UNITS 1, 2 AND 3

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1, 1993, THROUGH JUNE 30, 1993

USNRC Docket No. STN 50-528/529/530

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INTRODUCTION

This report summarizes meteorological data and doses from radioactive effluents for the Palo Verde Nuclear Generating Station (PVNGS) for the period of January through June 1993. The data presented meets the reporting requirements of Regulatory Guide 1.21 (Revision 1, June 1974) of the U.S. Nuclear Regulatory Commission and the PVNGS Technical Specifications.

The report is organized into four parts. Appendix A presents the effluent and waste disposal source term data. Appendix B presents a summary of onsite meteorological data for the report period. Appendix C presents the radiological doses from gaseous radioactive effluents. Appendix D contains the Offsite Dose Calculation Manual (ODCM) revision 6 and revision 7.

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APPENDIX A

SOURCE TERMS

AND

EFFLUENT AND WASTE DISPOSAL REPORTS

1.0 REGULATORY LIMITS

1.1 Liquid Releases

1.1.1 PVNGS ODCM Requirement 3.2

The concentration of radioactive material discharged from the secondary system liquid waste to the onsite evaporation ponds shall be limited to the Lower Limit of Detectability (LLD) defined as 5×10^{-7} μCi/ml for the principal gamma emitters or 1×10^{-6} μCi/ml for I-131.

1.1.2 PVNGS ODCM Requirement 4.4

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrems to the total body and to less than or equal to 5 mrems to any organ, and

b. During any calendar year to less than or equal to 3 mrems to the total body and to less than or equal to 10 mrems to any organ.

1.2 Gaseous Releases

1.2.1 PVNGS ODCM Requirement 3.1

The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

a. For noble gases: Less than or equal to 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin, and

b. For I-131 and I-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ.

1.2.2 PVNGS ODCM Requirement 4.1

The air dose due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrads for beta radiation and,

b. During any calendar year: Less than or equal to 10 mrads for gamma radiation and less than or equal to 20 mrads for beta radiation.

1.2.3 PVNGS ODCM Requirement 4.2

The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ and,

b. During any calendar year: Less than or equal to 15 mrems to any organ.

1.2.4 PVNGS ODCM Requirement 4.3

The GASEOUS RADWASTE SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases, from each reactor unit, from the site, when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases, from each reactor unit, to areas at and beyond the SITE BOUNDARY when averaged over 31 days, would exceed 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

1.3 Total Dose

1.3.1 PVNGS ODCM Requirement 5.1

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

2.0 MAXIMUM PERMISSIBLE CONCENTRATIONS

Air: Release Concentrations are limited to dose rate limits described in section 1.2.1 of this report.

3.0 AVERAGE ENERGY

The average energy ($\bar{E}$) of the radionuclide mixture in releases of fission and activation gases is not applicable to PVNGS.

4.0 MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY IN GASEOUS EFFLUENTS

For continuous releases, sampling is in accordance with PVNGS ODCM Table 3-1. Particulate and iodine radionuclides are sampled continuously at the three exhaust points. The particulate filters and charcoal cartridges are exchanged for analysis four times per month. Noble gas and tritium are sampled at least once per 31 days. The hourly average Radiation Monitoring System (RMS) effluent monitor readings are used, when available, to account for increases and decreases in noble gas concentrations between noble gas grab samples. The tritium concentration is assumed constant between sampling periods.

For batch releases, sampling is also in accordance with PVNGS ODCM Table 3-1. For containment purges, the noble gas concentration is adjusted to account for decreases or increases in concentration during the purge using RMS readings. The volume of air released during the purge is determined using the exhaust fan rated flow rate. For Waste Gas Decay Tank releases, the volume released is corrected to standard pressure.

The Lower Limit of Detection (LLD) of a measurement system is defined in Table 3-1 of the PVNGS ODCM. An average LLD for each radionuclide is provided in Table A1.

5.0 BATCH RELEASES

5.1 Gaseous

All times are in hours

	Unit 1	Unit 2	Unit 3
Number of batch releases	61	55	56
Total time period for batch releases	1816.72	4364.27	1049.79
Maximum time period for a batch release	168.00	168.00	166.00
Average time period for a batch release	29.78	79.35	18.75
Minimum time period for a batch release	0.02	0.10	0.01

5.2 Liquid

None.

6.0 ABNORMAL RELEASES

An abnormal release occurred in Unit One on February 17, 1993. Operations was attempting to obtain a Pre-Holdup Ion Exchanger effluent sample. The release occurred through the CVCS Holdup Tank strainer (1-M-CHN-F29) which was removed for maintenance. 3.74E-02 curies were released. Individual isotopic information is included in Table A3. The corresponding meteorological data is included in Appendix B. Specific release information is documented in Permit # 931039. For a detailed description of this event, refer to CRDR 1-3-0091.

An abnormal release occurred in Unit Two on March 19, 1993, when approximately 16,000 gallons of contaminated condensate was spilled. The condensate was contaminated as a result of a Steam Generator Tube Rupture that occurred on March 14, 1993. 6.45E-02 curies were released. Individual isotopic information is included in Table A6. The corresponding meteorological data is included in Appendix B. Specific release information is documented in Permit # 932081. For a detailed description of this event, refer to CRDR 2-3-0116.

A second abnormal release occurred in Unit Two on May 2, 1993, when approximately 100 gallons of water overflowed from the Blowdown Demineralizer sump. 1.35E-05 Curies were released, of which 1.11E-05 curies were tritium. This release was insignificant in terms of curies released as listed in Table A6. For a detailed description of this event, refer to CRDR 2-3-0298.

7.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) AND PROCESS CONTROL PROGRAM (PCP) REVISIONS

Revision 6.00 of the ODCM was effective March 21, 1993, revision 7.00 of the ODCM was effective June 25, 1993. Revision 6.00 revised page 29 only, and only this page and the associated justification are included in Appendix D. A complete copy of revision 7.00 is included in Appendix D.

There were no revisions to the PCP (76PR-9RW01).

8.0 EFFLUENTS AND SOLID WASTES

8.1 Gaseous Effluents

Gaseous effluent information is presented in Tables A2 through A10. Included in these tables are summaries of the effluents and estimated total error.

8.2 Liquid Effluents

There were no liquid effluents from the PVNGS site.

8.3 Solid Waste

Solid waste shipments are summarized in Table A12. There was an error in Table A12, section 3.a, of the July 1, 1992 through December 31, 1992 report. The report indicated 40 shipments by APS by truck to Hanford. The correct number of shipments by APS by truck to Hanford was 18.

9.0 MISCELLANEOUS INFORMATION

Releases made to the Evaporation Ponds have been limited, at the Chemical Waste Neutralizer tank, to the concentrations specified in PVNGS ODCM Requirement 3.2. In addition, PVNGS has imposed a limit of 3.00E-03 μCi/ml for tritium in tanks released to the Evaporation Ponds. This is the maximum permissible concentration for unrestricted areas for tritium in water from 10 CFR 20, Appendix B, Table II, Column 2. The Evaporation Ponds were monitored in accordance with PVNGS ODCM Requirement 6.1.

The average historical evaporation is approximately 12 inches, per pond, for each of the first and fourth quarters, and 33 inches, per pond, for each of the second and third quarters. This equates to 3.09E+11 cc evaporated from Pond 1 for each of the first and fourth quarters and 8.50E+11 cc evaporated from Pond 1 for each of the second and third quarters. The amount evaporated from Pond 2 is 2.89E+11 cc for each of the first and fourth quarters and 7.96E+11 cc for each of the second and third quarters. Using a X/Q of 5.0E-05 sec/m^3 for the evaporation ponds and equation 4-3 from the ODCM, the dose contribution from the evaporation ponds is summarized below.

1993 Evaporation Pond Data

Tritium Concentration (μCi/cc)					
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	
Pond 1	< LLD	5.52E-07	N/A	N/A	
Pond 2	9.59E-07	1.62E-06	N/A	N/A	
Dose (mRem)					
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Pond 1	< LLD	6.51E-03	N/A	N/A	6.51E-03
Pond 2	3.84E-03	1.79E-02	N/A	N/A	2.17E-02

The results of the third and fourth quarter 1992 Strontium-89 and Strontium-90 analysis for continuous releases, which were not available at the time the July - December 1992 Semiannual Report was written, are summarized below.

The fourth quarter 1992 composite filters for Unit 1, RU-143 and RU-145, were lost by the vendor laboratory. The results of the Unit 1, third quarter 1992 composites were used in place of the missing fourth quarter composites. The investigation of the missing filters was documented in CRDR 9-3-0242.

This additional data does not affect doses reported previously in Appendix C.

