



SAN ONOFRE NUCLEAR GENERATING STATION

Annual Radioactive Effluent Release Report

2002

January - December

PREFACE

San Onofre Nuclear Generating Station is located next to San Onofre State Beach, adjoining Camp Pendleton Marine Corps Base, in San Diego County, 64 miles south of Los Angeles, California. There are two operating pressurized water reactors with a total rated capacity of 2254 net megawatts electrical.

Unit 1, rated at 410 net megawatts electrical, was supplied by Westinghouse Electric Company and began commercial operation on January 1, 1968. The unit was permanently shutdown on November 30, 1992. It is owned by Southern California Edison (80%) and San Diego Gas and Electric (20%).

Unit 2 and Unit 3 were supplied by Combustion Engineering, Inc., with turbine generators supplied by G.E.C. Turbine Generators, Ltd., of England. The units began commercial operation on August 18, 1983, and April 1, 1984, respectively and are rated at 1127 net megawatts electrical each. The twin units are owned by Southern California Edison (75.05%), San Diego Gas and Electric (20%), City of Anaheim (3.16%), and the City of Riverside (1.79%).

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SECTION A. INTRODUCTION

This Annual Radioactive Effluent Release Report summarizes the gaseous and liquid radioactive effluent releases and radwaste shipments made from the San Onofre Nuclear Generating Station, Unit 1. This report is prepared in the general format of USNRC Regulatory Guide 1.21 and includes:

1. Quarterly Summaries of Gaseous and Liquid Effluents for "Continuous" and "Batch" Modes of Release
2. Percent of Applicable Limits
3. Estimated Total Percent Error
4. Lower Limit of Detection Concentrations
5. Batch Release Summaries
6. Previous Radioactive Effluent Release Report Addendum
7. Radwaste Shipments
8. 10 CFR 50 Appendix I Requirements
9. Changes to Offsite Dose Calculation Manual

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SECTION B. GASEOUS EFFLUENTS

Table 1A, "Gaseous Effluents-Summation of All Releases," provides a detailed listing of gaseous effluents released quarterly in four categories: fission and activation gases, iodine-131, particulates with half-lives greater than eight days, and tritium. Listed for each of the four categories are:

- (1) the total curies released
- (2) the average release rate
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, the particulate category lists the gross alpha radioactivity released for each quarter.

The methodology used to calculate the percent of Applicable Limit is presented in Section F of this report. The methodology used in Table 1A to calculate the estimated total error is presented in Section G of this report.

Table 1B, "Gaseous Effluents-Elevated Release," has not been included in this report since San Onofre Nuclear Generating Station Unit 1 does not conduct elevated releases.

Table 1C, "Gaseous Effluents-Ground Level Releases," provides the systematic listing by radionuclide for the quantity of radioactivity released in three categories: fission gases, iodines, and particulates. The total radioactivity for each radionuclide is listed for each quarterly period by "continuous" mode of release. Plant stack releases are considered to be "continuous" releases. As of 8/4/93, "batch" mode releases are no longer conducted because of the permanent shutdown of the reactor.

Table 1D, "Gaseous Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Tables 1A and 1C for continuous mode releases only.

Table 1E; "Gaseous Effluents-Radiation Doses at the Site Boundary," provides a quarterly summary of doses at the site boundary for this report period.

Table 1F, "Gaseous Effluents-Batch Release Summary," has been deleted. "Batch" mode releases are no longer conducted as of 8/4/93, due to the permanent shutdown of the reactor.

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TABLE 1A

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	<LLD	<LLD	3.00E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
B. Iodines				
1. Total iodine-131	Ci	<LLD	<LLD	1.90E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	<LLD	<LLD	1.60E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
5. Gross alpha activity	Ci	<LLD	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	1.64E-1	7.05E-1	2.50E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	2.11E-2	8.97E-2	
3. Percent of applicable limit	% MPC	1.37E-4	5.83E-4	
4. Percent Effluent Concentration Limit	% ECL	2.74E-4	1.17E-3	

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TABLE 1A (Continued)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	<LLD	<LLD	3.00E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
B. Iodines ⁽¹⁾				
1. Total iodine-131	Ci	<LLD	<LLD	1.90E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
C. Particulates ⁽¹⁾				
1. Particulates with half-lives >8 days	Ci	<LLD	1.89E-6	1.60E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	2.37E-7	
3. Percent of applicable limit	% MPC	0.00E+0	6.33E-7	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	1.70E-6	
5. Gross alpha activity	Ci	<LLD	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	<LLD	5.55E-1	2.50E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	0.00E+0	6.98E-2	
3. Percent of applicable limit	% MPC	0.00E+0	4.54E-4	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	9.08E-4	

(1) On 7/9/2002, plant vent stack particulate and iodine samples were not collected for 4 hrs and 22 minutes. Prior and subsequent samples were <LLD. There were no dose consequences to the public as a result of this event which is documented in AR 020700464.

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TABLE 1C

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD
2. Iodines					
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iodine-133	Ci	<LLD	<LLD	<LLD	<LLD
iodine-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD
3. Particulates					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	<LLD	<LLD	2.34E-8
cesium-137	Ci	<LLD	<LLD	<LLD	1.80E-6
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	<LLD	6.30E-8
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
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 1D.

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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TABLE 1D

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci}/\text{cc}$)
1. Fission and activation gases	
krypton-85	2.10E-5
krypton-85m	5.00E-8
krypton-87	2.60E-7
krypton-88	1.80E-7
xenon-133	1.30E-7
xenon-133m	4.10E-7
xenon-135	5.30E-8
xenon-135m	2.00E-6
xenon-138	3.50E-6
2. Iodines	
iodine-131	2.90E-13
iodine-133	2.80E-12
iodine-135	1.90E-10
3. Particulates	
barium-140	5.90E-13
cerium-141	6.60E-14
cerium-144	2.60E-13
cesium-134	1.70E-13
cesium-137	1.40E-13
cobalt-58	1.50E-13
cobalt-60	2.40E-13
iron-59	3.80E-13
lanthanum-140	1.20E-12
manganese-54	1.50E-13
molybdenum-99	7.90E-14
strontium-89	1.00E-14
strontium-90	1.00E-15
zinc-65	4.00E-13
4. alpha	1.00E-11
5. tritium	7.20E-8

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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TABLE 1E

GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A. Noble Gas					
1. Gamma Air Dose	mrad	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2. Percent Applicable Limit	%	0.00E+0	0.00E+0	0.00E+0	0.00E+0
3. Beta Air Dose	mrad	0.00E+0	0.00E+0	0.00E+0	0.00E+0
4. Percent Applicable Limit	%	0.00E+0	0.00E+0	0.00E+0	0.00E+0
B. Tritium, Iodine, Particulates (at the nearest receptor)					
1. Organ Dose	mrem	6.69E-6	3.67E-5	0.00E+0	3.61E-5
2. Percent Applicable Limit	%	8.92E-5	4.89E-4	0.00E+0	4.81E-4

NOTE: Calculations performed in accordance with the ODCM utilizing the historical X/Q.

TABLE 1F

GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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SECTION C. LIQUID EFFLUENTS

Table 2A, "Liquid Effluents-Summation of All Releases," provides a detailed summary of liquid effluents released quarterly in three categories: fission and activation products, tritium, and dissolved and entrained gases. Listed for each of the three categories are:

- (1) the total curies released
- (2) the average diluted concentration
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, Table 2A lists:

- (1) the gross alpha radioactivity
- (2) the volume of waste released (prior to dilution)
- (3) the volume of dilution water

The methodology used to calculate the percent of applicable limit is presented in Section F of this report. The methodology used to calculate the estimated total error in Table 2A is presented in Section G of this report.

Table 2B, "Liquid Effluents," provides the systematic listing by radionuclide for the quantity of radioactivity released in each category. The total radioactivity of each radionuclide released is listed for each quarterly period by both "continuous" and "batch" modes of release.

Table 2C, "Liquid Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Table 2B.

Table 2D, "Liquid Effluents-Radiation Doses at the Liquid Site Boundary," presents a quarterly summary of doses at the Liquid Site Boundary for this report period.

Table 2E, "Liquid Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Unit 1.

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TABLE 2A

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	1.00E-5	3.52E-3	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	6.36E-12	2.09E-9	
3. Percent of applicable limit	% MPC	3.10E-5	1.35E-2	
4. Percent Effluent Concentration Limit	% ECL	6.03E-4	1.46E-1	
B. Tritium				
1. Total release	Ci	1.81E-3	1.15E+0	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	1.15E-9	6.85E-7	
3. Percent of applicable limit	% MPC	3.82E-5	2.28E-2	
4. Percent Effluent Concentration Limit	% ECL	1.15E-4	6.85E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	1.49E-5	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)				
	liters	1.33E+6	9.00E+5	5.00E+0
F. Volume of dilution water used during period				
	liters	1.58E+9	1.68E+9	5.00E+0

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TABLE 2A (Continued)

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	7.79E-3	1.78E-5	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci}/\text{ml}$	5.23E-9	1.07E-11	
3. Percent of applicable limit	% MPC	2.35E-2	5.36E-5	
4. Percent Effluent Concentration Limit	% ECL	2.36E-1	1.07E-3	
B. Tritium				
1. Total release	Ci	4.62E+0	5.83E-4	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci}/\text{ml}$	3.10E-6	3.51E-10	
3. Percent of applicable limit	% MPC	1.03E-1	1.17E-5	
4. Percent Effluent Concentration Limit	% ECL	3.10E-1	3.51E-5	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci}/\text{ml}$	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
D. Gross alpha radioactivity				
1. Total release	Ci	7.85E-5	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)				
	liters	1.20E+6	7.02E+6	5.00E+0
F. Volume of dilution water used during period				
	liters	1.49E+9	1.66E+9	5.00E+0

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TABLE 2B

LIQUID EFFLUENTS
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	<LLD	<LLD	<LLD
cesium-137	Ci	9.26E-6	6.74E-6	1.95E-5	1.78E-5
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	7.86E-7	<LLD	<LLD	<LLD
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iron-55	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
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	1.00E-5	6.74E-6	1.95E-5	1.78E-5
2. Dissolved and entrained gases					
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
barium-140	Ci	N/A	<LLD	<LLD	N/A
cerium-141	Ci	N/A	<LLD	<LLD	N/A
cerium-144	Ci	N/A	<LLD	<LLD	N/A
cesium-134	Ci	N/A	9.93E-5	1.32E-4	N/A
cesium-137	Ci	N/A	1.79E-3	2.58E-3	N/A
chromium-51	Ci	N/A	<LLD	<LLD	N/A
cobalt-57	Ci	N/A	<LLD	1.69E-5	N/A
cobalt-58	Ci	N/A	<LLD	<LLD	N/A
cobalt-60	Ci	N/A	1.54E-3	2.01E-3	N/A
iodine-131	Ci	N/A	<LLD	<LLD	N/A
iron-55	Ci	N/A	<LLD	2.84E-3	N/A
iron-59	Ci	N/A	<LLD	<LLD	N/A
lanthanum-140	Ci	N/A	<LLD	<LLD	N/A
manganese-54	Ci	N/A	<LLD	<LLD	N/A
molybdenum-99	Ci	N/A	<LLD	<LLD	N/A
niobium-95	Ci	N/A	<LLD	<LLD	N/A
strontium-89	Ci	N/A	7.21E-5	1.67E-4	N/A
strontium-90	Ci	N/A	1.55E-5	2.38E-5	N/A
technetium-99m	Ci	N/A	<LLD	<LLD	N/A
zinc-65	Ci	N/A	<LLD	<LLD	N/A
zirconium-95	Ci	N/A	<LLD	<LLD	N/A
Total for period	Ci	N/A	3.52E-3	7.77E-3	N/A
2. Dissolved and entrained gases					
xenon-133	Ci	N/A	<LLD	<LLD	N/A
xenon-135	Ci	N/A	<LLD	<LLD	N/A
Total for period	Ci	N/A	<LLD	<LLD	N/A

N/A No releases conducted

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2C

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	3.90E-7
cerium-141	5.80E-8
cerium-144	2.30E-7
cesium-134	1.00E-7
chromium-51	4.60E-7
cobalt-58	9.00E-8
cobalt-60	1.30E-7
iodine-131	8.00E-8
iron-55	1.00E-6
iron-59	2.10E-7
lanthanum-140	7.20E-7
manganese-54	8.90E-8
molybdenum-99	7.50E-8
niobium-95	9.10E-8
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	7.70E-8
zinc-65	2.20E-7
zirconium-95	1.60E-7
2. Dissolved and entrained gases	
xenon-133	3.10E-7
xenon-135	1.20E-7
3. gross alpha	
	1.00E-7

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TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci}/\text{cc}$)
1. Fission and activation products	
barium-140	3.30E-7
cerium-141	5.30E-8
cerium-144	2.30E-7
chromium-51	4.20E-7
cobalt-57	2.90E-8
cobalt-58	8.70E-8
iodine-131	6.00E-8
iron-55	1.00E-6
iron-59	2.00E-7
lanthanum-140	2.40E-7
manganese-54	8.80E-8
molybdenum-99	3.50E-8
niobium-95	8.50E-8
technetium-99m	3.60E-8
zinc-65	2.20E-7
zirconium-95	1.50E-7
2. Dissolved and entrained gases	
xenon-133	3.10E-7
xenon-135	1.20E-7
3. gross alpha	1.00E-7

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S.O.N.G.S. 1

TABLE 2D

LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A.					
1. Total body dose	mrem	1.03E-4	1.44E-2	5.38E-2	1.27E-4
2. Percent Applicable Limit	%	6.85E-3	9.62E-1	3.59E+0	8.46E-3
B.					
1. Limiting organ dose	mrem	1.52E-4	3.32E-2	2.21E-1	1.94E-4
2. Percent Applicable Limit	%	3.05E-3	6.63E-1	4.41E+0	3.88E-3
3. Limiting organ for period		Liver	GI-LLI	Bone	Liver

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	6 releases
2. Total time period for batch releases:	9229 minutes
3. Maximum time period for a batch release:	3008 minutes
4. Average time period for a batch release:	1538 minutes
5. Minimum time period for a batch release:	682 minutes
6. Average saltwater flow during batch releases:	6733 gpm

SECTION D. PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORT ADDENDUM

None.

