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EXECUTIVE VICE PRESIDENT
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161-04129-WFC/JRP

August 23, 1991

Docket Nos. STN 50-528/529/530

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-37
Washington, D. C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Semiannual Radioactive Effluent Release Report
File: 91-A-056-026

Pursuant to 10 CFR 50.36a(a)(2), and in accordance with Technical Specification 6.9.1.8, attached please find the Semiannual Radioactive Effluent Release Report for PVNGS Units 1, 2, and 3 for the six month period ending June 30, 1991.

If you should have any questions, please contact Michael E. Powell of my staff at (602) 340-4981.

Sincerely,

WFC/JRP/pmm

Attachment

cc: J. B. Martin
D. H. Coe
A. C. Gehr
A. H. Gutterman

300003

PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2 AND 3

SEMIANNUAL RADIOACTIVE
EFFLUENT RELEASE REPORT

JANUARY 1, 1991 THROUGH JUNE 30, 1991

USNRC Dockets STN-50-528, STN-50-529 and STN-50-530

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List of Tables

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 1991. 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 three 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.

BIBLIOGRAPHY

Palo Verde Nuclear Generating Station Units 1, 2, and 3, Semiannual Radioactive Effluent Release Report, July 1, 1990 through December 31, 1990. USNRC Dockets STN-50-528, STN-50-529, STN-50-530.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants", Revision 1, 1974.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.23 (Safety Guide 23), "Onsite Meteorological Programs", 1972.

U.S. Nuclear Regulatory Commission, NUREG/CR-2919, "XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations", 1982.

U.S. Nuclear Regulatory Commission, NUREG-0579, "Users Guide to GASPAR Code", June 1980.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision 1, 1977.

U.S. Nuclear Regulatory Commission, NUREG-0172, "Age-specific Radiation Dose Commitment Factors for a One-Year Chronic Intake", 1977.

U.S. Nuclear Regulatory Commission, NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", 1978.

U.S. Nuclear Regulatory Commission, NUREG-1133, "Technical Specifications, Palo Verde Nuclear Generating Station, Unit No. 1, Docket No. 50-528, Appendix "A" to License No. NPF-41", 1985.

U.S. Nuclear Regulatory Commission, NUREG-1181, "Technical Specifications, Palo Verde Nuclear Generating Station, Unit No. 2, Docket No. 50-529, Appendix "A" to License No. NPF-51", 1986.

U.S. Nuclear Regulatory Commission, NUREG-1287, "Technical Specifications, Palo Verde Nuclear Generating Station, Unit No. 3, Docket No. 50-530, Appendix "A" to License No. NPF-74", 1987.

Bechtel Power Corp., "Cooling Tower Blowdown System Solar Evaporation Pond", Sep. 1980.

Generation Engineering, Geotechnical Exploration for Evaporation Pond #2", Oct. 1986

212-00789-WFQ/RHM, "1989 PVNGS Evaporation Pan Data", Jan. 1989.

APPENDIX A

SOURCE TERMS

AND

EFFLUENT AND WASTE DISPOSAL REPORTS

1.0 REGULATORY LIMITS

1.1 Liquid Releases

a. PVNGS Technical Specification 3.11.1.1

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.

b. PVNGS Technical Specification 3.11.1.2

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:

1 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

2 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

a. PVNGS Technical Specification 3.11.2.1

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

1 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

2 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.

b. PVNGS Technical Specification 3.11.2.2

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:

1 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,

2 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.

c. PVNGS Technical Specification 3.11.2.3

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:

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

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

d. PVNGS Technical Specification 3.11.2.4

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

a. PVNGS Technical Specification 3.11.4

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.a 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 Technical Specification Table 4.11-2 (Units 1, 2 and 3). 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 Technical Specification Table 4.11-2 (Units 1, 2 and 3). 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 4.11-2 of the PVNGS Technical Specifications (Units 1, 2 and 3). An average LLD for each radionuclide is provided in Table A1.

5.0 BATCH RELEASES

All times are in hours

5.1 Gaseous

	Unit 1	Unit 2	Unit 3
Number of batch releases:	74	45	55
Total time period for batch releases:	4298.03	1794.28	3212.49
Maximum time period for a batch release:	168.00	168.00	168.00
Average time period for a batch release:	58.08	39.87	58.41
Minimum time period for a batch release:	0.05	0.17	0.02

5.2 Liquid

None.

6.0 ABNORMAL RELEASES

None.

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

There were no revisions to the ODCM or the PCP.

8.0 EFFLUENTS AND SOLID WASTES

8.1 Gaseous Effluents

The gaseous effluents for the first and second quarters are included 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.

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 Technical Specification 3.11.1.1. 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. The Evaporation Ponds were monitored in accordance with PVNGS Technical Specification 3.12.1. During this report period, the analyses indicated tritium concentrations in the Evaporation Ponds to be a maximum of 1.45E-06 μCi/ml. Analysis of second quarter samples are not complete at this time. If results are greater than 1.46E-06 μCi/ml, revised Evaporation Pond dose contributions will be included in the next report.

The average historical evaporation is approximately 45 inches for each six month period (January - June and July - December). 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 was calculated to be 6.54E-02 mRem for the six month period.

The results of the fourth quarter 1990 Strontium-89 and Strontium-90 analysis for continuous releases, which were not available at the time the July - December 1990 Semiannual Report was written, were less than the Lower Limit of Detection.

Table A1

UNITS 1, 2 AND 3

GASEOUS EFFLUENTS - AVERAGE LOWER LIMIT OF DETECTION

μCi/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 1991
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	1.01E+03	1.76E+02	3.54E+01
2. Average release rate for period	μCi/sec	1.30E+02	2.24E+01	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	3.29E-03	1.89E-04	3.32E+01
2. Average release rate for period	μCi/sec	4.23E-04	2.40E-05	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	4.77E-05	2.46E-05	3.43E+01
2. Average release rate for period	μCi/sec	6.13E-06	3.13E-06	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	1.36E+02	8.20E+01	3.85E+01
2. Average release rate for period	μCi/sec	1.75E+01	1.04E+01	
3. Percent of technical specification limit	%	NA (2)	NA (2)	

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

(2) See Table A4 for percent of technical specification limits.

Table A3

UNIT 1 1991

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	3.14E-01	1.77E-01
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	< LLD	5.37E+00	7.59E+00
Krypton-85m	Ci	< LLD	< LLD	9.19E-02	2.44E-02
Krypton-87	Ci	< LLD	< LLD	< LLD	7.71E-05
Krypton-88	Ci	< LLD	< LLD	7.70E-02	2.04E-02
Krypton-89	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-90	Ci	< LLD	< LLD	< LLD	< LLD
Xenon-131m	Ci	< LLD	< LLD	2.24E+00	1.27E+00
Xenon-133	Ci	6.93E+02	6.70E+01	2.96E+02	8.81E+01
Xenon-133m	Ci	< LLD	9.43E-01	2.17E+00	6.47E-01
Xenon-135	Ci	6.47E+00	9.22E+00	2.78E+00	5.88E-01
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	6.99E+02	7.72E+01	3.09E+02	9.85E+01
2. Iodines					
Iodine-131	Ci	1.19E-03	1.48E-04	2.10E-03	4.10E-05
Iodine-132	Ci	1.33E-04	< LLD	1.27E-05	1.34E-05
Iodine-133	Ci	1.72E-04	4.08E-05	2.99E-04	3.89E-05
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	< LLD	7.98E-06	7.65E-05	3.39E-05
Total for period	Ci	1.50E-03	1.97E-04	2.49E-03	1.27E-04

