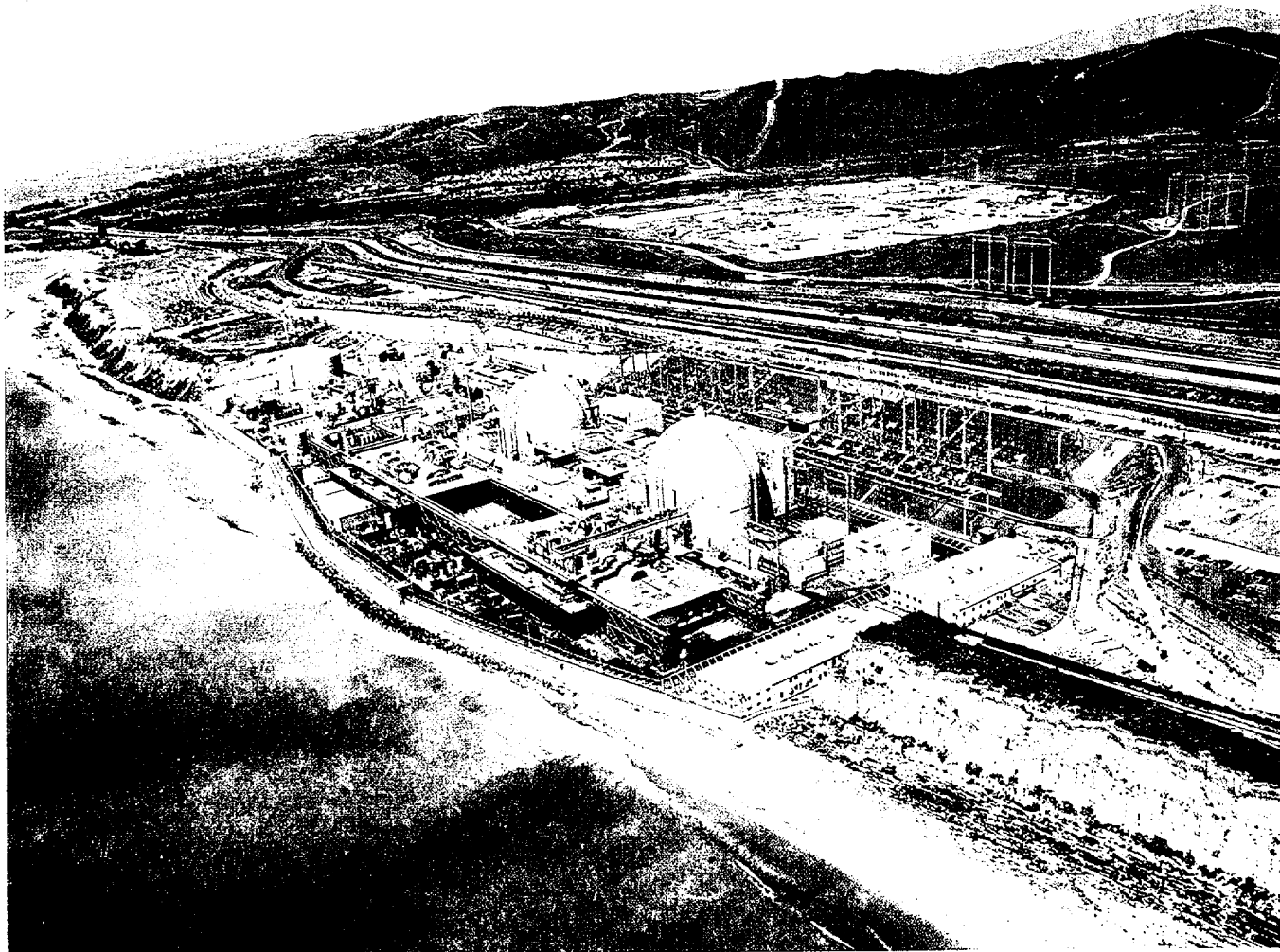




SAN ONOFRE NUCLEAR GENERATING STATION

Annual Radioactive Effluent Release Report

1999

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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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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, 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	μCi/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	μCi/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	μCi/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	6.56E-8	6.50E-9	5.00E+1
D. Tritium				
1. Total release	Ci	<LLD	1.78E-1	2.50E+1
2. Average release rate for period	μCi/sec	0.00E+0	2.26E-2	
3. Percent of applicable limit	% MPC	0.00E+0	1.47E-4	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	2.94E-4	

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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	μCi/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	μCi/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	μCi/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	7.25E-8	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	1.35E-1	5.44E-1	2.50E+1
2. Average release rate for period	μCi/sec	1.70E-2	6.84E-2	
3. Percent of applicable limit	% MPC	1.10E-4	4.45E-4	
4. Percent Effluent Concentration Limit	% ECL	2.21E-4	8.90E-4	

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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	<LLD
cesium-137	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	<LLD	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	<LLD	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
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 ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85	2.50E-5
krypton-85m	6.00E-8
krypton-87	3.10E-7
krypton-88	2.10E-7
xenon-133	1.90E-7
xenon-133m	4.80E-7
xenon-135	6.30E-8
xenon-135m	2.40E-6
xenon-138	4.10E-6
2. Iodines	
iodine-131	2.70E-13
iodine-133	1.70E-12
iodine-135	4.50E-11
3. Particulates	
barium-140	6.50E-13
cerium-141	7.60E-14
cerium-144	3.10E-13
cesium-134	1.90E-13
cesium-137	1.60E-13
cobalt-58	1.70E-13
cobalt-60	2.70E-13
iron-59	4.20E-13
lanthanum-140	1.10E-12
manganese-54	1.70E-13
molybdenum-99	8.00E-14
strontium-89	1.00E-14
strontium-90	1.00E-15
zinc-65	4.60E-13
4. gross alpha	1.00E-14

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	0.00E+0	6.65E-6	5.06E-6	2.04E-5
2. Percent Applicable Limit	%	0.00E+0	8.87E-5	6.74E-5	2.71E-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.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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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.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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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	<LLD	1.36E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00+0	8.72E-12	
3. Percent of applicable limit	% MPC	0.00+0	4.36E-5	
4. Percent Effluent Concentration Limit	% ECL	0.00+0	8.72E-4	
B. Tritium				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00+0	0.00+0	
3. Percent of applicable limit	% MPC	0.00+0	0.00+0	
4. Percent Effluent Concentration Limit	% ECL	0.00+0	0.00+0	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00+0	0.00+0	
3. Percent of applicable limit	% MPC	0.00+0	0.00+0	
4. Percent Effluent Concentration Limit	% ECL	0.00+0	0.00+0	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	6.54E+6	4.40E+5	5.00E+0
F. Volume of dilution water used during period	liters	1.68E+9	1.56E+9	5.00E+0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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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	1.86E-3	1.50E-6	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.25E-9	9.20E-13	
3. Percent of applicable limit	% MPC	6.19E-3	4.60E-6	
4. Percent Effluent Concentration Limit	% ECL	8.45E-2	9.20E-5	
B. Tritium				
1. Total release	Ci	5.41E-1	2.50E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	3.66E-7	1.53E-11	
3. Percent of applicable limit	% MPC	1.22E-2	5.11E-7	
4. Percent Effluent Concentration Limit	% ECL	3.66E-2	1.53E-6	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00+0	0.00E+0	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	3.00E+5	1.91E+5	5.00E+0
F. Volume of dilution water used during period	liters	1.48E+9	1.63E+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	<LLD	1.36E-5	3.43E-6	1.50E-6
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	1.36E-5	3.43E-6	1.50E-6
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	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	<LLD	5.73E-5	<LLD
cesium-137	Ci	<LLD	<LLD	8.69E-4	<LLD
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	9.22E-4	<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	3.26E-6	<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	1.85E-3	<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 2C

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	3.30E-7
cerium-141	5.20E-8
cerium-144	2.30E-7
cesium-134	9.90E-8
cesium-137	8.60E-8
chromium-51	4.20E-7
cobalt-58	8.70E-8
cobalt-60	1.30E-7
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
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	3.50E-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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	3.30E-7
cerium-141	5.20E-8
cerium-144	2.30E-7
cesium-134	9.90E-8
cesium-137	8.60E-8
chromium-51	4.20E-7
cobalt-58	8.70E-8
cobalt-60	1.30E-7
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
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	3.50E-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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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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	0.00E+0	1.46E-4	9.58E-3	1.62E-5
2. Percent Applicable Limit	%	0.00E+0	9.70E-3	6.39E-1	1.08E-3
B.					
1. Limiting organ dose	mrem	0.00E+0	2.22E-4	2.55E-2	2.47E-5
2. Percent Applicable Limit	%	0.00E+0	4.45E-3	5.09E-1	4.94E-4
3. Limiting organ for period		N/A	Liver	GI-LLI	Liver

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TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	2 releases
2. Total time period for batch releases:	5370 minutes
3. Maximum time period for a batch release:	5353 minutes
4. Average time period for a batch release:	2685 minutes
5. Minimum time period for a batch release:	17 minutes
6. Average saltwater flow during batch releases:	5125 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	7.50E+0	3.00E+1
	Ci	2.88E+2	
b. Dry active waste (DAW), compactable and non-compactable	m ³	N/A	N/A
	Ci	N/A	
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 High Integrity Containers and shipped in a Type B Cask (C of C 9208).

N/A No shipment made.

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2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	
americium-241	%	1.13E-3
carbon-14	%	1.92E-2
cesium-134	%	1.19E+1
cesium-137	%	8.13E+1
cobalt-60	%	2.14E+0
curium-242	%	1.43E-5
curium-243/244	%	8.61E-4
nickel-59	%	2.60E-2
nickel-63	%	4.40E+0
niobium-94	%	2.03E-2
plutonium-238	%	1.21E-3
plutonium-239/240	%	4.85E-4
plutonium-241	%	3.52E-2
strontium-90	%	1.79E-1
tritium	%	4.61E-3
b. not applicable	%	N/A
c. not applicable	%	N/A
d. not applicable	%	N/A

3. Solid Waste Disposition

See COMMON section of this report

B. IRRADIATED FUEL SHIPMENTS (Disposition)

See COMMON section of this report

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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:

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

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, $\mu\text{Ci/sec}$.

X/Q = $1.30\text{E-}5 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM, Rev. 13.

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

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, $\mu\text{Ci/sec}$.

X/Q = $1.30\text{E-}5 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM, Rev. 13.

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

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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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, $\mu\text{Ci/ml}$.

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

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.

- % 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, 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 individuals who may, at times, be within the site boundary, 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.

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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	0.00E+0	1.46E-4	9.58E-3	1.62E-5	9.74E-3
Organ	6)	7)	8)	9)	10)
	0.00+0	2.22E-4	2.55E-2	2.47E-5	2.55E-2
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	0.00E+0	6.07E-5	3.40E-5	4.96E-4	5.90E-4
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)
	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
DIRECT RADIATION	26)	27)	28)	29)	30)
	9.69E-2	8.93E-2	7.24E-2	8.79E-2	3.41E-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 data was calculated using the methodology of the ODCM.
2. This data was calculated using the methodology of the ODCM.
3. This data was calculated using the methodology of the ODCM.
4. This data was calculated using the methodology of the ODCM.
5. This data was calculated using the methodology of the ODCM.

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6. This data was calculated using the methodology of the ODCM.
7. This data was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
8. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
9. This data was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
10. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
11. There was no activity detected during the release period, therefore the reported organ dose was 0.00E+0 mrem.
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. 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.
14. 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.
15. 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.
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	0.00+0	9.70E-3	6.39E-1	1.08E-3	3.25E-1
Organ	0.00E+0	4.45E-3	5.09E-1	4.94E-4	2.55E-1
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	0.00E+0	8.09E-4	4.53E-4	6.61E-3	3.94E-3
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.

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SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

On February 25, 1999, revision 14 to the Unit 1 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision were:

1. changes due to the 1998 Land Use Census, and
2. updated monitor calibration constants to reflect periodic maintenance activity.

The Unit 1 ODCM contains requirements for an Inter-laboratory Comparison Program. Standard RETS uses wording that requires the program to be approved by the NRC. In the past, the approved program was the Environmental Protection Agency (EPA) cross-check program. The EPA no longer provides a cross-check program, as stated in a letter from Wayne N. Marchant, EPA to Charles L. Miller, NRC dated 5/18/95, discussing calibration standards and performance evaluation studies. However, Regulatory Guide 4.15 provides the guidance for this program. As such, Specification 5.3.1.A was changed to reflect that Reg. Guide.

