

WOLF CREEK

NUCLEAR OPERATING CORPORATION

Donna Jacobs
Plant Manager

APR 17 2002

WO 02-0019

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Subject: Docket No. 50-482: Wolf Creek Generating Station Annual
Radioactive Effluent Release Report - Report 25

Gentlemen:

This letter transmits the enclosed Wolf Creek Generating Station (WCGS) Annual Radioactive Effluent Release Report. The report covers the period from January 1, 2001, through December 31, 2001. It is being submitted pursuant to Section 5.6.3 of the WCGS Technical Specifications. Two procedures are included as attachments to the enclosed report: AP 07B-003, "Offsite Dose Calculation Manual" and AP 07B-004, "Offsite Dose Calculation Manual, (Radiological Environmental Monitoring Program)."

No commitments are contained in this submittal.

If you should have any questions regarding this submittal, please contact me at (620) 364-4246, or Mr. Karl A. (Tony) Harris at (620) 364-4038.

Very truly yours,



Donna Jacobs

DJ/pb

Enclosure

cc: J. N. Donohew (NRC), w/e
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Wolf Creek Nuclear Operating Corporation

Wolf Creek Generating Station

Docket No: 50-482
Facility Operating License No: NPF-42

Annual Radioactive Effluent Release Report

Report No. 25

Reporting Period: January 1, 2001 - December 31, 2001

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Attachment I – Corrected Pages from Annual Radioactive Release Reports Covering January 1, 1993 through December 31, 2000.

Attachment II - WCGS Procedure AP 07B-003, Revision 4, "Offsite Dose Calculation Manual"

Attachment III - WCGS Procedure AP 07B-004, Revision 2, "Offsite Dose Calculation Manual (Radiological Environmental Monitoring Program)"

EXECUTIVE SUMMARY

This Annual Radioactive Effluent Release Report (Report 25) documents the quantities of liquid and gaseous effluents and solid waste released by the Wolf Creek Generating Station (WCGS) from January 1, 2001, through December 31, 2001. The format and content of this report is in accordance with Regulatory Guide 1.21, Revision 1. Sections I, II, III, and IV of this report provide information required by NRC Regulatory Guide 1.21 and Section 7.2 of AP 07B-003, "Offsite Dose Calculation Manual" (ODCM).

Section I --- Section I lists in detail the quantities of radioactive liquid and gaseous effluents and cumulative dose summaries for 2001, tabulated for each quarter and for yearly totals. Specific ODCM effluent limits and dose limits are also listed in Section I, along with the percentage of the effluent limits actually released, and the percentages of the dose limit actually received. No effluent or dose limits were exceeded during 2001.

An elevated release pathway does not exist at WCGS. All airborne releases are considered to be ground level releases. The gaseous pathway dose determination is met by the WCGS ODCM methodology of assigning all gaseous pathways to a hypothetical individual residing at the highest annual X/Q and D/Q location, as specified in the ODCM. This results in a conservative estimate of dose to a member of the public, rather than determining each pathway dose for each release condition. A conservative error of thirty percent has been estimated in the effluent data. As stated above, no ODCM dose limits were exceeded in 2001.

Section II --- Section II includes supplemental information on continuous and batch releases, calculated doses, and solid waste disposal. The same number of gaseous batch releases occurred in 2001 and 2000 (75 for both years). There were fewer liquid batch releases in 2001 than there were in 2000 (51 versus 98). WCGS released 0.0356 Curies in liquid releases during 2000, excluding gas and tritium. WCGS reduced this release amount in 2001, when 0.018 Curies, excluding gas and tritium, were released. Continuous release pathways remained the same as previous years and all continuous releases were monitored. Performance Improvement Request (PIR) 2001-3090 was written as a result of 3rd quarter 2000 Lime Pond composite not meeting the Lower Limit of Detection (LLD) for Sr-89 due to the delay time in sending off the sample. PIR 2001-1599 was written previously to capture the fact that the Lime Pond composite was not sent off until July 2001. Maximum estimated doses to members of the public were approximately the same as in 2000 with the exception of the Coffey County Lake (Wolf Creek Lake, per USAR). Dose assigned to fishermen who use the lake lowered to 5.58E-02 mRem in 2001, compared to 6.10E-02 mRem for 2000. This decrease can be contributed to the Coffey County Lake (Wolf Creek Lake) closure since September 11, 2001.

Section III --- Section III documents the WCGS meteorological data for wind speed, wind direction, and atmospheric stability. The quantity of missing hours of data for 2001 was 1110 hours. This corresponds to approximately 87.3% data availability. This lower availability was largely due to the unavailability of the computer and equipment for short periods of time. PIR 2002-0576 was written to evaluate the fact that we did not meet the 90% availability goal as stated in Regulatory Guide 1.23.

Section IV ---Section IV contains corrected Annual Radioactive Effluent Release Reports covering the period January 1, 1993 through December 31, 2000. PIR 2000-0813 documents discrepancies found in the Effluent Management Software (EMS) Database. The Annual Reports submitted from 1993 to 1998 contained data inconsistent with true data. The EMS program was placed into service in 1993 to generate the release permits and associated reports. While performing the 1999 Annual Radioactive Effluent Report a problem was recognized where the values for Fe-55 were positive in Quarters 1 and 2. A comparison was made between the 1998 EMS Nuclide tables and the 1998 cumulative tables and several discrepancies were identified. The values calculated in the cumulative tables are used to complete the Annual Radioactive Effluent Report. The Annual Reports submitted for 1993-1998 have been manually verified/validated and corrected as necessary. PIR 2001-1834 identifies that the volume released in 2000 was under-reported by 50,000 gallons. The 2000 Annual Report was corrected to include the 50,000 gallons. These corrections are being submitted as Attachment I to this report.

Section V --- Section V documents planned and unplanned releases; changes to radwaste treatment systems, land use census, monitoring instruments, radwaste shipments; and, storage tank quantities. An

Section V --- Section V documents planned and unplanned releases; changes to radwaste treatment systems, land use census, monitoring instruments, radwaste shipments; and, storage tank quantities. An unplanned release on Gas Decay Tank #1 occurred on December 6, 2001, when Gas Decay Tank #1 was in re-circulation in support of STS IC-470A, "Gaseous Radwaste H2 and O2 Monitors HA Train "A"—Channel Calibration/ACOT." The tank pressure was 8.8 psig. During the performance of the procedure the Radwaste Vent Effluent monitor (GHN0103) release rate increased for a time period of two (2) hours. After the procedure was completed the tank pressure was 7.6 psig. When the Waste Gas Compressor was secured, the tank pressure dropped to 5.2 psig. During this evolution, 3.6 psig was lost. This evolution resulted in $4.31\text{E-}02$ Curies of Kr-85 and $5.90\text{E-}06$ Curies of Xe-133 being released. PIR 2001-3064 was initiated to capture and evaluate the events. No ODCM limits were exceeded.

PIR 2001-1798 was initiated June 1, 2001, to document a missed surveillance. The automatic isolation capability of the Mini-Purge valves was not verified quarterly as required by Section 3.4.2 and Table 3.3 of AP 07B-003, "Offsite Dose Calculation Manual." The last qualifying surveillance was performed on October 5, 2000.

No changes or events occurred on the land use census, monitoring instruments, radwaste shipments, and storage tanks.

ATTACHMENTS

AP 07B-003, Revision 4, "Offsite Dose Calculation Manual" is included as Attachment II and AP 07B-004, Revision 2, "Offsite Dose Calculation Manual (Radiological Environmental Monitoring Program)" is included as Attachment III.

SECTION I

REPORT OF 2001 RADIOACTIVE EFFLUENTS: LIQUID

		Unit	Quarter 1	Quarter 2
A.	Fission and Activation Products			
1.	Total Release (not including tritium, gases, alpha)	Ci	2.10E-03	2.18E-03
2.	Average Diluted Concentration During Period	μCi/ml	2.05E-10	1.23E-10
3.	Percent of Applicable Limit (1)	%	4.20E-02	4.36E-02
B.	Tritium			
1.	Total Release	Ci	3.32E+01	2.04E+02
2.	Average Diluted Concentration During Period	μCi/ml	3.23E-06	9.10E-06
3.	Percent of Applicable Limit (ECL) (2)	%	3.23E-01	9.10E-01
C.	Dissolved and Entrained Gases			
1.	Total Release	Ci	0.00E+00	3.06E-03
2.	Average Diluted Concentration During Period	μCi/ml	0.00E+00	1.37E-10
3.	Percent of Applicable Limit (3)	%	0.00E+00	6.85E-05
D.	Gross Alpha Radioactivity			
1.	Total Release	Ci	1.06E-05	0.00E+00
E.	Volume of waste released (prior to dilution)	liters	3.58E+07	4.93E+07
F.	Volume of dilution water used	liters	1.02E+10	2.23E+10

NOTES:

- 1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water Cooled Nuclear Power Reactors," Paragraph A.2.) The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.
- 2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{MPC or ECL, Appendix B, Table 2 10CFR20})}$$

- 3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

REPORT OF 2001 RADIOACTIVE EFFLUENTS: LIQUID

		Unit	Quarter 3	Quarter 4
A.	Fission and Activation Products			
1.	Total Release (not including tritium, gases, alpha)	Ci	8.18E-03	5.50E-03
2.	Average Diluted Concentration During Period	μCi/ml	5.85E-10	3.27E-10
3.	Percent of Applicable Limit (1)	%	1.64E-01	1.10E-01
B.	Tritium			
1.	Total Release	Ci	2.16E+02	3.94E+02
2.	Average Diluted Concentration During Period	μCi/ml	1.55E-05	2.34E-05
3.	Percent of Applicable Limit (ECL) (2)	%	1.55E+00	2.34E+00
C.	Dissolved and Entrained Gases			
1.	Total Release	Ci	2.15E-04	5.38E-03
2.	Average Diluted Concentration During Period	μCi/ml	1.54E-11	3.20E-10
3.	Percent of Applicable Limit (3)	%	7.71E-06	1.60E-04
D.	Gross Alpha Radioactivity			
1.	Total Release	Ci	1.19E-05	0.00E+00
E.	Volume of waste released (prior to dilution)	liters	8.03E+07	3.63E+07
F.	Volume of dilution water used	liters	1.39E+10	1.63E+10

NOTES:

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water Cooled Nuclear Power Reactors," Paragraph A.2.) The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{MPC or ECL, Appendix B, Table 2 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

2001 LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
H-3	Ci	7.04E-01	1.06E+00	3.25E+01	2.03E+02
Cr-51	Ci	n/a	n/a	n/a	n/a
Mn-54	Ci	<1.77E-02	<2.45E-02	<1.83E-04	2.29E-05
Fe-55	Ci	<3.54E-02	<4.89E-02	<3.66E-04	<4.39E-04
Fe-59	Ci	<1.77E-02	<2.45E-02	<1.83E-04	<2.20E-04
Co-57	Ci	n/a	n/a	3.72E-06	n/a
Co-58	Ci	<1.77E-02	<2.45E-02	1.19E-03	4.25E-04
Co-60	Ci	<1.77E-02	<2.45E-02	2.04E-04	4.72E-04
Zn-65	Ci	<1.77E-02	<2.45E-02	<1.83E-04	<2.20E-04
Sr-89	Ci	<1.77E-03	<2.45E-03	<1.83E-05	<2.20E-05
Sr-90	Ci	<1.77E-03	<2.45E-03	<1.83E-05	<2.20E-05
Sr-92	Ci	n/a	n/a	n/a	n/a
Nb-95	Ci	n/a	n/a	n/a	n/a
Zr-95	Ci	n/a	n/a	n/a	n/a
Zr-97	Ci	n/a	n/a	n/a	n/a
Mo-99	Ci	<1.77E-02	<2.45E-02	<1.83E-04	<2.20E-04
Ag-110M	Ci	n/a	n/a	n/a	n/a
Sn-113	Ci	n/a	n/a	n/a	n/a
Sn-117M	Ci	n/a	n/a	n/a	n/a
Sb-124	Ci	n/a	n/a	n/a	n/a
Sb-125	Ci	n/a	n/a	4.91E-04	1.18E-03
I-131	Ci	<3.54E-02	<4.89E-02	<3.66E-04	<4.39E-04
Cs-134	Ci	<1.77E-02	<2.45E-02	8.06E-05	5.92E-06
Cs-137	Ci	<1.77E-02	<2.45E-02	1.28E-04	6.95E-05
Ce-141	Ci	<1.77E-02	<2.45E-02	<1.83E-04	<2.20E-04
Ce-144	Ci	<1.77E-02	<2.45E-02	<1.83E-04	<2.20E-04
Gross Alpha	Ci	<3.54E-03	<4.89E-03	1.06E-05	<4.39E-05
Ar-41	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Kr-85M	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Kr-85	Ci	<3.54E-01	<4.89E-01	<3.66E-03	2.64E-03
Kr-87	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Kr-88	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Xe-131M	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Xe-133M	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Xe-133	Ci	<3.54E-01	<4.89E-01	<3.66E-03	4.22E-04
Xe-135M	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03
Xe-135	Ci	<3.54E-01	<4.89E-01	<3.66E-03	<4.39E-03

NOTE

“Less than” values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The “less than” values are not included in the summation for the total release values.

2001 LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci	4.37E-01	8.90E-01	2.16E+02	3.93E+02
Cr-51	Ci	n/a	n/a	6.68E-05	n/a
Mn-54	Ci	<3.98E-02	<1.79E-02	2.07E-05	<3.21E-04
Fe-55	Ci	<7.97E-02	<3.57E-02	1.59E-03	<6.42E-04
Fe-59	Ci	<3.98E-02	<1.79E-02	<3.18E-04	<3.21E-04
Co-57	Ci	n/a	n/a	2.88E-05	1.89E-05
Co-58	Ci	<3.98E-02	<1.79E-02	7.71E-04	4.88E-04
Co-60	Ci	<3.98E-02	<1.79E-02	7.18E-04	9.82E-04
Rb-88	Ci	n/a	n/a	n/a	n/a
Zn-65	Ci	<3.98E-02	<1.79E-02	<3.18E-04	<3.21E-04
Sr-89	Ci	<3.98E-03	<1.79E-03	<3.18E-05	<3.21E-03
Sr-90	Ci	<3.98E-03	<1.79E-03	<3.18E-05	<3.21E-03
Sr-92	Ci	n/a	n/a	n/a	n/a
Nb-95	Ci	n/a	n/a	n/a	n/a
Ru-103	Ci	n/a	n/a	n/a	n/a
Zr-95	Ci	n/a	n/a	n/a	n/a
Zr-97	Ci	n/a	n/a	n/a	n/a
Mo-99	Ci	<3.98E-02	<1.79E-02	<3.18E-04	<3.21E-04
Ag-110M	Ci	n/a	n/a	n/a	n/a
Sn-113	Ci	n/a	n/a	n/a	n/a
Na-24	Ci	n/a	n/a	n/a	n/a
Sb-125	Ci	n/a	n/a	4.59E-03	3.91E-03
I-131	Ci	<7.97E-02	<3.57E-02	<6.37E-04	5.11E-06
Cs-134	Ci	<3.98E-02	<1.79E-02	1.03E-04	1.71E-05
Cs-137	Ci	<3.98E-02	<1.79E-02	2.77E-04	8.99E-05
Cs-138	Ci	n/a	n/a	n/a	n/a
Ce-141	Ci	<3.98E-02	<1.79E-02	<3.11E-04	<3.21E-04
Ce-144	Ci	<3.98E-02	<1.79E-02	<3.18E-04	<3.21E-04
Gross Alpha	Ci	<7.97E-03	<3.57E-03	1.19E-05	<6.42E-05
Ar-41	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Kr-85M	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Kr-85	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Kr-87	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Kr-88	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Xe-131M	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Xe-133M	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Xe-133	Ci	<7.97E-01	<3.57E-01	2.13E-04	5.38E-03
Xe-135M	Ci	<7.97E-01	<3.57E-01	<6.37E-03	<6.42E-03
Xe-135	Ci	<7.97E-01	<3.57E-01	2.05E-06	<6.42E-03

NOTE

“Less than” values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The “less than” values are not included in the summation for the total release values.

**2001 LIQUID CUMULATIVE DOSE SUMMARY
TABLE 1**

QUARTER 1 OF 2001	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
TOTAL DOSE (mRem) FOR BONE	1.00E-03	5.00E+00	2.00E-02
TOTAL DOSE (mRem) FOR LIVER	1.53E-02	5.00E+00	3.06E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.49E-02	1.50E+00	9.90E-01
TOTAL DOSE (mRem) FOR THYROID	1.36E-02	5.00E+00	2.72E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.42E-02	5.00E+00	2.83E-01
TOTAL DOSE (mRem) FOR LUNG	1.38E-02	5.00E+00	2.76E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.37E-02	5.00E+00	2.74E-01
QUARTER 2 OF 2001			
TOTAL DOSE (mRem) FOR BONE	2.79E-04	5.00E+00	5.57E-03
TOTAL DOSE (mRem) FOR LIVER	3.19E-02	5.00E+00	6.37E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	3.17E-02	1.50E+00	2.12E+00
TOTAL DOSE (mRem) FOR THYROID	3.15E-02	5.00E+00	6.29E-01
TOTAL DOSE (mRem) FOR KIDNEY	3.16E-02	5.00E+00	6.32E-01
TOTAL DOSE (mRem) FOR LUNG	3.15E-02	5.00E+00	6.30E-01
TOTAL DOSE (mRem) FOR GI-LLI	3.15E-02	5.00E+00	6.31E-01
QUARTER 3 OF 2001			
TOTAL DOSE (mRem) FOR BONE	1.15E-03	5.00E+00	2.31E-02
TOTAL DOSE (mRem) FOR LIVER	2.17E-02	5.00E+00	4.34E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	2.12E-02	1.50E+00	1.41E+00
TOTAL DOSE (mRem) FOR THYROID	1.99E-02	5.00E+00	3.98E-01
TOTAL DOSE (mRem) FOR KIDNEY	2.05E-02	5.00E+00	4.10E-01
TOTAL DOSE (mRem) FOR LUNG	2.01E-02	5.00E+00	4.02E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.01E-02	5.00E+00	4.01E-01
QUARTER 4 OF 2001			
TOTAL DOSE (mRem) FOR BONE	4.54E-04	5.00E+00	9.09E-03
TOTAL DOSE (mRem) FOR LIVER	5.17E-02	5.00E+00	1.03E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	5.15E-02	1.50E+00	3.44E+00
TOTAL DOSE (mRem) FOR THYROID	5.11E-02	5.00E+00	1.02E+00
TOTAL DOSE (mRem) FOR KIDNEY	5.13E-02	5.00E+00	1.03E+00
TOTAL DOSE (mRem) FOR LUNG	5.11E-02	5.00E+00	1.02E+00
TOTAL DOSE (mRem) FOR GI-LLI	5.12E-02	5.00E+00	1.02E+00
TOTALS FOR 2001			
TOTAL DOSE (mRem) FOR BONE	2.89E-03	1.00E+01	2.89E-02
TOTAL DOSE (mRem) FOR LIVER	1.21E-01	1.00E+01	1.21E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	1.19E-01	3.00E+00	3.98E+00
TOTAL DOSE (mRem) FOR THYROID	1.16E-01	1.00E+01	1.16E+00
TOTAL DOSE (mRem) FOR KIDNEY	1.18E-01	1.00E+01	1.18E+00
TOTAL DOSE (mRem) FOR LUNG	1.17E-01	1.00E+01	1.17E+00
TOTAL DOSE (mRem) FOR GI-LLI	1.17E-01	1.00E+01	1.17E+00

1. Based on ODCM Section 2.2, which restricts dose to the whole body to less than or equal to 1.5 mRem per quarter and 3.0 mRem per year. Dose restriction of any organ is less than or equal to 5 mRem per quarter and 10 mRem per year.

**2001 LIQUID CUMULATIVE DOSE SUMMARY
TABLE 2**

A.	Fission and Activation Products (not including H-3, gases, alpha)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
1.	Total Release - (Ci)	2.10E-03	2.18E-03	8.18E-03	5.50E-03	1.80E-02
2.	Maximum Organ Dose (mRem)	1.71E-03	3.94E-04	1.82E-03	6.83E-04	4.61E-03
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4.	Percent of Limit	3.41E-02	7.88E-03	3.65E-02	1.37E-02	4.61E-02
B.	Tritium					
1.	Total Release - (Ci)	3.32E+01	2.04E+02	2.16E+02	3.94E+02	8.47E+02
2.	Maximum Organ Dose (mRem)	1.36E-02	3.15E-02	1.99E-02	5.10E-02	1.16E-01
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4.	Percent of Limit	2.72E-01	6.29E-01	3.98E-01	1.02E+00	1.16E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. Wolf Creek ODCM methodology is used to calculate the maximum organ dose which assumes that an individual drinks the water and eats the fish from the discharge point. ODCM Section 2.2 organ dose limits are used.

