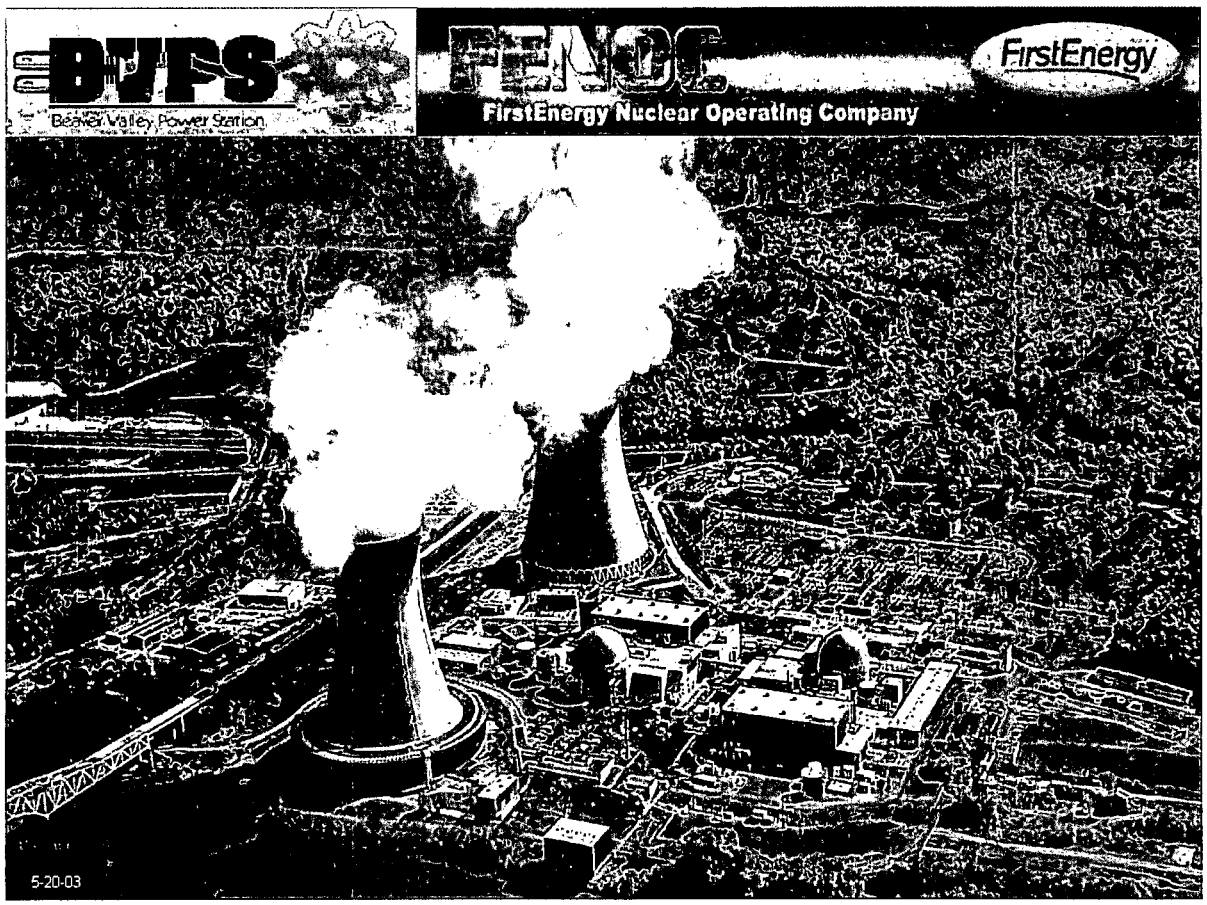
RTL# A9.690E

FIRSTENERGY NUCLEAR OPERATING COMPANY

BEAVER VALLEY POWER STATION



2009 RADIOACTIVE EFFLUENT RELEASE REPORT

AND

2009 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

RTL A9.690E
Enclosure 1

BEAVER VALLEY POWER STATION

ENVIRONMENTAL & CHEMISTRY SECTION

Technical Report Approval:

2009 RADIOACTIVE EFFLUENT RELEASE REPORT

AND

2009 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

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Subject: **Beaver Valley Power Station, Unit Nos. 1 and 2**
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Radioactive Effluent Release Report for 2009, and
Annual Radiological Environmental Operating Report for 2009

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BVRC - *Keywords: Radioactive Effluent Release Report,*
Annual Radiological Environmental Operating Report

2009 Radioactive Effluent Release Report

FirstEnergy Nuclear Operating Company
FENOC

Beaver Valley Power Station - Units 1 & 2
Unit 1 License No. DPR-66
Unit 2 License No. NPF-73

Radioactive Effluent Release Report

Calendar Year - 2009

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Note: The Total Error values (%) listed in this report are documented in Calculation Package No. ERS-ATL-04-002

Radioactive Effluent Release Report

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Executive Summary - Report Submittal Requirements

Report Submittal and Requirements: The report was prepared and submitted in accordance with the requirements contained in the following documents:

BVPS Integrated Technical Specifications, Administrative Control 5.6.2

Offsite Dose Calculation Manual (ODCM) procedure 1/2-ODC-3.03, "*Controls for RETS and REMP Programs*", Attachment U, Control 6.9.3

BVPS procedure 1/2-ENV-01.05, *"Compliance with Regulatory Guide 1.21 and Technical Specifications"*

NUREG-1301, "*Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors, Generic Letter 89-01, Supplement No.1, April 1991"*

Regulatory Guide 1.21, "*Measuring Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants, Revision 1, June 1974"*

BVPS Condition Report No. CR 09-52947 and BVPS-SAP Order Number 200197646-0790 are associated with reporting the failure to return a gaseous effluent radiation monitor to service within 30 days.

BVPS Condition Report No. CR 09-61459 is associated with reporting the failure to return a gaseous effluent radiation monitor to service within 30 days.

BVPS Condition Report No. CR 09-64033 is associated with reporting the inability to include a filter paper as part of the monthly composite particulate sample.

BVPS Condition Report No. CR 10-69838 is associated with reporting the inability to include a filter paper as part of the monthly composite particulate sample.

Radioactive Effluent Release Report

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Executive Summary - Liquid and Gaseous Effluent Control (Part 1 of 2)

Onsite Groundwater Monitoring: Tritium results from two (2) of seventeen (17) wells were >2000 pCi/L, which are similar to results initially communicated in 2007. All gamma spectrometry analyses were <LLD. No adverse effect has been detected in offsite groundwater, drinking water and surface water.

Onsite Spills: There were no onsite spills >100 gallons.

Decommissioning File Update: There were no items added to the site decommissioning files in accordance with 10CFR50.75(g).

Abnormal Liquid Releases: There were no abnormal liquid releases.

Abnormal Gaseous Releases: There were no abnormal gaseous releases.

Liquid Radwaste Treatment System: The site operated via a shared Liquid Radwaste Treatment System, even though each Unit has its own ion-exchange vessels. Shared operation allowed either Unit to process liquid waste at the Unit of origin, or at the other Unit. Typically, when Unit 1 or 2 high level liquid waste was processed (e.g., coolant recovery waste) it was performed at Unit 1, because it has a carbon pre-conditioning filter.

Gaseous Radwaste Treatment System: The site operated via a shared Gaseous Radwaste Treatment System, even though each Unit has its own charcoal delay beds and storage/decay tanks. Shared operation allowed either Unit to process gaseous waste at the Unit of origin, or at the other Unit. Typically, when Unit 1 or 2 went to a shutdown condition, the gaseous waste was transferred for storage and decay at Unit 2, because Unit 2 has four (4) additional storage tanks.

Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Liquid and Gaseous Effluent Control (Part 2 of 2)

Lower Limits of Detectability (LLD): All a-priori calculated LLD met the minimum requirements specified in the ODCM.

Effluent Monitoring Channels Inoperable >30 Days: There were two (2) Effluent Monitoring Instrumentation Channels not returned to Operable status within 30 days. They are described in Table 6.

ODCM Surveillance Deficiencies: There were two (2) ODCM Surveillance Deficiencies. They are described in Table 8.

ODCM Changes: There were two (2) changes made to the ODCM.

Meteorological Data Recovery: The Meteorological Data Recovery met the minimum requirement of at-least 90%, as specified in Section 5 of Revision 1 to Regulatory Guide 1.23, Meteorological Monitoring Programs for Nuclear Power Plants.

Population Dose vs. Natural Background: The 0-50 mile total and average population doses were calculated using liquid and gaseous release quantities and real time meteorology. The average population dose is based on four (4) million people within 0-50 miles of the BVPS site. The following comparison to natural background radiation demonstrates that BVPS operations did not adversely affect the surrounding environment.

621 man-mrem =BVPS Total Population Dose for the year

0.0001553 mrem = BVPS Average Individual Dose for the year

296 mrem = Natural Background Individual Dose for the year. This dose value is documented as natural background radiation exposure for an individual in a year from the 1990 BEIR V Report.

Radioactive Effluent Release Report

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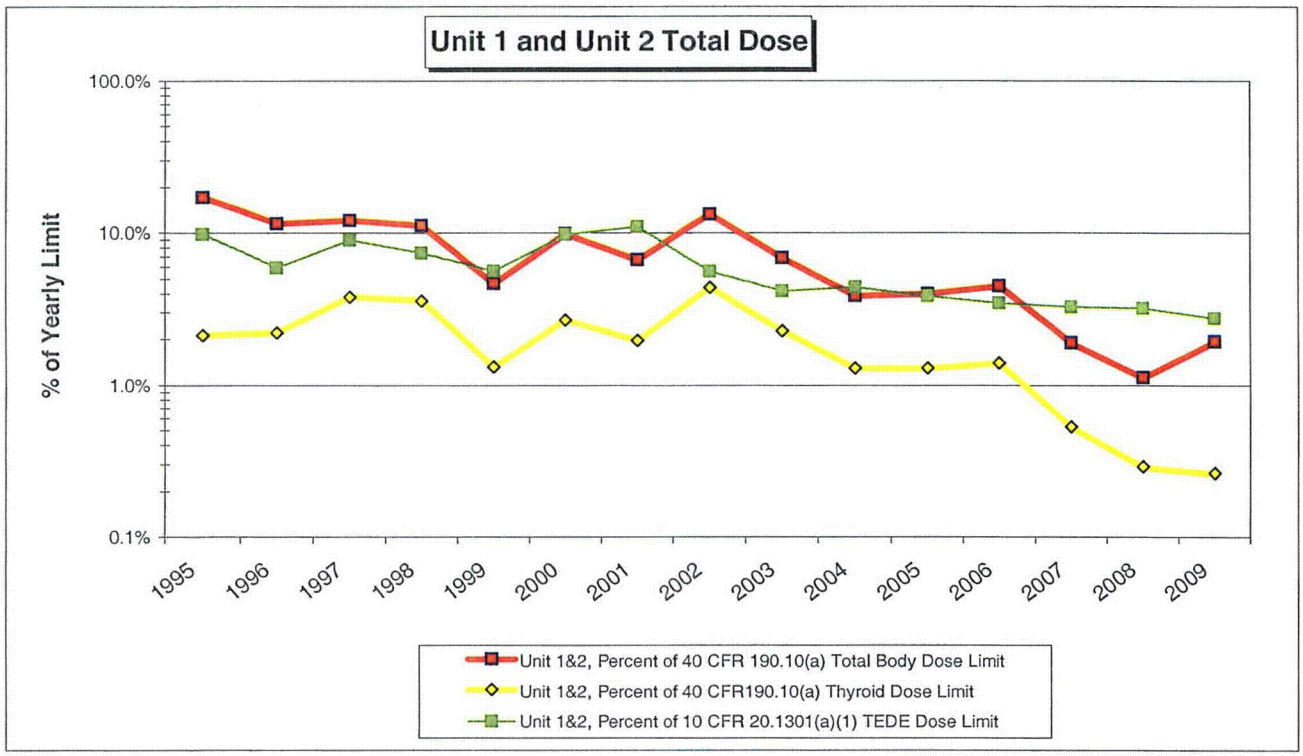
Executive Summary - Trends of Total Dose

Trends of Total Dose: The following graph provides a comparison of the ODCM dose projections from all facility releases and direct radiation exposures to show compliance with Member of the Public dose limits from 10 CFR 20.1301 and 40 CFR Part 190. The graph reflects the results of the efforts to stabilize and reduce offsite dose.

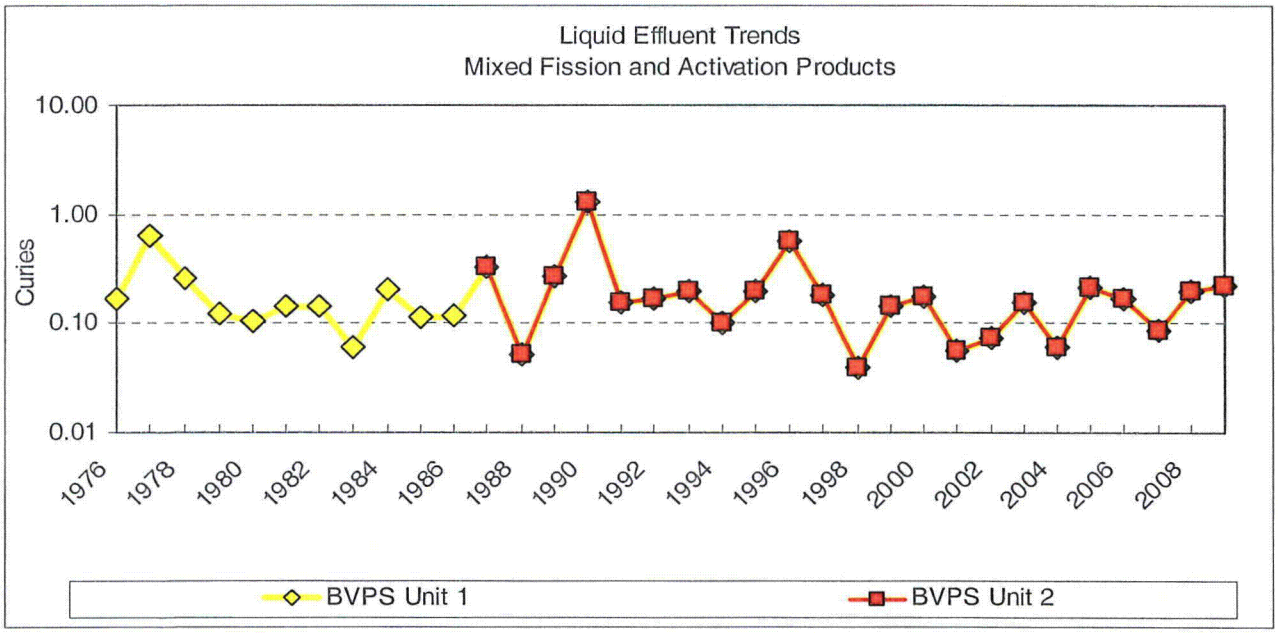


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Liquid Release Activity (Fission and Activation Products)

Liquid Release Activity (Fission and Activation Products): The following graph provides a comparison of total liquid mixed fission and activation product (particulate) radioactivity discharged from the site from 1976 to present. The recent increases were due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.

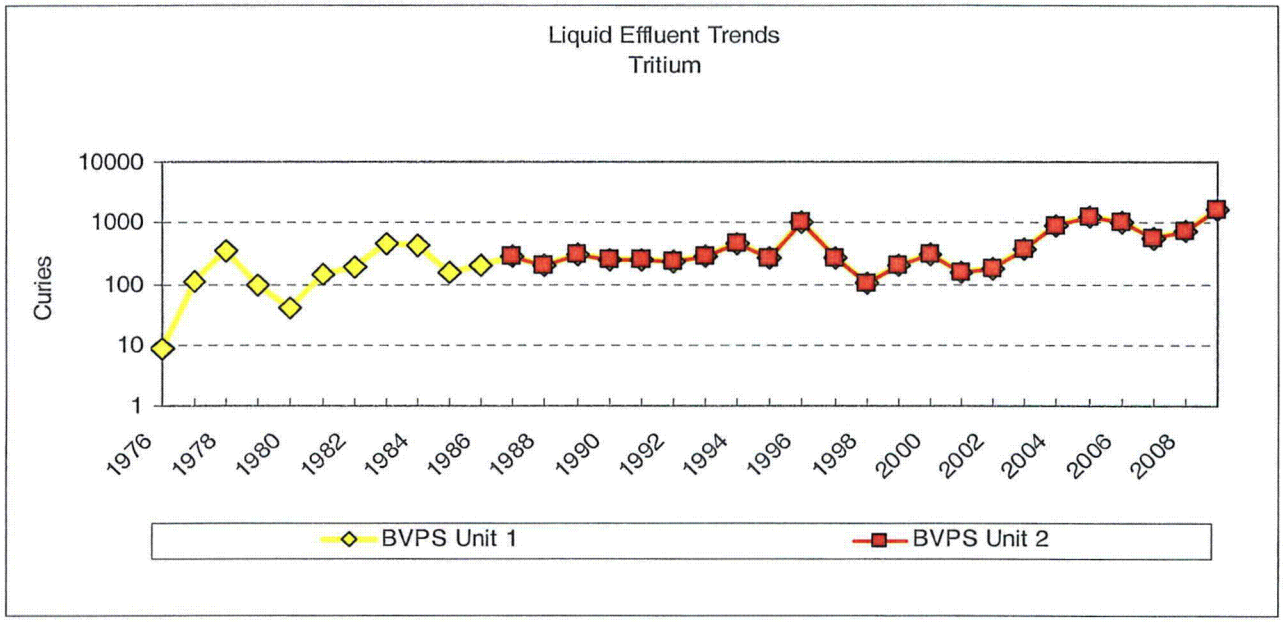


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Liquid Release Activity (Tritium)

Liquid Release Activity (Tritium): The following graph provides a comparison of total liquid tritium radioactivity discharged from the site from 1976 to present. The recent increases were due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.

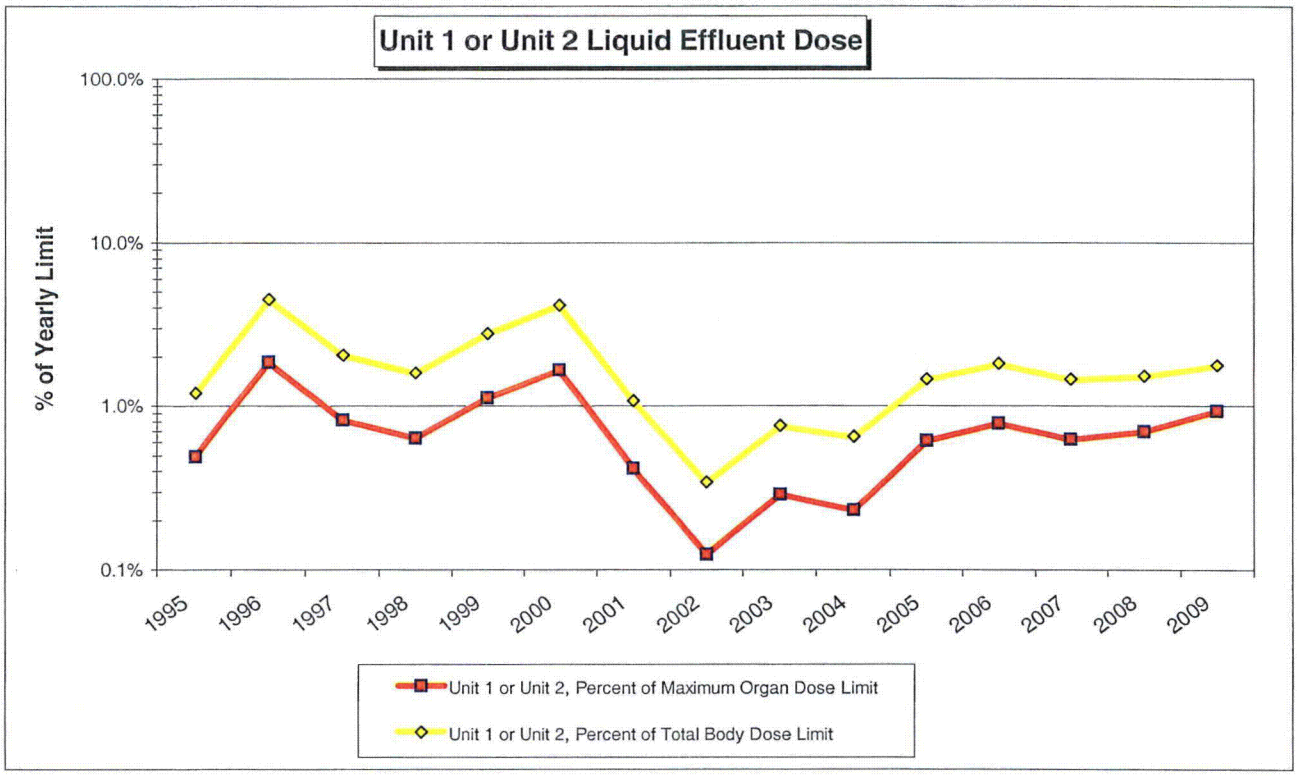


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Liquid Release Offsite Dose Projections

Liquid Release Offsite Dose Projections: The following graph provides a comparison of liquid offsite dose projections that were calculated to the maximum individual per 10 CFR 50, Appendix I and the ODCM. The projections use ODCM default flow rates for the receiving water (Ohio River), and were performed prior to release authorization. The recent increases were due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.

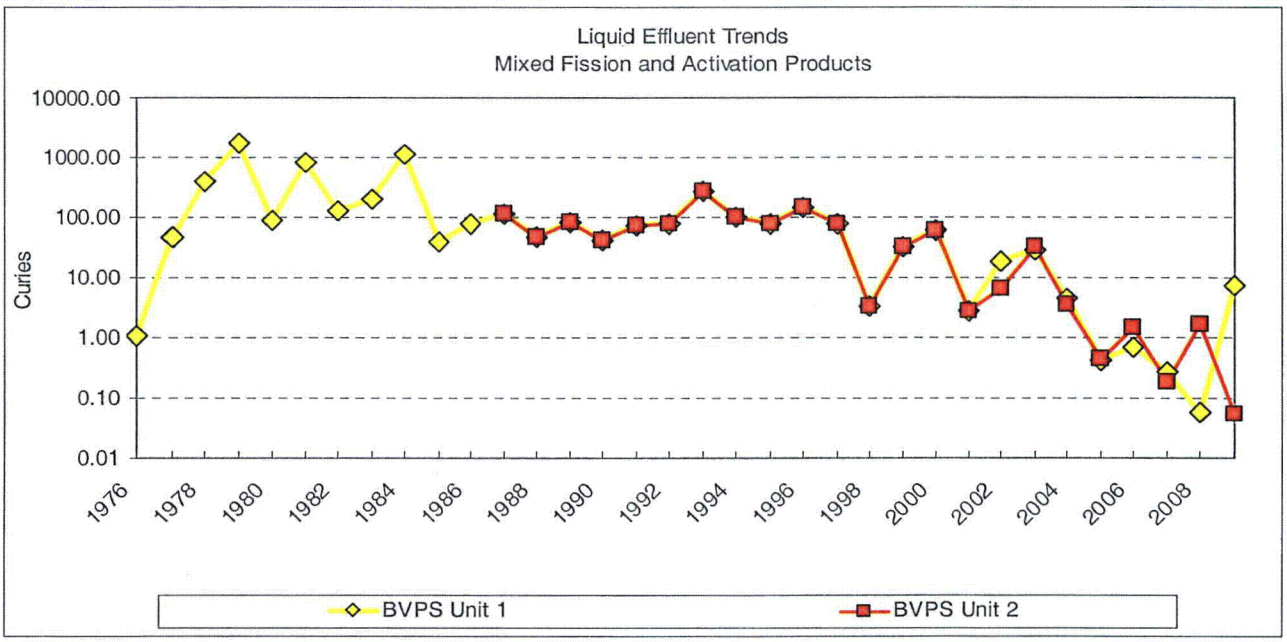


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Gaseous Release Activity (Fission and Activation Gas)

Gaseous Release Activity (Fission and Activation Gas): The following graph provides a comparison of total gaseous fission and activation gas discharged from the site from 1976 to present. The overall decreases are due to extended hold-up periods of gas space prior to release.

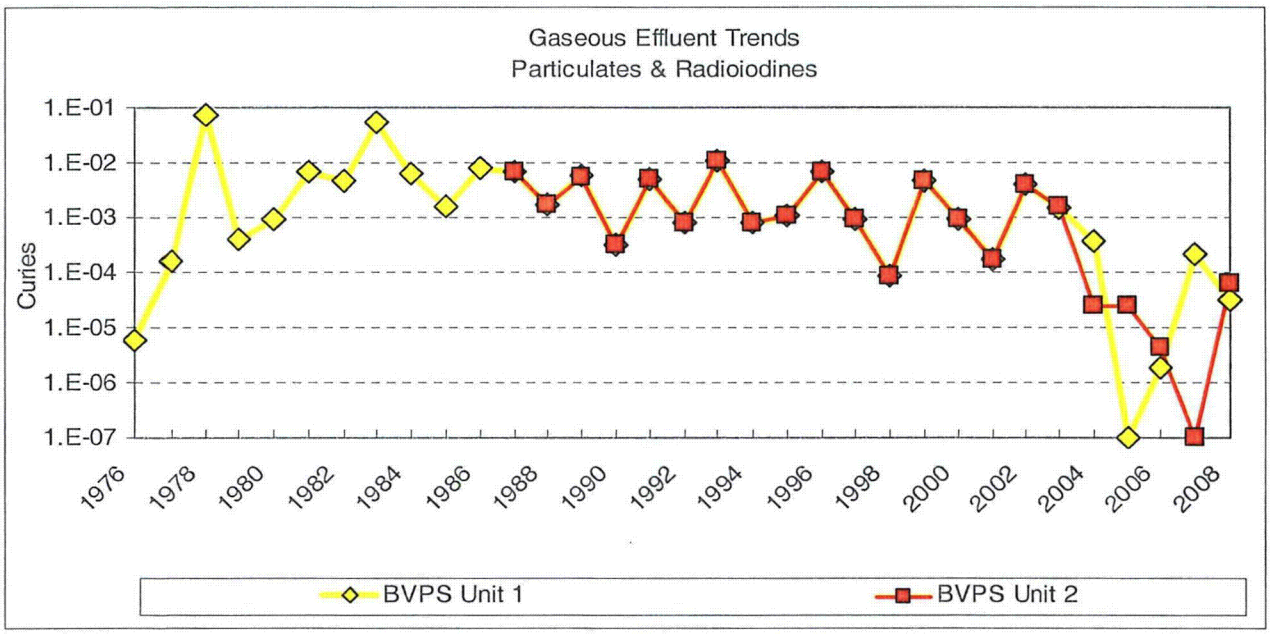


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Gaseous Release Activity (Particulates and Radioiodines)

Gaseous Release Activity (Particulates and Radioiodines): The following graph provides a comparison of total gaseous particulates and radioiodines discharged from the site from 1976 to present. The increase at at Unit 2 was due to identification of Co-58 and Co-60 in weekly effluent pathway samples during a refueling outage.

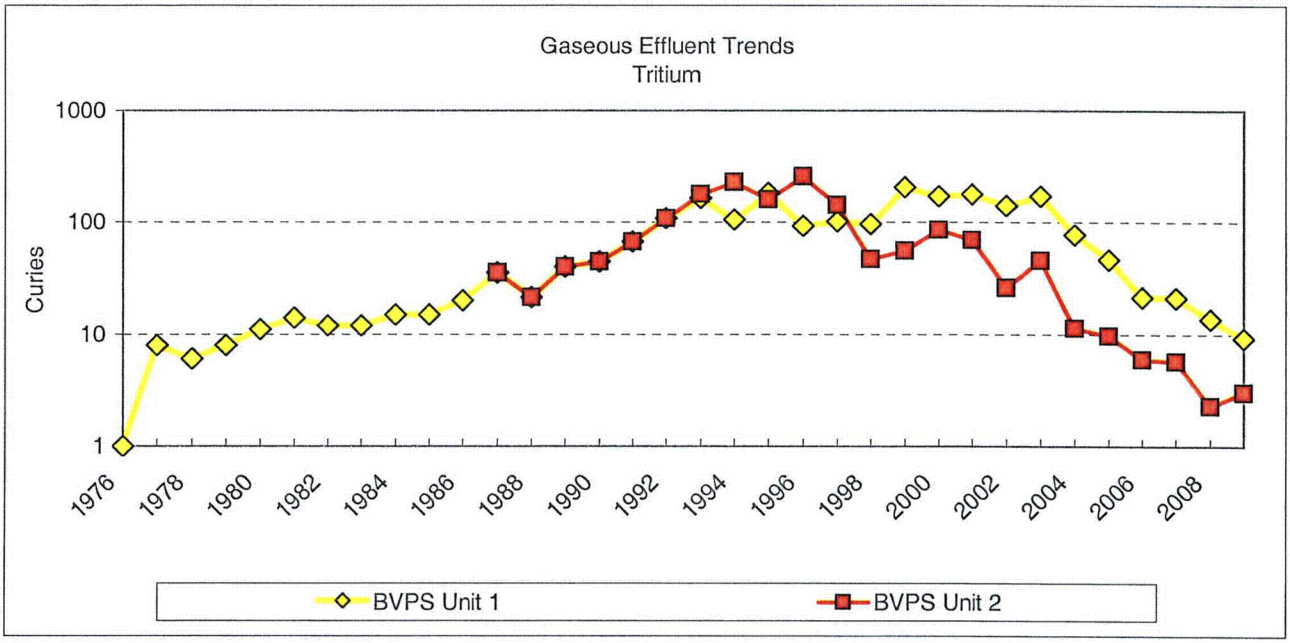


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Gaseous Release Activity (Tritium)

Gaseous Release Activity (Tritium): The following graph provides a comparison of total gaseous tritium discharged from the site from 1976 to present. The recent decreases were due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.

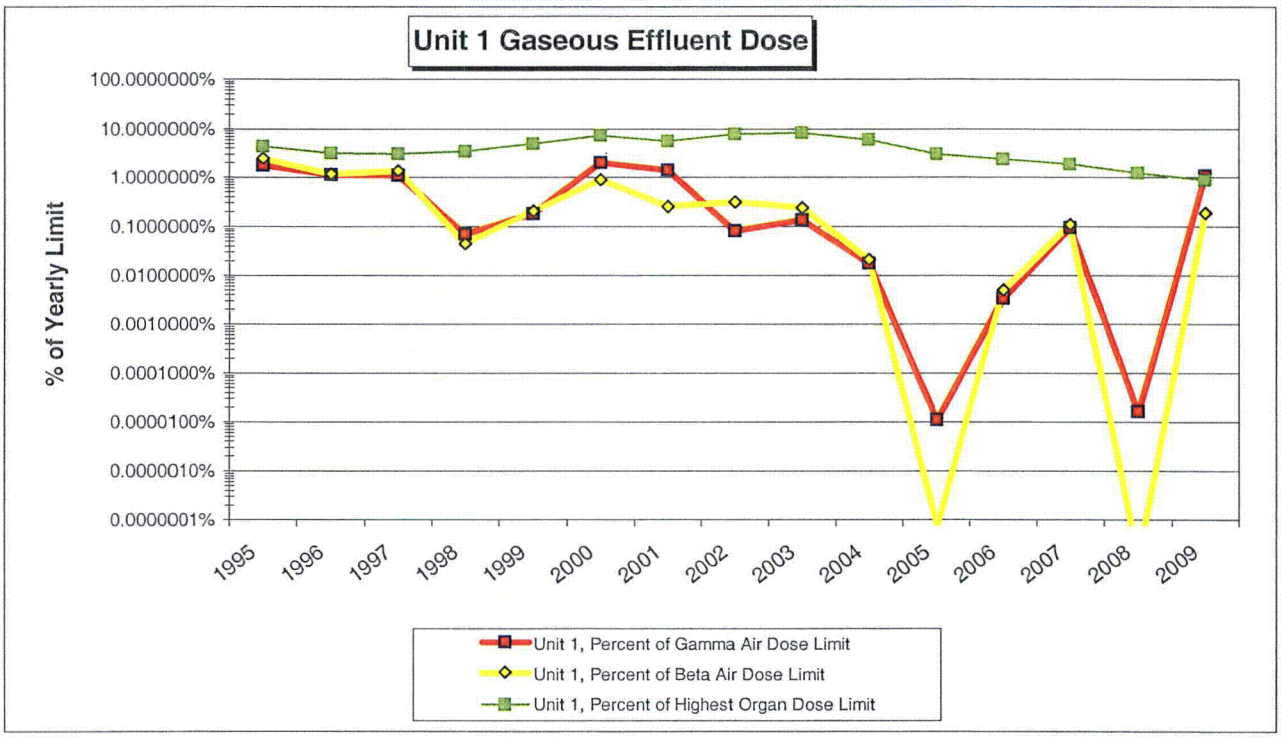


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Unit 1 Gaseous Release Offsite Dose Projections

Unit 1 Gaseous Release Offsite Dose Projections: The following graph provides a comparison of Unit 1 gaseous offsite dose projections that were calculated to the maximum individual per 10 CFR 50, Appendix I and the ODCM. The projections use ODCM default meteorological parameters for the atmospheric conditions surrounding the plant site, and were performed prior to release authorization. The steady decrease in highest organ dose was due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.

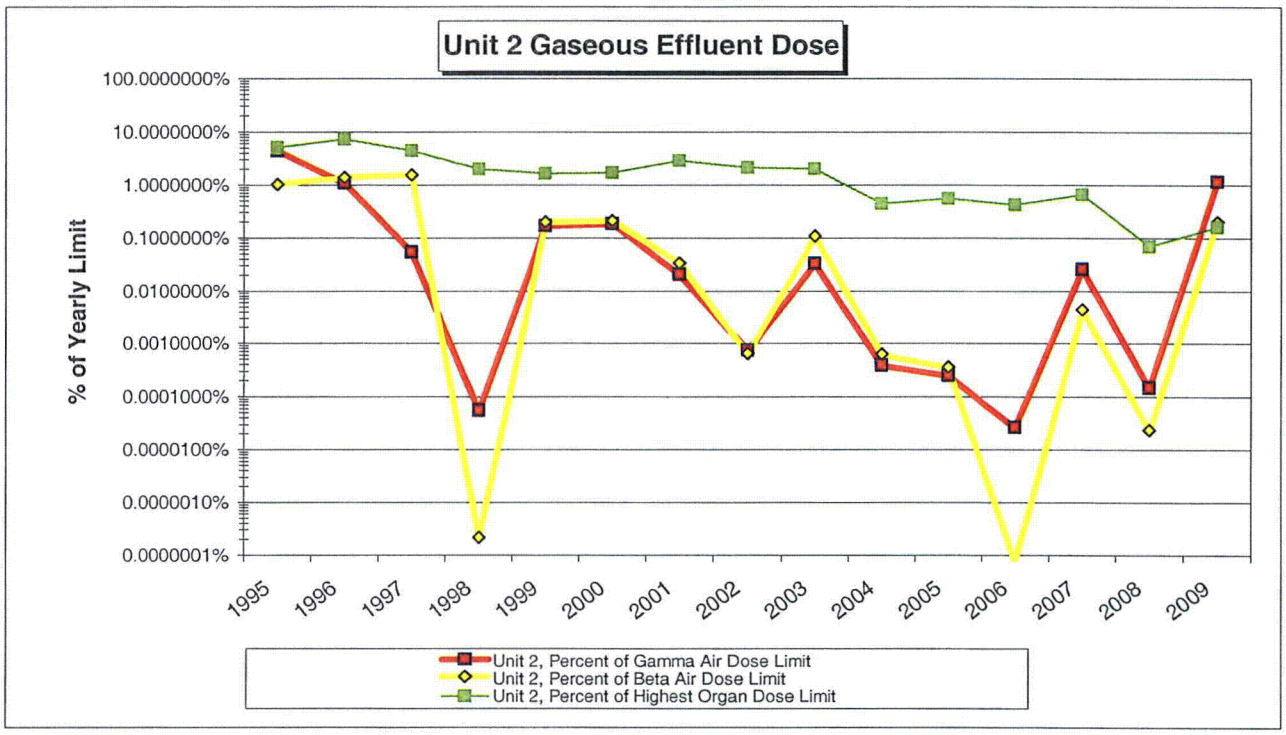


Radioactive Effluent Release Report

Calendar Year - 2009

Executive Summary - Trends of Unit 2 Gaseous Release Offsite Dose Projections

Unit 2 Gaseous Release Offsite Dose Projections: The following graph provides a comparison of Unit 2 gaseous offsite dose projections that were calculated to the maximum individual per 10 CFR 50, Appendix I and the ODCM. The projections use ODCM default meteorological parameters for the atmospheric conditions surrounding the plant site, and were performed prior to release authorization. The steady decrease in highest organ dose was due to efforts to reduce overall offsite dose. Specifically, discharging liquid radioactive inventory provided the benefit of reduced total offsite dose, due to reduction in evaporative losses from the fuel pools.



