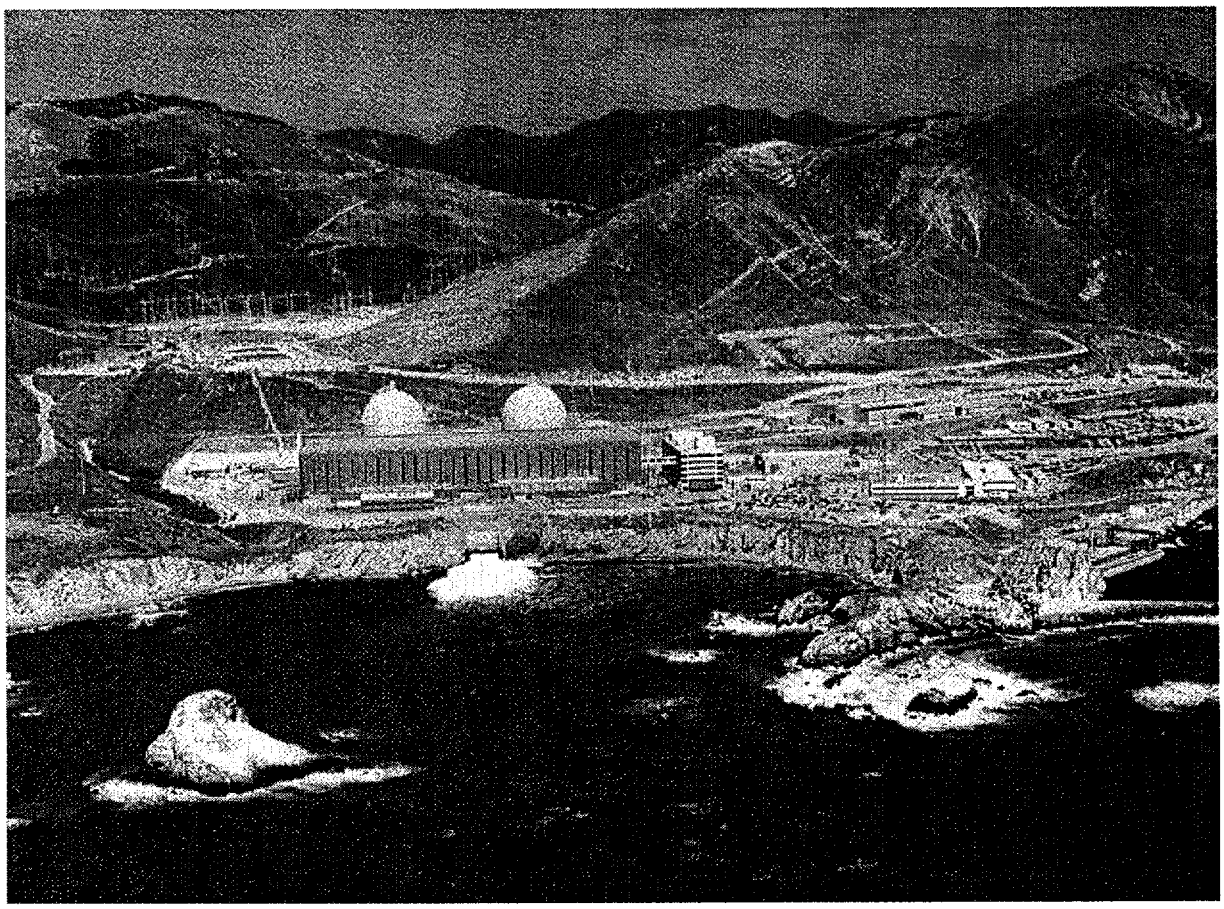
Enclosure
PG&E Letter DCL-00-061

DIABLO CANYON POWER PLANT
1999 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1 - December 31, 1999

DIABLO CANYON POWER PLANT

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT



JANUARY 1 - DECEMBER 31, 1999

DIABLO CANYON POWER PLANT

Annual Radioactive Effluent Release Report
January 1, 1999 Through December 31, 1999

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Attachments

1. Environmental Radiological Monitoring Procedure (ERMP), RP1.ID11 Revision 4
2. Off-Site Dose Calculation Procedure (ODCP), CAP A-8 Revision 23
3. Off-Site Dose Calculation Procedure (ODCP), CAP A-8 Revision 23A
4. 1999 Land Use Census

DIABLO CANYON POWER PLANT

1999 Annual Radioactive Effluent Release Report

Introduction

The 1999 Annual Radioactive Effluent Release Report summarizes gaseous and liquid effluent releases from Diablo Canyon Power Plant's (DCPP) Units 1 and 2. The report includes the dose due to release of radioactive liquid and gaseous effluents and summarizes solid radwaste shipments. The report contains information required by Units 1 and 2 Technical Specification (TS) 6.9.1.6 and 6.14, and is presented in the general format of Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water Nuclear Power Plants," Appendix B, "Effluent and Waste Disposal Report." Procedure revisions which implement the Radiological Monitoring and Controls Program (RMCP), Radioactive Effluent Control Procedure (RECP), Off-Site Dose Calculation Procedure (ODCP), and Process Control Program (PCP), and three diskettes containing meteorological data are attached.

In all cases, the plant effluent releases were well below TS limits for the report period.

I. Supplemental Information

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Dose Rate Limit

The dose rate in areas at or beyond the site boundary due to radioactive noble gases released in gaseous effluents is limited to less than or equal to 500 millirem (mR) per year to the total body and less than or equal to 3000 mR per year to the skin. (Radioactive Effluent Control Procedure 6.1.6.1.a.)

b. Particulate and Iodine Dose Rate Limit

The dose rate in areas at or beyond the site boundary due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents, is limited to less than or equal to 1500 mR per year to any organ. (RECP 6.1.6.1.b)

c. Noble Gas Dose Limit

The air dose due to noble gases released in gaseous effluents from each reactor unit to areas at or beyond the site boundary is limited to the following:

Radiation Type	Calendar Quarter Limit RECP 6.1.7.1.a	Calendar Year Limit RECP 6.1.7.1.b
Gamma	5 millirad	10 millirad
Beta	10 millirad	20 millirad

d. Particulate and Iodine Dose Limit

The dose to an individual from iodine 131, iodine 133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents released from each reactor unit to areas at or beyond the site boundary is limited to less than or equal to 7.5 mR to any organ in any calendar quarter and less than or equal to 15 mR to any organ during a calendar year. (RECP 6.1.8.1)

2. Liquid Effluents

a. Concentration

The concentration of radioactive material released from the site is limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration is limited to 2×10^{-4} microcuries/milliliter (μCi/ml) total activity. (RECP 6.1.3.1)

b. Dose

The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released from each reactor unit to areas at or beyond the site boundary is limited to the following:

Dose Type	**Calendar Quarter Limit RECP 6.1.4.1**	**Calendar Year Limit RECP 6.1.4.1**
Total Body	1.5 millirem	3 millirem
Any Organ	5 millirem	10 millirem

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum permissible concentrations are not used for determining allowable release rates for gaseous effluents at DCPP.

2. Liquid Effluents

The concentrations listed in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases are used for determining the allowable release concentration at the point of discharge from the site for liquid effluents. For dissolved or entrained noble gases, the allowable release concentration at the point of discharge is limited to 2×10^{-4} μCi/ml total activity for liquid effluents.

C. Measurements and Approximations of Total Radioactivity

1. Gaseous Effluents

a. Fission and Activation Gases

The gaseous radioactivity released from the plant vent is monitored by a pair of off-line monitors equipped with beta scintillator detectors. The monitor readings are correlated to isotopic concentration based on laboratory isotopic analysis of grab samples using a germanium detector.

When plant vent measurements as indicated by the process monitors are below the lower limit of detection, grab samples results are used to quantify releases. The individual batch release data are used to quantify the radioactivity discharged from the gas decay tanks and containment.

A noble gas grab sample is obtained and analyzed at least weekly. The isotopic mixture is assumed to remain constant between grab sample analyses.

Containment purges, gas decay tank releases, and air ejector discharges are released via the plant vent.

The gaseous radioactivity released from the steam generator blowdown tank vent is measured by analyzing liquid or steam condensate grab samples with a germanium detector. A factor R, a ratio of unit masses between water flashing to steam and water entering the tank, is used to calculate the activity. The isotopic concentrations are assumed to remain constant between grab samples.

Other potential pathways for releasing gaseous radioactivity are periodically monitored by collecting grab samples and analyzing these samples with a germanium detector system.

b. Iodines

Radioiodines released from the plant vent are monitored by continuous sample collection on silver zeolite cartridges. The cartridges are changed at least weekly and analyzed with a germanium detector. The radioiodine releases are averaged over the period of cartridge sample collection.

Other potential pathways for releasing radioiodines are periodically monitored by collecting samples using charcoal cartridges and analyzing with a germanium detector.

Radioactive materials in particulate form released from the plant vent are monitored by continuous sample collection on particulate filters. The filters are changed at least weekly and analyzed with a germanium detector. The particulate radioactivity is averaged over the period of particulate filter sample collection. Each filter is analyzed for alpha emitters using an internal proportional counter. Plant vent particulate filters collected during a quarter are used for the composite analysis for strontium-89 and -90 which is counted on an internal proportional counter after chemical separation.

Other potential pathways for releasing radioactive particulate are periodically monitored by collecting samples using particulate filters and analyzing these filters with a germanium detector.

c. Tritium

Tritium released from the plant vent is monitored by passing a measured volume of plant vent sample through a water column and determining the tritium increase in the water. An aliquot of the water is counted in a liquid scintillation spectrometer. The minimum routine sample frequency for tritium is weekly. The tritium concentration is assumed to remain constant between samples.

d. Estimations of Overall Error

Sources of error considered for batch release are: (1) calibration source; (2) calibration counting; (3) sampling; (4) sample counting; and (5) gas decay tank pressure gauge / containment exhaust fan flow rate.

Sources of error for continuous release are: (1) calibration source; (2) calibration counting; (3) sampling; (4) sample counting; (5) process monitor (RE-14) reading (fission gases only); and (6) plant vent exhaust fan flow rate.

Total error = $(\sigma^2_1 + \sigma^2_2 + \sigma^2_3 + \ldots \sigma^2_i)^{1/2}$

Where σ_i = error associated with each component

2. Liquid Effluents

a. Batch Releases

Each tank of liquid radwaste is analyzed for principal gamma emitters using a germanium detector prior to release. A monthly prerelease analysis includes dissolved and entrained gases. Volume proportional monthly and quarterly composites are prepared from aliquots of each tank volume discharged. The monthly composite is analyzed for tritium using a liquid scintillation spectrometer and gross alpha radioactivity using an internal proportional

counter. The quarterly composite is analyzed for iron-55 using a liquid scintillation spectrometer and for strontium-89 and -90 using an internal proportional detector following chemical separations.

b. Continuous releases

For the continuous liquid releases of the steam generator blowdown tank and turbine building sump oily water separator, daily grab samples are collected and aliquots are proportioned for weekly, monthly, and quarterly composites.

The oily water separator weekly composite is analyzed for principal gamma emitters using a germanium detector. The steam generator blowdown tank weekly composite is analyzed for principal gamma emitters and iodine-131.

The steam generator blowdown tank monthly composite is analyzed for tritium using a liquid scintillation spectrometer and for gross alpha using an internal proportional counter.

