Semiannual Radioactive Effluent Release

Report

July 1, 1985 - December 31, 1985

Waterford 3 SES

Louisiana Power and Light

IE25
1/1

TABLE OF CONTENTS

1.0 SCOPE

This Semi-Annual Release Report is submitted as required by Louisiana Power and Light's Waterford 3 Technical Specification 6.9.1.8. It covers the period from July 1, 1985 through December 31, 1985.

Included in this report is a summary of the quantities of radioactive liquid and gaseous effluents and solid wastes released from the plant for the reporting period. In addition, a summary of the meteorological data and results from the assessment of radiation doses due to the release of liquid and gaseous radioactive effluents, is reported for the entire 1985 year.

Information in this report is presented in the format outlined in Appendix B of Regulatory Guide 1.21.

Other required information in this report includes: (1) explanation of why certain instrumentation was not restored to operable status within the time specified in the ACTION Statement, as per Waterford 3 SES Technical Specification 3/4.3.3.11; and, (2) changes to the Off-Site Dose Calculation Manual.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

Specified as follows are the technical specification limits applicable to the release of radioactive material in liquid and gaseous effluents.

2.1.1 Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive noble gases 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 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

The air dose due to noble gases released in gaseous effluents from the site areas at or beyond the site 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 Iodines; Particulates, Half Lives > 8 Days; and Tritium

The dose rate due to iodine 131 and 133, tritium, and all radionuclides in particulate form with half lives greater than eight (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 and 133, tritium, and all radionuclides in particulate form with half lives greater than eight (8) days in gaseous effluents released 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 mrem to any organ and,

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

2.1.3 Liquid Effluents

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

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ, and
b. During any calendar year to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.

2.1.4 Uranium Fuel Cycle Sources

The dose or dose commitment to any member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which shall be limited to less than or equal to 75 mrem) over 12 consecutive months.

2.2 Maximum Permissible Concentrations

2.2.1 Fission and Activation Gases; Iodines; and Particulates, Half Lives > 8 Days

For gaseous effluents, maximum permissible concentrations 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 maximum permissible concentration (MPC) values specified in 10CFR20, Appendix B, Table II, Column 2 are used as the permissible concentrations of liquid radioactive effluents at the unrestricted area boundary. A value of 2.0E-4 μCi/ml is used as the MPC for dissolved and entrained noble gases in liquid effluents.

2.3 Average Energy

This is not applicable to Waterford 3 SES's radiological effluent technical specifications.

2.4 Measurements and Approximations of Total Radioactivity

The quantification of radioactivity in liquid and gaseous effluents was accomplished by performing the sampling and radiological analysis of effluents in accordance with the requirements of Tables 4.11-1 and 4.11-2 of the amended Waterford 3 SES Plant Technical Specifications (see Attachments 1 and 2). These Technical Specifications include changes made May 16, 1985 to allow discharge of the Steam Generator Blowdown directly into the circulating water system.

2.4.1 Fission and Activation Gases (Noble Gases)

For continuous releases, a gas grab sample was analyzed monthly for noble gases. Each week a Gas Ratio (GR) was calculated according to the following equation:

$$GR = \frac{\text{Average Weekly Noble Gas Monitor Reading}}{\text{Monitor Reading During Noble Gas Sampling}}$$

The monthly sample analysis and weekly Gas Ratio were then used to determine noble gases discharged continuously for the previous week. For gas decay tank and containment purge batch releases, a gas grab sample was analyzed prior to release to determine noble gas concentrations in the batch. In all cases the measured total radioactivity in gaseous effluents was determined from measured concentrations of each radionuclide present and the total volume discharged.

2.4.2 Iodines and Particulates

For continuous releases, iodines and particulates were sampled using a continuous sampler. Each week the charcoal cartridge and particulate filter were analyzed for gamma emitters using gamma spectroscopy. The determined radionuclide concentrations and effluent volume discharged were used to calculate the previous week's activity released.

Composites of the continuous particulate samples were analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory (Teledyne Isotopes). Gross alpha was measured weekly using gas flow proportional counting techniques. The determined activities were used to estimate effluent concentrations in subsequent releases until the next scheduled analysis was performed.

Grab tritium samples for continuous and batch releases were analyzed monthly. The determined concentrations were used to estimate tritium activity in subsequent releases until the next scheduled analysis was performed.

2.4.3 Liquid Effluents

For continuous releases, samples were collected weekly and analyzed using gamma spectroscopy. The measured concentrations were used to determine radionuclide concentrations in the previous week's releases. For batch releases, gamma analysis was performed on the sample prior to release.

For both continuous and batch releases, Sr-89, Sr-90, and Fe-55 composite samples were analyzed quarterly by a contract laboratory (Teledyne Isotopes). Tritium and gross alpha composite samples were analyzed monthly using liquid scintillation and gas flow proportional techniques respectively. For radionuclides analyzed in composite samples, the measured concentrations of the previous composite were used in determining concentrations in liquid effluents.

The measured total radioactivity in liquid effluent releases was determined from the measured concentrations of each radionuclide present and the total volume of the effluent discharged.

2.5 Batch Releases

The summarization of information for gaseous and liquid batch releases is included in Table 1.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A, 1B, and 1C. Note that there are no elevated releases at Waterford 3 SES.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 2A and 2B.

5.0 SOLID WASTES

The summary of radioactive solid wastes shipped offsite for disposal is listed Table 3.

6.0 METEOROLOGICAL DATA

A summary of the hourly meteorological data from March 1, 1985 through December 31, 1985 is present in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability in Table 4.

7.0 ASSESSMENT OF DOSES

7.1 Dose at the Site Boundary

An assessment of air doses from gaseous effluents was performed at the site boundary. Based on actual meteorological conditions existing during the reporting period and excluding any sectors over water, this location was determined to be the ESE sector at 1000 meters. Doses were assessed at this location considering only beta gamma exposures due to noble gas. The results of these assessments for the year 1985 are summarized as follows:

Beta air dose: 2.65 mrad

Gamma air dose: 0.96 mrad

The beta and gamma air doses are 13.3% and 9.6% of the Technical Specification Dose Limits respectively.

7.2 Dose to the Critical Receptor

7.2.1 The maximum organ dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary was determined for 1985.

An assessment of the dose was performed for the residential location nearest to the plant with the highest dispersion parameters. Using 1985 land use census data and actual meteorological data, the critical receptor location for the nearest residence was determined to be in the NNE sector at a distance of 1300 meters. The dose calculation was performed considering the inhalation, ground plane exposure, and cow's milk ingestion pathways.

7.2.2 The maximum dose to the critical organ was determined to be 3.14 mrem to the infant thyroid. This represents 20.9% of the annual Technical Specification Dose Limit.

7.3 Doses Due to Liquid Effluents

The total dose to the maximum exposed individual from liquid effluents during 1985 from Waterford 3 SES is 1.32E-3 mrem total body and 1.14E-2 mrem to the maximum exposed organ (thyroid). These values are 4.40E-2% and 1.14E-1% respectively of the annual Technical Specification Dose Limit.

7.4 40CFR190 Dose Evaluation

In accordance with Waterford 3 Offsite Dose Calculation Manual, Section 8.15, dose evaluations to demonstrate compliance with Surveillance Requirements 4.11.4.1 and 4.11.4.2 of the Waterford Technical Specifications, dealing with dose from the uranium fuel cycle, need to be performed only if quarterly doses exceed 3 mrem to the total body (liquid releases), 10 mrem to any organ (liquid releases), 10 mrad gamma air dose, 20 mrad beta air dose, or 15 mrem to any organ from radioiodines and particulates.

At no time during 1985 were any of these limits exceeded; therefore, no evaluations are required.

7.5 Doses to Public inside the Site Boundary

The member of the Public inside the Site Boundary expected to have the maximum exposure due to gaseous effluents is an employee at Waterford I and II fossil fuel plants, located in the NW sector, approximately 670 meters from the plant. Based on a assumption of 25% occupancy (40 hour work week) and the fact all employees are adults the maximum thyroid dose was 0.13 mrem.

8.0 RELATED INFORMATION

8.1 Changes to the Process Control Program

There were no changes to the Process Control Program for the period this report covers.

8.2 Changes to the Offsite Dose Calculation Manual

8.2.1 On June 27, 1985 Revision 5 of the Waterford 3 Offsite Dose Calculation Manual was reviewed at Plant Operating Review Committee (PORC) meeting 85-119, and approved by the Plant Manager for issue July 5, 1985.

The changes made were to incorporate Waterford 3 Technical Specification Changes, allow other liquid pathways to be considered for dose calculations, and to correct a typographical error.

8.2.1.1 Sections 8.5.1.4 and 8.5.1.5 were modified to reflect the Emergency Technical Specification change made on May 16, 1985, allowing discharge of Steam Generator Blowdown to Waste Ponds and Circulating Water.

8.2.1.2 The note after 8.6.2 was added to allow for other liquid pathways besides fish and water ingestion via the Mississippi River to be used in liquid dose calculations.

8.2.1.3 In section 8.7.1.2 a typographical error was corrected.

8.2.2 On December 5, 1985 Change 1 to Revision 5 of the Waterford 3 Offsite Dose Calculation Manual was reviewed at Plant Operating Committee (PORC) meeting 85-185, and approved by the Plant Manager for issue December 10, 1985.

The changes reflect updated information from the Land Use Census conducted July 10 and 11, 1985.

8.2.2.1 Table 1 was changed to reflect milk cows, milk goats, vegetable gardens, and residences identified in the 1985 Land Use Census.

8.2.2.2 Changes to Table 2 include designation of a new Milk Sampling Location and a new Broad Leaf Control Sampling Location.

8.2.2.3 The new Broad Leaf Control Sampling Location and the new Milk Sampling Location were identified in Table 3.

8.2.2.4 Figures 1, 2 and 3 were changed to reflect the changes described in Table 3.

8.2.2.5 Table 9 was changed to reflect the results of 1985 Annual Land Use Census as described for Table 1.

8.2.3 None of these described changed actually changed dose, dose rate, or setpoint calculations.

8.3 Unavailability of REMP Milk Samples

Due to the unavailability of three milk sampling locations within five kilometers of the plant, Broad Leaf sampling is performed in accordance with Technical Specification Table 3.12-1. Milk is collected, when available, from the control location and two identified sampling locations as indicated in ODCM, Table 2 and Table 3.

8.4 Report of Technical Specification Required Instrument Inoperability

Technical Specification, Limiting Condition for Operation (LCO), 3.3.3.11 requires the reporting in the Semi-annual Effluent Release Report of why designated inoperable instrumentation was not restored to operability within the time specified in the ACTION Statement.

8.4.1 Monitor: Waste Gas Holdup System Hydrogen Monitor and Oxygen Monitors

Period of Inoperability: 3/21/85 - 12/31/85
(At end of reporting period monitors were still inoperable)

Time Required by Technical Specifications to Restore Operability: 14 days

Cause of Inoperability:

Due to design problems excess amounts of moisture were allowed to leak into both the Beckman O_2 and Delphi H_2 and O_2 analyzer systems.

Reason Inoperability Not Restored Within Allotted Time:

Extensive hours were spent attempting to restore these analyzers to operable status. Several analyzer cells were replaced, the solenoid and regulator were repaired, and the sample pump was both repaired and replaced. After these efforts failed to return the monitor to service, a station modification was initiated to replace the analyzer cells with less moisture sensitive models and to completely redesign the sample line condensate drain system.

This modification entailed work in several areas of the plant and on four different systems. All existing piping and electronics associated with the Waste Gas Holdup System Hydrogen and Oxygen Monitors was essentially scrapped and redesigned.

Work included re-routing all sample lines in the Laundry Room, modifying the existing drain header, and fabrication of a new drain header to tie into the Vent Gas Collection Header. Re-routing of the Gas Surge Header Sample line and fabrication of its drain was performed in Safeguards Room B. On Gas Decay Tank A a new separator and drain line on the Waste Gas Collection Discharge Header was added to the second low point. Actual work on the Gas Analyzer Panel consisted of (1) adding 12 new solenoid valves in the sample inlets; (2) modifying the panel to accommodate the new exo-sensor units; (3) installing a new pump and its associated tubing; and (4) wiring of all new and relocated components.

It is estimated that 1.4 man-years have been expended on this project by Engineering, I&C, and Craft personnel. The testing and calibration is all that remains to be performed before the system is put in service. Anticipated completion date is sometime in the first quarter, 1986.

9.0 TABLES

1 Batch Release Summary

1A Semi-annual Summation of all Releases by Quarter - All Airborne Effluents

1B Semi-annual Airborne Continuous Elevated and Ground Level Releases

1C Semi-annual Airborne Batch Elevated and Ground Level Releases

2A Semi-annual Summation of All Releases by Quarter - All Liquid Effluents

2B Semi-annual Liquid Continuous and Batch Releases

3 Solid Waste Shipped Offsite for Disposal

4 Joint Frequency Distribution of Meteorological Data

10.0 ATTACHMENTS

1. Technical Specification Table 4.11-1
2. Technical Specification Table 4.11-2
3. Offsite Dose Calculation Manual, HP-1-230, Revision 5

Table 1 (1 of 1)

REPORT CATEGORY	: BATCH RELEASE SUMMARY
RELEASE POINT	: ALL
TYPE OF RELEASE	: BATCH LIQUID AND GASEOUS
PERIOD START TIME	: 4344:00 HRS = 12:00AM JULY 1, 1985
PERIOD END TIME	: 8759:59 HRS = 11:59PM DECEMBER 31, 1985

LIQUID RELEASES

NUMBER OF RELEASES	:	111	
TOTAL TIME FOR ALL RELEASES	:	29767.0	MINUTES
MAXIMUM TIME FOR A RELEASE	:	486.0	MINUTES
AVERAGE TIME FOR A RELEASE	:	268.2	MINUTES
MINIMUM TIME FOR A RELEASE	:	1.0	MINUTES
AVERAGE STREAM FLOW	:	683642.2	GPM

GASEOUS RELEASES

NUMBER OF RELEASES	:	10	
TOTAL TIME FOR ALL RELEASES	:	21432.0	MINUTES
MAXIMUM TIME FOR A RELEASE	:	4547.0	MINUTES
AVERAGE TIME FOR A RELEASE	:	2143.2	MINUTES
MINIMUM TIME FOR A RELEASE	:	492.0	MINUTES

Table 1A (1 of 1)

REPORT CATEGORY : SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER
TYPE OF ACTIVITY : ALL AIRBORNE EFFLUENTS
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

TYPE OF EFFLUENT	UNIT	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE	CURIES	9.05E 02	6.01E 03	1.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	5.69E 01	3.78E 02	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
B. RADIOIODINES				
1. TOTAL IODINE-131	CURIES	2.83E-04	2.60E-03	1.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	1.78E-05	1.63E-04	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
C. PARTICULATES				
1. PARTICULATES(HALF-LIVES>8 DAYS)	CURIES	7.61E-07	0.00E-01	1.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	4.79E-08	0.00E-01	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
4. GROSS ALPHA RADIOACTIVITY	CURIES	9.81E-06	2.44E-06	
D. TRITIUM				
1. TOTAL RELEASE	CURIES	0.00E-01	0.00E-01	1.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	0.00E-01	0.00E-01	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	

REPORT CATEGORY : SEMIANNUAL AIRBORNE CONTINUOUS ELEVATED AND GROUND LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
FISSION GASES					
KR-85M	CURIES	0.00E-01	0.00E-01	0.00E-01	4.01E 01
KR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-133M	CURIES	0.00E-01	0.00E-01	0.00E-01	5.33E 00
XE-133	CURIES	0.00E-01	0.00E-01	3.38E 02	5.64E 03
XE-135M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-135	CURIES	0.00E-01	0.00E-01	3.55E 01	2.38E 02
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	3.73E 02	5.93E 03
IODINES					
I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	3.25E-05	2.60E-03
I-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	0.00E-01	2.68E-05
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	3.25E-05	2.62E-03

REPORT CATEGORY : SEMIANNUAL AIRBORNE CONTINUOUS ELEVATED AND GROUND LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
		HOURS	HOURS	HOURS	HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES					
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NA-24	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-51	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-54	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-60	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NI-63	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NI-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

REPORT CATEGORY : SEMIANNUAL AIRBORNE CONTINUOUS ELEVATED AND GROUND LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES CONTINUED					
NB-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-99	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-99M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-101	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-105	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AG-110M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-125M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-136	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

REPORT CATEGORY : SEMIANNUAL AIRBORNE CONTINUOUS ELEVATED AND GROUND LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES CONTINUED					
ND-147	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NP-239	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
G ALPHA	CURIES	0.00E-01	0.00E-01	9.81E-06	2.44E-06
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	9.81E-06	2.44E-06

Table 1C (1 of 4)

REPORT CATEGORY : SEMIANNUAL AIRBORNE BATCH ELEVATED AND GROUND
: LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760
NUCLIDE					
FISSION GASES					
KR-85M	CURIES	0.00E-01	0.00E-01	0.00E-01	4.75E-03
KR-85	CURIES	0.00E-01	0.00E-01	5.83E-01	0.00E-01
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M	CURIES	0.00E-01	0.00E-01	1.06E 00	7.76E-01
XE-133M	CURIES	0.00E-01	0.00E-01	4.76E 00	8.75E-01
XE-133	CURIES	0.00E-01	0.00E-01	5.24E 02	8.13E 01
XE-135M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-135	CURIES	0.00E-01	0.00E-01	1.14E 00	3.50E-01
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	5.31E 02	8.33E 01
IODINES					
I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	2.50E-04	0.00E-01
I-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	1.29E-05	0.00E-01
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	2.63E-04	0.00E-01

REPORT CATEGORY : SEMIANNUAL AIRBORNE BATCH ELEVATED AND GROUND
: LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES					
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NA-24	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-51	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-54	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	0.00E-01	7.41E-07	0.00E-01
CO-60	CURIES	0.00E-01	0.00E-01	2.03E-08	0.00E-01
NI-63	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NI-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

REPORT CATEGORY : SEMIANNUAL AIRBORNE BATCH ELEVATED AND GROUND
: LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
		HOURS	HOURS	HOURS	HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES CONTINUED					
NB-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-99	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-99M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-101	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-105	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AG-110M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-125M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-136	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

REPORT CATEGORY : SEMIANNUAL AIRBORNE BATCH ELEVATED AND GROUND
: LEVEL RELEASES. TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		ELEVATED RELEASES		GROUND RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES CONTINUED					
ND-147	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NP-239	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
G ALPHA	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	7.61E-07	0.00E-01

Table 2A (1 of 1)

REPORT CATEGORY : SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER
TYPE OF ACTIVITY : ALL LIQUID EFFLUENTS
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

TYPE OF EFFLUENT	UNIT	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE(NOT INCLUDING TRITIUM, GASES, ALPHA)	CURIES	1.27E-01	1.19E-01	1.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	3.29E-09	3.11E-09	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
B. TRITIUM				
1. TOTAL RELEASE	CURIES	6.14E 00	1.47E 01	1.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	1.59E-07	3.83E-07	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	CURIES	6.83E-01	8.35E 00	1.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	1.77E-08	2.18E-07	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	CURIES	2.60E-05	0.00E-01	1.50E 01
E. WASTE VOL RELEASED(PRE-DILUTION)	GAL	8.82E 06	3.11E 06	2.00E 00
F. VOLUME OF DILUTION WATER USED	GAL	1.02E 10	1.01E 10	2.00E 00

REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		CONTINUOUS RELEASES		BATCH RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
ALL NUCLIDES					
H-3	CURIES	1.41E-01	0.00E-01	6.00E 00	1.47E 01
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NA-24	CURIES	0.00E-01	0.00E-01	9.83E-06	0.00E-01
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-51	CURIES	0.00E-01	0.00E-01	6.32E-03	1.09E-02
MN-54	CURIES	0.00E-01	0.00E-01	4.90E-04	6.06E-04
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	0.00E-01	2.38E-03	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	4.03E-04	7.26E-04
CO-58	CURIES	8.72E-03	0.00E-01	1.03E-01	7.30E-02
CO-60	CURIES	0.00E-01	0.00E-01	2.30E-03	1.63E-03
NI-63	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NI-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	3.21E-05
ZN-69	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	7.69E-06
Y-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		CONTINUOUS RELEASES		BATCH RELEASES	
	UNIT	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760
NUCLIDE					
ALL NUCLIDES CONTINUED					
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-95	CURIES	0.00E-01	0.00E-01	3.13E-04	9.30E-04
ZR-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NB-95	CURIES	3.02E-06	0.00E-01	5.10E-04	1.46E-03
MO-99	CURIES	0.00E-01	0.00E-01	0.00E-01	1.67E-03
TC-99M	CURIES	0.00E-01	0.00E-01	6.59E-05	2.45E-03
TC-101	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-105	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AG-110M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-125M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	1.37E-03	1.42E-02
I-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	4.14E-05	5.47E-04
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	1.93E-05	5.99E-05
CS-136	CURIES	0.00E-01	0.00E-01	2.94E-05	9.87E-05

REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

			CONTINUOUS RELEASES		BATCH RELEASES	
		UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE			4345-6552	6553-8760	4345-6552	6553-8760
ALL NUCLIDES CONTINUED						
CS-137		CURIES	0.00E-01	0.00E-01	5.19E-04	4.25E-04
CS-138		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-139		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140		CURIES	0.00E-01	0.00E-01	0.00E-01	4.58E-04
BA-141		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-142		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140		CURIES	0.00E-01	0.00E-01	1.02E-04	6.48E-04
LA-142		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-143		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144		CURIES	0.00E-01	0.00E-01	1.55E-04	4.25E-03
PR-143		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-144		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ND-147		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187		CURIES	0.00E-01	0.00E-01	2.43E-04	5.33E-03
NP-239		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-83M		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85M		CURIES	0.00E-01	0.00E-01	6.03E-06	3.82E-05
KR-85		CURIES	0.00E-01	0.00E-01	1.02E-04	1.21E-03
KR-87		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-89		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-90		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M		CURIES	0.00E-01	0.00E-01	4.94E-04	2.36E-03
XE-133M		CURIES	0.00E-01	0.00E-01	8.44E-04	7.94E-02
XE-133		CURIES	5.17E-01	1.60E-03	1.64E-01	8.25E 00
XE-135M		CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-135		CURIES	0.00E-01	0.00E-01	1.38E-03	9.69E-03

REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4

		CONTINUOUS RELEASES		BATCH RELEASES	
	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
NUCLIDE		4345-6552	6553-8760	4345-6552	6553-8760
ALL NUCLIDES CONTINUED					
XE-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	1.35E-05	0.00E-01
SR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
G ALPHA	CURIES	0.00E-01	0.00E-01	2.60E-05	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	6.67E-01	1.60E-03	6.29E 00	2.32E 01

Table 3 (1 of 1)

***** REGULATORY GUIDE 1.21 REPORT *****
SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL
**** DURING PERIOD FROM 7/1/85 - 12/31/85 *****

WASTE TYPE	CUBIC METERS	CURIES	% ERROR (CI)
DAW-C-NA Compacted Trash	40.3	9.1E-1	+/- 25%
EB-S-SM Solidified Bottoms	144.2	9.8E-1	+/- 25%
SR-D-NA Blowdown/RCS Bead Resins	5.2	3.4E-2	+/- 25%
SR-D-NA Portable Demin Resin (170 Cubic Foot Liner)	5.2	5.9E-2	+/- 25%
SR-D-NA RCS/Purification Resins	15.2	2.9E+1	+/- 25%
SR-D-NA Portable Demin Resin (182 Cubic Foot Liner)	51.5	2.1E+0	+/- 25%
SR-D-NA Blowdown/Portable Demin and RCS Bead Resin	10.3	1.4E-1	+/- 25%