Third Quarter 1992

	Curies	
	Sr-89	Sr-90
Unit 1	< LLD	3.00E-08
Unit 2	< LLD	4.60E-08
Unit 3	4.16E-08	1.36E-08

Fourth Quarter 1992

	Curies	
	Sr-89	Sr-90
Unit 1	< LLD	3.18E-08
Unit 2	3.52E-08	1.09E-08
Unit 3	1.06E-07	< LLD

Table A1

UNITS 1, 2 AND 3

GASEOUS EFFLUENTS - AVERAGE LOWER LIMIT OF DETECTION

$\mu Ci/cc$

NUCLIDE	CONTINUOUS	BATCH
Argon-41	4.50E-08	4.50E-08
Krypton-85	7.40E-06	7.40E-06
Krypton-85m	2.20E-08	2.20E-08
Krypton-87	5.70E-08	5.70E-08
Krypton-88	7.40E-08	7.40E-08
Xenon-131m	9.10E-07	9.10E-07
Xenon-133	6.30E-08	6.30E-08
Xenon-133m	1.90E-07	1.90E-07
Xenon-135	2.00E-08	2.00E-08
Xenon-135m	8.90E-08	8.90E-08
Xenon-138	2.00E-07	2.00E-07
Iodine-131	8.00E-14	7.00E-12
Iodine-132	6.60E-12	1.90E-11
Iodine-133	4.70E-13	1.10E-11
Iodine-134	5.90E-11	8.20E-11
Iodine-135	7.00E-12	5.50E-11
Antimony-122	2.20E-13	1.90E-11
Antimony-124	8.40E-14	1.70E-11
Barium-140	3.40E-13	5.70E-11
Bromine-82	3.30E-13	1.40E-11
Cerium-141	8.70E-14	3.10E-11
Cerium-144	3.60E-13	6.50E-11
Cesium-134	1.00E-13	2.60E-11
Cesium-137	8.10E-14	1.70E-11
Cesium-138	5.20E-10	7.30E-10
Chromium-51	6.90E-13	1.40E-10
Cobalt-58	8.50E-14	1.70E-11
Cobalt-60	1.00E-13	1.90E-11
Iron-59	1.70E-13	3.20E-11
Lanthanum-140	2.80E-13	2.10E-11
Manganese-54	8.30E-14	1.70E-11
Molybdenum-99	2.40E-13	2.80E-11
Niobium-95	8.70E-14	1.80E-11
Rubidium-88	1.90E-08	1.90E-08
Ruthenium-103	7.40E-14	1.50E-11
Strontium-89	2.15E-15	(1)
Strontium-90	5.60E-16	(1)
Tellurium-123m	6.60E-14	1.50E-11
Tritium	3.80E-07	3.80E-07
Zinc-65	1.90E-13	3.80E-11
Zirconium-95	1.80E-13	4.10E-11
Gross Alpha	3.60E-15	(1)

(1) Not required for batch releases.

Table A2
UNIT 1 1993
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	1.61E+02	1.86E+02	3.54E+01
2. Average release rate for period	μCi/sec	2.07E+01	2.37E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	3.33E-04	4.21E-03	3.32E+01
2. Average release rate for period	μCi/sec	4.28E-05	5.35E-04	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	4.18E-05	1.16E-04	3.43E+01
2. Average release rate for period	μCi/sec	5.38E-06	1.48E-05	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	1.64E+02	2.55E+02	3.85E+01
2. Average release rate for period	μCi/sec	2.11E+01	3.24E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	

(1) Estimated total error methodology is presented in Table A11.

(2) See Table A4 for percent of ODCM Requirement limits.

Table A3

UNIT 1 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
1. Fission gases					
Argon-41	Ci	< LLD	2.00E-02	1.97E-01	2.31E-01
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	< LLD	2.79E-04	7.04E+00
Krypton-85m	Ci	7.03E-01	1.76E-01	1.25E-03	2.59E-03
Krypton-87	Ci	3.51E-01	< LLD	< LLD	< LLD
Krypton-88	Ci	< LLD	4.98E-02	< LLD	< LLD
Krypton-89	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-90	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-131m	Ci	< LLD	< LLD	1.54E-02	6.40E-02
Xenon-133	Ci	1.45E+02	1.61E+02	2.64E+00	4.45E+00
Xenon-133m	Ci	< LLD	5.61E-03	2.14E-02	4.38E-02
Xenon-135	Ci	1.19E+01	1.24E+01	4.77E-02	7.09E-02
Xenon-135m	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-137	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-138	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	1.58E+02	1.74E+02	2.93E+00	1.19E+01
2. Iodines					
Iodine-131	Ci	3.27E-04	4.21E-03	6.44E-06	2.18E-07
Iodine-132	Ci	2.35E-06	3.18E-06	3.46E-08	1.88E-07
Iodine-133	Ci	5.67E-05	3.16E-04	3.11E-05	1.18E-07
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	3.55E-06	1.20E-05	< LLD	< LLD
Total for period	Ci	3.90E-04	4.54E-03	3.76E-05	5.24E-07

Table A3 (Continued)

UNIT 1 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
3. Particulates					
Antimony-124	Ci	< LLD	< LLD	< LLD	< LLD
Barium-140	Ci	< LLD	< LLD	< LLD	< LLD
Bromine-82	Ci	< LLD	< LLD	1.65E-05	2.01E-05
Cerium-141	Ci	< LLD	< LLD	< LLD	< LLD
Cerium-144	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-134	Ci	8.55E-06	4.95E-05	5.76E-09	< LLD
Cesium-137	Ci	1.10E-05	6.32E-05	5.03E-09	< LLD
Cesium-138	Ci	2.21E-04	3.84E-03	< LLD	5.75E-07
Chromium-51	Ci	< LLD	< LLD	< LLD	< LLD
Cobalt-58	Ci	< LLD	< LLD	< LLD	< LLD
Cobalt-60	Ci	< LLD	< LLD	< LLD	< LLD
Iron-59	Ci	< LLD	< LLD	< LLD	< LLD
Lanthanum-140	Ci	< LLD	< LLD	< LLD	< LLD
Manganese-54	Ci	< LLD	< LLD	< LLD	< LLD
Molybdenum-99	Ci	< LLD	< LLD	< LLD	< LLD
Niobium-95	Ci	< LLD	< LLD	< LLD	< LLD
Rubidium-88	Ci	< LLD	< LLD	6.58E-05	1.49E-04
Ruthenium-103	Ci	< LLD	< LLD	< LLD	< LLD
Selenium-75	Ci	4.33E-06	< LLD	< LLD	< LLD
Strontium-89	Ci	9.03E-07	(1)	(2)	(2)
Strontium-90	Ci	2.25E-07	(1)	(2)	(2)
Tellurium-123m	Ci	1.68E-05	3.71E-06	< LLD	< LLD
Tritium	Ci	< LLD	< LLD	1.64E+02	2.55E+02
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	2.62E-04	3.96E-03	1.64E+02	2.55E+02

(1) Analysis not yet completed. Additional information will be included in the next Semiannual Report.

(2) Not required for batch releases.

Table A4

PVNGS UNIT 1
RADIATION DOSES AT AND BEYOND THE SITE BOUNDARY(1) FOR 1993

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for 1993
Gamma Air Dose	mrad	2.26E-02	2.42E-02	N/A	N/A	4.68E-02
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	4.52E-01	4.84E-01	N/A	N/A	4.68E-01
Beta Air Dose	mrad	5.37E-02	6.20E-02	N/A	N/A	1.16E-01
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	5.37E-01	6.20E-01	N/A	N/A	5.80E-01
Maximum Organ Dose (excluding skin)	mrem	Child Thyroid 4.12E-01	Child (2) Thyroid 7.14E-01	N/A	N/A	Child (2) Thyroid 1.13E+00
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	5.49E+00	9.52E+00	N/A	N/A	7.53E+00

(1) Calculations are based on parameters and methodologies of the ODCM using historical meteorology.

(2) Does not include 2nd quarter Sr-89, 90 results.

Table A5
UNIT 2 1993
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	2.23E+02	1.91E+01	3.54E+01
2. Average release rate for period	µCi/sec	2.87E+01	2.43E+00	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	9.11E-04	3.20E-04	3.32E+01
2. Average release rate for period	µCi/sec	1.17E-04	4.07E-05	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	2.06E-04	1.97E-03	3.43E+01
2. Average release rate for period	µCi/sec	2.65E-05	2.51E-04	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	6.69E+01	8.68E+01	3.85E+01
2. Average release rate for period	µCi/sec	8.60E+00	1.10E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	

(1) Estimated total error methodology is presented in Table A11.

(2) See Table A7 for percent of ODCM Requirement limits.