Radioactive Effluent Release Report

Calendar Year - 2009

Results of Abnormal Releases

Abnormal Liquid Releases: None

Abnormal Gas Releases: None

Radioactive Effluent Release Report

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Results of Onsite Spills and Items Added to Decommissioning Files per 10CFR50.75(g)

Summary of Onsite Spills (>100 gallons): None

Summary of Items added to Decommissioning Files per 10CFR50.75(g) Files: None

Radioactive Effluent Release Report

Calendar Year - 2009

Results of Onsite Groundwater Monitoring Program

Summary of Onsite Groundwater Samples

	2009 H-3 Maximum (pCi/L)	2009 H-3 Minimum (pCi/L)	2009 H-3 Average (pCi/L)	Typical H-3 LLD (pCi/L)	Required H-3 LLD (pCi/L)	Pre Operational Mean For H-3 (pCi/L)	Are Any H-3 Analyses Greater Than The Pre Operational Mean For H-3 ?	NEI and FENOC Communication Level For H-3 (pCi/L)	EPA Reporting Level For H-3 (pCi/L)
1st Quarter	10992	148	1701	<200	<2000	440	Yes	2000	20000
3rd Quarter	8986	144	1306	<200	<2000	440	Yes	2000	20000

Sample Summary: Seventeen (17) onsite monitoring wells were sampled during the year. Each of these wells was sampled two (2) times during the year.

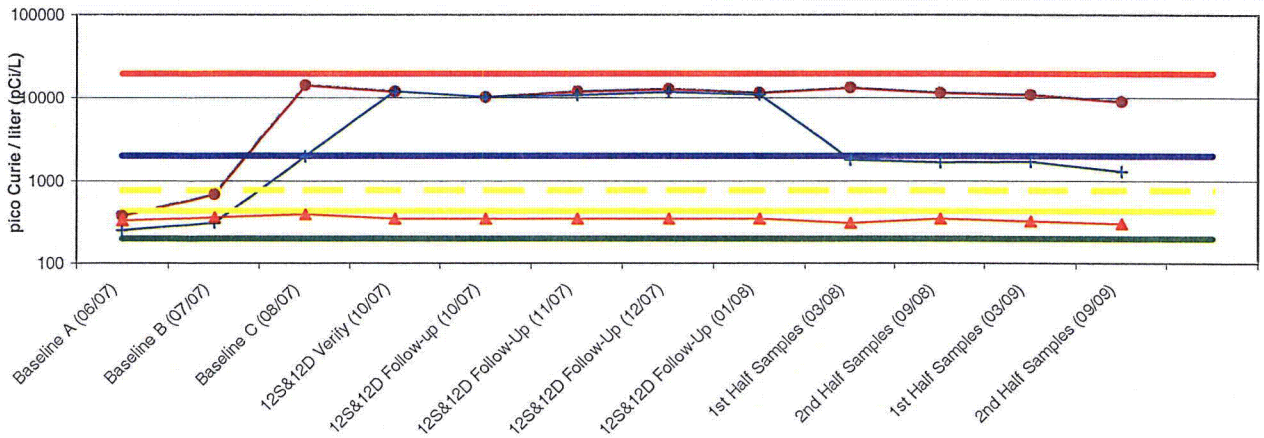
H-3 Summary: Results from eleven (11) wells were ≤440 pCi/L (BVPS pre-operational mean). Results from four (4) wells were >440 pCi/L, but ≤2000 pCi/L. Results from two (2) wells (MW-12S & MW-12D) were >2000 pCi/L, but ≤20,000 pCi/L. Results from no wells were >20,000 pCi/L. SINCE the NEI/FENOC communication level was reached for MW-12S & MW-12D during 2007, THEN notification to local, state & federal agencies was performed on 10/08/07. No additional wells reached the NEI/FENOC communication level during 2009. No adverse effect to the offsite environment has been detected at this time, because all offsite groundwater, drinking water and surface water samples were ≤440 pCi/L.

Principal Gamma Emitter Summary: Results showed <LLD for all principal gamma emitters associated with Licensed Radioactive Material (LRM).

Gross Alpha & Gross Beta Summary: Baseline analyses were performed on 3rd quarter 2008 samples. The Gross Alpha results ranged from <MDA to 2.2 pCi/L, and the Gross Beta results ranged from 1.0 pCi/L to 5.6 pCi/L. Gross Alpha & Gross Beta analyses will be performed next during the 3rd quarter 2010 sampling event.

Fe-55, Ni-63, Sr-89 & Sr-90: Baseline analyses were performed on 3rd quarter 2008 samples for MW-12S & MW-12D. The Fe-55 results were <LLD, the Ni-63 results were <LLD, the Sr-89 results were <LLD, and the Sr-90 results were <LLD. Fe-55, Ni-63, Sr-89 & Sr-90 analyses will be performed next during the 3rd quarter 2010 sampling event.

BVPS (2007-2009)
Onsite Groundwater Monitoring Program H-3 Trends
<200 pCi/l = Typical LLD
440 pCi/L = Pre-Operational Mean
800 pCi/L = Pre-Operational Max
2,000 pCi/L = NRC Required LLD (NEI Communication Level)
20,000 pCi/L = EPA Reporting Level



Radioactive Effluent Release Report

Calendar Year - 2009

Supplemental Information Page

FACILITY: B.V.P.S. Units 1 and 2	LICENSEE: FENOC

1. Regulatory Limits	
a. Fission and activation gases:	Annual Unit 1 or 2 Dose: 10 mrad from Gamma, & 20 mrad from Beta
b. Iodines & particulates, half-lives > 8 days:	Annual Unit 1 or 2 Dose: 15 mrem to Any Organ
c. Liquid effluents:	Annual Unit 1 or 2 Dose: 3 mrem to Total Body, & 10 mrem to Any Organ

2. Maximum Permissable Concentrations Used In Determining Allowable Release Rates Or Concentrations	
a. Fission and activation gases:	Site Release Rate: 500 mrem/yr to Total Body, & 3000 mrem/yr to the Skin
b. Iodines & particulates, half-lives > 8 days:	Site Release Rate: 1500 mrem/yr to Any Organ
c. Liquid effluents:	Site Release Concentration: 10 times 10 CFR 20 Appendix B, Table 2, EC's

3. Average Energy (Not Applicable To The BVPS ODCM)

4. Measurements and Approximations of Total Radioactivity	
The methods used to measure or approximate the total radioactivity in effluents, and the methods used to determine radionuclide composition are as follows:	
a. Fission and activation gases:	Ge Gamma Spectrometry, Liquid Scintillation Counter
b. Iodines:	Ge Gamma Spectrometry
c. Particulates, half-lives > 8 days:	Ge Gamma Spectrometry, Proportional Counter
d. Liquid effluents:	Ge Gamma Spectrometry, Proportional Counter, Liquid Scintillation

5. Batch & Abnormal Release Information	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
a. Liquid Batch Releases						
1. Number of batch releases		36	47	62	39	184
2. Total time period for batch releases	minutes	11413	14433	17677	15577	59100
3. Maximum time period for a batch release	minutes	1050	945	958	1020	1050
4. Average time period for batch releases	minutes	317	307	285	399	321
5. Minimum time period for a batch release	minutes	83	77	5	2	2
6. Average river flow during release periods	cuft/sec	52550	40200	21000	30700	36113
b. Gaseous Batch Releases						
1. Number of batch releases		10	23	9	18	60
2. Total time period for batch releases	minutes	4615	19931	478	58574	83598
3. Maximum time period for a batch release	minutes	763	7422	211	4592	7422
4. Average time period for batch releases	minutes	462	867	53	3254	1393
5. Minimum time period for a batch release	minutes	53	1	100	0.2	0.2
c. Abnormal Liquid Releases						
1. Number of releases		NONE	NONE	NONE	NONE	NONE
2. Total activity released	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Abnormal Gaseous Releases						
1. Number of releases		NONE	NONE	NONE	NONE	NONE
2. Total activity released	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Radioactive Effluent Release Report

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Table 1A

Gaseous Effluents - Summation Of All Releases

	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year	Total Error, %
A. Fission & Activation Gases							
1. Site Total release	Ci	0.00E+00	2.43E+00	0.00E+00	4.96E+00	7.40E+00	26.5%
1a. Unit 1 Gases	Ci	0.00E+00	2.39E+00	0.00E+00	4.96E+00	7.35E+00	
1b. Unit 2 Gases	Ci	0.00E+00	4.86E-02	0.00E+00	4.57E-03	5.31E-02	
2. Average release rate for period	uCi/sec	0.00E+00	3.09E-01	0.00E+00	6.30E-01	2.35E-01	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	N/A	
B. Iodines							
1. Site Total iodine - 131	Ci	0.00E+00	1.27E-07	6.52E-07	2.26E-07	1.01E-06	28.3%
1a. Unit 1 iodine - 131	Ci	0.00E+00	6.35E-08	0.00E+00	1.13E-07	1.77E-07	
1b. Unit 2 iodine - 131	Ci	0.00E+00	6.35E-08	6.52E-07	1.13E-07	8.29E-07	
2. Average release rate for period	uCi/sec	0.00E+00	1.61E-08	8.27E-08	2.87E-08	3.19E-08	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	N/A	
C. Particulates							
1. Particulates with half-lives > 8 days	Ci	0.00E+00	2.28E-04	0.00E+00	8.12E-05	3.09E-04	30.0%
1a. Unit 1 Particulates	Ci	0.00E+00	2.28E-04	0.00E+00	0.00E+00	2.28E-04	
1b. Unit 2 Particulates	Ci	0.00E+00	0.00E+00	0.00E+00	8.12E-05	8.12E-05	
2. Average release rate for period	uCi/sec	0.00E+00	2.90E-05	0.00E+00	1.03E-05	9.82E-06	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	N/A	
D. Gross Alpha							
1. Site Gross alpha radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	30.0%
1a. Unit 1 Gross alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1b. Unit 2 Gross alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
2. Average release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	N/A	
E. Tritium							
1. Site Total release	Ci	3.33E+00	1.47E+00	5.31E+00	2.12E+00	1.22E+01	32.9%
1a. Unit 1 Tritium	Ci	2.23E+00	1.22E+00	4.31E+00	1.44E+00	9.20E+00	
1b. Unit 2 Tritium	Ci	1.10E+00	2.53E-01	1.00E+00	6.80E-01	3.03E+00	
2. Average release rate for period	uCi/sec	4.23E-01	1.87E-01	6.74E-01	2.69E-01	3.88E-01	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	N/A	

N/A = Not Applicable

The amount of time (in seconds) used to calculate the release rates specified in A.2, B.2, C.2, D.2 and E.2 is the average amount of seconds per calendar quarter (7.88E+06 seconds).

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1B-EB
Gaseous Effluents - Elevated Batch Releases

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	1.87E-04	LLD	LLD	1.87E-04
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	4.82E-05	LLD	LLD	4.82E-05
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	6.97E-02	LLD	LLD	6.97E-02
xenon-133m	Ci	LLD	8.38E-04	LLD	LLD	8.38E-04
xenon-135	Ci	LLD	6.21E-03	LLD	LLD	6.21E-03
xenon-135m	Ci	LLD	5.43E-04	LLD	LLD	5.43E-04
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	7.75E-02	ND	ND	7.75E-02
2. Iodines						
iodine-131	Ci	LLD	LLD	LLD	LLD	LLD
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	ND	ND	ND	ND
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-60	Ci	LLD	LLD	LLD	LLD	LLD
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	LLD	LLD	LLD	LLD
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	LLD	LLD	LLD	LLD
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	ND	ND

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1B-EC
Gaseous Effluents - Elevated Continuous Releases

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	LLD	LLD	LLD	LLD
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	1.96E-02	LLD	LLD	1.96E-02
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	1.96E-02	ND	ND	1.96E-02
2. Iodines						
iodine-131	Ci	LLD	1.27E-07	LLD	2.26E-07	3.53E-07
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	1.27E-07	ND	2.26E-07	3.53E-07
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-60	Ci	LLD	LLD	LLD	LLD	LLD
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	LLD	LLD	LLD	LLD
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	LLD	LLD	LLD	LLD
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	ND	ND

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1C-GB1
Gaseous Effluents - Ground Level Batch Releases (Unit 1)

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	LLD	LLD	LLD	LLD
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	2.67E-02	LLD	LLD	2.67E-02
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	2.67E-02	ND	ND	2.67E-02
2. Iodines						
iodine-131	Ci	LLD	LLD	LLD	LLD	LLD
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	ND	ND	ND	ND
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	9.17E-06	LLD	LLD	9.17E-06
cobalt-60	Ci	LLD	6.11E-07	LLD	LLD	6.11E-07
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	LLD	LLD	LLD	LLD
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	6.11E-07	LLD	LLD	6.11E-07
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	1.04E-05	ND	ND	1.04E-05

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1C-GC1
Gaseous Effluents - Ground Level Continuous Releases (Unit 1)

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	2.31E+00	LLD	4.96E+00	7.27E+00
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	LLD	LLD	LLD	LLD
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	2.31E+00	ND	4.96E+00	7.27E+00
2. Iodines						
iodine-131	Ci	LLD	LLD	LLD	LLD	LLD
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	ND	ND	ND	ND
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	2.02E-04	LLD	LLD	2.02E-04
cobalt-60	Ci	LLD	1.25E-05	LLD	LLD	1.25E-05
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	3.35E-06	LLD	LLD	3.35E-06
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	LLD	LLD	LLD	LLD
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	2.18E-04	ND	ND	2.18E-04

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1C-GB2
Gaseous Effluents - Ground Level Batch Releases (Unit 2)

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	LLD	LLD	5.84E-04	5.84E-04
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	LLD	LLD	2.40E-05	2.40E-05
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	LLD	LLD	2.47E-03	2.47E-03
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	LLD	LLD	1.33E-03	1.33E-03
xenon-135m	Ci	LLD	LLD	LLD	1.60E-04	1.60E-04
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	4.57E-03	4.57E-03
2. Iodines						
iodine-131	Ci	LLD	LLD	LLD	LLD	LLD
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	ND	ND	ND	ND
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	LLD	LLD	9.17E-06	9.17E-06
cobalt-60	Ci	LLD	LLD	LLD	6.11E-07	6.11E-07
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	LLD	LLD	LLD	LLD
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	LLD	LLD	6.11E-07	6.11E-07
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	1.04E-05	1.04E-05

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009
Table 1C-GC2
Gaseous Effluents - Ground Level Continuous Releases (Unit 2)

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission gases						
argon-41	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
krypton-85m	Ci	LLD	LLD	LLD	LLD	LLD
krypton-87	Ci	LLD	LLD	LLD	LLD	LLD
krypton-88	Ci	LLD	LLD	LLD	LLD	LLD
xenon-131m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-138	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	ND	ND
2. Iodines						
iodine-131	Ci	LLD	LLD	6.52E-07	LLD	6.52E-07
iodine-133	Ci	LLD	LLD	LLD	LLD	LLD
iodine-135	Ci	LLD	LLD	LLD	LLD	LLD
Total for period	Ci	ND	ND	6.52E-07	ND	6.52E-07
3. Particulates						
chromium-51	Ci	LLD	LLD	LLD	LLD	LLD
manganese-54	Ci	LLD	LLD	LLD	LLD	LLD
iron-59	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-57	Ci	LLD	LLD	LLD	LLD	LLD
cobalt-58	Ci	LLD	LLD	LLD	6.16E-05	6.16E-05
cobalt-60	Ci	LLD	LLD	LLD	9.23E-06	9.23E-06
zinc-65	Ci	LLD	LLD	LLD	LLD	LLD
zirconium/niobium-95	Ci	LLD	LLD	LLD	LLD	LLD
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	LLD	LLD	LLD	LLD
molybdenum-99	Ci	LLD	LLD	LLD	LLD	LLD
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	LLD	LLD	LLD	LLD	LLD
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	ND	ND	7.08E-05	7.08E-05

LLD = Below the Lower Limit of Detectability, in uCi/cc (Table 4).

ND = None Detected

Radioactive Effluent Release Report

Calendar Year - 2009

Table 2A

Liquid Effluents - Summation Of All Releases

	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year	Total Error, %
A. Fission & activation products							
1. Total release (excl. H-3, gas & alpha)	Ci	3.72E-02	3.56E-02	4.26E-02	1.05E-01	2.20E-01	26.1%
2. Average diluted concentration	uCi/ml	4.42E-08	2.97E-08	2.15E-08	8.81E-08	4.23E-08	
3. Percent of applicable limit	%	1.49E+00	1.42E+00	1.70E+00	4.18E+00	2.20E+00	
B. Tritium							
1. Total release	Ci	4.15E+02	4.46E+02	3.71E+02	3.55E+02	1.59E+03	25.0%
2. Average diluted concentration	uCi/ml	4.93E-04	3.72E-04	1.88E-04	2.99E-04	3.05E-04	
3. Percent of applicable limit	%	4.93E+00	3.72E+00	1.88E+00	2.99E+00	3.05E+00	
C. Dissolved and entrained gases							
1. Total release	Ci	ND	1.98E-06	ND	4.24E-05	4.44E-05	27.0%
2. Average diluted concentration	uCi/ml		1.65E-12		3.57E-11	8.52E-12	
3. Percent of applicable limit	%		8.26E-07		1.79E-05	4.26E-06	
D. Gross alpha radioactivity (total release)	Ci	LLD	LLD	LLD	LLD	LLD	28.9%
E. Volume of waste released (prior to dilution)	liters	1.82E+06	2.31E+06	3.09E+06	2.10E+06	9.32E+06	11.2%
F. Volume of dilution water used	liters	8.40E+08	1.20E+09	1.98E+09	1.18E+09	5.20E+09	22.9%

LLD = Below the Lower Limit of Detectability, in uCi/ml (Table 4)

A.3 is based on a historical PA-DEP guide of 10 Ci/yr

B.3 is based on a ODCM limit of 1.00E-2 uCi/ml

C.3 is based on a ODCM limit of 2.00E-04 uCi/ml

The values listed at F. are the volumes during actual liquid waste discharge periods. The total dilution volume for a continuous calendar quarter is approximately 1E+10 liters for BVPS-1 & 2 (ie.; ~ 22,800 gpm is the total dilution flowrate from the site)

Radioactive Effluent Release Report

Calendar Year - 2009

Table 2B-B

Liquid Effluents - Batch Releases

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission and activation products						
beryllium-7	Ci	LLD	LLD	LLD	LLD	LLD
sodium-24	Ci	LLD	LLD	LLD	LLD	LLD
chromium-51	Ci	5.09E-04	LLD	LLD	2.26E-03	2.77E-03
manganese-54	Ci	5.44E-04	5.38E-05	LLD	8.36E-04	1.43E-03
iron-55	Ci	6.75E-03	1.66E-03	2.99E-03	1.29E-02	2.43E-02
iron-59	Ci	LLD	LLD	LLD	4.12E-04	4.12E-04
cobalt-57	Ci	3.64E-05	1.67E-05	7.51E-05	2.81E-04	4.10E-04
cobalt-58	Ci	2.87E-03	8.51E-03	2.18E-02	7.07E-02	1.04E-01
cobalt-60	Ci	2.40E-03	5.49E-03	4.64E-03	7.56E-03	2.01E-02
zinc-65	Ci	9.44E-04	2.13E-03	7.57E-04	LLD	3.83E-03
strontium-89	Ci	LLD	LLD	LLD	LLD	LLD
strontium-90	Ci	LLD	1.30E-04	LLD	LLD	1.30E-04
zirconium/niobium-95	Ci	LLD	1.46E-05	LLD	2.15E-04	2.30E-04
zirconium/niobium-97	Ci	LLD	7.25E-06	4.08E-06	LLD	1.13E-05
molybdenum-99/technetium-99m	Ci	LLD	3.80E-06	LLD	LLD	3.80E-06
tin-113	Ci	LLD	LLD	LLD	LLD	LLD
silver-110m	Ci	1.64E-04	2.29E-04	5.05E-04	2.71E-03	3.61E-03
antimony-122	Ci	LLD	LLD	LLD	3.16E-04	3.16E-04
antimony-124	Ci	LLD	6.65E-04	5.83E-04	1.65E-03	2.90E-03
antimony-125	Ci	2.22E-02	1.59E-02	1.09E-02	4.45E-03	5.35E-02
iodine-131	Ci	LLD	2.70E-05	3.46E-05	LLD	6.17E-05
iodine-133	Ci	LLD	4.20E-05	8.14E-05	LLD	1.23E-04
cesium-134	Ci	LLD	LLD	LLD	LLD	LLD
cesium-137	Ci	7.97E-04	6.92E-04	2.28E-04	2.98E-04	2.02E-03
barium/lanthanum-140	Ci	LLD	LLD	LLD	LLD	LLD
cerium-141	Ci	LLD	LLD	LLD	LLD	LLD
cerium-144	Ci	LLD	LLD	LLD	LLD	LLD
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	3.72E-02	3.56E-02	4.26E-02	1.05E-01	2.20E-01
2. Dissolved and entrained gases						
krypton-85	Ci	LLD	LLD	LLD	LLD	LLD
xenon-133	Ci	LLD	LLD	LLD	4.24E-05	4.24E-05
xenon-133m	Ci	LLD	LLD	LLD	LLD	LLD
xenon-135	Ci	LLD	1.98E-06	LLD	LLD	1.98E-06
unidentified	Ci	NONE	NONE	NONE	NONE	NONE
Total for period	Ci	ND	1.98E-06	ND	4.24E-05	4.44E-05

LLD = Below the Lower Limit of Detectability, in uCi/ml (Table 4)

Radioactive Effluent Release Report

Calendar Year - 2009

Table 2B-C

Liquid Effluents - Continuous Releases

Nuclides released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Calendar Year
1. Fission and activation products						
beryllium-7	Ci	N/A	N/A	N/A	N/A	N/A
sodium-24	Ci	N/A	N/A	N/A	N/A	N/A
chromium-51	Ci	N/A	N/A	N/A	N/A	N/A
manganese-54	Ci	N/A	N/A	N/A	N/A	N/A
iron-55	Ci	N/A	N/A	N/A	N/A	N/A
iron-59	Ci	N/A	N/A	N/A	N/A	N/A
cobalt-57	Ci	N/A	N/A	N/A	N/A	N/A
cobalt-58	Ci	N/A	N/A	N/A	N/A	N/A
cobalt-60	Ci	N/A	N/A	N/A	N/A	N/A
zinc-65	Ci	N/A	N/A	N/A	N/A	N/A
strontium-89	Ci	N/A	N/A	N/A	N/A	N/A
strontium-90	Ci	N/A	N/A	N/A	N/A	N/A
zirconium/niobium-95	Ci	N/A	N/A	N/A	N/A	N/A
zirconium/niobium-97	Ci	N/A	N/A	N/A	N/A	N/A
molybdenum-99	Ci	N/A	N/A	N/A	N/A	N/A
technetium-99m	Ci	N/A	N/A	N/A	N/A	N/A
ruthenium-103	Ci	N/A	N/A	N/A	N/A	N/A
silver-110m	Ci	N/A	N/A	N/A	N/A	N/A
antimony-124	Ci	N/A	N/A	N/A	N/A	N/A
antimony-125	Ci	N/A	N/A	N/A	N/A	N/A
iodine-131	Ci	N/A	N/A	N/A	N/A	N/A
iodine-133	Ci	N/A	N/A	N/A	N/A	N/A
cesium-134	Ci	N/A	N/A	N/A	N/A	N/A
cesium-137	Ci	N/A	N/A	N/A	N/A	N/A
barium/lanthanum-140	Ci	N/A	N/A	N/A	N/A	N/A
cerium-141	Ci	N/A	N/A	N/A	N/A	N/A
cerium-144	Ci	N/A	N/A	N/A	N/A	N/A
unidentified	Ci	N/A	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A	N/A
2. Dissolved and entrained gases						
argon-41	Ci	N/A	N/A	N/A	N/A	N/A
xenon-133	Ci	N/A	N/A	N/A	N/A	N/A
xenon-133m	Ci	N/A	N/A	N/A	N/A	N/A
xenon-135	Ci	N/A	N/A	N/A	N/A	N/A
unidentified	Ci	N/A	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable (liquids not discharged in a continuous mode during this period)

Radioactive Effluent Release Report

Calendar Year - 2009

Table 3A

Solid Waste And Irradiated Fuel Shipments (Part 1 of 3)

A. Solid Waste Shipped Offsite For Burial Or Disposal (Not irradiated fuel)				
1. Type of Waste (Spent resins, Filter Sludges, Evaporator Bottoms, Oil)		1st Half	2nd Half	Estimated Total Error
a. Volume Shipped		2.15E+00 m3	2.24E+00 m3	0.0% (1)
b. Volume Buried		2.15E+00 m3	2.24E+00 m3	0.0% (1)
c. Total Activity		2.59E+00 Ci	1.20E+01 Ci	30.0%
2. Estimate of Major Nuclide Composition by Type of Waste On This Table (2)		Percent (%)	Percent (%)	
H-3		12.30 %	0.46 %	
C-14		2.99 %	2.52 %	
Mn-54		0.52 %	5.10 %	
Fe-55		12.30 %	29.80 %	
Co-58		6.68 %	0.64 %	
Co-60		13.90 %	20.10 %	
Ni-59		0.24 %	0.32 %	
Ni-63		22.70 %	39.50 %	
Zn-65		10.65 %	0.00 %	
Sb-125		1.64 %	0.54 %	
Cs-134		0.54 %	0.05 %	
Cs-137		14.80 %	0.44 %	
Ce-144/Pr-144		0.01 %	0.00 %	
Pu-238		0.00 %	0.00 %	
Pu-241		0.11 %	0.01 %	
3. Number of Shipments		1	1	
a. Type of Container Used	LSA	1	1	
	Type A	0	0	
	Type B	0	0	
	Large Quantity	0	0	
b. Solidification Agent Used	Cement	0	0	
	Urea Formaldehyde	0	0	
	None	1	1	
c. Mode of Transport	Truck	1	1	
	Rail	0	0	
d. Final Destination	Erwin, TN	0	0	
	Oak Ridge, TN	1	1	
e. Waste Class per 10 CFR Part 61	Class A	1	1	
	Class B	0	0	
	Class C	0	0	
	> Class C	0	0	

(1) Since container volumes are provided by the burial site, a calculational error of zero is assumed.
(2) Percent values for any nuclide that are <0.01 % are not shown on this table. Data is available upon request

Radioactive Effluent Release Report

Calendar Year - 2009
Table 3B
Solid Waste And Irradiated Fuel Shipments (Part 2 of 3)

A. Solid Waste Shipped Offsite For Burial Or Disposal (Not irradiated fuel				
1. Type of Waste (Dry Compressible Waste, Contaminated Equipment, etc.)		1st Half	2nd Half	Estimated Total Error
a. Volume Shipped		6.11E+02 m3	7.11E+02 m3	0.0% (1)
b. Volume Buried		9.70E+01 m3	2.73E+02 m3	0.0% (1)
c. Total Activity		4.53E-01 Ci	3.51E-01 Ci	30.0%
2. Estimate of Major Nuclide Composition by Type of Waste On This Table (2)		Percent (%)	Percent (%)	
H-3		0.84 %	2.29 %	
C-14		0.44 %	1.47 %	
Cr-51		1.68 %	0.00 %	
Mn-54		0.03 %	0.91 %	
Fe-55		19.50 %	44.00 %	
Co-58		2.67 %	3.06 %	
Co-60		15.70 %	19.70 %	
Ni-59		0.18 %	0.38 %	
Ni-63		13.60 %	22.10 %	
Sr-90		0.14 %	0.06 %	
Nb-95		0.61 %	0.22 %	
Zr-95		0.31 %	0.00 %	
Tc-99		0.11 %	0.00 %	
Ag-110m		0.67 %	0.03 %	
Sb-124		0.00 %	0.00 %	
Sb-125		1.98 %	3.00 %	
I-129		0.08 %	0.01 %	
Cs-134		0.00 %	0.12 %	
Cs-137		36.30 %	1.81 %	
Ce-144/Pr-144		0.00 %	0.00 %	
Pu-241		0.24 %	0.20 %	
3. Number of Shipments		10	12	
a. Type of Container Used	LSA	10	12	
	Type A	0	0	
	Type B	0	0	
	Large Quantity	0	0	
b. Solidification Agent Used	Cement	0	0	
	Urea Formaldehyde	0	0	
	None	10	12	
c. Mode of Transport	Truck	10	12	
	Rail	0	0	
	Other	0	0	
d. Final Destination	Oak Ridge, TN	10	12	
	Wampum, PA	0	0	
e. Waste Class per 10 CFR Part 61	Class A	10	12	
	Class B	0	0	
	Class C	0	0	
	> Class C	0	0	

(1) Since container volumes are provided by the burial site, a calculational error of zero is assumed.
(2) Percent values for any nuclide that are <0.01 % are not shown on this table. Data is available upon request.

Radioactive Effluent Release Report

Calendar Year - 2009

Table 3C

Solid Waste And Irradiated Fuel Shipments (Part 3 of 3)

A. Solid Waste Shipped Offsite For Burial Or Disposal (Not irradiated fuel)

1. Type of Waste (Irradiated components, Control Rods, etc)		1st Half	2nd Half	Estimated Total Error
a. Volume Shipped		0.00E+00 m3	0.00E+00 m3	0.0% (1)
b. Volume Buried		0.00E+00 m3	0.00E+00 m3	0.0% (1)
c. Total Activity		0.00E+00 Ci	0.00E+00 Ci	0.0%
2. Estimate of Major Nuclide Composition by Type of Waste On This Table (2)		Percent (%)	Percent (%)	
3. Number of Shipments		0	0	
a. Type of Container Used	LSA	0	0	
	Type A	0	0	
	Type B	0	0	
	Large Quantity	0	0	
b. Solidification Agent Used	Cement	0	0	
	Urea Formaldehyde	0	0	
	None	0	0	
c. Mode of Transport	Truck	0	0	
	Rail	0	0	
	Other	0	0	
d. Final Destination	Barnwell, SC	0	0	
	Oak Ridge, TN	0	0	
e. Waste Class per 10 CFR Part 61	Class A	0	0	
	Class B	0	0	
	Class C	0	0	
	> Class C	0	0	

B. No Irradiated Fuel Shipments

(1) Since container volumes are provided by the burial site, a calculational error of zero is assumed.

(2) Percent values for any nuclide that are <0.01 % are not shown on this table. Data is available upon request.

Radioactive Effluent Release Report

Calendar Year - 2009
Table 4
Lower Limits Of Detectability (LLD)

	RWDA-G 1000 cc Gas Grab Sample		RWDA-L 1000 ml Liquid Grab Sample		Filter Paper / Charcoal Continuous Effluent Sample	
Nuclide	(3) Calculated LLD (uCi/cc)	ODCM Required LLD (uCi/cc)	(3) Calculated LLD (uCi/ml)	ODCM Required LLD (uCi/ml)	(3) Calculated (2) LLD (uCi/cc)	ODCM Required LLD (uCi/cc)
H-3	(4) 1.00E-06	1E-06	1.00E-06	1E-05	--------	-----
Na-24	1.86E-08	1E-04	4.33E-09	5E-07	3.44E-14	1E-11
Ar-41	5.61E-08	1E-04	1.32E-08	5E-07	--------	-----
Cr-51	3.74E-07	1E-04	1.00E-07	5E-07	6.21E-13	1E-11
Mn-54	9.93E-08	1E-04	2.38E-08	5E-07	6.82E-14	1E-11
Fe-55	--------	-----	(1) 1.00E-06	1E-06	--------	-----
Fe-59	1.70E-07	1E-04	4.03E-08	5E-07	1.57E-13	1E-11
Co-57	2.38E-08	1E-04	7.74E-09	5E-07	2.73E-14	1E-11
Co-58	5.20E-08	1E-04	1.25E-08	5E-07	2.11E-14	1E-11
Co-60	7.20E-08	1E-04	1.70E-08	5E-07	2.97E-14	1E-11
Zn-65	8.46E-08	1E-04	2.01E-08	5E-07	1.56E-13	1E-11
Kr-85	1.63E-05	1E-04	4.05E-06	1E-05	--------	-----
Kr-85m	3.17E-08	1E-04	9.81E-09	1E-05	--------	-----
Kr-87	8.08E-08	1E-04	2.08E-08	1E-05	--------	-----
Kr-88	8.06E-08	1E-04	2.36E-08	1E-05	--------	-----
Sr-89	--------	-----	(1) 5.00E-08	5E-08	(1) 1.00E-13	1E-11
Sr-90	--------	-----	(1) 5.00E-08	5E-08	(1) 1.00E-14	1E-11
Sr-92	2.08E-08	1E-04	4.86E-09	5E-07	1.73E-13	1E-11
Nb-95	4.91E-08	1E-04	1.18E-08	5E-07	8.89E-14	1E-11
Nb-97	3.05E-08	1E-04	7.44E-09	5E-07	7.77E-14	1E-11
Zr-95	8.76E-08	1E-04	2.11E-08	5E-07	3.54E-14	1E-11
Mo-99	3.27E-08	1E-04	1.03E-08	5E-07	4.03E-14	1E-11
Tc-99m	3.19E-08	1E-04	1.00E-08	5E-07	3.93E-14	1E-11
Ag-110m	3.17E-08	1E-04	7.73E-09	5E-07	8.08E-14	1E-11
Sb-124	4.86E-08	1E-04	1.19E-08	5E-07	5.04E-14	1E-11
Sb-125	1.85E-07	1E-04	4.71E-08	5E-07	3.30E-13	1E-11
I-131	4.84E-08	1E-04	1.27E-05	1E-06	4.89E-14	1E-12
I-133	4.83E-08	1E-04	1.20E-08	5E-07	6.95E-14	1E-10
I-135	1.90E-07	1E-04	4.47E-08	5E-07	3.49E-13	1E-11
Xe-131m	1.33E-06	1E-04	4.04E-07	1E-05	--------	-----
Xe-133	5.45E-08	1E-04	2.04E-08	1E-05	--------	-----
Xe-133m	2.74E-07	1E-04	7.77E-08	1E-05	--------	-----
Xe-135	3.36E-08	1E-04	9.40E-09	1E-05	--------	-----
Xe-135m	6.60E-08	1E-04	1.64E-08	1E-05	--------	-----
Xe-137	1.75E-07	1E-04	4.42E-08	1E-05	--------	-----
Xe-138	1.16E-07	1E-04	3.24E-08	1E-05	--------	-----
Cs-134	6.92E-08	1E-04	1.70E-08	5E-07	1.60E-14	1E-11
Cs-137	1.00E-07	1E-04	2.44E-08	5E-07	6.37E-14	1E-11
Ba-139	1.61E-07	1E-04	4.87E-08	5E-07	1.11E-13	1E-11
Ba-140	1.95E-07	1E-04	4.85E-08	5E-07	3.03E-13	1E-11
La-140	7.17E-08	1E-04	1.64E-08	5E-07	4.17E-14	1E-11
Ce-141	5.47E-08	1E-04	1.71E-08	5E-07	6.26E-14	1E-11
Ce-144	2.01E-06	1E-04	2.03E-07	5E-07	1.56E-13	1E-11
Gross Alpha	--------	-----	(1) 1.00E-07	1E-07	(1) 3.51E-15	1E-11

(1) Sample analyses performed by a contractor laboratory.

(2) These LLD calculations contain a default weekly continuous sample volume of 2.85E+8 cc. Therefore, grab sample LLD values reflect a different volume (ie; 10 cuft or 2.83E+5 cc).

(3) The calculated LLD's, except those denoted by (1), are from a counter/detector calibration on 06/08/09. These values are typical for other counter/detectors used for effluent counting at BVPS.

(4) Based on counting 50 ml of the water that was bubbled through a 20 liter air sample.

Radioactive Effluent Release Report

Calendar Year - 2009
Table 5A
Assessment Of Radiation Doses

		Unit 1 Liquid Effluents									
		1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Calendar Year	
	Batch Releases	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit
	Bone	1.35E-02	0.2700	1.33E-02	0.2660	3.56E-03	0.0712	7.83E-03	0.1566	3.82E-02	0.3819
O	Liver	4.53E-02	0.9060	2.61E-02	0.5220	9.09E-03	0.1818	1.29E-02	0.2580	9.34E-02	0.9339
R	Total Body	1.70E-02	1.1333	1.72E-02	1.1467	6.94E-03	0.4627	1.21E-02	0.8067	5.32E-02	1.7747
G	Thyroid	5.37E-03	0.1074	5.51E-03	0.1102	4.02E-03	0.0804	6.49E-03	0.1298	2.14E-02	0.2139
A	Kidney	1.25E-02	0.2500	1.41E-02	0.2820	5.91E-03	0.1182	8.52E-03	0.1704	4.10E-02	0.4103
N	Lung	7.61E-03	0.1522	7.63E-03	0.1526	4.61E-03	0.0922	7.19E-03	0.1438	2.70E-02	0.2704
(1)	GI-LLI	7.77E-03	0.1554	1.23E-02	0.2460	6.62E-03	0.1324	1.40E-02	0.2800	4.07E-02	0.4069

		Unit 1 Gaseous Effluents									
		1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Calendar Year	
	Batch & Continuous Releases	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit
(2)	Gamma Air	0.00E+00	0.0000	1.08E-01	2.1600	0.00E+00	0.0000	0.00E+00	0.0000	1.08E-01	1.0800
(2)	Beta Air	0.00E+00	0.0000	3.80E-02	0.3800	0.00E+00	0.0000	0.00E+00	0.0000	3.80E-02	0.1900
	Bone	0.00E+00	0.0000	4.60E-04	0.0061	0.00E+00	0.0000	1.19E-10	0.0000	4.60E-04	0.0031
O	Liver	3.16E-02	0.4213	2.71E-02	0.3613	1.91E-02	0.2547	5.32E-02	0.7093	1.31E-01	0.8733
R	Total Body	3.16E-02	0.4213	2.72E-02	0.3627	1.91E-02	0.2547	5.32E-02	0.7093	1.31E-01	0.8740
G	Thyroid	3.16E-02	0.4213	2.71E-02	0.3613	1.91E-02	0.2547	5.32E-02	0.7093	1.31E-01	0.8733
A	Kidney	3.16E-02	0.4213	2.71E-02	0.3613	1.91E-02	0.2547	5.32E-02	0.7093	1.31E-01	0.8733
N	Lung	3.16E-02	0.4213	2.78E-02	0.3707	1.91E-02	0.2547	5.32E-02	0.7093	1.32E-01	0.8780
(3)	GI-LLI	3.16E-02	0.4213	2.73E-02	0.3640	1.91E-02	0.2547	5.32E-02	0.7093	1.31E-01	0.8747

(1) These doses are listed in mrem; they are calculated for the maximum individual for all batch liquid effluents

(2) These doses are listed in mrad; they are calculated at the site boundary for batch & continuous gaseous effluents (0.4 miles NW)

(3) These doses are listed in mrem; they are calculated for the most likely exposed real individual (child) via all real pathways at 0.89 miles NW.