Table A3 (Continued)

UNIT 1 1991

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	2.02E-05	6.62E-06	< LLD	< LLD
Barium-140	Ci	< LLD	< LLD	< LLD	< LLD
Bromine-82	Ci	< LLD	< LLD	2.16E-05	1.85E-05
Cerium-141	Ci	< LLD	2.17E-06	< LLD	< LLD
Cerium-144	Ci	< LLD	< LLD	< LLD	< LLD
Cesium-134	Ci	3.73E-06	9.20E-07	8.17E-07	< LLD
Cesium-137	Ci	1.19E-05	1.48E-05	3.09E-07	< LLD
Cesium-138	Ci	< LLD	< LLD	9.17E-05	4.61E-05
Cromium-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	4.78E-03	1.32E-03
Ruthenium-103	Ci	1.08E-05	< LLD	< LLD	< LLD
Strontium-89	Ci	< LLD	(1)	(2)	(2)
Strontium-90	Ci	< LLD	(1)	(2)	(2)
Tritium	Ci	< LLD	< LLD	1.36E+02	8.20E+01
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	4.66E-05	2.46E-05	1.36E+02	8.20E+01

(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 1991

	Unit	Quarter #1	Quarter #2	Quarter #3	Quarter #4	Total for 1991
Gamma Air Dose	mrad	1.05E-01	2.16E-02	N/A	N/A	1.27E-01
T.S. 3.11.2.2 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% T.S. Limit	%	2.10E+00	4.32E-01	N/A	N/A	1.27E+00
Beta Air Dose	mrad	3.05E-01	5.83E-02	N/A	N/A	3.63E-01
T.S. 3.11.2.2 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% T.S. Limit	%	3.05E+00	5.83E-01	N/A	N/A	1.82E+00
Maximum Organ Dose		Child Thyroid	Child(2) Thyroid			Child (2) Thyroid
(excluding skin)	mrem	5.53E-01	2.97E-01	N/A	N/A	8.50E-01
T.S. 3.11.2.3 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% T.S. Limit	%	7.37E+00	3.96E+00	N/A	N/A	5.67E+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 1991
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	9.06E+01	1.75E+02	3.54E+01
2. Average release rate for period	μCi/sec	1.17E+01	2.23E+01	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	5.76E-05	3.05E-04	3.32E+01
2. Average release rate for period	μCi/sec	7.41E-06	3.88E-05	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	< LLD	< LLD	3.43E+01
2. Average release rate for period	μCi/sec	< LLD	< LLD	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	2.16E+02	2.09E+02	3.85E+01
2. Average release rate for period	μCi/sec	2.78E+01	2.66E+01	
3. Percent of technical specification limit	%	NA (2)	NA (2)	

(1) Estimated total error methodology is presented in Table A11.
(2) See Table A7 for percent of technical specification limits.

Table A6

UNIT 2 1991

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	1.06E-01	1.69E-01
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	< LLD	9.76E-02	2.14E-02
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	9.46E+00	< LLD	1.25E-01	1.32E-01
Xenon-133	Ci	7.63E+01	1.70E+02	4.46E+00	4.36E+00
Xenon-133m	Ci	< LLD	< LLD	2.25E-02	2.36E-02
Xenon-135	Ci	< LLD	< LLD	7.23E-03	1.23E-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	8.58E+01	1.70E+02	4.82E+00	4.72E+00
2. Iodines					
Iodine-131	Ci	5.15E-05	2.84E-04	6.14E-06	2.13E-05
Iodine-132	Ci	< LLD	< LLD	< LLD	1.77E-06
Iodine-133	Ci	< LLD	1.21E-04	7.09E-06	2.79E-05
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	< LLD	< LLD	< LLD	1.20E-05
Total for period	Ci	5.15E-05	4.05E-04	1.32E-05	6.30E-05

Table A6 (Continued)

UNIT 2 1991

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	1.22E-05	1.48E-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	< LLD	< LLD	< LLD	< LLD
Cromium-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	1.94E-08
Niobium-95	Ci	< LLD	< LLD	< LLD	< LLD
Rubidium-88	Ci	< LLD	< LLD	7.47E-06	1.56E-06
Ruthenium-103	Ci	< LLD	< LLD	< LLD	< LLD
Strontium-89	Ci	< LLD	(1)	(2)	(2)
Strontium-90	Ci	< LLD	(1)	(2)	(2)
Tritium	Ci	4.09E+00	< LLD	2.12E+02	2.09E+02
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	4.09E+00	< LLD	2.12E+02	2.09E+02

(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 1991

	Unit	Quarter #1	Quarter #2	Quarter #3	Quarter #4	Total for 1991
Gamma Air Dose	mrad	8.76E-03	1.79E-02	N/A	N/A	2.66E-02
T.S. 3.11.2.2 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% T.S. Limit	%	1.75E-01	3.58E-01	N/A	N/A	2.66E-01
Beta Air Dose	mrad	2.71E-02	5.20E-02	N/A	N/A	7.91E-02
T.S. 3.11.2.2 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% T.S. Limit	%	2.71E-01	5.20E-01	N/A	N/A	3.96E-01
Maximum Organ Dose		Child Thyroid	Child(2) Thyroid			Child (2) Thyroid
(excluding skin)	mrem	7.75E-01	7.53E-01	N/A	N/A	1.53E+00
T.S. 3.11.2.3 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% T.S. Limit	%	1.03E+01	1.00E+01	N/A	N/A	1.02E+01

(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 1991
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNIT	QUARTER #1	QUARTER #2	EST. TOTAL ERROR % (1)
A. Fission & activation gases				
1. Total release	Ci	3.38E+02	9.93E+01	3.54E+01
2. Average release rate for period	μCi/sec	4.35E+01	1.26E+01	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
B. Iodine 131				
1. Total Iodine 131	Ci	4.95E-04	1.67E-03	3.32E+01
2. Average release rate for period	μCi/sec	6.37E-05	2.12E-04	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	3.18E-05	1.10E-03	3.43E+01
2. Average release rate for period	μCi/sec	4.09E-06	1.40E-04	
3. Percent of technical specification limit	%	NA (2)	NA (2)	
4. Gross Alpha radio-activity	Ci	< LLD	< LLD	
D. Tritium				
1. Total release	Ci	1.43E+02	6.56E+01	3.85E+01
2. Average release rate for period	μCi/sec	1.84E+01	8.34E+00	
3. Percent of technical specification limit	%	NA (2)	NA (2)	

(1) Estimated total error methodology is presented in Table A11.
(2) See Table A10 for percent of technical specification limits.