Table A6

UNIT 2 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
1. Fission gases					
Argon-41	Ci	1.62E+00	< LLD	1.93E-01	< LLD
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	1.60E+01	3.50E-01	1.20E-02
Krypton-85m	Ci	2.66E+00	< LLD	< LLD	< LLD
Krypton-87	Ci	2.32E+00	< LLD	< LLD	< LLD
Krypton-88	Ci	5.33E+00	< LLD	< LLD	< LLD
Krypton-89	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-90	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-131m	Ci	< LLD	< LLD	1.44E-01	1.54E-02
Xenon-133	Ci	1.51E+02	1.32E+00	2.96E+01	1.74E+00
Xenon-133m	Ci	1.29E+00	< LLD	8.18E-02	4.43E-03
Xenon-135	Ci	2.48E+01	< LLD	1.09E-01	< LLD
Xenon-135m	Ci	2.93E+00	< LLD	< LLD	< LLD
Xenon-137	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-138	Ci	3.12E-01	< LLD	< LLD	< LLD
Total for period	Ci	1.92E+02	1.73E+01	3.05E+01	1.78E+00
2. Iodines					
Iodine-131	Ci	5.60E-04	2.95E-04	3.51E-04	2.51E-05
Iodine-132	Ci	2.60E-05	< LLD	< LLD	1.64E-06
Iodine-133	Ci	1.33E-04	< LLD	2.62E-05	< LLD
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	7.04E-05	< LLD	< LLD	< LLD
Total for period	Ci	7.89E-04	2.95E-04	3.77E-04	2.67E-05

Table A6 (Continued)

UNIT 2 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
3. Particulates					
Antimony-122	Ci	< LLD	< LLD	7.66E-05	< LLD
Antimony-124	Ci	4.07E-06	3.85E-05	1.47E-04	3.01E-04
Barium-139	Ci	< LLD	< LLD	6.57E-05	< LLD
Barium-140	Ci	< LLD	< LLD	< LLD	< LLD
Bromine-82	Ci	3.58E-07	< LLD	2.70E-05	< LLD
Cerium-141	Ci	< LLD	< LLD	< LLD	< LLD
Cerium-144	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-134	Ci	< LLD	5.73E-06	3.59E-06	< LLD
Cesium-137	Ci	< LLD	3.19E-06	3.78E-06	< LLD
Cesium-138	Ci	5.94E-02	< LLD	< LLD	< LLD
Chromium-51	Ci	< LLD	7.67E-06	< LLD	2.73E-04
Cobalt-58	Ci	1.20E-05	7.86E-05	2.66E-06	7.22E-04
Cobalt-60	Ci	6.63E-06	8.31E-06	< LLD	1.86E-04
Iron-59	Ci	< LLD	< LLD	< LLD	< LLD
Lanthanum-140	Ci	< LLD	< LLD	< LLD	< LLD
Manganese-54	Ci	< LLD	< LLD	< LLD	5.03E-05
Molybdenum-99	Ci	< LLD	< LLD	< LLD	< LLD
Niobium-95	Ci	< LLD	7.15E-06	< LLD	1.11E-04
Rubidium-88	Ci	5.35E-02	< LLD	1.84E-05	< LLD
Ruthenium-103	Ci	2.17E-05	9.00E-05	< LLD	8.83E-05
Strontium-89	Ci	4.55E-07	(1)	(2)	(2)
Strontium-90	Ci	1.38E-08	(1)	(2)	(2)
Tellurium-123m	Ci	4.13E-06	< LLD	< LLD	< LLD
Tritium	Ci	< LLD	< LLD	6.69E+01	8.68E+01
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	3.48E-06	< LLD	1.35E-04
Total for period	Ci	1.13E-01	2.43E-04	6.69E+01	8.68E+01

(1) Analysis not yet completed. Additional information will be included in the next Semiannual Report.

(2) Not required for batch releases.

Table A7

PVNGS UNIT 2
RADIATION DOSES AT AND BEYOND THE SITE BOUNDARY(1) FOR 1993

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for 1993
Gamma Air Dose	mrad	6.78E-02	3.84E-04	N/A	N/A	6.82E-02
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	1.36E+00	7.68E-03	N/A	N/A	6.82E-01
Beta Air Dose	mrad	8.69E-02	9.71E-03	N/A	N/A	9.66E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	8.69E-01	9.71E-02	N/A	N/A	4.83E-01
Maximum Organ Dose (excluding skin)	mrem	Child Thyroid 1.83E-01	Child (2) Thyroid 2.21E-01	N/A	N/A	Child (2) Thyroid 4.05E-01
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	2.44E+00	2.95E+00	N/A	N/A	2.70E+00

(1) Calculations are based on parameters and methodologies of the ODCM using historical meteorology.

(2) Does not include 2nd quarter Sr-89, 90 results.

Table A8
UNIT 3 1993
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	1.37E+01	1.87E+01	3.54E+01
2. Average release rate for period	µCi/sec	1.76E+00	2.38E+00	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	1.02E-04	1.31E-06	3.32E+01
2. Average release rate for period	µCi/sec	1.31E-05	1.67E-07	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	1.07E-05	< LLD	3.43E+01
2. Average release rate for period	µCi/sec	1.38E-06	NA	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	8.98E+01	7.30E+01	3.85E+01
2. Average release rate for period	µCi/sec	1.15E+01	9.28E+00	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	

(1) Estimated total error methodology is presented in Table A11.

(2) See Table A10 for percent of ODCM Requirement limits.

Table A9

UNIT 3 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
1. Fission gases					
Argon-41	Ci	< LLD	< LLD	7.36E-02	9.97E-02
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	< LLD	3.38E-02	2.65E-01
Krypton-85m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-87	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-88	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-89	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-90	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-131m	Ci	< LLD	< LLD	< LLD	4.17E-03
Xenon-133	Ci	1.16E+01	1.70E+01	2.06E-02	4.37E-02
Xenon-133m	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-135	Ci	1.94E+00	1.24E+00	1.96E-04	< LLD
Xenon-135m	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-137	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-138	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	1.36E+01	1.83E+01	1.28E-01	4.13E-01
2. Iodines					
Iodine-131	Ci	1.01E-04	3.30E-07	7.10E-07	9.80E-07
Iodine-132	Ci	2.63E-06	< LLD	< LLD	< LLD
Iodine-133	Ci	2.00E-06	3.61E-07	1.35E-07	1.59E-07
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	3.42E-06	< LLD	< LLD	< LLD
Total for period	Ci	1.09E-04	6.91E-07	8.45E-07	1.14E-06

Table A9 (Continued)

UNIT 3 1993

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode Quarter #1	Continuous Mode Quarter #2	Batch Mode Quarter #1	Batch Mode Quarter #2
3. Particulates					
Antimony-124	Ci	1.15E-06	< LLD	< LLD	< LLD
Barium-140	Ci	< LLD	< LLD	< LLD	< LLD
Bromine-82	Ci	< LLD	< LLD	1.10E-05	1.35E-05
Cerium-141	Ci	< LLD	< LLD	< LLD	< LLD
Cerium-144	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-134	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-137	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-138	Ci	1.72E-05	1.96E-05	< LLD	< LLD
Chromium-51	Ci	< LLD	< LLD	< LLD	< LLD
Cobalt-58	Ci	2.96E-06	< LLD	< LLD	< LLD
Cobalt-60	Ci	5.15E-06	< LLD	< LLD	< LLD
Iron-59	Ci	< LLD	< LLD	< LLD	< LLD
Lanthanum-140	Ci	< LLD	< LLD	< LLD	< LLD
Manganese-54	Ci	< LLD	< LLD	< LLD	< LLD
Molybdenum-99	Ci	< LLD	< LLD	< LLD	< LLD
Niobium-95	Ci	< LLD	< LLD	< LLD	< LLD
Rubidium-88	Ci	< LLD	< LLD	< LLD	< LLD
Ruthenium-103	Ci	< LLD	< LLD	< LLD	< LLD
Selenium-75	Ci	1.40E-06	< LLD	< LLD	< LLD
Strontium-89	Ci	< LLD	(1)	(2)	(2)
Strontium-90	Ci	6.01E-08	(1)	(2)	(2)
Tellurium-123m	Ci	1.40E-08	< LLD	< LLD	< LLD
Tritium	Ci	< LLD	< LLD	8.98E+01	7.30E+01
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	2.79E-05	1.96E-05	8.98E+01	7.30E+01

(1) Analysis not yet completed. Additional information will be included in the next Semiannual Report.

(2) Not required for batch releases.

Table A10

PVNGS UNIT 3
RADIATION DOSES AT AND BEYOND THE SITE BOUNDARY(1) FOR 1993

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for 1993
Gamma Air Dose	mrad	2.41E-03	2.64E-03	N/A	N/A	5.04E-03
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	4.82E-02	5.28E-02	N/A	N/A	5.04E-02
Beta Air Dose	mrad	4.89E-03	6.16E-03	N/A	N/A	1.11E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	4.89E-02	6.16E-02	N/A	N/A	5.55E-02
Maximum Organ Dose		Child Thyroid	Child (2) Thyroid			Child (2) Thyroid
(excluding skin)	mrem	2.24E-01	1.80E-01	N/A	N/A	4.05E-01
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	2.99E+00	2.40E+00	N/A	N/A	2.70E+00

(1) Calculations are based on parameters and methodologies of the ODCM using historical meteorology.

(2) Does not include 2nd quarter Sr-89, 90 results.

Table A11

Estimation of Total Percent Error

The estimated total error is calculated as follows:

$$\text{Total Percent Error} = (E_1^2 + E_2^2 + E_3^2 + \ldots + E_n^2)^{1/2}$$

Where E_n = Percent error associated with each contributing parameter.

Parameters contributing to errors in the measurement of gaseous effluents are; process flow rates, sample collection, analytical counting and tank volumes.

The following values (%) were used for error calculations.

