Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

See Envir. Rept.

February 26, 1985
G02-85-105

Docket No. 50-397

Mr. J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Dear Mr. Martin:

Subject: NUCLEAR PLANT NO. 2
SEMI-ANNUAL EFFLUENT REPORT
JULY 1 to DECEMBER 31, 1984 (ATTACHED)

In accordance with Title 10 of the Code of Federal Regulations, Part 50.36a (a) (2), the subject report is submitted.

Should you have any questions, please contact Mr. R. G. Graybeal, Manager, WNP-2 Health Physics/Chemistry.

Very truly yours,

CM Powers for
J. D. Martin
WNP-2 Plant Manager

tmh
Attachment

cc: R Auluck - NRC
RC DeYoung - NRC
C Eschels - EFSEC
D Jaquish - DOE
D Sherman - Amer. Nuclear Insurers
TR Strong - DSHS
AD Toth - NRC Site
G Yuhas - NRC RV (2)
Document Control Desk - NRC

CM
IE-17

WNP-2 SEMI-ANNUAL EFFLUENT REPORT

JULY 1 TO DECEMBER 31, 1984

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

LICENSE NO. NPF-21

FEBRUARY, 1985

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1.0 INTRODUCTION

On January 19, 1984 Washington Public Power Supply System's plant, WNP-2, initially went critical. The first Semi-Annual Report covering the first and second quarters of 1984 was submitted on August 16, 1984. In meeting the requirements of the license, this report is submitted in compliance with Technical Specification 6.9.1.11 and Regulatory Guide 1.21.

2.0 LIQUID EFFLUENTS

The radwaste liquid effluents from WNP-2 were released in a batch mode only, no continuous release of liquid effluent occurred during the six month period. A monthly LADTAP computer run was performed to verify compliance with Technical Specification limits using the assumptions in the ODCM.

The average diluted concentrations are based on the dilution in the blowdown line and are prior to being discharged to the river.

All liquid discharges from the radwaste building are recirculated in a vented holdup tank at atmospheric pressure prior to sampling and discharge. Thus, no dissolved or entrained noble gases were present in the liquid discharges.

The "Percent of Applicable Limit" is based on 10CFR20 Appendix B, Table 2, Column 2 concentrations.

The "Estimated Total Error" is calculated to be ?2% at the 95% confidence level. The estimated errors in the radioactivity are based on counting statistics, measurement of flow rates, both from the tank and in the blowdown line and in obtaining a representative sample prior to discharge.

The "Estimated Total Error" is calculated by taking the square root of the sum of the squares of the errors of the individual contributers.

No positive count of alpha activity was detected in the liquid effluent samples during the last six months.

Liquid effluent alpha activity has been consistently at or near the alpha MDA levels of the counting equipment, i.e. - 10^{-7} uCi/cc. Individual analysis in early 1984 yielded higher MDA results due to the alpha analyzer background at that time.

2.1 Turbine Buildings Non-Radioactive Sumps

WNP-2 also has three non-radioactive turbine building sumps that are continuously monitored for radioactivity. These sumps are designed to discharge water to the storm drain system, which is an open pond by the WNP-2 Warehouse, or to route the water to the Radioactive Waste Building floor drain receiving tank if the radiation monitor setpoint is exceeded. Under no conditions can the sumps discharge outside of the restricted area or to the river.

On October 31, 1984 radioactive material was detected in and around the pond. The sumps were isolated and a sampling program was initiated. The activity was due to a leaking isolation valve (FDR-V-18) in the line by which the normally non-radioactive sumps discharge to radwaste. The turbine building radioactive sumps were pumping radioactive water past the leaking valve and into the non-radioactive sump discharge line at a point downstream of the radiation monitor, thus an alarm never sounded.

An investigation revealed the following:

1. The concentration of radioactive material in and around the pond was below exempt concentrations. The sum of the maximum concentrations for all of the nuclides detected totaled 11.2% of the exempt limit. Table 2.1 compares the soil sample concentrations with the exempt limits.

2. The valve (FDR-V-18) was found to be open approximately 5% due to a lack of lubrication on the valve shaft and subsequent activation of a torque limit switch.

3. A total surface area of approximately 700 m^2 had detectable radiation levels above background.

The following corrective actions were taken:

1. The valves in the crosstie lines were lubricated and the torque limit switches were adjusted so the valves fully close.

2. Check valves will be added as second isolation valves in the crosstie lines.

3. A sample from the discharge of the line into the pond is analyzed routinely. No additional activity has been detected since the sump pumps were isolated. Sampling will continue until the check valves are installed and tested.

4. A composite samplers have been added to the non-radioactive sump discharge.

The event was not a license event report as defined in NUREG 1022 and 10 CFR 30.72 and was classified as non-reportable. No radioactivity was released to the unrestricted area and all concentrations were below exempt concentrations per 10 CFR 30.70 Schedule A and HAC 402-19-580. The on site NRC inspector was briefed of the event at the time of occurrence. Results from the soil sample analyses are listed in Table 2-3.

Table 2-1

WNP-2 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

July - December 1984

	Unit	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	7.4E-03	2.0E-02	2.2 E+1
2. Average diluted concentration during period	uCi/ml	2.2E-06	2.5E-05	
3. Percent of MPC limit	%	2.0E+01	3.1E+00	
B. Tritium				
1. Total release	Ci	5.2E-01	2.0E-02	2.2 E+1
2. Average diluted concentration during period	uCi/ml	1.0E-04	3.1E-04	
3. Percent of MPC limit	%	2.0E+00	1.0E+00	
C. Gross alpha radioactivity(1)				
1. Total release	Ci	5.2E-04	1.4E-04	1.7 E+1
D. Volume of waste (prior to dilution)	liters	3.4E+06	1.8E+06	1.5 E+1
E. Volume of dilution water used during period	liters	6.4E+06	9.2E+06	1.5 E+1

(1) Below MDA values.

Table 2-2

WNP-2 LIQUID EFFLUENTS - SOURCE TERMS

BATCH MODE

Nuclides Released	Unit	3rd Quarter	4th Quarter
Strontium-89	Ci	1.4 E-04	1.1 E-04
Strontium-90	Ci	5.0 E-04	4.9 E-04
Cesium-134	Ci	1.6 E-04	1.3 E-04
Cesium-137	Ci	1.5 E-04	1.3 E-04
Iodine-131	Ci	1.4 E-04	5.4 E-04
Cobalt-58(*)	Ci	4.7 E-04	7.2 E-04
Cobalt-60	Ci	1.6 E-04	1.3 E-04
Iron-59	Ci	2.7 E-04	2.4 E-04
Zinc-65(*)	Ci	3.7 E-04	5.2 E-04
Manganese-54	Ci	1.4 E-03	1.2 E-04
Chromium-51	Ci	1.3 E-03	1.2 E-02
Niobium-95	Ci	1.5 E-04	6.8 E-04
Molybdenum-99	Ci	1.5 E-04	1.2 E-04
Technetium-99m	Ci	1.5 E-04	1.6 E-04
Barium-lanthanum-140	Ci	5.1 E-04	3.4 E-04
Cerium-141	Ci	2.3 E-04	2.4 E-04

(*)Nuclides with detectable activity. All others are below MDA values.

TABLE 2-2 (Continued)

Cerium-144	Ci	1.1 E-03	1.0 F-03
Tritium(*)	Ci	5.2 E-01	3.3 E-01
Iron-55	Ci	4.0 E-05	5.4 E-04
Sodium-24(*)	Ci	0.0 E+0	8.9 E-05
Copper-64(*)	Ci	0.0 E+0	1.2 E-02
Arsenic-76(*)	Ci	0.0 E+0	1.3 E-04
Total for Period (Above)	Ci	5.3 E-01	3.5 E-01

TABLE 2-3

HIGHEST ACTIVITY SOIL SAMPLE
COMPARISON WITH EXEMPT CONCENTRATIONS (uCi/g)

Nuclide	Sample Concentration (uCi/g)	Exempt Concentration (uCi/g)	Fraction of Limit
Na-24	9.3E-7	2E-3	4.62E-4
Cr-51	5.7E-5	2E-2	2.83E-3
Mn-54	1.5E-6	1E-3	1.47E-3
Fe-59	2.4E-6	6E-4	4.07E-3
Co-58	2.4E-5	1E-3	2.37E-2
Co-60	2.6E-6	5E-4	5.23E-3
Cu-64	1.3E-4	3E-3	4.19E-2
Zn-65	2.0E-5	1E-3	2.04E-2
As-76	1.2E-6	2E-4	6.18E-3
I-133	4.1E-7	7E-5	5.82E-3
		TOTAL	1.12E-1

Exempt concentrations from 10CFR30.70 Schedule A and Washington Administrative Code (WAC) 402-19-580 Schedule C.

3.0 GASEOUS EFFLUENTS

The gaseous radwaste effluents from WNP-2 were released in a continuous mode. There are three (3) release points at WNP-2:

1. Main Plant Vent - mixed mode release
2. Turbine Building - ground level release
3. Radwaste Building - ground level release

There were no batch or abnormal releases of gaseous effluent during the third and fourth quarters of 1984. Monitoring and sampling of the gaseous effluents were performed according to plant procedures. The setpoints for the environmental radiation monitors were set as described in the ODCM.

The gaseous source terms from each release points are listed in Table 3-1 to 3-3. Table 3-4 is a summation of the total releases of gaseous effluents from WNP-2 plus the average release rate, gross alpha activities and the estimated total error associated with the measurements of radioactivity in the gaseous effluents.

The method of calculating the total estimated error associated with the gaseous effluent measurements is similar to the one described in Section 2.0 (Liquid Effluents). The error estimates were performed on the gas grab sample, volume determination, flow rates, gas analysis by gamma spectrometry, air monitoring flow, calibration error of the gas analyzer detectors, and beta scintillation readings. The final error was calculated to be 36% at the 95% confidence level.

In Table 3-4, the "Percent of Technical Specification Limit" calculations were based on the offsite exposure. For the noble gases, dose to the whole body was 6.0 E-02 mrem for the third quarter and 8.6 E-01 mrem for the fourth quarter.