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S.O.N.G.S. 1

SECTION E. RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges, evaporator bottoms	m ³	N/A	N/A
	Ci	N/A	
b. Dry active waste (DAW), compactable and non-compactable (incl. demolition rubble) *	m ³	1.10E+3	3.00E+1
	Ci	9.54E+2	
c. Irradiated components (Excore detectors and insulation) *	m ³	2.66E+0	3.00E+1
	Ci	2.43E+0	
d. Other: (High pressure garnet) #	m ³	3.13E+0	3.00E+1
	Ci	1.18E+3	

NOTE: Total curie content estimated.

(*) Material packaged in Type A or strong tight containers of various sizes.

(#) Material packaged in High Integrity Containers and shipped in Type B Cask.

N/A No shipment made.

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S.O.N.G.S. 1

2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	N/A
b. americium-241	%	5.28E-2
carbon-14	%	1.02E-1
cerium-144	%	3.20E-2
cesium-134	%	9.81E-3
cesium-137	%	1.82E-1
cobalt-58	%	1.89E-3
cobalt-60	%	3.63E+1
curium-242	%	1.49E-5
curium-243/244	%	2.36E-2
iodine-129	%	2.21E-5
iron-55	%	2.76E+1
manganese-54	%	3.33E-3
nickel-59	%	5.61E-1
nickel-63	%	3.30E+1
niobium-94	%	8.11E-4
niobium-95	%	1.13E-4
plutonium-238	%	7.95E-2
plutonium-239/240	%	2.95E-2
plutonium-241	%	1.93E+0
silver-110m	%	4.27E-6
strontium-90	%	7.10E-2
technetium-99	%	3.41E-4
tritium	%	3.61E-2
uranium-233	%	7.89E-8
zirconium-95	%	1.32E-4

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

2. Estimate of major nuclide composition (by type of waste)		(Cont'd)
c. americium-241	%	8.58E-6
carbon-14	%	2.53E-2
cerium-144	%	2.82E-6
cesium-134	%	4.22E-4
cesium-137	%	2.79E-3
cobalt-60	%	6.56E+1
curium-242	%	4.60E-8
curium-243/244	%	2.92E-6
iron-55	%	1.61E+1
manganese-54	%	6.48E-3
nickel-59	%	1.40E-1
nickel-63	%	1.81E+1
niobium-94	%	5.34E-4
plutonium-238	%	1.51E-5
plutonium-239/240	%	5.55E-6
plutonium-241	%	3.48E-4
strontium-90	%	3.34E-5
technetium-99	%	1.35E-4
tritium	%	2.89E-5
uranium-233	%	3.40E-9

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

2. Estimate of major nuclide composition (by type of waste)		(Cont'd)
d. americium-241	%	3.20E-8
carbon-14	%	4.30E-4
cerium-144	%	3.41E-8
cesium-137	%	5.95E-8
cobalt-58	%	9.56E-8
cobalt-60	%	4.46E-1
curium-242	%	1.99E-10
curium-243/244	%	1.86E-8
iron-55	%	2.48E-1
manganese-54	%	5.34E-5
nickel-59	%	2.19E-3
nickel-63	%	3.04E-1
niobium-94	%	6.57E-6
plutonium-238	%	5.31E-8
plutonium-239/240	%	1.44E-8
plutonium-241	%	9.90E-7
strontium-90	%	1.03E-7
technetium-99	%	1.40E-6
tritium	%	4.95E-9

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

3. Solid Waste Disposition		
Number of Shipments	Mode of Transportation	Destination
21	R&R Trucking Company Truck/Trailer	EnviroCare, UT
22	MHFLogistical Solutions Rail	EnviroCare, UT
2	KTC/TAG Flatbed Trailer	Barnwell, SC
2*	R&R Trucking Co. TN RAM Type B Cask	Barnwell, SC

* These shipments were done in a NRC Type B shipping cask.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	No shipments were made	N/A

C. DEWATERING

Number of Containers	Solidification Agent
None	N/A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

SECTION F. APPLICABLE LIMITS

Gaseous Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, C.3, and D.3 of Table 1A, was calculated using the following equation:

- % Applicable Limit =
$$\frac{(\text{Rel Rate}) (X/Q) (100)}{\text{MPC}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci}/\text{sec}$.

X/Q = $1.30\text{E}-5 \text{ sec}/\text{m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM.

- MPC_{eff} =
$$\frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 1.

- % ECL =
$$\frac{(\text{Rel Rate}) (X/Q) (100)}{\text{ECL}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci}/\text{sec}$.

X/Q = $1.30\text{E}-5 \text{ sec}/\text{m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM.

- ECL_{eff} =
$$\frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 1.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

Liquid Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, and C.3 of Table 2A, were calculated using the following equations:

- % Applicable Limit =
$$\frac{(\text{Dil Conc}) (100)}{\text{MPC}_{\text{eff}}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.

- MPC_{eff} =
$$\frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 2.

- % ECL =
$$\frac{(\text{Dil Conc}) (100)}{\text{ECL}_{\text{eff}}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.

- ECL_{eff} =
$$\frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 2.

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S.O.N.G.S. 1

SECTION G. ESTIMATION OF ERROR

Estimations of the error in reported values of gaseous and liquid effluents releases have been made.

Sources of error for gaseous effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for gaseous effluents - continuous releases are:

- (1) fan flow rate
- (2) sampling
- (3) counting
- (4) calibration
- (5) differential pressure drop

Sources of error for liquid effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for liquid effluents - continuous releases are:

- (1) dilution flow rate
- (2) sampling
- (3) counting
- (4) calibration

These sources of error are independent, and thus, the total error is calculated according to the following formula:

$$\text{Total Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \dots + \sigma_i^2}$$

where: σ_i = Error associated with each component.

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S.O.N.G.S. 1

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

Table 1 in Section H presents the quarterly and annual maximum dose to an individual. Six different categories are presented:

- (1) Liquid Effluents - Whole Body
- (2) Liquid Effluents - Organ
- (3) Airborne Effluents - Tritium, Iodines and Particulates
- (4) Noble Gases - Gamma
- (5) Noble Gases - Beta
- (6) Direct Radiation

The doses for categories 1 and 2 were calculated using the methodology of the ODCM; this data is also presented in Table 2D. Categories 3, 4, and 5 were calculated utilizing RRRGS (Radioactive Release Report Generating System) software, Regulatory Guide 1.109 methodology, and concurrent meteorology. Table 1E of gaseous effluents previously presented, however, lists data similar to categories 3, 4 and 5 using methods described in the ODCM and the historical meteorology (X/Q). Category 6 presents direct dose data measured by TLD dosimeters. Each portion of each category is footnoted to briefly describe each maximum individual dose presented.

For members of the public, per the ODCM, who may at times be within the site boundary¹, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. For members of the public who traverse the site boundary via highway I-5, the residency time shall be considered negligible and hence the dose "0".

Table 2 in Section H presents the percent of Applicable Limits for each dose presented in Table 1.

¹ ODCM Figures 2-1 & 2-2.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

TABLE 1

SOURCE	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	1.03E-4	1.44E-2	5.38E-2	1.27E-4	6.84E-2
Organ	6)	7)	8)	9)	10)
Organ	1.52E-4	3.32E-2	2.21E-1	1.94E-4	2.33E-1
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	2.17E-4	6.06E-4	0.00E+0	7.42E-4	1.57E-3
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Beta	21)	22)	23)	24)	25)
Beta	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
DIRECT RADIATION	26)	27)	28)	29)	30)
DIRECT RADIATION	1.37E-1	1.23E-1	7.60E-2	1.31E-1	4.67E-1

* The numbered footnotes below briefly explain how each maximum dose was calculated, including the organ and the predominant pathway(s).

** Noble gas doses due to airborne effluent are in units of mrad, reflecting the air dose.

1. This value was calculated using the methodology of the ODCM.
2. This value was calculated using the methodology of the ODCM.
3. This value was calculated using the methodology of the ODCM.
4. This value was calculated using the methodology of the ODCM.
5. This value was calculated using the methodology of the ODCM.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

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6. This value was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
7. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
8. This value was calculated using the methodology of the ODCM; the bone received the maximum dose primarily by the saltwater fish pathway.
9. This value was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
10. This value was calculated using the methodology of the ODCM; the bone received the maximum dose primarily by the saltwater fish pathway.
11. The maximum organ dose was to a child's thyroid and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
12. The maximum organ dose was to a child's thyroid and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
13. There was no activity detected during the release period, therefore the reported organ dose was 0.00E+0 mrem.
14. The maximum organ dose was to a child's liver and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
15. The maximum organ dose was to a child's liver and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
16. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
17. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
18. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
19. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
20. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
21. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
22. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
23. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
24. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.

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25. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
26. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
27. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
28. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
29. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
30. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS					
Whole Body	6.85E-3	9.62E-1	3.59E+0	8.46E-3	2.28E+0
Organ	3.05E-3	6.63E-1	4.41E+0	3.88E-3	2.33E+0
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	2.89E-3	8.08E-3	0.00E+0	9.90E-3	1.04E-2
NOBLE GASES					
Gamma	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Beta	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

NOTE: Direct Radiation is not specifically addressed in the Applicable Limits.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

On February 28, 2002, Revision 19 to the Unit 1 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision were:

1. A change to the requirement for reporting unplanned releases on a quarterly basis in the annual report,
2. Updates related to the recent Land Use Census, and
3. Changes to the Kelp and Shoreline Sediment environmental sample locations.

Item 1 is being changed in response to AR 011000482 to reflect the more generic language of NUREG 0472. An Effluent/ODCM Screen has been provided for item 1. Item 3 changes were made per email from Environmental Protection Group to Effluent Engineering dated 2/1/02.

Minor format changes, correction of typographical errors, and removal of previously blank pages have been made and are described in the attached List of Affected Pages. Per NRC Generic Letter 89-01, no safety reviews were required or performed for editorial changes or changes made to reflect actual plant operation.

None of the changes impact the accuracy or reliability of effluent dose or setpoint calculations. The level of radioactive effluent control required by 10CFR20, 40CFR190, 10CFR50.36a, and Appendix I to 10CFR50 will be maintained.

Throughout the document, change bars are marked in one of four ways as follows:

- A Addition
- D Deletion
- F Editorial/Format change
- R Revision

The following is a complete list of the changes:

PAGE	CHANGE	REASON
2-21	Updated CLF due to Land Use Census Update.	R
2-31	Updated Dose Parameters in Table 2-11, Outage Workers due to Land Use Census Update.	R
5-22	Removed distances from titles of Shoreline Sediment locations for San Onofre State Beach (Southeast)	R
	Changed dashes to the word "to" in the distance and directions for Local Crops - Oceanside (CONTROL).	F
5-23	Deleted Kelp sample Laguna Beach (CONTROL)	D
	Added Kelp sample Salt Creek (CONTROL) 11 to 13 miles WNW to NW	A
	Deleted Ocean Sediment sample Unit 1 Outfall	D
	Added Ocean Sediment sample SONGS Upcoast 0.9 miles WSW	A
5-26 thru 5-30	New maps reflecting changes to sample locations	R
6-9	Changed the time frame for unplanned releases reporting in the annual report by replacing "on a quarterly basis" with "during the reporting period" per AR 011000482.	R

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

- There were no changes to the Unit 1 Radioactive Waste Treatment Systems during the reporting period, January 1, 2002 to December 31, 2002.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

SECTION K. MISCELLANEOUS

- Yard Drain Sump Overflow

The Unit 1 Yard Drain sump overflowed to the PMF Catch Basin due to heavy rainfall three times in 2002. Since there was no detectable activity in the grab samples taken during the overflows, there were no dose consequences as a result of these unplanned, unmonitored releases.

