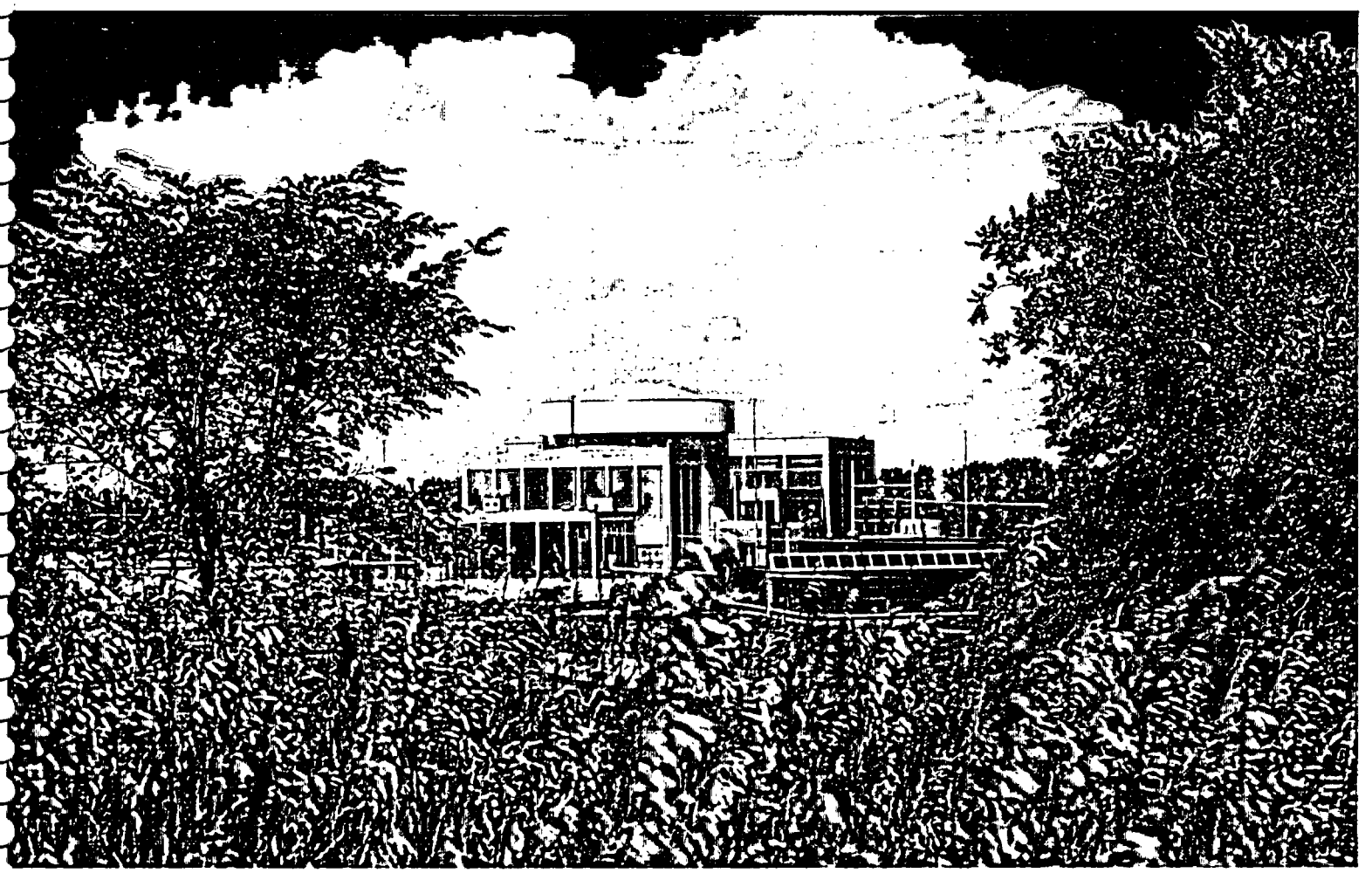
Omaha Public Power District
Fort Calhoun Station Unit No. 1

Annual Report
For
Technical Specification
Section 5.9.4.a

January 1, 2003 to December 31, 2003



DOCKET NO. 50-285

OPERATING LICENSE DPR-40

Omaha Public Power District
Fort Calhoun Station Unit No. 1

Annual Report
For
Technical Specifications,
Section 5.9.4.a

January 1, 2003 to December 31, 2003

DOCKET NO. 50-285 OPERATING LICENSE DPR-40

Annual Radiological Effluent Release Report

This report is submitted in accordance with Section 5.9.4.a of the Technical Specifications of Fort Calhoun Station Unit No. 1, Facility Operating License DPR-40 for the period January 1, 2003 through December 31, 2003. The Effluent Report is presented in the format outlined in Regulatory Guide 1.21, Revision 1.

In addition, this report provides the results of quarterly dose calculations performed in accordance with the Offsite Dose Calculation Manual. Results are presented by quarter for the period January 1, 2003 through December 31, 2003.

Further description of any changes made during the preceding twelve months to the Offsite Dose Calculation Manual and/or the Process Control Program for the Fort Calhoun Station are presented.

PRC RECOMMENDS APPROVAL

MAR 2 4 2004

PRC MTG. MINUTES

Manager-Fort Calhoun Station

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1.0 INTRODUCTION

This Annual Radiological Effluent Release Report, for Fort Calhoun Station Unit No. 1, is submitted as required by Technical Specification 5.9.4.a for the period January 1, 2003 through December 31, 2003.

1.1 Executive Summary

The Radioactive Effluent Monitoring program for the year 2003 was conducted as described in the following report. Major efforts were made to maintain the release of radioactive effluents to the environment as low as reasonably achievable. Activity released was significantly reduced due to the replacement of defective fuel in the spring of 2002.

The total gaseous activity released for 2003 was 19.2 Curies. This was less than 1% of the 2259.8 Curies released in 2002.

Dose contributions from gaseous effluents at the unrestricted area boundary were 4.12E-03 millirad maximum gamma air dose, and 6.79E-03 millirad maximum beta air dose. This was a considerable decrease from the 2002 values of 2.20E-01 millirad and 7.12E-01 millirad respectively.

Total activity (excluding tritium, dissolved gases and alpha) released in 2003 in liquid effluents was 1.06E-01 Curies. This was lower than the 2002 value of 4.20E-01 Curies.

The total tritium activity released in 2003 in liquid effluents was 295 Curies. This was a slight increase from the 2002 value of 293 Curies.

The calculated whole body dose due to liquid effluents at the site discharge from all sources in 2003 was 1.45E-02 mRem. This was a decrease from the 2002 dose of 1.69E-01 mRem.

The calculated critical organ dose due to liquid effluents at the site discharge from all sources in 2003 was 1.51E-03 mRem. This was a decrease from the 2002 dose of 2.22E-01 mRem.

The Fort Calhoun Station meteorological system achieved a cumulative availability rate of 96.5% for the joint frequency parameters required by Regulatory Guide 1.23 of wind speed, wind direction and delta temperature.

There were no abnormal releases during 2003.

During 2003 there was one change to the Offsite Dose Calculations Manual (ODCM) and no changes to the Process Control Program (PCP).

For 2003; the total volume of buried solid radwaste was 16.66 cubic meters, this was a decrease from the 23.30 cubic meters of solid waste buried in 2002. The total buried activity for 2003 was 19.13 Curies, 17.6 of which came from spent resin. This was a decrease from the 2002 value of 952.76 Curies.

Overall, the radioactive effluent monitoring program was conducted in a manner to ensure the activity released and associated dose to the public were maintained as low as reasonably achievable.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM Radiological Effluent Control Specifications applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections.

2.1.1 Fission and Activation Gases (Noble Gases)

The release rate of radioactive material in airborne effluents shall be controlled such that the instantaneous concentrations of radionuclides do not exceed the values specified in 10 CFR 20 for airborne effluents at the unrestricted area boundary. To support plant operations, Supervisor - System Chemistry may increase this limit up to the limits specified in Technical Specification 5.16.1.g.

Technical Specification 5.16.1.g establishes the administrative control limit on the concentration resulting from radioactive material, other than noble gases, released in gaseous effluents to unrestricted areas conforming to ten times 10 CFR 20.1001-20.2401, Appendix B, Table 2,

Column 1. For noble gases, the concentration shall be limited to five times 10 CFR 20.1001-20.2401, Appendix B, Table 2, Column 1.

The air dose due to noble gases released in gaseous effluents to areas at or beyond the unrestricted area boundary shall be limited to the following:

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

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

2.1.2 Dose - Iodine-131, Radioactive Material in Particulate Form with Half Lives Greater than 8 Days (Other than Noble Gases) and Tritium

a. The dose to an individual or dose commitment to any organ of an individual in unrestricted areas due to the release of I-131, radioactive material in particulate form with half-lives greater than eight days (other than noble gases), and tritium in airborne effluents shall not exceed 7.5 millirem from all exposure pathways during any calendar quarter.

b. The dose to an individual or dose commitment to any organ of an individual in unrestricted areas due to the release of I-131, radioactive materials in particulate form with half-lives greater than eight days (other than noble gases), and tritium in airborne effluents shall not exceed 15 millirem from all exposure pathways during any calendar year.

2.1.3 Liquid Effluents

The release rate of radioactive material in liquid effluents shall be controlled such that the instantaneous concentrations for radionuclides, other than dissolved or entrained noble gases, do not exceed the values specified in 10 CFR 20 for liquid

effluents at site discharge. To support plant operations, Supervisor - System Chemistry may increase this limit up to the limit specified in Technical Specifications 5.16.1.b.

Technical Specification 5.16.1.b establishes the administrative control limit on concentration of radioactive material, other than dissolved or entrained noble gases, released in liquid effluents to unrestricted areas conforming to ten times 10 CFR 20.1001-20.2401, Appendix B, Table 2, Column 2. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-04 µCi/ml total activity.

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to unrestricted areas shall be limited to:

a. During any calendar quarter: Less than or equal to 1.5 mRem to the whole body and less than or equal to 5 mRem to any organ, and

b. During any calendar year: Less than or equal to 3 mRem to the whole body and less than or equal to 10 mRem to any organ.

2.1.4 Total Dose-Uranium Fuel Cycle

The dose to any real individual from uranium fuel cycle sources shall be limited to ≤ 25 mRem to the total body or any organ (except the thyroid, which shall be limited to ≤ 75 mRem) during each calendar year.

2.2 Effluent Concentration Limits (ECL)

2.2.1 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of 2.0E-04 µCi/ml is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.2.2 Gaseous Effluents

The values specified in 10 CFR Part 20, Appendix B, Column 1 are used as the ECL for gaseous radioactive effluents released to unrestricted areas.

2.3 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 3.1 and 3.2 of Part I of the ODCM.

2.3.1 Liquid Radioactive Effluents

Each batch was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy, prior to release. Composite samples were analyzed monthly and quarterly for the Monitor and Hotel Waste Tanks. Composite samples were analyzed monthly in the onsite laboratory for tritium and gross alpha radioactivity using liquid scintillation and proportional counting techniques respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory (Teledyne Brown Engineering). A software program was used to project the total body and critical organ dose contribution at the unrestricted area boundary for each release and the percent contribution to the annual objective dose.

For continuous releases from the Steam Generator blowdown, daily grab samples were obtained for weekly, monthly and quarterly composites, in proportion to the rate of blowdown. Samples were analyzed using gamma spectroscopy techniques weekly. Composites were also analyzed monthly in the onsite laboratory for tritium and gross alpha radioactivity using liquid scintillation and proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, and Fe-55 by a contract laboratory (Teledyne Brown Engineering).

2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. For release of Waste Gas Decay Tanks, noble gas grab samples were analyzed for gamma emitting radionuclides using gamma spectroscopy. For releases from the Containment Building, samples were taken using charcoal and particulate filters, in addition to noble gas and tritium grab samples, and analyzed for gamma emitting radionuclides prior to each release. The results of the analysis and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode. A software program was developed and installed that can project the total body and critical organ dose contribution at the unrestricted area boundary for each release and the percent contribution to the annual objective dose. This program also adds the projected dose to the current actual dose totals in a temporary file, until it is updated with actual release data at the completion of a purge.

Continuous release effluent pathways were continuously sampled using charcoal and particulate filters and analyzed weekly for gamma emitting radionuclides using gamma spectroscopy. Weekly particulate filters were analyzed for gross alpha radioactivity in the onsite laboratory using proportional counting techniques. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by an offsite laboratory (Teledyne Brown Engineering).