The maximum organ dose from the noble gases was 1.1 E-01 mrem for the third quarter and 1.2 E+0 mrem for the fourth quarter.

The maximum whole body dose due to Iodines and particulates was 6.3 E-02 mrem for the third quarter and 6.9 E-01 mrem for the fourth quarter.

Gross alpha activity was based on the MDA of the counting equipment. During the final quarter of 1984 positive gross alpha activity was detected on a few particulate filters from the radioactive waste and reactor building ventilation system. Concentrations were in the range of 10^{-14} uCi/cm^3. No iodine or fission product activity was present on the filters with the low alpha activity. The final evaluation indicated that the alpha activity was due to radon/thoron decay products.

To verify compliance with Technical Specification limits, calculations were performed each month using the GASPAR computer program to determine the offsite radiation exposure at two special locations.

1. The site boundary at 1.2 miles from the plant and for the sector with the maximum X/Q value.

2. Taylor Flats - at 4.2 miles SE.

The calculations on the radiation levels at the site boundary were used to verify compliance with Technical Specification limits from 10CFR20, and for air dose limits as listed in 10CFR50. The Taylor Flats location was used to verify compliance with Technical Specification limits from 10CFR50 Appendix I.

In addition to the reactor site, WNP-2 has a permanent laundry facility which is located approximately 0.75 miles from the site. The laundry uses a dry cleaning process so there are no liquid discharges of radioactive effluents. The ventilation system contains HEPA filters on the discharge and is continuously monitored for particulates and radio iodines. A total of 8.4E-01 microcuries were released from the laundry facility during the reporting period. The results are based on the MDA of gross beta-gamma counting of the particulate filters. Gamma analysis indicated no isotopes present other than those attributable to natural background.

Table 3-1

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS - MIXED MODE RELEASES
MAIN PLANT VENT

July - December 1984

CONTINUOUS MODE

Nuclides Released	Unit	3rd Quarter	4th Quarter
1. Fission gases			
Krypton-85	Ci	0.0	0.0
Krypton-85m	Ci	9.1 E-02	7.8 E-01
Krypton-87	Ci	1.0 E+0	4.0 E+0
Krypton-88	Ci	1.1 E+0	1.9 E+02
Xenon-133	Ci	1.4 E-01	3.3 E+0
Xenon-135	Ci	5.8 E-01	2.1 E+01
Xenon-135m	Ci	1.2 E+0	1.6 E+0
Xenon-138	Ci	9.5 E+0	3.5 E+01
Xenon-131m	Ci	0.0	0.0
Xenon-133m	Ci	1.2 E+0	7.9 E+0
Argon-41	Ci	4.3 E-03	3.3 E+0
Total for period	Ci	1.5 E+01	2.7 E+02
2. Iodines			
Iodine-131	Ci	7.2 E-04	1.5 E-03
Iodine-133	Ci	4.2 E-02	1.1 E-02
Total for period	Ci	4.3 E-02	1.3 E-02

Table 3-1 (Continued)

3. Particulates

Strontium-89	Ci	1.9 E-05	2.6 E-05
Strontium-90	Ci	1.0 E-05	1.1 E-04
Cesium-134	Ci	1.0 E-04	3.3 E-04
Cesium-137	Ci	1.2 E-04	3.0 E-04
Barium-lanthanum-140	Ci	4.0 E-04	1.2 E-03
Molybdenum-99	Ci	5.9 E-04	5.1 E-04
Cerium-141	Ci	1.5 E-04	3.6 E-04
Cerium-144	Ci	5.1 E-04	1.0 E-03
Cobalt-58	Ci	1.3 E-04	1.8 E-03
Cobalt-60	Ci	1.3 E-04	3.9 E-04
Chromium-51	Ci	1.0 E-03	3.8 E-03
Zinc-65	Ci	4.5 E-04	1.6 E-03
Zirconium-95	Ci	1.9 E-04	4.0 E-04
Iron-59	Ci	2.0 E-04	9.0 E-04
Manganese-54	Ci	2.3 E-04	1.4 E-03
Total for period	Ci	4.2 E-03	1.4 E-02

4. Tritium	Ci	1.0 E-04	4.7 E-04

Total building release	Ci	1.5 E+01	2.7 E+02

Table 3-2

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS GROUND LEVEL RELEASES
TURBINE BUILDING

July - December 1984

CONTINUOUS MODE

Nuclides Released	Unit	3rd Quarter	4th Quarter
1. Fission gases			
Krypton-85	Ci	0.0	0.0
Krypton-85m	Ci	0.0	0.0
Krypton-87	Ci	8.5 E-01	1.9 E+0
Krypton-88	Ci	1.1 E+0	2.3 E+0
Xenon-133	Ci	1.1 E+0	2.1 E+0
Xenon-135	Ci	3.0 E-01	6.5 E-01
Xenon-138	Ci	1.4 E+01	2.3 E+01
Xenon-133m	Ci	2.6 E+0	5.2 E+0
Total for period	Ci	2.0 E+01	3.5 E+01
2. Iodines			
Iodine-131	Ci	1.4 E-03	4.7 E-04
Iodine-133	Ci	1.7 E-02	7.5 E-03
Total for period	Ci	1.8 E-02	8.0 E-03

Table 3-2 (Continued)

3. Particulates

Strontium-89	Ci	6.0 E-05	1.7 E-05
Strontium-90	Ci	8.4 E-05	2.7 E-05
Cesium-134	Ci	3.6 E-04	3.7 E-04
Cesium-137	Ci	4.1 E-04	4.1 E-04
Barium-lanthanum-140	Ci	1.5 E-03	1.6 E-03
Cerium-141	Ci	4.3 E-04	4.5 E-04
Cerium-144	Ci	1.8 E-03	1.6 E-03
Cobalt-58	Ci	3.8 E-04	3.6 E-04
Molybdenum-99	Ci	5.7 E-04	8.7 E-04
Cobalt-60	Ci	5.1 E-04	5.0 E-04
Chromium-51	Ci	3.0 E-03	3.4 E-03
Zinc-65	Ci	6.8 E-04	1.5 E-03
Zirconium-95	Ci	5.8 E-04	9.9 E-04
Iron-59	Ci	7.4 E-04	1.2 E-03
Manganese-54	Ci	3.5 E-04	3.2 E-04
Total for period	Ci	1.1 E-02	1.4 E-02

4. Tritium	Ci	5.8 E-03	2.6 E-03

Total building release	Ci	2.0 E+01	3.5 E+01

Table 3-3

WNP-2 GASEOUS EFFLUENTS
SOURCE TERMS GROUND LEVEL RELEASES
RADWASTE BUILDING

July - December 1984

CONTINUOUS MODE

Nuclides Released	Unit	3rd Quarter	4th Quarter
1. Fission gases			
Krypton-87	Ci	2.6 E-01	4.2 E-01
Krypton-88	Ci	2.8 E-01	4.4 E-01
Xenon-133	Ci	7.6 E-01	5.3 E-01
Xenon-135	Ci	2.4 E-01	1.4 E+0
Xenon-138	Ci	5.3 E+0	2.4 E+0
Xenon-133m	Ci	6.8 E-01	2.7 E-01
Total for period	Ci	7.5 E+0	5.5 E+0
2. Iodines			
Iodine-131	Ci	2.9 E-04	7.9 E-04
Iodine-133	Ci	6.1 E-03	5.1 E-02
Total for period	Ci	6.4 E-03	5.2 E-02

Table 3-3 (Continued)

3. Particulates

Strontium-89	Ci	1.0 E-05	1.8 E-06
Strontium-90	Ci	8.1 E-06	2.9 E-06
Cesium-134	Ci	5.8 E-05	3.2 E-04
Cesium-137	Ci	6.0 E-05	2.7 E-04
Barium-Lanthanum-140	Ci	2.1 E-04	8.3 E-04
Molybdenum-99	Ci	1.4 E-04	3.2 E-04
Cerium-141	Ci	7.2 E-05	3.1 E-04
Cerium-144	Ci	2.8 E-04	1.1 E-03
Cobalt-58	Ci	5.3 E-05	3.0 E-04
Cobalt-60	Ci	8.0 E-05	1.7 E-04
Chromium-51	Ci	4.4 E-04	2.4 E-03
Zinc-65	Ci	1.4 E-04	6.9 E-04
Zirconium-95	Ci	1.1 E-04	4.2 E-04
Iron-59	Ci	1.2 E-04	4.7 E-04
Manganese-54	Ci	6.7 E-05	3.4 E-04
Total for period	Ci	1.9 E-03	7.9 E-03

4. Tritium	Ci	1.0 E-02	1.6 E-03

Total building release	Ci	7.5 E+0	5.6 E+0

Table 3-4

WNP-2 GASEOUS EFFLUENTS
SUMMATION OF ALL RELEASES

July - December 1984

	Unit	3rd Quarter	4th Quarter	Est. Total Error %*
A. Fission & activation gases				
1. Total release	Ci	4.3 E+01	3.1 E+02	3.6 E+1
2. Average release rate for period	uCi/sec	1.6 E+01	1.2 E+02	
3. Percent of Tech. Spec. limit	%	1.2 E-02	1.7 E-01	
B. Iodines				
1. Total iodine (131, 133)	Ci	6.7 E-02	7.3 E-02	3.6 E+1
2. Average release rate for period	uCi/sec	2.6 E-02	3.4 E-02	
3. Percent of Tech. Spec. limit	%	3.2 E-03	6.2 E-04	
C. Particulates				
1. Particulates with half-lives 8 days	Ci	1.7 E-02	3.6 E-02	3.6 E+1
2. Average release rate for period	uCi/sec	4.7 E-03	1.4 E-02	
3. Percent of Tech. Spec. limit	%	1.9 E-03	4.5 E-02	
4. Gross alpha radioactivity	Ci	6.6 E-10	1.1 E-09	
D. Tritium				
1. Total releases	Ci	1.7 E-02	4.7 E-03	3.6 E+1
2. Average release rate for period	uCi/sec	1.7 E-02	5.5 E-03	
3. Percent of Tech. Spec. limit**	%	4.9 E-07	7.3 E-08	

* At 95% confidence level
** Based on offsite exposure to the maximum organ. age group, the child.