Start Date/Time	Stop Date/Time	Duration (min)	Activity ($\mu\text{Ci/ml}$)	Estimated Release (Curies)	Estimated Whole Body Dose (mrem)	Estimated Organ Dose (mrem)
11/29/02 @ 2047	11/29/02 @ 2053	6	<MDA	0.00E+0	0.00E+0	0.00E+0
12/16/02 @ 1712	12/16/02 @ 1745	33	<MDA	0.00E+0	0.00E+0	0.00E+0
12/20/02 @ 0502	12/20/02 @ 0640	98	<MDA	0.00E+0	0.00E+0	0.00E+0

- Airborne Particulate Release During Large Component Removal

In October 2002, penetrations were cut into the Containment sphere to allow large component removal (LCR) as a continuation of the decommissioning process. The Unit 1 containment sphere was breached on 10/7/2002 with the removal of the opening above the reactor vessel. The final sphere opening cap was installed 12/10/2002. Continuous air sampling was performed at each of the roof openings. The sample analyses indicated trace amounts of Cs-137 and occasionally Co-60 and Cs-134. The resultant curies and dose are included in the Unit 1 release data (Section B and H) of this report. There were minimal dose consequences to members of the public as a result of this event that is documented in AR 021100412.

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S.O.N.G.S. 1

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 2002 - December 31, 2002

S.O.N.G.S. 1			
Monitor	Inoperability Period	Inoperability Cause	Explanation
R-2100 Reheater Pit Sump Monitor	04/24/02 - 06/22/02	Corrosion in electronics and detector	Corrosion on the Local Processing Unit (LPU) caused monitor to fail. The LPU and detector were replaced. Upon returning to service, the monitor experienced frequent alarms. This event is documented in ARs 020401433 and 020501438.
	09/25/02 - 10/29/02	Low sample flow	Investigation of flow problems identified debris in canister which was blocking flow. Thorough cleaning of detector restored normal sample flow. This event is documented in AR 020901269.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 1

SECTION L. S.O.N.G.S. 1 CONCLUSIONS

- Gaseous releases totaled $1.42\text{E}+0$ curies of which noble gases were $0.00\text{E}+0$ curies, iodines were $0.00\text{E}+0$ curies, particulates were $1.89\text{E}-6$ curies, and tritium was $1.42\text{E}+0$ curies.
- The radiation doses from gaseous releases were: (a) gamma air dose: $0.00\text{E}+0$ mrad at the site boundary, (b) beta air dose: $0.00\text{E}+0$ mrad at the site boundary, organ dose: $1.57\text{E}-3$ mrem at the nearest receptor.
- Liquid releases totaled $5.79\text{E}+0$ curies of which particulates and iodines were $1.13\text{E}-2$ curies, tritium was $5.78\text{E}+0$ curies, and noble gases were $0.00\text{E}+0$ curies.
- The radiation doses from liquid releases were: (a) total body: $6.84\text{E}-2$ mrem, (b) limiting organ: $2.33\text{E}-1$ mrem.
- The radioactive releases and resulting doses generated from Unit 1 were below the Applicable Limits for both gaseous and liquid effluents.

S.O.N.G.S. 2 and 3

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

January - December

SECTION A. INTRODUCTION

This Annual Radioactive Effluent Release Report summarizes the gaseous and liquid radioactive effluent releases and radwaste shipments made from the San Onofre Nuclear Generating Station, Units 2 and 3. This report is prepared in the general format of USNRC Regulatory Guide 1.21 and includes:

1. Quarterly Summaries of Gaseous and Liquid Effluents for "Continuous" and "Batch" Modes of Release
2. Percent of Applicable Limits
3. Estimated Total Percent Error
4. Lower Limit of Detection Concentrations
5. Batch Release Summaries
6. Previous Radioactive Effluent Release Report Addendum
7. Radwaste Shipments
8. 10 CFR 50 Appendix I Requirements
9. Changes to Offsite Dose Calculation Manual

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SECTION B. GASEOUS EFFLUENTS

Table 1A, "Gaseous Effluents-Summation of All Releases," provides a detailed listing of gaseous effluents released quarterly in four categories: fission and activation gases, iodine-131, particulates with half-lives greater than eight days, and tritium. Listed for each of the four categories are:

- (1) the total curies released
- (2) the average release rate
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, the particulate category lists the gross alpha radioactivity released for each quarter.

The methodology used to calculate the percent of Applicable Limit is presented in Section F of this report. The methodology used in Table 1A to calculate the estimated total error is presented in Section G of this report.

Table 1B, "Gaseous Effluents-Elevated Release," has not been included in this report since San Onofre Nuclear Generating Station Units 2 and 3 do not conduct elevated releases.

Table 1C, "Gaseous Effluents-Ground Level Releases," provides the systematic listing by radionuclide for the quantity of radioactivity released in three categories: fission gases, iodines, and particulates. The total radioactivity for each radionuclide is listed for each quarterly period by both "continuous" and "batch" modes of release.

Waste gas decay tank releases are considered to be "batch" releases. Containment purges and plant stack releases are considered to be "continuous" releases.

Table 1D, "Gaseous Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Tables 1A and 1C.

Table 1E, "Gaseous Effluents-Radiation Doses at the Site Boundary," provides a quarterly summary of doses at the site boundary for this report period.

Table 1F, "Gaseous Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Units 2 and 3.

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TABLE 1A

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	8.23E+0	3.32E+1	3.00E+1
2. Average release rate for period	μCi/sec	1.06E+0	4.22E+0	
3. Percent of applicable limit	% MPC	2.57E-3	1.11E-2	
4. Percent Effluent Concentration Limit	% ECL	4.97E-3	2.32E-2	
B. Iodines				
1. Total iodine-131	Ci	2.03E-5	1.73E-2	1.90E+1
2. Average release rate for period	μCi/sec	2.61E-6	2.20E-3	
3. Percent of applicable limit	% MPC	1.25E-5	1.06E-2	
4. Percent Effluent Concentration Limit	% ECL	6.27E-6	5.28E-3	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	8.10E-5	1.17E-4	1.60E+1
2. Average release rate for period	μCi/sec	1.04E-5	1.48E-5	
3. Percent of applicable limit	% MPC	9.75E-6	6.76E-6	
4. Percent Effluent Concentration Limit	% ECL	2.43E-5	1.57E-5	
5. Gross alpha activity	Ci	5.58E-6	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	1.26E+1	1.51E+1	2.50E+1
2. Average release rate for period	μCi/sec	1.62E+0	1.92E+0	
3. Percent of applicable limit	% MPC	3.89E-3	4.61E-3	
4. Percent Effluent Concentration Limit	% ECL	7.78E-3	9.22E-3	

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TABLE 1A (Continued)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	1.33E+1	8.81E+0	3.00E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	1.67E+0	1.11E+0	
3. Percent of applicable limit	% MPC	1.10E-2	4.40E-3	
4. Percent Effluent Concentration Limit	% ECL	3.92E-2	1.29E-2	
B. Iodines				
1. Total iodine-131	Ci	1.70E-5	1.27E-5	1.90E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	2.14E-6	1.60E-6	
3. Percent of applicable limit	% MPC	1.03E-5	7.67E-6	
4. Percent Effluent Concentration Limit	% ECL	5.13E-6	3.83E-6	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	5.16E-5	6.42E-5	1.60E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	6.49E-6	8.07E-6	
3. Percent of applicable limit	% MPC	3.89E-6	7.31E-6	
4. Percent Effluent Concentration Limit	% ECL	9.35E-6	1.82E-5	
5. Gross alpha activity	Ci	<LLD	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	1.08E+1	5.78E+0	2.50E+1
2. Average release rate for period	$\mu\text{Ci}/\text{sec}$	1.36E+0	7.27E-1	
3. Percent of applicable limit	% MPC	3.26E-3	1.75E-3	
4. Percent Effluent Concentration Limit	% ECL	6.52E-3	3.49E-3	

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TABLE 1C

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
argon-41	Ci	6.58E-1	3.16E+0	6.35E+0	2.01E+0
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	<LLD	2.54E-2	<LLD	<LLD
krypton-87	Ci	<LLD	1.22E-3	<LLD	<LLD
krypton-88	Ci	<LLD	3.46E-3	<LLD	<LLD
xenon-133	Ci	6.86E+0	2.82E+1	6.19E+0	6.50E+0
xenon-133m	Ci	<LLD	4.95E-1	<LLD	<LLD
xenon-135	Ci	<LLD	3.79E-1	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	7.52E+0	3.23E+1	1.25E+1	8.52E+0
2. Iodines					
iodine-131	Ci	2.03E-5	1.73E-2	1.70E-5	1.27E-5
iodine-132	Ci	<LLD	1.08E-2	<LLD	1.16E-7
iodine-133	Ci	3.03E-5	6.42E-4	5.84E-6	1.87E-5
iodine-135	Ci	<LLD	<LLD	<LLD	1.36E-6
Total for period	Ci	5.05E-5	2.87E-2	2.29E-5	3.28E-5

LLD Lower Limit of Detection; see Table 1D.

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TABLE 1C (Continued)

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
3. Particulates					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
bromine-82	Ci	2.70E-5	9.70E-5	9.39E-5	4.73E-5
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	8.40E-8	4.61E-8	<LLD	<LLD
cesium-137	Ci	7.82E-5	3.49E-5	2.58E-5	5.93E-5
cobalt-58	Ci	2.67E-6	8.17E-5	2.58E-5	4.86E-6
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
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 1D.

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TABLE 1C (Continued)

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
 BATCH MODE *

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
krypton-85	Ci	7.10E-1	7.56E-1	6.21E-1	2.99E-1
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-131m	Ci	<LLD	3.25E-2	<LLD	<LLD
xenon-133	Ci	1.69E-3	1.09E-1	1.02E-1	<LLD
xenon-133m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	7.11E-1	8.98E-1	7.23E-1	2.99E-1

LLD Lower Limit of Detection; see Table 1D.

* Iodines and particulates are not analyzed prior to release via batch mode.

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TABLE 1D

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci}/\text{cc}$)
1. Fission and activation gases	
krypton-85	2.10E-5
krypton-85m	5.00E-8
krypton-87	2.60E-7
krypton-88	1.80E-7
xenon-133m	4.10E-7
xenon-135	5.30E-8
xenon-135m	2.00E-6
xenon-138	3.50E-6
2. Iodines	
iodine-132	6.00E-10
iodine-135	1.70E-10
3. Particulates	
barium-140	2.70E-11
cerium-141	3.40E-12
cerium-144	1.40E-11
cesium-134	9.20E-12
cobalt-60	1.30E-11
iron-59	2.00E-11
lanthanum-140	2.20E-11
manganese-54	8.20E-12
molybdenum-99	2.10E-12
strontium-89	1.00E-13
strontium-90	1.00E-14
zinc-65	2.20E-11
4. alpha	1.00E-11

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TABLE 1D (Continued)

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
 BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85m	2.50E-6
krypton-87	1.20E-5
krypton-88	8.90E-6
xenon-131m	1.70E-6
xenon-133	5.70E-6
xenon-133m	2.30E-5
xenon-135	2.90E-6
xenon-135m	3.70E-5
xenon-138	5.50E-5

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TABLE 1E

GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A. Noble Gas					
1. Gamma Air Dose	mrad	1.30E-3	6.14E-3	9.35E-3	3.18E-3
2. Percent Applicable Limit	%	1.30E-2	6.14E-2	9.35E-2	3.18E-2
3. Beta Air Dose	mrad	1.64E-3	6.60E-3	4.43E-3	2.06E-3
4. Percent Applicable Limit	%	8.18E-3	3.30E-2	2.21E-2	1.03E-2
B. Tritium, Iodine, Particulates (at the nearest receptor)					
1. Organ Dose	mrem	7.85E-4	1.46E-2	6.21E-4	4.59E-4
2. Percent Applicable Limit	%	5.24E-3	9.74E-2	4.14E-3	3.06E-3

NOTE: Calculations performed in accordance with the ODCM utilizing the historical X/Q.