Table A9

UNIT 3 1991

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	3.35E-01	4.81E-02
Krypton-83m	Ci	< LLD	< LLD	< LLD	< LLD
Krypton-85	Ci	< LLD	< LLD	7.79E+00	5.21E+00
Krypton-85m	Ci	1.66E+00	< LLD	1.96E-04	< 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	5.14E+00	4.93E+00	8.05E-01	2.85E-01
Xenon-133	Ci	2.16E+02	8.69E+01	9.03E+01	1.90E+00
Xenon-133m	Ci	< LLD	< LLD	4.82E-01	< LLD
Xenon-135	Ci	1.50E+01	< LLD	3.93E-01	1.27E-03
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	2.38E+02	9.19E+01	1.00E+02	7.44E+00
2. Iodines					
Iodine-131	Ci	2.06E-04	1.00E-03	2.89E-04	6.73E-04
Iodine-132	Ci	< LLD	3.97E-04	2.15E-06	3.78E-04
Iodine-133	Ci	1.54E-05	< LLD	1.56E-07	< LLD
Iodine-134	Ci	< LLD	< LLD	< LLD	< LLD
Iodine-135	Ci	< LLD	< LLD	< LLD	< LLD
Total for period	Ci	2.21E-04	1.40E-03	2.91E-04	1.05E-03

Table A9 (Continued)

UNIT 3 1991

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	2.72E-06	1.09E-04	< LLD	1.80E-08
Barium-140	Ci	< LLD	< LLD	< LLD	< LLD
Bromine-82	Ci	< LLD	< LLD	6.73E-04	1.21E-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	4.83E-07	< LLD	5.96E-09	3.09E-09
Cesium-138	Ci	< LLD	< LLD	< LLD	< LLD
Cromium-51	Ci	1.34E-05	2.78E-04	< LLD	< LLD
Cobalt-58	Ci	1.28E-05	3.82E-04	< LLD	2.28E-04
Cobalt-60	Ci	2.13E-06	7.76E-05	< LLD	< LLD
Iron-59	Ci	< LLD	< LLD	< LLD	< LLD
Lanthanum-140	Ci	< LLD	< LLD	< LLD	< LLD
Manganese-54	Ci	< LLD	1.37E-05	< LLD	< LLD
Molybdenum-99	Ci	< LLD	< LLD	< LLD	< LLD
Niobium-95	Ci	< LLD	9.51E-06	< LLD	< LLD
Rubidium-88	Ci	< LLD	< LLD	1.14E-03	6.47E-07
Ruthenium-103	Ci	< LLD	3.82E-06	< LLD	< LLD
Silver-110m	Ci	< LLD	9.14E-07	< LLD	< LLD
Strontium-89	Ci	2.95E-07	(1)	(2)	(2)
Strontium-90	Ci	< LLD	(1)	(2)	(2)
Tritium	Ci	< LLD	< LLD	1.43E+02	6.56E+01
Zinc-65	Ci	< LLD	< LLD	< LLD	< LLD
Zirconium-95	Ci	< LLD	9.85E-06	< LLD	< LLD
Total for period	Ci	3.18E-05	8.84E-04	1.43E+02	6.56E+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 1991

	Unit	Quarter #1	Quarter #2	Quarter #3	Quarter #4	Total for 1991
Gamma Air Dose	mrad	4.07E-02	9.24E-03	N/A	N/A	4.99E-02
T.S. 3.11.2.2 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% T.S. Limit	%	8.14E-01	1.85E-01	N/A	N/A	4.99E-01
Beta Air Dose	mrad	1.09E-01	3.09E-02	N/A	N/A	1.40E-01
T.S. 3.11.2.2 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% T.S. Limit	%	1.09E+00	3.09E-01	N/A	N/A	7.00E-01
Maximum Organ Dose		Child Thyroid	Child(2) Thyroid			Child (2) Thyroid
(excluding skin)	mrem	5.21E-01	2.68E-01	N/A	NA/	7.89E-01
T.S. 3.11.2.3 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% T.S. Limit	%	6.95E+00	3.57E+00	N/A	N/A	5.26E+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 1991 - JUNE 1991

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

1.0 Type of Waste	Unit	6-month period	estimated total error %
a) spent resin, filters, sludges, evaporator bottoms, etc.	M^3	1.62E+02	
	Ci	1.45E+02	± 25%
b) dry compressible waste, contaminated equipment etc.	M^3	1.53E+02	
	Ci	3.06E+00	± 25%
c) irradiated components fuel rods etc.	M^3	0.00E+00	N/A
	Ci	0.00E+00	N/A
d) other waste	M^3	0.00E+00	N/A
	Ci	0.00E+00	N/A

2.0 Principal Radionuclides

a) Estimate of major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc., as determined by measurement. (** indicates scaled nuclides)

WASTE CLASS		NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
A	**	Fe-55	52.755%	2.09E+01
A		Co-60	10.425%	4.12E+00
A		Co-58	6.912%	2.73E+00
A	**	H-3	6.849%	2.71E+00
A		Cs-137	6.762%	2.67E+00
A	**	Ni-63	5.225%	2.07E+00
A	**	C-14	3.951%	1.56E+00
A		Cs-134	3.512%	1.39E+00
A		Sb-124	2.195%	8.68E-01
A		Mn-54	0.661%	2.61E-01
A		Sb-125	0.381%	1.51E-01
A		Fe-59	0.231%	9.13E-02
A	**	Tc-99	0.061%	2.41E-02
A		Ag-110m	0.041%	1.62E-02
A		Zr-95	0.028%	1.10E-02
A	**	Sr-90	0.007%	2.65E-03
A		I-131	0.004%	1.39E-03
A		Ce-144	0.001%	2.35E-04

Table A12 (Continued)

b) Estimate of major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc., as determined by measurement. (** indicates scaled nuclides.)

WASTE CLASS		NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
B		Cs-137	49.655%	3.24E+01
B		Cs-134	19.494%	1.27E+01
B		Co-60	10.912%	7.12E+00
B	**	Fe-55	10.008%	6.53E+00
B	**	Ni-63	6.345%	4.14E+00
B		Mn-54	1.456%	9.50E-01
B		Sb-125	0.890%	5.81E-01
B	**	H-3	0.328%	2.14E-01
B	**	C-14	0.245%	1.60E-01
B	**	Sr-90	0.210%	1.37E-01
B		Ce-144	0.210%	1.37E-01
B		Co-58	0.161%	1.05E-01
B	**	Pu-241	0.084%	5.49E-02
B	**	Pu-239/40	0.001%	7.50E-04
B	**	Pu-238	0.001%	5.05E-04

c) Estimate of major nuclide concentration for dry compressible waste, contaminated equipment, etc., as determined by measurement. (** indicates scaled nuclides)

WASTE CLASS		NUCLIDE NAME	PERCENT ABUNDANCE	CURIES
A	**	Fe-55	26.976%	8.21E-01
A		Cs-137	22.079%	6.27E-01
A		Co-60	14.891%	4.53E-01
A	**	Ni-63	11.370%	3.46E-01
A		Cs-134	8.831%	2.69E-01
A		Co-58	6.217%	1.89E-01
A		Sb-124	5.614%	1.71E-01
A		Ag-110m	1.075%	3.72E-02
A	**	C-14	0.546%	1.66E-02
A		Nb-95	0.538%	1.64E-02
A	**	H-3	0.526%	1.60E-02
A		Mn-54	0.481%	1.46E-02
A		Ce-144	0.460%	1.40E-02
A		Zr-95	0.396%	2.02E-02

3.0 Solid Waste Disposition

Shipments	TYPE OF SHIPMENT	TYPE OF CONTAINER	MODE OF TRANSPORTATION	DESTINATION
18	LSA	STRONG TIGHT	TRUCK	HANFORD
7	LSA	TYPE A	TRUCK	HANFORD

b. **Irradiated Fuel Shipments:** None

c. **Supplimental Information**

NUMBER OF CONTAINERS	CONTAINER VOLUME FT³	TYPE OF WASTE	CONTAINER TYPE	SOLIDIFICATION AGENT
374	7.5	DAW	STRONG TIGHT	NONE
36	7.5	EVAP BOTTOMS	STRONG TIGHT	NONE
5	199.4	DEWATERED RESIN	STRONG TIGHT	NONE
2	199.4	DEWATERED RESIN	TYPE A	NONE
5	130.8	DEWATERED RESIN	TYPE A	NONE
17	199.4	EVAP. BOTTOMS	STRONG TIGHT	PORTLAND CEMENT
5	54.3	DAW	STRONG TIGHT	NONE
10	107.5	DAW	STRONG TIGHT	NONE
3	12.4	DAW	STRONG TIGHT	NONE
91	13.25	DAW	STRONG TIGHT	NONE

D. **Changes to Processes and/or Equipment**

D.1 No changes were made to the Solid Radwaste Process Control Program.

