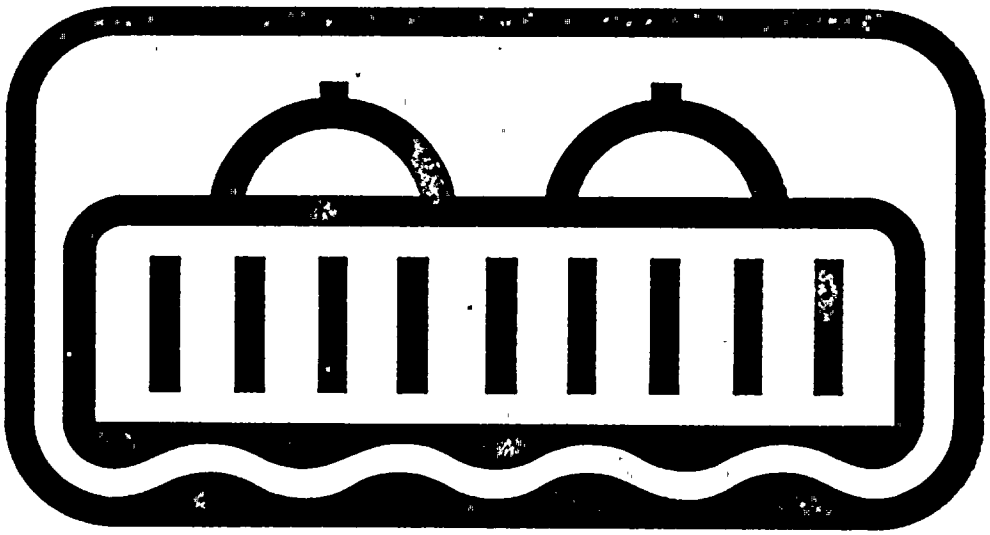
DIABLO CANYON POWER PLANT

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JULY 1 - DECEMBER 31, 1986



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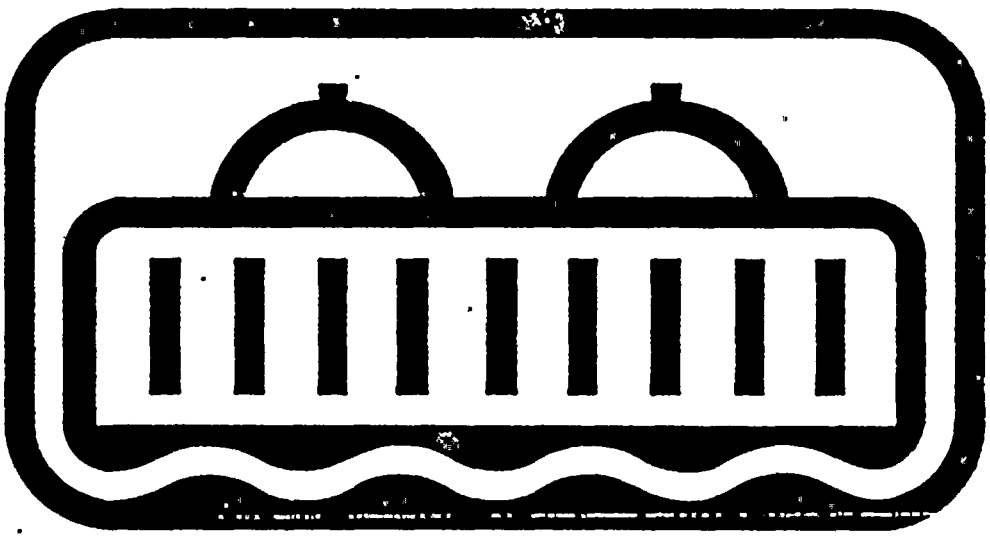

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INTRODUCTION

This Semiannual Radioactive Effluent Release Report summarizes the gaseous and liquid effluent releases made from Diablo Canyon Power Plant's Units 1 and 2 for the third and fourth quarters of 1986. This report also includes the doses due to the release of radioactive liquid and gaseous effluents and a summary of solid radwaste shipments. This report contains the information required by Unit 1 and 2 Technical Specification 6.9.1.6 and is generally presented in the format of Regulatory Guide 1.21, Appendix B.

The Unit 1 reactor was at power descension during July and most of August to prepare for the refueling outage which commenced on August 29. Unit 1 completed the outage on December 29, 1986. The Unit 2 reactor operated at full power throughout the report period except for short period outages in August and September.

I. SUPPLEMENTAL INFORMATION

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Dose Rate Limit

The dose rate in unrestricted areas due to radioactive noble gases released in gaseous effluents is limited to less than or equal to 500 millirem per year to the total body and less than or equal to 3000 millirem per year to the skin. (Technical Specification 3.11.2.1.a.)

b. Particulate and Iodine Dose Rate Limit

The dose rate in unrestricted areas 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 millirem per year to any organ. (Technical Specification 3.11.2.1.b.)

c. Noble Gas Dose Limit

The air dose due to noble gases released in gaseous effluents, from each reactor unit, from the site, is limited to the following.

	CALENDAR QUARTER	CALENDAR YEAR
Gamma radiation	5 millirad	10 millirad
Beta radiation	10 millirad	20 millirad

(Tech. Spec. 3.11.2.2)

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, from the site, is limited to less than or equal to 7.5 millirem to any organ in any calendar quarter and less than or equal to 15 millirem to any organ during a calendar year. (Technical Specification 3.11.2.3)

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 II, 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/ml total activity. (Technical Specification 3.11.1.1)

b. Dose

The dose or dose commitment to an individual from radioactive materials in liquid effluents released, from each reactor unit, from the site, is limited to the following:

	CALENDAR QUARTER	CALENDAR YEAR
Total Body	1.5 millirem	3 millirem
Any Organ	5 millirem	10 millirem

(Technical Specification 3.11.1.2)

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum permissible concentrations are not used in the methodology for determining allowable release rates for gaseous effluents at Diablo Canyon Power Plant.