The steam generator blowdown tank quarterly composite is analyzed for iron-55 using a liquid scintillation spectrometer and for strontium-89 and strontium-90 using an internal proportional counter following chemical separation. The results for each of the composites are averaged over the period of the composite.

In addition, one grab sample of the steam generator blowdown tank is analyzed monthly for dissolved and entrained gases using a germanium detector. The results of this analysis are assumed to remain constant over the period of one month.

On a routine basis, a grab sample of the steam generator blowdown is analyzed at least every 72 hours and analyzed for gamma activity using a germanium detector. This analysis is used to monitor activity, however, is not used in effluent calculations unless a significant change is detected.

Note on Dilution volume:

Tables 4A, 4B and 4C, "Liquid Effluents - Summation Of All Releases," item F., lists the "Volume of circulating water used during release periods" in liters. This value is calculated by multiplying the discharge duration by the circulating water flow rate. The values listed in the Tables are the summation of the circulating water discharge volume calculated for each individual batch and continuous discharge period. Therefore, in the case where two or more simultaneous discharges into the same circulating water are occurring, the calculated volume of circulating water is duplicated, and therefore the sum of the dilution volumes for the batch releases and continuous releases are

greater than the actual dilution volume since each discharge incorporates the circulating discharge flow rate in its own dose calculation.

c. Estimation of Overall Error

Sources of error considered are: (1) calibration source error; (2) calibration counting error; (3) sampling error; (4) sample counting error; and (5) volume of waste release error.

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

Total error = $(\sigma^2_1 + \sigma^2_2 + \sigma^2_3 + \ldots \sigma^2_i)^{1/2}$

Where σ_i = error associated with each component

D. Batch Releases

1. Liquid

a. Number of batch releases..... 631

b. Total time period for batch releases..... 1428.2 hours

c. Maximum time period for a batch release..... 8.17 hours

d. Average time period for a batch release..... 2.26 hours

e. Minimum time period for a batch release..... 0.12 hours

f. Average saltwater flow during batch releases..... 1.59E+6 GPM

2. Gaseous

a. Number of batch releases..... 150

b. Total time period for batch releases..... 1432.88 hours

c. Maximum time period for a batch release..... 72.00 hours

d. Average time period for a batch release..... 9.55 hours

e. Minimum time period for a batch release..... 0.10 hours

E. Abnormal Release (Gaseous and Liquid)

On January 1, 1999, an unplanned, but monitored, release of Unit 1 condensate occurred due to a leak on the Condensate Discharge Overboard Valve CND-1-128. During this event, 8.39E-3 curies of tritium were released. The percent of effluent concentration limit was 5.11 E-4 percent of that specified in RMCP IDAP CY2.ID1, step 6.1.3.1.

II. Major Changes to Liquid, Gaseous and Solid Radwaste Treatment System

There were no major changes to liquid, gaseous, and solid radwaste treatment systems during the report period.

III. Changes to the RMCP

There were no changes to CY2, "Radiological Monitoring And Controls Program," during 1999.

IV. Changes to the RECP

There were no changes to CY2.ID1, "Radioactive Effluents Control Program,".

V. Changes to the ERMP

RP1.ID11, "Environmental Radiological Monitoring Procedure," was revised during the report period. Revision 4 made the following changes:

Step 7.6.1.b: Changed the reference to 10 CFR 20 from ".106" to ".1301."

Table 1, notation 2, was revised to clarify the definition of a TLD to provide consistency between documents.

The text of Section 2.4 was moved to Section 4.

The change was reviewed by the Plant Staff Review Committee (PSRC) and approved by the Plant Manager on February 3, 1999 (see Attachment 1)

VI. Changes to the ODCP

CAP A-8, "Off-Site Dose Calculations," was revised. Revision 23 made the following change:

Table 10.2 was updated with the most recent 5-year meteorology data.

This change was reviewed by the PSRC and approved by the Plant Manager on April 2, 1999. (See Attachment 2).

Revision 23A replaced the acronym "RCMP" to "RECP" throughout the procedure. This "editorial correction" does not require PSRC or Plant Manager approval. (see Attachment 3)

VII. Changes to the Process Control Program

A. There were no changes made to RP2.DC2, "Process Control Program,".

B. RP2.DC4, "Mobile Service Operating Procedures For Low-level Radioactive Waste Processing," Revisions 10, 11 and 12 were made during the reporting period. None of the changes involved the PCP.

VIII. Land Use Census

Changes to the Land Use Census Program are included as Attachment 4.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 1A
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Est.Total Error %
A. Fission and activation gases				
1. Total release	Ci	1.06E+0	2.49E-1	31%
2. Average release rate for period	µCi/sec	1.36E-1	3.16E-2	
3. Percent of technical specification limit[1]	%	6.32E-4	4.35E-5	
B. Iodines				
1. Total iodine-131	Ci	MDA	MDA	24%
2. Average release rate for period	µCi/sec	MDA	MDA	
3. Percent of technical specification limit[1]	%	MDA	MDA	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	3.06E-4	MDA	24%
2. Average release rate for period	µCi/sec	3.94E-5	MDA	
3. Percent of technical specification limit[1]	%	1.41E-5	MDA	
4. Gross alpha radioactivity	Ci	3.11E-7	3.41E-8	
D. Tritium				
1. Total release	Ci	1.08E+2	2.98E+1	13%
2. Average release rate for period	µCi/sec	1.39E+1	3.79E+0	
3. Percent of technical specification limit[1]	%	2.95E-5	8.03E-6	

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[1] RMCP 6.1.6.1 Limit

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 1B
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	Third Quarter	Fourth Quarter	Est.Total Error %
A. Fission and activation gases				
1. Total release	Ci	1.50E+1	3.22E+1	31%
2. Average release rate for period	µCi/sec	1.89E+0	4.05E+0	
3. Percent of technical specification limit[1]	%	5.58E-4	1.15E-3	
B. Iodines				
1. Total iodine-131	Ci	3.67E-5	6.06E-3	24%
2. Average release rate for period	µCi/sec	4.62E-6	7.62E-4	
3. Percent of technical specification limit[1]	%	2.48E-5	4.09E-3	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	1.67E-4	3.02E-4	24%
2. Average release rate for period	µCi/sec	2.11E-5	3.80E-5	
3. Percent of technical specification limit[1]	%	7.75E-6	1.40E-5	
4. Gross alpha radioactivity	Ci	2.56E-7	MDA	
D. Tritium				
1. Total release	Ci	4.68E+1	1.05E+2	13%
2. Average release rate for period	µCi/sec	5.89E+0	1.32E+1	
3. Percent of technical specification limit[1]	%	1.25E-5	2.80E-5	

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[1] RMCP 6.1.6.1 Limit

DIABLO CANYON POWER PLANT
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TABLE 1C
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	Annual Total
A. Fission and activation gases		
1. Total release	Ci	4.85E+1
2. Average release rate for period	μCi/sec	1.54E+0
3. Percent of technical specification limit[1]	%	5.96E-4
B. Iodines		
1. Total iodine-131	Ci	6.10E-3
2. Average release rate for period	μCi/sec	1.93E-4
3. Percent of technical specification limit[1]	%	1.04E-3
C. Particulates		
1. Particulates with half-lives >8 days	Ci	7.76E-4
2. Average release rate for period	μCi/sec	2.46E-5
3. Percent of technical specification limit[1]	%	8.97E-6
4. Gross alpha radioactivity	Ci	6.00E-7
D. Tritium		
1. Total release	Ci	2.90E+2
2. Average release rate for period	μCi/sec	9.20E+0
3. Percent of technical specification limit[1]	%	1.95E-5

[1] RMCP 6.1.6.1 Limit

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TABLE 2A

GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		First Quarter		Second Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
1. Fission gases					
argon-41	Ci	MDA	5.53E-1	MDA	3.26E-2
krypton-85	Ci	MDA	3.59E-1	MDA	2.96E-2
krypton-85m	Ci	MDA	MDA	MDA	MDA
krypton-87	Ci	MDA	MDA	MDA	MDA
krypton-88	Ci	MDA	MDA	MDA	MDA
xenon-131m	Ci	MDA	4.10E-4	MDA	1.11E-3
xenon-133	Ci	MDA	1.48E-1	MDA	1.85E-1
xenon-133m	Ci	MDA	MDA	MDA	MDA
xenon-135	Ci	MDA	1.81E-4	MDA	1.42E-4
xenon-135m	Ci	MDA	MDA	MDA	MDA
xenon-138	Ci	MDA	MDA	MDA	MDA
TOTAL FOR PERIOD	Ci	MDA	1.06E+0	MDA	2.49E-1
2. Iodines					
iodine-131	Ci	MDA		MDA	
iodine-133	Ci	MDA		MDA	
iodine-135	Ci	MDA		MDA	
TOTAL FOR PERIOD	Ci	MDA		MDA	

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 2A (Continued)
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode	
Nuclides Released	Units	First Quarter	Second Quarter
3. Particulates			
barium-140	Ci	MDA	MDA
cesium-134	Ci	MDA	MDA
cesium-137	Ci	MDA	MDA
cerium-141	Ci	MDA	MDA
cerium-144	Ci	MDA	MDA
chromium-51	Ci	MDA	MDA
cobalt-57	Ci	MDA	MDA
cobalt-58	Ci	2.33E-4	MDA
cobalt-60	Ci	MDA	MDA
iron-59	Ci	MDA	MDA
lanthanum-140	Ci	MDA	MDA
manganese-54	Ci	MDA	MDA
molybdenum-99	Ci	MDA	MDA
ruthenium-103	Ci	MDA	MDA
strontium-89	Ci	MDA	MDA
strontium-90	Ci	MDA	MDA
zinc-65	Ci	7.34E-5	MDA
zirconium-95	Ci	MDA	MDA
TOTAL FOR PERIOD	Ci	3.06E-4	MDA

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 2B
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Third Quarter		Fourth Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
1. Fission gases					
argon-41	Ci	MDA	4.01E-2	MDA	1.93E-2
krypton-85	Ci	MDA	1.12E+0	MDA	1.55E+0
krypton-85m	Ci	MDA	MDA	MDA	MDA
krypton-87	Ci	MDA	MDA	MDA	MDA
krypton-88	Ci	MDA	MDA	MDA	MDA
xenon-131m	Ci	MDA	5.26E-2	MDA	1.15E-1
xenon-133	Ci	7.91E+0	5.87E+0	4.27E+0	2.62E+1
xenon-133m	Ci	MDA	6.02E-3	MDA	4.34E-2
xenon-135	Ci	MDA	1.66E-2	MDA	MDA
xenon-135m	Ci	MDA	MDA	MDA	MDA
xenon-138	Ci	MDA	MDA	MDA	MDA
TOTAL FOR PERIOD	Ci	7.91E+0	7.10E+0	4.27E+0	2.79E+1
2. Iodines					
iodine-131	Ci	3.67E-5		6.06E-3	
iodine-133	Ci	MDA		MDA	
iodine-135	Ci	MDA		MDA	
TOTAL FOR PERIOD	Ci	3.67E-5		6.06E-3	