4.0 SOLID WASTE

A total volume of 1.21E+04 ft^3 (3.43E+02 m^3) of solid waste was transported in 19 shipments during the reporting period. The total activity of the solid waste shipped was 35.7 Ci. The solid waste consisted of: A) Dewatered Spent Resins - 35.2 Ci, B) Dry Active Waste (DWA) - 0.5 Ci.

A. Dewatered Spent Resin

9711 ft^3 (275 m^3) of dewatered spent resin were shipped during the reporting period. The shipping casks were CNS 14-195H containers (burial volume - 195 ft^3, actual volume - 180 ft^3) from Chemical Nuclear. The total activity shipped during the reporting period was 35.2 Ci. The principle nuclides and their percentage contribution to the total activity is listed in Table 4-1. The solid wastes were shipped to the U.S. Ecology burial site in Richland, Washington using flat bed trailers.

The counting error associated with the total activity of the six nuclides (about 99.4% of the total activity shipped) is 1.26% at one standard deviation. Since the remaining nuclides represents such a small portion of the total activity shipped, their error contribution was neglected.

Other parameters considered in estimating the total error of the activity shipped included the error in measuring the absolute volume, the weight of the waste in the liners, the representativeness of the sample taken, the homogeneity of the nuclide distribution within a batch or liner and the geometry error in the gamma spectroscopy analysis. The ND6600 NBS calibration error was approximately 5%. The best estimate of the total error in the activity of spent resin shipped was assumed to be less than or equal to 20%.

B. A total of 2,341 ft^3 (66.3 m^3) of dry active waste (DAW) was shipped in 26 Container Product Corporation -B-25 steel boxes. The values for the activities shipped were determined by using dose rate-to-curie conversion factors. The conversion factors were based on a nuclide distribution taken from reactor coolant sample analyses which are representative for the time period in which the waste was generated. Short lived nuclides were eliminated based on a minimum of 1 month decay time for the DAW prior to shipment. A meaningful counting error cannot be generated for the DAW, however, the total error may be assumed to be less than or equal to 20% since DAW would be subjected to similar error contributions as the spent resins.

4.1 Scaling Factor Methodology

H-3

In accordance with the procedure outlined in the AIF report "Methodologies for Classification of Low Level Radioactive Waste from Nuclear Power Plants", the amount of H-3 in solid radwaste shipments was determined by estimating or measuring the amount of water present and multiplying by the average H-3 concentration in the coolant for the time period associated with the waste generation. Dewatered resin samples were weighed and dryed in an oven. It was found that the dewatered resin contained 38% water by weight.

C-14

The standard default value recommended in the AIF report of 1.0 E-8 mCi/g was used for the LSA radwaste shipped.

I-129

The I-129 concentration is determined by scaling to Cs-137. The Cs-137 detected and resulting values, if less than typical MDA for these nuclides, are reported as less than the typical MDA. The following scaling factors from the AIF report and MDAs (typical) were used for the waste streams indicated.

	COND	RHCU	FDR/EDR	DAW
Scaling Factors	5.0E-05	1.0E-05	5.0E-06	5.0E-06
Typical MDA	1.0E-05 uCi/g	3.0E-05 uCi/g	3.0E-05 uCi/g	3.0E-05 uCi/g

Where:

COND = Condensate Resins
RHCU = Reactor Water Cleanup Resins
FDR/EDR = Floor Drain and Equipment Drain Resins
DAW = Dry Active Waste

Tc-99

The Tc-99 concentration was determined by scaling to Cs-137. The Cs-137 MDA is used if no Cs-137 is detected and the resulting values, if less than typical MDA for these nuclides, were reported as less than the typical MDA. The following scaling factors from the AIF reported and typical were used for the waste stream indicated.

	COND	RHCU	FDR/EDR	DAW
Scaling Factors	2.0E-06	2.0E-06	1.0E-06	1.0E-06
Typical MDA	5.0E-05 uCi/g	3.0E-05 uCi/g	4.0E-06 uCi/g	3.0E-05 uCi/g

TRU, Pu-241, Cm-242, Sr-90, Ni-63

TRU, Pu-241 and Cm-242 are scaled to Ce-144 or if not present to the Cs-137 concentration or Cs-137 MDA. As recommended in the AIF report, these nuclides are not considered to be present if the scaled values are less then: 1 uCi/g for Cm-242. During the reporting period the Cs-137 MDA was used to estimate the concentrations. Based on the scaling factors the calculated concentrations of TRUs, Pu-241 and Cm-242 were below the threshold values to report and were assumed not to be present.

Sr-90 is scaled to Cs-137 and Ni-63 is scaled to Co-60. The following table contains the scaling factors used for the various waste streams.

TABLE 4-1

Scaling Factors for TRU, Pu-241, Cm-242, Sr-90 and Ni-63

Scaled Nuclide (Scaling nuclide)	COND/RWCU	FDR/EDR/DAW
TRU (Ce-144)	1.6E-2	8.0E-3
TRU (Cs-137)	4.0E-5	2.0E-5
Pu-241 (Ce-144)	0.2	0.1
Pu-241 (Cs-137)	8.0E-3	4.0E-3
Cm-242 (Ce-144)	8.0E-3	4.0E-3
Cm-242 (Cs-137)	3.0E-4	1.5E-4
Sr-90 (Cs-137)	1.8E-1	9.0E-2
Ni-63 (Co-60)	4.0E-2	2.0E-2

4.2 Process Control Program

No changes were initiated in Chem Nuclear's process Control Program during the last semi-annual reporting period.

Table 4-2
WNP-2 SOLID WASTE SHIPMENTS

July - December 1984

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, filter sludges, evaporator bottoms, etc.	m^3 Ci	2.75E+2 35.2	2.0 E+1
b. Dry active waste, contaminated equip., etc.	m^3 Ci	66.3 5.45E-1	2.0E+1
c. Irradiated components, control rods, etc.	m^3 Ci	No Shipment	
d. Other (describe)	m^3 Ci	No Shipment	

2. Estimate of major nuclide composition (by type of waste):

a. Dewatered Spent Resins

Cr-51	58.2%	20.5 Ci
Co-58	32.7%	11.5 Ci
Zn-65	4.83%	1.70 Ci
Co-60	1.83%	0.644 Ci
Fe-59	1.14%	4.03 E-1 Ci
Mn-54	0.81%	2.85 E-1 Ci

b. Dry Active Wastes (DAW)

Cr-51	71%	3.87 E-1
Co-58	24%	1.31 E-1
Zn-65	1.9%	1.04 E-2
Co-60	1.4%	7.63 E-3
Mn-54	0.57%	3.11 E-3
Fe-59	0.13%	7.09 E-4

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
19	Flat bed trailer	US Ecology Richland, WA

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None		

5.0 METEOROLOGY

The meteorological data contained in Tables 5-1 through 5-4 were obtained from the WNP-2 meteorological tower located 2500 ft. west of WNP-2. Data was recovered from 33 ft. and 245 ft. levels. The meteorological data is a composite file from both manual and automated data recovery systems.

The second half of 1984 was cooler than normal with a greater percentage of neutral and stable conditions affecting dispersion in the vicinity of WNP-2. The automated data recovery system continued to function at greater than 95% data recovery for the joint frequency parameters. A large range fire completely denuded a substantial portion (250,000 acres) of the terrain surrounding WNP-2. Several sooty, sandy and very windy periods occurred following the fire. Previously installed dust boots on the wind instruments prevented any significant bearing damage.

Tables 5-1 through 5-4 list the joint frequency distribution at the 33 ft. and 245 ft. levels for the third and fourth quarters. The tabulated stability classes, A-G, are denoted by numerals 1-7 respectively. Numerals 1-7 were used for the wind subfields as is noted at the top of each sensor level reported. The 16 compass sectors in Tables 5-1 through 5-4 pertain to the direction the wind is coming from.

Calibration performed in September 1984 produced no values exceeding WNP-2 FSAR meteorological equipment tolerances. Therefore, no correction has been made to the raw data. A cross check of Sigma Theta versus Delta Temperature was made with the Delta Temperature Stability Class being the most conservative. The NRC Delta Temperature Stability Classification scheme was utilized in the production of all joint frequency tables.

Table 5-1: JOINT FREQUENCY DISTRIBUTION FOR [illegible]
CALCULATED FROM HOURLY AVERAGES FROM [illegible]

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - [illegible] 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - [illegible]

THIRD QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	0.	2.	0.	0.	0.	1.	2.	4.	3.	2.	2.	3.	1.	3.	1.	2.
1	3	8.	8.	2.	0.	1.	5.	18.	27.	18.	7.	6.	6.	5.	4.	6.	2.
1	4	8.	5.	4.	0.	0.	0.	3.	4.	22.	7.	6.	3.	0.	4.	1.	..
1	5	0.	0.	0.	0.	0.	0.	0.	1.	4.	2.	3.	0.	1.	3.	0.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	4.	0.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	2.	1.	0.	1.	0.	0.	1.	0.	1.	0.	3.	0.	4.	2.	3.	1.
2	3	5.	3.	4.	1.	0.	1.	6.	10.	9.	7.	6.	9.	3.	4.	2.	9.
2	4	2.	2.	1.	0.	0.	1.	1.	2.	7.	6.	4.	5.	1.	2.	2.	5.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	1.	0.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
3	2	2.	0.	0.	1.	0.	2.	1.	1.	5.	2.	5.	3.	3.	3.	1.	5.
3	3	9.	8.	5.	1.	7.	10.	7.	13.	13.	12.	6.	7.	7.	6.	2.	8.
3	4	6.	2.	0.	0.	1.	4.	3.	4.	8.	7.	1.	5.	10.	2.	4.	6.
3	5	2.	0.	0.	0.	0.	0.	0.	2.	0.	0.	1.	0.	2.	3.	4.	1.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	1.	2.	2.	0.	3.	3.	4.	2.	2.	4.	2.	2.	2.	2.	1.	2.
4	3	11.	6.	5.	3.	16.	14.	16.	14.	14.	10.	4.	3.	6.	8.	11.	20.
4	4	10.	3.	1.	0.	5.	7.	5.	10.	8.	6.	4.	2.	7.	13.	4.	5.
4	5	0.	0.	0.	0.	1.	0.	3.	0.	1.	0.	0.	1.	0.	15.	2.	2.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	6.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2	10.	3.	6.	0.	3.	0.	2.	3.	2.	5.	4.	6.	5.	7.	5.	6.
5	3	5.	5.	8.	1.	7.	13.	11.	19.	14.	8.	9.	15.	14.	25.	20.	15.
5	4	3.	1.	0.	0.	1.	2.	7.	7.	9.	11.	7.	2.	9.	46.	11.	4.
5	5	0.	2.	0.	0.	1.	0.	1.	2.	0.	2.	1.	1.	3.	6.	0.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
6	2	5.	5.	5.	0.	0.	5.	7.	14.	8.	12.	5.	3.	5.	12.	5.	1.
6	3	14.	2.	5.	2.	5.	0.	14.	27.	26.	11.	6.	14.	7.	16.	24.	13.
6	4	0.	0.	1.	0.	2.	0.	3.	5.	8.	4.	0.	0.	1.	1.	2.	0.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	..	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	13.	13.	11.	6.	5.	5.	12.	11.	7.	5.	7.	4.	1.	6.	12.	11.
7	3	14.	11.	11.	1.	3.	1.	5.	32.	18.	7.	1.	..	1.	5.	10.	14.
7	4	3.	1.	5.	1.	0.	0.	1.	0.	1.	1.	0.	0.	0.	0.	1.	0.
7	5	0.	2.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 1[illegible] MISSING = 65 CALM = 0 VARIABLE = 5