2. Liquid Effluents

The concentrations listed in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases are used for determining the allowable release rate at the point of discharge from the site for liquid effluents. For dissolved or entrained noble gases, the allowable release rate concentration at the point of discharge is limited to 2×10^{-4} microcuries per milliliter 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 measured by a pair of off-line monitors each using Geiger-Mueller detector readings from these monitors. These monitor readings are correlated to isotopic concentration based on isotopic analysis of a grab sample using a germanium detector. 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 discharge are all routed through the plant vent for release. The gaseous radioactivity released from the steam generator blowdown tank vent is measured by analyzing grab samples with a germanium detector. The isotopic concentrations are assumed to remain constant between grab samples.

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

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 these cartridges with a germanium detector.

c. Particulates

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. All of the 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 particulates are periodically monitored by collecting samples using particulate filters and analyzing these filters with a germanium detector.

d. 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. Tritium is determined at a minimum sample frequency of weekly. The tritium concentration is assumed to remain constant between samples.

2. Liquid Effluents

a. Batch Releases

Each tank of liquid radwaste is analyzed for principal gamma emitters using a germanium detector prior to release. The prerelease analysis includes dissolved and entrained gases. Volume proportional monthly and quarterly composites are prepared from aliquots of each tank released. 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 steam generator blowdown tank and turbine building sump oily water separator, daily grab samples are collected and volume proportioned for weekly, monthly and quarterly composites. The oily water separator weekly composite is analyzed for gross gamma and 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-90 using an internal proportional counter following chemical separations. 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.

D. Batch Releases

1. Liquid

a.	Number of batch releases.....	463
b.	Total time period for batch releases.....	1529 hours
c.	Maximum time period for a batch release.....	12.02 hours
d.	Average time period for a batch release.....	3.30 hours
e.	Minimum time period for a batch release.....	0.008 hours
f.	Average saltwater flow during batch releases...	1.24E+6 GPM

2. Gaseous

a.	Number of batch releases.....	114
b.	Total time period for batch releases.....	1611.38 hours
c.	Maximum time period for a batch release.....	24.00 hours
d.	Average time period for a batch release.....	14.14 hours
e.	Minimum time period for a batch release.....	0.10 hours

E. Abnormal Releases

On August 19, 1986, an unplanned release from a Unit 2 gas decay tank and vent header occurred when a relief valve (RV-53) malfunctioned. The release occurred inside the Auxiliary Building and was monitored by the plant vent monitors. During this event, 1.58E0 curies of Xe-133, 2.46E-2 curies of Xe-131m, 6.84E-3 curies of Xe-133m, and 4.78E-3 curies of Xe-135 were released. The total activity of the release was 1.62E0 curies.

On September 19, 1986, an unplanned release from two gas decay tanks and vent header occurred when valve LWS-1-114 was misadjusted thus preventing it from properly seating. The release occurred inside the Auxiliary Building and was monitored by the plant vent monitors. During this event, 5.95E-1 curies of Xe-133, and 3.20E-2 curies of Xe-131m were released. The total activity of the release was 6.27E-1 curies.

On September 27, 1986, an unplanned release occurred inside the Unit 1 Fuel Handling Building due to the filling of the Unit 1 Spent Fuel Pool with Unit 2 Liquid Holdup Tank water which contained relatively fresh reactor coolant from Unit 2. The release was monitored by plant vent monitors. During this event, 1.13E+2 curies of Xe-133, 1.90E0 curies of Xe-133m, 3.70E0 curies of Xe-131m, 1.64E+1 curies of Xe-135, 2.17E0 curies of Kr-85m, 1.01E0 curies of Kr-87, 3.46 E0 curies of Kr-88, and 3.97E0 curies of Ar-41 were released. The total activity of the release was 1.46E+2 curies.

On October 11, 1986, an unplanned release from Unit 2 gaseous radwaste system occurred when a relief valve (RV-53) malfunctioned. The release occurred inside the Auxiliary Building and was monitored by the plant vent monitors. During this event, 4.65E-1 curies of Xe-133, 8.27E-5 curies of Kr-85m, 5.05E-3 curies of Xe-131m, 4.52E-3 curies of Xe-133m, and 5.93E-3 curies of Xe-135 were released. The total activity of the release was 4.81E-1 curies.

II. MAJOR CHANGES TO LIQUID, GASEOUS AND SOLID RADWASTE TREATMENT SYSTEMS

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

III. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

One revision to Diablo Canyon Power Plant Administrative Procedure AP C-253, Process Control Program, was made during the report period. The revision included two procedural changes to the particulate waste sample verification. First, the permissible pH range of the particulate sample after incremental (2 grams) addition of lime was changed from 10.5 to 11.5 to 10.5 to 13. This change in the pH range was performed for reasons of consistency, since pH is verified with narrow range (9-13) pH paper. Increasing the permissible pH range of the adjusted particulate sample does not exceed the bounds of the Process Control Program as stated in the Topical Report (i.e., adjust as necessary to a pH greater than 10.5). Second, the sample verification was changed to enable an additive S-4 to be used in the event that resin which is not fully depleted is to be solidified. This change to the PCP was required due to failure of a sample verification for a waste resin batch. The proprietary additive S-4 depletes resin thereby enabling the cement to solidify. The S-4 additive was used by the vendor to exhaust the new resins which were solidified and tested for their Topical Report. The S-4 additive is included in the vendor's current PCP for waste oil solidification in cement. This additive is therefore within the test results of cement solidified waste products submitted in the Topical Report. These revisions were reviewed and found acceptable to the PSRC on October 28, 1986. A copy of the changed pages are included as Attachment 1.