In accordance with the results of AR-980102040, Section 5.4 of the Unit 1 ODCM was changed to remove the reference to Regulatory Guide 4.18 and add Radiological Assessment Branch Technical Position, Revision 1, November 1979.

Section 3.4.1.2 provided a number of TLD's of 47 around the site. This section was changed from '47' to 'at a minimum of 30' locations around the site.

Elsewhere in the document, over the years, changes have left blank pages, mixed fonts, and other administrative errors. Additionally, equations located throughout the ODCM have been renumbered to provide a consecutive numerical sequence and to number identical equations with the same number throughout the ODCM. This revision corrected those.

None of the changes were substantive in nature nor did they 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 was maintained. As such, per NRC Generic Letter 89-01, no safety reviews were required or performed.

The following is a complete list of the changes:

OLD Page NEW Page CHANGE

TOC		Renumbered pages as necessary based on changes in the body of the ODCM.
TOC ii		Removed previously deleted lines
TOC iii		Removed previously deleted lines, added previously deleted title as a place holder
TOC iv		Removed previously deleted lines, added previously deleted title as a place holder
TOC vii		Removed previously deleted lines, added previously deleted title as a place holder
TOCv iii		Removed previously deleted lines
1-11		Changed from 3 saltwater pumps to 2
1-14		Changed from 3 saltwater pumps to 2
1-15		Removed previously blank page

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<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
1-16		Removed previously deleted page
1-17	1-15	Changed equation number 1-8 to 1-3
1-19	1-17	Renumbered step due to prior deletion
1-20	1-18	Renumbered step due to prior deletion
1-21	1-19	Updated calibration constants
2-3		Removed previously deleted lines, renumbered notes
2-5		Removed previously deleted lines, renumbered notes
2-9		Added previously deleted title as a place holder
	2-10	Reinserted Section 2.5.1, it was inadvertently deleted in the previous revision.
	2-11	Reinserted Section 2.5.1, it was inadvertently deleted in the previous revision.
	2-12	Changed will to shall
2-14		Removed previously deleted page
2-16		Removed previously deleted page
2-25	2-21	Changed CLF factors due to LUC
2-27		Removed previously deleted page, gaseous monitor calibration constants
2-28	2-23	Sector P, Cotton Point Estates, ingestion factor changed for child, teen, and adult
2-31	2-26	Sector Q, Outage Workers, occupancy factor changed
2-36	2-31	Sector Q, San Clemente Ranch, occupancy factor changed
2-38	2-33	Sector Q, S. C., Resident with garden, ingestion factor and distance changed
2-40	2-35	Sector R, San Clemente Ranch, occupancy factor changed
2-41	2-36	Removed 'W. Res.'
2-46	2-41	Sector C, Camp San Onofre Fr. Stn., X/Q, D/Q changes
2-49	2-44	Changed 'Treat.' to 'Treatment'
2-58	2-53	Sector F, Changed name to Border Patrol Checkpoint
2-60	2-55	Sector G, Hwy Patrol Weigh Station, occupancy factor changed
	3-5	Format only
	3-7	Changed number of TLD locations
	5-4	Added note f stating no drinking water pathway at SONGS
	5-6	Added note f stating no drinking water pathway at SONGS
5-9		Combined Zr/Nb, Ba/La
5-14		Changed 'which has been approved by the Commission' to 'that complies with Regulatory Guide 4.15.'
5-16		Changed reference to Reg Guide 4.8 to Radiological Assessment Branch Technical Position.
5-17		Format only
5-18		Removed reference to previously deleted TLD locations
5-19		Removed reference to previously deleted TLD locations
5-20		Removed reference to previously deleted TLD locations, added new TLD locations 75, 76, 77, and 78, changed TLD 55 and 56 title.
5-21		Removed previously deleted lines, changed 'NEW CONTROL' to 'CONTROL'
5-22		Added SONGS Garden to Local Crops, removed previously deleted lines, removed reference to previously deleted TLD locations
	5-26 to 5-30	Updated maps

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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On May 3, 1999, revision 15 to the Unit 1 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision were:

1. changes to Action Statements 20 and 24 for flow estimate requirements on inoperable radiation instruments,
2. added a definition of 25% extension on Surveillance Requirements and,
3. removal of dose parameter tables from section 2 per memo "ODCM Dose Parameter Evaluation" dated 11/13/99 from EM Goldin to D Dick.

Minor format changes, correction of typographical errors, and removal of previously blank pages were made and are described in the attached List of Affected Pages.

Safety Evaluations were provided for the first two items. 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 impacted 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 was maintained.

The following is a complete list of the changes:

OLD Page NEW Page CHANGE

TOC		Renumbered pages as necessary based on changes in the body of the ODCM. The following dose parameter location tables were removed from the ODCM since other, more dose-conservative locations exist in those sectors per memo "ODCM Dose Parameter Evaluation" dated 11/13/99 from EM Goldin to D Dick
2-24		Removed Surf Beach/Guard Shack from Sector Q
2-25		Removed State Park Office Trailer from Sector Q
2-27		Removed Rec. Building Staff from Sector Q
2-28		Removed "51 Area" Beach Campground from Sector Q
2-30		Removed "51 Area" Beach Check-in from Sector Q
2-31		Removed San Clemente Ranch (No Residents) from Sector Q
2-32		Removed S. C. Ranch Adm. Offices from Sector Q
2-33		Removed S. C. Resident with garden from Sector Q
2-35		Removed San Clemente Ranch (No Residents) from Sector R
2-36		Removed S. C. Ranch Pac. from Sector R
2-37		Removed Deer Consumer/Hunter from Sector A
2-39		Removed Deer Consumer/Hunter from Sector B
2-41		Removed Camp San Onofre Fr. Stn from Sector C
2-44		Removed Sewage Treatment Facility from Sector C
2-45		Removed Deer Consumer/Hunter from Sector D
2-47		Removed Sheep Meat/Shepherd from Sector E
2-50		Removed Sheep Meat/Shepherd from Sector F
2-51		Removed Deer Consumer/Hunter from Sector F
2-53		Removed Border Patrol Checkpoint from Sector F
2-55		Removed Hwy Patrol Weigh Station from Sector G
3-4		Single spaced lines
3-7		Changed cadmium covered TLDs to thulium doped TLDs, single spaced lines
4-3		Changed Action 20 per Safety Evaluation
4-9		Changed Action 24 per Safety Evaluation
4-14		Updated drawing - removed aux building fan, per Unit 1 OPS request

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<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
-----------------	-----------------	---------------

4-15		Updated drawing - removed redundant boxes
5-25		Changed Sector N limit from 281.15 to 281.25, per Environmental Protection request
6-4		Added definition for Surveillance Requirement Frequency Extension, Renumbered the definitions
6-5		Removed previously deleted page

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, 1999 to December 31, 1999.

SECTION K. MISCELLANEOUS

There were no entries in Section K Miscellaneous for Unit 1.

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1999 - December 31, 1999

There were no effluent radiation monitors out of service greater than 30 days in 1999 at Unit 1.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

S.O.N.G.S. 1

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

- Gaseous releases totaled $8.57\text{E-}1$ curies of which noble gases were $0.00\text{E+}0$ curies, iodines were $0.00\text{E+}0$ curies, particulates were $0.00\text{E+}0$ curies, and tritium was $8.57\text{E-}1$ 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: $5.90\text{E-}4$ mrem at the nearest receptor.
- Liquid releases totaled $5.43\text{E-}1$ curies of which particulates and iodines were $1.88\text{E-}3$ curies, tritium was $5.41\text{E-}1$ curies, and noble gases were $0.00\text{E+}0$ curies.
- The radiation doses from liquid releases were: (a) total body: $9.74\text{E-}3$ mrem, (b) limiting organ: $2.55\text{E-}2$ 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 (1999)

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 and monitor calibration 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, %
C. Fission and activation gases				
1. Total release	Ci	9.79E+1	4.52E+1	3.00E+1
2. Average release rate for period	μCi/sec	1.26E+1	5.74E+0	
3. Percent of applicable limit	% MPC	2.55E-2	1.55E-2	
4. Percent Effluent Concentration Limit	% ECL	3.57E-2	3.41E-2	
D. Iodines				
1. Total iodine-131	Ci	1.26E-2	1.87E-3	1.90E+1
2. Average release rate for period	μCi/sec	1.62E-3	2.38E-4	
3. Percent of applicable limit	% MPC	7.78E-3	1.14E-3	
4. Percent Effluent Concentration Limit	% ECL	3.89E-3	5.71E-4	
E. Particulates				
1. Particulates with half-lives >8 days	Ci	4.95E-4	1.06E-3	1.60E+1
2. Average release rate for period	μCi/sec	6.37E-5	1.35E-4	
3. Percent of applicable limit	% MPC	1.69E-5	2.83E-5	
4. Percent Effluent Concentration Limit	% ECL	5.06E-5	7.67E-5	
5. Gross alpha activity	Ci	1.19E-6	4.79E-7	5.00E+1
F. Tritium				
1. Total release	Ci	1.07E+1	1.40E+1	2.50E+1
2. Average release rate for period	μCi/sec	1.38E+0	1.78E+0	
3. Percent of applicable limit	% MPC	3.30E-3	4.27E-3	
4. Percent Effluent Concentration Limit	% ECL	6.60E-3	8.55E-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	2.66E+1	2.79E+1	3.00E+1
2. Average release rate for period	μCi/sec	3.35E+0	3.51E+0	
3. Percent of applicable limit	% MPC	9.34E-3	9.29E-3	
4. Percent Effluent Concentration Limit	% ECL	2.12E-2	2.00E-2	
B. Iodines ⁽¹⁾				
1. Total iodine-131	Ci	1.14E-4	7.35E-5	1.90E+1
2. Average release rate for period	μCi/sec	1.43E-5	9.25E-6	
3. Percent of applicable limit	% MPC	6.88E-5	4.44E-5	
4. Percent Effluent Concentration Limit	% ECL	3.44E-5	2.22E-5	
C. Particulates ⁽¹⁾				
1. Particulates with half-lives >8 days	Ci	<LLD	<LLD	1.60E+1
2. Average release rate for period	μCi/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	5.13E-7	7.73E-6	5.00E+1
D. Tritium				
1. Total release	Ci	5.41E+0	9.65E+0	2.50E+1
2. Average release rate for period	μCi/sec	6.81E-1	1.21E+0	
3. Percent of applicable limit	% MPC	1.63E-3	2.91E-3	
4. Percent Effluent Concentration Limit	% ECL	3.27E-3	5.83E-3	

(1) Unit 2 Condenser Air Ejector particulate and iodine samples from 8/2/99 @ 1530 to 8/3/99 @ 0015 and 10/13/99 @ 1200 to 10/14/99 @ 0635 were not collected. There was no measurable activity in the previous or subsequent samples. These incidents are documented in ARs 990800097 and 991000666.