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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TABLE 2B (Continued)
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode	
Nuclides Released	Units	Third Quarter	Fourth Quarter
3. Particulates			
barium-140	Ci	MDA	MDA
cesium-134	Ci	MDA	MDA
cesium-137	Ci	MDA	MDA
cerium-141	Ci	MDA	MDA
cerium-144	Ci	MDA	MDA
chromium-51	Ci	MDA	MDA
cobalt-57	Ci	MDA	MDA
cobalt-58	Ci	1.67E-4	3.02E-4
cobalt-60	Ci	MDA	MDA
iron-59	Ci	MDA	MDA
lanthanum-140	Ci	MDA	MDA
manganese-54	Ci	MDA	MDA
molybdenum-99	Ci	MDA	MDA
ruthenium-103	Ci	MDA	MDA
strontium-89	Ci	MDA	MDA
strontium-90	Ci	MDA	MDA
zinc-65	Ci	MDA	MDA
zirconium-95	Ci	MDA	MDA
TOTAL FOR PERIOD	Ci	1.67E-4	3.02E-4

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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TABLE 3
GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

			Batch Mode	
Nuclide	Units	Continuous Mode	Containment Purge	Gas Decay Tank
1. Fission gases				
argon-41	µCi/ml	1.51E-8	1.51E-8	1.51E-8
krypton-85	µCi/ml	3.31E-6	3.31E-6	3.31E-6
krypton-85m	µCi/ml	6.82E-9	6.82E-9	6.82E-9
krypton-87	µCi/ml	1.99E-8	1.99E-8	1.99E-8
krypton-88	µCi/ml	2.11E-8	2.11E-8	2.11E-8
xenon-131m	µCi/ml	2.67E-7	2.67E-7	2.67E-7
xenon-133	µCi/ml	2.42E-8	2.42E-8	2.42E-8
xenon-133m	µCi/ml	5.91E-8	5.91E-8	5.91E-8
xenon-135	µCi/ml	8.22E-9	8.22E-9	8.22E-9
xenon-135m	µCi/ml	1.37E-7	1.37E-7	1.37E-7
xenon-138	µCi/ml	5.07E-7	5.07E-7	5.07E-7
2. Tritium				
hydrogen-3	µCi/ml	4.18E-9	4.18E-9	N/A
3. Iodines				
iodine-131	µCi/ml	5.20E-13	N/A	
iodine-133	µCi/ml	6.27E-13	N/A	
iodine-135	µCi/ml	3.66E-12	N/A	

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TABLE 3 (Continued)
GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Units	Continuous Mode
4. Particulates		
barium-140	µCi/ml	2.19E-12
cesium-134	µCi/ml	4.06E-13
cesium-137	µCi/ml	4.96E-13
cerium-141	µCi/ml	4.48E-13
cerium-144	µCi/ml	2.05E-12
chromium-51	µCi/ml	2.75E-12
cobalt-57	µCi/ml	1.88E-13
cobalt-58	µCi/ml	8.63E-13
cobalt-60	µCi/ml	1.44E-12
iron-59	µCi/ml	1.09E-12
lanthanum-140	µCi/ml	8.29E-13
manganese-54	µCi/ml	5.93E-13
molybdenum-99	µCi/ml	1.83E-13
ruthenium-103	µCi/ml	3.68E-13
strontium-89	µCi/ml	1.41E-14
strontium-90	µCi/ml	3.98E-15
zinc-65	µCi/ml	1.27E-12
zirconium-95	µCi/ml	1.09E-12
gross alpha	µCi/ml	4.77E-15

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 4A
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Est.Total Error %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	6.58E-2	3.18E-2	24%
2. Average diluted concentration during period	µCi/ml	2.85E-11	1.18E-11	
3. Percent of applicable limit[1]	%	2.19E-4	1.26E-4	
B. Tritium				
1. Total release	Ci	4.65E+2	1.90E+2	13%
2. Average diluted concentration during period	µCi/ml	2.01E-7	7.07E-8	
3. Percent of applicable limit[1]	%	2.01E-2	7.07E-3	
C. Dissolved and entrained gasses				
1. Total release	Ci	2.54E-4	6.31E-4	24%
2. Average diluted concentration during period	µCi/ml	1.10E-13	2.35E-13	
3. Percent of applicable limit[1]	%	5.48E-8	1.17E-7	
D. Gross Alpha				
1. Total release	Ci	MDA	MDA	61%
E. Volume of waste release (prior to dilution)	liters	7.87E+7	8.42E+7	5%
F. Volume of circulating saltwater used during release periods	liters	2.31E+12	2.69E+12	7%

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[1] RMCP 6.1.6.1 Limit

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 4B
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	Third Quarter	Fourth Quarter	Est.Total Error %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	3.05E-2	6.09E-2	24%
2. Average diluted concentration during period	µCi/ml	1.16E-11	2.69E-11	
3. Percent of applicable limit[1]	%	1.93E-4	3.34E-4	
B. Tritium				
1. Total release	Ci	1.69E+2	3.43E+2	13%
2. Average diluted concentration during period	µCi/ml	6.44E-8	1.51E-7	
3. Percent of applicable limit[1]	%	6.44E-3	1.51E-2	
C. Dissolved and entrained gasses				
1. Total release	Ci	6.68E-3	5.68E-3	24%
2. Average diluted concentration during period	µCi/ml	2.55E-12	2.51E-12	
3. Percent of applicable limit[1]	%	1.28E-6	1.25E-6	
D. Gross Alpha				
1. Total release	Ci	MDA	MDA	61%
E. Volume of waste release (prior to dilution)	liters	8.12E+7	7.48E+7	5%
F. Volume of circulating saltwater used during release periods	liters	2.62E+12	2.26E+12	7%

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[1] RMCP 6.1.6.1 Limit

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 4C
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	Annual Total
A. Fission and activation products		
1. Total release (not including tritium, gases, alpha)	Ci	1.89E-1
2. Average diluted concentration during period	μCi/ml	1.91E-11
3. Percent of applicable limit[1]	%	2.13E-4
B. Tritium		
1. Total release	Ci	1.17E+3
2. Average diluted concentration during period	μCi/ml	1.18E-7
3. Percent of applicable limit[1]	%	1.18E-2
C. Dissolved and entrained gasses		
1. Total release	Ci	1.32E-2
2. Average diluted concentration during period	μCi/ml	1.34E-12
3. Percent of applicable limit[1]	%	6.70E-7
D. Gross Alpha		
1. Total release	Ci	MDA
E. Volume of waste release (prior to dilution)	liters	3.19E+8
F. Volume of circulating saltwater used during release periods	liters	9.89E+12

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[1] RMCP 6.1.6.1 Limit

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 5A
LIQUID EFFLUENTS - NUCLIDES RELEASED

		First Quarter		Second Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
antimony-122	Ci	MDA	7.92E-5	MDA	MDA
antimony-124	Ci	MDA	1.11E-3	MDA	2.08E-5
antimony-125	Ci	MDA	2.46E-2	MDA	7.37E-3
barium-140	Ci	MDA	MDA	MDA	MDA
beryllium-7	Ci	MDA	MDA	MDA	MDA
bromine-82	Ci	MDA	MDA	MDA	MDA
cerium-141	Ci	MDA	MDA	MDA	MDA
cerium-143	Ci	MDA	MDA	MDA	MDA
cerium-144	Ci	MDA	MDA	MDA	MDA
cesium-134	Ci	MDA	1.04E-5	MDA	MDA
cesium-136	Ci	MDA	MDA	MDA	MDA
cesium-137	Ci	MDA	1.12E-4	MDA	3.64E-5
cesium-138	Ci	MDA	MDA	MDA	MDA
chromium-51	Ci	MDA	1.88E-3	MDA	1.88E-4
cobalt-57	Ci	MDA	8.42E-6	MDA	8.50E-8
cobalt-58	Ci	9.89E-5	1.14E-2	MDA	8.46E-3
cobalt-60	Ci	MDA	6.96E-3	MDA	6.40E-3
iron-55	Ci	MDA	1.59E-2	MDA	7.16E-3
iron-59	Ci	MDA	3.33E-4	MDA	MDA
lanthanum-140	Ci	MDA	MDA	MDA	MDA

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 5A (CONTINUED)
LIQUID EFFLUENTS - NUCLIDES RELEASED

		First Quarter		Second Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
lanthanum-142	Ci	MDA	MDA	MDA	MDA
manganese-54	Ci	MDA	1.97E-4	MDA	1.19E-4
manganese-56	Ci	MDA	MDA	MDA	MDA
molybdenum-99	Ci	MDA	6.51E-5	MDA	9.67E-6
niobium-95	Ci	MDA	1.10E-4	MDA	1.27E-4
niodymium-147	Ci	MDA	MDA	MDA	MDA
rubidium-89	Ci	MDA	MDA	MDA	MDA
ruthenium-103	Ci	MDA	MDA	MDA	MDA
silver-110m	Ci	MDA	2.68E-5	MDA	3.71E-5
sodium-24	Ci	MDA	8.45E-6	MDA	4.93E-5
strontium-89	Ci	MDA	MDA	MDA	MDA
strontium-90	Ci	MDA	MDA	MDA	MDA
strontium-91	Ci	MDA	3.11E-6	MDA	MDA
strontium-92	Ci	MDA	MDA	MDA	7.71E-6
tellurium-129m	Ci	MDA	MDA	MDA	MDA
tellurium-131	Ci	MDA	MDA	MDA	MDA
tellurium-132	Ci	MDA	2.81E-5	MDA	MDA
tin-113	Ci	MDA	MDA	MDA	MDA

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 5A (CONTINUED)
LIQUID EFFLUENTS - NUCLIDES RELEASED

		First Quarter		Second Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
tin-117m	Ci	MDA	9.07E-5	MDA	MDA
tungsten-187	Ci	MDA	MDA	MDA	MDA
zinc-65	Ci	MDA	2.04E-3	MDA	1.13E-3
zirconium-95	Ci	MDA	MDA	MDA	8.56E-6
iodine-131	Ci	MDA	3.95E-4	MDA	1.99E-4
iodine-132	Ci	MDA	1.41E-5	MDA	7.53E-5
iodine-133	Ci	MDA	2.56E-4	MDA	2.31E-4
iodine-134	Ci	MDA	MDA	MDA	MDA
iodine-135	Ci	MDA	1.14E-4	MDA	2.08E-4
TOTAL FOR PERIOD	Ci	9.89E-5	6.57E-2	MDA	3.18E-2

DISSOLVED AND ENTRAINED GASES

xenon-133	Ci	MDA	1.76E-4	MDA	5.41E-4
xenon-133m	Ci	MDA	MDA	MDA	MDA
xenon-135	Ci	MDA	7.73E-5	MDA	9.01E-5
krypton-85	Ci	MDA	MDA	MDA	MDA
krypton-87	Ci	MDA	MDA	MDA	MDA
krypton-88	Ci	MDA	MDA	MDA	MDA
TOTAL FOR PERIOD	Ci	MDA	2.54E-4	MDA	6.31E-4

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 5B
LIQUID EFFLUENTS - NUCLIDES RELEASED