Fission & Act. gases	I-131	Partic-ulates	Tritium	
25	25	25	25	Sample counting error
10	10	10	10	Counting system calibration error
5	5	5	5	Counting system source error
20	N/A	N/A	N/A	Temperature/volume correction error
10	10	10	10	Process flow measuring device
N/A	15	15	15	Sample flow measuring device
N/A	5	N/A	N/A	Iodine collection efficiency error
N/A	N/A	10	N/A	Plateout error
N/A	N/A	N/A	20	Bubbler collection efficiency error
N/A	N/A	N/A	2	Sample volume transfer error (pipette)
N/A	N/A	N/A	2	Sample volume error (graduate)

TABLE A12

SOLID WASTE SUMMARY FOR PERIOD JANUARY 1, 1993 - JUNE 30, 1993

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (not irradiated fuel)

1.0 Type of Waste		Unit	6-month period	estimated total error %
1.a)	spent resin, filters, sludges, evaporator bottoms, etc.	M^3	2.52E+01	N/A
		Ci	6.81E+00	± 2.50E+01
1.b)	dry compressible waste, contaminated equipment, etc.	M^3	2.64E+01	N/A
		Ci	9.10E-01	± 2.50E+01
1.c)	irradiated components, fuel rods,etc.	M^3	0.00E+00	N/A
		Ci	0.00E+00	N/A
1.d)	other (Incinerator Ash)	M^3	9.71E-01	N/A
		Ci	1.81E-01	± 2.50E+01

NOTE

Volume and activity for dry compressible waste, contaminated equipment, etc., include PVNGS waste disposed of after being processed by a volume reduction facility.

2.0 Principal Radionuclides

2.a) Estimate a major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc.

WASTE CLASS	NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
A	FE-55	2.03E+01%	1.38E+00
A	CS-137	1.72E+01%	1.17E+00
A	CO-60	1.09E+01%	7.40E-01
A	SB-124	9.65E+00%	6.57E-01
A	CO-58	8.04E+00%	5.48E-01
A	H-3	7.50E+00%	5.11E-01
A	NI-63	6.65E+00%	4.53E-01
A	CS-134	6.29E+00%	4.28E-01
A	NB-95	3.00E+00%	2.04E-01
A	CE-144	2.86E+00%	1.95E-01
A	C-14	1.92E+00%	1.31E-01
A	AG-110m	1.70E+00%	1.16E-01
A	SB-125	1.63E+00%	1.11E-01
A	RU-106	1.38E+00%	9.40E-02
A	ZR-95	1.26E+00%	8.58E-02
A	CR-51	7.40E-01%	5.04E-02
A	MN-54	6.50E-01%	4.43E-02
A	PU-241	1.90E-01%	1.29E-02
A	SR-90	8.00E-02%	5.45E-03
A	CM-242	1.00E-02%	6.81E-04

2.b) Estimate a major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc.

WASTE CLASS	NUCLIDE NAME	PERCENT ABUNDANCE	CURIES

NO CLASS B SHIPPED

2.c) Estimate a major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc.

WASTE CLASS	NUCLIDE NAME	PERCENT ABUNDANCE	CURIES

NO CLASS C SHIPPED

2.d) Estimate a major nuclide concentration for dry compressible waste, contaminated equipment, etc.

WASTE CLASS	NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
A	FE-55	3.75E+01%	3.42E-01
A	CO-60	1.49E+01%	1.35E-01
A	CS-137	1.22E+01%	1.11E-01
A	CO-58	9.95E+00%	9.05E-02
A	NI-63	5.32E+00%	4.84E-02
A	SB-124	4.62E+00%	4.20E-02
A	CS-134	3.28E+00%	2.98E-02
A	NB-95	2.36E+00%	2.15E-02
A	H-3	2.34E+00%	2.13E-02
A	CE-144	1.25E+00%	1.14E-02
A	SB-125	1.22E+00%	1.11E-02
A	MN-54	1.14E+00%	1.04E-02
A	ZR-95	1.09E+00%	9.92E-03
A	AG-110m	1.05E+00%	9.56E-03
A	C-14	8.80E-01%	8.01E-03
A	CR-51	5.50E-01%	5.01E-03
A	FE-59	3.80E-01%	3.46E-03
A	RU-103	1.90E-01%	1.73E-03

2.e) Estimate a major nuclide concentration for solidified carbon and absorbed liquid waste.

WASTE CLASS	NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
A	CO-60	2.94E+01%	5.33E-02
A	FE-55	2.56E+01%	4.64E-02
A	CS-137	1.29E+01%	2.34E-02
A	CO-58	7.72E+00%	1.40E-02
A	SB-124	5.41E+00%	9.92E-03
A	CS-134	4.56E+00%	8.28E-03
A	MN-54	4.56E+00%	8.28E-03
A	NI-63	3.76E+00%	6.83E-03
A	FE-59	1.63E+00%	2.96E-03
A	CR-51	1.53E+00%	2.78E-03
A	H-3	1.52E+00%	2.76E-03
A	CE-144	1.27E+00%	2.29E-03
A	RU-103	8.50E-01%	1.54E-03
A	NB-95	8.40E-01%	1.52E-03
A	SB-125	5.00E-01%	9.16E-04
A	C-14	4.50E-01%	8.14E-04
A	AG-110m	4.20E-01%	7.67E-04
A	ZR-95	3.40E-01%	6.22E-04

3.0 Solid Waste Disposition

3.a)

SHIPMENTS	SHIPPER	MODE OF TRANSPORTATION	DESTINATION
6	APS	TRUCK	BARNWELL, SC
39	SEG	TRUCK	BARNWELL, SC

3.b) Irradiated Fuel Shipments: None

3.c) Supplemental Information - This section includes PVNGS and vendor provided containers.

NUMBER OF CONTAINERS	CONTAINER VOLUME FT³	TYPE OF WASTE	CONTAINER TYPE	SOLIDIFICATION AGENT
1	199.4	DEWATERED RESIN	STRONG TIGHT	NONE
91	7.5	RVR CONCENTRATES	STRONG TIGHT	NONE
7	7.5	DAW	STRONG TIGHT	NONE
10	46.0	ASH	STRONG TIGHT	NONE
2	12.1	DEWATERED RESIN	STRONG TIGHT	NONE
1	46.0	DEWATERED RESIN	STRONG TIGHT	NONE
1	13.1	DAW	STRONG TIGHT	NONE
4	11.6	DAW	STRONG TIGHT	NONE
32	46.0	DAW	STRONG TIGHT	NONE
13	12.1	DAW	STRONG TIGHT	NONE

4.0 Changes to Processes and/or Equipment

4.a) The Process Control Program has not been revised this report period.

4.b) No major changes were made to installed plant equipment.

4.c) No major changes were made to installed plant equipment. Therefore, predicted release or quantity of solid waste generated, remain unchanged as addressed in the FSAR.

4.d) No major changes were made to installed plant equipment. Therefore, predicted exposure to the public and general population, remain unchanged as addressed in the FSAR.

Table A13

Units 1, 2 and 3

EFFLUENT MONITORING INSTRUMENTATION OUT OF SERVICE GREATER THAN 30 DAYS

NONE

APPENDIX B

METEOROLOGY

JOINT FREQUENCY DISTRIBUTION TABLES

The tables presented in this section are results obtained from processing the hourly meteorological data collected at the Palo Verde Nuclear Generating Station for the period of January - June 1993. The joint frequency distribution (JFD) tables represent the frequency, in terms of the number of observations, that a particular wind speed, wind direction, and stability category occurred simultaneously. On a quarterly and semiannual basis, the JFDs were produced for 35-foot wind speed and wind direction by atmospheric stability class corresponding to the seven Pasquill stability categories, and for wind speed and wind direction for all stability classes combined. Atmospheric stability was classified per Regulatory Guide 1.23, using the 200-foot to 35-foot temperature difference (delta T).

In accordance with NUREG-0133, the batch releases for the first and second quarters of 1993 were considered as "long term," since for each quarter, the sum of the batch release periods for each unit exceeded 150 hours. Consequently, the JFDs for the batch releases for both quarters are the same as for the continuous releases.

Table B1

JFDs of 35-Foot Wind Versus Delta T

January - March 1993

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 3/31/93

1ST-QTR-93

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.51- 6.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.51- 8.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.51-11.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
11.51-14.50	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	4

STABILITY CLASS B

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.51- 6.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6.51- 8.50	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	3
8.51-11.50	0	1	0	0	0	1	0	0	0	0	2	2	1	2	0	0	9
11.51-14.50	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	5
14.51-20.50	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	0	1	0	1	0	1	0	1	9	3	2	2	0	0	21

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 3/31/93

1ST-QTR-93

STABILITY CLASS C

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
3.51- 4.50	1	1	0	0	2	2	0	0	0	0	0	1	1	1	1	0	10
4.51- 5.50	0	3	2	0	1	1	0	1	1	1	0	0	1	0	0	0	11
5.51- 6.50	0	1	1	4	1	0	0	0	0	0	1	1	0	0	0	0	9
6.51- 8.50	0	0	3	2	1	1	0	1	1	6	8	4	3	0	0	0	30
8.51-11.50	2	1	4	1	0	4	0	1	0	0	6	5	5	4	0	0	33
11.51-14.50	0	0	0	0	0	0	0	0	0	1	6	2	0	2	0	0	11
14.51-20.50	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	0	4
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	6	10	7	5	8	0	3	3	8	23	14	12	8	1	0	111