Limits used for calculation of percent (%) are from ODCM procedure 1/2-ODC-3.03, Attachment H Control 3.11.1.2, Attachment L Control 3.11.2.2, and Attachment M Control 3.11.2.3 (considered to be the design objectives).

Radioactive Effluent Release Report

Calendar Year - 2009
Table 5B
Assessment Of Radiation Doses

		Unit 2 Liquid Effluents									
		1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Calendar Year	
	Batch Releases	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit
	Bone	1.35E-02	0.2700	1.33E-02	0.2660	3.56E-03	0.0712	7.83E-03	0.1566	3.82E-02	0.3819
O	Liver	4.53E-02	0.9060	2.61E-02	0.5220	9.09E-03	0.1818	1.29E-02	0.2580	9.34E-02	0.9339
R	Total Body	1.70E-02	1.1333	1.72E-02	1.1467	6.94E-03	0.4627	1.21E-02	0.8067	5.32E-02	1.7747
G	Thyroid	5.37E-03	0.1074	5.51E-03	0.1102	4.02E-03	0.0804	6.49E-03	0.1298	2.14E-02	0.2139
A	Kidney	1.25E-02	0.2500	1.41E-02	0.2820	5.91E-03	0.1182	8.52E-03	0.1704	4.10E-02	0.4103
N	Lung	7.61E-03	0.1522	7.63E-03	0.1526	4.61E-03	0.0922	7.19E-03	0.1438	2.70E-02	0.2704
(1)	GI-LLI	7.77E-03	0.1554	1.23E-02	0.2460	6.62E-03	0.1324	1.40E-02	0.2800	4.07E-02	0.4069

		Unit 2 Gaseous Effluents									
		1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Calendar Year	
	Batch & Continuous Releases	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit	Dose	% of ODCM Limit
(2)	Gamma Air	0.00E+00	0.0000	7.27E-08	0.0000	1.13E-01	2.2600	5.17E-08	0.0000	1.13E-01	1.1300
(2)	Beta Air	0.00E+00	0.0000	3.42E-10	0.0000	3.98E-02	0.3980	1.77E-10	0.0000	3.98E-02	0.1990
	Bone	0.00E+00	0.0000	3.00E-10	0.0000	2.10E-07	0.0000	1.87E-04	0.0025	1.87E-04	0.0012
O	Liver	2.78E-03	0.0371	1.72E-03	0.0229	3.11E-04	0.0041	1.81E-02	0.2419	2.30E-02	0.1530
R	Total Body	2.78E-03	0.0371	1.72E-03	0.0229	3.11E-04	0.0041	1.81E-02	0.2419	2.30E-02	0.1530
G	Thyroid	2.78E-03	0.0371	1.72E-03	0.0229	3.76E-04	0.0050	1.81E-02	0.2413	2.30E-02	0.1532
A	Kidney	2.78E-03	0.0371	1.72E-03	0.0229	3.11E-04	0.0041	1.81E-02	0.2413	2.29E-02	0.1527
N	Lung	2.78E-03	0.0371	1.72E-03	0.0229	3.11E-04	0.0041	1.83E-02	0.2440	2.31E-02	0.1541
(3)	GI-LLI	2.78E-03	0.0371	1.72E-03	0.0229	3.11E-04	0.0041	1.82E-02	0.2427	2.30E-02	0.1534

(1) These doses are listed in mrem; they are calculated for the maximum individual for all batch liquid effluents

(2) These doses are listed in mrad; they are calculated at the site boundary for batch & continuous gaseous effluents (0.4 miles NW)

(3) These doses are listed in mrem; they are calculated for the most likely exposed real individual (child) via all real pathways at 0.89 miles NW.

Limits used for calculation of percent (%) are from ODCM procedure 1/2-ODC-3.03, Attachment H Control 3.11.1.2, Attachment L Control 3.11.2.2, and Attachment M Control 3.11.2.3 (considered to be the design objectives).

Radioactive Effluent Release Report

Calendar Year - 2009
Table 6

Effluent Monitoring Instrumentation Channels Not Returned To Operable Status Within 30 Days

[RM-1DA-100] - Unit 1 Auxiliary Feed Pump Bay Drain Monitor

On 11/16/08 this monitor was removed from service to perform the eighteen (18) month calibration. The installed Model 843-32 detector failed calibration requirements, and several attempts to calibrate new detectors (that were located from old stock and other nuclear power plants) were also unsuccessful. The thirty (30) day criteria was exceeded due to performance of Model 843-32 detectors that are no longer manufactured. An upgraded detector (Model 843-32R) was purchased (which required an updated calibration geometry) and subsequent changes were made to applicable engineering documents, calculation packages and procedures. The monitor was calibrated and returned to operable status on 02/05/09. This condition and associated Corrective Actions are detailed in BVPS Condition Report No. CR 08-50435, CR 08-50765, CR 08-50899, CR 09-52947, CR 09-52964 and BVPS-SAP Order Number 200197646-0700.

As required by ODCM procedure 1/2-ODC-3.03, "Controls for RETS and REMP Programs", (as referenced in procedure Attachment E, Control 3.3.3.9, Table 3.3-12, Action 24), effluent releases via this pathway may continue provided grab samples are analyzed once per 12 hours. However, SINCE this liquid effluent pathway was diverted to the Tunnel Sump / Liquid Radwaste Treatment System on 11/16/08 (and remained diverted until the monitor was returned to operable status on 02/05/09), THEN there were no liquid releases through this effluent pathway. Therefore, grab sampling was not required.

[RM-1VS-109] Ch-7 & Ch-9 - Unit 1 Auxiliary Building Ventilation System (Ventilation Vent) Noble Gas Activity Monitor

On 06/07/09 this monitor was removed from service to perform the eighteen (18) month calibration. The thirty (30) day criteria was exceeded due to additional work being required during the calibration. The computer system did not respond as expected and required parts and repair work. The two monitor channels were calibrated and returned to operable status on 07/29/09. This condition and associated Corrective Actions are detailed in BVPS Condition Report No. CR 09-61459.

As required by ODCM procedure 1/2-ODC-3.03, "Controls for RETS and REMP Programs", (as referenced in procedure Attachment D, Control 3.3.3.1, Table 3.3-6, Action 35), effluent releases via this pathway may continue provided the preplanned alternate method of monitoring of appropriate parameters is imitated. [RM-1VS-111] Unit 1 Ventilation Vent is the first Preplanned Method of Monitoring and was in-service during the maintenance and calibration of [RM-1VS-109].

Radioactive Effluent Release Report

Calendar Year - 2009

Table 7

Total Dose Commitments, Total Effective Dose Equivalents and Population Doses

Total Dose Commitment From All Facility Releases To Members of the Public 40 CFR 190.10(a) Environmental Doses				
Organ	(1) Effluent Dose (mrem)	(2) Direct Radiation Dose (mrem)	Total Dose (mrem)	% of ODCM or 40 CFR 190 Limit
Bone	7.70E-02	0.00E+00	7.70E-02	0.31%
Liver	3.41E-01	0.00E+00	3.41E-01	1.36%
Total Body	4.82E-01	0.00E+00	4.82E-01	1.93%
Thyroid	1.97E-01	0.00E+00	1.97E-01	0.26%
Kidney	2.36E-01	0.00E+00	2.36E-01	0.94%
Lung	2.09E-01	0.00E+00	2.09E-01	0.84%
GI-LLI	2.36E-01	0.00E+00	2.36E-01	0.94%

(1) The cumulative dose contributions from liquid and gaseous effluents were determined in accordance with the applicable CONTROLS & SURVEILLANCE REQUIREMENTS listed in ODCM procedure 1/2-ODC-3.03. The dose commitment limits for 40 CFR 190 MEMBERS OF THE PUBLIC (ODCM 1/2-ODC-3.03 Control 3.11.4.1) are as follows:
a) < or = 25 mrem / calendar year (for the total body, or any organ except the thyroid)
b) < or = 75 mrem / calendar year (for the thyroid)

(2) The dose contribution listed for the total body is for Direct Radiation. This was calculated by comparing offsite TLD exposure at the ODCM controlling location (0.8 miles NW; Midland, PA) to TLD exposure at the REMP control location (16.5 miles SSW; Weirton, WV).

Compliance to 100 mrem Limit of 10 CFR 20.1301 For Total Effective Dose Equivalent

Pursuant to 10 CFR 20.1301(a)(1), the Total Effective Dose Equivalent from licensed operation to the maximum individual during the report period, is 2.74 mrem. This is a summation of Direct Radiation Exposure (calculated by comparing the maximum of all perimeter TLD exposures to TLD exposure at the REMP control location) plus Effluent Doses (calculated per the ODCM).

Members of the Public Doses Due To Their Activities Inside The Site Boundary

The radiation doses for MEMBER(S) OF THE PUBLIC due to their activities inside the site boundary are not greater than the doses listed in this table to show compliance with 40 CFR Part 190 or 10 CFR 20.1301. Evaluations have shown that exposure time for individuals not occupationally associated with the plant site is minimal in comparison to the exposure time considered for the dose calculation at or beyond the site boundary. Therefore, a separate assessment of radiation doses from radioactive effluents to MEMBER(S) OF THE PUBLIC, due to their activities inside the site boundary, is not necessary for this report period.

0-50 Mile Population Doses From Liquid and Gaseous Effluents

0-50 mile Total Population Dose from liquid and gaseous effluents = 621 man-mrem (Total Body)
0-50 mile Average Population Dose from liquid and gaseous effluents = 0.0001553 man-mrem (Total Body)

Radioactive Effluent Release Report

Calendar Year - 2009
Table 8

Offsite Dose Calculation Manual Surveillance Deficiencies
Inability to Include a Filter Paper as Part of the Monthly Composite Particulate Sample The weekly particulate filter paper samples for the weeks of 07/05/09 to 07/12/09 and 11/01/09 to 11/08/09 for the Warehouse Extension Decon Facility were unable to be located for inclusion in the monthly composite analysis. The Warehouse Extension Decon Facility is monitored as required by OCDM procedure 1/2-ODC-3.03 as an effluent pathway. The particulate filter paper samples from this area are included in the monthly composite analysis for Gross Alpha and Sr-89 and Sr-90. An extensive search was conducted to locate these filter papers but they were never located. Analysis data was available for I-133, I-131 and principle gamma emitters. This condition and associated Corrective Actions are detailed in BVPS Condition Report No. CR 09-64033 and CR 10-69838. ODCM procedure 1/2-ODC-3.03, "Controls for RETS and REMP Programs", (as referenced in procedure Attachment K, Control 3.11.2.1, Table 4.11-2), requires a monthly composite for Gross Alpha, Sr-89 and Sr-90. Activity was estimated at Lower Levels of Detection for this release pathway based on the work that occurred in the facility during the time period the sample was collected. Also the results from the monthly composite sample for the same time period were evaluated. No Gross Specific Activity or activity from Sr-89 or Sr-90 was detected for the weeks prior to and after the time periods of the missing particulate filter paper samples.

Radioactive Effluent Release Report

Calendar Year - 2009

Table 9

Unit 1 and 2 Offsite Dose Calculation Manual Changes (Description)
There were two changes made to the Unit 1 and 2 Offsite Dose Calculation Manual during this report period. Change 25 to the ODCM added the Emergency Planning & Preparedness Emergency Action Level Radiation Monitors (EPP-EAL). This changed added the EAL Area Monitors and Process Monitors for both Units that were not specifically required by the ITS, LRM or ODCM. Shortly after the implementation of this change it was determined that the ODCM is not the appropriate document for control of the EPP-EAL monitors. Change 26 removed the changes made during Change 25 and restored the affected ODCM documents to their previous content (Change 24).

Beaver Valley Power Station - Units 1 & 2

Radioactive Effluent Release Report

Calendar Year - 2009
Attachment 1
Joint Frequency Distribution Tables

Attachment 1

As specified in the ODCM, an annual summary of hourly meteorological data (in the form of joint frequency distribution) is provided for the calendar year. In summary the joint frequency distributions for 2009 returned to a more normal distribution than in 2008. During 2009 there were fewer hours of "D" stability and correspondingly more hours of "E" stability class than normally expected. This was probably caused by a combination of normal year-to-year variation and the cooler and wetter than normal conditions that occurred in the Beaver Valley area during 2009.

Meteorological Data Recovery

The Meteorological Data Recovery for the calendar year met the minimum requirement of at-least 90% (as specified in Section 5 of Revision 1 to Regulatory Guide 1.23, Meteorological Monitoring Programs for Nuclear Power Plants). The actual Meteorological Data Recovery is shown in the following table:

PERCENT RECOVERY OF INDIVIDUAL METEOROLOGICAL PARAMETERS
99.4% = Wind Speed 35'
99.4% = Wind Speed 150'
98.3% = Wind Speed 500'
99.4% = Wind Direction 35'
99.4% = Wind Direction 150'
99.4% = Wind Direction 500'
99.4% = Delta Temperature (150' - 35') 1P
99.4% = Delta Temperature (500' - 35') 2P
99.4% = Temperature 35'
99.4% = Precipitation
99.3% = Average Recovery of Individual Meteorological Parameters

PERCENT RECOVERY OF COMPOSITE VARIABLES
99.4% = Wind Speed 35', Wind Direction 35', Delta Temperature 1P
99.4% = Wind Speed 150', Wind Direction 150', Delta Temperature 1P
99.0% = Wind Speed 500', Wind Direction 500', Delta Temperature 2P
99.3% = Average Recovery of Composite Variables

Attachment 1 Clarification

Hourly meteorological data is not provided for specific periods of Abnormal Gaseous Release during the calendar quarters (as indicated in Regulatory Guide 1.21), for the following reasons:

1) All routine Gaseous Releases for the calendar year were determined to be within design objectives, where as, the ODCM Dose Limits and the ODCM Dose Rate Limits are considered to be the design objectives.

2) There were no Abnormal Gaseous Releases during the calendar year.

For a copy of the hourly meteorological data during the calendar quarters, contact Ms. Jennifer Powell-Campbell at 724-682-4209.

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	9	30	1	0	0	0	40
NNE	19	22	2	0	0	0	43
NE	21	16	0	0	0	0	37
ENE	33	47	0	0	0	0	80
E	18	35	0	0	0	0	53
ESE	25	18	0	0	0	0	43
SE	9	10	0	0	0	0	19
SSE	8	9	0	0	0	0	17
S	6	19	0	0	0	0	25
SSW	5	26	1	0	0	0	32
SW	3	31	15	0	0	0	49
WSW	2	35	40	0	0	0	77
W	7	97	25	0	0	0	129
WNW	6	41	10	0	0	0	57
NW	7	31	2	0	0	0	40
NNW	7	25	2	0	0	0	34
Total	185	492	98	0	0	0	775

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	775
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

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Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	7	6	1	0	0	0	14
NNE	4	6	0	0	0	0	10
NE	8	1	0	0	0	0	9
ENE	10	5	0	0	0	0	15
E	5	9	0	0	0	0	14
ESE	6	0	0	0	0	0	6
SE	1	1	0	0	0	0	2
SSE	5	1	0	0	0	0	6
S	1	2	0	0	0	0	3
SSW	5	16	0	0	0	0	21
SW	1	9	7	1	0	0	18
WSW	2	17	12	1	0	0	32
W	3	34	8	0	0	0	45
WNW	4	15	3	0	0	0	22
NW	4	17	0	0	0	0	21
NNW	3	12	1	0	0	0	16
Total	69	151	32	2	0	0	254

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	254
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	8	12	2	0	0	0	22
NNE	5	2	0	0	0	0	7
NE	4	3	0	0	0	0	7
ENE	10	10	0	0	0	0	20
E	6	5	0	0	0	0	11
ESE	2	2	0	0	0	0	4
SE	4	0	0	0	0	0	4
SSE	6	0	0	0	0	0	6
S	1	1	0	0	0	0	2
SSW	2	12	2	0	0	0	16
SW	6	11	8	1	0	0	26
WSW	3	18	6	1	0	0	28
W	6	44	10	0	0	0	60
WNW	4	17	2	0	0	0	23
NW	5	17	1	0	0	0	23
NNW	5	10	2	0	0	0	17
Total	77	164	33	2	0	0	276

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	276
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	76	87	0	0	0	0	163
NNE	69	18	1	0	0	0	88
NE	110	14	0	0	0	0	124
ENE	114	63	0	0	0	0	177
E	74	28	0	0	0	0	102
ESE	28	4	0	0	0	0	32
SE	43	3	0	0	0	0	46
SSE	31	3	0	0	0	0	34
S	30	16	0	0	0	0	46
SSW	40	56	13	0	0	0	109
SW	68	147	101	3	1	0	320
WSW	94	201	127	17	1	0	440
W	83	257	97	10	0	0	447
WNW	87	145	34	0	0	0	266
NW	86	129	7	0	0	0	222
NNW	79	90	1	0	0	0	170
Total	1112	1261	381	30	2	0	2786

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	2786
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	74	17	0	0	0	0	91
NNE	97	9	0	0	0	0	106
NE	166	24	0	0	0	0	190
ENE	212	103	0	0	0	0	315
E	194	35	0	0	0	0	229
ESE	144	8	0	0	0	0	152
SE	140	3	0	0	0	0	143
SSE	139	11	0	0	0	0	150
S	182	21	0	0	0	0	203
SSW	153	57	7	1	0	0	218
SW	121	74	41	2	0	0	238
WSW	76	92	59	8	1	0	236
W	75	62	18	1	0	0	156
WNW	69	29	2	0	0	0	100
NW	102	37	2	0	0	0	141
NNW	93	19	0	0	0	0	112
Total	2037	601	129	12	1	0	2780

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	2780
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	14	1	0	0	0	0	15
NNE	15	0	0	0	0	0	15
NE	40	0	0	0	0	0	40
ENE	60	0	0	0	0	0	60
E	100	0	0	0	0	0	100
ESE	190	0	0	0	0	0	190
SE	219	1	0	0	0	0	220
SSE	167	1	0	0	0	0	168
S	114	2	0	0	0	0	116
SSW	85	13	1	1	0	0	100
SW	39	5	5	1	0	0	50
WSW	18	3	6	5	0	0	32
W	7	1	0	0	0	0	8
WNW	4	0	0	0	0	0	4
NW	15	1	0	0	0	0	16
NNW	8	0	0	0	0	0	8
Total	1095	28	12	7	0	0	1142

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	1142
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP35P **Direction:** DI35P **Lapse:** DT150-35
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	0	0	0	0	0	0	0
NNE	9	0	0	0	0	0	9
NE	13	0	0	0	0	0	13
ENE	15	0	0	0	0	0	15
E	42	0	0	0	0	0	42
ESE	98	0	0	0	0	0	98
SE	197	0	0	0	0	0	197
SSE	124	0	0	0	0	0	124
S	67	1	0	0	0	0	68
SSW	27	5	0	0	0	0	32
SW	26	3	2	0	0	0	31
WSW	11	1	0	0	0	0	12
W	3	0	0	0	0	0	3
WNW	1	0	0	0	0	0	1
NW	13	0	0	0	0	0	13
NNW	2	0	0	0	0	0	2
Total	648	10	2	0	0	0	660

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	660
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 1: Joint Frequency Distribution Tables (35ft)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP35P **Direction:** DI35P **Lapse:** DT150-35

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	188	153	4	0	0	0	345
NNE	218	57	3	0	0	0	278
NE	362	58	0	0	0	0	420
ENE	454	228	0	0	0	0	682
E	439	112	0	0	0	0	551
ESE	493	32	0	0	0	0	525
SE	613	18	0	0	0	0	631
SSE	480	25	0	0	0	0	505
S	401	62	0	0	0	0	463
SSW	317	185	24	2	0	0	528
SW	264	280	179	8	1	0	732
WSW	206	367	250	32	2	0	857
W	184	495	158	11	0	0	848
WNW	175	247	51	0	0	0	473
NW	232	232	12	0	0	0	476
NNW	197	156	6	0	0	0	359
Total	5223	2707	687	53	3	0	8673

Calm Hours not Included above for :	**Total Period**	27
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	8673
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	2	24	17	6	0	0	49
NNE	5	15	16	5	0	0	41
NE	2	23	9	0	0	0	34
ENE	3	31	32	3	0	0	69
E	1	46	27	0	0	0	74
ESE	0	18	21	0	0	0	39
SE	1	15	14	2	0	0	32
SSE	0	13	7	1	0	0	21
S	0	17	18	2	0	0	37
SSW	0	7	12	1	0	0	20
SW	2	12	8	5	0	0	27
WSW	1	5	34	21	1	0	62
W	4	32	54	27	5	0	122
WNW	0	17	46	25	2	0	90
NW	6	9	15	0	0	0	30
NNW	1	16	11	0	0	0	28
Total	28	300	341	98	8	0	775

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	775
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	1	9	6	2	0	0	18
NNE	3	4	3	0	0	0	10
NE	1	8	1	0	0	0	10
ENE	1	8	4	1	0	0	14
E	0	8	8	0	0	0	16
ESE	2	5	1	0	0	0	8
SE	0	4	0	1	0	0	5
SSE	1	4	1	0	0	0	6
S	0	3	12	0	0	0	15
SSW	0	4	7	1	0	0	12
SW	1	1	5	5	0	0	12
WSW	0	3	7	4	1	0	15
W	1	16	22	12	2	1	54
WNW	2	15	8	5	2	0	32
NW	0	4	6	0	0	0	10
NNW	2	10	5	0	0	0	17
Total	15	106	96	31	5	1	254

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	254
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	1	12	10	1	0	0	24
NNE	1	6	3	0	0	0	10
NE	1	1	2	0	0	0	4
ENE	0	9	7	0	0	0	16
E	0	10	5	0	0	0	15
ESE	0	5	1	0	0	0	6
SE	1	6	3	0	0	0	10
SSE	0	1	4	0	0	0	5
S	1	2	5	1	0	0	9
SSW	1	4	4	1	0	0	10
SW	1	6	5	1	0	0	13
WSW	4	1	10	8	1	0	24
W	1	20	25	13	2	0	61
WNW	0	13	18	4	2	0	37
NW	3	8	6	0	0	0	17
NNW	1	9	5	0	0	0	15
Total	16	113	113	29	5	0	276

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	276
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	31	87	49	6	0	0	173
NNE	24	55	12	6	0	0	97
NE	32	49	13	0	0	0	94
ENE	24	101	49	1	0	0	175
E	9	59	28	1	0	0	97
ESE	8	25	8	1	0	0	42
SE	12	24	14	0	0	0	50
SSE	9	28	9	0	0	0	46
S	10	28	25	1	0	0	64
SSW	23	35	42	8	0	0	108
SW	21	52	116	34	2	0	225
WSW	41	82	113	50	13	3	302
W	45	126	233	173	44	9	630
WNW	25	128	148	54	5	0	360
NW	29	84	67	5	0	0	185
NNW	22	75	41	0	0	0	138
Total	365	1038	967	340	64	12	2786

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	2786
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	65	41	12	0	0	0	118
NNE	90	40	8	0	0	0	138
NE	98	67	11	0	0	0	176
ENE	81	249	111	2	0	0	443
E	48	63	41	4	0	0	156
ESE	28	35	13	0	0	0	76
SE	34	58	11	0	0	0	103
SSE	33	40	22	0	0	0	95
S	46	61	37	1	0	0	145
SSW	70	65	36	5	1	0	177
SW	87	74	60	21	0	1	243
WSW	78	79	57	28	5	1	248
W	54	84	81	46	14	1	280
WNW	31	115	43	7	1	0	197
NW	29	69	19	0	0	0	117
NNW	31	40	1	0	0	0	72
Total	903	1180	563	114	21	3	2784

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	2784
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	71	11	1	0	0	0	83
NNE	116	15	0	0	0	0	131
NE	85	58	1	0	0	0	144
ENE	52	66	3	0	0	0	121
E	29	20	0	0	0	0	49
ESE	16	4	0	0	0	0	20
SE	19	6	2	0	0	0	27
SSE	13	9	3	0	0	0	25
S	41	16	2	0	0	0	59
SSW	96	43	5	1	1	0	146
SW	83	51	16	3	0	0	153
WSW	42	25	5	3	2	3	80
W	26	14	1	2	0	1	44
WNW	10	13	3	0	0	0	26
NW	15	5	1	0	0	0	21
NNW	21	7	0	0	0	0	28
Total	735	363	43	9	3	4	1157

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	1157
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	38	2	0	0	0	0	40
NNE	52	17	0	0	0	0	69
NE	52	26	2	0	0	0	80
ENE	27	26	2	0	0	0	55
E	16	12	0	0	0	0	28
ESE	8	5	0	0	0	0	13
SE	8	5	1	0	0	0	14
SSE	9	8	3	0	0	0	20
S	20	24	0	0	0	0	44
SSW	43	34	0	0	0	0	77
SW	66	31	3	1	0	0	101
WSW	35	20	5	0	0	0	60
W	12	1	1	0	0	0	14
WNW	14	0	0	0	0	0	14
NW	20	0	0	0	0	0	20
NNW	15	1	0	0	0	0	16
Total	435	212	17	1	0	0	665

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	665
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 2: Joint Frequency Distribution Tables (150ft)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00

Elevation: **Speed:** SP150P **Direction:** DI150P **Lapse:** DT150-35

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	209	186	95	15	0	0	505
NNE	291	152	42	11	0	0	496
NE	271	232	39	0	0	0	542
ENE	188	490	208	7	0	0	893
E	103	218	109	5	0	0	435
ESE	62	97	44	1	0	0	204
SE	75	118	45	3	0	0	241
SSE	65	103	49	1	0	0	218
S	118	151	99	5	0	0	373
SSW	233	192	106	17	2	0	550
SW	261	227	213	70	2	1	774
WSW	201	215	231	114	23	7	791
W	143	293	417	273	67	12	1205
WNW	82	301	266	95	12	0	756
NW	102	179	114	5	0	0	400
NNW	93	158	63	0	0	0	314
Total	2497	3312	2140	622	106	20	8697

Calm Hours not Included above for :	**Total Period**	3
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	60
Valid Hours for this Stability Class for:	**Total Period**	8697
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	1	0	0	0	2
ENE	0	0	2	0	0	0	2
E	0	0	0	0	0	0	0
ESE	0	0	1	0	0	0	1
SE	0	1	2	0	0	0	3
SSE	0	0	0	0	0	0	0
S	0	0	1	0	1	0	2
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	1	0	0	0	1
W	0	1	1	0	0	0	2
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Total	0	3	9	0	1	0	13

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	13
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	2	5	3	0	0	10
E	0	3	11	0	0	0	14
ESE	0	0	2	2	0	0	4
SE	0	3	2	0	0	0	5
SSE	0	0	3	0	0	0	3
S	0	0	1	0	0	0	1
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	1	0	0	1
W	0	1	0	0	0	0	1
WNW	1	0	1	0	0	0	2
NW	0	0	0	0	0	0	0
NNW	0	0	1	0	0	0	1
Total	1	9	26	6	0	0	42

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	42
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	2	7	1	0	0	10
NNE	0	0	3	0	0	0	3
NE	0	0	3	1	0	0	4
ENE	0	6	12	2	0	0	20
E	0	5	8	4	0	0	17
ESE	0	4	7	2	0	0	13
SE	0	2	2	2	0	0	6
SSE	0	1	6	0	0	0	7
S	0	2	11	0	0	0	13
SSW	0	2	3	4	1	0	10
SW	1	2	3	0	1	0	7
WSW	0	0	4	1	0	0	5
W	0	1	7	7	1	0	16
WNW	0	2	7	12	4	2	27
NW	0	0	6	0	0	0	6
NNW	0	3	2	0	0	0	5
Total	1	32	91	36	7	2	169

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	169
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

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Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: Speed: SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	23	72	151	74	2	0	322
NNE	29	29	32	18	0	0	108
NE	17	57	32	5	0	0	111
ENE	21	64	126	54	2	0	267
E	18	113	185	46	2	0	364
ESE	19	72	90	46	7	0	234
SE	11	46	70	28	7	0	162
SSE	8	28	61	36	3	0	136
S	11	30	62	45	12	0	160
SSW	11	23	80	70	15	1	200
SW	15	29	118	202	63	12	439
WSW	27	56	133	172	85	49	522
W	19	64	249	283	148	55	818
WNW	20	76	245	170	71	12	594
NW	12	59	126	74	2	0	273
NNW	15	82	149	32	0	0	278
Total	276	900	1909	1355	419	129	4988

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	4988
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	19	36	32	20	0	0	107
NNE	20	32	12	10	0	0	74
NE	37	31	36	7	0	0	111
ENE	31	59	60	11	0	0	161
E	41	79	81	19	0	0	220
ESE	24	39	38	26	5	0	132
SE	30	38	33	23	11	0	135
SSE	20	37	40	24	9	0	130
S	30	31	52	58	5	0	176
SSW	22	23	43	37	13	3	141
SW	42	45	57	72	42	14	272
WSW	57	63	36	12	6	6	180
W	37	92	122	25	5	3	284
WNW	25	56	45	9	0	0	135
NW	18	27	27	8	0	0	80
NNW	17	22	26	7	0	0	72
Total	470	710	740	368	96	26	2410

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	2410
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

Calendar Year – 2009
Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	12	13	5	1	0	0	31
NNE	10	10	0	0	0	0	20
NE	21	19	6	1	0	0	47
ENE	16	46	20	6	0	0	88
E	16	23	2	0	0	0	41
ESE	10	27	13	1	0	0	51
SE	19	22	17	7	0	0	65
SSE	16	25	23	1	1	0	66
S	18	10	21	7	2	0	58
SSW	12	25	28	11	1	0	77
SW	10	25	11	12	7	0	65
WSW	11	30	10	2	0	0	53
W	17	18	26	6	0	0	67
WNW	20	27	10	0	0	0	57
NW	13	15	3	1	0	0	32
NNW	10	6	5	1	0	0	22
Total	231	341	200	57	11	0	840

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	840
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

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Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35
Stability Class G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	> 25	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	1	0	2	0	0	0	3
ENE	0	2	1	0	0	0	3
E	4	1	0	0	0	0	5
ESE	0	1	1	0	0	0	2
SE	2	1	0	0	0	0	3
SSE	5	5	3	0	0	0	13
S	0	7	4	2	0	0	13
SSW	4	3	15	9	0	0	31
SW	5	16	19	8	1	0	49
WSW	1	3	2	0	0	0	6
W	2	2	1	0	0	0	5
WNW	0	2	1	0	0	0	3
NW	0	1	0	0	0	0	1
NNW	0	1	0	0	0	0	1
Total	24	45	49	19	1	0	138

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	138
Total Hours for Period		8760

Beaver Valley Power Station – Units 1 & 2

Radioactive Effluent Release Report

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Attachment 1

Part 3: Joint Frequency Distribution Tables (500ft)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record = 1/1/2009 00:00 - 12/31/2009 23:00
Elevation: **Speed:** SP500P **Direction:** DI500P **Lapse:** DT500-35

Delta Temperature

Wind Speed (mph)

Wind Direction	1 - 4	4 - 8	8 - 13	13 - 19	19 - 25	≥ 25	Total
N	54	123	195	96	2	0	470
NNE	59	71	47	28	0	0	205
NE	76	108	80	14	0	0	278
ENE	68	179	226	76	2	0	551
E	79	224	287	69	2	0	661
ESE	53	143	152	77	12	0	437
SE	62	113	126	60	18	0	379
SSE	49	96	136	61	13	0	355
S	59	80	152	112	20	0	423
SSW	49	76	169	131	30	4	459
SW	73	117	208	294	114	26	832
WSW	96	152	186	188	91	55	768
W	75	179	406	321	154	58	1193
WNW	66	163	309	191	75	14	818
NW	43	102	162	83	2	0	392
NNW	42	114	183	40	0	0	379
Total	1003	2040	3024	1841	535	157	8600

Calm Hours not Included above for :	**Total Period**	2
Variable Direction Hours for:	**Total Period**	0
Invalid Hours for:	**Total Period**	158
Valid Hours for this Stability Class for:	**Total Period**	8600
Total Hours for Period		8760

Beaver Valley Power Station - Units 1 & 2

Radioactive Effluent Release Report

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Attachment 2
Unit 1 and 2 Offsite Dose Calculation Manual Changes

Attachment 2
Attached is a complete copy of the ODCM that includes: Change (26) of the ODCM (Effective: May 2009)

Attachment 2 Clarification
A complete copy of the ODCM has been provided to the following offices: United States Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555-0001 United States Nuclear Regulatory Commission Regional Administrator 475 Allendale Road King of Prussia, PA 19406
For a complete copy of the ODCM, contact Ms. Jennifer Powell-Campbell at 724-682-4209.

RTL A9.690E
Enclosure 3

Beaver Valley Power Station - Units 1 & 2

2009 Annual Radiological Environmental Operating Report

FirstEnergy Nuclear Operating Company
FENOC

Beaver Valley Power Station - Units 1 & 2
Unit 1 License No. DPR-66
Unit 2 License No. NPF-73

EXECUTIVE SUMMARY and INDEX

Report Preparation and Submittal Requirements: The Beaver Valley Power Station (BVPS) Annual Radiological Environmental Operating Report (AREOR) was prepared and submitted in accordance with the requirements contained in the following documents:

- BVPS Integrated Technical Specifications, Administrative Control 5.6.1
- Offsite Dose Calculation Manual (ODCM) procedure 1/2-ODC-3.03, Attachment T, Control 6.9.2, *"Controls for RETS and REMP Programs"*
- BVPS procedure 1/2-ENV-01.05, *"Compliance with Regulatory Guide 1.21 and Technical Specifications"*
- BVPS procedure 1/2-ENV-02.01, *"Description of Overall Radiological Environmental Monitoring Program"*
- NUREG-1301, *"Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors, Generic Letter 89-01, Supplement No.1, April 1991"*
- BVPS CR 09-64044: Deficiencies found in previous REMP Land Use Census Reports
- BVPS CR 09-65670: REMP TLD Location #55 Removed/Discarded
- BVPS CR 09-65940: Vendor laboratory reports anomalous REMP data for location 2.1
- BVPS CR 09-66654: Missed REMP Sample for the Month of September
- BVPS SAP Order No. 200197646-0770 is associated with documenting upstream (control location) surface water I-131 analyses above the reporting level.
- BVPS SAP Order No. 200197646-0820 is associated with documenting unusual gross beta analysis results of air particulate filter media.
- BVPS SAP Order No. 200197646-0850 is associated with documenting the interruption of air particulate and iodine sampling.
- BVPS SAP Order No. 200197646-0860 is associated with documenting missing thermoluminescent dosimeters (TLDs) in the field.
- BVPS SAP Order No. 200197646-0870 is associated with documenting an anomalous data report.
- BVPS SAP Order No. 200197646-0880 is associated with documenting a missed Feedstuff sample.

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Report Overview:

The AREOR provides a detailed summary of the BVPS Radiological Environmental Monitoring Program (REMP). During the report period, samples of air, water, shoreline sediment, milk, fish, food crops, feed crops, vegetation, and direct radiation (in the vicinity of the BVPS site) have been measured, analyzed, evaluated, and summarized. During the report period, the BVPS radioactive effluent releases (as performed in accordance with the Radiological Effluent Technical Specification (RETS) program), did not exceed the limits identified in the BVPS Operating License Technical Specifications, and/or the ODCM. The results of the REMP verify that the effluent releases did not impact the environment with measurable concentration of radioactive materials and/or levels of radiation that are higher than expected.

Description of Pre-operational REMP (1974 – 1975):

A pre-operational REMP program was performed during the period 1974 through 1975. At that time, samples were collected and analyzed to determine the amount of radioactivity present in the environment prior to BVPS operation. The resulting values are considered a "baseline" to which current sample analyses can be compared. A summary of the pre-operational data is summarized in Table 2-3 of this report.

Description of Operational REMP (1976 – Present):

The operational REMP program was initiated during calendar year 1976 and continued through the report period. During the past thirty-four (34) years, radiation and radioactivity in the environment was monitored within a 10-mile radius of the site. A description of the operational REMP program is outlined in Table 2-1 of this report. In general, two (2) types of samples were collected and compared during the report period, and are described as follows:

- **Control Samples:** These samples are collected from areas that are beyond measurable influence of BVPS operation, and are used as reference data. Normal background radiation levels, or radiation present due to causes other than BVPS operation, can thus be compared to the environment surrounding the BVPS site. During the report period, three hundred fifty eight (358) analyses were performed on samples from the control locations. In addition, eight (8) analyses were completed for TLDs at the control locations. Results of the analyses from the control locations are summarized in Table 2-2 of this report.