REPORT OF 2001 RADIOACTIVE EFFLUENTS: AIRBORNE

	Unit	Quarter 1	Quarter 2
A. Fission and Activation Gases			
1. Total Release	Ci	8.54E-01	1.04E+00
2. Average Release Rate for Period	μCi/sec	1.10E-01	1.32E-01
3. Percent of ODCM Limit (1)	%	4.31E-03	5.12E-03
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of Applicable Limit (2)	%	0.00E+00	0.00E+00
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00
D. Tritium			
1. Total Release	Ci	5.70E+00	1.19E+01
2. Average Release Rate for Period	μCi/sec	7.33E-01	1.52E+00
3. Percent of ODCM Limit (4)	%	5.59E-02	1.14E-01

NOTES:

- The percent of ODCM limit for fission and activation gases is calculated using the following methodology: % of ODCM Limit = $\frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}}$ or $\frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$
The largest value calculated between Gamma and Beta air dose is listed as the % of ODCM Limit.
- The percent of ODCM limit for iodine is calculated using the following methodology:
% of ODCM Limit = $\frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$
- The percent of ODCM limit for particulates is calculated using the following methodology:
% of ODCM Limit = $\frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$

NOTE

This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates

- The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

REPORT OF 2001 RADIOACTIVE EFFLUENTS: AIRBORNE

	Unit	Quarter 3	Quarter 4
A. Fission and Activation Gases			
1. Total Release	Ci	8.68E-01	1.88E+00
2. Average Release Rate for Period	μCi/sec	1.09E-01	2.36E-01
3. Percent of ODCM Limit (1)	%	9.98E-03	9.28E-03
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of Applicable Limit (2)	%	0.00E+00	0.00E+00
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00
D. Tritium			
1. Total Release	Ci	1.96E+01	1.55E+01
2. Average Release Rate for Period	μCi/sec	2.47E+00	1.95E+00
3. Percent of ODCM Limit (4)	%	1.83E-01	1.44E-01

NOTES:

- The percent of ODCM limit for fission and activation gases is calculated using the following methodology: % of ODCM Limit = $\frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}}$ or $\frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$
The largest value calculated between Gamma and Beta air dose is listed as the % of ODCM Limit.
- The percent of ODCM limit for iodine is calculated using the following methodology:
% of ODCM Limit = $\frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$
- The percent of ODCM limit for particulates is calculated using the following methodology:
% of ODCM Limit = $\frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$

NOTE

This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates.

- The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

2001 GASEOUS EFFLUENTS

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	2.93E-01	3.59E-01
Kr-85	Ci	n/a	n/a	3.44E-01	2.09E-01
Kr-85M	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<3.53E+01	<3.74E+01	<4.10E-02	<5.27E-02
Kr-88	Ci	<4.52E+01	<4.79E+01	<5.26E-02	<6.75E-02
Xe-131M	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	<2.56E+01	3.29E-01	3.01E-02	3.99E-02
Xe-133M	Ci	<7.94E+01	<8.41E+01	<9.26E-02	<1.19E-01
Xe-135	Ci	1.87E-01	1.04E-01	<1.36E-02	1.36E-04
Xe-138	Ci	<1.11E+03	<1.17E+03	<1.29E+00	<1.65E+00
Total	Ci	1.87E-01	4.32E-01	6.67E-01	6.08E-01
2. Halogens (Gaseous)					
I-131	Ci	<2.44E-04	<2.58E-04	<2.84E-07	<3.65E-07
I-133	Ci	<2.44E-02	<2.58E-02	<2.84E-05	<3.65E-05
Total	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	5.41E+00	1.06E+01	2.89E-01	1.32E+00
Mn-54	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Fe-59	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Co-58	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Co-60	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Zn-65	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Mo-99	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Cs-134	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Cs-137	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Ce-141	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Ce-144	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Sr-89	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Sr-90	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Gross Alpha	Ci	<2.44E-03	<2.57E-03	<2.84E-06	<3.65E-06
Total	Ci	5.41E+00	1.06E+01	2.89E-01	1.32E+00

NOTE

“Less than” values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

2001 GASEOUS EFFLUENTS (Continued)

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	7.65E-01	7.10E-01
Kr-85	Ci	n/a	n/a	n/a	1.06E+00
Kr-85M	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<3.85E+01	<3.86E+01	<9.20E-02	<1.04E-01
Kr-88	Ci	<4.93E+01	<4.95E+01	<1.18E-01	<1.33E-01
Xe-131M	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	<2.79E+01	<2.80E+01	1.02E-01	1.10E-01
Xe-133M	Ci	<8.66E+01	<8.69E+01	<2.07E-01	<2.33E-01
Xe-135	Ci	<1.27E+01	<1.27E+01	2.67E-04	<6.09E-04
Xe-138	Ci	<1.21E+03	<1.21E+03	<2.88E+00	<3.24E+00
Total	Ci	0.00E+00	0.00E+00	8.68E-01	1.88E+00
2. Halogens (Gaseous)					
I-131	Ci	<2.66E-04	<2.67E-04	<6.36E-07	<7.16E-07
I-133	Ci	<2.66E-02	<2.67E-02	<6.36E-05	<7.16E-05
Total	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	1.59E+01	1.26E+01	3.71E+00	2.83E+00
Mn-54	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Fe-59	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Co-58	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Co-60	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Zn-65	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Mo-99	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Cs-134	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Cs-137	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Ce-141	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Ce-144	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Sr-89	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Sr-90	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Gross Alpha	Ci	<2.66E-03	<2.67E-03	<6.36E-06	<7.16E-06
Total	Ci	1.59E+01	1.26E+01	3.71E+00	2.83E+00

NOTE

“Less than” values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates, the ODCM LLD values are used.

**2001 GASEOUS CUMULATIVE DOSE SUMMARY
TABLE 1**

QUARTER 1 OF 2001	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	4.03E-03	7.50E+00	5.37E-02
TOTAL DOSE (mRem) FOR TOTAL BODY	4.03E-03	7.50E+00	5.37E-02
TOTAL DOSE (mRem) FOR THYROID	4.03E-03	7.50E+00	5.37E-02
TOTAL DOSE (mRem) FOR KIDNEY	4.03E-03	7.50E+00	5.37E-02
TOTAL DOSE (mRem) FOR LUNG	4.03E-03	7.50E+00	5.37E-02
TOTAL DOSE (mRem) FOR GI-LLI	4.03E-03	7.50E+00	5.37E-02
QUARTER 2 OF 2001			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	8.44E-03	7.50E+00	1.13E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	8.44E-03	7.50E+00	1.13E-01
TOTAL DOSE (mRem) FOR THYROID	8.44E-03	7.50E+00	1.13E-01
TOTAL DOSE (mRem) FOR KIDNEY	8.44E-03	7.50E+00	1.13E-01
TOTAL DOSE (mRem) FOR LUNG	8.44E-03	7.50E+00	1.13E-01
TOTAL DOSE (mRem) FOR GI-LLI	8.44E-03	7.50E+00	1.13E-01
QUARTER 3 OF 2001			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	1.39E-02	7.50E+00	1.85E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.39E-02	7.50E+00	1.85E-01
TOTAL DOSE (mRem) FOR THYROID	1.39E-02	7.50E+00	1.85E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.39E-02	7.50E+00	1.85E-01
TOTAL DOSE (mRem) FOR LUNG	1.39E-02	7.50E+00	1.85E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.39E-02	7.50E+00	1.85E-01
QUARTER 4 OF 2001			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	1.09E-02	7.50E+00	1.46E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.09E-02	7.50E+00	1.46E-01
TOTAL DOSE (mRem) FOR THYROID	1.09E-02	7.50E+00	1.46E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.09E-02	7.50E+00	1.46E-01
TOTAL DOSE (mRem) FOR LUNG	1.09E-02	7.50E+00	1.46E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.09E-02	7.50E+00	1.46E-01
TOTALS FOR 2001			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	1.50E+01	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	3.73E-02	1.50E+01	2.49E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	3.73E-02	1.50E+01	2.49E-01
TOTAL DOSE (mRem) FOR THYROID	3.73E-02	1.50E+01	2.49E-01
TOTAL DOSE (mRem) FOR KIDNEY	3.73E-02	1.50E+01	2.49E-01
TOTAL DOSE (mRem) FOR LUNG	3.73E-02	1.50E+01	2.49E-01
TOTAL DOSE (mRem) FOR GI-LLI	3.73E-02	1.50E+01	2.49E-01

1. Based on Wolf Creek ODCM Section 3.2.2 which restricts dose during any calendar quarter to less than or equal to 7.5 mRem to any organ and during any calendar year to less than or equal to 15 mRem to any organ.

**2001 GASEOUS CUMULATIVE DOSE SUMMARY
TABLE 2**

Nuclides Released	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A. Fission and Activation Gases					
1. Total Release - (Ci)	8.54E-01	1.04E+00	8.68E-01	1.88E+00	4.64E+00
2. Total Gamma Airdose (mRad)	2.16E-04	2.56E-04	4.99E-04	4.64E-04	1.44E-03
3. Gamma Airdose Limit (mRad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Gamma Airdose Limit	4.33E-03	5.12E-03	9.98E-03	9.29E-03	1.44E-02
5. Total Beta Airdose (mRad)	1.48E-04	1.55E-04	1.83E-04	3.14E-04	8.01E-04
6. Beta Airdose Limit (mRad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
7. Percent of Beta Airdose Limit (mRad)	1.48E-03	1.55E-03	1.83E-03	3.14E-03	4.00E-03
B. Particulates					
1. Total Particulates (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Maximum Organ Dose (mRem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Tritium					
1. Total Release (Ci)	5.70E+00	1.19E+01	1.96E+01	1.55E+01	5.27E+01
2. Maximum Organ Dose (mRem)	4.19E-03	8.54E-03	1.37E-02	1.08E-02	3.73E-02
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	5.59E-02	1.14E-01	1.83E-01	1.44E-01	2.49E-01
D. Iodine					
1. Total I-131, I-133 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Maximum Organ Dose (mRem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. The maximum organ dose is calculated using Wolf Creek ODCM methodology which assumes that an individual actually resides at the release point. ODCM Section 3.2.2 organ dose limits are used.

SECTION II

SUPPLEMENTAL INFORMATION

1. Offsite Dose Calculation Manual Limits

A. For liquid waste effluents

- A.1 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 other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microCuries/ml total activity.
- A.2 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to UNRESTRICTED AREAS shall be limited:
 - a. During any calendar quarter to less than or equal to 1.5 mremS to the whole body and to less than or equal to 5 mremS to any organ, and
 - b. During any calendar year to less than or equal to 3 mremS, to the whole body and to less than or equal to 10 mremS to any organ.

B. For gaseous waste effluents

- B.1 The dose rate due to radioactive material released in gaseous effluents from the site to area at and beyond the SITE BOUNDARY shall be limited to the following:
 - a. For noble gases: Less than or equal to 500 mremS/yr to the whole body and less than or equal to 3000 mremS/yr to the skin, and
 - b. For Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mremS/yr to any organ.
- B.2 The air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:
 - a. During any calendar quarter: Less than or equal to 5 mradS for gamma radiation and less than or equal to 10 mradS for beta radiation, and
 - b. During any calendar year: Less than or equal to 10 mradS for gamma radiation and less than or equal to 20 mradS for beta radiation.
- B.3 The dose from Iodine-131, Iodine-133, tritium, and a radionuclide in particulate form with half-lives greater than 8 days in gaseous effluents released to area at and beyond the SITE BOUNDARY shall be limited to the following:
 - a. During any calendar quarter: Less than or equal to 7.5 mremS to any organ, and
 - b. During any calendar year: Less than or equal to 15 mremS to any organ.

2. Effluent Concentration Limits (ECLs)

Water - covered in Section 1.A.

Air - covered in Section 1.B.

3. **Average Energy**

Average energy of fission and activation gaseous effluents is not applicable. See ODCM Section 3.1 for the methodology used in determining the release rate limits from noble gas releases.

4. **Measurements and Approximations of Total Radioactivity**

A. **Liquid Effluents**

Liquid Release Type	Sampling Frequency	Method of Analysis	Type of Activity Analysis
1. Batch Waste Release Tank	P Each Batch	P.H.A.	Principal Gamma Emitters
	P Each Batch	P.H.A.	I-131
a. Waste Monitor Tank	P One Batch/M	P.H.A.	Dissolved and Entrained Gases (Gamma Emitters)
b. Secondary Liquid Waste Monitor Tanks	P Each Batch	L.S. S.A.C.	H-3 Gross Alpha
	P	O.S.L.	Sr-89, Sr-90
2. Continuous Releases	Daily Grab Sample	P.H.A.	Principal Gamma Emitters
		P.H.A.	I-131
a. Steam Generator Blowdown	M Grab Sample	P.H.A.	Dissolved and entrained Gases (Gamma Emitters)
b. Turbine Building Sump/Waste Water Treatment	Daily Grab Sample	L.S.	H-3
		S.A.C.	Gross Alpha
c. Lime Sludge Pond	Daily Grab Sample	O.S.L.	Sr-89, Sr-90
		O.S.L.	Fe-55

P = prior to each batch

M = monthly

L. S. = Liquid scintillation detector

S.A.C. = scintillation alpha counter

O.S.L. = performed by an offsite laboratory

P.H.A. = gamma spectrum pulse height analysis using a High Purity Germanium detector

B. Gaseous Waste Effluents

Gaseous, Release Type	Sampling Frequency	Method of Analysis	Type of Activity Analysis
Waste Gas Decay Tank	P Each Tank Grab Sample	P.H.A.	Principal Gamma Emitters
Containment Purge or Vent	P Each Purge Grab Sample	P.H.A. <hr/> Gas Bubbler and L.S.	Principal Gamma Emitters <hr/> H-3 (oxide)
Unit Vent	M Grab Sample	P.H.A. <hr/> Gas Bubbler and L.S.	Principal Gamma Emitters <hr/> H-3 (oxide)
Radwaste Building Vent	M Grab Sample	P.H.A.	Principal Gamma Emitters
For Unit Vent and Radwaste Building Vent release types listed above	Continuous	P.H.A.	I-131 <hr/> I-133
	Continuous	P.H.A. Particulate Sample	Principal Gamma Emitters
	Continuous Composite	S.A.C. Particulate Sample	Gross Alpha
	Continuous	O.S.L. Composite Particulate Sample	Sr-89, Sr-90

P = prior to each batch
M = monthly
L.S. = Liquid scintillation detector

S.A.C. = scintillation alpha counter
O.S.L. = performed by an offsite laboratory
P.H.A. = gamma spectrum pulse height analysis using a High Purity Germanium detector

5. Batch Releases

A batch release is the discontinuous release of gaseous or liquid effluents which takes place over a finite period of time, usually hours or days.

There were 75 gaseous batch releases during the reporting period. The longest gaseous batch release lasted 2,240 minutes, while the shortest lasted 63 minutes. The average release lasted 230 minutes with a total gaseous batch release time of 16,992 minutes.

There were 51 liquid batch releases during the reporting period. The longest liquid batch release lasted 317 minutes, while the shortest lasted 48 minutes. The average release lasted 181 minutes with a total liquid batch release time of 8,793 minutes.

6. Continuous Releases

A continuous release is a release of gaseous or liquid effluent, which is essentially uninterrupted for extended periods during normal operation of the facility. Four liquid release pathways were designated as continuous releases during this reporting period: Steam Generator Blowdown, Turbine Building Sump, Waste Water Treatment, and Lime Sludge Pond. Two gas release pathways were designated as continuous releases: Unit Vent and Radwaste Building Vent.

7. Doses to a Member of the Public from Activities Inside the Site Boundary

Four activities by members of the public were considered in this evaluation: personnel making deliveries to the plant, workers at the William Allen White Building located outside of the restricted area, the use of the access road south of the Radwaste Building, and personnel using the lake during times when fishing was allowed. The dose calculated for the maximum exposed individual for these four activities was as follows:

Plant Deliveries	4.02E-01 mRem
William Allen White Building Workers	9.17E-03 mRem
Access Road Users	4.12E-03 mRem
Lake Use	5.58E-02 mRem

The plant delivery calculations were based on deliveries 3 hours per week for 50 weeks per year. The William Allen White Building occupancy was based on normal working hours of 2000 per year. The usage factor for the access road south of the Radwaste Building was 25 hours per year. The dose to fishermen on the lake was based upon 3048 hours (12 hours a day for 254 days, based on the number of days that the lake was open to fisherman). Pathways used in the calculation were gaseous inhalation, submersion, and ground plane. All calculations were performed in accordance with the methodology and parameters in the ODCM.

8. Additional Information

PIR 2001-1798 was written to document the fact that on June 1, 2001, Operations person identified that the automatic isolation capability of the Mini-Purge valves had not been verified quarterly, as required by Section 3.4.2 and Table 3.3 of AP 07B-003, ODCM. The last qualifying surveillance was performed on October 5, 2000. Licensee initiated changes to the ODCM must be documented and changes must be submitted to the NRC as part of or concurrent with the Annual Radioactive Effluent Release Report. Although Wolf Creek Nuclear Operating Corporation (WCNOC) did not change the ODCM document itself to remove the requirement for performing the subject surveillances, the elimination of the surveillance implementing the procedure, STN GT-004, Containment Purge Valves Actuation Test, constituted a change to the ODCM implementation program. Deletion of STN GT-004 was an inappropriate action and this procedure has since been incorporated into STS ST-201, Containment purge System In-service Valve Test.

PIR 2001-1599 was written June 20, 2001, and identified that the 3rd quarter, year 2000, Lime Pond sample was not sent off for Sr-89, Sr-90 and Fe-55 analysis as required by Table 2-1 of the ODCM. The sample was located and sent to the offsite laboratory in July of 2001. The value for Sr-89 was <5.8E-07 microcurie/ml. This did not meet the required LLD of 5E-08 due to the half-life of Sr-89 and the delay time in sending off the sample. We did not have enough remaining sample to meet the LLD.

There has been no detectable Sr-89 and 90 in previous samples. There was no detectable gamma in the sample that failed to meet the LLD for Sr-89. Based on the absence of commonly found isotopes, it is logical that there would also be no Sr-89.

2001 EFFLUENT CONCENTRATION LIMITS
Liquid Effluents

<u>Nuclides</u>	<u>Curies</u>	<u>Average Diluted Concentration</u> (uCi/ml)	<u>10 CFR 20 ECL</u> (uCi/ml)	<u>% of ECL</u>
H-3	8.47E+02	1.35E-05	1.00E-03	1.35E+00
Cr-51	6.68E-05	1.06E-12	5.00E-04	2.12E-07
Mn-54	4.36E-05	6.93E-13	3.00E-05	2.31E-06
Fe-55	1.59E-03	2.43E-11	1.00E-04	2.43E-05
Co-57	5.14E-05	8.17E-13	6.00E-05	1.36E-06
Co-58	2.87E-03	4.56E-11	2.00E-05	2.28E-04
Co-60	2.38E-03	3.78E-11	3.00E-06	1.26E-03
Sb-125	1.02E-02	1.62E-10	3.00E-05	5.40E-04
I-131	5.11E-06	8.12E-14	1.00E-06	8.12E-06
Cs-134	2.07E-04	3.29E-12	9.00E-07	3.66E-04
Cs-137	5.64E-04	8.97E-12	1.00E-06	8.97E-04
Kr-85	2.64E-03	4.20E-11	2.00E-04	2.10E-05
Xe-133	6.02E-03	9.57E-11	2.00E-04	4.78E-05
Xe-135	2.05E-06	3.26E-14	2.00E-04	1.63E-08

**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
2001 SOLID WASTE SHIPMENTS**

A. SOLID RADWASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of Waste	Unit	1- Year Period	Est. Total Error %
a. Spent resins, filter sludges evaporator bottoms, etc.	m3*	1.32E+01**	2.50E+01
	Ci	9.33E+2	
b. Dry compressible waste, contaminated equip. etc.	m3*	2.71E+02**	2.50E+01
	Ci	8.03E+00	
c. Irradiated components, control rods, etc.	m3*	0.00E+00	2.50E+01
	Ci	0.00E+00	
d. Other	m3*	0.00E+00	2.50E+01
	Ci	0.00E+00	

*m3 = cubic meters **Volume sent offsite for volume reduction, prior to disposal.

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

[Nuclides listed with % abundance greater than 10 %]

a. Spent resin, filter sludges, evaporator bottoms, etc.

<u>Nuclide Name</u>	<u>Percent Abundance</u>	<u>Curies</u>
Fe-55	24.289	1.80E+02
Ni-63	32.856	2.40E+02

b. Dry compressible waste, contaminated equipment, etc.

<u>Nuclide Name</u>	<u>Percent Abundance</u>	<u>Curies</u>
Be-7	52.980	4.26E+00
Cs-137	23.055	1.85E+00

- c. Irradiated components, control rods, etc. - None
- d. Other - None

3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
6	Truck (Hittman Transport Services)	Barnwell Waste Management Facility, Barnwell, SC
5	Truck (Hittman Transport Services)	Duratek, Inc., Bear Creek, Oak Ridge, TN
3	Truck (Hittman Transport Services)	Duratek Inc., Gallaher, Oak Ridge, TN
2	Truck (Hittman Transport Services)	Studsvik Processing Facility, LLC; Erwin, TN
1	Truck (Kindrick Trucking)	Studsvik Processing Facility, LLC; Erwin, TN

4. Class of Solid Waste

- a. Class A, Class B, Class C- Corresponding to 2a
- b. Class A, Class B - Corresponding to 2b
- c. Not applicable
- d. Not applicable

5. Type of Container

- a. LSA (Strong, tight), Type A, Type B - corresponding to 2a
- b. LSA (Strong, tight) - corresponding to 2b
- c. Not applicable
- d. Not applicable

6. Solidification Agent

- a. Not applicable
- b. Not applicable
- c. Not applicable
- d. Not applicable

B. IRRADIATED FUEL SHIPMENTS (Disposition)

No irradiated fuel shipments occurred during the 2001 period.

