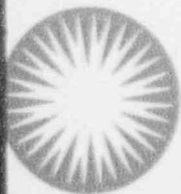


HOPE CREEK GENERATING STATION
SEMIANNUAL RADIOACTIVE
EFFLUENT RELEASE REPORT
HCGS RERR-14

DOCKET NO. 50-354
OPERATING LICENSE NO. NFP-57

FEBRUARY 1993



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The Energy People

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HOPE CREEK GENERATING STATION
RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1992

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HOPE CREEK GENERATING STATION
RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1992

INTRODUCTION

This report, HCGS-RERR-14, summarizes information pertaining to the releases of radioactive materials in liquid, gaseous and solid form from the Hope Creek Generating Station (HCGS) for the period July 1, 1992 to December 31, 1992.

The Hope Creek Generating Station (HCGS) employs a General Electric (GE) Boiling Water Reactor designed to operate at a rated core thermal power of 3293 MWt with a gross electrical output of approximately 1118 MWe and a net output of approximately 1067 MWe. The HCGS achieved initial criticality on June 28, 1986 and went into commercial operation on December 20, 1986.

This report is prepared in the format of Regulatory Guide 1.21, Appendix B, as required by Specification 6.9.1.7 of the Hope Creek Technical Specifications. Our responses to parts A-F of the "Supplemental Information" section of Regulatory Guide 1.21, Appendix B, are included in the following pages.

As required by Regulatory Guide 1.21, the Hope Creek Technical Specification limits are described in detail within this report along with a summary description of how total radioactivity measurements and their approximations were developed.

To facilitate determination of compliance with 40CFR190 requirements, the following information on electrical output is provided.

Hope Creek generated 2,980,807 megawatt-hours of electrical energy (net) during the reporting period.

Results of liquid and gaseous composites analyzed for Sr-89, Sr-90 and Fe-55 for the fourth quarter of 1992 were not available for inclusion in this report. The results of these composites will be provided in the next Radioactive Effluent Release Report.

The Sr-89, Sr-90 and Fe-55 analyses for the second half of 1992 (refer to RERR-13) have been completed; amended pages to RERR-13 are included in this report.

PART A. PRELIMINARY SUPPLEMENTAL INFORMATION

1.0 REGULATORY LIMITS

1.1 Fission and Activation Gas Release Limits

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to the following:

For noble gases: Less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

In addition, the air dose due to noble gases released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to the following:

During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation and,

During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

1.2 Iodine, Particulates, and Tritium

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to the following:

For Iodine-131, I-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

In addition, the dose to a member of the public from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the site boundary, shall be limited to the following:

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

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

1.3 Liquid Effluents Release Limits

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10CFR20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to $2E-4$ microcuries per milliliter.

In addition, the dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas shall be limited to:

During any calendar quarter: Less than or equal to 1.5 mrem to the total body, and less than or equal to 5 mrem to any organ, and

During any calendar year: Less than or equal to 3 mrem to the total body, and less than or equal to 10 mrem to any organ.

1.4 Total Dose Limit

The annual (calendar year) dose or dose commitment to any member of the public, due to releases of radioactivity and radiation, from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which shall be limited to less than or equal to 75 mrem).

2.0 MAXIMUM PERMISSIBLE CONCENTRATIONS (MPC)

Regulatory Guide 1.21 requires that the licensee provide the MPCs used in determining allowable release rates or concentrations for radioactive releases.

- a. MPC values were not used to determine the maximum release rates for fission gases, iodines, or particulates.
- b. MPC values as stated in 10CFR20, Appendix B, Table II, Column 2 are used for liquid effluents.
- c. The MPC value used for dissolved or entrained noble gases is $2E-4$ microcuries per milliliter.

3.0 AVERAGE ENERGY

Regulatory Guide 1.21 requires that the licensee provide the average energy of the radionuclide mixture in releases of fission and activation gases, if applicable.

Release limits for HCGS are not based upon average energy. Therefore this section is not applicable to HCGS.

4.0 MEASUREMENTS AND APPROXIMATION OF TOTAL RADIOACTIVITY

4.1 Liquid Effluents

Liquid effluents are monitored in accordance with Table 4.11.1.1.1-1 of the Technical Specifications. During the period of record, all batch liquid wastes were routed to the sampling tanks for monitoring prior to release. Technical Specifications require these tanks to be uniformly mixed for sampling and analysis before being released. Batch releases are defined as releases from the equipment drain sample tanks, floor drain sample tanks, detergent drain tanks, and the condensate storage tank dike. Normally, there are no continuous liquid releases. Specific activities from analyses were multiplied by the volume of effluent discharged to the environment in order to determine the total liquid activity discharged.

The detection requirements of Table 4.11.1.1-1 of the Technical Specifications are achieved or exceeded. Radionuclides measured at concentrations below the Technical Specification detection limit (LLDs) are treated as being present. Radionuclides for which no activity was detected while meeting the required LLDs are treated as absent.

4.2 Gaseous Effluents

Gaseous effluent streams are monitored and sampled in accordance with Table 4.11.2.1.2-1 of the Technical Specifications. The north plant vent (NPV) and south plant vent (SPV) are the final release points for most planned gaseous effluent releases. A small quantity of gaseous effluent will be released via the filtration, recirculation, and ventilation system (FRVS) vent during testing periods. The NPV and SPV are continuously monitored for iodine, particulates and noble gases; the FRVS is continuously monitored for noble gases. The NPV and SPV monitors have moving particulate and fixed charcoal filters; the FRVS monitor has fixed particulate and charcoal filters.

The filters and charcoal are changed weekly, and are analyzed on a multichannel analyzer. The NPV and SPV are sampled monthly for noble gases and tritium.

The detection requirements of Tables 4.11.2.1.2-1 of the Technical Specifications are achieved or exceeded. Radionuclides detected at concentrations below the Technical Specification detection limit (LLDs) are treated as being present. Radionuclides for which no activity was detected while meeting the required LLDs are treated as absent.

Continuous Mode gaseous releases are quantified by routine (monthly) sampling and isotopic analyses of the plant vents. If noble gases are detected during the routine sampling, the measured concentrations are adjusted using the radiation monitoring readings to obtain an average concentration for the period. This average concentration is then multiplied by the total vent flow value for the entire sampling period in order to estimate the normal continuous release of radioactivity through the plant vent.

When monthly vent grab samples yield no detectable activity, continuous mode releases are quantified by integrating Radiation Monitor System readings. Noble gas isotopic abundances for these integrations are based on the ANSI N237-1976/ANS-18.1 mix for BWRs. Doses calculated from this data employ the methods from Section 2.0 and Appendix C of the Hope Creek ODCM.

Batch Mode gaseous releases (primary containment purge) are quantified by pre-release sampling and isotopic analysis. Specific activities for each isotope are multiplied by the total purge flow volume for that batch in order to estimate the batch release of radioactivity through the plant vent.

Elevated plant vent radiation monitoring system readings while the channel is in an alarm state are treated as batch mode releases. If specific activity data from grab samples taken is not available, then the abnormal release is quantified by the use of the plant vent radiation monitors. The monitor's response is converted to a "specific activity" using historical efficiency factors. The "specific activity" is multiplied by the volume of effluent discharged while the channel was in an alarm state in order to estimate the total activity discharged.

4.3 Estimated Total Error

The estimated total error of reported liquid releases is within 25%.

The estimated total error of the reported continuous gaseous releases is within 50% when concentrations exceed detectable levels. This error is due primarily to variability of waste stream flow rates and changes in isotopic distributions of waste streams between sampling periods. The estimated total error of the reported batch gaseous releases is within 10%.

Error estimates for releases where sample activity is below the detectable concentration levels are not included since error estimates at the LLD are not defined.

The estimated total error of reported solid releases is within 25%.

5.0 BATCH RELEASES

Summaries of batch releases of gaseous and liquid effluents are provided in Tables 4A and 4B.

6.0 UNPLANNED RELEASES

During this reporting period there were no unplanned releases.

7.0 ELEVATED RADIATION MONITOR RESPONSES

During this reporting period, there were no elevated radiation monitor readings.

8.0 MODIFICATION TO PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORTS

Our last report (RERR-13) did not include the quarterly Sr-89, Sr-90 and Fe-55 composite data for the second half of 1992. Amended pages to RERR-13 are included at the end of this report.

PART B. GASEOUS EFFLUENTS

See Summary Tables 1A through 1C.

PART C. LIQUID EFFLUENTS

See Summary Tables 2A through 2B.

PART D. SOLID WASTE

See Summary in Table 3.

PART E. RADIOLOGICAL IMPACT ON MAN

The calculated individual doses in this section are based on actual locations of nearby residents and farms. The population dose impact is based on historical site specific data i.e., food production, milk production, feed for milk animals and seafood production.

The doses were calculated using methods described in Regulatory Guide 1.109 and represent calculations for the six month reporting interval. Individual doses from batch and continuous releases were calculated using the annual average historic meteorological dispersion coefficients as described in the Offsite Dose Calculation Manual. Population doses were calculated using the meteorological dispersion coefficients for the six month reporting interval.

Liquid Pathways

Doses to the "maximum hypothetical individual" in the population from liquid releases are primarily from the seafood ingestion pathway. Calculated doses are as shown below.

Total body dose : $9.46\text{E-}02$ mrem

Highest organ dose (GI-LLI): $2.18\text{E-}01$ mrem

Dose to the 6 million individuals living within the 50 mile radius of the plant site:

Total population dose: $1.09\text{E+}00$ person-rem

Average population dose: $1.83\text{E-}04$ mrem/person

Air Pathways

The calculated doses to individuals via the air pathway are shown below:

Total body dose: 4.28E-02 mrem

Skin dose: 9.33E-02 mrem

Highest organ dose due to radioiodines and particulates with half lives greater than 8 days:

1.43E-05 mrem to the GI-LLI

Dose to the 6 million individuals living within the 50 mile radius of the plant site:

Total population dose: 1.02E-01 person-rem

Average population dose: 1.71E-05 mrem/person

Direct Radiation

Direct radiation may be estimated by Thermoluminescent dosimetric (TLD) measurements. One method for comparing TLD measurements is by comparison with pre-operational data. It should be noted that the TLDs measure direct radiation from both the Salem and Hope Creek Generating Stations at Artificial Island, and natural background radiation.

TLD data for the six month reporting period is given below:

TLD	Location	Measurement
2S-2	0.3 mile	5.2 mrad/month
5S-1	0.9 mile	4.7 mrad/month

These values are interpreted to represent natural background, since the values are within the statistical variation associated with the pre-operational program results, which are 3.7 mrad/month for location 2S-2, and 4.2 mrad/month for location 5S-1.

Total Dose

40CFR190 limits the total dose to members of the public due to radioactivity and radiation from uranium fuel cycle sources to:

<25 mrem total body or any organ
<75 mrem thyroid

for a calendar year. For Artificial Island, the major sources of dose are from liquid and gaseous effluents from the Hope Creek and Salem plants.

The following doses to a "maximum hypothetical individual " have been calculated for the six month reporting period. They are the sum of gaseous and liquid pathway doses for the Salem 1 and 2 and Hope Creek plants:

0.407 mrem total body
1.348 mrem organ (GI-LLI)
0.005 mrem thyroid

Dose to members of the public due to activities inside the site boundary.

In accordance with the requirements of Technical Specification 6.9.1.7, the dose to members of the public inside the site boundary has been calculated based on the following assumptions:

- a. Such persons are participating or spectators in company softball league
- b. 10 hours per week on site
- c. dose due to airborne pathway (inhalation and immersion)
- d. persons are located about 3/4 mile east of plant discharge points (baseball fields)
- e. occupancy coincides with batch gaseous discharges

For the six month reporting period, the calculated doses are:

6.13E-05 mrem total body
6.25E-05 mrem organ (Lung)

Assessment

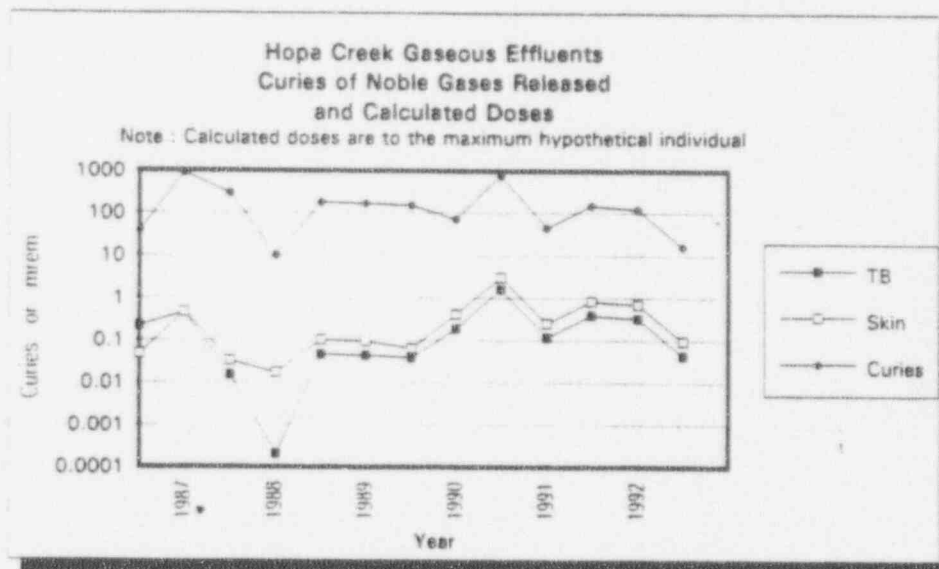
Gaseous effluents released from Hope Creek resulted in a minimal dose to the maximum hypothetical individual. The air dose for the 6 month period was a small fraction of all applicable limits.