**** ESTIMATES OF MAJOR NUCLIDES BY WASTE TYPE ****

WASTE TYPE	NUCLIDE	ABUNDANCE	CURIES
DAW-C-NA Compacted Trash	Co-58	33.%	3.0E-1
	Co-60	2.%	1.6E-2
	Cs-137	4.%	3.2E-2
	I-131	49.%	4.4E-1
EB-S-CM Evaporator Bottoms Solidified With Cement	Co-58	86.%	8.4E-1
	Co-60	2.%	2.3E-2
	H-3	0.%	9.2E-4
	Cs-137	3.%	3.3E-2
SR-D-NA Dewatered Steam Generator Blowdown and RCS Bead Resin	Co-58	11.%	3.6E-3
	Co-60	1.%	1.8E-4
	H-3	5.%	1.7E-3
	Cs-137	0.%	5.4-E6
	I-131	75.%	2.6E-2
SR-D-NA Dewatered Portable Demin Bead Resin in a 170 Cubic Foot Liner	Co-58	26.%	1.5E-2
	Co-60	1.%	6.4E-4
	H-3	24.%	1.4E-2
	I-131	44.%	2.6E-2
SR-D-NA Dewatered RCS and Purification Ion Exchange Bead Resin	Co-58	45.%	1.3E+1
	Co-60	3.%	8.9E-1
	H-3	9.%	2.6E+0
	Cs-137	9.%	2.5E+0
	I-131	11.%	3.2E+0
SR-D-NA Dewatered Portable Demin Bead Resin in a 182 Cubic Foot Liner	Co-58	33.%	6.8E-1
	Co-60	2.%	3.7E-2
	H-3	31.%	6.4E-1
	Cs-137	18.%	3.7E-1
SR-D-NA Dewatered Blowdown Portable Demin, and RCS Bead Resin	Co-58	20.%	2.9E-2
	Co-60	1.%	1.8E-3
	H-3	45.%	6.4E-2
	Cs-137	4.%	5.4E-3
	I-131	13.%	1.8E-2

***** SOLID WASTE DISPOSITION SUMMARY *****

CLASS	NUMBER OF SHIPMENTS	TYPE OF SHIPMENT	TYPE OF CONTAINER	MODE OF TRANSPORTATION	DESTINATION
A	5	LSA	Strong Tight	Truck	Barnwell
A	2	LSA	USNRC Certified Cask	Truck	Barnwell
A	15	LSA	Strong Tight	Truck	Richland
B	*	*	*	*	*
C	*	*	*	*	*

***** IRRIATED COMPONENTS/FUEL SHIPMENTS *****

NONE

*NOT APPLICABLE

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS A

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	0	0	0	1	6	6	11	6	0	0	0	0	30
NNE	0	0	0	1	5	12	15	2	0	0	0	0	35
NE	0	0	0	0	5	15	29	15	1	0	0	0	65
ENE	0	0	0	1	2	20	57	14	0	0	0	0	94
E	0	0	0	1	1	2	11	2	0	0	0	0	17
ESE	0	0	0	0	1	5	8	6	0	0	0	0	20
SE	0	0	0	1	4	10	10	5	0	0	0	0	30
SSE	0	0	0	0	0	4	6	4	0	0	0	0	14
S	0	0	0	2	0	3	18	0	0	0	0	0	23
SSW	0	0	0	0	2	10	28	5	0	0	0	0	45
SW	0	0	1	0	3	17	40	6	0	0	0	0	67
WSW	0	0	0	0	3	24	39	9	0	0	0	0	75
W	0	0	0	1	7	34	50	7	0	0	0	0	99
WNW	0	0	0	0	4	21	41	3	0	0	0	0	69
NW	0	0	0	1	1	13	8	1	0	0	0	0	24
NNW	0	0	0	0	1	4	17	4	0	0	0	0	26
TOTAL	0	0	1	9	45	200	388	89	1	0	0	0	733

NUMBER OF CALMS FOR A STABILITY 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS B

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	0	0	0	0	0	3	5	6	0	0	0	0	14
NNE	0	0	1	2	1	1	8	1	0	0	0	0	14
NE	0	0	1	3	0	5	12	1	1	0	0	0	23
ENE	0	0	0	1	0	9	7	6	0	0	0	0	23
E	0	0	0	0	1	1	2	1	0	0	0	0	5
ESE	0	0	0	0	0	4	1	1	0	0	0	0	6
SE	0	0	0	1	4	2	4	2	1	0	0	0	14
SSE	0	0	0	0	0	1	6	5	0	0	0	0	12
S	0	0	1	0	2	3	7	0	0	0	0	0	13
SSW	0	0	0	0	1	3	6	1	0	0	0	0	11
SW	0	0	0	0	1	4	12	2	0	0	0	0	19
WSW	0	0	0	1	1	5	8	4	0	0	0	0	19
W	0	0	0	1	1	8	12	0	0	0	0	0	22
WNW	0	0	0	1	1	4	5	0	0	0	0	0	11
NW	0	0	1	0	0	4	3	0	0	0	0	0	8
NNW	0	0	0	0	2	3	4	5	1	0	0	0	15
TOTAL	0	0	4	10	15	60	102	35	3	0	0	0	229

NUMBER OF CALMS FOR B STABILITY 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS C

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	0	0	0	0	1	3	8	10	1	0	0	0	23
NNE	0	0	1	1	1	6	7	0	0	0	0	0	16
NE	0	0	0	3	4	7	4	1	1	0	0	0	20
ENE	0	0	0	0	1	8	11	3	1	0	0	0	24
E	0	0	0	1	0	1	5	0	0	0	0	0	7
ESE	0	0	0	0	0	0	4	0	0	0	0	0	4
SE	0	0	0	0	1	3	15	2	1	0	0	0	22
SSE	0	0	0	1	0	0	11	4	0	0	0	0	16
S	0	0	0	1	1	1	9	2	0	0	0	0	14
SSW	0	0	0	1	2	1	6	4	0	0	0	0	13
SW	0	0	0	0	2	2	13	4	0	0	0	0	22
WSW	0	0	0	1	2	6	9	1	0	0	0	0	18
W	0	0	0	0	2	7	13	0	0	0	0	0	22
WNW	0	0	0	0	0	4	5	0	0	0	0	0	11
NW	0	0	0	0	2	5	3	1	0	0	0	0	11
NNW	0	0	0	0	1	4	6	2	1	0	0	0	14
TOTAL	0	0	1	8	20	58	131	34	5	0	0	0	257

NUMBER OF CALMS FOR C STABILITY 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS D

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	0	0	0	3	4	33	71	66	6	0	0	0	183
NNE	0	1	1	5	10	26	39	17	12	1	1	0	113
NE	0	0	1	4	7	43	65	25	9	0	0	0	154
ENE	0	0	1	4	3	27	40	19	3	1	0	0	98
E	0	0	1	2	3	15	28	11	5	1	0	0	66
ESE	0	0	1	2	4	15	35	3	5	2	0	0	67
SE	0	0	0	2	1	15	62	25	9	0	0	0	114
SSE	0	0	0	2	1	29	37	14	0	0	0	0	83
S	0	0	0	3	2	12	51	12	1	0	0	0	81
SSW	0	0	0	3	4	22	52	18	0	0	0	0	99
SW	0	0	1	0	10	27	42	7	0	0	0	0	87
WSW	0	1	1	5	4	25	28	17	2	0	0	0	83
W	0	0	1	3	7	29	43	8	0	0	0	0	91
WNW	0	0	0	5	3	17	26	6	0	0	0	0	57
NW	0	0	0	4	5	10	19	20	4	0	0	0	62
NNW	0	0	0	0	3	14	48	34	13	0	0	0	112
TOTAL	0	2	8	47	71	359	686	302	69	5	1	0	1550

NUMBER OF CALMS FOR D STABILITY 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS E

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	1	1	5	16	22	38	54	6	0	0	0	0	143
NNE	1	0	2	14	21	37	34	3	2	0	2	0	116
NE	2	0	4	10	24	76	63	9	1	0	1	0	190
ENE	0	1	2	7	14	66	57	9	0	1	0	0	157
E	0	0	1	3	10	57	93	8	1	0	0	0	173
ESE	0	2	1	9	9	58	70	1	1	0	0	0	151
SE	0	2	0	11	21	81	110	6	1	1	0	0	233
SSE	0	0	5	16	15	77	59	3	0	0	0	0	175
S	2	1	4	6	24	58	49	4	0	0	0	0	148
SSW	2	0	6	21	28	81	40	2	0	0	0	0	180
SW	0	2	9	25	39	67	28	2	0	0	0	0	172
WSW	1	3	12	30	40	97	20	1	0	0	0	0	204
W	0	4	8	27	30	57	18	1	0	0	0	0	145
WNW	2	4	4	19	11	26	20	0	0	0	0	0	86
NW	2	5	5	12	11	16	9	0	0	0	0	0	60
NNW	2	1	6	9	11	22	33	13	1	0	0	0	98
TOTAL	15	26	74	235	330	914	757	68	7	2	3	0	2431

NUMBER OF CALMS FOR E STABILITY 5

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS F

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	5	1	7	10	11	18	1	0	0	0	0	0	53
NNE	0	1	1	9	6	16	2	0	0	0	0	0	35
NE	1	2	6	21	12	13	4	0	0	0	0	0	59
ENE	2	0	3	8	7	11	7	0	0	0	0	0	38
E	0	2	3	5	13	12	1	0	0	0	0	0	36
ESE	1	1	4	1	4	5	2	0	0	0	0	0	18
SE	1	4	4	10	11	10	2	0	0	0	0	0	42
SSE	1	4	9	17	31	21	4	0	0	0	0	0	87
S	1	4	8	33	39	20	2	0	0	0	0	0	107
SSW	1	3	8	49	47	25	5	0	0	0	0	0	138
SW	2	3	13	53	36	12	1	0	0	0	0	0	120
WSW	3	5	14	43	26	25	4	0	0	0	0	0	120
W	3	9	20	31	15	17	5	0	0	0	0	0	100
WNW	8	5	8	21	6	4	2	1	0	0	0	0	55
NW	4	4	9	15	9	5	2	0	0	0	0	0	48
NNW	5	2	4	5	10	9	2	0	0	0	0	0	37
TOTAL	38	50	121	331	283	223	46	1	0	0	0	0	1093

NUMBER OF CALMS FOR F STABILITY 12

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS (MARCH TO DECEMBER 1985) PASQUILL CLASS G

WIND SPEED (M/S) AT 10-m LEVEL

WIND DIRECTION	.35-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.	10.1-13	13.1-18.0	>18.0	TOTAL
N	1	3	6	3	5	2	0	0	0	0	0	0	20
NNE	3	2	0	4	1	0	0	0	0	0	0	0	10
NE	2	1	1	0	2	1	1	0	0	0	0	0	8
ENE	1	0	1	3	1	2	0	0	0	0	0	0	8
E	0	2	2	0	0	0	0	0	0	0	0	0	4
ESE	0	1	2	1	1	0	0	0	0	0	0	0	5
SE	2	1	1	0	1	1	0	0	0	0	0	0	6
SSE	2	1	2	2	2	3	0	0	0	0	0	0	12
S	0	3	10	12	10	5	0	0	0	0	0	0	40
SSW	2	2	3	12	13	4	0	0	0	0	0	0	36
SW	1	2	9	20	6	2	0	0	0	0	0	0	40
WSW	0	1	16	17	4	1	0	0	0	0	0	0	39
W	4	4	13	6	7	2	0	0	0	0	0	0	36
WNW	4	1	6	6	3	1	0	0	0	0	0	0	21
NW	0	1	5	5	0	2	0	0	0	0	0	0	13
NNW	3	4	0	4	0	1	0	0	0	0	0	0	14
TOTAL	27	29	77	95	56	27	1	0	0	0	0	0	312

NUMBER OF CALMS FOR G STABILITY 13

TOTAL VALID HOURS FOR ALL STABLITIES = 6635
TOTAL INVALID HOURS FOR ALL STABLITIES = 637

ATTACHMENT 1

TABLE 4.11-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)a (μCi/mL)
A. Batch Waste Release Tanks[b,f,g,h,i]	P Each Batch	P Each Batch	Principal Gamma Emitters[c]	$5x10^{-7}$
1. Boric Acid Condensate			I-131	$1x10^{-6}$
2. Waste Condensate	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
3. Laundry Waste	P Each Batch	M Composite[d]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
4. Turbine Building Industrial Waste Sumps*	P Each Batch	Q Composite[d]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$
5. Dry Cooling Tower Sumps #1 and #2*				
6. Regenerative Waste				
7. Filter Flush				
8. Waste				

*When release from this source is batch in nature.

ATTACHMENT 1

TABLE 4.11-1 (Continued)

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)a (μCi/mL)
8. Continuous Releases e,f	W Grab Sample	W	Principal Gamma Emitters[c]	$5x10^{-7}$
			I-131	$1x10^{-6}$
1. Turbine Building Industrial h Waste Sumps**	M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
			H-3	$1x10^{-5}$
2. Dry Cooling Tower i Sump #1**	W Grab Sample	M Composite[d]	Gross Alpha	$1x10^{-7}$
			Sr-89, Sr-90	$5x10^{-8}$
3. Dry Cooling Tower i Sump #2**	W Grab Sample	Q Composite[d]	Fe-55	$1x10^{-6}$
4. Circulating Water Discharge-Steam Generator Blowdown HX	W Grab Sample	—		
5. Auxiliary Component Cooling i Water Pumps				

**When release from this source is continuous in nature.

ATTACHMENT 1

TABLE 4.11-1 (Continued)

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)a (uCi/mL)
B. Continuous Releases e,f	W Continuous[k]	W Composite[d]	Principal Gamma Emitters[c]	$5x10^{-7}$
6. Steam Generator Blowdown Discharge j,l			I-131	$1x10^{-6}$
	M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
	W Continuous[k]	M Composite[d]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	W Continuous[k]	Q Composite[d]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

ATTACHMENT 1

TABLE 4.11-1 (Continued)

TABLE NOTATION

[a]The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the "a priori" lower limit of detection as defined above, as microcuries per unit mass or volume,

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield, when applicable,

λ is the radioactive decay constant for the particular radionuclide, and

Δt for plant effluents is the elapsed time between the midpoint of sample collection and the time of counting.

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

[b]A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed by a method described in the ODCM to assure representative sampling.

ATTACHMENT 1

TABLE 4.11-1 (Continued)

TABLE NOTATIONS

[c]The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.1.8.

[d]A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

[e]A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

[f]Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

[g]If the contents of the filter flush tank or the regenerative waste tank contain detectable radioactivity, no discharges from these tanks shall be made to the UNRESTRICTED AREA and the contents of these tanks shall be directed to the liquid radwaste treatment system.

[h]Turbine Building Industrial Waste Sump (TBIWS)

The TBIWS shall be required to be sampled and analyzed in accordance with this table if any of the following conditions exist:

(1) Primary to secondary leakage is occurring; or,

(2) Activity is present in the secondary system as indicated by either the SGB monitors or secondary sampling and analysis; or,

(3) Activity was present in the TBIWS during the previous 4 weeks.

If none of the above situations exists, then the sampling and analysis of this stream need not be performed.

[i]Sampling and analysis of the dry cooling tower sumps and the auxiliary component cooling water pump discharge will be required only when detectable activity exists in the CCW.

Sampling and analysis of the circulating water discharge-steam generator blowdown heat exchanger discharge (CWD-SGB) will be required only when detectable activity exists in the secondary system.

ATTACHMENT 1

Table 4.11-1 (Continued)

TABLE NOTATIONS

[j] Sampling and analysis of the steam generator blowdown will be required only when the blowdown is directed to the circulating water system or Waterford 3 waste pond.

Steam generator blowdown to the Waterford 3 waste pond will be limited to situations requiring secondary chemistry control where the Circulating Water System is not available or the secondary chemistry is outside the requirements for Circulating Water System discharge. Blowdown to the waste pond will be terminated upon detection of sample activity greater than the LLD levels of Table 4.11-1 Section B.

[k] To be representative of the quantities and concentration of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream.

[l] Steam generator blowdown discharge to the waste pond shall be limited to a period of six months with the circulating water system discharge path not available unless radiation monitoring and automatic isolation capabilities are added to the waste pond discharge path.

TABLE 4.11-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[a] (μCi/mL)
A. Waste Gas Holdup Tanks	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[b]	$1x10^{-4}$
B. Containment PURGE (Plant Stack)	P Each PURGE[c] Grab Sample	P Each PURGE[c]	Principal Gamma Emitters[b]	$1x10^{-4}$
		M	H-3	$1x10^{-6}$
C.1 Plant Stack	M[c,d,i] Grab Sample	M	Principal Noble Gas Gamma Emitters[b]	$1x10^{-4}$
			H-3	$1x10^{-6}$
C.2 Fuel Handling Building Ventilation (Normal) Exhaust	M[e,j] Grab Sample	M	Principal Noble Gas Gamma Emitters[b]	$1x10^{-4}$
			H-3	$1x10^{-6}$
D.1 All Release Types as listed in B., C.1, and C.2 above	Continuous[f,h,j]	W[g] Charcoal Sample	I-131	$1x10^{-12}$
			I-133	$1x10^{-10}$
D.2 Main Condenser Evacuation and Turbine Gland Sealing System	Continuous[f,h,j]	W[g] Particulate Sample	Principal Particulate Gamma Emitters[b]	$1x10^{-11}$
	Continuous[f,h,j]	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
	Continuous[f,h,j]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
	Continuous[f,h,j]	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	$1x10^{-6}$

ATTACHMENT 2

TABLE 4.11-2 (Continued)

TABLE NOTATION

[a]The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the "a priori" lower limit of detection as defined above, as microcuries per unit mass or volume,

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield, when applicable,

λ is the radioactive decay constant for the particular radionuclide, and

Δt for plant effluents is the elapsed time between the midpoint of sample collection and the time of counting.

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

ATTACHMENT 2

TABLE 4.11-2 (Continued)

TABLE NOTATIONS

[b] The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, I-131, I-133, Cs-134, Cs-137, Ce-141, and Ce-144 in iodine and particulate releases. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.1.8.

[c] Sampling shall also be performed within 24 hours following shutdown, startup, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1-hour period. Analysis for principle gamma emitters as defined in (b) above shall be completed within 48 hours of sampling.

[d] Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

[e] Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

[f] The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 3.11.2.1, 3.11.2.2, and 3.11.2.3.

[g] Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from sampler. Sampling shall also be performed at least once per 24 hours for at least 7 days following each shutdown, startup or THERMAL POWER change exceeding 15% of RATED THERMAL POWER in 1 hour and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

[h] If no primary to secondary leakage exists, then only the gross beta or gamma noble gases analysis need be performed for the main condenser evacuation and turbine gland sealing system. If a primary to secondary leak exists and the release from the main condenser evacuation and turbine gland sealing system has not been released via the plant stack, then the sampling and analysis must be performed.

[i] Note (c) above is not applicable for the plant stack unless the noble gas monitor shows that effluent activity has increased by a factor of 3.

[j] Fuel Handling Building sampling is required whenever irradiated fuel is in the storage pool.

ATTACHMENT 3

OFFSITE DOSE CALCULATION MANUAL

HP-1-230, Revision 5

LOUISIANA POWER & LIGHT
MIDDLE SOUTH UTILITIES SYSTEM

POM VOLUME 13

POM SECTION 3

HP-1-230

REVISION 5

SURVEILLANCE PROCEDURE

OFFSITE DOSE CALCULATION MANUAL

PORC Meeting No. 85-119

Reviewed _____ / 6-27-85
PORC Chairman DATE

Approved _____ / 7/3-85
Plant Manager-Nuclear DATE

_____
Effective Date

REVIEW COVER SHEET

REVIEW OF: HP-1-230 - Offsite Dose Calculation Manual (Rev. 5)

PORC REVIEW

The PORC has reviewed this item and determined that a safety evaluation was performed (as applicable), that an unreviewed safety question does not exist (as applicable), that a change to the Technical Specifications is not required, and that nuclear safety is/was not adversely affected.

ORDER OF REVIEW	PORC MEMBER	PORC MEMBER SIGNATURE	RECOMMENDED FOR APPROVAL YES	RECOMMENDED FOR APPROVAL NO	DATE
	Maintenance Superintendent	J.A. Smith	✓		6/27/85
	Operations Superintendent	W. Pendergrass	—		6/27/85
	Radiation Protection Superintendent	R.W. Kenning	✓		6/27/85
	Plant Quality Manager	J.J. Zabitsh	✓		6/27/85
	Technical Support Superintendent	[illegible]	✓		6/27/85
	Assistant Plant Manager				
	PORC Chairman	J.A. Alleman	✓		6/27/85

PORC Meeting No. 85-19 Item No. 55 Date: 6-27-85

This item is recommended for approval? ☒ YES ☐ NO

This item requires SRC/NRC review prior to implementation? ☐ YES ☒ NO

If yes, ensure documentation supporting review is attached.

This item requires QA review prior to PM-N approval? ☐ YES ☒ NO

QA REVIEW

Reviewed by N/A DATE N/A
Corporate QA Manager

PLANT MANAGER-NUCLEAR APPROVAL (REFER TO 5.4.12.1)

Comments:

Approved by N/A DATE N/A
Plant Manger-Nuclear

REVIEW COVER SHEET

REVIEW OF: HP-1-230 - (Change 1) Offsite Dose Calculation Manual (Rev. 5)

PORC REVIEW

The PORC has reviewed this item and determined that a safety evaluation was performed (as applicable), that an unreviewed safety question does not exist (as applicable), that a change to the Technical Specifications is not required, and that nuclear safety is/was not adversely affected.

ORDER OF REVIEW	PORC MEMBER	PORC MEMBER SIGNATURE	RECOMMENDED FOR APPROVAL YES	RECOMMENDED FOR APPROVAL NO	DATE
	Maintenance Superintendent	/s/ [illegible]	✓		12/5/85
	Operations Superintendent	[illegible]	✓		12/5/85
	Radiation Protection Superintendent	R W Kenning	✓		12/5/85
	Plant Quality Manager	[illegible]	✓		12/5/85
	Technical Support Superintendent	[illegible]	✓		12/5/85
	Assistant Plant Manager				
	PORC Chairman	[illegible]	✓		12-5-85

PORC Meeting No. 85-185 Item No. 22 Date: 12-5-85

This item is recommended for approval? ☒ YES ☐ NO

This item requires SRC/NRC review prior to implementation? ☐ YES ☒ NO

If yes, ensure documentation supporting review is attached.

This item requires QA review prior to PM-N approval? ☐ YES ☒ NO

QA REVIEW

Reviewed by N/A DATE N/A
Corporate QA Manager

PLANT MANAGER-NUCLEAR APPROVAL (REFER TO 5.4.12.1)

Comments:

Approved by [illegible] DATE 12/10/85
Plant Manger-Nuclear

WATERFORD 3 SES

PLANT OPERATING MANUAL — Check Block Below

CHANGE/REVISION/DELETION REQUEST — [X] POM [ ] PORC-S/C

Procedure No. HP-1-230 Title OFFSITE DOSE CALCULATION MANUAL

Effective Date _____ (if different from approval date)

Complete A, B, and C

A. Change No. 1 [X] Permanent [ ] Deviation Expiration Date _____

B. Revision No. ~~0JA~~ BR ~~5 NUMNA~~ 5

C. Deletion [ ] YES [X] NO

DESCRIPTION OF CHANGE OR REVISION

change sample location and Values of L-THETA-V and X/Q Tables.