2.4 Estimation of Total Percent Error

The estimated total percent error is calculated as follows:

$$\text{Total Percent Error} = (E_1^2 + E_2^2 + E_3^2 + \ldots + E_n^2)^{1/2}$$

Where E_n = Percent Error Associated with each contributing parameter.

Sample counting error is estimated by the Canberra Genie System Software for samples analyzed by gamma spectroscopy. This calculation can include the error

associated with peak area determination, gamma ray abundance, efficiency and half-life. Systematic error is estimated for gaseous and liquid effluent analyses and dilution and wastewater volume.

2.5 Batch Releases

A summary of information for liquid and gaseous batch releases is included in Table III-1.

2.6 Abnormal Releases

Abnormal Releases are defined as unplanned and unmonitored releases of radioactive material from the site.

A summary of information for liquid and gaseous abnormal releases is included in Table III-2.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables III-3, III-4 and III-5. All radioactive material released in gaseous form is considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables III-6, III-7 and III-8.

5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Section VI.

6.0 RELATED INFORMATION

6.1 Operability of Liquid and Gaseous Monitoring Instrumentation

During the reporting period no instruments used to monitor radioactive effluent releases were in violation of the reportable instrument operability requirements listed in the ODCM.

6.2 Changes to the Offsite Dose Calculation Manual (ODCM) or Process Control Program (PCP)

During 2003 there was one change made to the ODCM and no changes made to the PCP.

6.3 New Locations or Modifications for Dose Calculations or Environmental Monitoring

No new receptor locations were identified which resulted in changes to our environmental monitoring sample locations.

6.4 Noncompliance with Radiological Effluent Control Requirements

This section provides a list of any event that did not comply with the applicable requirements of the Radiological Effluent Controls given in the Offsite Dose Calculation Manual (ODCM). Detailed documentation concerning the evaluations and corrective actions is maintained onsite.

6.4.1 Abnormal Gaseous and Liquid Releases

No abnormal releases were made during the calendar year of 2003.

6.4.2 Failure to Meet Specified Sampling Requirements

During 2003 there were no instances in which specified sampling requirements were not met.

6.5 Modifications to Liquid and Gaseous Waste Treatment and Ventilation Exhaust Systems

During the reporting period no design modifications were approved nor implemented involving major changes to the Liquid and Gaseous Waste Treatment Systems.

6.6 Meteorological Monitoring Program

A summary of hourly meteorological data, collected during 2003, is retained onsite. This data is available for review by the Nuclear Regulatory Commission upon request. Joint Frequency tables are included in Section VII, Attachment 2.

Real time hourly meteorological data is used to calculate the annual air effluent dose to individuals. For quarterly estimates during the year an annual average X/Q is used which is an average of the highest X/Qs calculated for each of the previous two years.

6.7 Assessment of Doses

6.7.1 Doses Due to Liquid Effluents

Total body, skin, and organ dose for liquid releases were calculated in mRem for all significant liquid pathways using the annual configuration of the LADTAP II program. The site discharge location was chosen to present a most conservative estimate of dose for an average adult, teenager, child and infant. A conservative approach is also presented by the assumption that Omaha and Council Bluffs receive all drinking water from the Missouri River.

The LADTAP II program in its annual configuration was also used to calculate the total body and organ doses for the population of 853,274 within a 50-mile radius of the plant (based on the 2000 census). The results of the calculations are listed in Section V.

The dose due to liquid effluents for total body and critical organ are also calculated quarterly using the methods in the ODCM. The results are listed in Section II.

6.7.2 Doses Due to Gaseous Effluents

Total body, skin and organ doses from ground releases were calculated in mRem to an average adult, teenager, child, and infant in each receptor using the annual configuration of the GASPAR II program. Also, the doses to the same groups, in units of mrad, due to gamma and beta radiation carried by air, were computed using GASPAR II.

The GASPAR II program in its annual configuration was also used to calculate the ALARA integrated population dose summary for the total body, skin and organ doses in person-rem for all individuals within a 50-mile radius. The results of the calculations are shown in Section IV.

The dose due to gaseous effluents for total body gamma and beta noble gas air dose are calculated quarterly using the methods in the ODCM with an annual average X/Q. The results are listed in Section II.

6.7.3 Doses Due to I-131, Tritium and Particulates with Half Lives Greater than 8 days.

The doses due to I-131, Tritium and Particulates with half lives greater than 8 days for total body and critical organ dose are calculated quarterly using the highest of infant or child dose factors and an annual average X/Q. The results are listed in Section II for inhalation, ground and food.

6.7.4 Direct Radiation Dose to Individuals and Populations

Direct radiation doses attributed to the gamma radiation emitted from the containment structure were not observed above local background at any TLD sample locations for this annual period.

6.7.5 40 CFR 190 Dose Evaluation

ODCM Radiological Effluent Controls require dose evaluations to demonstrate compliance with 40 CFR Part 190 only if calculated yearly doses exceed two times the annual design objectives for liquid and/or gaseous effluents. At no time during 2003 were any of these limits exceeded, therefore, no evaluations were required.

SECTION II

QUARTERLY DOSES FROM EFFLUENTS

Offsite Dose Calculation Manual

January 1, 2003 - December 31, 2003

Quarterly Dose Calculation Results

January 1, 2003 through December 31, 2003

With the implementation of the Fort Calhoun Station Radiological Effluent Technical Specifications (RETS) on October 1, 1985, radiation doses in the unrestricted area from liquid and gaseous effluents must be calculated on a quarterly basis in accordance with the Offsite Dose Calculation Manual (ODCM). These calculations are performed to ensure the annual dose limits delineated in Appendix I of 10 CFR 50 and implemented by RETS are not exceeded. If the results of the quarterly calculations exceed fifty percent (50%) of the annual limits of Appendix I, actions are taken to reduce effluents so that the resultant doses do not exceed the annual limits during the remainder of the year and a special report is submitted to the Nuclear Regulatory Commission.

This section presents the results of the quarterly dose calculations performed during the period January 1, 2003 through December 31, 2003. Details are shown as to the types, sources and resultant doses from the effluents, the annual limits and a comparison to the annual limits.

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS
FORT CALHOUN FIRST QUARTER 2003 DOSE PROJECTIONS

I. Liquid Effluents:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Batch:	3.64E-02	4.87E-02
Continuous:	0.00E+00	0.00E+00
Totals:	3.64E-02	4.87E-02
ODCM Quarterly Objective:	1.50E+00	5.00E+00
Percent of Quarterly Obj:	2.43 %	0.97 %
ODCM Annual Objective:	3.00E+00	1.00E+01
YTD Percent of Annual Obj:	1.21 %	0.49 %

II. Gaseous Effluents:	Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
A. Noble Gas Air Dose:	1.18E-03	1.56E-03
ODCM Quarterly Objective:	5.00E+00	1.00E+01
Percent of Quarterly Obj:	0.02 %	0.02 %
ODCM Annual Objective:	1.00E+01	2.00E+01
YTD Percent of Annual Obj:	0.01 %	0.01 %

B. I-131, H-3, and Particulates with Half-lives > 8 Days:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Inhalation:	5.83E-06	1.81E-04
Ground and Food:	2.90E-05	2.06E-03
Totals:	3.48E-05	2.24E-03
ODCM Quarterly Objective:	7.50E+00	7.50E+00
Percent of Quarterly Obj:	0.00 %	0.03 %
ODCM Annual Objective:	1.50E+01	1.50E+01
YTD Percent of Annual Obj:	0.00 %	0.01 %

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS
FORT CALHOUN SECOND QUARTER 2003 DOSE PROJECTIONS

I. Liquid Effluents:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Batch:	1.66E-02	2.15E-02
Continuous:	0.00E+00	0.00E+00
Totals:	1.66E-02	2.15E-02
ODCM Quarterly Objective:	1.50E+00	5.00E+00
Percent of Quarterly Obj:	1.11 %	0.43 %
ODCM Annual Objective:	3.00E+00	1.00E+01
YTD Percent of Annual Obj:	1.77 %	0.69 %

II. Gaseous Effluents:	Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
A. Noble Gas Air Dose:	1.38E-03	1.55E-03
ODCM Quarterly Objective:	5.00E+00	1.00E+01
Percent of Quarterly Obj:	0.03 %	0.02 %
ODCM Annual Objective:	1.00E+01	2.00E+01
YTD Percent of Annual Obj:	0.03 %	0.02 %

B. I-131, H-3, and Particulates with Half-lives > 8 Days:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Inhalation:	1.55E-05	3.51E-04
Ground and Food:	1.29E-04	4.82E-03
Totals:	1.44E-04	5.17E-03
ODCM Quarterly Objective:	7.50E+00	7.50E+00
Percent of Quarterly Obj:	0.00 %	0.07 %
ODCM Annual Objective:	1.50E+01	1.50E+01
YTD Percent of Annual Obj:	0.00 %	0.05 %

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS
FORT CALHOUN THIRD QUARTER 2003 DOSE PROJECTIONS

I. Liquid Effluents:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Batch:	5.20E-02	6.89E-02
Continuous:	9.22E-06	1.47E-05
Totals:	5.20E-02	6.89E-02
ODCM Quarterly Objective:	1.50E+00	5.00E+00
Percent of Quarterly Obj:	3.47 %	1.38 %
ODCM Annual Objective:	3.00E+00	1.00E+01
YTD Percent of Annual Obj:	3.50 %	1.38 %

II. Gaseous Effluents:	Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
A. Noble Gas Air Dose:	2.55E-03	4.69E-03
ODCM Quarterly Objective:	5.00E+00	1.00E+01
Percent of Quarterly Obj:	0.05 %	0.05 %
ODCM Annual Objective:	1.00E+01	2.00E+01
YTD Percent of Annual Obj:	0.05 %	0.04 %

B. I-131, H-3, and Particulates with Half-lives > 8 Days:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Inhalation:	1.16E-03	2.46E-03
Ground and Food:	5.36E-03	2.35E-02
Totals:	6.52E-03	2.60E-02
ODCM Quarterly Objective:	7.50E+00	7.50E+00
Percent of Quarterly Obj:	0.09 %	0.35 %
ODCM Annual Objective:	1.50E+01	1.50E+01
YTD Percent of Annual Obj:	0.04 %	0.22 %

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS
FORT CALHOUN FOURTH QUARTER 2003 DOSE PROJECTIONS

I. Liquid Effluents:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Batch:	8.25E-03	1.08E-02
Continuous:	4.09E-05	6.39E-05
Totals:	8.29E-03	1.09E-02
ODCM Quarterly Objective:	1.50E+00	5.00E+00
Percent of Quarterly Obj:	0.55 %	0.22 %
ODCM Annual Objective:	3.00E+00	1.00E+01
YTD Percent of Annual Obj:	3.77 %	1.49 %

II. Gaseous Effluents:	Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
A. Noble Gas Air Dose:	8.73E-04	9.03E-04
ODCM Quarterly Objective:	5.00E+00	1.00E+01
Percent of Quarterly Obj:	0.02 %	0.01 %
ODCM Annual Objective:	1.00E+01	2.00E+01
YTD Percent of Annual Obj:	0.06 %	0.04 %
B. I-131, H-3, and Particulates with Half-lives > 8 Days:	Total Body Dose (mrem)	Critical Organ Dose (mrem)
Inhalation:	2.19E-05	1.69E-04
Ground and Food:	1.04E-04	2.89E-03
Totals:	1.26E-04	3.06E-03
ODCM Quarterly Objective:	7.50E+00	7.50E+00
Percent of Quarterly Obj:	0.00 %	0.04 %
ODCM Annual Objective:	1.50E+01	1.50E+01
YTD Percent of Annual Obj:	0.05 %	0.24 %

SECTION III
RADIOLOGICAL EFFLUENT RELEASES
Technical Specification (5.9.4.a)

Table III-1	Batch Liquid and Gas Release Summary
Table III-2	Abnormal Batch Liquid and Gaseous Release Summary
Table III-3	Gaseous Effluents - Summation of all Releases
Table III-4	Gaseous Effluent Releases - Batch Mode
Table III-5	Gaseous Effluent Releases - Continuous Mode
Table III-6	Liquid Effluents - Summation of all Releases
Table III-7	Liquid Effluent Releases - Batch Mode
Table III-8	Liquid Effluent Releases - Continuous Mode