SECTION III

HOURS AT EACH WIND SPEED AND DIRECTION

This section documents WCGS meteorological data for wind speed, wind direction, and atmospheric stability.

The meteorological data supplied in the following tables covers the period from January 1, 2001, through December 31, 2001, and indicates the number of hours at each wind speed and direction for each stability class. All gaseous releases at the WCGS are ground level releases.

The quantity of missing hours in the following tables is 1110 hours. The lower availability (less than 90%) was due to several factors: equipment out-of-service for a short period of time, short computer down time and the major factor of Wolf Creek's stringent method of calculating data availability. Wolf Creek has approximately 20 different calculations that are used to calculate data availability; any one of these different calculations can cause a questionable data point. All data points in question were discarded. The missing/bad hours represent approximately 13% of the total; therefore, the meteorological tower was available approximately 87% of the time.

PIR 2002-0576 was written March 11, 2002, to evaluate the fact that we did not meet the 90% availability as stated in Regulatory Guide 1.23. The evaluation of the meteorological tower in PIR 2002-0576 is being performed in accordance with the corrective action program.

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
 STABILITY CLASS: A
 ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	1	5	18	37	11	0	72
NNE	0	26	19	9	4	1	59
NE	1	14	4	0	0	0	19
ENE	1	12	14	0	0	0	27
E	0	4	23	8	0	0	35
ESE	0	7	19	8	1	0	35
SE	1	17	38	13	3	0	72
SSE	4	25	91	29	3	3	151
S	2	37	106	139	30	3	317
SSW	1	21	62	97	23	3	207
SW	0	19	29	12	2	0	62
WSW	1	13	11	3	1	0	29
W	1	16	18	13	2	0	50
WNW	2	8	11	21	10	1	53
NW	3	5	11	11	7	1	38
NNW	0	7	28	53	5	0	93
TOTAL	14	236	502	453	102	12	1319

PERIOD OF
 CALM
 (HOURS): 0

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: B
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	5	5	4	2	0	16
NNE	0	10	14	3	2	0	29
NE	2	8	1	0	0	0	11
ENE	1	7	7	0	0	0	15
E	0	5	3	4	0	0	12
ESE	1	8	5	2	0	0	16
SE	0	8	6	1	0	0	15
SSE	0	23	23	14	0	2	62
S	3	18	27	24	8	3	83
SSW	1	7	14	17	11	1	51
SW	3	5	5	1	0	0	14
WSW	7	5	4	0	1	0	17
W	1	9	4	3	0	0	17
WNW	1	1	3	10	8	3	26
NW	0	6	15	14	12	2	49
NNW	0	1	20	15	1	0	37
TOTAL	20	126	156	112	45	11	470

PERIOD OF
CALM
(HOURS): 0

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: C
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	6	9	12	5	0	32
NNE	1	6	13	5	0	0	25
NE	2	5	4	0	0	0	11
ENE	2	4	1	0	0	0	7
E	2	4	7	3	0	0	16
ESE	0	5	6	3	0	0	14
SE	2	11	10	1	0	0	24
SSE	1	27	18	7	2	1	56
S	0	12	23	16	5	2	58
SSW	1	6	12	21	6	1	47
SW	0	3	6	2	1	0	12
WSW	0	4	5	1	1	0	11
W	1	5	2	3	1	1	13
WNW	2	3	6	15	12	1	39
NW	2	1	16	33	7	1	60
NNW	0	3	17	13	2	0	35
TOTAL	16	105	155	135	42	7	460

PERIOD OF
CALM
(HOURS): 0

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: D
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	10	63	23	23	4	123
NNE	2	22	52	30	11	0	117
NE	7	33	34	6	0	0	80
ENE	8	21	38	12	0	0	79
E	5	29	46	13	2	0	95
ESE	9	44	35	12	0	0	100
SE	7	49	65	34	1	0	156
SSE	8	26	114	110	30	11	299
S	4	31	162	166	68	17	448
SSW	4	27	89	84	13	3	220
SW	4	37	26	9	1	2	79
WSW	3	17	22	12	3	2	59
W	3	20	25	18	14	4	84
WNW	5	12	52	31	8	3	111
NW	3	22	55	60	12	0	152
NNW	1	30	69	51	21	3	175
TOTAL	73	430	947	671	207	49	2377

PERIOD OF
CALM
(HOURS): 0

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001

STABILITY CLASS: E

ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	26	22	5	0	0	60
NNE	4	34	26	2	1	0	77
NE	20	34	4	0	0	0	57
ENE	7	40	14	2	1	0	64
E	6	40	33	3	0	0	85
ESE	8	49	36	5	0	0	83
SE	5	67	53	10	2	0	118
SSE	5	64	185	56	26	5	362
S	8	44	175	147	82	18	359
SSW	5	18	63	31	7	1	151
SW	3	43	14	3	1	0	67
WSW	3	18	12	3	0	0	59
W	1	12	18	1	0	0	35
WNW	3	14	20	0	0	0	37
NW	0	42	43	2	0	0	87
NNW	6	73	40	9	0	0	128
TOTAL	84	618	758	279	120	24	1883

PERIOD OF
CALM
(HOURS): 1

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: F
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	2	21	7	0	0	0	30
NNE	7	45	16	0	0	0	68
NE	14	26	0	0	0	0	40
ENE	6	50	3	0	0	0	59
E	1	70	12	0	0	0	83
ESE	7	66	3	0	0	0	76
SE	2	77	19	0	0	0	98
SSE	6	66	29	1	0	0	102
S	0	33	17	7	0	0	57
SSW	4	7	3	1	0	0	15
SW	2	11	2	0	0	0	15
WSW	5	8	3	0	0	0	16
W	1	3	0	0	0	0	4
WNW	3	3	0	1	0	0	7
NW	3	16	8	0	0	0	27
NNW	2	39	5	0	0	0	46
TOTAL	65	541	127	10	0	0	743

PERIOD OF
CALM
(HOURS): 2

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: G
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	14	1	0	0	0	15
NNE	0	37	1	0	0	0	38
NE	18	20	0	0	0	0	38
ENE	6	35	3	0	0	0	44
E	2	44	2	0	0	0	48
ESE	5	56	1	0	0	0	62
SE	3	56	0	0	0	0	59
SSE	1	26	1	0	0	0	28
S	1	5	6	0	0	0	12
SSW	2	2	0	0	0	0	4
SW	0	1	1	0	0	0	2
WSW	1	1	0	0	0	0	2
W	0	1	0	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	7	0	0	0	0	7
NNW	4	28	3	0	0	0	35
TOTAL	43	333	19	0	0	0	395

PERIOD OF
CALM
(HOURS): 0

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: JANUARY 1 THROUGH DECEMBER 31 2001
STABILITY CLASS: ALL
ELEVATION: 10 METERS

WIND DIRECTION	WIND SPEED (mph)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	3	87	125	81	41	4	341
NNE	14	180	141	49	18	1	403
NE	64	140	47	6	0	0	257
ENE	31	169	80	14	1	0	295
E	16	196	126	31	2	0	371
ESE	30	235	105	30	1	0	401
SE	20	285	191	59	6	0	561
SSE	21	257	461	217	61	22	1039
S	18	180	516	499	193	43	1449
SSW	18	88	243	251	60	9	669
SW	12	119	83	27	5	2	248
WSW	20	66	57	19	6	2	170
W	8	66	67	38	17	5	201
WNW	16	41	92	78	38	8	273
NW	11	99	148	120	38	4	420
NNW	13	181	182	141	29	3	549
TOTAL	315	2389	2664	1660	516	103	7647

PERIOD OF
CALM
(HOURS): 3

HOURS
OF
MISSING
DATA: 1110

SECTION IV

This section contains corrected Annual Radioactive Effluent Release Reports covering the period January 1, 1993 through December 31, 2000. PIR 2000-0813 documents discrepancies found in the Effluent Management Software (EMS) Database. The Annual Reports submitted from 1993 to 1998 contained data inconsistent with true data.

The EMS program was placed into service in 1993 to generate the release permits and associated reports. While performing the 1999 Annual Effluent Report a problem was recognized where the values for Fe-55 were positive in Quarters 1 and 2. A comparison was made between the 1998 EMS nuclide tables and the 1998 cumulative tables and several discrepancies were found. The values calculated in the cumulative tables are used to complete the Annual Radioactive Effluent Report. The Annual Radioactive Effluent Reports submitted for 1993-1998 have been manually verified/validated and corrected as necessary. PIR 2001-1834 identifies that the volume released in 2000 was under-reported by 50,000 gallons. The 2000 Annual Radioactive Effluent Release Report was corrected to include the 50,000 gallons. These corrections are being submitted as Attachment I.

SECTION V

ADDITIONAL INFORMATION

1. Unplanned or Abnormal Releases

On December 6, 2001, Waste Gas Decay Tank #1 (THA01A) lost 3.6 psig during the performance of procedure STS IC-470A, "Gaseous Radwaste H₂ and O₂ Monitors HA Train "A"—Channel Calibration/ACOT." The pressure at initiation was 8.8 psig. During the performance of the procedure, GHN0103, Radwaste Vent Effluent Monitor release rate showed a slight increase for 2 hours. After the procedure was completed the tank pressure was 7.6 psig. The pressure had dropped to 5.2 psig when the Waste Gas Compressor was secured. PIR 2001-3064 was written to capture the events. 4.31E-02 curies of Kr-85 and 5.90E-06 curies of Xe-133 were released. This is captured on GRP 2001173. No ODCM limits were exceeded. The cause of this unplanned release was due to an inappropriate valve line-up, where the gas analyzer discharge to the waste gas compressor was open at the same time as the gas analyzer discharge to the Radwaste Building HVAC. Only one should have been open at a time. This provided a flow path so that any time the common downstream discharge to Radwaste HVAC valve was opened, a direct flow path from the Radwaste system to HVAC was opened. This inappropriate valve line up was because of a problem in the gas analyzer discharge valve configuration, which gave indications of the valve being closed when it was actually not fully seated. The gas analyzer discharge valves are located on top of the gas analyzer rack panel. The valve stem and hand wheel are on the front of the panel, while the valve body is behind the panel. The valve is not physically attached to the panel, rather the valve bonnet goes into a cutout in the panel, and is held in place by the gas tubing. Because of this configuration, there is very little to hold the valve from moving in or out of the panel. The as-found condition had the valve bonnets for two analyzers pushed back into the panel, so that the valve had dropped down. In this configuration, when the valve was taken to CLOSE, the hand wheel hit the panel before the valve vent closed. This gave the indication to the operator of the valve being closed when it was not. The valves in question have a work request written to provide support or relief of interference. This work request package is currently in the design phase.

2. Offsite Dose Calculation Manual (ODCM)

The ODCM is in the form of two separate Wolf Creek Nuclear Operating Corporation (WCNOC) administrative procedures. One of these procedures, the WCNOC "Offsite Dose Calculation Manual", AP 07B-003, Revision 4, was revised in 2001; it is included with this report as Attachment II. The other procedure, "Offsite Dose Calculation Manual (Radiological Environmental Monitoring Program), AP 07B-004, Revision 2, was revised in 2001; it is included with this report as Attachment III.

3. Major Changes to Liquid, Solid, or Gaseous Radioactive Waste Treatment Systems

As previously reported in the "1999 Annual Radioactive Effluent Release Report- Report 22", a state-of-the-art filtration system was installed in 1998. Below is a summary of the improvements that were made to the system in 2001.

In July an Ozone (O₃) generation system was installed inline prior to the Tubular Ultrafiltration Unit (TUF) for treatment and destruction of organics, largely oil and grease. Since the installation of the O₃ system, we have extended processing times and rates. This unit can treat the feed stream prior to the TUF, or clean the Reverse Osmosis membranes following a process that has degraded the unit flow to a minimum. With the O₃ unit, TUF cleaning will typically recover the permeate flow to normal conditions within 12 to 24 hours. This method is an improvement over using Sodium Hypochlorite (Bleach). The use of bleach resulted in aggressive corrosion to waste containers. This concentrated solution also reduced the concentration of the reject stream for activity since a high ratio was occupied by the chloride.

Ammonia intrusion has been a significant contributor to recent processing difficulties. The TUF continued to perform reliably, however the ammonia induced a chemical degradation of the Spiral Reverse Osmosis Unit membranes and downstream ion exchangers. New replacement membranes have restored the system performance. A new media was placed into the flow path with the WPS demineralizers to remove ammonia prior to the other operating demins. This media has performed well and has enabled WCNOG to regain our processing goal.

4. Land Use Census

No new locations for dose calculation were identified during this report period.

5. Radwaste Shipments

Seventeen shipments of radioactive waste occurred during this report period. Section II, Subsection 3, of this report contains specific details regarding each shipment's mode of transportation and destination.

6. Inoperability of Effluent Monitoring Instrumentation

No events occurred that violated ODCM Requirements Tables 2-2 and 3-2, liquid or gaseous effluent monitoring instrumentation.

7. Storage Tanks

At no time during the year 2001 was there an event that lead to liquid holdup tanks or gas storage tanks exceeding the limits of Technical Requirements Manual Sections 3.10.1 or 3.10.3 . Technical Specification requirements for the program are now covered by Technical Requirements Manual Section 3.10, "Explosive Gas and Storage Tank Radioactivity Monitoring."

ATTACHMENT I

Corrections to the Annual Radioactive Effluent Reports covering the reporting period from January 1, 1993, through December 31, 2000, are being submitted as Attachment I. Only the corrected pages are being submitted.

1993 Annual Report

This report was reviewed and no errors were identified.

**1994 Annual Report
Liquid Effluents - 1994**

<u>Nuclides Released</u>	<u>Unit</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
H-3	Ci	4.55E-01	5.60E-01	4.54E+02	1.61E+02
Cr-51	Ci	0.00E+00	0.00E+00	3.30E-05	0.00E+00
Mn-54	Ci	<5.36E-02	<4.75E-02	2.34E-04	3.68E-04
Fe-55	Ci	<1.07E-01	<9.50E-02	6.05E-03	4.87E-03
Fe-59	Ci	<5.36E-02	<4.75E-02	<5.13E-04	<3.34E-04
Co-57	Ci	0.00E+00	0.00E+00	1.33E-04	3.12E-05
Co-58	Ci	6.58E-07	<4.75E-02	5.02E-03	5.15E-04
Co-60	Ci	2.74E-07	<4.75E-02	5.73E-03	7.81E-03
Zn-65	Ci	<5.36E-02	<4.75E-02	<5.13E-04	<3.34E-04
Sr-89	Ci	<5.36E-03	<4.75E-03	<5.13E-05	<3.34E-05
Sr-90	Ci	<5.36E-03	<4.75E-03	<5.13E-05	1.16E-05
Nb-95	Ci	0.00E+00	0.00E+00	7.76E-05	0.00E+00
Tc-99M	Ci	0.00E+00	0.00E+00	0.00E+00	3.66E-05
Mo-99	Ci	<5.36E-02	<4.75E-02	<5.13E-04	<3.34E-04
Ag-110M	Ci	0.00E+00	0.00E+00	3.40E-06	5.49E-05
Sn-113	Ci	0.00E+00	0.00E+00	3.34E-06	0.00E+00
Sn-117M	Ci	0.00E+00	0.00E+00	9.53E-06	0.00E+00
Sb-125	Ci	7.33E-07	0.00E+00	4.86E-03	8.90E-04
I-131	Ci	<1.07E-01	<9.50E-02	4.97E-05	2.66E-04
I-133	Ci	0.00E+00	0.00E+00	6.10E-06	1.30E-05
Cs-134	Ci	<5.36E-02	<4.75E-02	3.98E-04	4.21E-04
Cs-137	Ci	<5.36E-02	<4.75E-02	5.23E-04	5.85E-04
La-140	Ci	0.00E+00	0.00E+00	0.00E+00	6.40E-06
Ce-141	Ci	<5.36E-02	<4.75E-02	<5.13E-04	<3.34E-04
Ce-144	Ci	<5.36E-02	<4.75E-02	<5.13E-04	1.03E-04
Ar-41	Ci	<1.07E+00	<9.50E-01	<1.03E-02	<6.68E-03
Kr-85M	Ci	<1.07E+00	<9.50E-01	1.05E-05	<6.68E-03
Kr-85	Ci	<1.07E+00	<9.50E-01	<1.03E-02	3.06E-03
Kr-87	Ci	<1.07E+00	<9.50E-01	<1.03E-02	<6.68E-03
Kr-88	Ci	<1.07E+00	<9.50E-01	<1.03E-02	<6.68E-03
Xe-131M	Ci	<1.07E+00	<9.50E-01	1.15E-03	2.45E-03
Xe-133M	Ci	<1.07E+00	<9.50E-01	1.10E-03	7.02E-04
Xe-133	Ci	<1.07E+00	<9.50E-01	1.18E-01	1.46E-01
Xe-135	Ci	<1.07E+00	<9.50E-01	1.26E-03	8.02E-05
Xe-138	Ci	<1.07E+00	<9.50E-01	<1.03E-02	<6.68E-03
G-ALPHA	Ci	<1.07E-02	<9.50E-03	5.52E-05	5.03E-06
PERIOD	Ci	4.55E-01	5.60E-01	4.54E+02	1.61E+02
TOTAL					

NOTE: Less than values are calculated using the lower limit of detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

LIQUID EFFLUENTS - 1994

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci	1.54E-02	1.27E-02	3.30E+02	2.70E+01
Na-24	Ci	0.00E+00	0.00E+00	4.02E-06	3.34E-05
Cr-51	Ci	0.00E+00	0.00E+00	4.88E-03	3.02E-02
Mn-54	Ci	<1.35E-03	<4.23E-02	1.07E-03	1.82E-03
Fe-55	Ci	<2.70E-03	<8.47E-02	1.61E-02	9.48E-03
Fe-59	Ci	<1.35E-03	<4.23E-02	1.05E-03	3.19E-03
Co-57	Ci	0.00E+00	0.00E+00	1.20E-04	2.50E-04
Co-58	Ci	<1.35E-03	<4.23E-02	4.58E-02	7.09E-02
Co-60	Ci	<1.35E-03	<4.23E-02	2.10E-02	1.39E-02
Zn-65	Ci	<1.35E-03	<4.23E-02	<1.15E-03	<6.33E-04
Rb-88	Ci	0.00E+00	0.00E+00	5.49E-04	0.00E+00
Sr-89	Ci	<1.35E-04	<4.23E-03	<1.15E-04	<6.33E-05
Sr-90	Ci	<1.35E-04	<4.23E-03	<1.15E-04	<6.33E-05
Sr-92	Ci	0.00E+00	0.00E+00	2.90E-06	0.00E+00
Zr-95	Ci	0.00E+00	0.00E+00	3.05E-04	3.96E-03
Mo-99	Ci	<1.35E-03	<4.23E-02	<1.15E-03	<6.33E-04
Nb-95	Ci	0.00E+00	0.00E+00	4.25E-04	6.81E-03
TC-99M	Ci	0.00E+00	0.00E+00	7.56E-05	4.70E-05
Ru-103	Ci	0.00E+00	0.00E+00	1.00E-04	6.34E-04
Ag-110M	Ci	0.00E+00	0.00E+00	5.34E-05	0.00E+00
Sn-113	Ci	0.00E+00	0.00E+00	5.11E-05	6.08E-04
Sn-117M	Ci	0.00E+00	0.00E+00	1.01E-03	3.16E-05
Sb-124	Ci	0.00E+00	0.00E+00	1.49E-04	3.08E-03
Sb-125	Ci	0.00E+00	0.00E+00	6.16E-03	4.32E-02
Sb-126	Ci	0.00E+00	0.00E+00	0.00E+00	8.93E-05
I-131	Ci	<2.70E-03	<8.47E-02	6.85E-03	5.98E-03
I-132	Ci	0.00E+00	0.00E+00	0.00E+00	6.56E-05
I-133	Ci	0.00E+00	0.00E+00	4.51E-05	4.25E-04
I-135	Ci	0.00E+00	0.00E+00	0.00E+00	3.16E-05
Cs-134	Ci	<1.35E-03	<4.23E-02	1.84E-03	9.24E-04
Cs-137	Ci	<1.35E-03	<4.23E-02	2.47E-03	9.16E-04
La-140	Ci	0.00E+00	0.00E+00	1.58E-04	8.43E-05
Ce-141	Ci	<1.35E-03	<4.23E-02	<1.15E-03	5.14E-05
Ce-144	Ci	<1.35E-03	<4.23E-02	2.05E-04	2.83E-04
Hf-181	Ci	0.00E+00	0.00E+00	0.00E+00	1.09E-04
Ar-41	Ci	<2.70E-02	<8.47E-01	<2.29E-02	<1.26E-02
Kr-85M	Ci	<2.70E-02	<8.47E-01	1.84E-03	<1.26E-02
Kr-85	Ci	<2.70E-02	<8.47E-01	2.29E-01	2.50E-03
Kr-87	Ci	<2.70E-02	<8.47E-01	<2.29E-02	<1.26E-02
Kr-88	Ci	<2.70E-02	<8.47E-01	2.31E-04	<1.26E-02
Xe-131M	Ci	<2.70E-02	<8.47E-01	2.40E-01	4.17E-03
Xe-133M	Ci	<2.70E-02	<8.47E-01	2.75E-01	<1.26E-02
Xe-133	Ci	5.03E-04	1.16E-03	2.62E+01	2.52E-02
Xe-135	Ci	<2.70E-02	<8.47E-01	1.83E-01	1.07E-04
Xe-138	Ci	<2.70E-02	<8.47E-01	<2.29E-02	<1.26E-02
G-ALPHA	Ci	<2.70E-04	<8.47E-03	2.98E-05	9.37E-06
PERIOD TOTAL	Ci	1.59E-02	1.39E-02	3.57E+02	2.73E+01

NOTE: Less than values are calculated using the lower limit of detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

REPORT OF RADIOACTIVE EFFLUENT (1994) AIRBORNE

Type of Effluent	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
A. Fission and Activation Gases					
1. Total Release	Ci	1.33E+01	2.26E+01	4.95E+02	4.06E+00
2. Average Release Rate for Period	μCi/sec	1.71E+00	2.87E+00	6.23E+01	5.11E-01
3. Percent of ODCM Limit (1)	%	2.47E-02	2.72E-02	3.83E-01	3.25E-03
B. Iodines (Iodine-131)					
1. Total Release	Ci	0.00E+00	0.00E+00	1.64E-04	1.72E-04
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00	2.06E-05	2.17E-05
3. Percent of ODCM Limit (2)	%	0.00E+00	0.00E+00	1.64E-02	1.72E-02
C. Particulates (Half lives > 8 days)					
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	5.00E-06
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00	0.00E+00	6.30E-07
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00	0.00E+00	3.55E-05
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
1. Total Release	Ci	4.93E+00	6.67E+00	6.42E+00	6.72E+00
2. Average Release Rate for Period	μCi/sec	6.56E-01	8.22E-01	8.08E-01	8.45E-01
3. Percent of ODCM Limit (4)	%	5.02E-02	6.49E-02	6.12E-02	5.89E-02

- 1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

- 2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total curies of Iodine-131})(100)}{1 \text{ Curie}}$$

- 3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose due to Particulates})(100)}{7.5 \text{ mrem}}$$

- 4) The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H-3})(100)}{7.5 \text{ mrem}}$$

NOTE: This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates.