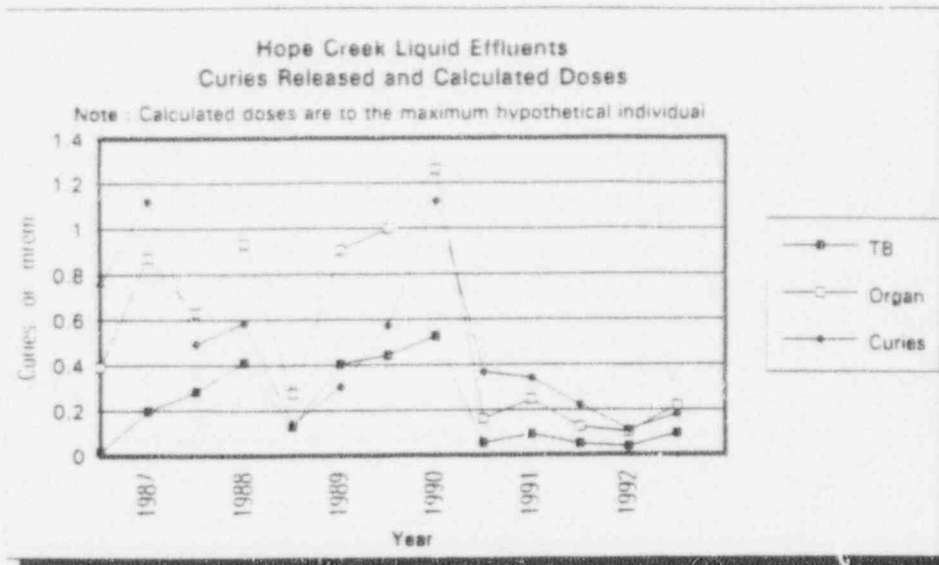
Individual noble gas radionuclide concentrations are too low to measure directly. Calculated doses from noble gases are based on a default isotopic mixture, which assumes little decay, and has principally short lived species with large dose factors. Because of this assumed isotopic mix, calculated doses are probably conservative by a factor of 25, assuming that the actual discharge consisted of mostly Xenon-133.

Hope Creek liquid effluents increased slightly from previous reporting period due to a refueling outage.

Tritium in liquid effluents increased significantly until the unit was shutdown for a refueling outage in November 1992. Weekly tritium samples following the refueling outage have indicated that tritium values have returned to normal. Chemistry, Nuclear Fuels and Chemistry Services are investigating the cause of the increase. Initial suspected cause is the control rods that were removed from the core during the refueling.

The following two trend graphs show the total curies of gaseous and liquid effluents released for Hope Creek since plant operation in 1986. Calculated doses in the graphs are to the maximum hypothetical individual.





PART F. METEOROLOGICAL DATA

Cumulative joint wind frequency distributions by atmospheric stability class at the 300 foot elevation are provided for the third and fourth quarters of 1992 in Tables 5 and 6.

PART G. OFFSITE DOSE CALCULATION MANUAL (ODCM) CHANGES

During this period, there was a revision to the HCGS Off-site Dose Calculation Manual. Revision 12 was approved by SORC on 11/4/92. This revision did not affect the dose calculation methodology.

PART H. INOPERABLE MONITORS

During this period, there were no effluent monitors inoperable for greater than 30 days.

PART I. ENVIRONMENTAL MONITORING LOCATION CHANGES

During the reporting period, there were no changes to the environmental monitoring sampling locations.

HOPE CREEK GENERATING STATION

TABLE 1A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Units	3rd Quarter	4th Quarter	Est. Total Error %
A. Fission and Activation Gases				
1. Total release	Ci	1.35E+01	2.88E+00	25
2. Average release rate for period	μCi/sec	1.69E+00	3.62E-01	
3. Percent of technical specification limit (T.S. 3.11.2.2(a))	%	1.83E-01	3.92E-02	
B. Iodines				
1. Total iodine-131,133	Ci	0.00E+00	0.00E+00	25
2. Average release rate for period	μCi/sec	0.00E+00	0.00E+00	
3. Percent of technical specification limit (2) (T.S. 3.11.2.3(a))	%	1.91E-04	5.13E-05	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	9.17E-04	2.09E-04	25
2. Average release rate for period	μCi/sec	1.15E-04	2.62E-05	
3. Percent of technical specification limit (2) (T.S. 3.11.2.3(a))	%	1.91E-04	5.13E-05	
4. Gross alpha	Ci	6.58E-06	4.12E-06	
D. Tritium				
1. Total Release	Ci	1.37E+01	2.97E+00	25
2. Average release rate for period	μCi/sec	1.72E+00	3.74E-01	
3. Percent of technical specification limit (2) (T.S. 3.11.2.3(a))	%	1.91E-04	5.13E-05	

(1) For batch releases the estimated overall error is within 10%

(2) Iodine, tritium and particulates are treated as a group

HOPE CREEK GENERATING STATION

TABLE 1B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	3rd Quarter	4th Quarter	3rd Quarter	4th Quarter
1. Fission Gases					
Krypton-83m	Ci	1.35E-01	2.88E-02	0.00E+00	0.00E+00
Krypton-85m	Ci	1.35E-01	2.88E-02	0.00E+00	0.00E+00
Krypton-87	Ci	5.38E-01	1.15E-01	0.00E+00	0.00E+00
Krypton-88	Ci	5.38E-01	1.15E-01	0.00E+00	0.00E+00
Krypton-89	Ci	3.63E+00	7.75E-01	0.00E+00	0.00E+00
Xenon-133	Ci	2.69E-01	5.76E-02	0.00E+00	0.00E+00
Xenon-135	Ci	6.74E-01	1.44E-01	0.00E+00	0.00E+00
Xenon-135m	Ci	8.08E-01	1.73E-01	0.00E+00	0.00E+00
Xenon-137	Ci	4.17E+00	8.93E-01	0.00E+00	0.00E+00
Xenon-138	Ci	2.56E+00	5.47E-01	0.00E+00	0.00E+00
TOTALS	Ci	1.35E+01	2.88E+00	0.00E+00	0.00E+00
2. Iodines					
Iodine-131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTALS	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates (half-live >8 days)					
Manganese-54	Ci	6.64E-04	2.09E-04	5.39E-08	0.00E+00
Cobalt-60	Ci	2.53E-04	0.00E+00	0.00E+00	0.00E+00
Strontium-89	Ci	1.13E-10	2.25E-10	0.00E+00	0.00E+00
TOTALS	Ci	9.17E-04	2.09E-04	5.39E-08	0.00E+00

HOPE CREEK GENERATING STATION

TABLE 1C

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

JULY - DECEMBER 1992

GASEOUS EFFLUENTS-ELEVATED RELEASES

There were no elevated gaseous releases during this reporting period.

HOPE CREEK GENERATING STATION

TABLE 2A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Units	3rd Quarter	4th Quarter	Est. Total Error %
<hr/>				
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	1.06E-01	7.52E-02	25
2. Average diluted concentration during release period.	μCi/mL	6.13E-08	8.51E-08	
3. Percent of technical specification limit (T.S. 3.11.1.2.(a))	%	2.87E+00	3.44E+00	
B. Tritium				
1. Total release	Ci	6.06E+01	2.38E+01	25
2. Average diluted concentration during release period	μCi/mL	3.50E-05	2.69E-05	
3. Percent of technical specification limit (T.S. 3.11.1.1)	%	1.16E+00	8.97E-01	
C. Dissolved and entrained noble gases				
1. Total release	Ci	4.60E-03	1.63E-03	25
2. Average diluted concentration during release period.	μCi/mL	2.66E-09	1.84E-09	
3. Percent of technical specification limit (T.S. 3.11.1.1)	%	1.33E-03	9.20E-04	
D. Gross alpha activity				
1. Total release	Ci	0.00E+00	0.00E+00	25
E. Volume of waste release (prior to dilution - Batch Release)	liters	7.04E+06	4.89E+06	25
F. Volume of dilution water used during entire period	liters	1.61E+10	1.20E+10	25

HOPE CREEK GENERATING STATION

TABLE 2B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992

LIQUID EFFLUENTS

Nuclides Released	Unit	CONTINUOUS MODE		BATCH MODE	
		3rd Quarter	4th Quarter	3rd Quarter	4th Quarter
Niobium-95	Ci	0.00E+00	0.00E+00	2.92E-05	4.66E-05
Chromium-51	Ci	0.00E+00	0.00E+00	2.95E-02	1.17E-02
Manganese-54	Ci	0.00E+00	0.00E+00	2.99E-02	2.66E-02
Iron-55	Ci	0.00E+00	0.00E+00	6.49E-03	0.00E+00
Iron-59	Ci	0.00E+00	0.00E+00	5.53E-03	7.91E-03
Cobalt-58	Ci	0.00E+00	0.00E+00	9.23E-04	9.12E-04
Cobalt-60	Ci	0.00E+00	0.00E+00	5.20E-03	3.71E-03
Zinc-65	Ci	0.00E+00	0.00E+00	2.64E-02	2.23E-02
Silver-110m	Ci	0.00E+00	0.00E+00	1.98E-03	2.00E-03
Sodium-24	Ci	0.00E+00	0.00E+00	0.00E+00	7.25E-06
Lanthanum-140	Ci	0.00E+00	0.00E+00	8.28E-06	0.00E+00
Arsenic-76	Ci	0.00E+00	0.00E+00	3.35E-05	0.00E+00
Zinc-69m	Ci	0.00E+00	0.00E+00	9.24E-06	0.00E+00
TOTALS	Ci	0.00E+00	0.00E+00	1.06E-01	7.52E-02
Tritium	Ci	0.00E+00	0.00E+00	6.06E+01	2.38E+01
Xenon-133	Ci	0.00E+00	0.00E+00	2.91E-04	0.00E+00
Xenon-135	Ci	0.00E+00	0.00E+00	4.31E-03	1.63E-03
TOTALS	Ci	0.00E+00	0.00E+00	6.06E+01	2.38E+01

HOPE CREEK GENERATING STATION

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL
(Not irradiated fuel)

1. Type of waste	Units(1)	6-month period	Est. Total Error, %
a. Spent resins, filters, sludges, evaporator bottoms	m3 Ci	4.27E+01 9.38E+02	25
b. Dry compressible waste, contaminated equipment.	m3 Ci	2.26E+01 5.37E+00	25
c. Irradiated components, control rods	m3 Ci	0.00E+00 0.00E+00	25
d. Others (described) Oil, Sewage Sludge	m3 Ci	2.89E+01 2.04E-03	25

2. Estimate of major nuclide composition (for Type A and B waste)

	(%)	RESINS (Ci)	(%)	DAW (Ci)	(%)	OIL (Ci)
Chromium-51	0.0	0.00E+00	13.6	7.30E-01	0.0	0.00E+00
Iron-55	44.0	4.13E+02	35.2	1.89E+00	73.7	1.39E-03
Manganese-54	8.8	8.26E+01	4.0	2.10E-01	4.9	9.26E-05
Cerium-144	2.4	2.25E+01	0.0	0.00E+00	0.0	0.00E+00
Cobalt-60	3.5	3.28E+01	2.4	1.30E-01	5.0	9.45E-05
Nickel-63	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00
Zinc-65	40.8	3.83E+02	43.0	2.31E+00	16.1	3.04E-04

2. Estimate of major nuclide composition (for Type A and B waste)

	(%)	Sewage Sludge (Ci)
Zinc-65	64.4	9.72E-05
Cobalt-60	25.0	3.78E-05
Manganese-54	10.6	1.60E-05

(1) Volumes are measured, activities are estimated

HOPE CREEK GENERATING STATION

TABLE 3
(CONT'D)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT JULY - DECEMBER 1992 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination	Type of Containers
14	Truck	Barnwell, SC	HIC and 17E Drums
11	Truck	Oak Ridge, Tn	Strong, Tight Containers
1	Truck	Richland, WA.	17H Drums

IRRADIATED FUEL SHIPMENTS (Disposition)

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

HOPE CREEK GENERATING STATION
TABLE 4A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
SUMMARY SHEET FOR RADIOACTIVE EFFLUENTS RELEASED
IN A BATCH MODE

BATCH RELEASES ONLY

1. Dates: July 1 - September 30, 1992
2. Type of release: Gas
3. Number of releases during the 3rd Quarter: 1
4. Total time duration for all releases of type listed above:
7.80E+02 min
5. Maximum duration for release of type listed above:
7.80E+02 min
6. Average duration for release of type listed above:
7.80E+02 min
7. Minimum duration for release of type listed above:
7.80E+02 min
8. Average stream flow (dilution flow) during the period of
release: N/A

HOPE CREEK GENERATING STATION
TABLE 4A
(CONT'D)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
SUMMARY SHEET FOR RADIOACTIVE EFFLUENTS RELEASED
IN A BATCH MODE

BATCH RELEASES ONLY

1. Dates: October 1 - December 31, 1992
2. Type of release: Gas
3. Number of releases during the 4th Quarter: 1
4. Total time duration for all releases of type listed above:
3.60E+03 min
5. Maximum duration for release of type listed above:
3.60E+03 min
6. Average duration for release of type listed above:
3.60E+03 min
7. Minimum duration for release of type listed above:
3.60E+03 min
8. Average stream flow (dilution flow) during the period of
release: N/A

HOPE CREEK GENERATING STATION
TABLE 4B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
SUMMARY SHEET FOR RADIOACTIVE EFFLUENTS RELEASED
IN A BATCH MODE

BATCH RELEASES ONLY

1. Dates: July 1 - September 30, 1992
2. Type of release: Liquid
3. Number of releases during the 3rd Quarter: 167
4. Total time duration for all releases of type listed above:
1.34E+04 min
5. Maximum duration for release of type listed above:
1.30E+02 min
6. Average duration for release of type listed above:
8.00E+01 min
7. Minimum duration for release of type listed above:
1.5E+01 min
8. Average stream flow (dilution flow) during the period of
release: 34231 gpm

HOPE CREEK GENERATING STATION
TABLE 4B
(CONT'D)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JULY - DECEMBER 1992
SUMMARY SHEET FOR RADIOACTIVE EFFLUENTS RELEASED
IN A BATCH MODE

BATCH RELEASES ONLY

1. Dates: October 1 - December 31, 1992
2. Type of release: Liquid
3. Number of releases during the 4th Quarter: 126
4. Total time duration for all releases of type listed above:
9.41E+03 min
5. Maximum duration for release of type listed above:
1.18E+02 min
6. Average duration for release of type listed above:
7.47E+01 min
7. Minimum duration for release of type listed above:
1.8E+01 min
8. Average stream flow (dilution flow) during the period of
release: 24832 gpm

TIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: LE -1.9 DEG C/100M
CLASS A

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
RECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	0	0.0	5	0.2	0	0.0	0	0.0	1	0.0	0	0.0	6	0.3
NNE	0	0.0	0	0.0	2	0.1	1	0.0	0	0.0	0	0.0	0	0.0	3	0.1
NE	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	0	0.0	0	0.0	2	0.1
ENE	0	0.0	0	0.0	2	0.1	1	0.0	0	0.0	0	0.0	0	0.0	3	0.1
E	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
ESE	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
SE	0	0.0	0	0.0	1	0.0	2	0.1	1	0.0	1	0.0	0	0.0	5	0.2
SSE	0	0.0	0	0.0	2	0.1	0	0.0	4	0.2	1	0.0	0	0.0	7	0.3
S	0	0.0	0	0.0	2	0.1	2	0.1	0	0.0	0	0.0	0	0.0	4	0.2
SSW	0	0.0	2	0.1	1	0.0	0	0.0	1	0.0	0	0.0	0	0.0	4	0.2
SW	0	0.0	0	0.0	4	0.2	1	0.0	0	0.0	0	0.0	0	0.0	5	0.2
WSW	0	0.0	0	0.0	5	0.2	3	0.1	1	0.0	0	0.0	0	0.0	9	0.4
W	0	0.0	0	0.0	4	0.2	2	0.1	3	0.1	1	0.0	0	0.0	10	0.5
WNW	0	0.0	0	0.0	0	0.0	0	0.0	4	0.2	3	0.1	0	0.0	7	0.3
NW	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	2	0.1	0	0.0	4	0.2
NNW	0	0.0	0	0.0	1	0.0	2	0.1	1	0.0	0	0.0	0	0.0	4	0.2
	0	0.0	2	0.1	30	1.4	17	0.8	17	0.8	9	0.4	0	0.0	75	3.5

AN WIND SPEED: 10.8
SSING: 0

TIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -1.8 TO -1.7 DEG C/100M
CLASS B

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
RECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	0	0.0	2	0.1	4	0.2	4	0.2	1	0.0	0	0.0	11	0.5
NNE	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0	0	0.0	2	0.1
NE	0	0.0	0	0.0	2	0.1	1	0.0	2	0.1	1	0.0	0	0.0	6	0.3
ENE	0	0.0	0	0.0	3	0.1	0	0.0	0	0.0	0	0.0	0	0.0	3	0.1
E	0	0.0	0	0.0	5	0.2	2	0.1	0	0.0	0	0.0	0	0.0	7	0.3
ESE	0	0.0	0	0.0	1	0.0	1	0.0	0	0.0	0	0.0	0	0.0	2	0.1
SE	0	0.0	0	0.0	1	0.0	4	0.2	4	0.2	0	0.0	0	0.0	9	0.4
SSE	0	0.0	2	0.1	0	0.0	1	0.0	5	0.2	1	0.0	0	0.0	9	0.4
S	0	0.0	0	0.0	3	0.1	2	0.1	0	0.0	0	0.0	0	0.0	5	0.2
SSW	0	0.0	0	0.0	5	0.2	0	0.0	0	0.0	0	0.0	0	0.0	5	0.2
SW	0	0.0	0	0.0	6	0.3	3	0.1	2	0.1	0	0.0	0	0.0	11	0.5
WSW	0	0.0	0	0.0	4	0.2	6	0.3	0	0.0	0	0.0	0	0.0	10	0.5
W	0	0.0	0	0.0	2	0.1	5	0.2	1	0.0	1	0.0	0	0.0	9	0.4
WNW	0	0.0	0	0.0	1	0.0	0	0.0	4	0.2	1	0.0	0	0.0	6	0.3
NW	0	0.0	0	0.0	2	0.1	1	0.0	6	0.3	2	0.1	0	0.0	11	0.5
NNW	0	0.0	0	0.0	0	0.0	5	0.2	3	0.1	1	0.0	0	0.0	9	0.4
	0	0.0	2	0.1	37	1.7	36	1.7	31	1.4	9	0.4	0	0.0	115	5.4

AN WIND SPEED: 10.8
SSING: 0

ARTIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -1.6 TO -1.5 DEG C/100M
CLASS C

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	0	0.0	2	0.1	8	0.4	2	0.1	1	0.0	0	0.0	13	0.6
NNE	0	0.0	0	0.0	1	0.0	1	0.0	2	0.1	1	0.0	0	0.0	5	0.2
NE	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1
ENE	0	0.0	0	0.0	4	0.2	2	0.1	3	0.1	0	0.0	0	0.0	9	0.4
E	0	0.0	0	0.0	2	0.1	1	0.0	0	0.0	0	0.0	0	0.0	3	0.1
ESE	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1
SE	0	0.0	0	0.0	1	0.0	4	0.2	4	0.2	4	0.2	3	0.1	16	0.7
SSE	0	0.0	0	0.0	4	0.2	7	0.3	3	0.1	3	0.1	0	0.0	17	0.8
S	0	0.0	1	0.0	4	0.2	3	0.1	0	0.0	0	0.0	0	0.0	8	0.4
SSW	0	0.0	1	0.0	2	0.1	0	0.0	3	0.1	0	0.0	0	0.0	6	0.3
SW	0	0.0	1	0.0	6	0.3	3	0.1	1	0.0	0	0.0	0	0.0	11	0.5
WSW	0	0.0	0	0.0	4	0.2	5	0.2	0	0.0	1	0.0	0	0.0	10	0.5
W	0	0.0	0	0.0	1	0.0	9	0.4	2	0.1	1	0.0	0	0.0	13	0.6
WNW	0	0.0	0	0.0	4	0.2	4	0.2	1	0.0	0	0.0	0	0.0	9	0.4
NW	0	0.0	1	0.0	4	0.2	0	0.0	7	0.3	1	0.0	0	0.0	13	0.6
NNW	0	0.0	0	0.0	4	0.2	2	0.1	1	0.0	3	0.1	0	0.0	10	0.5
	0	0.0	4	0.2	47	2.2	49	2.3	29	1.4	15	0.7	3	0.1	147	6.9

MEAN WIND SPEED: 10.8
MISSING: 0

ARTIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASSWIND: 300 FT
DELTA T: (300-33FT)LAPSE RATE: +1.4 TO -0.5 DEG C/100M
CLASS D

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	6	0.3	12	0.6	8	0.4	9	0.4	2	0.1	1	0.0	38	1.8
NNE	0	0.0	1	0.0	10	0.5	20	0.9	10	0.5	6	0.3	0	0.0	47	2.2
NE	0	0.0	2	0.1	7	0.3	19	0.9	23	1.1	7	0.3	7	0.3	65	3.0
ENE	0	0.0	0	0.0	5	0.2	29	1.4	11	0.5	1	0.0	0	0.0	46	2.1
E	0	0.0	0	0.0	9	0.4	28	1.3	4	0.2	0	0.0	0	0.0	41	1.9
ESE	0	0.0	1	0.0	2	0.1	11	0.5	9	0.4	0	0.0	0	0.0	23	1.1
SE	0	0.0	0	0.0	3	0.1	11	0.5	22	1.0	9	0.4	7	0.3	52	2.4
SSE	0	0.0	2	0.1	13	0.6	25	1.2	40	1.9	9	0.4	3	0.1	92	4.3
S	0	0.0	5	0.2	16	0.7	35	1.6	35	1.6	7	0.3	0	0.0	98	4.6
SSW	0	0.0	3	0.1	13	0.6	18	0.8	33	1.5	14	0.7	1	0.0	82	3.8
SW	0	0.0	8	0.4	12	0.6	16	0.7	22	1.0	4	0.2	1	0.0	63	2.9
WSW	0	0.0	3	0.1	4	0.2	15	0.7	3	0.1	3	0.1	0	0.0	28	1.3
W	0	0.0	1	0.0	9	0.4	21	1.0	11	0.5	4	0.2	0	0.0	46	2.1
WNW	0	0.0	1	0.0	10	0.5	8	0.4	10	0.5	4	0.2	0	0.0	33	1.5
NW	0	0.0	3	0.1	4	0.2	12	0.6	11	0.5	4	0.2	0	0.0	34	1.6
NNW	0	0.0	1	0.0	12	0.6	8	0.4	11	0.5	4	0.2	3	0.1	39	1.8
	0	0.0	37	1.7	141	6.6	284	13.3	264	12.3	78	3.6	23	1.1	827	38.6

MEAN WIND SPEED: 12.1
MISSING: 0

TIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -0.4 TO 1.5 DEG C/100M
CLASS E

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
RECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	0	0.0	7	0.3	16	0.7	17	0.8	14	0.7	3	0.1	57	2.7
NNE	0	0.0	2	0.1	8	0.4	13	0.6	7	0.3	7	0.3	0	0.0	37	1.7
NE	0	0.0	2	0.1	6	0.3	16	0.7	14	0.7	0	0.0	0	0.0	38	1.8
ENE	0	0.0	3	0.1	10	0.5	21	1.0	4	0.2	1	0.0	2	0.1	41	1.9
E	0	0.0	0	0.0	16	0.7	11	0.5	0	0.0	0	0.0	0	0.0	27	1.3
ESE	0	0.0	2	0.1	8	0.4	12	0.6	8	0.4	0	0.0	1	0.0	31	1.4
SE	0	0.0	1	0.0	3	0.1	12	0.6	9	0.4	3	0.1	3	0.1	31	1.4
SSE	0	0.0	0	0.0	10	0.5	12	0.6	9	0.4	2	0.1	0	0.0	33	1.5
S	0	0.0	5	0.2	10	0.5	8	0.4	9	0.4	1	0.0	0	0.0	33	1.5
SSW	0	0.0	0	0.0	12	0.6	20	0.9	29	1.4	6	0.3	0	0.0	67	3.1
SW	0	0.0	8	0.4	14	0.7	33	1.5	45	2.1	6	0.3	0	0.0	106	4.9
WSW	0	0.0	3	0.1	14	0.7	17	0.8	31	1.4	7	0.3	0	0.0	72	3.4
W	0	0.0	3	0.1	18	0.8	26	1.2	14	0.7	1	0.0	1	0.0	63	2.9
WNW	0	0.0	1	0.0	9	0.4	11	0.5	7	0.3	0	0.0	0	0.0	28	1.3
NW	0	0.0	5	0.2	12	0.6	18	0.8	12	0.6	1	0.0	0	0.0	48	2.2
NNW	0	0.0	1	0.0	9	0.4	12	0.6	16	0.7	5	0.2	3	0.1	46	2.1
	0	0.0	36	1.7	166	7.7	258	12.0	231	10.8	54	2.5	13	0.6	758	35.4

AN WIND SPEED: 11.2
SSING: 0

TIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: 1.6 TO 4.0 DEG C/100M
CLASS F

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
RECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	1	0.0	7	0.3	6	0.3	1	0.0	7	0.3	0	0.0	22	1.0
NNE	0	0.0	0	0.0	8	0.4	4	0.2	6	0.3	0	0.0	0	0.0	18	0.8
NE	0	0.0	0	0.0	2	0.1	5	0.2	7	0.3	5	0.2	0	0.0	19	0.9
ENE	0	0.0	0	0.0	1	0.0	2	0.1	3	0.1	1	0.0	0	0.0	7	0.3
E	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1
ESE	0	0.0	0	0.0	0	0.0	4	0.2	1	0.0	1	0.0	0	0.0	6	0.3
SE	0	0.0	0	0.0	2	0.1	3	0.1	7	0.3	0	0.0	0	0.0	12	0.6
SSE	0	0.0	1	0.0	2	0.1	5	0.2	0	0.0	0	0.0	0	0.0	8	0.4
S	0	0.0	1	0.0	2	0.1	1	0.0	0	0.0	0	0.0	0	0.0	4	0.2
SSW	0	0.0	1	0.0	3	0.1	2	0.1	5	0.2	0	0.0	0	0.0	11	0.5
SW	0	0.0	2	0.1	3	0.1	3	0.1	14	0.7	2	0.1	0	0.0	24	1.1
WSW	0	0.0	1	0.0	1	0.0	2	0.1	5	0.2	4	0.2	0	0.0	13	0.6
W	0	0.0	1	0.0	2	0.1	7	0.3	1	0.0	0	0.0	0	0.0	11	0.5
WNW	0	0.0	2	0.1	8	0.4	2	0.1	3	0.1	0	0.0	0	0.0	15	0.7
NW	0	0.0	4	0.2	7	0.3	9	0.4	3	0.1	0	0.0	0	0.0	23	1.1
NNW	0	0.0	5	0.2	2	0.1	5	0.2	4	0.2	0	0.0	0	0.0	16	0.7
	0	0.0	19	0.9	52	2.4	60	2.8	60	2.8	20	0.9	0	0.0	211	9.9

AN WIND SPEED: 10.8
SSING: 0

ARTIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
 BY ATMOSPHERIC STABILITY CLASS
 WIND: 300 FT
 DELTA T: (300-33FT)

LAPSE RATE: GT 4.0 DEG C/100M
 CLASS G

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT
N	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NNE	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
NE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ENE	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	1	0.0	0	0.0	3	0.1
E	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ESE	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	0	0.0	2	0.1
SE	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	0	0.0	0	0.0	2	0.1
SSE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
S	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
SSW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
SW	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	1	0.0
WSW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
W	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
WNW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NNW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	0	0.0	0	0.0	1	0.0	2	0.1	4	0.2	2	0.1	0	0.0	9	0.4