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TABLE 1F

GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	10 releases
2. Total time period for batch releases:	4340 minutes
3. Maximum time period for a batch release:	582 minutes
4. Average time period for a batch release:	434 minutes
5. Minimum time period for a batch release:	145 minutes

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SECTION C. LIQUID EFFLUENTS

Table 2A, "Liquid Effluents-Summation of All Releases," provides a detailed summary of liquid effluents released quarterly in three categories: fission and activation products, tritium, and dissolved and entrained gases. Listed for each of the three categories are:

- (1) the total curies released
- (2) the average diluted concentration
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, Table 2A lists:

- (1) the gross alpha radioactivity
- (2) the volume of waste released (prior to dilution)
- (3) the volume of dilution water

The methodology used to calculate the percent of applicable limit is presented in Section F of this report. The methodology used to calculate the estimated total error in Table 2A is presented in Section G of this report.

Table 2B, "Liquid Effluents," provides the systematic listing by radionuclide for the quantity of radioactivity released in each category. The total radioactivity of each radionuclide released is listed for each quarterly period by both "continuous" and "batch" modes of release.

Table 2C, "Liquid Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Table 2B.

Table 2D, "Liquid Effluents-Radiation Doses at the Liquid Site Boundary," presents a quarterly summary of doses at the Liquid Site Boundary for this report period.

Table 2E, "Liquid Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Units 2 and 3.

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TABLE 2A

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	1.03E-3	5.81E-3	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	1.37E-12	9.15E-12	
3. Percent of applicable limit	% MPC	2.62E-6	2.10E-5	
4. Percent Effluent Concentration Limit	% ECL	2.01E-5	1.64E-4	
B. Tritium				
1. Total release	Ci	4.26E+1	6.54E+2	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	5.70E-8	1.03E-6	
3. Percent of applicable limit	% MPC	1.90E-3	3.44E-2	
4. Percent Effluent Concentration Limit	% ECL	5.70E-3	1.03E-1	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	2.40E-1	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	0.00E+0	3.78E-10	
3. Percent of applicable limit	% MPC	0.00E+0	1.89E-4	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	1.89E-4	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)				
	liters	1.12E+8	9.03E+7	5.00E+0
F. Volume of dilution water used during period				
	liters	7.47E+11	6.34E+11	5.00E+0

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TABLE 2A (Continued)

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	3.06E-3	6.69E-3	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	4.12E-12	8.71E-12	
3. Percent of applicable limit	% MPC	7.21E-6	2.07E-5	
4. Percent Effluent Concentration Limit	% ECL	8.37E-5	2.47E-4	
B. Tritium				
1. Total release	Ci	1.16E+2	6.76E+2	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	1.56E-7	8.80E-7	
3. Percent of applicable limit	% MPC	5.20E-3	2.93E-2	
4. Percent Effluent Concentration Limit	% ECL	1.56E-2	8.80E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	6.82E-3	4.81E-2	1.90E+1
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	9.19E-12	6.25E-11	
3. Percent of applicable limit	% MPC	4.59E-6	3.13E-5	
4. Percent Effluent Concentration Limit	% ECL	4.59E-6	3.13E-5	
D. Gross alpha radioactivity				
1. Total release	Ci	2.15E-5	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)				
	liters	1.17E+8	1.06E+8	5.00E+0
F. Volume of dilution water used during period				
	liters	7.43E+11	7.68E+11	5.00E+0

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TABLE 2B

LIQUID EFFLUENTS
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
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
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	<LLD	<LLD
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iron-55	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
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD
2. Dissolved and entrained gases					
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
antimony-125	Ci	3.14E-4	1.94E-3	1.01E-3	3.13E-3
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	1.32E-4	7.39E-5	2.98E-4
cesium-137	Ci	2.41E-5	5.66E-4	4.21E-4	1.25E-3
chromium-51	Ci	<LLD	3.35E-4	3.12E-4	2.13E-5
cobalt-58	Ci	3.22E-4	2.24E-3	5.64E-4	8.53E-4
cobalt-60	Ci	2.50E-4	3.47E-4	1.20E-4	4.29E-4
iodine-131	Ci	<LLD	8.73E-6	<LLD	<LLD
iron-55	Ci	<LLD	<LLD	3.44E-4	<LLD
iron-59	Ci	<LLD	<LLD	2.55E-5	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	2.38E-5	3.63E-5	2.90E-5	8.43E-5
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	<LLD	4.07E-5	8.27E-5	3.96E-4
niobium-97	Ci	<LLD	9.33E-6	<LLD	<LLD
silver-110m	Ci	9.30E-5	1.17E-4	2.68E-5	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
strontium-92	Ci	<LLD	2.10E-6	2.06E-6	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
tin-113	Ci	<LLD	<LLD	4.27E-6	<LLD
tungsten-187	Ci	<LLD	8.59E-6	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	1.98E-5	4.57E-5	2.26E-4
Total for period	Ci	1.03E-3	5.81E-3	3.06E-3	6.69E-3
2. Dissolved and entrained gases					
krypton-85	Ci	<LLD	5.82E-2	5.89E-3	2.36E-2
xenon-131m	Ci	<LLD	7.03E-3	<LLD	1.01E-3
xenon-133	Ci	<LLD	1.74E-1	9.37E-4	2.34E-2
xenon-133m	Ci	<LLD	5.02E-4	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	1.11E-5
Total for period	Ci	<LLD	2.40E-1	6.82E-3	4.81E-2

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2C

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	3.90E-7
cerium-141	5.80E-8
cerium-144	2.30E-7
cesium-134	1.00E-7
cesium-137	8.60E-8
chromium-51	4.60E-7
cobalt-58	9.00E-8
cobalt-60	1.30E-7
iodine-131	8.00E-8
iron-55	1.00E-6
iron-59	2.10E-7
lanthanum-140	7.20E-7
manganese-54	8.90E-8
molybdenum-99	7.50E-8
niobium-95	9.10E-8
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	7.70E-8
zinc-65	2.20E-7
zirconium-95	1.60E-7
2. Dissolved and entrained gases	
xenon-133	3.10E-7
xenon-135	1.20E-7
3. gross alpha	
	1.00E-7

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TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci}/\text{cc}$)
1. Fission and activation products	
barium-140	3.30E-7
cerium-141	5.30E-8
cerium-144	2.30E-7
cesium-134	9.90E-8
chromium-51	4.20E-7
iodine-131	6.00E-8
iron-55	1.00E-6
iron-59	2.00E-7
lanthanum-140	2.40E-7
molybdenum-99	3.50E-8
niobium-95	8.50E-8
niobium-97	2.00E-7
silver-110m	1.30E-7
strontium-89	5.00E-8
strontium-90	1.00E-8
strontium-92	7.80E-5
technetium-99m	3.60E-8
tin-113	7.50E-8
tungsten-187	4.90E-7
zinc-65	2.20E-7
zirconium-95	1.50E-7
2. Dissolved and entrained gases	
krypton-85	4.20E-5
xenon-131m	4.00E-6
xenon-133	3.10E-7
xenon-133m	9.20E-7
xenon-135	1.20E-7
3. gross alpha	1.00E-7

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TABLE 2D

LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A.					
1. Total body dose	mrem	8.16E-5	1.16E-3	2.56E-4	1.23E-3
2. Percent Applicable Limit	%	2.72E-3	3.87E-2	8.54E-3	4.11E-2
B.					
1. Limiting organ dose	mrem	4.47E-4	1.74E-3	5.14E-4	1.36E-3
2. Percent Applicable Limit	%	4.47E-3	1.74E-2	5.14E-3	1.36E-2
3. Limiting organ for period		GI-LLI	GI-LLI	GI-LLI	GI-LLI

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TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	170 releases
2. Total time period for batch releases:	26435 minutes
3. Maximum time period for a batch release:	510 minutes
4. Average time period for a batch release:	156 minutes
5. Minimum time period for a batch release:	5 minutes
6. Average saltwater flow during batch releases:	735000 gpm

SECTION D. PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORT ADDENDUM

None.

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SECTION E. RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges, evaporator bottoms	m ³	N/A	N/A
	Ci	N/A	
b. Dry active waste (DAW), compactable and non-compactable*	m ³	2.09E+2	3.00E+1
	Ci	3.31E+2	
c. Irradiated components, control rods	m ³	N/A	N/A
	Ci	N/A	
d. Other	m ³	N/A	N/A
	Ci	N/A	

Note: Total curie content estimated.

(*) Material packaged in Type A or strong tight containers of various sizes.

N/A No shipment made.

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2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	N/A
b. americium-241	%	3.56E-5
antimony-124	%	5.67E-8
antimony-125	%	1.18E-2
carbon-14	%	2.13E-2
cerium-144	%	1.43E-7
cesium-134	%	8.76E-3
cesium-137	%	6.73E-2
chromium-51	%	7.87E-2
cobalt-57	%	2.31E-8
cobalt-58	%	3.33E-1
cobalt-60	%	1.25E-1
curium-242	%	1.05E-5
curium-243/244	%	3.40E-5
iodine-129	%	3.95E-11
iron-55	%	1.63E-1
iron-59	%	6.64E-3
manganese-54	%	2.51E-2
nickel-59	%	6.22E-6
nickel-63	%	1.19E-1
niobium-94	%	1.47E-6
niobium-95	%	2.05E-2
plutonium-238	%	2.07E-5
plutonium-239/240	%	1.99E-5
plutonium-241	%	1.65E-3
ruthenium-103	%	2.74E-7
silver-110m	%	1.30E-5
strontium-90	%	2.03E-4
technetium-99	%	5.85E-5
tin-113	%	1.28E-8
tritium	%	3.19E-3
uranium-233/234	%	2.62E-9
uranium-238	%	8.90E-12
zirconium-95	%	1.36E-2
c. not applicable	%	0.00E+0
d. not applicable	%	0.00E+0

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A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

3. Solid Waste Disposition		
Number of Shipments	Mode of Transportation	Destination
None	No shipments were made	N/A

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	No shipments were made	N/A

C. DEWATERING

Number of Containers	Solidification Agent
None	N/A

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SECTION F. APPLICABLE LIMITS

Gaseous Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A, B, C, and D of Table 1A, were calculated using the following equation:

$$\bullet \quad \% \text{ Applicable Limit} = \frac{(\text{Rel Rate}) (X/Q) (100)}{\text{MPC}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci}/\text{sec}$.

X/Q = $4.80\text{E-}6 \text{ sec}/\text{m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM.

$$\circ \quad \text{MPC}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 1.

$$\bullet \quad \% \text{ ECL} = \frac{(\text{Rel Rate}) (X/Q) (100)}{\text{ECL}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci}/\text{sec}$.

X/Q = $4.80\text{E-}6 \text{ sec}/\text{m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM.

$$\circ \quad \text{ECL}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 1.

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S.O.N.G.S. 2 and 3

Liquid Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A, B, and C of Table 2A, were calculated using the following equations:

- $\% \text{ Applicable Limit} = \frac{(\text{Dil Conc}) (100)}{\text{MPC}_{\text{eff}}}$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.
- $\text{MPC}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 2.
- $\% \text{ ECL} = \frac{(\text{Dil Conc}) (100)}{\text{ECL}_{\text{eff}}}$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.
- $\text{ECL}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 2.

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SECTION G. ESTIMATION OF ERROR

Estimations of the error in reported values of gaseous and liquid effluents releases have been made.

Sources of error for gaseous effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for gaseous effluents - continuous releases are:

- (1) fan flow rate
- (2) sampling
- (3) counting
- (4) calibration
- (5) differential pressure drop

Sources of error for liquid effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for liquid effluents - continuous releases are:

- (1) dilution flow rate
- (2) sampling
- (3) counting
- (4) calibration

These sources of error are independent, and thus, the total error is calculated according to the following formula:

$$\text{Total Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \dots + \sigma_i^2}$$

where: σ_i = Error associated with each component.

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SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

Table 1 in Section H presents the quarterly and annual maximum dose to an individual. Six different categories are presented:

- (1) Liquid Effluents - Whole Body
- (2) Liquid Effluents - Organ
- (3) Airborne Effluents - Tritium, Iodines and Particulates
- (4) Noble Gases - Gamma
- (5) Noble Gases - Beta
- (6) Direct Radiation

The doses for categories 1 and 2 were calculated using the methodology of the ODCM; these data are also presented in Table 2D. Categories 3, 4, and 5 were calculated utilizing RRRGS (Radioactive Release Report Generating System) software, Regulatory Guide 1.109 methodology, and concurrent meteorology. Table 1E of gaseous effluents previously presented, however, lists data similar to categories 3, 4 and 5 using methods described in the ODCM and the historical meteorology (X/Q). Category 6 presents direct dose data measured by TLD dosimeters. Each portion of each category is footnoted to briefly describe each maximum individual dose presented.

For members of the public, per the ODCM, who may at times be within the site boundary¹, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. For members of the public who traverse the site boundary via highway I-5, the residency time shall be considered negligible and hence the dose "0".

Table 2 in Section H presents the percent of Applicable Limits for each dose presented in Table 1.

¹ ODCM Figures 2-1 & 2-2.