		Third Quarter		Fourth Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
antimony-122	Ci	MDA	MDA	MDA	9.19E-6
antimony-124	Ci	MDA	MDA	MDA	2.67E-4
antimony-125	Ci	MDA	4.75E-3	MDA	1.99E-2
barium-140	Ci	MDA	MDA	MDA	MDA
beryllium-7	Ci	MDA	MDA	MDA	MDA
bromine-82	Ci	MDA	MDA	MDA	MDA
cerium-141	Ci	MDA	MDA	MDA	MDA
cerium-143	Ci	MDA	MDA	MDA	MDA
cerium-144	Ci	MDA	MDA	MDA	MDA
cesium-134	Ci	MDA	3.04E-6	MDA	2.77E-6
cesium-136	Ci	MDA	MDA	MDA	MDA
cesium-137	Ci	MDA	5.22E-5	MDA	1.57E-5
cesium-138	Ci	MDA	MDA	MDA	MDA
chromium-51	Ci	MDA	3.67E-4	MDA	2.97E-3
cobalt-57	Ci	MDA	2.33E-5	MDA	2.18E-5
cobalt-58	Ci	9.90E-5	5.50E-3	MDA	1.15E-2
cobalt-60	Ci	MDA	5.24E-3	MDA	5.64E-3
iron-55	Ci	MDA	9.44E-3	MDA	1.44E-2
iron-59	Ci	MDA	2.70E-6	MDA	4.95E-4
lanthanum-140	Ci	MDA	4.34E-7	MDA	3.41E-7

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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TABLE 5B (CONTINUED)
LIQUID EFFLUENTS - NUCLIDES RELEASED

		Third Quarter		Fourth Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
lanthanum-142	Ci	MDA	MDA	MDA	MDA
manganese-54	Ci	MDA	1.40E-4	MDA	1.90E-4
manganese-56	Ci	MDA	MDA	MDA	MDA
molybdenum-99	Ci	MDA	9.96E-5	MDA	2.66E-5
niobium-95	Ci	MDA	9.57E-5	MDA	2.10E-4
niodymium-147	Ci	MDA	MDA	MDA	MDA
rubidium-89	Ci	MDA	MDA	MDA	MDA
ruthenium-103	Ci	MDA	MDA	MDA	MDA
silver-110m	Ci	MDA	MDA	MDA	6.72E-5
sodium-24	Ci	MDA	1.93E-5	MDA	3.55E-7
strontium-89	Ci	MDA	MDA	MDA	MDA
strontium-90	Ci	MDA	MDA	MDA	MDA
strontium-91	Ci	MDA	MDA	MDA	MDA
strontium-92	Ci	MDA	MDA	MDA	MDA
tellurium-129m	Ci	MDA	MDA	MDA	MDA
tellurium-131	Ci	MDA	MDA	MDA	1.79E-5
tellurium-132	Ci	MDA	MDA	MDA	2.63E-5
tin-113	Ci	MDA	MDA	MDA	1.64E-5

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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TABLE 5B (CONTINUED)
LIQUID EFFLUENTS - NUCLIDES RELEASED

		Third Quarter		Fourth Quarter	
Nuclides Released	Units	Continuous Mode	Batch Mode	Continuous Mode	Batch Mode
tin-117m	Ci	MDA	MDA	MDA	4.34E-5
tungsten-187	Ci	MDA	MDA	MDA	MDA
zinc-65	Ci	MDA	1.58E-3	MDA	1.14E-3
zirconium-95	Ci	MDA	MDA	MDA	4.79E-5
iodine-131	Ci	MDA	2.29E-3	MDA	3.92E-3
iodine-132	Ci	MDA	MDA	MDA	MDA
iodine-133	Ci	MDA	8.03E-4	MDA	MDA
iodine-134	Ci	MDA	MDA	MDA	MDA
iodine-135	Ci	MDA	MDA	MDA	MDA
TOTAL FOR PERIOD	Ci	9.90E-5	3.04E-2	MDA	6.09E-2

DISSOLVED AND ENTRAINED GASES

xenon-133	Ci	MDA	6.61E-3	MDA	5.68E-3
xenon-133m	Ci	MDA	MDA	MDA	MDA
xenon-135	Ci	MDA	7.41E-5	MDA	MDA
krypton-85	Ci	MDA	MDA	MDA	MDA
krypton-87	Ci	MDA	MDA	MDA	MDA
krypton-88	Ci	MDA	MDA	MDA	MDA
TOTAL FOR PERIOD	Ci	MDA	6.68E-3	MDA	5.68E-3

MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

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TABLE 6

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Units	LLD
antimony-122	µCi/ml	5.20E-8
antimony-124	µCi/ml	1.37E-7
antimony-125	µCi/ml	1.07E-7
barium-140	µCi/ml	2.27E-7
beryllium-7	µCi/ml	3.47E-7
bromine-82	µCi/ml	3.70E-8
cerium-141	µCi/ml	4.23E-8
cerium-143	µCi/ml	6.16E-8
cerium-144	µCi/ml	1.79E-7
cesium-134	µCi/ml	4.39E-8
cesium-136	µCi/ml	5.75E-8
cesium-137	µCi/ml	4.94E-8
cesium-138	µCi/ml	2.52E-7
chromium-51	µCi/ml	2.66E-7
cobalt-57	µCi/ml	2.11E-8
cobalt-58	µCi/ml	5.78E-8
cobalt-60	µCi/ml	7.61E-8
iron-55	µCi/ml	3.00E-7
iron-59	µCi/ml	9.59E-8
lanthanum-140	µCi/ml	5.40E-8
lanthanum-142	µCi/ml	1.61E-7
manganese-54	µCi/ml	4.91E-8
manganese-56	µCi/ml	3.49E-7
molybdenum-99	µCi/ml	2.17E-8
niobium-95	µCi/ml	5.44E-8

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TABLE 6 (CONTINUED)
LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Units	LLD
niodymium-147	µCi/ml	1.19E-7
rubidium-89	µCi/ml	1.97E-6
ruthenium-103	µCi/ml	4.51E-8
silver-110m	µCi/ml	4.39E-8
sodium-24	µCi/ml	7.56E-8
strontium-89	µCi/ml	7.82E-8
strontium-90	µCi/ml	2.02E-8
strontium-91	µCi/ml	4.88E-8
strontium-92	µCi/ml	1.06E-7
tellurium-129m	µCi/ml	1.52E-6
tellurium-131	µCi/ml	1.74E-7
tellurium-132	µCi/ml	2.93E-8
tin-113	µCi/ml	5.93E-8
tin-117m	µCi/ml	2.45E-8
tungsten-187	µCi/ml	1.18E-7
zinc-65	µCi/ml	9.69E-8
zirconium-95	µCi/ml	6.39E-8
gross alpha	µCi/ml	9.78E-8
hydrogen-3	µCi/ml	4.18E-6

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TABLE 6 (CONTINUED)

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Units	LLD
iodine-131	µCi/ml	3.34E-8
iodine-132	µCi/ml	6.81E-8
iodine-133	µCi/ml	3.35E-8
iodine-134	µCi/ml	1.08E-7
iodine-135	µCi/ml	1.90E-7
xenon-133	µCi/ml	8.05E-8
xenon-133m	µCi/ml	2.73E-7
xenon-135	µCi/ml	3.59E-8
krypton-85	µCi/ml	1.07E-5
krypton-87	µCi/ml	1.13E-7
krypton-88	µCi/ml	1.12E-7

X. Solid Radwaste Shipments

X. Solid Radwaste Shipments

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	Est. Total Error, %
a. Spent Resins, Filter Sludges, Evaporator Bottoms, etc.	m^3 Ci	9.65E+0 2.32E+2	0.00E+0 4.92E+0
b. Dry Compressible Waste, Contaminated Equipment, etc.	m^3 Ci	1.55E+1 * 3.50E+0 *	0.00E+0 1.00E+1
c. Irradiated Components, Control Rods, etc.	m^3 Ci	0.00E+0 0.00E+0	0.00E+0 0.00E+0
d. Other	m^3 Ci	0.00E+0 0.00E+0	0.00E+0 0.00E+0

- *These values are not final. They are expected to increase when the final disposal report from the waste processor is provided to DCPP. The volume increase is not expected to exceed 3 m3. The curie value is not expected to increase by more than 1 curie.

2. Estimate of Major Nuclide Composition (by type of waste)

a.

Co-60	%	41
Ni-63	%	23.5
Fe-55	%	12.9
Zn-65	%	12.3

b.

Fe-55	%	40
Nb-95	%	13.9
Co-60	%	13.3
Zr-95	%	9
Ni-63	%	7
Fe-59	%	5.4
Sb-125	%	1.2

c.

Not Applicable	%	N/A

d.

Not Applicable	%	N/A

Solid Waste and Irradiated Fuel Shipment (Continued)

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
17	Truck	BARNWELL, SC
8	Truck	ENVIROCARE, UT
7	Rail	ENVIROCARE, UT

4. Supplemental Information Required by TS 6.9.1.6

Solidification Agent	Type of Container	Number of Containers	10 CFR 61 Waste Class	Shipping Type
None	TypeA, Cement HIC	1	C	LSA II
Metal	Type A, Metal HIC	1	AS	LSA II
None	Type A, Poly HIC	1	B	LSA II (Type B Cask)
None	Type A, Poly HIC	2	B	LSA II (LSA Cask)
None	Strong Tight	38	AU	LSA II

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

XI. Radiation Dose Due to Gaseous and Liquid Effluents

Radiation Doses

A. Radiation doses from radioactive liquid effluents

The radiation dose contributions due to releases of radioactive liquid effluents to the total body and each individual organ for the maximum exposed adult have been calculated in accordance with the methodology in the ODCP. Dose contributions listed in Table 7 show conformance to RECP 6.1.4.1.

B. Radiation doses from radioactive gaseous effluents

The radiation dose contributions due to radioactive gaseous effluents at the site boundary for the land sectors have been calculated in accordance with the calculation methodology in the ODCP. Each unit's dose contribution has been calculated separately. The latest five year historical average meteorology conditions were used in these calculations. In addition to the site boundary doses, the dose to an individual (critical receptor) due to radioiodines, tritium, and particulates released in gaseous effluents with half-lives greater than 8 days is determined in accordance with the methodology in the ODCP based on the methodology described in NUREG 0133. Dose contributions listed in Table 8, which represents the maximum dose for age groups, organs, and geographic locations for the report period, show conformance to RECP 6.1.6.1, 6.1.7.1, and 6.1.8.1.

C. Radiation Doses from Direct Radiation (Line-of-Sight Plus Sky-Shine) - Closest Site Boundary (800 m)

For the report period, the radiation dose is evaluated to be 7.52E-2 mrem due to the presence of radioactive waste containers outside of plant buildings and the storage of contaminated tools and equipment inside plant buildings.

D. Radiation Doses from Chemistry Laboratory Radioactive Gaseous Effluents - Closest Site Boundary (800m)

The radiation doses due to chemistry laboratory radioactive gaseous effluents for the report period is evaluated to be 3.07E-6 mrem.

E. Radiation Doses from Post accident Sampling System Radioactive Gaseous Effluents - Closest Site Boundary (800m)

The radiation doses due to post accident sampling system radioactive gaseous effluents for the report period is evaluated to be 2.29E-6 mrem.

F. CFR 190 Considerations

The release of radioactivity in liquid and gaseous effluents resulted in doses that are small percentages of the TS limits as shown in Tables 9 and 10. This, coupled with the fact that there are no other uranium fuel cycle sources within eight kilometers of the DCPP, shows conformance to 40 CFR 190.

G. Radiation Doses from Radioactive Liquid And Gaseous Effluents to Members of the Public Due To Their Activities Inside The Site Boundary

1. Liquid Effluents

   The radiation dose to members of the public within the site boundary due to the release of radioactive liquid effluents is negligible because the discharge piping for liquid radwaste is mostly imbedded in concrete, located in remote or inaccessible areas, or is underground. In addition, the quantity of radioactivity released was very low.