Table 5-2: JOINT FREQUENCY DISTRIBUTION FOR THE 245 FT LEVEL CALCULATED FROM HOURLY AVERAGES FROM TAPE

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 25.

THIRD QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	2.	1.	0.	0.	0.	0.	0.	1.	3.	3.	1.	1.	3.	3.	2.	0.
1	3	7.	11.	4.	0.	0.	3.	16.	24.	13.	11.	10.	6.	5.	7.	7.	12.
1	4	10.	7.	5.	0.	0.	0.	0.	8.	16.	12.	2.	0.	3.	0.	1.	5.
1	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.	1.	1.	1.	3.	2.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	1.	0.	1.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	1.	0.	0.	0.	1.	0.	2.	1.	1.	2.	2.	2.	5.	1.	1.	2.
2	3	6.	6.	7.	2.	0.	3.	5.	8.	7.	7.	10.	6.	7.	1.	3.	10.
2	4	3.	2.	0.	0.	1.	0.	1.	0.	4.	11.	3.	4.	2.	2.	0.	2.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.
3	2	1.	2.	0.	2.	1.	1.	1.	4.	2.	4.	1.	3.	0.	2.	1.	2.
3	3	15.	10.	6.	1.	7.	6.	10.	12.	12.	6.	7.	3.	8.	6.	6.	6.
3	4	6.	1.	0.	0.	1.	2.	4.	5.	6.	4.	2.	3.	7.	7.	3.	2.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	2.	0.	2.	4.	3.	1.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	2.	1.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
4	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	2	0.	2.	2.	1.	0.	3.	6.	3.	4.	4.	1.	2.	5.	1.	2.	4.
4	3	17.	9.	7.	8.	15.	11.	13.	17.	10.	8.	2.	4.	5.	5.	12.	13.
4	4	13.	0.	0.	0.	1.	6.	9.	8.	9.	7.	1.	2.	4.	10.	2.	6.
4	5	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	3.	10.	13.	1.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	6.	6.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2	2.	4.	3.	2.	2.	3.	0.	4.	6.	0.	3.	1.	3.	2.	3.	5.
5	3	16.	10.	5.	2.	8.	10.	5.	10.	14.	2.	7.	7.	12.	16.	18.	11.
5	4	4.	5.	0.	0.	0.	2.	7.	7.	10.	13.	3.	1.	10.	24.	20.	6.
5	5	0.	0.	0.	0.	0.	0.	0.	1.	2.	6.	6.	1.	3.	55.	13.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	0.	3.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	2	3.	5.	3.	3.	4.	1.	2.	3.	6.	6.	5.	7.	5.	2.	4.	5.
6	3	8.	4.	2.	4.	2.	4.	7.	9.	15.	10.	10.	7.	11.	16.	17.	13.
6	4	2.	1.	2.	1.	0.	1.	6.	6.	12.	8.	4.	3.	8.	11.	33.	7.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	2.	5.	0.	0.	3.	3.	1.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	2	8.	6.	4.	7.	1.	2.	5.	5.	8.	6.	2.	2.	2.	5.	5.	9.
7	3	11.	9.	21.	6.	3.	2.	8.	19.	16.	10.	5.	1.	3.	2.	12.	19.
7	4	0.	2.	2.	1.	0.	0.	2.	4.	7.	5.	1.	2.	2.	7.	17.	12.
7	5	0.	0.	3.	0.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 1967 MISSING = 65 CALM = 1 VARIABLE = 55

Table 5-3: JOINT FREQUENCY DISTRIBUTION FOR THE 33 FT LEVEL CALCULATED FROM HOURLY AVERAGED DATA

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.6 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18.0 6 - 25.0

FOURTH QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND CAT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	2	0.	1.	0.	0.	0.	1.	0.	0.	1.	0.	0.	1.	0.	1.	2.	1.
1	3	0.	2.	0.	0.	0.	0.	0.	0.	2.	1.	0.	0.	0.	0.	0.	1.
1	4	0.	0.	0.	0.	0.	0.	0.	1.	2.	3.	2.	1.	0.	0.	0.	0.
1	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	1.	0.	0.	0.	0.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	2.	2.	1.	0.	1.	1.	0.	5.	1.	2.	1.	1.	0.	2.	3.	3.
2	3	2.	1.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
2	4	0.	0.	0.	0.	0.	0.	0.	0.	2.	5.	1.	2.	0.	0.	0.	0.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2	3.	3.	0.	0.	2.	1.	2.	5.	4.	4.	1.	2.	2.	4.	6.	4.
3	3	8.	4.	2.	0.	0.	0.	0.	3.	1.	1.	1.	0.	2.	1.	3.	5.
3	4	7.	0.	0.	0.	0.	0.	0.	1.	0.	4.	3.	1.	0.	0.	1.	1.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	1.	3.	2.	1.	0.	0.	0.	0.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	1	1.	0.	0.	0.	0.	1.	0.	0.	0.	1.	0.	1.	0.	1.	0.	0.
4	2	20.	16.	7.	5.	1.	9.	7.	6.	8.	13.	10.	11.	6.	20.	23.	20.
4	3	18.	20.	22.	2.	0.	2.	6.	29.	24.	8.	7.	1.	1.	11.	40.	39.
4	4	6.	3.	0.	0.	0.	0.	4.	12.	12.	14.	8.	4.	2.	5.	12.	18.
4	5	0.	0.	0.	0.	0.	0.	0.	1.	2.	10.	6.	0.	0.	0.	1.	0.
4	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	3.	0.	0.	0.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	1.	0.	0.	1.	0.	2.	0.	2.	0.	1.
5	2	12.	7.	5.	4.	2.	6.	11.	10.	24.	20.	11.	20.	15.	21.	19.	15.
5	3	11.	9.	9.	3.	1.	3.	14.	30.	44.	19.	13.	11.	4.	25.	32.	25.
5	4	1.	0.	0.	1.	0.	0.	1.	16.	24.	28.	16.	2.	3.	12.	4.	1.
5	5	0.	0.	0.	0.	0.	0.	1.	3.	4.	18.	4.	1.	2.	1.	0.	0.
5	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	1	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
6	2	14.	9.	4.	2.	0.	4.	4.	8.	10.	5.	11.	7.	9.	14.	21.	20.
6	3	7.	10.	16.	1.	0.	2.	5.	26.	25.	7.	6.	5.	5.	7.	28.	13.
6	4	0.	0.	0.	0.	0.	0.	0.	3.	5.	10.	3.	2.	2.	5.	1.	0.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.	0.
6	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	1	0.	0.	0.	0.	0.	0.	1.	0.	1.	0.	0.	1.	0.	0.	0.	0.
7	2	12.	10.	7.	7.	2.	3.	8.	4.	5.	7.	3.	2.	1.	7.	9.	16.
7	3	2.	3.	6.	4.	0.	0.	1.	10.	9.	4.	3.	2.	1.	3.	17.	16.
7	4	0.	0.	1.	0.	0.	0.	0.	0.	2.	1.	0.	0.	4.	3.	0.	1.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS
USED = 1864 MISSING = 42 CALM = 2 VARIABLE = 32

