COMANCHE PEAK STEAM ELECTRIC STATION

UNITS 1 AND 2

RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 1999 - December 31, 1999

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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPSES	Comanche Peak Steam Electric Station
ECL	Effluent Concentration Limit
LHMT	Laundry Holdup and Monitor Tanks
LVW	Low Volume Waste
ODCM	Offsite Dose Calculation Manual
PET	Primary Effluent Tanks
REC	Radiological Effluent Control
SORC	Station Operations Review Committee
WMT	Waste Monitor Tanks
WWHT	Waste Water Holdup Tanks

1.0 INTRODUCTION

This Radioactive Effluent Release Report, for Comanche Peak Steam Electric Station Unit 1 and Unit 2, is submitted as required by Technical Specification 5.6.3 and Offsite Dose Calculation Manual (ODCM) Administrative Control 6.9.1.4 for the period January 1, 1999, through December 31, 1999.

1.1 Executive Summary

The radioactive effluent monitoring program for the year 1999 was conducted as described in the following report. The results of the monitoring program indicate the continued effort to maintain the release of radioactive effluents to the environment as low as reasonably achievable.

A summation of all the radioactive gaseous releases to the environment during 1999 produced the following results:

- The total gaseous tritium released from the site for 1999 was 43.6 Curies which is a decrease from 77.5 Curies in 1998 and 58.5 Curies in 1997.

- The total gaseous fission and activation activity (Noble gas) released from the site for 1999 and 1998 were both 1.6 Curies which is a decrease from 2.6 Curies in 1997 and 25.2 Curies in 1996. This maintains Comanche Peak in the first Quartile of the "ANI Three Year Weighted Average" for all U.S. Power Plants.

- The total gaseous particulate activity released for 1999 was 0 Curies.

- The gross alpha and iodine released has continued at 0 Curies for 1999 matching the performance of 1998, 1997 and 1996. This is indicative of excellent fuel integrity and chemistry controls.

- The calculated gamma air dose from the site due to noble gases released during 1999 is 7.49 E-04 mrad which is an increase from 1998 which calculated out as 6.93 E-04 mrad; however, this represents only 0.00375% of the annual limit for each unit.

- The calculated beta air dose from the site due to noble gases released during 1999 is 3.73 E-04 mrad which is a decrease from 1998 which calculated out as 4.07 E-04 mrad; however, this represents only 0.00093% of the annual limit. (Note: Dose is nuclide specific therefore gamma air dose may increase while beta air dose may decrease based on individual nuclides released.)

- The total whole body dose from the site due to gaseous radioactivity released based on I-131, I-133, H-3(tritium), and particulate nuclides for 1999 calculated out to be 0.04 mrem. This value is a decrease from the 1998 whole body dose of 0.11 mrem. This decrease is directly attributable to the decrease in gaseous tritium released since tritium is responsible for >99% of the total gaseous dose.

- Overall the gaseous radioactivity releases from CPSES are extremely well controlled and maintained ALARA. CPSES is well below all applicable limits for gaseous releases.

A summation of all the radioactive liquid releases to the environment during 1999 produced the following results:

- The total number of Curies of radioactive nuclides released from the site in liquid effluents in 1999 was 1550.26 Curies.

- Of the total Curies released from the site, tritium accounted for 1550 Curies while all other nuclides released accounted for only 0.26 Curies. The total curies of tritium released is up from the 1998 total of 669 Curies and the 1997 level of 1455 Curies. The release total of all other nuclides increased from the 1998 total of 0.24 Curies and 0.11 Curies in 1997.

- The total whole body dose from the site due to liquid effluents calculated out at 1.06 E-01 mrem which is only 1.77% of the annual limit for each unit. Tritium accounts for >99% of the calculated total whole body dose with the Squaw Creek Reservoir (SCR) tritium concentration being the controlling factor. The SCR tritium concentration for 1999 was 13,000 pCi/l to 14,000 pCi/l throughout the year.

- The 1999 average SCR tritium concentration of 13,250 pCi/l is 44.2% of the reporting limit of 30,000 pCi/l.

The CPSES meteorological system achieved a 98.3% recoverable data rate for the joint frequency parameters required by Regulatory Guide 1.23 for wind speed, wind direction and delta temperature. All other parameters achieved a >90% recoverable data rate.

There are three ODCM noncompliance related events discussed in this annual report. The first event was a programatic issue concerning a less than adequate practice for maintaining the calibration of stack radiation monitor velocity flow probes on an 18-month cycle. The second event was a Chemistry procedural

requirement not meeting the requirement for "lower limit of detection" per Action Statements in the ODCM. The third event was a failure to record a stop time on an air sample that was monitoring the outage laundry trailer evaporator exhaust. Additional details of these events are discussed in sections 6.5.2, 6.5.3 and 6.5.4 of this report.

During 1999 there were no Technical Specification/ODCM effluent radiation monitors out of service for >30 days.

There were four revisions to the ODCM approved and implemented in 1999. Details can be found in section 6.2 of this report.

For 1999, the total volume of solid radwaste buried was 27.1 cubic meters and the total radioactivity buried was 1150 curies. The majority of the buried solid waste volume comes from spent resins and filters at 13.7 cubic meters. Also, spent resins and filters were responsible for >99% of all the total radioactivity buried.

Overall, the radioactive effluent monitoring program has been conducted in an appropriate manner to ensure the activity released and associated dose to the public has been maintained as low as reasonably achievable.

Information pertaining to the following items is included in this report:

- A summary of the quantities of radioactive liquid and gaseous effluents released from CPSES during the reporting period in the format outlined in Appendix B of Regulatory Guide 1.21, Revision 1, June 1974.

- A summary of solid waste shipped from CPSES in the format shown in Appendix B of Regulatory Guide 1.21, Revision 1, June 1974, supplemented with three additional categories: class of waste (per 10CFR61), type of container (Strong Tight, HIC) and shipped and buried volumes and curies.