MEAN WIND SPEED: 13.7
 MISSING: 0

ARTIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

ALL STABILITY CLASSES

WIND SPEED GROUPS (MPH)																
0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT		
DIRECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	7	0.3	35	1.6	42	2.0	33	1.5	26	1.2	4	0.2	147	6.9
NNE	0	0.0	3	0.1	30	1.4	40	1.9	25	1.2	15	0.7	0	0.0	113	5.3
NE	0	0.0	4	0.2	19	0.9	42	2.0	47	2.2	13	0.6	7	0.3	132	6.2
ENE	0	0.0	3	0.1	25	1.2	56	2.6	22	1.0	4	0.2	2	0.1	112	5.2
E	0	0.0	0	0.0	35	1.6	42	2.0	4	0.2	0	0.0	0	0.0	81	3.8
ESE	0	0.0	3	0.1	13	0.6	29	1.4	19	0.9	2	0.1	1	0.0	67	3.1
SE	0	0.0	1	0.0	11	0.5	37	1.7	48	2.2	17	0.8	13	0.6	127	5.9
SSE	0	0.0	5	0.2	31	1.4	50	2.3	61	2.8	16	0.7	3	0.1	166	7.7
S	0	0.0	12	0.6	37	1.7	51	2.4	44	2.1	8	0.4	0	0.0	152	7.1
SSW	0	0.0	7	0.3	36	1.7	40	1.9	71	3.3	20	0.9	1	0.0	175	8.2
SW	0	0.0	19	0.9	45	2.1	59	2.8	85	4.0	12	0.6	1	0.0	221	10.3
WSW	0	0.0	7	0.3	32	1.5	48	2.2	40	1.9	15	0.7	0	0.0	142	6.6
W	0	0.0	5	0.2	36	1.7	70	3.3	32	1.5	8	0.4	1	0.0	152	7.1
WNW	0	0.0	4	0.2	32	1.5	25	1.2	29	1.4	8	0.4	0	0.0	98	4.6
NW	0	0.0	13	0.6	29	1.4	41	1.9	40	1.9	10	0.5	0	0.0	133	6.2
NNW	0	0.0	7	0.3	28	1.3	34	1.6	36	1.7	13	0.6	6	0.3	124	5.8
	0	0.0	100	4.7	474	22.1	706	33.0	636	29.7	187	8.7	39	1.8	2142	100.0

MISSING HOURS: 66

MEAN WIND SPEED: 11.5

ARTIFICIAL ISLAND 7/92 - 9/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

DIRECTION VS SPEED ONLY

WIND SPEED GROUPS (MPH)																
	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	8	0.4	36	1.6	42	1.9	33	1.5	26	1.2	4	0.2	149	6.7
NNE	0	0.0	3	0.1	30	1.4	40	1.8	25	1.1	15	0.7	0	0.0	113	5.1
NE	0	0.0	4	0.2	19	0.9	42	1.9	47	2.1	13	0.6	7	0.3	132	6.0
ENE	0	0.0	3	0.1	26	1.2	56	2.5	22	1.0	4	0.2	2	0.1	113	5.1
E	0	0.0	0	0.0	36	1.6	42	1.9	4	0.2	0	0.0	0	0.0	82	3.7
ESE	0	0.0	3	0.1	13	0.6	29	1.3	19	0.9	2	0.1	1	0.0	67	3.0
SE	0	0.0	1	0.0	13	0.6	38	1.7	49	2.2	17	0.8	13	0.6	131	5.9
SSE	0	0.0	5	0.2	34	1.5	52	2.4	65	2.9	16	0.7	3	0.1	175	7.9
S	0	0.0	13	0.6	38	1.7	52	2.4	44	2.0	8	0.4	0	0.0	155	7.0
SSW	0	0.0	7	0.3	37	1.7	40	1.8	71	3.2	20	0.9	1	0.0	176	8.0
SW	0	0.0	19	0.9	48	2.2	60	2.7	85	3.8	12	0.5	1	0.0	225	10.2
WSW	0	0.0	7	0.3	38	1.7	49	2.2	42	1.9	15	0.7	0	0.0	151	6.8
W	0	0.0	6	0.3	43	1.9	77	3.5	39	1.8	8	0.4	1	0.0	174	7.9
WNW	0	0.0	5	0.2	35	1.6	26	1.2	29	1.3	8	0.4	0	0.0	103	4.7
NW	0	0.0	13	0.6	30	1.4	42	1.9	40	1.8	10	0.5	0	0.0	135	6.1
NNW	0	0.0	7	0.3	30	1.4	34	1.5	36	1.6	14	0.6	6	0.3	127	5.8
	0	0.0	104	4.7	506	22.9	721	32.7	650	29.4	188	8.5	39	1.8	2208	100.0

MISSING HOURS: 0

MEAN WIND SPEED: 11.4

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
 BY ATMOSPHERIC STABILITY CLASS
 WIND: 300 FT
 DELTA T: (300-33FT)

DIRECTION VS SPEED ONLY

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	6	0.3	24	1.1	52	2.4	44	2.0	8	0.4	7	0.3	141	6.5
NNE	0	0.0	0	0.0	17	0.8	70	3.2	78	3.6	21	1.0	7	0.3	193	8.9
NE	0	0.0	4	0.2	21	1.0	44	2.0	55	2.5	7	0.3	2	0.1	133	6.1
ENE	0	0.0	7	0.3	10	0.5	28	1.3	22	1.0	0	0.0	2	0.1	69	3.2
E	0	0.0	7	0.3	22	1.0	38	1.8	18	0.8	4	0.2	11	0.5	100	4.6
ESE	0	0.0	7	0.3	8	0.4	12	0.6	19	0.9	6	0.3	0	0.0	52	2.4
SE	0	0.0	5	0.2	11	0.5	27	1.2	12	0.6	13	0.6	7	0.3	75	3.5
SSE	0	0.0	5	0.2	25	1.2	29	1.3	30	1.4	21	1.0	17	0.8	127	5.9
S	0	0.0	6	0.3	20	0.9	25	1.2	55	2.5	25	1.2	8	0.4	139	6.4
SSW	0	0.0	6	0.3	20	0.9		2.4	62	2.9	20	0.9	4	0.2	164	7.6
SW	0	0.0	3	0.1	19	0.9	41	1.9	51	2.4	12	0.6	3	0.1	129	6.0
WSW	0	0.0	3	0.1	17	0.8	54	2.5	45	2.1	7	0.3	0	0.0	126	5.8
W	0	0.0	9	0.4	21	1.0	41	1.9	52	2.4	9	0.4	0	0.0	132	6.1
WNW	0	0.0	4	0.2	19	0.9	36	1.7	81	3.7	34	1.6	11	0.5	185	8.5
NW	0	0.0	2	0.1	13	0.6	37	1.7	97	4.5	58	2.7	27	1.2	234	10.8
NNW	0	0.0	6	0.3	25	1.2	66	3.0	49	2.3	18	0.8	3	0.1	167	7.7
	0	0.0	80	3.7	292	13.5	652	30.1	770	35.5	263	12.1	109	5.0	2166	100.0

MISSING HOURS: 42

MEAN WIND SPEED: 13.4

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASSWIND: 300 FT
DELTA T: (300-33FT)

ALL STABILITY CLASSES

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	6	0.3	24	1.1	52	2.4	44	2.0	8	0.4	7	0.3	141	6.5
NNE	0	0.0	0	0.0	17	0.8	70	3.2	78	3.6	21	1.0	7	0.3	193	8.9
NE	0	0.0	4	0.2	21	1.0	44	2.0	55	2.5	7	0.3	2	0.1	133	6.1
ENE	0	0.0	7	0.3	10	0.5	28	1.3	22	1.0	0	0.0	2	0.1	69	3.2
E	0	0.0	7	0.3	22	1.0	38	1.8	18	0.8	4	0.2	11	0.5	100	4.6
ESE	0	0.0	7	0.3	8	0.4	12	0.6	19	0.9	6	0.3	0	0.0	52	2.4
SE	0	0.0	5	0.2	11	0.5	27	1.2	12	0.6	13	0.6	7	0.3	75	3.5
SSE	0	0.0	5	0.2	25	1.2	29	1.3	30	1.4	21	1.0	17	0.8	127	5.9
S	0	0.0	6	0.3	20	0.9	25	1.2	55	2.5	25	1.2	8	0.4	139	6.4
SSW	0	0.0	6	0.3	20	0.9	52	2.4	62	2.9	20	0.9	4	0.2	164	7.6
SW	0	0.0	3	0.1	19	0.9	40	1.8	51	2.4	12	0.6	3	0.1	128	5.9
WSW	0	0.0	3	0.1	17	0.8	54	2.5	45	2.1	7	0.3	0	0.0	126	5.8
W	0	0.0	9	0.4	21	1.0	41	1.9	52	2.4	9	0.4	0	0.0	132	6.1
WNW	0	0.0	4	0.2	19	0.9	36	1.7	81	3.7	34	1.6	11	0.5	185	8.5
WW	0	0.0	2	0.1	13	0.6	37	1.7	97	4.5	58	2.7	27	1.2	274	10.8
NNW	0	0.0	6	0.3	25	1.2	66	3.0	49	2.3	18	0.8	3	0.1	167	7.7
	0	0.0	80	3.7	292	13.5	651	30.1	770	35.6	263	12.1	124	5.0	2165	100.0

MISSING HOURS: 43

MEAN WIND SPEED: 13.4

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS

WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: GT 4.0 DEG C/100M
CLASS G

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NNE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NE	0	0.0	0	0.0	1	0.0	2	0.1	0	0.0	0	0.0	0	0.0	3	0.1
ENE	0	0.0	0	0.0	1	0.0	3	0.1	0	0.0	0	0.0	0	0.0	4	0.2
E	0	0.0	0	0.0	3	0.1	6	0.3	3	0.1	0	0.0	0	0.0	12	0.6
ESE	0	0.0	1	0.0	2	0.1	0	0.0	5	0.2	0	0.0	0	0.0	8	0.4
SE	0	0.0	0	0.0	2	0.1	2	0.1	0	0.0	0	0.0	0	0.0	4	0.2
SSE	0	0.0	0	0.0	2	0.1	1	0.0	1	0.0	0	0.0	1	0.0	5	0.2
S	0	0.0	1	0.0	1	0.0	4	0.2	8	0.4	12	0.6	1	0.0	27	1.2
SSW	0	0.0	0	0.0	0	0.0	0	0.0	11	0.5	1	0.0	0	0.0	12	0.6
SW	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
WSW	0	0.0	0	0.0	1	0.0	2	0.1	0	0.0	0	0.0	0	0.0	3	0.1
W	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
WNW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NNW	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
	0	0.0	3	0.1	14	0.6	20	0.9	28	1.3	13	0.6	2	0.1	80	3.7

MEAN WIND SPEED: 13.0

MISSING: 0

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: 1.6 TO 4.0 DEG C/100M
CLASS F

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	1	0.0	1	0.0	3	0.1	7	0.3	2	0.1	0	0.0	14	0.6
NNE	0	0.0	0	0.0	3	0.1	3	0.1	6	0.3	2	0.1	0	0.0	14	0.6
NE	0	0.0	0	0.0	0	0.0	2	0.1	4	0.2	1	0.0	0	0.0	7	0.3
ENE	0	0.0	1	0.0	1	0.0	2	0.1	1	0.0	0	0.0	0	0.0	5	0.2
E	0	0.0	3	0.1	5	0.2	10	0.5	5	0.2	0	0.0	0	0.0	23	1.1
ESE	0	0.0	0	0.0	0	0.0	4	0.2	5	0.2	0	0.0	0	0.0	9	0.4
SE	0	0.0	2	0.1	1	0.0	3	0.1	2	0.1	0	0.0	0	0.0	8	0.4
SSE	0	0.0	0	0.0	4	0.2	4	0.2	2	0.1	2	0.1	4	0.2	16	0.7
S	0	0.0	1	0.0	6	0.3	4	0.2	10	0.5	2	0.1	5	0.2	28	1.3
SSW	0	0.0	1	0.0	1	0.0	4	0.2	13	0.6	6	0.3	1	0.0	26	1.2
SW	0	0.0	1	0.0	1	0.0	8	0.4	6	0.3	2	0.1	0	0.0	18	0.8
WSW	0	0.0	1	0.0	1	0.0	7	0.3	8	0.4	1	0.0	0	0.0	18	0.8
W	0	0.0	5	0.2	8	0.4	7	0.3	5	0.2	0	0.0	0	0.0	25	1.2
WNW	0	0.0	0	0.0	3	0.1	2	0.1	1	0.0	0	0.0	0	0.0	6	0.3
NW	0	0.0	1	0.0	3	0.1	2	0.1	1	0.0	0	0.0	0	0.0	7	0.3
NNW	0	0.0	1	0.0	1	0.0	5	0.2	3	0.1	0	0.0	0	0.0	10	0.5
	0	0.0	18	0.8	39	1.8	70	3.2	79	3.6	18	0.8	10	0.5	234	10.8

MEAN WIND SPEED: 12.2
MISSING: 0

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -0.4 TO 1.5 DEG C/100M
CLASS E

WIND SPEED GROUPS (MPH)															
0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT
N	0 0.0	5 0.2	7 0.3	22 1.0	30 1.4	0 0.0	0 0.0	64 3.0							
NNE	0 0.0	0 0.0	5 0.2	31 1.4	40 1.8	6 0.3	1 0.0	83 3.8							
NE	0 0.0	2 0.1	8 0.4	21 1.0	29 1.3	6 0.3	2 0.1	68 3.1							
ENE	0 0.0	3 0.1	3 0.1	20 0.9	20 0.9	0 0.0	2 0.1	48 2.2							
E	0 0.0	1 0.0	11 0.5	16 0.7	6 0.3	2 0.1	1 0.0	37 1.7							
ESE	0 0.0	4 0.2	4 0.2	8 0.4	1 0.0	5 0.2	0 0.0	22 1.0							
SE	0 0.0	2 0.1	3 0.1	18 0.8	7 0.3	4 0.2	6 0.3	40 1.8							
SSE	0 0.0	2 0.1	8 0.4	11 0.5	11 0.5	15 0.7	11 0.5	58 2.7							
S	0 0.0	3 0.1	5 0.2	3 0.1	12 0.6	3 0.1	2 0.1	28 1.3							
SSW	0 0.0	2 0.1	7 0.3	15 0.7	22 1.0	7 0.3	2 0.1	55 2.5							
SW	0 0.0	0 0.0	8 0.4	16 0.7	30 1.4	8 0.4	2 0.1	64 3.0							
WSW	0 0.0	0 0.0	5 0.2	17 0.8	21 1.0	6 0.3	0 0.0	49 2.3							
W	0 0.0	2 0.1	10 0.5	16 0.7	11 0.5	2 0.1	0 0.0	41 1.9							
WNW	0 0.0	3 0.1	14 0.6	17 0.8	34 1.6	6 0.3	1 0.0	75 3.5							
NW	0 0.0	1 0.0	4 0.2	25 1.2	57 2.6	30 1.4	5 0.2	122 5.6							
NNW	0 0.0	3 0.1	14 0.6	36 1.7	23 1.1	13 0.6	2 0.1	91 4.2							
	0 0.0	33 1.5	116 5.4	292 13.5	354 16.4	113 5.2	37 1.7	945 43.6							