REASON FOR CHANGE, REVISION, OR DELETION

To reflect updated information from most recent land use census.

REQUIRED SIGNATURES

ORIGINATOR Michael L Marler DATE 10/23/85

SAFETY REVIEW

Does this change, revision, or deletion:

1. Change the facility as described in the FSAR? YES ____ NO X
2. Change the procedures as described in the FSAR? YES ____ NO X
3. Conduct tests/experiments not described in the FSAR? YES ____ NO X
4. Require a change to the Technical Specifications? YES ____ NO X

If the answer to any of the above is yes, complete and attach a 10CFR50.59 Safety Evaluation.

SAFETY REVIEW Michael L Marler DATE 10/23/85

TECHNICAL REVIEW Bernadette Rowe DATE 10/25/85

GROUP HEAD REVIEW R W Keating DATE 11/22/85

TEMPORARY APPROVAL* (SRO) _____ DATE _____

TEMPORARY APPROVAL* _____ DATE _____

*Temporary approval must be followed by Plant Manager/APM-N - Nuclear approval within 14 days.

WATERFORD 3 SES

PLANT OPERATING MANUAL — Check Block Below

CHANGE/REVISION/DELETION REQUEST [X] POM [ ] PORC-S/C

Procedure No. HP-1-230 Title Offsite Dose Calculation manual

Effective Date _____ (if different from approval date)

Complete A, B, and C

A. Change No. NA [X] Permanent [ ] Deviation Expiration Date _____ PWR

B. Revision No. 5

C. Deletion [ ] YES [X] NO

DESCRIPTION OF CHANGE OR REVISION

Liquid Continuous Effluent Section revised to include S.G.B.

REASON FOR CHANGE, REVISION, OR DELETION

New Tech Specs referring to S.G.B.

REQUIRED SIGNATURES

ORIGINATOR Bernadette Romo DATE 6/14/85

SAFETY REVIEW

Does this change, revision, or deletion:

1. Change the facility as described in the FSAR? YES ____ NO ✓
2. Change the procedures as described in the FSAR? YES ____ NO ✓
3. Conduct tests/experiments not described in the FSAR? YES ____ NO ✓
4. Require a change to the Technical Specifications? YES ____ NO ✓

If the answer to any of the above is yes, complete and attach a 10CFR50.59 Safety Evaluation.

SAFETY REVIEW Bernadette Romo DATE 6/14/85

TECHNICAL REVIEW Donald H Epperson DATE 6/20/85

GROUP HEAD REVIEW RW Keating DATE 6/24/85

TEMPORARY APPROVAL* (SRO) _____ DATE _____

TEMPORARY APPROVAL* _____ DATE _____

*Temporary approval must be followed by Plant Manager/APM-N - Nuclear approval within 14 days.

TABLE OF CONTENTS

9.0 SETPOINTS

10.0 ATTACHMENTS

10.1 Annual Average Dispersion and Deposition Parameters for Areas at or Beyond the Unrestricted Area Boundary (Table 1) (1 page)

10.2 Radiological Environmental Monitoring Program (Table 2) (2 pages)

10.3 Sample Location Table (Table 3) (9 pages)

10.4 Sector and Zone Designators for Radiological Sampling and Monitoring Points (Table 4) (1 page)

10.5 REMP Sample Locations Within 2 Miles of Waterford 3 (Figure 1) (1 page)

10.6 REMP Sample Locations Within 10 Miles of Waterford 3 (Figure 2) (1 page)

10.7 REMP Sample Locations Within 50 Miles of Waterford 3 (Figure 3) (1 page)

10.8 Liquid Waste Management System Effluent Sources and Release Pathways and Points (Figure 4) (2 pages)

10.9 Gaseous Effluent Sources, Gaseous Waste Management Systems Effluent Sources, and Exhaust Release Points (Figure 5) (1 page)

10.10 Open Terrain Correction Factor (Figure 6) (1 page)

10.11 Site-Related Liquid Dose Factor (Table 5) (1 page)

10.12 Bioaccumulation Factor for Freshwater Fish and Invertebrate and Ingestion Dose Factors for Adults (Table 6) (5 pages)

10.13 Dose Factors for Exposure to a Semi-Infinite Cloud of Noble Gases (Table 7) (1 page)

10.14 Inhalation Dose Factors for Child (Table 8) (3 pages)

10.15 Values of L-Theta-V (Table 9) (~~6~~ 5 pages)

10.16 Pathway Dose Factors Due to Radionuclides Other Than Noble Gases, R (Table 10) (19 pages)

10.17 Relative Deposition for Ground-Level Releases (All Atmospheric Stability Classes) (Figure 7) (1 page)

Change 1 12/23/85

11.0 COMMITMENTS AND REFERENCES

LIST OF EFFECTIVE PAGES

Title	Revision 5
~~1-102 AB~~ 7-8-85	Revision 5
1-103	
2, 3, 46, 47, 55, 56, 59, 60, 61, 76-80	Change 1

Change 1 10/27/85

1.0 PURPOSE

1.1 This document provides: (1) the general characteristics of the Waterford 3 site; (2) the detailed Radiological Environmental Monitoring Program (REMP); (3) the description of the Radiological Environmental Monitoring Interlaboratory Comparison Program; (4) the liquid and gaseous radwaste block flow diagram; (5) the Radioactive Liquid and Gaseous Waste Sampling and Analysis Programs; (6) the general methodology to be used to calculate dose to individuals due to releases of radioactive gaseous and liquid effluents from the Waterford 3 site; (7) the general methodology to be used to calculate effluent monitor setpoints and allowable release rates to ensure compliance with the Waterford 3 STS, 10CFR20, and 10CFR50 criteria; (8) the methodology to be used to ensure representative sampling of liquids; and (9) the methodology to be used to comply with 40CFR190 criteria.

1.2 The Offsite Dose Calculation Manual (ODCM) follows the general models suggested by NUREG 0133 (Nov., 1978) and Regulatory Guide 1.109 (Mar., 1976). However, alternate calculation methods from those presented may be used provided the overall methodology is acceptable and consistent with regulation or provided the alternate methodology is conservative. In addition, the most up-to-date dose conversion factors and bioaccumulation factors may be substituted in lieu of Regulatory Guide 1.109 values.

1.3 Actual step-by-step dose calculations will be performed by in-plant procedures which are consistent with the methodology presented in this document.

2.0 REFERENCES

2.1 Waterford SES Unit 3 STS (Standard Technical Specifications), Chapter 16 of Waterford 3 FSAR

2.1.1 Technical Specification Section 3/4 11.1

2.1.2 Technical Specification Section 3/4.11.2

2.1.3 Technical Specification Section 3/4.11.4

2.1.4 Technical Specification Section 3/4.12.1

2.1.5 Technical Specification Section 3/4.12.3

2.1.6 Technical Specification Section 6.14.1

2.1.7 Technical Specification Section 6.14.2

2.1.8 HP-1-215, NRC Radiological Reporting Requirements

2.2 USNRC Regulatory Guide 1.111, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases of Gaseous Effluents from Light-Water-Cooled Reactors, July 1977

2.3 USNRC Regulatory Guide 1.113, Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I, April 1977

2.4 USNRC Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I. Revision 1, October, 1977

2.5 USNRC NUREG 0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978

2.6 Title 10, Code of Federal Regulations, Parts 20, 50 and 100, Latest Edition

2.7 Title 40, Code of Federal Regulations, Part 190, Latest Edition

3.0 PREREQUISITES

NONE

4.0 PRECAUTIONS AND LIMITATIONS

References 2.1.6 and 2.1.7 should be satisfied at all times

5.0 INITIAL CONDITIONS

Reference 2.1.6 should be satisfied prior to implementation.

6.0 MATERIAL AND TEST EQUIPMENT

NONE

7.0 ACCEPTANCE CRITERIA

NONE

8.0 PROCEDURE

8.1 SITE CHARACTERISTICS

Waterford 3 SES is located on the west (right descending) bank of the Mississippi River at River Mile 129.6 between Baton Rouge, Louisiana, and New Orleans, Louisiana. The site is in the northwestern section of St. Charles Parish, Louisiana, near the towns of Killona and Taft.

The geographic coordinates for the Waterford 3 reactor are Latitude 29° 59' 42" North, and Longitude 90° 28' 16" West. Based on the UTM (Universal Transverse Mercator) Zone 15, the UTM coordinates are Northing 3,320,743 meters and Easting 743,962 meters.

The Mississippi River is the closest prominent natural feature to Waterford 3, while other important natural features include Lac des Allemands, about 5.5 miles southwest of the site, and Lake Pontchartrain, about 7 miles northeast of the site. The land slopes gently from its high points near the Mississippi (10-15 ft. above mean sea level) to extensive wetlands located 1.5 to 2.5 miles inland from the river.

Most of the man-made features are located on the narrow strip of dry land between the Mississippi River and the wetlands. Near the Waterford 3 site are several large industrial facilities, including Waterford 1 and 2 (0.4 miles northwest of the site), Little Gypsy Steam Electric Station (0.8 miles northeast of the site, across the river from Waterford 3), Beker Industries, a fertilizer manufacturer (0.6 miles east-southeast), Occidental Chemical Company (0.8 miles east-southeast), and Union Carbide, a chemical manufacturer (1.2 miles east-southeast). Louisiana Power & Light Company (LP&L) owns and operates the above-mentioned steam electric stations.

A map of the UNRESTRICTED AREA and SITE BOUNDARY for radioactive effluents (Figure 5.1-3) is provided in the STS. LP&L will have full control of all activities conducted within the exclusion area boundary of the Waterford 3 site. All of the property within the designated exclusion area is owned by LP&L with the exception of the bottom lands below mean low water of the Mississippi River.

LP&L owns, in title, all surface rights within the exclusion area boundary of the plant. There is presently no intention to allow exploration for subsurface minerals from points on the surface of the exclusion area.

The Mississippi River, Louisiana Highway 18, the Missouri Pacific Railroad right-of-way, and the west (right descending) bank levee of the Mississippi River constitute traversals of the site exclusion area as allowed by 10CFR100.3 (a). Refer to the Waterford 3 Emergency Plan Implementing Document for the arrangements which have been made to give LP&L authority and control over these traversals. (Note that Louisiana Highway 3127 does traverse the SITE BOUNDARY but not the exclusion area. However, LP&L does have the authority to control this traversal in accordance with the Waterford 3 Emergency Plan Implementing Document.)

In addition to Waterford 3, there are two fossil-fueled units, Waterford SES Units 1 and 2, which are owned by LP&L and which are within the site exclusion area. The plant staff for these two units consists of about 60 people. Since this includes workers assigned to shifts, it is a conservative estimate of the maximum number of fossil plant personnel that would be within the exclusion area at any given time. Evacuation procedures for Waterford SES Units 1 and 2 are described in the Waterford 3 Emergency Plan Implementing Document.

A portion of the land within the SITE BOUNDARY is utilized for agricultural activities. Farmers presently work the land but can be expected to actually be in the field less than 10 percent of the time.

Fishing in the Mississippi River from the batture is a rare practice in the Waterford area. An estimated maximum of 2 people may be expected to be engaged in this activity for a period less than 10 percent of the time within the exclusion area.

Texaco maintains a gas valve station east-southeast of the Waterford 3 SES island structure just within the radius of the exclusion area. This valve station is automated and requires only periodic monthly maintenance involving, typically, two persons. Evacuation procedures for these maintenance workers are described in the Waterford 3 Emergency Plan Implementing Document.

The Waterford property is shown in Figure 5.1-3 of the STS and includes 3,561.3 acres. The plant area is about 48 acres and is defined as including the fenced area immediately adjacent to Waterford 3. The site area is shown in Figure 5.1-3 of the STS along with principal station structures and nearby features. The site includes only station structures and does not include any residential, recreational, or other industrial structures. There is a visitor center approximately 1.0 mile SSW of the plant.

The SITE BOUNDARIES for establishing effluent release limits along with radioactive effluent release points are given in Figure 5.1-3 of the STS. The nearest distances to the boundary line are shown in Table 1 of this procedure. The release point elevations for gaseous effluents are provided in Figure 5.1-3 of the STS.

The restricted area, defined for the purpose of controlling ingress into and egress from the site, coincides with the plant area which is enclosed by the plant perimeter fence.

For the purpose of establishing effluent release limits in accordance with 10CFR20 and Appendix I to 10CFR50, the concept of the restricted area, as defined above for the purpose of ingress and egress control, is not applicable. The effluent release limits are established in order to ensure that: (1) the concentrations of the radionuclides in gaseous effluents discharged from the plant stack and exhaust systems do not result in exceeding the limits outside the site boundary set forth in Table II, Column 1 of Appendix B to 10CFR20; (2) the concentration of radionuclides in liquid effluent at the unrestricted area boundary does not exceed the limits set forth in Table II, Column 2 of Appendix B to 10CFR20; and (3) the cumulative liquid and gaseous radionuclide releases do not result in exposures to individuals outside the UNRESTRICTED AREA or SITE BOUNDARY in excess of the limits set forth in Appendix I to 10CFR50.

1980 population by annular sectors within 5 miles of Waterford 3 can be found in the Environmental Report. Population was estimated for 1977 and projected for 1980. The methodology for estimating and projecting population is described in detail in section 6.1.4.2 of the Environmental Report. The closest town to Waterford 3 is Killona, 0.9 miles west-northwest. Other towns near the plant include Norco 2.5 miles east; Hahnville, 3.7 miles east-southeast; and LaPlace, 4.7 miles north. There are also smaller settlements and homes along both banks of the river, the nearest such place to Waterford 3 being Montz, 1.0 mile northeast.

8.2 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

This section satisfies Surveillance Requirement 4.12.1 of the Waterford 3 STS.

Table 1 shows the average annual dispersion parameters for areas at or beyond the exclusion area boundary. This table will be subject to change based on the annual land-use census results. Tables 2, 3 and 4 are the detailed Radiological Environmental Monitoring Program, the Sample Location Table, and the sector and zone designations for the sample locations, respectively. Figures 1, 2 and 3 show the sample locations for samples within 2, 10 and 50 miles of Waterford 3, respectively.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practical to continue to obtain samples of the media of choice at the most desired location or time. In these instances, suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program.

8.3 RADIOLOGICAL ENVIRONMENTAL MONITORING INTERLABORATORY COMPARISON PROGRAM

This section satisfies Surveillance Requirement 4 12.3 of the Waterford 3 STS.

Quality assurance in radiological environmental sampling will be maintained through participation in the Environmental Protection Agency's Radiological Laboratory Quality Assurance Program. The summary of results will be presented in tabular form and will detail the type of analysis, the preparation (collection) date, the date the results are returned, the mean of the analyses (usually triplicate), the standard deviation, the date the values are released for information, the known value, the three standard deviation limit, and a two standard deviation/three standard deviation warning/action flag. If the sample analysis indicates results outside the three standard deviation range, then the corrective actions taken to prevent a recurrence will be documented and submitted along with all results when the Annual Radiological Environmental Operating Report is submitted.

8.4 LIQUID AND GASEOUS RADWASTE BLOCK FLOW DIAGRAM

This section of the document presents the block flow diagrams for the radwaste systems. Any modifications to the radwaste systems should be documented in the ODCM. In order to obtain a more detailed description of the various components, see the appropriate sections of the FSAR. Figures 4 and 5 show the existing radwaste systems.

8.5 LIQUID AND GASEOUS WASTE SAMPLING AND ANALYSIS

8.5.1 Liquids

8.5.1.1 At Waterford 3 there are four liquid holdup systems that should always contain detectable activity. These liquid radiological effluent batch release systems include:

A. Boric Acid Condensate (BAC) - four tanks
B. Waste Condensate (WC) - two tanks
C. Laundry Waste (LW) - two tanks
D. Waste Tanks (WT) - three tanks

8.5.1.2 In addition to the tanks above, there are other holdup tanks and sumps that may contain detectable activity. These tanks and sumps include the following:

A. Regenerative Waste Tank (RWT) - one tank
B. Filter Flush Tank (FFT) - one tank
C. Turbine Building Industrial Waste Sump (TBIWS) - two sumps
D. Dry Cooling Tower Sumps (DCTS) - two sumps

NOTE

If flow to the sump is isolated and volume of release is known, sump discharge may be treated as a batch release rather than a continuous release.

8.5.1.3 If the contents of the RWT or FFT contain detectable radioactivity, no discharges from these tanks shall be made to the UNRESTRICTED AREA and the contents of these tanks should be directed to the liquid radwaste treatment system. The TBIWS shall be required to be sampled and analyzed if any of the following conditions exists: (1) primary to secondary leakage is occurring or (2) activity is present in the secondary system, as indicated by either the steam generator blowdown monitor or secondary sampling and analysis; or (3) activity was present in the TBIWS during the previous four weeks. If none of these situations exists, then the sampling and analysis of this stream need not be performed. Sampling and analysis of the DCTS will be required only when detectable activity exists in the Component Cooling Water System.

8.5.1.4 There are three additional liquid radiological effluent continuous releases at Waterford 3. These include:

A. Circulating Water Discharge
   1. Steam Generator Blowdown
   2. Steam Generator Blowdown Heat Exchanger

B. Auxilliary Component Cooling Tower (Water) pumps (ACTP)

8.5.1.5 The Steam Generator Blowdown will be analyzed weekly via an in-line continuous composite sampler when blowdown is discharged to the waste ponds or circulating water discharge.

8.5.1.5.1 Steam generator blowdown may be routed to the waste ponds only if no detectable radioactivity is present.

8.5.1.6 Sampling and analysis of the steam generator blowdown heat exchanger will be required only when detectable activity exists in the secondary system.

8.5.1 7 Sampling and analysis of the ACTP discharge will be required only when detectable activity exists in the Component Cooling Water System.

8.5.2 Gases

8.5.2.1 Waterford 3 gaseous radiological effluent batch releases include:

A. Waste Gas Holdup Tanks (WGHT) - three tanks within the Gaseous Waste Management System (GWMS)
B. Containment Purge (CP)

8.5.2.2 Gaseous radiological effluent continuous releases should include:

A. The Fuel Handling Building (FHB) ventilation exhaust
B. The Containment Purge (CP)
C. The Plant Stack (PS)
D. The Main Condenser Evacuation and Turbine Gland Sealing System (MCE & TGSS)

8.5.2.3 For the MCE & TGSS, if no primary to secondary leakage exists, then only the RETS Table 4.11-2 gross beta or gamma analysis need be performed. If a primary to secondary leak exists and the release from the MCE & TGSS has not been released via the PS, then the sampling and analysis found in Table 4.11-2 must be performed. A continuous permit should be issued if detectable activity is released through the MCE and TGSS.

8.6 DOSE CALCULATIONS DUE TO LIQUID EFFLUENTS

This section presents the calculated methods used for calculating liquid effluent doses in accordance with Surveillance Requirements 4.11.1.1.1, 4.11.1.2 and 4.11.1.3.1 of the Waterford 3 Standard Technical Specifications (STS).

NOTE
The Waterford 3 Radiological Effluent Technical Specifications (RETS) are a subset of the Waterford 3 STS. For purposes of this document, RETS and STS are interchangeable.

8.6.1 The dose contributions for the total time period $\sum_{\ell=1}^{m} \Delta t_{\ell}$ should be determined by calculation at least once every 31 days and a cumulative summation of these total body and any organ doses should be maintained for each calendar quarter. These dose contributions should be calculated for all radionuclides identified in liquid effluents released to the UNRESTRICTED AREA using the following expression:

$$D_{t\ell} = \Delta t_{\ell} F_{\ell} \sum_{i=1}^{n} A_{it} C_{i\ell} \quad (1)$$

$$D_{t} = \sum_{\ell=1}^{m} D_{t\ell} \quad (2)$$

where:

$D_{t\ell}$ = the cumulative dose commitment to the total body or any organ (t) from the liquid effluents for each liquid release in mrem during time period (ℓ)

D_{t} = the cumulative dose commitment to the total body or any organ (t) from the liquid effluents for all (ℓ) time periods

$\sum_{\ell=1}^{m} \Delta t_{\ell}$ in mrem

Δt_{ℓ} = the length of the ℓ^{th} time period over which the release is made, in hours

$C_{i\ell}$ = the concentration of radionuclide (i) in undiluted liquid effluent during time period Δt_{ℓ} from any liquid release, in μCi/ml

A_{it} = the site-related ingestion dose commitment factor to the total body or any organ (t) for each identified nuclide (i) listed in Table 4.11-1 of the Waterford 3 STS in mrem-ml per hr-μCi (Table 5)

F_{ℓ} = the near field average dilution factor for $C_{i\ell}$ during any liquid effluent release. Defined as the ratio of the undiluted liquid waste flow during release to the average flow from the site discharge structure to site boundary receiving waters.

$$F_{\ell} = \frac{\text{liquid radioactive waste flow}}{\text{discharge structure exit flow}}$$

The liquid radioactive waste flow is the maximum flow from the effluent release. The discharge structure exit flow is the flow during disposal from the discharge structure release point into the receiving water body. For radionuclides not determined in each batch or weekly composite, the dose contribution to the current calendar quarter cumulative summation may be approximated by using a ratio of concentrations based on the previous monthly or quarterly composite analyses. When the current quarterly composite is analyzed, these contributions will be updated as appropriate.

8.6.2 Equation (2) above for calculating the dose contributions requires the use of a dose factor, A_{it}, for each nuclide (i) which embodies the dose factors and dilution factors for the points of pathway origin. The adult total body dose factor and the adult organ dose factor for each radionuclide will be used from Table E-11 of Regulatory Guide 1.109; thus the list contains critical organ dose factors for various organs. The dose factor is written:

$$A_{it} = K_o(U_w/D_w + U_f BF_i)\ DCF_{it} \qquad (3)$$

where:

U_w = 730 kg/yr. adult water consumption

Dw = Dilution factor from near field area to potable water intake = 220

$$220 = \frac{\text{avg Mississippi flow}}{\text{maximum discharge flow}}$$

A_{it} = Composite dose parameter for the total body or critical organ (t) of an adult for nuclide (i) for all appropriate pathways (mrem/hr per μCi/ml)

K_o = Units conversion factor, 1.14E5 = 10^6 pCi/μCi x 10^3 ml/l ÷ 8760hr/yr

U_f = 21 kg/yr, adult fish consumption

BF_i = Bioaccumulation factor for nuclide (i) in fish (pCi/kg per pCi/l) from Table A-1 of Regulatory Guide 1.109 (Table 6)

DCF_{it} = Dose conversion factor for nuclide (i) and organ (t) for adults (mrem/pCi). Values are from Table E-11 of Regulatory Guide 1.109 (Table 6)

Inserting the usage factors of Regulatory Guide 1.109 as appropriate into equation (3) gives:

$$A_{it} = [(3.78E + 5) + (2.39E + 6)BF_i] DCF_{it} \quad (4)$$

NOTE

For other liquid pathways, the appropriate dose factors will be utilized.

8.7 DETERMINATION OF ALARM/TRIP SETPOINTS FOR LIQUID MONITORS

Waterford 3 STS 3.3.3.10 and 3.11.1.1 require that the liquid effluent monitoring instrumentation alarm/trip setpoints be set so that the concentration of radioactive material released from the site is limited to 10CFR20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. (For dissolved or entrained noble gases, the concentration shall be limited to 2E-4 μCi/ml total activity.) This section presents the method to be used for determining setpoints in accordance with Surveillance Requirements of 4.11.1.1.2 of the Waterford 3 STS.