IV. CHANGES TO THE ENVIRONMENTAL RADIOLOGICAL MONITORING PROCEDURE (ERMP)

There were no changes to the DCPP Environmental Radiological Monitoring Procedure (ERMP) during the report period.

V. CHANGES TO THE OFFSITE DOSE CALCULATION PROCEDURE (ODCP)

There were no changes to the DCPP Offsite Dose Calculation Procedure (ODCP) during the report period.

VI. 1986 LAND USE CENSUS

A total of eight permanent residences were identified within five miles of the plant. The residence that was previously identified in the north sector no longer exists. The 1986 Land Use Census, as required by Technical Specification 3.12.2, was performed by PGandE's Department of Engineering Research and is included as Attachment 2.

VII. GASEOUS AND LIQUID EFFLUENTS

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TABLE 1

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	Third Quarter	Fourth Quarter	Est. Total Error,%
A. Fission & activation gases				
1. Total release	Ci	5.86 E+2	2.90 E+2	5.0 E+1
2. Average release rate for period	uCi/sec	7.37 E+1	3.65 E+1	
3. Percent of technical specification limit[2]	%	3.08 E-2	1.19 E-2	
B. Iodines				
1. Total iodine-131	Ci	4.64 E-4	3.84 E-4	2.3 E+1
2. Average release rate for period	uCi/sec	5.84 E-5	4.83 E-5	
3. Percent of technical specification limit[2]	%	4.00 E-2	3.31 E-2	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	2.31 E-5	4.53 E-5	2.3 E+1
2. Average release rate for period	uCi/sec	2.91 E-6	5.70 E-6	
3. Percent of technical specification limit[2]	%	4.30 E-5	2.42 E-5	
4. Gross alpha radioactivity	Ci	MDA	MDA	
D. Tritium				
1. Total release	Ci	4.41 E0	8.35 E0	1.2 E+1
2. Average release rate for period	uCi/sec	5.55 E-1	1.05 E0	
3. Percent of technical specification limit[2]	%	1.14 E-3	2.15 E-3	

NOTE:

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

[2] Technical Specification 3.11.2.1 Limit

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TABLE 2

GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES

Nuclides Released	Unit	THIRD QUARTER		FOURTH QUARTER	
		CONTINUOUS MODE	BATCH MODE	CONTINUOUS MODE	BATCH MODE
1. Fission gases					
krypton-85	Ci	MDA	9.89 E-2	MDA	4.83 E-1
krypton-85m	Ci	MDA	1.96 E-1	1.08 E0	4.93 E-2
krypton-87	Ci	MDA	7.37 E-3	MDA	1.56 E-2
krypton-88	Ci	9.08 E-2	1.65 E-1	3.00 E-1	5.26 E-2
xenon-131m	Ci	4.08 E-4	3.62 E0	MDA	1.07 E0
xenon-133	Ci	1.11 E+2	3.07 E+2	1.85 E+2	8.40 E+1
xenon-133m	Ci	3.60 E-3	3.06 E0	MDA	5.62 E-1
xenon-135	Ci	7.38 E0	4.16 E0	1.47 E+1	8.05 E-1
xenon-135m	Ci	MDA	MDA	MDA	MDA
xenon-138	Ci	MDA	MDA	MDA	MDA
argon-41	Ci	MDA	1.27 E0	MDA	9.87 E-1
TOTAL FOR PERIOD	Ci	1.18 E+2	3.20 E+2	2.01 E+2	8.80 E+1
2. Iodines					
iodine-131	Ci	4.64 E-4		3.84 E-4	
iodine-133	Ci	5.17 E-4		2.86 E-4	
iodine-135	Ci	MDA		MDA	
TOTAL FOR PERIOD	Ci	9.81 E-4		6.70 E-4	

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TABLE 2 (Continued)

GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES

Nuclides Released	Unit	CONTINUOUS MODE	
		Third Quarter	Fourth Quarter
3. Particulates			
cerium-141	Ci	MDA	MDA
cerium-144	Ci	MDA	MDA
cesium-134	Ci	1.36 E-6	MDA
cesium-137	Ci	1.25 E-6	MDA
cobalt-58	Ci	1.64 E-5	3.52 E-5
cobalt-60	Ci	2.75 E-6	7.91 E-6
iron-59	Ci	MDA	MDA
manganese-54	Ci	1.29 E-6	2.19 E-6
molybdenum-99[1]	Ci	MDA	MDA
strontium-89	Ci	MDA	MDA
strontium-90[1]	Ci	MDA	MDA
zinc-65	Ci	MDA	MDA
TOTAL FOR PERIOD	Ci	2.31 E-5	4.53 E-5

NOTES:

[1] Includes Daughters

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TABLE 3

GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	Continuous Mode	Batch Mode	
1. Fission gases			Containment Purge	Gas Decay Tank
krypton-85	uCi/ml	2.63 E-6	2.63 E-6	3.67 E-3
krypton-85m	uCi/ml	6.90 E-9	6.90 E-9	9.58 E-6
krypton-87	uCi/ml	1.88 E-8	1.88 E-8	1.36 E-5
krypton-88	uCi/ml	2.26 E-8	2.26 E-8	3.23 E-5
xenon-131m	uCi/ml	1.87 E-7	1.87 E-7	3.39 E-4
xenon-133	uCi/ml	1.97 E-8	1.97 E-8	6.97 E-5
xenon-133m	uCi/ml	4.61 E-8	4.61 E-8	9.35 E-5
xenon-135	uCi/ml	4.15 E-9	4.15 E-9	6.37 E-5
xenon-135m	uCi/ml	4.13 E-8	4.13 E-8	2.67 E-5
xenon-138	uCi/ml	1.09 E-7	1.09 E-7	3.30 E-5
argon-41	uCi/ml	3.34 E-8	3.34 E-8	2.84 E-5
2. Tritium				
hydrogen-3	uCi/ml	3.52 E-10	4.12 E-10	
3. Iodines				
iodine-131	uCi/ml	2.83 E-13		
iodine-133	uCi/ml	4.77 E-13		
iodine-135	uCi/ml	6.66 E-12		

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TABLE 3 (Continued)

GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	Continuous Mode
4. Particulates		
cerium-141	uCi/ml	2.82 E-13
cerium-144	uCi/ml	1.51 E-12
cesium-134	uCi/ml	3.45 E-13
cesium-137	uCi/ml	2.72 E-13
cobalt-58	uCi/ml	3.03 E-13
cobalt-60	uCi/ml	4.91 E-13
iron-59	uCi/ml	7.29 E-13
manganese-54	uCi/ml	4.37 E-13
molybdenum-99[1]	uCi/ml	2.36 E-12
strontium-89	uCi/ml	2.71 E-14
strontium-90[1]	uCi/ml	7.98 E-15
zinc-65	uCi/ml	8.12 E-13
gross alpha	uCi/ml	9.89 E-15

Notes:

[1]Includes daughters

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TABLE 4

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Est Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	2.81 E0	2.89 E0	2.1 E+1
2. Average diluted concentration during period	uCi/ml	1.22 E-8	1.45 E-8	
3. Percent of applicable limit[1]	%	4.59 E-1	1.04 E-1	
B. Tritium				
1. Total release	Ci	1.45 E+2	1.49 E+2	1.3 E+1
2. Average diluted concentration during period	uCi/ml	6.28 E-7	7.45 E-7	
3. Percent of applicable limit[1]	%	2.09 E-2	2.48 E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	3.92 E-1	1.26 E-1	2.1 E+1
2. Average diluted concentration during period	uCi/ml	1.70 E-9	6.30 E-10	
3. Percent of applicable limit[1]	%	8.50 E-4	3.15 E-4	
D. Gross alpha radioactivity				
1. Total release	Ci	MDA	MDA	6.0 E+1

Technical Specification 3.11.1.1 Limit

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TABLE 4 (Continued)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Est Total Error, %
E. Volume of waste released (prior to dilution)	liters	1.22 E+7	1.12 E+7	5.0 E0
F. Volume of circulating saltwater used during release	liters	2.30 E+11	2.00 E+11	6.6 E0

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TABLE 5

LIQUID EFFLUENTS

Nuclides Released	Unit	THIRD QUARTER CONTINUOUS MODE	THIRD QUARTER BATCH MODE	FOURTH QUARTER CONTINUOUS MODE	FOURTH QUARTER BATCH MODE
antimony-124	Ci	MDA	8.99 E-4	MDA	1.96 E-3
antimony-125	Ci	MDA	2.34 E-4	MDA	5.66 E-3
beryllium-7	Ci	MDA	1.04 E-2	MDA	1.34 E-4
cerium-141	Ci	MDA	5.76 E-5	MDA	MDA
cerium-144	Ci	MDA	MDA	MDA	2.27 E-6
cesium-134	Ci	MDA	1.98 E-2	MDA	9.06 E-3
cesium-136	Ci	MDA	4.17 E-3	MDA	4.29 E-4
cesium-137	Ci	MDA	2.95 E-2	MDA	1.27 E-2
chromium-51	Ci	MDA	5.90 E-2	MDA	6.02 E-2
cobalt-57	Ci	MDA	3.47 E-3	MDA	5.00 E-3
cobalt-58	Ci	MDA	9.14 E-1	MDA	1.68 E0
cobalt-60	Ci	MDA	1.87 E-1	MDA	2.54 E-1
iron-55	Ci	MDA	7.54 E-1	MDA	2.06 E-1
iron-59	Ci	MDA	1.51 E-1	MDA	8.19 E-2
lanthanum-140	Ci	MDA	3.89 E-2	MDA	3.28 E-3
manganese-54	Ci	MDA	4.81 E-2	MDA	5.73 E-2
manganese-56	Ci	MDA	4.13 E-6	MDA	MDA
molybdenum-99[1]	Ci	MDA	1.02 E-1	MDA	1.26 E-2
ruthenium-103	Ci	MDA	1.37 E-4	MDA	MDA
silver-110m	Ci	MDA	5.35 E-5	MDA	MDA
sodium-24	Ci	MDA	1.48 E-2	MDA	1.02 E-3

NOTES:
[1] Includes daughters

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TABLE 5 (CONTINUED)