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TABLE 1

SOURCE	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	8.16E-5	1.16E-3	2.56E-4	1.23E-3	2.73E-3
Organ	6)	7)	8)	9)	10)
Organ	4.47E-4	1.74E-3	5.14E-4	1.36E-3	4.06E-3
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	5.98E-3	1.18E-2	2.93E-3	5.10E-4	1.35E-2
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	3.48E-4	1.30E-3	5.71E-3	3.82E-3	9.18E-3
Beta	21)	22)	23)	24)	25)
Beta	7.58E-4	1.30E-3	2.68E-3	2.02E-3	6.37E-3
DIRECT RADIATION	26)	27)	28)	29)	30)
DIRECT RADIATION	1.37E-1	1.23E-1	7.60E-2	1.31E-1	4.67E-1

* The numbered footnotes below briefly explain how each maximum dose was calculated, including the organ and the predominant pathway(s).

** Noble gas doses due to airborne effluent are in units of mrad, reflecting the air dose.

1. This value was calculated using the methodology of the ODCM.
2. This value was calculated using the methodology of the ODCM.
3. This value was calculated using the methodology of the ODCM.
4. This value was calculated using the methodology of the ODCM.
5. This value was calculated using the methodology of the ODCM.

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6. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
7. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
8. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
9. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
10. This value was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
11. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
12. The maximum organ dose was to a child's thyroid and was located in the ENE sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
13. The maximum organ dose was to a child's liver and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
14. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
15. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
16. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
17. The maximum air dose for gamma radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
18. The maximum air dose for gamma radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
19. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
20. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
21. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
22. The maximum air dose for beta radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
23. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
24. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.

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25. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
26. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
27. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
28. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
29. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.
30. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the W sector.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS					
Whole Body	2.72E-3	3.87E-2	8.54E-3	4.11E-2	4.56E-2
Organ	4.47E-3	1.74E-2	5.14E-3	1.36E-2	2.03E-2
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	3.99E-2	7.84E-2	1.95E-2	3.40E-3	4.50E-2
NOBLE GASES					
Gamma	3.48E-3	1.30E-2	5.71E-2	3.82E-2	4.59E-2
Beta	3.79E-3	6.51E-3	1.34E-2	1.01E-2	1.59E-2

NOTE: Direct Radiation is not specifically addressed in the Applicable Limits.

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SECTION I. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

On February 28, 2002, Revision 37 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. This change incorporated the following:

1. A change to the requirement for reporting unplanned releases on a quarterly basis in the annual report,
2. Updates related to the recent Land Use Census, and
3. Changes to Kelp and Shoreline Sediment environmental sample locations.

Item 1 is being changed in response to AR 011000482 to reflect the more generic language of NUREG 0472. An Effluent/ODCM Screen has been provided for item 1. Item 3 changes were made per email from Environmental Protection Group to Effluent Engineering dated 2/1/02.

Minor format changes, correction of typographical errors, and removal of previously blank pages have been made and are described in the attached List of Affected Pages. Per NRC Generic Letter 89-01, no safety reviews were required or performed for editorial changes or changes made to reflect actual plant operation.

None of the changes impact the accuracy or reliability of effluent dose or setpoint calculations. The level of radioactive effluent control required by 10CFR20, 40CFR190, 10CFR50.36a, and Appendix I to 10CFR50 will be maintained.

Throughout the document, change bars are marked in one of four ways as follows:

- A Addition
- D Deletion
- F Editorial/Format change
- R Revision

The following is a complete list of the changes:

PAGE	CHANGE	REASON
TOC	Renumbered pages as necessary based on changes in the body of the ODCM.	F
2-39	Format change for numbers	F
2-31	Updated CLF due to Land Use Census Update.	R
2-33	Removed previously blank page.	F
2-41	Updated Dose Parameters in Table 2-9, Outage Workers due to Land Use Census Update.	R
Sect. 2	Renumbered Section 2 pages from 2-33 on to reflect the addition of pages.	F
5-19	Removed distances from titles of Shoreline Sediment locations for San Onofre State Beach (Southeast)	R
	Removed a previously deleted line	F
5-20	Deleted Kelp sample Laguna Beach (CONTROL)	D
	Added Kelp sample Salt Creek (CONTROL) 11 to 13 miles WNW to NW	A
	Deleted Ocean Sediment sample Unit 1 Outfall	D
	Removed distance and direction from title of Ocean Sediment location for Unit 1 Outfall	R
	Added Ocean Sediment sample SONGS Upcoast 0.9 miles WSW	A

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5-23 thru 5-27	New maps reflecting changes to sample locations	R
6-9	Changed the time frame for unplanned releases reporting in the annual report by replacing "on a quarterly basis" with "during the reporting period" per AR 011000482.	R

SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

- There were no changes to the Units 2&3 Radioactive Waste Treatment Systems during the reporting period, January 1, 2002 to December 31, 2002.

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SECTION K. MISCELLANEOUS

- Leaking Unit 2 Steam Generator Blowdown Valves

In December 2000, Unit 2 Steam Generators were estimated to be leaking past their blowdown isolation valves to the outfall at 1 gpm, with a maximum leak rate of 2 gpm. Compensatory sampling was performed all year (samples indicated no detectable gamma activity for 2001 with trace amounts of tritium). The valves were repaired during the Unit 2 refueling outage in May 2002. This event is documented in AR 001200733.

- Waste Gas System leakage in the Radwaste Building

In May 2002, while venting the volume control tank through the waste gas system, equipment failure lead to a system leak into the radwaste building. Samples were collected in the vicinity of the leak for release evaluation. The dose was included in the monthly dose data. The dose received by the public as a result of this event was bounded by the dose received from the site for the month. This event is documented in AR 020501046.

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EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 2002 - December 31, 2002

S.O.N.G.S. 2			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2RT-7870 Condenser Air Ejector Process Flow Monitor	04/17/00 - present	Inoperable process flow measuring device whenever vacuum pump is running.	Design deficiency causes process flow instrument to be inoperable while the vacuum pump is running. Substitute flow value is automatically inserted whenever the vacuum pump is running as high flow values are not sensed. Flow monitor works properly during normal operations. This event is documented in ARs 000101252 and 000400960.
2RT-7817 BPS/FFCPD Discharge Monitor	05/20/02 - 07/08/02	Monitor failure with low flow	Investigation identified detector was non-functional and was replaced. The flow switch was found to be slightly degraded but still functional. This event is documented in AR 020501134.
	09/21/02 - 10/26/02	Shorted circuitry with corrosion forming	Investigation identified the detector had been shorted and the connector was corroded due to water intrusion into the detector. An overhead floor plug was found to leak excessively and was repaired. This event is documented in AR 020901084.
2RT-7865 Plant Vent Stack (Containment Purge) Monitor	09/23/02 - 11/21/02	Isokinetic flow probe inspection	Major inspection and repair of the isokinetic flow probes. This event is documented in AR 011100588.

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S.O.N.G.S. 2 and 3

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 2002 - December 31, 2002

S.O.N.G.S. 3			
Monitor	Inoperability Period	Inoperability Cause	Explanation
3RT-7870 Condenser Air Ejector Process Flow Monitor	04/17/00 - present	Inoperable process flow measuring device whenever vacuum pump is running.	Design deficiency causes process flow instrument to be inoperable while the vacuum pump is running. Substitute flow value is automatically inserted whenever the vacuum pump is running as high flow values are not sensed. Flow monitor works properly during normal operations. This event is documented in ARs 000101252 and 000400960.
3RT-7865 Plant Vent Stack (Containment Purge) Monitor	04/29/02 - 07/02/02	Isokinetic flow probes	Major inspection, repair and calibration of the isokinetic flow probes. This event is documented in AR 020500049.
3RT-7817 BPS/FFCPD Discharge Monitor	06/04/02 - current	Failure due to low sample flow.	Monitor has had low sample flow problems since installation. The piping was replaced in 2000 with marginal improvement. The long lengths of pipe and low motive force are the cause of this problem. Corrective actions currently in progress include a simplified piping design. This event is documented in ARs 010600960 and 020701020.

S.O.N.G.S. 2/3			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2/3FIT-7202 Waste Gas Holdup System Process Flow Rate Monitoring Device	08/22/01 - 01/12/02	Suspected process flow measuring device	Investigation during two subsequent releases showed no instrument or component error. The system was verified to be properly functioning. This event is documented in AR 010801138.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

S.O.N.G.S. 2 and 3

SECTION L. S.O.N.G.S. 2 and 3 CONCLUSIONS

- Gaseous releases totaled $1.08\text{E}+2$ curies of which noble gases were $6.35\text{E}+1$ curies, iodines were $1.74\text{E}-2$ curies, particulates were $3.14\text{E}-4$ curies, and tritium was $4.42\text{E}+1$ curies.
- The radiation doses from gaseous releases were: (a) gamma air dose: $9.18\text{E}-3$ mrad at the site boundary, (b) beta air dose: $6.37\text{E}-3$ mrad at the site boundary, (c) organ dose: $1.35\text{E}-2$ mrem at the nearest receptor.
- Liquid releases totaled $1.49\text{E}+3$ curies of which particulates and iodines were $1.66\text{E}-2$ curies, tritium was $1.49\text{E}+3$ curies, and noble gases were $2.95\text{E}-1$ curies.
- The radiation doses from liquid releases were: (a) total body: $2.73\text{E}-3$ mrem, (b) limiting organ: $4.06\text{E}-3$ mrem.
- The radioactive releases and resulting doses generated from Units 2 and 3 were below the Applicable Limits for both gaseous and liquid effluents.

COMMON

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

COMMON RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges, evaporator bottoms	m ³	N/A	N/A
	Ci	N/A	
b. Dry active waste (DAW), compactable and non-compactable *	m ³	9.47E+1	3.00E+1
	Ci	1.42E+1	
c. Irradiated components, (incl. excore detectors and heated junction thermocouple) *	m ³	1.93E+0	3.00E+1
	Ci	4.59E+1	
d. Other (filters)	m ³	N/A	N/A
	Ci	N/A	

Note: Total curie content estimated.

(*) Material packaged in Type A or strong tight containers of various sizes.

N/A No shipment made.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	N/A
b. americium-241	%	5.72E-2
antimony-124	%	2.85E-3
antimony-125	%	6.05E-1
carbon-14	%	1.17E+0
cerium-144	%	4.12E-2
cesium-134	%	6.36E-1
cesium-137	%	7.31E+0
chromium-51	%	2.70E-1
cobalt-57	%	2.05E-2
cobalt-58	%	1.44E+0
cobalt-60	%	3.07E+1
curium-242	%	8.89E-4
curium-243/244	%	2.97E-2
iodine-129	%	4.92E-9
iron-55	%	3.13E+1
iron-59	%	1.66E-2
manganese-54	%	6.18E-1
nickel-59	%	1.05E-1
nickel-63	%	2.37E+1
niobium-94	%	3.28E-2
niobium-95	%	6.83E-2
plutonium-238	%	8.43E-2
plutonium-239/240	%	2.63E-2
plutonium-241	%	1.66E+0
ruthenium-106	%	4.83E-6
silver-110m	%	2.82E-2
strontium-90	%	1.67E-1
technetium-99	%	5.33E-3
tritium	%	1.27E-1
uranium-233	%	1.56E-4
uranium-235	%	3.19E-7
uranium-238	%	1.74E-10
zirconium-95	%	5.05E-2

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

2. Estimate of major nuclide composition (by type of waste) (Cont'd)		
c. americium-241	%	6.91E-7
antimony-124	%	1.66E-4
antimony-125	%	2.66E-2
carbon-14	%	4.75E-3
cerium-144	%	1.35E+0
cesium-137	%	4.60E+0
chromium-51	%	2.38E-5
cobalt-57	%	2.53E-3
cobalt-58	%	6.56E-2
cobalt-60	%	1.38E+1
curium-242	%	6.21E-7
curium-243/244	%	2.53E-6
iron-55	%	6.30E+1
iron-59	%	6.95E-5
manganese-54	%	7.56E-1
nickel-59	%	3.73E-4
nickel-63	%	2.38E+0
niobium-95	%	1.41E-5
plutonium-238	%	2.59E-7
plutonium-239/240	%	1.66E-7
plutonium-241	%	3.12E-5
promethium-147	%	2.51E+0
silver-110m	%	5.84E-4
strontium-89	%	3.36E-6
strontium-90	%	4.56E+0
tin-113	%	7.28E-4
tritium	%	6.67E-4
uranium-233	%	5.19E-7
uranium-235	%	7.99E-5
zinc-65	%	7.04E+0
zirconium-95	%	1.23E-4
d. not applicable	%	N/A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

3. Solid Waste Disposition (S.O.N.G.S. 1, 2, and 3)		
Number of Shipments	Mode of Transportation	Destination
39*	Hitman Trucking Company Truck/Trailer	EnviroCare, UT
1	KTC/TAG Flatbed Trailer	EnviroCare, UT

* SONGS maintains a contract with vendors (ATG/Duratek) that provide volume reduction services. These shipments were made from the ATG/Duratek processing facilities to EnviroCare. The 39 shipments made from these facilities included waste from other generators. SCE's waste volume was a small fraction of the total waste volume of these shipments.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	No shipments were made	N/A

C. DEWATERING

Number of Containers	Solidification Agent
None	N/A

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3

None.