GASEOUS EFFLUENTS - 1994

<u>Nuclides Released</u>	<u>Unit</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
1. Fission Gases					
Ar-41	Ci	0.00E+00	0.00E+00	3.75E-01	3.08E-01
Kr-85M	Ci	9.20E-02	8.47E-02	0.00E+00	1.99E-05
Kr-85	Ci	0.00E+00	0.00E+00	1.50E+00	2.21E+00
Kr-87	Ci	<1.48E+01	1.05E-01	<2.83E-02	<1.75E-02
Kr-88	Ci	<1.94E+01	2.10E-01	<3.70E-02	<2.30E-02
Xe-131M	Ci	0.00E+00	0.00E+00	0.00E+00	1.48E-03
Xe-133M	Ci	<3.84E+01	<4.06E+01	2.43E-04	2.11E-03
Xe-133	Ci	4.67E+00	1.47E+01	8.40E-02	2.20E-01
Xe-135	Ci	6.40E+00	4.88E+00	1.48E-03	6.75E-03
Xe-138	Ci	<9.10E+01	<9.60E+01	<1.73E-01	<1.08E-01
Total for Period	Ci	1.13E+01	2.00E+01	1.96E+00	2.75E+00
2. Iodines					
I-131	Ci	<2.53E-04	<2.67E-04	<4.81E-07	<2.99E-07
I-133	Ci	<2.53E-02	<2.67E-03	<4.81E-05	<2.99E-05
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates & Tritium					
H-3	Ci	4.43E+00	6.26E+00	4.98E-01	4.06E-01
Mn-54	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Fe-59	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Co-58	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Co-60	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Zn-65	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Sr-89	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Sr-90	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Mo-99	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Cs-134	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Cs-137	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Ce-141	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
Ce-144	Ci	<2.53E-03	<2.67E-03	<4.81E-06	<2.99E-06
G-Alpha	Ci	<2.53E-03	5.49E-08	<4.81E-06	<2.99E-06
Total for Period	Ci	4.43E+00	6.26E+00	4.98E-01	4.06E-01

NOTE: Less than values for Noble Gases are calculated using the lower limit of detection (LLD) values obtained at WCGS multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used. The less than values are not included in the summation for the total release values.

GASEOUS CUMULATIVE DOSE SUMMARY 1994
Table 2

<u>Nuclides Released</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Total</u>
A. Fission and Activation					
1. Total Release (Ci)	1.33E+01	2.26E+01	4.95E+02	4.06E+00	5.35E+02
2. Total Gamma Airdose (mrad)	1.24E-03	1.51E-03	1.44E-02	1.58E-04	1.71E-02
3. Gamma Airdose Limit (mrad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Gamma Airdose Limit	2.47E-02	3.02E-02	2.88E-01	3.16E-03	1.71E-01
5. Total Beta Airdose (mrad)	1.77E-03	2.38E-03	3.83E-02	3.25E-04	4.28E-02
6. Beta Airdose Limit (mrad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
7. Percent of Beta Airdose Limit (mrad)	1.77E-02	2.38E-02	3.83E-01	3.25E-03	2.14E-01
B. Particulates					
1. Total Particulates (Ci)	0.00E+00	0.00E+00	0.00E+00	5.00E-06	5.00E-06
2. Maximum Organ Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	2.66E-06	2.66E-06
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	0.00E+00	3.55E-05	1.77E-05
C. Tritium					
1. Total Particulates (Ci)	4.93E+00	6.67E+00	6.42E+00	6.72E+00	2.47E+01
2. Maximum Organ Dose (mrem)	3.76E-03	4.86E-03	4.59E-03	4.42E-03	1.76E-02
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	5.02E-02	6.49E-02	6.12E-02	5.89E-02	1.17E-01
D. Iodine					
1. Total I-131, I-133 (Ci)	0.00E+00	0.00E+00	1.64E-04	1.72E-04	3.36E-04
2. Maximum Organ Dose (mrem)	0.00E+00	0.00E+00	1.67E-01	2.56E-02	1.93E-01
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	2.23E+00	3.41E-01	1.28E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. The maximum organ dose is calculated using Wolf Creek ODCM methodology which assumes that an individual actually resides at the release point. ODCM Section 3.2.2 organ dose limits are used.

1994 PERCENTAGE EFFLUENT CONCENTRATION LIMIT

<u>Nuclides</u>	<u>Curies</u>	<u>Average Diluted Concentration (μCi/ml)</u>	<u>10 CFR20 ECL</u>	<u>% of ECL</u>
H-3	9.73E+02	1.62E-05	1E-03	1.62E+00
Na-24	3.74E-05	6.22E-13	5E-05	1.24E-06
Cr-51	3.51E-02	5.84E-10	5E-04	1.17E-04
Mn-54	3.49E-03	5.80E-11	3E-05	1.93E-04
Fe-55	6.21E-02	1.03E-09	1E-04	1.03E-03
Fe-59	4.24E-03	7.05E-11	1E-05	7.05E-04
Co-57	5.34E-04	8.88E-12	6E-05	1.48E-05
Co-58	1.22E-01	2.03E-09	2E-05	1.02E-02
Co-60	4.84E-02	8.05E-10	3E-06	2.68E-02
Rb-88	5.49E-04	9.13E-12	4E-04	2.28E-06
Sr-90	1.16E-05	1.93E-13	5E-07	3.86E-05
Sr-92	2.90E-06	4.82E-14	4E-05	1.20E-07
Zr-95	4.26E-03	7.08E-11	2E-05	3.54E-06
Nb-95	7.31E-03	1.22E-10	3E-05	4.07E-04
TC-99M	1.59E-04	2.64E-12	1E-03	2.64E-07
Ru-103	7.34E-04	1.22E-11	3E-05	4.07E-04
Ag-110M	1.12E-04	1.86E-12	6E-06	3.10E-05
Sn-113	7.74E-04	1.29E-11	3E-05	4.30E-05
Sn-117M	1.05E-03	1.75E-11	3E-05	5.83E-05
Sb-124	3.23E-03	5.37E-11	7E-06	7.67E-04
Sb-125	5.51E-02	9.16E-10	3E-05	3.05E-03
Sb-126	8.93E-05	1.48E-12	7E-06	2.11E-05
I-131	1.31E-02	2.18E-10	1E-06	2.18E-02
I-132	6.56E-05	1.09E-12	1E-04	1.09E-06
I-133	4.89E-04	8.13E-12	7E-06	1.16E-04
I-135	3.16E-05	5.25E-13	3E-05	1.75E-06
Cs-134	3.58E-03	5.95E-11	9E-07	6.61E-04
Cs-137	4.49E-03	7.47E-11	1E-06	7.47E-03
La-140	2.42E-04	4.02E-12	9E-06	4.47E-05
Ce-141	5.14E-05	8.55E-13	3E-05	2.85E-06
Ce-144	5.91E-04	2.60E-12	3E-06	8.67E-05
Hf-181	1.09E-04	1.81E-12	2E-05	9.05E-06
Kr-85M	1.85E-03	8.13E-12	2E-04	4.07E-06
Kr-85	2.35E-01	3.91E-09	2E-04	1.05E-05
Kr-88	2.31E-04	3.84E-12	2E-04	1.92E-06
Xe-131M	2.48E-01	4.12E-09	2E-04	2.06E-03
Xe-133	2.65E+01	4.41E-07	2E-04	2.20E-01
Xe-133M	2.77E-01	4.61E-09	2E-04	2.30E-03
Xe-135	4.61E-01	7.66E-09	2E-04	3.83E-05

1995 Annual Report

LIQUID EFFLUENTS - 1995

<u>Nuclides Released</u>	<u>Unit</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
H-3	Ci	1.77E-01	1.73E-01	2.86E+02	2.89E+02
Cr-51	Ci	0.00E+00	0.00E+00	2.41E-04	2.11E-04
Mn-54	Ci	<1.22E-02	<1.74E-02	1.04E-03	8.00E-03
Fe-55	Ci	<2.45E-02	<3.48E-02	3.50E-02	1.34E-01
Fe-59	Ci	<1.22E-02	<1.74E-02	5.59E-05	<7.14E-04
Co-57	Ci	0.00E+00	0.00E+00	5.61E-05	5.78E-04
Co-58	Ci	<1.22E-02	<1.74E-02	4.52E-03	1.55E-02
Co-60	Ci	<1.22E-02	<1.74E-02	9.17E-03	1.04E-01
Zn-65	Ci	<1.22E-02	<1.74E-02	<4.39E-04	<7.14E-04
Rb-88	Ci	0.00E+00	0.00E+00	0.00E+00	8.80E-04
Sr-89	Ci	<1.22E-03	<1.74E-03	<4.39E-05	<7.14E-05
Sr-90	Ci	<1.22E-03	<1.74E-03	<4.39E-05	2.71E-05
Sr-92	Ci	0.00E+00	0.00E+00	0.00E+00	2.56E-06
Zr-95	Ci	0.00E+00	0.00E+00	4.76E-04	1.37E-03
Nb-95	Ci	0.00E+00	0.00E+00	8.85E-04	3.64E-03
Mo-99	Ci	<1.22E-02	<1.74E-02	<4.39E-04	<7.14E-04
Ru-103	Ci	0.00E+00	0.00E+00	1.67E-06	0.00E+00
Ag-110M	Ci	0.00E+00	0.00E+00	1.85E-04	2.28E-03
Sn-113	Ci	0.00E+00	0.00E+00	2.05E-04	7.61E-04
Sn-117M	Ci	0.00E+00	0.00E+00	0.00E+00	2.50E-04
Sb-125	Ci	0.00E+00	0.00E+00	1.27E-02	3.13E-02
I-131	Ci	<2.45E-02	<3.48E-02	<8.78E-04	<1.43E-03
Cs-134	Ci	<1.22E-02	<1.74E-02	4.80E-04	2.37E-03
Cs-137	Ci	<1.22E-02	<1.74E-02	9.47E-04	3.90E-03
La-140	Ci	0.00E+00	0.00E+00	1.22E-06	0.00E+00
Ce-141	Ci	<1.22E-02	<1.74E-02	<4.39E-04	<7.14E-04
Ce-144	Ci	<1.22E-02	<1.74E-02	<4.39E-04	6.83E-04
Ar-41	Ci	<2.45E-01	<3.48E-01	<8.78E-03	<1.43E-02
Kr-85M	Ci	<2.45E-01	<3.48E-01	<8.78E-03	3.66E-04
Kr-85	Ci	<2.45E-01	<3.48E-01	5.30E-02	9.31E-02
Kr-87	Ci	<2.45E-01	<3.48E-01	<8.78E-03	<1.43E-02
Kr-88	Ci	<2.45E-01	<3.48E-01	<8.78E-03	4.37E-05
Xe-131M	Ci	<2.45E-01	<3.48E-01	2.71E-02	7.43E-02
Xe-131	Ci	<2.45E-01	<3.48E-01	<8.78E-03	<1.43E-02
Xe-133M	Ci	<2.45E-01	<3.48E-01	1.71E-02	3.11E-02
Xe-133	Ci	<2.45E-01	<3.48E-01	2.15E+00	4.22E+00
Xe-135	Ci	<2.45E-01	<3.48E-01	3.34E-03	1.85E-02
Xe-138	Ci	<2.45E-01	<3.48E-01	<8.78E-03	<1.43E-02
G-ALPHA	Ci	<2.45E-03	<3.48E-03	1.72E-06	8.75E-05
PERIOD TOTAL	Ci	1.77E-01	1.73E-01	2.88E+02	2.93E+02

NOTE: Less than values are calculated using the lower limit of detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

REPORT OF RADIOACTIVE EFFLUENT 1995 - AIRBORNE

Type of Effluent	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
A. Fission and Activation Gases					
1. Total Release	Ci	3.36E+01	6.64E-01	2.10E+01	2.31E+01
2. Average Release Rate for Period	μ Ci/sec	4.33E+00	8.45E-02	2.64E+00	2.91E+00
3. Percent of ODCM Limit (1)	%	4.62E-02	1.68E-03	1.57E-02	1.71E-02
B. Iodines (Iodine-131)					
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of ODCM Limit (2)	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates (Half lives > 8 days)					
1. Total Release	Ci	0.00E+00	0.00E+00	1.03E-06	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00	1.30E-07	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00	1.90E-04	0.00E+00
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
1. Total Release	Ci	7.85E+00	5.60E+00	6.61E+00	3.89E+00
2. Average Release Rate for Period	μCi/sec	1.01E+00	7.24E-01	8.32E-01	4.89E-01
3. Percent of ODCM Limit (4)	%	7.65E-02	5.23E-02	6.16E-02	3.58E-02

- The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

- The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total curies of Iodine-131})(100)}{1 \text{ Curie}}$$
- The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose due to Particulates})(100)}{7.5 \text{ mrem}}$$
- The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H-3})(100)}{7.5 \text{ mrem}}$$

NOTE: This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates.

GASEOUS EFFLUENTS - 1995

<u>Nuclides Released</u>	<u>Unit</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
1. Fission Gases					
Ar-41	Ci	0.00E+00	0.00E+00	9.18E-02	1.02E-01
Kr-85M	Ci	0.00E+00	6.45E-02	0.00E+00	0.00E+00
Kr-85	Ci	1.12E+01	0.00E+00	2.12E+01	0.00E+00
Kr-87	Ci	<1.95E+01	<1.93E+01	<6.72E-03	<6.39E-03
Kr-88	Ci	<2.26E+01	<2.24E+01	<7.79E-03	<7.41E-03
Xe-131M	Ci	0.00E+00	0.00E+00	7.81E-03	0.00E+00
Xe-133M	Ci	<4.28E+01	<4.23E+01	<1.47E-02	<1.40E-02
Xe-133	Ci	<1.25E+01	4.92E-01	7.59E-03	4.59E-03
Xe-135	Ci	9.76E-01	<5.14E+00	7.42E-05	<1.70E-03
Xe-138	Ci	<8.07E+02	<7.98E+02	<2.78E-01	<2.64E-01
Total for Period	Ci	1.23E+01	5.56E-01	2.13E+01	1.07E-01
2. Iodines					
I-131	Ci	<2.71E-04	<2.68E-04	<9.32E-08	<8.86E-08
I-133	Ci	<2.71E-02	<2.68E-04	<9.32E-06	<8.86E-06
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates & Tritium					
H-3	Ci	7.75E+00	5.38E+00	8.76E-02	1.41E-01
Mn-54	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Fe-59	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Co-58	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Co-60	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Zn-65	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Sr-89	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Sr-90	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Mo-99	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Cs-134	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Cs-137	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Ce-141	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Ce-144	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
G-Alpha	Ci	<2.71E-03	<2.68E-03	<9.32E-07	<8.86E-07
Total for Period	Ci	7.75E+00	5.38E+00	8.76E-02	1.41E-01

NOTE: Less than values for Noble Gases are calculated using the lower limit of detection (LLD) values obtained at WCGS multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used. The less than values are not included in the summation for the total release values.

GASEOUS EFFLUENTS - 1995

<u>Nuclides</u> <u>Released</u>	<u>Unit</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
1. Fission Gases					
Ar-41	Ci	0.00E+00	0.00E+00	1.47E-01	1.26E-01
Kr-85M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-85	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-87	Ci	<1.92E+01	<1.88E+01	<8.92E-03	<7.00E-03
Kr-88	Ci	<2.22E+01	<2.18E+01	<1.03E-02	<8.12E-03
Xe-131M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-133	Ci	2.05E+01	2.26E+01	1.36E-01	2.65E-01
Xe-133M	Ci	<4.20E+01	<4.13E+01	<1.96E-02	<1.53E-02
Xe-135	Ci	1.67E-01	2.53E-02	6.06E-04	8.07E-03
Xe-138	Ci	<7.92E+02	<7.78E+02	<3.69E-01	<2.89E-01
Total for Period	Ci	2.07E+01	2.27E+01	2.83E-01	3.99E-01
2. Iodines					
I-131	Ci	<2.66E-04	<2.61E-04	<1.24E-07	<9.71E-08
I-133	Ci	<2.66E-02	<2.61E-02	<1.24E-05	<9.71E-06
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	6.21E+00	3.82E+00	3.78E-01	6.85E-02
Mn-54	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Fe-59	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Co-58	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Co-60	Ci	1.03E-06	<2.61E-03	<1.24E-06	<9.71E-07
Zn-65	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Sr-89	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Sr-90	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Mo-99	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Cs-134	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Cs-137	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Ce-141	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Ce-144	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
G-Alpha	Ci	<2.66E-03	<2.61E-03	<1.24E-06	<9.71E-07
Total for Period	Ci	6.21E+00	3.82E+00	3.78E-01	6.85E-02

NOTE: Less than values for Noble Gases are calculated using the LLD values obtained at WCGS multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used. The less than values are not included in the summation for the total release values.

GASEOUS CUMULATIVE DOSE SUMMARY (1995)
Table 2

<u>Nuclides Released</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Total</u>
A. Fission and Activation					
1. Total Release (Ci)	3.36E+01	6.64E-01	2.10E+01	2.31E+01	7.84E+01
2. Total Gamma Airdose (mrad)	2.44E-04	8.43E-05	6.27E-04	6.50E-04	1.60E-03
3. Gamma Airdose Limit (mrad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Gamma Airdose Limit	4.88E-03	1.68E-03	1.25E-02	1.30E-02	1.60E-02
5. Total Beta Airdose (mrad)	4.62E-03	6.87E-05	1.57E-03	1.71E-03	7.98E-03
6. Beta Airdose Limit (mrad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
7. Percent of Beta Airdose Limit (mrad)	4.62E-02	6.87E-04	1.57E-02	1.71E-02	3.99E-02
B. Particulates					
1. Total Particulates (Ci)	0.00E+00	0.00E+00	1.03E-06	0.00E+00	1.03E-06
2. Maximum Organ Dose (mrem)	0.00E+00	0.00E+00	1.42E-05	0.00E+00	1.42E-05
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	1.90E-04	0.00E+00	1.90E-04
C. Tritium					
1. Total Particulates (Ci)	7.84E+00	5.60E+00	6.61E+00	3.89E+00	2.40E+01
2. Maximum Organ Dose (mrem)	5.74E-03	3.92E-03	4.62E-03	2.69E-03	1.69E-02
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	7.65E-02	5.23E-02	6.16E-02	3.58E-02	1.13E-01
D. Iodine					
1. Total I-131, I-133 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Maximum Organ Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Organ Dose Limit (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. The maximum organ dose is calculated using Wolf Creek ODCM methodology which assumes that an individual actually resides at the release point. ODCM Section 3.2.2 organ dose limits are used.