- An explanation of why inoperable liquid or gaseous effluent monitoring instrumentation was not corrected within 30 days.

- Changes to the ODCM in the form of a complete, legible copy of the entire ODCM.

- A listing of new locations for dose calculations and/or environmental monitoring identified by the Land Use Census.

- A description of the events leading to liquid holdup tanks or gas storage tanks exceeding Technical Specification limits.

- A list and description of abnormal releases of radioactive material from the site to unrestricted areas.

- A description of secondary resin releases to the LVW Pond.

- A description of major changes to radioactive waste treatment systems (liquid, gaseous and solid).

- An assessment of radiation doses due to the radioactive liquid and gaseous effluents released from CPSES Unit 1 and Unit 2 in 1999.

- An assessment of radiation doses to the likely, most exposed MEMBER OF THE PUBLIC from CPSES releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the reporting period, to show conformance with 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

- An assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the Site Boundary.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM Radiological Effluent Control limits 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 dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to 500 mrems/yr to the whole body and less than or equal to 3000 mrems/yr to the skin.

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.

2.1.2 Iodine-131, Iodine-133, Tritium and Radioactive Material in Particulate Form

The dose rate due to iodine-131, iodine-133, tritium and all radionuclides in particulate form with half lives greater than 8 days, released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to less than or equal to 1500 mrem/yr to any organ.

The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium and all radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents released, from each 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 7.5 mrems to any organ, and

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

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/ml total activity.

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.

2.1.4 LVW Pond Resin Inventory

The quantity of radioactive material contained in resins transferred to the LVW pond shall be limited

by the following expression:

$$(264/V) \cdot \Sigma_j A_j/C_j < 1.0$$

excluding tritium, dissolved or entrained noble gases and radionuclides with less than an 8 day half life, where:

A_j = pond inventory limit for a single radionuclide j (Curies),

C_j = 10CFR20, Appendix B, Table 2 Column 2, concentration for a single radionuclide j (μCi/ml),

V = volume of resins in the pond (gallons), and

264 = conversion factor (μCi/Ci per ml/gal)

2.1.5 Total Dose

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

2.2 Effluent Concentration Limits

2.2.1 Gaseous Effluents

For gaseous effluents, effluent concentration limits (ECL) values are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Table 2, 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.

2.3 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 4.11-1 and 4.11-2, respectively, of the CPSES ODCM.

2.3.1 Liquid Radioactive Effluents

Each batch release was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy, prior to release. Composite samples were analyzed monthly and quarterly for the Primary Effluent Tanks (PET), Waste Monitor Tanks (WMT), Laundry Holdup and Monitor Tanks (LHMT) and Waste Water Holdup Tanks (WWHT). Composite samples were analyzed monthly for tritium and gross alpha radioactivity in the onsite laboratory using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory (Teledyne Brown). The results of the composite analyses from the previous month or quarter were used to estimate the quantities of these radionuclides in liquid effluents during the current month or quarter. The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent released during periods of discharge.

For batch releases of powdex resin to the LVW pond, samples were analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques, prior to release. Composite samples were analyzed quarterly, for Sr-89 and Sr-90, by an offsite laboratory (Teledyne Brown).

For continuous releases to the Circulating Water Discharge from the LVW pond, daily grab samples were obtained over the period of pond discharge. These samples were composited and analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were also analyzed for tritium and gross alpha radioactivity using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory (Teledyne Brown).

2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. For releases from 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 with the exception of Containment vents made as a precursor to a Containment purge. In these cases, samples collected and analyzed as a prerequisite to the vent were used to estimate total radioactivity released during the subsequent purge. The results of the analyses and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode.

For continuous effluent release pathways, noble gas and tritium grab samples were collected and analyzed weekly for gamma emitting radionuclides by gamma spectroscopy and liquid scintillation counting techniques, respectively. Continuous release pathways were continuously sampled using radioiodine adsorbers and particulate filters. The radioiodine adsorbers and particulate filters were analyzed weekly for I-131 and gamma emitting radionuclides using gamma spectroscopy. Results of the noble gas and tritium grab samples, radioiodine adsorber and particulate filter analyses from the current week and the average effluent flow rate for the previous week were used to determine the total amount of radioactivity released in the continuous mode. Monthly composites of particulate filters were analyzed for gross alpha activity, in the onsite laboratory using the gas flow proportional counting technique. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by an offsite laboratory (Teledyne Brown).

2.4 Batch Releases

A summary of information for gaseous and liquid batch releases is included in Table 7.1.

2.5 Abnormal Releases

Abnormal releases are defined as unplanned or uncontrolled releases of radioactive material from the site boundary.

No abnormal gaseous effluent release occurred during the period covered by this report.

A summary of information for gaseous and liquid abnormal releases is included in Table 7.2.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 7.3 and 7.4. All releases of radioactive material in gaseous form are considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 7.5 and 7.6.

5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Table 7.13.

6.0 RELATED INFORMATION

6.1 Operability of Liquid and Gaseous Monitoring Instrumentation

ODCM Radiological Effluent Controls 3.3.3.4 and 3.3.3.5 require an explanation of why designated inoperable liquid and gaseous monitoring instrumentation was not restored to operable status within thirty days.

During the period covered by this report, there were no instances where these instruments were inoperable for more than thirty days.

6.2 Changes to the Offsite Dose Calculation Manual

There were four revisions issued to the Offsite Dose Calculation Manual during 1999.

Revision 15 included the following changes: revised the program of required environmental samples to add a clarifying statement that the control location at 12.3 miles in the SW Sector has been justified as an acceptable substitute control sampling location based on a plant evaluation: revised the discussion of the Station Service Water (SSW) Effluent Radiation Monitors to clarify and add information on alarm set points, periodic monitor detection of natural radionuclides (radon daughters), and verification methods to ascertain if detected radioactivity is from natural radionuclides or potential plant contamination sources; corrected Action Statement 32a to change the Lower

Limit for Detection (LLD) of radioactivity in the required grab sample of the Service Water System Effluent Lines to a LLD value previously approved in ODCM Revision 8 for Action Statements 31, 31a and 32b.