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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	3.86E+0	4.79E+0	3.04E+0	2.81E+0
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	6.62E-3	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	9.33E+1	3.91E+1	2.33E+1	2.51E+1
xenon-133m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	3.36E-1	2.59E-3	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	9.75E+1	4.39E+1	2.63E+1	2.79E+1
2. Iodines					
iodine-131	Ci	1.26E-2	1.87E-3	1.14E-4	7.35E-5
iodine-132	Ci	4.29E-3	6.88E-4	<LLD	<LLD
iodine-133	Ci	6.96E-4	1.54E-4	2.60E-4	7.84E-5
iodine-135	Ci	2.07E-6	<LLD	<LLD	<LLD
Total for period	Ci	1.76E-2	2.71E-3	3.74E-4	1.52E-4

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	7.28E-5	6.17E-5	7.43E-5	5.34E-5
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	2.70E-7	<LLD	<LLD	<LLD
cesium-137	Ci	1.54E-6	<LLD	<LLD	<LLD
chromium-51	Ci	6.80E-5	3.03E-4	<LLD	<LLD
cobalt-58	Ci	4.01E-4	6.60E-4	<LLD	<LLD
cobalt-60	Ci	2.02E-5	2.44E-5	<LLD	<LLD
iron-59	Ci	2.39E-7	6.84E-6	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	3.51E-7	1.11E-5	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	2.58E-6	3.44E-5	<LLD	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
yttrium-92	Ci	8.48E-6	<LLD	<LLD	2.02E-5
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	7.66E-7	2.28E-5	<LLD	<LLD
zirconium-97	Ci	3.04E-8	<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	4.18E-1	1.26E+0	3.03E-1	<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	3.31E-3	1.13E-2	<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	4.22E-1	1.27E+0	3.03E-1	<LLD

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 ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85	2.50E-5
krypton-85m	6.00E-8
krypton-87	3.10E-7
krypton-88	2.10E-7
xenon-133m	4.80E-7
xenon-135	6.30E-8
xenon-135m	2.40E-6
xenon-138	4.10E-6
2. Iodines	
iodine-132	3.80E-13
iodine-135	1.50E-12
3. Particulates	
barium-140	3.00E-11
cerium-141	3.90E-12
cerium-144	1.70E-11
cesium-134	1.00E-11
cesium-137	8.60E-12
chromium-51	3.50E-11
cobalt-58	9.10E-12
cobalt-60	1.50E-11
iron-59	2.20E-11
lanthanum-140	2.00E-11
manganese-54	9.30E-12
molybdenum-99	2.10E-12
niobium-95	8.60E-12
strontium-89	1.00E-13
strontium-90	1.00E-14
yttrium-92	1.30E-10
zinc-65	2.50E-11
zirconium-95	1.50E-11
zirconium-97	9.50E-12

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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-85	1.30E-3
krypton-85m	2.80E-6
krypton-87	1.30E-5
krypton-88	1.00E-5
xenon-133	8.30E-6
xenon-133m	2.50E-5
xenon-135	3.20E-6
xenon-135m	4.10E-5
xenon-138	6.10E-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	1.06E-2	8.88E-3	5.55E-3	5.32E-3
2. Percent Applicable Limit	%	1.06E-1	8.88E-2	5.55E-2	5.32E-2
3. Beta Air Dose	mrad	1.71E-2	9.01E-3	5.33E-3	5.41E-3
4. Percent Applicable Limit	%	8.55E-2	4.51E-2	2.66E-2	2.71E-2
B. Tritium, Iodine, Particulates (at the nearest receptor)					
1. Organ Dose	mrem	8.79E-3	2.00E-3	2.65E-4	3.39E-4
2. Percent Applicable Limit	%	5.86E-2	1.33E-2	1.77E-3	2.26E-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:	5 releases
2. Total time period for batch releases:	1965 minutes
3. Maximum time period for a batch release:	422 minutes
4. Average time period for a batch release:	393 minutes
5. Minimum time period for a batch release:	358 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	1.26E-1	6.21E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	2.29E-10	9.95E-11	
3. Percent of applicable limit	% MPC	2.77E-4	1.62E-4	
4. Percent Effluent Concentration Limit	% ECL	1.14E-3	5.14E-4	
B. Tritium				
1. Total release	Ci	2.87E+2	2.74E+1	1.90E+1
2. Average diluted concentration during period	μCi/ml	5.22E-7	4.39E-8	
3. Percent of applicable limit	% MPC	1.74E-2	1.46E-3	
4. Percent Effluent Concentration Limit	% ECL	5.22E-2	4.39E-3	
C. Dissolved and entrained gases				
1. Total release	Ci	4.68E-1	9.49E-4	1.90E+1
2. Average diluted concentration during period	μCi/ml	8.51E-10	1.52E-12	
3. Percent of applicable limit	% MPC	4.26E-4	7.60E-7	
4. Percent Effluent Concentration Limit	% ECL	4.26E-4	7.60E-7	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	4.24E-6	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	6.35E+7	7.19E+7	5.00E+0
F. Volume of dilution water used during period	liters	5.50E+11	6.24E+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⁾				
1. Total release (not including tritium, gases, alpha)	Ci	9.20E-3	1.49E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.21E-11	1.95E-11	
3. Percent of applicable limit	% MPC	2.17E-5	3.84E-5	
4. Percent Effluent Concentration Limit	% ECL	1.78E-4	2.89E-4	
B. Tritium				
1. Total release	Ci	4.25E+1	4.84E+1	1.90E+1
2. Average diluted concentration during period	μCi/ml	5.57E-8	6.33E-8	
3. Percent of applicable limit	% MPC	1.86E-3	2.11E-3	
4. Percent Effluent Concentration Limit	% ECL	5.57E-3	6.33E-3	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00+0	0.00+0	
3. Percent of applicable limit	% MPC	0.00+0	0.00+0	
4. Percent Effluent Concentration Limit	% ECL	0.00+0	0.00+0	
D. Gross alpha radioactivity ⁽¹⁾				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	1.03E+8	8.40E+7	5.00E+0
F. Volume of dilution water used during period	liters	7.63E+11	7.65E+11	5.00E+0

(1) A Unit 3 Full Flow Condensate Polishing Demineralizer Holdup Tank clean sump release permit sample was not included in the August monthly composite for Fe-55, Sr-89 and Sr-90. This incident is documented in AR 990900593.

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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	8.03E-5	<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	8.03E-5	<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-122	Ci	<LLD	3.96E-5	<LLD	<LLD
antimony-124	Ci	3.43E-3	5.10E-3	<LLD	<LLD
antimony-125	Ci	6.08E-2	5.02E-2	6.25E-4	5.89E-4
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	4.10E-4	9.43E-5	1.89E-4	5.52E-5
cesium-137	Ci	3.64E-4	4.09E-4	2.35E-4	1.11E-4
cesium-138	Ci	<LLD	5.39E-4	<LLD	<LLD
chromium-51	Ci	1.21E-2	2.92E-3	8.69E-4	<LLD
cobalt-57	Ci	<LLD	<LLD	7.07E-6	<LLD
cobalt-58	Ci	2.18E-2	2.07E-3	2.42E-3	1.17E-3
cobalt-60	Ci	3.25E-3	2.30E-4	1.84E-3	4.09E-3
iodine-131	Ci	4.87E-5	<LLD	<LLD	<LLD
iron-55 ⁽¹⁾	Ci	1.32E-2	<LLD	9.06E-4	4.49E-3
iron-59	Ci	1.30E-3	1.63E-5	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	8.90E-4	6.88E-5	3.72E-4	3.66E-4
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	4.58E-3	1.78E-4	7.16E-4	4.89E-4
niobium-97	Ci	6.56E-5	<LLD	1.58E-5	<LLD
silver-110m	Ci	4.42E-4	2.02E-5	5.48E-4	2.91E-3
strontium-89 ⁽¹⁾	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90 ⁽¹⁾	Ci	<LLD	<LLD	<LLD	<LLD
strontium-92	Ci	<LLD	<LLD	2.56E-5	9.29E-5
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
tin-113	Ci	4.38E-4	<LLD	5.10E-5	1.27E-4
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	2.74E-3	9.79E-5	3.79E-4	2.50E-4
zirconium-97	Ci	<LLD	<LLD	<LLD	1.74E-4
Total for period	Ci	1.26E-1	6.20E-2	9.20E-3	1.49E-2

LLD Lower Limit of Detection; see Table 2C.

(1) A Unit 3 Full Flow Condensate Polishing Demineralizer Holdup Tank clean sump release permit sample was not included in the August monthly composite for Fe-55, Sr-89 and Sr-90. This incident is documented in AR 990900593.

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TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2. Dissolved and entrained gases					
krypton-85	Ci	6.30E-2	<LLD	<LLD	<LLD
xenon-131m	Ci	3.31E-2	<LLD	<LLD	<LLD
xenon-133	Ci	3.72E-1	9.49E-4	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	4.68E-1	9.49E-4	<LLD	<LLD

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	3.30E-7
cerium-141	5.20E-8
cerium-144	2.30E-7
cesium-134	9.90E-8
cesium-137	8.60E-8
chromium-51	4.20E-7
cobalt-58	8.70E-8
cobalt-60	1.30E-7
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
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	3.50E-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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TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
antimony-122	1.20E-7
antimony-124	3.10E-7
barium-140	3.30E-7
cerium-141	5.20E-8
cerium-144	2.30E-7
cesium-138	7.90E-5
chromium-51	4.20E-7
cobalt-57	2.90E-8
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-97	2.00E-7
strontium-89	5.00E-8
strontium-90	1.00E-8
strontium-92	7.80E-5
technetium-99m	3.50E-8
tin-113	7.50E-8
zinc-65	2.20E-7
zirconium-97	2.20E-7
2. Dissolved and entrained gases	
krypton-85	4.20E-5
xenon-131m	3.90E-6
xenon-133	3.10E-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	2.01E-3	1.22E-4	2.09E-4	4.29E-4
2. Percent Applicable Limit	%	6.70E-2	4.07E-3	6.97E-3	1.43E-2
B.					
1. Limiting organ dose	mrem	1.27E-2	1.23E-3	2.66E-3	1.11E-2
2. Percent Applicable Limit	%	1.27E-1	1.23E-2	2.66E-2	1.11E-1
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:	85 releases
2. Total time period for batch releases:	15,118 minutes
3. Maximum time period for a batch release:	756 minutes
4. Average time period for a batch release:	178 minutes
5. Minimum time period for a batch release:	93 minutes
6. Average saltwater flow during batch releases:	740,000 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	1.71E+1	3.00E+1
	Ci	1.76E+2	
b. Dry active waste (DAW), compactable and non-compactable ^(#)	m ³	3.64E+1	3.00E+1
	Ci	1.44E+0	
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 High Integrity Containers and shipped in Type B Cask (C of C 9208).

(#) Material packaged in strong, tight containers of various sizes.

N/A No shipment made.

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

2. Estimate of major nuclide composition (by type of waste)		
a. americium-241	%	7.28E-8
antimony-125	%	1.46E-5
carbon-14	%	1.20E-1
cerium-144	%	2.93E-6
cesium-134	%	1.06E+1
cesium-137	%	1.60E+1
cobalt-57	%	2.76E-7
cobalt-58	%	1.01E+1
cobalt-60	%	6.07E+0
curium-242	%	1.16E-5
curium-243/244	%	2.59E-8
iodine-129	%	4.04E-6
iron-55	%	1.27E+1
manganese-54	%	3.00E+0
nickel-59	%	2.51E-1
nickel-63	%	4.12E+1
niobium-94	%	2.43E-2
plutonium-238	%	2.15E-8
plutonium-239/240	%	4.07E-8
plutonium-241	%	5.82E-3
strontium-90	%	2.70E-2
technetium-99	%	2.76E-5
tritium	%	8.71E-3
uranium-234	%	1.43E-7
uranium-238	%	7.63E-8

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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2. Estimate of major nuclide composition (by type of waste) (Cont'd)		
b. americium-241	%	1.10E-3
antimony-124	%	1.20E-1
antimony-125	%	1.87E-1
carbon-14	%	1.29E+0
cerium-141	%	1.95E-2
cerium-144	%	6.52E-2
cesium-134	%	3.04E+0
cesium-137	%	3.08E+1
chromium-51	%	4.08E+0
cobalt-57	%	3.84E-2
cobalt-58	%	1.07E+1
cobalt-60	%	6.68E+0
curium-242	%	9.29E-4
curium-243/244	%	2.37E-3
iodine-129	%	9.17E-3
iron-55	%	2.98E+1
iron-59	%	3.77E-1
manganese-54	%	2.82E-1
nickel-63	%	1.11E+1
niobium-94	%	1.84E-3
niobium-95	%	6.77E-1
plutonium-238	%	1.03E-3
plutonium-239/240	%	8.02E-4
plutonium-241	%	1.26E-1
silver-110m	%	4.63E-3
strontium-89	%	8.52E-3
strontium-90	%	1.08E-2
technetium-99	%	7.21E-4
tin-113	%	1.14E-1
tritium	%	4.18E-2
zirconium-95	%	3.92E-1
c. not applicable	%	0.00E+0
d. not applicable	%	0.00E+0

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

3. Solid Waste Disposition

See COMMON section of this report

B. IRRADIATED FUEL SHIPMENTS (Disposition)

See COMMON section of this report

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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:

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

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, $\mu\text{Ci/sec}$.

X/Q = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 31.

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

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, $\mu\text{Ci/sec}$.

X/Q = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 31.

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

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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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:

- $\% \text{ Applicable Limit} = \frac{(\text{Dil Conc}) (100)}{\text{MPC}_{\text{eff}}}$
 - 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, 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 individuals who may, at times, be within the site boundary, 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.