1996 Annual Report

REPORT OF RADIOACTIVE EFFLUENTS (1996) LIQUID

<u>Type of Effluent</u>	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
A. Fission and Activation Products			
1. Total Release (not including tritium, gases, alpha)	Ci	8.10E-01	3.07E-01
2. Average Diluted Concentration During Period	μCi/ml	6.18E-08	6.65E-09
3. Percent of Applicable Limit (1)	%	1.62E+01	6.10E+00
B. Tritium			
1. Total Release	Ci	2.12E+02	7.57E+01
2. Average Diluted Concentration During Period	μCi/ml	1.62E-05	1.64E-06
3. Percent of Applicable Limit (MPC) (2) (ECL)	% %	1.62E+00 5.40E-01	1.64E-01 5.47E-02
C. Dissolved and Entrained Gases			
1. Total Release	Ci	9.75E+00	1.28E-02
2. Average Diluted Concentration During Period	μCi/ml	7.44E-07	2.78E-10
3. Percent of Applicable Limit (3)	%	3.70E-01	1.39E-04
D. Gross Alpha Radioactivity			
1. Total Release	Ci	2.79E-03	7.98E-06
E. Volume of Waste Release (prior to dilution)			
	Liters	4.62E+07	8.25E+07
F. Volume of Dilution Water Used			
	Liters	1.31E+10	4.60E+10

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water-Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table II} / 2 \text{ 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

REPORT OF RADIOACTIVE EFFLUENTS (1996) LIQUID

<u>Type of Effluent</u>	<u>Unit</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
A. Fission and Activation Products			
1. Total Release (not including tritium, gases, alpha)	Ci	4.91E-02	2.11E-02
2. Average Diluted Concentration During Period	µCi/ml	3.61E-09	2.86E-09
3. Percent of Applicable Limit (1)	%	9.82E-01	4.22E-01
B. Tritium			
1. Total Release	Ci	1.69E+02	5.98E+01
2. Average Diluted Concentration During Period	µCi/ml	1.24E-05	8.09E-06
3. Percent of Applicable Limit (MPC) (2)	%	1.24E+00	8.09E-01
(ECL)	%	4.14E-01	2.70E-01
C. Dissolved and Entrained Gases			
1. Total Release	Ci	6.75E-03	5.94E-06
2. Average Diluted Concentration During Period	µCi/ml	4.97E-10	8.04E-13
3. Percent of Applicable Limit (3)	%	2.48E-04	4.02E-07
D. Gross Alpha Radioactivity			
1. Total Release	Ci	8.92E-06	8.60E-06
E. Volume of Waste Release (prior to dilution)	Liters	2.79E+07	1.78E+07
F. Volume of Dilution Water Used	Liters	1.36E+10	7.38E+09

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water-Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table II} / 2 \text{ 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

LIQUID EFFLUENTS 1996
Continuous Mode

Batch Mode

NUCLIDES RELEASED	Unit	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
Sb-126	Ci	n/a	n/a	2.61E-05	n/a
H-3	Ci	2.79E-01	4.89E-01	2.12E+02	7.52E+01
Cr-51	Ci	n/a	n/a	7.83E-02	2.53E-02
Mn-54	Ci	<1.69E-02	<7.49E-02	2.31E-02	4.83E-03
Fe-55	Ci	<3.38E-02	<1.50E-01	3.39E-01	1.09E-01
Fe-59	Ci	<1.69E-02	<7.49E-02	2.95E-03	3.12E-03
Co-57	Ci	n/a	n/a	1.33E-03	3.53E-04
Co-58	Ci	4.11E-05	<7.49E-02	1.50E-01	5.76E-02
Co-60	Ci	5.82E-05	<7.49E-02	1.26E-01	2.59E-02
Zn-65	Ci	<1.69E-02	<7.49E-02	<3.64E-04	<3.05E-04
Sr-89	Ci	<1.69E-03	<7.49E-03	<3.64E-05	<3.05E-05
Sr-90	Ci	<1.69E-03	<7.49E-03	4.01E-05	<3.05E-05
Hf-181	Ci	n/a	n/a	1.26E-04	n/a
Nb-95	Ci	n/a	n/a	1.32E-02	7.39E-03
Zr-95	Ci	n/a	n/a	9.54E-03	4.22E-03
Mo-99	Ci	<1.69E-02	<7.49E-03	5.82E-04	<3.05E-04
Ag-110m	Ci	n/a	n/a	8.47E-04	1.22E-04
Sn-113	Ci	n/a	n/a	1.59E-03	3.64E-04
Sn-117m	Ci	n/a	n/a	6.07E-04	n/a
Sb-125	Ci	n/a	n/a	5.38E-02	6.04E-02
I-131	Ci	1.12E-05	<1.50E-01	2.44E-03	<3.05E-04
Cs-134	Ci	3.61E-05	<7.49E-02	1.47E-03	9.33E-04
Cs-137	Ci	3.01E-05	<7.49E-02	2.84E-03	9.73E-04
Ce-141	Ci	<1.69E-02	<7.49E-02	1.91E-04	6.11E-05
Ce-144	Ci	<1.69E-02	<7.49E-02	2.23E-03	9.26E-04
Gross Alpha	Ci	<3.38E-03	<1.50E-02	2.79E-03	7.98E-06
Ar-41	Ci	<3.38E-01	<1.50E+00	<7.28E-03	<6.11E-03
Kr-85m	Ci	<3.38E-01	<1.50E+00	<7.28E-03	<6.11E-03
Kr-85	Ci	<3.38E-01	<1.50E+00	3.04E-01	<6.11E-03
Kr-87	Ci	<3.38E-01	<1.50E+00	<7.28E-03	<6.11E-03
Kr-88	Ci	<3.38E-01	<1.50E+00	<7.28E-03	<6.11E-03
Xe-131m	Ci	<3.38E-01	<1.50E+00	1.75E-01	1.16E-02
Xe-133m	Ci	<3.38E-01	<1.50E+00	5.51E-02	<6.11E-03
Xe-133	Ci	1.17E-03	<1.50E+00	9.21E+00	9.65E-04
Xe-135m	Ci	<3.38E-01	<1.50E+00	<7.28E-03	<6.11E-03
Xe-135	Ci	<3.38E-01	<1.50E+00	9.73E-04	2.27E-04
Tc-99m	Ci	n/a	n/a	5.36E-04	n/a
Ru-103	Ci	n/a	n/a	1.04E-03	9.36E-04
Ru-106	Ci	n/a	n/a	8.10E-04	n/a
Sb-124	Ci	n/a	n/a	1.34E-03	2.82E-03
Te-132	Ci	n/a	n/a	8.91E-05	n/a
I-132	Ci	n/a	n/a	1.28E-04	n/a
Ba-140	Ci	n/a	n/a	5.18E-04	n/a
La-140	Ci	n/a	n/a	1.29E-03	n/a
Np-239	Ci	n/a	n/a	6.33E-04	n/a

NOTE

Less than values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

LIQUID EFFLUENTS - 1996

NUCLIDES RELEASED	Unit	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
H-3	Ci	2.17E-01	1.75E-01	1.69E+02	5.98E+01
Cr-51	Ci	n/a	n/a	3.31E-04	6.20E-04
Mn-54	Ci	<1.62E-02	<8.88E-03	1.43E-03	7.93E-04
Fe-55	Ci	<1.78E-02	<2.34E-01	1.31E-02	6.92E-03
Fe-59	Ci	<1.62E-02	<8.88E-03	<1.41E-04	3.03E-05
Co-57	Ci	n/a	n/a	4.99E-05	4.95E-05
Co-58	Ci	<1.62E-02	<8.88E-03	3.97E-03	4.98E-03
Co-60	Ci	<1.62E-02	<8.88E-03	9.52E-03	5.05E-03
Zn-65	Ci	<1.62E-02	<8.88E-03	<1.41E-04	<7.27E-05
Sr-89	Ci	<1.62E-03	<8.88E-04	<1.41E-05	<7.27E-06
Sr-90	Ci	<1.62E-03	<8.88E-04	<1.41E-05	<7.27E-06
Sr-92	Ci	n/a	n/a	n/a	2.11E-06
Nb-95	Ci	n/a	n/a	6.59E-04	1.39E-03
Zr-95	Ci	n/a	n/a	2.88E-04	7.31E-04
Mo-99	Ci	<1.62E-02	<8.88E-03	<1.41E-04	<7.27E-05
Ag-110m	Ci	n/a	n/a	1.10E-05	4.20E-05
Sn-113	Ci	n/a	n/a	5.88E-05	1.31E-04
Sb-124	Ci	n/a	n/a	2.70E-05	3.25E-06
Sb-125	Ci	n/a	n/a	8.02E-03	5.23E-03
I-131	Ci	<3.24E-02	<1.78E-02	7.46E-05	<1.45E-04
Cs-134	Ci	<1.62E-02	<8.88E-03	6.31E-03	9.83E-04
Cs-137	Ci	<1.62E-02	<8.88E-03	4.75E-03	8.73E-04
Ce-141	Ci	<1.62E-02	<8.88E-03	<1.41E-04	<7.27E-05
Ce-144	Ci	<1.62E-02	<8.88E-03	3.18E-05	1.98E-04
Gross Alpha	Ci	<3.24E-03	<1.78E-03	8.92E-06	8.60E-06
Ar-41	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Kr-85m	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Kr-85	Ci	<3.24E-01	<1.78E-01	5.63E-03	<1.45E-03
Kr-87	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Kr-88	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Xe-131m	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Xe-133m	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Xe-133	Ci	<3.24E-01	<1.78E-01	1.16E-03	5.94E-06
Xe-135m	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Xe-135	Ci	<3.24E-01	<1.78E-01	<2.82E-03	<1.45E-03
Na-24	Ci	n/a	n/a	n/a	1.30E-06

NOTE

Less than values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

LIQUID CUMULATIVE DOSE SUMMARY 1996

TABLE 1

	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
QUARTER 1 OF 1996			
TOTAL DOSE (mRem) FOR BONE	3.50E-02	5.00E+00	7.00E-01
TOTAL DOSE (mRem) FOR LIVER	1.62E-01	5.00E+00	3.24E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	1.46E-01	1.50E+00	9.73E+00
TOTAL DOSE (mRem) FOR THYROID	1.13E-01	5.00E+00	2.27E+00
TOTAL DOSE (mRem) FOR KIDNEY	1.22E-01	5.00E+00	2.44E+00
TOTAL DOSE (mRem) FOR LUNG	1.08E-01	5.00E+00	2.17E+00
TOTAL DOSE (mRem) FOR GI-LLI	5.56E-01	5.00E+00	1.11E+01
QUARTER 2 OF 1996			
TOTAL DOSE (mRem) FOR BONE	7.37E-03	5.00E+00	1.47E+01
TOTAL DOSE (mRem) FOR LIVER	1.44E-01	5.00E+00	2.89E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	1.41E-01	1.50E+00	9.40E+00
TOTAL DOSE (mRem) FOR THYROID	1.32E-01	5.00E+00	2.64E+00
TOTAL DOSE (mRem) FOR KIDNEY	1.36E-01	5.00E+00	2.72E+00
TOTAL DOSE (mRem) FOR LUNG	4.06E-02	5.00E+00	8.12E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.76E-01	5.00E+00	5.52E+00
QUARTER 3 OF 1996			
TOTAL DOSE (mRem) FOR BONE	3.22E-02	5.00E+00	6.44E-01
TOTAL DOSE (mRem) FOR LIVER	9.45E-02	5.00E+00	1.89E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	8.00E-02	1.50E+00	5.33E+00
TOTAL DOSE (mRem) FOR THYROID	3.41E-02	5.00E+00	6.82E-01
TOTAL DOSE (mRem) FOR KIDNEY	5.39E-02	5.00E+00	1.08E+00
TOTAL DOSE (mRem) FOR LUNG	1.31E-01	5.00E+00	2.62E+00
TOTAL DOSE (mRem) FOR GI-LLI	4.47E-02	5.00E+00	8.94E-01
QUARTER 4 OF 1996			
TOTAL DOSE (mRem) FOR BONE	6.54E-03	5.00E+00	1.31E-01
TOTAL DOSE (mRem) FOR LIVER	1.62E-02	5.00E+00	3.24E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.33E-02	1.50E+00	8.87E-01
TOTAL DOSE (mRem) FOR THYROID	4.86E-03	5.00E+00	9.72E-02
TOTAL DOSE (mRem) FOR KIDNEY	8.50E-03	5.00E+00	1.70E-01
TOTAL DOSE (mRem) FOR LUNG	6.26E-03	5.00E+00	1.25E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.41E-02	5.00E+00	4.82E-01
TOTALS FOR 1996			
TOTAL DOSE (mRem) FOR BONE	8.11E-02	1.00E+01	8.11E-01
TOTAL DOSE (mRem) FOR LIVER	4.17E-01	1.00E+01	4.17E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	3.80E-01	3.00E+00	1.27E+01
TOTAL DOSE (mRem) FOR THYROID	2.86E-01	1.00E+01	2.86E+00
TOTAL DOSE (mRem) FOR KIDNEY	3.21E-01	1.00E+01	3.21E+00
TOTAL DOSE (mRem) FOR LUNG	2.86E-01	1.00E+01	2.86E+00
TOTAL DOSE (mRem) FOR GI-LLI	9.01E-01	1.00E+01	9.01E+00

1. Based on ODCM Section 2.2 which restricts dose to the whole body to less than or equal to 1.5 mRem per quarter and 3.0 mRem per year. Dose restriction of any organ is less than or equal to 5 mRem per quarter and 10 mRem per year.

LIQUID CUMULATIVE DOSE SUMMARY 1996
TABLE 2

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A.	Fission and Activation Products (not including H-3, gases, alpha)					
1.	Total Release - (Ci)	8.10E-01	3.07E-01	4.91E-02	2.11E-02	1.19E+00
2.	Maximum Organ Dose (mRem)	4.71E-01	1.44E-01	6.10E-02	2.70E-02	7.03E-01
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4.	Percent of Limit	9.43E+00	2.87E+00	1.22E+00	5.40E-01	1.41E+01
B.	Tritium					
1.	Total Release - (Ci)	2.12E+02	7.57E+01	1.69E+02	5.98E+01	5.17E+02
2.	Maximum Organ Dose (mRem)	9.89E-02	1.32E-01	3.35E-02	5.81E-03	2.70E-01
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4.	Percent of Limit	1.98E+00	2.64E+00	6.70E-01	1.16E-01	5.41E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. WCGS ODCM methodology is used to calculate the maximum organ dose which assumes that an individual drinks the water and eats the fish from the discharge point. ODCM Section 2.2 organ dose limits are used. The less than values are not included in the summation for the total release values.

REPORT OF RADIOACTIVE EFFLUENTS 1996 - AIRBORNE

	Unit	Quarter 1	Quarter 2
A. Fission and Activation Gases			
1. Total Release	Ci	4.86E+02	7.45E+00
2. Average Release Rate for Period	μCi/sec	6.24E+01	9.47E-01
3. Percent of ODCM Limit (1)	%	3.78E-01	1.01E-02
B. Iodines			
1. Total Iodine-131	Ci	5.54E-05	3.43E-05
2. Average Release Rate for Period	μCi/sec	7.04E-06	4.36E-06
3. Percent of Applicable Limit (2)	%	5.5E-03	3.4E-03
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	6.88E-08	1.07E-06
2. Average Release Rate for Period	μCi/sec	8.75E-09	1.36E-07
3. Percent of ODCM Limit (3)	%	1.72E-07	7.58E-06
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00
D. Tritium			
1 Total Release	Ci	5.79E+00	7.35E+00
2 Average Release Rate for Period	μCi/sec	7.44E-01	9.35E-01
3 Percent of ODCM Limit (4)	%	5.48E-02	6.95E-02

1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$$

3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$$

4) The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

NOTE

This type of methodology is used since the WCGS ODCM ties release limits to doses rather than Curie release rates.

REPORT OF RADIOACTIVE EFFLUENTS 1996 - AIRBORNE

	Unit	Quarter 3	Quarter 4
A. Fission and Activation Gases			
1. Total Release	Ci	1.38E+00	9.33E+00
2. Average Release Rate for Period	μCi/sec	1.73E-01	1.17E+00
3. Percent of ODCM Limit (1)	%	7.94E-03	1.27E-02
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of Applicable Limit (2)	%	0.00E+00	0.00E+00
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	0.00E+00	0.00E+00
D. Tritium			
1 Total Release	Ci	1.65E+01	1.08E+01
2 Average Release Rate for Period	μCi/sec	2.08E+00	1.36E+00
3 Percent of ODCM Limit (4)	%	1.55E-01	1.01E-01

1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$$

3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$$

4) The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

NOTE

This type of methodology is used since the WCGS ODCM ties release limits to doses rather than Curie release rates.

GASEOUS EFFLUENTS - 1996

NUCLIDES RELEASED	Unit	<u>Continuous</u> Quarter 1	<u>Mode</u> Quarter 2	<u>Batch</u> Quarter 1	<u>Mode</u> Quarter 2
1. Fission and Activation					
Gases					
Ar-41	Ci	n/a	n/a	4.23E-02	7.51E-02
Kr-85	Ci	n/a	n/a	3.89E+01	7.23E+00
Kr-85m	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<2.26E+01	<2.38E+01	<2.64E+00	<9.21E-03
Kr-88	Ci	<1.97E+01	<2.08E+01	<2.30E+00	<8.02E-03
Xe-131m	Ci	1.52E+00	n/a	1.31E+01	7.97E-02
Xe-133	Ci	1.41E+02	<1.71E+02	4.32E+02	5.85E-02
Xe-133m	Ci	<3.74E+01	<3.95E+01	7.57E-01	<1.52E-02
Xe-135	Ci	1.29E+00	<3.64E+00	1.29E+00	0.00E+00
Xe-138	Ci	<5.70E+02	<6.01E+02	<6.66E+01	<2.32E-01
Total for Period	Ci	1.44E+02	0.00E+00	4.86E+02	7.45E+00
2. Halogens (Gaseous)					
I-131	Ci	5.54E-05	3.43E-05	<2.65E-05	<9.24E-08
I-133	Ci	<2.27E-02	<2.39E-02	<2.65E-03	<9.24E-06
Total for Period	Ci	5.54E-05	3.43E-05	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	4.39E+00	7.22E+00	1.40E+00	1.33E-01
Mn-54	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Fe-59	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Co-57	Ci	6.88E-08	<2.39E-03	<2.65E-04	<9.24E-07
Co-58	Ci	n/a	1.07E-06	n/a	n/a
Co-60	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Zn-65	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Mo-99	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Cs-134	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Cs-137	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Ce-141	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Ce-144	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Sr-89	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Sr-90	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Gross Alpha	Ci	<2.27E-03	<2.39E-03	<2.65E-04	<9.24E-07
Total for Period	Ci	4.39E+00	7.22E+00	1.43E+00	1.33E-01

NOTE

Less than values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at WCGS multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

GASEOUS EFFLUENTS 1996

NUCLIDES RELEASED	Unit	<u>Continuous</u> Quarter 3	<u>Mode</u> Quarter 4	<u>Batch</u> Quarter 3	<u>Mode</u> Quarter 4
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	5.37E-01	1.09E-01
Kr-85	Ci	n/a	n/a	n/a	9.09E+00
Kr-85m	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<2.52E+01	<2.78E+01	<6.72E-02	<1.19E-02
Kr-88	Ci	<2.19E+01	<2.42E+01	<5.85E-02	<1.03E-02
Xe-131m	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	5.10E-01	1.07E-01	6.65E-02	1.05E-02
Xe-133m	Ci	<4.17E+01	<4.61E+01	<1.11E-01	<1.97E-02
Xe-135	Ci	2.64E-01	9.03E-03	<1.02E-02	<1.81E-03
Xe-138	Ci	<6.34E+02	<7.01E+02	<1.69E+00	<2.99E-01
Total for Period	Ci	7.74E-01	1.16E-01	6.04E-01	9.21E+00
2. Halogens (Gaseous)					
I-131	Ci	<2.53E-04	<2.79E-04	<6.74E-07	<1.19E-07
I-133	Ci	<1.80E+02	<2.79E-02	<6.74E-05	<1.19E-05
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	1.28E+01	1.05E+01	3.71E+00	3.54E-01
Mn-54	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Fe-59	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Co-58	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Co-60	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Zn-65	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Mo-99	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Cs-134	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Cs-137	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Ce-141	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Ce-144	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Sr-89	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Sr-90	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Gross Alpha	Ci	<2.53E-03	<2.79E-03	<6.74E-06	<1.19E-06
Total for Period	Ci	1.28E+01	1.05E+01	3.71E+00	3.54E-01

NOTE

Less than values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at WCGS multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