Table 5-4: JOINT FREQUENCY DISTRIBUTION FOR THE 245 FT LEVEL
CALCULATED FROM HOURLY AVERAGES FROM 1ST

MAXIMUM WIND SPEEDS FOR EACH CATEGORY IN MPH ARE:
1 - 0.0 2 - 3.0 3 - 7.0 4 - 12.0 5 - 18. 6 - 24.0

FOURTH QUARTER 1984

NUMBERS GIVEN ARE HOURS

STAB CLASS	WIND UNIT	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0	0.	0.	0.	0.
1	2	2.	1.	1.	1.	0.	0.	1.	1.	0.	1.	0.	0.	1.	1.	1.	1.
1	3	1.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
1	5	0.	0.	0.	0.	0.	0.	0.	1.	0.	2.	3.	0.	0.	0.	0.	0.
1	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
1	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	2	2.	1.	1.	0.	1.	1.	0.	1.	2.	4.	0.	1.	0.	1.	1.	4.
2	3	3.	0.	0.	1.	0.	0.	1.	2.	0.	0.	0.	0.	0.	1.	2.	0.
2	4	0.	0.	0.	0.	0.	0.	0.	0.	1.	5.	1.	1.	0.	0.	0.	0.
2	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	1.	0.	0.	0.	0.
2	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.
2	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2	1.	1.	0.	1.	2.	1.	3.	6.	2.	2.	1.	4.	0.	1.	3.	6.
3	3	3.	2.	3.	1.	1.	0.	0.	2.	1.	2.	1.	0.	0.	1.	3.	1.
3	4	3.	2.	0.	0.	0.	0.	0.	2.	0.	2.	2.	1.	0.	0.	2.	3.
3	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.	3.	1.	0.	0.	0.	0.
3	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
3	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
4	2	14.	12.	5.	1.	3.	5.	5.	3.	13.	17.	8.	6.	8.	14.	19.	23.
4	3	15.	15.	16.	3.	2.	2.	7.	26.	26.	11.	2.	2.	1.	17.	36.	22.
4	4	10.	1.	6.	1.	0.	1.	0.	13.	10.	12.	4.	1	2.	8.	20.	23.
4	5	0.	4.	0.	0.	0.	0.	1.	3.	7.	9.	6.	3.	1.	3.	6.	2.
4	6	0.	0.	0.	0.	0.	1.	0.	0.	0.	2.	7.	0.	0.	0.	0.	0.
4	7	0.	0.	0.	0.	0.	0.	0.	1.	0.	3.	4.	1.	0.	0.	0.	0.
5	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
5	2	19.	9.	6.	5.	5.	3.	3.	12.	7.	12.	9.	9.	3.	8.	5.	11.
5	3	9.	15.	8.	4.	2.	3.	13.	27.	23.	10.	7.	9.	11.	21.	30.	17.
5	4	3.	6.	1.	1.	1.	1.	4.	19.	20.	13.	10.	4.	3.	12.	23.	11.
5	5	1.	0.	0.	0.	1.	0.	0.	7.	13.	26.	21.	5.	1.	9.	5.	1.
5	6	0.	1.	0.	0.	0.	0.	0.	1.	2.	4.	4.	1.	3.	0.	1.	0.
5	7	0.	0.	0.	0.	0.	0.	0.	1.	4.	23.	2.	1.	0.	0.	0.	0.
6	1	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	2	5.	6.	4.	1.	1.	7.	3.	2.	2.	6.	11.	5.	5.	5.	8.	8.
6	3	20.	16.	12.	5.	2.	1.	5.	18.	12.	5.	4.	2.	3.	8.	15.	19.
6	4	0.	0.	4.	0.	1.	0.	1.	10.	12.	7.	4.	1.	4.	8.	18.	7.
6	5	0.	0.	0.	0.	0.	0.	0.	0.	2.	11.	6.	2.	5.	3.	2.	0.
6	6	1.	0.	0.	0.	0.	0.	0.	1.	0.	1.	4.	1.	0.	0.	0.	0.
6	7	0.	0.	0.	0.	0.	0.	0.	0.	2.	5.	0.	0.	0.	0	0.	0.
7	1	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
7	2	2.	2.	2.	7.	4.	2.	6.	1.	10.	5.	2.	2.	3.	2.	5.	0.
7	3	11.	7.	3.	7.	2.	2.	4.	13.	0.	4.	1.	5.	0.	2.	3.	12.
7	4	0.	1.	2.	1.	0.	0.	0.	5.	2.	5.	5.	1.	1.	6.	16.	8.
7	5	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	1.	0.	1.	2.	0.	0.
7	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NUMBER OF HOURS = [illegible]
USE = 1866 MISSING = [illegible] CALM = 7 VARIABLE = 11

6.0 DOSE ASSESSMENT - IMPACT ON MAN

Liquid Effluents - The doses to the maximum individual from WNP-2 liquid effluents were calculated using the NRC LADTAP computer code and the site specific input parameters applicable to the reporting period (e.g., food production, agricultural productivity, etc.) The maximum exposed individual considered in the analysis was assumed to be an adult residing in Richland, who fishes at the WNP-2 slough area and eats food locally grown at the Riverview area district southwest of Pasco, Washington.

Table 6-1 lists the doses to the maximum individual during the third and the fourth quarters respectively. The liquid source terms used in the analyses are listed in Table 2-2 of this report.

The doses to the average exposed individual are listed in Table 6-2. The 50-mile population doses are listed in Table 6-3. All data was obtained from calculations using the LADTAP computer code.

Gaseous Effluents - The NRC GASPAR computer code was used to calculate the doses at 1.2 mile site boundary and Taylor Flats location at 4.2 miles southeast. The sector with the highest X/Q values at the 1.2 mile location was used to verify compliance with Technical Specifications. The quarterly GASPAR runs utilized the updated annual averaged X/Q and D/Q values, site specific input parameters pertaining to food productions (e.g., goat and cow grazing periods, etc.) Since no residential area and crops are present at the site boundary, the exposure pathways considered for the 1.2 mile site boundary were plume submersion, ground and inhalation, with the child age group being the maximum exposed individual.

The air doses at 1.2 miles were used to verify compliance with Technical Specifications. To verify compliance with 10CFR50, Appendix I limits the doses at Taylor Flats, were used with the infant age group being the maximum exposed individual. Taylor Flats is the nearest residential location with a significant home garden food production. (4.2 miles SE) Table 6-4 lists the doses at the two special locations.

6.1 EXPOSURE TO THE PUBLIC WITHIN 1.2 MILE EXCLUSION AREA

Within the WNP-2 exclusion area there are five special locations where the dose from gaseous effluents are routinely calculated. These areas are unique in that access is not completely controlled to them by WNP-2 personnel. These areas are:

1. Wye burial site - normally controlled by DOE
2. The DOE train has tracks through the area
3. The BPA Ashe Substation
4. The WNP-2 Visitor Center
5. WNP-2 Parking Lot
6. WNP-1/4 parking lot and construction site

The WNP-2 Visitor Center and the WNP-2 parking lot were assumed to be the location with the highest potential for exposure to a member of the public due to there close proximity to the plant. Although the workers at the BPA Ashe Substation have a higher assumed occupancy, 2000 hours/year versus 8 hours/year for the Visitor Center, they are not considered members of the public as defined in the Technical Specifications because they are "occupationally associated with the plant".

The ODCM assumes an eight (8) hour/year occupancy by a non-Supply System individual at the Visitor Center. In calculating the doses from the gaseous effluents the GASPAR computer program used X/Q and D/Q values at a distance of 0.5 miles from the plant in the analysis.

This resulted in a calculated whole body dose committment from the noble gases for the third and fourth quarters of 1.3 E-06 mrem and 8.3 E-05 mrem respectively at the WNP-2 Visitor Center. The maximum organ dose commitment from noble gases was: 3.5 E-06 mrem for the third quarter and 1.1 E-04 mrem for the fourth quarter.

The whole body dose commitment from iodines and particulates was 4.5 E-07 mrem and 5.3 E-05 mrem for the third and fourth quarters respectively. The maximum organ dose commitment from the iodines and particulates for the third and fourth quarter were 2.0 E-06 mrem and 6.3 E-05 mrem respectively.

During the last six months of 1984 direct radiation levels, above background, were detected just outside of WNP-2 Primary Access Point. During the initial review daily surveys were conducted when the reactor was operating and an average dose rate of 250 micro R/hr due to turbine skyshine was detected at the WNP-2 parking lot. The maximum exposure to an individual of the public is the local Transit System bus driver who spends 10-15 minutes per day in the parking lot. Assuming a 6 minute a day, 5 days a week and 50 weeks per year occupancy results in a total of 25.0 hours per year. The calculated whole body dose of that person is 6.3E+0 mrem/yr well below the 25 mrem/yr as specified in Tech. Spec 3.11.4 and 40CFR190.

The direct radiation levels will continue to be monitored routinely. Near the end of 1984 radiation levels were trending downward. Investigations will continue to correlate plant parameters to the direct radiation levels from N-16 near the plant. These efforts are expected to continue into 1985.

Table 6-1

MAXIMUM INDIVIDUAL DOSES FROM WNP-2 LIQUID EFFLUENTS(1)

Third Quarter 1984				
Pathway	Whole Body (mrem/yr)	1984 Cumulative Whole Body (mrem/yr)	Max. Organ. (mrem/yr)	1984 Cumulative Max. Organ. (mrem/yr)
Drinking	4.7E-06	1.1E-05	7.3E-05	9.4E-05
Shoreline	3.9E-07	9.1E-07	4.6E-07	1.0E-06
Fishing	6.8E-03	1.5E-02	9.5E-03	2.3E-02
Swimming	1.2E-09	1.2E-09	1.0E-09	1.2E-09
Boating	2.4E-09	3.6E-09	2.4E-09	3.4E-09
Leafy Veg.	3.5E-06	6.3E-06	1.3E-05	2.3E-05
Vegetables	4.4E-05	5.7E-05	1.6E-04	2.1E-04
Milk	9.7E-05	1.4E-04	2.0E-04	3.1E-04
Meat	1.2E-06	1.4E-06	2.9E-06	5.7E-04
Total	7.0E-03	1.5E-02	9.9E-03	2.4E-02

Fourth Quarter 1984				
Pathway	Whole Body (mrem/yr)	1984 Cumulative Whole Body (mrem/yr)	Max. Organ. (mrem/yr)	1984 Cumulative Max. Organ. (mrem/yr)
Drinking	9.5E-06	2.1E-05	9.4E-04	1.0E-04
Shoreline	9.1E-06	1.0E-05	5.0E-07	1.5E-06
Fishing	5.4E-03	2.0E-02	3.8E-02	6.1E-02
Swimming	0.0	1.2E-09	0.0	1.2E-09
Boating	2.1E-09	5.7E-09	2.1E-09	5.5E-09
Leafy Veg.	2.0E-06	8.3E-06	7.0E-06	9.3E-06
Vegetables	9.7E-06	6.7E-05	3.4E-05	2.4E-04
Milk	6.2E-05	2.2E-04	1.2E-04	3.2E-04
Meat	1.7E-07	1.6E-06	4.3E-07	5.7E-04
Total	5.5E-03	2.0E-02	3.9E-02	6.2E-02

(1) Age Group - Adult: Maximum individual resides at Richland and fishes at the WNP-2 slough area.