January 1, 2003 - December 31, 2003

TABLE III.1

BATCH LIQUID AND GASEOUS RELEASE SUMMARY

JANUARY THROUGH DECEMBER 2003

A. Liquid Releases All Sources	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Number of Batch Releases:	26	24	60	50
2. Total Time Period for Batch Releases(min):	3,100	2,936	20,362	8,306
3. Maximum Time Period for Batch Releases(min):	160	167	8,251	418
4. Average Time Period for Batch Releases(min):	119	122	339	166
5. Minimum Time Period for Batch Releases(min):	99	102	88	55
6. Average Dilution Stream Flow During Periods of Release into the Missouri River(mls/min):	1.223E+09	1.363E+09	7.975E+08	7.842E+08

B. Gaseous Releases All Sources	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Number of Batch Releases:	18	18	46	20
2. Total Time Period for Batch Releases(min):	65,497	66,999	116,609	78,272
3. Maximum Time Period for Batch Releases(min):	5,047	5,410	23,094	8,085
4. Average Time Period for Batch Releases(min):	3,639	3,722	2,535	3,914
5. Minimum Time Period for Batch Releases(min):	327	285	100	321

TABLE III.2

ABNORMAL BATCH LIQUID AND GASEOUS RELEASE SUMMARY

JANUARY THROUGH DECEMBER 2003

A. Liquid Releases All Sources	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Number of Releases:	0	0	0	0
Total Activity Releases(Ci):	0.00E+00	0.00E+00	0.00E+00	0.00E+00

B. Gaseous Releases All Sources				
Number of Releases:	0	0	0	0
Total Activity Releases (Ci):	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE III.3

GASEOUS EFFLUENTS--SUMMATION OF ALL RELEASES

JANUARY THROUGH DECEMBER 2003

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
A. Fission & Activation Gases				
Total Release (Ci):	3.22E+00	3.13E+00	1.11E+01	1.75E+00
Avg. Release Rate for period (uCi/sec):	4.18E-01	4.02E-01	1.41E+00	2.23E-01
Total Error(%): 37.97				
B. Iodines				
Total Release (Ci):	8.27E-05	1.41E-04	5.67E-03	1.77E-04
Avg. Release Rate for period (uCi/sec):	1.08E-05	1.81E-05	7.21E-04	2.26E-05
Total Error(%): 54.07				
C. Particulates				
Total Release (Ci):	0.00E+00	5.32E-06	0.00E+00	0.00E+00
Avg. Release Rate for period (uCi/sec):	0.00E+00	6.84E-07	0.00E+00	0.00E+00
Total Error(%): 57.73				
Gross Alpha	5.64E-06*	4.96E-06*	9.55E-06*	8.20E-06*
Total Error(%): 20.62				
D. Tritium				
Total Release (Ci):	2.12E-02	5.42E-02	4.39E+00	8.22E-02
Avg. Release Rate for period (uCi/sec):	2.75E-03	6.98E-03	5.59E-01	1.05E-02
Total Error(%): 25.08				

* Alpha activity attributed to naturally occuring short lived alpha emitters.

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.4
GASEOUS EFFLUENTS--GROUND LEVEL RELEASES
JANUARY THROUGH DECEMBER 2003
Batch Mode

Nuclides(Ci)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Gases				
AR-41	2.39E-01	2.85E-01	2.60E-01	1.64E-01
KR-85	3.31E-01	1.70E-01	1.17E-01	3.93E-02
KR-85M	2.46E-03	2.67E-03	4.76E-03	4.73E-03
KR-87	0.00E+00	0.00E+00	0.00E+00	1.86E-03
KR-88	6.57E-04	2.59E-04	1.56E-02	6.21E-03
XE-131M	7.25E-03	0.00E+00	5.03E-02	5.17E-03
XE-133	2.29E+00	2.31E+00	8.32E+00	1.36E+00
XE-133M	2.81E-02	3.32E-02	8.77E-02	2.00E-02
XE-135	6.83E-02	7.89E-02	2.97E-01	1.10E-01
Totals for Period:	2.97E+00	2.88E+00	9.15E+00	1.71E+00
Iodines				
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pariculates				
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium and Gross Alpha				
H-3	2.12E-02	5.42E-02	4.39E+00	8.22E-02

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.5

GASEOUS EFFLUENTS--GROUND LEVEL RELEASES

JANUARY THROUGH DECEMBER 2003

Continuous Mode

Nuclides(Ci)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Gases				
XE-133	2.45E-01	1.86E-01	1.85E+00	0.00E+00
XE-135	0.00E+00	6.71E-02	9.57E-02	4.17E-02
Totals for Period:	2.45E-01	2.53E-01	1.95E+00	4.17E-02
Iodines				
I-131	1.36E-05	3.20E-05	1.35E-04	1.96E-05
I-132	0.00E+00	0.00E+00	5.33E-03	1.40E-04
I-133	6.92E-05	1.09E-04	2.01E-04	1.79E-05
Totals for Period:	8.27E-05	1.41E-04	5.67E-03	1.77E-04
Particulates				
CS-134	0.00E+00	1.85E-06	0.00E+00	0.00E+00
CS-137	0.00E+00	3.47E-06	0.00E+00	0.00E+00
Totals for Period:	0.00E+00	5.32E-06	0.00E+00	0.00E+00
Tritium and Gross Alpha				
ALPHA	5.64E-06	4.96E-06	9.55E-06	8.20E-06

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.6

LIQUID EFFLUENTS--SUMMATION OF ALL RELEASES

JANUARY THROUGH DECEMBER 2003

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
A. Fission & Activation Products				
Total Release (No Tritium, Gas, Alpha) (Ci):	2.61E-02	1.54E-02	2.41E-02	4.08E-02
Avg Diluted Concentration (uCi/ml):	8.12E-11	4.40E-11	8.15E-11	2.19E-10
10 CFR 20, App. B Limit 1.00E-06 uCi/ml Percent of Limit (%):	8.12E-03	4.40E-03	8.15E-03	2.19E-02
Total Error (%): 29.38				
B. Tritium				
Total Release (Ci):	6.15E+01	8.70E+01	1.20E+02	2.61E+01
Avg Diluted Concentration (uCi/ml):	1.91E-07	2.49E-07	4.06E-07	1.40E-07
10 CFR 20, App. B Limit 1.00E-03 uCi/ml Percent of Limit (%):	1.91E-02	2.49E-02	4.06E-02	1.40E-02
Total Error (%): 25.08				
C. Dissolved & Entrained Gases				
Total Release (Ci):	9.66E-04	5.94E-04	3.20E-03	7.00E-04
Avg Diluted Concentration (uCi/ml):	3.00E-12	1.70E-12	1.08E-11	3.76E-12
ODCM Limit 2.00E-04 uCi/ml Percent of Limit (%):	1.50E-06	8.50E-07	5.40E-06	1.88E-06
Total Error (%): 30.66				
D. Gross Alpha Radioactivity				
Total Release (Ci):	9.17E-05	4.36E-04	1.11E-03	3.40E-03
Total Error (%): 25.08				
E. Volume of Waste Released Prior to Dilution (Liters):	5.46E+07	4.45E+07	3.44E+07	3.16E+07
F. Volume of Dilution Water This Period (Liters):	3.22E+11	3.49E+11	2.96E+11	1.86E+11

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.7

LIQUID EFFLUENTS

JANUARY THROUGH DECEMBER 2003

Batch Mode

Nuclides(Ci)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Gases				
AG-110M	2.88E-03	2.19E-03	2.34E-03	1.61E-03
BA-140	0.00E+00	0.00E+00	9.87E-05	0.00E+00
BE-7	0.00E+00	0.00E+00	0.00E+00	6.61E-05
CE-144	5.69E-05	3.98E-05	0.00E+00	1.66E-05
CO-57	9.64E-05	5.54E-06	5.93E-05	3.55E-05
CO-58	5.28E-03	3.37E-04	1.60E-03	5.34E-03
CO-60	4.10E-03	7.41E-04	1.25E-03	8.18E-04
CR-51	0.00E+00	3.85E-04	1.03E-03	2.03E-03
CS-134	1.86E-03	5.75E-04	2.32E-03	3.26E-04
CS-137	3.25E-03	1.07E-03	4.76E-03	6.72E-04
FE-55	1.42E-03	0.00E+00	0.00E+00	2.29E-03
FE-59	0.00E+00	0.00E+00	1.15E-04	7.73E-05
HF-181	0.00E+00	0.00E+00	0.00E+00	3.69E-06
I-131	7.39E-04	0.00E+00	1.08E-04	4.09E-04
I-132	0.00E+00	0.00E+00	1.35E-03	5.68E-05
I-133	1.81E-05	0.00E+00	0.00E+00	0.00E+00
LA-140	5.23E-05	9.36E-06	9.69E-04	2.75E-04
MN-54	3.12E-04	5.40E-05	8.15E-05	9.55E-05
NB-95	1.04E-03	2.56E-05	3.24E-04	6.98E-04
PR-144	5.69E-05	3.98E-05	0.00E+00	1.66E-05
RU-103	0.00E+00	7.16E-07	4.24E-05	9.95E-05
SB-122	0.00E+00	0.00E+00	1.77E-05	0.00E+00
SB-124	3.71E-06	1.57E-05	8.15E-05	2.74E-03
SB-125	4.69E-03	9.81E-03	6.87E-03	1.88E-02
SB-126	0.00E+00	0.00E+00	0.00E+00	8.50E-05
SE-75	3.31E-06	4.49E-05	2.68E-04	2.82E-04
SN-113	0.00E+00	0.00E+00	6.12E-06	1.00E-05
SN-117M	0.00E+00	0.00E+00	5.17E-06	8.33E-06
SR-89	3.67E-05	0.00E+00	0.00E+00	6.82E-05
SR-90	1.47E-05	0.00E+00	0.00E+00	0.00E+00
TE-129	0.00E+00	0.00E+00	9.85E-06	9.13E-05
TE-129M	0.00E+00	0.00E+00	0.00E+00	3.31E-03
TE-132	0.00E+00	1.68E-06	2.87E-04	1.88E-05
Y-90	1.47E-05	0.00E+00	0.00E+00	0.00E+00
ZN-65	0.00E+00	0.00E+00	1.39E-05	1.21E-04
ZR-95	2.23E-04	1.74E-05	1.15E-04	2.62E-04
Totals for Period:	2.61E-02	1.54E-02	2.41E-02	4.08E-02
Dissolved & Entrained Gases				
AR-41	0.00E+00	0.00E+00	8.69E-06	0.00E+00
KR-88	8.74E-06	0.00E+00	0.00E+00	0.00E+00
XE-131M	0.00E+00	0.00E+00	1.56E-04	0.00E+00
XE-133	9.57E-04	5.92E-04	3.02E-03	7.00E-04
XE-135	0.00E+00	1.60E-06	7.92E-06	0.00E+00
Totals for Period:	9.66E-04	5.94E-04	3.20E-03	7.00E-04
Tritium and Gross Alpha				
ALPHA	9.17E-05	4.36E-04	1.11E-03	1.87E-03
H-3	6.15E+01	8.70E+01	1.20E+02	2.61E+01

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD) values.

TABLE III.8
LIQUID EFFLUENTS
JANUARY THROUGH DECEMBER 2003
Continuous Mode

Nuclides(Ci)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Products				
CS-137	0.00E+00	0.00E+00	1.85E-06	7.94E-06
Totals for Period:	0.00E+00	0.00E+00	1.85E-06	7.94E-06
Dissolved & Entrained Gases				
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium and Gross Alpha				
ALPHA	0.00E+00	0.00E+00	0.00E+00	1.53E-03
H-3	0.00E+00	0.00E+00	0.00E+00	1.96E-02

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

SECTION IV

DOSE FROM GASEOUS EFFLUENTS

Technical Specification 5.9.4.a

GASPAR II OUTPUT

January 1, 2003 - December 31,2003

Radioactive Effluent Releases - First, Second, Third and Fourth Quarters 2003

GASEOUS EFFLUENTS

Radioactive gaseous releases for the reporting period totaled 1.92E+01 Curies of inert gas. The gross gaseous activity release rates were 4.18E-01 µCi/sec for the first quarter, 4.02E-01 µCi/sec for the second quarter, 1.41E+00 µCi/sec for the third quarter, and 2.23E-01 µCi/sec for the fourth quarter.