- **Indicator Samples:** Indicator samples are collected to determine the radiological impact of BVPS operation in the environment. These samples are collected from various locations near the BVPS site. At a minimum, the samples are collected from areas where the BVPS contribution would indicate the most significant radiological impact. During the report period, one thousand five hundred sixteen (1516) analyses were performed on samples collected from ninety one (91) indicator locations. In addition, five hundred two (502) analyses were completed for TLDs at the indicator locations. Results of the analyses from the indicator locations are also summarized in Table 2-2 of this report.

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- **Comparisons:** Current analysis results from the indicator samples were compared to both current control sample values and the pre-operational baseline to determine if changes in radioactivity levels were attributable to BVPS operation.

Determination of Environmental Impact

- **2009 Sample Media and Analyses:** Results for drinking water, surface water, precipitation, groundwater, shoreline stream sediment, fish, cow milk, goat milk, feedstuff, foodcrops, air particulate and air radioiodine media remained consistent with previous data. Minor increases and decreases were noted in most sample media, and any positive results attributable to the BVPS operation were consistent with station data of authorized radioactive discharges, and were within limits permitted by the operating license and the ODCM. 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).

- **Airborne Exposure Pathway:** This ODCM required pathway was evaluated via sampling of airborne radioiodine and airborne particulates. The results during this report period 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.

- **Direct Exposure Pathway:** This ODCM required pathway was evaluated via measurement of environmental radiation doses by use of Thermo-Luminescent Dosimeters (TLDs). The results of TLD processing have indicated a stable trend and compare well with previous years.

- **Ingestion Exposure Pathway:** This ODCM required pathway was evaluated via sampling of milk, fish, and foodcrops (leafy vegetables).

  For milk samples, Strontium-90 (attributable to past atmospheric weapons testing), was detected at levels similar to those of previous years. The gamma spectrometry analyses only indicated positive results for naturally occurring Potassium-40 at average environmental levels. No other radionuclides were identified.

  The fish samples indicated below LLD levels in each of the sample analyses.

  Foodcrop (leafy vegetation) samples indicated naturally occurring Potassium-40 at average environmental levels.

- **Waterborne Exposure Pathway:** This ODCM pathway was evaluated via samples of drinking water, ground (well) water, surface (river) water and river sediment.

  Water samples were analyzed for tritium and gamma-emitting radionuclides. Tritium was not identified in any of these water samples. Iodine-131 analysis of drinking water indicated

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positive analyses, but the values were consistent with Iodine-131 at the upstream surface (river) water control location, and was not due to liquid effluent releases from BVPS.

Sediment samples were collected from upstream of the site, at the discharge point of BVPS liquid effluent releases, and downstream of the site. Analysis of samples indicated naturally occurring radionuclides Potassium-40, Thallium-208, Bismuth-214, Lead-212, Lead-214, Radium-226, and Actinium-228 in all results. The analyses also indicated Cesium-137, but the values were consistent with Cesium-137 at the control location, and most likely due from previous nuclear weapons tests. Cobalt-58, Cobalt-60 and Zinc-65 were identified in some of the samples that were obtained at the shoreline of the BVPS main outfall facility. This is not unusual, because the BVPS site discharges Cobalt-58, Cobalt-60 and Zinc-65 in liquid waste effluents. The activity detected at this sample location is consistent with discharge data of authorized liquid effluent releases, and all liquid effluent releases during the report period did not exceed the release concentration limits set forth in the ODCM.

- **Other Exposure Pathways:** In addition to the samples collected from the exposure pathways described above, other media (i.e., precipitation, feedstuff and soil) were also collected. Results were consistent with previous years, with no degrading trends.

- **Offsite Groundwater Monitoring:** A total of six (6) offsite groundwater samples were collected and analyzed for Tritium and by gamma spectrometry during the report period. The samples were collected on a semi-annual basis from three (3) locations within four (4) miles of the site. The locations included one (1) well in Shippingport PA, one (1) well in Hookstown PA, and one (1) well in Georgetown PA. No gamma-emitting radionuclides were detected in the analyses. All tritium results were less than the pre-operational value.

- **Supplemental Sample Sites:** The REMP program includes supplemental sampling sites in addition to the required sites set forth in the ODCM. The supplemental sites include five (5) air sampling sites, one (1) surface water site, three (3) groundwater sites, three (3) precipitation sites, two (2) sediment sites, ten (10) soil sites, one (1) local large dairy, and one (1) milk animal feedstuff site. The soil sites are on a triennial sample frequency. They were sampled in 2009 and are scheduled to be sampled again in 2012.

- **Population Dose vs. Natural Background:** During the report period, the total calculated 0-50 mile population dose was 422 man-mrem (liquid releases), and 199 man-mrem (gaseous releases). The average individual population dose from BVPS operation was much less than <1 mrem. For information, the National Academy of Sciences 1990 BEIR Report shows that the typical dose to an individual from background (natural radiation exposure including radon) is an estimated average of 296 mrem per year. The following graph illustrates that the average individual population dose was not affected from BVPS operation.

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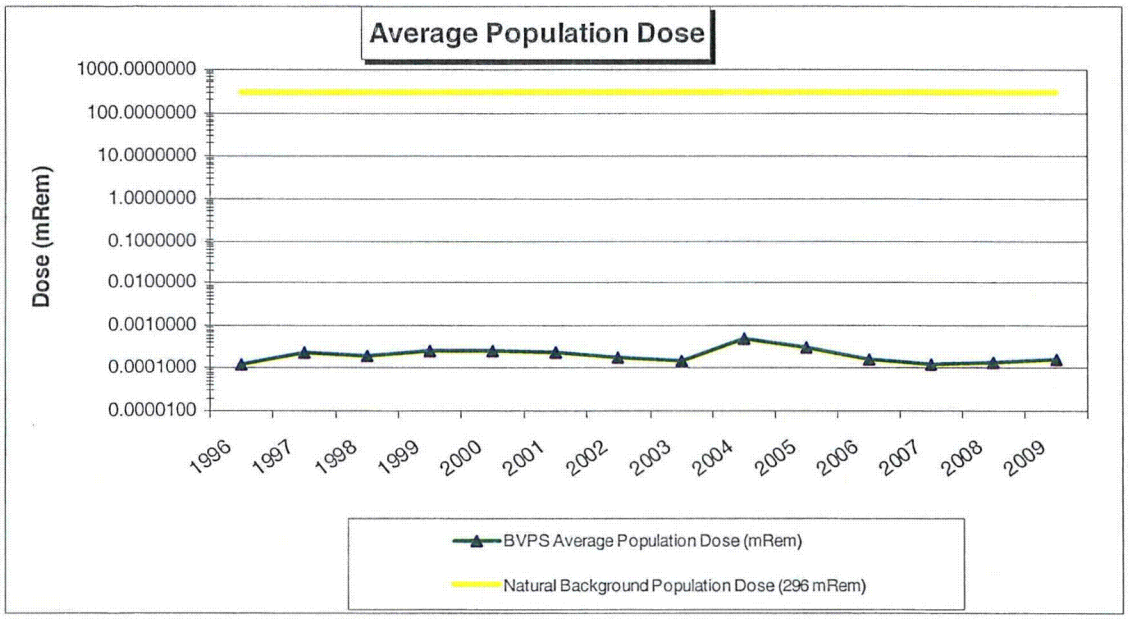
Figure i-1
Graph of Annual Average Population Dose: BVPS Dose and Natural Background Dose



- **Summary:** During the report period, radioactive effluent releases from the BVPS site did not exceed the limits identified in the BVPS Operating License Technical Specifications, and/or the ODCM. The BVPS operational REMP program was followed throughout the report period. The results demonstrate the adequacy of radioactive effluent control at BVPS, and that BVPS operation did not adversely affect the surrounding environment. Positive results attributable to BVPS operation were consistent with station data of authorized radioactive discharges and were within limits permitted by the NRC license and the ODCM. 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).

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Inter-laboratory Comparison Programs:

- **Split Sample Program:** BVPS shared split samples with the Pennsylvania Department of Environmental Protection (PADEP) in support of their nuclear power plant monitoring program. The shared media and number of locations were typically comprised of; milk (1), surface water (3), river sediment (1), fish (1), foodcrops (2), co-located air particulate/air iodine (4), and TLD (24). The split sample program was coordinated by the state, and the results are not provided with this report.

- **Spike Sample Program:** Spiked samples were provided by an independent laboratory and then analyzed by the REMP contractor laboratory. The samples were provided throughout the report period and included water samples, milk samples, filter paper samples and charcoal cartridge samples. All one-hundred-thirteen (113) analyses performed by the contactor laboratory on the spiked samples met the NRC comparison criteria.

Special Reports:

- **SINCE** no reporting levels were exceeded during 2009, **THEN** no Special Reports were required. For information, a Special Report shall be submitted to the NRC when (1) levels of radioactivity in an environmental sampling medium exceeds the limits specified in ODCM procedure 1/2-ODC-3.03, Attachment Q Table 3.12-2, and when (2) the results of the following calculation are $\geq$1.0 (for calculations performed when more than one radionuclide is detected in the sampling medium):

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

Land Use Census Results:

Highlights from the most recent Land Use Census are documented in letter NPD3NRE:0627, dated September 29, 2009 and are summarized as follows:

- Nearest Residence: The location of the Nearest Residence has not changed since the previous census. The Nearest Residence location remains at the Terwilliger Residence, 211 Ferry Hill Road, Shippingport, PA (0.406 miles, in the NE Sector).

- Nearest Garden: The location of the nearest garden has changed since the previous census. The new location is at the Knisley Residence, 175 Kerona Road, Shippingport, PA (0.7 miles, NE). However, the previous sampling location at the Cox Residence, 238 State Route 168, Hookstown, PA (0.760 miles, in the SSW Sector) will remain the primary sample location because the Knisley Residence garden did not contain leafy vegetables most appropriate for sampling (cabbage) this year.

- Nearest Dairy Cow: The nearest dairy cow milked has not changed since the previous census. The location remains at the Searight Dairy, 948 McCleary Road, RD 1, Hookstown, PA (2.097 miles SSW).

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- Nearest Doe Goat: The nearest location has changed since the previous census. The new location is at the Ferry Farm, 227 Calhoun Road, Aliquippa, PA (3.320 miles SE).

- Nearest Beef Cattle: The Beef Cattle locations in each sector were not validated during the current census. This was not performed because (1) the census of Beef Cattle is not required by ODCM Control 3.12.1, and (2) there has been a steady decline in total number of Beef Cattle from 1977 through 2007. All associated sections were removed from the report.

- Prevailing Winds: The prevailing wind direction for Ground Releases was identified by showing the highest D/Q in the East Sector. The prevailing wind direction for Elevated Releases was identified by showing the highest D/Q in the ESE Sector. The REMP properly monitors the environment with air particulate sampling stations in some Sectors and direct radiation TLDs in all Sectors.

- 2010 Dairy Cow Sampling Locations: Using the results of the 2009 Land Use Census, the 2010 dairy cow milk sampling locations will remain at the same locations used in 2009. The locations are; Searight Dairy, 948 McCleary Road, RD1, Hookstown, PA (2.097 miles SSW), Halstead Dairy, 104 Tellish Drive, Hookstown PA (5.079 miles SSW), Brunton Dairy, 3681 Ridge Road, Aliquippa, PA (6.158 miles SE), and Weindsheimer Dairy, RD 1 Burgettstown, PA (10.476 miles SSW).

- 2010 Doe Goat Sampling Locations: Using the results of the 2009 Land Use Census, the 2010 Doe Goat sampling location will be at the Ferry Farm, 227 Calhoun Road, Aliquippa, PA (3.320 miles SE).

- D/Q for Milch Animal Locations: None of the 2009 milch animal sampling locations experienced a >20% increase in deposition parameter (D/Q).

- D/Q for Offsite Dose Determination: There was no adverse effect on the current ODCM methodology used for offsite dose determination from effluent releases. Specifically, a linear regression analysis of D/Q did not yield any valid locations where the offsite dose could have increased >20% more than the offsite dose previously calculated using current ODCM methodology.

- D/Q Historical Comparison: There was no adverse trend in D/Q when comparing data to the ODCM default D/Q values, which validates that there was no adverse effect on the current ODCM methodology used for offsite dose determination from effluent releases. Specifically, the analysis of D/Q did not yield any valid locations where the offsite dose could have increased >20% more than the offsite dose previously calculated using current ODCM methodology. Therefore, a change in ODCM Receptor location and/or a change to meteorology at the current ODCM Receptor location were not required.

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Deviations, Changes and Adjustments to the Normal Sampling Program

- **Deviation from Normal Milk Sampling & Analysis Schedule:** Doe Goat sampling was not available from REMP Location #69, Collins Farm (3.5 miles, SE) because goats were dry for the whole season. Doe goat sampling was available to meet the program requirements from REMP Location #102, Ferry Farm (3.3 miles, SE).

- **Deviation from Normal Surface Water Sampling and Analysis Schedule:** There were no deviations to the surface water sampling and analysis schedule.

- **Deviation from Normal Air Particulate & Iodine Sampling and Analysis Schedule:** The air particulate and iodine sampling stations were interrupted on six (6) separate occasions during the report period. This issue was documented in SAP Order 200197646-0850.

- **Deviation from Normal Direct Radiation Monitoring:** The Direct Radiation Monitoring by Thermoluminescent Dosimeters (TLDs) was missing data from one sample location for one quarterly sample period. This issue was documented in Condition Report 09-65670 and SAP Order 200197646-0860.

- **Deviation from Normal Feedstuff Monitoring:** The Feedstuff Monitoring was missing data from one monthly sample period. This issue was documented in Condition Report 09-66654 and SAP Order 200197646-0880.

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SECTION 1 - INTRODUCTION

A. Radiation Fundamentals

Radiation is the conveyance of energy through space. For example, heat emanating from a stove is a form of radiation, as are light rays, microwaves, and radio waves. All matter consists of atoms, which are comprised of positively charged particles (protons), negatively charged particles (electrons), and non-charged/neutral particles (neutrons). The relatively large particles (protons and neutrons) are packed tightly together in a cluster at the center of the atom called the nucleus, while the smaller particles (electrons) orbit around the nucleus. In an electrically neutral atom, the negative charges of the electrons are balanced by the positive charges of the protons. Due to their dissimilar charges, the protons and electrons have a strong attraction for each other. This holds the atom together. Other attractive forces between the protons and neutrons keep the densely packed protons from repelling each other, and prevent the nucleus from breaking apart.

B. Radiation and Radioactivity

The following provides an alphabetical glossary of terms associated with radiation, radioactivity, and the radioactive decay process. The terms discussed include Alpha Particles, Beta Particles, Gamma Rays, Genetic Effects, Half-life, Ionization, Isotopes, Neutrons, Radiation, Radioactive Decay, Radionuclides and Somatic Effects.

Alpha Particles: Particulate and electromagnetic radiation each travel through matter differently because of their different properties. Alpha particles contain 2 protons and 2 neutrons, are relatively large, and carry an electrical charge of +2. Alpha particles are ejected from the nucleus of a radioactive atom at speeds ranging from 2,000 to 20,000 miles per second. However, due to its comparatively large size, an alpha particle usually does not travel very far before it loses most of its energy through collisions and interactions with other atoms. As a result, a sheet of paper or a few centimeters of air can easily stop alpha particles.

Beta Particles: Beta Particles: Beta particles are very small, and comparatively fast particles, traveling at speeds near the speed of light (186,000 miles per second). Beta particles have an electrical charge of either +1 or -1. Because they are so small and have a low charge, they do not collide and interact as often as alpha particles, so they can travel farther. Beta particles can usually travel through several meters of air, but may be stopped by a thin piece of metal or wood.

Gamma Rays: Gamma rays are pure energy and travel at the speed of light. They have no measurable charge or mass, and generally travel much farther than alpha or beta particles before being absorbed. After repeated interactions, the gamma ray loses its energy and vanishes. The range of a gamma ray in air varies, depending on the ray's energy and interactions. Very high-energy gamma radiation can travel a considerable distance, where as, low energy gamma radiation may travel only a few feet in air. Lead is used as shielding material for gamma radiation because of its density. Several inches of Lead or concrete may be needed to effectively shield gamma rays.

Genetic Effects: The effects of ionizing radiation which are observed in the offspring of the exposed individual that could occur as a result of ionizing radiation interacting with the genes in the human cells.

Half-life: The length of time an atom remains radioactive is defined in terms of half-life, which is the amount of time required for a radioactive substance to lose half of its activity through the process of radioactive decay. Radionuclides that have infrequent emissions have a long half-life, where as, radionuclides that have more frequent emissions have a short half-life.

SECTION 1 - INTRODUCTION

Ionization: Through interactions with atoms, alpha, beta, and gamma radiation lose their energy. When these forms of radiation interact with any form of material, the energy they impart may cause atoms in that material to become **ions**, or charged particles. Normally, an atom has the same number of protons as electrons, thus, the number of positive and negative charges cancel, in which the atom is electrically neutral. When one or more electrons are removed, an ion is formed. Ionization is one of the processes that may result in damage to biological systems.

Isotopes: A group of identical atoms containing the same number of protons make up an element. In fact, the number of protons an atom contains determines its chemical identity. For instance, all atoms with one proton are hydrogen atoms, and all atoms with eight protons are oxygen atoms. However, the number of neutrons in the nucleus of an element may vary. Atoms with the same number of protons but different numbers of neutrons are called isotopes. Different isotopes of the same element have the same chemical properties, and many are stable or non-radioactive. An unstable or radioactive isotope of an element is called a radioisotope, a radioactive atom, or a radionuclide. Radionuclides usually contain an excess amount of energy in the nucleus. The excess energy is usually due to a surplus or deficit in the number of neutrons in the nucleus. Radionuclides such as Uranium-238, Berylium-7 and Potassium-40 occur naturally. Others are man-made, such as Iodine-131, Cesium-137, and Cobalt-60.

Neutrons: Neutrons come from several sources, including the interactions of cosmic radiation with the earth's atmosphere and nuclear reactions within operating nuclear power reactors. However, neutrons are not of environmental concern since the neutron source at nuclear power stations is sealed within the containment building. Because neutrons have no charge, they are able to pass very close to the nuclei of the material through which they are traveling. As a result, neutrons may be captured by one of these nuclei or they may be deflected. When deflected, the neutron loses some of its energy. After a series of these deflections, the neutron has lost most of its energy. At this point, the neutron moves about as slowly as the atoms of the material through which it is traveling, and is called a thermal neutron. In comparison, fast neutrons are much more energetic than thermal neutrons and have greater potential for causing damage to the material through which they travel. Fast neutrons can have from 200 thousand to 200 million times the energy of thermal neutrons. Neutron shielding is designed to slow fast neutrons and absorb thermal neutrons. Neutron shielding materials commonly used to slow neutrons down are water or polyethylene. The shield is then completed with a material such as Cadmium, to absorb the now thermal neutrons. Concrete is also used to form an effective neutron shield because it contains water molecules and can be easily molded around odd shapes.

Radiation: This is the conveyance of energy through space. For instance, heat emanating from a stove is a form of radiation, as are light rays, microwaves, and radio waves. Ionizing radiation is another type of radiation and has similar properties to those of the examples listed above. Ionizing radiation consists of both electromagnetic radiation and particulate radiation. Electromagnetic radiation is energy with no measurable mass that travels with a wave-like motion through space. Included in this category are gamma rays and X-rays. Particulate radiation consists of tiny, fast moving particles which, if unhindered, travel in a straight line through space. The three types of particulate radiation of concern to us are alpha particles, which are made up of 2 protons and 2 neutrons; beta particles, which are essentially free electrons; and neutrons. The properties of these types of radiation will be described more fully in the Range and Shielding section.

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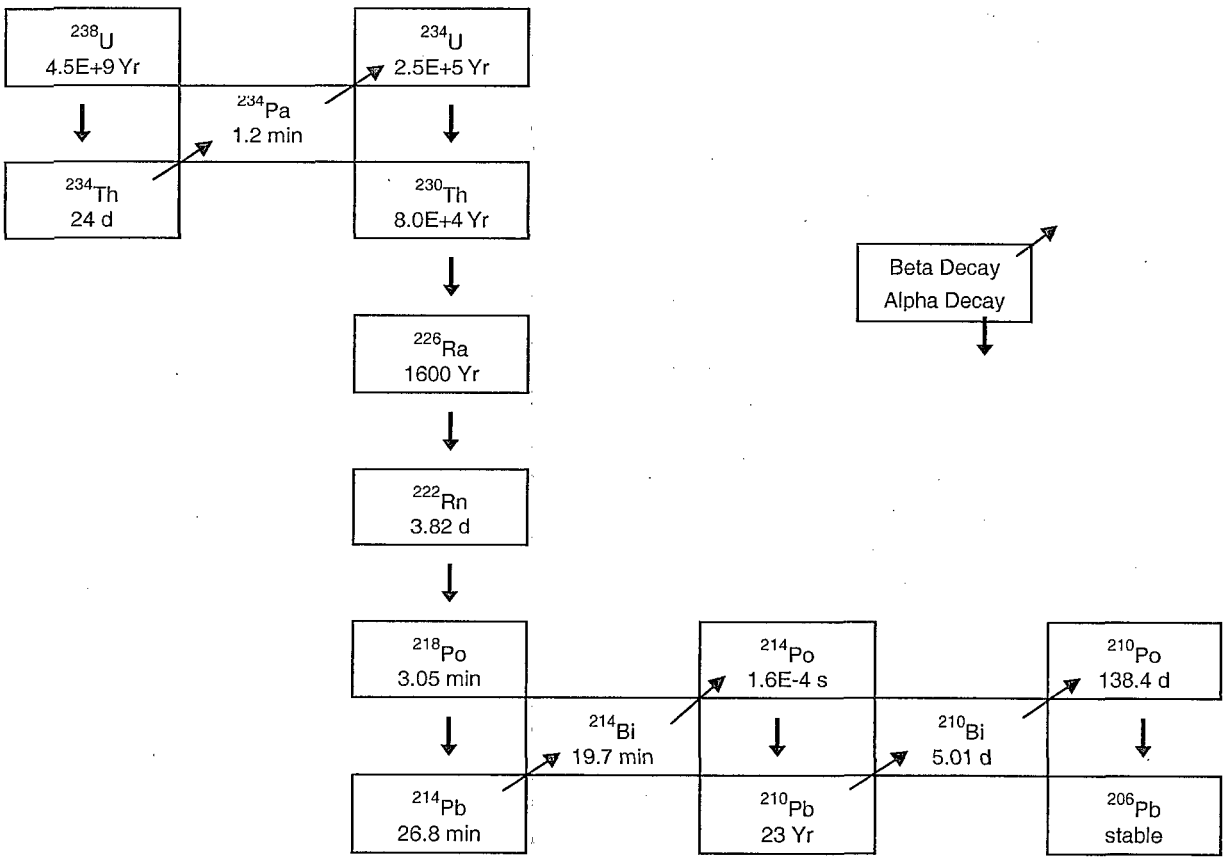
Radioactive Decay: Radioactive atoms, over time, will reach a stable, non-radioactive state through a process known as radioactive decay, which is the release of energy from an atom through the emission of ionizing radiation. Radioactive atoms may decay directly to a stable state or may go through a series of decay stages, called a radioactive decay series, and produce several daughter products that eventually result in a stable atom. The loss of energy through radioactive decay may transform the atom into a chemically different element. For example, when Uranium-238 decays, it emits an alpha particle and, as a result, the atom loses 2 protons and 2 neutrons. Since the number of protons in the nucleus of an atom determines its chemical identity, then when the Uranium-238 atom loses the 2 protons and 2 neutrons, it is transformed into an atom of Thorium-234. Thorium-234 is one of the 14 successive daughter products of Uranium-238. Radon is another daughter product, and the decay series ends with stable Lead-206. The following example is part of a known radioactive decay series, called the Uranium series, which begins with Uranium-238 and ends with Lead-206. The information provided in the upper portion of each block is the isotope name, while the information provided in the lower portion of each block is the half-life.



Radionuclides: See description for "isotopes".

Somatic Effects: The effects of ionizing radiation which develop in the directly exposed individual, including an unborn child. Somatic effects can be divided further into acute and chronic effects. Acute effects develop shortly after exposure to large amount of radiation. Chronic effects are a result of exposure to radiation over an extended period of time.

SECTION 1 - INTRODUCTION

C. Units of Measurement

Activity (Curie): This relates the number of atoms in a sample that disintegrate (decay) per unit of time. Each time an atom disintegrates, radiation is emitted. The curie (Ci) is the unit used to describe the activity of a material and indicates the rate at which the atoms of a radioactive substance are decaying. One curie indicates the disintegration of 37 billion atoms per second. A curie is a unit of activity, not a quantity of material. Thus, the amount of material required to produce one curie varies. A smaller unit of the curie is used when discussing the low concentrations of radioactivity detected in environmental samples. For instance, the picocurie (pCi) represents one trillionth of a curie.

Absorbed Dose (rad): This is a term used to describe the radiation energy absorbed by any material exposed to ionizing radiation, and can be used for both particulate and electromagnetic radiation. The rad is the unit used to measure the absorbed dose. It is defined as the energy of ionizing radiation deposited per gram of absorbing material (1 rad = 100 erg/gm). The rate of absorbed dose is usually given in rad/hr. The rad is not used to quantify biological damage caused by ionizing radiation.

Dose Equivalent (rem): Biological damage due to alpha, beta, gamma and neutron radiation may result from ionizing radiation. Some types of radiation, especially alpha particles which cause dense local ionization, can result in up to 20 times the amount of biological damage for the same energy imparted as do gamma or X-rays. Therefore, a quality factor must be applied to account for the different ionizing capabilities of various types of ionizing radiation. When the quality factor is multiplied by the absorbed dose (Rad), the result is the dose equivalent, which is an estimate of the possible biological damage resulting from exposure to a particular type of ionizing radiation. The dose equivalent is measured in rem. An example of this conversion from absorbed dose (rad) to dose equivalent (rem) uses the quality factor for alpha radiation, which is equal to 20. Thus, 1 Rad of alpha radiation = 20 rem. Since beta and gamma radiation each have a quality factor of 1, then 1 Rad of either beta or gamma radiation = 1 rem. Neutrons have a quality factor ranging from 2 to 10. In terms of radiation, the rem is a relatively large unit. Therefore, a smaller unit, the millirem, is often used, where as, one millirem (mrem) is equal to 1/1000 of a rem.

D. Lower Limit of Detection

The Lower Limit of Detection (LLD) for environmental samples is a calculated value that represents an a-priori (before-the-fact) limit for the smallest concentration (i.e.; pCi per unit mass or volume) of radioactive material in a sample that will be detected with 95% probability, and with 5% probability of falsely concluding that a blank observation represents a real signal. A calculated LLD must consider such analytical variables as standard deviation of the background counting rate, the counting efficiency, the sample size, the fractional radiochemical yield, the radioactive decay constant, and the elapsed time between sample collection and time of counting.

E. Scope and Objectives of the REMP Program

The environmental program consists of environmental monitoring for radioactivity in the vicinity of BVPS. Environmental sampling and analyses include 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 Operating Report (AREOR) for BVPS summarizes the Radiological Environmental

SECTION 1 - INTRODUCTION

Monitoring Program (REMP) conducted by the FirstEnergy Nuclear Operating Company during the report period.

F. Description of the Beaver Valley Site

BVPS is located on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania, on a 453 acre tract of land. The site is approximately one mile from Midland, Pennsylvania; five miles from East Liverpool, Ohio; and twenty-five miles from Pittsburgh, Pennsylvania. Figure 1-1 shows the site location in relation to the principal population centers. Population density in the immediate vicinity of the site is relatively low. The population within a five mile radius of the plant is approximately 15,493 and the only area within the radius, of concentrated population is the Borough of Midland, Pennsylvania, with a population of approximately 3,321.

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 1,078 feet. Plant grade level is approximately 735 feet above sea level.

BVPS 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. During the report period, the Ohio River flow (as obtained from the Corps of Engineers – Water Resources Engineering) at the New Cumberland Dam ranged from 16,000 cubic feet per second (minimum monthly average) to 64,800 cubic feet per second (maximum monthly average). The mean flow during the report period was 36,113 cubic feet per second.

Water temperature of the Ohio River typically varies from 34° Fahrenheit to 75° Fahrenheit. The minimum temperatures occur in January and/or February and maximum temperatures in July and/or 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. The predominant wind direction is typically from the southwest in summer and from the west southwest in winter. The National Climate Data Center (http://www.ncdc.noaa.gov/oa/climate/research/cag3/v4.html) indicates the following data for the Pittsburgh, PA area:

- The total annual precipitation during the report period was 32.27 inches
- The average mean temperature during the report period was 51.0° Fahrenheit

SECTION 1 - INTRODUCTION

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

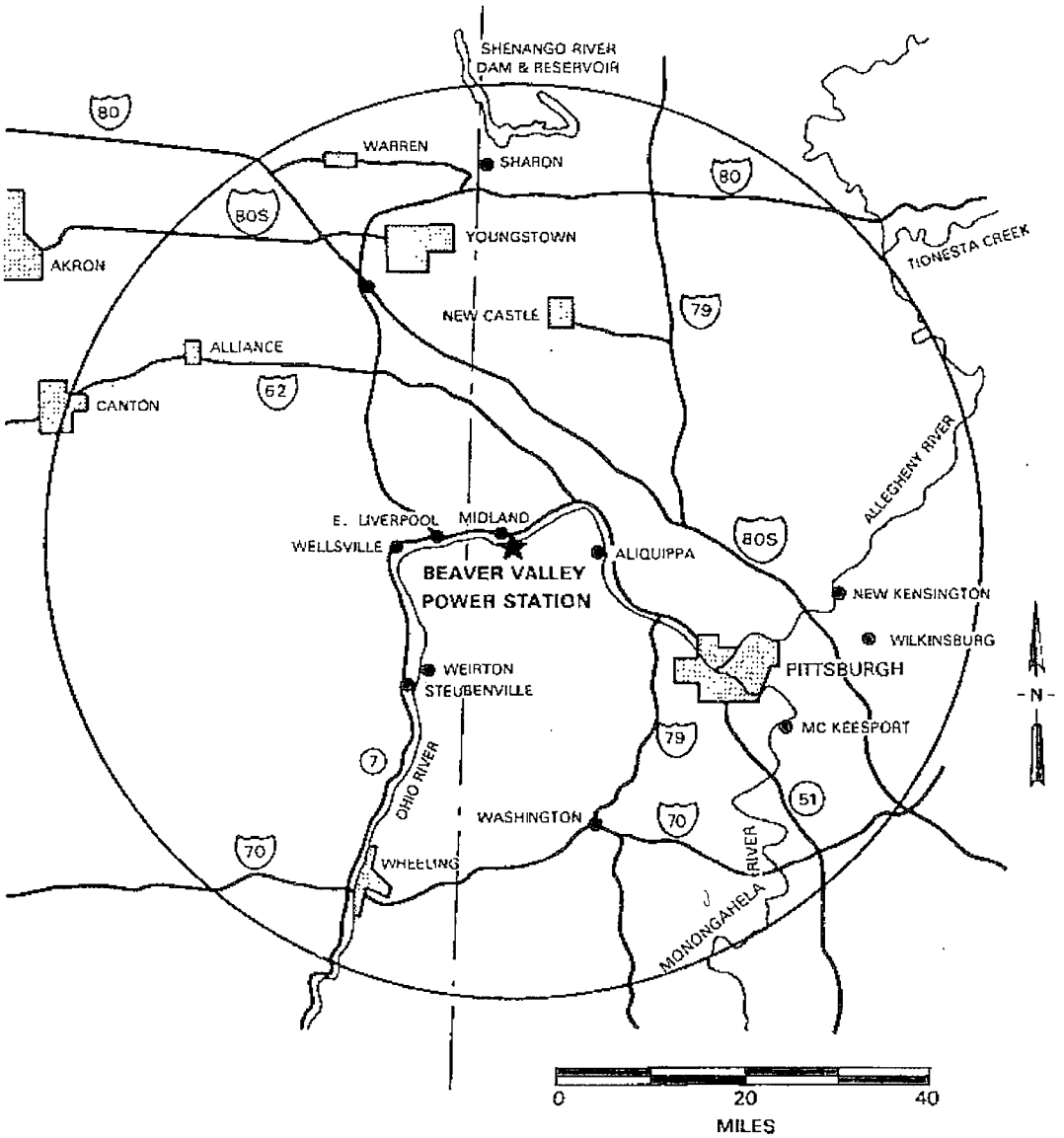
	Beaver Valley Unit 1	Beaver Valley Unit 2
Licensed Power Level	2900 – megawatts thermal	2900 – megawatts thermal
Type of Power	PWR	PWR
No. of Reactor Coolant Loops	3	3
No. of Steam Generators & Type	3 - Vertical	3 - Vertical
Steam Used by Main Turbine	Saturated	Saturated

The BVPS 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.

SECTION 1 - INTRODUCTION

Figure 1-1

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



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

A. Radiological Environmental Monitoring Program

1. Program Description

The program consists of monitoring water, air, soil, river bottoms (sediment), feedstuff, vegetation, foodcrops, cow's milk, ambient radiation levels in areas surrounding the site, and aquatic life as summarized in Table 2-1. Further description of each portion of the program (Sampling Methods, Sample Analysis, Discussion and Results) are included in Sections 2-B through 2-I of this report.