D.2 No major changes were made to installed plant equipment.

D.3 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.

D.4 No major changes were made to installed plant equipment. Therefore, predicted exposures 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 1991. 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 semi-annual 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 1991 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 1991

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 3/31/91

JAN-MAR 91

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	0	0	0	0
11.51-14.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	2	3	1	7
>20.50	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	3	6
TOTAL	0	0	0	0	0	0	0	0	0	0	1	2	0	3	5	5	16

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	1	0	0	0	0	0	0	0	0	0	1
5.51- 6.50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6.51- 8.50	0	0	1	2	0	0	1	0	0	0	0	1	0	0	0	0	5
8.51-11.50	0	0	3	0	1	2	0	0	0	1	1	0	2	0	2	0	12
11.51-14.50	0	1	1	0	0	0	0	0	0	0	2	0	1	0	0	1	6
14.51-20.50	0	0	0	0	0	0	0	0	0	0	1	3	1	2	0	1	8
>20.50	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	1	6
TOTAL	0	1	6	2	1	2	2	0	0	1	6	7	4	2	2	3	39

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 3/31/91

JAN-MAR 91

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.51- 4.50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.51- 5.50	0	1	1	1	0	0	2	0	0	0	0	0	0	0	0	0	5
5.51- 6.50	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	3
6.51- 8.50	0	0	8	2	1	3	0	1	1	0	3	0	1	0	0	0	20
8.51-11.50	0	0	0	4	2	1	0	0	0	2	2	3	3	0	0	0	17
11.51-14.50	0	0	1	2	3	0	0	0	0	0	1	0	1	0	0	0	8
14.51-20.50	0	0	0	0	0	0	0	0	0	1	1	2	0	0	1	2	7
>20.50	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	3
TOTAL	0	2	13	9	6	4	2	1	1	3	9	5	5	0	2	3	65

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																	1
.76- 1.50	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	5
1.51- 2.50	7	2	1	1	1	0	0	1	3	1	9	8	3	5	8	9	59
2.51- 3.50	9	9	5	5	2	3	3	5	11	9	11	14	8	12	7	6	119
3.51- 4.50	7	9	6	4	4	3	2	5	6	9	12	4	2	5	4	4	86
4.51- 5.50	3	2	8	4	1	1	4	3	5	8	12	8	0	2	2	1	64
5.51- 6.50	1	1	4	8	0	2	3	4	5	5	6	3	0	0	0	1	43
6.51- 8.50	1	3	7	13	3	2	3	7	5	6	8	7	3	1	1	0	70
8.51-11.50	1	1	6	15	11	13	5	4	3	7	8	5	1	0	1	0	81
11.51-14.50	0	1	2	1	13	0	0	3	2	3	1	4	3	1	0	4	38
14.51-20.50	0	0	1	1	8	0	0	0	3	4	6	3	3	1	4	4	38
>20.50	0	0	0	0	3	0	0	0	0	6	1	3	0	0	0	0	13
TOTAL	31	28	41	52	46	24	20	32	43	58	74	59	23	28	27	30	617

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 3/31/91

JAN-MAR 91

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																	1
.76- 1.50	0	1	0	2	0	0	0	0	0	0	0	1	0	4	1	0	9
1.51- 2.50	6	3	0	4	2	2	1	4	0	0	1	7	11	6	6	6	59
2.51- 3.50	7	2	2	1	0	0	2	1	1	3	5	5	7	8	12	2	58
3.51- 4.50	2	2	1	0	2	1	1	1	2	5	13	4	6	2	4	2	48
4.51- 5.50	3	3	0	1	3	0	1	2	0	4	5	1	1	2	4	5	35
5.51- 6.50	3	2	0	2	1	0	0	1	2	4	6	1	2	0	1	1	26
6.51- 8.50	3	1	5	1	2	2	2	3	4	7	9	13	4	2	2	0	60
8.51-11.50	0	3	2	4	3	3	5	5	5	9	9	8	5	3	2	0	66
11.51-14.50	2	1	1	1	4	4	2	1	3	6	4	3	0	0	5	1	38
14.51-20.50	0	0	3	2	4	0	0	0	4	6	4	2	2	0	0	1	28
>20.50	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	3
TOTAL	26	18	14	18	21	12	14	18	21	45	57	46	38	27	37	18	431

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	2	0	0	0	0	0	0	0	0	0	1	0	1	0	4
1.51- 2.50	2	3	0	2	1	1	0	1	0	4	1	2	1	8	6	8	40
2.51- 3.50	15	8	4	2	1	2	3	0	2	0	1	5	6	10	15	11	85
3.51- 4.50	10	4	1	2	1	0	1	0	1	3	4	5	9	2	7	14	64
4.51- 5.50	7	5	1	0	1	1	0	0	1	2	3	4	3	2	3	8	41
5.51- 6.50	2	2	0	1	0	1	2	0	2	3	6	3	4	5	3	3	37
6.51- 8.50	5	6	1	0	0	2	0	0	4	2	15	0	8	5	5	6	59
8.51-11.50	4	2	0	2	2	0	0	1	0	1	4	0	1	0	2	1	20
11.51-14.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1	4
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	45	30	9	9	6	7	6	2	10	15	35	19	33	32	44	52	354

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 3/31/91

JAN-MAR 91

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																	1
.76- 1.50	2	1	1	0	0	0	0	0	0	0	0	0	0	0	2	4	10
1.51- 2.50	17	4	3	0	0	0	2	1	1	0	1	1	7	7	10	20	74
2.51- 3.50	39	14	11	2	2	0	0	1	1	2	0	1	9	16	29	40	167
3.51- 4.50	50	25	10	1	0	0	0	0	0	0	7	1	3	5	14	45	161
4.51- 5.50	35	25	9	3	0	2	0	0	1	1	1	0	3	1	3	15	99
5.51- 6.50	30	26	1	0	0	1	0	0	0	1	1	0	0	0	3	4	67
6.51- 8.50	8	11	9	1	0	0	0	0	0	1	0	0	0	0	1	4	35
8.51-11.50	8	6	0	2	0	0	0	0	0	0	2	0	0	0	0	3	21
11.51-14.50	0	3	0	0	0	0	0	0	0	0	0	0	0	0	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	189	115	44	9	2	3	2	2	3	5	12	3	22	29	62	135	638

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																	3
.76- 1.50	4	2	4	2	0	0	0	0	0	0	0	1	1	5	4	5	28
1.51- 2.50	32	12	4	7	4	3	3	7	4	5	12	18	22	26	30	43	232
2.51- 3.50	70	34	22	10	5	5	8	7	15	14	17	25	30	46	63	59	430
3.51- 4.50	69	40	19	7	7	4	4	6	9	17	36	14	20	14	29	65	360
4.51- 5.50	48	36	19	9	5	4	8	5	7	15	21	13	7	7	12	29	245
5.51- 6.50	36	31	8	11	1	4	5	5	9	13	19	7	6	5	8	9	177
6.51- 8.50	17	21	31	19	6	9	6	11	14	16	35	21	16	8	9	10	249
8.51-11.50	13	12	11	27	19	19	10	10	8	20	26	16	12	3	7	4	217
11.51-14.50	2	6	5	4	20	4	2	4	5	9	9	7	5	2	8	8	100
14.51-20.50	0	0	4	3	12	0	0	0	7	11	13	10	6	5	8	9	88
>20.50	0	0	0	0	3	0	0	0	0	7	6	9	0	0	1	5	31
TOTAL	291	194	127	99	82	52	46	55	78	127	194	141	125	121	179	246	2160