8.7.1 Determination of Liquid Monitor Setpoints

8.7.1.1 The calculated setpoints for the liquid effluent monitors satisfy the following equation:

$$c = \frac{(SF)\ (RF)\ (F + f) \sum_{i=1}^{n} C_i}{TMPC\ (f)} \qquad (5)$$

where;

$\sum_{i=1}^{n} C_i$ = the undiluted effluent gamma concentration in μCi/ml for all radionuclides (i). The value will be derived from radioanalysis of liquid effluent to be released. This value will be supplied for each liquid release.

c = the setpoint, in μCi/ml, of the liquid effluent monitor measuring the radioactivity concentration in the effluent line prior to dilution and subsequent release. This setpoint represents a value which, if exceeded would result in concentrations exceeding the limits of 10CFR20, Appendix B, Table II. Column 2, to an UNRESTRICTED AREA.

f = the liquid effluents flow as measured at the liquid effluent monitor location in gpm.

F = the dilution water flow as determined via pump curves or other apropriate measures that determine currect plant operating configuration in gpm.

NOTE

F is large compared to f; $\therefore F + f \cong F$.

SF = Safety factor to ensure that the effluent limit is not exceeded. Actual value is set by procedure (in the range 0.5 - 0.9).

RF = Release fraction allocated to this release (to be used only in situations of simultaneous or concurrent release).

$$TMPC = \sum_{i=1}^{n} \frac{C_i}{MPC_i} + \sum_{j=1}^{m} \frac{C_j}{MPC_j}$$

$\frac{C_j}{MPC_j}$ = the undiluted nongamma MPC_j fraction for all nongamma radionuclides (j)

$\frac{C_i}{MPC_i}$ = undiluted gamma MPC_i fraction for all gamma radionuclides (i)

MPC_j = Maximum Permissible Concentration for the applicable nongamma-emitting isotope (j) from 10CFR20, Appendix B, table II, column 2.

MPC_i = Maximum Permissible Concentration for the applicable gamma-emitting isotope (i) from 10CFR20, Appendix B, table II, Column 2.

8.7.1.2 The values of C_i and C_j will be measured for each release and the parameters for f and F will be supplied based on current plant operating configurations. The setpoint will be calculated in terms of µCi/ml and the liquid effluent monitor will be adjusted as necessary to ensure that liquid releases are secured prior to exceeding limits specified in 10CFR20, Appendix B, Table II, Column 2 to an UNRESTRICTED AREA.

Example:

Assume C_i = 3E-4 µCi/ml

C_j = 3E-4 µCi/ml

f = 50 gpm

F = 750,000 gpm

MPC_i = 2E-5 µCi/ml

MPC_j = 3E-7 µCi/ml

$$c = \frac{CF}{(f)TMPC} \; ; TMPC = \frac{3E\text{-}4}{2E\text{-}5} + \frac{3E\text{-}4}{3E\text{-}7} = 1E+3$$

$$c = \frac{(3E\text{-}4\ \mu Ci/ml)(750{,}000\ gpm)}{(50\ gpm)\ (1E+3)}$$

$$c = 4.51E\text{-}3\ \mu Ci/ml$$

Then the SF and RF values can be applied; e.g., SF = 0.8 and RF = 1 because normally concurrent releases will not occur.

$$c = 3.61E\text{-}3\ \mu Ci/ml$$

8.8 REPRESENTATIVE SAMPLING OF LIQUIDS

8.8.1 Prior to grab sampling liquid waste tanks, methods should be used to guarantee representative sampling. Large volumes of liquid waste should be mixed in as short a time as possible and uniformly distributed prior to sampling. To determine the minimum mixing time for tanks from which releases are made, the following tests were performed prior to initial use for release purposes.

8.8.1.1 The tank was filled to a known volume.

8.8.1.2 A specific quantity of a selected chemical and/or sediments was added to the tank.

8.8.1.3 Recirculation was initiated through the normal path.

8.8.1.4 Periodic samples was taken until equilibrium is reached.

8.8.1.5 The time observed to completely mix the tank is used as a minimum recirculation time prior to effluent sampling. Records of the test will be maintained.

8.9 PROJECTING DOSE FOR RADIOACTIVE LIQUID EFFLUENTS

Technical Specification 3.11.1.3 requires that appropriate subsystems of the liquid radwaste treatment system be used to reduce releases of radioactivity when the projected doses due to the liquid effluent from each reactor unit to UNRESTRICTED AREAS would exceed 0.06 mrem total body or 0.2 mrem to any organ in a 31-day period. The following calculational method is provided for performing this dose projection.

At least once every 31 days, the total dose from all liquid releases for the quarter-to-date will be divided by the number of days into the quarter and multiplied by 31. If this projected dose exceeds 0.06 mrem total body or 0.2 mrem any organ, and the Liquid Waste Management System has not been operating, it shall be operated, if operation would reduce the monthly projected doses below 0.06 mrem total body or 0.2 mrem any organ. (This is performed in accordance with Surveillance Requirements 4.11.1.3.1 and 4.11.1.3.2.)

8.10 DOSE RATE DUE TO GASEOUS EFFLUENTS

This section presents the calculational methods used for calculating gaseous effluent doses in accordance with Surveillance Requirements 4.11.2.1.1 and 4.11.2.1.3 of the Waterford 3 STS.

8.10.1 Real Time Meteorological Input

The instantaneous dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY shall be limited to the following values:

8.10.1.1 Release rate limit for noble gases:

$$D_{\theta b} = K'(\chi/Q)_{\theta v} \sum_{i=1}^{n} K_i \, (Q)_{iv} \qquad (6)$$

$$D_{\theta s} = K'(\chi/Q)_{\theta v} \sum_{i=1}^{n} (L_i + 1.1M_i) \, (Q)_{iv} \qquad (7)$$

8.10.1.2 Release rate limit for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days:

$$D_{\theta I} = (\chi/Q)_{\theta v} \sum_{i=1}^{n} P_{it} \, (Q)_{iv} \qquad (8)$$

where:

$D_{\theta b}$ = the instantaneous dose rate to the total body (b) due to noble gases in sector θ for the release in mrem/yr; not to exceed 500 mrem/yr

$D_{\theta s}$ = the instantaneous dose rate to the skin(s) due to noble gases in sector θ for the release in mrem/yr; not to exceed 3000 mrem/yr

$D_{\theta I}$ = the instantaneous dose rate to the child thyroid (I) for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in sector θ for the release in units of mrem/yr; not to exceed 1500 mrem/yr.

K' = a constant of unit conversion, 1E6pCi/μCi.

K_i = the total body dose factor due to gamma emissions for each identified radionuclide (i) in units of mrem/yr per pCi/m^3 (Table 7).

L_i = the skin dose factor due to beta emissions for each identified radionuclide (i) in units of mrad/yr per pCi/m^3 (Table 7).

M_i = the air dose factor due to gamma emissions for each identified radionuclide (i) in units of mrad/yr per pCi/m^3 (Table 7).

P_{it} = the thyroid dose parameter for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days (i) for the inhalation pathway only, in mrem/yr per $\mu Ci/m^3$ (Table 10, Page 2). The dose factor is based on the most restrictive group (child) and most restrictive organ at the SITE BOUNDARY.

P_{it} = (child breathing rate of 3700 m^3/yr)(DFA_i) (K') where DFA_i is the inhalation dose factor for each radionuclide from Table 8.

$\sum_{i=1}^{n}$ = summation for all identified radionuclides

$(Q)_{iv}$ = the average release rate of noble gas or of Iodine-131, Iodine-133, tritium, and radionuclides in the particulate form with half-lives greater than 8 days (i) during the time of release from all vent releases (v). Value is averaged over one hour and is in units of μCi/sec.

$(\chi/Q)_{\theta v}$ = the average atmosphere dispersion factor at the SITE BOUNDARY for the time of the release in sector θ in sec/m^3 for all vent releases (v). When release time is greater than 1 hour, the average shall be based on observations of windspeed and atmospheric stability taken at least every hour during the release.

$$(\chi/Q)_{\theta v} = L_{\theta v}/\bar{u}$$

where:

$\bar{u}$ = the average wind speed determined at least hourly, during time of the release, in sector θ , at 10 meters above grade, in m/sec

and, $L_{\theta v} = 2.032/r_{\theta} \Sigma_{zj}$.

2.032 = $(2/\pi)^{\frac{1}{2}}$ divided by the width in radians of a 22.5° sector.

r_{θ} = the distance from the release to the receptor for each sector (θ) in m, and provided in Table 9.

Σ_{zj} = the vertical (z) standard deviation of the materials in the plume, for stability class j, with a correction for additional dispersion within the building wake cavity, restricted by the condition that

$$\Sigma_{zj} = (\sigma_{zj}^2 + 0.5D_z^2/\pi)^{\frac{1}{2}} \leq \sqrt{3}\,\sigma_{zj}$$

furthermore,

$$\Sigma_{zj} = \sqrt{3}\,\sigma_{zj}$$

when

$$(\sigma_{zj}^2 + 0.5D_z^2/\pi)^{\frac{1}{2}} > \sqrt{3}\,\sigma_{zj}$$

and

D_z = the maximum adjacent building height (z) either up or downwind from the release point.

σ_{zj} = the vertical (z) standard deviation of the material in the plume at the downwind distance for stability class j.

The (χ/) values to be calculated using the above model will be adjusted to reflect the results of analysis of the straight line trajectory model (Reference 2.2, R.G. 1.111, Sections C.1.c and C.2.c). This adjustment is accomplished by multiplying the (χ/Q) values by the correction factors, found in Figure 6, which applies to areas with terrain features similar to those at the Waterford 3 site.

NOTE

The Radioactive Effluent Release Report, to be submitted within 60 days after January 1, of each year, shall include an annual summary of hourly meteorological data collected over the previous year. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurements, shall be used for determining the gaseous pathway doses.

8.10.2 No Real Time Meteorological Input (Used in Place of Real Time)

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY shall be limited to the following values and expressions:

8.10.2.1 Release rate limit for noble gases:

$$K' \overline{(X/Q)}_v \sum_{i=1}^{n} K_i \dot{Q}_{iv} \leq 500\text{mrem/yr. total body} \quad (9)$$

$$K' \overline{(X/Q)}_v \sum_{i=1}^{n} (L_i + 1.1M_i) \dot{Q}_{iv} \leq 3000\text{mrem/yr. skin} \quad (10)$$

8.10.2.2 Release rate limit for Iodine-131, Iodine-133, tritium and for all radionuclides in particulate form with half-lives greater than 8 days:

$$K' \overline{(\chi/Q)}_v \sum_{i=1}^{n} P_{it} \dot{Q}_{iv} \leq 1500 \text{ mrem/yr any organ} \quad (11)$$

Where:

Q_{iv} = the average release rate of radionuclides (i) in gaseous effluent from all vent releases (v) in μCi/sec

$\overline{(\chi/Q)}_v$ = 1.1E-5 sec/m^3 in the ESE sector at 0.6 mile for all vent releases (v) (the highest calculated annual average dispersion factor at the SITE BOUNDARY)

NOTE

All radioiodines are assumed to be released in elemental form.

8.11 AIR DOSE CALCULATIONS DUE TO NOBLE GASES

This section presents the calculational methods used for calculating noble gas effluent dose to air in accordance with Surveillance Requirement 4.11.2.2 of the Waterford 3 STS.

8.11.1 Real Time Meteorological Input

The air dose due to noble gases released in gaseous effluents to areas at and beyond the SITE BOUNDARY will be determined by the following expressions:

8.11.1.1 During any calendar quarter, for gamma radiation:

$$D_{\theta\gamma} = (1.14E2) \sum_{i=1}^{n} (M_i) \sum_{j=1}^{m} (\Delta t_j) (X/Q)_{j\theta v} (Q)_{ijv} \quad (12)$$

During any calendar quarter, for beta radiation:

$$D_{\theta\beta} = (1.14E2) \sum_{i=1}^{n} (N_i) \sum_{j=1}^{m} (\Delta t_j) (X/Q)_{j\theta v} (Q)_{ijv} \quad (13)$$

8.11.1.2 During any calendar year, for gamma radiation:

$$D_{\theta\gamma} = (1.14E2) \sum_{i=1}^{n} (M_i) \sum_{j=1}^{m} (\Delta t_j) (X/Q)_{j\theta v} (Q)_{ijv} \quad (14)$$

During any calendar year, for beta radiation:

$$D_{\theta\beta} = (1.14E2) \sum_{i=1}^{n} (N_i) \sum_{j=1}^{m} (\Delta t_j) (X/Q)_{j\theta v} (Q)_{ijv} \quad (15)$$

where all terms are as previously defined; and

$D_{\theta\gamma}$ = the total gamma (γ) air dose in sector θ from gaseous effluents for the total time period (e.g., quarter or year)

$$\sum_{j=1}^{m} \Delta t_j$$

and not to exceed 5 mrad quarterly or 10 mrad yearly

$D_{\theta\beta}$ = the total beta (β) air dose in sector θ from gaseous effluents for the total time period (e.g., quarter or year)

$$\sum_{j=1}^{m} \Delta t_j$$

and not to exceed 10 mrad quarterly or 20 mrad yearly

$$1.14E2 = \left(\frac{1E6pCi}{\mu Ci}\right) \left(\frac{yr.}{8760hr.}\right)$$

$(Q)_{ijv}$ = the average release rate of radionuclides (i) during the time of release Δt_j for vent releases (v)

Δt_j = the length of the j^{th} time period over which $(X/Q)_{\theta v}$ and Q_{ijv} are accumulated for all gaseous releases (hours).

M_i and N_i = the gamma and beta air dose factors (respectively) for a uniform semi-infinite cloud of radionuclide (i) (mrad/yr per pCi/m^3) (Table 7)

$(\chi/Q)_{j\theta v}$ = the average atmospheric dispersion factor at the site boundary for the time of the release (j), in sector (θ), in sec/m^3, for all vent releases (v). When release time is greater than one hour, the average shall be based on observations of windspeed and atmospheric stability taken at least every hour during the release.

8.11.2 No Real Time Meteorological Input (Used in Place of Real Time)

The air dose due to noble gases released in gaseous effluents to areas at or beyond the SITE BOUNDARY will be determined by the following expressions when the real time meteorological inputs are not applicable:

8.11.2.1 During any calendar quarter, for gamma radiation:

$$D_\gamma = (1.14E2)\ \overline{(\chi/Q)}_v \sum_{i=1}^{n} (M_i) \sum_{j=1}^{m} (\Delta t_j)\ (Q)_{ijv} \qquad (16)$$

During any calendar quarter, for beta radiation:

$$D_\beta = (1.14E2)\ \overline{(\chi/Q)}_v \sum_{i=1}^{n} (N_i) \sum_{j=1}^{m} (\Delta t_j)\ (Q)_{ijv} \qquad (17)$$

8.11.2.2 During any calendar year, for gamma radiation:

$$D_\theta = (1.14E2)\ \overline{(\chi/Q)}_v \sum_{i=1}^{n} (M_i) \sum_{j=1}^{m} (\Delta t_j)\ (Q)_{ijv} \qquad (18)$$

During any calendar year, for beta radiation;

$$D = (1.14E2)\ \overline{(\chi/Q)}_v \sum_{i=1}^{n} (N_i) \sum_{j=1}^{m} (\Delta t_j)\ (Q)_{ijv} \qquad (19)$$

where all values are as defined previously; and

D_γ = the total gamma (γ) air dose from gaseous effluents for the total time period and not to exceed 5 mrad quarterly and 10 mrad yearly.

D_β = the total beta (β) air dose from gaseous effluents for the total time period and not to exceed 10 mrad quarterly and 20 mrad yearly.

Q_{ijv} = the average release rate of radionuclides (i) in gaseous effluent from all vent releases (v) in μCi/sec during the time period Δt_j.

$\overline{(\chi/Q)}_v$ = 1.1E-5 sec/m^3 in the ESE sector at 0.6 mile for all vent releases (v).

8.12 DOSE CALCULATIONS DUE TO RADIOIODINES AND RADIOACTIVE MATERIALS IN PARTICULATE FORM

This section presents the calculational methods used for calculating doses due to Iodine-131, Iodine-133, tritium, and radionuclides in particulate form in accordance with Surveillance Requirement 4.11.2.3 of the Waterford 3 STS.

8.12.1 Real Time Meteorological Input

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 to areas at and beyond the SITE BOUNDARY will be determined by the following expressions:

8.12.1.1 During any calendar quarter for age group a:

$$D_{\theta ta} = (1.14E\text{-}4) \sum_{i=1}^{n} (R_{ita}) \sum_{j=1}^{m} (\Delta t_j) [(W)_{\theta jv} (Q)_{ijv}] \quad (20)$$

8.12.1.2 During any calendar year for age group a:

$$D_{\theta ta} = (1.14E - 4) \sum_{i=1}^{n} (R_{ita}) \sum_{j=1}^{m} (\Delta t_j) [(W)_{\theta jv} (Q)_{ijv}] \quad (21)$$

where all terms are as previously defined; and

$D_{\theta ta}$ = the cumulative dose due to Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents, to an organ (t), of an individual (a), in sector θ, for the total time period:

$$\sum_{j=1}^{m} \Delta t_j$$

not to exceed 7.5 mrem in any calendar quarter or 15 mrem in any calendar year.

$$1.14E\text{-}4 = \frac{1 \text{yr.}}{8760 \text{hr.}}$$

R_{ita} = the dose factor from each identified radionuclide (i), for each applicable organ (t), and age group (a), in mrem/yr per pCi/m^3 for the inhalation pathway and in mrem/yr per pCi/m^2-sec for the food and ground plane pathway from Table 10. For sectors with real pathways within 5 miles of the plant, the values of R_i are used based on these real pathways; for sectors with no real pathways within 5 miles from the plant, R_i is used assuming that the cow-grass-milk pathway exists at the 5-mile distance. (R_i's were calculated using the methodology found in Reference 2.5, pages 31-36.)

$W_{\theta jv}$ = dispersion parameter for time period (j) and release pt (v) for calculation of food pathway dose

$W_{\theta jv} = (\chi/Q)_{\theta vj}$ for the inhalation pathway

$W_{\theta jv} = (D/Q)_{\theta vj}$ for the food and ground plane pathway

where $(\chi/Q)_{\theta vj}$ is as defined previously; and,

$(D/Q)_{\theta vj}$ = relative deposition for the time period (Δt_j), in sector (θ), for release pt (v), in square meters. When Δt_j is greater than one hour, relative deposition shall be based on observation of atmospheric stability taken at least every hour during Δt_j.

$$(D/Q)_{\theta vj} = \frac{f_\theta d_{\theta v}}{(0.3927)(r_\theta)}$$

where:

$(0.3927)r_\theta$ = arc length of the 22.5° sector at distance r_θ in meters.

f_θ = wind direction factor; equals 1 if wind in hour t is into sector θ; equals zero if wind is not into sector θ.

$d_{\theta v}$ = relative deposition rate for ground-level vent release (v) at distance (r_θ) in sector (θ) for all stability classes of interest, (meters $^{-1}$) taken from Figure 7.

8.12.2 No Real Time Meteorological Input (Used in Place of Real Time)

The dose to an individual from Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the SITE BOUNDARY will be determined by the following expressions:

8.12.2.1 During any calendar quarter:

$$D_{ita} = 1.14E\text{-}4 \ \Delta t \sum_{i=1}^{n} R_{ita} \ W_v \ Q_{iv}. \qquad (22)$$

8.12.2.2 During any calendar year:

$$D_{ita} = 1.14E\text{-}4 \ \Delta t \sum_{i=1}^{n} R_{ita} \ W_v \ Q_{iv} \qquad (23)$$

where all terms are as previously defined; and

Δt = the time required for the release in hours for all releases per quarter or per year

D_{ita} = the cumulative dose to an organ (t), age group (a), due to radionuclides (i) in gaseous effluents; not to exceed 7.5 mrem quarterly or 15 mrem yearly

W_v = the dispersion parameter for estimating the dose to an individual at the controlling location for long term vent releases (v)

W_v = $(\overline{\chi/Q})_v$ for the inhalation pathway from vent releases (v) in sec/m^3, from Table 11 or Table 1, for the critical receptor.

W_v = $(\overline{D/Q})_v$ for the food and ground plane pathways from vent releases (v) in m^2, from Table 12 or Table 1, for the critical receptor.

8.13 DETERMINATION OF ALARM/TRIP SETPOINTS FOR GASEOUS MONITORS

Waterford 3 STS 3.3.3.11 states that the radioactive gaseous effluent monitoring instrumentation alarm/trip setpoint be set to ensure that the limits of Waterford 3 STS 3.11.2.1 are not exceeded.

8.13.1 Setpoint Calculations for Gaseous Monitors

The calculated high level alarm and flow termination trip setpoints will be regarded as the limiting conditions for the actual setpoint adjustments. The gaseous effluent radiation monitor setpoints are usually expressed in μCi/cc. For conservatism, an administrative safety factor SF (% of dose rate limit) will be introduced into setpoint calculation. To allow for multiple sources of release from different or common release points, the allowable operating setpoints will be controlled administratively by allocating a percentage of the total allowable release to each release source (RF).

8.13.2 General Gaseous Setpoint Bases

Gaseous setpoints will be based on noble gas dose rate (less than or equal to 500 mrem/yr total body, and less than or equal to 3000 mrem/yr skin). Specifically, gaseous setpoints will be based on the most limiting of the following equations:

8.13.2.1 Total Body

$$Q_{tb} = \frac{(500\ \text{mrem/yr.})(RF)(SF)}{(\overline{X/Q})_v(1E6pCi/\mu Ci)\ \dfrac{\sum_{i=1}^{n} K_i\ Q_{iv}}{\sum_{i=1}^{n} Q_{iv}}}$$

Then, based on maximum flow rate, the monitor setpoint SN in uCi/cc can be calculated:

$$SN = \frac{Q_{tb}}{F_{max}}$$

where:

F_{max} = maximum effluent flow rate (cc/sec).

$\sum_{i=1}^{n}$ = summation of all nuclides considered.

Q_{tb} = maximum release rate allowed to give limiting total body (tb) dose of 500 mrem/yr (μCi/sec).

K_i = the total body dose factor due to gamma emissions for each identified radionuclide (i) in units of mrem/yr per pCi/m^3 (Table 7).

Q_{iv} = average release rate of isotope (i) from the release point (v) in μCi/sec.

RF = release fraction allotted to release point in consideration.

$(\overline{X/Q})_v$ = 1.1E-5 sec/m^3 (in the ESE sector at 0.6 mile). The sector with highest value of annual average atmospheric dispersion factor at the site boundary for the release point (v) in question.

SF = administrative safety factor to account for uncontrollable variables (sampling, monitoring errors, etc.). Usually, the SF takes on a value between 0.5-0.8.

8.13.2.2 For skin

$$Q_{skin} = \frac{(3000\ \text{mrem/yr.})(RF)(SF)}{(\overline{\chi/Q})_v(1E6\text{pCi}/\mu\text{Ci})\ \dfrac{\sum_{i=1}^{n}(L_i + 1.1\ M_i)Q_{iv}}{\sum_{i=1}^{n} Q_{iv}}} \qquad (25)$$

$$SN = \frac{Q_{skin}}{\overline{Fmax}}$$

where all terms are as defined above except:

Q_{skin} = maximum release rate allowed to give limiting skin dose of 3000 mrem/yr (μCi/sec).

L_i = skin dose factor due to beta emissions for each identified radionuclide (i) in units of mrem/yr per pCi/m^3 (Table 7).

1.1 = conversion factor to convert from air to skin dose.

M_i = air dose factor due to gamma emissions for identified noble gas isotope (i) in units of mrad/yr per pCi/m^3 from Table 7.