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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	2.01E-3	1.22E-4	2.09E-4	4.29E-4	2.77E-3
Organ	6)	7)	8)	9)	10)
	1.27E-2	1.23E-3	2.66E-3	1.11E-2	2.77E-2
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	1.71E-2	4.55E-3	1.12E-3	4.84E-3	2.76E-2
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	4.15E-3	1.99E-3	2.42E-3	1.90E-3	1.00E-2
Beta	21)	22)	23)	24)	25)
	8.25E-3	1.86E-3	2.10E-3	2.53E-3	1.47E-2
DIRECT RADIATION	26)	27)	28)	29)	30)
	9.69E-2	8.93E-2	7.24E-2	8.79E-2	3.41E-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 data was calculated using the methodology of the ODCM.
2. This data was calculated using the methodology of the ODCM.
3. This data was calculated using the methodology of the ODCM.
4. This data was calculated using the methodology of the ODCM.
5. This data was calculated using the methodology of the ODCM.

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6. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
7. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
8. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
9. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
10. This data 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 NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
13. 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.
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 E 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 E 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	6.70E-2	4.07E-3	6.97E-3	1.43E-2	4.62E-2
Organ	1.27E-1	1.23E-2	2.66E-2	1.11E-1	1.38E-1
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	1.14E-1	3.04E-2	7.46E-3	3.23E-2	9.21E-2
NOBLE GASES					
Gamma	4.15E-2	1.99E-2	2.42E-2	1.90E-2	5.00E-2
Beta	4.13E-2	9.31E-3	1.05E-2	1.26E-2	3.69E-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 25, 1999, revision 32 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision were:

1. changes due to the 1998 Land Use Census,
2. updated monitor calibration constants to reflect periodic maintenance activity, and
3. moved dose calculations to Section 3.

The Units 2/3 ODCM contains requirements for an Inter-laboratory Comparison Program. Standard RETS uses wording that requires the program to be approved by the NRC. In the past, the approved program was the Environmental Protection Agency (EPA) cross-check program. The EPA no longer provides a cross-check program, as stated in a letter from Wayne N. Marchant, EPA to Charles L. Miller, NRC dated 5/18/95, discussing calibration standards and performance evaluation studies. However, Regulatory Guide 4.15 provides the guidance for this program. As such, Specification 5.3.1 was changed to reflect Regulatory Guide 4.15.

In accordance with the results of AR-980102040, Section 5.4 of the Units 2/3 ODCM was changed to remove the reference to Regulatory Guide 4.18 and add Radiological Assessment Branch Technical Position, Revision 1, November 1979.

Section 2.9.1.2 provided a number of TLD's of 47 around the site. This section has been moved to 3.4.1 and was changed from '47' to 'at a minimum of 30' locations around the site.

In a previous revision some equation factors were combined for simplicity. The factors were once again separated to provide a background for understanding the equations.

Elsewhere in the document, over the years, changes have left blank pages, mixed fonts, and other administrative errors. Additionally, equations located throughout the ODCM have been renumbered to provide a consecutive numerical sequence and to number identical equations with the same number throughout the ODCM. Finally, this revision changes the title of 'Blowdown Polishing Sump' to the correct nomenclature of 'Blowdown Polishing System Neutralization Sump' throughout. This revision corrected those.

None of the changes were substantive in nature nor did they 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. As such, per NRC Generic Letter 89-01, no safety reviews were required or performed.

The following is a complete list of the changes:

<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
TOC		Renumbered pages as necessary based on changes in the body of the ODCM.
TOCi		Format only
TOCii		Moved Total Dose from Section 2 to Section 3
TOCv		Format only

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OLD Page NEW Page CHANGE

		Changed the following equation numbers: 1-4a to 1-5, 1-5 to 1-6, 1-9 to 1-3, 1-10 to 1-4, 1-11 to 1-7, 1-12 to 1-8, 1-13 to 1-9, 1-14 to 1-10, 1-15 to 1-11, 1-16 to 1-12, 1-17 to 1-13, 1-18 to 1-14, 1-19 to 1-15, 2-3 to 2-4, 2-4 to 2-5, 2-4a to 2-6, 2-5 to 2-3, 2-6 to 2-8, 2-6a to 2-10, 2-7 to 2-9, 2-7a to 2-11, 2-8 to 2-7, 2-9 to 2-12, 2-10 to 2-13, 2-11 to 2-18, 2-12 to 2-19, 2-13 to 2-20, 2-14 to 2-21, 2-15 to 2-22, 2-16 to 2-23, 2-17 to 2-24, 2-18 to 2-25, 2-19 to 2-26
1-2		Changed 'Blowdown Processing Sump' to 'Blowdown Processing System Neutralization Sump'
1-4		Note ***, Corrected valve numbers
1-10		Reordered factors to the order presented in the equation
1-13		Removed previously blank page
1-14	1-13	Changed 'Blowdown Processing Sump' to 'Blowdown Processing System Neutralization Sump'
1-15	1-14	Changed 'Blowdown Processing Sump' to 'Blowdown Processing System Neutralization Sump'
1-15	1-14	Reordered factors to the order presented in the equation
1-16	1-15	Changed 'Blowdown Processing Sump' to 'Blowdown Processing System Neutralization Sump'
1-17	1-16	Changed 'Blowdown Processing Sump' to 'Blowdown Processing System Neutralization Sump'
1-21	1-20	Added "is" to sentence
1-22	1-21	Updated calibration constants
2-2		Removed previously deleted line, changed note j to h
2-4		Removed previously deleted notes h and i, renumbered note j as h
2-6		Removed previously deleted line
2-9	3-2	Moved Total Dose Specification from Section 2 to Section 3
2-13		Format only
2-14		Split equation factor 472 into its separate factors
2-18		Format only
2-19		Format only
2-20		Format only
2-21		Format only
2-22		Split equation factor 472 into its separate factors
2-23		Format only
2-27		Removed previously blank page
2-32		Removed previously blank page
2-35	2-33	Changed CLF factors due to LUC
2-37	2-35	Sector P, Cotton Point Estates, ingestion factor changed
2-44	2-42	Sector Q, S. C. Resident, ingestion factor changed
2-45	2-43	Sector Q, San Clemente Ranch, occupancy factor changed
2-46	2-44	Sector Q, San Clemente Ranch Admin Office, occupancy factor changed
2-47	2-45	Sector Q, Outage Workers, occupancy factor changed
2-49	2-47	Sector R, San Clemente Ranch, occupancy factor changed, format
2-57	2-55	Renamed 'Sewage Facility' to 'Sewage Treatment Facility'
2-69	2-67	Sector G, Hwy Patrol Weigh Station, occupancy factor changed
2-70 to	3-3 to	Moved Total Dose Calculations to from Section 3
2-72	3-5	
3-5		Changed number of TLD's to reflect current arrangements
5-4		Added note g stating no drinking water pathway at SONGS.
5-6		Added note g stating no drinking water pathway at SONGS.

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<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
5-7		Format only
5-8		Format only
5-12		Changed 'is approved by the Commission' to 'complies with Regulatory Guide 4.15'
5-13		Changed reference to Reg Guide 4.8 to Radiological Assessment Branch Technical Position.
5-15		Removed reference to previously deleted TLD locations, removed previously deleted line
5-16		Removed reference to previously deleted TLD locations
5-17		Added new TLD locations 75, 76, 77, and 78, changed TLD location for 55 and 56 in title only, removed reference to previously deleted TLD locations
5-17		Removed reference to previously deleted TLD locations
5-18		Format, removed previously deleted line, changed 'NEW CONTROL' to 'CONTROL'
5-19		Added SONGS Garden to Local Crops
5-23 to		Updated maps
5-27		
6-14		Changed Total Dose (2.5) to Total Dose (3.3)

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

On May 3, 1999, revision 33 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision were:

1. clarified 'transient sampling' requirements,
2. changes to Action Statements 31 and 36 for flow estimate requirements on inoperable radiation instruments,
3. added Action 41 for the SYF,
4. added a definition of 25% extension on Surveillance Requirements
5. removed dose parameter tables from section 2 per memo "ODCM Dose Parameter Evaluation" dated 11/13/99 from EM Goldin to D Dick,
6. clarified Operability testing requirements for liquid waste treatment systems 1.3.1.2 and 1.3.1.3, and
7. changes 'Blowdown Polishing Sump' to 'Blowdown Polishing System Neutralization Sump' in Section 4.

Minor format changes, correction of typographical errors, and removal of previously blank pages were made and are described in the attached List of Affected Pages.

Safety Evaluations were provided for the first four items. 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 impacted 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 was maintained.

The following is a complete list of the changes:

<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
TOC		Renumbered pages as necessary based on changes in the body of the ODCM.
1-6		Clarified Operability testing requirements for liquid waste treatment systems 1.3.1.2 and 1.3.1.3
2-4		Clarified requirements for transient and routine sampling of noble gases, particulates, and iodines in notes b and d
2-10		Removed previously deleted page
2-15	2-14	Single spaced the lines
2-16	2-15	Single spaced the lines
2-17	2-15	Single spaced the lines and moved to the previous page
2-25	2-23	Single spaced the lines
2-27	2-25	Single spaced the lines
2-28	2-26	Single spaced the lines
2-29	2-27	Single spaced the lines

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<u>OLD Page</u>	<u>NEW Page</u>	<u>CHANGE</u>
		The following dose parameter location tables were removed from the ODCM since other, more dose-conservative locations exist in those sectors:
2-34	2-32	Surf Beach/Life Guard from Sector P
2-37	2-35	Rec. Building Staff from Sector Q
2-39	2-37	State Park Office Trailer from Sector Q
2-40	2-38	Surf Beach/Guard Shack from Sector Q
2-41	2-39	51 Area Beach/Campground from Sector Q
2-44	2-42	S. C. Ranch Adm. Offices from Sector Q
2-48	2-46	SC Ranch Packing from Sector R
2-50	2-48	Deer Consumer/Hunter from Sector A
2-54	2-52	Camp San Onofre Fr. Stn from Sector C
2-55	2-53	Sewage Treatment Facility from Sector C
2-60	2-58	Sheep (Meat) from Sector E
2-63	2-61	Border Patrol Checkpt. from Sector E
2-64	2-62	Sheep (Meat)/Shepherd from Sector F
2-65	2-63	Deer Consumer/Hunter from Sector F
2-67	2-65	Hwy Patrol Weigh Station from Sector G
		Format the following changes due to table deletion
		2-32 through 2-48, 2-51 through 2-54, 2-57 through 2-65
2-69	2-67	Format nuclide abbreviations
2-70	2-68	Format nuclide abbreviations
2-71	2-69	Format nuclide abbreviations
2-72	2-70	Format nuclide abbreviations
2-73	2-71	Format nuclide abbreviations
2-74	2-72	Format nuclide abbreviations
2-75	2-73	Format nuclide abbreviations
2-76	2-74	Format nuclide abbreviations
2-77	2-75	Format nuclide abbreviations
2-78	2-76	Format nuclide abbreviations
3-1		Single spaced the lines
3-3		Single spaced the lines
3-5		Single spaced the lines, changed cadmium covered TLD to thallium doped TLD
4-1		Changed 4.1.1.2 per Safety Evaluation
4-2		Added 'Processing System' to 1.b and 2.b
4-4		Changed Action 31 per Safety Evaluation
4-5		Added 'Processing System' to 1.b and 2.b
4-6		Added reference symbol to 'automatic pathway isolation' in note 1, in order to clarify when the requirement is applicable
4-8		Added P&I to Associated Sample Flow Measuring Device for clarification per the Safety Evaluation
4-9		Changed Action 36 to Action 41, Added P&I to Associated Sample Flow Measuring Device for clarification
4-11		Changed Action 36 per Safety Evaluation
4-11		Added Action 41 per Safety Evaluation
4-15		Added reference symbol to 'automatic pathway isolation' in note 1, in order to clarify when the requirement is applicable
5-18		Corrected distance to City of San Clemente per Environmental Protection request
5-22		Corrected Sector limit for Sector N per Environmental Protection request
6-4		Added definition for Surveillance Requirement Frequency Extension, renumbered equation as required, format
6-5		Formatted Table 6-1 to match TSIP

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

On November 9, 1999, revision 34 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. This change incorporated final turnover items related to DCP 6926 (replacement of various radiation monitors), along with some other minor administrative improvements. Incorporated into this revision were:

1. Revised Liquid Setpoint equation to adjust for low (<100 KeV) energy gamma emitters,
2. 2/3 RE-7808 setpoint methodology changes related to DCP 6926,
3. Modifying Tables 4-1 and 4-2 to include process flow devices for radiation monitor operability,
4. Data Acquisition System introduction related to DCP 6926,
5. Revised the Source Check definition,
6. Surveillance Requirement 4.1.1.2 wording change,
7. Valve number change for discharges from Steam Generator Blowdown paths, and
8. Updated Liquid and Gaseous Effluent Radiation Monitor Calibration Constants.