Revision 16 included the following changes; revised the ODCM to be consistent with the implementation of the CPSES Improved Technical Specifications (ITS): revised the ODCM to reflect the new company name (TXU Electric); corrected transcription errors identified for selected ingestion dose commitment factors listed in Part II, Table 1.2.

Revision 17 revised the definition for "Rated Thermal Power" to reflect the uprate of Unit 2 reactor core thermal power from 3411 Mwt to 3445 Mwt.

Revision 18 included the following changes: corrected Part I, Table 3.3.9 "Meteorological Monitoring Instrumentation" column heading and instrumentation tag numbers; revised Part I, Section 3.3.3.6 "Meteorological Monitoring Instrumentation" and 3/4.3.3.6 "Bases-Meteorological Monitoring Instrumentation" to take an exception to guidance in Regulatory Guide 1.23 and extend the calibration frequency for the Wind Speed and Wind Direction sensors from 6 to 12 months based on recommendations from the manufacturer.

Detailed documentation for these revision changes is maintained onsite.

6.3 New Locations for Dose Calculations or Environmental Monitoring

ODCM Administrative Control 6.9.1.4 requires any new locations for dose calculations and/or environmental monitoring, identified by the Land Use Census, to be included in the Radioactive Effluent Release Report. Based on the 1999 Land Use Census, no new receptor locations were identified which resulted in changes requiring a revision in current environmental sample locations. Values for the new nearest resident, milk animal, garden, X/Q and D/Q values were included in the 1999 Land Use Census.

6.4 Liquid Holdup and Gas Storage Tanks

ODCM Administrative Control 6.9.1.4 requires a description of the events leading to liquid holdup or gas storage tanks exceeding the limits required to be established by Technical Specification 5.5.12. Technical Requirements Manual 13.10.33 limits the quantity of radioactive material contained in each unprotected outdoor tank to less than or equal to ten curies, excluding tritium and dissolved or entrained noble gases. Technical Requirements Manual 13.10.32 limits the quantity of

radioactive material contained in each gas storage tank to less than or equal to 200,000 curies of noble gases (considered as Xe-133 equivalent). These limits were not exceeded during the period covered by this report.

6.5 Noncompliance with Radiological Effluent Control Requirements

This section provides a listing of events that did not comply with the applicable requirements of the Radiological Effluent Controls given in Part I of the CPSES ODCM. Detailed documentation concerning evaluations of these events and corrective actions is maintained onsite.

6.5.1 Abnormal Gaseous and Liquid Releases

- None

6.5.2 Stack Wide Range Gas Monitor(WRGM) Flow Velocity Probes Out-Of-Calibration

On January 13, 1999 a WRGM flow velocity probe was replaced during a scheduled surveillance work order. The calibration on the removed probe expired on September 27, 1998(18-month cycle). The probe was replaced with a calibrated probe and the monitor was returned to service. A follow up technical evaluation discovered that the remaining probes on the WRGM's were in calibration but would expire on March 29, 1999 and April 29, 1999.

Actions were taken to update the surveillance data base work orders with the proper "TSN USAGE and NUMBER" and also update the PR-ISM data base. Additionally a data base search from 1996 to this date was performed with no indication of previous occurrences. It was also believed that the vendor would concurr with the belief that equipment operability would continue to be satisfactory with a 25% extension of the probe's calibration due date.

On April 7, 1999 a technician reviewing the event above for required reportability in the Radioactive Effluent Release Report noted that the probe calibration date of March 29, 1999 had just past. The technician questioned if the previous issue had been resolved and if the 25% extension had been approved. The answers were not known at that time. In order to ensure another probe had not exceeded its calibration, the vendor was contacted. The reply was that based on previous data for these probes, the vendor would not concurr with allowing a 25%

extension. Therefore the velocity probes(September 27, 1998 and March 29, 1999) for both monitors were actually out of calibration while still in service.

Operations declared the monitor (March 29, 1999) out of service. Work was started and completed on this monitor on April 9, 1999 which replaced the probe and returned the monitor to service. Another work order was issued to replace the soon expiring probe (April 29, 1999) on the remaining monitor. This was accomplished on April 26, 1999 prior to being out of calibration.

The original WRGM monitor discovered to be out of calibration was never declared inoperable since it was discovered after the fact. It is now known that the monitor should have been declared inoperable on September 27, 1998. The second WRGM monitor was declared inoperable and then returned to service approximately 2 days later when work was completed. In both instances the monitors were technically inoperable (one for 108 days, one for 11 days) during these periods based on the information provided by the vendor. Inoperability was not discovered until April 9, 1999. **The backup stack noble gas monitors were available for each stack and no unmonitored condition existed at any time during these out of calibration periods.**

Further actions were taken to enhance the tracking of probes and calibration dates by creating 2 new Administrative Preventative Maintenance Items (one for each stack monitor) specifically for ensuring calibration dates and scheduled work orders occur at the correct times to ensure the situation does not occur again. The work orders will be performed as needed, based on probe calibration dates, instead of on a strict 18-month cycle.

6.5.3 <u>Chemistry Procedure Requirement not in Compliance with ODCM Action Statement</u>

On January 23, 1999 it was discovered that procedure CHM-517, "Chemistry Control of Liquid Waste Systems" was not in agreement with the ODCM Action Statement 32a for Station Service Water radiation monitoring requirements. The ODCM read "With the component cooling water monitors operable and indicating an activity of less than 1E-4 uCi/ml, a grab sample is collected and analyzed for gross gamma activity with

lower limit detection of 1E-7 uCi/ml".

It was determined that an error occurred in Revision 8 of the ODCM when the wording of this statement was inadvertently not revised along with Action Statements 31, 31a and 32b which were changed to a value of 5E-7 uCi/ml for the LLD value of principal gamma emitters as allowed by Regulatory Guide 1.21, Revision 1.