REFERENCES:

1. Unit 1 Technical Specifications, section D6.13.2.
2. Units 2 and 3 License Controlled Specifications, section 5.0.103.2.2.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

COMMON 40 CFR 190 REQUIREMENTS

Table 1 below presents the annual site-wide doses and percent of ODCM Specification limits to members of the public. These values were calculated utilizing doses resulting from all effluent pathways and direct radiation. The different categories presented are: (1) Total Body, (2) Limiting Organ, and (3) Thyroid.

Dose Category	Units	Year
1. Total Body		
a. Total Body Dose	mrem	5.58E-1
b. Percent ODCM Specification Limit	%	2.23E+0
2. Limiting Organ		
a. Organ Dose (Bone)	mrem	2.50E-1
b. Percent ODCM Specification Limit	%	1.00E+0
3. Thyroid		
a. Thyroid Dose	mrem	2.01E-2
b. Percent ODCM Specification Limit	%	2.68E-2

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

COMMON

COMMON CONCLUSIONS

- Gaseous releases from S.O.N.G.S. 1, 2 and 3 totaled $1.09E+2$ curies of which noble gases were $6.35E+1$ curies, iodines were $1.74E-2$ curies, particulates were $3.16E-4$ curies, and tritium was $4.56E+1$ curies.
- Liquid releases from S.O.N.G.S. 1, 2 and 3 totaled $1.49E+3$ curies of which particulates and iodines were $2.79E-2$ curies, tritium was $1.49E+3$ curies, and noble gases were $2.95E-1$ curies.
- Radioactive releases and resulting doses generated from S.O.N.G.S. 1, 2 and 3 were below the Applicable Limits for both gaseous and liquid effluents.
- S.O.N.G.S. 1, 2 and 3 made 83 radwaste shipments to Envirocare, UT and 4 shipments to Barnwell, SC. Total volume was $1.41E+3$ cubic meters containing $2.53E+3$ curies of radioactivity.
- Meteorological conditions during the year were typical for S.O.N.G.S. Meteorological dispersion was good 33% of the time, fair 43% of the time and poor 24% of the time.
- The net result from the analysis of these effluent releases indicates that the operation of S.O.N.G.S. 1, 2 and 3 has met all the requirements of the applicable regulations and therefore has not resulted in any detrimental effects to a member of the public.

METEOROLOGY

METEOROLOGY

The meteorology of the San Onofre Nuclear Generating Station for each of the four quarters, 2002 is described in this section. Meteorological measurements have been made according to the guidance provided in USNRC Regulatory Guide 1.23, "Onsite Meteorological Programs." A summary report of the meteorological measurements taken during each calendar quarter are presented in Table 4A as joint frequency distribution (JFD) of wind direction and wind speed by atmospheric stability class.

Hourly meteorological data for batch releases have been recorded for the periods of actual release. These data are available, as well as the hourly data for the Annual Report, but have not been included in this report because of the bulk of data records.

Table 4A lists the joint frequency distribution for each quarter, 2002. Each page of Table 4A represents the data for the individual stability classes: A, B, C, D, E, F, and G. The last page of each section is the JFD for all the stability classes. The wind speeds have been measured at the 10-meter level, and the stability classes are defined by the temperature differential between the 10-meter and 40-meter levels.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

January - March
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 01123124-02033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A
EXTREMELY UNSTABLE (DT/DZ < -1.9 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	1	1	0	0	0	2
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1
NE	0	0	0	0	0	0	0	3	2	0	0	0	5
ENE	0	0	0	0	0	0	0	0	1	1	0	0	2
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	2	1	0	0	0	0	4
SSE	0	0	0	0	0	3	0	1	0	0	0	0	4
S	0	0	0	2	3	10	14	4	0	0	0	0	33
SSW	0	0	1	1	2	15	5	0	0	0	0	0	24
SW	0	0	0	6	17	19	18	0	0	0	0	0	60
WSW	0	0	0	7	19	43	21	3	0	0	0	0	93
W	0	0	0	0	11	82	57	4	0	0	0	0	154
WNW	0	0	0	0	1	20	51	20	5	0	0	0	97
NW	0	0	0	0	0	0	1	1	0	0	0	0	2
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	0	0	1	16	53	194	169	39	9	1	0	0	482

NUMBER OF VALID HOURS 482 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2160

PASQUILL B
MODERATELY UNSTABLE (-1.9 < DT/DZ ≤ -1.7 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	1	0	1	0	0	0	0	2
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	1	1	0	0	0	2
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	2	1	0	0	0	0	4
SSE	0	0	0	1	0	3	2	2	0	0	0	0	8
S	0	0	1	0	1	1	3	1	0	0	0	0	7
SSW	0	0	0	0	1	1	1	0	0	0	0	0	3
SW	0	0	0	2	2	1	1	0	0	0	0	0	6
WSW	0	0	0	1	2	1	0	0	0	0	0	0	4
W	0	0	0	2	3	4	0	1	0	0	0	0	10
WNW	0	0	0	0	1	4	2	0	1	0	0	0	8
NW	0	0	0	0	0	0	1	0	0	0	0	0	1
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS	0	0	1	6	10	17	12	8	2	0	0	0	56

NUMBER OF VALID HOURS 56 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

January - March
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 01123124-02033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C
SLIGHTLY UNSTABLE (-1.7 < DT/DZ ≤ -1.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	2	1	0	0	0	0	0	3
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	1	0	0	0	1
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	4	1	0	0	0	0	5
S	0	0	0	0	1	1	3	0	0	0	0	0	5
SSW	0	0	0	0	2	1	0	0	0	0	0	0	3
SW	0	0	0	3	1	1	3	1	1	0	0	0	10
WSW	0	0	0	1	0	1	0	0	0	0	0	0	2
W	0	0	0	1	0	1	1	0	0	0	0	0	3
WNW	0	0	0	2	2	3	4	0	0	0	0	0	11
NW	0	0	0	1	0	1	2	0	0	0	0	0	4
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	8	6	11	18	2	2	0	0	0	47

NUMBER OF VALID HOURS 47
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

PASQUILL D
NEUTRAL (-1.5 < DT/DZ ≤ -0.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	2	5	7	2	0	0	0	0	0	16
NNE	0	1	2	5	4	5	4	1	0	0	0	0	22
NE	0	0	0	1	0	2	1	2	1	0	0	0	7
ENE	0	0	0	1	0	0	0	2	1	0	0	0	4
E	0	0	1	1	0	4	2	0	0	0	0	0	8
ESE	0	0	0	1	4	9	5	1	0	0	0	0	20
SE	0	0	1	3	12	26	35	9	0	0	0	0	86
SSE	0	1	1	7	8	17	23	13	1	1	0	0	72
S	0	0	1	6	5	4	8	4	6	0	0	0	34
SSW	0	1	1	6	2	6	3	2	1	2	0	0	24
SW	0	0	1	2	4	4	0	2	1	0	0	0	14
WSW	0	1	1	3	0	4	1	2	0	0	0	0	12
W	0	1	2	4	7	7	6	5	0	0	0	0	32
WNW	0	1	2	0	3	16	11	10	1	0	0	0	44
NW	0	0	1	4	6	12	23	6	1	0	0	0	53
NNW	0	0	2	1	7	6	2	0	0	0	0	0	18
TOTALS	0	6	16	47	67	129	126	59	13	3	0	0	466

NUMBER OF VALID HOURS 466
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

January - March
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 01123124-02033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq 1.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	0	2	3	6	12	3	0	1	0	0	0	28
NNE	0	2	5	15	14	20	14	1	1	0	0	0	72
NE	0	0	0	9	4	1	4	1	4	0	0	0	23
ENE	0	1	2	4	4	2	3	2	1	0	0	0	19
E	0	2	6	3	4	7	8	0	0	0	0	0	30
ESE	1	0	0	5	2	6	1	0	0	0	0	0	15
SE	0	0	0	4	4	8	10	0	0	0	0	0	26
SSE	0	0	1	6	1	2	1	0	0	0	0	0	11
S	1	1	1	2	1	1	0	0	0	0	0	0	7
SSW	0	1	2	3	1	0	0	0	0	0	0	0	7
SW	1	0	1	6	0	0	0	0	0	0	0	0	8
WSW	0	0	0	1	0	0	0	1	0	0	0	0	2
W	0	0	1	3	3	2	1	1	0	0	0	0	11
WNW	0	0	0	1	3	4	11	2	0	0	0	0	21
NW	0	0	1	2	1	5	2	3	0	0	0	0	14
NNW	0	0	1	5	6	8	7	1	0	0	0	0	28
TOTALS	4	7	23	72	54	78	65	12	7	0	0	0	322

NUMBER OF VALID HOURS 322 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2160

PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq 4.0$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	1	2	4	4	6	8	0	0	0	0	0	25
NNE	0	2	2	19	39	56	9	0	0	0	0	0	127
NE	0	1	4	16	10	4	2	0	0	0	0	0	37
ENE	0	1	7	8	6	3	0	0	0	0	0	0	25
E	0	0	2	3	2	0	0	0	0	0	0	0	7
ESE	0	0	1	1	3	0	0	0	0	0	0	0	5
SE	0	0	1	3	1	0	0	0	0	0	0	0	5
SSE	0	0	0	0	1	0	1	0	0	0	0	0	2
S	0	0	0	1	1	0	0	0	0	0	0	0	2
SSW	1	0	0	0	0	0	0	0	0	0	0	0	1
SW	0	0	0	1	1	0	0	0	0	0	0	0	2
WSW	0	0	0	0	1	0	1	0	0	0	0	0	2
W	0	0	0	1	0	2	0	0	0	0	0	0	3
WNW	0	0	0	1	0	3	1	0	0	0	0	0	5
NW	0	0	0	0	1	0	2	0	0	0	0	0	3
NNW	0	1	0	2	0	1	0	0	0	0	0	0	4
TOTALS	1	6	19	60	70	75	24	0	0	0	0	0	255

NUMBER OF VALID HOURS 255 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

January - March
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 01123124-02033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL G EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	2	1	2	6	17	4	0	0	0	0	32
NNE	0	0	2	10	27	140	214	16	0	0	0	0	409
NE	0	1	1	16	12	10	3	0	0	0	0	0	43
ENE	0	0	2	5	3	2	1	0	0	0	0	0	13
E	0	0	0	1	1	0	0	0	0	0	0	0	2
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	1	0	0	0	0	0	0	0	0	0	1
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1
S	0	0	0	1	0	0	1	0	0	0	0	0	2
SSW	0	1	0	1	0	0	0	0	0	0	0	0	2
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	1	1	1	0	0	1	0	0	0	0	0	4
W	0	0	1	1	1	3	0	0	0	0	0	0	6
WNW	0	0	1	1	1	4	0	0	0	0	0	0	7
NW	0	0	0	2	1	0	0	0	0	0	0	0	3
NNW	0	0	0	3	0	0	4	0	0	0	0	0	7
TOTALS	0	3	11	43	49	165	241	20	0	0	0	0	532

NUMBER OF VALID HOURS	532	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2160

ALL STABILITY CLASSES, ALL DT/DZ WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	1	6	10	17	32	30	6	2	0	0	0	105
NNE	0	5	11	49	84	223	242	19	1	0	0	0	634
NE	0	2	5	42	26	17	10	6	7	0	0	0	115
ENE	0	2	11	18	13	7	4	5	5	1	0	0	66
E	0	2	9	8	7	11	10	0	0	0	0	0	47
ESE	1	0	1	7	9	15	6	1	0	0	0	0	40
SE	0	0	3	10	17	36	49	11	0	0	0	0	126
SSE	0	1	2	14	11	25	31	17	1	1	0	0	103
S	1	1	3	12	12	17	29	9	6	0	0	0	90
SSW	1	3	4	11	8	23	9	2	1	2	0	0	64
SW	1	0	2	20	25	25	22	3	2	0	0	0	100
WSW	0	2	2	14	22	49	24	6	0	0	0	0	119
W	0	1	4	12	25	101	65	11	0	0	0	0	219
WNW	0	1	3	5	11	54	80	32	7	0	0	0	193
NW	0	0	2	9	9	18	31	10	1	0	0	0	80
NNW	0	1	3	11	13	16	13	2	0	0	0	0	59
TOTALS	5	22	71	252	309	669	655	140	33	4	0	0	2160