2. Gaseous Effluents

   The radiation dose to members of the public within the site boundary due to the release of radioactive gaseous effluents are listed in Table 11.

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TABLE 7

RADIATION DOSE DUE TO THE RELEASE OF RADIOACTIVE LIQUID EFFLUENTS

	millirem				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Total Body	4.72E-04	2.04E-04	2.76E-04	3.45E-04	1.30E-03
Bone	7.75E-04	2.90E-04	4.09E-04	6.77E-04	2.15E-03
Liver	1.12E-03	4.61E-04	6.54E-04	8.54E-04	3.09E-03
Thyroid	7.34E-05	2.82E-05	2.40E-04	3.99E-04	7.41E-04
Kidney	4.70E-04	2.18E-04	3.14E-04	2.95E-04	1.30E-03
Lung	2.82E-04	9.19E-05	1.19E-04	2.66E-04	7.58E-04
G.I. LLI	1.22E-03	5.75E-04	6.36E-04	1.12E-03	3.55E-03

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 8A
RADIATION DOSE DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Site Boundary						
Noble Gas						
Gamma Air Dose	mrad	8.54E-4	2.15E-5	2.54E-5	2.09E-5	9.22E-4
Beta Air Dose	mrad	3.40E-4	7.60E-6	4.68E-5	7.36E-6	4.02E-4

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Neareset Residence - NNW						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	1.59E-3	2.66E-4	3.04E-4	3.26E-4	2.49E-3

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Nearest Vegetable Garden						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	1.32E-3	2.39E-4	2.90E-4	3.91E-4	2.24E-3

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 8B
RADIATION DOSE DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Site Boundary						
Noble Gas						
Gamma Air Dose	mrad	3.99E-5	3.75E-5	8.09E-4	1.71E-3	2.60E-3
Beta Air Dose	mrad	1.17E-4	4.99E-5	2.61E-3	5.55E-3	8.33E-3

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Neareset Residence - NNW						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	2.10E-4	1.36E-4	3.47E-4	9.04E-3	9.73E-3

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Nearest Vegetable Garden						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	1.89E-4	1.23E-4	3.68E-4	4.59E-2	4.66E-2

Notes for Tables 8a And 8b

1. This represents the maximum dose of age groups, organs, and geographic locations for the quarter and the year.

2. Radioiodines, radioactive material in particulate form, and radionuclides other than noble gases with half-lives greater than eight days.

3. The inhalation and ground plane pathways are included for this location.

4. The inhalation, ground plane and vegetable pathways are included for this location. An occupancy factor of 0.5 was used for the inhalation and ground plane pathways. The teen age group had the highest calculated dose for this location.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 9
PERCENT OF TECHNICAL SPECIFICATION LIMITS FOR RADIOACTIVE LIQUID EFFLUENTS

	Percent				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Total Body	3.14E-02	1.36E-02	1.84E-02	2.30E-02	4.32E-02
Bone	1.55E-02	5.80E-03	8.18E-03	1.35E-02	2.15E-02
Liver	2.25E-02	9.22E-03	1.31E-02	1.71E-02	3.09E-02
Thyroid	1.47E-03	5.65E-04	4.81E-03	7.97E-03	7.41E-03
Kidney	9.40E-03	4.36E-03	6.28E-03	5.91E-03	1.30E-02
Lung	5.64E-03	1.84E-03	2.38E-03	5.32E-03	7.58E-03
G.I. LLI	2.44E-02	1.15E-02	1.27E-02	2.24E-02	3.55E-02

NOTE:

RECP 6.1.4.1

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE10A
PERCENT OF TECHNICAL SPECIFICATION LIMITS FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		First Quarter %	Second Quarter %	Third Quarter %	Fourth Quarter %	Annual Total %
Site Boundary						
Noble Gas						
Gamma Air Dose	mrad	1.71E-2	4.30E-4	5.08E-4	4.18E-4	9.22E-3
Beta Air Dose	mrad	3.40E-3	7.60E-5	4.68E-4	7.36E-5	2.01E-3

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Nearest Residence - NNW						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	2.12E-2	3.54E-3	4.05E-3	4.35E-3	1.66E-2

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Nearest Vegetable Garden - ESE						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	1.76E-2	3.19E-3	3.86E-3	5.21E-3	1.49E-2

NOTE:
RECP 6.1.6.1, 6.1.7.1 and 6.1.8.1

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 10B
PERCENT OF TECHNICAL SPECIFICATION LIMITS FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		First Quarter %	Second Quarter %	Third Quarter %	Fourth Quarter %	Annual Total %
Site Boundary						
Noble Gas						
Gamma Air Dose	mrad	7.98E-4	7.50E-4	1.62E-2	3.42E-2	2.60E-2
Beta Air Dose	mrad	1.17E-3	4.99E-4	2.61E-2	5.55E-2	4.16E-2

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Neareset Residence - NNW						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	2.80E-3	1.82E-3	4.62E-3	1.20E-1	6.49E-2

		First Quarter Dose	Second Quarter Dose	Third Quarter Dose	Fourth Quarter Dose	Annual Total Dose
Nearest Vegetable Garden						
I ,P, T						
Critical Receptor (Highest Organ)	mrem	2.53E-3	1.64E-3	4.90E-3	6.12E-1	3.11E-1

NOTE:
RECP 6.1.6.1, 6.1.7.1 and 6.1.8.1

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 11A
RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
FIRST QUARTER, 1999
ON-SITE DOSE TO MEMBERS OF THE PUBLIC (SPECIAL INTEREST GROUPS)

				External Dose			Internal Dose
				Noble Gas		Iodines, Particulates, and Tritium	
Specific Activity	Exposure Location (Sectors)	Exposure Closest Dist. (meters)	Exposure Time (Hours)	Whole Body	Skin	Ground Plane	Inhalation
Police at Shooting Range	SE	700	52.0	3.16E-5	4.95E-5	8.67E-6	4.46E-4
Tour Participants							
(a) Simulator Bldg.	S	310	1.00	4.15E-7	6.49E-7	6.02E-8	5.85E-6
(b) Bio Lab	SSE	460	1.50	6.23E-7	9.74E-7	1.37E-7	8.77E-6
(c) Overlook	E	210	0.25	2.89E-7	4.52E-7	1.96E-8	4.07E-6
American Indians	NW	200	24.0	1.15E-4	1.79E-4	8.96E-6	1.62E-3
at Burial Grounds	NNW	200	24.0	8.02E-5	1.25E-4	5.11E-6	1.13E-3
Ranch Hands driving	NW	250	0.25	8.00E-7	1.25E-6	6.58E-8	1.13E-5
cattle around site	NNW	350	0.25	3.06E-7	4.79E-7	2.22E-8	4.32E-6
	N	320	0.25	2.03E-7	3.18E-7	1.12E-8	2.87E-6
	NNE	450	0.25	7.96E-8	1.25E-7	4.81E-9	1.12E-6
	NE	630	0.25	4.05E-8	6.33E-8	2.96E-9	5.71E-7

NOTE: All doses are in mrem.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 11B
RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
SECOND QUARTER, 1999
ON-SITE DOSE TO MEMBERS OF THE PUBLIC (SPECIAL INTEREST GROUPS)

				External Dose			Internal Dose
				Noble Gas		Iodines, Particulates, and Tritium	
Specific Activity	Exposure Location (Sectors)	Exposure Closest Dist. (meters)	Exposure Time (Hours)	Whole Body	Skin	Ground Plane	Inhalation
Police at Shooting Range	SE	700	52.0	2.20E-6	3.78E-6	0.00E+0	1.22E-4
Tour Participants							
(a) Simulator Bldg.	S	310	1.00	2.89E-8	4.96E-8	0.00E+0	1.60E-6
(b) Bio Lab	SSE	460	1.50	4.33E-8	7.44E-8	0.00E+0	2.40E-6
(c) Overlook	E	210	0.25	2.01E-8	3.45E-8	0.00E+0	1.11E-6
American Indians	NW	200	24.0	7.98E-6	1.37E-5	0.00E+0	4.42E-4
at Burial Grounds	NNW	200	24.0	5.58E-6	9.58E-6	0.00E+0	3.09E-4
Ranch Hands driving	NW	250	0.25	5.57E-8	9.56E-8	0.00E+0	3.09E-6
cattle around site	NNW	350	0.25	2.13E-8	3.66E-8	0.00E+0	1.18E-6
	N	320	0.25	1.42E-8	2.43E-8	0.00E+0	7.85E-7
	NNE	450	0.25	5.54E-9	9.51E-9	0.00E+0	3.07E-7
	NE	630	0.25	2.82E-9	4.84E-9	0.00E+0	1.56E-7

NOTE: All doses are in mrem.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 11C
RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
THIRD QUARTER, 1999
ON-SITE DOSE TO MEMBERS OF THE PUBLIC (SPECIAL INTEREST GROUPS)

				External Dose			Internal Dose
				Noble Gas		Iodines, Particulates, and Tritium	
Specific Activity	Exposure Location (Sectors)	Exposure Closest Dist. (meters)	Exposure Time (Hours)	Whole Body	Skin	Ground Plane	Inhalation
Police at Shooting Range	SE	700	52.0	2.17E-5	5.86E-5	3.89E-6	8.60E-4
Tour Participants							
(a) Simulator Bldg.	S	310	1.00	2.85E-7	7.68E-7	2.70E-8	1.13E-5
(b) Bio Lab	SSE	460	1.50	4.27E-7	1.15E-6	6.14E-8	1.69E-5
(c) Overlook	E	210	0.25	1.98E-7	5.35E-7	8.81E-9	7.85E-6
American Indians	NW	200	24.0	7.86E-5	2.12E-4	4.02E-6	3.12E-3
at Burial Grounds	NNW	200	24.0	5.50E-5	1.48E-4	2.29E-6	2.18E-3
Ranch Hands driving	NW	250	0.25	5.49E-7	1.48E-6	2.95E-8	2.18E-5
cattle around site	NNW	350	0.25	2.10E-7	5.67E-7	9.95E-9	8.33E-6
	N	320	0.25	1.40E-7	3.77E-7	5.01E-9	5.53E-6
	NNE	450	0.25	5.46E-8	1.47E-7	2.16E-9	2.16E-6
	NE	630	0.25	2.78E-8	7.49E-8	1.33E-9	1.10E-6

NOTE: All doses are in mrem.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 11D
RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
FOURTH QUARTER, 1999
ON-SITE DOSE TO MEMBERS OF THE PUBLIC (SPECIAL INTEREST GROUPS)

				External Dose			Internal Dose
				Noble Gas		Iodines, Particulates, and Tritium	
Specific Activity	Exposure Location (Sectors)	Exposure Closest Dist. (meters)	Exposure Time (Hours)	Whole Body	Skin	Ground Plane	Inhalation
Police at Shooting Range	SE	700	52.0	5.88E-5	1.51E-4	1.33E-5	1.10E-3
Tour Participants							
(a) Simulator Bldg.	S	310	1.00	7.71E-7	1.98E-6	9.20E-8	1.44E-5
(b) Bio Lab	SSE	460	1.50	1.16E-6	2.97E-6	2.09E-7	2.16E-5
(c) Overlook	E	210	0.25	5.36E-7	1.38E-6	3.00E-8	1.00E-5
American Indians	NW	200	24.0	2.13E-4	5.46E-4	1.37E-5	3.99E-3
at Burial Grounds	NNW	200	24.0	1.49E-4	3.82E-4	7.82E-6	2.79E-3
Ranch Hands driving	NW	250	0.25	1.49E-6	3.81E-6	1.01E-7	2.78E-5
cattle around site	NNW	350	0.25	5.69E-7	1.46E-6	3.39E-8	1.07E-5
	N	320	0.25	3.78E-7	9.70E-7	1.71E-8	7.08E-6
	NNE	450	0.25	1.48E-7	3.79E-7	7.36E-9	2.77E-6
	NE	630	0.25	7.52E-8	1.93E-7	4.53E-9	1.41E-6

NOTE: All doses are in mrem.