Corrective actions included a revision of the ODCM which became effective March 3, 1999 and a procedure change to the Chemistry procedure to ensure all the terminology and notes matched the ODCM revision. All surveillance requirements were met. Changes to the ODCM are discussed in section 6.2 of this report and a complete copy of the ODCM is included in attachment 8.1.

6.5.4 Failure to Record Stop Time on Air Sample

On April 13, 1999 it was discovered that a particulate air sampler monitoring the evaporator exhaust of the outage laundry trailer was not running. The laundry equipment had been secured on April 9, 1999 but the air sample required to monitor this exhaust was not collected at that time and no record of it being turned off was found. Therefore the sample results were indeterminate, although there was no activity (other than natural isotopes) on the filter when counted.

This air sample is required to verify that no unmonitored release occurs via this pathway during operation of the laundry water evaporator. Since this trailer is in the fenced RCA yard and not inside the buildings which provide monitored pathways, it is important to ensure the air sampler is operating at all times that the laundry is in operation. No radioacivity has been found on any air samples taken via this process and the "planned non-routine" release permits that are used to document this process have never indicated any release to the enviroment or associated dose.

Actions taken to ensure this does not happen again included requiring the sample to be collected on a daily basis and verified on a shiftly basis that the air sampler is running. There were no problems obtaining air sample data during the fall 1999 outage and no indication of any release occurring

during the laundry process.

6.6 Resin Releases to the LVW Pond

A total of 630 ft^3 of resin was transferred to the LVW pond during the period covered by this report. The results of the sample analyses indicate no radioactive material was transferred to the pond.

6.7 Changes to the Liquid, Gaseous and Solid Waste Treatment Systems

In accordance with the CPSES Process Control Program, Section 6.2.6.2, changes to the Radwaste Treatment Systems (liquid, gaseous and solid) should be summarized and reported to the Commission in the Radioactive Effluent Release Report if the changes implemented required a 10CFR50.59 safety evaluation.

During this reporting period no such changes to Radwaste Treatment Systems were approved and implemented.

6.8 Meteorological Monitoring Program

In accordance with ODCM Administrative Control 6.9.1.4, a summary of hourly meteorological data, collected during 1999, is retained onsite. This data is available for review by the NRC upon request. Joint Frequency Tables are included in Attachment 8.2.

6.9 Assessment of Doses

6.9.1 Doses Due to Liquid Effluents

The doses to an adult from the fish and cow-meat consumption pathways from Squaw Creek Reservoir were calculated in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 7.7.

6.9.2 Doses Due to Gaseous Effluents

The air dose due to gamma emissions and the air dose due to beta emissions were calculated using the highest annual average atmospheric dispersion factor at the Site Boundary location, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 7.8.

6.9.3 Dose Due to Radioiodines, Tritium and Particulates

The doses to an infant, child, teen and adult from radioiodines and particulates, for the pathways listed in Part II, Table 2.4 of the ODCM, were calculated using the highest dispersion and deposition factors, as appropriate, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Tables 7.9 through 7.12.

6.9.4 40CFR190 Dose Evaluation

ODCM Radiological Effluent Control 3.11.4 requires dose evaluations to demonstrate compliance with 40 CFR Part 190 only if the calculated quarterly or yearly doses exceed two times the applicable quarterly or annual dose limits. At no time during 1999 were any of these limits exceeded, therefore no evaluations are required.

6.9.5 Doses to a MEMBER OF THE PUBLIC From Activities Inside the Site Boundary

Three activities are considered in this evaluation: fishing on Squaw Creek Reservoir, recreation activities at the CPSES employee recreational area and site tours through the CPSES Visitors Center.

The highest dose occurred in the evaluation for fishing, resulting in a dose of 1.27E-4 mrem/yr. The dose to a MEMBER OF THE PUBLIC (fisherman) on Squaw Creek Reservoir was calculated based on fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all doses are calculated at the point of circwater discharge into the lake.

The dose to a MEMBER OF THE PUBLIC engaged in recreational activities at the CPSES employee recreational park was calculated based on one visit a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation, submersion and ground plane.

The dose to a MEMBER OF THE PUBLIC during site tours through the CPSES Visitors Center was calculated based on two visits per year, thirty minutes each

visit. Pathways included in the calculation were gaseous inhalation and submersion.

All calculations were performed in accordance with the methodology and parameters in the ODCM.

SECTION 7.0

TABLES

Table 7.1

BATCH LIQUID AND GASEOUS RELEASE SUMMARY

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
A. Liquid Releases All Sources				
Number of Batch Releases	18	12	15	9
Total Time Period for Batch Releases (min)	7.30E+03	4.62E+03	5.79E+03	3.76E+03
Maximum Time Period for a Batch Release (min)	5.00E+02	4.53E+02	4.63E+02	4.44E+02
Average Time Period for a Batch Release (min)	4.06E+02	3.85E+02	3.86E+02	4.18E+02
Minimum Time Period for a Batch Release (min)	3.43E+02	2.86E+02	1.00E+00*	3.90E+02
Average Stream Flow During Periods of Release (ft^3/s)	N/A	N/A	N/A	N/A

*Monitor alert alarm tripped divert valve to secure release on detected high concentration.