2-B - **Air Monitoring**

2-C - **Monitoring of Shoreline Stream Sediment and Soil**

2-D - **Monitoring of Feedstuff and Foodcrops**

2-E - **Monitoring of Local Cow and Goat Milk**

2-F - **Environmental Radiation Monitoring**

2-G - **Monitoring of Fish**

2-H - **Monitoring of Surface Water, Drinking Water, Groundwater and Precipitation**

2-I - **Estimates of Radiation Dose to Man**

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-1

Operational Radiological Environmental Monitoring Program

Section	Sample Type	Sample Site No.	Sample Location	Sample Frequency	Sample Preparation / Analysis Frequency	Analysis
1	Air Particulate & Radionuclide	13	Hookstown, PA (Old Meyer Farm)	Continuous Sampling with Sample Collection at least weekly	Weekly - Air Particulate Weekly – Charcoal Quarterly Composite [c]	Gross Beta [b] Iodine-131 Gamma Scan
		27	Aliquippa, PA (Brunton Farm)			
		28	Sherman Farm			
		29B	Beaver, Pa (Friendship Ridge)			
		30	Shippingport, PA (Cook's Ferry Substation)			
		32	Midland, PA (North Substation)			
		46.1	Industry, PA (McKeel's Service - Rt. 68)			
		47	East Liverpool, OH (Water Department)			
		48 [a]	Weirton, WV (Water Tower - Collier Way)			
		51	Aliquippa, PA (Sheffield Substation)			
2	Direct Radiation	10	Shippingport, PA (Post Office)	Continuous (TLD)	Quarterly [l]	Gamma Dose
		13	Hookstown, PA (Old Meyer Farm)			
		14	Hookstown, PA			
		15	Georgetown, PA (Post Office)			
		27	Aliquippa, PA (Brunton Farm)			
		28	Sherman Farm			
		29B	Beaver, PA (Friendship Ridge)			
		30	Shippingport, PA (Cook's Ferry Substation)			
		32	Midland, PA (North Substation)			
		33-44	BVPS Site Perimeter Locations			
		45	Raccoon Township, PA (Christian House Baptist Chapel - Rt. 18)			
		45.1	Raccoon Township, PA (Kennedy's Corner)			
		46	Industry, PA (Midway Drive)			
		46.1	Industry, PA (McKeel's Service - Rt. 68)			
		47	East Liverpool, OH (Water Department)			
		48 [a]	Weirton, WV (Water Tower - Collier Way)			
		51	Aliquippa, PA (Sheffield Substation)			
		52-56	BVPS Site Perimeter Locations			
		59	236 Green Hill Road			
		60	Georgetown, PA (444 Hill Road)			
		70	Industry, PA (236 Engle Road)			
		71	Brighton Township, PA (First Western Bank)			
		72	Ohioview, PA (Lutheran Church – Rear)			
		73	618 Squirrel Run Road			
		74	Monaca, PA (37 Poplar Avenue – CCBC)			
		75	Aliquippa, PA (117 Holt Road)			
		76	Raccoon Township, PA (Elementary School)			
		77	Aliquippa, PA (3614 Green Garden Road)			
		78	Raccoon Township, PA (Municipal Building)			
		79	106 Rt. 151 - Ted McWilliams Auto Body			
		80	Raccoon Township, PA (Park Office -Rt. 18)			
		81	Millcreek United Presbyterian, Church			
		82	2697 Rt. 18			
		83	735 Mill Creek Road			
		84	Hancock County, WV (Senior Center)			
		85	2048 Rt. 30			
		86	East Liverpool, OH (1090 Ohio Avenue)			
		87	50103 Calcutta Smith's Ferry Road			
		88	Midland, PA (110 Summit Road)			
		89	Ohioville, PA (488 Smith Ferry Road)			
		90	Midland, PA (6286 Tuscarawras Road)			
		91	Pine Grove Road & Doyle Road			
		92	Georgetown, PA (Georgetown Road Substation)			
		93	104 Linden - Sunrise Hills			
		94	Hookstown, PA (McCleary & Pole Cat Hollow Roads)			
		95	Hookstown, PA (832 McCLeary Road)			
		111-112	BVPS Site Perimeter Locations			

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-1

Operational Radiological Environmental Monitoring Program

Section	Sample Type	Sample Site No.	Sample Location	Sample Frequency	Sample Preparation / Analysis Frequency	Analysis
3	Surface Water	49A [a]	Industry, PA (Upstream of Montgomery Dam)	Weekly Grab Sample [h]	Weekly Sample from Site49 only	Iodine-131
		2.1	Midland, PA (ATI Allegheny Ludlam)	Weekly Intermittent Composite Sample [h]	Monthly Composite of Weekly Sample [c]	Gamma Scan
		5	East Liverpool, OH (Water Department)	Daily Grab Sample Collected Weekly [h]	Quarterly Composite [c]	Tritium (H-3)
4	Groundwater	11 [a] 14A 15B	Shippingport, PA (Upstream) Hookstown, PA (Downstream) Georgetown, PA (Downstream)	Semi-Annual	Semi-Annual	Gamma Scan Tritium (H-3)
5	Drinking Water	4 5	Midland, PA (Water Department) East Liverpool, OH (Water Department)	Intermittent [d] Sample Collected Weekly	Weekly Composite of Daily sample [d] Monthly Composite [d] Quarterly Composite [d]	Iodine-131 Gamma Scan Tritium (H-3)
6	Shoreline Sediment	2A 49A[a] 50	BVPS Outfall Vicinity Industry, PA (Upstream of Montgomery Dam) New Cumberland, WV (Upstream of Dam)	Semi-Annual	Semi-Annual	Gamma Scan
7	Milk	25	Hookstown, PA (Searight Farm)	Weekly [e]	Weekly Samples from Searight only	Weekly Iodine-131 from Searight only
		27a [k] 69 [k] 96 [a] 102 [k] 113 [k]	Aliquippa, PA (Brunton Farm) Aliquippa, PA (Collins Farm) Burgettstown, PA (Windsheimer Farm) Aliquippa, PA (Ferry Farm) Hookstown, PA (Halstead Farm)	Biweekly [f] When animals are on pasture; monthly at other times	All other samples & analyses are Biweekly during grazing, but Monthly during other times	Gamma Scan Iodine-131 Strontium-89 Strontium-90
8	Fish	2A 49A[a]	BVPS Outfall Vicinity Industry, PA (Upstream of Montgomery Dam)	Semi-Annual	Composite of edible parts by species [g]	Gamma Scan on edible parts
9	Food Products	10A/B 15A 46A 48A[a]	Shippingport, PA Georgetown, PA Industry, PA Weirton, WV	Annual at Harvest if available	Composite of each sample species	Gamma Scan Iodine-131 on green leafy vegetables
10	Feedstuff & Summer Forage	25	Hookstown, PA (Searight Farm)	Monthly	Monthly	Gamma Scan
11	Soil	13A 22 27B 29A 30A 32A 46B 47A 48 [a] 51A	Hookstown, PA (Old Meyer Farm) South of BVPS, Transmission Lines Aliquippa, PA (Brunton Farm) Beaver, PA (Nicol Farm) Shippingport, PA (Cook's Ferry Substation) Midland, PA (North Substation) Industry, PA (Willows Inn - Rt. 68) East Liverpool, OH (Water Department) Weirton WV (Water Tower - Collier Way) Aliquippa, PA (Sheffield Substation)	Every Three (3) Years (1997, 2000, 2003)	12 Core Samples 3" Deep (2" diameter at each location approx. 10' radius)	Gamma Scan
12	Precipitation	30 47 48 [a]	Shippingport, PA (Cook's Ferry Substation) East Liverpool, OH (Water Department) Weirton WV (Water Tower–Collier Way)	Weekly grab samples when available	Quarterly Composite [c]	Gamma Scan Tritium (H-3)

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-1

Operational Radiological Environmental Monitoring Program

Notes for Table 2-1

(a) Control Sample Station: These Locations which are presumed to be outside the influence of plant effluents.

(b) Particulate Samples are not counted within 24 hours after filter change. Perform Gamma isotopic analysis on each sample when gross beta is greater than 10 times the yearly mean of control samples.

(c) Long-term composite samples are obtained from short-term composite samples at the specified locations.

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

(e) Weekly milk sample from the Searight Dairy is analyzed for Iodine-131 only.

(f) Milk samples are collected bi-weekly when animals are grazing. The milk samples are collected monthly at other times.

(g) The fish samples contain whatever species are available.
IF adequate sample size is available, THEN the sample is separated according to species, and compositing will provide one sample of each species.
IF adequate sample size is not available, THEN separation by species is not practical. Therefore edible parts of all fish in the sample are mixed to provide one sample.

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

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

(k) ODCM procedure 1/2-ODC-3.03, Attachment Q, Table 3.12-1 requires three (3) dairies to be selected on basis of highest potential thyroid dose using milch census data. See Section 2-E of this report (Monitoring of Local Cows Milk) for specific locations sampled.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

2. Summary of Results

All results of this monitoring program are summarized in Table 2-2. This table is prepared in the format specified by the NRC via the Branch Technical Position in NUREG-1301, and in accordance with Beaver Valley Power Station Offsite Dose Calculation Manual. Summaries of results of analysis of each media are discussed in Sections 2-B through 2-H and an assessment of radiation doses are given in Section 2-I. Table 2-3 summarizes BVPS pre-operational ranges for the various sampling media during the years 1974 and 1975. Comparisons of pre-operational data with operational data indicate the ranges of values are 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).

The conclusion from all program data is that the operation of BVPS has resulted in no significant changes to the environment.

3. Quality Control Program

The Quality Control Program implemented by BVPS to assure reliable performance by the contractor and the supporting QC data are presented and discussed in Section 4 of this report.

4. Program Changes

There were no changes of significance to the sampling program during the report period.

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Air Particulate and Radioiodine
Unit of Measurement: (pico Curies / cubic meter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gross Beta 519	< 0.002	0.024 (467 / 467) 0.009 - 0.045	No. 47 East Liverpool, OH Water Department 4.9 miles WNW	0.027 (52 / 52) 0.012 - 0.045	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	0.025 (52 / 52) 0.011 - 0.035	0
I-131 519	< 0.04	LLD (0 / 467)		LLD (0 / 467)		LLD (0 / 52)	0
Gamma 40							
Be-7	NA	0.088 (36 / 36) 0.056 - 0.112	No. 30 Shippingport, PA Cook's Ferry Substation 0.5 miles ENE	0.097 (4 / 4) 0.075 - 0.112	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	0.091 (4 / 4) 0.069 - 0.115	NA
Co-60	NA	LLD (0 / 36)		LLD (0 / 36)		LLD (0 / 4)	NA
Cs-134	< 0.0005	LLD (0 / 36)		LLD (0 / 36)		LLD (0 / 4)	0
Cs-137	< 0.0005	LLD (0 / 36)		LLD (0 / 36)		LLD (0 / 4)	0
Ba-La-140	NA	LLD (0 / 36)		LLD (0 / 36)		LLD (0 / 4)	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Drinking Water
Unit of Measurement: (pico Curies / liter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
I-131 165	< 0.5	0.6 (55 / 104) 0.2 - 1.5	No. 4 Midland Water Dept. 1.3 miles NW	0.6 (29 / 52) 0.2 - 1.5	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	0.8 (43 / 52) 0.3 - 2.4	0
H-3 12	< 200	LLD (0 / 8)		LLD (0 / 4)		LLD (0 / 4)	0
Gamma 36							
Mn-54	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Fe-59	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Co-58	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Co-60	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Zn-65	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Zr-Nb-95	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Cs-134	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Cs-137	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Ba-La-140	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Surface Water
Unit of Measurement: (pico Curies / liter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
I-131 52	< 0.5				No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	0.8 (43 / 52) 0.3 - 2.4	0
H-3 12	< 200	LLD (0 / 8)		LLD (0 / 4)		LLD (0 / 4)	0
Gamma 36							
Mn-54	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Fe-59	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Co-58	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Co-60	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Zn-65	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Zr-Nb-95	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Cs-134	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Cs-137	< 5	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0
Ba-La-140	< 10	LLD (0 / 24)		LLD (0 / 24)		LLD (0 / 12)	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Ground Water
Unit of Measurement: (pico Curies / liter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
H-3 6	< 200	LLD (0 / 4)		LLD (0 / 4)	No. 11 Shippingport, PA Upstream 0.8 miles NE	LLD (0 / 2)	0
Gamma 6							
Mn-54	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Fe-59	< 10	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Co-58	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Co-60	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Zn-65	< 10	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Zr-Nb-95	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Cs-134	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Cs-137	< 5	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Ba-La-140	< 10	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Precipitation Water
Unit of Measurement: (pico Curies / liter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
H-3 12	< 200	195 (2 / 8) 181 - 208	No. 30 Shippingport, PA Cook's Ferry Substation 0.5 miles ENE	208 (1 / 8) 208 - 208	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	LLD (0 / 4)	0
Gamma 12							
Mn-54	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Fe-59	< 10	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Co-58	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Co-60	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Zn-65	< 10	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Zr-Nb-95	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Cs-134	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Cs-137	< 5	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0
Ba-La-140	< 10	LLD (0 / 8)		LLD (0 / 8)		LLD (0 / 4)	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Milk
Unit of Measurement: (pico Curies / liter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
I-131 126	< 0.5	LLD (0 / 106)		LLD (0 / 106)	No. 96 Burgettstown, PA Windsheimer Farm 10.4 miles SSW	LLD (0 / 20)	0
Sr-89 94	< 2.0	LLD (0 / 74)		LLD (0 / 74)	No. 96 Burgettstown, PA Windsheimer Farm 10.4 miles SSW	LLD (0 / 20)	NA
Sr-90 94	< 0.7	1.5 (66 / 74) 0.6 - 4.0	No. 102 Aliquippa, PA Ferry Farm 3.3 miles SE	2.8 (14 / 14) 2.0 - 4.0	No. 96 Burgettstown, PA Windsheimer Farm 10.4 miles SSW	1.2 (20 / 20) 0.9 - 1.9	NA
Gamma 94							
K-40	< 150	1415 (74 / 74) 1086 - 1960	No. 102 Aliquippa, PA Ferry Farm 3.3 miles SE	1703 (14 / 14) 1484 - 1960	No. 96 Burgettstown, PA Windsheimer Farm 10.4 miles SSW	1410 (20 / 20) 1296 - 1519	NA
Mn-54	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Fe-59	< 10	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Co-58	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Co-60	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Zn-65	< 10	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Zr-Nb-95	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	NA
Cs-134	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	0
Cs-137	< 5	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	0
Ba-La-140	< 10	LLD (0 / 74)		LLD (0 / 74)		LLD (0 / 20)	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Fish
Unit of Measurement: (pico Curies / gram) Wet

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gamma					No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE		
Mn-54	< 0.05	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Fe-59	< 0.10	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Co-58	< 0.05	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Co-60	< 0.05	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Zn-65	< 0.10	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Zr-Nb-95	< 0.01	LLD (0 /)		LLD (0 /)		LLD (0 /)	NA
Cs-134	< 0.05	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Cs-137	< 0.05	LLD (0 /)		LLD (0 /)		LLD (0 /)	0
Ba-La-140	< 0.01	LLD (0 /)		LLD (0 /)		LLD (0 /)	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Foodcrops
Unit of Measurement: (pico Curies / gram) Wet

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
I-131 5	< 0.06	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	0
Gamma 5							
K-40	NA	1.95 (4 / 4) 1.75 - 2.13	No. 46A Industry, PA Rosepiler Garden 3.1 miles NNE	2.06 (1 / 1) 2.06 - 2.06	No. 48A Weirton, WV Weirton Area 16.5 miles SSW	2.62 (1 / 1) 2.62 - 2.62	NA
Mn-54	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Fe-59	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Co-58	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Co-60	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Zn-65	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Zr-Nb-95	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA
Cs-134	0.04	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	0
Cs-137	0.06	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	0
Ba-La-140	NA	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 1)	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Feedstuff
Unit of Measurement: (pico Curies / gram) Wet

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gamma 11							
Be-7	< 0.2	0.65 (4 / 11) 0.39 - 1.14	No. 25 Searight Farm 948 McCleary Road Hookstown, PA 2.1 miles SSW	0.65 (4 / 11) 0.39 - 1.14	No. 25 Searight Farm 948 McCleary Road Hookstown, PA 2.1 miles SSW	0.65 (4 / 11) 0.39 - 1.14	NA
K-40	< 0.15	10.26 (11 / 11) 8.35 - 12.27	No. 25 Searight Farm 948 McCleary Road Hookstown, PA 2.1 miles SSW	10.26 (11 / 11) 8.35 - 12.27	No. 25 Searight Farm 948 McCleary Road Hookstown, PA 2.1 miles SSW	10.26 (11 / 11) 8.35 - 12.27	NA
Mn-54	< 0.02	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Fe-59	< 0.04	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Co-58	< 0.02	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Co-60	< 0.02	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Zn-65	< 0.04	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Zr-Nb-95	< 0.03	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
Ru-103	< 0.03	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA
I-131	< 0.06	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	0
Cs-134	< 0.04	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	0
Cs-137	< 0.06	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	0
Ba-La-140	< 0.01	LLD (0 / 11)		LLD (0 / 11)		LLD (0 / 11)	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Sediment (page 1 of 2)
Unit of Measurement: (pico Curies / gram) Dry

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gamma 6							
K-40	NA	9.69 (4 / 4) 7.97 - 11.41	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	11.23 (2 / 2) 11.05 - 11.41	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	13.35 (2 / 2) 13.11 - 13.59	NA
Mn-54	< 0.02	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	NA
Fe-59	< 0.03	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	NA
Co-58	< 0.02	0.51 (1 / 4) 0.51 - 0.51	No. 2A BVPS Outfall Vicinity 0.2 miles WSW	0.51 (1 / 2) 0.51 - 0.51	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	LLD (0 / 2)	NA
Co-60	< 0.02	0.61 (2 / 4) 0.34 - 0.88	No. 2A BVPS Outfall Vicinity 0.2 miles WSW	0.61 (2 / 2) 0.34 - 0.88	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	LLD (0 / 2)	NA
Zn-65	< 0.04	0.12 (1 / 4) 0.12 - 0.12	No. 2A BVPS Outfall Vicinity 0.2 miles WSW	0.12 (1 / 4) 0.12 - 0.12	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	LLD (0 / 2)	NA
Zr-95	< 0.03	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	NA
Nb-95	< 0.03	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	NA
Cs-134	< 0.06	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	0
Cs-137	< 0.08	0.11 (3 / 4) 0.07 - 0.15	No. 2A BVPS Outfall Vicinity 0.2 miles WSW	0.15 (2 / 2) 0.14 - 0.15	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	0.11 (2 / 2) 0.11 - 0.11	0
Ba-La-140	< 0.03	LLD (0 / 4)		LLD (0 / 4)		LLD (0 / 2)	NA
Tl-208	NA	0.33 (4 / 4) 0.27 - 0.39	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	0.37 (2 / 2) 0.35 - 0.39	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	0.42 (2 / 2) 0.41 - 0.43	NA

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Sediment (page 2 of 2)
Unit of Measurement: (pico Curies / gram) Dry

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Bi-214	NA	0.79 (4 / 4) 0.65 - 0.91	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	0.90 (2 / 2) 0.88 - 0.91	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	1.08 (2 / 2) 1.08 - 1.08	NA
Pb-212	NA	0.93 (4 / 4) 0.69 - 1.19	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	1.10 (2 / 2) 1.01 - 1.19	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	1.36 (2 / 2) 1.20 - 1.51	NA
Pb-214	NA	0.89 (4 / 4) 0.79 - 1.03	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	0.97 (2 / 2) 0.90 - 1.03	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	1.15 (2 / 2) 1.09 - 1.20	NA
Ra-226	NA	1.79 (4 / 4) 1.45 - 1.97	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	1.90 (2 / 2) 1.82 - 1.97	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	2.40 (2 / 2) 2.32 - 2.48	NA
Ac-228	NA	0.99 (4 / 4) 0.81 - 1.12	No. 50 Upstream of New Cumberland Dam 11.8 miles WSW	1.08 (2 / 2) 1.03 - 1.12	No. 49A Industry, PA Upstream of Montgomery Dam 5.0 miles NE	1.35 (2 / 2) 1.30 - 1.39	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Soil (page 1 of 2)
Unit of Measurement: (pico Curies / gram) Dry

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gamma 10							
K-40	NA	12.43 (9 / 9) 9.42 - 17.18	No. 22 South of BVPS Transmission Line 0.3 miles SSE	17.18 (1 / 1) 17.18 - 17.18	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	14.16 (1 / 1) 14.16 - 14.16	NA
Mn-54	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Fe-59	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Co-58	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Co-60	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Zn-65	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Zr-95	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Nb-95	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Cs-134	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Cs-137	NA	0.20 (9 / 9) 0.13 - 0.26	No. 13A Hookstown, PA Old Meyer Farm 1.4 miles SW No. 51A Aliquippa, PA Sheffield Substation 8.0 miles SW	0.26 (1 / 1) 0.26 - 0.26 0.26 (1 / 1) 0.26 - 0.26	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	0.25 (1 / 1) 0.25 - 0.25	NA

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2009

Medium: Soil (page 2 of 2)
Unit of Measurement: (pico Curies / gram) Dry

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Ba-La-140	NA	LLD (0 / 9)		LLD (0 / 9)		LLD (0 / 1)	NA
Tl-208	NA	0.36 (9 / 9) 0.24 - 0.48	No. 22 South of BVPS Transmission Line 0.3 miles SSE	0.48 (1 / 1) 0.48 - 0.48	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	0.36 (1 / 1) 0.36 - 0.36	NA
Bi-214	NA	0.83 (9 / 9) 0.57 - 1.10	No. 29A Beaver, PA Nicol Farm 8.3 miles NE	1.10 (1 / 1) 1.10 - 1.10	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	1.02 (1 / 1) 1.02 - 1.02	NA
Pb-212	NA	1.11 (9 / 9) 0.82 - 1.48	No. 29A Beaver, PA Nicol Farm 8.3 miles NE	1.48 (1 / 1) 1.48 - 1.48	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	1.11 (1 / 1) 1.11 - 1.11	NA
Pb-214	NA	0.90 (9 / 9) 0.57 - 1.18	No. 29A Beaver, PA Nicol Farm 8.3 miles NE	1.18 (1 / 1) 1.18 - 1.18	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	1.07 (1 / 1) 1.07 - 1.07	NA
Ra-226	NA	2.07 (9 / 9) 1.34 - 2.72	No. 29A Beaver, PA Nicol Farm 8.3 miles NE	2.72 (1 / 1) 2.72 - 2.72	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	2.78 (1 / 1) 2.78 - 2.78	NA
Ac-228	NA	1.13 (9 / 9) 0.72 - 1.40	No. 22 South of BVPS Transmission Line 0.3 miles SSE	1.40 (1 / 1) 1.40 - 1.40	No. 48 Weirton, WV Water Tower Collier Way 16.3 miles SSW	1.10 (1 / 1) 1.10 - 1.10	NA

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 - ENVIRONMENTAL MONITORING PROGRAM

Table 2-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Beaver Valley Power Station Unit 1 and Unit 2
Docket No.: 50-334 / 50-412
Location of Facility: Beaver County, Pennsylvania
Reporting Period: Calendar Year - 2006

Medium: External Radiation
Unit of Measurement: (mR / Quarter)

Type and Total Number of Analysis Performed	Lower Limit of Detection LLD [a]	All Indicator Locations Mean (fraction) [b] Range [b]	Locations with Highest Annual Mean: Name Distance and Direction	Locations with Highest Annual Mean: Mean (fraction) [b] Range [b]	Control Location: Name Distance and Direction	Control Location: Mean (fraction) [b] Range [b]	Number of Nonroutine Reported Measurements [c]
Gamma 510	4.6	18.5 (502 / 502) 12.9 - 25.8	No. 112 BVPS Site Perimeter Location 0.3 miles SSE	23.4 (8 / 8) 21.3 - 25.8	No. 48 Weirton, WV Water Tower Collier Way 16.4 miles SSW	21.2 (8 / 8) 20.2 - 22.1	0

[a] Nominal Lower Limit of Detection

[b] Mean and range based upon detectable measurements only.
Fraction of detectable measurements at specified locations is indicated in parentheses (fraction)

[c] Nonroutine Reported Measurements (Reference: ODCM procedure 1/2-ODC-3.03, Attachment Q, Control 3.12.1)

NA = Not Applicable (Naturally Occurring Radionuclides Not required by ODCM)

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-3

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility: Beaver Valley Power Station **Docket No.:** 50-334
Location of Facility: Beaver County, Pennsylvania **Reporting Period:** Calendar years 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 (pico Curie /gram) 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	
Foodcrops (pico Curie /gram) 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 (pico Curie /gram) 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 - Template Samples - (pico Curie /gram) dry	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.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility: Beaver Valley Power Station **Docket No.:** 50-334
Location of Facility: Beaver County, Pennsylvania **Reporting Period:** Calendar years 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)	--		--	
- Core Samples -	Gross Beta	(8)	1	21	(8/8)	16 - 28
(pico Curie /gram) dry	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
(pico Curie / liter)	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)	--		--	
(pico Curie / liter)	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	
(pico Curie / liter)	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
(pico Curie /cubic meter)	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.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-3 (Continued)

Pre-Operational Environmental Radiological Monitoring Program Summary

Name of Facility: Beaver Valley Power Station **Docket No.:** 50-334
Location of Facility: Beaver County, Pennsylvania **Reporting Period:** Calendar years 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 (pico Curie / liter)	I-131	(91)	0.25	0.6	(4/91)	0.3 - 0.8
	Sr-89	(134)	5	7	(4/134)	6 - 11
	Sr-90	(134)	1	5.3	(132/134)	1.5 - 12.8
	Gamma	(134)	--		--	
	Cs-137		10	13	(19/134)	11 - 16
	Others				< LLD	
External Radiation (milli Roentgen / day)	γ - Monthly	(599)	0.5 mR*	0.20	(599/599)	0.08 - 0.51
	γ - Quarterly	(195)	0.5 mR*	0.20	(195/195)	0.11 - 0.38
	γ - Annual	(48)	0.5 mR*	0.19	(48/48)	0.11 - 0.30
Fish (pico Curie / gram) wet	Gross Beta	(17)	0.01	1.9	(15/17)	1.0 - 3.2
	Sr-90	(17)	0.005	0.14	(17/17)	0.02 - 0.50
	Gamma	(17)	0.5			
	K-40		--	2.4	(17/17)	1.0 - 3.7
	Others		--		< LLD	

* 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.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

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 2-1 and shown on a map in Figure 2-1.

Samples are collected at each of these stations by continuously drawing two cubic feet per minute of atmosphere air through a glass fiber filter paper and a charcoal cartridge. The glass fiber filter paper is used for collection of airborne particulates, while the charcoal cartridge is used for collection of radioiodine. Samples are collected on a weekly basis.

The charcoal cartridge is used in the weekly analysis of airborne Iodine-131. The glass fiber filter papers are analyzed each week for gross beta, then composited by station each quarter for gamma spectrometry analysis. In order to reduce interference from short-lived naturally occurring radioactivity (e.g.; radon and thorium), the glass fiber filter papers are decayed prior to performing beta analysis in a low background counting system.

b. Procedures

Gross Beta Analysis of Filter Paper: Analysis is performed by placing the glass fiber filter paper from the weekly air sample in a 2 inch planchet and analyzing it in a low background, gas flow proportional counter.

Gamma Emitter Analysis of Filter Paper: Analysis is performed by stacking all of the glass fiber filter papers collected from each monitoring station during the quarter and scanning this composite on a high resolution germanium gamma spectrometer.

Iodine-131 Analysis of Charcoal Cartridge: Analysis is performed by a gamma scan of each charcoal cartridge.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

3. Results and Conclusions

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

a. Airborne Radioactive Particulates

Gross Beta: A total of five-hundred-nineteen (519) weekly samples from ten (10) locations were analyzed for gross beta. Results were comparable to previous years. Figure 2-2 indicates the weekly average concentration of gross beta in air particulates.

During the period 03/23/09 - 03/30/09, the Gross Beta Results were unusually low. Specifically, the Gross Beta results for the ten (10) air particulate sample stations ranged from 0.014 to 0.019 pCi/cubic meter, whereas the cumulative average ranged from 0.021 to 0.027 pCi/cubic meter. As noted, this condition existed at all nine (9) indicator locations and at the one (1) control location. This issue was discussed with the REMP Administrators at the other two FENOC sites (i.e. Davis-Besse Nuclear Power Plant and the Perry Nuclear Power Plant), and they also noticed similar decreases in Gross Beta results during this period. There is no consequence to unusually low sample results and the cause is most likely due to cosmic interference. This issue is documented in SAP Order 200197646-0820.

During the period 05/26/09 - 06/01/09, the Gross Beta Results were unusually low. Specifically, the Gross Beta results for the ten (10) air particulate sample stations ranged from 0.010 to 0.015 pCi/cubic meter, whereas the cumulative average ranged from 0.020 to 0.025 pCi/cubic meter. As noted, this condition existed at all nine (9) indicator locations and at the one (1) control location. This issue was discussed with the REMP Administrators from two other FENOC sites (i.e. Davis-Besse Nuclear Power Plant and Perry Nuclear Power Plant), and they also noticed similar decreases in Gross Beta results during this period. There is no consequence to unusually low sample results and the cause is most likely due to cosmic interference. This issue is documented in SAP Order 200197646-0820.

During the period 06/15/09 - 06/22/09, the Gross Beta Results were unusually low. Specifically, the Gross Beta results for the ten (10) air particulate sample stations ranged from 0.013 to 0.022 pCi/cubic meter, whereas the cumulative average ranged from 0.021 to 0.025 pCi/cubic meter. As noted, this condition existed at all nine (9) indicator locations and at the one (1) control location, although the control location did not decrease as much. This issue was discussed with the REMP Administrators from two other FENOC sites (i.e. Davis-Besse Nuclear Power Plant and Perry Nuclear Power Plant), and they also noticed similar decreases in Gross Beta results during this period. There is no consequence to unusually low sample results and the cause is most likely due to cosmic interference. This issue is documented in SAP Order 200197646-0820.

During the period 10/05/09 - 10/12/09, the Gross Beta Results were unusually low. Specifically, the Gross Beta results for the ten (10) air particulate sample stations ranged from 0.009 to 0.016 pCi/cubic meter, where as the cumulative average ranged from 0.021 to 0.026 pCi/cubic meter. As noted, this condition existed at all nine (9) indicator locations and at the one (1) control location. There is no consequence to unusually low sample results and the cause is most likely due to cosmic interference. This issue is documented in SAP Order 200197646-0820.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Gamma Spectrometry: The weekly air particulate samples were composited into forty (40) quarterly samples which were analyzed by gamma spectrometry. Naturally occurring Beryllium-7 was identified in thirty-six of thirty-six (36 of 36) indicator samples, and four of four (4 of 4) control samples. No other radionuclides were detected. A summary of the analysis results during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figure 2-2.

Deviations from Required Sampling and Analysis Schedule: There were some deviations from the required airborne particulate sampling and analysis schedule during the report period. Specifically, the following events occurred:

During the sampling period of 06/22/09 - 06/29/09, the Air Particulate and Iodine Sampling Station at Shippingport, PA, Cooks Ferry Substation (Site No. 30, 0.43 miles ENE) was interrupted for 83 hours and 53 minutes. The problem was traced to tripped breaker that apparently occurred during thunderstorm during that time period.

On 07/06/09, the Air Particulate and Iodine Sampling Station at Industry - Mckeel's Service Rt. 68, (Site No. 46.1, 2.28 miles NNE/NE) did not pass the leak check after the Air Particulate and Iodine sampling media were collected. The station sample pump was replaced and the leak check passed. The station was then calibrated and returned to service the same day.

On 07/20/09, the Air Particulate and Iodine Sampling Station at Weirton Water Tower, Collier Way (Site No.48, 16.40 miles SSW) was found with "0.0" flow rate on Totalizer. Air Particulate and Iodine Sampling media were changed and the Air Sample Station was returned to service. Sample volume for the week was estimated.

During the sampling period of 08/10/09 - 08/17/09, the Air Particulate and Iodine Sampling Station at Brunton's Dairy Farm (Site No. 27, 6.14 miles, SE), was found out of service due to a power outage. Total out of service time was estimated to be 164 hours and 30 minutes. Air Particulate and Iodine Sampling media were changed, the breaker was reset, and the air sampling station was returned to service on 08/17/09.

During the sampling period of 08/17/009 - 08/24/09, the Air Particulate and Iodine Sampling Station at Shippingport, Cook's Ferry S.S. (Site No. 30, 0.43 miles, ENE) was found out of service due to a tripped breaker, possibly from storms during that week. The total out of service time was approximately 86 hours and 16 minutes for the week, and the air sampling station was returned to service on 08/24/09.

During the sampling period of 08/17/09 - 08/24/09, the Air Particulate and Iodine Sampling Station at East Liver Pool Water Department (Site No. 47, 4.88 miles, WNW) was found out of service due to a tripped breaker, possibly from storms during that week. The total out of service time was approximately 99 hours and 35 minutes for the week, and the air sampling station was returned to service on 08/24/09.

SINCE BVPS uses ten (10) airborne particulate sample stations versus five (5) required by the ODCM, THEN there was no consequence to interruption of sample collection during these periods. These conditions are documented in SAP order 200197646-0850.

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Summary: Based on the analytical results, the operation of BVPS did not contribute any measurable increase in air particulate radioactivity during the report period.

b. Airborne Radioiodine

Iodine-131: A total of five-hundred-nineteen (519) weekly charcoal filter samples were analyzed for Iodine-131. No detectable concentrations were present at any locations.

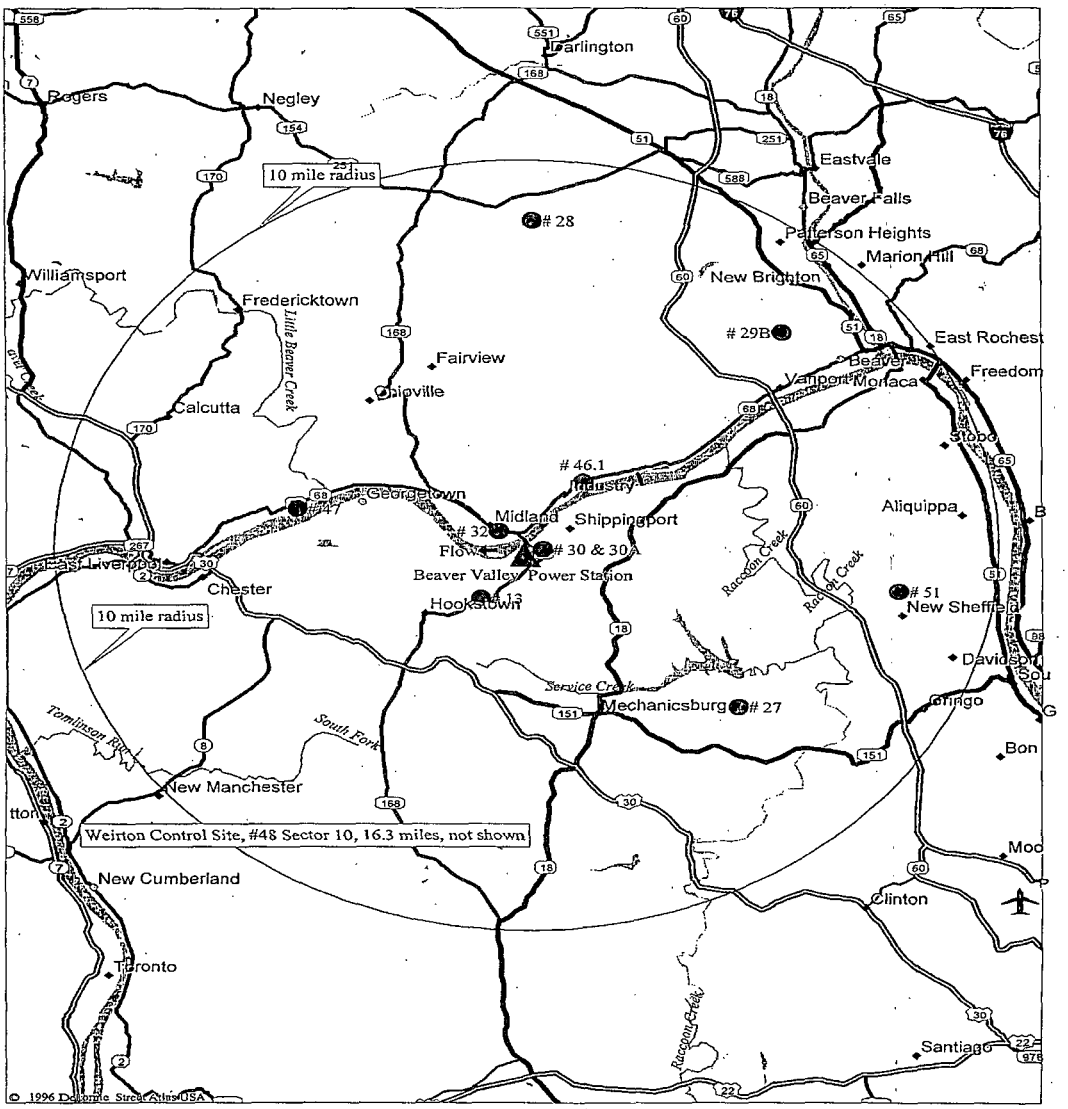
Deviations from Required Sampling and Analysis Schedule: The deviations are the same as described above for airborne particulates.

Summary: Based on analytical results, the operation of BVPS did not contribute any measurable increase in airborne radioiodine during the report period.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-1

Environmental Monitoring Locations - Air Sampling Stations

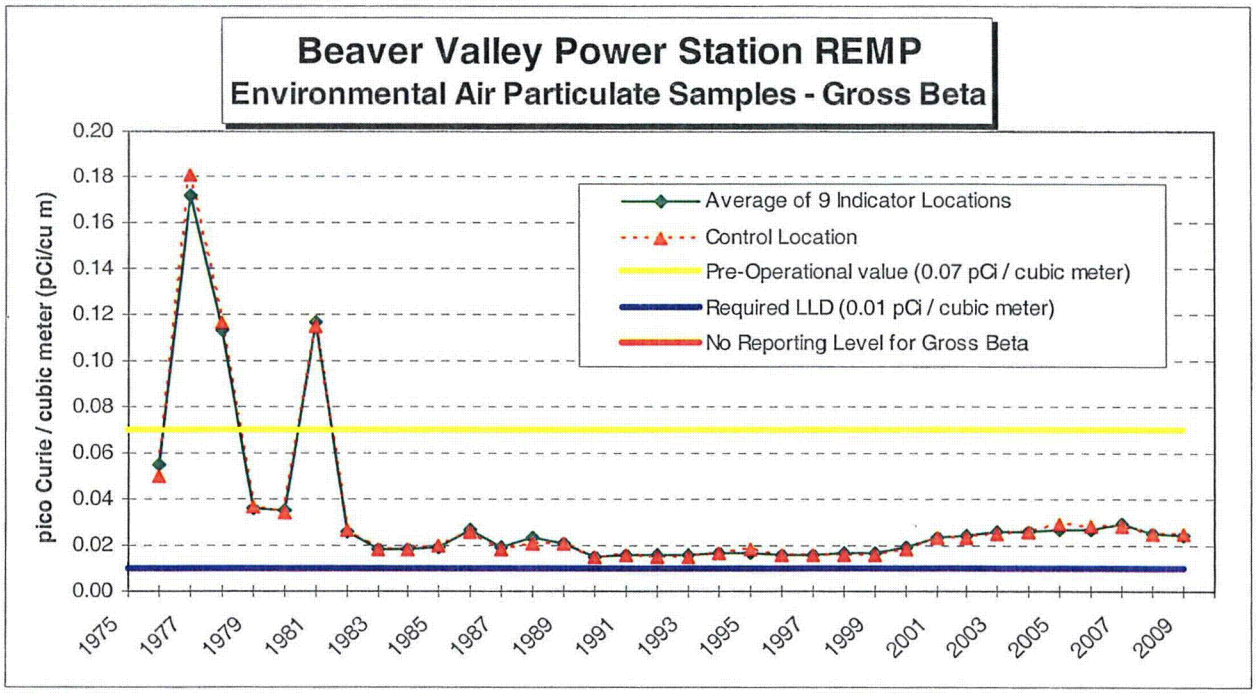


Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Air Particulate & Radioiodine	13	11-SW	1.49	Hookstown, PA (Old Meyer Farm)
	27	7-SE	6.14	Aliquippa, Pa (Brunton Farm)
	28	1-N	8.60	Beaver Falls, PA (Sherman Farm)
	29B	3-NE	7.97	Beaver, PA (Friendship Ridge)
	30	4-ENE	0.43	Shippingport, PA (Cook's Ferry Substation)
	32	15-NW 2-NNE	0.75	Midland, PA (North Substation - Rt. 68)
	46.1	3-NE	2.28	Industry, PA (McKeels Service - Rt. 68)
	47	14-WNW	4.88	East Liverpool, OH (Water Department)
	48	10-SSW	16.40	Weirton, WV (Water Tower, Collier Way)
	51	5-E	8.00	Aliquippa, PA (Sheffield Substation)

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-2

Graph of Annual Average Concentration: Gross Beta in Air Particulates



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

C. Monitoring of Shoreline Stream Sediment and Soil

1. Characterization of Shoreline Stream Sediment and Soil

The stream sediment (river bottoms) consists 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

Shoreline stream sediment were collected semi-annually above the Montgomery Dam, in the vicinity of the BVPS outfall structure, 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 2-1 and are shown in Figure 2-3.