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 3/31/91

JAN-MAR 91

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: 6.1 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
.74	1.81	3.01	28.56	19.95	16.39	29.54

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	2	0	3	5	5	0
B	0	1	6	2	1	2	2	0	0	1	6	7	4	2	2	3	0
C	0	2	13	9	6	4	2	1	1	3	9	5	5	0	2	3	0
D	31	28	41	52	46	24	20	32	43	58	74	59	23	28	27	30	1
E	26	18	14	18	21	12	14	18	21	45	57	46	38	27	37	18	1
F	45	30	9	9	6	7	6	2	10	15	35	19	33	32	44	52	0
G	189	115	44	9	2	3	2	2	3	5	12	3	22	29	62	135	1
TOTAL	291	194	127	99	82	52	46	55	78	127	194	141	125	121	179	246	3

Table B2

JFDs of 35-Foot Wind Versus Delta T

April - June 1991

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR SECOND QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/91 - 6/30/91

APR-JUN 91

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	2	0	0	0	0	0	0	0	0	2
6.51- 8.50	0	0	0	0	0	1	0	3	7	9	9	2	0	0	0	0	31
8.51-11.50	1	0	0	0	0	0	0	0	10	38	26	9	9	4	2	0	99
11.51-14.50	1	0	0	0	0	0	0	0	3	20	27	2	4	5	4	2	68
14.51-20.50	1	0	0	0	0	0	0	0	0	14	30	2	0	7	0	0	54
>20.50	0	0	0	0	0	0	0	0	0	3	3	0	0	1	0	0	7
TOTAL	3	0	0	0	0	1	0	5	20	84	95	15	13	17	6	2	261

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	1	0	1	0	0	0	0	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	1	0	0	1	2	1	0	1	0	1	0	0	7
5.51- 6.50	0	1	1	1	3	1	3	8	8	1	3	2	1	0	0	0	33
6.51- 8.50	2	2	1	0	0	1	4	9	18	15	10	5	3	2	1	1	74
8.51-11.50	0	0	2	1	0	1	0	3	4	9	15	12	2	1	0	0	50
11.51-14.50	0	0	0	0	0	0	0	0	0	2	9	2	1	2	0	0	16
14.51-20.50	0	0	0	0	0	0	0	0	0	1	7	1	0	1	1	0	11
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	2	3	4	3	4	4	7	21	32	29	45	23	7	7	2	1	194

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR SECOND QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/91 - 6/30/91

APR-JUN 91

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.51- 4.50	2	0	0	0	0	0	0	0	3	1	0	3	0	0	0	0	9
4.51- 5.50	2	0	1	1	2	0	1	7	10	7	2	4	1	1	1	0	40
5.51- 6.50	0	0	1	0	0	2	4	18	14	6	1	0	0	0	0	0	46
6.51- 8.50	2	3	1	0	0	1	3	10	9	3	8	8	3	2	1	0	54
8.51-11.50	0	0	1	0	0	1	0	1	1	2	11	5	0	3	1	0	26
11.51-14.50	0	0	0	0	1	0	0	0	0	2	6	1	1	0	0	0	11
14.51-20.50	1	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	6
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
TOTAL	7	3	5	1	3	4	8	36	37	22	31	21	5	6	6	0	195

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	2	2	1	1	3	3	0	0	3	3	0	0	0	2	0	0	20
2.51- 3.50	1	2	3	6	8	1	2	6	9	9	3	2	7	2	2	2	65
3.51- 4.50	0	3	4	6	5	4	6	7	17	10	5	3	2	0	1	0	73
4.51- 5.50	1	2	5	3	0	3	6	9	14	19	3	3	1	0	1	0	70
5.51- 6.50	1	1	2	0	1	0	3	5	6	3	5	3	0	1	0	0	31
6.51- 8.50	0	0	0	1	0	0	3	3	2	0	8	8	3	1	1	2	32
8.51-11.50	1	0	0	0	1	1	1	2	0	3	13	8	1	2	0	0	33
11.51-14.50	0	0	0	0	0	0	1	0	1	4	13	9	1	6	0	0	35
14.51-20.50	0	0	0	0	0	0	0	1	0	4	12	1	0	2	2	0	22
>20.50	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	4
TOTAL	6	10	15	17	18	12	22	33	52	57	63	37	15	16	8	4	385

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR SECOND QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/91 - 6/30/91

APR-JUN 91

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	0	0	0	1	0	0	0	2
1.51- 2.50	2	1	1	2	0	0	0	0	0	0	0	3	0	0	2	2	13
2.51- 3.50	4	1	1	3	0	1	1	0	1	2	4	3	2	0	2	2	27
3.51- 4.50	6	1	2	0	0	0	0	2	1	2	4	1	1	2	0	1	23
4.51- 5.50	0	5	2	0	0	0	0	0	6	4	6	6	0	0	0	1	30
5.51- 6.50	0	3	0	0	1	0	1	1	0	8	6	6	3	1	0	0	30
6.51- 8.50	0	0	2	1	0	1	1	0	3	15	9	15	9	3	2	0	61
8.51-11.50	0	0	0	0	1	3	0	1	2	21	38	25	9	6	5	0	111
11.51-14.50	0	0	0	0	1	0	0	1	1	13	13	6	5	2	5	0	47
14.51-20.50	0	0	0	0	1	0	0	0	0	6	5	0	1	1	2	1	17
>20.50	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	6
TOTAL	13	11	8	6	4	5	3	5	14	73	86	68	31	15	18	7	367

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	1	0	0	0	0	0	1
1.51- 2.50	5	2	1	0	0	0	0	1	3	0	0	4	5	2	6	4	33
2.51- 3.50	3	2	1	0	0	0	0	2	4	5	4	13	4	6	5	10	59
3.51- 4.50	3	6	2	0	0	0	1	0	1	3	6	4	2	5	1	1	35
4.51- 5.50	1	0	1	0	0	0	0	1	4	5	9	15	10	2	3	1	52
5.51- 6.50	0	3	0	0	0	0	0	1	2	5	13	7	8	3	2	3	47
6.51- 8.50	0	0	0	0	0	0	0	2	2	12	24	14	17	4	3	1	79
8.51-11.50	0	0	0	2	0	0	0	0	0	15	15	6	3	1	6	0	48
11.51-14.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
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	12	13	5	2	0	0	1	7	16	45	73	63	49	23	26	20	355

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR SECOND QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/91 - 6/30/91

APR-JUN 91

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	0	0	0	0
1.51- 2.50	2	2	2	0	0	0	0	0	0	0	0	2	2	5	0	3	18
2.51- 3.50	28	7	2	1	1	3	1	1	0	1	2	2	4	9	16	22	100
3.51- 4.50	50	15	5	7	3	2	1	1	0	0	4	4	10	5	10	20	137
4.51- 5.50	37	8	8	1	0	0	0	1	0	0	0	2	2	4	5	15	83
5.51- 6.50	19	8	5	0	1	0	0	0	0	1	3	0	2	3	1	5	48
6.51- 8.50	4	8	2	1	1	0	0	0	0	2	3	1	0	0	2	2	26
8.51-11.50	1	2	1	0	0	0	0	0	0	5	5	0	0	0	0	1	15
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	141	50	25	10	6	5	2	3	0	9	17	11	20	26	34	68	427