GASEOUS CUMULATIVE DOSE SUMMARY - 1996

Table 1

	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
QUARTER 1 OF 1996			
TOTAL DOSE (mRem) FOR BONE	9.64E-05	7.50E+00	1.28E-03
TOTAL DOSE (mRem) FOR LIVER	4.17E-03	7.50E+00	5.56E-02
TOTAL DOSE (mRem) FOR TOTAL BODY	4.13E-03	7.50E+00	5.51E-02
TOTAL DOSE (mRem) FOR THYROID	3.59E-02	7.50E+00	4.79E-01
TOTAL DOSE (mRem) FOR KIDNEY	4.23E-03	7.50E+00	5.64E-02
TOTAL DOSE (mRem) FOR LUNG	4.07E-03	7.50E+00	5.43E-02
TOTAL DOSE (mRem) FOR GI-LLI	4.08E-03	7.50E+00	5.44E-02
QUARTER 2 OF 1996			
TOTAL DOSE (mRem) FOR BONE	5.99E-05	7.50E+00	7.99E-04
TOTAL DOSE (mRem) FOR LIVER	5.19E-03	7.50E+00	6.92E-02
TOTAL DOSE (mRem) FOR TOTAL BODY	5.17E-03	7.50E+00	6.89E-02
TOTAL DOSE (mRem) FOR THYROID	2.49E-02	7.50E+00	3.32E-01
TOTAL DOSE (mRem) FOR KIDNEY	5.23E-03	7.50E+00	6.97E-02
TOTAL DOSE (mRem) FOR LUNG	5.13E-03	7.50E+00	6.84E-02
TOTAL DOSE (mRem) FOR GI-LLI	5.14E-03	7.50E+00	6.85E-02
QUARTER 3 OF 1996			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	1.17E-02	7.50E+00	1.56E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.17E-02	7.50E+00	1.56E-01
TOTAL DOSE (mRem) FOR THYROID	1.17E-02	7.50E+00	1.56E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.17E-02	7.50E+00	1.56E-01
TOTAL DOSE (mRem) FOR LUNG	1.17E-02	7.50E+00	1.56E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.17E-02	7.50E+00	1.56E-01
QUARTER 4 OF 1996			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	7.64E-03	7.50E+00	1.02E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	7.64E-03	7.50E+00	1.02E-01
TOTAL DOSE (mRem) FOR THYROID	7.64E-03	7.50E+00	1.02E-01
TOTAL DOSE (mRem) FOR KIDNEY	7.64E-03	7.50E+00	1.02E-01
TOTAL DOSE (mRem) FOR LUNG	7.64E-03	7.50E+00	1.02E-01
TOTAL DOSE (mRem) FOR GI-LLI	7.64E-03	7.50E+00	1.02E-01
TOTALS FOR 1996			
TOTAL DOSE (mRem) FOR BONE	1.56E-04	1.50E+00	1.04E-03
TOTAL DOSE (mRem) FOR LIVER	2.87E-02	1.50E+00	1.91E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	2.86E-02	1.50E+00	1.91E-01
TOTAL DOSE (mRem) FOR THYROID	8.01E-01	1.50E+00	5.34E-01
TOTAL DOSE (mRem) FOR KIDNEY	2.88E-02	1.50E+00	1.92E-01
TOTAL DOSE (mRem) FOR LUNG	2.85E-02	1.50E+00	1.90E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.85E-02	1.50E+00	1.90E-01

1. Based on WCGS ODCM Section 3.2.2 which restricts dose during any calendar quarter to less than or equal to 7.5 mRem to any organ and during any calendar year to less than or equal to 15 mRem to any organ.

1996 Effluent Concentration Limits

Nuclides	Curies	Average Diluted Conc(mCi/ml)	10 CFR20 ECL	% of ECL
H-3	5.17E+02	6.45E-06	1.00E-03	6.45E-01
Cr-51	1.05E-01	1.30E-09	5.00E-04	2.61E-04
Mn-54	3.02E-02	3.77E-10	3.00E-05	1.27E-03
Fe-55	4.68E-01	5.84E-09	1.00E-04	5.84E-03
Fe-59	6.10E-03	7.58E-11	1.00E-05	7.58E-04
Co-57	1.78E-03	2.21E-11	6.00E-05	3.69E-05
Co-58	2.17E-01	2.70E-09	2.00E-05	1.35E-02
Co-60	1.66E-01	2.07E-09	3.00E-06	6.90E-02
Sr-90	4.05E-05	5.03E-13	5.00E-07	1.01E-04
Sr-92	2.11E-06	2.62E-14	4.00E-05	6.55E-08
Zr-95	1.50E-02	1.86E-10	2.00E-05	9.32E-04
Nb-95	2.23E-02	2.78E-10	3.00E-05	9.27E-04
Ru-103	1.96E-03	2.44E-11	3.00E-05	8.13E-05
Ag-110M	1.03E-03	1.28E-11	6.00E-06	2.13E-04
Sn-113	2.10E-03	2.62E-11	3.00E-05	8.73E-05
Sn-117M	6.07E-04	7.54E-12	3.00E-05	2.51E-05
Sb-124	4.19E-03	5.20E-11	7.00E-06	7.44E-04
Sb-125	1.29E-01	1.60E-09	3.00E-05	5.34E-03
I-131	2.52E-03	3.14E-11	1.00E-06	3.14E-03
Cs-134	9.69E-03	1.21E-10	9.00E-07	1.37E-02
Cs-137	9.43E-03	1.18E-10	1.00E-06	1.18E-02
La-140	1.29E-03	1.60E-11	9.00E-06	1.78E-04
Ce-144	3.39E-03	4.23E-11	3.00E-06	1.41E-03
Hf-181	1.26E-04	1.57E-12	2.00E-05	7.83E-06
Kr-85	3.10E-01	3.85E-09	2.00E-04	1.93E-03
Xe-131M	1.87E-01	2.32E-09	2.00E-04	1.16E-03
Xe-133	9.21E+00	1.14E-07	2.00E-04	5.72E-02
Xe-133M	5.51E-02	6.84E-10	2.00E-04	3.42E-04
Xe-135	1.20E-03	1.50E-11	2.00E-04	7.50E-06
Tc-99m	5.36E-04	6.68E-12	1.00E-03	6.68E-07
Ru-106	8.10E-04	1.01E-11	3.00E-06	3.35E-04
Te-132	8.91E-05	1.11E-12	9.00E-06	1.23E-05
I-132	1.28E-04	1.59E-12	1.00E-04	1.59E-06
Ba-140	5.18E-04	6.43E-12	8.00E-06	8.04E-05
Np-239	6.33E-04	7.89E-12	2.00E-05	3.95E-05
Na-24	1.30E-06	1.61E-14	5.00E-05	3.23E-08
Sb-126	2.61E-05	3.25E-13	7.00E-06	4.64E-06
Ce-141	2.52E-04	3.14E-12	3.00E-05	1.05E-05
Mo-99	5.82E-04	7.26E-12	2.00E-05	3.63E-05

1997 Annual Report

Section I REPORT OF RADIOACTIVE EFFLUENTS (1997) LIQUID

<u>Type of Effluent</u>	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
A. Fission and Activation Products			
1. Total Release (not including tritium, gases, alpha)	Ci	1.01E-02	3.92E-02
2. Average Diluted Concentration During Period	μCi/ml	6.33E-10	8.53E-10
3. Percent of Applicable Limit (1)	%	2.00E-01	8.00E-01
B. Tritium			
1. Total Release	Ci	2.10E+02	7.12E+02
2. Average Diluted Concentration During Period	μCi/ml	1.32E-05	1.54E-05
3. Percent of Applicable Limit (MPC) (2)	%	4.38E-01	5.14E-01
(ECL)	%	1.3E+00	1.5E+00
C. Dissolved and Entrained Gases			
1. Total Release	Ci	2.33E-04	8.83E-02
2. Average Diluted Concentration During Period	μCi/ml	1.46E-11	1.91E-09
3. Percent of Applicable Limit (3)	%	7.30E-06	9.56E-04
D. Gross Alpha Radioactivity			
1. Total Release	Ci	6.34E-06	2.80E-05
E. Volume of Waste Release (prior to dilution)			
	Liters	3.94E+07	3.60E+07
F. Volume of Dilution Water Used			
	Liters	1.59E+10	4.61E+10

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water-Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table 2 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

REPORT OF RADIOACTIVE EFFLUENTS (1997) LIQUID

<u>Type of Effluent</u>	<u>Unit</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
A. Fission and Activation Products			
1. Total Release (not including tritium, gases, alpha)	Ci	5.32E-02	6.41E-02
2. Average Diluted Concentration During Period	μCi/ml	2.21E-09	1.47E-08
3. Percent of Applicable Limit (1)	%	1.06E+00	1.30E+00
B. Tritium			
1. Total Release	Ci	2.77E+02	1.29E+02
2. Average Diluted Concentration During Period	μCi/ml	1.15E-05	2.96E-05
3. Percent of Applicable Limit (MPC) (2) (ECL)	%	3.84E-01	9.88E-01
	%	1.2E+00	3.0E+00
C. Dissolved and Entrained Gases			
1. Total Release	Ci	1.50E-02	2.67E-02
2. Average Diluted Concentration During Period	μCi/ml	6.24E-10	6.13E-09
3. Percent of Applicable Limit (3)	%	3.12E-04	3.07E-03
D. Gross Alpha Radioactivity			
1. Total Release	Ci	2.55E-05	7.53E-06
E. Volume of Waste Release (prior to dilution)			
	Liters	3.40E+07	7.84E+06
F. Volume of Dilution Water Used			
	Liters	2.40E+10	4.35E+09

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water-Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table 2 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

LIQUID EFFLUENTS 1997

NUCLIDE RELEASED	Unit	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
H-3	Ci	4.79E-01	4.35E-01	2.10E+02	7.12E+02
Cr-51	Ci	n/a	n/a	n/a	n/a
Mn-54	Ci	<1.95E-02	<1.75E-02	2.84E-05	9.69E-04
Fe-55	Ci	<3.91E-02	<3.50E-02	1.80E-02	1.35E-02
Fe-59	Ci	<1.95E-02	<1.75E-02	<1.46E-04	<5.14E-04
Co-57	Ci	n/a	n/a	n/a	6.68E-05
Co-58	Ci	<1.95E-02	<1.75E-02	2.68E-04	1.46E-03
Co-60	Ci	<1.95E-02	<1.75E-02	4.44E-03	1.49E-02
Zn-65	Ci	<1.95E-02	<1.75E-02	<1.46E-04	<5.14E-04
Sr-89	Ci	<1.95E-03	<1.75E-03	<1.46E-05	<5.14E-05
Sr-90	Ci	<1.95E-03	<1.75E-03	<1.46E-05	1.46E-05
Nb-95	Ci	n/a	n/a	n/a	2.89E-04
Zr-95	Ci	n/a	n/a	n/a	5.78E-05
Mo-99	Ci	<1.95E-02	<1.75E-02	<1.46E-04	<5.14E-04
Ag-110m	Ci	n/a	n/a	2.01E-06	n/a
Sn-113	Ci	n/a	n/a	2.69E-05	1.31E-04
Sn-117m	Ci	n/a	n/a	n/a	1.26E-06
Sb-125	Ci	n/a	n/a	3.03E-03	5.48E-03
I-131	Ci	<3.91E-02	<3.50E-02	<2.93E-04	<1.03E-03
Cs-134	Ci	<1.95E-02	<1.75E-02	3.20E-04	1.22E-03
Cs-137	Ci	<1.95E-02	<1.75E-02	4.40E-04	1.34E-03
Ce-141	Ci	<1.95E-02	<1.75E-02	<1.46E-04	<5.14E-04
Ce-144	Ci	<1.95E-02	<1.75E-02	<1.46E-04	4.41E-05
Gross Alpha	Ci	<3.91E-03	<3.50E-03	6.34E-06	2.80E-05
Ar-41	Ci	<3.91E-01	<3.50E-01	<2.93E-03	<1.03E-02
Kr-85m	Ci	<3.91E-01	<3.50E-01	<2.93E-03	2.38E-06
Kr-85	Ci	<3.91E-01	<3.50E-01	<2.93E-03	6.25E-03
Kr-87	Ci	<3.91E-01	<3.50E-01	<2.93E-03	<1.03E-02
Kr-88	Ci	<3.91E-01	<3.50E-01	<2.93E-03	<1.03E-02
Xe-131m	Ci	<3.91E-01	<3.50E-01	<2.93E-03	4.01E-05
Xe-133m	Ci	<3.91E-01	<3.50E-01	<2.93E-03	1.38E-04
Xe-133	Ci	<3.91E-01	<3.50E-01	2.33E-04	8.18E-02
Xe-135m	Ci	<3.91E-01	<3.50E-01	<2.93E-03	<1.03E-02
Xe-135	Ci	<3.91E-01	<3.50E-01	<2.93E-03	2.45E-05
Tc-99m	Ci	n/a	n/a	n/a	n/a
Ru-103	Ci	n/a	n/a	n/a	n/a
Ru-106	Ci	n/a	n/a	n/a	n/a
Sb-124	Ci	n/a	n/a	n/a	n/a
Sb-126	Ci	n/a	n/a	n/a	1.38E-06
Te-132	Ci	n/a	n/a	n/a	n/a
I-132	Ci	n/a	n/a	n/a	n/a

NOTE

Less than values are calculated using the Lower Limit of detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

LIQUID EFFLUENTS 1997

NUCLIDE RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci	4.26E-01	1.20E-01	2.77E+02	1.29E+02
Cr-51	Ci	n/a	n/a	8.53E-05	7.13E-03
Mn-54	Ci	<1.50E-02	<1.60E-02	6.59E-04	5.69E-04
Fe-55	Ci	<3.00E-02	<3.20E-02	1.60E-02	5.31E-03
Fe-59	Ci	<1.50E-02	<1.60E-02	<4.07E-04	3.84E-04
Co-57	Ci	n/a	n/a	1.18E-05	4.80E-05
Co-58	Ci	<1.50E-02	1.12E-04	4.54E-04	2.47E-02
Co-60	Ci	<1.50E-02	<1.60E-02	1.13E-02	2.83E-03
Zn-65	Ci	<1.50E-02	<1.60E-02	<4.07E-04	<3.79E-04
Sr-89	Ci	<1.50E-03	<1.60E-03	<4.07E-05	<3.79E-05
Sr-90	Ci	<1.50E-03	<1.60E-03	<4.07E-05	<3.79E-05
Sr-92	Ci	n/a	n/a	n/a	n/a
Nb-95	Ci	n/a	n/a	4.39E-05	1.14E-03
Zr-95	Ci	n/a	n/a	n/a	8.58E-04
Mo-99	Ci	<1.50E-02	<1.60E-02	<4.07E-04	<3.79E-04
Tc-99M	Ci	n/a	n/a	n/a	1.05E-05
Ru-103	Ci	n/a	n/a	n/a	2.71E-06
Ag-110m	Ci	n/a	n/a	8.43E-06	n/a
Sn-113	Ci	n/a	n/a	3.39E-05	2.82E-05
Sn-117m	Ci	n/a	n/a	n/a	1.15E-04
Sb-124	Ci	n/a	n/a	n/a	1.19E-03
Sb-125	Ci	n/a	n/a	2.16E-02	1.81E-02
Sb-126	Ci	n/a	n/a	n/a	4.86E-06
I-131	Ci	<3.00E-02	<3.20E-02	1.47E-06	<7.59E-04
I-132	Ci	n/a	n/a	n/a	6.83E-05
Te-132	Ci	n/a	n/a	n/a	9.27E-06
Cs-134	Ci	<1.50E-02	1.07E-04	1.71E-03	7.90E-04
Cs-137	Ci	<1.50E-02	<1.60E-02	1.41E-03	6.86E-04
Ce-141	Ci	<1.50E-02	<1.60E-02	<4.07E-04	<3.79E-04
Ce-144	Ci	<1.50E-02	<1.60E-02	6.57E-06	<3.79E-04
Gross Alpha	Ci	<3.00E-03	<3.20E-03	2.55E-05	7.53E-06
Ar-41	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Kr-85m	Ci	<3.00E-01	<3.20E-01	8.44E-06	6.73E-05
Kr-85	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Kr-87	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Kr-88	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Xe-131m	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Xe-133m	Ci	<3.00E-01	<3.20E-01	1.21E-04	6.34E-04
Xe-133	Ci	<3.00E-01	<3.20E-01	1.48E-02	1.70E-02
Xe-135m	Ci	<3.00E-01	<3.20E-01	<8.14E-03	<7.59E-03
Xe-135	Ci	<3.00E-01	<3.20E-01	1.06E-04	8.93E-03
Na-24	Ci	n/a	n/a	n/a	1.32E-06

NOTE

Less than values are calculated using the Lower Limit of detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The less than values are not included in the summation for the total release values.

LIQUID CUMULATIVE DOSE SUMMARY (1997)
TABLE 2

		Quarter 1	Quarter 2	Quarter 3	Quarter 4
A.	Fission and Activation Products(not including H-3, gases, alpha)				
1.	Total Release - (Ci)	1.01E-02	3.92E-02	5.32E-02	6.41E-02
2.	Maximum Organ Dose (mRem)	6.25E-03	1.34E-02	1.42E-02	9.77E-02
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00
4.	Percent of Limit	1.25E-01	2.69E-01	2.84E-01	1.95E+00
B.	Tritium				
1.	Total Release - (Ci)	2.10E+02	7.12E+02	2.77E+02	1.29E+02
2.	Maximum Organ Dose (mRem)	3.80E-02	6.45E-02	2.73E-02	7.76E-02
3.	Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00
4.	Percent of Limit	7.60E-01	1.29E+00	5.45E-01	1.55E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. Wolf Creek ODCM methodology is used to calculate the maximum organ dose which assumes that an individual drinks the water and eats the fish from the discharge point. ODCM Section 2.2 organ dose limits are used.

REPORT OF RADIOACTIVE EFFLUENTS (1997) AIRBORNE

	Unit	Quarter 1	Quarter 2
A. Fission and Activation Gases			
1. Total Release	Ci	1.29E-01	4.52E-01
2. Average Release Rate for Period	μCi/sec	1.67E-02	5.75E-02
3. Percent of ODCM Limit (1)	%	1.08E-03	7.82E-04
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	2.95E-06
2. Average Release Rate for Period	μCi/sec	0.00E+00	3.75E-07
3. Percent of Applicable Limit (2)	%	0.00E+00	2.95E-04
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	6.18E-08	0.00E+00
D. Tritium			
Total Release	Ci	1.20E+01	2.58E+01
Average Release Rate for Period	μCi/sec	1.61E+00	3.28E+00
Percent of ODCM Limit (4)	%	1.19E-01	2.44E-01

1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$$

3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$$

NOTE

This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates.

4) The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

GASEOUS EFFLUENTS 1997

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	7.68E-02	2.90E-01
Kr-85	Ci	n/a	n/a	n/a	n/a
Kr-85m	Ci	4.39E-02	n/a	n/a	2.67E-05
Kr-87	Ci	<2.03E+01	<2.34E+01	<8.19E-04	<3.90E-02
Kr-88	Ci	<1.51E+01	<1.75E+01	<6.11E-04	<2.91E-02
Xe-131m	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	<6.10E+00	1.13E-01	8.76E-03	4.90E-02
Xe-133m	Ci	<2.89E+01	<3.34E+01	<1.17E-03	<5.56E-02
Xe-135	Ci	<3.94E+00	<4.56E+00	5.58E-05	<7.58E-03
Xe-138	Ci	<3.17E+02	<3.67E+02	<1.28E-02	<6.10E-01
Total	Ci	4.39E-02	1.13E-01	8.56E-02	3.39E-01
2. Halogens (Gaseous)					
I-131	Ci	<1.88E-04	2.95E-06	<7.59E-09	<3.61E-07
I-133	Ci	<1.88E-02	<2.17E-02	<7.59E-07	<3.61E-05
Total	Ci	0.00E+00	2.95E-06	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	1.17E+01	2.26E+01	2.95E-01	3.25E+00
Mn-54	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Fe-59	Ci	<2.27E-03	<2.17E-03	<7.59E-08	<3.61E-06
Co-57	Ci	n/a	n/a	n/a	n/a
Co-58	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Co-60	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Zn-65	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Mo-99	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Cs-134	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Cs-137	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Ce-141	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Ce-144	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Sr-89	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Sr-90	Ci	<1.88E-03	<2.17E-03	<7.59E-08	<3.61E-06
Gross Alpha	Ci	6.18E-08	<2.17E-03	<7.59E-08	<3.61E-06
Total.	Ci	1.17E+01	2.26E+01	2.95E-01	3.25E+00

NOTE

Less than values for Noble Gases are calculated using the lower limit of detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

GASEOUS CUMULATIVE DOSE SUMMARY 1997
TABLE 2

Nuclides Released	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A. Fission and Activation Gases					
1. Total Release - (Ci)	1.29E-01	4.52E-01	1.22E+01	1.44E+00	1.42E+01
2. Total Gamma Airdose (mRad)	5.38E-05	1.92E-04	1.71E-03	3.02E-04	2.23E-03
3. Gamma Airdose Limit (mRad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Gamma Airdose Limit	1.08E-03	3.84E-03	3.42E-02	6.04E-03	2.26E-02
5. Total Beta Airdose (mRad)	2.42E-05	7.82E-05	1.88E-03	1.75E-04	2.16E-03
6. Beta Airdose Limit (mRad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
7. Percent of Beta Airdose Limit (mRad)	2.42E-04	7.82E-04	1.88E-02	1.75E-03	1.08E-02
B. Particulates					
1. Total Particulates (Ci)	0.00E+00	0.00E+00	0.00E+00	1.27E-08	1.27E-08
2. Maximum Organ Dose (mRem)	0.00E+00	0.00E+00	0.00E+00	1.08E-08	1.08E-08
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	0.00E+00	0.00E+00	1.44E-07	7.18E-08
C. Tritium					
1. Total Release (Ci)	1.20E+01	2.58E+01	1.83E+01	2.83E+01	8.44E+01
2. Maximum Organ Dose (mRem)	8.94E-03	1.83E-02	1.32E-02	1.97E-02	6.01E-02
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	1.19E-01	2.44E-01	1.76E-01	2.62E-01	4.00E-01
D. Iodine					
1. Total I-131, I-133 (Ci)	0.00E+00	2.95E-06	2.27E-07	1.91E-10	3.18E-06
2. Maximum Organ Dose (mRem)	0.00E+00	1.83E-03	0.00E+00	1.10E-07	1.83E-03
3. Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4. Percent of Limit	0.00E+00	2.44E-02	0.00E+00	1.47E-06	1.22E-02

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. The maximum organ dose is calculated using Wolf Creek ODCM methodology which assumes that an individual actually resides at the release point. ODCM Section 3.2.2 organ dose limits are used.