Although not required by the ODCM, soil samples are collected every three years. They were collected at each of ten (10) locations during 2009 and are scheduled to be collected again in 2012. At each location, twelve (12) core samples (3" diameter by 2" deep) are gathered at prescribed points on a 10 foot radius circle. Each location is permanently marked with reference pins. Each set of samples is systematically selected by moving along the radius in such a manner as to assure representative undisturbed samples. Sampling locations are listed in Table 2-1 and are shown in Figure 2-3.

Shoreline stream sediment and soil are analyzed for gamma-emitting radionuclides.

b. Analytical Procedures

Gamma Emitter Analysis of Stream Sediment: Analysis is performed in a 300 ml plastic bottle, which is analyzed by gamma spectrometry.

Gamma Emitter Analysis of Soil: Although not required by the ODCM, analysis is performed in a 300 ml plastic bottle, which is analyzed by gamma spectrometry

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

3. Results and Conclusions

A summary of the analysis results during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figure 2-4 and Figure 2-5.

a. Shoreline Stream Sediment

Gamma Spectrometry: A total of six (6) sediment samples were analyzed by gamma spectrometry during the report period. Naturally occurring Potassium-40, Thalium-208, Lead-212, Lead-214, Bismuth-214, Radium-226 and Actinum-228, were detected in four of four (4 of 4) indicator samples and two of two (2 of 2) control samples.

Cesium-137: This radionuclide was identified in three of four (3 of 4) indicator samples and two of two (2 of 2) control samples. The results were similar to previous years (current years range = 0.07 to 0.15 pico Curie / gram) and less than the pre-operational level of 0.4 pico Curie / gram. Also, SINCE Cesium-137 was identified at the control location (upstream), THEN it was not due to plant effluent releases and is most likely residual contamination due from previous nuclear weapons tests.

Cobalt-58: Radionuclide Cobalt-58 was identified in one of four (1 of 4) indicator samples and zero of two (0 of 2) control samples. The samples which indicated Cobalt-58 was obtained at the shore line of the main outfall facility. The results were similar to previous years (current years range = 0.51 to 0.51 pico Curie / gram), although this data is NOT currently less than the pre-operational level of 0.098 pico Curie / gram.

Cobalt-60: Radionuclide Cobalt-60 was identified in two of four (2 of 4) indicator samples and zero of two (0 of 2) control samples. The samples that indicated Cobalt-60 were obtained at the shore line of the main outfall facility. The results were similar to previous years (current years range = 0.34 to 0.88 pico Curie / gram), although this data is NOT currently less than the pre-operational level of 0.4 pico Curie / gram.

Zinc-65: Radionuclide Zinc-65 was identified in one of four (1 of 4) indicator samples and zero of two (0 of 2) control samples. The samples that indicated Zinc-65 were obtained at the shore line of the main outfall facility. Although this data is NOT currently less than the pre-operational level of 0.4 pico Curie / gram, it is not an unlikely result for shoreline stream sediment near the main outfall. The plant discharges this radionuclide in liquid effluent releases.

Deviations from Required Sampling and Analysis Schedule: There were no deviations from the required sediment sampling and analysis schedule during the report period.

Summary: The identification of Cobalt-58, Cobalt-60 and Zinc-65 in the shoreline stream sediment near the main outfall facility is not unusual, because the plant discharges these radionuclides in liquid effluent releases. The analyses are consistent with discharge data of authorized liquid effluent releases, and all liquid effluent releases during the report period did not exceed the release limits set forth in the ODCM.

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b. Soil

Gamma Spectrometry: A total of ten (10) soil samples were analyzed by gamma spectrometry during the report period. Naturally occurring Potassium-40, Thalium-208, Lead-212, Lead-214, Bismuth-214, Radium-226 and Actinum-228 was detected in nine of nine (9 of 9) indicator samples and one of one (1 of 1) control samples.

Cesium-137: This radionuclide was identified in nine of nine (9 of 9) indicator samples and one of one (1 of 1) control samples. SINCE Cesium-137 was identified at the control location (upstream), THEN it was not due to plant effluent releases and is most likely residual contamination due from previous nuclear weapons tests.

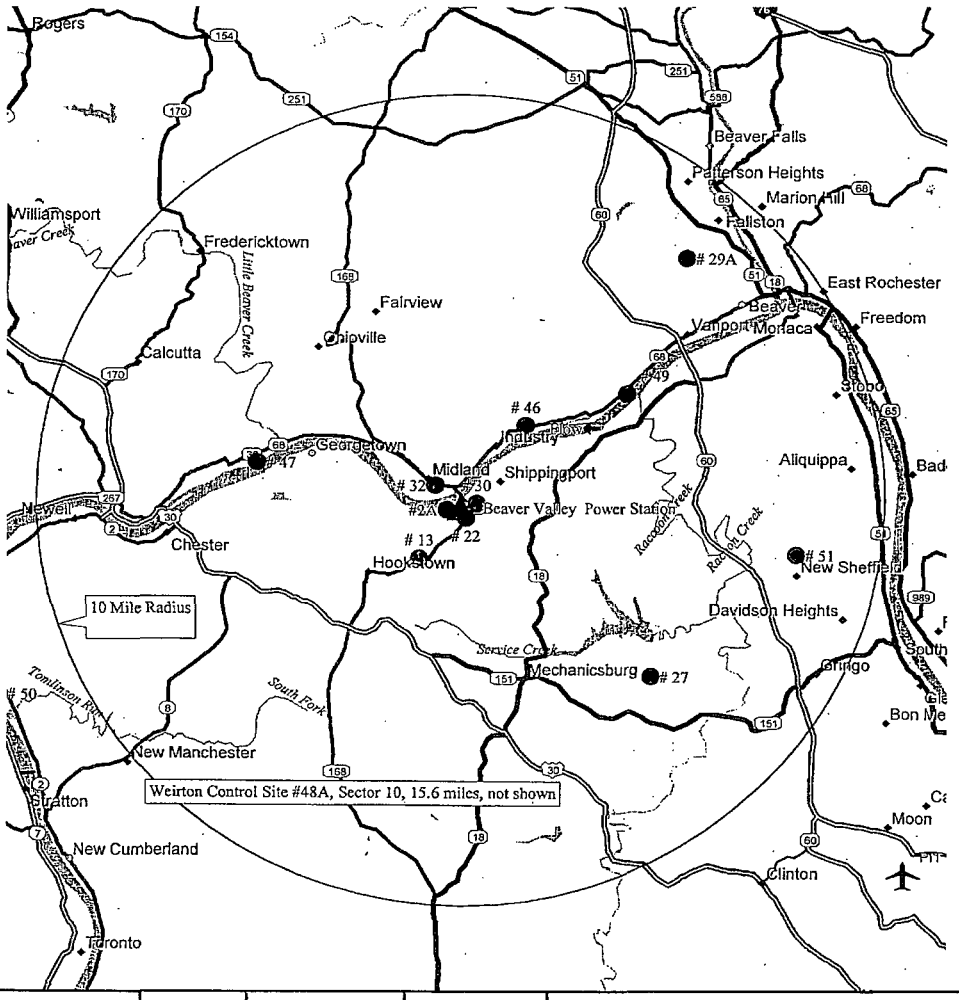
Deviations from Required Sampling and Analysis Schedule: There were no deviations from the required sediment sampling and analysis schedule during the report period.

Summary: The identification of Cesium-137 in the soil surrounding BVPS is not unusual. The analyses are consistent with discharge data of authorized liquid effluent releases, and all liquid effluent releases during the report period did not exceed the release limits set forth in the ODCM.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-3

Environmental Monitoring Locations - Shoreline Sediments and Soil



Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Soil	13A	11-SW	1.49	Hookstown, PA (Old Meyer Farm)
	22	8-SSE	0.28	South of BVPS, Transmission Lines
	27B	7-SE	6.19	Aliquippa, PA (Brunton Farm)
	29A	3-NE	8.09	Beaver, PA (Nicol Farm)
	30A	4-ENE	0.43	Shippingport, PA (Cooks Ferry Substation)
	32A	15-NW	0.74	Midland, PA (North Substation)
	46B	3-NE	2.66	Industry, PA (Willows Inn – Rt. 68)
	47A	14-WNW	4.89	East Liverpool, OH (Water Department)
	48	10-SSW	16.40	Weirton, WV (Collier Way Water Tower)
	51A	5-E	7.99	Aliquippa, PA (Sheffield Substation)
Sediment	2A	12-WSW	0.31	Shippingport, PA (BVPS Outfall Vicinity)
	49A	3-NE	4.93	Industry, PA (Upstream Montgomery Dam)
	50	12-WSW	11.77	New Cumberland, WV (Upstream of Dam

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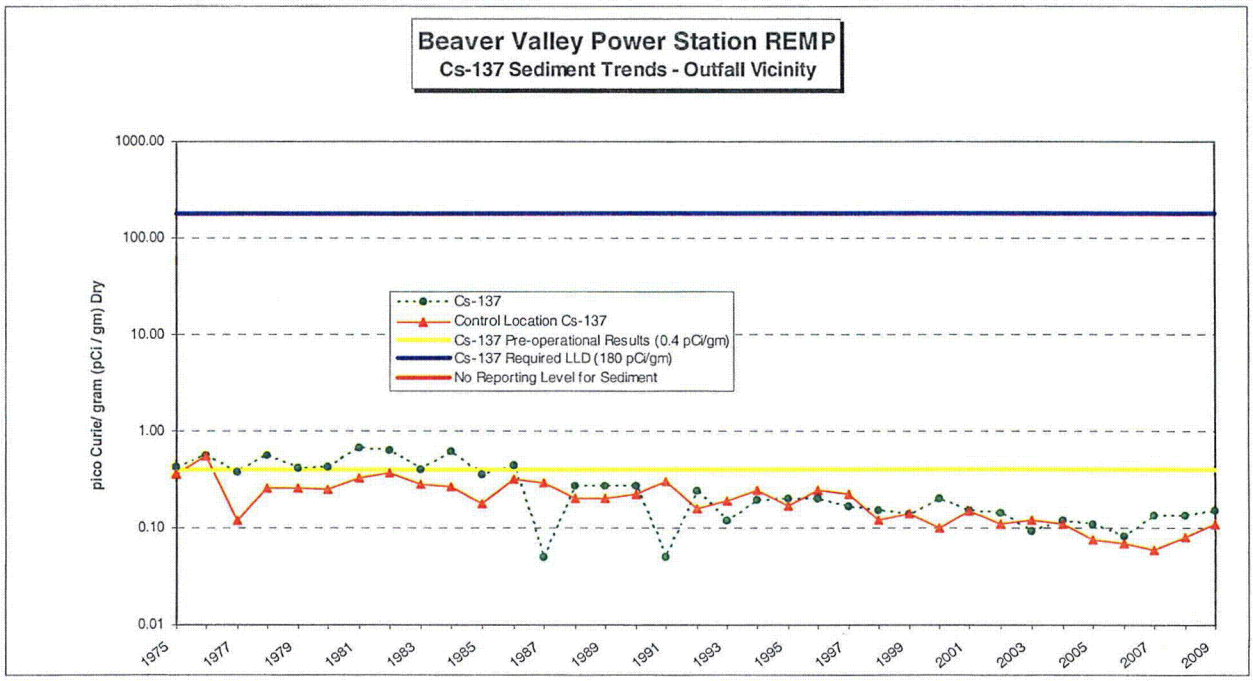
Figure 2-4

Graph of Annual Average Concentration: Cesium-137, Cobalt-58 & Cobalt-60 in Sediment



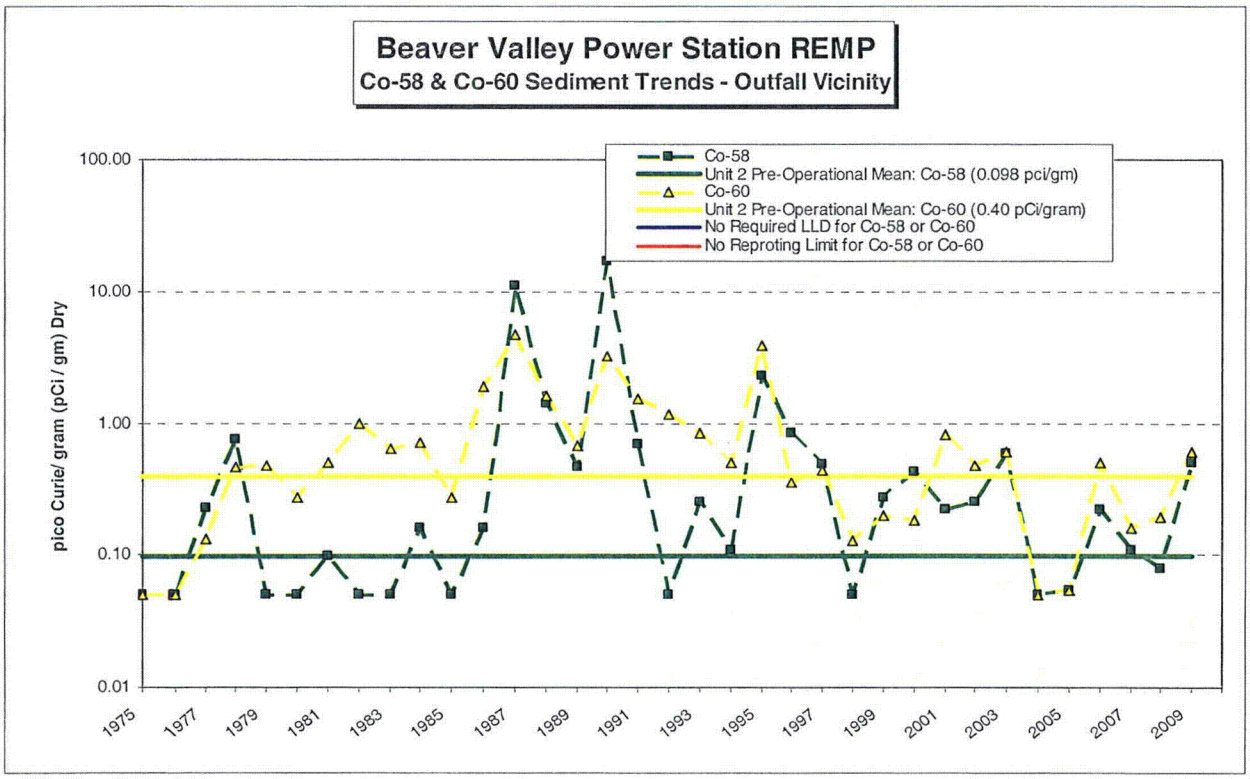


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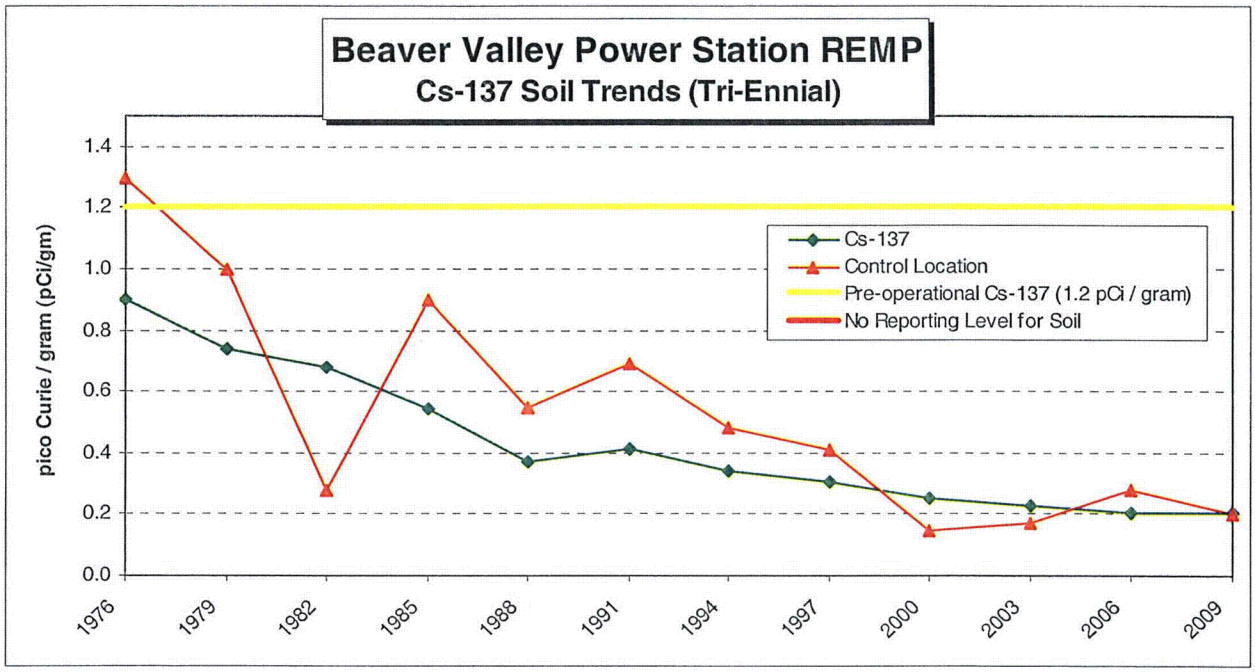
Figure 2-5

Graph of Annual Average Concentration: Cesium-137 in Soil



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

D. Monitoring of Feedstuff and Foodcrops

1. Characterization of Farm Products

According to the 2007 Census of Agriculture [(1)], there were 824 farms in Beaver County. Total market value of production (Crops and Livestock) was $15,187,000.00. Some of the principal sources of revenue (>$50,000.00) are as follows:

Milk and Other Dairy Products from Cows	$5,647,000.00
Nursery, Greenhouse, Floriculture and Sod	$2,813,000.00
Grains, Oil Seeds, Dry Beans and Dry Peas	$1,243,000.00
Other Crops and Hay	$1,120,000.00
Vegetables, Melons, Potatoes and Sweet Potatoes	$989,000.00
Fruits, Tree Nuts and Berries	$449,000.00
Poultry and Eggs	$327,000.00
Cut Christmas Trees, and Short Rotation Woody Crops	$204,000.00
Horses, Ponies, Mules, Burros, and Donkeys	$182,000.00
Sheep, Goats and their Products	$90,000.00
Hogs & Pigs	Undisclosed Amount
Aquaculture	Undisclosed Amount
Cattle and Calves	Undisclosed Amount
Other Animals and Other Animal Products	Undisclosed Amount

(1) http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Pennsylvania/index.asp

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

2. Sampling Program and Analytical Techniques

a. Program

Feedstuff: Although not required by the ODCM, representative samples of Feedstuff (cattle feed) are collected monthly from the nearest dairy farm (Searight Dairy). See Figure 2-6. Each sample is analyzed by gamma spectrometry.

Foodcrops (leafy vegetables): Foodcrops are collected at garden locations during the growing season. Leafy vegetables, (e.g.; cabbage) are obtained from Shippingport, Georgetown, and Industry, Pennsylvania. Samples are also obtained from the control location in Weirton, West Virginia. All samples are analyzed for gamma emitters by gamma spectrometry. Samples are also analyzed by radiochemical analysis for Iodine-131.

b. Procedures

Gamma Emitter Analysis of Foodcrops: Analysis is performed by scanning a dried, homogenized sample with a gamma spectrometry system. A high resolution germanium detector is utilized with this system. Samples of feedstuff and foodcrops are loaded into tare weight 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.

Gamma Emitter Analysis of Feedstuff: Although not required by the ODCM, analysis is performed by scanning a dried, homogenized sample with a gamma spectrometry system. A high resolution germanium detector is utilized with this system. Samples of feedstuff and foodcrops are loaded into tare weight 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.

Iodine-131 Analysis of Foodcrops: Analysis is performed by radiochemistry. A stable iodide carrier is added to a chopped sample, which is then leached with a 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.

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3. Results and Conclusions

A summary of the analysis results during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figure 2-7.

a. Feedstuff

Gamma Spectrometry: Although not required by the ODCM, a total of eleven (11) samples were analyzed by gamma spectrometry. Naturally occurring Potassium-40 was identified in eleven of eleven (11 of 11) samples. Naturally occurring Beryllium-7 was found in four of eleven (4 of 11) samples.

Deviations from Required Sampling and Analysis Schedule: The September monthly Feedstuff sample was not obtained. A monthly Feedstuff sample from REMP Sample Site #25, Searight's Dairy, is required per procedure ½-ENV-02.01, but is NOT required per the BVPS Offsite Dose Calculation Manual (ODCM). REMP procedures and forms were enhanced to prevent future occurrences. This condition was documented in CR 09-66654 and SAP Order 200197646-0880.

Summary: The data from the feedstuff analyses was consistent with previous data. Based on the analytical results, the operation of BVPS did not contribute any measurable increase in radioactivity in the feedstuff in the vicinity of the site during the report period

b. Foodcrops

Iodine-131: A total of five (5) samples were analyzed for Iodine-131. No detectable concentrations were present in the four (4) indicator samples or the one (1) control sample.

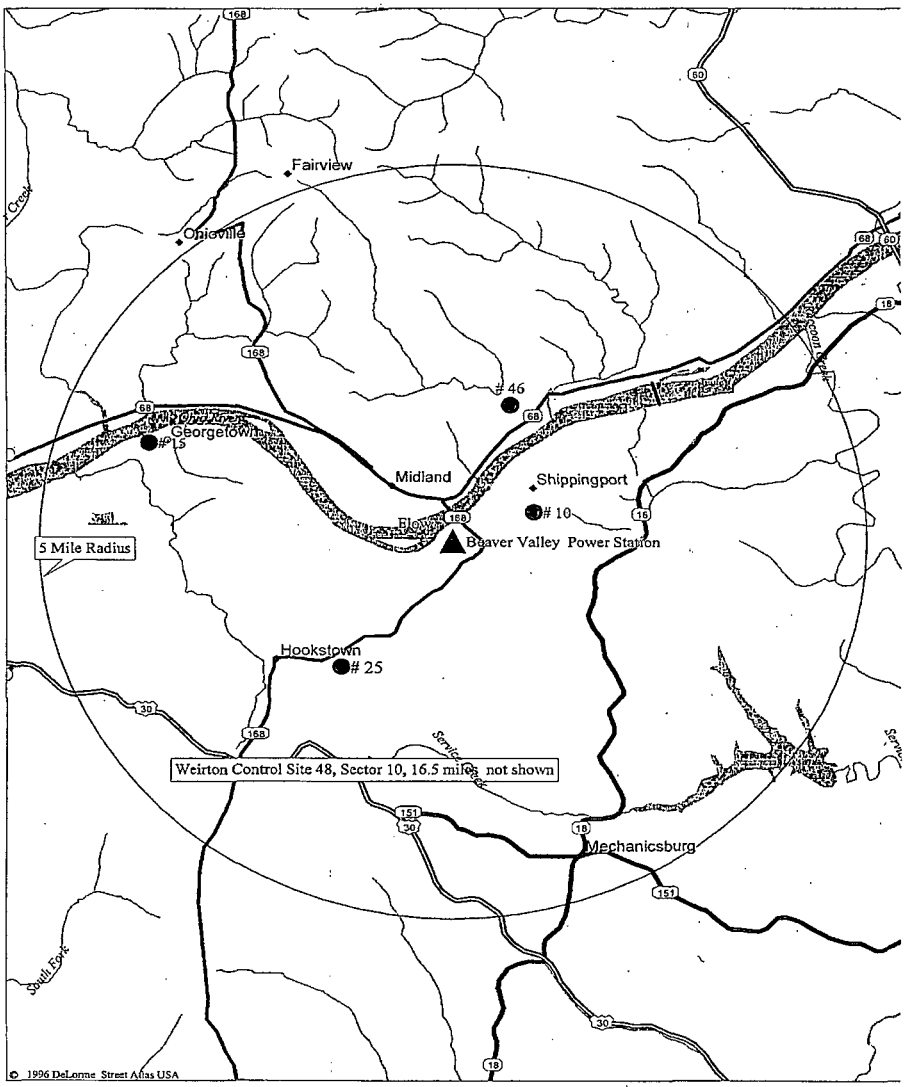
Gamma Spectrometry: A total of five (5) samples were analyzed by gamma spectrometry. Naturally occurring Potassium-40 was identified in four of four (4 of 4) indicator samples and one of one (1of 1) control samples. No other radionuclides were identified.

Deviations from Required Sampling and Analysis Schedule: There were no deviations from the required foodstuff sampling and analysis schedule during the report period.

Summary: The data from the foodcrops analyses was consistent with previous data. Based on the analytical results, the operation of BVPS did not contribute any measurable increase in radioactivity in the foodcrops in the vicinity of the site during the report period.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-6



Environmental Monitoring Locations – Feedstuff and Foodcrops

Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Feed	25	10-SSW	2.10	Hookstown, PA (Searight Farm)
Food	10A	4-ENE	0.8	Shippingport, PA
	10B	4-ENE	1.0	Shippingport, PA
	15A	14-WNW	3.6	Georgetown, PA
	46A	3-NE	3.1	Industry, PA
	48B	10-SSW	16.5	Weirton, WV

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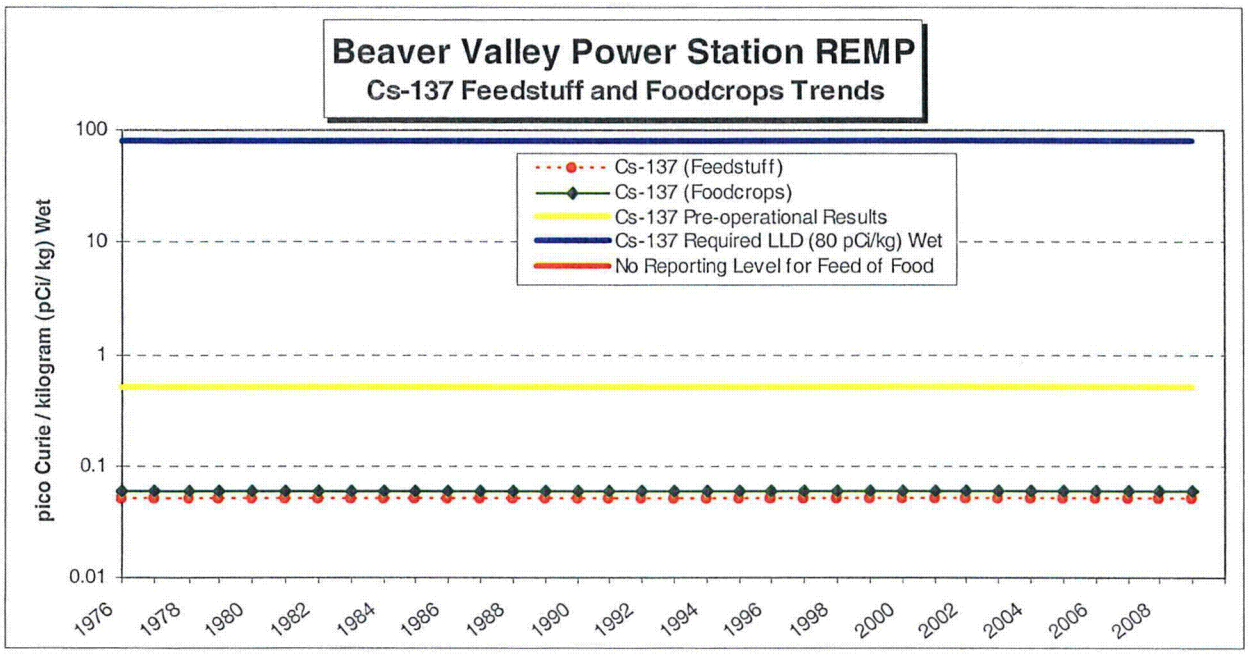
Figure 2-7

Graph of Annual Average Concentration: Cesium-137 in Feedstuff and Foodcrops



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

E. Monitoring of Local Cow and Goat Milk

1. Description - Milch Animal Locations

Samples of fresh milk are obtained from milch animals at locations and frequencies noted in Table 2-1. The milk is analyzed for its radioiodine content, gamma emitters, Strontium-89 and Strontium-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 3, Land Use Census.

2. Sampling Program and Analytical Techniques

a. Program

Cow milk was collected from the two (2) reference dairy farms within a 10-mile radius of the BVPS. These milk samples were obtained at the Searight Dairy Farm (2.1 miles SSW) and the Brunton Dairy Farm (6.1 miles SE).

Cow milk and goat milk were also collected from two (2) other dairy farms within a 10-mile radius of the BVPS site. The goat milk samples obtained at the Ferry Farm (3.3 miles SE) and the cow milk samples obtained at the Halstead Dairy Farm (5.1 miles SSW) were selected based on milch animal surveys and evaluations of meteorological data (i.e.; deposition parameters). They were added to the sampling program to ensure the highest potential milk pathway for radioiodine uptake is evaluated. The dairies are subject to change based upon availability of milk or when more recent data (milch animal census, and/or change in meteorological conditions) indicate other locations are more appropriate.

Cow milk was also collected from the one (1) control location dairy farm outside of the 10-mile radius. These milk samples were obtained at the Windsheimer Dairy Farm (10.4 miles SSW).

The cow milk sample from the Searight Dairy Farm (2.1 miles SSW) is collected and analyzed weekly for Iodine-131 using a method that ensures a high sensitivity. Samples from each of the other dairies are collected monthly when cows are indoors and bi-weekly when cows are grazing. The monthly and/or bi-weekly sample is analyzed for principle gamma emitters (including Cesium-137 by high resolution germanium gamma spectrometry), and Iodine-131 high sensitivity analysis. Although not required by the ODCM, the monthly and/or bi-weekly sample is also analyzed for Strontium-89, Strontium-90.

It was determined early in the year that all doe goats from the Collin's Dairy Farm (3.5 miles SE) would be dry for the entire milking season. The Ferry Farm (3.3 miles SE) agreed to participate in the sampling program during the milking season. Both sampling locations will be evaluated during 2010 for participation in the sampling program.

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The location of each is shown in Figure 2-8 and described below.

Site	Dairy	Approximate Number of Animals being Milked	Distance and Direction from Midpoint between Unit 1 and Unit 2 Reactor	Collection Period
25	Searight Dairy 948 McCleary Road Hookstown, PA	40 Cows	2.1 miles SSW	January thru December
27a	Brunton Dairy 3681 Ridge Road Aliquippa, PA	101 Cows	6.1 miles SE	January thru December
69	Collins Dairy 289 Calhoun Road Aliquippa, PA	0 Goats	3.5 miles SE	Not Applicable: No goat milk available during 2009
96	Windsheimer Dairy RD #11 Burgettstown, PA	80 Cows	10.4 miles SSW	January thru December
102*	Ferry Farm 227 Calhoun Rd Aliquippa, PA	2 Goats	3.3 miles SE	March thru September
113*	Halstead Dairy 104 Tellish Drive Hookstown, PA	67 Cows	5.1 miles SSW	January thru December
* Highest potential pathway dairies based on evaluation of deposition parameters				

b. Procedure

Iodine-131 Analysis of Milk: The milk samples are chemically prepared, and then analyzed with a low-level beta counting system.

Gamma Emitter Analysis of Milk: This is determined by gamma spectrometry analysis of a 1 liter Marinelli container of milk.

Strontium-90 Analysis of Milk: Although not required by the ODCM, the milk samples are prepared by adding a 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 in-growth of Yttrium-90 (Y-90). Yttrium is then precipitated as hydroxide 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 Strontium-90 activity.

Strontium-89 Analysis of Milk: Although not required by the ODCM, the Strontium-89 activity is determined by precipitating strontium carbonate ($SrCO_3$) 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 by gravimetric means.

3. Results and Conclusions

A summary of the analysis results during the report period are listed in Table 2-2. A trend graph of Iodine-131 and Strontium-90 analyses (including the pre-operational period through the report period) is shown on Figure 2-9.

a. Strontium-89: Although not required by the ODCM, a total of ninety-four (94) milk samples were analyzed for Strontium-89 during the report period. Strontium-89 was not detected in any of the seventy-four (74) indicator samples, nor was it detected in any of the twenty (20) control samples.

b. Strontium-90: Although not required by the ODCM, a total of ninety-four (94) milk samples were analyzed for Strontium-90 during the report period. Strontium-90 was detected in sixty-six of seventy-four (66 of 74) indicator samples and twenty of twenty (20 of 20) control samples. The levels detected were attributable to previous nuclear weapons tests and are within the normally expected range.

c. Gamma Spectrometry: A total of ninety-four (94) milk samples were analyzed by gamma spectrometry during the report period. Naturally occurring Potassium-40 was present in seventy-four of seventy-four (74 of 74) indicator samples and twenty of twenty (20 of 20) control samples. No other gamma-emitting radionuclides were identified during analysis.

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d. Iodine-131: A total of one hundred twenty-six (126) milk samples were analyzed for Iodine-131 during the report period. Iodine-131 was not detected in any of the one hundred six (106) indicator samples, nor was it detected in any of the twenty (20) control samples. All analyses were less than the 0.5 pico Curie / liter LLD value.

e. Deviations from Required Sampling and Analysis: There were no deviations from the required milk sampling and analysis schedule for the reporting period.

f. Summary: Based on all the analytical results and the comparison to pre-operational levels, the operation of BVPS did not contribute any measurable increase in radioactivity in the milk in the vicinity of the site during the report period.