8.13.3 Gaseous Setpoint Calculations Based on Kr-88.

Since the noble gas dose rate is more limiting than the radioiodine dose rate, the initial monitor setpoints can be based on a conservative count rate using Kr-88 until operating experience is accumulated. Total body dose will be more limiting than skin dose; therefore, the release limit would be:

$$Q_{Kr\text{-}88} = \frac{(500\ \text{mrem/yr.})(RF)(SF)}{(\overline{\chi/Q})_v(1e6\text{pCi}/\mu\text{Ci})(K_{KR\text{-}88})} \qquad (24a)$$

Then, based on maximum flow rate, the monitor setpoint SN in μCi/cc can be calculated:

$$SN = \frac{K_{Kr\text{-}88}}{F_{max}} \qquad (26)$$

where:

F_{max} = maximum effluent flow rate (cc/sec)

NOTE

To determine whether total body or skin dose is more limiting for Kr-88, equations (24) and (25) are solved for $Q_{Kr\text{-}88}$. Since a lower $Q_{Kr\text{-}88}$ is required to reach the total body limit of 500 mrem/yr, the total body dose is more limiting.

8.14 PROJECTING DOSE FOR RADIOACTIVE GASEOUS EFFLUENTS

Technical Specification 3.11.2.4 requires that appropriate subsystems of the Gaseous Radwaste Treatment System be used to reduce releases of radioactivity when the projected doses due to the gaseous effluent to areas at and beyond the SITE BOUNDARY would exceed, in a 31-day period, either:

0.2 mrad to air from gamma radiation; or
0.4 mrad to air from beta radiation; or
0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

The following calculational method is provided for performing this dose projection.

At least once every 31 days the gamma air dose, beta air dose and the maximum organ dose for the month-to-quarter will be divided by the number of days into the quarter and multiplied by 31. If these projected doses exceed any of the values listed above and the Gaseous Waste Management System has not been operating, it shall be operated to reduce radioactivity levels prior to release. (This is performed in accordance with Surveillance Requirements 4.11.2.4.1 and 4.11.2.4.2.)

8.15 40CFR190 DOSE EVALUATION

This section demonstrates compliance with Surveillance Requirements 4.11.4.1 and 4.11.4.2 of the Waterford 3 STS. Specifically, the dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which shall be limited to less than or equal to 75 mrem) over 12 consecutive months.

Dose evaluations to demonstrate compliance with the above dose limits need be performed only if the quarterly doses calculated in sections 8.6, 8.10, 8.11 and 8.12 exceed twice the dose limits of STS 3.11.1.2.a, 3.11.1.2.b, 3.11.2.2.a, 3.11.2.2.b, 3.11.2.3.a or 3.11.2.3.b, respectively; i.e., quarterly doses exceeding 3 mrem to the total body (liquid releases), 10 mrem to any organ (liquid releases), 10 mrad gamma air dose, 20 mrad beta air dose, or 15 mrem to the thyroid or any organ from radioiodines and particulates (gaseous releases). Otherwise, no evaluations are required.

For the evaluation of doses to real individuals from liquid releases, the same calculational methods as employed in section 8.6 will be used. However, more encompassing and realistic assumptions will be made concerning the dilution and ingestion of radionuclides by individuals who live and fish in the Waterford 3 area. The results of the Radiological Environmental Monitoring Program will be used in determining the realistic dose based on actual measured radionuclide concentrations. For the evaluation of doses to real individuals from gaseous releases, the same calculational methods as employed in sections 8.10, 8.11 and 8.12 will be used. In sections 8.10 and 8.11, the total body dose factor should be substituted for the gamma air dose factor (M_i) to determine the total body dose. Otherwise, the same calculational sequence applies. More realistic assumptions will be made concerning the actual location of real individuals, the meteorological conditions, and the consumption of food. Data obtained from the latest land use census should be used to determine locations for evaluating doses. The results of the Radiological Environmental Monitoring Program will be included in determining more realistic doses based on actual measured radionuclide concentrations.

Cumulative dose contributions from direct radiation, from the reactor unit, and from Radwaste Storage Tanks shall be determined utilizing the results of routine plant perimeter surveys, TLD data, or a combination of both when necessary.

9.0 SETPOINTS

NONE

10.0 ATTACHMENTS

10.1 Annual Average Dispersion and Deposition Parameters For Areas At or Beyond the Unrestricted Area Boundary (Table 1)

10.2 Radiological Environmental Monitoring Program (Table 2)

10.3 Sample Location Table (Table 3)

10.4 Sector and Zone Designators for Radiological Sampling and Monitoring Points (Table 4)

10.5 REMP Sample Locations Within 2 Miles of Waterford 3 (Figure 1)

10.6 REMP Sample Locations Within 10 Miles of Waterford 3 (Figure 2)

10.7 REMP Sample Locations Within 50 Miles of Waterford 3 (Figure 3)

10.8 Liquid Waste Management System Effluent Sources and Release pathways and Points (Figure 4)

10.9 Gaseous Effluent Sources, Gaseous Waste Management Systems Effluent Sources, and Exhaust Release Points (Figure 5)

10.10 Open Terrain Correction Factor (Figure 6)

10.11 Site-Related Liquid Dose Factor (Table 5)

10.12 Bioaccumulation Factor for Freshwater Fish and Invertebrate and Ingestion Dose Factors for Adults (Table 6)

10.13 Dose Factors for Exposure to a Semi-Infinite Cloud of Noble Gases (Table 7)

10.14 Inhalation Dose Factors for Child (Table 8)

10.15 Values of L-Theta-V (Table 9)

10.16 Pathway Dose Factors Due to Radionuclides Other Than Noble Gases, R (Table 10)

10.17 Relative Deposition for Ground-Level Releases (All Atmospheric Stability Classes) (Figure 7)

10.18 Annual Average Dispersion Parameters at or Beyond the Unrestricted Area Boundary (Table 11)

10.19 Annual Average Deposition Parameters for Areas at or Beyond the Unrestricted Area Boundary (Table 12)

10.20 ODCM Technical Specifications Cross-Reference (Table 13)

11.0 COMMITMENTS AND REFERENCES

TABLE 1

ANNUAL AVERAGE DISPERSION (X/Q) AND DEPOSITION (D/Q) VALUES

GROUND LEVEL RELEASE, 0 M
CORRECTED USING STANDARD OPEN TERRAIN FACTORS
SPECIFIC POINTS OF INTEREST

RELEASE ID	TYPE OF LOCATION	DIRECTION FROM SITE	DISTANCE (MILES)	DISTANCE (METERS)	X/Q (SEC/CUB.METER) NO DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 2.260 DAY DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 8.000 DAY DECAY DEPLETED	D/Q (PER SQ.METER)
G	MILK COWS	NW	1.10	1770.	4.7E-06	4.6E-06	4.0E-06	1.4E-08
G	MILK COWS	NW	4.40	7081.	3.1E-07	2.9E-07	2.3E-07	5.1E-10
G	MILK GOAT	E	3.30	5311.	3.4E-07	3.3E-07	2.7E-07	3.9E-10
G	VEGETABLE GARDEN	N	1.10	1770.	4.7E-06	4.7E-06	4.1E-06	1.1E-08
G	VEGETABLE GARDEN	NNE	1.30	2092.	2.9E-06	2.9E-06	2.5E-06	5.8E-09
G	VEGETABLE GARDEN	NE	1.00	1609.	4.8E-06	4.7E-06	4.1E-06	9.2E-09
G	VEGETABLE GARDEN	ENE	0.90	1448.	6.5E-06	6.4E-06	5.7E-06	1.1E-08
G	VEGETABLE GARDEN	E	3.20	5149.	3.6E-07	3.4E-07	2.8E-07	4.2E-10
G	VEGETABLE GARDEN	ESE	2.30	3701.	6.2E-07	6.0E-07	5.0E-07	9.6E-10
G	VEGETABLE GARDEN	SE	2.30	3701.	6.0E-07	5.9E-07	4.9E-07	1.3E-09
G	VEGETABLE GARDEN	S	0.90	1448.	3.1E-06	3.1E-06	2.8E-06	1.1E-08
G	VEGETABLE GARDEN	SSW	0.90	1448.	3.8E-06	3.8E-06	3.4E-06	1.6E-08
G	VEGETABLE GARDEN	SW	0.90	1448.	5.1E-06	5.0E-06	4.5E-06	2.3E-08
G	VEGETABLE GARDEN	WSW	0.90	1448.	5.1E-06	5.0E-06	4.5E-06	1.8E-08
G	VEGETABLE GARDEN	W	1.10	1770.	1.8E-06	1.8E-06	1.6E-06	5.7E-09
G	VEGETABLE GARDEN	WNW	0.90	1448.	5.5E-06	5.4E-06	4.8E-06	2.0E-08
G	VEGETABLE GARDEN	NW	0.90	1448.	7.4E-06	7.4E-06	6.5E-06	2.3E-08
G	VEGETABLE GARDEN	NNW	2.90	4666.	7.9E-07	7.6E-07	6.2E-07	1.4E-09
G	RESIDENCES	N	0.80	1287.	1.0E-05	1.0E-05	8.9E-06	2.4E-08
G	RESIDENCES	NNE	0.80	1287.	9.1E-06	9.0E-06	8.1E-06	2.0E-08
G	RESIDENCES	NE	0.90	1448.	6.1E-06	6.0E-06	5.4E-06	1.2E-08
G	RESIDENCES	ENE	0.90	1448.	6.5E-06	6.4E-06	5.7E-06	1.1E-08
G	RESIDENCES	E	2.60	4184.	5.2E-07	5.0E-07	4.2E-07	6.8E-10
G	RESIDENCES	ESE	3.40	5472.	3.0E-07	2.9E-07	2.4E-07	3.9E-10
G	RESIDENCES	SE	3.90	6276.	2.3E-07	2.2E-07	1.7E-07	3.8E-10
G	RESIDENCES	W	1.30	2092.	1.3E-06	1.2E-06	1.1E-06	3.7E-09
G	RESIDENCES	WNW	0.90	1448.	5.5E-06	5.4E-06	4.8E-06	2.0E-08
G	RESIDENCES	NW	0.90	1448.	7.4E-06	7.4E-06	6.5E-06	2.3E-08
G	RESIDENCES	NNW	2.00	3219.	1.6E-06	1.5E-06	1.3E-06	3.3E-09
G	SITE BOUNDARY	N	0.80	1287.	1.0E-05	1.0E-05	8.9E-06	2.4E-08
G	SITE BOUNDARY	NNE	0.60	966.	1.6E-05	1.6E-05	1.4E-05	3.4E-08
G	SITE BOUNDARY	NE	0.60	966.	1.4E-05	1.4E-05	1.3E-05	2.8E-08
G	SITE BOUNDARY	ENE	0.60	966.	1.5E-05	1.5E-05	1.4E-05	2.5E-08
G	SITE BOUNDARY	E	0.80	1287.	6.6E-06	6.6E-06	5.9E-06	1.3E-08
G	SITE BOUNDARY	ESE	0.60	966.	1.1E-05	1.1E-05	9.8E-06	2.3E-08
G	SITE BOUNDARY	SE	0.60	966.	1.0E-05	1.0E-05	9.3E-06	3.1E-08
G	SITE BOUNDARY	SSE	0.80	1287.	6.1E-06	6.0E-06	5.4E-06	2.4E-08
G	SITE BOUNDARY	S	1.60	2575.	8.6E-07	8.5E-07	7.3E-07	2.7E-09
G	SITE BOUNDARY	SSW	3.10	4989.	2.9E-07	2.8E-07	2.2E-07	7.9E-10
G	SITE BOUNDARY	SW	3.40	5472.	3.2E-07	3.1E-07	2.5E-07	9.1E-10
G	SITE BOUNDARY	WSW	1.50	2414.	1.6E-06	1.6E-06	1.4E-06	4.9E-09
G	SITE BOUNDARY	W	1.00	1609.	2.3E-06	2.2E-06	2.0E-06	7.3E-09
G	SITE BOUNDARY	WNW	0.80	1287.	7.3E-06	7.2E-06	6.4E-06	2.7E-08
G	SITE BOUNDARY	NW	0.80	1287.	9.9E-06	9.8E-06	8.8E-06	3.2E-08
G	SITE BOUNDARY	NNW	0.90	1448.	9.1E-06	9.0E-06	8.0E-06	2.4E-08

Change 1
1/31/05 mm

Table 2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Sample Type	Location	Analysis	Frequency	Volume
TLD	A-2, B-1, C-1, D-2, E-1, F-2, G-2, H-2, J-2, K-1, L-1, M-1, N-1, P-1, Q-1, R-1, A-5, B-4, D-5, E-5, F-4, G-4, H-6, P-6, Q-5, R-6, F-9, G-9, E-15, J-15, E-30	TLD[a]	Quarterly	N/A
Radioiodine and Particulates	APP-1, APQ-1, APG-1, APC-1, APE-30	Gross beta, I-131 isotopic[b]	Weekly Quarterly composite	285m^3/wk 3700 m^3/qtr
Ground Water[f]	GWJ-1	γ isotopic, H-3	Quarterly	4 liters
Drinking Water[c]	DWG-2, DWE-5[d], DWP-7	H-3 Gross beta, γ isotopic I-131[g]	Quarterly composite Monthly composite Semi-monthly composite	Homogeneous 4 liters
Surface Water[c]	SWG-2, SWE-5[d], SWP-7	H-3 γ isotopic	Quarterly composite Monthly composite	Homogeneous 4 liters
Shoreline Sediment	SHWE-3	γ isotopic	Semi-annually	2 kilograms
Milk	MKE-4, MKQ-5, MKQ-50, MKQ-1	γ isotopic, I-131	Semi-monthly/monthly[h]	4 liters
Fish	FH-1, FH-2	γ isotopic	In season or semi-annually[i]	500 grams
Food Products	FPP-1	γ isotopic	At harvest time[j]	500 grams
Broad Leaf	BLQ-1, BLB-1, ~~BLH-10~~ BLK 15	γ isotopic, I-131	Monthly When milk samples not collected	500 grams

Change 1 11/21/95 mrm

Change 1

a. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. A TLD is considered one phosphor, two or more phosphors in a packet are considered two or more dosimeters. Geographical limitations affect siting of dosimeters.

b. Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopes analysis shall be performed on the individual samples. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

c. Drinking Water and Surface Water samples are identical samples.

d. The downstream sample is beyond the mixing zone.

e. A composite sample will contain aliquots of sample taken proportional to the quantity of flowing liquid that results in a specimen representative of the liquid flow.

f. Ground water samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

g. This analysis will be performed when the dose calculated for the consumption of water is greater than 1 mrem per year as calculated for maximum organ and age group as per the ODCM (see section 8.6).

h. Milk will be collected semimonthly when animals are on pasture, monthly otherwise. If milk sampling is not performed, broad leafy vegetation will be sampled.

i. Striped mullet, gizzard shad, freshwater drum, and catfish will be collected. If they are not available, substitute species will be collected and identified in reporting.

j. One sample of each principal class of food products will be sampled in an area irrigated by water in which plant wastes have been inadvertently discharged (see section 8.5 of this procedure). If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvesting occurs continuously, sampling shall be monthly. Tuberous and root products will be sampled when available.

TABLE 3

SAMPLE LOCATION TABLE

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
DIRECT RADIATION (TLD)			
A-2	(Eastbank) On fence enclosure surrounding water tower west of Little Gypsy opposite Etienne St. Access from River Road (LA 628). The TLD's are located on the (S) fence opposite the entrance gate to the water tower.	1.1	N
B-1	(Eastbank) On fence enclosing the transmission tower 0.3 miles west (up-river) from Little Gypsy. Access from River Road (LA 628). TLD's are located at SW corner of fence enclosure.	0.8	NNE
C-1	(Eastbank) On fence enclosing the Little Gypsy Cooling Water Intake. Access is from River Road (LA 628) across from Little Gypsy Power Station entrance. TLD's are on the south side (inside) of the Cooling Water Intake fence enclosure, directly opposite the entrance gate.	0.8	NE
D-2	(Eastbank) Located at USGS Witness Post Survey Marker approximately 0.3 miles east of Little Gypsy Power Station. Access from River Road (LA 628) near the west end of the Bonne Carre Spillway. TLD's are on the back of the Survey Marker Sign (located on levee).	1.1	ENE
E-1	(Westbank) Located on utility pole along River Road (LA 18) approximately 0.3 miles east of Waterford 3 plant entrance. Access from LA 18. TLD's are on the third utility pole east of the construction entrance road.	0.2	E

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
F-2	(Westbank) Located on fence enclosure surrounding the LP&L substation on LA 3142. Access from LA 3142 approximately 0.2 miles south of LA 18. TLD's are on the southeast corner of the fence enclosure.	1.1	ESE
G-2	(Westbank) Located on utility pole on East side of LA 3142 near Witco entrance gate (Next to Union Carbide Star Plant Gate 3). Access from LA 3142 approximately 0.2 miles north of railroad overpass.	1.2	SE
H-2	(Westbank) Located on fence enclosure to shell road off of LA 3142. Access from LA 3142 south of railroad overpass on east side of LA 3142. TLD's are on the south side of the gate for shell road. (Just south of Texaco pipeline station)	1.2	SSE
J-2	(Westbank) Located on northeast corner of fence enclosing Texaco valve station south of LA 3127. Access from LA 3127, approximately 0.6 miles west of LA 3127/3142 intersection.	1.3	S
K-1	(Westbank) Located behind "Private Road" sign at Gate 8 entrance off of LA 3127. Access from LA 3127, approximately 1.3 miles west of LA 3127/3142 intersection. (Gate 8 is the access to the Waterford 3 switchyard station)	1.0	SSW
L-1	(Westbank) located behind "Private Road" sign at LP&L Gate 9 entrance off of LA 3127, approximately 1.6 miles west of LA 3127/3142 intersection. (Gate 9 is an access road for Waterford 3)	1.0	SW

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
M-1	(Westbank) Located on south gate into the Waterford 1 and 2 fuel oil storage tank enclosure. Access is either thru LP&L Gate 8, Gate 9 off of LA 3127, the shell access road from LA 18 between Waterford 3, or thru the Waterford 1 and 2 access road.	0.7	WSW
N-1	(Westbank) Located behind the "No Trespassing" sign off on Short Street, in Killona, just south of the entrance to Killona Elementary School.	0.9	W
P-1	(Westbank) Located behind "No Trespassing" sign on Short Street, in Killona, approximately 0.1 miles south of air sample station.	0.8	WNW
Q-1	(Westbank) Located on fence enclosing air sample station approximately 0.5 miles west of Waterford 1 and 2 on River Road (LA 18).	0.8	NW
R-1	(Westbank) Located on fence enclosure for Waterford 1 and 2 Cooling Water Intake Structure. Access is from River Road (LA 18) opposite Waterford 1 and 2. TLD's are on the southwest corner of fence.	0.5	NNW
A-5	(Eastbank) Located on utility pole just east of the Shady Nook Trailer Park on Hwy 61 in La Place. TLD's are on second utility pole east of trailer park on north side of Hwy 61 (eastern end of La Place).	4.5	N

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
B-4	(Eastbank) Located on utility pole just east of shell access road to South Central Bell transmission tower on south side of Hwy 61. Transmission tower is just east of Weigh Station at St. John/St. Charles Parish line. TLD's are on first utility pole east of access road.	3.8	NNE
D-5	(Eastbank) Located on fence gate on shell access road to Big 3 Chemical Plant. Shell access road is approximately 0.1 miles west of Hwy 61/48 intersection (at black and yellow gate). TLD's are on fence gate 0.1 miles north on shell access road from Hwy 61.	4.2	ENE
E-5	(Eastbank) Located on the Norco Substation fence enclosure. Access from River Road (LA 48) onto Wesco St. (adjacent to Norco Shell Chemical Plant), take Wesco St. to the dead end. TLD's are located on sixth fence post south of the north substation gate.	4.2	E
F-4	(Westbank) Located on utility pole behind blonde brick house on Aquarius St. in Hahnville. Access from River Road (LA 18) and turn onto Oak St. Follow Oak St. to Hickory St., turn right on Hickory St. and follow to Aquarius St. and turn left. Blonde brick house is second house on right (west) side of Aquarius St. heading south.	3.5	ESE
G-4	(Westbank) Located on railroad sign northwest side of LA 3160/railroad track intersection. Access from either LA 3127 or River Road (LA 18) onto LA 3160.	3.2	SE

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
H-6	(Westbank) Located on a construction sign on the southwest side of the second canal bridge east of LA 3160 along LA 3127.	5.7	SSE
P-6	(Westbank) Located on utility pole at southwest corner of LA 640/ railroad track intersection. Utility pole is just west of LA 640 and east of radio transmission tower.	5.5	WNW
Q-5	(Westbank) Located on fence post surrounding (green) river marker on levee just east of Edgard. Fence post is located along River Road (LA 18) across from the Webre's house.	5.0	NW
R-6	(Eastbank) Located on fence enclosing LP&L Laydown Yard on LA 3223 in La Place. Access from Hwy 61 onto Elm St. (LA 3223), take Elm St. to the northeast corner of LA 3223/railroad intersection. TLD's are located on the southeast corner of fence enclosure.	5.3	NNW
F-9	(Eastbank) Located on entrance gate to Destrehan Substation. Access from River Road (LA 48), approximate 0.3 miles east of Luling-Destrehan Ferry, onto Destrehan Road (west of Bunge Corp. Grain Elevator), and proceed to substation gate.	8.2	ESE
G-9	(Westbank) Located on back fence of LP&L District Office in Luling. Access via Ellington St. from either River Road (LA 18); or Second or Third St. from Paul Mallard Rd. (LA 52) to Ellington St.	8.1	SE

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
E-15	(Eastbank) Located on Kenner Substation fence enclosure. Access from either River Road (LA 48) or Hwy 61, turn onto Alliance Ave. TLD's are located on the north side of the fence enclosure, near a light pole.	11.8	E
J-15	(Westbank) Located on fence enclosure surrounding LP&L switchyard at LA 631/Hwy 90 intersection in Des Allemands. TLD's are on the northwest corner of fence. Access from LA 631 via shell road.	12.0	S
E-30*	(Westbank) Located on fence at LP&L General Office on Delaronde St. in Algiers. TLD's are on the fence, facing the Mississippi River, in the passageway to the transformer shop.	27.0	E
Airborne			
APP-1	(Westbank) Located in soybean field at northwest corner of Short St. in Killona.	0.8	WNW
APQ-1	(Westbank) Located at northwest corner of soybean field on east side of Killona. Access from River Road (LA 18) approximately 0.6 miles east of LA 18/3141 intersection.	0.8	NW
APG-1	(Westbank) Located at the north side of the Secondary Metrology Tower.	0.5	SE

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
APC-1	(Eastbank) Located inside the Little Gypsy Cooling Water Intake Structure fence enclosure.	0.8	NE
APE-30*	(Westbank) Located on the roof of the LP&L General Office building on Delaronde St. in Algiers.	27.0	E
Food Products			
FPP-1	(Westbank) Located in soybean field on eastern edge of Killona, between air sample stations APP-1 and APQ-1.	0.8	WNW
Broad Leaf			
BLQ-1	(Westbank) Located between LA 18 and soybean field on eastern edge Killona, near air sample station APQ-1.	0.8	NW
BLB-1	(Eastbank) Located at wooded area at the southwestern corner of the LP&L Little Gypsy plant along River Road.	0.8	NNE
BLK 15	(Westbank) Located 3.5 miles SSW of Des Allemands on Hwy. 90.	15.0	SSW