B. Gaseous Releases All Sources				
Number of Batch Releases	47	40	45	39
Total Time Period for Batch Releases (min)	1.66E+04	8.93E+04**	1.64E+04	1.51E+04
Maximum Time Period for a Batch Release (min)	7.20E+02	7.49E+04**	7.31E+02	4.63E+02
Average Time Period for a Batch Release (min)	3.53E+02	2.23E+03**	3.64E+02	3.87E+02
Minimum Time Period for a Batch Release (min)	1.68E+02	1.74E+02	2.00E+02	2.23E+02

**Waste gas decay tank leak permitted.

TABLE 7.2

ABNORMAL BATCH LIQUID AND GASEOUS RELEASE SUMMARY

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
A. Liquids				
Number of Releases	0	0	0	0
Total Activity Released, Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B. Gases				
Number of Releases	0	0	0	0
Total Activity Released, Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 7.3

GASEOUS EFFLUENTS--SUMMATION OF ALL RELEASES

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est.Total Error, %
A. Fission and Activation Gases						
1. Total release (site)	Ci	4.47E-01	2.01E-01	6.81E-01	2.64E-01	2.35E+01
2. Average release rate for period (site)	μCi/sec	5.81E-02	2.62E-02	8.57E-02	3.36E-02	
3. Percent of ODCM REC limit (Dose Rate 500 mrem/yr/site)	%	6.82E-05	3.97E-05	9.13E-05	4.81E-05	
4. Percent of ODCM REC limit (Skin Dose Rate 3000 mrem/yr/site)	%	4.21E-05	2.97E-05	4.71E-05	3.19E-05	
B. Iodines						
1. Total Iodine-131 (site)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+01
2. Average release rate for period (site)	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of ODCM REC limit (Organ Dose Rate 1500 mrem/yr/site)	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
C. Particulates						
1. Particulates with half lives > 8 days (site)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E+01
2. Average release rate for period (site)	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of ODCM REC limit (Organ Dose Rate 1500 mrem/yr/site)	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross alpha radioactivity (site)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
D. Tritium						
1. Total release (site)	Ci	7.56E+00	1.44E+01	1.17E+01	9.92E+00	2.38E+01
2. Average release rate for period (site)	μCi/sec	9.83E-01	1.88E+00	1.47E+00	1.26E+00	
3. Percent of ODCM REC limit (Organ Dose 7.5 mrem/qtr/unit)	%	4.84E-02	9.25E-02	7.50E-02	6.35E-02	

TABLE 7.4

GASEOUS EFFLUENTS--GROUND LEVEL RELEASES

Nuclides Released from the site	Units	Continuous Mode Quarter 1	Continuous Mode Quarter 2	Batch Mode Quarter 1	Batch Mode Quarter 2
A. Fission and Activation Gases					
Ar-41	Ci	0.00E+00	0.00E+00	2.00E-01	1.60E-01
Kr-85	Ci	0.00E+00	0.00E+00	6.41E-03	7.38E-03
Xe-131M	Ci	0.00E+00	0.00E+00	1.29E-05	0.00E+00
Xe-133	Ci	0.00E+00	0.00E+00	2.19E-01	3.23E-02
Xe-133M	Ci	0.00E+00	0.00E+00	4.91E-05	7.19E-04
Xe-135	Ci	0.00E+00	0.00E+00	2.14E-02	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	4.47E-01	2.00E-01
B. Iodines					
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates					
	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
H-3	Ci	7.51E+00	1.44E+01	5.04E-02	5.75E-03
Total for period	Ci	7.51E+00	1.44E+01	5.04E-02	5.75E-03

TABLE 7.4 (con't.)

GASEOUS EFFLUENTS--GROUND LEVEL RELEASES

Nuclides Released from the site	Units	Continuous Mode Quarter 3	Continuous Mode Quarter 4	Batch Mode Quarter 3	Batch Mode Quarter 4
A. Fission and Activation Gases					
Ar-41	Ci	0.00E+00	0.00E+00	1.87E-01	1.68E-01
Kr-85	Ci	0.00E+00	0.00E+00	0.00E+00	9.26E-02
Xe-131M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-133	Ci	0.00E+00	0.00E+00	3.70E-01	3.85E-03
Xe-133M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	Ci	0.00E+00	0.00E+00	1.23E-01	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	6.80E-01	2.65E-01
B. Iodines					
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates					
	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
H-3	Ci	1.17E+01	9.89E+00	1.30E-02	2.02E-02
Total for period	Ci	1.17E+01	9.89E+00	1.30E+02	2.02E-02

TABLE 7.5

LIQUID EFFLUENTS--SUMMATION OF ALL RELEASES

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est.Total Error, %
A. Fission and Activation Products						
1. Total release (not including tritium, gases, alpha) (site)	Ci	5.43E-02	6.14E-02	6.79E-02	5.52E-02	3.03E+01
2. Average diluted concentration during period (site)	μCi/ml	2.32E-09	3.72E-09	3.13E-09	4.03E-09	
3. Percent of ODCM REC limit (Σ diluted conc/10*ECL)	%	1.27E-03	2.72E-03	3.47E-03	2.25E-03	
B. Tritium						
1. Total release (site)	Ci	7.53E+02	2.19E+02	4.39E+02	1.36E+02	1.34E+01
2. Average diluted concentration during period (site)	μCi/ml	3.22E-05	1.33E-05	2.02E-05	9.96E-06	
3. Percent of ODCM REC limit (diluted conc/1E-02 μCi/ml)	%	3.22E-01	1.33E-01	2.02E-01	9.96E-02	
C. Dissolved and Entrained Gases						
1. Total release (site)	Ci	5.09E-03	3.73E-04	1.04E-02	2.40E-04	1.16E+01
2. Average diluted concentration during period (site)	μCi/ml	2.18E-10	2.26E-11	4.82E-10	1.75E-11	
3. Percent of ODCM REC limit (diluted conc/2.0E-04 μCi.ml)	%	1.09E-04	1.13E-05	2.41E-04	8.75E-06	
D. Gross Alpha Radioactivity						
1. Total release (site)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E. Volume of waste released (prior to dilution) (site)	Liters	1.51E+06	9.70E+05	1.19E+06	7.75E+05	2.20E+00
F. Volume dilution of water used during period (Note 1) (site)	Liters	2.34E+10	1.65E+10	2.17E+10	1.37E+10	1.00E+01

Note 1: The dilution volume reported is the total dilution volume during periods when effluent releases were occurring. The additional dilution volume available when there are no effluent releases occurring is not included.