Radioactive halogens and Particulates with half-lives greater that eight days released during the reporting period totaled 6.07E-03 Curies. The halogen release rates were 1.08E-05 µCi/sec for the first quarter, 1.81E-05 µCi/sec for the second quarter, 7.21E-04 µCi/sec for the third quarter, and 2.26E-05 µCi/sec for the fourth quarter. The release rates for Particulates with half-lives greater than eight days were 0.00E+00 µCi/sec for the first quarter, 6.84E-07 µCi/sec for the second quarter, 0.00E+00 µCi/sec for the third quarter and 0.00E+00 µCi/sec for the fourth quarter.

Radioactive tritium released during the reporting period totaled 4.55E+00 Curies. Gross alpha radioactivity released during the reporting period totaled 2.84E-05 Curies. Reanalysis of alpha samples indicated that the reported concentration was attributed to short lived, natural occurring, alpha emitters.

POTENTIAL DOSES TO INDIVIDUALS AND POPULATIONS

A. Potential Annual Doses to Individuals from Gaseous Releases

Total body, skin, and organ doses from ground releases were calculated in mRem to an average adult, teenager, child, and infant using the annual configuration of the GASPAR II program. Results to each receptor are shown in Tables IV-A-1 through IV-A-39. Also, the doses to the same groups, Table IV-B-1, in units of mrad, due to gamma and beta radiation carried by air, were computed using GASPAR II. In its annual configuration, GASPAR II assumes that all release rates are entered in curies per year (Ci/yr).

The inputs to GASPAR II for the annual period from January 1, 2003 through December 31, 2003 were as follows:

(1) All gaseous effluents

(2) Entrained gases (Ar-41, Xe-131M, Xe-133M, Xe-133, Xe-135M, Xe-135, Kr-85M, Kr-87, and Kr-88) from liquid effluents.

(3) Annual X/Qs at the actual receptor locations, which are corrected for open terrain and plume depletion, are calculated according to Regulatory Guideline 1.111. Also included are annual deposition rates corrected for the open terrain factor.

(4) The production, intake and grazing fractions were as follows: 1.0 for leafy vegetables grown in garden of interest, 0.76 for produce grown in garden of interest, 0.5 for the pasture grazing season of the milk animal, 1.0 for pasture grazing season of the meat animal, and 8 g/m^3 for the air water (humidity) concentrations.

(5) All dose factors, transport times from receptor to individual, and usage factors are defined by Regulatory Guide 1.109 and NUREG-0172.

(6) Site specific information, within a five-mile radius of the plant, on types of receptors located in each sector was used. That is, if a cow was not present in a sector, then the milk pathway for that sector was not considered. If it was present, then the actual sector distance was used.

These inputs introduce a most conservative approach for the following reasons:

(1) The open terrain and deposition corrections increase annual X/Qs by a factor ranging between 1.0 and 4.0

(2) The production, intake, and grazing fractions, as defined in the input definition statement, represent the environment in an extremely conservative manner.

B. Potential Semiannual Doses to Population from Gaseous Releases

The GASPAR II program in its annual configuration was also used to calculate the ALARA integrated population dose summary for the total body, skin, and organ doses in man-rem for all individuals within a 50-mile radius. The population-integrated dose is the summation of the dose received by all individuals and has units of man-thyroid-rem when applied to the summation of thyroid doses. The same inputs were used as in the individual case with the addition of the following:

(1) A total population of 853,274 (based on the 2000 census) was used to define the sector segments within a 50-mile radius of the plant.

(2) Production of milk, meat, and vegetation is based on 1973 annual data for Nebraska as recommended by the Nuclear Regulatory Commission for use in GASPAR II.

TABLE IV-A-1

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 1 RES
AT 4.57 MILES N

ANNUAL_BETA_AIR_DOSE = 6.56E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.83E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.73E-05	1.73E-05	1.73E-05	1.73E-05	1.73E-05	1.73E-05	1.80E-05	4.63E-05
GROUND	8.13E-07	8.13E-07	8.13E-07	8.13E-07	8.13E-07	8.13E-07	8.13E-07	9.50E-07
INHAL								
ADULT	1.04E-05	1.04E-05	3.30E-08	1.04E-05	1.04E-05	1.95E-05	1.04E-05	1.04E-05
TEEN	1.05E-05	1.05E-05	4.61E-08	1.05E-05	1.06E-05	2.20E-05	1.05E-05	1.05E-05
CHILD	9.27E-06	9.25E-06	6.23E-08	9.31E-06	9.34E-06	2.27E-05	9.23E-06	9.23E-06
INFANT	5.33E-06	5.32E-06	4.75E-08	5.38E-06	5.38E-06	1.76E-05	5.31E-06	5.31E-06

TABLE IV-A-2

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 2 RES
AT 1.93 MILES NNE

ANNUAL_BETA_AIR_DOSE = 3.13E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.15E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.40E-04	3.00E-04
GROUND	4.43E-06	4.43E-06	4.43E-06	4.43E-06	4.43E-06	4.43E-06	4.43E-06	5.18E-06
INHAL								
ADULT	4.27E-05	4.26E-05	2.02E-07	4.29E-05	4.31E-05	8.85E-05	4.25E-05	4.25E-05
TEEN	4.31E-05	4.30E-05	2.80E-07	4.34E-05	4.37E-05	1.01E-04	4.29E-05	4.29E-05
CHILD	3.81E-05	3.81E-05	3.77E-07	3.84E-05	3.86E-05	1.07E-04	3.79E-05	3.79E-05
INFANT	2.19E-05	2.19E-05	2.92E-07	2.22E-05	2.23E-05	8.49E-05	2.18E-05	2.18E-05

TABLE IV-A-3

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 3 RES
AT 1.52 MILES NE

ANNUAL_BETA_AIR_DOSE = 4.44E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.54E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.63E-04	3.75E-04
GROUND	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	5.55E-06
INHAL								
ADULT	6.45E-05	6.44E-05	2.71E-07	6.48E-05	6.50E-05	1.30E-04	6.43E-05	6.42E-05
TEEN	6.51E-05	6.50E-05	3.77E-07	6.55E-05	6.59E-05	1.49E-04	6.48E-05	6.48E-05
CHILD	5.75E-05	5.75E-05	5.08E-07	5.79E-05	5.82E-05	1.56E-04	5.73E-05	5.72E-05
INFANT	3.31E-05	3.31E-05	3.90E-07	3.35E-05	3.36E-05	1.23E-04	3.29E-05	3.29E-05

TABLE IV-A-4

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 4 RES
AT 4.79 MILES ENE

ANNUAL_BETA_AIR_DOSE = 3.58E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.50E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.17E-06	9.17E-06	9.17E-06	9.17E-06	9.17E-06	9.17E-06	9.52E-06	2.48E-05
GROUND	2.12E-07	2.12E-07	2.12E-07	2.12E-07	2.12E-07	2.12E-07	2.12E-07	2.48E-07
INHAL								
ADULT	5.71E-06	5.71E-06	1.79E-08	5.73E-06	5.74E-06	1.07E-05	5.70E-06	5.70E-06
TEEN	5.77E-06	5.76E-06	2.50E-08	5.79E-06	5.81E-06	1.20E-05	5.75E-06	5.75E-06
CHILD	5.10E-06	5.09E-06	3.37E-08	5.12E-06	5.14E-06	1.24E-05	5.08E-06	5.08E-06
INFANT	2.93E-06	2.93E-06	2.57E-08	2.96E-06	2.96E-06	9.65E-06	2.92E-06	2.92E-06

TABLE IV-A-5

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 5 RES
AT 4.67 MILES E

ANNUAL_BETA_AIR_DOSE = 5.64E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.33E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.47E-05	3.87E-05
GROUND	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	3.16E-07
INHAL								
ADULT	9.04E-06	9.03E-06	2.79E-08	9.06E-06	9.09E-06	1.69E-05	9.02E-06	9.01E-06
TEEN	9.12E-06	9.11E-06	3.90E-08	9.16E-06	9.19E-06	1.90E-05	9.10E-06	9.10E-06
CHILD	8.06E-06	8.05E-06	5.28E-08	8.10E-06	8.12E-06	1.96E-05	8.03E-06	8.03E-06
INFANT	4.64E-06	4.63E-06	4.02E-08	4.68E-06	4.68E-06	1.52E-05	4.62E-06	4.62E-06

TABLE IV-A-6

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 6 RES
AT 4.22 MILES ESE

ANNUAL_BETA_AIR_DOSE = 1.03E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 4.14E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.61E-05	6.95E-05
GROUND	5.39E-07	5.39E-07	5.39E-07	5.39E-07	5.39E-07	5.39E-07	5.39E-07	6.30E-07
INHAL								
ADULT	1.66E-05	1.66E-05	5.05E-08	1.67E-05	1.67E-05	3.09E-05	1.66E-05	1.66E-05
TEEN	1.68E-05	1.68E-05	7.06E-08	1.68E-05	1.69E-05	3.48E-05	1.67E-05	1.67E-05
CHILD	1.48E-05	1.48E-05	9.54E-08	1.49E-05	1.49E-05	3.59E-05	1.48E-05	1.48E-05
INFANT	8.53E-06	8.51E-06	7.26E-08	8.60E-06	8.60E-06	2.78E-05	8.50E-06	8.50E-06

TABLE IV-A-7

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 7 RES
AT 1.67 MILES SE

ANNUAL_BETA_AIR_DOSE = 6.56E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.97E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.56E-04	5.75E-04
GROUND	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.19E-05
INHAL								
ADULT	9.36E-05	9.34E-05	4.03E-07	9.40E-05	9.44E-05	1.90E-04	9.33E-05	9.33E-05
TEEN	9.45E-05	9.44E-05	5.61E-07	9.52E-05	9.57E-05	2.17E-04	9.41E-05	9.41E-05
CHILD	8.35E-05	8.35E-05	7.56E-07	8.41E-05	8.46E-05	2.28E-04	8.31E-05	8.31E-05
INFANT	4.81E-05	4.80E-05	5.82E-07	4.87E-05	4.88E-05	1.80E-04	4.78E-05	4.78E-05

TABLE IV-A-8

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 8 RES
AT 0.94 MILES SSE

ANNUAL_BETA_AIR_DOSE = 2.37E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.63E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.06E-03	2.27E-03
GROUND	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.88E-05
INHAL								
ADULT	3.23E-04	3.22E-04	1.56E-06	3.24E-04	3.26E-04	6.77E-04	3.21E-04	3.21E-04
TEEN	3.26E-04	3.25E-04	2.18E-06	3.28E-04	3.31E-04	7.76E-04	3.24E-04	3.24E-04
CHILD	2.88E-04	2.88E-04	2.93E-06	2.90E-04	2.92E-04	8.23E-04	2.86E-04	2.86E-04
INFANT	1.66E-04	1.66E-04	2.26E-06	1.68E-04	1.68E-04	6.53E-04	1.65E-04	1.65E-04

TABLE IV-A-9

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 9 RES
AT 0.74 MILES S

ANNUAL_BETA_AIR_DOSE = 2.93E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.56E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.97E-04	2.36E-03
GROUND	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	6.66E-05
INHAL								
ADULT	4.37E-04	4.36E-04	1.76E-06	4.38E-04	4.40E-04	8.79E-04	4.35E-04	4.35E-04
TEEN	4.41E-04	4.40E-04	2.46E-06	4.44E-04	4.46E-04	1.00E-03	4.39E-04	4.39E-04
CHILD	3.90E-04	3.89E-04	3.32E-06	3.92E-04	3.94E-04	1.05E-03	3.88E-04	3.88E-04
INFANT	2.24E-04	2.24E-04	2.54E-06	2.27E-04	2.27E-04	8.27E-04	2.23E-04	2.23E-04

TABLE IV-A-10

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 10 RES
AT 0.60 MILES SSW

ANNUAL_BETA_AIR_DOSE = 2.90E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.00E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.29E-03	2.78E-03
GROUND	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.71E-05
INHAL								
ADULT	3.95E-04	3.95E-04	1.95E-06	3.98E-04	4.00E-04	8.35E-04	3.94E-04	3.94E-04
TEEN	3.99E-04	3.99E-04	2.71E-06	4.03E-04	4.05E-04	9.59E-04	3.97E-04	3.97E-04
CHILD	3.53E-04	3.53E-04	3.64E-06	3.56E-04	3.58E-04	1.02E-03	3.51E-04	3.51E-04
INFANT	2.03E-04	2.03E-04	2.81E-06	2.06E-04	2.07E-04	8.08E-04	2.02E-04	2.02E-04