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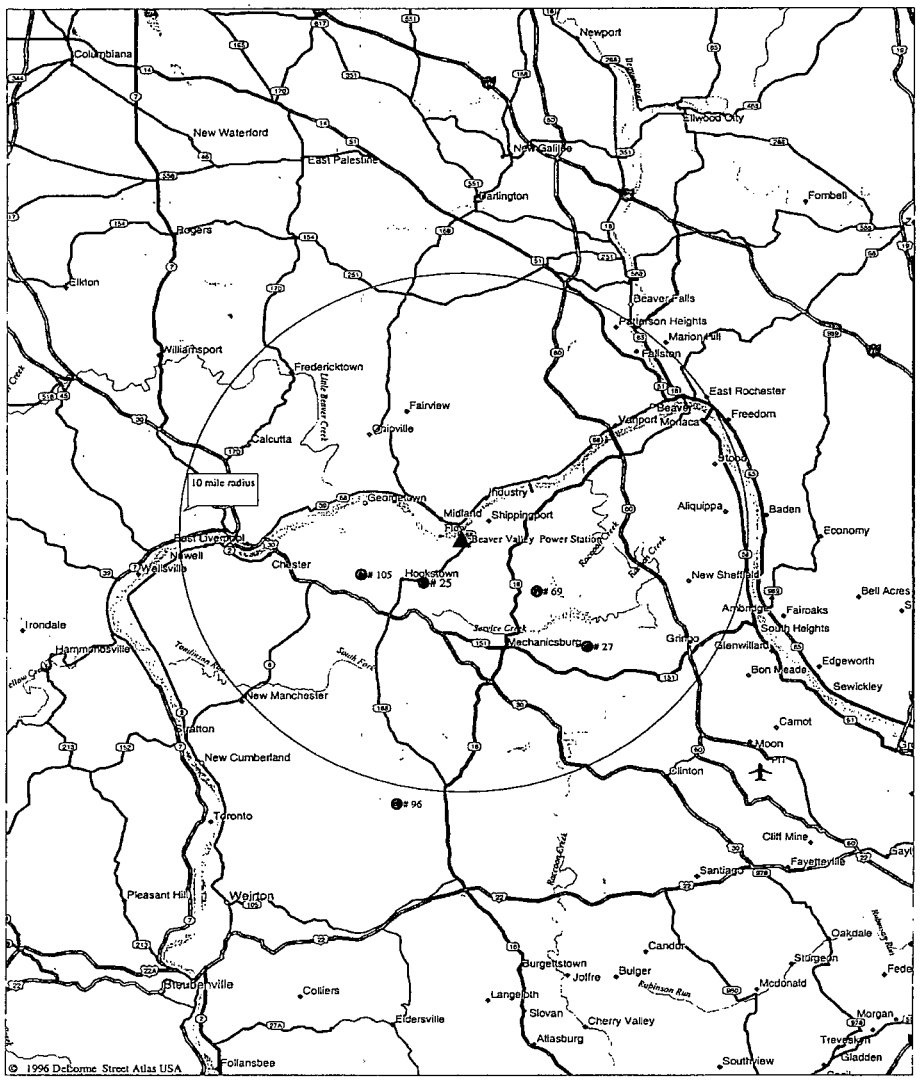
Figure 2-8

Environmental Monitoring Locations - Milk

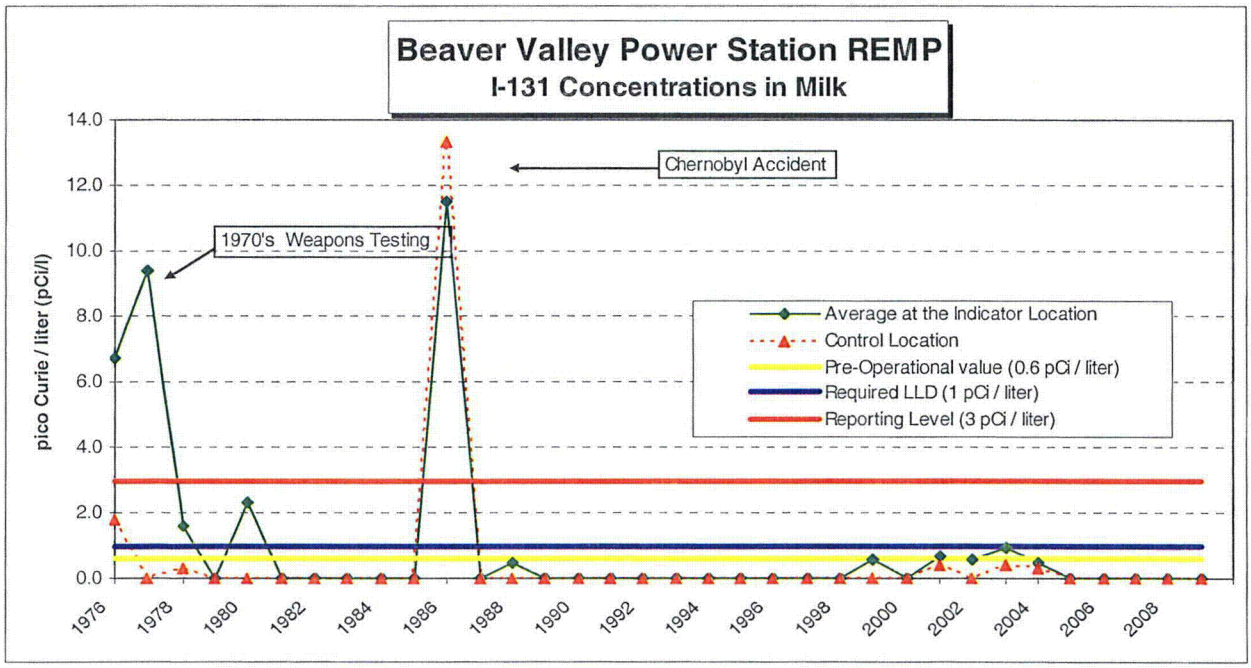


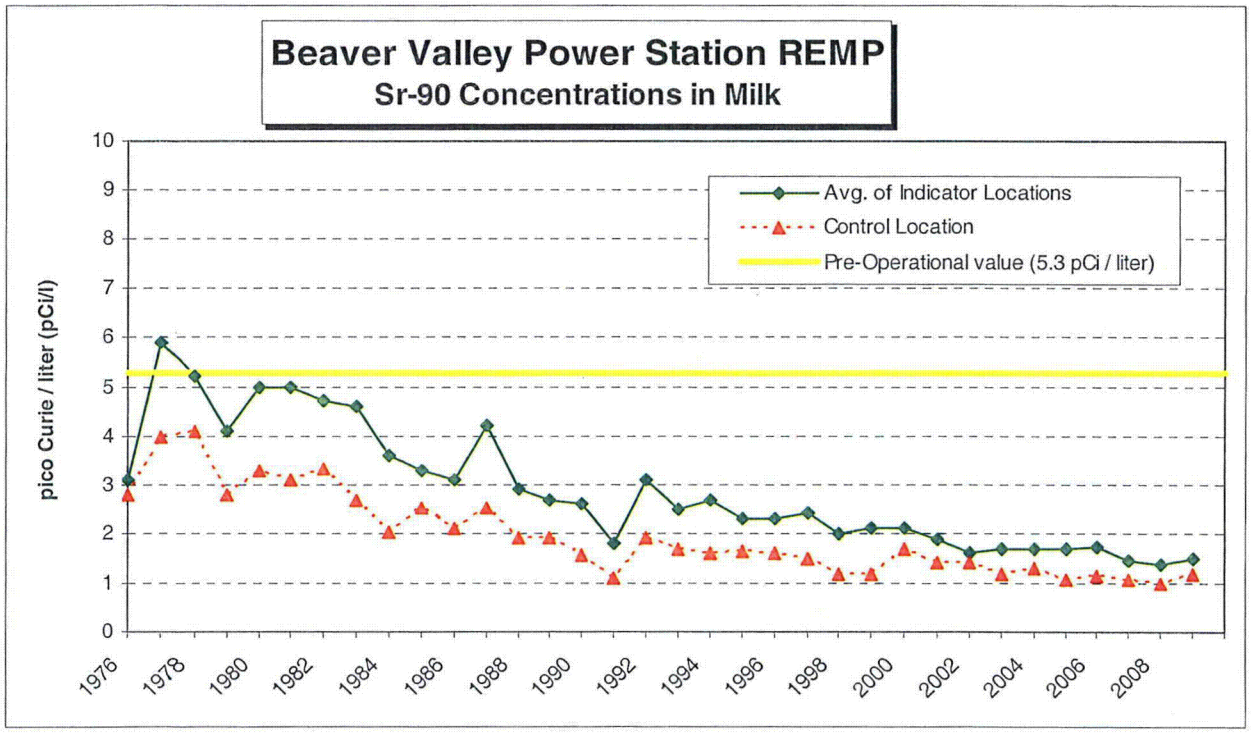
Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Milk	25	10-SSW	2.1	Hookstown, PA (Searight Farm)
	27A	7-SE	6.1	Aliquippa, PA (Brunton Farm)
	69	7-SE	3.5	Aliquippa, PA (Collins Farm)
	96	10-SSW	10.4	Burgettstown, PA (Windsheimer Farm)
	102*	7-SE	3.3	Aliquippa, PA (Ferry Farm)
	113*	10-SSW	5.1	Hookstown, PA (Halstead Farm)

* Dairies selected based on evaluation of deposition parameters

Figure 2-9

Graph of Annual Average Concentration: Iodine-131 & Sr-90 in Milk





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F. Environmental Radiation Monitoring

1. Description of Regional Background Radiation and Sources

Historical information for regional background was obtained from Reuter-Stokes instruments that were previously located within a five (5) mile radius of the BVPS site. Data is no longer available from these instruments, but historical data indicated that the background exposure rates ranged from 6 μR/hr to 12 μR/hr.

The sources of background radiation are affected by the terrain in the vicinity of BVPS, where as, the local hills (i.e., with altitude variations of 300-400 feet) and densely wooded areas contribute to differences in background radiation level. Other sources (e.g., Radon) are affected by the geological features of the region, which are characterized by nearly flat-laying sedimentary beds of the Pennsylvania Age. For information, the local sedimentary 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.

2. Locations and Analytical Procedures

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

During the report period, there were a total of sixty-four (64) environmental TLD locations. This is comprised of forty-four (44) offsite locations, along with twenty (20) fence perimeter locations. The offsite TLD locations are plotted on Figure 2-10, but the fence perimeter locations are not plotted due to the large scale of the figure.

The 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 for a calendar quarter, in a specific holder that contains two (2) TLDs at each location.

3. Results and Conclusions

A summary of the TLD results during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figure 2-11.

TLD Analysis: During the report period, the average quarterly external exposure rate (as measured from TLD) was 18.5 mR at the sixty-four (64) indicator locations, and 21.2 mR at the Control location. This external exposure rate is comparable to previous years. As expected, there was some variation in external exposure rate among locations and seasons.

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TLD Trend Evaluation: As discussed in the 2007 report, the trends of the environmental TLD data during the period 2001 thru 2007 showed a small increase for the indicator locations, and a step (level) increase for the Control location. The increase was traced to a change made in late 2001 with regards to the environmental TLD field holders, which resulted in an increased sensitivity to natural background beta radiation. In summary, the increase in TLD data was consistent at all locations (including the control location), was most likely due to increased sensitivity to natural background beta radiation, and was not a consequence of BVPS gaseous effluent releases. This issue is documented in SAP Order No. 200197646-0400.

Deviations from Required Sampling and Analysis Schedule: There was one deviation from the required sampling schedule (i.e.; TLD change out frequency) and analysis schedule (i.e.; TLD processing frequency) during the report period. Specifically, REMP TLD location #55-Shippingport Bridge (0.3 miles NE), was inadvertently discarded during construction activities on the bridge during the third quarter of 2009. This condition was found on 10/8/09, during the scheduled quarterly TLD change-out. The location is considered an onsite TLD because it resides within the site boundary and is therefore not a required sample by the ODCM. This issue is documented in Condition Report 09-65670 and SAP Order No. 200197646-0860.

Summary: The quarterly TLD external exposure rates are comparable to those of previous years, except for the overall increase in 2001, as described above in the TLD Trend Evaluation. There was no evidence of anomalies that could be attributed to the operation of BVPS. It should also be noted that the average external exposure rate at the indicator locations was less than average external exposure rate at the Control location. Based on all the analytical results and the comparison to pre-operational levels, the operation of BVPS did not contribute any measurable increase in external exposure in the vicinity of the site during the report period. The TLD exposure rates also confirm that changes from natural radiation levels, if any, are negligible.

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Figure 2-10

Environmental Monitoring Locations - TLDs

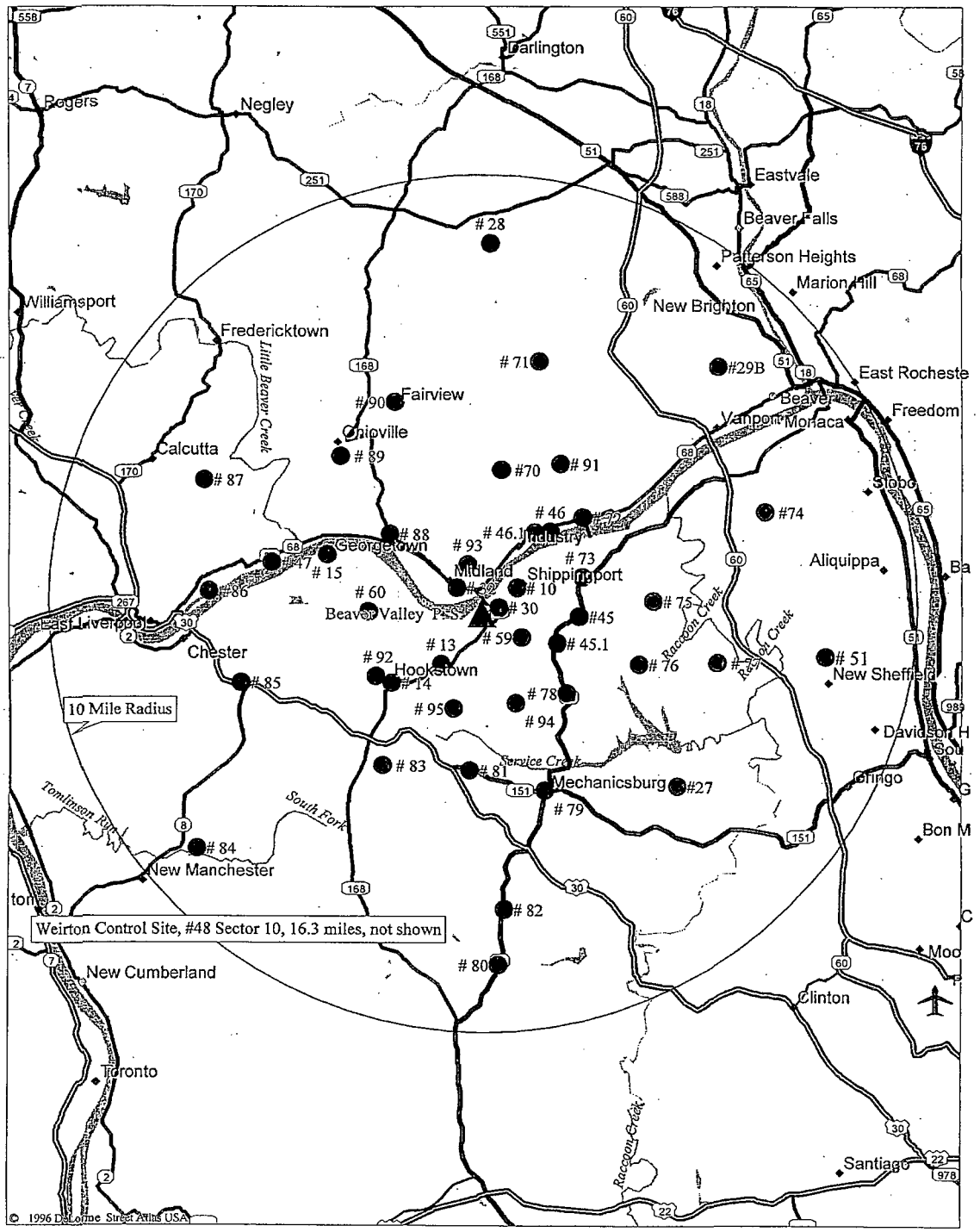
Darlington
Rogers
Negley
Eastvale
Beaver Falls
Patterson Heights
Marion Hill
New Brighton
Williamsport
Fredericktown
Little Beaver Creek
East Rocheste
Freedom
Fairview
Chipoville
Calcutta
Vanport
Monaca
Stobo
Aliquippa
Georgetown
Industry
Midland
Shippingport
Beaver Valley
East Liverpool
Chester
Hookstown
New Sheffield
Raccoon Creek
Mechanicsburg
Service Creek
Tomlinson Run
South Fork
New Manchester
Bridgewater
Bridgewater
Bridgewater

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Figure 2-10 (Continued)

TLD Locations

SOUTHEAST QUADRANT

Site No.	Sector	Distance (miles)	Location
27	7-SE	6.14	Brunton Dairy Farm Aliquippa, PA
45.1	6-ESE	1.92	Kennedy's Corners Raccoon Township, PA
51	5-E	8.00	Sheffield Substation Aliquippa, PA
59	6-ESE	0.99	236 Green Hill Road Aliquippa, PA
76	6-ESE	3.80	Raccoon Elementary School Raccoon Township, PA
77	6-ESE	5.52	3614 Green Garden Road Aliquippa, PA
78	7-SE	2.72	Racoon Twsp Municipal Building Raccoon Township, PA
79	8-SSE	4.46	106 State Route 151 Green Twp. Ted McWilliams Auto Body
80	9-S	8.27	Park Office, State Route 18 Raccoon Township, PA
82	9-S	6.99	2697 State Route 18 Raccoon Twp, PA
94	8-SSE	2.25	McCleary & Pole Cat Hollow Road Hookstown, PA

NORTHWEST QUADRANT

Site No.	Sector	Distance (miles)	Location
15	14-WNW	3.75	Post Office Georgetown, PA
32	15-NW	0.75	North Substation Midland, PA
47	14-WNW	4.88	Water Department East Liverpool, OH
60	13-W	2.51	444 Hill Road Georgetown, PA
86	13-W	6.18	1090 Ohio Avenue East Liverpool, OH
87	14-WNW	7.04	50103 Calcutta Smith's Ferry Road
88	15-NW	2.74	110 Summit Road Midland, PA
89	15-NW	4.72	488 Smith's Ferry Road Ohioville, PA
90	16-NNW	5.20	6286 Tuscarawras Road Midland, PA
93	16-NNW	1.10	104 Linden - Sunrise Hills Midland, PA

NORTHEAST QUADRANT

Site No.	Sector	Distance (miles)	Location
10	3-NE 4-ENE	0.94	Post Office Shippingport, PA
28	1-N	8.60	Sherman Farm Brighton Twp, PA
29B	3-NE	7.97	Friendship Ridge Beaver, PA
30	4-ENE	0.43	Cook's Ferry Substation Shippingport, PA
45	5-E	2.19	Christian House Baptist Chapel, State Rte 18 Raccoon Township, PA
46	3-NE	2.49	Midway Drive Industry, PA
46.1	2-NNE 3-NE	2.28	McKeel's Service, State Route 68 Industry, PA
70	1-N	3.36	236 Engle Road Industry, PA
71	2-NNE	6.01	First Western Bank Brighton Township, PA
72	3-NE	3.25	Ohioview Lutheran Church – Rear Raccoon Twp, PA
73	4-ENE	2.48	618 Squirrel Run Road Industry, PA
74	4-ENE	6.92	137 Poplar Avenue (CCBC) Monaca, PA
75	5-E	4.08	117 Holt Road Aliquippa, PA
91	2-NNE	3.89	Pine Grove Road & Doyle Road Industry

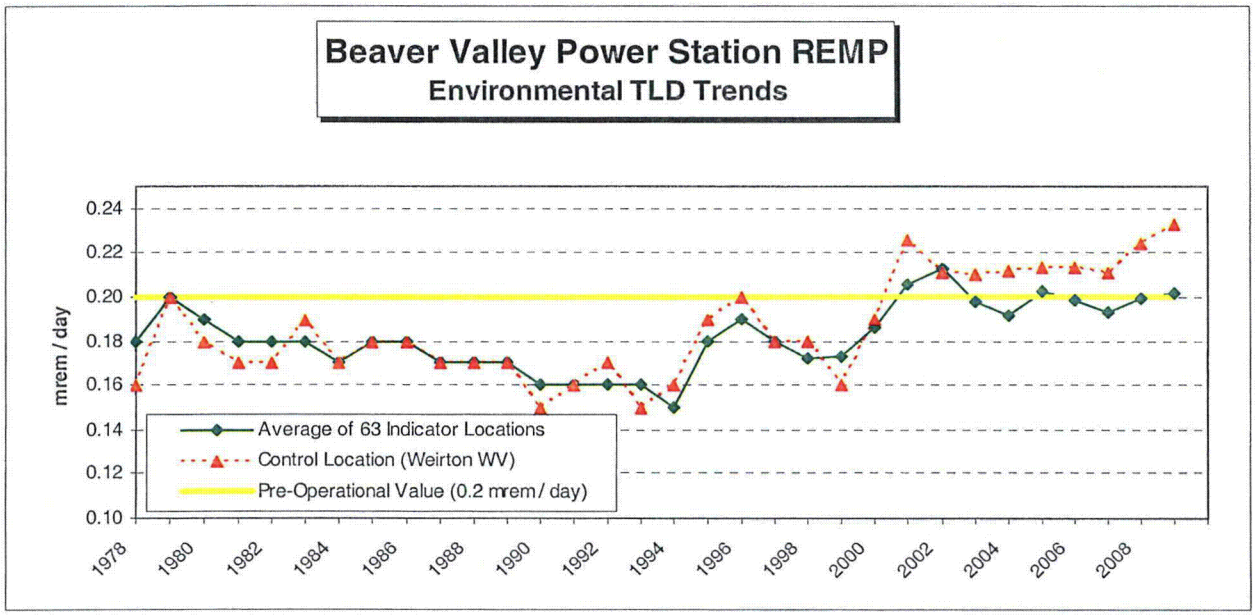
SOUTHWEST QUADRANT

Site No.	Sector	Distance (miles)	Location
13	11-SW	1.49	Old Meyer Farm Hookstown, PA
14	11-SW	2.53	Hookstown, PA
48	10-SSW	16.40	Collier Way Water Tower Weirton , WV
81	9-S	3.69	Millcreek United Presbyterian Church
83	10-SSW	4.26	735 Mill Creek Road, Hookstown
84	11-SW	8.35	Senior Center Hancock County, WV
85	12-WSW	5.73	2048 State Route 30 West Chester, WV
92	12-WSW	2.81	Georgetown Road Substation Georgetown, PA
95	10-SSW	2.37	832 McCleary Road Hookstown, PA

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-11

Graph of Annual Average Exposure: Direct Radiation in Environment



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

G. Monitoring of Fish

1. Description

During the report period, fish collected for the radiological monitoring program included carp, channel catfish, flathead catfish, quillback, red horse, sheepshead, gizzard shad and smallmouth bass.

2. Sampling Program and Analytical Techniques

a. Program

Fish samples are collected semi-annually in the New Cumberland pool of the Ohio River at the Beaver Valley effluent discharge point and upstream of the Montgomery Dam. The edible portion of each different species caught is analyzed by gamma spectroscopy. Fish sampling locations are shown in Figure 2-12.

b. Procedure

A sample is prepared in a standard tare weight 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 analysis results during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figure 2-13.

Gamma Spectrometry: A total of eleven (11) fish samples were analyzed by gamma spectrometry during the report period. Gamma emitting radionuclides were not detected in any of the five (5) indicator samples, nor were they detected in any of the six (6) control samples.

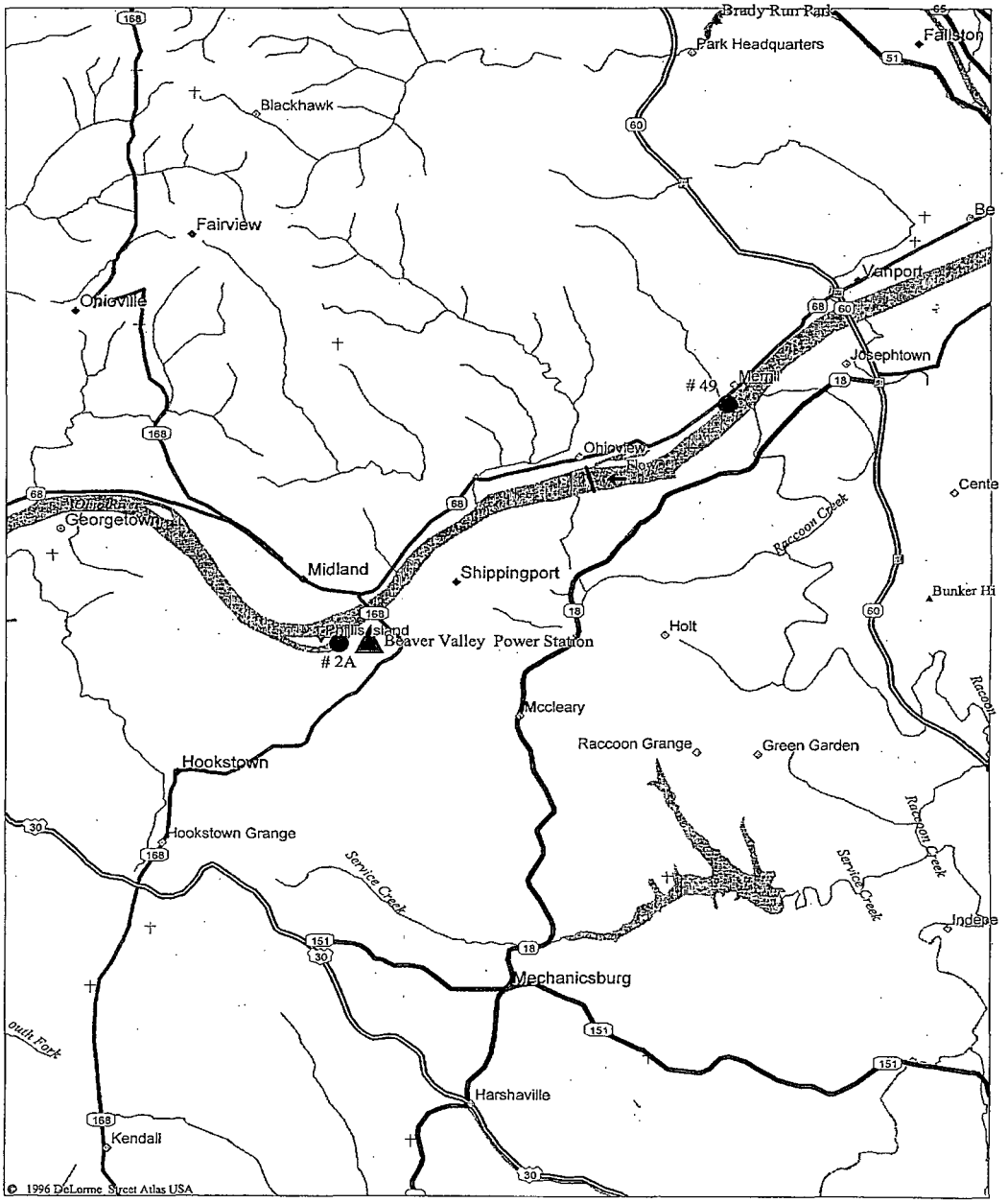
Deviations from Required Sampling and Analysis Schedule: There were no deviations from the required fish sampling and analysis schedule during the report period.

Summary: Based on the analytical results, the operation of BVPS did not contribute any measurable increase in radioactivity in the Ohio River fish population during the report period.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-12

Environmental Monitoring Locations - Fish

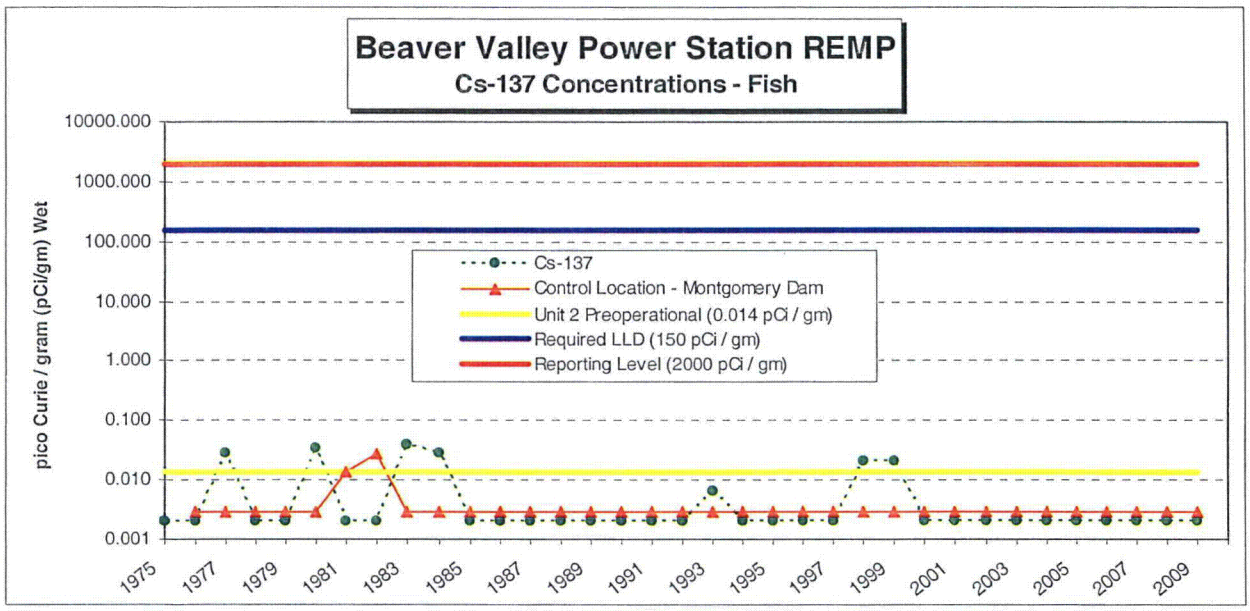


Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Fish	2A	12-WSW	0.31	BVPS Outfall Vicinity
	49A	3-NE	4.93	Industry, PA (Upstream Montgomery Dam)

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-13

Graph of Annual Average Concentration: Cesium-137 in Fish



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

H. Monitoring of Surface Water, Drinking Water, Groundwater and Precipitation

1. Description of Water Sources

The Ohio River is the main body of water in the area. It is the main surface water supply for generation of drinking water in the area. The Beaver Valley Power Station obtains water from the Ohio River for plant make-up water and discharges water to the Ohio River via NPDES discharge points (e.g. cooling tower blowdown, liquid effluent releases, etc).

The Ohio River is the main surface water supply source for towns, municipalities and industries both upstream and downstream of the BVPS 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, also 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 National Climate Data Center (http://www.ncdc.noaa.gov/oa/climate/research/cag3/v4.html) indicates the total annual precipitation during the report period for the Pittsburgh, PA area was 32.27 inches.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

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 collected daily at the East Liverpool (Ohio) Water Treatment Plant, sample location 5, [River Mile 41.2], and the made into a weekly composite sample. One automatic river water sampler is located at the ATI-Allegheny Ludlam (formerly J&L Steel) river water intake, sample location 2.1, [River Mile 36.2]. The automatic sampler takes a 20-40 ml sample every 15 minutes and samples are collected on a weekly basis. The weekly samples are then made into a monthly composite sample for each location. The monthly composite samples are analyzed for gamma emitters. In addition, a quarterly composite sample is prepared for each sample point from the monthly composites. Quarterly composites are analyzed for Hydrogen-3 (Tritium).

A weekly grab sample is taken upstream of the Montgomery Dam, sample location 49 [River Mile 29.6]. This upstream sample at the Montgomery Dam is the control sample. The weekly grab samples upstream of the Montgomery Dam are analyzed for Iodine-131. Weekly grab samples are then made into monthly composites are analyzed for gamma emitters. Quarterly composite are prepared from each of the monthly composites. The quarterly composites are analyzed for Tritium.

Locations of each sample point are shown in Figure 2-14.

b. Drinking Water (Public Supplies)

Drinking water (i.e.; treated water) is collected at both the Midland, PA Water Treating Plant, sample location 4, and East Liverpool, OH Water Treating Plant, sample location 5. An automatic sampler at each location collects 20-40 ml every 20 minutes, which is then made into a weekly composite sample. The weekly composite sample from each location is analyzed for Iodine-131. Monthly composites are made from the weekly samples and are analyzed by gamma spectrometry. In addition, a quarterly composite sample is prepared for each sample point from the monthly composites. Quarterly composites are analyzed for Tritium.

A weekly grab sample is taken upstream of the Montgomery Dam, sample location 49 [River Mile 29.6]. This upstream sample at the Montgomery Dam is the control sample. The weekly grab samples upstream of the Montgomery Dam are analyzed for Iodine-131. Weekly grab samples are then made into monthly composites are analyzed by gamma spectrometry. Quarterly composite are prepared from each of the monthly composites. The quarterly composites are analyzed for Tritium.

Locations of each sample point are shown in Figure 2-14.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

c. Groundwater

Although not required by the ODCM, semi-annual grab samples were collected from three (3) locations within four (4) miles of the site (see Figure 2-14). 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 is analyzed by gamma spectrometry.

d. Precipitation

Although not required by the ODCM, precipitation is collected in Shippingport PA, East Liverpool OH, and Weirton WV. Precipitation, when available, is collected each week and then made into quarterly composite samples from the weekly samples. The quarterly composites are analyzed for Tritium and gamma emitters. Locations of each of the sample points are shown in Figure 2-14.

e. Procedures

Gamma Analysis of Drinking Water and Surface Water: The analysis is performed on water samples by placing one liter of the sample into a Marinelli container and analyzing the sample on a high resolution germanium gamma spectrometry system. Although not required by the ODCM, this analysis is also performed on Groundwater and Precipitation.

Tritium Analysis of Drinking Water and Surface Water: The Tritium is determined in water samples by liquid scintillation analysis. Although not required by the ODCM, this analysis is also performed on Surface Water, Groundwater and Precipitation.

Iodine-131 Analysis of Drinking Water: The sample is chemically prepared and analyzed with a low-level beta counting system. Although not required by the ODCM, this analysis is also performed on Surface Water.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

3. Results and Conclusions

A summary of the analysis results of water samples (surface water, drinking water, ground water and precipitation) during the report period are listed in Table 2-2. A trend graph of analyses (including the pre-operational period through the report period) is shown on Figures 2-15 through 2-18.

a. Surface Water

Tritium: A total of twelve (12) surface water samples were analyzed for Tritium during the report period. Tritium was not detected in any of the eight (8) indicator samples, nor was it detected in any of the four (4) control samples.

Gamma Spectrometry: A total of thirty-six (36) surface water samples were analyzed by gamma spectrometry during the report period. Gamma emitting radionuclides were not detected in any of the twenty-four (24) indicator samples, nor were they detected in any of the twelve (12) control samples.

Iodine-131: Although not required by the ODCM, a total of fifty-two (52) surface water control samples were analyzed for Iodine-131 using radiochemical methods during the report period. Iodine131 was detected in forty-three of fifty-two (43 of 52) weekly control samples, of which one (1) analysis exceeded the reporting level of 2 pico Curie / liter. The results were similar to previous years, (current years range = 0.3 to 2.4 pico Curie / liter). The positive results were detected at the Control location, which is five (5) miles upstream (not influenced by BVPS operation). Identification of Iodine-131 during the report period was most likely due to medical diagnostic and treatment procedures from upstream facilities. This issue is documented in SAP Order 200197646-0770.

b. Drinking Water

Tritium: A total of twelve (12) drinking water samples were analyzed for Tritium during the report period. Tritium was not detected in any of the eight (8) indicator samples, nor was it detected in any of the four (4) control samples.

Gamma Spectrometry: A total of thirty-six (36) drinking water samples were analyzed by gamma spectrometry during the report period. Gamma emitting radionuclides were not detected in any of the twenty-four (24) indicator samples, nor were they detected in any of the twelve (12) control samples.

Iodine-131: A total of one hundred-fifty-six (156) drinking water samples were analyzed for Iodine-131 (using radiochemical methods) during the report period. Iodine-131 was detected in fifty-five of one hundred four (55 of 104) indicator samples and forty-three of fifty-two (43 of 52) control samples. Some of the positive results at the downstream location exceeded the positive results from the upstream surface water Control location, but none of these analyses exceeded the reporting level of 2 pico Curie / liter. Because positive results were detected in the upstream control sample, some positive results are most likely due to medical diagnostic and treatment procedures from upstream facilities, and not caused by BVPS operations. However, the analyses are also consistent with

discharge data of authorized liquid effluent releases, and all liquid effluent releases during the report period did not exceed the release limits set forth in the ODCM.

c. Groundwater

Tritium: Although not required by ODCM, a total of six (6) groundwater samples were analyzed for Tritium during the report period. Tritium was not detected in any of the four (4) indicator samples, nor was it detected in any of the two (2) control samples.

Gamma Spectrometry: Although not required by ODCM, a total of six (6) groundwater samples were analyzed by gamma spectrometry during the report period. Gamma emitting radionuclides were not detected in any of the four (4) indicator samples, nor were they detected in any of the two (2) control samples.

d. Precipitation

Tritium: Although not required by ODCM, a total of twelve (12) precipitation samples were analyzed for Tritium during the report period. Tritium was detected in two of eight (2 of 8) indicator samples, but was not detected in any of the four (4) control samples. The positive results at the Cooks Ferry Substation in Shippingport, PA (current range = 208 pico Curie / liter, with an LLD of 152 pico Curie / liter) and the East Liverpool Water Department, in East Liverpool, OH (current range = 181 pico Curie / liter, with an LLD of 152 pico Curie / liter), are less than the pre-operational level of 300 pico Curie / liter, and are consistent with washout of tritium (from gaseous releases) during precipitation events. Specifically, identification of tritium at this location is not unusual, because the plant discharges tritium in gaseous waste effluents, and washout does occur during precipitation. Also, the liquid tritium activity is less than the tritium discharge data of authorized gaseous effluent releases. All gaseous effluent releases during the report period did not exceed the release limits set forth in the Offsite Dose Calculation Manual.

Gamma Spectrometry: Although not required by ODCM, a total of twelve (12) precipitation samples were analyzed by gamma spectrometry during the report period. Gamma emitting radionuclides were not detected in any of the eight (8) indicator samples, nor were they detected in any of the four (4) control samples.

e. Deviations from Required Sampling and Analysis Schedule: The monthly surface water composite sample at ATI-Allegheny Ludlam in Midland, PA (Site No. 2.1, 1.43 miles WNW) from September was inaccurately reported. A positive result for Iodine-131 of 11.1 pico Curies/Liter was reported. The ODCM does not require Iodine-131 analysis at this sample location. Upon investigation, it was determined that the analysis was performed using gamma spectroscopy, which is not the preferred method of analysis for Iodine-131. Additionally, it was determined that the Lower Level of Detection (LLD) for Iodine-131 by gamma spectroscopy is 15 pico Curies/ Liter. Therefore, the initial analysis was inaccurately reported as a positive result when it was actually lower then the gamma spectroscopy LLD. To confirm the initial sample result, it was requested that the same sample be analyzed utilizing the wet chemical separation method for Iodine- 131 (EPA Method 7500-I C). Results from the Iodine-131 wet chemical separation method were less than detectable. This condition is documented in Condition Report 09-65940 and SAP Order No. 200197646-0870.