DIABLO CANYON POWER PLANT
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1999
TABLE 11E
RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
ANNUAL TOTAL, 1999
ON-SITE DOSE TO MEMBERS OF THE PUBLIC (SPECIAL INTEREST GROUPS)

				External Dose			Internal Dose
				Noble Gas		Iodines, Particulates, and Tritium	
Specific Activity	Exposure Location (Sectors)	Exposure Closest Dist. (meters)	Exposure Time (Hours)	Whole Body	Skin	Ground Plane	Inhalation
Police at Shooting Range	SE	700	208.0	1.14E-4	2.63E-4	2.58E-5	2.53E-3
Tour Participants							
(a) Simulator Bldg.	S	310	4.00	1.50E-6	3.45E-6	1.79E-7	3.32E-5
(b) Bio Lab	SSE	460	6.00	2.25E-6	5.17E-6	4.07E-7	4.97E-5
(c) Overlook	E	210	1.00	1.04E-6	2.40E-6	5.85E-8	2.31E-5
American Indians	NW	200	96.0	4.14E-4	9.52E-4	2.67E-5	9.16E-3
at Burial Grounds	NNW	200	96.0	2.90E-4	6.66E-4	1.52E-5	6.41E-3
Ranch Hands driving	NW	250	1	2.89E-6	6.64E-6	1.96E-7	6.39E-5
cattle around site	NNW	350	1	1.11E-6	2.54E-6	6.61E-8	2.45E-5
	N	320	1	7.35E-7	1.69E-6	3.33E-8	1.63E-5
	NNE	450	1	2.88E-7	6.61E-7	1.43E-8	6.36E-6
	NE	630	1	1.46E-7	3.36E-7	8.81E-9	3.24E-6

NOTE: All doses are in mrem.

XII. Meteorological Data

Meteorological Data

The hour-by-hour listing of wind speed, wind direction, atmospheric stability and precipitation is contained on disks with this submittal in accordance with TS 6.9.1.6.

Attachment 1

Environmental Radiological Monitoring Procedure
(ERMP Revision 4)

TITLE: ENVIRONMENTAL RADIOLOGICAL MONITORING PROCEDURE

02/08/99
EFFECTIVE DATE

SPONSORING ORGANIZATION: RADIATION PROTECTION
PROCEDURE CLASSIFICATION: QUALITY RELATED
REVIEW LEVEL: "A"

1. SCOPE

This procedure constitutes the Environmental Radiological Monitoring Procedure (ERMP) and implements the requirements of the Radiological Environmental Monitoring Program (REMP) for Diablo Canyon Power Plant in accordance with Technical Specification 6.8.4.h, 6.9.1.5 and 6.14.2.

2. DISCUSSION

2.1 This procedure describes the minimum required program, describing sample locations, types of sample locations, methods and frequency of analysis, reporting requirements, performance of Land Use Census and participation in an Interlaboratory Comparison Program.

2.2 This procedure also contains the state of California Department of Health Services (DHS) cross-check program.

2.3 The program described by this procedure provides measurements of radiation and of radioactive materials in those exposure pathways and for those nuclides that lead to the highest potential radiation exposures of Members of the Public resulting from plant operation. This monitoring program implements section IV.B.2, IV.B.3 and IV.C of Appendix I to 10 CFR 50 and supplements the Radioactive Effluent Control Program. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Radiological Environmental Monitoring, revision 1, November, 1979.

3. DEFINITIONS

3.1 Broadleaf Vegetation - means the leafy portion of plants such as lettuce, cabbage, spinach, or other similar leafy plants, typically used for human consumption.

3.2 Supplemental Sample - means samples that should be collected when available, but when they are not available, they are not subject to the substitution requirements of Table 1 Note 1. These types of samples are specifically designated as "supplemental" in Table 1.

4. RESPONSIBILITIES

4.1 The Director, Radiation Protection is responsible for ensuring implementation of the Environmental Radiological Monitoring Procedure, including:

4.1.1 Ensuring the performance of the annual Land Use Census and that the results are provided to CEO so that CEO can establish the dose requirements of Appendix 6.1.12.1 of CY2.ID1," Radioactive Effluent Controls Program."

4.1.2 Ensuring that the results of the annual Land Use Census and environmental TLD results are provided to TES for inclusion in the Annual Radiological Environmental Operating Report.

4.1.3 Ensuring that changes to the ERMP are provided to CEO for inclusion in the Annual Radiological Effluent Release Report.

4.1.4 Ensuring that the required sampling and monitoring program is performed.

4.1.5 Approving the Annual Radiological Environmental Operating Report prior to its submittal to the NRC.

4.1.6 Ensuring that the environmental TLD program is maintained.

4.2 The Director, Chemical and Environmental, TES is responsible for:

4.2.1 Ensuring analysis is performed for the samples as required by the ERMP.

4.2.2 Ensuring that summaries, interpretations and trends required for the Annual Radiological Environmental Operating Report are performed and that the Report is prepared and reviewed.

4.2.3 Ensuring that participation is maintained in an Interlaboratory Comparison Program sufficient to satisfy Technical Specification 6.8.4.h.

4.2.4 Ensuring that ERMP sample results exceeding the criteria of Appendix 6.1.11.1 of CY2.ID1, "Radioactive Effluent Controls Program" are communicated promptly to the Director , CEO and the Director, RP at DCPP.

4.2.5 Ensuring that appropriate procedures are established and maintained for sample handling, sample analysis and all associated laboratory equipment.

4.3 The Manager, Regulatory and Design Services is responsible for ensuring that reports required by the ERMP are submitted to the appropriate recipients in accordance with XI1.ID2, "Regulatory Reporting Requirements and Reporting Process."

4.4 The REMP Engineer is responsible for ensuring that the personnel responsible for the management and for the implementation of the REMP receive training on the changes to the REMP at least annually. Such training should consist of topics related to the changes in the DCPP REMP procedures, industry events, any changes in technology that pertain to REMP sampling techniques or to the analysis of REMP samples and the nature and goals of the quality assurance program. Proficiency of personnel who perform activities affecting the quality of the REMP shall be maintained by retraining, reexamining, recertifying, or by periodic performance reviews as appropriate. Initial training will be provided on an as needed basis to new personnel responsible for quality related REMP activities.

5. PREREQUISITES

None

6. PRECAUTIONS

None

7. INSTRUCTIONS

Sampling and Monitoring

7.1 Environmental samples shall be collected and analyzed according to Table 1 at the locations shown in Table 5 and Figures 1 and 2. Analytical techniques used will be such that the detection capabilities in Table 2 are routinely achieved. The sampling frequencies specified in Table 1 are allowed an extension of 25 percent.

7.2 Land Use Census

7.2.1 This Census satisfies the requirements of section IV.B.3 of Appendix I to 10 CFR 50. Restricting the Census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via broadleaf vegetation will be identified and monitored as necessary. The size of the garden is the minimum to produce the quantity of 26 kg/year of broadleaf assumed in Regulatory Guide 1.109 for consumption by a child.

7.2.2 A Land Use Census will be conducted at least once per year, during the growing season, which will determine the locations in each of the 16 meteorological sectors within a distance of 8 km (5 mi) for:

a. The nearest milk animal, and

b. The nearest residence, and

c. The nearest garden of greater than 50 square meters (500 sq. ft.) producing broadleaf vegetation

NOTE: Broadleaf vegetation sampling may be performed at the Site Boundary in a sector with the highest D/Q in lieu of the garden census portion of the Land Use Census.

7.2.3 The Land Use Census will be conducted using that information which will provide the best results, which typically consists of discussions with landowners/tenants in conjunction with an aerial survey. Local agricultural authorities may also be consulted.

7.2.4 If the Land Use Census identifies a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in accordance with Appendix 6.1.12 of CY2.ID1, the new location(s) shall be identified in the next Annual Radioactive Effluent Release Report.

7.2.5 If the Land Use Census identifies a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained in accordance with Appendix 6.1.11 of CY2.ID1, add the new location(s) within 30 days to the Radiological Environmental Monitoring Program given in this ERMP. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Documentation for a change in the ERMP will be submitted in the next Annual Radioactive Effluent Release Report including a revised figure(s) and table(s) for the ERMP reflecting the new location(s) with information supporting the change in sampling locations.

7.3 Cross-check Programs

7.3.1 Participation will be maintained in an Interlaboratory Comparison Program. This participation will include each of the determinations (sample medium-radionuclide combination) as described in Table 1 to ensure independent checks on the precision and accuracy of the measurements of radioactive materials in the ERMP samples.

7.3.2 Participation will be maintained in a split-sampling program with the State of California Department of Health Services (DHS) as required by DHS. The program will consist of radiological analyses of duplicate samples or replicate analyses of the same sample by both TES and DHS. The results of TES's analyses of the samples will be transmitted to DHS as soon as practicable after the end of the quarter in which the samples were collected. The sample types, analyses performed, and frequencies of collection are given in Table 6.

7.4 Annual Radiological Environmental Operating Report

7.4.1 A report on the Radiological Environmental Monitoring Program will be prepared annually and submitted to the NRC prior to May 1 of the following year.

7.4.2 The Annual Radiological Environmental Operating Report shall include:

a. summaries, interpretations, and an analysis of trends of the results of the Radiological Environmental Monitoring Program activities for the report period

b. a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports

c. an assessment of the observed impacts of the plant operation on the environment

d. the results of Land Use Census

e. the results of analyses of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in tables and figures in this ERMP as well as summarized and tabulated results of these analyses and measurements in the format of Table 3 or equivalent

f. a summary description of the Radiological Environmental Monitoring Program

g. legible maps covering all sampling locations keyed to a table giving distances and directions from the centerline of Unit One Reactor

h. the results of licensee participation in the Interlaboratory Comparison Program and the corrective action taken if the specified program is not being performed as required

i. the reason for not conducting the Radiological Environmental Monitoring Program as required, and discussion of all deviations from the sampling schedule of Table 1, including plans for preventing a recurrence

j. a discussion of environmental sample measurements that exceed the reporting levels of Table 4, but are not the result of plant effluents (i.e., demonstrated by comparison with a control station or with preoperational data)

k. a discussion of all analyses in which the LLD required by Table 2 was not achievable

7.5 Nonroutine Reports

7.5.1 Supplementary Report

a. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a Supplementary Report.