LIQUID EFFLUENTS

Nuclides Released	Unit	THIRD QUARTER CONTINUOUS MODE	THIRD QUARTER BATCH MODE	FOURTH QUARTER CONTINUOUS MODE	FOURTH QUARTER BATCH MODE
strontium-89	Ci	MDA	9.55 E-3	MDA	2.16 E-3
strontium-90[1]	Ci	MDA	1.45 E-4	MDA	1.05 E-4
strontium-91	Ci	MDA	7.07 E-4	MDA	MDA
tin-113[1]	Ci	MDA	1.83 E-3	MDA	7.85 E-4
tin-117m	Ci	MDA	2.13 E-4	MDA	MDA
tungsten-187	Ci	MDA	5.86 E-3	MDA	MDA
zirconium-95[1]	Ci	MDA	1.79 E-2	MDA	1.86 E-2
zinc-65	Ci	MDA	1.54 E-3	MDA	8.25 E-4
iodine-131	Ci	MDA	2.58 E-1	MDA	4.73 E-2
iodine-132	Ci	MDA	8.31 E-5	MDA	3.20 E-5
iodine-133	Ci	MDA	1.58 E-1	MDA	1.43 E-2
iodine-134	Ci	MDA	MDA	MDA	1.80 E-7
iodine-135	Ci	MDA	1.43 E-2	MDA	3.03 E-3
TOTAL FOR PERIOD	Ci	0.00 E+0	2.81 E0	0.00 E+0	2.48 E0
xenon-131m	Ci	MDA	3.69 E-3	MDA	MDA
xenon-133	Ci	MDA	3.53 E-1	MDA	1.23 E-1
xenon-133m	Ci	MDA	5.09 E-3	MDA	8.57 E-5
xenon-135	Ci	MDA	2.98 E-2	MDA	3.20 E-3
krypton-85m	Ci	MDA	1.31 E-4	MDA	3.37 E-5

NOTE:
[1]Includes daughters

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TABLE 6

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	LLD
antimony-124	uCi/ml	2.06 E-8
antimony-125	uCi/ml	8.47 E-8
beryllium-7	uCi/ml	1.82 E-6
cerium-141	uCi/ml	3.49 E-8
cerium-144	uCi/ml	1.88 E-7
cesium-134	uCi/ml	2.92 E-8
cesium-136	uCi/ml	5.06 E-8
cesium-137	uCi/ml	4.90 E-8
chromium-51	uCi/ml	2.50 E-7
cobalt-57	uCi/ml	2.17 E-8
cobalt-58	uCi/ml	3.82 E-8
cobalt-60	uCi/ml	4.36 E-8
iron-55	uCi/ml	3.00 E-7
iron-59	uCi/ml	6.45 E-8
lanthanum-140	uCi/ml	5.68 E-8
manganese-54	uCi/ml	3.91 E-8
manganese-56	uCi/ml	2.96 E-7
molybdenum-99[1]	uCi/ml	2.79 E-7
ruthenium-103	uCi/ml	2.73 E-8
silver-110m	uCi/ml	9.67 E-8
sodium-24	uCi/ml	4.72 E-8
strontium-89	uCi/ml	4.86 E-8
strontium-90[1]	uCi/ml	2.60 E-8
strontium-91	uCi/ml	1.56 E-7

NOTES:
[1]Includes Daughters

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TABLE 6 (CONTINUED)

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	LLD
tin-113[1]	uCi/ml	7.11 E-7
tin-117m	uCi/ml	3.33 E-7
tungsten-187	uCi/ml	8.96 E-8
zirconium-95[1]	uCi/ml	6.51 E-8
zinc-65	uCi/ml	7.22 E-8
gross alpha	uCi/ml	8.33 E-8
iodine-131	uCi/ml	2.55 E-8
iodine-132	uCi/ml	3.20 E-8
iodine-133	uCi/ml	2.12 E-8
iodine-134	uCi/ml	1.12 E-7
iodine-135	uCi/ml	1.63 E-7
xenon-131m	uCi/ml	9.68 E-7
xenon-133	uCi/ml	2.08 E-7
xenon-133m	uCi/ml	2.28 E-7
xenon-135	uCi/ml	2.16 E-8
krypton-85m	uCi/ml	3.34 E-8

NOTES:

[1]Includes daughters

VIII. SOLID RADWASTE SHIPMENTS

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SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel)

1. Type of Waste	Unit	6-Month Period	Est. Total Error, %
a. Spent Resins, sludges	m^3 Ci	2.53 E+1 6.59 E0	10.0
b. Dry Compressible Waste, Contaminated Equip. Etc.	m^3 Ci	6.69 E+1 3.80 E-1	11.0
c. Irradiated Components, Control Rods, Etc.	m^3 Ci	0.00 E0 0.00 E0	N/A
d. Sand, Building Rubble, Biological Waste	m^3 Ci	0.00 E0 0.00 E0	N/A

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

a.		
Co-60	%	86
H-3	%	14
b.		
Co-58	%	50
H-3	%	50
c.		
NOT APPLICABLE	%	N/A
d.		
NOT APPLICABLE	%	N/A

3. Supplemental Information Required by T.S. 6.9.1.6

Solidification Agent	Type of Container	Number of Containers	10 CFR 61 Waste Class
Cement	Type A	2	A
Absorbant	Limited Quantity	18	A
	LSA	33	A
None	Type A	1	A
	LSA	32	A

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SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel) (Continued)

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
6	Truck	Hanford, WA

B. Irradiated Fuel Shipments (Disposition)

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

IX. RADIATION DOSE DUE TO GASEOUS AND LIQUID EFFLUENTS

RADIATION DOSES

A. Radiation doses due to 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 Offsite Dose Calculation Procedure. Since the liquid radwaste system is common to both units, no attempt has been made to segregate each unit's contribution to the total dose. The dose contributions may be assumed to be due to a single unit. Dose contributions, listed in Table 7, show conformance with Technical Specification 3.11.1.2.

B. Radiation doses due to 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 calculational methodology in the Offsite Dose Calculation Procedure. Each unit's dose contribution has been calculated separately. The meteorology conditions concurrent with the time of discharge were used in these calculations. In addition to the site boundary doses, the dose to all age groups at the nearest residence within the low population zone for each of the land sectors and a five mile infant milk dose in each of the land sectors is included. Dose contributions, listed in Table 8 for the third and fourth quarters, show conformance with Technical Specifications 3.11.2.2 and 3.11.2.3.