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	1	4
1.51- 2.50	0	2	1	2	1	0	1	1	1	5	6	7	4	7	3	4	45
2.51- 3.50	5	9	4	1	2	3	1	3	4	9	10	19	14	9	5	8	106
3.51- 4.50	12	9	3	6	5	2	1	1	7	13	16	20	11	12	5	6	129
4.51- 5.50	1	3	6	4	3	3	2	2	7	5	12	7	2	2	1	1	61
5.51- 6.50	1	8	6	3	2	1	2	1	6	5	8	6	1	4	1	1	56
6.51- 8.50	2	5	7	7	4	4	2	3	11	5	17	1	2	1	2	1	74
8.51-11.50	1	0	1	3	5	22	8	2	4	6	10	6	7	5	1	0	81
11.51-14.50	1	0	0	0	6	0	0	0	2	4	6	4	3	2	1	1	30
14.51-20.50	0	0	0	2	7	0	0	2	2	2	9	9	2	0	0	0	35
>20.50	0	0	0	0	1	0	0	0	0	1	1	2	1	0	0	0	6
TOTAL	23	36	28	28	36	35	17	15	44	57	95	82	47	42	19	23	627

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 3/31/93

1ST-QTR-93

STABILITY CLASS E
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	4
1.51- 2.50	3	1	4	0	0	1	0	0	0	3	3	4	8	2	8	6	43
2.51- 3.50	6	3	4	0	1	0	1	0	3	8	3	6	10	6	12	7	70
3.51- 4.50	8	6	4	3	0	0	1	5	2	6	8	5	7	7	8	3	73
4.51- 5.50	1	3	1	2	0	0	1	1	4	8	9	4	4	3	6	5	52
5.51- 6.50	3	4	4	3	1	0	2	3	6	4	9	8	3	1	4	0	55
6.51- 8.50	0	4	1	4	1	3	3	7	8	14	8	7	5	2	3	2	72
8.51-11.50	1	3	3	3	6	4	5	2	3	8	6	5	4	4	4	1	62
11.51-14.50	0	0	0	1	13	16	12	0	3	6	8	3	2	0	1	0	65
14.51-20.50	0	0	0	0	13	3	2	2	2	1	2	0	0	0	0	0	25
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	23	24	21	16	35	27	27	20	31	59	56	42	43	25	46	26	521

STABILITY CLASS F
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	5
1.51- 2.50	3	5	0	1	2	0	2	0	0	3	3	5	2	12	7	6	51
2.51- 3.50	10	4	3	0	2	0	0	1	2	1	4	8	12	14	17	28	106
3.51- 4.50	16	8	3	0	2	0	0	0	0	1	8	8	5	4	6	16	77
4.51- 5.50	9	6	3	0	2	0	0	0	0	3	5	4	3	3	0	7	45
5.51- 6.50	1	2	2	2	0	0	0	0	1	1	6	0	2	2	3	2	24
6.51- 8.50	3	1	1	1	0	0	0	1	1	4	13	2	3	1	2	0	33
8.51-11.50	1	0	3	0	0	0	1	0	1	0	4	0	1	2	1	0	14
11.51-14.50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5
14.51-20.50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	46	26	16	4	8	0	3	2	5	13	43	28	28	38	39	62	361

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 3/31/93

1ST-QTR-93

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	4
1.51- 2.50	7	9	2	1	0	0	0	0	0	0	2	2	1	8	11	11	54
2.51- 3.50	32	12	3	2	0	1	1	0	0	0	1	2	5	11	22	35	127
3.51- 4.50	53	19	2	2	1	0	0	0	0	0	1	2	4	0	15	36	135
4.51- 5.50	48	16	1	1	1	0	0	0	0	0	1	3	0	1	6	18	96
5.51- 6.50	24	9	1	0	1	0	0	0	0	0	0	1	0	0	3	9	48
6.51- 8.50	22	10	2	0	0	0	0	0	0	0	2	1	0	0	0	6	43
8.51-11.50	4	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8
11.51-14.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	190	77	11	6	3	1	1	0	0	0	7	11	10	22	57	119	515

STABILITY CLASS ALL

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	3	0	0	0	0	0	0	0	0	3	0	2	0	1	2	6	17
1.51- 2.50	13	17	7	4	3	1	3	1	1	11	14	19	15	29	29	27	194
2.51- 3.50	53	28	14	3	5	4	3	4	9	18	18	35	43	40	56	78	411
3.51- 4.50	90	43	12	11	10	4	2	6	9	20	33	36	28	24	35	61	424
4.51- 5.50	59	31	13	7	7	4	3	4	12	17	27	18	10	9	13	31	265
5.51- 6.50	29	24	14	13	5	1	4	4	13	10	24	16	6	7	11	12	193
6.51- 8.50	27	20	14	14	6	8	5	13	21	29	49	15	14	4	7	9	255
8.51-11.50	9	7	11	7	11	31	14	5	8	14	28	18	18	19	6	2	208
11.51-14.50	2	0	0	1	19	16	12	0	5	12	24	10	6	5	3	4	119
14.51-20.50	0	0	1	2	20	3	2	4	5	3	16	9	2	1	0	0	68
>20.50	0	0	0	0	1	0	0	0	0	1	1	2	1	0	0	0	6
TOTAL	285	170	86	62	87	72	48	41	83	138	234	180	143	139	162	230	2160

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 3/31/93

1ST-QTR-93

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 2160
TOTAL NUMBER OF VALID OBSERVATIONS: 2160
TOTAL NUMBER OF MISSING OBSERVATIONS: 0
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 5.9 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
.19	.97	5.14	29.03	24.12	16.71	23.84

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0
B	0	1	0	1	0	1	0	1	0	1	9	3	2	2	0	0	0
C	3	6	10	7	5	8	0	3	3	8	23	14	12	8	1	0	0
D	23	36	28	28	36	35	17	15	44	57	95	82	47	42	19	23	0
E	23	24	21	16	35	27	27	20	31	59	56	42	43	25	46	26	0
F	46	26	16	4	8	0	3	2	5	13	43	28	28	38	39	62	0
G	190	77	11	6	3	1	1	0	0	0	7	11	10	22	57	119	0
TOTAL	285	170	86	62	87	72	48	41	83	138	234	180	143	139	162	230	0

Table B2

JFDs of 35-Foot Wind Versus Delta T

April - June 1993

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/93 - 6/30/93

2ND-QTR-93

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	1	1	0	0	1	1	2	0	0	3	2	2	0	0	0	13
5.51- 6.50	0	0	0	0	0	1	1	2	4	2	9	5	4	0	0	2	30
6.51- 8.50	0	0	1	1	1	2	1	2	12	14	20	9	2	2	1	0	68
8.51-11.50	1	0	0	1	3	3	0	1	11	26	44	19	7	3	1	3	123
11.51-14.50	1	0	0	0	2	0	0	0	2	18	31	7	10	5	3	1	80
14.51-20.50	0	0	0	0	0	0	0	0	0	3	13	4	3	9	1	3	36
>20.50	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	1	6
TOTAL	2	1	2	2	6	7	3	7	29	65	120	49	28	19	6	10	356

STABILITY CLASS B

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	5
4.51- 5.50	0	2	0	0	1	0	1	2	9	4	3	5	1	0	0	0	28
5.51- 6.50	0	0	1	0	2	5	0	3	14	15	4	3	4	2	0	1	54
6.51- 8.50	0	0	1	0	1	4	2	3	8	11	8	7	4	0	1	0	50
8.51-11.50	0	0	1	0	2	2	0	0	3	4	8	9	2	1	3	1	36
11.51-14.50	0	0	0	0	1	1	0	0	0	3	6	4	0	0	0	0	15
14.51-20.50	0	0	0	0	1	0	0	0	0	2	3	1	3	0	1	1	12
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	0	2	3	0	8	13	4	8	34	41	33	30	14	3	5	3	201

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/93 - 6/30/93

2ND-QTR-93

STABILITY CLASS C
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	1	6
3.51- 4.50	0	0	0	1	0	1	2	1	5	7	2	2	0	0	0	1	22
4.51- 5.50	1	3	1	1	3	5	3	9	11	8	10	3	1	0	1	1	61
5.51- 6.50	0	0	0	0	4	4	3	6	5	8	1	1	1	1	0	0	34
6.51- 8.50	0	1	0	0	2	8	1	1	5	2	7	7	1	1	1	0	37
8.51-11.50	0	0	0	0	1	1	0	0	0	0	6	8	2	0	1	1	20
11.51-14.50	0	0	0	0	1	0	0	0	0	3	7	3	0	0	1	0	15
14.51-20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	3
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	4	1	2	11	19	9	17	26	28	36	26	5	3	6	4	198

STABILITY CLASS D
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	1	2	0	1	1	3	1	1	0	2	1	0	3	1	0	17
2.51- 3.50	0	1	4	2	4	2	5	2	2	5	6	0	2	0	1	0	36
3.51- 4.50	4	2	1	7	4	3	2	6	7	3	4	2	3	1	2	1	52
4.51- 5.50	0	0	1	3	3	2	3	4	5	6	3	1	1	1	1	0	34
5.51- 6.50	0	0	1	0	3	2	0	1	1	1	2	2	3	0	0	0	16
6.51- 8.50	0	0	0	1	1	1	0	0	3	6	6	9	2	3	0	0	32
8.51-11.50	0	1	0	0	0	1	0	0	1	3	5	12	3	4	2	1	33
11.51-14.50	0	0	0	0	0	0	0	0	1	1	15	11	1	1	1	0	31
14.51-20.50	0	0	0	0	0	0	0	0	0	5	7	3	1	5	1	0	22
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	5	9	13	16	12	13	14	21	30	50	41	16	18	9	2	273