1997 Effluent Concentration Limits

Nuclides	Curies	Average Diluted Concentration (mCi/ml)	10 CFR 20 ECL	% of ECL
H-3	1.33E+03	1.47E-05	1.00E-03	1.47E+00
Cr-51	7.22E-03	7.97E-11	5.00E-04	1.59E-05
Mn-54	2.22E-03	2.45E-11	3.00E-05	8.17E-05
Fe-55	5.28E-02	5.83E-10	1.00E-04	5.83E-04
Fe-59	3.84E-04	4.24E-12	1.00E-05	4.24E-05
Co-57	1.28E-04	1.41E-12	6.00E-05	2.36E-06
Co-58	2.70E-02	2.98E-10	2.00E-05	1.49E-03
Co-60	3.37E-02	3.70E-10	3.00E-06	1.23E-02
Sr-90	1.46E-05	1.61E-13	5.00E-07	3.23E-05
Zr-95	9.16E-04	1.01E-11	2.00E-05	5.05E-05
Nb-95	1.47E-03	1.62E-11	3.00E-05	5.41E-05
Ru-103	2.71E-06	2.99E-14	3.00E-05	9.98E-08
Ag-110M	1.04E-05	1.15E-03	6.00E-06	1.91E-06
Sn-113	2.20E-04	2.43E-12	3.00E-05	8.10E-06
Sn-117M	1.16E-04	1.28E-12	3.00E-05	4.27E-06
Sb-124	1.19E-03	1.31E-11	7.00E-06	1.88E-04
Sb-125	4.83E-02	5.33E-10	3.00E-05	1.78E-03
Sb-126	6.24E-06	6.89E-14	7.00E-06	9.85E-07
I-131	1.47E-06	1.62E-14	1.00E-06	1.62E-06
Cs-134	4.13E-03	4.56E-11	9.00E-07	5.07E-03
Cs-137	3.89E-03	4.27E-11	1.00E-06	4.27E-03
Ce-144	5.07E-05	5.60E-13	3.00E-06	1.87E-05
Kr-85	6.25E-03	6.90E-11	2.00E-04	3.45E-05
Kr-85M	7.81E-05	8.63E-13	2.00E-04	4.31E-07
Xe-131M	4.01E-05	4.43E-13	2.00E-04	2.21E-07
Xe-133	1.15E-01	1.27E-09	2.00E-04	6.35E-04
Xe-133M	8.93E-04	9.86E-12	2.00E-04	4.93E-06
Xe-135	9.08E-03	1.00E-10	2.00E-04	5.00E-05
Tc-99m	1.05E-05	1.16E-13	1.00E-03	1.16E-08
Te-132	9.27E-06	1.02E-13	9.00E-06	1.14E-06
I-132	6.83E-05	7.54E-13	7.00E-06	1.08E-05
Na-24	1.32E-06	1.46E-14	5.00E-05	2.92E-08

GASEOUS EFFLUENTS 1997

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission and Activation					
Gases					
Ar-41	Ci	n/a	n/a	2.61E+00	4.19E-01
Kr-85	Ci	n/a	n/a	9.25E+00	n/a
Kr-85m	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<2.42E+01	2.44E+01	<2.78E-01	<2.84E+00
Kr-88	Ci	<1.81E+01	<1.82E+01	<2.08E-01	<2.12E+00
Xe-131m	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	7.80E-02	7.96E-01	2.40E-01	1.79E-01
Xe-133m	Ci	<3.45E+01	<3.48E+01	<3.97E-01	<4.06E+00
Xe-135	Ci	<4.71E+00	4.32E-02	5.97E-04	<5.53E-01
Xe-138	Ci	<3.79E+02	<4.74E+00	<4.35E+00	<4.45E+01
Total	Ci	7.80E-02	8.39E-01	1.21E+01	5.99E-01
2. Halogens (Gaseous)					
I-131	Ci	2.27E-07	<2.24E-04	<2.57E-06	1.91E-10
I-133	Ci	<2.24E-02	<2.26E-02	<2.57E-04	<2.63E-03
Total	Ci	2.27E-07	0.00E+00	0.00E+00	1.91E-10
3. Particulates and Tritium					
H-3	Ci	1.28E+01	2.02E+01	5.57E+00	8.11E+00
Cr-51	Ci	n/a	n/a	n/a	3.14E-09
Mn-54	Ci	<2.24E-03	<2.79E-03	<2.57E-05	2.07E-10
Fe-59	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Co-58	Ci	<2.24E-03	<2.79E-03	<2.57E-05	8.46E-09
Co-60	Ci	<2.24E-03	<2.79E-03	<2.57E-05	3.77E-10
Zn-65	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Zr-95	Ci	n/a	n/a	n/a	2.31E-10
Nb-95	Ci	n/a	n/a	n/a	3.24E-10
Mo-99	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Cs-134	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Cs-137	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Ce-141	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Ce-144	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Sr-89	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Sr-90	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Gross Alpha	Ci	<2.24E-03	<2.79E-03	<2.57E-05	<2.63E-04
Total	Ci	1.28E+01	2.02E+01	5.57E+00	8.11E+00

NOTE

Less than values for Noble Gases are calculated using the lower limit of detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

GASEOUS CUMULATIVE DOSE SUMMARY 1997

Table 1

QUARTER 1 OF 1997	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	8.37E-03	7.50E+00	1.12E-01
TOTAL DOSE (mRem) FOR T-BODY	8.37E-03	7.50E+00	1.12E-01
TOTAL DOSE (mRem) FOR THYROID	8.37E-03	7.50E+00	1.12E-01
TOTAL DOSE (mRem) FOR KIDNEY	8.37E-03	7.50E+00	1.12E-01
TOTAL DOSE (mRem) FOR LUNG	8.37E-03	7.50E+00	1.12E-01
TOTAL DOSE (mRem) FOR GI-LLI	8.37E-03	7.50E+00	1.12E-01
QUARTER 2 OF 1997			
TOTAL DOSE (mRem) FOR BONE	5.14E-06	7.50E+00	6.85E-05
TOTAL DOSE (mRem) FOR LIVER	1.82E-02	7.50E+00	2.43E-01
TOTAL DOSE (mRem) FOR T-BODY	1.82E-02	7.50E+00	2.43E-01
TOTAL DOSE (mRem) FOR THYROID	1.99E-02	7.50E+00	2.66E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.82E-02	7.50E+00	2.43E-01
TOTAL DOSE (mRem) FOR LUNG	1.82E-02	7.50E+00	2.43E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.82E-02	7.50E+00	2.43E-01
QUARTER 3 OF 1997			
TOTAL DOSE (mRem) FOR BONE	3.87E-07	7.50E+00	5.16E-06
TOTAL DOSE (mRem) FOR LIVER	1.30E-02	7.50E+00	1.73E-01
TOTAL DOSE (mRem) FOR T-BODY	1.30E-02	7.50E+00	1.73E-01
TOTAL DOSE (mRem) FOR THYROID	1.31E-02	7.50E+00	1.75E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.30E-02	7.50E+00	1.73E-01
TOTAL DOSE (mRem) FOR LUNG	1.30E-02	7.50E+00	1.73E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.30E-02	7.50E+00	1.73E-01
QUARTER 4 OF 1997			
TOTAL DOSE (mRem) FOR BONE	7.02E-09	7.50E+00	9.37E-08
TOTAL DOSE (mRem) FOR LIVER	2.00E-02	7.50E+00	2.67E-01
TOTAL DOSE (mRem) FOR T-BODY	2.00E-02	7.50E+00	2.67E-01
TOTAL DOSE (mRem) FOR THYROID	2.00E-02	7.50E+00	2.67E-01
TOTAL DOSE (mRem) FOR KIDNEY	2.00E-02	7.50E+00	2.67E-01
TOTAL DOSE (mRem) FOR LUNG	2.00E-02	7.50E+00	2.67E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.00E-02	7.50E+00	2.67E-01
TOTALS FOR 1997			
TOTAL DOSE (mRem) FOR BONE	5.54E-06	1.50E+01	3.69E-05
TOTAL DOSE (mRem) FOR LIVER	5.96E-02	1.50E+01	3.97E-01
TOTAL DOSE (mRem) FOR T-BODY	5.96E-02	1.50E+01	3.97E-01
TOTAL DOSE (mRem) FOR THYROID	6.14E-02	1.50E+01	4.09E-01
TOTAL DOSE (mRem) FOR KIDNEY	5.96E-02	1.50E+01	3.97E-01
TOTAL DOSE (mRem) FOR LUNG	5.96E-02	1.50E+01	3.97E-01
TOTAL DOSE (mRem) FOR GI-LLI	5.96E-02	1.50E+01	3.97E-01

1998 Annual Report

SECTION I REPORT OF 1998 RADIOACTIVE EFFLUENTS LIQUID

		Unit	Quarter 1	Quarter 2
A.	Fission and Activation Products			
1.	Total Release (not including tritium, gases, alpha)	Ci	1.47E-02	1.15E-02
2.	Average Diluted Concentration During Period	μCi/ml	4.58E-10	4.86E-10
3.	Percent of Applicable Limit (1)	%	0.29	0.23
B.	Tritium			
1.	Total Release	Ci	1.45E+01	5.01E+01
2.	Average Diluted Concentration During Period	μCi/ml	4.51E-07	2.12E-06
3.	Percent of Applicable Limit (MPC)	%	1.50E-02	7.08E-02
	(ECL) (2)	%	0.05	0.21
C.	Dissolved and Entrained Gases			
1.	Total Release	Ci	0.00E+00	4.57E-04
2.	Average Diluted Concentration During Period	μCi/ml	0.00E+00	1.94E-11
3.	Percent of Applicable Limit (3)	%	0.00E+00	9.69E-06
D.	Gross Alpha Radioactivity			
1.	Total Release	Ci	1.92E-04	2.69E-04
E.	Volume of Waste Released (prior to dilution)	Liters	3.75E+07	1.08E+08
F.	Volume of dilution water used	Liters	1.11E+10	2.37E+10

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table 210CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2.0e - 04 \text{ from ODCM Section 2.1})}$$

1998 RADIOACTIVE EFFLUENTS LIQUID

		Unit	Quarter 3	Quarter 4
A.	Fission and Activation Products			
1.	Total Release (not including tritium, gases, alpha)	Ci	1.54E-02	2.51E-02
2.	Average Diluted Concentration During Period	µCi/ml	6.66E-10	1.11E-09
3.	Percent of Applicable Limit (1)	%	0.31	0.50
B.	Tritium			
1.	Total Release	Ci	2.10E+02	5.50E+02
2.	Average Diluted Concentration During Period	µCi/ml	9.11E-06	2.43E-05
3.	Percent of Applicable Limit (MPC) (ECL) (2)	%	3.04E-01 0.91	8.10E-01 2.43
C.	Dissolved and Entrained Gases			
1.	Total Release	Ci	7.22E-03	1.29E-01
2.	Average Diluted Concentration During Period	µCi/ml	3.13E-10	5.71E-09
3.	Percent of Applicable Limit (3)	%	1.57E-04	2.85E-03
D.	Gross Alpha Radioactivity			
1.	Total Release	Ci	1.12E-03	0.00E+00
E.	Volume of Waste Released (prior to dilution)	Liters	4.20E+07	1.37E+08
F.	Volume of dilution water used	Liters	2.30E+10	2.24E+10

1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water Cooled Nuclear Power Reactors", paragraph A.2). The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.

2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{ECL, Appendix B, Table 2 10CFR20})}$$

3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

1998 LIQUID EFFLUENTS

NUCLIDES RELEASED	Unit	<u>Continuous Mode</u>		<u>Batch Mode</u>	
		<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 1</u>	<u>Quarter 2</u>
H-3	Ci	2.61E-01	3.85E-01	1.42E+01	4.95E+01
Cr-51	Ci	n/a	n/a	n/a	n/a
Mn-54	Ci	<2.06E-02	<5.91E-02	1.02E-04	3.36E-04
Fe-55	Ci	<4.13E-02	<1.18E-01	1.65E-03	2.44E-03
Fe-59	Ci	<2.06E-02	<5.91E-02	<8.24E-05	<1.58E-04
Co-57	Ci	n/a	n/a	7.33E-05	4.58E-05
Co-58	Ci	<2.06E-02	<5.91E-02	8.82E-03	3.33E-03
Co-60	Ci	<2.06E-02	<5.91E-02	5.31E-04	3.04E-03
Zn-65	Ci	<2.06E-02	<5.91E-02	<8.24E-05	<1.58E-04
Sr-89	Ci	<2.06E-03	<5.91E-03	<8.24E-06	<1.58E-05
Sr-90	Ci	<2.06E-03	<5.91E-03	<8.24E-06	<1.58E-05
Sr-92	Ci	n/a	n/a	n/a	n/a
Nb-95	Ci	n/a	n/a	7.82E-05	1.01E-04
Zr-95	Ci	n/a	n/a	3.38E-05	2.98E-05
Zr-97	Ci	n/a	n/a	n/a	n/a
Mo-99	Ci	<2.06E-02	<5.91E-02	<8.24E-05	<1.58E-04
Ag-110m	Ci	n/a	n/a	n/a	n/a
Sn-113	Ci	n/a	n/a	1.26E-05	n/a
Sn-117m	Ci	n/a	n/a	n/a	n/a
Sb-124	Ci	n/a	n/a	1.54E-04	1.67E-05
Sb-125	Ci	n/a	n/a	2.99E-03	1.86E-03
I-131	Ci	<4.13E-02	<1.18E-01	<1.65E-04	<3.17E-04
Cs-134	Ci	<2.06E-02	<5.91E-02	1.19E-04	9.54E-05
Cs-137	Ci	<2.06E-02	<5.91E-02	1.25E-04	1.85E-04
Ce-141	Ci	<2.06E-02	<5.91E-02	<8.24E-05	<1.58E-04
Ce-144	Ci	<2.06E-02	<5.91E-02	<8.24E-05	<1.58E-04
Gross Alpha	Ci	1.90E-04	2.60E-04	1.42E-06	5.41E-07
Ar-41	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Kr-85M	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Kr-85	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Kr-87	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Kr-88	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Xe-131M	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Xe-133M	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Xe-133	Ci	<4.13E-01	<1.65E-03	<1.65E-03	4.57E-04
Xe-135M	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03
Xe-135	Ci	<4.13E-01	<1.18E+00	<1.65E-03	<3.17E-03

NOTE

"Less than" values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The "less than" values are not included in the summation for the total release values.

1998 LIQUID EFFLUENTS

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci	6.54E-01	5.70E-01	2.09E+02	5.49E+02
Cr-51	Ci	n/a	n/a	3.44E-05	n/a
Mn-54	Ci	<2.08E-02	<6.83E-02	6.34E-04	1.23E-03
Fe-55	Ci	<4.16E-02	<1.37E-01	2.97E-03	6.63E-03
Fe-59	Ci	<2.08E-02	<6.83E-02	<2.29E-04	<3.99E-04
Co-57	Ci	n/a	n/a	7.11E-05	1.06E-04
Co-58	Ci	<2.08E-02	<6.83E-02	3.35E-03	4.14E-03
Co-60	Ci	<2.08E-02	<6.83E-02	4.73E-03	6.88E-03
Zn-65	Ci	<2.08E-02	<6.83E-02	<2.29E-04	<3.99E-04
Sr-89	Ci	<2.08E-03	<6.83E-03	<2.29E-05	<3.99E-05
Sr-90	Ci	<2.08E-03	<6.83E-03	<2.29E-05	<3.99E-05
Sr-92	Ci	n/a	n/a	n/a	n/a
Nb-95	Ci	n/a	n/a	2.60E-04	2.45E-04
Zr-95	Ci	n/a	n/a	4.22E-05	4.18E-05
Zr-97	Ci	n/a	n/a	n/a	n/a
Mo-99	Ci	<2.08E-02	<6.83E-02	<2.29E-04	<3.99E-04
Ag-110m	Ci	n/a	n/a	n/a	n/a
Sn-113	Ci	n/a	n/a	1.53E-05	2.20E-05
Sn-117m	Ci	n/a	n/a	n/a	1.37E-05
Sb-125	Ci	n/a	n/a	2.78E-03	5.20E-03
I-131	Ci	<4.16E-02	<1.37E-01	8.64E-05	3.08E-05
Cs-134	Ci	<2.08E-02	<6.83E-02	1.54E-04	2.30E-04
Cs-137	Ci	<2.08E-02	<6.83E-02	2.33E-04	4.27E-04
Ce-141	Ci	<2.08E-02	<6.83E-02	<2.29E-04	<3.99E-04
Ce-144	Ci	<2.08E-02	<6.83E-02	<2.29E-04	<3.99E-04
Gross Alpha	Ci	1.103E-03	<1.37E-02	2.26E-05	<7.98E-05
Ar-41	Ci	<4.16E-01	<1.37E+00	<4.57E-03	<7.98E-03
Kr-85M	Ci	<4.16E-01	<1.37E+00	<4.57E-03	<7.98E-03
Kr-85	Ci	<4.16E-01	<1.37E+00	<4.57E-03	1.31E-02
Kr-87	Ci	<4.16E-01	<1.37E+00	<4.57E-03	<7.98E-03
Kr-88	Ci	<4.16E-01	<1.37E+00	<4.57E-03	<7.98E-03
Xe-131M	Ci	<4.16E-01	<1.37E+00	<4.57E-03	1.80E-03
Xe-133M	Ci	<4.16E-01	<1.37E+00	<4.57E-03	3.37E-04
Xe-133	Ci	<4.16E-01	<1.38E+00	7.22E-03	1.14E-01
Xe-135M	Ci	<4.16E-01	<1.37E+00	<4.57E-03	<7.98E-03
Xe-135	Ci	<4.16E-01	<1.37E+00	<4.57E-03	1.25E-05

NOTE

"Less than" values are calculated using the Lower Limit of Detection (LLD) values listed in Table 2-1 of the ODCM multiplied by the volume of waste discharged during the respective quarter. The "less than" values are not included in the summation for the total release values.