7.5.2 Nonroutine Radiological Environmental Operating Report

a. If a measured radionuclide concentration resulting from plant effluents in an environmental sampling medium, averaged over any calendar quarter sampling period, exceeds the reporting level given in Table 4, or when radionuclides other than those in Table 4 are detected and are the result of plant effluents where the potential annual dose to a Member of the Public from all radionuclides is equal to or greater than the calendar year limits of Appendix I of 10CFR50, a Nonroutine Radiological Environmental Operating Report shall be prepared in accordance with CY2.ID1. This report is not required if the measured level of radioactivity was not the result of plant effluents, however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

7.6 ERMP Changes

7.6.1 Changes to the ERMP shall be documented and the records of reviews performed shall be retained for the duration of the Operating License, as required by Technical Specification 6.10.2.o. This documentation shall contain:

a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s) and

b. A determination that the change will maintain the level of radioactive effluent control required by 10CFR20.1301, 40CFR190, 10CFR50.36a, and Appendix I to 10CFR50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

7.6.2 Shall become effective after review and acceptance by the PSRC and the approval of the Plant Manager.

7.6.3 Shall be submitted to the Nuclear Regulatory Commission in the form of a complete, legible copy of the entire ERMP as part of or concurrent with the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ERMP was made. Each change shall be identified by:

a. markings in the margin of the affected pages

b. clearly indicating the area of the page that was changed

c. indicating the date (e.g., month/year) the change was implemented

7.6.4 Notification of Sample Unavailability

a. If milk or vegetation sampling is not being performed as required by Table 1, identify specific locations for obtaining replacement samples and add them within 30 days to the Radiological Environmental Monitoring Program given in the ERMP. The specific locations from which samples were unavailable may then be deleted from the monitoring program. Submit in the next Annual Radioactive Effluent Release Report documentation for a change in the ERMP including a revised figure(s) and table for the ERMP reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples and justifying the selection of the new location(s) for obtaining samples.

NOTE: The currently approved ERMP allows for substitution of milk and broadleaf vegetation sampling with additional air sampling in two sectors.

8. RECORDS

8.1 Performance of the Land Use Census shall be documented, including as a minimum the names of persons contacted and dates of contact. This documentation does not need to appear in the required reports, but should be entered into the Records Management System.

8.2 Changes to the ERMP shall be retained in the Records Management System for the duration of the plant Operating License.

8.3 REMP training shall be documented and recorded in PIMS. Training records shall also be placed in the Records Management System (RMS) for the duration of the plant Operating License.

9. APPENDICES

None

10. ATTACHMENTS

None

11. REFERENCES

11.1 CY2, "Radiological Monitoring and Controls Program."

11.2 CY2.ID1, "Radioactive Effluent Control Program."

11.3 10CFR50 Appendix I

11.4 DCPP, Units 1 & 2, Plant Manual, Licenses, Amendments & Tech Specs, Volume 4A.

12. SPONSOR

D.P. Royer

Table 1
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[1]	Sampling and Collection Frequency	Type of Analysis
1. Direct Radiation[2]	Thirty-one routine monitoring stations[3] containing thermoluminescent dosimeters (TLDs) such that at least two (2) phosphors are present at each station, placed as follows: An inner ring of stations, one in each terrestrial meteorological sector in the general area of the SITE BOUNDARY; An outer ring of stations, one in each terrestrial meteorological sector in the 2.5 to 12 km range from the site; and The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.	Quarterly	Gamma dose.

Table 1 (Continued)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[1]	Sampling and Collection Frequency	Type of Analysis
2. Airborne			
(Radioiodine and particulates)	Samples from five locations: Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground level D/Q. (Historically these have been: MT1, OS2 and 8S1). One sample (7D1) from the vicinity of a community having the highest calculated annual average ground level D/Q; One sample (5F1) from a control location.	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Cartridge: I-131 analysis. Particulate Sample: Gross beta radio-activity analysis following filter change[4] and gamma isotopic analysis[5] of composite (by location) consisting of approximately 12 filters. Perform gamma isotopic analysis on composite (by location) quarterly.
3. Waterborne			
a. Surface	One sample from the plant Outfall (OUT), Diablo Cove (DCM) and an area not influenced by plant discharge (7C2).	Monthly grab sample.	Gamma isotopic analysis[5]. Tritium analysis (quarterly).
b. Drinking	One sample of plant drinking water (DW1) and one from Diablo Creek (5S2).	Monthly grab sample.	I-131, gamma isotopic analysis[5]. Tritium analysis (quarterly).
c. Sediment	One sample (from DCM and 7C2).	Annual sample.	Gamma isotopic.
d. Marine Flora[6]	One sample of kelp (from DCM, PON, POS and 7C2).	Quarterly, when available.	Gamma isotopic.
	One sample of intertidal algae (from DCM and 7C2).	Quarterly, when available.	Gamma isotopic.

Table 1 (Continued)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[1]	Sampling and Collection Frequency	Type of Analysis
4. Ingestion			
a. Milk	Samples from milking animals in three locations within 5 km distance having the highest dose potential. If there are none, then one sample from milking animals in each of three areas between 5 to 8 km distance where doses are calculated to be greater than 1 mrem per year. One sample from milking animals at a control location 15 to 30 km distant and in the least prevalent wind direction.	Semimonthly when animals are on pasture; monthly at other times.	Gamma isotopic[5] and I-131 analysis.
	Note: The sample (5F2)[6] should be taken monthly even if there are no indicator samples available.		
b. Fish and Invertebrates	One sample of rock fish (Sebastes), one sample of perch (Family Embiotocidae), and one sample of mussel (Mytilus), (from DCM, PON[6], POS[6] and 7C2).	Sample quarterly.	Gamma isotopic analysis[5] on edible portions of each sample.
	One sample of market fish[6] (from 7D3 or 2F1).	Sample quarterly.	
	One sample of red abalone[6] (from DCM and 7C2).	Sample semiannually, when available.	
c. Broadleaf Vegetation[7]	Three samples of broadleaf vegetation grown nearest off-site locations of highest calculated annual average ground level D/Q IF milk sampling is not performed.	Monthly, when available.	Gamma isotopic analysis[5] (that includes I-131) on edible portion.
	One sample of each of the similar broadleaf vegetation grown 15 to 30 km distant in the least prevalent wind direction IF milk sampling is not performed.	Monthly, when available.	

Table 1 (Continued)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[1]	Sampling and Collection Frequency	Type of Analysis
d. Vegetative Crops[6]	One sample of broadleaf vegetation or vegetables or fruit (from 5F2, 6C1, 7G1 and 7C1).	Monthly, when available. (6C1 is sampled quarterly)	Gamma isotopic analysis[5] of edible portion.

Table Notations

1. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances, suitable specific alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program, and submitted in the next Annual Radioactive Effluent Release Report, including a revised figure(s) and table for the ERMP reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples for that pathway and justifying the section of the new location(s) for obtaining samples.

2. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor. There are normally three calcium sulfate phosphors in an environmental TLD BADGE. Film badges shall not be used as dosimeters for measuring direct radiation.

3. Inner ring stations: 0S1, WN1, 0S2, 1S1, 2S1, 3S1, 4S1, 5S1, 5S3, 6S1, 7S1, 8S1, 8S2, 9S1, and MT1.

   Outer ring stations: 1A1, 0B1, 1C1, 2D1, 3D1, 4C1, 5C1, 6D1, and 7C1.

   Special interest stations: 4D1, 7F1, 7D1, 7D2, 7G2, and 5F3.

   Control station: 5F1.

4. Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

5. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

6. Supplemental sample.

7. If food products are unavailable, additional air sampling as specified in Table 1, Part 2 will be done in the SE (Station 8S2) and NNW (station 1S1) sectors.

Table 2

Detection Capabilities for Environmental Sample Analysis [(1) (2)]
Lower Limits of Detection (LLD) [(3)]

Analysis	Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/L)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
Gross beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1**	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

Table Notations

(1) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report.

(2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13, Revision 1, July 1977.

(3) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95 percent probability with only 5 percent probability of falsely concluding that a blank observation represents a "real" signal.

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*For surface water samples, a value of 3000 pCi/L may be used.

** If no drinking water pathway exists, a value of 15 pCi/L may be used.

Table 2 (Continued)

Table Notations

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \times V \times 2.22 \times Y \times \exp(-\lambda t)}$$

Where:

LLD = the "a priori" the lower limit of detection as defined above (as pCi per unit mass or volume)

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

E = the counting efficiency (as counts per transformation)

V = the sample size (in units of mass or volume)

2.22 = the number of transformations per minute per picocurie

Y = the fractional radiochemical yield (when applicable)

λ = the radioactive decay constant for the particular radionuclide

t = the elapsed time between sample collection (or end of the sample collection period) and time of counting

The value of S_b used in the calculation of the LLD for a detection system will be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background will include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples).

Analyses will be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors will be identified and described in the Annual Environmental Radiological Operating Report.

Typical values of E, V, Y and t should be used in the calculation. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

Table 3

Environmental Radiological Monitoring Program Summary

Name of Facility _____ Docket No. _____

Location of Facility (County, State) _____ Reporting Period _____

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection(a) (LLD)	Location with Highest Annual Mean: Name, Distance and Direction	Location with Highest Annual Mean: Mean (1)(b) Range (b)	All Indicator Locations Mean (1)(b) Range (b)	Control Locations Mean(1)(b) Range(b)	Number of Reportable Occurrences

(a) Unless indicated the LLDs specified in Table 2 were met.

(b) Mean and the range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (1); e.g., (10/12) means that 10 out of 12 samples contained detectable activity.

Table 4

Reporting Levels for Radioactivity Concentrations in Environmental Samples

Analysis	Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/L)	Food Products (pCi/kg, wet)
H-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2**	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

* For drinking water samples. This is the 40CFR141 value. If no drinking water pathway exists, a value of 30,000 pCi/L may be used.

** If no drinking water pathway exists, a value of 20 pCi/L may be used.

Table 5

Distances and Directions to Environmental Monitoring Stations
(Stations are shown on Figures 1 and 2)

Station Code*	Station Name	Radial Direction (True Heading) (Degrees)	Radial Distance from Plant km (Miles)	
0S1	Exclusion Fence-Northwest Corner	320	.16	(0.1)
0S2	North Gate	320	.8	(0.5)
1S1	Wastewater Pond	330	.64	(0.4)
2S1	Back Road-300 m North of Plant	0	.32	(0.2)
3S1	Road NW of 230 kv Switchyard	23	.64	(0.4)
4S1	Back Road Between Switchyards	43	.8	(0.5)
5S1	400 kv Switchyard	58	.64	(0.4)
5S2	Diablo Creek Weir	65	.96	(0.6)
5S3	Microwave Tower Road	70	1.02	(0.7)
6S1	Microwave Tower	94	.8	(0.5)
7S1	Overlook Road	112	.48	(0.3)
8S1	Target Range	125	.8	(0.5)
8S2	Southwest Site Boundary	128	1.76	(1.1)
9S1	South Cove	167	.64	(0.4)
MT1	Meteorological Tower	185	.32	(0.2)
DCM	Diablo Cove Marine	270	.32	(0.2)
WN1	Northwest Guard Shack	290	.32	(0.2)
1A1	Crowbar Canyon	327	2.56	(1.6)
0B1	Point Buchon	325	5.76	(3.6)
1C1	Montana de Oro Campground	336	7.52	(4.7)
4C1	Clark Valley Gravel Pit	45	9.28	(5.8)
6C1	Household Garden	98	7.24	(4.5)
5C1	Junction Prefumo/See Canyon Roads	64	7.52	(4.7)
7C1	Pecho Creek Ruins (Mello Farm)	120	6.56	(4.1)
7C2	Rattlesnake Canyon	124	7.52	(4.7)
2D1	Sunnyside School	10	11.04	(6.9)
3D1	Clark Valley	24	9.92	(6.2)
4D1	Los Osos School	36	12.16	(7.6)
6D1	Junction See/Davis Canyon Roads	89	12.0	(7.5)
7D1	Avila Gate	118	10.56	(6.6)
7D2	Avila Beach	110	12.16	(7.6)
7D3	Avila Pier	120	11.0	(6.9)
2F1	Morro Bay (Commercial Landing)	0	17.44	(10.9)
5F1	SLO Zone I Substation	68	17.92	(11.2)
5F2	Cal Poly Farm	60	20.16	(12.6)
5F3	SLO County Health Department	70	20.32	(12.7)
7F1	Shell Beach	110	17.28	(10.8)

