1.2	< 1.3	pCi/liter
			Sr-90	1.1 ± 0.2	1.3 ± 0.2	pCi/liter
			Co-60	< 4	< 3	pCi/liter
			I-131	< 0.30	< 0.29	pCi/liter
			Cs-134	< 4	< 4	pCi/liter
			Cs-137	< 4	< 4	pCi/liter
			K-40	1320 ± 130	1480 ± 150	pCi/liter

* Indicates non-comparison

** Resolution < 4, see Section 5A.

Table 5-9

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Water Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
3/18/99	Water 53-374	Sr-89	91 ± 5	82 ± 3
		Sr-90	79 ± 4	73 ± 1
		I-131	91 ± 5	89 ± 9
		Ce-141	177 ± 9	183 ± 18
		Cr-51	398 ± 20	443 ± 44
		Cs-134	114 ± 6	115 ± 12
		Cs-137	240 ± 12	261 ± 26
		Mn-54	152 ± 8	165 ± 17
		Fe-59	79 ± 4	86 ± 11
		Zn-65	195 ± 10	207 ± 21
		Co-60	181 ± 9	193 ± 19
3/18/99	Water 53-375	H-3	2698 ± 135	2500 ± 200
6/24/99	Water 53-376	Sr-89	69 ± 3	51 ± 2*
		Sr-90	46 ± 2	37 ± 1
		I-131	68 ± 3	64 ± 4
		Ce-141	134 ± 7	136 ± 14
		Cr-51	172 ± 9	185 ± 38
		Cs-134	92 ± 5	96 ± 10
		Cs-137	151 ± 8	168 ± 17
		Mn-54	68 ± 3	74 ± 7
		Fe-59	38 ± 2	57 ± 10*
		Zn-65	98 ± 5	93 ± 12
		Co-60	171 ± 9	176 ± 18
6/24/99	Water 53-377	H-3	9349 ± 467	10000 ± 4000

(Table 5-9 continued on next page)

Table 5-9 (Continued)

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Water Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
9/23/99	Water 53-378	Sr-89	77 ± 4	78 ± 2
		Sr-90	38 ± 2	39 ± 1
		I-131	77 ± 4	75 ± 2
		Ce-141	244 ± 12	248 ± 25
		Cr-51	184 ± 9	212 ± 47
		Cs-134	119 ± 6	118 ± 12
		Cs-137	268 ± 13	293 ± 29
		Mn-54	210 ± 11	234 ± 23
		Fe-59	94 ± 5	110 ± 12
		Zn-65	202 ± 10	229 ± 23
		Co-60	159 ± 8	166 ± 17
9/23/99	Water 53-379	H-3	4534 ± 277	4900 ± 300
12/19/99	Water 53-380	Sr-89	77 ± 4	70 ± 2
		Sr-90	61 ± 3	60 ± 1
		I-131	96 ± 5	81 ± 1
		Ce-141	105 ± 5	97 ± 10
		Cr-51	290 ± 15	331 ± 46
		Cs-134	125 ± 6	123 ± 12
		Cs-137	96 ± 5	99 ± 10
		Co-58	110 ± 6	115 ± 11
		Mn-54	100 ± 5	107 ± 11
		Fe-59	94 ± 5	109 ± 11
		Zn-65	186 ± 9	202 ± 20
		Co-60	132 ± 7	138 ± 14
12/19/99	Water 53-381	H-3	8015 ± 401	7200 ± 300

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

Table 5-10

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Milk Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
3/18/99	Milk 52-290	Sr-89	70 ± 4	36 ± 3*
		Sr-90	43 ± 2	40 ± 1
		I-131	96 ± 5	111 ± 11
		Ce-141	136 ± 7	136 ± 14
		Cr-51	306 ± 15	316 ± 47
		Cs-134	88 ± 4	92 ± 9
		Cs-137	185 ± 9	197 ± 20
		Mn-54	117 ± 6	129 ± 13
		Fe-59	61 ± 3	71 ± 12
		Zn-65	150 ± 8	156 ± 16
		Co-60	139 ± 7	146 ± 15
6/24/99	Milk 52-291	Sr-89	70 ± 4	60 ± 3*
		Sr-90	42 ± 2	41 ± 1
		I-131	72 ± 4	59 ± 4
		Ce-141	168 ± 8	171 ± 17
		Cr-51	215 ± 11	213 ± 34
		Cs-134	115 ± 6	115 ± 12
		Cs-137	188 ± 9	209 ± 21
		Mn-54	85 ± 4	96 ± 10
		Fe-59	48 ± 2	54 ± 10
		Zn-65	122 ± 6	136 ± 14
		Co-60	214 ± 11	218 ± 22

(Table 5-10 continued on next page)

Table 5-10 (Continued)

Interlaboratory Comparison Program
Independent Laboratory/Contractor Laboratory
Comparison Spiked Milk Samples (pCi/l)

Sample Date	Sample Type and Identification No.	Sample Analyses	Independent Lab (1)	Contractor Lab (1)
9/23/99	Milk 52-292	Sr-89	48 ± 2	52 ± 3
		Sr-90	80 ± 4	72 ± 1
		I-131	91 ± 5	91 ± 3
		Ce-141	197 ± 10	189 ± 19
		Cr-51	149 ± 7	130 ± 38
		Cs-134	96 ± 5	96 ± 10
		Cs-137	217 ± 11	234 ± 23
		Mn-54	170 ± 9	189 ± 19
		Fe-59	76 ± 4	88 ± 10
		Zn-65	164 ± 8	163 ± 16
		Co-60	129 ± 6	142 ± 14
12/9/99	Milk 52-293	Sr-89	36 ± 2	*14 ± 4
		Sr-89	36 ± 2	**28 ± 3
		Sr-90	70 ± 4	92 ± 2
		I-131	77 ± 4	76 ± 1
		Ce-141	117 ± 6	101 ± 10
		Cr-51	322 ± 16	252 ± 43
		Cs-134	138 ± 7	130 ± 13
		Cs-137	104 ± 5	105 ± 11
		Co-58	121 ± 6	115 ± 11
		Mn-54	111 ± 6	99 ± 10
		Fe-59	104 ± 5	103 ± 12
		Zn-65	206 ± 10	198 ± 20
		Co-60	146 ± 7	137 ± 14

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

* See Section 5-A.

** 2nd Count

Table 5-11

Interlaboratory Comparison Program
Contractor/Quality Control Laboratory
Comparison Spiked Air Particulate/Charcoal Filters

Sample Date	Sample Type and Identification No.	Sample Analyses	Contractor Lab (1)	QC Lab (1)	Units
1/29/99	Air Particulate Filter DQQC AP-8	Gross Beta	4.68 ± 0.31	5.38 ± 0.54	pCi/m^3
7/12/99	Air Particulate Filter DQQC AP-9	Gross Beta	5.8 ± 1.0	8.15 ± 0.82	pCi/m^3
8/6/99	Air Charcoal Filter DQQC CH-8	I-131	1.11 ± 0.11	1.40 ± 0.14	pCi/m^3
12/28/99	Air Charcoal Filter DQQC CH-9	I-131	0.09 ± 0.01	0.06 ± 0.01	pCi/m^3

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