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/93 - 6/30/93

2ND-QTR-93

STABILITY CLASS E

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	1	0	2	1	1	0	0	0	0	0	3	1	1	1	1	1	13
2.51- 3.50	3	5	1	1	0	0	1	0	0	1	2	0	1	1	0	1	17
3.51- 4.50	2	3	3	1	1	0	0	0	1	2	2	2	2	3	1	3	26
4.51- 5.50	1	3	1	1	0	0	0	0	2	4	8	0	3	0	0	0	23
5.51- 6.50	0	1	0	0	0	0	0	0	2	5	7	3	1	0	2	0	21
6.51- 8.50	1	1	1	0	0	0	0	0	2	6	8	15	9	2	2	2	49
8.51-11.50	1	0	0	0	0	0	0	0	2	4	37	26	14	7	5	4	100
11.51-14.50	0	0	0	1	0	1	0	1	1	7	20	10	0	7	1	1	50
14.51-20.50	0	0	0	0	0	0	0	0	1	0	5	0	1	3	4	1	15
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9	13	8	5	2	1	1	1	11	29	92	57	32	24	16	13	314

STABILITY CLASS F

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1.51- 2.50	4	1	1	0	0	0	0	1	1	0	1	1	1	0	4	0	15
2.51- 3.50	3	2	4	2	1	1	2	0	5	4	5	4	3	1	1	2	40
3.51- 4.50	5	5	2	2	0	0	1	0	3	2	5	3	5	2	1	5	41
4.51- 5.50	1	2	2	0	0	0	0	0	0	3	5	2	7	2	6	2	32
5.51- 6.50	1	1	1	0	0	1	0	0	1	2	6	5	3	4	3	2	30
6.51- 8.50	3	2	1	0	0	0	0	0	4	12	26	16	16	11	3	2	96
8.51-11.50	2	2	1	0	0	0	0	2	0	17	23	16	3	7	1	5	79
11.51-14.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	5
14.51-20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	19	15	12	4	1	2	3	3	14	41	72	47	38	28	20	21	340

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/93 - 6/30/93

2ND-QTR-93

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1.51- 2.50	5	1	3	1	0	0	0	1	0	1	2	1	3	3	4	7	32
2.51- 3.50	37	19	4	2	3	1	0	2	1	1	3	3	3	10	11	19	119
3.51- 4.50	41	20	4	5	1	2	2	0	1	1	5	1	6	5	10	21	125
4.51- 5.50	43	29	7	2	0	0	1	0	0	0	2	3	6	2	11	14	120
5.51- 6.50	6	11	3	3	0	0	0	0	1	2	6	1	3	5	2	4	47
6.51- 8.50	5	7	3	1	0	0	0	0	1	2	1	5	3	1	0	3	32
8.51-11.50	6	2	2	0	0	0	0	0	0	0	2	2	0	0	2	7	23
11.51-14.50	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	144	89	26	14	4	3	3	3	5	7	21	17	24	26	40	76	502

STABILITY CLASS ALL

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2
1.51- 2.50	10	3	8	2	2	1	3	3	2	1	8	4	5	7	10	8	77
2.51- 3.50	43	27	13	7	8	4	8	4	8	11	18	9	9	12	14	23	218
3.51- 4.50	52	30	10	16	6	7	8	7	17	16	19	11	16	11	14	31	271
4.51- 5.50	46	40	13	7	7	8	9	17	27	25	34	16	21	5	19	17	311
5.51- 6.50	7	13	6	3	9	13	4	12	28	35	35	20	19	12	7	9	232
6.51- 8.50	9	11	7	3	5	15	4	6	35	53	76	68	37	20	8	7	364
8.51-11.50	10	5	4	1	6	7	0	3	17	54	125	92	31	22	15	22	414
11.51-14.50	2	0	0	1	4	2	0	1	4	32	80	36	11	13	7	6	199
14.51-20.50	0	0	0	0	1	0	0	0	1	11	29	8	8	18	8	5	89
>20.50	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	1	7
TOTAL	179	129	61	40	48	57	36	53	140	241	424	267	157	121	102	129	2184

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/93 - 6/30/93

2ND-QTR-93

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 2184
TOTAL NUMBER OF VALID OBSERVATIONS: 2184
TOTAL NUMBER OF MISSING OBSERVATIONS: 0
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 7.3 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
16.30	9.20	9.07	12.50	14.38	15.57	22.99

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	2	1	2	2	6	7	3	7	29	65	120	49	28	19	6	10	0
B	0	2	3	0	8	13	4	8	34	41	33	30	14	3	5	3	0
C	1	4	1	2	11	19	9	17	26	28	36	26	5	3	6	4	0
D	4	5	9	13	16	12	13	14	21	30	50	41	16	18	9	2	0
E	9	13	8	5	2	1	1	1	11	29	92	57	32	24	16	13	0
F	19	15	12	4	1	2	3	3	14	41	72	47	38	28	20	21	0
G	144	89	26	14	4	3	3	3	5	7	21	17	24	26	40	76	0
TOTAL	179	129	61	40	48	57	36	53	140	241	424	267	157	121	102	129	0

Table B3

JFDs of 35-Foot Wind Versus Delta T

January - June 1993

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 6/30/93

1ST SEMIANNUAL

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	1	1	0	0	1	1	2	0	0	3	2	2	0	0	0	13
5.51- 6.50	0	0	0	0	0	1	1	2	4	2	9	5	4	0	0	2	30
6.51- 8.50	0	0	1	1	1	2	1	2	12	14	20	9	2	2	1	0	68
8.51-11.50	1	0	0	1	3	3	0	1	11	26	44	19	7	4	1	3	124
11.51-14.50	1	0	0	0	2	0	0	0	2	18	32	7	11	6	3	1	83
14.51-20.50	0	0	0	0	0	0	0	0	0	3	13	4	3	9	1	3	36
>20.50	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	1	6
TOTAL	2	1	2	2	6	7	3	7	29	65	121	49	29	21	6	10	360

STABILITY CLASS B

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	5
4.51- 5.50	0	2	0	0	1	0	1	2	9	4	3	5	1	0	0	0	28
5.51- 6.50	0	0	1	1	2	5	0	3	14	15	4	3	4	2	0	1	55
6.51- 8.50	0	0	1	0	1	4	2	4	8	11	9	7	5	0	1	0	53
8.51-11.50	0	1	1	0	2	3	0	0	3	4	10	11	3	3	3	1	45
11.51-14.50	0	0	0	0	1	1	0	0	0	4	9	5	0	0	0	0	20
14.51-20.50	0	0	0	0	1	0	0	0	0	2	6	1	3	0	1	1	15
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	0	3	3	1	8	14	4	9	34	42	42	33	16	5	5	3	222

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 6/30/93

1ST SEMIANNUAL

STABILITY CLASS C

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	1	8
3.51- 4.50	1	1	0	1	2	3	2	1	5	7	2	3	1	1	1	1	32
4.51- 5.50	1	6	3	1	4	6	3	10	12	9	10	3	2	0	1	1	72
5.51- 6.50	0	1	1	4	5	4	3	6	5	8	2	2	1	1	0	0	43
6.51- 8.50	0	1	3	2	3	9	1	2	6	8	15	11	4	1	1	0	67
8.51-11.50	2	1	4	1	1	5	0	1	0	0	12	13	7	4	1	1	53
11.51-14.50	0	0	0	0	1	0	0	0	0	4	13	5	0	2	1	0	26
14.51-20.50	0	0	0	0	0	0	0	0	1	0	3	0	0	2	1	0	7
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	10	11	9	16	27	9	20	29	36	59	40	17	11	7	4	309

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	1	4
1.51- 2.50	0	3	3	2	2	1	4	2	2	5	8	8	4	10	4	[illegible]	62
2.51- 3.50	5	10	8	3	6	5	6	5	6	14	16	[illegible]	16	9	6	8	142
3.51- 4.50	16	11	4	13	9	5	3	7	14	16	20	22	14	13	7	7	181
4.51- 5.50	1	3	7	7	6	5	5	6	12	11	15	8	3	3	2	1	95
5.51- 6.50	1	8	7	3	5	3	2	2	7	6	10	8	4	4	1	1	72
6.51- 8.50	2	5	7	8	5	5	2	3	14	11	23	10	4	4	2	1	106
8.51-11.50	1	1	1	3	5	23	8	2	5	9	15	18	10	9	3	1	114
11.51-14.50	1	0	0	0	6	0	0	0	3	5	21	15	4	3	2	1	61
14.51-20.50	0	0	0	2	7	0	0	2	2	7	16	12	3	5	1	0	57
>20.50	0	0	0	0	1	0	0	0	0	1	1	2	1	0	0	0	6
TOTAL	27	41	37	41	52	47	30	29	65	87	145	123	63	60	28	25	900