1998 LIQUID CUMULATIVE DOSE SUMMARY
TABLE 1

QUARTER 1 OF 1998	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
TOTAL DOSE (mRem) FOR BONE	1.17E-03	5.00E+00	2.34E-02
TOTAL DOSE (mRem) FOR LIVER	7.70E-03	5.00E+00	1.54E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	7.19E-03	1.50E+00	4.79E-01
TOTAL DOSE (mRem) FOR THYROID	5.60E-03	5.00E+00	1.12E-01
TOTAL DOSE (mRem) FOR KIDNEY	6.28E-03	5.00E+00	1.26E-01
TOTAL DOSE (mRem) FOR LUNG	5.84E-03	5.00E+00	1.17E-01
TOTAL DOSE (mRem) FOR GI-LLI	7.75E-03	5.00E+00	1.55E-01
QUARTER 2 OF 1998			
TOTAL DOSE (mRem) FOR BONE	9.98E-04	5.00E+00	2.00E-02
TOTAL DOSE (mRem) FOR LIVER	2.28E-02	5.00E+00	4.56E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	2.23E-02	1.50E+00	1.49E+00
TOTAL DOSE (mRem) FOR THYROID	2.11E-02	5.00E+00	4.22E-01
TOTAL DOSE (mRem) FOR KIDNEY	2.17E-02	5.00E+00	4.33E-01
TOTAL DOSE (mRem) FOR LUNG	2.13E-02	5.00E+00	4.26E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.28E-02	5.00E+00	4.57E-01
QUARTER 3 OF 1998			
TOTAL DOSE (mRem) FOR BONE	1.14E-03	5.00E+00	2.28E-02
TOTAL DOSE (mRem) FOR LIVER	1.72E-02	5.00E+00	3.44E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.67E-02	1.50E+00	1.11E+00
TOTAL DOSE (mRem) FOR THYROID	1.55E-02	5.00E+00	3.10E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.59E-02	5.00E+00	3.18E-01
TOTAL DOSE (mRem) FOR LUNG	1.55E-02	5.00E+00	3.10E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.90E-02	5.00E+00	3.80E-01
QUARTER 4 OF 1998			
TOTAL DOSE (mRem) FOR BONE	2.74E-03	5.00E+00	5.49E-02
TOTAL DOSE (mRem) FOR LIVER	6.58E-02	5.00E+00	1.32E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	6.45E-02	1.50E+00	4.30E+00
TOTAL DOSE (mRem) FOR THYROID	6.13E-02	5.00E+00	1.23E+00
TOTAL DOSE (mRem) FOR KIDNEY	6.27E-02	5.00E+00	1.25E+00
TOTAL DOSE (mRem) FOR LUNG	6.17E-02	5.00E+00	1.23E+00
TOTAL DOSE (mRem) FOR GI-LLI	6.51E-02	5.00E+00	1.30E+00
TOTALS FOR 1998			
TOTAL DOSE (mRem) FOR BONE	6.05E-03	1.00E+01	6.05E-02
TOTAL DOSE (mRem) FOR LIVER	1.13E-01	1.00E+01	1.13E+00
TOTAL DOSE (mRem) FOR TOTAL BODY	1.11E-01	3.00E+00	3.70E+00
TOTAL DOSE (mRem) FOR THYROID	1.03E-01	1.00E+01	1.03E+00
TOTAL DOSE (mRem) FOR KIDNEY	1.07E-01	1.00E+01	1.07E+00
TOTAL DOSE (mRem) FOR LUNG	1.04E-01	1.00E+01	1.04E+00
TOTAL DOSE (mRem) FOR GI-LLI	1.15E-01	1.00E+01	1.15E+00

1. Based on ODCM Section 2.2, which restricts dose to the whole body to less than or equal to 1.5 mRem per quarter and 3.0 mRem per year. Dose restriction of any organ is less than or equal to 5 mRem per quarter and 10 mRem per year.

**1998 LIQUID CUMULATIVE DOSE SUMMARY
 TABLE 2**

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A. Fission and Activation Products (not including H-3, gases, alpha)					
1. Total Release - (Ci)	1.47E-02	1.15E-02	1.54E-02	2.52E-02	6.68E-02
2. Maximum Organ Dose (mRem)	2.15E-03	1.73E-03	5.80E-03	4.57E-03	1.42E-02
3. Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Limit	4.30E-02	3.47E-02	1.16E-01	9.15E-02	1.36E-01
B. Tritium					
1. Total Release - (Ci)	1.45E+01	5.01E+01	2.10E+02	5.50E+02	8.25E+02
2. Maximum Organ Dose (mRem)	5.60E-03	2.11E-02	1.53E-02	6.12E-02	1.03E-01
3. Organ Dose Limit (mRem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4. Percent of Limit	1.12E-01	4.22E-01	3.05E-01	1.22E+00	1.03E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. Wolf Creek ODCM methodology is used to calculate the maximum organ dose which assumes that an individual drinks the water and eats the fish from the discharge point. ODCM Section 2.2 organ dose limits are used.

REPORT OF 1998 RADIOACTIVE EFFLUENTS: AIRBORNE

	Unit	Quarter 1	Quarter 2
A. Fission and Activation Gases			
1. Total Release	Ci	2.63E-01	2.17E+00
2. Average Release Rate for Period	µCi/sec	3.39E-02	2.75E-01
3. Percent of ODCM Limit (1)	%	1.93E-03	2.22E-03
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00
3. Percent of Applicable Limit (2)	%	0.00E+00	0.00E+00
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	1.37E-08	6.38E-08
D. Tritium			
Total Release	Ci	9.03E+00	1.70E+01
Average Release Rate for Period	µCi/sec	1.16E+00	2.16E+00
Percent of ODCM Limit (4)	%	8.51E-02	1.61E-01

1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}} \text{ or } \frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total Curies of Iodine -131})(100)}{1 \text{ Curie}}$$

3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$$

NOTE

This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie release rates.

4) The percent of ODCM limit for tritium is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to H - 3})(100)}{7.5 \text{ mrem}}$$

REPORT OF 1998 RADIOACTIVE EFFLUENTS - AIRBORNE

	Unit	Quarter 3	Quarter 4
A. Fission and Activation Gases			
1. Total Release	Ci	8.86E+00	1.01E+01
2. Average Release Rate for Period	µCi/sec	1.12E+00	1.26E+00
3. Percent of ODCM Limit (1)	%	3.00E-02	1.13E-02
B. Iodines			
1. Total Iodine-131	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00
3. Percent of Applicable Limit (2)	%	0.00E+00	0.00E+00
C. Particulates			
1. Particulates with Half-lives > 8 days	Ci	0.00E+00	0.00E+00
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00
3. Percent of ODCM Limit (3)	%	0.00E+00	0.00E+00
4. Gross Alpha Radioactivity	Ci	1.11E-08	1.28E-08
D. Tritium			
1. Total Release	Ci	3.54E+01	1.45E+01
2. Average Release Rate for Period	µCi/sec	4.45E+00	1.82E+00
3. Percent of ODCM Limit (4)	%	3.32E-01	1.37E-01

1) The percent of ODCM limit for fission and activation gases is calculated using the following methodology: % of ODCM Limit = $\frac{(\text{Qtrly Total Beta Airdose})(100)}{10 \text{ mrad}}$ or $\frac{(\text{Qtrly Total Gamma Airdose})(100)}{5 \text{ mrad}}$

The largest value calculated between Gamma and Beta airdose is listed as the % of ODCM Limit.

2) The percent of ODCM limit for iodine is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Total Curies of Iodine - 131})(100)}{1 \text{ Curie}}$$

3) The percent of ODCM limit for particulates is calculated using the following methodology:

$$\% \text{ of ODCM Limit} = \frac{(\text{Highest Organ Dose Due to Particulates})(100)}{7.5 \text{ mrem}}$$

NOTE

This type of methodology is used since the Wolf Creek ODCM ties release limits to doses rather than Curie rates.

4) The percent of ODCM limit for tritium is calculated using the following methodology:

1998 GASEOUS EFFLUENTS

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	1.44E-01	4.09E-01
Kr-85	Ci	n/a	n/a	n/a	n/a
Kr-85m	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<2.76E+01	<2.87E+01	<1.55E-02	<4.47E-02
Kr-88	Ci	<2.06E+01	<2.14E+01	<1.15E-02	<3.33E-02
Xe-131m	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	<1.39E+01	1.16E+00	1.19E-01	5.98E-01
Xe-133m	Ci	<3.93E+01	<4.09E+01	<2.20E-02	<6.37E-02
Xe-135	Ci	<5.36E+00	<5.58E+00	8.21E-05	1.70E-03
Xe-138	Ci	<4.32E+02	<4.49E+02	<2.42E-01	<6.99E-01
Total	Ci	0.00E+00	1.16E+00	2.63E-01	1.01E+00
2. Halogens (Gaseous)					
I-131	Ci	<2.55E-04	<2.66E-04	<1.43E-07	<4.13E-07
I-133	Ci	<2.55E-02	<2.66E-02	<1.43E-05	<4.13E-05
Total	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	8.96E+00	1.58E+01	7.18E-02	1.21E+00
Mn-54	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Fe-59	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Co-58	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Co-60	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Zn-65	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Mo-99	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Cs-134	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Cs-137	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Ce-141	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Ce-144	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Sr-89	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Sr-90	Ci	<2.55E-03	<2.66E-03	<1.43E-06	<4.13E-06
Gross Alpha	Ci	<2.55E-03	6.38E-08	1.37E-08	<4.13E-06
Total	Ci	8.96E+00	1.58E+01	7.18E-02	1.21E+00

NOTE

"Less than" values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

1998 GASEOUS EFFLUENTS (Continued)

NUCLIDES RELEASED	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission and Activation Gases					
Ar-41	Ci	1.56E+00	n/a	4.97E-01	6.35E-01
Kr-85	Ci	n/a	n/a	n/a	3.37E+00
Kr-85m	Ci	n/a	3.23E-02	n/a	n/a
Kr-87	Ci	<2.82E+01	<2.88E+01	<1.14E-01	<7.42E-02
Kr-88	Ci	<2.10E+01	<2.15E+01	<8.48E-02	<5.54E-02
Xe-131m	Ci	n/a	n/a	n/a	6.16E-03
Xe-133	Ci	4.31E+00	4.85E+00	2.48E+00	1.15E+00
Xe-133m	Ci	<4.02E+01	<4.11E+01	<1.62E-01	4.45E-03
Xe-135	Ci	<5.48E+00	<5.61E+00	2.55E-03	<1.44E-02
Xe-138	Ci	<4.41E+02	<4.51E+02	<1.78E+00	<1.16E+00
Total	Ci	5.88E+00	4.88E+00	2.98E+00	5.17E+00
2. Halogens (Gaseous)					
I-131	Ci	<2.61E-04	<2.67E-04	<1.05E-06	<6.87E-07
I-133	Ci	<2.61E-02	<2.67E-02	<1.05E-04	<6.87E-05
Total	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	2.48E+01	1.30E+01	1.06E+01	1.53E+00
Mn-54	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Fe-59	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Co-58	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Co-60	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Zn-65	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Mo-99	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Cs-134	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Cs-137	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Ce-141	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Ce-144	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Sr-89	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Sr-90	Ci	<2.61E-03	<2.67E-03	<1.05E-05	<6.87E-06
Gross Alpha	Ci	1.11E-08	1.28E-08	<1.05E-05	<6.87E-06
Total	Ci	2.48E+01	1.30E+01	1.06E+01	1.53E+00

NOTE

"Less than" values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.

1998 GASEOUS CUMULATIVE DOSE SUMMARY
Table 1

QUARTER 1 OF 1998	ODCM CALCULATED DOSE	ODCM ¹ LIMIT	% OF LIMIT
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	6.37E-03	7.50E+00	8.50E-02
TOTAL DOSE (mRem) FOR TOTAL BODY	6.37E-03	7.50E+00	8.50E-02
TOTAL DOSE (mRem) FOR THYROID	6.37E-03	7.50E+00	8.50E-02
TOTAL DOSE (mRem) FOR KIDNEY	6.37E-03	7.50E+00	8.50E-02
TOTAL DOSE (mRem) FOR LUNG	6.37E-03	7.50E+00	8.50E-02
TOTAL DOSE (mRem) FOR GI-LLI	6.37E-03	7.50E+00	8.50E-02
QUARTER 2 OF 1998			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	1.20E-02	7.50E+00	1.60E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.20E-02	7.50E+00	1.60E-01
TOTAL DOSE (mRem) FOR THYROID	1.20E-02	7.50E+00	1.60E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.20E-02	7.50E+00	1.60E-01
TOTAL DOSE (mRem) FOR LUNG	1.20E-02	7.50E+00	1.60E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.20E-02	7.50E+00	1.60E-01
QUARTER 3 OF 1998			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	2.50E-02	7.50E+00	3.34E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	2.50E-02	7.50E+00	3.34E-01
TOTAL DOSE (mRem) FOR THYROID	2.50E-02	7.50E+00	3.34E-01
TOTAL DOSE (mRem) FOR KIDNEY	2.50E-02	7.50E+00	3.34E-01
TOTAL DOSE (mRem) FOR LUNG	2.50E-02	7.50E+00	3.34E-01
TOTAL DOSE (mRem) FOR GI-LLI	2.50E-02	7.50E+00	3.34E-01
QUARTER 4 OF 1998			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	7.50E+00	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	1.02E-02	7.50E+00	1.36E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	1.02E-02	7.50E+00	1.36E-01
TOTAL DOSE (mRem) FOR THYROID	1.02E-02	7.50E+00	1.36E-01
TOTAL DOSE (mRem) FOR KIDNEY	1.02E-02	7.50E+00	1.36E-01
TOTAL DOSE (mRem) FOR LUNG	1.02E-02	7.50E+00	1.36E-01
TOTAL DOSE (mRem) FOR GI-LLI	1.02E-02	7.50E+00	1.36E-01
TOTALS FOR 1998			
TOTAL DOSE (mRem) FOR BONE	0.00E+00	1.50E+01	0.00E+00
TOTAL DOSE (mRem) FOR LIVER	5.36E-02	1.50E+01	3.57E-01
TOTAL DOSE (mRem) FOR TOTAL BODY	5.36E-02	1.50E+01	3.57E-01
TOTAL DOSE (mRem) FOR THYROID	5.36E-02	1.50E+01	3.57E-01
TOTAL DOSE (mRem) FOR KIDNEY	5.36E-02	1.50E+01	3.57E-01
TOTAL DOSE (mRem) FOR LUNG	5.36E-02	1.50E+01	3.57E-01
TOTAL DOSE (mRem) FOR GI-LLI	5.36E-02	1.50E+01	3.57E-01

1. Based on Wolf Creek ODCM Section 3.2.2 which restricts dose during any calendar quarter to less than or equal to 7.5 mRem to any organ and during any calendar year to less than or equal to 15 mRem to any organ.

1998 GASEOUS CUMULATIVE DOSE SUMMARY
TABLE 2

	Nuclides Released	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
A.	Fission and Activation Gases					
1.	Total Release - (Ci)	2.63E-01	2.17E+00	8.86E+00	1.00E+01	2.13E+01
2.	Total Gamma Airdose (mRad)	9.65E-05	3.09E-04	1.50E-03	5.53E-04	2.46E-03
3.	Gamma Airdose Limit (mRad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
4.	Percent of Gamma Airdose Limit	1.93E-03	6.17E-03	3.01E-02	1.11E-02	2.46E-02
5.	Total Beta Airdose (mRad)	4.17E-05	2.22E-04	9.70E-04	1.01E-03	2.24E-03
6.	Beta Airdose Limit (mRad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
7.	Percent of Beta Airdose Limit (mRad)	4.17E-04	2.22E-03	9.70E-03	1.01E-02	1.12E-02
B.	Particulates					
1.	Total Particulates (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2.	Maximum Organ Dose (mRem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3.	Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4.	Percent of Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C.	Tritium					
1.	Total Release (Ci)	9.03E+00	1.70E+01	3.54E+01	1.45E+01	7.59E+01
2.	Maximum Organ Dose (mRem)	6.38E-03	1.21E-02	2.49E-02	1.03E-02	5.37E-02
3.	Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4.	Percent of Limit	8.51E-02	1.62E-01	3.32E-01	1.37E-01	3.58E-01
D.	Iodine					
1.	Total I-131, I-133 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2.	Maximum Organ Dose (mRem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3.	Organ Dose Limit (mRem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
4.	Percent of Limit	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

This table is included to show the correlation between Curies released and the associated calculated maximum organ dose. The maximum organ dose is calculated using Wolf Creek ODCM methodology which assumes that an individual actually resides at the release point. ODCM Section 3.2.2 organ dose limits are used.

1998 Effluent Concentration Limits

<u>Nuclides</u>	<u>Curies</u>	<u>Average Diluted Concentration (uCi/ml)</u>	<u>10CFR 20 ECL</u>	<u>% of ECL</u>
H-3	8.24E+02	1.30E-05	1.00E-03	1.30E+00
Cr-51	3.44E-05	5.43E-13	5.00E-04	1.09E-07
Mn-54	2.30E-03	3.63E-11	3.00E-05	1.21E-04
Fe-55	1.37E-02	2.16E-10	1.00E-04	2.16E-04
Co-57	2.96E-04	4.67E-12	6.00E-05	7.78E-06
Co-58	1.96E-02	3.09E-10	2.00E-05	1.55E-03
Co-60	1.52E-02	2.40E-10	3.00E-06	7.99E-03
Zr-95	1.48E-04	2.33E-12	2.00E-05	1.17E-05
Nb-95	6.84E-04	1.08E-11	3.00E-05	3.60E-05
Sn-113	4.99E-05	7.87E-13	3.00E-05	2.62E-06
Sn-117m	1.37E-05	2.16E-13	3.00E-05	7.20E-07
Sb-124	1.71E-04	2.70E-12	7.00E-06	3.85E-05
Sb-125	1.28E-02	2.02E-10	3.00E-05	6.73E-04
I-131	1.17E-04	1.85E-12	1.00E-06	1.85E-04
Cs-134	5.98E-04	9.43E-12	9.00E-07	1.05E-03
Cs-137	9.70E-04	1.53E-11	1.00E-06	1.53E-03
Kr-85	1.31E-02	2.07E-10	2.00E-04	1.03E-04
Xe-131M	1.80E-03	2.84E-11	2.00E-04	1.42E-05
Xe-133	1.22E-01	1.92E-09	2.00E-04	9.62E-04
Xe-133M	3.37E-04	5.32E-12	2.00E-04	2.66E-06
Xe-135	1.25E-05	1.97E-13	2.00E-04	9.86E-08

2000 Annual Report

SECTION I REPORT OF 2000 RADIOACTIVE EFFLUENTS: LIQUID

		Unit	Quarter 1	Quarter 2
A.	Fission and Activation Products			
1.	Total Release (not including tritium, gases, alpha)	Ci	4.16E-03	1.66E-02
2.	Average Diluted Concentration During Period	μCi/ml	3.49E-10	5.45E-10
3.	Percent of Applicable Limit (1)	%	8.33E-02	3.33E-01
B.	Tritium			
1.	Total Release	Ci	1.19E+02	7.44E+02
2.	Average Diluted Concentration During Period	μCi/ml	9.98E-06	2.44E-05
3.	Percent of Applicable Limit (MPC) (ECL) (2)	%	9.98E-01	2.44E+00
C.	Dissolved and Entrained Gases			
1.	Total Release	Ci	1.32E-03	1.47E-01
2.	Average Diluted Concentration During Period	μCi/ml	1.101E-10	4.81E-09
3.	Percent of Applicable Limit (3)	%	5.54E-05	2.41E-03
D.	Gross Alpha Radioactivity			
1.	Total Release	Ci	2.06E-04	5.55E-05
E.	Volume of Waste Released (prior to dilution)	Liters	4.50E+07	5.35E+07
F.	Volume of dilution water used	Liters	1.19E+10	3.05E+10

NOTES:

- 1) The applicable limit for the Wolf Creek Generating Station is 5 Curies per year. (Reference 10 CFR 50, Appendix I, "Guides On Design Objectives For Light-Water Cooled Nuclear Power Reactors," Paragraph A.2.) The value printed here is derived by dividing the total release Curies by 5 Curies and then multiplying the result by 100.
- 2) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(\text{MPC or ECL, Appendix B, Table 210CFR20})}$$

- 3) This value is derived by the following formula:

$$\% \text{ of Applicable Limit} = \frac{(\text{Average Diluted Concentration}) (100)}{(2E - 4 \text{ from ODCM Section 2.1})}$$

2000 GASEOUS EFFLUENTS

NUCLIDES RELEASED	Unit	<u>Continuous Mode</u>		<u>9</u>	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission and Activation Gases					
Ar-41	Ci	n/a	n/a	4.17E-01	2.55E-01
Kr-85	Ci	n/a	n/a	2.31E+00	1.03E+00
Kr-85m	Ci	n/a	n/a	n/a	n/a
Kr-87	Ci	<4.24E+01	<4.22E+01	<8.52E-02	<3.98E-02
Kr-88	Ci	<5.09E+01	<5.07E+01	<1.02E-01	<4.78E-02
Xe-131m	Ci	n/a	n/a	n/a	n/a
Xe-133	Ci	<3.49E+01	1.42E+00	9.70E-02	9.00E-02
Xe-133m	Ci	<9.97E+01	<9.93E+01	<2.01E-01	<9.37E-02
Xe-135	Ci	8.61E-02	<1.23E+01	1.66E-04	3.74E-04
Xe-138	Ci	<1.12E+03	<1.12E+03	<2.25E+00	<1.05E+00
Total	Ci	8.61E-02	1.42E+00	2.82E+00	1.38E+00
2. Halogens (Gaseous)					
I-131	Ci	<2.58E-04	<2.57E-04	<5.20E-07	<2.43E-07
I-133	Ci	<2.58E-02	<2.57E-02	<5.20E-05	<2.43E-05
Total	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates and Tritium					
H-3	Ci	1.37E+01	1.32E+01	1.52E+00	4.04E-01
Mn-54	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Fe-59	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Co-58	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Co-60	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Zn-65	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Mo-99	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Cs-134	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Cs-137	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Ce-141	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Ce-144	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Sr-89	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Sr-90	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Gross Alpha	Ci	<2.58E-03	<2.57E-03	<5.20E-06	<2.43E-06
Co-57	Ci	n/a	n/a	n/a	n/a
Total	Ci	1.37E+01	1.32E+01	1.52E+00	4.04E-01

NOTE

"Less than" values for Noble Gases are calculated using the Lower Limit of Detection (LLD) values obtained at Wolf Creek Generating Station multiplied by the volume of air discharged during the respective quarter. For the Halogens and Particulates the ODCM LLD values are used.