Table 6-2

AVERAGE INDIVIDUAL DOSES FROM WNP-2 LIQUID EFFLUENTS(1)

3RD AND 4TH QUARTERS

	Total per 3rd Quarter		Total per 4th Quarter	
Pathway	Max. Organ. (mrem)	Whole Body (mrem)	Max. Organ. (mrem)	Whole Body (mrem)
Drinking Water	1.2E-05	3.3E-06	8.9E-06	2.7E-06
Shoreline	1.4E-07	1.8E-07	1.7E-08	1.4E-08
Fishing	6.8E-03	5.2E-03	4.5E-03	3.2E-03
Swimming	3.9E-11	3.9E-11	0.0	0.0
Boating	1.0E-09	1.0E-09	1.3E-10	1.3E-10
Vegetables	2.7E-06	4.4E-05	3.4E-05	9.7E-06
Leafy vegetables	5.4E-07	3.5E-06	7.0E-06	2.0E-06
Milk	2.0E-04	9.8E-05	1.2E-04	6.2E-05
Meat	3.0E-06	1.3E-03	4.3E-07	1.7E-07
Total	7.0E-03	5.4E-03	4.7E-03	3.3E-03

(1) Age group - Adult. Average individual residing at Richland.

Table 6-3

50-MILE POPULATION DOSES FROM WNP-2 LIQUID EFFLUENTS

3RD AND 4TH QUARTERS 1984

Month	Total per 3rd Quarter		Total per 4th Quarter	
Pathway	Max. Organ. (man-rem)	Whole Body (man-rem)	Max. Organ. (man-rem)	Whole Body (man-rem)
Drinking Water	6.2E-04	1.8E-04	5.9E-04	1.7E-04
Shoreline	5.0E-06	4.3E-06	5.5E-06	4.7E-06
Fishing	1.6E-05	1.0E-05	1.5E-05	9.2E-06
Swimming	1.3E-08	1.3E-08	0.0	0.0
Boating	1.7E-08	1.7E-08	2.1E-08	2.1E-08
Vegetables	5.6E-03	1.6E-03	1.3E-03	3.4E-04
Leafy vegetables	2.1E-03	1.4E-03	6.3E-04	3.0E-04
Milk	1.9E-05	8.6E-06	1.1E-05	5.6E-06
Meat	1.7E-05	7.0E-06	2.2E-06	9.7E-07
Total	8.4E-03	3.3E-03	2.6E-03	8.3E-04

Table 6-4

SEMI-ANNUAL SUMMARY OF DOSES FROM WNP-2 GASEOUS EFFLUENTS

Location: 1.2 miles site boundary

Reporting Period: Third and Fourth Quarter, 1984

Age Group: Child

	Third Quarter	Fourth Quarter	Cumulative	Balance to Year-End
Beta air dose (mrad)	5.0E-02	2.6E-01	3.6E-01	1.96E+01
Gamma air dose (mrad)	9.0E-02	1.3E+0	1.5E+0	8.49E+0
Whole body dose from Noble gases (mrem)*	6.0E-02	8.6E-01	9.5E-01	4.99E+02
Maximum organ dose from Noble gases (mrem)*	1.1E-01	1.2E+0	1.5E+0	2.99E+03
Whole body dose from Iodines and particulates (mrem)**	1.3E-02	4.8E-01	6.4E-01	1.49E+03
Maximum organ dose from Iodines and particulates (mrem)**	6.3E-02	6.9E-01	9.9E-01	1.49E+03

Location: Taylor Flats, 4.2 miles SE

Reporting Period: Third and Fourth Quarters, 1984

Age Group: Infant

	Third Quarter	Fourth Quarter	Cumulative	Balance to Year-End
Whole body dose (mrem)***	5.2E-04	2.5E-02	5.7E-02	1.49E+01
Maximum organ dose (mrem)***	1.6E-02	6.5E-02	2.0E-01	1.48E+01
50 mile population whole body dose (man-rem)	4.9E-03	6.9E-01		
50 mile maximum organ dose (man-rem)	4.1E-02	1.1E+0		

* Plume submersion exposure pathway.
** Inhalation and ground contamination exposure pathways.
*** Ground, goat milk, and inhalation exposure pathways.

7.0 REVISIONS TO THE ODCM

During the semi-annual reporting period, three revisions were made to the Offsite Dose Calculation Manual (ODCM). These changes were approved in POC meeting held on January 23, 1985. A description of each change is included below and the effected pages are attached.

SCN-84-176

This revision expands Table 3-4, and Tables 3-5a through 3-5d to include Mo-99, Ce-141 and Ce-144. The original radionuclides list was based on the design basis mixture (i.e., NRC Gale Gaseous Computer Code). The additional radionuclides reported here have been detected in the reactor water.

SCN-84-171

The method to determine the setpoints for three liquid process monitors was slightly altered. The process radiation monitors were for the Stand-by Service Water System, the Turbine Building Service Water System and the Non-Radioactive Turbine Sump Water. The previous methodology specified the setpoint be set at 4.66 times background or 80% of an MPC. The 4.66 times background factor was causing unnecessary and spurious alarms. On the Turbine Building sump monitor the background was continually altering with the raising and lowering of the sump water level. On the service water radiation monitors the background was so low the setpoints were alarming due to normal instrument fluctuation. To prevent this the ODCM now states "the alarm setpoints shall be established at 80% or less of the maximum setpoint plus background" with the maximum being 1 MPC using 10CFR20 concentrations.

SCN-84-198

This SCN added a fifth milk sample location based on the results of the land use census. Offsite dose calculation identified a location with a potential for a greater dose due to its closer location.

The attached pages contain the revisions to the OCDM as it was approved by the Plant Operation Committee (POC).

8.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

No Radiological Effluent Monitoring Program locations were changed other than identified in SCN-84-198 during the first six months.

Table 3-4

DOSE RATE PARAMETERS
IMPLEMENTATION OF 10 CFR 20, AIRBORNE RELEASES

Nuclide	λ sec^{-1}	Child Dose Factor* DFA_i mrem/pCi	Child Dose Factor* DFG_i mrem/hr / pCi/m^2	P_i^I Inhalation mrem/yr / µCi/m^3
H-3	1.8E-09	3.0E-07	0.0	1.1E+03
I-131	1.0E-06	4.4E-03	3.4E-09	1.6E+07
I-133	9.2E-06	1.0E-03	4.5E-09	3.7E+06
Cr-51	2.9E-07	4.6E-06	2.6E-10	1.7E+04
Mn-54	2.6E-[illegible]	4.3E-04	6.8E-09	1.6E+06
Fe-55	8.5E-09	3.0E-05	0.0	1.1E+05
Fe-59	1.8E-07	3.4E-04	9.4E-09	1.3E+06
Co-58	1.1E-07	[illegible]E-04	8.2E-09	1.1E+06
Co-60	4.2E-09	1.[illegible]E-03	2.0E-08	7.0E+06
Zn-65	3.3E-08	2.7E-[illegible]	4.6E-09	1.0E+06
Sr-89	1.5E-07	5.8E-04	6.5E-13	2.2E+06
Sr-90	7.9E-10	2.7E-02	2.6E-12**	1.0E+08
Zr-95	1.2E-07	6.3E-04	5.8E-09	2.3E+06
Mo-99	2.9E-06	3.7E-05	2.2E-09	1.4E+05
Cs-134	1.1E-08	2.7E-04	1.4E-08	1.0E+06
Cs-137	7.3E-010	2.5E-04	4.9E-09	9.3E+05
Ba-140	6.3E-07	4.7E-04	2.4E-09	1.7E+06
Ce-141	2.4E-07	1.5E-04	6.2E-10	5.4E+05
Ce-144	2.8E-08	3.2E-03	2.5E-09	1.2E+07

* Maximum Organ
**No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 valves were used for dose conversion factor Sr-90.

Table 3-5a

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Infant

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per $\mu Ci/m^3$)	Ground R_i^G m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Cow) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)	Milk (Goat) R_i^C m^2 x mrem/yr (per $\mu Ci/sec$)
H-3	1.8E-9	6.5E+2	0.0	3.4E+3	7.0E+3
I-131	1.0E-6	1.5E+7	1.0E+7	[illegible]E+11	4.3E+11
I-133	9.2E-6	3.6E+6	1.5E+6	[illegible]E+9	4.0E+9
Cr-51	2.9E-7	1.3E+4	5.5E+6	2.0E+6	3.5E+5
Fe-55	8.5E-9	8.7E+4	0.0	7.0E+7	7.1E+6
Fe-59	1.8E-7	1.0E+6	3.[illegible]E+8	1.7E+8	3.2E+7
Mn-54	2.6E-8	9.9E+5	[illegible].E+9	2.0E+7	2.9E+6
Co-58	1.1E-7	7.8E+5	4.4E+8	2.8E+7	4.5E+6
Co-60	4.2E-9	4.5E+6	2.5E+10	1.1E+8	1.4E+7
Sr-89	1.5E-7	2.0[illegible]	2.5E+4	5.6E+9	1.6E+10
Sr-90	7.9E-10	[illegible]	8.9E+6*	7.1E+10	1.7E+11
Mo-99	2.9E-6	1.3E+5	4.7E+6	1.6E+8	2.4E+8
Cs-134	1.1E-8	7.0E+5	8.0E+9	3.6E+10	1.3E+11
Cs-136	5.9E-7	5.6E+4	1.7E+8	2.6E+9	1.2E+10
Cs-137	7.3E-10	6.1E+5	1.2E+10	3.4E+10	1.2E+11
Ba-140	6.3E-7	1.6E+6	2.3E+7	1.1E+8	1.9E+7
Ce-141	2.4E-7	5.2E+5	1.5E+7	3.6E+7	6.2E+6
Ce-144	2.8E-8	9.8E+6	8.0E+7	1.1E+8	6.0E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-5b