MEAN WIND SPEED: 13.3
MISSING: 22

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
 BY ATMOSPHERIC STABILITY CLASS
 WIND: 300 FT
 DELTA T: (300-33FT)

LAPSE RATE: -1.4 TO -0.5 DEG C/100M
 CLASS D

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT		SUM PERCENT			
N	0	0.0	0	0.0	14	0.6	14	0.6	2	0.1	6	0.3	7	0.3	43	2.0
NNE	0	0.0	0	0.0	6	0.3	32	1.5	26	1.2	12	0.6	6	0.3	82	3.8
NE	0	0.0	2	0.1	12	0.6	17	0.8	22	1.0	0	0.0	0	0.0	53	2.4
ENE	0	0.0	3	0.1	4	0.2	1	0.0	1	0.0	0	0.0	0	0.0	9	0.4
E	0	0.0	3	0.1	1	0.0	2	0.1	4	0.2	2	0.1	10	0.5	22	1.0
ESE	0	0.0	2	0.1	1	0.0	0	0.0	8	0.4	1	0.0	0	0.0	12	0.6
SE	0	0.0	1	0.0	2	0.1	3	0.1	2	0.1	8	0.4	0	0.0	16	0.7
SSE	0	0.0	3	0.1	7	0.3	12	0.6	16	0.7	3	0.1	1	0.0	42	1.9
S	0	0.0	0	0.0	8	0.4	14	0.6	25	1.2	7	0.3	0	0.0	54	2.5
SSW	0	0.0	1	0.0	10	0.5	28	1.3	16	0.7	6	0.3	1	0.0	62	2.9
SW	0	0.0	1	0.0	6	0.3	15	0.7	12	0.6	1	0.0	1	0.0	36	1.7
WSW	0	0.0	2	0.1	7	0.3	19	0.9	11	0.5	0	0.0	0	0.0	39	1.8
W	0	0.0	2	0.1	2	0.1	12	0.6	25	1.2	7	0.3	0	0.0	48	2.2
WNW	0	0.0	1	0.0	1	0.0	13	0.6	31	1.4	18	0.8	7	0.3	71	3.3
NW	0	0.0	0	0.0	5	0.2	7	0.3	26	1.2	19	0.9	17	0.8	74	3.4
NNW	0	0.0	2	0.1	9	0.4	18	0.8	11	0.5	3	0.1	1	0.0	44	2.0
	0	0.0	23	1.1	95	4.4	207	9.6	238	11.0	93	4.3	51	2.4	707	32.7

MEAN WIND SPEED: 13.9

MISSING: 20

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -1.6 TO -1.5 DEG C/100M
CLASS C

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	0	0.0	2	0.1	8	0.4	3	0.1	0	0.0	0	0.0	13	0.6
NNE	0	0.0	0	0.0	3	0.1	1	0.0	3	0.1	1	0.0	0	0.0	8	0.4
NE	0	0.0	0	0.0	9	0.0	2	0.1	0	0.0	0	0.0	0	0.0	2	0.1
ENE	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
E	0	0.0	0	0.0	2	0.1	3	0.1	0	0.0	0	0.0	0	0.0	5	0.2
ESE	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
SE	0	0.0	0	0.0	2	0.1	0	0.0	1	0.0	0	0.0	0	0.0	3	0.1
SSE	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	1	0.0	0	0.0	2	0.1
S	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0
SSW	0	0.0	2	0.1	1	0.0	3	0.1	0	0.0	0	0.0	0	0.0	6	0.3
SW	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0	1	0.0	0	0.0	3	0.1
WSW	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0	0	0.0	0	0.0	2	0.1
W	0	0.0	0	0.0	1	0.0	2	0.1	4	0.2	0	0.0	0	0.0	7	0.3
WNW	0	0.0	0	0.0	1	0.0	2	0.1	7	0.3	7	0.3	3	0.1	20	0.9
NW	0	0.0	0	0.0	1	0.0	1	0.0	5	0.2	3	0.1	4	0.2	14	0.6
NNW	0	0.0	0	0.0	0	0.0	4	0.2	7	0.3	1	0.0	0	0.0	12	0.6
	0	0.0	2	0.1	18	0.8	26	1.2	32	1.5	15	0.7	7	0.3	100	4.6

MEAN WIND SPEED: 14.0
MISSING: 0

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
BY ATMOSPHERIC STABILITY CLASS
WIND: 300 FT
DELTA T: (300-33FT)

LAPSE RATE: -1.8 TO -1.7 DEG C/100M
CLASS B

WIND SPEED GROUPS (MPH)														
0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT
DIRECTION	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	SUM PERCENT	
N	0 0.0	0 0.0	0 0.0	5 0.2	2 0.1	0 0.0	0 0.0	0 0.0	0 0.0	7 0.3				
NNE	0 0.0	0 0.0	0 0.0	3 0.1	3 0.1	0 0.0	0 0.0	0 0.0	0 0.0	6 0.3				
NE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0				
ENE	0 0.0	0 0.0	0 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0				
E	0 0.0	0 0.0	0 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0				
ESE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0				
SE	0 0.0	0 0.0	1 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0	3 0.1				
SSE	0 0.0	0 0.0	2 0.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.1				
S	0 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0				
SSW	0 0.0	0 0.0	1 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.1				
SW	0 0.0	0 0.0	3 0.1	1 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	5 0.2				
WSW	0 0.0	0 0.0	2 0.1	6 0.3	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	9 0.4				
W	0 0.0	0 0.0	0 0.0	4 0.2	4 0.2	0 0.0	0 0.0	0 0.0	0 0.0	8 0.4				
WNW	0 0.0	0 0.0	0 0.0	0 0.0	4 0.2	2 0.1	0 0.0	0 0.0	6 0.3					
NW	0 0.0	0 0.0	0 0.0	2 0.1	7 0.3	3 0.1	1 0.0	13 0.6						
NNW	0 0.0	0 0.0	0 0.0	3 0.1	5 0.2	1 0.0	0 0.0	9 0.4						
	0 0.0	1 0.0	9 0.4	28 1.3	27 1.2	6 0.3	2 0.1	73 3.4						

MEAN WIND SPEED: 12.8
MISSING: 0

ARTIFICIAL ISLAND 10/92-12/92

JOINT DISTRIBUTION OF WIND DIRECTION AND SPEED
 BY ATMOSPHERIC STABILITY CLASS
 WIND: 300 FT
 DELTA T: (300-33FT)

LAPSE RATE: LE -1.9 DEG C/100M
 CLASS A

WIND SPEED GROUPS (MPH)

	0.0-0.5		0.6-3.5		3.6-7.5		7.6-12.5		12.6-18.5		18.6-24.5		GE 24.6		SUM PERCENT	
DIRECTION	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT	SUM	PERCENT		
N	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NNE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
NE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ENE	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
E	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ESE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
SE	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0
SSE	0	0.0	0	0.0	1	0.0	1	0.0	0	0.0	0	0.0	0	0.0	2	0.1
S	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
SSW	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
SW	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	1	0.0
WSW	0	0.0	0	0.0	0	0.0	3	0.1	3	0.1	0	0.0	0	0.0	6	0.3
W	0	0.0	0	0.0	0	0.0	0	0.0	3	0.1	0	0.0	0	0.0	3	0.1
WNW	0	0.0	0	0.0	0	0.0	2	0.1	4	0.2	1	0.0	0	0.0	7	0.3
NW	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	3	0.1	0	0.0	4	0.2
NNW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	0	0.0	0	0.0	1	0.0	8	0.4	12	0.6	5	0.2	0	0.0	26	1.2

MEAN WIND SPEED: 14.2

MISSING: 0

AMENDMENT TO RERR 13

8.0 MODIFICATION TO PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORTS

Our last report (RERR-12) did not include the quarterly Sr-89, Sr-90 and Fe-55 composite data for the second half of 1991. Amended pages to RERR-12 are included at the end of this report.

Additionally calculational errors were found in previous reports, amended pages are included at the end of this report.

PART B. GASEOUS EFFLUENTS

See Summary Tables 1A through 1C.

PART C. LIQUID EFFLUENTS

See Summary Tables 2A through 2B.

PART D. SOLID WASTE

See Summary in Table 3.

PART E. RADIOLOGICAL IMPACT ON MAN

The calculated individual doses in this section are based on actual locations of nearby residents and farms. The population dose impact is based on historical site specific data i.e., food production, milk production, feed for milk animals and seafood production.

The doses were calculated using methods described in Regulatory Guide 1.109 and represent calculations for the six month reporting interval. Individual doses from batch and continuous releases were calculated using the annual average historic meteorological dispersion coefficients as described in the Offsite Dose Calculation Manual. Population doses were calculated using the meteorological dispersion coefficients for the six month reporting interval.

Liquid Pathways

Doses to individuals in the population from liquid releases are primarily from the seafood ingestion pathway. Calculated doses to individuals are as shown below.

Total body dose to an individual: $3.64\text{E-}02$ mrem

Highest organ dose: $1.02\text{E-}01$ mrem to the GI-LLI

Dose to the 6 million individuals living within the
50 mile radius of the plant site:

Total population dose: $4.11\text{E-}01$ person-rem

Average population dose: $6.88\text{E-}05$ mrem/person

Air Pathways

The calculated doses to individuals via the air
pathway are shown below:

Total body dose: $3.20\text{E-}01$ mrem

Skin dose: $7.00\text{E-}01$ mrem

Highest organ dose due to radioiodines and
particulates with half lives greater than 8 days:

$1.96\text{E-}04$ mrem to the Liver.

Dose to the 6 million individuals living within the
50 mile radius of the plant site:

Total population dose: $3.48\text{E-}01$ person-rem

Average population dose: $5.83\text{E-}05$ mrem/person

Direct Radiation

Direct radiation may be estimated by Thermoluminescent
dosimetric (TLD) measurements. One method for
comparing TLD measurements is by comparison with pre-
operational data. It should be noted that the TLDs
measure direct radiation from both the Salem and Hope
Creek Generating Stations at Artificial Island, and
natural background radiation.

TLD data for the six month reporting period is given
below:

TLD	Location	Measurement
2S-2	0.3 mile	5.7 mrad/month
5S-1	0.9 mile	4.9 mrad/month

HOPE CREEK GENERATING STATION

TABLE 2A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JANUARY - JUNE 1992

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Units	1st Quarter	2nd Quarter	Est. Total Error %
<hr/>				
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	5.70E-02	6.24E-02	25
2. Average diluted concentration during period	μCi/mL	5.09E-08	6.77E-08	
3. Percent of technical specification limit (T.S. 3.11.1.2.(a))	%	1.20E+00	1.22E+00	
B. Tritium				
1. Total release	Ci	1.83E+01	2.23E+01	25
2. Average diluted concentration during period	μCi/mL	1.63E-05	2.42E-05	
3. Percent of technical specification limit (T.S. 3.11.1.1)	%	5.43E-01	8.07E-01	
C. Dissolved and entrained noble gases				
1. Total release	Ci	4.18E-03	3.41E-03	25
2. Average diluted concentration during period	μCi/mL	3.73E-09	3.70E-09	
3. Percent of technical specification limit (T.S. 3.11.1.1)	%	1.87E-03	1.85E-02	
D. Gross alpha activity				
1. Total release	Ci	0.00E+00	0.00E+00	25
E. Volume of waste release (prior to dilution - Batch Release)	liters	5.91E+06	4.33E+06	25
F. Volume of dilution water used during entire period	liters	1.27E+10	1.48E+10	25

HOPE CREEK GENERATING STATION

TABLE 2B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
JANUARY - JUNE 1992

LIQUID EFFLUENTS

Nuclides Released	Unit	CONTINUOUS MODE		BATCH MODE	
		1st Quarter	2nd Quarter	1st Quarter	2nd Quarter
Niobium-95	Ci	0.00E+00	0.00E+00	7.13E-05	1.73E-05
Chromium-51	Ci	0.00E+00	0.00E+00	2.73E-02	3.13E-02
Manganese-54	Ci	0.00E+00	0.00E+00	8.75E-03	6.60E-03
Iron-55	Ci	0.00E+00	0.00E+00	5.44E-03	7.36E-03
Iron-59	Ci	0.00E+00	0.00E+00	1.83E-03	2.32E-03
Cobalt-58	Ci	0.00E+00	0.00E+00	2.48E-04	1.58E-04
Cobalt-60	Ci	0.00E+00	0.00E+00	1.94E-03	1.24E-03
Zinc-65	Ci	0.00E+00	0.00E+00	8.22E-03	9.35E-03
Silver-110m	Ci	0.00E+00	0.00E+00	2.89E-03	2.96E-03
Sodium-24	Ci	0.00E+00	0.00E+00	2.53E-05	1.08E-03
Strontium-92	Ci	0.00E+00	0.00E+00	2.57E-04	0.00E+00
Arsenic-76	Ci	0.00E+00	0.00E+00	0.00E+00	2.38E-05
Cesium-137	Ci	0.00E+00	0.00E+00	0.00E+00	1.56E-05
Zirconium-97	Ci	0.00E+00	0.00E+00	1.02E-05	1.21E-05
TOTALS	Ci	0.00E+00	0.00E+00	5.70E-02	6.24E-02
Tritium	Ci	0.00E+00	0.00E+00	1.83E+01	2.23E+01
Xenon-133	Ci	0.00E+00	0.00E+00	7.75E-04	4.71E-04
Xenon-135	Ci	0.00E+00	0.00E+00	3.40E-03	2.94E-03
TOTALS	Ci	0.00E+00	0.00E+00	1.83E+01	2.23E+01

HOPE CREEK ODCM

REVISION 12

REVISION 12 OF THE HOPE CREEK OFFSITE DOSE CALCULATION MANUAL

Attached is a breakdown of the revisions made to the Hope Creek Generating Station Offsite Dose Calculation Manual (ODCM). The revision was made to correct previous typographical errors and to update information contained in the ODCM.