C. Radiation doses due to direct radiation (Line-of-Sight Plus Sky-Shine) - Closest site boundary (800 m)

The radiation doses due to direct radiation for the report period is evaluated to be 5.41 E-2 mrem due to the presence of radioactive waste containers outside of plant buildings.

D. 40 CFR 190 Considerations

The release of radioactivity in liquid and gaseous effluents during 1986 resulted in doses that are small percentages of the technical specification 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 Diablo Canyon Nuclear Power Plant shows conformance with 40 CFR 190.

E. 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. This is because the discharge piping for liquid radwaste is mostly buried in concrete walls, is located in remote or inaccessible areas or is underground. In addition, the quantity of radioactivity released was very low during 1986.

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 for the year of 1986.

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TABLE 7

RADIATION DOSE DUE TO THE RELEASE OF RADIOACTIVE LIQUID EFFLUENTS

ORGAN	MILLIREM				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Total Body	5.62 E-3	8.72 E-4	1.27 E-2	1.21 E-2	3.13 E-2
Bone	4.33 E-3	1.01 E-3	3.26 E-2	3.14 E-2	6.93 E-2
Liver	6.04 E-3	1.25 E-3	3.66 E-2	3.27 E-2	7.66 E-2
Thyroid	8.54 E-4	2.24 E-3	1.86 E-2	5.23 E-3	2.69 E-2
Kidney	3.10 E-4	1.40 E-4	6.97 E-4	4.72 E-4	1.62 E-3
Lung	1.75 E-3	4.07 E-4	1.45 E-2	1.35 E-2	3.02 E-2
G. I. LLI	4.52 E-2	5.95 E-3	9.33 E-2	9.22 E-2	2.37 E-1

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TABLE 8A

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		First Quarter		Second Quarter	
		Sector[2]	Dose	Sector	Dose
Site Boundary					
Noble Gas					
Gamma air dose	mrad	NW	5.38 E-2	NW	7.34 E-2
Beta air dose	mrad	NW	1.34 E-1	NW	1.67 E-1
I;P,T[3]					
Child[4] (Thyroid)	mrem	NW	1.17 E-3	NW	5.93 E-4
Residence					
Noble Gas					
Gamma air dose	mrad	NNW	4.20 E-3	NW	6.85 E-3
Beta air dose	mrad	NNW	1.04 E-2	NNW	6.11 E-3
I,P,T					
Child[5] (Thyroid)	mrem	NNW	1.14 E-3	ESE	9.16 E-4
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	ESE	1.36 E-3	ESE	1.59 E-3

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TABLE 8A (CONTINUED)

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		Third Quarter		Fourth Quarter		Annual Total	
		Sector[2]	Dose	Sector	Dose	Sector	Dose
Site Boundary							
Noble Gas							
Gamma air dose	mrad	N	6.05 E-2	NNW	2.38 E-3	NW	1.59 E-1
Beta air dose	mrad	N	1.57 E-1	NNW	6.80 E-3	NW	3.87 E-1
I,P,T[3]							
Teen[4] (Thyroid)	mrem	NNW	2.33 E-3	NNW	1.33 E-3	NNW	5.09 E-3
Residence							
Noble Gas							
Gamma air dose	mrad	NNW	3.71 E-3	NNW	3.86 E-4	NNW	1.44 E-2
Beta air dose	mrad	NNW	9.31 E-3	NNW	1.12 E-3	NNW	2.69 E-2
I,P,T							
Child[5] (Thyroid)	mrem	ESE	1.25 E-3	ESE	4.65 E-4	ESE	3.47 E-3
Five Mile Dairy							
I,P,T							
Infant (Thyroid)	mrem	ESE	1.19 E-3	NNW	1.56 E-4	ESE	4.23 E-3

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TABLE 8B

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		First Quarter		Second Quarter	
		Sector[2]	Dose	Sector	Dose
Site Boundary					
Noble Gas					
Gamma air dose	mrad	N	5.99 E-3	NNW	8.05 E-3
Beta air dose	mrad	NNW	1.66 E-2	NNE	1.95 E-2
I,P,T[3]					
Teen[4] (Thyroid)	mrem	NW	1.14 E-4	NNW	3.98 E-4
Residence					
Noble Gas					
Gamma air dose	mrad	ESE	1.39 E-4	NNW	8.87 E-4
Beta air dose	mrad	ESE	3.83 E-4	NNW	1.59 E-3
I,P,T					
Child[5] (Thyroid)	mrem	NNW	3.29 E-5	ESE	2.28 E-4
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	NNW	3.68 E-5	ESE	4.41 E-4

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TABLE 8B (CONTINUED)

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		Third Quarter		Fourth Quarter		Annual Total	
		Sector[2]	Dose	Sector	Dose	Sector	Dose
Site Boundary							
Noble Gas							
Gamma air dose	mrad	SE	2.51 E-2	NNW	3.55 E-2	NNW	5.25 E-2
Beta air dose	mrad	SE	5.73 E-2	NNW	6.85 E-2	NNW	1.02 E-1
I,P,T[3]							
Child[4] (Thyroid)	mrem	ESE	1.21 E-3	NNW	3.80 E-3	NNW	5.09 E-3
Residence							
Noble Gas							
Gamma air dose	mrad	ESE	2.71 E-3	NNW	6.26 E-3	NNW	7.60 E-3
Beta air dose	mrad	ESE	6.27 E-3	NNW	1.19 E-2	NNW	1.42 E-2
I,P,T							
Child[5] (Thyroid)	mrem	ESE	3.41 E-3	NNW	1.59 E-3	ESE	4.30 E-3
Five Mile Dairy							
I,P,T							
Infant (Thyroid)	mrem	ESE	6.28 E-3	NNW	1.79 E-3	ESE	7.70 E-3

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TABLE 8 (Continued)

NOTES:

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

2. The ocean sectors SSE, S, SSW, SW, WSW, W, and WNW are not included.

3. Radioiodines, Radioactive Material in Particulate Form and Radionuclides Other Than Noble Gases With Half-lives Greater Than Eight Days.