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 6/30/93

1ST SEMIANNUAL

STABILITY CLASS E

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	4
1.51- 2.50	4	1	6	1	1	1	0	0	0	3	6	5	9	3	9	7	56
2.51- 3.50	9	8	5	1	1	0	2	0	3	9	5	6	11	7	12	8	87
3.51- 4.50	10	9	7	4	1	0	1	5	3	8	10	7	9	10	9	6	99
4.51- 5.50	2	6	2	3	0	0	1	1	6	12	17	4	7	3	6	5	75
5.51- 6.50	3	5	4	3	1	0	2	3	8	9	16	11	4	1	6	0	76
6.51- 8.50	1	5	2	4	1	3	3	7	10	20	16	22	14	4	5	4	121
8.51-11.50	2	3	3	3	6	4	5	2	5	12	43	31	18	11	9	5	162
11.51-14.50	0	0	0	2	13	17	12	1	4	13	28	13	2	7	2	1	115
14.51-20.50	0	0	0	0	13	3	2	2	3	1	7	0	1	3	4	1	40
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	32	37	29	21	37	28	28	21	42	88	148	99	75	49	62	39	835

STABILITY CLASS F

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	6
1.51- 2.50	7	6	1	1	2	0	2	1	1	3	4	6	3	12	11	6	66
2.51- 3.50	13	6	7	2	3	1	2	1	7	5	9	12	15	15	18	30	146
3.51- 4.50	21	13	5	2	2	0	1	0	3	3	13	11	10	6	7	21	118
4.51- 5.50	10	8	5	0	2	0	0	0	0	6	10	6	10	5	6	9	77
5.51- 6.50	2	3	3	2	0	1	0	0	2	3	12	5	5	6	6	4	54
6.51- 8.50	6	3	2	1	0	0	0	1	5	16	39	18	19	12	5	2	129
8.51-11.50	3	2	4	0	0	0	1	2	1	17	27	16	4	9	2	5	93
11.51-14.50	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2	6	10
14.51-20.50	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	65	41	28	8	9	2	6	5	19	54	115	75	66	66	59	83	701

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 6/30/93

1ST SEMIANNUAL

STABILITY CLASS G
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	5
1.51- 2.50	12	10	5	2	0	0	0	1	0	1	4	3	4	11	15	18	86
2.51- 3.50	69	31	7	4	3	2	1	2	1	1	4	5	8	21	33	54	246
3.51- 4.50	94	39	6	7	2	2	2	0	1	1	6	3	10	5	25	57	260
4.51- 5.50	91	45	8	3	1	0	1	0	0	0	3	6	6	3	17	32	216
5.51- 6.50	30	20	4	3	1	0	0	0	1	2	6	2	3	5	5	13	95
6.51- 8.50	27	17	5	1	0	0	0	0	1	2	3	6	3	1	0	9	75
8.51-11.50	10	4	2	0	0	0	0	0	0	0	2	2	0	1	2	8	31
11.51-14.50	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	334	166	37	20	7	4	4	3	5	7	28	28	34	48	97	195	1017

STABILITY CLASS ALL
STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	3	0	0	0	0	0	0	0	1	3	0	2	0	2	2	6	19
1.51- 2.50	23	20	15	6	5	2	6	4	3	12	22	23	20	36	39	35	271
2.51- 3.50	96	55	27	10	13	8	11	8	17	29	36	44	52	52	70	101	629
3.51- 4.50	142	73	22	27	16	11	10	13	26	36	52	47	44	35	49	92	695
4.51- 5.50	105	71	26	14	14	12	12	21	39	42	61	34	31	14	32	48	576
5.51- 6.50	36	37	20	16	14	14	8	16	41	45	59	36	25	19	18	21	425
6.51- 8.50	36	31	21	17	11	23	9	19	56	82	125	83	51	24	15	16	619
8.51-11.50	19	12	15	8	17	38	14	8	25	68	153	110	49	41	21	24	622
11.51-14.50	4	0	0	2	23	18	12	1	9	44	104	46	17	18	10	10	318
14.51-20.50	0	0	1	2	21	3	2	4	6	14	45	17	10	19	8	5	157
>20.50	0	0	0	0	1	0	0	0	0	4	1	5	1	0	0	1	13
TOTAL	464	299	147	102	135	129	84	94	223	379	658	447	300	260	264	359	4344

JOINT FREQUENCY DISTRIBUTION ANALYSIS
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/93 - 6/30/93

1ST SEMIANNUAL

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 4344
TOTAL NUMBER OF VALID OBSERVATIONS: 4344
TOTAL NUMBER OF MISSING OBSERVATIONS: 0
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 6.6 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
8.29	5.11	7.11	20.72	19.22	16.14	23.41

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	2	1	2	2	6	7	3	7	29	65	121	49	29	21	6	10	0
B	0	3	3	1	8	14	4	9	34	42	42	33	16	5	5	3	0
C	4	10	11	9	16	27	9	20	29	36	59	40	17	11	7	4	0
D	27	41	37	41	52	47	30	29	65	87	145	123	63	60	28	25	0
E	32	37	29	21	37	28	28	21	42	88	148	99	75	49	62	39	0
F	65	41	28	8	9	2	6	5	19	54	115	75	66	66	59	83	0
G	334	166	37	20	7	4	4	3	5	7	28	28	34	48	97	195	0
TOTAL	464	299	147	102	135	129	84	94	223	379	658	447	300	260	264	359	0

APPENDIX C

DOSE CALCULATIONS

GASEOUS EFFLUENT DOSE CALCULATIONS

Doses to the maximum individual and the surrounding population resulting from the release of radioactive material in gaseous effluents from the Palo Verde Nuclear Generating Station were calculated using the GASPAR computer program. The radionuclides considered in the dose calculations were Tritium, Iodine-131, Iodine-132, Iodine-133, Iodine-135, all noble gases, and particulates having a half-life greater than eight days and for which dose factors are contained in NUREG-0172. Locations selected for individual dose calculations included for each sector, the site boundary, and within five miles, if present, the nearest residence, the nearest garden, and the nearest milk animal. GASPAR implements the radiological dose models of Regulatory Guide 1.109 to determine the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground deposition, inhalation, and ingestion. Doses to the maximum individual and the population were calculated as a function of age group and pathway for significant body organs. Assumptions and data sources used for input to the GASPAR code are described on page C7.

Table C1 presents the doses on a quarterly and semiannual basis for the Energy Information Center. An occupancy factor of 1.0 (implying continuous occupancy over the entire year) was considered for the Energy Information Center and the exposure pathways considered to calculate its doses were plume, ground deposition, and inhalation.

Table C2 presents the population doses.

Table C3 summarizes the individual doses and compares the result to PVNGS ODCM Requirement limits. The site boundary and residence locations for which data are presented represent the highest annual doses.

Based on results obtained by placing TLDs on the site boundary in each sector, the net dose for this reporting peroid, from direct-radiation, (plume and ground deposition) from all three units was determined to be zero.

There were no liquid effluents associated with the operation of this facility.

Table C1

DOSES TO SPECIAL LOCATIONS FOR JANUARY - JUNE 1993

ENERGY INFORMATION CENTER LOCATED ONSITE 0.44 MILE S FROM UNIT 1, 0.29 MILE SSE FROM UNIT 2 AND 0.20 MILE ESE FROM UNIT 3

(MREM)	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
1ST QUARTER								
ADULT	4.74E-01	4.74E-01	1.78E-01	4.74E-01	4.74E-01	4.88E-01	4.75E-01	7.06E-01
TEEN	4.76E-01	4.76E-01	1.78E-01	4.76E-01	4.76E-01	4.92E-01	4.77E-01	7.08E-01
CHILD	4.42E-01	4.42E-01	1.78E-01	4.42E-01	4.42E-01	4.60E-01	4.42E-01	6.73E-01
INFANT	3.29E-01	3.29E-01	1.78E-01	3.29E-01	3.29E-01	3.47E-01	3.30E-01	5.61E-01
2ND QUARTER								
ADULT	2.71E-01	2.71E-01	3.42E-02	2.71E-01	2.71E-01	2.98E-01	2.72E-01	3.35E-01
TEEN	2.73E-01	2.73E-01	3.43E-02	2.73E-01	2.73E-01	3.05E-01	2.74E-01	3.36E-01
CHILD	2.45E-01	2.45E-01	3.43E-02	2.46E-01	2.46E-01	2.82E-01	2.46E-01	3.08E-01
INFANT	1.55E-01	1.55E-01	3.43E-02	1.56E-01	1.55E-01	1.89E-01	1.56E-01	2.05E-01
1ST SEMI-ANNUAL								
ADULT	7.46E-01	7.46E-01	2.12E-01	7.46E-01	7.46E-01	7.86E-01	7.47E-01	1.04E+00
TEEN	7.49E-01	7.49E-01	2.12E-01	7.49E-01	7.49E-01	7.98E-01	7.51E-01	1.04E+00
CHILD	6.86E-01	6.86E-01	2.12E-01	6.87E-01	6.87E-01	7.42E-01	6.88E-01	9.81E-01
INFANT	4.85E-01	4.85E-01	2.12E-01	4.85E-01	4.85E-01	5.35E-01	4.86E-01	7.66E-01