NUMBER OF VALID HOURS	2160	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

April - June
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02033124-02063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A
EXTREMELY UNSTABLE (DT/DZ < -1.9 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	0	1	0	0	0	0	2
SSE	0	0	0	0	2	1	4	0	0	0	0	0	7
S	0	0	0	0	2	8	58	18	4	0	0	0	90
SSW	0	0	0	0	4	17	51	4	0	0	0	0	76
SW	0	0	0	2	7	46	68	0	0	0	0	0	123
WSW	0	0	1	1	8	90	113	9	1	0	0	0	223
W	0	0	0	1	7	49	109	0	0	0	0	0	166
WNW	0	0	0	1	1	12	42	8	0	0	0	0	64
NW	0	0	0	1	0	0	0	1	0	0	0	0	2
NNW	0	0	0	1	0	1	0	0	0	0	0	0	2
TOTALS	0	0	1	7	31	225	445	41	5	0	0	0	755

NUMBER OF VALID HOURS 755 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

PASQUILL B
MODERATELY UNSTABLE (-1.9 < DT/DZ ≤ -1.7 °C/100)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	1	0	0	0	0	0	0	0	0	1
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	2	1	0	0	0	0	3
SSE	0	0	0	0	0	0	1	3	0	0	0	0	4
S	0	0	0	1	2	7	9	3	0	0	0	0	22
SSW	0	0	0	1	3	3	9	1	0	0	0	0	17
SW	0	0	0	0	1	3	3	0	0	0	0	0	7
WSW	0	0	0	1	0	2	1	0	0	0	0	0	4
W	0	0	0	1	1	3	0	0	0	0	0	0	5
WNW	0	0	0	0	2	4	1	1	0	0	0	0	8
NW	0	0	0	0	0	2	1	1	0	0	0	0	4
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	5	9	24	27	10	0	0	0	0	75

NUMBER OF VALID HOURS 75 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

April - June
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02033124-02063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C
SLIGHTLY UNSTABLE (-1.7 < DT/DZ ≤ -1.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	1	0	0	0	0	0	1
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1
NE	0	0	0	1	0	0	0	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	2	0	1	0	0	0	0	3
SSE	0	0	0	0	0	1	7	3	2	0	0	0	13
S	0	0	0	0	2	5	8	6	0	0	0	0	21
SSW	0	0	0	1	1	4	7	1	0	0	0	0	14
SW	0	0	0	3	4	7	1	0	0	0	0	0	15
WSW	0	0	1	0	4	6	1	0	0	0	0	0	12
W	0	0	0	0	1	5	0	0	0	0	0	0	6
WNW	0	0	0	1	0	2	2	0	0	0	0	0	5
NW	0	0	0	1	0	2	6	1	0	0	0	0	10
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	1	7	12	35	33	12	2	0	0	0	102

NUMBER OF VALID HOURS 102 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

PASQUILL D
NEUTRAL (-1.5 < DT/DZ ≤ -0.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	2	5	19	3	2	0	0	0	0	0	31
NNE	1	0	2	16	13	32	3	0	0	0	0	0	67
NE	0	0	1	8	11	5	0	0	0	0	0	0	25
ENE	0	0	1	3	5	4	0	0	0	0	0	0	13
E	0	0	1	2	4	13	5	0	0	0	0	0	25
ESE	1	2	1	4	6	27	14	0	0	0	0	0	55
SE	1	3	2	4	15	49	57	5	2	0	0	0	138
SSE	0	0	2	19	27	35	67	29	6	0	0	0	185
S	0	2	2	26	14	32	35	17	3	0	0	0	131
SSW	1	0	1	10	15	31	11	1	0	0	0	0	70
SW	1	0	3	7	6	18	11	0	0	0	0	0	46
WSW	0	0	1	4	4	9	3	2	0	0	0	0	23
W	0	1	1	8	6	3	5	0	0	0	0	0	24
WNW	0	1	2	5	6	9	7	2	0	0	0	0	32
NW	0	2	1	3	7	13	19	2	0	0	0	0	47
NNW	0	0	1	6	3	13	4	0	0	0	0	0	27
TOTALS	5	11	24	130	161	296	243	58	11	0	0	0	939

NUMBER OF VALID HOURS 939 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

April - June
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02033124-02063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq 1.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	1	2	6	4	3	0	0	0	0	0	16
NNE	1	0	2	13	14	25	5	0	0	0	0	0	60
NE	0	0	1	8	3	0	0	0	0	0	0	0	12
ENE	0	0	0	0	1	4	0	0	0	0	0	0	5
E	0	0	2	0	0	2	2	0	0	0	0	0	6
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1
SE	0	0	1	0	0	4	3	0	0	0	0	0	8
SSE	0	0	0	0	1	0	2	0	0	0	0	0	3
S	0	0	0	1	0	1	0	0	0	0	0	0	2
SSW	0	0	0	0	0	1	0	0	0	0	0	0	1
SW	0	1	0	1	0	0	0	0	0	0	0	0	2
WSW	0	0	1	0	0	0	0	0	0	0	0	0	1
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1
NW	0	0	0	0	1	1	0	0	0	0	0	0	2
NNW	0	0	0	0	0	2	1	0	0	0	0	0	3
TOTALS	1	1	8	26	26	44	17	0	0	0	0	0	123

NUMBER OF VALID HOURS 123 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq 4.0$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	2	0	0	0	0	0	0	0	2
NNE	0	0	2	5	20	31	11	0	0	0	0	0	69
NE	0	0	3	3	1	0	0	0	0	0	0	0	7
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	1	0	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	1	0	0	0	0	0	0	1
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	5	9	25	32	11	0	0	0	0	0	82

NUMBER OF VALID HOURS 82 NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

April - June
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02033124-02063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	1	3	0	0	0	0	0	4
NNE	0	0	1	2	4	57	34	0	0	0	0	0	98
NE	0	0	0	0	0	1	0	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	1	0	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	1	0	0	0	0	1
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1
NW	0	0	0	0	0	0	2	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	1	2	4	60	40	1	0	0	0	0	108

NUMBER OF VALID HOURS	108	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2184

ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	3	7	27	8	9	0	0	0	0	0	54
NNE	2	0	7	37	51	146	53	0	0	0	0	0	296
NE	0	0	5	20	15	6	0	0	0	0	0	0	46
ENE	0	0	1	3	6	8	0	0	0	0	0	0	18
E	0	0	3	2	4	16	7	0	0	0	0	0	32
ESE	1	2	1	4	7	27	15	0	0	0	0	0	57
SE	1	3	3	4	15	56	62	9	2	0	0	0	155
SSE	0	0	2	19	30	37	81	35	8	0	0	0	212
S	0	2	2	28	20	53	110	44	7	0	0	0	266
SSW	1	0	1	12	23	57	78	7	0	0	0	0	179
SW	1	1	3	13	18	74	83	0	0	0	0	0	193
WSW	0	0	4	6	17	107	118	11	1	0	0	0	264
W	0	1	1	10	15	60	114	0	0	0	0	0	201
WNW	0	1	2	9	9	27	53	11	0	0	0	0	112
NW	0	2	1	5	8	18	28	5	0	0	0	0	67
NNW	0	0	1	7	3	16	5	0	0	0	0	0	32
TOTALS	6	12	40	186	268	716	816	122	18	0	0	0	2184

NUMBER OF VALID HOURS	2184	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

July - September
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02063024-02093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A EXTREMELY UNSTABLE (DT/DZ < -1.9 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1
NE	0	0	0	1	0	0	0	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	1	0	0	0	0	0	0	0	1
SSE	0	0	0	0	1	2	1	1	0	0	0	0	5
S	0	0	0	1	5	12	33	8	0	0	0	0	59
SSW	0	0	0	4	5	10	33	3	0	0	0	0	55
SW	0	0	0	3	18	51	38	0	0	0	0	0	110
WSW	0	0	1	2	14	82	62	0	0	0	0	0	161
W	0	0	2	2	5	73	123	0	0	0	0	0	205
WNW	0	0	0	2	1	12	34	0	0	0	0	0	49
NW	0	0	0	0	1	1	2	2	0	0	0	0	6
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTALS	0	0	3	15	52	244	326	14	0	0	0	0	654

NUMBER OF VALID HOURS	654	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

PASQUILL B MODERATELY UNSTABLE (-1.9 < DT/DZ ≤ -1.7 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	1	0	0	0	0	0	1
NNE	0	0	0	0	1	1	0	0	0	0	0	0	2
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	1	0	0	0	1	0	1	0	0	0	0	3
S	0	0	0	0	0	1	9	0	0	0	0	0	10
SSW	0	0	0	3	1	7	2	1	0	0	0	0	14
SW	0	0	0	0	1	6	4	0	0	0	0	0	11
WSW	0	0	0	0	6	5	0	0	0	0	0	0	11
W	0	0	0	3	3	5	3	0	0	0	0	0	14
WNW	0	0	0	0	2	7	5	0	0	0	0	0	14
NW	0	0	0	0	0	2	0	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	1	0	6	14	35	24	2	0	0	0	0	82

NUMBER OF VALID HOURS	82	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

July - September
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02063024-02093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C
SLIGHTLY UNSTABLE (-1.7 < DT/DZ ≤ -1.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	1	0	1	0	0	0	0	0	0	2
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1
NE	0	0	0	0	1	0	0	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	1	0	0	0	0	0	2
SSE	0	0	0	0	0	0	2	1	0	0	0	0	3
S	0	0	0	0	3	3	7	2	0	0	0	0	15
SSW	0	0	0	0	4	8	7	0	0	0	0	0	19
SW	0	0	0	0	3	12	6	0	0	0	0	0	21
WSW	0	0	0	3	5	7	1	0	0	0	0	0	16
W	0	0	0	2	3	5	2	0	0	0	0	0	12
WNW	0	0	0	0	0	8	3	1	0	0	0	0	12
NW	0	0	0	0	0	0	2	0	0	0	0	0	2
NNW	0	0	0	0	0	1	1	0	0	0	0	0	2
TOTALS	0	0	0	6	19	47	32	4	0	0	0	0	108

NUMBER OF VALID HOURS 108 NUMBER OF CALMS 1
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL D
NEUTRAL (-1.5 < DT/DZ ≤ -0.5 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	1	2	12	10	10	0	0	0	0	0	0	35
NNE	0	0	1	17	13	18	0	0	0	0	0	0	49
NE	0	0	2	8	5	0	0	0	0	0	0	0	15
ENE	0	1	0	2	3	1	0	0	0	0	0	0	7
E	0	1	3	1	2	3	1	0	0	0	0	0	11
ESE	1	0	4	3	2	6	4	0	0	0	0	0	20
SE	1	1	1	12	14	30	26	4	0	0	0	0	89
SSE	0	3	3	13	19	36	49	12	1	0	0	0	136
S	0	2	2	11	15	36	56	5	0	0	0	0	127
SSW	0	1	7	14	17	27	12	2	0	0	0	0	80
SW	0	7	9	11	4	14	2	0	0	0	0	0	47
WSW	1	3	6	7	8	4	0	0	0	0	0	0	29
W	2	4	5	15	11	8	8	0	0	0	0	0	53
WNW	0	2	3	10	18	15	7	1	0	0	0	0	56
NW	1	2	1	9	9	6	6	0	0	0	0	0	34
NNW	0	1	3	11	11	5	0	0	0	0	0	0	31
TOTALS	6	29	52	156	161	219	171	24	1	0	0	0	819

NUMBER OF VALID HOURS 819 NUMBER OF CALMS 1
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

July - September
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02063024-02093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E SLIGHTLY STABLE ($-0.5 < DT/DZ \leq 1.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	1	2	17	7	8	2	0	0	0	0	0	37
NNE	2	0	7	11	14	11	2	0	0	0	0	0	47
NE	0	3	0	3	2	1	0	0	0	0	0	0	9
ENE	0	0	3	4	1	0	0	0	0	0	0	0	8
E	0	1	1	0	1	1	0	0	0	0	0	0	4
ESE	0	0	0	2	3	2	0	0	0	0	0	0	7
SE	0	0	1	6	10	14	8	0	0	0	0	0	39
SSE	0	1	1	7	5	10	10	1	0	0	0	0	35
S	0	0	3	9	5	4	5	1	0	0	0	0	27
SSW	0	0	3	4	3	3	1	0	0	0	0	0	14
SW	0	2	1	6	3	5	0	0	0	0	0	0	17
WSW	0	0	1	6	1	0	0	0	0	0	0	0	8
W	1	2	1	2	3	1	1	0	0	0	0	0	11
WNW	0	0	3	2	4	7	3	1	0	0	0	0	20
NW	0	0	0	1	7	4	1	0	0	0	0	0	13
NNW	0	0	2	3	2	2	0	0	0	0	0	0	9
TOTALS	3	10	29	83	71	73	33	3	0	0	0	0	305