TABLE IV-A-11

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 11 RES
AT 0.73 MILES SW

ANNUAL_BETA_AIR_DOSE = 1.91E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.31E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.51E-04	1.83E-03
GROUND	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.35E-05
INHAL								
ADULT	2.60E-04	2.60E-04	1.30E-06	2.62E-04	2.63E-04	5.53E-04	2.59E-04	2.59E-04
TEEN	2.63E-04	2.62E-04	1.81E-06	2.65E-04	2.67E-04	6.36E-04	2.61E-04	2.61E-04
CHILD	2.32E-04	2.32E-04	2.43E-06	2.34E-04	2.36E-04	6.75E-04	2.31E-04	2.31E-04
INFANT	1.34E-04	1.34E-04	1.88E-06	1.36E-04	1.36E-04	5.37E-04	1.33E-04	1.33E-04

TABLE IV-A-12

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 12 RES
AT 1.06 MILES WSW

ANNUAL_BETA_AIR_DOSE = 9.93E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 6.83E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.43E-04	9.51E-04
GROUND	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.22E-05
INHAL								
ADULT	1.35E-04	1.35E-04	6.46E-07	1.36E-04	1.37E-04	2.82E-04	1.35E-04	1.35E-04
TEEN	1.37E-04	1.36E-04	8.99E-07	1.38E-04	1.39E-04	3.23E-04	1.36E-04	1.36E-04
CHILD	1.21E-04	1.21E-04	1.21E-06	1.22E-04	1.22E-04	3.42E-04	1.20E-04	1.20E-04
INFANT	6.95E-05	6.95E-05	9.34E-07	7.05E-05	7.06E-05	2.71E-04	6.91E-05	6.90E-05

TABLE IV-A-13

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 13 RES
AT 1.20 MILES W

ANNUAL_BETA_AIR_DOSE = 9.93E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 6.83E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.43E-04	9.51E-04
GROUND	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	1.04E-05
INHAL								
ADULT	1.35E-04	1.35E-04	6.46E-07	1.36E-04	1.37E-04	2.82E-04	1.35E-04	1.35E-04
TEEN	1.37E-04	1.36E-04	8.99E-07	1.38E-04	1.39E-04	3.23E-04	1.36E-04	1.36E-04
CHILD	1.21E-04	1.21E-04	1.21E-06	1.22E-04	1.22E-04	3.42E-04	1.20E-04	1.20E-04
INFANT	6.95E-05	6.95E-05	9.34E-07	7.05E-05	7.06E-05	2.71E-04	6.91E-05	6.90E-05

TABLE IV-A-14

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 14 RES
AT 2.26 MILES WNW

ANNUAL_BETA_AIR_DOSE = 3.83E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.14E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.34E-04	1.34E-04	1.34E-04	1.34E-04	1.34E-04	1.34E-04	1.38E-04	3.19E-04
GROUND	2.37E-06	2.37E-06	2.37E-06	2.37E-06	2.37E-06	2.37E-06	2.37E-06	2.77E-06
INHAL								
ADULT	5.61E-05	5.60E-05	2.26E-07	5.64E-05	5.66E-05	1.12E-04	5.60E-05	5.60E-05
TEEN	5.67E-05	5.66E-05	3.15E-07	5.70E-05	5.73E-05	1.27E-04	5.65E-05	5.65E-05
CHILD	5.01E-05	5.01E-05	4.24E-07	5.04E-05	5.07E-05	1.34E-04	4.99E-05	4.99E-05
INFANT	2.88E-05	2.88E-05	3.26E-07	2.92E-05	2.92E-05	1.05E-04	2.87E-05	2.87E-05

TABLE IV-A-15

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 15 RES
AT 2.40 MILES NW

ANNUAL_BETA_AIR_DOSE = 4.30E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.13E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.36E-04	3.30E-04
GROUND	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	3.43E-06
INHAL								
ADULT	6.55E-05	6.54E-05	2.40E-07	6.57E-05	6.59E-05	1.28E-04	6.53E-05	6.53E-05
TEEN	6.61E-05	6.60E-05	3.35E-07	6.65E-05	6.68E-05	1.45E-04	6.59E-05	6.59E-05
CHILD	5.84E-05	5.84E-05	4.52E-07	5.87E-05	5.90E-05	1.51E-04	5.82E-05	5.82E-05
INFANT	3.36E-05	3.36E-05	3.46E-07	3.40E-05	3.40E-05	1.18E-04	3.35E-05	3.35E-05

TABLE IV-A-16

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 16 RES
AT 2.08 MILES NNW

ANNUAL_BETA_AIR_DOSE = 4.45E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.22E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.42E-04	3.43E-04
GROUND	5.48E-06	5.48E-06	5.48E-06	5.48E-06	5.48E-06	5.48E-06	5.48E-06	6.40E-06
INHAL								
ADULT	6.76E-05	6.75E-05	2.50E-07	6.78E-05	6.80E-05	1.32E-04	6.74E-05	6.74E-05
TEEN	6.82E-05	6.81E-05	3.49E-07	6.86E-05	6.89E-05	1.50E-04	6.80E-05	6.80E-05
CHILD	6.03E-05	6.02E-05	4.71E-07	6.06E-05	6.09E-05	1.57E-04	6.00E-05	6.00E-05
INFANT	3.47E-05	3.46E-05	3.61E-07	3.50E-05	3.51E-05	1.23E-04	3.45E-05	3.45E-05

TABLE IV-A-17

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 17 VEG
AT 3.29 MILES NE

ANNUAL_BETA_AIR_DOSE = 6.86E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.44E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.13E-05	2.13E-05	2.13E-05	2.13E-05	2.13E-05	2.13E-05	2.20E-05	5.32E-05
GROUND	6.07E-07	6.07E-07	6.07E-07	6.07E-07	6.07E-07	6.07E-07	6.07E-07	7.09E-07
VEGET								
ADULT	1.93E-05	1.89E-05	5.51E-07	1.96E-05	1.95E-05	1.27E-04	1.88E-05	1.88E-05
TEEN	2.20E-05	2.16E-05	8.35E-07	2.27E-05	2.25E-05	1.57E-04	2.16E-05	2.15E-05
CHILD	3.40E-05	3.34E-05	1.94E-06	3.54E-05	3.50E-05	2.87E-04	3.35E-05	3.33E-05

TABLE IV-A-18

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 18 VEG
AT 4.67 MILES E

ANNUAL_BETA_AIR_DOSE = 5.64E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.33E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.47E-05	3.87E-05
GROUND	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	3.16E-07
VEGET								
ADULT	1.66E-05	1.64E-05	2.48E-07	1.67E-05	1.67E-05	6.48E-05	1.64E-05	1.63E-05
TEEN	1.89E-05	1.87E-05	3.76E-07	1.92E-05	1.92E-05	7.95E-05	1.87E-05	1.87E-05
CHILD	2.93E-05	2.90E-05	8.71E-07	3.00E-05	2.98E-05	1.43E-04	2.91E-05	2.90E-05

TABLE IV-A-19

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 19 VEG
AT 1.74 MILES SE

ANNUAL_BETA_AIR_DOSE = 6.10E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.66E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.36E-04	5.32E-04
GROUND	9.34E-06	9.34E-06	9.34E-06	9.34E-06	9.34E-06	9.34E-06	9.34E-06	1.09E-05
VEGET								
ADULT	1.66E-04	1.59E-04	8.37E-06	1.71E-04	1.69E-04	1.81E-03	1.59E-04	1.58E-04
TEEN	1.89E-04	1.82E-04	1.27E-05	2.00E-04	1.97E-04	2.25E-03	1.82E-04	1.80E-04
CHILD	2.90E-04	2.81E-04	2.94E-05	3.12E-04	3.06E-04	4.15E-03	2.82E-04	2.80E-04

TABLE IV-A-20

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 20 VEG
AT 0.94 MILES SSE

ANNUAL_BETA_AIR_DOSE = 2.37E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.63E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.04E-03	1.06E-03	2.27E-03
GROUND	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.88E-05
VEGET								
ADULT	6.28E-04	5.90E-04	4.46E-05	6.51E-04	6.43E-04	9.39E-03	5.87E-04	5.82E-04
TEEN	7.11E-04	6.74E-04	6.76E-05	7.68E-04	7.53E-04	1.17E-02	6.74E-04	6.66E-04
CHILD	1.09E-03	1.04E-03	1.57E-04	1.20E-03	1.17E-03	2.17E-02	1.05E-03	1.03E-03

TABLE IV-A-21

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 21 VEG
AT 0.74 MILES S

ANNUAL_BETA_AIR_DOSE = 2.93E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.56E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.70E-04	9.97E-04	2.36E-03
GROUND	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	5.70E-05	6.66E-05
VEGET								
ADULT	8.41E-04	7.98E-04	5.16E-05	8.69E-04	8.58E-04	1.09E-02	7.94E-04	7.88E-04
TEEN	9.55E-04	9.12E-04	7.82E-05	1.02E-03	1.00E-03	1.36E-02	9.11E-04	9.02E-04
CHILD	1.46E-03	1.41E-03	1.81E-04	1.60E-03	1.56E-03	2.52E-02	1.41E-03	1.40E-03

TABLE IV-A-22

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 22 VEG
AT 0.60 MILES SSW

ANNUAL_BETA_AIR_DOSE = 2.90E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.00E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.29E-03	2.78E-03
GROUND	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.71E-05
VEGET								
ADULT	7.50E-04	7.20E-04	3.57E-05	7.69E-04	7.62E-04	7.76E-03	7.17E-04	7.13E-04
TEEN	8.52E-04	8.23E-04	5.41E-05	8.98E-04	8.85E-04	9.66E-03	8.22E-04	8.16E-04
CHILD	1.31E-03	1.27E-03	1.25E-04	1.40E-03	1.38E-03	1.78E-02	1.28E-03	1.27E-03

TABLE IV-A-23

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 23 VEG
AT 1.31 MILES SW

ANNUAL_BETA_AIR_DOSE = 4.43E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.05E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.98E-04	4.24E-04
GROUND	4.63E-06	4.63E-06	4.63E-06	4.63E-06	4.63E-06	4.63E-06	4.63E-06	5.41E-06
VEGET								
ADULT	1.13E-04	1.10E-04	4.10E-06	1.15E-04	1.14E-04	9.19E-04	1.09E-04	1.09E-04
TEEN	1.29E-04	1.25E-04	6.22E-06	1.34E-04	1.33E-04	1.14E-03	1.25E-04	1.25E-04
CHILD	1.98E-04	1.94E-04	1.44E-05	2.09E-04	2.06E-04	2.09E-03	1.95E-04	1.93E-04

TABLE IV-A-24

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 24 VEG
AT 1.21 MILES WSW

ANNUAL_BETA_AIR_DOSE = 6.56E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.97E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.56E-04	5.75E-04
GROUND	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	8.13E-06
VEGET								
ADULT	1.75E-04	1.70E-04	6.23E-06	1.79E-04	1.77E-04	1.40E-03	1.70E-04	1.69E-04
TEEN	2.00E-04	1.94E-04	9.45E-06	2.08E-04	2.05E-04	1.74E-03	1.94E-04	1.93E-04
CHILD	3.08E-04	3.01E-04	2.19E-05	3.24E-04	3.19E-04	3.18E-03	3.02E-04	3.00E-04

TABLE IV-A-25

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 25 VEG
AT 1.20 MILES W

ANNUAL_BETA_AIR_DOSE = 9.93E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 6.83E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.34E-04	4.43E-04	9.51E-04
GROUND	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	8.86E-06	1.04E-05
VEGET								
ADULT	2.52E-04	2.46E-04	7.85E-06	2.56E-04	2.55E-04	1.79E-03	2.45E-04	2.44E-04
TEEN	2.87E-04	2.81E-04	1.19E-05	2.97E-04	2.94E-04	2.22E-03	2.81E-04	2.79E-04
CHILD	4.43E-04	4.35E-04	2.76E-05	4.63E-04	4.58E-04	4.07E-03	4.36E-04	4.34E-04