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	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
1.51- 2.50	11	7	5	3	3	3	0	1	6	3	0	9	7	9	8	9	84
2.51- 3.50	36	12	8	10	9	5	4	9	14	17	13	20	17	17	25	36	252
3.51- 4.50	61	25	13	14	8	7	8	10	22	16	19	15	15	12	12	22	279
4.51- 5.50	41	15	17	5	3	3	7	19	36	36	20	31	14	8	10	17	282
5.51- 6.50	20	16	9	1	6	3	11	35	30	24	31	18	14	8	3	8	237
6.51- 8.50	8	13	6	3	1	4	11	27	41	56	71	53	35	12	10	6	357
8.51-11.50	3	2	4	3	2	6	1	7	17	93	123	65	24	17	14	1	382
11.51-14.50	1	0	0	0	2	0	1	1	5	41	69	20	12	15	9	2	178
14.51-20.50	2	0	0	0	1	0	0	1	0	25	57	4	1	11	7	1	110
>20.50	0	0	0	0	0	0	0	0	0	8	6	3	0	1	2	0	20
TOTAL	184	90	62	39	35	31	43	110	171	319	410	238	140	110	100	102	2184

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR SECOND QUARTER 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/91 - 6/30/91

APR-JUN 91

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
11.95	8.88	8.93	17.63	16.80	16.25	19.55

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	3	0	0	0	0	1	0	5	20	84	95	15	13	17	6	2	0
B	2	3	4	3	4	4	7	21	32	29	45	23	7	7	2	1	0
C	7	3	5	1	3	4	8	36	37	22	31	21	5	6	6	0	0
D	6	10	15	17	18	12	22	33	52	57	63	37	15	16	8	4	0
E	13	11	8	6	4	5	3	5	14	73	86	68	31	15	18	7	0
F	12	13	5	2	0	0	1	7	16	45	73	63	49	23	26	20	0
G	141	50	25	10	6	5	2	3	0	9	17	11	20	26	34	68	0
TOTAL	184	90	62	39	35	31	43	110	171	319	410	238	140	110	100	102	0

Table B3

JFDs of 35-Foot Wind Versus Delta T

January - June 1991

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST SEMIANNUAL 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 6/30/91

JAN-JUN 91

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	2	0	0	0	0	0	0	0	0	2
6.51- 8.50	0	0	0	0	0	1	0	3	7	9	9	2	0	0	0	0	31
8.51-11.50	1	0	0	0	0	0	0	0	10	38	26	9	9	4	2	0	99
11.51-14.50	1	0	0	0	0	0	0	0	3	20	27	2	4	6	5	3	71
14.51-20.50	1	0	0	0	0	0	0	0	0	14	31	2	0	9	3	1	61
>20.50	0	0	0	0	0	0	0	0	0	3	3	2	0	1	1	3	13
TOTAL	3	0	0	0	0	1	0	5	20	84	96	17	13	20	11	7	277

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	1	0	1	0	0	0	0	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	1	0	1	1	2	1	0	1	0	1	0	0	8
5.51- 6.50	0	1	2	1	3	1	3	8	8	1	3	2	1	0	0	0	34
6.51- 8.50	2	2	2	2	0	1	5	9	18	15	10	6	3	2	1	1	79
8.51-11.50	0	0	5	1	1	3	0	3	4	10	16	12	4	1	2	0	62
11.51-14.50	0	1	1	0	0	0	0	0	0	2	11	2	2	2	0	1	22
14.51-20.50	0	0	0	0	0	0	0	0	0	1	8	4	1	3	1	1	19
>20.50	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	1	7
TOTAL	2	4	10	5	5	6	9	21	32	30	51	30	11	9	4	4	233

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST SEMIANNUAL 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 6/30/91

JAN-JUN 91

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	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3.51- 4.50	2	0	1	0	0	0	0	0	3	1	0	3	0	0	0	0	10
4.51- 5.50	2	1	2	2	2	0	3	7	10	7	2	4	1	1	1	0	45
5.51- 6.50	0	0	3	0	0	2	4	18	14	6	1	0	0	0	1	0	49
6.51- 8.50	2	3	9	2	1	4	3	11	10	3	11	8	4	2	1	0	74
8.51-11.50	0	0	1	4	2	2	0	1	1	4	13	8	3	3	1	0	43
11.51-14.50	0	0	1	2	4	0	0	0	0	2	7	1	2	0	0	0	19
14.51-20.50	1	0	0	0	0	0	0	0	0	1	4	2	0	0	3	2	13
>20.50	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	5
TOTAL	7	5	18	10	9	8	10	37	38	25	40	26	10	6	8	3	260

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																	1
.76- 1.50	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	5
1.51- 2.50	9	4	2	2	4	3	0	1	6	4	9	8	3	7	8	9	79
2.51- 3.50	10	11	8	11	10	4	5	11	20	18	14	16	15	14	9	8	184
3.51- 4.50	7	12	10	10	9	7	8	12	23	19	17	7	4	5	5	4	159
4.51- 5.50	4	4	13	7	1	4	10	12	19	27	15	11	1	2	3	1	134
5.51- 6.50	2	2	6	8	1	2	6	9	11	8	11	6	0	1	0	1	74
6.51- 8.50	1	3	7	14	3	2	6	10	7	6	16	15	6	2	2	2	102
8.51-11.50	2	1	6	15	12	14	6	6	3	10	21	13	2	2	1	0	114
11.51-14.50	0	1	2	1	13	0	1	3	3	7	14	13	4	7	0	4	73
14.51-20.50	0	0	1	1	8	0	0	1	3	8	18	4	3	3	6	4	60
>20.50	0	0	0	0	3	0	0	0	0	8	2	3	0	0	1	0	17
TOTAL	37	38	56	69	64	36	42	65	95	115	137	96	38	44	35	34	1002

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST SEMIANNUAL 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 6/30/91

JAN-JUN 91

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																	1
.76- 1.50	1	1	0	2	0	0	0	0	0	0	0	1	1	4	1	0	11
1.51- 2.50	8	4	1	6	2	2	1	4	0	0	1	10	11	6	8	8	72
2.51- 3.50	11	3	3	4	0	1	3	1	2	5	9	8	9	8	14	4	85
3.51- 4.50	8	3	3	0	2	1	1	3	3	7	17	5	7	4	4	3	71
4.51- 5.50	3	8	2	1	3	0	1	2	6	8	11	7	1	2	4	6	65
5.51- 6.50	3	5	0	2	2	0	1	2	2	12	12	7	5	1	1	1	56
6.51- 8.50	3	1	7	2	2	3	3	3	7	22	18	28	13	5	4	0	121
8.51-11.50	0	3	2	4	4	6	5	6	7	30	47	33	14	9	7	0	177
11.51-14.50	2	1	1	1	5	4	2	2	4	19	17	9	5	2	10	1	85
14.51-20.50	0	0	3	2	5	0	0	0	4	12	9	2	3	1	2	2	45
>20.50	0	0	0	0	0	0	0	0	0	3	2	4	0	0	0	0	9
TOTAL	39	29	22	24	25	17	17	23	35	118	143	114	69	42	55	25	798