TABLE 7.6

LIQUID EFFLUENTS

Nuclides Released	Units	Continuous Mode Quarter 1	Continuous Mode Quarter 2	Batch Mode Quarter 1	Batch Mode Quarter 2
Cr-51	Ci	0.00E+00	0.00E+00	1.34E-03	3.67E-03
Mn-54	Ci	0.00E+00	0.00E+00	1.57E-03	1.10E-03
Fe-55	Ci	0.00E+00	0.00E+00	1.36E-02	1.13E-02
Co-57	Ci	0.00E+00	0.00E+00	5.56E-05	5.01E-04
Co-58	Ci	0.00E+00	0.00E+00	1.59E-03	2.26E-02
Fe-59	Ci	0.00E+00	0.00E+00	1.87E-05	3.22E-04
Co-60	Ci	0.00E+00	0.00E+00	4.86E-03	7.93E-03
Zn-65	Ci	0.00E+00	0.00E+00	3.05E-05	7.67E-06
Nb-95	Ci	0.00E+00	0.00E+00	2.00E-04	6.56E-04
Zr-95	Ci	0.00E+00	0.00E+00	3.38E-05	4.15E-04
Mo-99	Ci	0.00E+00	0.00E+00	0.00E+00	4.29E-06
Tc-99M	Ci	0.00E+00	0.00E+00	0.00E+00	4.18E-06
Ag-110M	Ci	0.00E+00	0.00E+00	1.73E-04	4.09E-05
Sn-113	Ci	0.00E+00	0.00E+00	7.34E-06	0.00E+00
In-113M	Ci	0.00E+00	0.00E+00	1.18E-05	0.00E+00
Sn-117M	Ci	0.00E+00	0.00E+00	0.00E+00	5.33E-06
Sb-122	Ci	0.00E+00	0.00E+00	5.14E-05	0.00E+00
Sb-124	Ci	0.00E+00	0.00E+00	1.35E-04	3.49E-04
Sb-125	Ci	0.00E+00	0.00E+00	3.06E-02	1.24E-02
Sb-126	Ci	0.00E+00	0.00E+00	1.44E-05	0.00E+00
Ba-140	Ci	0.00E+00	0.00E+00	3.37E-05	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	5.43E-02	6.15E-02
H-3	Ci	0.00E+00	0.00E+00	7.54E+02	2.19E+02
Total for period	Ci	0.00E+00	0.00E+00	7.54E+02	2.19E+02
Xe-133	Ci	0.00E+00	0.00E+00	4.79E-03	3.73E-04
Xe-133M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	Ci	0.00E+00	0.00E+00	3.06E-04	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	5.10E-03	3.73E-04

TABLE 7.6 (continued)

LIQUID EFFLUENTS

Nuclides Released	Units	Continuous Mode Quarter 3	Continuous Mode Quarter 4	Batch Mode Quarter 3	Batch Mode Quarter 4
Cr-51	Ci	0.00E+00	0.00E+00	1.89E-04	9.26E-03
Mn-54	Ci	0.00E+00	0.00E+00	1.11E-03	5.22E-04
Fe-55	Ci	0.00E+00	0.00E+00	7.69E-03	8.52E-03
Co-57	Ci	0.00E+00	0.00E+00	8.62E-04	1.57E-04
Co-58	Ci	0.00E+00	0.00E+00	3.53E-02	2.18E-02
Fe-59	Ci	0.00E+00	0.00E+00	5.33E-05	7.77E-04
Co-60	Ci	0.00E+00	0.00E+00	1.62E-02	3.31E-03
Zn-65	Ci	0.00E+00	0.00E+00	9.00E-05	6.46E-05
Nb-95	Ci	0.00E+00	0.00E+00	4.53E-04	7.48E-04
Zr-95	Ci	0.00E+00	0.00E+00	1.49E-04	5.82E-04
Mo-99	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tc-99M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ag-110M	Ci	0.00E+00	0.00E+00	7.20E-05	0.00E+00
Sn-113	Ci	0.00E+00	0.00E+00	3.32E-05	2.99E-05
In-113M	Ci	0.00E+00	0.00E+00	1.97E-04	3.74E-05
Sn-117M	Ci	0.00E+00	0.00E+00	0.00E+00	9.50E-06
Sb-122	Ci	0.00E+00	0.00E+00	0.00E+00	4.67E-05
Sb-124	Ci	0.00E+00	0.00E+00	1.50E-04	2.81E-03
Sb-125	Ci	0.00E+00	0.00E+00	5.35E-03	6.52E-03
Sb-126	Ci	0.00E+00	0.00E+00	0.00E+00	2.90E-05
Ba-140	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	6.78E-02	5.52E-02
H-3	Ci	0.00E+00	0.00E+00	4.39E+02	1.36E+02
Total for period	Ci	0.00E+00	0.00E+00	4.39E+02	1.36E+02
Xe-133	Ci	0.00E+00	0.00E+00	9.90E-03	2.40E-04
Xe-133M	Ci	0.00E+00	0.00E+00	2.23E-04	0.00E+00
Xe-135	Ci	0.00E+00	0.00E+00	3.19E-04	0.00E+00
Total for period	Ci	0.00E+00	0.00E+00	1.04E-02	2.40E-04

TABLE 7.7

DOSES FROM LIQUID EFFLUENTS (mrem) **(site)**

Any Organ 5 mrem/qtr/unit -- 10 mrem/yr/unit.
Whole Body 1.5 mrem/qtr/unit -- 3 mrem/yr/unit.