TABLE IV-A-26

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 26 VEG
AT 2.97 MILES WNW

ANNUAL_BETA_AIR_DOSE = 1.75E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 8.18E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.04E-05	5.04E-05	5.04E-05	5.04E-05	5.04E-05	5.04E-05	5.20E-05	1.30E-04
GROUND	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.18E-06
VEGET								
ADULT	4.98E-05	4.90E-05	9.23E-07	5.02E-05	5.01E-05	2.30E-04	4.89E-05	4.88E-05
TEEN	5.68E-05	5.60E-05	1.40E-06	5.79E-05	5.76E-05	2.83E-04	5.60E-05	5.58E-05
CHILD	8.78E-05	8.68E-05	3.24E-06	9.02E-05	8.95E-05	5.12E-04	8.70E-05	8.67E-05

TABLE IV-A-27

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 27 VEG
AT 2.40 MILES NW

ANNUAL_BETA_AIR_DOSE = 4.30E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.13E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.36E-04	3.30E-04
GROUND	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	2.93E-06	3.43E-06
VEGET								
ADULT	1.21E-04	1.19E-04	2.66E-06	1.22E-04	1.22E-04	6.41E-04	1.19E-04	1.18E-04
TEEN	1.38E-04	1.36E-04	4.04E-06	1.41E-04	1.40E-04	7.92E-04	1.36E-04	1.35E-04
CHILD	2.13E-04	2.10E-04	9.37E-06	2.20E-04	2.18E-04	1.44E-03	2.11E-04	2.10E-04

TABLE IV-A-28

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 28 VEG
AT 4.01 MILES NNW

ANNUAL_BETA_AIR_DOSE = 1.03E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 4.14E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.51E-05	2.61E-05	6.95E-05
GROUND	1.06E-06	1.06E-06	1.06E-06	1.06E-06	1.06E-06	1.06E-06	1.06E-06	1.24E-06
VEGET								
ADULT	3.10E-05	3.02E-05	9.73E-07	3.15E-05	3.13E-05	2.20E-04	3.01E-05	3.00E-05
TEEN	3.53E-05	3.45E-05	1.48E-06	3.66E-05	3.62E-05	2.73E-04	3.45E-05	3.44E-05
CHILD	5.45E-05	5.35E-05	3.42E-06	5.71E-05	5.63E-05	4.99E-04	5.36E-05	5.34E-05

TABLE IV-A-29

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 29 BEEF
AT 4.72 MILES NNE

ANNUAL_BETA_AIR_DOSE = 4.37E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.94E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.19E-05	1.19E-05	1.19E-05	1.19E-05	1.19E-05	1.19E-05	1.23E-05	3.14E-05
GROUND	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.89E-07
MEAT								
ADULT	1.82E-06	1.78E-06	3.69E-08	1.84E-06	1.82E-06	5.81E-06	1.79E-06	1.78E-06
TEEN	1.08E-06	1.06E-06	3.03E-08	1.11E-06	1.09E-06	3.98E-06	1.07E-06	1.06E-06
CHILD	1.30E-06	1.29E-06	5.55E-08	1.35E-06	1.32E-06	5.70E-06	1.29E-06	1.29E-06

TABLE IV-A-30

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 30 BEEF
AT 4.91 MILES E

ANNUAL_BETA_AIR_DOSE = 5.21E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.11E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.33E-05	3.53E-05
GROUND	2.50E-07	2.50E-07	2.50E-07	2.50E-07	2.50E-07	2.50E-07	2.50E-07	2.93E-07
MEAT								
ADULT	2.21E-06	2.19E-06	1.84E-08	2.21E-06	2.20E-06	4.19E-06	2.19E-06	2.19E-06
TEEN	1.31E-06	1.30E-06	1.51E-08	1.33E-06	1.32E-06	2.76E-06	1.30E-06	1.30E-06
CHILD	1.59E-06	1.58E-06	2.77E-08	1.61E-06	1.60E-06	3.77E-06	1.58E-06	1.58E-06

TABLE IV-A-31

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 31 BEEF
AT 4.59 MILES SE

ANNUAL_BETA_AIR_DOSE = 7.06E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.89E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.43E-05	2.43E-05	2.43E-05	2.43E-05	2.43E-05	2.43E-05	2.50E-05	5.82E-05
GROUND	8.48E-07	8.48E-07	8.48E-07	8.48E-07	8.48E-07	8.48E-07	8.48E-07	9.91E-07
MEAT								
ADULT	2.77E-06	2.71E-06	6.11E-08	2.80E-06	2.76E-06	9.42E-06	2.71E-06	2.70E-06
TEEN	1.64E-06	1.61E-06	5.02E-08	1.69E-06	1.66E-06	6.47E-06	1.62E-06	1.61E-06
CHILD	1.97E-06	1.95E-06	9.19E-08	2.05E-06	2.01E-06	9.30E-06	1.96E-06	1.95E-06

TABLE IV-A-32

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 32 BEEF
AT 1.82 MILES SSE

ANNUAL_BETA_AIR_DOSE = 4.74E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.74E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.72E-04	1.72E-04	1.72E-04	1.72E-04	1.72E-04	1.72E-04	1.77E-04	4.03E-04
GROUND	9.70E-06	9.70E-06	9.70E-06	9.70E-06	9.70E-06	9.70E-06	9.70E-06	1.13E-05
MEAT								
ADULT	1.86E-05	1.79E-05	6.96E-07	1.89E-05	1.85E-05	9.45E-05	1.79E-05	1.78E-05
TEEN	1.10E-05	1.07E-05	5.73E-07	1.15E-05	1.12E-05	6.62E-05	1.07E-05	1.06E-05
CHILD	1.32E-05	1.29E-05	1.05E-06	1.40E-05	1.36E-05	9.67E-05	1.30E-05	1.29E-05

TABLE IV-A-33

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 33 BEEF
AT 2.60 MILES S

ANNUAL_BETA_AIR_DOSE = 1.24E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 5.28E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.22E-05	3.22E-05	3.22E-05	3.22E-05	3.22E-05	3.22E-05	3.34E-05	8.67E-05
GROUND	2.13E-06	2.13E-06	2.13E-06	2.13E-06	2.13E-06	2.13E-06	2.13E-06	2.48E-06
MEAT								
ADULT	5.30E-06	5.14E-06	1.56E-07	5.38E-06	5.28E-06	2.22E-05	5.15E-06	5.13E-06
TEEN	3.14E-06	3.07E-06	1.28E-07	3.25E-06	3.18E-06	1.54E-05	3.07E-06	3.05E-06
CHILD	3.77E-06	3.71E-06	2.34E-07	3.96E-06	3.86E-06	2.23E-05	3.72E-06	3.70E-06

TABLE IV-A-34

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 34 BEEF
AT 0.60 MILES SSW

ANNUAL_BETA_AIR_DOSE = 2.90E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.00E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.29E-03	2.78E-03
GROUND	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.71E-05
MEAT								
ADULT	1.06E-04	1.03E-04	2.84E-06	1.07E-04	1.05E-04	4.17E-04	1.03E-04	1.03E-04
TEEN	6.26E-05	6.13E-05	2.34E-06	6.47E-05	6.34E-05	2.89E-04	6.15E-05	6.11E-05
CHILD	7.52E-05	7.41E-05	4.28E-06	7.87E-05	7.69E-05	4.18E-04	7.44E-05	7.40E-05

TABLE IV-A-35

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 35 BEEF
AT 0.73 MILES SW

ANNUAL_BETA_AIR_DOSE = 1.91E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.31E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.35E-04	8.51E-04	1.83E-03
GROUND	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.35E-05
MEAT								
ADULT	6.90E-05	6.76E-05	1.42E-06	6.97E-05	6.89E-05	2.25E-04	6.77E-05	6.75E-05
TEEN	4.10E-05	4.03E-05	1.17E-06	4.20E-05	4.13E-05	1.54E-04	4.04E-05	4.02E-05
CHILD	4.93E-05	4.87E-05	2.14E-06	5.11E-05	5.01E-05	2.21E-04	4.89E-05	4.87E-05

TABLE IV-A-36

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 36 BEEF
AT 2.42 MILES WSW

ANNUAL_BETA_AIR_DOSE = 1.30E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 8.93E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.79E-05	1.24E-04
GROUND	1.15E-06	1.15E-06	1.15E-06	1.15E-06	1.15E-06	1.15E-06	1.15E-06	1.34E-06
MEAT								
ADULT	4.68E-06	4.60E-06	8.10E-08	4.72E-06	4.67E-06	1.35E-05	4.60E-06	4.59E-06
TEEN	2.78E-06	2.74E-06	6.67E-08	2.84E-06	2.80E-06	9.22E-06	2.74E-06	2.73E-06
CHILD	3.35E-06	3.31E-06	1.22E-07	3.45E-06	3.39E-06	1.31E-05	3.32E-06	3.31E-06

TABLE IV-A-37

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 37 BEEF
AT 3.25 MILES W

ANNUAL_BETA_AIR_DOSE = 8.19E-05 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 3.11E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.87E-05	1.87E-05	1.87E-05	1.87E-05	1.87E-05	1.87E-05	1.95E-05	5.34E-05
GROUND	6.33E-07	6.33E-07	6.33E-07	6.33E-07	6.33E-07	6.33E-07	6.33E-07	7.39E-07
MEAT								
ADULT	3.56E-06	3.51E-06	4.67E-08	3.58E-06	3.55E-06	8.58E-06	3.51E-06	3.51E-06
TEEN	2.12E-06	2.09E-06	3.84E-08	2.15E-06	2.13E-06	5.76E-06	2.10E-06	2.09E-06
CHILD	2.55E-06	2.53E-06	7.02E-08	2.61E-06	2.58E-06	8.08E-06	2.54E-06	2.53E-06

TABLE IV-A-38

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 38 BEEF
AT 2.74 MILES WNW

ANNUAL_BETA_AIR_DOSE = 2.19E-04 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 1.09E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.93E-05	1.68E-04
GROUND	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.51E-06
MEAT								
ADULT	8.74E-06	8.64E-06	9.36E-08	8.78E-06	8.73E-06	1.89E-05	8.65E-06	8.63E-06
TEEN	5.20E-06	5.15E-06	7.71E-08	5.26E-06	5.22E-06	1.26E-05	5.16E-06	5.14E-06
CHILD	6.27E-06	6.24E-06	1.41E-07	6.39E-06	6.33E-06	1.75E-05	6.25E-06	6.23E-06

TABLE IV-A-39

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
SPECIAL LOCATION NO. 39 GOAT
AT 0.60 MILES SSW

ANNUAL_BETA_AIR_DOSE = 2.90E-03 MILLRADS
ANNUAL_GAMMA_AIR_DOSE = 2.00E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.27E-03	1.29E-03	2.78E-03
GROUND	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.03E-05	4.71E-05
GOATMILK								
ADULT	5.76E-04	5.02E-04	7.82E-05	6.16E-04	5.78E-04	1.10E-02	5.01E-04	4.91E-04
TEEN	7.33E-04	6.54E-04	1.41E-04	8.57E-04	7.92E-04	1.73E-02	6.60E-04	6.39E-04
CHILD	1.12E-03	1.02E-03	3.37E-04	1.38E-03	1.27E-03	3.41E-02	1.04E-03	1.01E-03
INFANT	1.69E-03	1.55E-03	5.88E-04	2.30E-03	1.96E-03	8.19E-02	1.59E-03	1.54E-03

TABLE IV-B-1

FORT CALHOUN 1

DOSE CONTRIBUTIONS FROM GASEOUS EFFLUENTS
UNRESTRICTED AREA BOUNDARY

REQUIRED BY TECHNICAL SPECIFICATION 5.9.4.a.