Safety Evaluations were provided for items 1, through 5.

Per NRC Generic Letter 89-01, no safety reviews were required or performed for editorial changes or changes made to reflect actual plant operation. Item 8 reflects routine calibration of the radiation monitors as is required by Section 4; no safety evaluation is required. Discussions are provided below for items 6 and 7.

Minor format changes, correction of typographical errors, and removal of previously blank pages were made and are described in the attached List of Affected Pages.

Surveillance Requirement 4.1.1.2 requirement of dilution flow "At least once per 12 hours or within 1 hour...." This wording could lead to confusion as to when the flow must be checked. The 'or' is being replaced with 'and' so as to clarify that the flow check is required under both conditions rather than either.

Action Request 990700033 identified that valve number HV-3773 could not be locked closed as required by ODCM Action 29c. Investigation revealed that HV-3773 is an air operated valve with no physical means of locking. Valve number S2(3)1319MU577 has been substituted in this Action. It is a butterfly valve with a built-in locking device.

None of the changes impacted 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.

The following is a complete list of the changes:

<u>Page</u>	<u>CHANGE</u>
TOC	Renumbered pages as necessary based on changes in the body of the ODCM.
Throughout	Changed $\Sigma_i C_{yi}$ to $\Sigma_i C'_{yi}$
Section 1	
1-9	Added 'Blowdown Processing System' to 'Neutralization Sump'
1-10	Added Factor C_{xe} to equation 1-3
	Changed definition of $\Sigma_i C_{yi}$
1-12	Changed definition of $\Sigma_i C_{yi}$

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

<u>Page</u>	<u>CHANGE</u>
1-13	Changed definition of $\Sigma_i C_{yi}$
1-14	Changed definition of $\Sigma_i C_{yi}$ Added Factor C_{xe} to equation 1-3
1-16	Changed definition of $\Sigma_i C_{yi}$
1-18	Changed definition of $\Sigma_i C_{yi}$
1-19	Changed definition of $\Sigma_i C_{yi}$
1-21	Updated Liquid Rad Monitor calibration constants Removed calibration constants for monitors that are being converted to MGP
1-25	Changed procedure reference from S0123-III-5.11.23 to S0123-III-5.23
2-12	Left page intentionally blank due to consolidating equations Changed 7808 setpoint calculation to remove cpm values since the monitor is being converted to MGP.
2-13	Added 2/3RT-7808 to title Changed correction factor '2' to a variable value 'S'
2-16	Added note for applicability of 2(3)RT-7865
2-17	Added 2(3)RT-7828 only to main purge flow rate
2-18	Added 2(3)RT-7828 only to main purge flow rate
2-19	Changed 7808 setpoint calculation to remove cpm values Added 2/3RT-7808 to title Changed correction factor '2' to a variable value 'S'
2-20	Consolidated pages
2-21	Left page intentionally blank due to consolidating equations
2-22	Removed 2/3-7808C Calibration Constants since the monitor is being converted to MGP. Removed previously blank pages: 2-32, 2-35, 2-37, 2-38, 2-39, 2-42, 2-46, 2-48, 2-52, 2-53, 2-58, 2-61, 2-62, 2-63, and 2-65
4-1	In Surveillance Requirement 4.1.1.2, Changed word 'or' to 'and' in order to clarify when the action is required
4-2	Added "Process" to 2.0 title Added TPS to process flow rate measurement devices Added DAS to Table 4-1
4-3	Changed valve numbers to identify a new valve to be locked closed per Action 29c.
4-4	Revised Action 31 Added Action 32
4-5	Added "Effluent" to 1.e. Added "Process" to 2.0 title Added TPS to process flow rate measurement devices Added DAS to Table 4-2
4-6	Added Note 4 about the DAS
4-8	Added equipment ID to 3e. Added DAS to Table 4-3
4-9	Renamed SYF monitors to correct nomenclature
4-10	Deleted note (2), removed previously deleted note (4)
4-11	Corrected typo in Action 41 Added Action 42
4-13	Added DAS to Table 4-4
4-14	Removed reference to Note (8)
4-16	Revised Note (8)
4-17	Format only
6-3	Changed definition of Source Check

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

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, 1999 to December 31, 1999.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

SECTION K. MISCELLANEOUS

- Improper Setpoint for Unit 3 Containment Purge

On 5/23/99, a Unit 3 Containment Purge was conducted using a non-conservative setpoint. The analysis instrumentation did not identify an isotope resulting in a non-conservative setpoint. The error was discovered and the purge was stopped. A new release permit was generated with the proper setpoint and the purge was restarted. A review of the release data showed at no time did the monitor reading exceed the correct setpoint value. The resultant dose and curies released are included in the 1999 data. The station procedure was revised to require a second review of analyses and training was conducted to help identify analysis errors. This incident is documented in AR 990501863.

- Missed Sample flow Verification on Auxiliary Sampling Equipment

On 9/6/99, a required sample flow check on the Unit 3 Condenser Air Ejector Auxiliary Sample Equipment was missed. The check was made upon discovery. The time between flow checks was 12 hours and 10 minutes, exceeding both the procedure and ODCM time limit. This incident is documented in AR 990900295.

- Missed Channel Functional Test on Unit 2 Turbine Plant Sump (TPS) Process Flow Instrumentation

On 11/24/99, it was determined that unit 2 TPS radmonitor was inoperable due to a missed surveillance on the process flow instrument loop. A new revision of the ODCM had been issued 11/9/99 which required testing on the process flow loop. The instrument was placed in service on 11/16/99. On 12/2/99, the surveillance was performed on the instrument and the radiation monitor was returned to service. Since it was not recognized that the monitor was inoperable, nine days of compensatory sampling were not performed. None of the weekly composites for this time period showed any detectable gamma activity. The procedure is being changed to verify that the affected departments complete their required program changes prior to issuance of the revised ODCM. This incident is documented in AR 991101352.

- Non-isokinetic Particulate and Iodine (P&I) Sampling on Condenser Air Ejector Monitors

On 1/21/00, it was determined the Unit 2 and Unit 3 Condenser Air Ejector (CAE) radiation monitors' sample flow was outside the isokinetic flow range. The process flow was immediately adjusted to allow sampling within the allowable range. The new nozzles installed during the 1999 cycle 10 outages maintained isokinetic sampling at a process flow of 11.3 cfm to 18.7 cfm. The allowable range was tested and recalculated to allow a process flow rate of 7 cfm to 22.5 cfm. From 2/21/99 to 1/21/00, Unit 2 CAE monitor sample flow was outside the allowable range 30% of the time while Unit 3, from 5/6/99, was outside 80% of the time. For the entire year, no P&I sample showed any detectable activity. The noble gas monitor was in service for the entire time period. This incident is documented in AR 000101252.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1999 - December 31, 1999

S.O.N.G.S. 2			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2RT-7817 BPS/FFCPD Discharge Monitor	08/23/99 - 10/21/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
2RT-7821 Turbine Plant Sump Monitor	08/25/99 - 11/16/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
2RT-7865 Containment Purge. (Plant Vent Stack) Monitor	01/06/99 - 02/17/99	Radmonitor upgrade design change	Upgrade modification to connect to new radiation monitoring Data Acquisition System.
2RT-7870 Condenser Air Ejector Monitor	08/08/93 - 02/18/99	Non-isokinetic sample flow during normal air ejector operation	UFSAR Design Basis Document review identified non-isokinetic sample flow during normal air ejector operation. New sample probe nozzle installed during 1999 outage. Noble gas radiation monitor functions were operable during this period. LER-2-1998-015
	05/02/99 - 08/04/99	Process flow rate monitoring device	Substitute process flow installed during troubleshoot and trending of new design flow instrumentation. Noble gas radiation monitor functions were operable during this period.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1999 - December 31, 1999

S.O.N.G.S. 3			
Monitor	Inoperability Period	Inoperability Cause	Explanation
3RT-7817 BPS/FFCPD Discharge Monitor	04/26/99 - 07/14/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
3RT-7821 Turbine Plant Sump Monitor	04/26/99 - 09/21/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
3RT-7828 Containment Purge Monitor	04/01/84 - 01/13/99	Non-isokinetic sample flow during containment venting (mini-purge with fans off)	Non-isokinetic sample flow during containment venting. Procedures and monitor software modified to restrict venting within isokinetic flow limits. Noble gas radiation monitor functions were operable during this period. LER-2-1998-015
3RT-7865 Plant Vent Stack (Containment Purge) Monitor	03/28/99 - 05/17/99	Radmonitor upgrade design change	Upgrade modification to connect to new radiation monitoring Data Acquisition System.
3RT-7870 Condenser Air Ejector	04/01/84 - 05/06/99	Non-isokinetic sample flow during normal air ejector operation	UFSAR Design Basis Document review identified non-isokinetic sample flow during normal air ejector operation. New sample probe nozzle installed during 1999 outage. Noble gas radiation monitor functions were operable during this period. LER-2-1998-015
S.O.N.G.S. 2/3			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2/3RT-7808 Plant Vent Stack Monitor	08/23/99 - 12/30/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
2/3RT-7813 Liquid Radwaste Monitor	04/13/99 - 05/20/99	Surveillance and decon effort	Extensive decontamination of detector and shielding components in effort to reduce background in addition to testing for installation of new radmonitor.
	08/23/99 - 12/23/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.
Liquid Radwaste System Flow Meter	08/23/99 - 12/23/99	Radmonitor upgrade design change	Design change upgrade modification to install a new instrument and connect to Data Acquisition System.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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

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

- Gaseous releases totaled $2.38\text{E}+2$ curies of which noble gases were $1.98\text{E}+2$ curies, iodines were $2.08\text{E}-2$ curies, particulates were $1.85\text{E}-3$ curies, and tritium was $3.98\text{E}+1$ curies.
- The radiation doses from gaseous releases were: (a) gamma air dose: $1.00\text{E}-2$ mrad at the site boundary, (b) beta air dose: $1.47\text{E}-2$ mrad at the site boundary, (c) organ dose: $2.76\text{E}-2$ mrem at the nearest receptor.
- Liquid releases totaled $4.06\text{E}+2$ curies of which particulates and iodines were $2.12\text{E}-1$ curies, tritium was $4.06\text{E}+2$ curies, and noble gases were $4.69\text{E}-1$ curies.
- The radiation doses from liquid releases were: (a) total body: $2.77\text{E}-3$ mrem, (b) limiting organ: $2.77\text{E}-2$ 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 (1999)

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), compatible and non-compatible	m ³	N/A	N/A
	Ci	N/A	
c. Irradiated components, control rods	m ³	N/A	N/A
	Ci	N/A	
d. Other (filters)	m ³	N/A	N/A
	Ci	N/A	

N/A No shipment made.

2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	N/A
b. not applicable	%	N/A
c. not applicable	%	N/A
d. not applicable	%	N/A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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
1 *	Kindrick Trucking Company Truck/Trailer	Barnwell, SC
1 *	Kindrick Trucking Company Truck/Trailer	Envirocare, UT
5 #	Kindrick Trucking Company Truck/Trailer	Envirocare, UT
1 #	Kindrick Trucking Company Truck/Trailer	Barnwell, SC

* All waste packaged at SONGS is staged at one location. There are no independent shipments of dry active waste made for Unit 1 or Units 2/3. All shipments consisted of waste from all three units, with Unit 1 contributing a very small percentage.