Change #1 TYPOGRAPHICAL ERRORS

Page	Change From	Change To	Comments
2	3.3.7.9	3.3.7.10	Corrected Tech. Spec. reference.
3	3.3.3.8	3.3.7.10	Corrected Tech Spec. reference
5	Iuci/ml)	(uci/ml)	Typographical error
7	CP _i	C _i	Typographical error
8	8.35E04	8.35E-04	Corrected conversion factor.
9	(5 kg/hr)	(5 kg/yr)	Corrected units
9	Regulator	Regulatory	Corrected spelling
12	RE-4875B	RE-4875A	Corrected monitor ID
12	RE-4573B	RE-4873B	Corrected monitor ID
13	3.3.3.10	3.3.7.11	Corrected Tech Spec reference
14	AP	AP	Typographical error
26	3.11.2.4	3.11.2.5	Corrected Tech Spec reference
30	a typical	a non-typical	Typographical error
36	MPC I-131 - 3.0E-08	MPC I-131 - 3.0E-07	Typographical error
39	no value for phosphorus	Fish - 3.0E3 Invert. - 3.0E4	Added value for bioaccumulation factor
39	NE - 3.0E+40	NB- 3.0E+04	Typographical error
39	CS - 2.5E+02	CS - 2.5E+01	Typographical error
42	Kr-90 - 1.63E+40	Kr-90 - 1.63E+04	Typographical error
42	Xe-153	Xe-135	Typographical error

Change #2

Page 5

Change from:

MPC default value of $5.00E-05$ uci/ml.

Change to:

MPC default value of $1.60E-05$ uci/ml.

Reason:

Evaluated liquid releases for 1989 - 1991 for default MPC calculation. Updated value includes curies released from gamma emitters as well as curies released from tritium, Fe-55, Fe-59, and strontium as required by Technical Specification 3.11.1.1.

Change #3

Page 28

Changed from:

Reference to "Second Sun" as location for Members of the General Public activities.

Change to:

Delete reference to "Second Sun".

Reason:

The "Second Sun" is no longer used as a visitors center. The access to the "Second Sun" is restricted and the ship in the process of being removed from Artificial Island.

Change #4

Page 36 Table 1-1

Changed from:

MPC, value of $5.0E-05$ uci/ml.

Changed to:

MPC, value of $1.6E-05$ uci/ml.

Reason:

Liquid releases were evaluated from the period 1989 - 1991.
Default value includes gamma emitters as well as alpha emitters,
tritium, Iron-55, and Iron-59.

Change #5

Page 36

Changed from:

Setpoint Value for RE-4861 of: $3.41E-3$ uci/ml (Liquid Radwaste)
 $4.62E-4$ uci/ml (CST Releases)

Setpoint value for RE-8817 of: $5.00E-5$ uci/ml (Liquid Radwaste
and CST)

Change to:

Setpoint value for RE-4861 of: $1.09E-3$ uci/ml (Liquid Radwaste)
 $1.48E-4$ uci/ml (CST Releases)

Setpoint value for RE-8817 of: $1.60E-5$ uci/ml (Liquid Radwaste
and CST)

Reason:

Setpoint values were updated to reflect default MPC value for
1989 - 1991 liquid releases.

Change #6

Page 41 Figure 2-2

Change from:

Reference to "foot-treatment" monitor

Change to:

Deleted reference to "foot-treatment" monitor.

Reason:

Typographical error

Change #7

page 44 Table 2-3

Change from:

Atmospheric Dispersion parameters for the "Second Sun".

Change to:

Deleted Atmospheric Dispersion parameters for the "Second Sun".

Reason:

Second Sun is no longer used as a visitors center or a place for activities related to members of the general public.

Change #8

Appendix A page A-1

Change from:

Equation for MPC_e of: $MPC_e = C_i / (C_i / MPC_i)$

Change to:

Equation for MPC_e = ΣC_i (gamma emitters only)

$$MPC_e = \frac{\Sigma C_i \text{ (gamma)}}{\Sigma \frac{C_i \text{ (gamma)}}{MPC_i}} + \frac{\Sigma C_i \text{ (non-gamma)}}{\Sigma \frac{C_i \text{ (non-gamma)}}{MPC_i}}$$

Reason:

Modified default effective MPC equation to include contribution from non-gamma emitters (tritium, Fe-55) as required by Technical Specification 3.11.1.1.

Change #9

Appendix A Table A-1

Change from:

Calculation of effective MPC for liquid releases during the period 1987, 1988, and 1989.

Change to:

Calculation of effective MPC for liquid releases during the period 1989, 1990, and 1991.

Reason:

Updated information for a more representative distribution of radionuclides released in liquid effluents from Hope Creek Station.

Change #10

Appendix B - Technical Basis for Effective Dose Factors - Liquid Releases.

Change from:

Evaluation of effective dose factors from liquid releases for the period 1987, 1988, and 1989.

Change to:

Evaluation of effective dose factors from liquid releases for the period 1989, 1990, and 1991.

Reason:

Evaluation was performed to verify the distribution of radionuclides in liquid releases has not changed significantly from previous evaluations.

Change #11 ENVIRONMENTAL SAMPLING LOCATIONS

Appendix E Page E-2, E-3, E-4, E-5

PAGE	LOCATION	CHANGE	COMMENTS
E-2	3S3	Changed 3S3 to 2S3	Typographical error
E-2	6S2	Added soil location	Updated information
E-2	5D1	Deleted well water	Updated information
E-2	10D1	Added soil location	Updated information
E-3	3E2	Deleted	Farm no longer used
E-3	3E3	Added	Added farm to REMP
E-3	13E3	Deleted	Farm no longer used
E-3	16E1	Added soil location	Updated information
E-3	1F1	Added soil location	Updated information
E-3	1F3	Deleted	Farm no longer used
E-3	2F3	Corrected sample location	Updated information
E-3	2F4	Added soil location	Updated information
E-4	2F7	Added soil location	Updated information
E-4	5F1	Deleted VGT sampling	Updated information
E-4	5F2	Deleted	Farm no longer used
E-4	5F3	Added	Added Farm to REMP
E-4	11F3	Added soil sampling	Updated information
E-4	14F1	Deleted	Farm no longer used
E-4	14F4	Added	Added farm to REMP
E-5	2G1	Deleted	Farm no longer used
E-5	2G2	Added	Added farm to REMP
E-5	3G1	Added soil sampling	Updated information

1.0 LIQUID EFFLUENTS

1.1 Radiation Monitoring Instrumentation and Controls

The liquid effluent monitoring instrumentation and controls at Hope Creek for controlling and monitoring normal radioactive material releases in accordance with the Hope Creek Radiological Effluent Technical Specifications are summarized as follows:

- 1) Alarm (and Automatic Termination) - Liquid Radwaste Discharge Line Monitor provides the alarm and automatic termination of liquid (RE4861) radioactive material releases from the liquid waste management system as required by Technical Specification 3.3.7.10.
- 2) Alarm (Only) - The Cooling-Tower Blowdown Effluent Monitor (RE8817) provides an Alarm function only for releases into the environment as required by Technical Specification 3.3.7.10.

Liquid radioactive waste flow diagrams with the applicable, associated radiation monitoring instrumentation and controls are presented in Figure 1-1.

1.2 Liquid Effluent Monitor Setpoint Determination

Per the requirements of Technical Specification 3.3.3.10, alarm setpoints shall be established for the liquid monitoring instrumentation to ensure that the release concentration limits of Specification 3.11.1.1 are met (i.e., the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS shall be limited to the concentrations specified in 10 CFR 20 Appendix B, Table II, column 2, for radionuclides and $2.0E-04$ uCi/ml for dissolved or entrained noble gases). The following equation* must be satisfied to meet the liquid effluent restrictions:

$$c \leq \frac{C (F + f)}{f} \quad (1.1)$$

where:

- C = the effluent concentration limit of Technical Specification (3.11.1.1) implementing the 10 CFR 20 MPC for the site, in uCi/ml.
- c = the setpoint, in uCi/ml, of the radioactivity monitor measuring the radioactivity concentration in the effluent line prior to dilution and subsequent release; the setpoint, represents a value which, if exceeded, would result in concentrations exceeding the limits of 10 CFR 20 in the UNRESTRICTED AREA.

-----* Adopted from NUREG-0133

MPC_i = the MPC value corresponding to radionuclide i from 10 CFR 20, Appendix B, Table II, Column 2 (uCi/ml).
CTBD = the Cooling-Tower Blowdown Discharge rate at the time of release (gal/min).
RR = the liquid effluent release rate (gal/min) at the monitor location (i.e., at the liquid radwaste monitor or at the CTBD monitor).
bkg = the background of the monitor (uCi/ml).

The radioactivity monitor setpoint equation (1.2) remains valid during outages when the Cooling-Tower Blowdown discharge is potentially as its lowest value. Reduction of the waste stream flow (RR) may be necessary during these periods to meet the discharge criteria. Procedural restrictions prevent simultaneous liquid releases.

1.2.2 Conservative Default Values

Conservative alarm setpoints may be determined through the use of default parameters. Table 1-1 summarized all current default values in use for Hope Creek. They are based upon the following:

- a) substitution of the effective MPC value with a default value of 1.60E-05 uCi/ml for radwaste releases (Refer to Appendix A for justification);
- b) substitutions of the Cooling-Tower Blowdown discharge rate with the minimum average flow, in gal/min; and,
- c) substitutions of the effluent release rate with the highest allowed rate, in gal/min.

1.3 Liquid Effluent Concentration Limits - 10 CFR 20

Technical Specification 3.11.1.1 limits the concentration of radioactive material in liquid effluents (after dilution in the Cooling-Tower Blowdown Discharge System) to less than the concentrations as specified in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than noble gases. Noble gases are limited to a diluted concentration of $2.0E-04$ uCi/ml. Release rates are controlled and radiation monitor alarm setpoints are established as addressed above to ensure that these concentration limits are not exceeded. However, in the event any liquid release results in an alarm setpoint being exceeded, an evaluation of compliance with the concentration limits of Technical Specification 3.11.1.1 may be performed using the following equation:

$$\frac{C_i}{MPC_i} * \frac{RR}{CTBD + RR} \leq 1 \quad (1.4)$$

where:

- C_i = actual concentration of radionuclide i as measured in the undiluted liquid effluent (uCi/ml);
- MPC_i = the MPC value corresponding to radionuclide i from 10 CFR 20, Appendix B, Table II, Column 2 (uCi/ml).
- = $2E-04$ uCi/ml for dissolved or entrained noble gases.
- RR = the actual liquid effluent release rate (gal/min)
- CTBD = the actual Cooling-Tower Blowdown discharge at the time of release (gal/min).

1.4 Liquid Effluent Dose Calculation - 10 CFR 50

1.4.1 MEMBER OF THE PUBLIC Dose - Liquid Effluents

Technical Specification 3.11.1.2 limits the dose or dose commitment to MEMBERS OF THE PUBLIC from radioactive materials in liquid effluents from Hope Creek Generating Station to:

- during any calendar quarter:
 ≤ 1.5 mrem to total body
 ≤ 5.0 mrem to any organ

- during any calendar year:
 ≤ 3.0 mrem to total body
 ≤ 10.0 mrem to any organ

Per the surveillance requirements to Technical Specification 4.11.1.2, the following calculation methods shall be used for determining the dose or dose commitment due to the liquid radioactive effluents from Hope Creek.

$$D_o = \frac{8.35E-04 * VOL}{CTBD} * \sum (C_i * A_{io}) \quad 1.5$$

where:

D_o = dose or dose commitment to organ o, including total body (mrem).
 A_{io} = site-related ingestion dose commitment factor to the total body or any organ o for radionuclide i (mrem/hr per uCi/ml).
 C_i = average concentration of radionuclide i, in undiluted liquid effluent representative of volume VOL (uCi/ml).
VOL = volume of liquid effluent released (gal).
CTBD = Average Cooling-Tower Blowdown discharge rate during release period (gal/min).
8.35E-04 = conversion factor (1.67E-2 hr/min) and a near field dilution factor of 0.05 (refer to Appendix B, Page B-4 for definition).

The site-related ingestion dose/dose commitment factors (A_o) are presented in Table 1-2 and have been derived in accordance with a NUREG-0133 by the equation:

$$A_o = 1.14E5 [(UI * BI_i) + (UF * BF_i)] DF_i \quad (1.6)$$

where:

- A_o = composite dose parameter for the total body or critical organ o of an adult for radionuclide i, for the fish and invertebrate ingestion pathways (mrem/hr per uCi/ml).
- 1.14E5 = conversion factor (pCi/uCi * ml/kg per hr/yr).
- UI = adult invertebrate consumption (5 kg/yr).
- BI_i = bioaccumulation factor for radionuclide i in invertebrates from Table 1-3 (pCi/kg per pCi/l).
- UF = adult fish consumption (21 kg/yr).
- BF_i = bioaccumulation factor for nuclide i in fish from Table 1-4 (pCi/kg per pCi/l).
- DF_i = dose conversion factor for nuclide i for adults in preselected organ, o, from Table E-11 of Regulatory Guide 1.109 (mrem/pCi).

The radionuclides included in the periodic dose assessment per the requirements of Technical Specification 3/4.11.1.2 are those as identified by gamma spectral analysis of the liquid waste samples collected and analyzed per the requirements of Technical Specification 3/4.11.1.1, Table 4.11.1.1.1-1.

Radionuclides requiring radiochemical analysis (e.g., Sr-89 and Sr-90) will be added to the dose analysis at a frequency consistent with the required minimum analysis frequency of Technical Specification Table 4.11.1.1.1-1.

2.0 GASEOUS EFFLUENTS

2.1 Radiation Monitoring Instrumentation and Controls

The gaseous effluent monitoring instrumentation and controls at Hope Creek for controlling and monitoring normal radioactive material releases in accordance with the Radiological Effluent Technical Specifications are summarized as follows:

1) Filtration, Recirculation, and Ventilation System -

The FRVS is maintained in a standby condition. Upon reactor building isolation, the FRVS recirculation system recirculates the reactor building air through HEPA and charcoal filters. Releases are made to the atmosphere via a reactor building vent or the South Plant Vent depending on mode of operation. Noble gas monitoring is provided by RE-4811A.