ANNUAL FOR JANUARY 1, 2003 TO DECEMBER 31, 2003

MAXIMUM SITE BOUNDARY GAMMA AIR DOSE - 4.41E-03 MILLRADS

MAXIMUM SITE BOUNDARY BETA AIR DOSE - 6.79E-03 MILLRADS

TABLE IV-C-1

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS
ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.16E-03	1.16E-03	1.16E-03	1.16E-03	1.16E-03	1.16E-03	1.24E-03	4.08E-03
	28.19%	28.39%	92.22%	27.94%	28.09%	11.87%	29.61%	58.11%
GROUND	4.63E-05	4.63E-05	4.63E-05	4.63E-05	4.63E-05	4.63E-05	4.63E-05	5.41E-05
	1.12%	1.13%	3.67%	1.11%	1.12%	0.47%	1.11%	0.77%
INHAL	1.22E-03	1.22E-03	3.74E-06	1.22E-03	1.22E-03	2.25E-03	1.21E-03	1.21E-03
	29.45%	29.63%	0.30%	29.26%	29.48%	22.92%	29.09%	17.30%
VEGET	1.17E-03	1.16E-03	2.06E-05	1.18E-03	1.16E-03	1.24E-03	1.16E-03	1.16E-03
	28.29%	28.18%	1.63%	28.41%	28.10%	12.66%	27.75%	16.46%
COW MILK	2.71E-04	2.59E-04	2.38E-05	2.87E-04	2.84E-04	4.46E-03	2.58E-04	2.56E-04
	6.57%	6.31%	1.89%	6.89%	6.85%	45.49%	6.19%	3.65%
MEAT	2.64E-04	2.61E-04	3.88E-06	2.66E-04	2.64E-04	6.47E-04	2.61E-04	2.60E-04
	6.38%	6.36%	0.31%	6.39%	6.37%	6.59%	6.25%	3.71%
TOTAL	4.13E-03	4.10E-03	1.26E-03	4.17E-03	4.15E-03	9.81E-03	4.17E-03	7.02E-03

SECTION V

DOSE FROM LIQUID EFFLUENTS
LADTAP II OUTPUT
Technical Specification 5.9.4.a

January 1, 2003 - December 31, 2003

Radioactive Effluent Releases - First, Second, Third, and Fourth Quarters 2003

LIQUID EFFLUENTS

During the reporting period, a total of 1.06E-01 Curies of radioactive liquid materials less tritium, dissolved noble gases, and alpha was released to the Missouri River at an average concentration of 1.06E-10 µCi/mL. This represents 1.06E-02% of the limits specified in Appendix B to 10 CFR 20 (1.0E-06 µCi/mL for unrestricted areas), 295 Curies of tritium were discharged at an average diluted concentration of 2.47E-07 µCi/mL or 2.47E-02% of ECL (1.0E-03 µCi/mL). Gross alpha radioactivity released during the reporting period total 5.03E-03 Curies.

Dilution water during the period amounted to 1.15E+12 liters, while radioactive liquid waste volume was 1.65E+08 liters.

A. Potential Annual Doses to Individuals from Liquid Releases

Total body, skin, and organ mRem for liquid releases were calculated for all significant liquid pathways using the annual configuration of the LADTAP II program.

The inputs to LADTAP II for the annual period from January 1, 2003 through December 31, 2003 were as follows:

(1) All liquid effluents were as described in Section IV except for entrained noble gases (Ar-41, Xe-131M, Xe-133M, Xe-133, Xe-135M, Xe-135, Kr-85M, Kr-87, and Kr-88)

(2) An average plant discharge rate of 733.0 cubic feet per second (CFS) was utilized for 2003. The average discharge rate during releases was 678.0 cubic feet per second (CFS).

(3) Dilution factors (inverse of the mixing ratios) were computed based on Regulatory Guide 1.113 (equation 7 in Section 2.a.1 of Appendix A) for a one dimensional transport model.

(4) Drinking water transport times of 6.6 hours to the Omaha intake and 7.0 hours to the Council Bluffs intake for the ALARA doses were used. A transport time of 0.0 was used from the plant to the discharge site.

(5) A shorewidth factor of 0.2 was used.

(6) All dose factors, transport times from receptor to individual, and usage factors are defined by Regulatory Guide 1.109 and NUREG-0172.

The discharge site was chosen to present the most conservative estimate of mRem dose for an average adult, teenager, child, and infant. A conservative approach is also presented by the assumption that Omaha and Council Bluffs receive all drinking water from the Missouri River.

B. Potential Annual Doses to Population from Liquid Releases

The LADTAP II program in its annual configuration was also used to calculate to total body and organ doses for the population of 853,274 within a 50-mile radius of the plant (based on the 2000 census). The same input was used as in the individual cases with the addition of the following:

(1) Dilution factors and transport times for the pathways of sport fish, commercial fish, recreation and biota were calculated based on a distance of two miles downstream as approximately the distance to the nearest recreation facility - DeSoto National Wildlife Preserve.

(2) The total fish harvest for both sport and commercial purposes was calculated using an average commercial fish catch for Nebraska.

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L       AAA   DDDD   TTTTT   AAA   PPPP     IIIII IIIII
L      A   A  D   D    T    A   A  P   P      I     I
L      A   A  D   D    T    A   A  P   P      I     I
L      AAAAA  D   D    T    AAAAA  PPPP       I     I
L      A   A  D   D    T    A   A  P          I     I
LLLLL  A   A  DDDD     T    A   A  P        IIIII IIIII
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EVALUATION OF RADIATION DOSES FROM RELEASES OF RADIACTIVITY

IN NUCLEAR POWER PLANTS LIQUID EFFLUENTS

REVISION DATE: PNL VAX - OCTOBER 1985

FORT CALHOUN ANNUAL 2003, DOSE PROJECTIONS

RADIOLOGICAL ASSESSMENT BRANCH

DIVISION OF SYSTEMS INTEGRATION

U. S. NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C.

DATE OF RUN: 9-MAR-04

A D U L T D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		1.14E-02	1.89E-02	1.36E-02	2.83E-04	6.66E-03	2.15E-03	7.68E-03
DRINKING		5.91E-05	8.29E-04	8.09E-04	8.47E-04	7.83E-04	7.61E-04	8.55E-04
SHORELINE	4.09E-05	3.52E-05	3.52E-05	3.52E-05	3.52E-05	3.52E-05	3.52E-05	3.52E-05
SWIMMING		5.42E-07	5.42E-07	5.42E-07	5.42E-07	5.42E-07	5.42E-07	5.42E-07
BOATING		2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07
TOTAL	4.09E-05	1.15E-02	1.97E-02	1.45E-02	1.17E-03	7.48E-03	2.95E-03	8.57E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	21.0	7.3	24.00	
DRINKING	730.0	30.8	18.60	
SHORELINE	12.0	7.3	0.00	
SWIMMING	12.0	7.3	0.00	
BOATING	12.0	7.3	0.00	

T E E N A G E R D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		1.20E-02	1.94E-02	7.72E-03	2.53E-04	6.82E-03	2.53E-03	5.49E-03
DRINKING		5.65E-05	6.03E-04	5.60E-04	6.12E-04	5.59E-04	5.40E-04	5.98E-04
SHORELINE	2.28E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04
SWIMMING		3.02E-06	3.02E-06	3.02E-06	3.02E-06	3.02E-06	3.02E-06	3.02E-06
BOATING		1.51E-06	1.51E-06	1.51E-06	1.51E-06	1.51E-06	1.51E-06	1.51E-06
TOTAL	2.28E-04	1.23E-02	2.02E-02	8.49E-03	1.07E-03	7.58E-03	3.27E-03	6.29E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	16.0	7.3	24.00	
DRINKING	510.0	30.8	18.60	
SHORELINE	67.0	7.3	0.00	
SWIMMING	67.0	7.3	0.00	
BOATING	67.0	7.3	0.00	

C H I L D D O S E S

	DOSE (MREM PER YEAR INTAKE)						
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		1.50E-02	1.71E-02	3.02E-03	2.55E-04	5.81E-03	2.00E-03	2.02E-03
DRINKING		1.62E-04	1.17E-03	1.05E-03	1.21E-03	1.08E-03	1.04E-03	1.07E-03
SHORELINE	4.77E-05	4.11E-05	4.11E-05	4.11E-05	4.11E-05	4.11E-05	4.11E-05	4.11E-05
SWIMMING		6.32E-07	6.32E-07	6.32E-07	6.32E-07	6.32E-07	6.32E-07	6.32E-07
BOATING		3.16E-07	3.16E-07	3.16E-07	3.16E-07	3.16E-07	3.16E-07	3.16E-07
TOTAL	4.77E-05	1.52E-02	1.83E-02	4.11E-03	1.51E-03	6.93E-03	3.08E-03	3.14E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	6.9	7.3	24.00	
DRINKING	510.0	30.8	18.60	
SHORELINE	14.0	7.3	0.00	
SWIMMING	14.0	7.3	0.00	
BOATING	14.0	7.3	0.00	

I N F A N T D O S E S

	DOSE (MREM PER YEAR INTAKE)						
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		1.67E-04	1.19E-03	1.02E-03	1.31E-03	1.06E-03	1.02E-03	1.03E-03
SHORELINE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.67E-04	1.19E-03	1.02E-03	1.31E-03	1.06E-03	1.02E-03	1.03E-03

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	0.0	7.3	24.00	
DRINKING	330.0	30.8	18.60	

LOCATION IS SITE DISCHG.

A D U L T D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		8.32E-02	1.38E-01	9.95E-02	2.07E-03	4.86E-02	1.57E-02	5.61E-02
DRINKING		1.82E-03	2.55E-02	2.49E-02	2.62E-02	2.41E-02	2.34E-02	2.63E-02
SHORELINE	2.99E-04	2.57E-04	2.57E-04	2.57E-04	2.57E-04	2.57E-04	2.57E-04	2.57E-04
SWIMMING		3.95E-06	3.95E-06	3.95E-06	3.95E-06	3.95E-06	3.95E-06	3.95E-06
BOATING		1.98E-06	1.98E-06	1.98E-06	1.98E-06	1.98E-06	1.98E-06	1.98E-06
TOTAL	2.99E-04	8.52E-02	1.63E-01	1.25E-01	2.85E-02	7.30E-02	3.94E-02	8.27E-02

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	21.0	1.0	24.00	
DRINKING	730.0	1.0	12.00	
SHORELINE	12.0	1.0	0.00	
SWIMMING	12.0	1.0	0.00	
BOATING	12.0	1.0	0.00	

T E E N A G E R D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		8.79E-02	1.42E-01	5.64E-02	1.85E-03	4.98E-02	1.85E-02	4.01E-02
DRINKING		1.74E-03	1.86E-02	1.73E-02	1.89E-02	1.72E-02	1.66E-02	1.84E-02
SHORELINE	1.67E-03	1.43E-03	1.43E-03	1.43E-03	1.43E-03	1.43E-03	1.43E-03	1.43E-03
SWIMMING		2.21E-05	2.21E-05	2.21E-05	2.21E-05	2.21E-05	2.21E-05	2.21E-05
BOATING		1.10E-05	1.10E-05	1.10E-05	1.10E-05	1.10E-05	1.10E-05	1.10E-05
TOTAL	1.67E-03	9.11E-02	1.62E-01	7.51E-02	2.22E-02	6.85E-02	3.66E-02	6.00E-02

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)	SHOREWIDTH FACTOR=0.2
FISH	16.0	1.0	24.00	
DRINKING	510.0	1.0	12.00	
SHORELINE	67.0	1.0	0.00	
SWIMMING	67.0	1.0	0.00	
BOATING	67.0	1.0	0.00	

LOCATION IS SITE DISCHG.