Change 1 10/31/95 MRW

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
Ingestion			
Milk			
MKE-4	(Westbank) Located .8 miles west of the Time Saver in Hahnville off of River Road.	4.0	E
MKQ-5	(Westbank) Located at the Webre's house, just across LA 18 from river marker, at the eastern end of Edgard.	5.0	NW
MKQ-50*	(Eastbank) Located at the LSU Dairy in Baton Rouge.	52	NW
MKQ-1	(Westbank) 1.0 miles west of Waterford 3 at the corner of River Road and Post Street in Killona.	1.0	NW
Fish			
FH-1*	Upstream of the plant intake structure.		
FH-2	Downstream of the plant intake structure.		
Waterborne			
GWJ-1	(Westbank) Located at 40 Arpent Canal south of the plant. Access from LA 3127 through LP&L Gate 8. The canal is northwest of the shell access road/railroad track intersection.	0.3	S

Change 1 10/1/93 MRM

Table 3 (continued)

LOCATION NUMBER	LOCATION DESCRIPTION	MILES FROM PLANT	SECTOR DIRECTION
DWG-2 SWG-2	(Westbank) Located at the Union Carbide drinking water canal. Access from LA 3142 through Gate 28.	2.0	ESE
SHWE-3	(Westbank) Located at the Foot Ferry Landing off of LA 18 in Taft.	3.0	E
DWE-5 SWE-5	(Eastbank) Located at the St. Charles Parish Waterworks off of River Road (LA 48) near New Sarpy.	4.5	E
DWP-7* SWP-7	(Westbank) Located at the St. John Parish Waterworks off of LA 18 in Edgard.	6.5	NW

* DENOTES CONTROL LOCATIONS

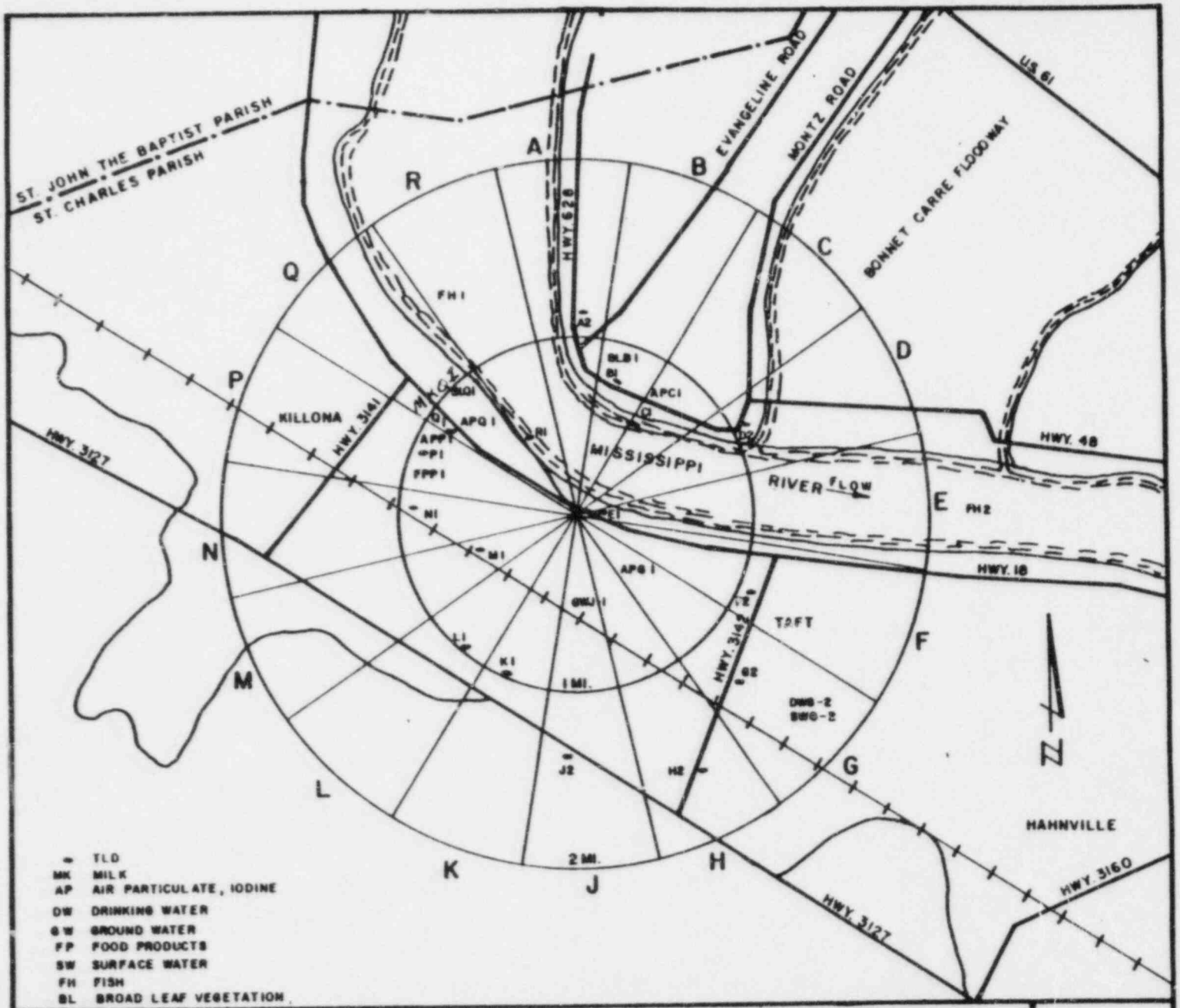
Table 4

SECTOR AND ZONE DESIGNATORS FOR RADIOLOGICAL SAMPLING AND MONITORING POINTS

SECTOR NOMENCLATURE			ZONE NOMENCLATURE	
CENTERLINE OF SECTOR IN DEGREES TRUE NORTH FROM FACILITY	22 ½° SECTOR		MILES FROM FACILITY	ZONE
0 & 360	*A	N	0-1	1
22½	B	NNE	1-2	2
45	C	NE	2-3	3
67½	D	ENE	3-4	4
90	E	E	4-5	5
112½	F	ESE	5-6	6
135	G	SE	6-7	7
157½	H or	SSE	7-8	8
180	J	S	8-9	9
202½	K	SSW	9-10	10
225	L	SW	10-15	15
247½	M	WSW	15-20	20
270	N	W	20-25	25
292½	P	WNW	25-30	30
315	Q	NW	35-40	40
337½	R	NNW	40-45	45
			45-50	50

AREA SEGMENT - An area is identified by a Sector and Zone designator. Thus, area N-1 is that area which lies between 348 3/4 and 11¼ degrees true north from the facility out to a radius of 1 mile. Area G-4 would be that area between 123 3/4 to 146 ¼ degrees and the 3- and 4-mile arcs from the facility. For Airborne, Ingestion (milk), and Food Products pathways, the sector designator will be preceded by acronyms AP, MK, and FP, respectively.

* The letters I and O have been omitted from these sector designators so as to eliminate possible confusion between letters and numbers.



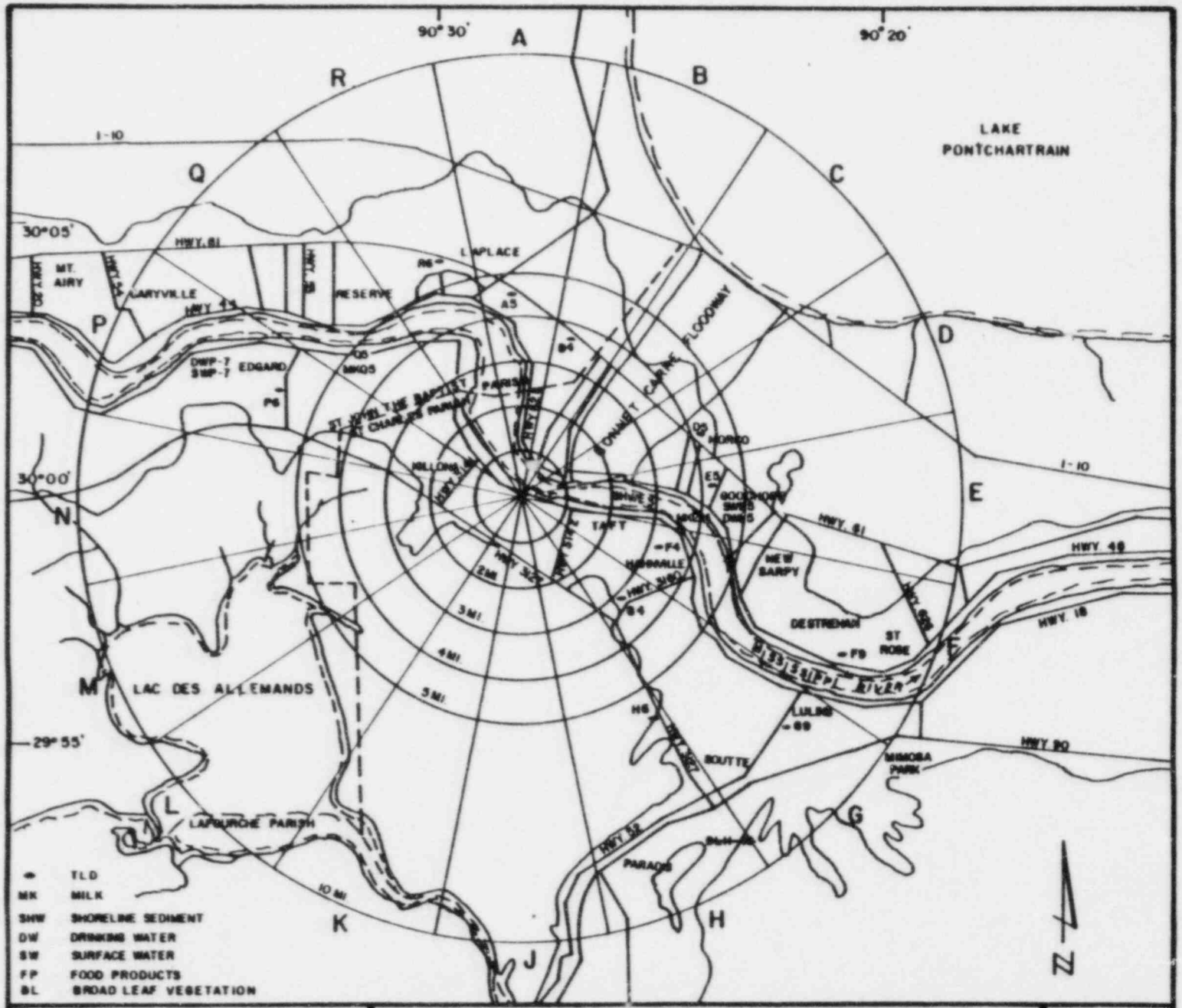
LOUISIANA POWER & LIGHT CO.
Waterford Steam Electric Station ODCM

REMP SAMPLE LOCATIONS WITHIN 2 MILES OF WATERFORD 3

HP-1-230, Rev 5 Attachment 10.5 (1 of 1)

FIGURE 1

Change 1
1-1-95



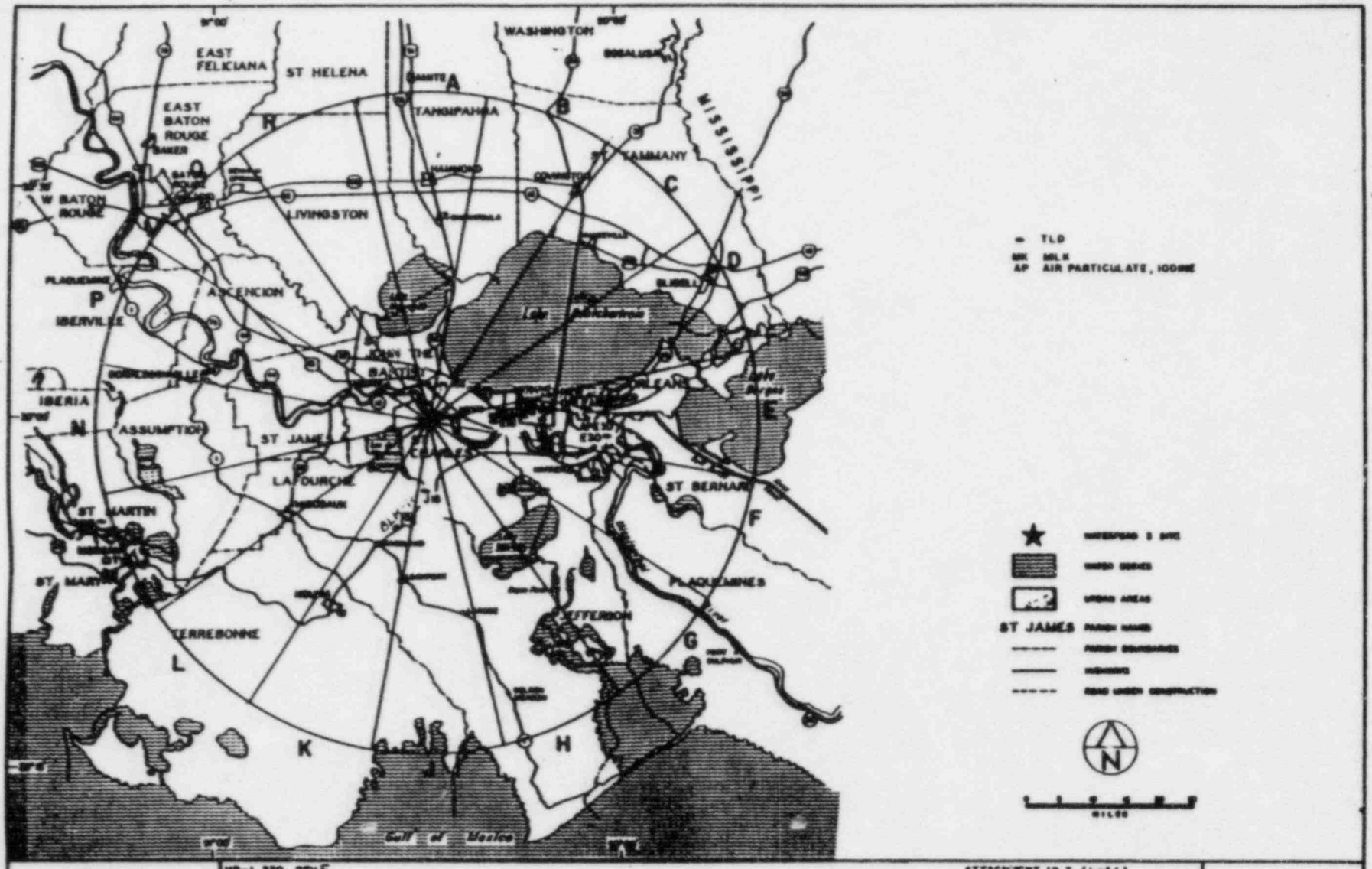
LOUISIANA
POWER & LIGHT CO
Waterford Steam
Electric Station

REMP SAMPLE LOCATIONS WITHIN 10 MILES OF WATERFORD 3

HP-1-230, REV. 5

ATTACHMENT 10.6 (1 of 1)

FIGURE 2



LOUISIANA POWER & LIGHT Co. WATERFORD STEAM ELECTRIC STATION	HP-1 230, REV 5	ATTACHMENT 10.7 (1 of 1)	FIGURE 3

REMP SAMPLE LOCATIONS
WITHIN 50 MILES OF WATERFORD 3

FIGURE 4
LIQUID WASTE MANAGEMENT SYSTEM EFFLUENT SOURCES
AND RELEASE PATHWAYS AND POINTS

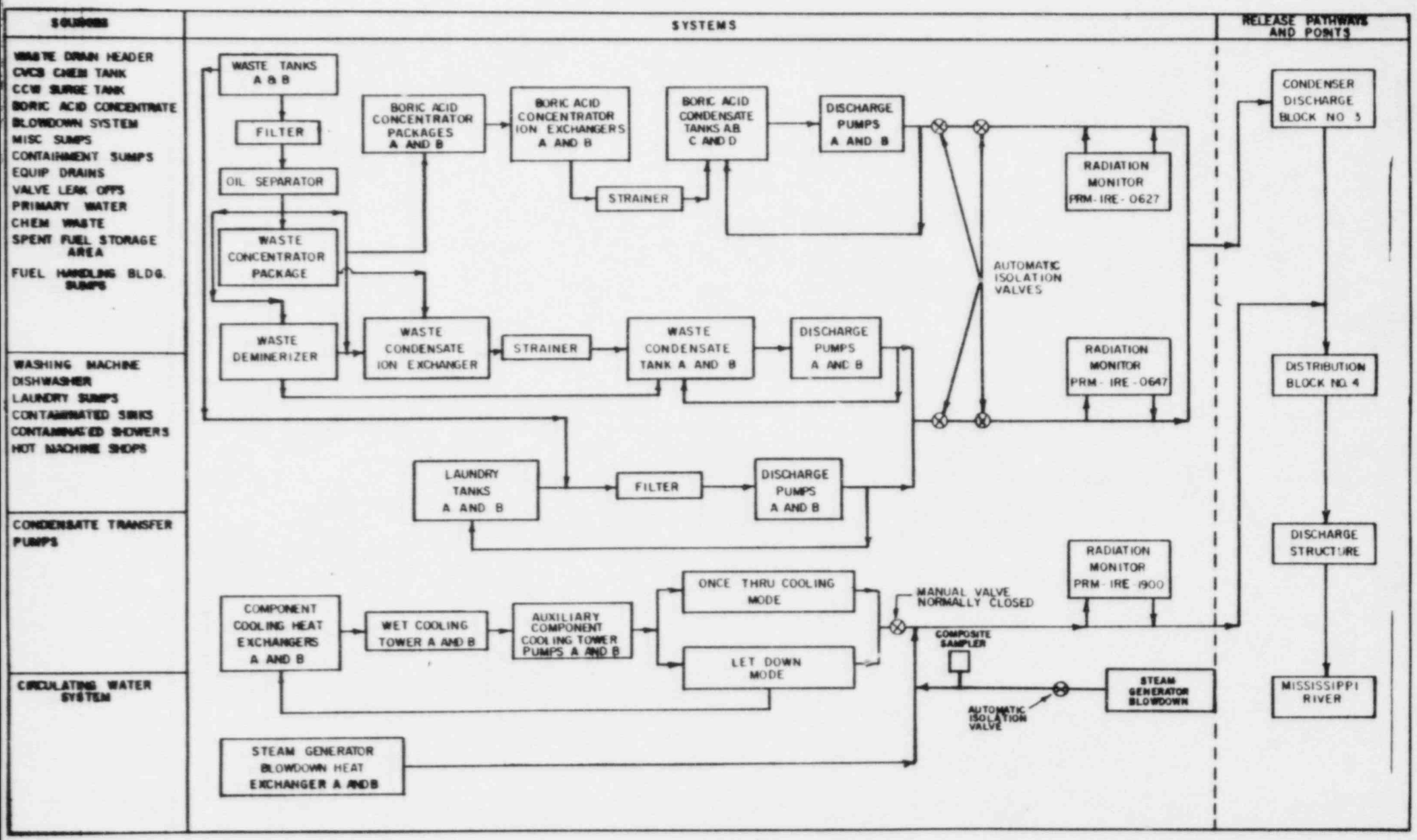


FIGURE 4 (CONT.)

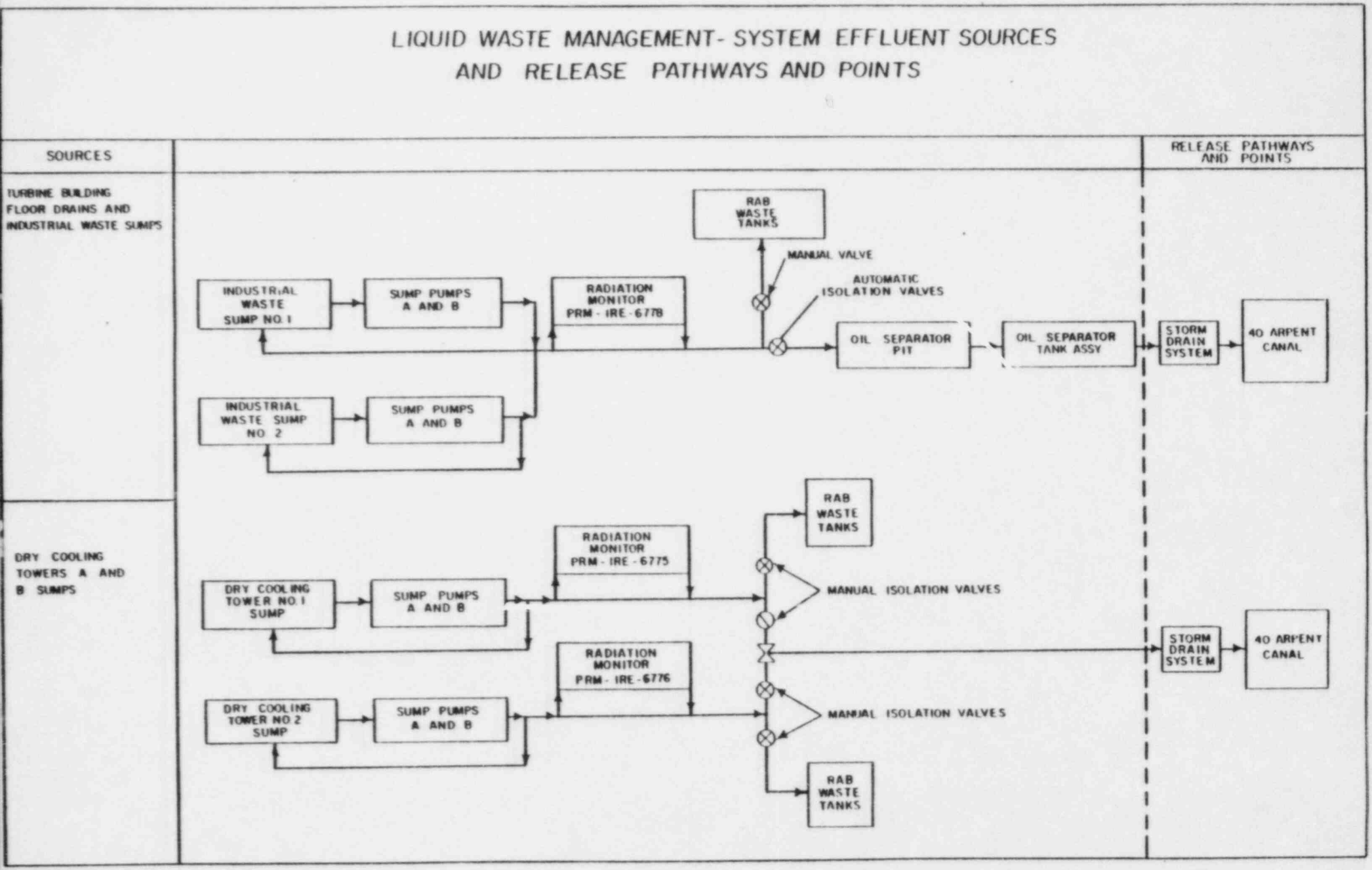
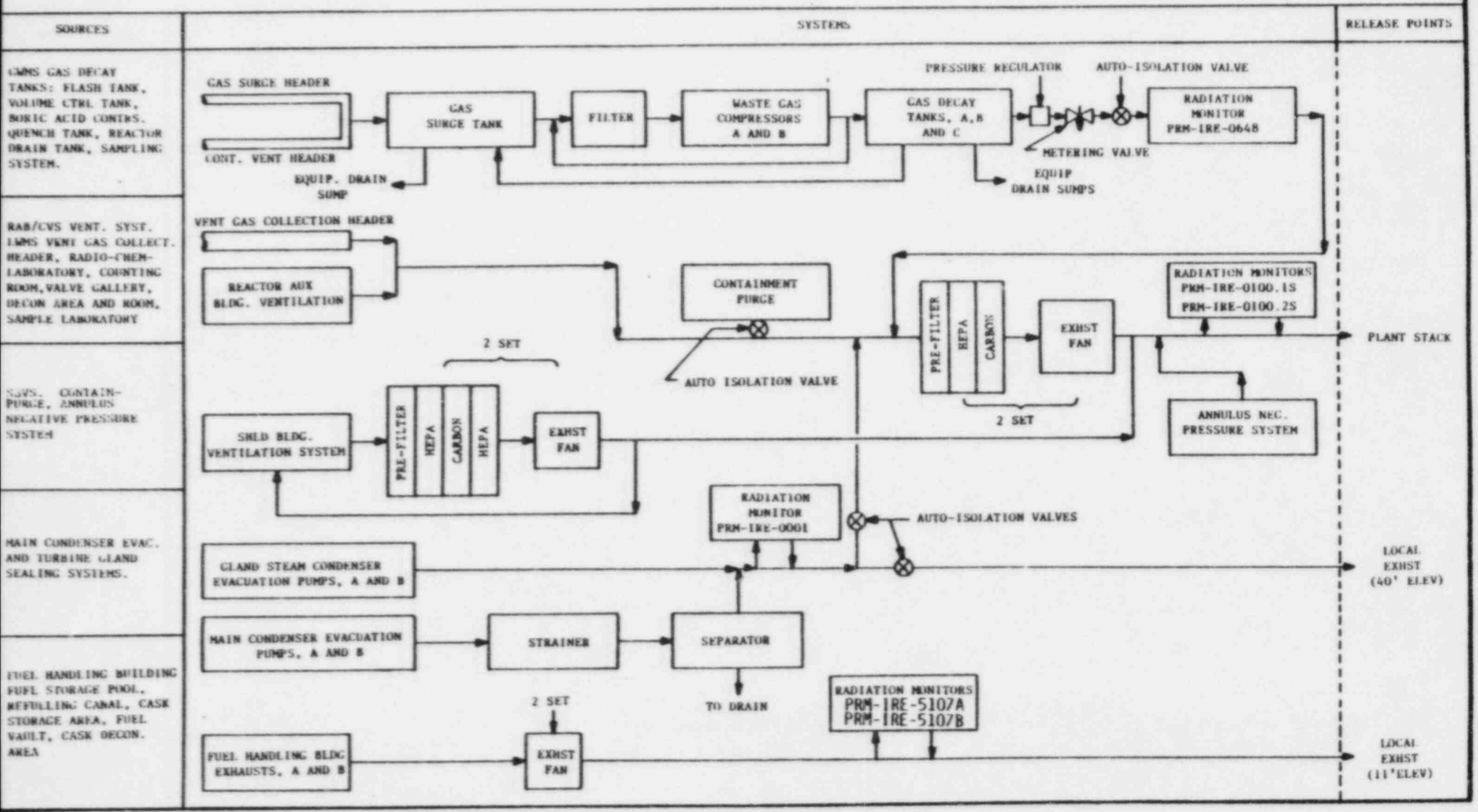