SONGS maintains contracts with vendors (GTS/ATG) that provide volume reduction services. These shipments were made from their processing facility. The six shipments made from these facilities included waste from other generators. Edison'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
5	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 Licensee Controlled Specifications, Section 5.0.103.2.2.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

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	3.88E-1
b. Percent ODCM Specification Limit	%	1.55E+0
2. Limiting Organ		
a. Organ Dose (GI-LLI)	mrem	7.97E-2
b. Percent ODCM Specification Limit	%	3.19E-1
3. Thyroid		
a. Thyroid Dose	mrem	1.16E-2
b. Percent ODCM Specification Limit	%	1.54E-2

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

COMMON

COMMON CONCLUSIONS

- Gaseous releases from S.O.N.G.S. 1, 2 and 3 totaled $2.39\text{E}+2$ curies of which noble gases were $1.98\text{E}+2$ curies, iodines were $2.08\text{E}-2$ curies, particulates were $1.85\text{E}-3$ curies, and tritium was $4.07\text{E}+1$ curies.
- Liquid releases from S.O.N.G.S. 1, 2 and 3 totaled $4.07\text{E}+2$ curies of which particulates and iodines were $2.14\text{E}-1$ curies, tritium was $4.07\text{E}+2$ curies, and noble gases were $4.69\text{E}-1$ 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 2 radwaste shipments to Barnwell, SC and 6 shipments to Envirocare, UT. Total volume was $6.11\text{E}+1$ cubic meters containing $4.66\text{E}+2$ curies of radioactivity.
- Meteorological conditions during the year were typical for S.O.N.G.S. Meteorological dispersion was good 30% of the time, fair 44% of the time and poor 26% 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 on the environment.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

COMMON

APPENDIX A

GASEOUS EFFLUENTS - APPLICABLE LIMITS

- A. Table 1A lists the total curies released and the release rate. The percent of applicable limit compares the released concentrations to the concentration limits of 10 CFR 20, Appendix B, Table II, Column 1.
- B. Table 1E lists the air doses as calculated using the historical X/Q. The air dose due to noble gases released in gaseous effluents from S.O.N.G.S. (per reactor) to areas at and beyond the site boundary shall be limited to the following values:
1. During any calendar quarter: ≤ 5 mrad for gamma radiation and ≤ 10 mrad for beta radiation.
 2. During any calendar year: ≤ 10 mrad for gamma radiation and ≤ 20 mrad for beta radiation.
- C. The dose to a Member of the Public from iodines, tritium, and all radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released from S.O.N.G.S. (per reactor) to areas at and beyond the site boundary shall be limited to the following values:
1. During any calendar quarter: ≤ 7.5 mrem to any organ.
 2. During any calendar year: ≤ 15 mrem to any organ.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

COMMON

APPENDIX A (Continued)

LIQUID EFFLUENTS - APPLICABLE LIMITS

- A. Table 2A lists the total curies released, the diluted concentration, and percent of the applicable limit. The percent of applicable limit compares the diluted concentration of radioactive material released to the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained gases. For dissolved or entrained noble gases, the concentration is limited to $2.00\text{E-}4 \mu\text{Ci/ml}$.
- B. Table 2D lists doses due to liquid releases. The dose commitment to a Member of the Public from radioactive materials in liquid effluents released from S.O.N.G.S. (per reactor) to unrestricted areas shall be limited to the following values:
1. During any calendar quarter:
 - ≤ 1.5 mrem to the total body and
 - ≤ 5 mrem to any organ.
 2. During any calendar year:
 - ≤ 3 mrem to the total body and
 - ≤ 10 mrem to any organ.

METEOROLOGY

METEOROLOGY

The meteorology of the San Onofre Nuclear Generating Station for each of the four quarters, 1999 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. This data is available, as well as the hourly data for the Annual Report, but has not been included in this report because of the bulk of data records.

Table 4A lists the joint frequency distribution for each quarter, 1999. 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 (1999)

METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 98123124-99033123
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	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	1	1	0	0	0	0	0	0	2
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	1	0	0	1	0	0	2
SSE	0	0	0	0	0	1	1	3	2	0	1	0	8
S	0	0	0	0	1	2	17	15	10	4	0	0	49
SSW	0	0	0	1	1	8	14	13	3	1	0	0	41
SW	0	0	0	0	1	6	23	11	3	0	0	0	44
WSW	0	0	0	1	2	5	40	20	16	2	0	0	86
W	0	0	0	0	0	5	50	53	22	3	1	0	134
WNW	0	0	0	0	0	2	13	25	32	3	3	0	78
NW	0	0	0	0	0	0	0	2	2	0	0	0	4
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	3	6	31	159	142	90	14	5	0	450

NUMBER OF VALID HOURS 450
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 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	1	0	0	0	0	0	0	0	1
NNE	1	0	0	0	0	1	0	0	0	0	0	0	2
NE	0	0	0	0	0	0	0	0	0	1	1	0	2
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	1	1	0	0	0	2
SSE	0	0	0	0	0	0	0	1	1	0	0	0	2
S	0	0	0	0	0	0	2	3	3	0	0	0	8
SSW	0	0	0	0	0	0	1	0	0	1	0	0	2
SW	0	0	0	0	0	1	5	1	1	0	0	0	8
WSW	0	0	0	0	0	1	0	0	0	1	0	0	2
W	0	0	0	0	0	1	2	1	0	0	0	0	4
WNW	0	0	0	0	0	3	1	3	1	0	0	0	8
NW	0	0	0	0	1	0	0	0	0	1	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1	0	0	0	2	7	11	10	7	4	1	0	43

NUMBER OF VALID HOURS 43
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 98123124-99033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)													TOTAL
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	
N	0	0	0	0	0	0	1	0	1	0	0	0	2
NNE	1	0	0	0	0	0	1	0	0	0	0	0	2
NE	0	0	0	0	0	0	0	0	1	0	0	0	1
ENE	0	0	0	0	0	0	0	1	0	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	1	0	0	1	0	0	0	0	0	2
SSE	0	0	0	0	0	1	0	3	2	1	0	0	7
S	0	0	0	0	0	2	1	4	0	0	0	0	7
SSW	0	0	0	0	0	0	3	1	1	0	0	0	5
SW	0	0	0	1	0	1	1	0	1	0	1	0	5
WSW	0	0	0	0	1	1	1	0	0	1	0	0	4
W	0	0	0	0	0	1	2	1	0	0	0	0	4
WNW	0	0	0	0	0	0	3	1	1	0	0	0	5
NW	0	0	0	0	1	0	1	1	2	0	0	0	5
NNW	0	0	0	0	0	0	0	0	1	0	0	0	1
TOTALS	1	0	0	2	2	6	15	12	10	2	1	0	51

NUMBER OF VALID HOURS 51
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

PASQUILL D NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)													TOTAL
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	
N	0	0	0	3	2	4	7	2	1	0	0	0	19
NNE	0	0	0	2	0	5	10	5	1	0	0	0	23
NE	0	0	0	0	3	1	2	3	2	0	1	0	12
ENE	0	0	0	0	0	1	1	0	2	0	0	0	4
E	0	0	0	1	0	2	0	3	2	0	0	0	8
ESE	0	0	0	1	3	3	2	2	12	0	2	0	25
SE	0	0	0	1	2	4	25	26	20	8	8	0	94
SSE	0	0	1	0	2	10	24	18	10	2	2	0	69
S	0	0	0	3	3	4	17	10	3	1	0	1	42
SSW	0	1	1	1	6	7	9	7	4	0	1	1	38
SW	0	0	1	1	5	2	11	7	1	1	0	0	29
WSW	0	0	0	1	1	2	10	6	1	1	0	0	22
W	0	0	1	0	2	4	18	7	5	0	0	1	38
WNW	0	0	0	1	1	6	12	11	7	0	0	0	38
NW	1	0	0	3	2	4	11	18	13	5	1	0	58
NNW	0	0	1	0	1	5	9	8	5	1	0	0	30
TOTALS	1	1	5	18	33	64	168	133	89	19	15	3	549

NUMBER OF VALID HOURS 549
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

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METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 98123124-99033123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL E
SLIGHTLY STABLE ($-0.5 < \Delta T/\Delta Z \leq -1.5$ °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	1	0	2	6	7	2	1	0	0	20
NNE	0	0	1	4	3	26	40	20	5	1	0	0	100
NE	0	0	0	3	8	14	5	3	6	1	3	0	43
ENE	0	0	0	0	1	1	2	0	1	0	0	0	5
E	0	0	0	1	0	4	2	2	2	1	0	0	12
ESE	0	0	0	0	5	5	4	1	1	0	0	0	16
SE	0	0	0	0	2	3	5	5	3	1	0	0	19
SSE	0	0	0	0	2	3	4	3	0	0	0	0	12
S	0	0	0	0	0	1	1	0	0	0	0	0	2
SSW	0	0	0	0	1	2	0	0	0	0	0	0	3
SW	0	0	0	0	1	2	0	0	0	0	0	0	3
WSW	0	0	0	0	1	3	2	1	0	0	0	0	7
W	0	0	0	0	0	0	2	0	0	0	0	0	2
WNW	0	0	0	1	1	0	5	1	0	0	4	0	12
NW	0	0	0	0	1	0	8	2	3	1	1	0	16
NNW	0	0	0	1	0	2	4	2	1	0	0	0	10
TOTALS	0	0	2	11	26	68	90	47	24	6	8	0	282

NUMBER OF VALID HOURS 282
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160PASQUILL F
MODERATELY STABLE ($1.5 \leq \Delta T/\Delta Z \leq -0.5$ °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	0	1	1	1	1	4	6	4	1	0	0	0	19
NNE	0	0	0	2	8	20	72	32	12	0	0	0	146
NE	0	2	0	5	9	26	16	5	3	2	1	0	69
ENE	0	0	0	1	2	9	4	0	0	0	0	0	16
E	0	0	0	0	1	6	2	2	0	0	0	0	11
ESE	0	0	0	0	3	3	1	0	0	0	0	0	7
SE	0	0	0	0	1	4	2	0	1	0	0	0	8
SSE	0	0	0	1	0	0	4	1	0	0	0	0	6
S	0	0	0	0	0	1	0	0	0	0	0	0	1
SSW	0	0	0	0	0	1	0	0	0	0	0	0	1
SW	0	0	0	0	1	1	0	0	0	0	0	0	2
WSW	0	0	0	1	2	1	0	0	0	0	0	0	4
W	0	0	0	0	0	1	0	0	0	0	0	0	1
WNW	0	0	0	0	0	1	3	4	1	0	0	0	9
NW	0	0	0	0	0	1	3	1	0	0	0	0	5
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	3	1	11	28	79	113	49	18	2	1	0	305

NUMBER OF VALID HOURS 305
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 98123124-99033123
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	1	2	5	1	3	0	0	0	12
NNE	3	0	0	1	5	16	69	120	81	17	0	0	312
NE	0	0	0	2	4	15	42	20	7	1	0	0	91
ENE	0	0	0	2	4	9	6	0	0	0	0	0	21
E	0	0	0	0	2	1	1	1	0	0	0	0	5
ESE	0	0	0	0	1	1	1	0	0	0	0	0	3
SE	0	1	0	0	1	2	0	0	0	0	0	0	4
SSE	0	0	0	1	0	1	1	0	0	0	0	0	3
S	0	0	0	0	0	0	1	0	0	0	0	0	1
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	2	0	0	0	1	1	0	0	0	0	0	0	4
W	0	0	0	1	1	0	2	0	0	0	0	0	4
WNW	0	0	0	0	0	2	6	1	0	0	0	0	9
NW	0	0	1	0	0	1	0	1	0	0	0	0	3
NNW	0	0	0	0	0	0	2	4	1	0	0	0	7
TOTALS	5	1	1	7	20	52	136	148	92	18	0	0	480

NUMBER OF VALID HOURS 480
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 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	0	1	2	5	5	12	25	14	8	1	0	0	73
NNE	5	0	1	10	16	68	192	177	99	18	0	0	586
NE	0	2	0	10	24	56	65	31	19	5	6	0	218
ENE	0	0	0	3	7	20	13	1	3	0	0	0	47
E	0	0	0	2	4	14	5	8	4	1	0	0	38
ESE	0	0	0	1	12	13	8	3	13	0	2	0	52
SE	0	1	0	2	6	13	34	32	25	10	8	0	131
SSE	0	0	1	2	4	16	34	29	15	3	3	0	107
S	0	0	0	3	4	10	39	32	16	5	0	1	110
SSW	0	1	1	2	8	19	27	21	8	2	1	1	91
SW	0	0	1	2	8	13	40	19	6	1	1	0	91
WSW	2	0	0	3	8	14	53	27	17	5	0	0	129
W	0	0	1	1	3	12	76	62	27	3	1	1	187
WNW	0	0	0	2	2	14	43	46	42	3	7	0	159
NW	1	0	1	3	5	6	23	25	20	7	2	0	93
NNW	0	0	1	1	1	7	15	14	8	1	0	0	48
TOTALS	8	5	9	52	117	307	692	541	330	65	31	3	2160

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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99033124-99063023
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	0	1	1	0	0	0	0	2
SSE	0	0	0	0	0	1	0	3	3	3	0	0	10
S	0	0	0	0	0	1	4	18	26	15	0	0	64
SSW	0	0	0	0	0	3	12	17	26	1	1	0	60
SW	0	0	0	0	0	4	22	55	22	1	0	0	104
WSW	0	0	0	0	0	2	37	78	28	5	0	0	150
W	0	0	0	0	0	3	26	100	64	1	0	0	194
WNW	0	0	0	0	0	1	9	11	16	4	7	0	48
NW	0	0	0	0	0	0	1	0	0	1	1	0	3
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	15	112	283	185	31	9	0	635