Organ	Bone	Liver	Whole Body	Thyroid	Kidney	Lung	GI-LLI
Quarter 1	5.76E-05	2.35E-02	2.34E-02	2.34E-02	2.34E-02	2.41E-02	2.53E-02
% Limit per unit	5.76E-04	2.35E-01	7.80E-01	2.34E-01	2.34E-01	2.41E-01	2.53E-01
Quarter 2	4.10E-05	2.59E-02	2.58E-02	2.58E-02	2.58E-02	2.61E-02	3.09E-03
% Limit per unit	4.10E-04	2.59E-01	8.60E-01	2.58E-01	2.58E-01	2.61E-01	3.09E-02
Quarter 3	3.40E-05	2.78E-02	2.77E-02	2.77E-02	2.77E-02	2.78E-02	3.14E-02
% Limit per unit	3.40E-04	2.78E-01	9.23E-01	2.77E-01	2.77E-01	2.78E-01	3.14E-01
Quarter 4	3.97E-05	2.88E-02	2.88E-02	2.87E-02	2.88E-02	2.89E-02	3.43E-02
% Limit per unit	3.97E-04	2.88E-01	9.60E-01	2.87E-01	2.88E-01	2.89E-01	3.43E-01
Total 1999	1.72E-04	1.06E-01	1.06E-01	1.06E-01	1.06E-01	1.07E-01	1.22E-01
% Limit per unit	8.60E-04	5.30E-01	1.77E+00	5.30E-01	5.30E-01	5.35E-01	6.10E-01

TABLE 7.8

DOSES FROM GASEOUS EFFLUENTS

Site Noble Gas Air Dose (mRad)

5 mrad gamma/qtr/unit -- 10 mrad beta/qtr/unit
10 mrad gamma/yr/unit -- 20 mrad beta/yr/unit

Air Dose (mRad)	Gamma Air	Beta Air
Quarter 1	2.07E-04	9.95E-05
% Limit per unit	2.07E-03	4.98E-04
Quarter 2	1.58E-04	6.03E-05
% Limit per unit	1.58E-03	3.02E-04
Quarter 3	2.20E-04	1.37E-04
% Limit per unit	2.20E-03	6.85E-04
Quarter 4	1.64E-04	7.69E-05
% Limit per unit	1.64E-03	3.85E-04
Total 1999	7.49E-04	3.73E-04
% Limit per unit	3.75E-03	9.33E-04

TABLE 7.9

DOSES FROM GASEOUS EFFLUENTS

Iodines, Particulates and Tritium
Adult Age Group, (mrem)
Any Organ Dose Limit - 7.5 mrem/qtr/unit -- 15 mrem/yr/unit

Organ	Bone	Liver	Whole Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Qtr-1	0.00E+00	4.81E-03	4.81E-03	4.81E-03	4.81E-03	4.81E-03	4.81E-03	1.26E-03
% Limit per Unit	0.00E+00	3.21E-02	3.21E-02	3.21E-02	3.21E-02	3.21E-02	3.21E-02	8.40E-03
Qtr-2	0.00E+00	9.18E-03	9.18E-03	9.18E-03	9.18E-03	9.18E-03	9.18E-03	8.90E-04
% Limit per Unit	0.00E+00	6.12E-02	6.12E-02	6.12E-02	6.12E-02	6.12E-02	6.12E-02	5.93E-03
Qtr-3	0.00E+00	7.44E-03	7.44E-03	7.44E-03	7.44E-03	7.44E-03	7.44E-03	1.41E-03
% Limit per Unit	0.00E+00	4.96E-02	4.96E-02	4.96E-02	4.96E-02	4.96E-02	4.96E-02	9.40E-03
Qtr-4	0.00E+00	6.31E-03	6.31E-03	6.31E-03	6.31E-03	6.31E-03	6.31E-03	9.56E-04
% Limit per Unit	0.00E+00	4.21E-02	4.21E-02	4.21E-02	4.21E-02	4.21E-02	4.21E-02	6.37E-03
Total 1999	0.00E+00	2.78E-02	2.78E-02	2.78E-02	2.78E-02	2.78E-02	2.78E-02	4.52E-03
% Limit per Unit	0.00E+00	9.27E-02	9.27E-02	9.27E-02	9.27E-02	9.27E-02	9.27E-02	1.51E-02

TABLE 7.10

DOSES FROM GASEOUS EFFLUENTS

Iodines, Particulates and Tritium
Teen Age Group, (mrem)
Any Organ Dose Limit - 7.5 mrem/qtr/unit -- 15 mrem/yr/unit

Organ	Bone	Liver	Whole Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Qtr-1	0.00E+00	5.27E-03	5.27E-03	5.27E-03	5.27E-03	5.27E-03	5.27E-03	1.26E-03
% Limit per Unit	0.00E+00	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02	8.40E-03
Qtr-2	0.00E+00	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	8.90E-04
% Limit per Unit	0.00E+00	6.73E-02	6.73E-02	6.73E-02	6.73E-02	6.73E-02	6.73E-02	5.93E-03
Qtr-3	0.00E+00	8.16E-03	8.16E-03	8.16E-03	8.16E-03	8.16E-03	8.16E-03	1.41E-03
% Limit per Unit	0.00E+00	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	9.40E-03
Qtr-4	0.00E+00	6.29E-03	6.29E-03	6.29E-03	6.29E-03	6.29E-03	6.29E-03	9.56E-04
% Limit per Unit	0.00E+00	4.19E-02	4.19E-02	4.19E-02	4.19E-02	4.19E-02	4.19E-02	6.37E-03
Total 1999	0.00E+00	3.04E-02	3.04E-02	3.04E-02	3.04E-02	3.04E-02	3.04E-02	4.52E-03
% Limit per Unit	0.00E+00	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.51E-02

TABLE 7.11

DOSES FROM GASEOUS EFFLUENTS

Iodines, Particulates and Tritium
Child Age Group, (mrem)
Any Organ Dose Limit - 7.5 mrem/qtr/unit -- 15 mrem/yr/unit