4. The inhalation, ground plane and animal-meat pathways are included in this dose calculation.

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

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TABLE 9

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE LIQUID EFFLUENTS

	PERCENT				
ORGAN	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Total Body	3.75 E-1	5.81 E-2	8.47 E-1	8.07 E-1	1.04 E0
Bone	8.66 E-2	2.02 E-2	6.52 E-1	6.28 E-1	6.93 E-1
Liver	1.21 E-1	2.50 E-2	7.32 E-1	6.54 E-1	7.66 E-1
Thyroid	1.71 E-2	4.48 E-2	3.72 E-1	1.05 E-1	2.69 E-1
Kidney	6.20 E-3	2.80 E-3	1.39 E-2	9.44 E-3	1.62 E-2
Lung	3.50 E-2	8.14 E-3	2.90 E-1	2.70 E-1	3.02 E-1
G. I. LLI	9.04 E-1	1.19 E-1	1.87 E0	1.84 E0	2.37 E0

NOTE:

[1] Technical Specification 3.11.1.2

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1986

TABLE 10A

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

	First Quarter		Second Quarter	
	Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary				
Noble Gas				
Gamma air dose	NW	1.08 E0	NW	1.47 E0
Beta air dose	NW	1.34 E0	NW	1.67 E0
I,P,T				
Teen (Thyroid)	NW	1.56 E-2	NW	7.91 E-3
Residence				
Noble Gas				
Gamma air dose	NNW	8.40 E-2	NW	1.37 E-1
Beta air dose	NNW	1.04 E-1	NNW	6.11 E-2
I,P,T				
Child (Thyroid)	NNW	1.52 E-2	ESE	1.22 E-2
Five Mile Dairy				
I,P,T				
Infant (Thyroid)	ESE	1.81 E-2	ESE	2.12 E-2

Note:

[1] Technical Specification 3.11.2.2 and 3.11.2.3

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1986

TABLE 10A (CONTINUED)

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

	Third Quarter		Fourth Quarter		Annual Total	
	Sector	% of T.S. Limit	Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary						
Noble Gas						
Gamma air dose	N	1.21 E0	NNW	4.67 E-2	NW	1.59 E0
Beta air dose	N	1.57 E0	NNW	6.80 E-2	NW	1.94 E0
I,P,T						
Teen (Thyroid)	NNW	3.11 E-2	NNW	1.77 E-2	NNW	3.39 E-2
Residence						
Noble Gas						
Gamma air dose	NNW	7.42 E-2	NNW	7.72 E-3	NNW	1.44 E-1
Beta air dose	NNW	9.31 E-2	NNW	1.12 E-2	NNW	1.35 E-1
I,P,T						
Child (Thyroid)	ESE	1.67 E-2	ESE	6.20 E-3	ESE	2.31 E-2
Five Mile Dairy						
I,P,T						
Infant (Thyroid)	ESE	1.59 E-2	NNW	2.08 E-3	ESE	2.82 E-2

NOTE:

[1] Technical Specification 3.11.2.2 and 3.11.2.3

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TABLE 10B

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

	First Quarter		Second Quarter	
	Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary				
Noble Gas				
Gamma air dose	N	1.20 E-1	NNW	1.61 E-1
Beta air dose	NNW	1.66 E-1	NNE	1.95 E-1
I,P,T				
Teen	NW	1.52 E-3	NNW	5.31 E-3
Residence				
Noble Gas				
Gamma air dose	ESE	2.78 E-3	NNW	1.78 E-2
Beta air dose	ESE	3.83 E-3	NNW	1.59 E-2
I,P,T				
Child	NNW	4.39 E-4	ESE	3.04 E-3
Five Mile Dairy				
I,P,T				
Infant	NNW	4.91 E-4	ESE	5.88 E-3

NOTE:

[1] Technical Specification 3.11.2.2 and 3.11.2.3

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TABLE 10B (CONTINUED)

PERCENT OF TECNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

	Third Quarter		Fourth Quarter		Annual Total	
	Sector	% of T.S. Limit	Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary						
Noble Gas						
Gamma air dose	SE	5.02 E-1	NNW	7.10 E-1	NNW	5.25 E-1
Beta air dose	SE	5.73 E-1	NNW	6.85 E-1	NNW	5.10 E-1
I,P,T						
Child (Thyroid)	ESE	1.61 E-2	NNW	5.07 E-2	NNW	3.39 E-2
Residence						
Noble Gas						
Gamma air dose	ESE	5.42 E-2	NNW	1.25 E-1	NNW	7.60 E-2
Beta air dose	ESE	6.27 E-2	NNW	1.19 E-1	NNW	7.10 E-2
I,P,T						
Child (Thyroid)	ESE	4.55 E-2	NNW	2.12 E-2	ESE	2.87 E-2
Five Mile Dairy						
I,P,T						
Infant (Thyroid)	ESE	8.37 E-2	NNW	2.39 E-2	ESE	5.13 E-2

NOTE:

[1] Technical Specification 3.11.2.2 and 3.11.2.3

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TABLE 11A

RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
FIRST QUARTER, 1986
ONSITE DOSE TO MEMBERS OF THE PUBLIC
SPECIAL INTEREST GROUPS