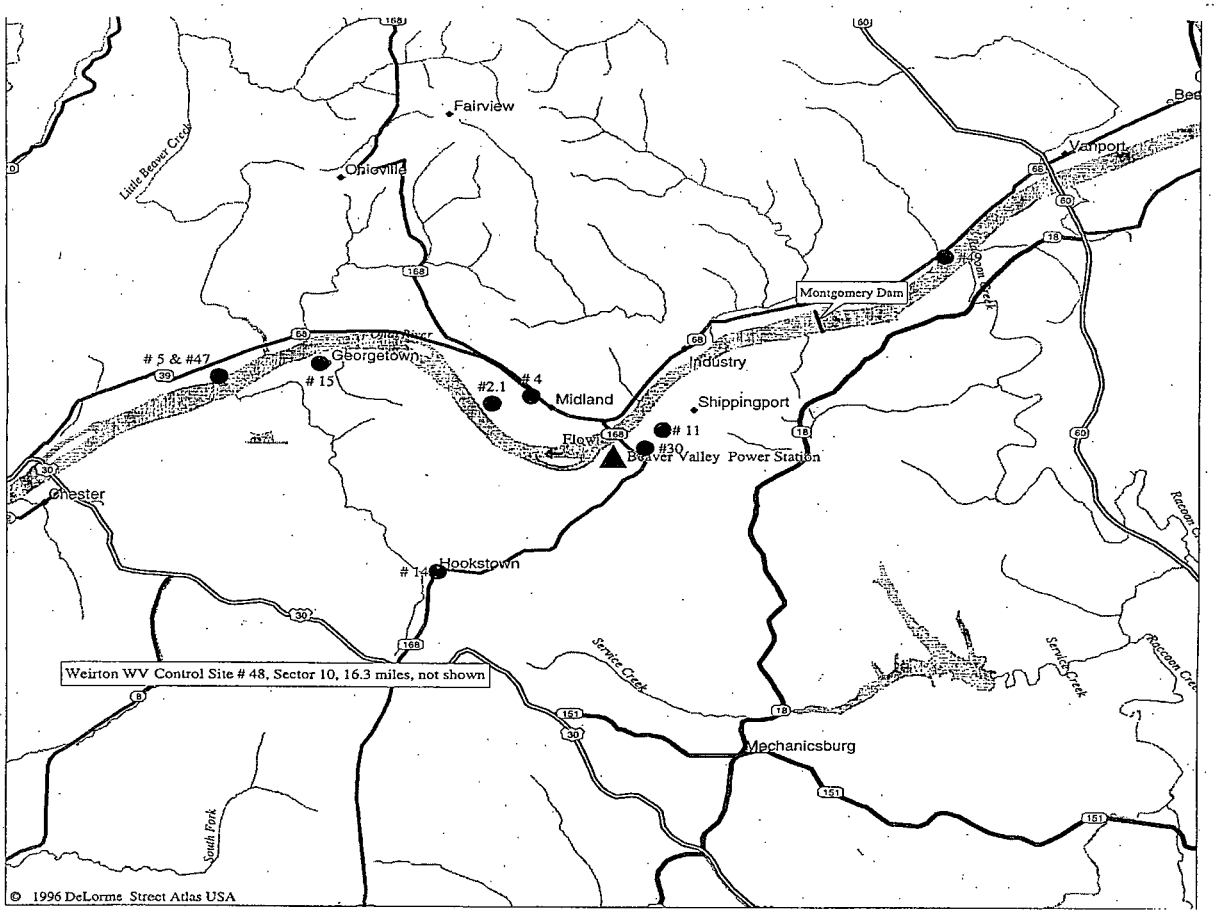
SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

f. Summary: Data from the water sample analyses demonstrate that BVPS did not contribute a significant increase of radioactivity in the local river, in the drinking water, in the well water, or in the 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.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-14

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



Sample Type	Site No.	Sector	Distance (miles)	Sample Point Description
Drinking Water	4	15-NW	1.26	Midland, PA (Water Department)
	5	14-WNW	4.90	East Liverpool, OH (Water Department)
Surface Water	2.1	14-WNW	1.43	Midland, PA (ATI Allegheny Ludlam)
	5	14-WNW	4.90	East Liverpool, OH (Water Department)
	49A	3-NE	4.93	Industry, PA (Upstream Montgomery Dam)
Ground Water	11	3-NE	0.94	Shippingport, PA
	14A	11-SW	2.61	Hookstown, PA
	15B	14-WNW	3.75	Georgetown, PA
Precipitation	30	4-ENE	0.43	Shippingport, PA (Cook's Ferry Substation)
	47	14-WNW	4.88	East Liverpool, OH (Water Department)
	48	10-SSW	16.40	Weirton WV (Water Tower, Collier Way)

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-15

Graph of Annual Average Concentration: Iodine-131 in Surface Water & Drinking Water

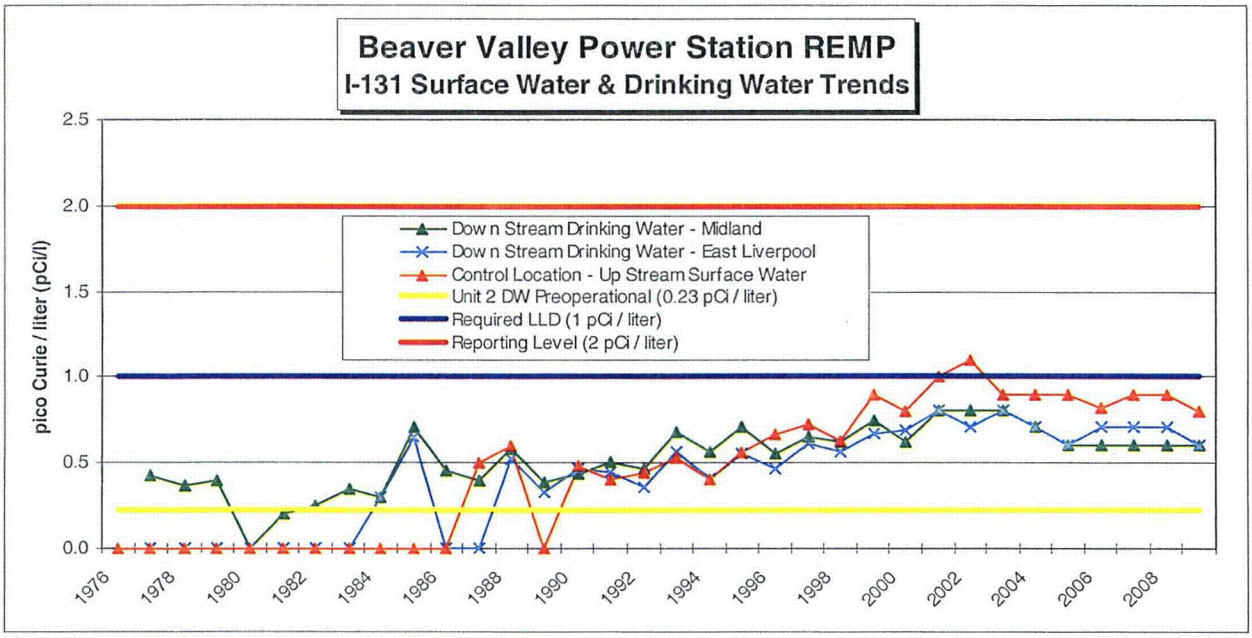


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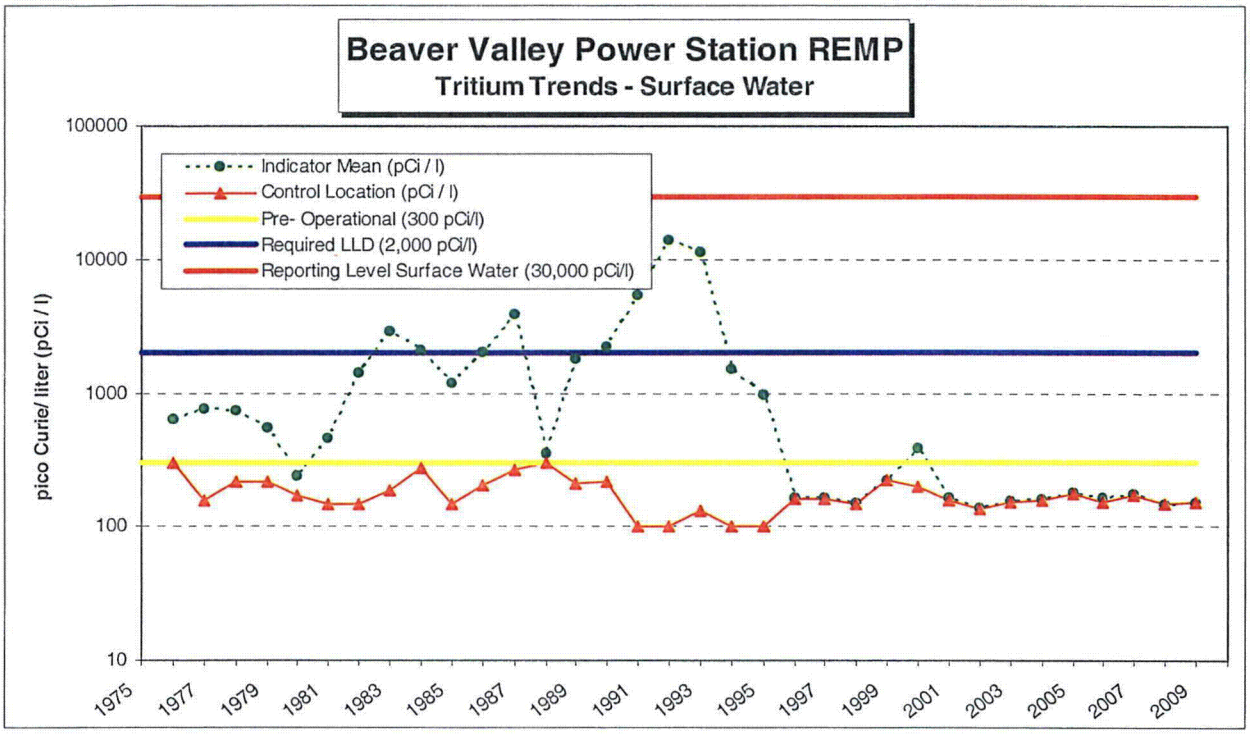
Figure 2-16

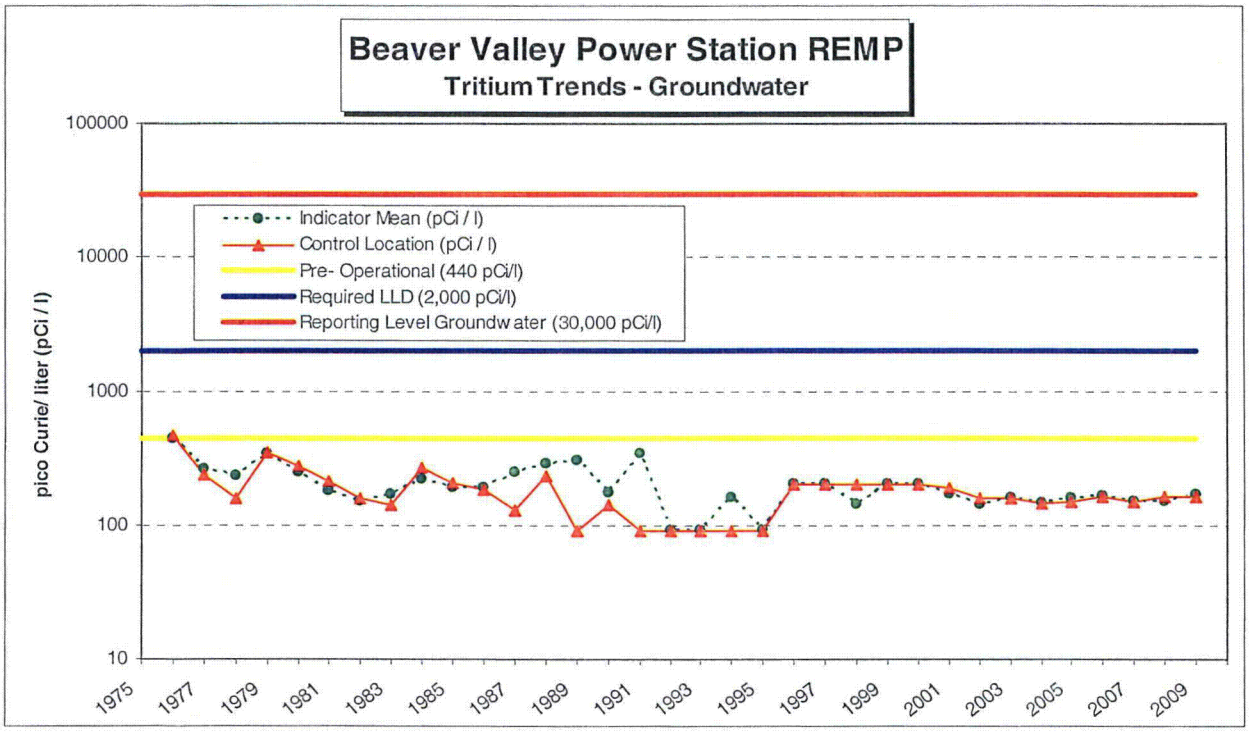
Graph of Annual Average Concentration: Tritium in Surface Water



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-17

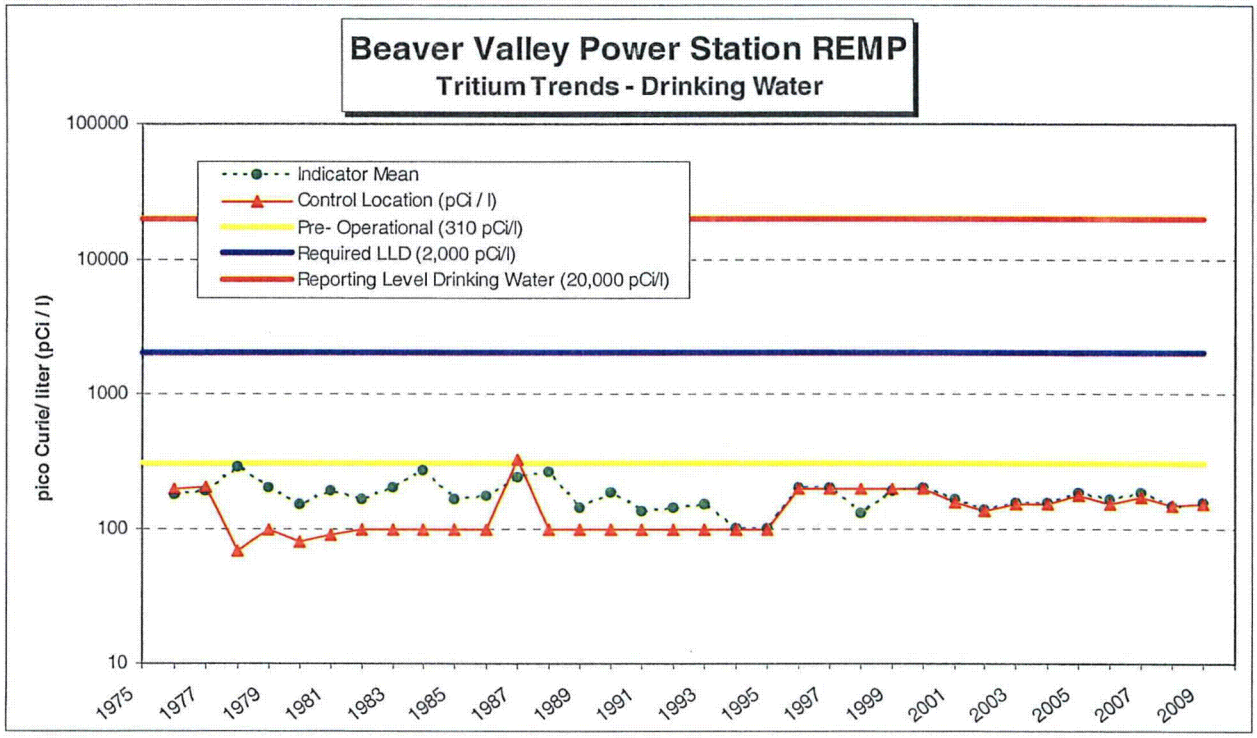
Graph of Annual Average Concentration: Tritium in Ground Water



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Figure 2-18

Graph of Annual Average Concentration: Tritium in Drinking Water



SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

I. Estimates of Radiation Dose to Man

1. Pathways to Man - Calculational Models

The radiation doses to man as a result of BVPS operations were calculated for both gaseous and liquid effluent pathways using computer codes for the ARERAS/MIDAS computer system. These computer codes are equivalent to NRC computer codes XOQDOQ2, GASPAR, and LADTAP. Dose factors listed in the ODCM are used to calculate doses from radioactive noble gases in discharge plumes. BVPS effluent data, based on sample analysis were used as the radionuclide activity input.

All liquid and gaseous effluent radionuclides listed in the Annual Radioactive Effluent Release Report were input as source terms to the computer codes.

All batch and continuous gaseous effluent releases were included in the dose assessment calculations. The release activities are based on laboratory analysis. Meteorological data collected by the BVPS Meteorology System was also used as input to the computer codes. Except when more recent or specific data was available, the usage factors were obtained from the BVPS Final Environmental Statements or Regulatory Guide 1.109.

All radioactive liquid effluents are released by batch mode after analysis by gamma spectrometry. Each batch is diluted by cooling tower blowdown water prior to discharge into the Ohio River via the main outfall (River Mile 35.0). The actual data from these analyses are tabulated and used as the radionuclide source term input to the computer code. Except when more recent or specific data was available, the usage factors were obtained from the BVPS Final Environmental Statements or Regulatory Guide 1.109.

The total population doses were evaluated for all liquid and gaseous effluent pathways out to 50 miles. For these evaluations, a total population of ~4 million people was used. An estimate of the populations are listed in the BVPS-2 UFSAR Section 2.1.3.1 for 0-10 miles and Section 2.1.3.2 for 10-50 miles.

2. Results of Calculated Population Dose to Man - Liquid Effluent Releases

During the report period, the calculated dose to the entire population within 50 miles of the plant is presented in Table 2-4 for BVPS liquid effluent releases. Also shown in this table is a comparison to natural radiation exposure.

3. Results of Calculated Population Dose to Man – Gaseous Effluent Releases

During the report period, the calculated dose to the entire population within 50 miles of the plant is presented in Table 2-5 for BVPS airborne effluent releases. Also shown in this table is a comparison to natural radiation exposure. The doses include the contribution of all pathways.

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

4. Conclusions

Based upon the estimated dose to individuals from the natural background radiation exposure in Tables 2-4 and 2-5, the incremental increase in total body dose to the 50-mile population from the operation of BVPS - Unit 1 and 2, is less than 0.00005% of the annual background dose.

The calculated doses to the public from the operation of BVPS - Unit 1 and 2, are below ODCM 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.

Table 2-4

Comparison of Natural Radiation Exposure Versus
Calculated Population Dose to Man - Liquid Effluent Releases

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE [(a)]		
Ambient Gamma Radiation	=	58 millirem / year
Radionuclides in Body	=	40 millirem / year
Global Fallout	=	< 1 millirem / year
Radon	=	198 millirem / year
Average Individual	=	**296 millirem / year**
(Total from all sources shown above)		

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

0-50 mile Population Dose from BVPS Liquid Effluent Releases		
	Man-millirem	**Largest Isotope Contributor**
Total Dose	**422**	**Tritium**
Average Dose (per Individual)	**0.0001055**	**Tritium**

Comparison of Individual Dose BVPS Liquid Effluent Releases Versus Natural Background Radiation	
	millirem
BVPS Liquid Effluent Release Dose	**0.0001055**
Natural Radiation Exposure	**296**

SECTION 2 – ENVIRONMENTAL MONITORING PROGRAM

Table 2-5

Comparison of Natural Radiation Exposure Versus

Calculated Population Dose to Man – Gaseous Effluent Releases

TYPICAL DOSE TO INDIVIDUALS FROM NATURAL RADIATION EXPOSURE [a]		
Ambient Gamma Radiation	=	58 millirem / year
Radionuclides in Body	=	40 millirem / year
Global Fallout	=	< 1 millirem / year
Radon	=	198 millirem / year
Average Individual	**=**	**296 millirem / year**
(Total from all sources shown above)		

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

0-50 mile Population Dose from BVPS Gaseous Effluent Releases		
	Man-millirem	**Largest Isotope Contributor**
Total	**199**	**Tritium**
Average (per Individual)	**0.0000498**	**Tritium**

Comparison of Individual Dose BVPS Gaseous Effluent Releases Versus Natural Background Radiation	
	millirem
BVPS Gaseous Effluent Release Dose	**0.0000498**
Natural Radiation Exposure	**296**

SECTION 3 – LAND USE CENSUS

A. **Land Use Census Overview:** A Land Use Census was conducted August 6 through September 25, 2009 to comply with:

- Offsite Dose Calculation Manual procedure 1/2-ODC-3.03, *"Controls for RETS and REMP Programs"*, Attachment R, Control 3.12.2, and Surveillance Requirement 4.12.2.1

- BVPS REMP procedure 1/2-ENV-04.02, *"Milch Animal Sampling Location Determination & ODCM Procedure 1/2-ODC-3.03, Control 3.12.2 Action Statements a and b Compliance Determination"*

The Land Use census indicated that no changes were required in the current sampling locations, and no changes were required to the methodology used for determination of offsite dose from plant releases. A numerical summary of the Land Use Census results are provided in Table 3-1. The following information is also provided to clarify the Land Use Census as documented in letter NPD3NRE:0627, dated September 29, 2009:

B. **Nearest Residence:**
The current location has not changed since the previous census.
The current location is at 211 Ferry Hill Road, Shippingport, PA (0.406 miles NE).

C. **Nearest Garden >500 sqft:**
The location of the nearest garden has changed since the previous census. The new location is at the Knisley Residence, 175 Kerona Road, Shippingport, PA (0.7 miles, NE). However, the previous sampling location at the Cox Residence, 238 State Route 168, Hookstown, PA (0.760 miles, in the SSW Sector) will remain the primary sample location because the Knisley Residence did not contain leafy vegetables most appropriate for sampling (cabbage) this year.

D. **Nearest Dairy Cow:**
The current location has not changed since the previous census.
The current location is at the Searight Dairy, 948 McCleary Road, RD 1, Hookstown, PA (2.097 miles SSW).

E. **Nearest Doe Goat:**
The nearest location has not changed since the previous census. The location remains at the Ferry Farm, 227 Calhoun Road, Aliquippa, PA (3.320 miles SE). During 2009, the goat sampling location changed. The goats at the previous sampling location, (Collin's Farm 289 Calhoun Road, Aliquippa, PA - 3.547 miles SE), went dry, and goats at the Ferry Farm became available for milk sampling.

SECTION 3 – LAND USE CENSUS

F. Projection for 2010 Dairy Cow Sampling Locations:

Using a linear regression analysis of deposition parameters (D/Q), Dairy Cow sampling locations were determined to remain at the same locations used in 2009:

- **Searight Dairy**, 948 McCleary Road, RD1, Hookstown, PA (2.097 miles SSW)
- **Halstead Dairy**, 104 Tellish Drive, Hookstown, PA (5.079 miles SSW)
- **Brunton Dairy**, 3681 Ridge Road, Aliquippa, PA (6.158 miles SE)
- **Windsheimer Dairy**, RD 1 Burgettstown, PA (10.476 miles SSW)

G. Projection for 2010 Doe Goat Sampling Locations:

The linear regression analysis also indicated that there may be a Doe Goat sampling location in 2010. The Doe Goat sampling location for 2010 may be as follows:

- **Ferry Farm**, 227 Calhoun Road, Aliquippa, PA (3.320 miles SE)

H. D/Q for Milch Animal Locations:

None of the 2009 milch animal sampling locations experienced a >20% increase in D/Q. Therefore, a Special Report per ODCM procedure 1/2-ODC-3.03, Attachment R, Control 3.12.2 Action "a" and/or Action "b" was not required.

I. D/Q for Offsite Dose Determination:

There was no adverse effect on the current ODCM methodology used for offsite dose determination from effluent releases. Specifically, a linear regression analysis of D/Q did not yield any valid locations where the offsite dose could have increased >20% more than the offsite dose previously calculated using current ODCM methodology. Therefore, a Special Report per ODCM procedure 1/2-ODC-3.03, Attachment R, Control 3.12.2 Action "a" and/or Action "b" was not required.

J. D/Q Historical Comparison:

There was no adverse trend in D/Q when comparing 1997 to 2009 data to the ODCM default D/Q values. This validates that there was no adverse effect on the current ODCM methodology used for offsite dose determination from effluent releases. Specifically, the analysis of D/Q did not yield any valid locations where the offsite dose could have increased >20% more than the offsite dose previously calculated using current ODCM methodology. Therefore, a change in ODCM Receptor location and/or a change to meteorology at the current ODCM Receptor location are not required.

SECTION 3 – LAND USE CENSUS

K. Discrepancies or Conditions of Note:

During performance of the 2009 Land Use Census, discrepancies were discovered and documented in Condition Report 09-64044. These discrepancies are summarized below.

For years 2005-2008, two sectors (13-W and 14-WNW) within the five mile radius were erroneously reported as containing no Gardens. In 2009, communications with property owners revealed that between the years 2005-2008, Gardens were in fact present in sectors 13-W and 14WNW. These Gardens are co-located with the Nearest Residence of the sectors. During the investigation of these oversights, it was discovered that the format of the Land Use Census report changed in 2005 and these two Gardens were mistakenly omitted from the 2005-2008 Land Use Census Reports.

Although Gardens were identified in the North sector (1-N), it was not until 2009 that the Nearest Garden co-located with the Nearest Residence of this sector was identified. Upon review of historical Land Use Census Reports, it was determined that this Garden had not been previously identified.

In 2008, 5 out of 16 sectors were reported to contain no Gardens within the five mile radius. In 2009, 16 out of 16 sectors were reported to contain Gardens within the five mile radius; only one Garden was identified outside of the three mile radius (8-SSE).

SECTION 3 – LAND USE CENSUS

Table 3-1

Location of Nearest Residences, Gardens, Dairy Cows and Doe Goats

SECTOR	RESIDENCES	GARDENS	DAIRY COWS	DOE GOATS
	0 to 5 miles (miles)	0 to 5 miles (miles)	0 to 5 miles (miles)	0 to 5 miles (miles)
N	1.584	1.584	None	None
NNE	1.661	2.0	None	None
NE	**0.406** [b]	**0.7** [b]	None	None
ENE	0.603	1.047	None	None
E	0.429	2.252	None	3.402
ESE	0.476	1.713	None	None
SE	1.583	1.5	None [a]	**3.320** [b]
SSE	1.102	3.1	None	None
S	1.399	2.354	3.851	None
SSW	0.760	0.760	**2.097** [b]	None
SW	1.453	1.453	None	None
WSW	1.394	2.5	None	None
W	2.204	2.2	None	None
WNW	2.742	2.742	None	None
NW	0.885	1.033	None	None
NNW	0.902	2.413	2.442	None

[a] Although there are no Dairy Cows within 5 miles in this sector, a large local dairy located at 6.158 miles is included in the milk sampling program.

[b] **Distances shown in Bold print are the nearest location for that receptor.**

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

A. **Split Sample Program (Inter-Laboratory Comparison, Part 1 of 2):** BVPS participates in a split sample program with the Pennsylvania Department of Environmental Protection (PADEP) in support of their nuclear power plant monitoring program.

- BVPS provided split samples to PADEP throughout the report period. The shared media and number of locations were typically comprised of; milk (1), surface water (3), sediment (1), fish (1), and food crops (2).
- PADEP has co-located continuous air particulate & air iodine sample stations with four (4) of the BVPS locations.
- PADEP has co-located TLDs with twenty-four (24) of the BVPS TLDs.

B. **Spike Sample Program (Inter-Laboratory Comparison, Part 2 of 2):** BVPS participates in a spike sample program with an Independent Laboratory. This program is used to independently verify sample analyses performed by the BVPS Contractor Laboratory.

- **Acceptance Criteria 1:** The NRC criteria listed in NRC Inspection Procedure 84750, 12/4/90, Inspection Guidance 84750-03 is used as acceptance criteria for comparisons of results of spiked samples between the Contractor Lab and the Independent Lab. These comparisons are performed by dividing the comparison standard (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. However, in such cases where the counting precision of the standard yields a resolution of less than 4, a valid comparison is not practical, and therefore, not performed.

NRC Criteria	
Resolution	**Ratio**
< 4	--
4 - 7	0.50 - 2.00
8 - 15	0.60 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
> 200	0.85 - 1.18

- **Acceptance Criteria 2:** BVPS also has self imposed acceptance criteria. That criteria requires the percent difference between the Contractor Lab Activity and the Independent Lab Calculated Activity to agree by ± 20%.

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

Participation in an Inter-Laboratory Comparison Program is required by BVPS Unit 1 and 2 Offsite Dose Calculation Manual procedure 1/2-ODC-3.03 Attachment S Control 3.12.3. For the report period, the requirement was met by the Contractor Lab analyzing NIST traceable spiked samples supplied by an Independent Lab.

During the report period, BVPS used (Environmental, Inc., Midwest Laboratory – Northbrook, IL) as the Contractor Laboratory, and (Analytics – Atlanta, GA) as the Independent Laboratory.

The spiked samples included air particulate filter papers, charcoal cartridges, water samples, and milk samples. The samples were submitted by the Independent Laboratory to the Contractor Laboratory for analysis. The "spiked to" values were used for calculating comparison Acceptance Criteria.

- **Spiked Milk & Water Samples:** The spiked sample results (i.e.; the BVPS criteria) for each calendar quarter are reported in Table 4-1 through Table 4-4, respectively. The following summary is provided:

  - A total of forty-eight (48) gamma spectrometry radionuclide analyses were performed by the Contractor Laboratory on four (4) milk samples.

  - A total of forty-eight (48) gamma spectrometry radionuclide analyses were performed by the Contractor Laboratory on four (4) water samples.

  - A total of four (4) chemical analyses for I-131 were performed by the Contractor Laboratory on four (4) milk samples.

  - A total of four (4) chemical analyses for I-131 analyses were performed by the Contractor Laboratory on four (4) water samples.

  - A total of four (4) tritium analyses were performed by the Contractor Laboratory on four (4) water samples.

  - Comparison of results of the spiked milk and water samples showed acceptable agreement with the NRC acceptance criteria. All one-hundred-eight (108) analyses met the NRC acceptance criteria.

  - Comparison of results of the spiked milk and water samples showed acceptable agreement with BVPS acceptance criteria. All but one (1) of the one-hundred-eight (108) analyses met the BVPS acceptance criteria.

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

- **Spiked Filter Paper and Charcoal Cartridge Samples:** The spiked sample results for each calendar quarter are also reported in Table 4-1 through Table 4-4, respectively. The following summary is provided:

  - Gross Beta (Cesium-137) analyses were performed by the Contractor Laboratory on two (2) filter paper samples.

  - Iodine-131 analyses were performed by the Contractor Laboratory on two (2) charcoal cartridge samples.

  - Comparison of results of the spiked filter paper and charcoal cartridge samples showed acceptable agreement with the NRC acceptance criteria. All four (4) analyses performed by the Contractor Laboratory met the NRC acceptance criteria.

  - Comparison of results of the spiked filter paper and charcoal cartridge samples showed acceptable agreement with the BVPS acceptance criteria. All four (4) analyses performed by the Contractor Laboratory met the BVPS acceptance criteria.

C. Conclusions

- **Results of Split Sample Program:**

  The split sample program is coordinated by the state, and the results are not provided with this report.

- **Results of Spike Sample Program:**

  Based on the Inter-Laboratory comparison data, BVPS considers all analyses provided throughout the report period by the Contractor Laboratory to be acceptable with respect to both accuracy and measurement. A comparison of the data, to the BVPS Acceptance Criteria, is provided in the following tables. There was one sample that is not within the BVPS Acceptance Criteria. Although this sample analysis is not within the BVPS Acceptance Criteria, it is within the NRC Acceptance Criteria. The BVPS acceptance criteria are self imposed FENOC internal goals and can be considered stringent compared to the NRC acceptance criteria. The deviation occurred in the second quarter for milk for Sr-90 (-34.73%).

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

Table 4-1

Inter-Laboratory Comparison Program
Spiked Samples – 1st Quarter

Sample Date	Sample Type and Identification No.	Sample Analyses	Percent Difference Between Contractor Lab Activity and Independent Lab Calculated Activity (Contr. Lab – Ind. Lab) / Ind. Lab
03/19/2009	**Water** Ind Lab: E6573-93 Con. Lab: SPW-891	Sr-89	-11.43%
		Sr-90	-12.58%
		I-131 (Chemical)	6.23%
		I-131	0.72%
		Ce-141	2.00%
		Cr-51	4.21%
		Cs-134	-8.74%
		Cs-137	0.21%
		Co-58	-1.99%
		Mn-54	2.90%
		Fe-59	3.78%
		Zn-65	2.39%
		Co-60	2.50%
03/19/2009	**Water** Ind. Lab: E6572-93 Con. Lab: SPW-890	H-3	13.17%
03/19/2009	**Milk** Ind. Lab: E6574-93 Con. Lab: SPMI-892	Sr-89	-9.42%
		Sr-90	-10.90%
		I-131 (Chemical)	14.88%
		I-131	1.64%
		Ce-141	4.64%
		Cr-51	2.52%
		Cs-134	-9.39%
		Cs-137	0.90%
		Co-58	-3.28%
		Mn-54	2.27%
		Fe-59	4.30%
		Zn-65	1.15%
		Co-60	2.46%
03/19/2009	**Filter Paper** Ind. Lab: E6575-93 Con. Lab: SPAP-893	Cs-137 (Gross Beta)	12.56%
03/19/2009	**Charcoal Cartridge** Ind. Lab: E6576-93 Con. Lab: SPCH-894	I-131	-5.31%

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

Table 4-2

Inter-Laboratory Comparison Program
Spiked Samples – 2nd Quarter

Sample Date	Sample Type and Identification No.	Sample Analyses	Percent Difference Between Contractor Lab Activity and Independent Lab Calculated Activity (Contr. Lab – Ind. Lab) / Ind. Lab
06/18/2009	**Water** Ind. Lab: E6727-93 Con. Lab: SPW-3032	Sr-89	0.22%
		Sr-90	-7.35%
		I-131 (Chemical)	-4.08%
		I-131	0.91%
		Ce-141	-8.19%
		Cr-51	3.85%
		Cs-134	-15.24%
		Cs-137	1.16%
		Co-58	0.00%
		Mn-54	0.10%
		Fe-59	5.60%
		Zn-65	5.86%
		Co-60	-0.51%
06/18/2009	**Water** Ind. Lab: E6726-93 Con. Lab: SPW-3031	H-3	0.77%
06/18/2009	**Milk** Ind. Lab: E6728-93 Con. Lab: SPMI-3033	Sr-89	-14.73%
		Sr-90	-34.73%
		I-131 (Chemical)	-5.98%
		I-131	-2.94%
		Ce-141	-6.44%
		Cr-51	-3.70%
		Cs-134	-13.92%
		Cs-137	-3.70%
		Co-58	-3.26%
		Mn-54	-2.99%
		Fe-59	-0.98%
		Zn-65	3.94%
		Co-60	-3.30%

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

Table 4-3

Inter-Laboratory Comparison Program
Spiked Samples – 3rd Quarter

Sample Date	Sample Type and Identification No.	Sample Analyses	Percent Difference Between Contractor Lab Activity and Independent Lab Calculated Activity (Contr. Lab – Ind. Lab) / Ind. Lab
09/17/2009	**Water** Ind. Lab: E6858-93 Con. Lab: SPW-4828	Sr-89	15.24%
		Sr-90	4.32%
		I-131 (Chemical)	-8.43%
		I-131	-0.10%
		Ce-141	0.64%
		Cr-51	8.11%
		Cs-134	-8.98%
		Cs-137	3.95%
		Co-58	1.99%
		Mn-54	4.55%
		Fe-59	7.94%
		Zn-65	10.62%
		Co-60	-0.45%
09/17/2009	**Water** Ind. Lab: E6857-93 Con. Lab: SPW-4827	H-3	3.09%
09/17/2009	**Milk** Ind. Lab: E6859-93 Con. Lab: SPMI-4829	Sr-89	-10.93%
		Sr-90	-15.43%
		I-131 (Chemical)	-8.92%
		I-131	2.03%
		Ce-141	-2.29%
		Cr-51	2.13%
		Cs-134	-10.57%
		Cs-137	0.92%
		Co-58	1.01%
		Mn-54	2.04%
		Fe-59	4.90%
		Zn-65	6.67%
		Co-60	-0.44%
09/17/2009	**Filter Paper** Ind. Lab: E6860-93 Con. Lab: SPAP-4830	Cs-137 (Gross Beta)	8.55%
09/17/2009	**Charcoal Cartridge** Ind. Lab: E6861-93 Con. Lab: SPCH-4831	I-131	-12.54%

SECTION 4 - SPLIT SAMPLE PROGRAM and SPIKE SAMPLE INTER-LABORATORY COMPARISON PROGRAM

Table 4-4

Inter-Laboratory Comparison Program
Spiked Samples – 4th Quarter

Sample Date	Sample Type and Identification No.	Sample Analyses	Percent Difference Between Contractor Lab Activity and Independent Lab Calculated Activity (Contr. Lab – Ind. Lab) / Ind. Lab
12/10/2009	**Water** Ind. Lab: E6955-93 Con. Lab: SPW-6797	Sr-89	-5.95%
		Sr-90	7.19%
		I-131 (Chemical)	-2.91%
		I-131	2.19%
		Ce-141	-1.18%
		Cr-51	-1.90%
		Cs-134	8.63%
		Cs-137	3.43%
		Co-58	-0.80%
		Mn-54	2.46%
		Fe-59	4.47%
		Zn-65	3.19%
		Co-60	-3.06%
12/10/2009	**Water** Ind. Lab: E6954-93 Con. Lab: SPW-6762	H-3	5.01%
12/10/2009	**Milk** Ind. Lab: E6956-93 Con. Lab: SPMI-6763	Sr-89	-8.55%
		Sr-90	-8.94%
		I-131 (Chemical)	-12.60%
		I-131	-0.92%
		Ce-141	-2.87%
		Cr-51	-1.92%
		Cs-134	-11.74%
		Cs-137	1.51%
		Co-58	-1.37%
		Mn-54	3.76%
		Fe-59	2.02%
		Zn-65	2.43%
		Co-60	-3.40%