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Child

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per pCi/m^3)	Ground R_i^G m^2 x mrem/yr (per pCi/sec)	Milk (Cow) R_i^C m^2 x mrem/yr (per pCi/sec)	Milk (Goat) R_i^C m^2 x mrem/yr (per pCi/sec)	Vegetables R_i^V m^2 x mrem/yr (per pCi/sec)	Meat R_i^M m^2 x mrem/yr (per pCi/sec)
H-3	1.8E-9	1.1E+3	0.0	2.3E+3	4.6E+3	5.6E+3	3.4E+2
I-131	1.0E-6	1.6E+7	1.0E+7	9.9E+10	1.[illegible]	1.1E+10	1.3E+9
I-133	9.2E-6	3.8E+6	1.5E+6	9.2E+8	[illegible]	1.7E+8	3.0E+1
Cr-51	2.9E-7	1.7E+4	5.5E+6	2.3E+6	[illegible]1E+5	5.3E+6	2.0E+5
Fe-55	8.5E-9	1.1E+5	0.0	5.6E+7	9.1E+6	3.9E+8	2.4E+8
Fe-59	1.8E-7	1.3E+6	3.2E+8	9.0[illegible]	1.6E+7	6.0E+8	2.8E+8
Mn-54	2.6E-8	1.6E+6	1.6E+9	[illegible]	1.6E+6	6.3E+8	4.1E+6
Co-58	1.1E-7	1.1E+6	4.4E+8	3.2E+7	5.2E+6	3.4E+8	4.4E+7
Co-60	4.2E-9	7.1E+6	2.5E+10	1.3E+8	1.8E+7	2.0E+9	2.1E+8
Sr-89	1.5E-7	2.2E+6	2.5E+4	3.0E+9	8.6E+9	3.3E+10	2.2E+8
Sr-90	7.9E-10	1.0E+8	8.9E[illegible]	6.5E+10	1.6E+11	1.3E+12	6.1E+9
Mo-99	2.9E-6	1.4E+5	4.7E+6	8.8E+7	1.3E+8	7.0E+6	1.3E+5
Cs-134	1.1E-8	1.0E+6	8.0E+9	2.0E+10	7.0E+10	2.5E+10	7.9E+8
Cs-136	5.9E-7	1.7E+5	1.7E+8	1.2E+9	5.6E+9	1.5E+8	2.0E+7
Cs-137	7.3E-10	9.1E+5	1.2E+10	1.8E+10	6.4E+10	2.4E+10	7.5E+8
Ba-140	6.3E-7	1.7E+6	2.3E+7	5.2E+7	9.4E+6	1.8E+8	2.0E+7
Ce-141	2.4E-7	5.4E+5	1.6E+7	3.6E+7	6.2E+6	3.6E+8	6.0E+6
Ce-144	2.8E-8	1.2E+7	8.0E+7	4.0E+8	5.9E+7	9.5E+9	9.5E+7

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Teen

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per pCi/m³)	Ground R_i^G m² x mrem/yr (per pCi/sec)	Milk (Cow) R_i^C m² x mrem/yr (per pCi/sec)	Milk (Goat) R_i^C m² x mrem/yr (per pCi/sec)	Vegetables R_i^V m² x mrem/yr (per pCi/sec)	Meat R_i^M m² x mrem/yr (per pCi/sec)
H-3	1.8E-9	1.3E+3	0.0	1.4E+3	2.9E+3	3.5E+3	2.8E+2
I-131	1.0E-6	1.5E+7	1.0E+7	5.1E+10	9.1E+10	7.0E+9	8.4E+8
I-133	9.2E-6	2.9E+6	1.5E+6	3.9E+8	7.0E+8	9.4E+7	1.7E+1
Cr-51	2.9E-7	2.1E+4	5.5E+6	3.6E+6	6.4E+5	8.5E+6	4.1E+5
Fe-55	8.5E-9	1.2E+5	0.0	1.6E+7	3.6E+6	3.0E+8	8.8E+7
Fe-59	1.8E-7	1.5E+6	3.2E+8	1.3E+	2.3E+7	8.7E+8	5.2E+8
Mn-54	2.6E-8	2.0E+6	1.6E+9	1.5E	2.2E+6	8.7E+8	7.4E+6
Co-58	1.1E-7	1.3E+6	4.4E+8	5.0E+7	6.1E+6	5.4E+8	8.9E+7
Co-60	4.2E-9	8.7E+6	2.5E+10	2.0E+8	2.8E+7	3.1E+9	4.1E+8
Sr-89	1.5E-7	2.4E+6	2.5E	1.2E+9	3.5E+9	1.3E+10	1.1E+8
Sr-90	7.9E-10	1.1E+8	8	3.8E+10	9.4E+10	7.9E+11	4.7E+9
Mo-99	2.9E-6	2.7E+5	E+6	5.2E+7	7.8E+7	5.5E+6	1.0E+5
Cs-134	1.1E-8	5.5E+5	8.0E+9	1.2E+10	4.4E+10	1.5E+10	6.5E+8
Cs-136	5.9E-7	1.9E+5	1.7E+8	7.9E+8	3.5E+9	1.0E+10	1.6E+7
Cs-137	7.3E-10	8.5E+5	1.2E+10	1.0E+10	3.5E+10	1.3E+10	5.4E+8
Ba-140	6.3E-7	2.0E+6	2.3E+7	3.3E+7	6.0E+6	1.2E+8	1.6E+7
Ce-141	2.4E-7	6.1E+5	1.6E+7	4.4E+7	7.7E+6	4.6E+8	9.8E+6
Ce-144	2.8E-8	1.3E+7	8.0E+7	5.0E+8	7.4E+7	1.2E+10	1.6E+8

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

Table 3-5d

DOSE RATE PARAMETERS--IMPLEMENTATION OF 10 CFR 50, AIRBORNE RELEASES

Age Group: Adult

Nuclide	λ sec^{-1}	Dose Parameters (Maximum Organ) Inhalation R_i^I mrem/yr (per (μCi/m^3))	Ground R_i^G m^2 x mrem/yr (per μCi/sec)	Milk (Cow) R_i^C m^2 x mrem/yr (per μCi/sec)	Milk (Goat) R_i^C m^2 x mrem/yr (per μCi/sec)	Vegetables R_i^V m^2 x mrem/yr (per μCi/sec)	Meat R_i^M m^2 x mrem/yr (per μCi/sec)
H-3	1.8E-9	1.3E+3	0.0	1.1E+3	2.2E+3	3.0E+3	4.7E+2
I-131	1.0E-6	1.2E+7	1.0E+7	3.2E+10	5.7E+10	8.2E+9	1.2E+9
I-133	9.2E-6	2.2E+6	1.5E+6	2.3E+8	4.1E+8	1.1E+8	2.2E+1
Cr-51	2.9E-7	1.4E+4	5.5E+6	3.1E+6	5.5E+6	8.7E+6	7.7E+5
Fe-55	8.5E-9	7.2E+4	0.0	1.3E+7	2.3E+6	1.8E+8	1.5E+8
Fe-59	1.6E-7	1.0E+6	3.2E+8	1.0E+8	1.9E+7	8.0E+8	9.2E+8
Mn-54	2.6E-8	1.4E+6	1.6E+9	1.3E+8	1.9E+6	8.5E+8	1.4E+7
Co-58	1.1E-7	9.3E+5	4.4E+8	4.4E+8	7.1E+6	5.3E+8	1.7E+8
Co-60	4.2E-9	6.0E+6	2.5E+10	1.7E+8	2.4E+7	2.9E+9	7.6E+8
Sr-89	1.5E-7	1.4E+6	2.5E+4	6.5E+8	1.9E+9	8.2E+9	1.3E+8
Sr-90	7.9E-10	9.9E+7	8.9E+6	2.7E+10	6.7E+10	6.2E+11	7.2E+9
Mo-99	2.9E-6	2.5E+5	4.7E+6	2.9E+7	4.4E+7	6.0E+6	1.2E+5
Cs-134	1.1E-8	8.5E+5	8.0E+9	7.0E+9	2.5E+10	9.9E+9	8.2E+8
Cs-136	5.9E-7	1.5E+5	1.7E+8	4.6E+8	2.1E+9	9.0E+7	2.1E+7
Cs-137	7.3E-10	6.2E+5	1.2E+10	5.6E+9	1.5E+10	8.3E+9	6.7E+8
Ba-140	6.3E-7	1.3E+6	2.3E+7	2.5E+7	4.4E+6	1.4E+8	2.6E+7
Ce-141	2.4E-7	3.6E+5	1.5E+7	3.3E+7	5.7E+6	4.0E+8	1.6E+7
Ce-144	2.8E-8	8.6E+7	8.0E+7	3.7E+8	5.4E+7	1.0E+10	2.5E+8

*No data is listed for Sr-90 in Table E-6 of Regulatory Guide 1.109. Y-90 values were used for the dose conversion factor for Sr-90.

yields:

$$K_d = A_T \sum \frac{f_i}{MPC_i e^{-\lambda t}}$$

or

$$A_T = K_d \sum \frac{f_i}{MPC_i e^{-\lambda t}} \qquad (24)$$

2.9 Liquid Process Monitors and Alarm Setpoints Calculations

As mentioned in Section 2.2 of this manual, all liquid radwaste effluent is discharged through a four-inch line that is monitored by an off-line sodium iodide radiation monitor. This monitor is located on the 437' level of the Radwaste Building. All WNP-2 radwaste liquid effluent is discharged to the Columbia River through the 36-inch Cooling Water Blowdown line. In addition to the liquid effluent discharge monitor there are three liquid streams that are normally non-radioactive but have a finite possibility of having radioactive material injected into them. These liquid streams are:

- Standby Service Water (SH)
- Turbine Building Service Water (TSH)
- Turbine Building Sump Water (FD)

To prevent any discharges of radioactive liquid from these streams, radiation monitoring systems have been installed to detect any increase above the normal background concentration of radioactive material.

Alarm/setpoints are established to prevent any release of radioactive material in concentrations greater than 10CFR20 limits. The maximum radiation detector setpoint calculation for the three systems is based on the MPC_f concentration of Cs-137 which is 2.0E-05 microCi/ml. The following equation is used to calculate the maximum setpoint:

$$\text{Setpoint max. (in cpm or cps)} = \left[(2.0E\text{-}05\ \mu Ci/ml)\ (CF)\right] \qquad (25)$$

where:

2.0E-05 μCi/ml = MPC limit for Cs-137

CF = Monitor calibration factor - in cpm/ μCi/ml or cps/ μCi/ml

2.9.1 Standby Service Water (SW) Monitor - The Standby Service Water Monitors (SW) are located on the 522' level of the Reactor Building.

The meter is located in the main control room on panel P-604.