2) South Plant Vent -

The SPV received discharge from the radwaste evaporator, reactor building purge, auxiliary building radwaste area, condensate demineralizer, pipe chase, feedwater heater, and untreated ventilation sources. Effluents are monitored (for noble gas) by the RE-4875A monitor.

3) North Plant Vent -

The NPV received discharges from the gaseous radwaste treatment system (Offgas system) and untreated ventilation air sources. Effluents are monitored (for noble gases) by the RE-4873B monitor.

Gaseous radioactive waste flow diagrams with the applicable, associated radiation monitoring instrumentation controls are presented in Figures 2-1 and 2-2.

2.2 Gaseous Effluent Monitor Setpoint Determination

2.2.1 Plant Vent and FRVS Vent Monitors

Per the requirements of Technical Specification 3.3.7.11, alarm setpoints shall be established for the gaseous effluent monitoring instrumentation to ensure that the release rate of noble gases does not exceed the limits of Specification 3.11.2.1, which corresponds to a dose rate at the SITE BOUNDARY of 500 mrem/year to the total body or 3000 mrem/year to the skin. Based on a grab sample analysis of the applicable release (i.e., of FRVS, pipe chase, gaseous radwaste treatment system air, etc.), the radiation monitoring alarm setpoints may be established by the following calculation method. The measured radionuclide concentrations and release rate are used to calculate the fraction of the allowable release rate, as limited by Specification 3.11.2.1, by the equation:

$$\text{FRAC} = [4.72\text{E}+02 * X/Q * VF * (C_i * K_i)] / 500 \quad (2.1)$$

$$\text{FRAC} = [4.72\text{E}+02 * X/Q * VF * (C_i * (L_i + 1.1M_i))] / 3000 \quad (2.2)$$

where:

FRAC = fraction of the allowable release rate based on the identified radionuclide concentrations and the release flow rate.
 X/Q = annual average meteorological dispersion to the controlling site boundary location (sec/m³).
 VF = ventilation system flow rate for the applicable release point and monitor (ft³/min).

C_i	=	concentration of noble gas radionuclide i as determined by radioanalysis of grab sample (uCi/cm ³)
K_i	=	total body dose conversion factor for noble gas radionuclide i (mrem/yr per uCi/m ³), from Table 2-1
L_i	=	beta skin dose conversion factor for noble gas radionuclide i (mrem/yr per uCi/m ³), from Table 2-1
M_i	=	gamma air dose conversion factor for noble gas radionuclide i (mrad/yr per uCi/m ³), from Table 2-1
1.1	=	mrem skin dose per mrad gamma air dose (mrem/mrad)
4.72E+02	=	conversion factor (cm ³ /ft ³ * min/sec)
500	=	total body dose rate limit (mrem/yr)
3000	=	skin dose rate limit (mrem/yr)

Based on the more limiting FRAC (i.e., higher value) as determined above, the alarm setpoints for the applicable monitors may be calculated by the equation:

$$SP = [AF * \sum C_i / FRAC] + bkg \quad (2.3)$$

where:

SP	=	alarm setpoint corresponding to the maximum allowable release rate (uCi/cc).
FRAC	=	highest fraction of the allowable release rate as determined in equation 2.1 or 2.2.
bkg	=	background of the monitor (uCi/cc).
AF	=	administrative allocation factor for the specific monitor (0.2 NPV, 0.2 SPV, 0.1 FRVS).

The allocation factor (AF) is an administrative control imposed to ensure that combined releases from Salem Units 1 and 2 and Hope Creek will not exceed the regulatory limits on release rate from the site (i.e., the release rate limits of Technical Specification

2.6 Gaseous Effluent Dose Projection

Technical Specification 3.11.2.5 requires that the VENTILATION EXHAUST TREATMENT SYSTEM be used to reduce radioactive material levels prior to discharge when projected doses in 31-days exceed:

- 0.1 mrad to air from gamma radiation, or
- 0.4 mrad to air from beta radiation, or
- 0.3 mrad to any organ of a MEMBER OF THE PUBLIC

The applicable gaseous processing systems for maintaining radioactive material releases ALARA are the Gaseous Radwaste Treatment System and Exhaust Treatment System as delineated in Figures 2-1 and 2-2.

Dose projection are performed at least once per 31-days by the following equations:

$$D_{gp} = (D_g / d) * 31d \quad (2.17)$$

$$D_{bp} = (D_b / d) * 31d \quad (2.18)$$

$$D_{maxp} = (D_{max} / d) * 31d \quad (2.19)$$

where:

- D_{gp} = gamma air dose projection for current 31-day period (mrad).
- D_g = gamma air dose to date for current calendar quarter as determined by equation (2.7) or (2.9) (mrad).
- D_{bp} = beta air dose projection for current 31-day period (mrad).
- D_b = beta air dose to date for current calendar quarter as determined by equation (2.8) or (2.10) (mrad).

3.0 SPECIAL DOSE ANALYSIS

3.1 Doses Due to Activities Inside the SITE BOUNDARY

In accordance with Technical Specification 6.9.1.7, the Radioactive Effluent Release Report (RERR) submitted within 60-days after January 1st of each year shall include an assessment of radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY.

The calculation methods as presented in Sections 1.4 and 2.5 may be used for determining the maximum potential dose to a MEMBER OF THE PUBLIC based on the parameters from Table 2-3 and the number of hours per visit per year. The default value for the meteorological dispersion data as presented in Table 2-3 may be used if current year meteorology is unavailable at the time of NRC reporting. However, a follow-up evaluation shall be performed when the data becomes available.

3.2.1 Effluent Dose Calculations

For purposes of implementing the surveillance requirements of Technical Specification 3/4.11.4 and the reporting requirements of 6.9.1.11 (RERR), dose calculations for the Hope Creek Generating Station may be performed using the calculation methods contained within the ODCM; the conservative controlling pathways and locations of Table 2-3 or the actual pathways and locations as identified by the land use census (Technical Specification 3/4.12.1) may be used. Average annual meteorological dispersion parameters or meteorological conditions concurrent with the release period under evaluation may be used.

3.2.2 Direct Exposure Dose Determination

Any potentially significant direct exposure contribution to off-site individual doses may be evaluated based on the results of the environmental measurements (e.g., TLD, ion chamber measurements) and/or by the use of a radiation transport and shielding calculation method. Only during a non-typical condition will there exist any potential for significant on-site sources at Hope Creek that would yield potentially significant off-site doses (i.e., in excess of 1 mrem per year to a MEMBER OF THE PUBLIC), that would require detailed evaluation for demonstrating compliance with

TABLE 1-1
PARAMETERS FOR LIQUID ALARM SETPOINT DETERMINATION

<u>Parameter</u>	<u>Actual Value</u>	<u>Default Value</u>	<u>Units</u>	<u>Comments</u>
MPCe	Calculated	1.60E-5	uCi/ml*	Calculated for each batch to be released
MPC I-131	3.0E-07	N/A	uCi/ml	Taken from 10 CFR 20, Appendix B, Table II, Column 2
C _i	Measured	N/A	uCi/ml	Taken from gamma spectral analysis of liquid effluent
MPC _i	As Determined	N/A	uCi/ml	Taken from 10 CFR 20, Appendix B, Table II, Column 2
CTBD	As Determined	1.20E4	gpm	Cooling tower blowdown discharge
RR	As Determined	176 1300	gpm or gpm (CST)	Determined prior to release; release rate can be adjusted for Technical Specification compliance
SP				
A) RE4861	Calculated	1.09E-03	uCi/ml	Default alarm setpoints; more conservative values may be used as deemed appropriate and desirable for ensuring regulatory compliance and for maintaining releases ALARA
RE8817	Calculated	1.60E-05	uCi/ml	
B) RE4861	Calculated	1.48E-04	uCi/ml	These setpoints are for condensate storage tank releases
RE8817	Calculated	1.60E-05	uCi/ml	

* See Appendix A for basis

TABLE 1-3

BIOACCUMULATION FACTORS
(pCi/kg per pCi/liter)*

<u>ELEMENT</u>	<u>SALTWATER FISH</u>	<u>SALTWATER INVERTEBRATES</u>
H	9.0E-01	9.3E-01
C	1.8E+03	1.4E+03
Na	6.7E-02	1.9E-01
P	3.0E+03	3.0E+04
Cr	4.0E+02	2.0E+03
Mn	5.5E+02	4.0E+02
Fe	3.0E+03	2.0E+04
Co	1.0E+02	1.0E+03
Ni	1.0E+02	2.5E+02
Cu	6.7E+02	1.7E+03
Zn	2.0E+03	5.0E+04
Br	1.5E-02	3.1E+00
Rb	8.3E+00	1.7E+01
Sr	2.0E+00	2.0E+01
Y	2.5E+01	1.0E+03
Zr	2.0E+02	8.0E+01
Nb	3.0E+04	1.0E+02
Mo	1.0E+01	1.0E+01
Tc	1.0E+01	5.0E+01
Ru	3.0E+00	1.0E+03
Rh	1.0E+01	2.0E+03
Ag	3.3E+03	3.3E+03
Sb	4.0E+01	5.4E+00
Te	1.0E+01	1.0E+02
I	1.0E+01	5.0E+01
Cs	4.0E+01	2.5E+01
Ba	1.0E+01	1.0E+02
La	2.5E+01	1.0E+03
Ce	1.0E+01	6.0E+02
Pr	2.5E+01	1.0E+03
Nd	2.5E+01	1.0E+03
W	3.0E+01	3.0E+01
Np	1.0E+01	1.0E+01

* Values in this table are taken from Regulatory Guide 1.109 except for phosphorus (fish) which is adapted from NUREG/CR-1336 and silver and antimony which are taken from UCRL 50564, Rev. 1, October 1972.

FIGURE 2-2
VENTILATION EXHAUST TREATMENT SYSTEM

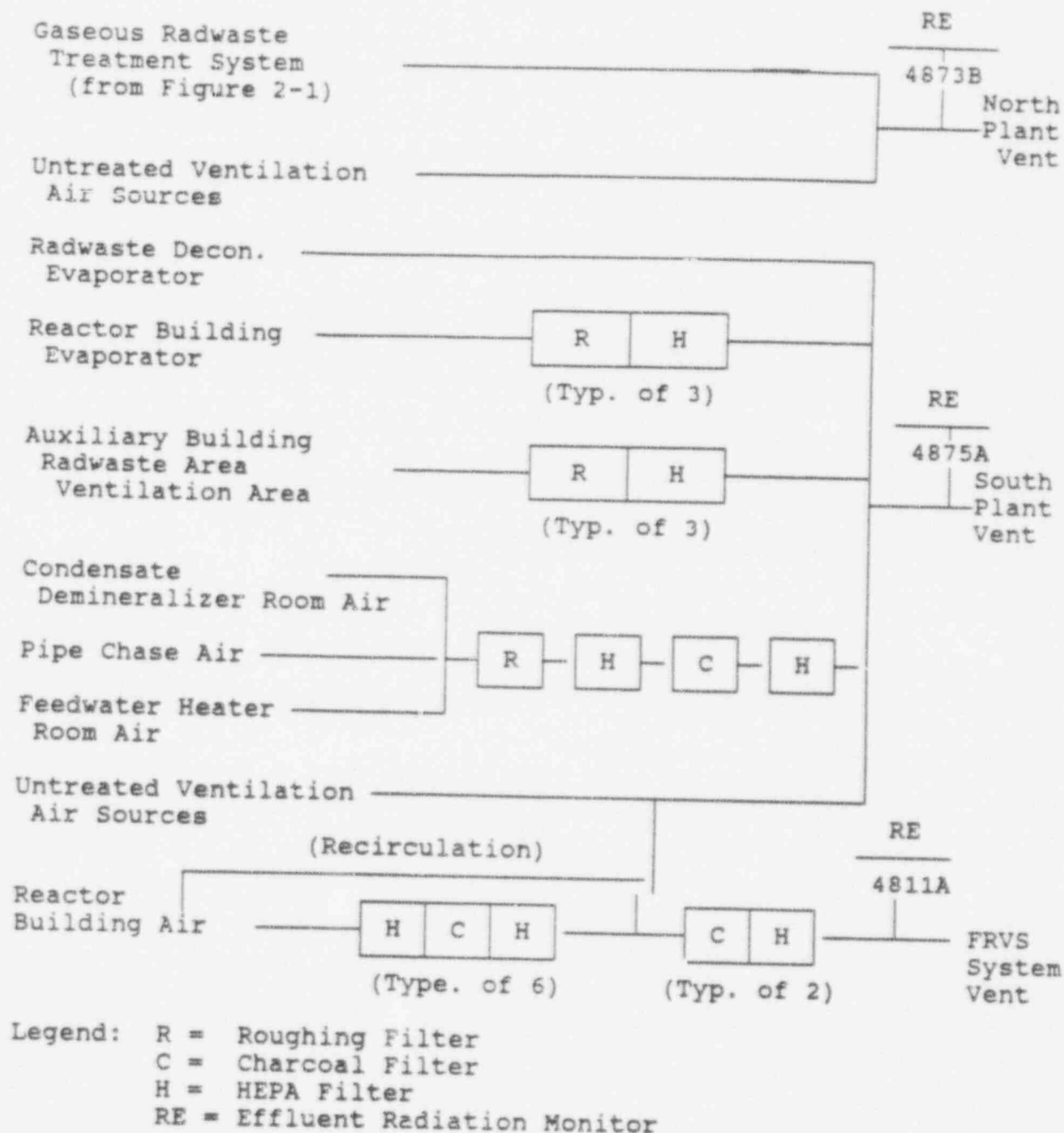


TABLE 2-1

DOSE FACTORS FOR NOBLE GASES

<u>Radionuclide</u>	Total Body Dose Factor Ki (mrem/yr per <u>uCi/m3</u>)	Skin Dose Factor Li (mrem/yr per <u>uCi/m3</u>)	Gamma Air Dose Factor Mi (mrad/yr per <u>uCi/m3</u>)	Beta Air Dose Factor Ni (mrad/yr per <u>uCi/m3</u>)
Kr-83m	7.56E-02	-	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

TABLE 2-3

CONTROLLING LOCATIONS PATHWAYS AND
ATMOSPHERIC DISPERSION FOR DOSE CALCULATIONS*

<u>Tech Spec</u>	<u>Location</u>	<u>Pathway(s)</u>	<u>Controlling Age Group</u>	<u>X/Q (sec/m3)</u>	<u>D/Q (1/m2)</u>
3.11.2.1a	Site Boundary 0.5 Mile, N	Noble Gases direct exposure	N/A	2.67E-06	N/A
3.11.2.1b	Site Boundary 0.5 Mile, N	Inhalation	Child	2.67E-06	N/A
3.11.2.2	Site Boundary 0.5 Mile, N	Gamma-Air Beta-Air	N/A	2.67E-06	N/A
3.11.2.3	Residence/ Dairy - 4.9 Miles, W	Milk, ground plane and inhalation	Infant	7.2E-08	2.87E-10

* The identified controlling locations, pathways and atmospheric dispersion are from the Artificial Island Radiological Monitoring Program and the Hope Creek FSAR.