Table 5 (Continued)

Distances and Directions to Environmental Monitoring Stations
(Stations are shown on Figures 1 and 2)

Station Code*	Station Name	Radial Direction (True Heading) (Degrees)	Radial Distance from Plant km (Miles)	
7G1	Arroyo Grande (Kawaoka Farm)	115	26.88	(16.8)
7G2	Oceano Substation	118	27.68	(17.3)
OUT	Plant Outfall	270	.32	(0.2)
DW1	Drinking Water from Plant Potable Water System	Bio Lab	—	—
PON	Pacific Ocean North of Diablo Cove	305	2.4	(1.5)
POS	Pacific Ocean South of Diablo Cove	145	1.28	(0.8)

*Station Code (XYZ):

X - First number (0-9) represents the radial sector in which the station is located:

0	- Northwest	5	- East-northeast
1	- North-northwest	6	- East
2	- North	7	- East-southeast
3	- North-northeast	8	- Southeast
4	- Northeast	9	- South-southeast

Y - Letter (S, A-H) represents the distance from the plant:

S - On-site
A - 0-2 miles from plant (but off-site)
B - 2-4 miles from plant
C - 4-6 miles from plant
D - 6-8 miles from plant
E - 8-10 miles from plant
F - 10-15 miles from plant
G - 15-20 miles from plant
H - Greater than 20 miles from plant

Z - Second number represents the station number within the zone.

*Station Codes (DCM, MT1, WN1, PON, POS, OUT, DW1):

The following stations do not follow the coding system: Diablo Cove Marine (DCM), Meteorological Tower (MT1), Northwest guard shack (WN1), Pacific Ocean North (PON), Pacific Ocean South (POS), Plant outfall (OUT), and Drinking water (DW1).

Table 6

Summary of Cross-Check Program with State of California

Sample Type	Station No.	Frequency*	Radioanalyses
Milk (supplemental)	5F2	Monthly	Gamma Isotopic (incl. I-131 and K-40)
Drinking Water	DW1	Monthly	Gamma Isotopic (incl. I-131), H-3
Outfall Water	OUT	Monthly	Gamma Isotopic, H-3
Diablo Creek	5S2	Monthly	Gamma Isotopic, H-3
Vegetative Crops (supplemental)	7G1	Quarterly	Gamma Isotopic
Fish or Invertebrate	DCM	Quarterly	Gamma Isotopic
Air Particulates and Radioiodine	5F1, 7D1	Weekly Quarterly	Gross Beta, I-131 Gamma Isotopic (composite airborne particulate samples)
Sediment	DCM	Annually	Gamma Isotopic
Direct Radiation (TLD)	MT1, 4D1, 5F3, 7D1, 7C1	Quarterly	Gamma Exposure (mR)
Kelp (supplemental)	DCM	Quarterly	Gamma Isotopic

*When available

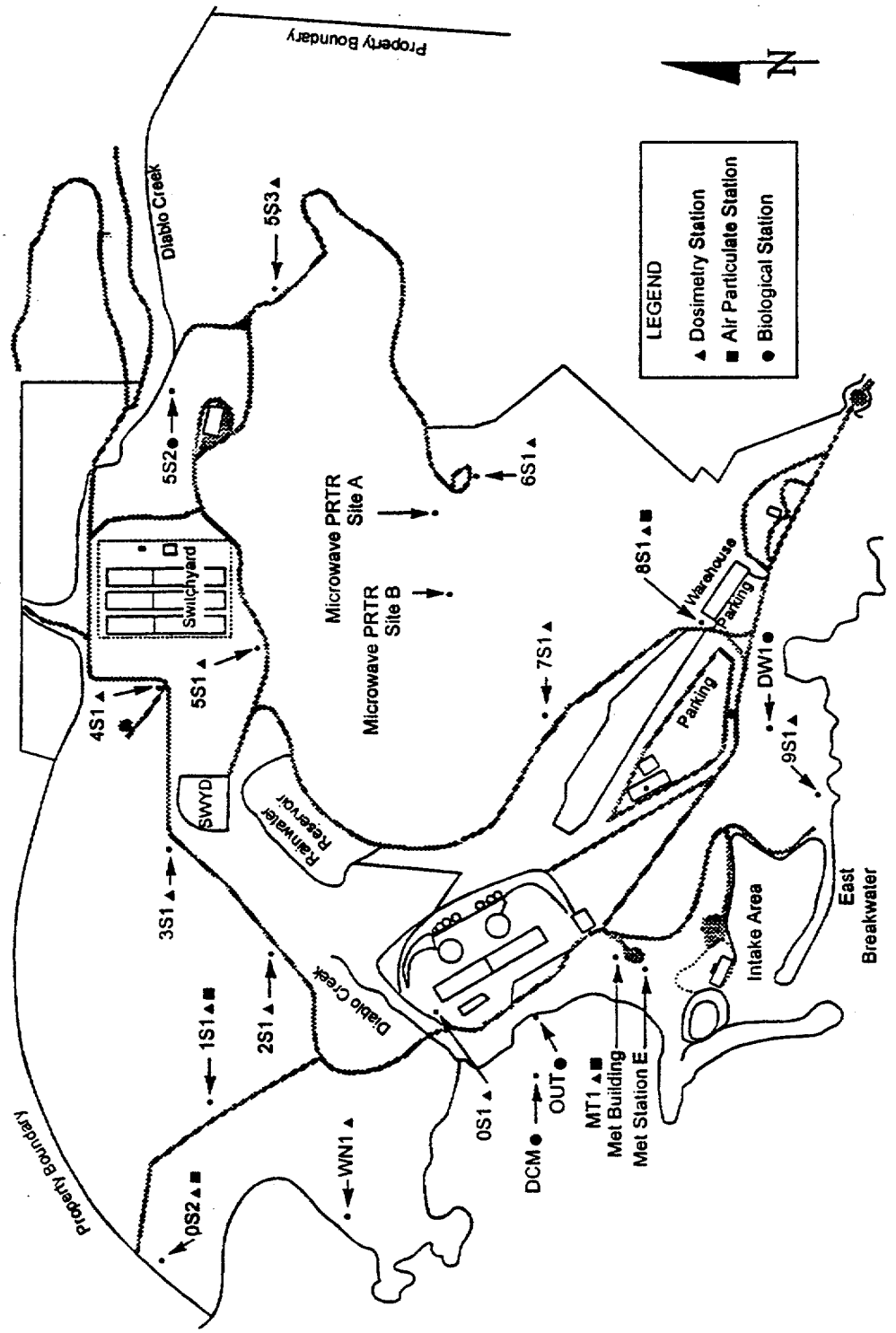

Figure 1 - DCPP Onsite ERMP Stations

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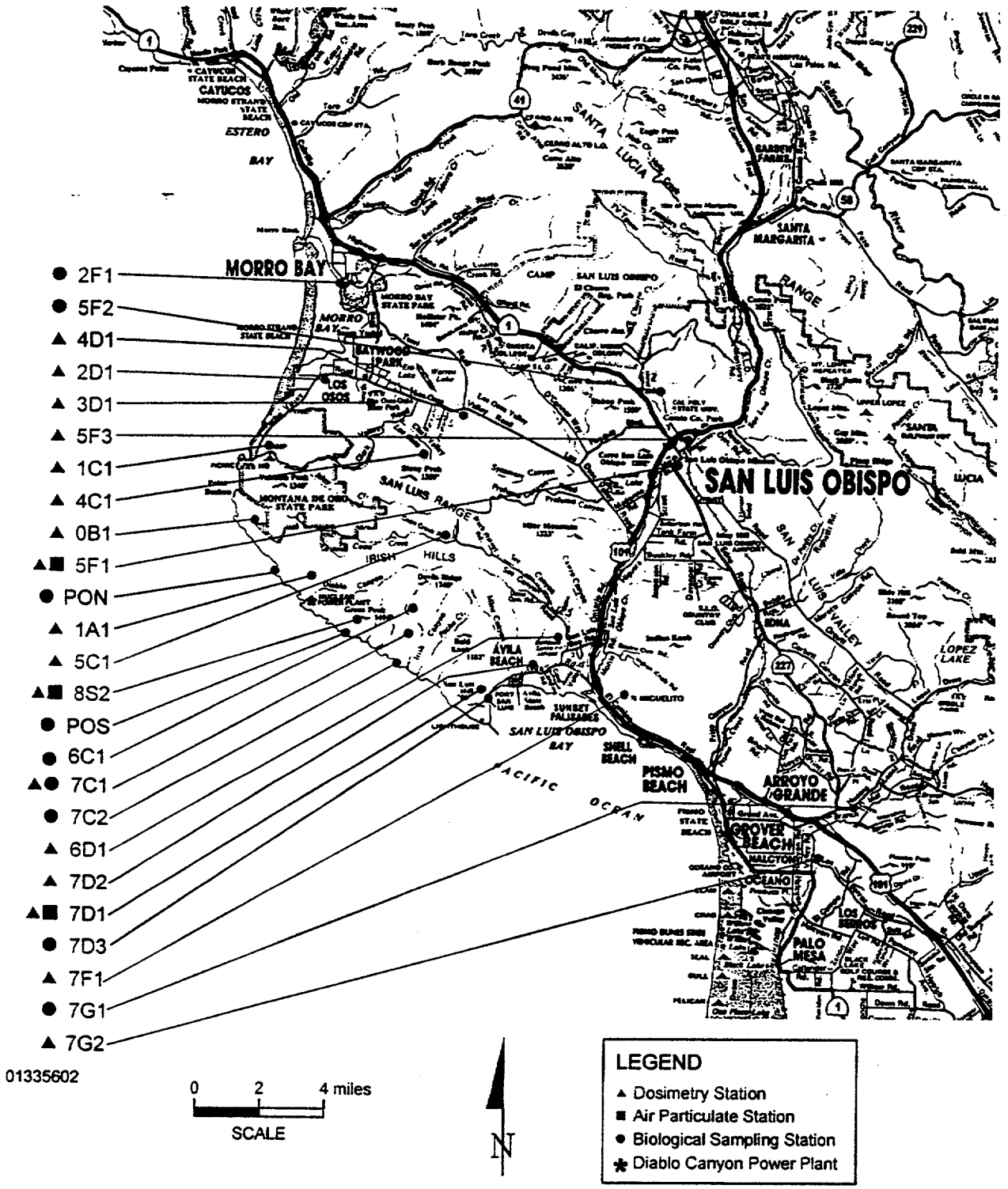

Figure 2 - DCPP Offsite ERMP Stations