NUMBER OF VALID HOURS	306	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

PASQUILL F MODERATELY STABLE ($1.5 \leq DT/DZ \leq 4.0$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	0	2	5	10	6	2	0	0	0	0	0	26
NNE	0	1	7	13	12	25	1	0	0	0	0	0	59
NE	0	2	0	2	1	1	0	0	0	0	0	0	6
ENE	1	0	0	0	1	0	0	0	0	0	0	0	2
E	0	1	2	1	0	0	0	0	0	0	0	0	4
ESE	0	0	0	2	0	1	1	0	0	0	0	0	4
SE	0	0	0	1	0	2	4	1	0	0	0	0	8
SSE	0	0	0	2	5	2	0	0	0	0	0	0	9
S	0	2	1	3	0	0	0	0	0	0	0	0	6
SSW	0	0	2	2	0	0	0	0	0	0	0	0	4
SW	1	0	0	0	0	1	0	0	0	0	0	0	2
WSW	0	0	0	0	0	1	0	0	0	0	0	0	1
W	0	0	0	0	0	2	1	0	0	0	0	0	3
WNW	0	0	0	0	0	1	3	1	0	0	0	0	5
NW	0	2	0	0	0	0	1	0	0	0	0	0	3
NNW	0	2	1	0	1	0	0	0	0	0	0	0	4
TOTALS	3	10	15	31	30	42	13	2	0	0	0	0	146

NUMBER OF VALID HOURS	146	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

July - September
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02063024-02093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	1	2	3	4	9	0	0	0	0	0	19
NNE	0	0	0	4	6	25	14	0	0	0	0	0	49
NE	0	0	0	0	3	1	0	0	0	0	0	0	4
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	1	1	0	1	0	3	0	0	0	0	6
SSE	0	0	0	0	0	2	1	0	0	0	0	0	3
S	0	0	1	0	0	0	0	0	0	0	0	0	1
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	1	0	0	0	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	1	0	0	0	0	0	1
WNW	0	0	0	0	0	0	1	1	0	0	0	0	2
NW	0	0	1	0	0	2	1	0	0	0	0	0	4
NNW	0	0	0	0	1	0	2	0	0	0	0	0	3
TOTALS	1	0	4	7	13	35	29	4	0	0	0	0	93

NUMBER OF VALID HOURS	93	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	2	7	37	30	29	14	0	0	0	0	0	120
NNE	2	1	15	45	46	82	17	0	0	0	0	0	208
NE	0	5	2	14	12	3	0	0	0	0	0	0	36
ENE	1	1	3	6	5	1	0	0	0	0	0	0	17
E	0	3	6	2	3	4	1	0	0	0	0	0	19
ESE	1	0	4	7	5	9	5	0	0	0	0	0	31
SE	1	1	3	20	25	48	39	8	0	0	0	0	145
SSE	0	5	4	22	30	53	63	16	1	0	0	0	194
S	0	4	7	24	28	56	110	16	0	0	0	0	245
SSW	0	1	12	27	30	55	55	6	0	0	0	0	186
SW	2	9	10	20	29	89	50	0	0	0	0	0	209
WSW	1	3	8	18	34	99	63	0	0	0	0	0	226
W	3	6	8	24	25	94	139	0	0	0	0	0	299
WNW	0	2	6	14	25	50	56	5	0	0	0	0	158
NW	1	4	2	10	17	15	13	2	0	0	0	0	64
NNW	0	3	6	14	16	8	3	0	0	0	0	0	50
TOTALS	13	50	103	304	360	695	628	53	1	0	0	0	2208

NUMBER OF VALID HOURS	2208	NUMBER OF CALMS	1
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

October - December

TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02093024-02123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A EXTREMELY UNSTABLE (DT/DZ < -1.9 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	1	2	4	0	1	0	0	0	8
SSE	0	0	0	1	1	5	3	0	0	0	0	0	10
S	0	0	1	4	10	19	9	1	0	0	0	0	44
SSW	0	0	0	4	7	12	4	0	0	0	0	0	27
SW	2	1	2	3	16	25	11	0	0	0	0	0	60
WSW	0	2	4	6	11	47	14	3	0	0	0	0	87
W	0	3	0	5	12	82	65	0	0	0	0	0	167
WNW	0	0	0	0	0	11	26	5	1	0	0	0	43
NW	0	0	0	0	0	1	0	0	0	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	2	6	7	23	58	204	136	9	2	0	0	0	447

NUMBER OF VALID HOURS	447	NUMBER OF CALMS	27
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

PASQUILL B MODERATELY UNSTABLE (-1.9 < DT/DZ ≤ -1.7 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	1	0	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	0	1	0	0	0	0	1
SSE	0	0	0	0	1	1	2	0	0	0	0	0	4
S	0	0	0	0	0	2	2	0	0	0	0	0	4
SSW	0	0	0	0	0	2	4	0	0	0	0	0	6
SW	0	0	0	0	0	0	1	0	0	0	0	0	1
WSW	0	0	0	1	3	3	1	2	0	0	0	0	10
W	0	0	0	0	1	2	0	0	0	0	0	0	3
WNW	0	0	0	0	1	1	2	1	0	0	0	0	5
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	0	0	0	1	6	14	13	4	0	0	0	0	38

NUMBER OF VALID HOURS	38	NUMBER OF CALMS	27
NUMBER OF INVALID HOURS	0	TOTAL HOURS FOR THE PERIOD	2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

October - December
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02093024-02123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C
SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	2	0	0	0	0	0	2
SSE	0	0	0	0	0	3	2	0	0	0	0	0	5
S	0	0	0	1	0	3	2	0	0	0	0	0	6
SSW	0	0	0	3	0	3	4	0	0	0	0	0	10
SW	1	0	0	0	2	0	1	0	0	0	0	0	4
WSW	0	0	0	1	1	1	0	0	0	0	0	0	3
W	0	0	0	2	0	1	1	0	0	0	0	0	4
WNW	1	0	0	1	0	1	2	0	0	0	0	0	5
NW	0	0	0	0	0	0	0	1	0	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	2	0	0	8	3	12	14	1	0	0	0	0	40

NUMBER OF VALID HOURS 40
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 27
TOTAL HOURS FOR THE PERIOD 2208

PASQUILL D
NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	2	4	7	9	11	0	0	0	0	0	0	35
NNE	0	3	2	8	7	4	2	0	0	0	0	0	28
NE	0	1	0	3	3	4	0	1	1	0	0	0	13
ENE	0	0	1	6	1	0	0	4	1	0	0	0	14
E	0	0	3	1	1	3	6	1	1	0	0	0	17
ESE	0	0	1	0	3	3	1	2	1	0	0	0	11
SE	0	1	1	7	6	29	20	4	10	0	0	0	78
SSE	0	0	4	4	8	27	19	1	2	1	1	0	68
S	1	1	3	10	4	11	4	0	1	0	2	0	37
SSW	2	2	1	2	5	2	2	1	0	0	0	0	17
SW	1	0	3	1	4	7	12	3	0	1	0	0	32
WSW	1	1	0	6	6	1	8	2	0	0	0	0	26
W	0	0	0	4	9	2	3	0	1	0	0	0	20
WNW	0	0	3	8	8	18	10	0	1	0	0	0	48
NW	0	2	2	8	6	20	8	1	0	0	0	0	49
NNW	2	2	6	8	3	7	1	1	0	0	0	0	34
TOTALS	8	15	34	83	83	149	96	21	19	2	3	0	527

NUMBER OF VALID HOURS 527
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 27
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

October - December
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02093024-02123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq 1.5$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	3	1	2	14	9	25	7	0	2	1	0	0	64
NNE	1	0	5	13	20	16	9	1	0	0	0	0	66
NE	0	1	2	5	3	3	2	1	0	0	0	0	17
ENE	0	1	2	3	1	4	1	0	0	0	0	0	12
E	0	1	3	4	1	4	2	0	0	0	0	0	15
ESE	0	0	0	1	1	1	2	0	0	0	0	0	5
SE	2	1	1	2	3	6	6	0	0	0	0	0	22
SSE	0	0	0	2	0	1	1	0	2	0	0	0	6
S	1	1	1	0	3	1	2	0	0	0	0	0	9
SSW	0	1	0	1	0	0	4	2	1	0	0	0	10
SW	1	1	1	2	0	0	2	3	0	0	0	0	10
WSW	0	0	0	0	1	2	1	4	0	0	0	0	8
W	0	0	0	1	2	1	2	2	1	0	0	0	9
WNW	1	0	0	0	3	7	3	2	3	0	0	0	19
NW	0	0	1	2	3	7	4	1	1	0	0	0	19
NNW	1	1	3	0	4	4	3	0	0	0	0	0	16
TOTALS	10	9	21	50	54	82	51	16	10	1	0	0	307

NUMBER OF VALID HOURS 307 NUMBER OF CALMS 27
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq 4.0$ °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	1	1	2	9	7	15	16	0	0	0	0	0	51
NNE	0	1	7	20	35	43	17	0	0	0	0	0	124
NE	4	0	2	6	3	3	3	0	0	0	0	0	21
ENE	1	1	5	4	1	1	0	0	0	0	0	0	14
E	0	0	2	1	1	0	0	0	0	0	0	0	5
ESE	0	0	2	0	1	2	0	0	0	0	0	0	5
SE	2	0	0	0	0	0	0	0	0	0	0	0	2
SSE	0	0	1	1	0	0	0	0	0	0	0	0	2
S	0	1	0	0	0	0	0	0	0	0	0	0	1
SSW	0	0	1	1	0	0	0	0	0	0	0	0	2
SW	0	0	1	0	0	0	0	0	0	0	0	0	1
WSW	0	0	0	1	1	0	0	0	0	0	0	0	2
W	0	0	2	1	0	0	0	0	0	0	0	0	3
WNW	0	0	1	1	3	8	2	0	0	0	0	0	15
NW	1	1	0	0	0	3	0	0	0	0	0	0	5
NNW	0	0	1	2	1	4	0	0	0	0	0	0	8
TOTALS	9	5	27	47	53	79	38	0	0	0	0	0	261

NUMBER OF VALID HOURS 261 NUMBER OF CALMS 27
NUMBER OF INVALID HOURS 0 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (2002)

METEOROLOGY

October - December
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 02093024-02123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	2	0	2	4	6	27	46	4	0	0	0	0	91
NNE	1	2	3	12	20	162	218	7	0	0	0	0	425
NE	1	0	2	1	4	4	1	0	0	0	0	0	14
ENE	0	4	1	4	0	1	0	0	0	0	0	0	10
E	0	0	0	0	1	0	0	0	0	0	0	0	2
ESE	0	0	0	1	0	2	0	0	0	0	0	0	3
SE	0	0	2	3	0	2	3	0	0	0	0	0	10
SSE	1	1	0	1	2	1	0	0	0	0	0	0	6
S	0	0	3	0	1	0	0	0	0	0	0	0	4
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
SW	1	0	0	0	0	0	0	0	0	0	0	0	2
WSW	1	0	1	0	0	0	0	0	0	0	0	0	2
W	0	0	0	0	1	1	2	1	0	0	0	0	5
WNW	0	0	0	0	1	1	4	0	0	0	0	0	6
NW	0	0	1	0	0	0	0	0	0	0	0	0	1
NNW	0	0	0	2	0	3	1	0	0	0	0	0	6
TOTALS	7	7	15	29	36	204	275	12	0	0	0	0	588

NUMBER OF VALID HOURS 588
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 27
TOTAL HOURS FOR THE PERIOD 2208

ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	7	4	10	34	31	79	69	4	2	1	0	0	242
NNE	2	6	17	53	82	225	246	8	0	0	0	0	643
NE	5	2	6	15	13	14	7	2	1	0	0	0	66
ENE	1	6	9	17	3	6	1	4	1	0	0	0	50
E	0	1	8	6	4	7	8	1	1	0	0	0	39
ESE	0	0	3	2	5	9	3	2	1	0	0	0	25
SE	4	2	4	12	10	39	35	5	11	0	0	0	123
SSE	1	1	5	9	12	38	27	1	4	1	1	0	101
S	2	3	8	15	18	36	19	1	1	0	2	0	105
SSW	2	3	2	12	12	19	18	3	1	0	0	0	73
SW	6	2	7	6	22	32	27	6	0	1	0	0	110
WSW	2	3	5	15	23	54	24	11	0	0	0	0	138
W	0	3	2	13	25	89	73	3	2	0	0	0	211
WNW	2	0	4	10	16	47	49	8	5	0	0	0	141
NW	1	3	4	10	9	31	12	3	1	0	0	0	76
NNW	3	3	10	12	8	19	5	1	0	0	0	0	65
TOTALS	38	42	104	241	293	744	623	63	31	3	3	0	2208

NUMBER OF VALID HOURS 2208
NUMBER OF INVALID HOURS 0
NUMBER OF CALMS 27
TOTAL HOURS FOR THE PERIOD 2208