APPENDIX A

Evaluation of Default MPC Value

for Liquid Effluent

In accordance with the requirements of Technical Specification 3.3.7.10 the radioactive effluent monitors shall be operable with alarm setpoints established to ensure that the concentration of radioactive material at the discharge point does not exceed the MPC value of 10 CFR 20, Appendix B, Table II, Column 2. The determination of allowable radionuclide concentration and corresponding alarm setpoint is a function of the individual monitor.

In order to limit the need for routinely having to reestablish the alarm setpoints as a function of changing radionuclide distributions, a default alarm setpoint can be established. This default setpoint can be based on an evaluation of the radionuclide distribution from the 1989 to 1991 release data of the liquid effluents from Hope Creek and the effective MPC value for this distribution.

The effective MPC value for a radionuclide distribution is calculated by the equation:

$$MPC_e = \frac{\sum C_i \text{ (gamma emitters only)}}{\sum \frac{C_i \text{ (gamma)}}{MPC_i} + \sum \frac{C_i \text{ (non-gamma)}}{MPC_i}} \quad (A.1)$$

where:

- MPC_e = an effective MPC value for a mixture of radionuclides (uCi/ml)
- C_i = concentration of radionuclide i in the mixture
- MPC_i = the 10 CFR 20, Appendix B, Table II, Column 2 MPC value for radionuclide (uCi/ml)

Considering the average effective MPC values from 1989 thru 1991 releases it is reasonable to select an MPC value of $1.6E-05$ uCi/ml as typical of liquid radwaste discharges. This value will be reviewed and adjusted as necessary based on the distribution history of effluents from Hope Creek. Using the value of $1.6E-5$ uCi/ml to calculate the default alarm setpoint, results in a setpoint that:

- 1) Will not require frequent re-adjustment due to minor variations in the nuclide distribution which are typical of routine plant operations, and;
- 2) Will provide for a liquid radwaste discharge rate (as evaluated for each batch release) that is compatible with plant operations (Refer to Table 1-1).
- 3) Will account for alpha emitters, H-3, Sr-90, Sr-89, and Fe-55 as required by Technical Specification 3.11.1.1.

TABLE A-1
CALCULATION OF EFFECTIVE MPC
HOPE CREEK

NUCLIDE	MPC	1991 ACTIVITY RELEASED (Ci)	1990 ACTIVITY RELEASED (Ci)	1989 ACTIVITY RELEASED (Ci)
Na-24	3.0E-05	2.05E-04	2.06E-05	9.28E-03
Cr-51	2.0E-03	5.60E-02	7.48E-02	1.85E-01
Mn-54	1.0E-04	3.42E-02	1.58E-01	2.02E-01
As-76	2.0E-05	8.39E-0	N/D	N/D
Co-58	9.0E-05	8.86E-04	8.07E-03	1.69E-02
Fe-59	6.0E-05	5.54E-03	8.76E-03	5.77E-02
Co-60	3.0E-05	7.51E-03	3.65E-02	4.56E-02
Zn-65	1.0E-04	5.94E-02	2.64E-01	3.22E-01
Y-91m	3.0E-03	2.48E-05	N/D	N/D
Y-91	3.0E-05	N/D	3.36E-05	N/D
Sr-92	7.0E-05	3.26E-04	5.57E-04	3.83E-04
Nb-95	1.0E-04	2.01E-05	N/D	4.33E-06
Nb-97	9.0E-04	N/D	N/D	2.14E-05
Tc-99m	6.0E-03	1.03E-05	N/D	4.61E-04
Sb-124	2.0E-05	N/D	1.49E-05	N/D
Sb-125	1.0E-04	N/D	N/D	5.82E-05
I-131	3.0E-07	N/D	6.73E-06	1.33E-05
I-133	1.0E-06	7.91E-06	N/D	N/D
Cs-137	2.0E-05	2.09E-05	N/D	3.94E-03
Hg-203	2.0E-05	2.72E-06	N/D	N/D
H-3	3.0E-03	2.45E+01	1.18E+01	1.04E+01
Fe-55	8.0E-04	6.23E-01	8.40E-01	2.06E-01
Total Curies (Gamma)		1.65E-01	5.52E-01	6.62E-01
Total Curies (Non-Gamma)		2.51E+01	1.26E+01	1.06E+01
SUM (Ci/MPCi) (Gamma)		1.39E+03	5.82E+03	6.93E+03
SUM (Ci/MPCi) (Non-Gamma)		8.95E+03	4.98E+03	3.71E+03
MPCe (uCi/ml) (Beta Corrected)		1.60E-05	5.11E-05	6.22E-05

N/D=Not detected

APPENDIX B

Technical Basis for Effective Dose Factors -
Liquid Effluent Releases

The radioactive liquid effluents from Hope Creek from 1989 through 1991 were evaluated to determine the dose contribution of the radionuclide distribution. This analysis was performed to evaluate the use of a limited dose analysis for determining environmental doses, providing a simplified method of determining compliance with the dose limits of Technical Specification 3.11.1.2. For the expected radionuclide distribution of effluent from Hope Creek during 1989 to 1991, the controlling organ is the liver. The calculated liver dose is predominately a function of the Zn-65 and Fe-55 releases. The radionuclides, Zn-65 and Fe-55 also contribute the large majority of the calculated total body dose. The results of this evaluation are presented in Table B-1.

For purposes of simplifying the details of the dose calculation process, it is conservative to identify a controlling, dose significant radionuclide and limit the calculation process to the use of the dose conversion factor for this nuclide. Multiplication of the total release (i.e., cumulative activity for all radionuclides) by this dose conversion factor provides for a dose calculation method that is simplified while also being conservative.

For the evaluation of the maximum organ dose, it is conservative to use the Zn-65 dose conversion factor (5.13E5 mrem/hr per uCi/ml). By this approach, the maximum organ dose will be overestimated since this nuclide has the highest organ dose fraction of all the radionuclides evaluated. For the total body calculation, the Zn-65 dose factor (2.32E5 mrem/hr per uCi/ml, total body) is the highest among the identified dominant nuclides.

For evaluating compliance with the dose limits of technical Specification 3.11.1.2, the following simplified equations may be used:

Total Body

$$D_b = \frac{8.35E-04}{CTBD} * Vol * A_{i,b} * C_i \quad (B.1)$$

TABLE B-1
Adult Dose Contributions
Fish and Invertebrate Pathways
Hope Creek

Nuclide	Release (Ci)	TB Dose Frac.	GI-LLI Dose Frac.	Liver Dose Frac.	Year
Fe-55	2.06E-1	0.02	0.03	0.04	1989
Fe-55	8.40E-1	0.10	0.15	0.18	1990
Fe-55	6.23E-1	0.26	0.34	0.41	1991
Mn-54	2.02E-1	*	*	*	1989
Mn-54	1.58E-1	*	0.03	*	1990
Mn-54	3.42E-2	*	0.02	*	1991
Co-58	1.69E-2	*	*	*	1989
Co-58	8.07E-3	*	*	*	1990
Co-58	8.86E-4	*	*	*	1991
Fe-59	5.77E-2	0.05	0.25	0.06	1989
Fe-59	8.76E-3	*	0.05	*	1990
Fe-59	5.54E-3	0.02	0.09	0.02	1991
Co-60	4.56E-2	*	0.01	*	1989
Co-60	3.65E-2	*	0.01	*	1990
Co-60	7.51E-3	*	*	*	1991
Zn-65	3.22E-1	0.92	0.70	0.90	1989
Zn-65	2.64E-1	0.89	0.75	0.81	1990
Zn-65	5.94E-2	0.71	0.52	0.57	1991

* = Less than 0.01

SAMPLING LOCATIONS

All sampling locations and specific information about the individual locations are given in Table E. Maps E-1 and E-2 show the locations of sampling stations with respect to the site.

TABLE E-1

<u>STATION CODE</u>	<u>STATION LOCATION</u>	<u>SAMPLE TYPES</u>
2S2	0.4 mi. NNE of vent	IDM
2S3	700 ft. NNE of vent; fresh water holding tank	WWA
5S1	1.0 mi. E of vent; site access road	AIO, APT, IDM
6S2	0.2 mi. ESE of vent; observation building	IDM, SOL
7SI	0.12 mi. SE of vent; station personnel gate	IDM
10S1	0.14 mi. SSW of vent; site shoreline	IDM
11S1	0.09 mi. SW of vent; site shoreline	IDM
11A1	0.2 mi. W of vent; outfall area	ECH, ESF, ESS, SWA
15A1	0.3 mi. NW of vent; cooling tower blowdown discharge line	ESS
16A1	0.7 mi. NNW of vent; south storm drain discharge line	ESS
12C1	2.5 mi. WSW of vent; west bank of Delaware River	ECH, ESF, ESS, SWA
4D2	3.7 mi. ENE of vent; Alloway Creek Neck Road	IDM
5D1	3.5 mi. E of vent; Alloway Creek Neck Road	AIO, APT, IDM,
10D1	3.9 mi. SSW of vent; Taylor's Bridge Spur	IDM, SOL

TABLE E-1 (Cont'd)

<u>STATION CODE</u>	<u>STATION LOCATION</u>	<u>SAMPLE TYPES</u>
11D1	3.5 mi. SW of vent	GAM
14D1	3.4 mi. WNW of vent; Bay View, Delaware	IDM
2E1	4.4 mi. NNE of vent; local farm	IDM
3E1	4.1 mi. NE of vent; local	FPB, FPV, GAM,
3E3	5.6 mi. NE of vent; local farm	IDM, VGT, WWA, FPV
7E1	4.5 mi. SE of vent; 1 mi. W of Mad Horse Creek	ESF, ESS, SWA
9E1	5.0 mi. SW of vent	IDM
11E2	5.0 mi. SW of vent	IDM
12E1	4.4 mi. WSW of vent; Thomas Landing	IDM
13E1	4.2 mi. W of vent; Diehl House Lab	IDM
16E1	4.1 mi. NNW of vent; Port Penn	AIO, APT, IDM SOL
1F1	5.8 mi. N of vent; Fort Elfsborg	AIO, APT, IDM SOL
1F2	7.1 mi. N of vent; midpoint of Delaware	SWA
2F2	8.7mi. NNE of vent; Salem Substation	AIO, APT, IDM, RWA
2F3	8.0 mi. NNE of vent; Salem Water Co.	PWR, PWT
2F4	6.3 mi. NNE of vent; local	FPV, FPL, SOL
2F5	7.5 mi. NNE of vent; Salem High School	IDM

TABLE E-1 (Cont'd)

<u>STATION CODE</u>	<u>STATION LOCATION</u>	<u>SAMPLE TYPES</u>
2F6	7.3 mi. NNE of vent; Southern Training Center	IDM
2F7	5.7 mi. NNE of vent; local farm	MLK,VGT,SOL
3F2	5.1 mi. NE of vent; Hancocks Bridge Municipal Building	IDM
3F3	8.6 mi. NE of vent; Quinton Township School	IDM
5F1	6.5 mi. E of vent	SOL,IDM
5F3	6.5 mi. E of vent; local farm	FPL
6F1	6.4 mi. ESE of vent; Stow Neck Road	IDM
7F2	9.1 mi. SE of vent; Bayside, NJ	IDM
10F2	5.8 mi. SSW of vent	IDM
11F1	6.2 mi. SW of vent; Taylor's Bridge Delaware	IDM
11F3	5.3 mi. SW of vent; Townsend, DE	MLK,VGT,SOL
12F1	9.4 mi. WSW of vent; Townsend Elem. School	IDM
13F2	6.5 mi. W of vent; Odessa, DE	IDM
13F3	9.3 mi. W of vent; Redding Middle School, Middletown, DE	IDM
13F4	9.8 mi. W of vent; Middletown, DE	IDM
14F2	6.6 mi. WNW of vent; Boyds Corner	IDM
14F3	5.4 mi. WNW of vent; local farm	FPV
14F4	7.6 mi. WNW of vent; local farm	MLK,SOL,VGT
15F3	5.4 mi. NW of vent	IDM

TABLE E-1 (Cont'd)

<u>STATION CODE</u>	<u>STATION LOCATION</u>	<u>SAMPLE TYPES</u>
16F1	6.9 mi. NNW of vent; C&D Canal	ESS, SWA
16F2	8.1 mi. NNW of vent; Delaware City Public School	IDM
1G1	10.3 mi. N of vent; local farm	FPV
1G3	19 mi. N of vent; Wilmington, DE	IDM
2G2	13.5 mi. NNE of vent; local farm	FPV
3G1	17 mi. NE of vent; local farm	IDM, MLK, VGT SOL
10G1	12 mi. SSW of vent; Smyrna, DE	IDM
16G1	15 mi. NNW of vent; Greater Wilmington Airport	IDM
3H1	32 mi. NE of vent; National Park, NJ	IDM
3H3	110 mi. NE of vent; Research and Testing Laboratory	AIO, APT, IDM
3H5	25 mi. NE of vent; local farm	FPL, FPV