FIGURE 5

GASEOUS EFFLUENT SOURCES, GASEOUS WASTE MANAGEMENT SYSTEMS EFFLUENT SOURCES AND EXHAUST RELEASE POINTS



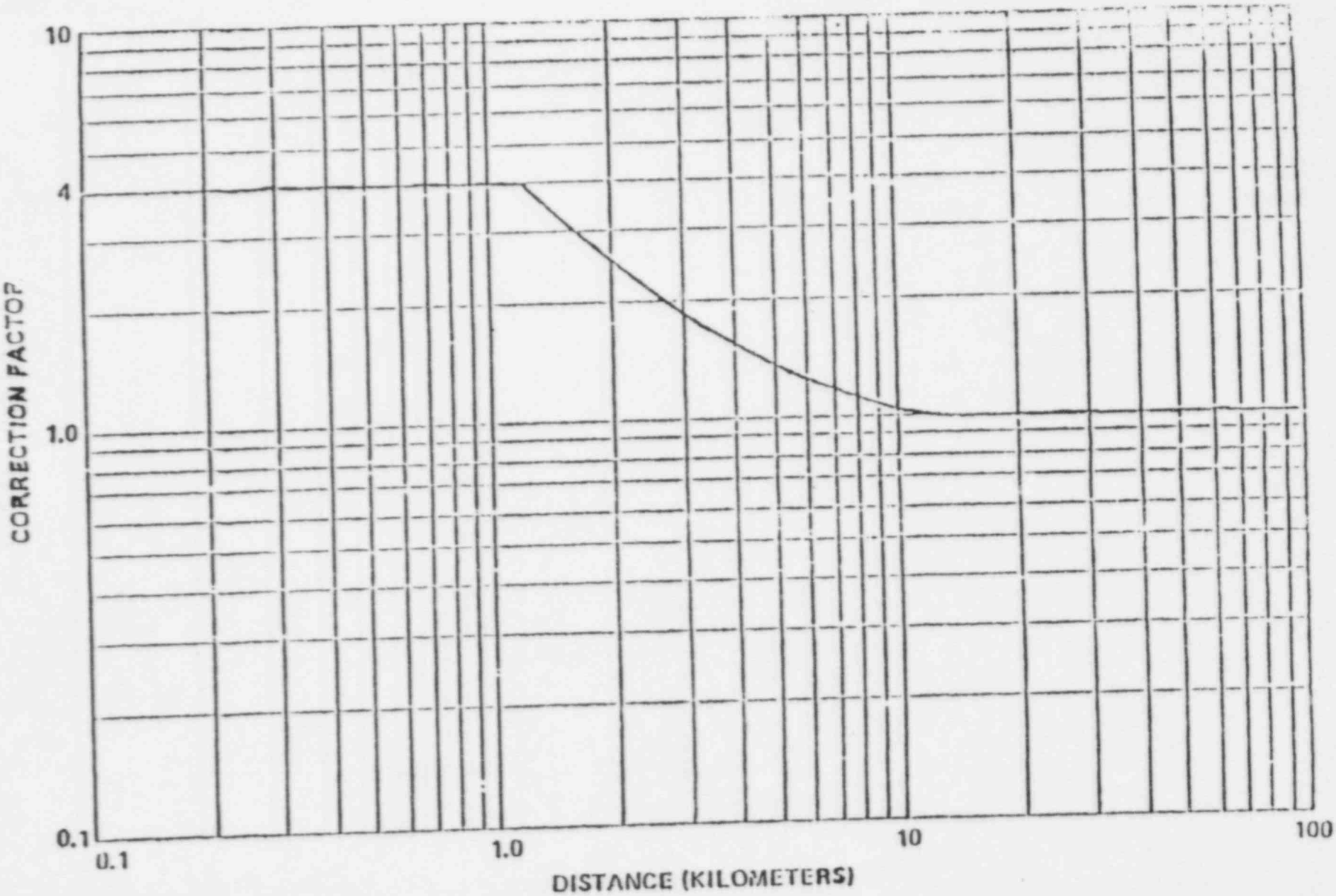


Figure 6

OPEN TERRAIN CORRECTION FACTOR

TABLE 5

SITE RELATED LIQUID DOSE FACTORS

$A_{i,t} = (3.78E+05 + 2.39E+06BF_i)DCF_{i,t}$

(mrem/hr per uCi/ml)

ELEMENT	BF_i (1.)	DCF_i (mrem/pCi) (2.)		A_i	
		GI LLI	LIVER	GI LLI	LIVER
Cr-51	2.0E+02	6.69E-07	--	3.20E+02	--
Mn-54	4.0E+02	1.40E_05	4.57E-06	1.34E+04	4.37E+03
Mn-56	4.0E+02	3.67E_06	1.15E-07	3.51E+03	1.20E+02
Fe-55	1.0E+02	1.09E-06	1.90E-06	2.61E+02	4.55E+02
Fe-59	1.0E+02	3.40E-05	1.02E-05	8.14E+03	2.44E+03
Co-58	5.0E+01	1.51E-05	7.45E-07	1.81E+03	8.93E+01
Co-60	5.0E+01	4.02E-05	2.14E-06	4.82E+03	2.57E+02
Ni-63	1.0E+02	1.88E-06	9.01E-06	4.50E+02	2.16E+03
Ni-65	1.0E+02	1.74E-06	6.86E-08	4.17E+02	1.64E+01
Cu-64	5.0E+01	7.10E-06	8.33E-08	8.51E+02	9.99E 00
Zn-65	2.0E+03	9.70E-06	1.54E-05	4.64E+04	7.36E+04
Sr-89	3.0E+01	4.94E-05	--	3.56E+03	--
Sr-90	3.0E+01	2.19E-04	--	1.58E+04	--
Y-90	2.5E+01	1.02E-04	--	6.13E+03	--
Zr-95	3.3E 00	3.09E-05	9.75E-09	2.55E+02	8.06E-02
Zr-97	3.3E 00	1.05E-04	3.39E-10	8.32E+03	2.80E-03
Nb-95	3.0E+04	2.10E-05	3.46E-09	1.51E+06	2.48E+03
I-131	1.5E+01	1.57E-06	5.95E-06	5.69E+01	2.16E+02
Cs-134	2.0E+03	2.59E-06	1.48E-04	1.24E+04	7.07E+05
Cs-137	2.0E+03	2.11E-06	1.09E-04	1.01E+04	5.21E+05

1. Extracted from Table A-1 of Regulatory Guide 1.109, Revision 1,1977.

2. Extracted from Table E-11 of Regulatory Guide 1.109, Revision 1,1977.

TABLE 6

BIOACCUMULATION FACTOR FOR FRESHWATER FISH AND INVERTEBRATE[1]

(pCi/Kg per pCi/liter)

ELEMENT	FRESHWATER FISH	INVERTEBRATE
H	9.0E-01	9.0E-01
C	4.6E 03	9.1E 03
Na	1.0E 02	2.0E 02
P	1.0E 05	2.0E 04
Cr	2.0E 02	2.0E 03
Mn	4.0E 02	9.0E 04
Fe	1.0E 02	3.2E 03
Co	5.0E 01	2.0E 02
Ni	1.0E 02	1.0E 02
Cu	5.0E 01	4.0E 02
Zn	2.0E 03	1.0E 04
Br	4.2E 02	3.3E 02
Rb	2.0E 03	1.0E 03
Sr	3.0E 01	1.0E 02
Y	2.5E 01	1.0E 03
Zr	3.3E 00	6.7E 00

1. Extracted from Table A-1 of Regulatory Guide 1.109, Revision 1, 1977.

TABLE 6

BIOACCUMULATION FACTOR FOR FRESHWATER FISH AND INVERTEBRATE[1]

(pCi/Kg per pCi/liter)

ELEMENT	FRESHWATER FISH	FRESHWATER INVERTEBRATE
Nb	3.0E-04	1.0E-02
Mo	1.0E 01	1.0E 01
Tc	1.5E 01	5.0E 00
Ru	1.0E 01	3.0E 02
Rh	1.0E 01	3.0E 02
Te	4.0E 02	6.1E 03
I	1.5E 01	5.0E 00
Cs	2.0E 03	1.0E 03
Ba	4.0E 00	2.0E 02
La	2.5E 01	1.0E 03
Ce	1.0E 00	1.0E 03
Pr	2.5E 01	1.0E 03
Nd	2.5E 01	1.0E 03
W	1.2E 03	1.0E 01
Np	1.0E 01	4.0E 02

1. Extracted from Table A-1 of Regulatory Guide 1.109, Revision 1, 1977.

TABLE 6

INGESTION DOSE FACTORS FOR ADULTS
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07
C 14	2.84E-06	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07
NA 24	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06
P 32	1.93E-04	1.20E-05	7.46E-06	NO DATA	NO DATA	NO DATA	2.17E-05
CR 51	NO DATA	NO DATA	2.60E-09	1.57E-09	5.86E-10	3.53E-09	6.69E-07
MN 54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05
MN 56	NO DATA	1.15E-07	2.04E-08	NO DATA	1.46E-07	NO DATA	3.67E-06
FE 55	2.75E-06	1.90E-06	4.43E-07	NO DATA	NO DATA	1.06E-06	1.09E-06
FE 59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05
CO 58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05
CO 60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05
NI 63	1.30E-04	9.01E-06	4.36E-06	NO DATA	NO DATA	NO DATA	1.88E-06
NI 65	5.28E-07	6.86E-08	3.13E-08	NO DATA	NO DATA	NO DATA	1.74E-06
CU 64	NO DATA	8.33E-08	3.91E-08	NO DATA	2.10E-07	NO DATA	7.10E-06
ZN 65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06
ZN 69	1.03E-08	1.97E-08	1.37E-09	NO DATA	1.28E-08	NO DATA	2.96E-09
BR 83	NO DATA	NO DATA	4.02E-08	NO DATA	NO DATA	NO DATA	5.79E-08
BR 84	NO DATA	NO DATA	5.21E-08	NO DATA	NO DATA	NO DATA	4.09E-13
BR 85	NO DATA	NO DATA	2.14E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	2.11E-05	9.83E-06	NO DATA	NO DATA	NO DATA	4.16E-06
RB 88	NO DATA	6.05E-08	1.21E-08	NO DATA	NO DATA	NO DATA	8.36E-19
RB 89	NO DATA	4.01E-08	2.82E-08	NO DATA	NO DATA	NO DATA	2.33E-21
SR 89	3.08E-04	NO DATA	8.84E-06	NO DATA	NO DATA	NO DATA	4.94E-05
SR 90	7.58E-03	NO DATA	1.86E-03	NO DATA	NO DATA	NO DATA	2.19E-04
SR 91	5.67E-06	NO DATA	2.29E-07	NO DATA	NO DATA	NO DATA	2.70E-05
SR 92	2.15E-06	NO DATA	9.30E-08	NO DATA	NO DATA	NO DATA	4.26E-05
Y 90	9.62E-09	NO DATA	2.58E-10	NO DATA	NO DATA	NO DATA	1.02E-04
Y 91M	9.09E-11	NO DATA	3.52E-12	NO DATA	NO DATA	NO DATA	2.67E-10
Y 91	1.41E-07	NO DATA	3.77E-09	NO DATA	NO DATA	NO DATA	7.76E-05
Y 92	8.45E-10	NO DATA	2.47E-11	NO DATA	NO DATA	NO DATA	1.48E-05

TABLE 6 (continued)

INGESTION DOSE FACTORS FOR ADULTS
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	2.68E-09	NO DATA	7.40E-11	NO DATA	NO DATA	NO DATA	8.50E-05
ZR 95	3.04E-08	9.75E-09	6.60E-09	NO DATA	1.53E-08	NO DATA	3.09E-05
ZR 97	1.68E-09	3.39E-10	1.55E-10	NO DATA	5.12E-10	NO DATA	1.05E-04
NB 95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05
MO 99	NO DATA	4.31E-06	8.20E-07	NO DATA	9.76E-06	NO DATA	9.99E-06
TC 99M	2.47E-10	6.98E-10	8.89E-09	NO DATA	1.06E-08	3.42E-10	4.13E-07
TC101	2.54E-10	3.66E-10	3.59E-09	NO DATA	6.59E-09	1.87E-10	1.10E-21
RU103	1.85E-07	NO DATA	7.97E-08	NO DATA	7.06E-07	NO DATA	2.16E-05
RU105	1.54E-08	NO DATA	6.08E-09	NO DATA	1.99E-07	NO DATA	9.42E-06
RU106	2.75E-06	NO DATA	3.48E-07	NO DATA	5.31E-06	NO DATA	1.78E-04
AG110M	1.60E-07	1.48E-07	8.79E-08	NO DATA	2.91E-07	NO DATA	6.04E-05
TE125M	2.69E-06	9.71E-07	3.57E-07	8.06E-07	1.09E-05	NO DATA	1.07E-05
TE127M	6.77E-06	2.42E-06	8.25E-07	1.73E-06	2.75E-05	NO DATA	2.27E-05
TE127	1.10E-07	3.95E-08	2.38E-08	8.15E-08	4.48E-07	NO DATA	8.68E-06
TE129M	1.15E-05	4.29E-06	1.82E-06	3.95E-06	4.80E-05	NO DATA	5.79E-05
TE129	3.14E-08	1.18E-08	7.63E-09	2.41E-08	1.32E-07	NO DATA	2.37E-08
TE131M	1.73E-06	8.46E-07	7.05E-07	1.34E-06	8.57E-06	NO DATA	8.40E-05
TE131	1.97E-08	8.23E-09	6.22E-09	1.62E-08	8.63E-08	NO DATA	2.79E-09
TE132	2.52E-06	1.63E-06	1.53E-06	1.80E-06	1.57E-05	NO DATA	7.71E-05
I 130	7.56E-07	2.23E-06	8.80E-07	1.89E-04	3.48E-06	NO DATA	1.92E-06
I 131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06
I 132	2.03E-07	5.43E-07	1.90E-07	1.90E-05	8.65E-07	NO DATA	1.02E-07
I 133	1.42E-06	2.47E-06	7.53E-07	3.63E-04	4.31E-06	NO DATA	2.22E-06
I 134	1.06E-07	2.88E-07	1.03E-07	4.99E-06	4.58E-07	NO DATA	2.51E-10
I 135	4.43E-07	1.16E-06	4.28E-07	7.65E-05	1.86E-06	NO DATA	1.31E-06
CS134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06
CS136	6.51E-06	2.57E-05	1.85E-05	NO DATA	1.43E-05	1.96E-06	2.42E-06
CS137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06
CS138	5.52E-08	1.09E-07	5.40E-08	NO DATA	8.01E-08	7.91E-09	4.45E-13
BA139	9.70E-08	6.91E-11	2.84E-09	NO DATA	6.44E-11	3.92E-11	1.72E-07

TABLE 6 (continued)

INGESTION DOSE FACTORS FOR ADULTS
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.67E-09	1.46E-08	4.18E-05
BA141	4.71E-08	3.56E-11	1.59E-09	NO DATA	3.31E-11	2.02E-11	2.22E-17
BA142	2.13E-08	2.19E-11	1.34E-09	NO DATA	1.35E-11	1.24E-11	3.00E-26
LA140	2.50E-09	1.26E-09	5.33E-10	NO DATA	NO DATA	NO DATA	9.25E-05
LA142	1.28E-10	5.82E-11	1.45E-11	NO DATA	NO DATA	NO DATA	4.25E-07
CE141	9.36E-09	6.33E-09	7.19E-10	NO DATA	2.94E-09	NO DATA	2.42E-05
CE143	1.65E-09	1.22E-06	1.35E-10	NO DATA	5.37E-10	NO DATA	4.56E-05
CE144	4.88E-07	2.04E-07	2.62E-08	NO DATA	1.21E-07	NO DATA	1.65E-04
PR143	9.20E-09	3.69E-09	4.56E-10	NO DATA	2.13E-09	NO DATA	4.03E-05
PR144	3.01E-11	1.25E-11	1.53E-12	NO DATA	7.05E-12	NO DATA	4.33E-18
ND147	6.29E-09	7.27E-09	4.35E-10	NO DATA	4.25E-09	NO DATA	3.49E-05
W 187	1.03E-07	8.61E-08	3.01E-08	NO DATA	NO DATA	NO DATA	2.82E-05
NP239	1.19E-09	1.17E-10	6.45E-11	NO DATA	3.65E-10	NO DATA	2.40E-05

TABLE 7

DOSE FACTORS FOR EXPOSURE TO A SEMI-INFINITE CLOUD OF NOBLE GASES

Nuclide	β-air* (N_i)	β-Skin** (L_i)	γ-Air* (M_i)	γ-Body** (K_i)
Kr-83m	2.88E-04***	---	1.93E-05	7.56E-08
Kr-85m	1.97E-03	1.46E-03	1.23E-03	1.17E-03
Kr-85	1.95E-03	1.34E-03	1.72E-05	1.61E-05
Kr-87	1.03E-02	9.73E-03	6.17E-03	5.92E-03
Kr-88	2.93E-03	2.37E-03	1.52E-02	1.47E-02
Kr-89	1.06E-02	1.01E-02	1.73E-02	1.66E-02
Kr-90	7.83E-03	7.29E-03	1.63E-02	1.56E-02
Xe-131m	1.11E-03	4.76E-04	1.56E-04	9.15E-05
Xe-133m	1.48E-03	9.94E-04	3.27E-04	2.51E-04
Xe-133	1.05E-03	3.06E-04	3.53E-04	2.94E-04
Xe-135m	7.39E-04	7.11E-04	3.36E-03	3.12E-03
Xe-135	2.46E-03	1.86E-03	1.92E-03	1.81E-03
Xe-137	1.27E-02	1.22E-02	1.51E-03	1.42E-03
Xe-138	4.75E-03	4.13E-03	9.21E-03	8.83E-03
Ar-41	3.28E-03	2.69E-03	9.30E-03	8.84E-03

* $\frac{\text{mrad-m}^3}{\text{pCi-yr}}$

** $\frac{\text{mrem-m}^3}{\text{pCi-yr}}$

*** 2.88E-04 = 2.88×10^{-4}

TABLE 8

INHALATION DOSE FACTORS FOR CHILD (DFA_i)
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	3.04E-07	3.04E-07	3.04E-07	3.04E-07	3.04E-07	3.04E-07
C 14	9.70E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06
NA 24	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06
P 32	7.04E-04	3.09E-05	2.67E-05	NO DATA	NO DATA	NO DATA	1.14E-05
CR 51	NO DATA	NO DATA	4.17E-08	2.31E-08	6.57E-09	4.59E-06	2.93E-07
MN 54	NO DATA	1.16E-05	2.57E-06	NO DATA	2.71E-06	4.26E-04	6.19E-06
MN 56	NO DATA	4.48E-10	8.43E-11	NO DATA	4.52E-10	3.55E-06	3.33E-05
FE 55	1.28E-05	6.80E-06	2.10E-06	NO DATA	NO DATA	3.00E-05	7.75E-07
FE 59	5.59E-06	9.64E-06	4.51E-06	NO DATA	NO DATA	3.43E-04	1.91E-05
CO 58	NO DATA	4.79E-07	8.55E-07	NO DATA	NO DATA	2.99E-04	9.29E-06
CO 60	NO DATA	3.55E-06	6.12E-06	NO DATA	NO DATA	1.91E-03	2.60E-05
NI 63	2.22E-04	1.25E-05	7.56E-06	NO DATA	NO DATA	7.43E-05	1.71E-06
NI 65	8.08E-10	7.99E-11	4.44E-11	NO DATA	NO DATA	7.21E-06	2.27E-05
CU 64	NO DATA	5.39E-10	2.90E-10	NO DATA	1.63E-09	2.59E-06	9.92E-06
ZN 65	1.15E-05	3.06E-05	1.90E-05	NO DATA	1.93E-05	7.69E-04	4.41E-06
ZN 69	1.81E-11	2.61E-11	2.41E-12	NO DATA	1.58E-11	3.84E-07	2.75E-06
BR 83	NO DATA	NO DATA	1.28E-07	NO DATA	NO DATA	NO DATA	LT E-24
BR 84	NO DATA	NO DATA	1.48E-07	NO DATA	NO DATA	NO DATA	LT E-24
RB 85	NO DATA	NO DATA	6.84E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	5.36E-05	3.07E-05	NO DATA	NO DATA	NO DATA	2.16E-06
RB 88	NO DATA	1.52E-07	9.90E-08	NO DATA	NO DATA	NO DATA	4.66E-09
RB 89	NO DATA	9.33E-08	7.85E-08	NO DATA	NO DATA	NO DATA	5.11E-10
SR 89	1.62E-04	NO DATA	4.66E-06	NO DATA	NO DATA	5.81E-04	4.52E-05
SR 90	2.73E-02	NO DATA	1.74E-03	NO DATA	NO DATA	3.99E-03	9.28E-05
SR 91	3.28E-08	NO DATA	1.24E-09	NO DATA	NO DATA	1.44E-05	4.70E-05
SR 92	3.54E-09	NO DATA	1.42E-10	NO DATA	NO DATA	6.49E-06	6.55E-05
Y 90	1.11E-06	NO DATA	2.94E-08	NO DATA	NO DATA	7.07E-05	7.24E-05
Y 91M	1.37E-10	NO DATA	4.98E-12	NO DATA	NO DATA	7.60E-07	4.64E-07
Y 91	2.47E-04	NO DATA	6.59E-06	NO DATA	NO DATA	7.10E-04	4.97E-05
Y 92	5.50E-09	NO DATA	1.57E-10	NO DATA	NO DATA	6.46E-06	6.46E-05