Table C2

INTEGRATED POPULATION DOSES FOR JANUARY - JUNE 1993

PERSONREM

JANUARY 1 - MARCH 31, 1993

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.47E-02 2.84%	8.47E-02 2.84%	8.47E-02 99.23%	8.47E-02 2.84%	8.47E-02 2.84%	8.47E-02 2.79%	8.47E-02 2.84%	2.83E-01 8.91%
GROUND	1.80E-04 .01%	1.80E-04 .01%	1.80E-04 .21%	1.80E-04 .01%	1.80E-04 .01%	1.80E-04 .01%	1.80E-04 .01%	2.10E-04 .01%
INHAL	5.52E-01 18.54%	5.52E-01 18.54%	7.52E-05 .09%	5.52E-01 18.54%	5.52E-01 18.54%	5.69E-01 18.76%	5.52E-01 18.55%	5.52E-01 17.38%
VEGET	2.03E+00 68.32%	2.03E+00 68.32%	3.58E-04 .42%	2.03E+00 68.32%	2.03E+00 68.32%	2.07E+00 68.18%	2.03E+00 68.31%	2.03E+00 64.05%
COW MILK	2.06E-01 6.93%	2.06E-01 6.93%	4.57E-05 .05%	2.06E-01 6.93%	2.06E-01 6.93%	2.12E-01 6.98%	2.06E-01 6.93%	2.06E-01 6.49%
MEAT	1.00E-01 3.36%	1.00E-01 3.36%	1.84E-06 .00%	1.00E-01 3.36%	1.00E-01 3.36%	1.00E-01 3.29%	1.00E-01 3.36%	1.00E-01 3.15%
TOTAL	2.98E+00	2.98E+00	8.54E-02	2.98E+00	2.98E+00	3.04E+00	2.98E+00	3.17E+00
(a) PER CAPITA DOSE (REM)	1.52E-06	1.52E-06	4.36E-08	1.52E-06	1.52E-06	1.55E-06	1.52E-06	1.62E-06

APRIL 1 - JUNE 30, 1993

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.31E-02 1.49%	5.31E-02 1.49%	5.31E-02 93.90%	5.31E-02 1.49%	5.31E-02 1.49%	5.31E-02 1.41%	5.31E-02 1.49%	2.32E-01 6.21%
GROUND	2.18E-03 .06%	2.18E-03 .06%	2.18E-03 3.85%	2.18E-03 .06%	2.18E-03 .06%	2.18E-03 .06%	2.18E-03 .06%	2.56E-03 .07%
INHAL	8.76E-01 24.62%	8.76E-01 24.62%	2.47E-04 .44%	8.76E-01 24.62%	8.76E-01 24.62%	9.47E-01 25.17%	8.78E-01 24.68%	8.75E-01 23.44%
VEGET	2.20E+00 61.89%	2.20E+00 61.90%	8.11E-04 1.43%	2.20E+00 61.89%	2.20E+00 61.89%	2.31E+00 61.50%	2.20E+00 61.84%	2.20E+00 58.92%
COW MILK	3.36E-01 9.44%	3.36E-01 9.43%	2.09E-04 .37%	3.36E-01 9.44%	3.36E-01 9.44%	3.58E-01 9.50%	3.36E-01 9.43%	3.35E-01 8.98%
MEAT	8.86E-02 2.49%	8.86E-02 2.49%	5.88E-06 .01%	8.86E-02 2.49%	8.86E-02 2.49%	8.86E-02 2.35%	8.86E-02 2.49%	8.86E-02 2.37%
TOTAL	3.56E+00	3.56E+00	5.65E-02	3.56E+00	3.56E+00	3.76E+00	3.56E+00	3.73E+00
(a) PER CAPITA DOSE (REM)	1.82E-06	1.82E-06	2.88E-08	1.82E-06	1.82E-06	1.92E-06	1.82E-06	1.90E-06

(a) PERSONREM DIVIDED BY 50-MILE POPULATION OF 1,796,000

Table C2 (continued)

INTEGRATED POPULATION DOSES FOR JANUARY - JUNE 1993

PERSONREM

JANUARY 1 - JUNE 30, 1993

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.38E-01 2.11%	1.38E-01 2.11%	1.38E-01 97.10%	1.38E-01 2.11%	1.38E-01 2.11%	1.38E-01 2.03%	1.38E-01 2.11%	5.15E-01 7.45%
GROUND	2.36E-03 .04%	2.36E-03 .04%	2.36E-03 1.66%	2.36E-03 .04%	2.36E-03 .04%	2.36E-03 .03%	2.36E-03 .04%	2.77E-03 .04%
INHAL	1.43E+00 21.85%	1.43E+00 21.85%	3.22E-04 .23%	1.43E+00 21.85%	1.43E+00 21.85%	1.52E+00 22.31%	1.43E+00 21.89%	1.43E+00 20.66%
VEGET	4.23E+00 64.82%	4.24E+00 64.83%	1.17E-03 .82%	4.24E+00 64.82%	4.24E+00 64.82%	4.38E+00 64.48%	4.23E+00 64.79%	4.23E+00 61.28%
COW MILK	5.42E-01 8.29%	5.42E-01 8.29%	2.54E-04 .18%	5.42E-01 8.30%	5.42E-01 8.29%	5.69E-01 8.37%	5.42E-01 8.29%	5.42E-01 7.84%
MEAT	1.89E-01 2.89%	1.89E-01 2.89%	7.72E-06 .01%	1.89E-01 2.89%	1.89E-01 2.89%	1.89E-01 2.77%	1.89E-01 2.89%	1.89E-01 2.73%
TOTAL	6.53E+00	6.53E+00	1.42E-01	6.53E+00	6.53E+00	6.80E+00	6.54E+00	6.91E+00
(a) PER CAPITA DOSE (REM)	3.33E-06	3.33E-06	7.25E-08	3.33E-06	3.33E-06	3.47E-06	3.34E-06	3.53E-06

(a) PERSONREM DIVIDED BY 50-MILE POPULATION OF 1,796,000

Table C3

SUMMARY OF INDIVIDUAL DOSES FOR JANUARY - JUNE 1993

	Unit	Quarter #1	Quarter #2	Quarter #3	Quarter #4	Total for 1993
Gamma Air Dose	mrad	6.76E-02	1.59E-02	N/A	N/A	8.35E-02
ODCM Req. 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	1.35E+00	3.18E-01	N/A	N/A	8.35E-01
Beta Air Dose	mrad	1.12E-01	4.59E-02	N/A	N/A	1.58E-01
ODCM Req. 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	1.12E+00	4.59E-01	N/A	N/A	7.90E-01
Maximum Individual						
Total Body	mrem	4.29E-02	9.66E-03	N/A	N/A	5.26E-02
Skin	mrem	1.01E-01	3.14E-02	N/A	N/A	1.33E-01
Location						
Unit 1	miles	1.87 S	1.87 S	N/A	N/A	1.87 S
Unit 2	miles	1.68 S	1.68 S	N/A	N/A	1.68 S
Unit 3	miles	1.46 S	1.46 S	N/A	N/A	1.46 S
Maximum Organ Dose		Teen Thyroid	Child(1) Thyroid			Child (1) Thyroid
(excluding skin)	mrem	5.86E-02	7.59E-02	N/A	N/A	1.24E-01
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit (2)	%	7.81E-01	1.01E+00	N/A	N/A	8.27E-01
Location						
Unit 1	miles	5.05 S	3.36 SW	N/A	N/A	2.67 ENE
Unit 2	miles	4.88 S	3.14 SW	N/A	N/A	2.85 ENE
Unit 3	miles	4.67 S	2.92 SW	N/A	N/A	2.99 ENE

Note 1 : Does not include second quarter Sr-89,90 results.

Note 2 : These control location doses are imparted via three principal atmospheric pathways: plume, ground exposure and inhalation. ODCM Requirement 5.1 has higher limits than ODCM Requirement 4.2, therefore the percent of limits are more conservative based on ODCM Requirement 4.2 than on ODCM Requirement 5.1.

DOSE CALCULATION MODELS

The GASPAR computer code was used to evaluate the radiological consequences of the routine release of gaseous effluents. GASPAR implements the dose calculational methodologies of Regulatory Guide 1.109, Revision 1.

Source terms for each quarter are combined with station-specific demographic data and each quarter's atmospheric diffusion estimates for gaseous dose calculations.

Atmospheric diffusion estimates are generated by the XOQDOQ computer code using onsite meteorological data as input. Doses for the semiannual period are the summation for the quarterly doses. Additional input to GASPAR includes the following site-specific data:

0 to 5 mile nearest residence, milk animal and garden in each of the 16 compass sectors, based on the 1992 Land Use Census.

0 to 10 mile population distribution based on the Maricopa County Department of Emergency Management, Emergency Response Manual, Annex B - PVNGS Emergency Procedures, Appendix 13, page 133, March 1993.

The 10 to 50 mile population distribution from the PVNGS UFSAR, Figure 2.1-10.

The population distribution of metropolitan Phoenix greater than 50 miles from PVNGS, based on the 1980 federal census results, is conservatively included in the 40 to 50 mile sectors (NE=123; ENE=140,097; E=621,130; ESE=8,392).

Absolute humidity of 6.0 g/m^3 from the PVNGS UFSAR, Table 2.3-16.

The fraction of the year that vegetables are grown (0.667) from the PVNGS ER-OL, Section 2.1.3.4, Table 2.1-8.

The fraction of daily feed derived from pasture while on pasture (0.35) and length of grazing season for milk animals beyond 5 miles (0.75) from the PVNGS ER-OL, Section 2.1.3.4.3.

The fraction of daily feed derived from pasture while on pasture (0.05) and length of grazing season for meat animals (0.25) from the PVNGS ER-OL, Section 2.1.3.4.4.

There were no milk animals located within 5 miles.

Other values used for input to GASPAR are default values from Regulatory Guide 1.109, Revision 1.