NUMBER OF VALID HOURS	635	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2	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	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	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	3	1	1	0	0	5
S	0	0	0	0	0	1	3	4	3	2	1	0	14
SSW	0	0	0	0	0	0	4	6	8	2	0	0	20
SW	0	0	0	0	1	1	10	6	8	0	0	0	26
WSW	0	0	0	0	0	0	7	2	1	1	0	0	11
W	0	0	0	0	0	0	5	0	0	0	1	0	6
WNW	0	0	0	0	0	1	3	3	0	0	0	0	7
NW	0	0	0	0	0	0	0	0	1	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	1	3	32	24	22	6	2	0	90

NUMBER OF VALID HOURS	90	NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2	TOTAL HOURS FOR THE PERIOD	2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99033124-99063023
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	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	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	1	0	1	0	0	0	2
SSE	0	0	0	0	1	0	0	0	3	0	0	0	4
S	0	0	0	0	1	1	2	5	2	3	2	0	16
SSW	0	0	0	0	0	0	3	8	8	0	0	0	19
SW	0	0	0	0	0	0	5	9	4	1	0	0	19
WSW	0	0	0	0	0	2	4	1	4	1	0	0	12
W	0	0	0	0	0	1	2	1	0	0	0	0	4
WNW	0	0	0	0	0	1	3	1	1	0	0	0	6
NW	0	0	0	0	0	0	0	2	0	1	0	0	3
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	2	5	21	27	23	6	2	0	86

NUMBER OF VALID HOURS 86
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 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	0	1	1	9	14	1	0	0	0	0	26
NNE	0	0	0	0	1	7	27	5	0	0	0	0	40
NE	0	0	0	1	1	4	18	6	1	0	0	0	31
ENE	0	0	0	0	1	6	7	4	1	0	0	0	19
E	0	0	0	0	0	4	6	15	1	0	0	0	26
ESE	0	0	0	0	1	6	13	6	4	1	1	0	32
SE	0	0	0	2	1	7	25	45	35	10	5	0	130
SSE	0	0	0	0	0	12	54	35	54	32	17	0	204
S	0	0	0	0	1	5	33	31	38	22	5	3	138
SSW	0	0	0	0	3	11	32	15	15	5	1	1	83
SW	0	0	0	1	3	13	19	12	6	2	0	0	56
WSW	0	0	0	0	4	9	15	4	2	1	1	0	36
W	0	0	0	3	3	8	19	5	1	5	1	0	45
WNW	0	0	0	0	2	10	21	6	4	3	2	2	50
NW	0	0	0	0	3	11	12	13	5	4	0	0	48
NNW	0	0	0	0	2	6	9	4	1	0	0	0	22
TOTALS	0	0	0	8	27	128	324	207	168	85	33	6	986

NUMBER OF VALID HOURS 986
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99033124-99063023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL 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	0	0	1	5	4	0	0	0	0	0	10
NNE	0	0	0	2	0	9	20	6	0	0	0	0	37
NE	0	0	0	1	3	4	5	0	0	0	0	0	13
ENE	0	0	0	0	1	1	1	0	0	0	0	0	3
E	1	0	0	2	0	3	3	2	1	0	0	0	12
ESE	0	0	0	0	1	5	6	1	0	0	0	0	13
SE	0	0	0	0	1	1	5	5	3	0	0	0	15
SSE	0	0	0	1	1	2	6	0	0	0	0	0	10
S	0	0	0	0	0	3	3	0	0	0	0	0	6
SSW	0	0	0	0	1	2	1	0	0	0	0	0	4
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	1	1	0	0	0	0	0	0	0	2
WNW	0	0	0	0	1	0	4	2	0	0	0	0	7
NW	0	0	0	0	0	0	1	1	0	0	2	0	4
NNW	0	0	0	0	0	3	0	0	1	0	0	0	4
TOTALS	1	0	0	7	11	38	59	17	5	0	2	0	140

NUMBER OF VALID HOURS 140
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °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	0	0	0	0	0	2	1	0	0	0	0	0	3
NNE	0	0	0	1	3	13	23	10	3	1	0	0	54
NE	0	0	0	0	4	7	7	1	0	0	0	0	19
ENE	0	0	0	0	2	4	0	0	0	0	0	0	6
E	0	0	0	0	2	0	1	0	0	0	0	0	3
ESE	0	0	0	0	0	3	0	0	0	0	0	0	3
SE	0	0	0	0	1	0	0	1	0	0	0	0	2
SSE	0	0	0	0	0	0	4	0	0	0	0	0	4
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	1	1	0	0	0	0	0	0	0	2
WSW	0	0	0	0	0	1	1	0	0	0	0	0	2
W	0	0	0	0	0	0	0	1	0	0	0	0	1
WNW	0	0	0	0	0	0	0	4	0	0	0	0	4
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	1	1	0	0	0	0	0	2
TOTALS	0	0	0	2	13	31	38	17	3	1	0	0	105

NUMBER OF VALID HOURS 105
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99033124-99063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL G EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)													TOTAL
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	
N	0	0	0	0	0	0	1	0	0	0	0	0	1
NNE	0	0	0	0	1	5	28	36	17	5	0	0	92
NE	0	0	0	0	3	6	14	3	0	0	0	0	26
ENE	0	0	0	0	0	0	2	0	0	0	0	0	2
E	0	0	0	0	0	0	1	0	0	0	0	0	1
ESE	0	0	0	0	1	0	0	0	0	0	0	0	1
SE	0	0	0	0	1	1	0	0	0	0	0	0	2
SSE	0	0	0	1	0	0	0	0	0	0	0	0	1
S	0	0	0	1	0	0	0	0	0	0	0	0	1
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	0	1	1	0	0	0	0	0	2
W	0	0	0	0	0	2	0	0	0	0	0	0	2
WNW	0	0	0	0	0	0	2	4	0	0	0	0	6
NW	0	0	0	0	0	0	0	1	0	0	0	0	1
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS	0	0	0	2	6	16	49	44	18	5	0	0	140

NUMBER OF VALID HOURS 140
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ALL STABILITY CLASSES, ALL DT/DZ WIND SPEED (M/S) AT 10 METER LEVEL													TOTAL
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	
N	0	0	0	1	2	16	20	1	0	0	0	0	40
NNE	0	0	0	3	5	34	98	57	20	6	0	0	223
NE	0	0	0	2	11	21	45	10	1	0	0	0	90
ENE	0	0	0	0	4	11	10	4	1	0	0	0	30
E	1	0	0	2	2	7	11	17	2	0	0	0	42
ESE	0	0	0	0	3	14	19	7	4	1	1	0	49
SE	0	0	0	2	4	9	32	52	39	10	5	0	153
SSE	0	0	0	2	2	15	64	41	61	36	17	0	238
S	0	0	0	1	2	11	45	58	69	42	8	3	239
SSW	0	0	0	0	4	17	52	46	57	8	2	1	187
SW	0	0	0	2	5	18	56	82	40	4	0	0	207
WSW	0	0	0	0	4	15	65	85	35	8	1	0	213
W	0	0	0	4	4	14	52	107	65	6	2	0	254
WNW	0	0	0	0	3	13	42	31	21	7	9	2	128
NW	0	0	0	0	3	11	14	16	7	6	3	0	60
NNW	0	0	0	0	2	10	10	5	2	0	0	0	29
TOTALS	1	0	0	19	60	236	635	619	424	134	48	6	2182

NUMBER OF VALID HOURS 2182
NUMBER OF INVALID HOURS 2NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

July - September

TABLE 4A

SITE: SAN ONOFRE
 PERIOD OF RECORD 99063024-99093023
 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	1	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	0	0	1	0	0	0	1
SSE	0	0	0	0	0	1	1	1	3	1	0	0	7
S	0	0	0	0	2	7	9	9	11	4	1	0	43
SSW	0	0	0	0	1	4	9	15	22	3	0	0	54
SW	0	0	0	1	7	5	16	28	11	0	0	0	68
WSW	0	0	0	2	6	20	38	50	15	0	0	0	131
W	0	0	0	0	4	13	43	102	47	1	0	0	210
WNW	0	0	0	0	0	10	31	59	62	3	0	0	165
NW	0	0	0	0	0	0	0	3	7	0	0	0	10
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	3	20	60	147	268	179	12	1	0	690

NUMBER OF VALID HOURS 690
 NUMBER OF INVALID HOURS 0

NUMBER OF CALMS 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	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	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	2	0	0	0	0	2
S	0	0	0	0	0	2	2	0	1	2	0	0	7
SSW	1	0	0	0	1	2	2	9	2	0	0	0	17
SW	0	0	0	0	0	3	8	7	4	0	0	0	22
WSW	0	0	0	0	0	1	5	1	0	0	0	0	7
W	0	0	0	1	0	2	7	0	0	0	0	0	10
WNW	0	0	0	0	0	1	3	1	1	0	0	0	6
NW	0	0	0	0	0	1	1	3	1	0	0	0	6
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1	0	0	1	1	12	28	23	9	2	0	0	77

NUMBER OF VALID HOURS 77
 NUMBER OF INVALID HOURS 0

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99063024-99093023
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	1	0	1	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	1	0	0	0	0	0	0	1
SSE	0	0	0	0	0	0	0	6	0	0	0	0	6
S	0	0	0	0	0	2	4	2	0	1	0	0	9
SSW	0	0	0	0	0	0	2	10	5	1	0	0	18
SW	0	0	0	0	3	3	4	5	3	0	0	0	18
WSW	0	0	0	0	0	2	3	0	0	0	0	0	5
W	0	0	0	0	0	2	7	3	0	0	0	0	12
WNW	0	0	0	0	0	1	3	2	0	0	0	0	6
NW	0	0	0	0	0	0	2	5	6	0	0	0	13
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	4	11	26	33	14	2	0	0	90

NUMBER OF VALID HOURS 90
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 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	0	0	2	5	15	10	5	0	0	1	0	38
NNE	0	0	1	2	7	20	33	4	0	0	0	0	67
NE	0	0	0	2	4	8	14	0	0	0	0	0	28
ENE	0	0	0	0	1	7	2	0	0	0	0	0	10
E	0	0	0	0	2	3	7	0	0	0	0	0	12
ESE	0	0	0	2	1	6	5	2	4	1	0	0	21
SE	0	0	0	2	2	13	28	18	14	0	1	0	78
SSE	0	0	1	1	10	24	52	38	24	5	0	0	155
S	0	1	2	3	7	19	34	28	21	1	0	0	116
SSW	0	0	0	5	5	10	20	18	14	0	0	0	72
SW	0	1	0	4	5	18	15	6	0	1	0	0	50
WSW	0	0	1	3	6	13	9	2	1	0	0	0	35
W	0	0	2	1	6	17	23	8	3	0	0	0	60
WNW	0	1	2	2	7	14	32	6	4	0	0	0	68
NW	0	0	0	1	4	7	21	21	11	1	0	0	66
NNW	0	1	0	4	5	13	18	5	0	0	0	0	46
TOTALS	0	4	9	34	77	207	323	161	96	9	2	0	922

NUMBER OF VALID HOURS 922
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

July - September

TABLE 4A

SITE: SAN ONOFRE
 PERIOD OF RECORD 99063024-99093023
 WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)													TOTAL
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	
N	0	0	1	0	7	8	10	1	0	0	0	0	27
NNE	0	0	3	4	8	26	27	1	0	0	0	0	69
NE	0	0	1	1	4	5	3	0	0	0	0	0	14
ENE	0	0	1	1	1	0	1	0	0	0	0	0	4
E	0	0	0	2	2	6	1	0	0	0	0	0	11
ESE	0	0	0	0	2	0	0	0	0	0	0	0	2
SE	0	0	0	0	2	2	3	6	1	0	0	0	14
SSE	0	0	0	2	2	3	9	0	0	0	0	0	16
S	0	0	1	0	4	2	2	0	0	0	0	0	9
SSW	0	0	2	3	2	2	2	1	0	0	0	0	12
SW	0	0	0	0	3	0	2	1	0	0	0	0	6
WSW	0	1	0	0	0	6	2	0	1	0	0	0	10
W	0	1	0	6	1	3	5	0	0	0	0	0	16
WNW	0	0	0	1	2	2	4	1	1	0	0	0	11
NW	0	0	1	2	0	1	3	2	0	0	0	0	9
NNW	0	0	0	2	1	4	1	1	0	0	0	0	9
TOTALS	0	2	10	24	41	70	75	14	3	0	0	0	239