Organ	Bone	Liver	Whole Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Qtr-1	0.00E+00	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	1.26E-03
% Limit per Unit	0.00E+00	4.84E-02	4.84E-02	4.84E-02	4.84E-02	4.84E-02	4.84E-02	8.40E-03
Qtr-2	0.00E+00	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	8.90E-04
% Limit per Unit	0.00E+00	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	5.93E-03
Qtr-3	0.00E+00	1.12E-02	1.12E-02	1.12E-02	1.12E-02	1.12E-02	1.12E-02	1.41E-03
% Limit per Unit	0.00E+00	7.47E-02	7.47E-02	7.47E-02	7.47E-02	7.47E-02	7.47E-02	9.40E-03
Qtr-4	0.00E+00	9.52E-03	9.52E-03	9.52E-03	9.52E-03	9.52E-03	9.52E-03	9.56E-04
% Limit per Unit	0.00E+00	6.35E-02	6.35E-02	6.35E-02	6.35E-02	6.35E-02	6.35E-02	6.37E-03
Total 1999	0.00E+00	4.18E-02	4.18E-02	4.18E-02	4.18E-02	4.18E-02	4.18E-02	4.52E-03
% Limit per Unit	0.00E+00	1.39E-01	1.39E-01	1.39E-01	1.39E-01	1.39E-01	1.39E-01	1.51E-02

TABLE 7.12

DOSES FROM GASEOUS EFFLUENTS

Iodines, Particulates and Tritium
Infant Age Group, (mrem)
Any Organ Dose Limit - 7.5 mre/qtr/unit -- 15 mrem/yr/unit

Organ	Bone	Liver	Whole Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Qtr-1	0.00E+00	3.16E-03	3.16E-03	3.16E-03	3.16E-03	3.16E-03	3.16E-03	1.26E-03
% Limit per Unit	0.00E+00	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	8.40E-03
Qtr-2	0.00E+00	6.03E-03	6.03E-03	6.03E-03	6.03E-03	6.03E-03	6.03E-03	8.90E-04
% Limit per Unit	0.00E+00	4.02E-02	4.02E-02	4.02E-02	4.02E-02	4.02E-02	4.02E-02	5.93E-03
Qtr-3	0.00E+00	4.89E-03	4.89E-03	4.89E-03	4.89E-03	4.89E-03	4.89E-03	1.41E-03
% Limit per Unit	0.00E+00	3.26E-02	3.26E-02	3.26E-02	3.26E-02	3.26E-02	3.26E-02	9.40E-03
Qtr-4	0.00E+00	4.15E-03	4.15E-03	4.15E-03	4.15E-03	4.15E-03	4.15E-03	9.56E-04
% Limit per Unit	0.00E+00	2.77E-02	2.77E-02	2.77E-02	2.77E-02	2.77E-02	2.77E-02	6.37E-03
Total 1999	0.00E+00	1.82E-02	1.82E-02	1.82E-02	1.82E-02	1.82E-02	1.82E-02	4.52E-03
% Limit per Unit	0.00E+00	6.07E-02	6.07E-02	6.07E-02	6.07E-02	6.07E-02	6.07E-02	1.51E-02

TABLE 7.13

SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste	Shipped m^3	Shipped Ci	Buried m^3	Buried Ci	Percent Error
a. Spent resins/filters	2.58E+01	1.14E+03	1.37E+01	1.14E+03	±25%
b. Dry active waste	2.79E+02	1.54E+00	1.34E+01	5.25E+00	±25%
c. Irradiated components	-0-	-0-	-0-	-0-	N/A
d. Other (oil/miscellaneous liquids sent to processor for volume reduction)	-0-	-0-	-0-	-0-	N/A
TOTAL	3.05E+02	1.15E+03	2.71E+01	1.15E+03	±25%

Includes 80.5 m^3 of suspected clean trash sent to offsite processor for monitoring before final disposition.

Note: Shipped volumes and curies are not always equal to the buried volumes and curies since some disposal occurs outside the twelve month time period in which shipments occurred.

Dry active waste also includes some low-level radioactive resins that are handled and processed in a manner that is consistent with this waste stream.

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abund.	Activity (Ci)
a. Spent resins/filters	Fe-55	73.64	8.43E+02
	Ni-63	13.04	1.49E+02
	Co-60	9.27	1.06E+02
	Mn-54	2.28	2.61E+01
	H-3	0.05	6.12E-01
	C-14	0.00	3.27E-02
	Tc-99	LLD	0
	I-129	LLD	-0-
	Other*	1.72	1.97E+01
	Total	100.00	1.15E+03

* Nuclides representing <1% of total shipped activity: Be-7, Cr-51, Co-57, Fe-59, Ni-59, Zn-65, Sr-89, Sr-90, Nb-95, Zr-95, Ru-106, Ag-110M, Sn-113, Sn-117M, Sb-124, Sb-125, I-131, Cs-134, Cs-137, Ce-144, Np-237, Pu-238, Pu-239/40, Pu-241, Am-241, Cm-242, Cm-243/244.

TABLE 7.13 (Continued)

SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abund.	Activity (Ci)
b. Dry active waste	Fe-55	73.48	1.13E+00
	Co-60	8.49	1.31E-01
	Ni-63	6.95	1.07E-01
	Co-58	5.02	7.75E-02
	Cs-137	1.85	2.85E-02
	Mn-54	1.71	2.64E-02
	H-3	0.04	5.98E-04
	C-14	LLD	-0-
	Tc-99	LLD	-0-
	I-129	LLD	-0-
	Other*	2.46	3.79E-02
	Total	100.00	1.54E+00

* Nuclides representing <1% of total shipped activity: Cr-51, Co-57, Fe-59, Sr-90, Nb-95, Zr-95, Sn-113, Sb-125, Cs-134, Ce-144, Pu-238, Pu-239/40, Pu-241, Am-241, Cm-242, Cm-243/44.

TABLE 7.13 (Continued)

SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS

3. **Solid Waste Disposition** (Mode of Transportation: Truck)				
Waste Type	Waste Class	Container Type	Number of Shipments	Destination
a. Resin/filters	A	Poly *HIC	2	ATG Oak Ridge, TN
	B	Poly *HIC	1	ATG Oak Ridge, TN
	C	Poly *HIC	4	Chem-Nuclear Barnwell, SC
b. Dry active waste	A	Strong-tight	4	GTS Duratek Oak Ridge, TN
	A	Strong-tight	2	US Ecology Oak Ridge, TN

* High Integrity Container

B. **Irradiated Fuel Shipments (Disposition)**

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