C H I L D D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		1.09E-01	1.25E-01	2.20E-02	1.86E-03	4.24E-02	1.46E-02	1.47E-02
DRINKING		4.99E-03	3.60E-02	3.23E-02	3.76E-02	3.32E-02	3.19E-02	3.31E-02
SHORELINE	3.48E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04
SWIMMING		4.61E-06	4.61E-06	4.61E-06	4.61E-06	4.61E-06	4.61E-06	4.61E-06
BOATING		2.31E-06	2.31E-06	2.31E-06	2.31E-06	2.31E-06	2.31E-06	2.31E-06
TOTAL	3.48E-04	1.15E-01	1.61E-01	5.46E-02	3.97E-02	7.59E-02	4.68E-02	4.82E-02

	USAGE (KG/YR,HR/YR)	DILUTION	TIME(HR)
FISH	6.9	1.0	24.00
DRINKING	510.0	1.0	12.00
SHORELINE	14.0	1.0	0.00
SWIMMING	14.0	1.0	0.00
BOATING	14.0	1.0	0.00

SHOREWIDTH FACTOR=0.2

I N F A N T D O S E S

	DOSE (MREM PER YEAR INTAKE)							
PATHWAY	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		5.15E-03	3.65E-02	3.14E-02	4.06E-02	3.27E-02	3.15E-02	3.18E-02
SHORELINE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	5.15E-03	3.65E-02	3.14E-02	4.06E-02	3.27E-02	3.15E-02	3.18E-02

* * * FISH CONSUMPTION POPULATION DOSES * * *

PERSON-REM

SPORT HARVEST

			DOSE (PERSON-REM)						
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	6.10E+04	3.30E-02	5.46E-02	3.95E-02	6.06E-04	1.92E-02	6.23E-03	1.99E-02
FISH	TEENAGER	7.12E+03	5.34E-03	8.61E-03	3.43E-03	8.15E-05	3.01E-03	1.12E-03	2.18E-03
FISH	CHILD	4.93E+03	1.07E-02	1.22E-02	2.15E-03	1.30E-04	4.11E-03	1.43E-03	1.29E-03
FISH	TOTAL	7.30E+04	4.90E-02	7.53E-02	4.50E-02	8.17E-04	2.63E-02	8.78E-03	2.34E-02

LOCATION	DILUTION	CATCH	TIME(HR)-INCLUDES FOOD PROCESSING TIME OF 1.68E+02 HR	POPULATION
	7.30E+00	7.30E+04	1.69E+02	1.24E+04

AVERAGE INDIVIDUAL CONSUMPTION (KG/YR) ADULT=6.90E+00 TEEN=5.20E+00 CHILD=2.20E+00

COMMERCIAL HARVEST

			DOSE (PERSON-REM)						
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	4.18E+06	3.75E-03	6.20E-03	4.48E-03	6.06E-05	2.17E-03	7.09E-04	2.14E-03
FISH	TEENAGER	4.88E+05	6.07E-04	9.78E-04	3.89E-04	8.08E-06	3.41E-04	1.27E-04	2.35E-04
FISH	CHILD	3.38E+05	1.21E-03	1.38E-03	2.44E-04	1.28E-05	4.65E-04	1.62E-04	1.39E-04
FISH	TOTAL	5.01E+06	5.57E-03	8.56E-03	5.11E-03	8.15E-05	2.98E-03	9.98E-04	2.51E-03

LOCATION	DILUTION	CATCH	TIME(HR)-INCLUDES FOOD PROCESSING TIME OF 2.40E+02 HR	POPULATION
	7.30E+00	7.30E+04	2.41E+02	8.53E+05

AVERAGE INDIVIDUAL CONSUMPTION (KG/YR) ADULT=6.90E+00 TEEN=5.20E+00 CHILD=2.20E+00

* * * POPULATION WATER CONSUMPTION DOSES * * *

SUPPLIER-OMAHA

			DOSE (PERSON-REM)						
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	ADULT	1.39E+08	1.12E-02	1.58E-01	1.54E-01	1.60E-01	1.49E-01	1.45E-01	1.63E-01
DRINKING	TEENAGER	1.51E+07	1.68E-03	1.79E-02	1.66E-02	1.80E-02	1.66E-02	1.60E-02	1.77E-02
DRINKING	CHILD	2.48E+07	7.85E-03	5.67E-02	5.09E-02	5.86E-02	5.23E-02	5.03E-02	5.21E-02
DRINKING	TOTAL	1.79E+08	2.08E-02	2.32E-01	2.21E-01	2.37E-01	2.18E-01	2.11E-01	2.32E-01

POPULATION=5.29E+05 DILUTION=3.08E+01 TRANSIT TIME=3.06E+01 HR (INCLUDING 24 HR FOR TREATMENT FACILITY)

AVERAGE INDIVIDUAL CONSUMPTION (L/YR) ADULT=3.70E+02 TEEN=2.60E+02 CHILD=2.60E+02

SUPPLIER-COUNCIL BLUFFS

			DOSE (PERSON-REM)						
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	ADULT	2.29E+07	1.82E-03	2.55E-02	2.49E-02	2.60E-02	2.41E-02	2.34E-02	2.63E-02
DRINKING	TEENAGER	2.49E+06	2.71E-04	2.90E-03	2.69E-03	2.92E-03	2.69E-03	2.59E-03	2.87E-03
DRINKING	CHILD	4.07E+06	1.27E-03	9.17E-03	8.24E-03	9.47E-03	8.46E-03	8.14E-03	8.43E-03
DRINKING	TOTAL	2.94E+07	3.36E-03	3.76E-02	3.58E-02	3.84E-02	3.52E-02	3.42E-02	3.76E-02

POPULATION=8.70E+04 DILUTION=3.13E+01 TRANSIT TIME=3.10E+01 HR (INCLUDING 24 HR FOR TREATMENT FACILITY)

AVERAGE INDIVIDUAL CONSUMPTION (L/YR) ADULT=3.70E+02 TEEN=2.60E+02 CHILD=2.60E+02

-----CUMULATIVE TOTAL-----

PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	CUMUL TOTAL	2.08E+08	2.41E-02	2.70E-01	2.57E-01	2.75E-01	2.53E-01	2.45E-01	2.70E-01

NEPA DOSES

NOTE--TOTAL NEPA DOSE INCLUDES SPORT CATCH

			DOSE (PERSON-REM)						
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	1.22E+05	6.59E-02	1.09E-01	7.88E-02	1.14E-03	3.82E-02	1.25E-02	3.87E-02
FISH	TEENAGER	1.42E+04	1.07E-02	1.72E-02	6.84E-03	1.52E-04	6.00E-03	2.24E-03	4.24E-03
FISH	CHILD	9.85E+03	2.13E-02	2.43E-02	4.29E-03	2.43E-04	8.20E-03	2.85E-03	2.51E-03
FISH	TOTAL	1.46E+05	9.79E-02	1.51E-01	9.00E-02	1.53E-03	5.24E-02	1.76E-02	4.55E-02

HYDROSPHERE TRITIUM DOSE

AVERAGE INDIVIDUAL WATER CONSUMPTION = 3.0 L/DAY

PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
WATER	TOTAL	2.86E+11	0.00E+00	2.25E-03	2.25E-03	2.25E-03	2.25E-03	2.25E-03	2.25E-03

* * * RECREATION POPULATION DOSES * * *

LOCATION- DOWN STREAM SWIMMING
DILUTION= 7.30E+00 TRANSIT TIME= 6.70E-01 HR SWF= 0.2

			DOSE (PERSON-REM)		
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SHORELINE	TOTAL POPUL	4.10E+07	1.40E-01	1.20E-01	1.20E-01

LOCATION- DOWN STREAM SWIMMING
DILUTION= 7.30E+00 TRANSIT TIME= 6.70E-01 HR

			DOSE (PERSON-REM)		
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SWIMMING	TOTAL POPUL	4.10E+07		1.84E-03	1.84E-03

LOCATION- DOWN STREAM BOATING
DILUTION= 7.30E+00 TRANSIT TIME= 6.70E-01 HR

			DOSE (PERSON-REM)		
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
BOATING	TOTAL POPUL	4.10E+07		9.19E-04	9.19E-04

* * * DOSE TO BIOTA * * *

MRADS PER YEAR

DILUTION= 1.00E+00 TRANSIT TIME= 0.00E+00 HR

BIOTA	INTERNAL	EXTERNAL	TOTAL
FISH	5.02E-01	9.40E-01	1.44E+00
INVERTEBRATE	8.12E-01	1.88E+00	2.69E+00
ALGAE	6.54E-01	2.89E-03	6.57E-01
MUSKRAT	1.76E+00	6.26E-01	2.38E+00
RACCOON	6.66E-01	4.69E-01	1.14E+00
HERON	9.51E+00	6.26E-01	1.01E+01
DUCK	1.55E+00	9.39E-01	2.49E+00

SECTION VI

RADIOACTIVE EFFLUENT RELEASES - SOLID RADIOACTIVE WASTE

Technical Specifications 5.9.4.a, 5.17.d and 5.18.d

January 1, 2003 - December 31, 2003

III. RADIOACTIVE EFFLUENT RELEASES- SOLID RADIOACTIVE WASTE EFFLUENT AND WASTE DISPOSAL REPORT

January 1, 2003 through December 31, 2003

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED)

1.	Type of Waste	Month Shipped	Number of Shipments	Volume Cu. Meter	Curie Content	Est. Total # Error
a.	Spent resins, filter sludges, evaporator bottoms, etc.	January	0	0.00E+00	0.00E+00	N/A
		February	0	0.00E+00	0.00E+00	N/A
		March	1	3.86E+00	1.76E+01	20
		April	0	0.00E+00	0.00E+00	N/A
		May	0	0.00E+00	0.00E+00	N/A
		June	0	0.00E+00	0.00E+00	N/A
		July	0	0.00E+00	0.00E+00	N/A
		August	0	0.00E+00	0.00E+00	N/A
		September	0	0.00E+00	0.00E+00	N/A
		October	0	0.00E+00	0.00E+00	N/A
		November	0	0.00E+00	0.00E+00	N/A
		December	0	0.00E+00	0.00E+00	N/A
Total	(Type a)		1	3.86E+00	1.76E+01	N/A
b.	Dry compressible, contaminated equipment, etc.	January	2	1.24E+00	1.09E-02	20
		February	0	0.00E+00	0.00E+00	N/A
		March	3	2.00E-02	9.80E-06	20
		April	3	6.10E-01	1.33E-02	20
		May	3	1.06E+00	4.73E-02	20
		June	0	0.00E+00	0.00E+00	N/A
		July	0	0.00E+00	0.00E+00	N/A
		August	0	0.00E+00	0.00E+00	20
		September	2	1.27E+00	1.22E-02	20
		October	1	8.00E-02	1.44E-02	20
		November	1	1.36E+00	6.56E-03	20
		December	6	7.19E+00	1.42E+00	20
Total	(Type b)		21	1.28E+01	1.53E+00	20

III. RADIOACTIVE EFFLUENT RELEASES- SOLID RADIOACTIVE WASTE EFFLUENT AND WASTE DISPOSAL REPORT (continued)

1.	Type of Waste		Month Shipped	Number of Shipments	Volume Cu. Meter	Curie Content	Est. Total # Error
c.	Irradiated components and other categories		January	0	0	0	N/A
			February	0	0	0	N/A
			March	0	0	0	N/A
			April	0	0	0	N/A
			May	0	0	0	N/A
			June	0	0	0	N/A
			July	0	0	0	N/A
			August	0	0	0	N/A
			September	0	0	0	N/A
			October	0	0	0	N/A
			November	0	0	0	N/A
			December	0	0	0	N/A
							A
Total		(Type c)		0	0	0	N/A
d.	Other		January	0	0	0	N/A
			February	0	0	0	N/A
			March	0	0	0	N/A
			April	0	0	0	N/A
			May	0	0	0	N/A
			June	0	0	0	N/A
			July	0	0	0	N/A
			August	0	0	0	N/A
			September	0	0	0	N/A
			October	0	0	0	N/A
			November	0	0	0	N/A
			December	0	0	0	N/A
Total		(Type d)		0	0	0	N/A

III. RADIOACTIVE EFFLUENT RELEASES- SOLID RADIOACTIVE WASTE EFFLUENT AND WASTE DISPOSAL REPORT (continued)

B. ESTIMATE OFMAJOR NUCLIDE COMPOSITION (By Type of Waste)

1. Percentage of Curies from Represented Isotopes

	Isotope	Percent	Curies	
a.	Cs-134	46.5%	8.16E+00	All other nuclides
	Cs-137	46.1%	8.15E+00	constitute less
	Co-58	5.0%	8.77E-01	than 1%
	Co-60	1.0%	1.79E-01	
b.	Cs-137	63.4%	9.67R-01	All other nuclides
	Cs-134	29.7%	4.53E-01	constitute less
	Ni-63	3.1%	4.70E-02	than 1%
	Co-60	2.4%	3.62E-02	
c.	N/A	N/A	N/A	
d.	N/A	N/A	N/A	

C. SOLID WASTE (DISPOSITION)

Number of shipments	Transportation Mode	Destination
2	Closed Sole Use Vehicle	Barnwell, S.C.
20	Closed Sole Use Vehicle	Clive, Utah

D. IRRADIATED FUEL SHIPMENTS (DISPOSITION)

Number of Shipments	Transportation Mode	Destination
N/A	N/A	N/A

SECTION VII

ATTACHMENT 1

ODCM and PCP revisions for the period January 1, 2003 through December 31, 2003 in accordance with Technical Specification 5.17.d and 5.18.d, the radioactive effluent release report shall include any revisions to the Offsite Dose Calculation Manual (ODCM) and the Process Control Program (PCP).

___1___ revision(s) made to the Offsite Dose Calculation Manual (ODCM).

___0___ revision(s) made to the Process Control Program (PCP).

January 1, 2003 - December 31, 2003