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	2	0	0	0	0	0	0	0	1	0	1	0	1	0	5
1.51- 2.50	7	5	1	2	1	1	0	2	3	4	1	6	6	10	12	12	73
2.51- 3.50	18	10	5	2	1	2	3	2	6	5	5	18	10	16	20	21	144
3.51- 4.50	13	10	3	2	1	0	2	0	2	6	10	9	11	7	8	15	99
4.51- 5.50	8	5	2	0	1	1	0	1	5	7	12	19	13	4	6	9	93
5.51- 6.50	2	5	0	1	0	1	2	1	4	8	19	10	12	8	5	6	84
6.51- 8.50	5	6	1	0	0	2	0	2	6	14	39	14	25	9	8	7	138
8.51-11.50	4	2	0	4	2	0	0	1	0	16	19	6	4	1	8	1	68
11.51-14.50	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	5
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	57	43	14	11	6	7	7	9	26	60	108	82	82	55	70	72	709

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST SEMIANNUAL 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 6/30/91

JAN-JUN 91

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																	1
.76- 1.50	2	1	1	0	0	0	0	0	0	0	0	0	0	0	2	4	10
1.51- 2.50	19	6	5	0	0	0	2	1	1	0	1	3	9	12	10	23	92
2.51- 3.50	67	21	13	3	3	3	1	2	1	3	2	3	13	25	45	62	267
3.51- 4.50	100	40	15	8	3	2	1	1	0	0	11	5	13	10	24	65	298
4.51- 5.50	72	33	17	4	0	2	0	1	1	1	1	2	5	5	8	30	182
5.51- 6.50	49	34	6	0	1	1	0	0	0	2	4	0	2	3	4	9	115
6.51- 8.50	12	19	11	2	1	0	0	0	0	3	3	1	0	0	3	6	61
8.51-11.50	9	8	1	2	0	0	0	0	0	5	7	0	0	0	0	4	36
11.51-14.50	0	3	0	0	0	0	0	0	0	0	0	0	0	0	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	330	165	69	19	8	8	4	5	3	14	29	14	42	55	96	203	1065

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																	3
.76- 1.50	5	2	4	2	0	0	0	0	0	0	1	1	2	5	4	5	31
1.51- 2.50	43	19	9	10	7	6	3	8	10	8	12	27	29	35	38	52	316
2.51- 3.50	106	46	30	20	14	10	12	16	29	31	30	45	47	63	88	95	682
3.51- 4.50	130	65	32	21	15	11	12	16	31	33	55	29	35	26	41	87	639
4.51- 5.50	89	51	36	14	8	7	15	24	43	51	41	44	21	15	22	46	527
5.51- 6.50	56	47	17	12	7	7	16	40	39	37	50	25	20	13	11	17	414
6.51- 8.50	25	34	37	22	7	13	17	38	55	72	106	74	51	20	19	16	606
8.51-11.50	16	14	15	30	21	25	11	17	25	113	149	81	36	20	21	5	599
11.51-14.50	3	6	5	4	22	4	3	5	10	50	78	27	17	17	17	10	278
14.51-20.50	2	0	4	3	13	0	0	1	7	36	70	14	7	16	15	10	198
>20.50	0	0	0	0	3	0	0	0	0	15	12	12	0	1	3	5	51
TOTAL	475	284	189	138	117	83	89	165	249	446	604	379	265	231	279	348	4344

JOINT FREQUENCY DISTRIBUTION ANALYSIS FOR FIRST SEMIANNUAL 1991
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/91 - 6/30/91

JAN-JUN 91

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: 6.7 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
6.38	5.36	5.99	23.07	18.37	16.32	24.52

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	3	0	0	0	0	1	0	5	20	84	96	17	13	20	11	7	0
B	2	4	10	5	5	6	9	21	32	30	51	30	11	9	4	4	0
C	7	5	18	10	9	8	10	37	38	25	40	26	10	6	8	3	0
D	37	38	56	69	64	36	42	65	95	115	137	96	38	44	35	34	1
E	39	29	22	24	25	17	17	23	35	118	143	114	69	42	55	25	1
F	57	43	14	11	6	7	7	9	26	60	108	82	82	55	70	72	0
G	330	165	69	19	8	8	4	5	3	14	29	14	42	55	96	203	1
TAL	475	284	189	138	117	83	89	165	249	446	604	379	265	231	279	348	3

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. Gaseous effluents were released from Units 1, 2 and 3. 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. Strontium-89 and Strontium-90 were considered only through the first quarter since the second quarter results were not available. 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. The ingestion pathways considered were cow milk, goat milk, meat, and vegetables. 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 Visitor Center. An occupancy factor of 1.0 (implying continuous occupancy over the entire year) was considered for the Visitor 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 Technical Specification 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 report period, 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 1991

VISITORS CENTER LOCATED ONSITE 0.45 MILE WNW FROM UNIT 1, 0.45 MILE NW FROM UNIT 2 AND 0.61 MILE NNW FROM UNIT 3

(MREM)	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
1ST QUARTER								
ADULT	4.63E-02	4.63E-02	1.50E-02	4.63E-02	4.63E-02	4.83E-02	4.63E-02	7.42E-02
TEEN	4.65E-02	4.65E-02	1.50E-02	4.65E-02	4.65E-02	4.91E-02	4.65E-02	7.44E-02
CHILD	4.29E-02	4.29E-02	1.50E-02	4.29E-02	4.29E-02	4.57E-02	4.29E-02	7.08E-02
INFANT	3.10E-02	3.10E-02	1.50E-02	3.10E-02	3.10E-02	3.37E-02	3.10E-02	5.89E-02
2ND QUARTER								
ADULT	2.05E-02	2.05E-02	4.34E-03	2.05E-02	2.05E-02	2.16E-02	2.05E-02	2.74E-02
TEEN	2.06E-02	2.06E-02	4.34E-03	2.06E-02	2.06E-02	2.20E-02	2.07E-02	2.75E-02
CHILD	1.87E-02	1.87E-02	4.34E-03	1.87E-02	1.87E-02	2.03E-02	1.88E-02	2.56E-02
INFANT	1.26E-02	1.26E-02	4.34E-03	1.26E-02	1.26E-02	1.40E-02	1.26E-02	1.74E-02
1ST SEMI-ANNUAL								
ADULT	6.67E-02	6.68E-02	1.93E-02	6.68E-02	6.68E-02	6.99E-02	6.68E-02	1.02E-01
TEEN	6.70E-02	6.70E-02	1.94E-02	6.70E-02	6.71E-02	7.11E-02	6.71E-02	1.02E-01
CHILD	6.16E-02	6.16E-02	1.94E-02	6.16E-02	6.16E-02	6.60E-02	6.16E-02	9.63E-02
INFANT	4.36E-02	4.36E-02	1.94E-02	4.36E-02	4.36E-02	4.77E-02	4.36E-02	7.63E-02