				EXTERNAL DOSE (MREM)			INTERNAL DOSE (MREM)
				NOBLE GAS		IODINES, PARTICULATES, AND TRITIUM	
SPECIFIC ACTIVITY	EXPOSURE LOCATION (SECTORS)	EXPOSURE CLOSEST DISTANCE	EXPOSURE TIME (HOURS)	WHOLE BODY	SKIN	GROUND PLANE	INHALATION
Police at shooting range	SE	700m	52	5.16 E-4	1.08 E-3	1.40 E-7	1.82 E-5
Tour Participants							
(a) Simulator Bldg.	S	320m	1.0				
(b) Bio Lab	SSE	700m	1.5	4.53 E-5	9.46 E-5	1.22 E-8	5.46 E-6
(c) Overlook	E	200m	0.25				
American Indians at burial grounds	NW NNW	200m 200m	24 24	3.97E-3	8.73 E-3	3.33 E-7	3.87 E-4
Ranch hands driving cattle around site	NW NNW N NNE NE	250m 350m 320m 450m 630m	0.25 0.25 0.25 0.25 0.25	3.07 E-5	6.59 E-5	2.95 E-9	3.33 E-6

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1986

TABLE 11B

RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
SECOND QUARTER, 1986
ONSITE DOSE TO MEMBERS OF THE PUBLIC
SPECIAL INTEREST GROUPS

				EXTERNAL DOSE (MREM)			INTERNAL DOSE (MREM)
				NOBLE GAS		IODINES, PARTICULATES, AND TRITIUM	
SPECIFIC ACTIVITY	EXPOSURE LOCATION (SECTORS)	EXPOSURE CLOSEST DISTANCE	EXPOSURE TIME (HOURS)	WHOLE BODY	SKIN	GROUND PLANE	INHALATION
Police at shooting range	SE	700m	52	2.20 E-3	4.69 E-3	2.17 E-7	3.02 E-5
Tour Participants							
(a) Simulator Bldg.	S	320m	1.0				
(b) Bio Lab	SSE	700m	1.5	1.86 E-4	3.95 E-4	1.85 E-8	8.09 E-6
(c) Overlook	E	200m	0.25				
American Indians at burial grounds	NW NNW	200m 200m	24 24	4.87 E-3	1.06 E-2	1.84 E-7	2.59 E-4
Ranch hands driving cattle around site	NW NNW N NNE NE	250m 350m 320m 450m 630m	0.25 0.25 0.25 0.25 0.25	3.94 E-5	8.90 E-5	1.58 E-9	2.16 E-6

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TABLE 11C

RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
THIRD QUARTER, 1986
ONSITE DOSE TO MEMBERS OF THE PUBLIC
SPECIAL INTEREST GROUPS

				EXTERNAL DOSE (MREM)			INTERNAL DOSE (MREM)
				NOBLE GAS		IODINES, PARTICULATES, AND TRITIUM	
SPECIFIC ACTIVITY	EXPOSURE LOCATION (SECTORS)	EXPOSURE CLOSEST DISTANCE	EXPOSURE TIME (HOURS)	WHOLE BODY	SKIN	GROUND PLANE	INHALATION
Police at shooting range	SE	700m	52	1.62 E-3	3.68 E-3	2.99 E-6	9.11 E-5
Tour Participants							
(a) Simulator Bldg.	S	320m	1.0				
(b) Bio Lab	SSE	700m	1.5	1.58 E-4	3.60 E-4	2.57 E-7	2.60 E-5
(c) Overlook	E	200m	0.25				
American Indians at burial grounds	NW NNW	200m 200m	24 24	3.42 E-3	7.81 E-3	3.11 E-6	7.62 E-4
Ranch hands driving cattle around site	NW NNW N NNE NE	250m 350m 320m 450m 630m	0.25 0.25 0.25 0.25 0.25	4.05 E-5	9.28 E-5	3.44 E-8	7.73 E-6

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TABLE 11D

RADIATION DOSE DUE TO RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS
FOURTH QUARTER, 1986
ONSITE DOSE TO MEMBERS OF THE PUBLIC
SPECIAL INTEREST GROUPS

				EXTERNAL DOSE (MREM)			INTERNAL DOSE (MREM)
				NOBLE GAS		IODINES, PARTICULATES, AND TRITIUM	
SPECIFIC ACTIVITY	EXPOSURE LOCATION (SECTORS)	EXPOSURE CLOSEST DISTANCE	EXPOSURE TIME (HOURS)	WHOLE BODY	SKIN	GROUND PLANE	INHALATION
Police at shooting range	SE	700m	52	2.29 E-4	5.03 E-4	3.98 E-6	3.94 E-5
Tour Participants							
(a) Simulator Bldg.	S	320m	1.0				
(b) Bio Lab	SSE	700m	1.5	2.34 E-5	5.11 E-5	3.42 E-7	1.15 E-5
(c) Overlook	E	200m	0.25				
American Indians at burial grounds	NW NNW	200m 200m	24 24	2.66 E-3	5.58 E-3	1.26 E-5	1.30 E-3
Ranch hands driving cattle around site	NW NNW N NNE NE	250m 350m 320m 450m 630m	0.25 0.25 0.25 0.25 0.25	1.98 E-5	4.19 E-5	1.00 E-7	9.84 E-6

X. METEOROLOGICAL DATA

METEOROLOGICAL DATA

The hour-by-hour listing of wind speed, wind direction, atmospheric stability and precipitation is being submitted on magnetic tape in accordance with Technical Specification 6.9.1.6.

ATTACHMENT 1