NUMBER OF VALID HOURS 239
 NUMBER OF INVALID HOURS 0

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL F MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)													TOTAL
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	
N	0	0	0	2	2	1	4	1	1	0	0	0	11
NNE	0	1	1	0	2	15	35	7	2	0	0	0	63
NE	0	0	0	3	3	12	5	0	0	0	0	0	23
ENE	0	0	0	0	0	2	0	0	0	0	0	0	2
E	0	0	0	0	1	1	0	0	0	0	0	0	2
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1
SE	0	0	0	1	0	1	0	0	1	0	0	0	3
SSE	0	0	0	1	0	1	0	1	0	0	0	0	3
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	1	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	1	0	0	0	0	0	0	2	0	0	0	3
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	1	1	1	0	0	0	3
TOTALS	0	2	1	8	8	33	46	10	7	0	0	0	115

NUMBER OF VALID HOURS 115
 NUMBER OF INVALID HOURS 0

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99063024-99093023
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	2	0	2	0	0	0	0	0	4
NNE	0	0	0	0	0	2	18	32	3	0	0	0	55
NE	0	0	0	0	0	1	1	0	0	0	0	0	2
ENE	0	0	0	2	1	0	1	0	0	0	0	0	4
E	0	0	0	0	1	0	0	0	0	0	0	0	1
ESE	0	0	0	0	1	1	0	0	0	0	0	0	2
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	1	0	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	1	0	0	0	0	0	0	0	0	1
W	0	0	0	0	0	0	0	0	1	0	0	0	1
WNW	0	0	0	0	0	0	0	0	0	1	0	0	1
NW	0	0	0	0	0	0	0	0	1	0	0	0	1
NNW	0	0	0	1	0	1	0	0	0	0	0	0	2
TOTALS	0	0	0	4	6	5	22	32	5	1	0	0	75

NUMBER OF VALID HOURS 75
NUMBER OF INVALID HOURS 0NUMBER OF CALMS 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	0	0	1	4	16	24	26	7	1	0	1	0	80
NNE	0	1	5	6	18	63	114	45	5	0	0	0	257
NE	0	0	1	6	11	26	23	0	0	0	0	0	67
ENE	0	0	1	3	3	9	4	0	0	0	0	0	20
E	0	0	0	2	6	10	8	0	0	0	0	0	26
ESE	0	0	0	2	4	7	6	2	4	1	0	0	26
SE	0	0	0	3	4	17	31	24	17	0	1	0	97
SSE	0	0	1	4	12	29	62	48	27	6	0	0	189
S	0	1	3	3	13	32	51	39	33	8	1	0	184
SSW	1	0	2	8	10	18	35	53	43	4	0	0	174
SW	0	1	0	5	18	29	45	47	18	1	0	0	164
WSW	0	1	1	7	12	42	57	53	17	0	0	0	190
W	0	1	2	8	11	37	85	113	51	1	0	0	309
WNW	0	2	2	3	9	28	73	69	70	4	0	0	260
NW	0	0	1	3	4	9	27	34	26	1	0	0	105
NNW	0	1	0	7	6	18	20	7	1	0	0	0	60
TOTALS	1	8	20	74	157	398	667	541	313	26	3	0	2208

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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

October - December

TABLE 4A

SITE: SAN ONOFRE
 PERIOD OF RECORD 99093024-99123123
 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	3	0	0	3
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	1	0	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	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	2	2	0	0	0	4
S	0	0	0	0	0	1	16	9	7	0	0	0	33
SSW	0	0	0	0	0	1	12	2	0	0	0	0	15
SW	0	0	0	0	0	15	8	7	1	0	0	0	31
WSW	0	0	0	0	0	6	20	14	2	0	0	0	42
W	0	0	0	0	1	4	40	52	8	0	0	0	105
WNW	0	0	0	0	0	1	28	35	26	2	1	0	93
NW	0	0	0	0	0	0	2	2	3	1	0	0	8
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	2	28	126	123	49	6	1	0	335

NUMBER OF VALID HOURS 335
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL B MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °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	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	1	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	1	0	0	0	0	2
SSE	0	0	0	0	0	0	0	1	0	0	0	0	1
S	0	0	0	0	0	0	1	0	0	0	0	0	1
SSW	0	0	0	1	0	1	0	1	0	0	0	0	3
SW	0	0	0	0	0	0	1	1	0	0	0	0	2
WSW	0	0	0	0	0	0	1	0	0	0	0	0	1
W	0	0	0	0	0	1	2	1	0	0	0	0	4
WNW	0	0	0	0	0	0	3	8	0	0	0	0	11
NW	0	0	0	0	0	0	0	2	1	0	0	0	3
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	1	1	2	8	15	2	0	0	0	29

NUMBER OF VALID HOURS 29
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

October - December

TABLE 4A

SITE: SAN ONOFRE

PERIOD OF RECORD 99093024-99123123

WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	PASQUILL C SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)												TOTAL
	.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	
N	0	0	0	0	0	0	0	1	1	0	0	0	2
NNE	0	0	0	0	0	0	1	0	0	0	1	0	2
NE	0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	4	0	0	0	4
S	0	0	0	0	0	4	4	0	0	0	0	0	8
SSW	0	0	0	0	0	0	3	2	0	0	0	0	5
SW	0	0	0	0	0	1	1	0	0	0	0	0	2
WSW	0	0	0	0	0	0	5	0	0	0	0	0	5
W	0	0	0	0	0	1	0	1	0	0	0	0	2
WNW	0	0	0	0	0	0	2	1	0	0	0	0	3
NW	0	0	0	0	0	0	3	1	2	0	0	0	6
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	6	19	6	7	1	1	0	40

NUMBER OF VALID HOURS 40

NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0

TOTAL HOURS FOR THE PERIOD 2208

WIND DIR	PASQUILL D NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)												TOTAL
	.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	
N	0	0	0	0	1	5	6	3	0	1	0	0	16
NNE	0	0	0	0	2	4	13	6	2	0	0	0	27
NE	0	0	0	0	0	2	2	4	3	1	0	0	12
ENE	0	0	0	1	0	0	2	0	0	0	0	0	3
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	2	1	1	1	1	0	0	6
SE	0	0	0	0	0	1	6	3	3	1	0	0	14
SSE	0	0	1	2	1	3	13	12	5	0	1	0	38
S	0	0	0	1	1	6	8	6	6	2	0	0	30
SSW	0	0	0	0	4	3	7	3	3	0	0	0	20
SW	0	0	0	2	1	7	6	2	0	0	0	0	18
WSW	0	0	0	2	1	6	2	2	1	0	0	0	14
W	0	0	0	0	1	10	16	0	0	0	0	0	27
WNW	0	0	0	2	5	3	10	15	3	0	0	0	38
NW	0	0	0	1	2	6	10	17	12	5	1	0	54
NNW	0	0	0	0	3	4	7	5	1	0	0	0	20
TOTALS	0	0	1	11	22	62	109	79	40	11	2	0	337

NUMBER OF VALID HOURS 337

NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0

TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

October - December

TABLE 4A

SITE: SAN ONOFRE
 PERIOD OF RECORD 99093024-99123123
 WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)													TOTAL
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	
N	0	0	0	3	3	10	12	4	1	0	0	0	33
NNE	0	1	0	1	14	22	42	10	2	2	0	0	94
NE	0	0	0	2	4	10	10	1	4	0	8	0	39
ENE	0	0	0	2	3	5	5	1	3	0	0	0	19
E	0	0	1	0	2	1	3	7	0	0	0	0	14
ESE	0	0	0	1	2	6	6	2	1	0	0	0	18
SE	0	0	0	1	2	8	13	9	6	0	0	0	39
SSE	0	0	0	2	4	1	12	9	3	1	1	0	33
S	0	0	0	0	4	8	7	0	1	1	0	0	21
SSW	0	0	0	0	1	6	1	0	0	0	0	0	8
SW	0	1	0	0	0	3	2	2	1	0	0	0	9
WSW	0	0	0	2	3	3	2	0	0	0	0	0	10
W	0	0	0	0	0	7	13	1	0	0	0	0	21
WNW	1	0	0	0	1	3	8	15	1	0	0	0	29
NW	0	0	0	1	3	5	5	9	2	0	0	0	25
NNW	0	0	0	1	1	2	10	5	1	1	0	0	21
TOTALS	1	2	1	16	47	100	151	75	26	5	9	0	433

NUMBER OF VALID HOURS 433
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL F MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)													TOTAL
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	
N	0	0	1	4	3	4	12	5	1	0	0	0	30
NNE	0	0	0	3	12	37	80	29	7	0	0	0	168
NE	0	0	0	5	9	20	23	7	4	1	0	0	69
ENE	0	0	1	1	6	7	3	0	1	0	0	0	19
E	0	0	0	4	6	5	4	1	0	0	0	0	20
ESE	0	0	1	3	2	4	6	0	0	0	0	0	16
SE	0	0	0	0	0	7	3	2	2	0	0	0	14
SSE	0	0	0	1	0	4	4	4	1	0	0	0	14
S	0	0	0	3	1	7	2	0	0	0	0	0	13
SSW	0	0	0	0	0	4	2	0	0	0	0	0	6
SW	0	0	0	1	0	1	0	0	0	0	0	0	2
WSW	0	0	0	1	1	1	3	1	1	0	0	0	8
W	0	0	0	0	1	5	5	2	0	0	0	0	13
WNW	0	0	0	1	1	1	9	6	1	1	0	0	20
NW	0	0	1	0	3	1	5	3	3	0	0	0	16
NNW	0	0	0	1	1	2	3	2	2	0	0	0	11
TOTALS	0	0	4	28	46	110	164	62	23	2	0	0	439

NUMBER OF VALID HOURS 439
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1999)

METEOROLOGY

October - December
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 99093024-99123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL 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	1	2	12	1	5	1	0	0	22
NNE	0	0	0	2	1	7	79	157	70	13	0	0	329
NE	0	0	0	0	6	16	35	18	13	1	0	0	89
ENE	0	0	1	2	0	5	7	2	0	0	0	0	17
E	0	0	0	5	2	3	2	1	0	0	0	0	13
ESE	3	0	0	2	4	3	5	1	1	0	0	0	19
SE	0	0	0	3	1	2	3	3	0	0	0	0	12
SSE	0	0	1	0	6	1	6	4	0	0	0	0	18
S	0	0	0	1	1	2	0	0	0	0	0	0	4
SSW	0	0	0	2	1	4	0	0	0	0	0	0	7
SW	0	0	0	1	1	2	0	0	0	0	0	0	4
WSW	0	0	0	0	2	0	0	0	0	0	0	0	2
W	0	0	0	0	0	4	3	0	0	0	0	0	7
WNW	0	0	0	0	0	4	8	3	2	0	0	0	17
NW	0	0	0	0	0	0	6	5	1	1	0	0	13
NNW	1	0	0	1	0	3	3	2	1	0	0	0	11
TOTALS	4	0	2	19	26	58	169	197	93	16	0	0	584

NUMBER OF VALID HOURS 584
NUMBER OF INVALID HOURS 11NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208ALL 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	1	7	8	21	42	14	8	2	0	0	103
NNE	0	1	0	6	29	70	215	202	81	15	1	0	620
NE	0	0	0	7	19	48	70	30	25	7	8	0	214
ENE	0	0	2	6	9	17	17	3	4	0	0	0	58
E	0	0	1	9	11	9	9	9	0	0	0	0	48
ESE	3	0	1	6	8	15	18	4	3	1	0	0	59
SE	0	0	0	4	4	18	25	18	11	1	0	0	81
SSE	0	0	2	5	11	9	35	32	15	1	2	0	112
S	0	0	0	5	7	28	38	15	14	3	0	0	110
SSW	0	0	0	3	6	19	25	8	3	0	0	0	64
SW	0	1	0	4	2	29	18	12	2	0	0	0	68
WSW	0	0	0	5	7	16	33	17	4	0	0	0	82
W	0	0	0	0	3	32	79	57	8	0	0	0	179
WNW	1	0	0	3	7	12	68	83	33	3	1	0	211
NW	0	0	1	2	8	12	31	39	24	7	1	0	125
NNW	1	0	0	3	5	11	23	14	5	1	0	0	63
TOTALS	5	2	8	75	144	366	746	557	240	41	13	0	2197

NUMBER OF VALID HOURS 2197
NUMBER OF INVALID HOURS 11NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208