The flow rate through the monitor is variable, from zero (0) to two (2) gpm with a normal flow of 1.0-1.5 gpm.

To ensure 10CFR20 limits are never exceeded, the alarm setpoint shall be established at 80% or less of the maximum setpoint plus background.

If the setpoint is exceeded, an alarm will activate in the main control room. The control room operator can then terminate the discharge and mitigate any uncontrolled release of radioactive material.

2.9.2 Turbine Building Service Water (TSW) Monitor - This monitor is located on the 441' level of the Turbine Building. The readout meter and recorder is located in the main control panel BD-RAD-24.

The flow rate through that monitor is variable, from zero (0) to six (6) gpm with a normal flow of 3-4 gpm.

To ensure 10CFR20 limits are never exceeded, the alarm setpoint shall be established at 80% or less of the maximum setpoint plus background.

If the setpoint is exceeded, an alarm will activate in the main control room. The control room operator can then terminate the discharge and mitigate any uncontrolled release of radioactive material.

2.9.3 Turbine Building Sumps Water (TD) Monitor - There are three detectors to measure the activity of each of the three non-radioactive sumps. The monitors are located on the 441' level of the Turbine Building. The readout meters and recorder are located in the Radwaste Control Room Panel BD-RAD-41.

The Turbine Building Sump Water Effluents are not released to the Columbia River. This effluent is discharged to the Storm Drain System which is an open pond by the WNP-2 Warehouse.

The hydrological analysis performed for the WNP-2 FSAR (Section 2.4) determined that the transmit time through the ground water from WNP-2 to the WNP-1 well is 67 years for strontium and 660 years for cesium.

In the event the setpoint is exceeded, the sump water will be automatically routed to the radioactive waste system.

To prevent the sum of the sump water discharged from the three pumps from exceeding 10CFR20 limits, the alarm/setpoint will be established at 80% or less of the maximum setpoint plus background.

TABLE 5-1 (cont'd.)

Sample Type[12]	Sample Location Code[1]	Sampling and Collection Frequency[1]	Type and Frequency of Analysis[1]
WATERBORNE (contd.)			
c. Sediment from shoreline (1/2)	33 and 34	Semiannually	Gamma isotopic[3]
4. INGESTION			
a. Milk[7] (4/5)	9, 35, 36, 40, and 60	Semimonthly during grazing season, monthly at other times	Gamma isotopic[3] Iodine-131
b. Fish[8] (2/2)	30, 38, or 39	Semiannually	Gamma isotopic[3]
c. Garden produce[9] (2/2)	37 and 9	Monthly during growing season in the Riverview area of Pasco and a control near Grandview	Gamma isotopic[3]

*Sample locations are graphically depicted in Figures 5-1 and 5-2.

[1]Deviations are permitted if samples are unobtainable due to hazardous conditions, seasonal availability, malfunction of automatic sampling equipment, or other legitimate reasons. All deviations will be documented in the Annual Radiological Environmental Monitoring Report.

[2]Particulate sample filters will be analyzed for gross beta after at least 24-hour decay. If gross beta activity is greater than 10 times the mean of the control sample, gamma isotopic analysis should be performed on the individual sample.

[3]Gamma isotopic means identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents of the facility.

TABLE 5-1 (contd.)

[4]TLD refers to thermoluminescent dosimeter. For purposes of WNP-2 REMP, a TLD is a phosphor card (32mm x 45mm x 0.5mm) with eight individual read-out areas (four main dosimeter areas and four back-up dosimeter areas) in each badge case. TLDs used in REMP meet the requirements of Regulatory Guide 4.13 (ANSI N545-1975), except for specified energy-dependence response. Correction factors are available for energy ranges with response outside of the specified tolerances. TLD stations 1S-16S are special interest stations and are not included amongst the 34 routine TLD stations required by Plant Technical Specification, Table 3.12-1.

[5]Composite samples will be collected with equipment which is capable of collecting an aliquot at time intervals which are short relative to the compositing period.

[6]Station 26, WNP-2 makeup water intake from the Columbia River, satisfies the RETS criteria for upstream surface water and drinking water control samples. Station 28, 300 Area Drinking Water Intake satisfies the RETS criteria for downstream surface water and drinking water sample. Drinking water samples are not routinely analyzed for I-131 from two week composite. I-131 analysis will be performed when the calculated dose for the consumption of water is greater than 1 mrem per year to the maximum organ.

[7]Milk samples will be obtained from farms or individual milk animals which are located in sectors with high calculated annual average ground-level D/Qs and high dose potential. There are no milk animals located within 5 km of WNP-2. If Cesium-134 or Cesium-137 is measured in an individual milk sample in excess of 30 pCi/l, then Strontium-90 analysis should be performed.

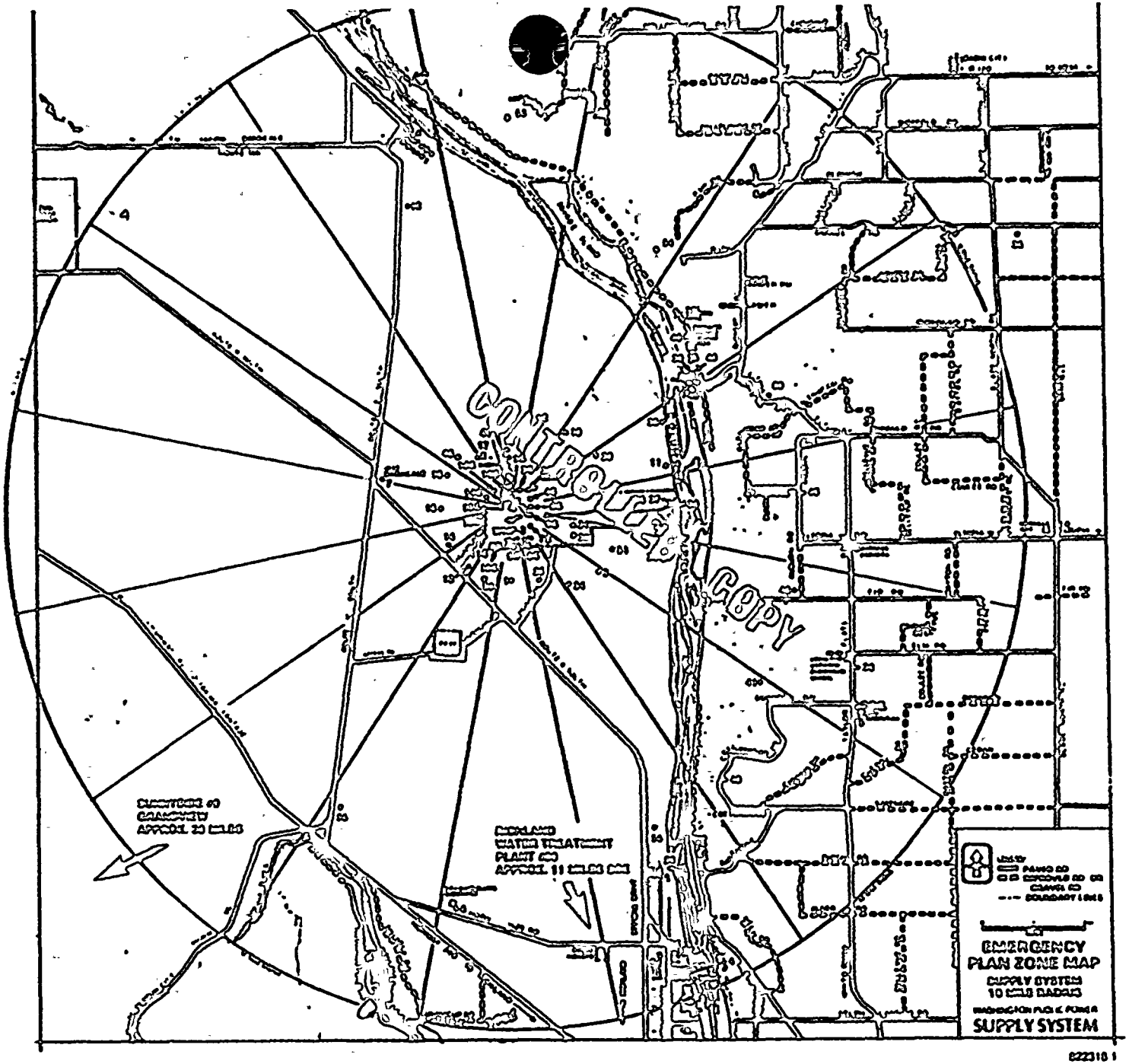
[8]There are no commercially important species in the Hanford reach of the Columbia River. Most recreationally important species in the area are anadromous, primarily salmonoids. Four fish specimen will normally be collected by electroshock technique in the vicinity of the plant discharge (Station 30). If electroshocking produces insufficient fish samples, anadromous species may be obtained from Ringold Fish Hatchery (Station 39). Control samples are normally collected in the vicinity of Ice Harbor Dam (salmonoids may be obtained through the National Marine Fisheries Service at Lower Granite Dam).

[9]Garden produce will routinely be obtained from farms or gardens using Columbia River water for irrigation. One sample of a root crop, leafy vegetable, and a fruit should be collected each sample period if available. The variety of the produce sample will be dependent on seasonal availability.

[10]Soil samples are collected to satisfy the requirements of the Site Certification Agreement (SCA), WNP-2.

TABLE 5
(Continued)

Station	Sector	Radial Miles[a]	TLD	AP/AI	SH	DH	GH	SE	HI	FI	GP	PIC_b	SO_b
39	NE	4.3								X			
40	SE	6.4	0	0					0				
41	SE	5.8	0										
42	ESE	5.6	0										
43	E	5.7	0										
44	ENE	5.7	0										
45	ENE	4.2	0										
46	NE	4.7	0										
47	N	0.5	X										
48	NE	4.3		0									
49	NW	1.2	0										
50	SSW	1.2	0										
51	ESE	2.1	0										
52	N	0.1					0						
53	N	7.5	0										
54	NNE	6.5	0										
55	SSE	7.0	0										
56	SSW	7.0	0										
57	N	0.7		0									
60	ENE	5.4							0				



RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS INSIDE OF 10 MILE RADIUS

Figure 5-1