Table C2

INTEGRATED POPULATION DOSES FOR JANUARY - JUNE 1991

PERSONREM

JANUARY 1 - MARCH 31 1991

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.39E-01 5.71%	3.39E-01 5.71%	3.39E-01 99.82%	3.39E-01 5.71%	3.39E-01 5.71%	3.39E-01 5.55%	3.39E-01 5.71%	1.20E+00 17.66%
GROUND	6.30E-05 .00%	6.30E-05 .00%	6.30E-05 .02%	6.30E-05 .00%	6.30E-05 .00%	6.30E-05 .00%	6.30E-05 .00%	7.39E-05 .00%
INHAL	1.07E+00 18.10%	1.07E+00 18.10%	1.56E-04 .05%	1.07E+00 18.10%	1.07E+00 18.10%	1.14E+00 18.60%	1.07E+00 18.10%	1.07E+00 15.81%
VEGET	3.86E+00 65.08%	3.86E+00 65.09%	3.31E-04 .10%	3.86E+00 65.08%	3.86E+00 65.08%	3.96E+00 64.84%	3.86E+00 65.08%	3.86E+00 56.83%
COW MILK	4.72E-01 7.96%	4.72E-01 7.96%	5.24E-05 .02%	4.72E-01 7.96%	4.72E-01 7.96%	4.86E-01 7.96%	4.72E-01 7.96%	4.72E-01 6.95%
MEAT	1.86E-01 3.14%	1.86E-01 3.14%	1.05E-06 .00%	1.86E-01 3.14%	1.86E-01 3.14%	1.86E-01 3.05%	1.86E-01 3.14%	1.86E-01 2.74%
TOTAL	5.93E+00	5.93E+00	3.39E-01	5.93E+00	5.93E+00	6.10E+00	5.93E+00	6.79E+00
(a) PER CAPITA DOSE (REM)	3.30E-06	3.30E-06	1.89E-07	3.30E-06	3.30E-06	3.40E-06	3.30E-06	3.78E-06

APRIL 1 - JUNE 30 1991

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.03E-01 3.34%	1.03E-01 3.34%	1.03E-01 99.04%	1.03E-01 3.34%	1.03E-01 3.34%	1.03E-01 3.24%	1.03E-01 3.34%	3.86E-01 11.43%
GROUND	6.60E-04 .02%	6.60E-04 .02%	6.60E-04 .63%	6.60E-04 .02%	6.60E-04 .02%	6.60E-04 .02%	6.60E-04 .02%	7.75E-04 .02%
INHAL	7.41E-01 23.95%	7.41E-01 23.94%	9.18E-05 .09%	7.41E-01 23.95%	7.41E-01 23.95%	7.74E-01 24.30%	7.42E-01 23.97%	7.41E-01 21.94%
VEGET	1.86E+00 60.30%	1.87E+00 60.30%	2.08E-04 .20%	1.87E+00 60.30%	1.87E+00 60.30%	1.92E+00 60.12%	1.86E+00 60.27%	1.86E+00 55.25%
COW MILK	3.07E-01 9.93%	3.07E-01 9.93%	4.47E-05 .04%	3.07E-01 9.93%	3.07E-01 9.93%	3.16E-01 9.93%	3.07E-01 9.93%	3.07E-01 9.10%
MEAT	7.64E-02 2.47%	7.64E-02 2.47%	7.84E-07 .00%	7.64E-02 2.47%	7.64E-02 2.47%	7.64E-02 2.40%	7.64E-02 2.47%	7.64E-02 2.26%
TOTAL	3.09E+00	3.09E+00	1.04E-01	3.09E+00	3.09E+00	3.19E+00	3.09E+00	3.38E+00
(a) PER CAPITA DOSE (REM)	1.72E-06	1.72E-06	5.79E-08	1.72E-06	1.72E-06	1.78E-06	1.72E-06	1.88E-06

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

Table C2 (Continued)

INTEGRATED POPULATION DOSES FOR JANUARY - JUNE 1991

PERSONREM

JANUARY 1 - JUNE 30 1991

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.42E-01 4.90%	4.42E-01 4.90%	4.42E-01 99.64%	4.42E-01 4.90%	4.42E-01 4.90%	4.42E-01 4.76%	4.42E-01 4.90%	1.59E+00 15.59%
GROUND	7.23E-04 .01%	7.23E-04 .01%	7.23E-04 .16%	7.23E-04 .01%	7.23E-04 .01%	7.23E-04 .01%	7.23E-04 .01%	8.49E-04 .01%
INHAL	1.81E+00 20.10%	1.81E+00 20.10%	2.47E-04 .06%	1.81E+00 20.11%	1.81E+00 20.11%	1.91E+00 20.55%	1.82E+00 20.12%	1.81E+00 17.84%
VEGET	5.72E+00 63.44%	5.73E+00 63.45%	5.39E-04 .12%	5.73E+00 63.44%	5.73E+00 63.44%	5.87E+00 63.22%	5.72E+00 63.44%	5.72E+00 56.31%
COW MILK	7.79E-01 8.64%	7.79E-01 8.64%	9.71E-05 .02%	7.79E-01 8.64%	7.79E-01 8.64%	8.02E-01 8.63%	7.79E-01 8.64%	7.79E-01 7.67%
MEAT	2.63E-01 2.91%	2.63E-01 2.91%	1.83E-06 .00%	2.63E-01 2.91%	2.63E-01 2.91%	2.63E-01 2.83%	2.63E-01 2.91%	2.63E-01 2.58%
TOTAL	9.02E+00	9.02E+00	4.43E-01	9.02E+00	9.02E+00	9.29E+00	9.02E+00	1.02E+01
(a) PER CAPITA DOSE (REM)	5.02E-06	5.02E-06	2.47E-07	5.02E-06	5.02E-06	5.17E-06	5.02E-06	5.68E-06

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

Table C3

SUMMARY OF INDIVIDUAL DOSES FOR JANUARY - JUNE 1991

	Unit	Quarter #1	Quarter #2	Quarter #3	Quarter #4	Total for 1991
Gamma Air Dose	mrad	1.40E-01	2.80E-02	N/A	N/A	1.67E-01
T.S. 3.11.2.2 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% T.S. Limit	%	2.80E+00	5.60E-01	N/A	N/A	1.67E+00
Beta Air Dose	mrad	4.02E-01	8.18E-02	N/A	N/A	4.79E-01
T.S. 3.11.2.2 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% T.S. Limit	%	4.02E+00	8.18E-01	N/A	N/A	2.40E+00
Maximum Individual						
Total Body	mrem	8.26E-02	1.65E-02	N/A	N/A	9.85E-02
Skin	mrem	2.37E-01	4.93E-02	N/A	N/A	2.85E-01
Location						
Unit 1	miles	1.70 SSE	1.87 S	N/A	N/A	1.87 S
Unit 2	miles	1.88 SSE	1.68 S	N/A	N/A	1.68 S
Unit 3	miles	1.73 SSE	1.46 S	N/A	N/A	1.46 S
Maximum Organ Dose		Teen Thyroid	Child(1) Thyroid			Teen (1) Thyroid
(excluding skin)	mrem	1.10E-01	7.12E-02	N/A	N/A	1.51E-01
T.S. 3.11.2.3 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% T.S. Limit	%	1.47E+00	9.49E-01	N/A	N/A	1.01E+00
Location						
Unit 1	miles	5.05 S	2.67 ENE	N/A	N/A	5.05 S
Unit 2	miles	4.88 S	2.85 ENE	N/A	N/A	4.88 S
Unit 3	miles	4.67 S	2.99 ENE	N/A	N/A	4.67 S

Note 1 : Does not include 2nd quarter Sr-89,90 results

Note 2 : These control location doses are imparted via three principal atmospheric pathways: plume, ground exposure and inhalation. Technical Specification 3.11.4 has higher limits than Technical Specification 3.11.2.3, therefore the percent of limits are more conservative based on Technical Specification 3.11.2.3 than on Technical Specification 3.11.4.

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 1988 Land Use Census.

0 to 5 mile population distribution based on the Land Use Census conducted during June-August, 1984.

The population distribution from the PVNGS UFSAR, Figure 2.1-8.

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 from the PVNGS during this reporting period. Since there were no replacement locations, no changes were made to the ODCM sample locations. Milk samples were unavailable because the only milk animals present within 5 miles were goats at a private residence. These goats are no longer present.

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