TABLE 8 (Continued)

INHALATION DOSE FACTORS FOR CHILD (DFA_i)
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 91	5.04E-08	NO DATA	1.38E-09	NO DATA	NO DATA	2.01E-05	1.05E-04
ZR 95	5.13E-05	1.13E-05	1.00E-05	NO DATA	1.61E-05	6.03E-04	1.65E-05
ZR 97	5.07E-08	7.34E-09	4.32E-09	NO DATA	1.05E-08	3.06E-05	9.49E-05
NB 95	6.35E-06	2.48E-06	1.77E-06	NO DATA	2.33E-06	1.66E-04	1.00E-05
MO 99	NO DATA	4.66E-08	1.15E-08	NO DATA	1.06E-07	3.66E-05	3.42E-05
TC 99M	4.81E-13	9.41E-13	1.56E-11	NO DATA	1.37E-11	7.57E-07	1.30E-06
TC101	2.19E-14	2.30E-14	2.91E-13	NO DATA	3.72E-13	1.58E-07	4.41E-09
RU103	7.55E-07	NO DATA	2.90E-07	NO DATA	1.70E-06	1.79E-04	1.21E-05
RU105	4.13E-10	NO DATA	1.50E-10	NO DATA	3.63E-10	4.30E-06	2.69E-05
RU106	3.68E-05	NO DATA	4.57E-06	NO DATA	4.97E-05	3.87E-03	1.16E-04
AG110M	4.56E-06	3.08E-06	2.47E-06	NO DATA	5.74E-06	1.48E-03	2.71E-05
TE125M	1.82E-06	6.29E-07	2.47E-07	5.20E-07	NO DATA	1.29E-04	9.13E-06
TE127M	6.72E-06	2.31E-06	8.16E-07	1.64E-06	1.72E-05	4.00E-04	1.93E-05
TE127	7.49E-10	2.57E-10	1.65E-10	5.30E-10	1.91E-09	2.71E-06	1.52E-05
TE129M	5.19E-06	1.85E-06	8.22E-07	1.71E-06	1.36E-05	4.76E-04	4.91E-05
TE129	2.64E-11	9.45E-12	6.44E-12	1.93E-11	6.94E-11	7.93E-07	6.89E-06
TE131M	3.63E-08	1.60E-08	1.37E-08	2.64E-08	1.08E-07	5.56E-05	8.32E-05
TE131	5.87E-12	2.28E-12	1.78E-12	4.59E-12	1.59E-11	5.55E-07	3.60E-07
TE132	1.30E-07	7.36E-08	7.12E-08	8.58E-08	4.79E-07	1.02E-04	3.72E-05
I 130	2.21E-06	4.43E-06	2.28E-06	4.99E-04	6.61E-06	NO DATA	1.38E-06
I 131	1.30E-05	1.30E-05	7.37E-06	4.39E-03	2.13E-05	NO DATA	7.68E-07
I 132	5.72E-07	1.10E-06	5.07E-07	5.25E-05	1.69E-06	NO DATA	8.65E-07
I 133	4.48E-06	5.49E-06	2.08E-06	1.04E-03	9.13E-06	NO DATA	1.48E-06
I 134	3.17E-07	5.84E-07	2.69E-07	1.37E-05	8.92E-07	NO DATA	2.58E-07
I 135	1.33E-06	2.36E-06	1.12E-06	2.14E-04	3.62E-06	NO DATA	1.20E-06
CS134	1.76E-04	2.74E-04	6.07E-05	NO DATA	8.93E-05	3.27E-05	1.04E-06
CS136	1.76E-05	4.62E-05	3.14E-05	NO DATA	2.58E-05	3.93E-06	1.13E-06
CS137	2.45E-04	2.23E-04	3.47E-05	NO DATA	7.63E-05	2.81E-05	9.78E-07
CS138	1.71E-07	2.27E-07	1.50E-07	NO DATA	1.68E-07	1.84E-08	7.29E-08
BA139	4.98E-10	2.66E-13	1.45E-11	NO DATA	2.33E-13	1.56E-08	1.54E-05

TABLE 8 (continued)

INHALATION DOSE FACTORS FOR CHILD (DFA_1)
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.00E-05	1.75E-08	1.17E-06	NO DATA	5.71E-09	4.71E-04	2.75E-05
BA141	5.29E-11	2.95E-14	1.72E-12	NO DATA	7.56E-14	7.89E-07	7.44E-08
BA142	1.35E-11	7.73E-15	7.54E-13	NO DATA	7.57E-15	4.44E-07	7.41E-10
LA140	1.74E-07	6.08E-08	2.04E-08	NO DATA	NO DATA	4.94E-05	6.10E-05
LA142	3.50E-10	1.11E-10	3.44E-11	NO DATA	NO DATA	7.35E-06	2.05E-05
CE141	1.06E-05	5.28E-06	7.83E-07	NO DATA	2.31E-06	1.47E-04	1.53E-05
CE143	9.89E-08	5.37E-08	7.77E-09	NO DATA	2.26E-08	3.12E-05	3.44E-05
CE144	1.83E-03	5.72E-04	9.77E-05	NO DATA	3.17E-04	3.23E-03	1.05E-04
PR143	4.99E-06	1.50E-06	2.47E-07	NO DATA	8.11E-07	1.17E-04	2.63E-05
PR144	1.61E-11	4.99E-12	8.10E-13	NO DATA	2.64E-12	4.23E-07	5.32E-08
ND147	2.92E-06	2.36E-06	1.84E-07	NO DATA	1.30E-06	8.87E-05	2.22E-05
W 187	4.41E-09	2.61E-09	1.17E-09	NO DATA	NO DATA	1.11E-05	2.46E-05
NP239	1.26E-07	9.04E-09	6.35E-09	NO DATA	2.63E-08	1.57E-05	1.73E-05

TABLE 9

Values of L-Theta-V
(Inverse Meters-Squared)

Calculated Using Open-Terrain Factors

Pathway: MILK GOAT

Sector	Distance (Miles)	Distance (Meters)	Pasquill Category A	B	C	D	E	F	G
E	3.3	5311	5.23E-07	7.70E-07	1.87E-06	5.67E-06	9.01E-06	1.46E-05	2.35E-05

Change 1

TABLE 9 (CONT.)

Values of L-Theta-V
(Inverse Meters-Squared)

Calculated Using Open-Terrain Factors

Pathway: MILK COWS

Sector	Distance (Miles)	Distance (Meters)	Pasquill Category A	B	C	D	E	F	G
NW	1.1	1770	3.28E-06	1.60E-05	3.19E-05	7.01E-05	1.03E-04	1.58E-04	2.42E-04
NW	4.4	7081	3.44E-07	3.70E-07	9.48E-07	3.16E-06	5.18E-06	8.52E-06	1.40E-05

TABLE 9

Values of L-Theta-V
(Inverse Meters-Squared)

Calculated Using Open-Terrain Factors

Pathway: VEGETABLE GARDEN

Sector	Distance (Miles)	Distance (Meters)	Pasquill Category A	B	C	D	E	F	G
N	1.1	1770	3.28E-06	1.60E-05	3.19E-05	7.01E-05	1.03E-04	1.58E-04	2.42E-04
NNE	1.3	2092	2.42E-06	9.85E-06	2.02E-05	4.44E-05	6.65E-05	1.06E-04	1.63E-04
NE	1.0	1609	3.91E-06	2.12E-05	4.15E-05	8.91E-05	1.30E-04	2.00E-04	3.06E-04
ENE	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
E	3.2	5150	5.48E-07	8.35E-07	2.01E-06	6.04E-06	9.57E-06	1.54E-05	2.49E-05
ESE	2.3	3701	9.17E-07	2.00E-06	4.55E-06	1.23E-05	1.89E-05	2.99E-05	4.74E-05
SE	2.3	3701	9.17E-07	2.00E-06	4.55E-06	1.23E-05	1.89E-05	2.99E-05	4.74E-05
S	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
SSW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
SW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
WSW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
W	1.1	1770	3.28E-06	1.60E-05	3.19E-05	7.01E-05	1.03E-04	1.58E-04	2.42E-04
WNW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
NW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
NNW	2.9	4667	6.36E-07	1.08E-06	2.56E-06	7.44E-06	1.17E-05	1.87E-05	3.00E-05

TABLE 9

Values of L-Theta-V
(Inverse Meters-Squared)

Calculated Using Open-Terrain Factors

Pathway: RESIDENCES

Sector	Distance (Miles)	Distance (Meters)	Pasquill Category A	B	C	D	E	F	G
N	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
NNE	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
NE	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
ENE	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
E	2.6	4184	7.54E-07	1.44E-06	3.35E-06	9.41E-06	1.46E-05	2.33E-05	3.71E-05
ESE	3.4	5472	5.00E-07	7.13E-07	1.74E-06	5.32E-06	8.49E-06	1.38E-05	2.23E-05
SE	3.9	6276	4.09E-07	5.02E-07	1.26E-06	4.02E-06	6.50E-06	1.06E-05	1.74E-05
W	1.3	2092	2.42E-06	9.85E-06	2.02E-05	4.64E-05	6.85E-05	1.06E-04	1.63E-04
WNW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
NW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04
NNW	2.0	3219	1.15E-06	2.93E-06	6.50E-06	1.69E-05	2.56E-05	4.02E-05	6.32E-05

TABLE 9

Values of L-Theta-V
(Inverse Meters-Squared)

Calculated Using Open-Terrain Factors

Pathway: SITE BOUNDARY

Sector	Distance (Miles)	Distance (Meters)	Pasquill Category A	B	C	D	E	F	G
N	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
NNE	0.6	966	2.01E-05	7.94E-05	1.42E-04	2.74E-04	4.01E-04	6.21E-04	9.61E-04
NE	0.6	966	2.01E-05	7.94E-05	1.42E-04	2.74E-04	4.01E-04	6.21E-04	9.61E-04
ENE	0.6	966	2.01E-05	7.94E-05	1.42E-04	2.74E-04	4.01E-04	6.21E-04	9.61E-04
E	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
ESE	0.6	966	2.01E-05	7.94E-05	1.42E-04	2.74E-04	4.01E-04	6.21E-04	9.61E-04
SE	0.6	966	2.01E-05	7.94E-05	1.42E-04	2.74E-04	4.01E-04	6.21E-04	9.61E-04
SSE	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
S	1.6	2575	1.68E-06	5.46E-06	1.16E-05	2.82E-05	4.21E-05	6.56E-05	1.02E-04
SSW	3.1	4989	5.75E-07	9.07E-07	2.18E-06	6.46E-06	1.02E-05	1.64E-05	2.65E-05
SW	3.4	5472	5.00E-07	7.13E-07	1.74E-06	5.32E-06	8.49E-06	1.38E-05	2.23E-05
WSW	1.5	2414	1.88E-06	6.55E-06	1.38E-05	3.29E-05	4.89E-05	7.59E-05	1.18E-04
W	1.0	1609	3.91E-06	2.12E-05	4.15E-05	8.91E-05	1.30E-04	2.00E-04	3.06E-04
WNW	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
NW	0.8	1287	7.77E-06	4.13E-05	7.78E-05	1.59E-04	2.32E-04	3.54E-04	5.40E-04
NNW	0.9	1448	4.83E-06	2.90E-05	5.57E-05	1.17E-04	1.71E-04	2.61E-04	3.98E-04

TABLE 10

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: INHALATION AGE GROUP: INFANT (1 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (MREM/YR PER UCI/CU.METER)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.647E+03	.000E+00	.647E+03	.647E+03	.647E+03	.647E+03	.647E+03
CR--51	.892E+02	.000E+00	.000E+00	.575E+02	.132E+02	.128E+05	.357E+03
MN--54	.498E+04	.000E+00	.253E+05	.000E+00	.498E+04	.100E+07	.706E+04
FE--59	.948E+04	.136E+05	.235E+05	.000E+00	.000E+00	.102E+07	.248E+05
CO--58	.182E+04	.000E+00	.122E+04	.000E+00	.000E+00	.777E+06	.111E+05
CO--60	.118E+05	.000E+00	.802E+04	.000E+00	.000E+00	.451E+07	.319E+05
ZN--65	.311E+05	.193E+05	.626E+05	.000E+00	.325E+05	.647E+06	.514E+05
SR--89	.114E+05	.398E+06	.000E+00	.000E+00	.000E+00	.203E+07	.612E+05
SR--90	.259E+07	.409E+08	.000E+00	.000E+00	.000E+00	.112E+08	.131E+07
ZR--95	.203E+05	.115E+06	.279E+05	.000E+00	.311E+05	.175E+07	.217E+05
I--131	.196E+05	.379E+05	.444E+05	.148E+08	.518E+05	.000E+00	.106E+04
I--133	.560E+04	.132E+05	.192E+05	.356E+07	.224E+05	.000E+00	.216E+04
CS-134	.745E+05	.396E+06	.703E+06	.000E+00	.190E+06	.834E+05	.133E+04
CS-136	.529E+05	.483E+05	.135E+06	.000E+00	.564E+05	.118E+05	.143E+04
CS-137	.455E+05	.549E+06	.612E+06	.000E+00	.172E+06	.713E+05	.133E+04
BA-140	.293E+04	.560E+05	.560E+02	.000E+00	.134E+02	.160E+07	.384E+05
CE-141	.199E+04	.277E+05	.167E+05	.000E+00	.525E+04	.517E+06	.218E+05

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: INHALATION AGE GROUP: CHILD (2 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (MREM/YR PER UCI/CU.METER)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.112E+04	.000E+00	.112E+04	.112E+04	.112E+04	.112E+04	.112E+04
CR--51	.154E+03	.000E+00	.000E+00	.855E+02	.243E+02	.170E+05	.108E+04
MN--54	.951E+04	.000E+00	.429E+05	.000E+00	.100E+05	.158E+07	.229E+05
FE--59	.167E+05	.207E+05	.334E+05	.000E+00	.000E+00	.127E+07	.707E+05
CO--58	.316E+04	.000E+00	.177E+04	.000E+00	.000E+00	.111E+07	.344E+05
CO--60	.226E+05	.000E+00	.131E+05	.000E+00	.000E+00	.707E+07	.962E+05
ZN--65	.703E+05	.426E+05	.113E+06	.000E+00	.714E+05	.995E+06	.163E+05
SR--89	.172E+05	.599E+06	.000E+00	.000E+00	.000E+00	.216E+07	.167E+06
SR--90	.644E+07	.101E+09	.000E+00	.000E+00	.000E+00	.111E+08	.343E+06
ZR--95	.370E+05	.190E+06	.418E+05	.000E+00	.596E+05	.223E+07	.610E+05
I--131	.273E+05	.481E+05	.481E+05	.162E+08	.788E+05	.000E+00	.284E+04
I--133	.770E+04	.166E+05	.203E+05	.385E+07	.338E+05	.000E+00	.548E+04
CS-134	.225E+06	.651E+06	.101E+07	.000E+00	.330E+06	.121E+06	.385E+04
CS-136	.116E+06	.651E+05	.171E+06	.000E+00	.955E+05	.145E+05	.418E+04
CS-137	.128E+06	.907E+06	.825E+06	.000E+00	.282E+06	.104E+06	.362E+04
BA-140	.433E+04	.740E+05	.648E+02	.000E+00	.21[illegible]E+02	.174E+07	.102E+06
CE-141	.290E+04	.392E+05	.195E+05	.000E+00	.85[illegible]+04	.544E+06	.566E+05

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: INHALATION AGE GROUP: TEEN (3 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (MREM/YR PER UCI/CU.METER)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.127E+04	.000E+00	.127E+04	.127E+04	.127E+04	.127E+04	.127E+04
CR--51	.135E+03	.000E+00	.000E+00	.750E+02	.307E+02	.210E+05	.300E+04
MN--54	.840E+04	.000E+00	.511E+05	.000E+00	.127E+05	.198E+07	.668E+05
FE--59	.143E+05	.159E+05	.370E+05	.000E+00	.000E+00	.153E+07	.178E+06
CO--58	.278E+04	.000E+00	.207E+04	.000E+00	.000E+00	.134E+07	.952E+05
CO--60	.198E+05	.000E+00	.151E+05	.000E+00	.000E+00	.872E+07	.259E+06
ZN--65	.624E+05	.386E+05	.134E+06	.000E+00	.864E+05	.124E+07	.466E+05
SR--89	.125E+05	.434E+06	.000E+00	.000E+00	.000E+00	.242E+07	.371E+06
SR--90	.668E+07	.108E+09	.000E+00	.000E+00	.000E+00	.165E+08	.765E+06
ZR--95	.315E+05	.146E+06	.458E+05	.000E+00	.674E+05	.269E+07	.149E+06
I--131	.264E+05	.354E+05	.491E+05	.146E+08	.840E+05	.000E+00	.649E+04
I--133	.622E+04	.122E+05	.205E+05	.292E+07	.359E+05	.000E+00	.103E+05
CS-134	.549E+06	.502E+06	.113E+07	.000E+00	.375E+06	.146E+06	.976E+04
CS-136	.137E+06	.515E+05	.194E+06	.000E+00	.110E+06	.178E+05	.109E+05
CS-137	.311E+06	.670E+06	.848E+06	.000E+00	.304E+06	.121E+06	.848E+04
BA-140	.352E+04	.547E+05	.670E+02	.000E+00	.228E+02	.203E+07	.229E+06
CE-141	.217E+04	.284E+05	.190E+05	.000E+00	.888E+04	.614E+06	.126E+06

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: INHALATION — AGE GROUP: ADULT (4 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (MREM/YR PER UCI/CU.METER)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	126E+04	.000E+00	.126E+04	.126E+04	.126E+04	.126E+04	.126E+04
CR--51	[illegible]00E+03	.000E+00	.000E+00	.595E+02	.228E+02	.144E+05	.332E+04
MN--54	.630E+04	.000E+00	.396E+05	.000E+00	.984E+04	.140E+07	.774E+05
FE--59	.106E+05	.118E+05	.278E+05	.000E+00	.000E+00	.102E+07	.188E+06
CO--58	.207E+04	.000E+00	.158E+04	.000E+00	.000E+00	.928E+06	.106E+06
CO--60	.148E+05	.000E+00	.115E+05	.000E+00	.000E+00	.597E+07	.285E+06
ZN--65	.466E+05	.324E+05	.103E+06	.000E+00	.690E+05	.864E+06	.534E+05
SR--89	.872E+04	.304E+06	.000E+00	.000E+00	.000E+00	.140E+07	.350E+06
SR--90	.610E+07	.992E+08	.000E+00	.000E+00	.000E+00	.960E+07	.722E+06
ZR--95	.233E+05	.107E+06	.344E+05	.000E+00	.542E+05	.177E+07	.150E+06
I--131	.205E+05	.252E+05	.358E+05	.119E+08	.613E+05	.000E+00	.628E+04
I--133	.452E+04	.864E+04	.148E+05	.215E+07	.258E+05	.000E+00	.888E+04
CS-134	.728E+06	.373E+06	.848E+06	.000E+00	.287E+06	.976E+05	.104E+05
CS-136	.110E+06	.390E+05	.146E+06	.000E+00	.856E+05	.120E+05	.117E+05
CS-137	.428E+06	.478E+06	.621E+06	.000E+00	.222E+06	.752E+05	.164E+05
BA-140	.257E+04	.390E+05	.490E+02	.000E+00	.167E+02	.127E+07	.218E+06
CE-141	.153E+04	.199E+05	.135E+05	.000E+00	.626E+04	.362E+06	.120E+06

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: GROUND-PLANE DEPOSITION AGE GROUP: ALL (1 OF 1)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)
H----3	.000E+00
CR--51	.463E+07
MN--54	.138E+10
FE--59	.271E+09
CO--58	.376E+09
CO--60	.215E+11
ZN--65	.741E+09
SR--89	.215E+05
SR--90	.000E+00
ZR--95	.243E+09
I--131	.172E+08
I--133	.245E+07
CS-134	.477E+10
CS-136	.150E+09
CS-137	.103E+11
BA-140	.204E+08
CE-141	.136E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: COWS MILK (CONTAMINATED FORAGE) AGE GROUP: INFANT (1 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.238E+04	.000E+00	.238E+04	.238E+04	.238E+04	.238E+04	.238E+04
CR--51	.804E+06	.000E+00	.000E+00	.525E+06	.115E+06	.102E+07	.234E+08
MN--54	.442E+08	.000E+00	.195E+09	.000E+00	.432E+08	.000E+00	.716E+08
FE--59	.770E+09	.112E+10	.196E+10	.000E+00	.000E+00	.578E+09	.934E+09
CO--58	.300E+09	.000E+00	.121E+09	.000E+00	.000E+00	.000E+00	.302E+09
CO--60	.104E+10	.000E+00	.441E+09	.000E+00	.000E+00	.000E+00	.105E+10
ZN--65	.439E+11	.277E+11	.951E+11	.000E+00	.461E+11	.000E+00	.803E+11
SR--89	.180E+10	.628E+11	.000E+00	.000E+00	.000E+00	.000E+00	.129E+10
SR--90	.155E+12	.608E+12	.000E+00	.000E+00	.000E+00	.000E+00	.759E+10
ZR--95	.587E+04	.340E+05	.828E+04	.000E+00	.892E+04	.000E+00	.412E+07
I--131	.141E+10	.271E+10	.320E+10	.105E+13	.373E+10	.000E+00	.114E+09
I--133	.155E+08	.363E+08	.529E+08	.962E+10	.700E+08	.000E+00	.895E+07
CS-134	.340E+11	.181E+12	.337E+12	.000E+00	.867E+11	.356E+11	.915E+09
CS-136	.108E+11	.982E+10	.289E+11	.000E+00	.115E+11	.235E+10	.439E+09
CS-137	.213E+11	.257E+12	.301E+12	.000E+00	.808E+11	.327E+11	.941E+09
BA-140	.619E+08	.120E+10	.120E+07	.000E+00	.285E+06	.738E+06	.295E+09
CE-141	.155E+05	.216E+06	.132E+06	.000E+00	.407E+05	.000E+00	.682E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: COWS MILK (CONTAMINATED FORAGE) AGE GROUP: CHILD (2 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.157E+04	.000E+00	.157E+04	.157E+04	.157E+04	.157E+04	.157E+04
CR--51	.508E+06	.000E+00	.000E+00	.282E+06	.770E+05	.515E+06	.269E+08
MN--54	.279E+08	.000E+00	.105E+09	.000E+00	.294E+08	.000E+00	.879E+08
FE--59	.483E+09	.600E+09	.970E+09	.000E+00	.000E+00	.281E+09	.101E+10
CO--58	.185E+09	.000E+00	.605E+08	.000E+00	.000E+00	.000E+00	.353E+09
CO--60	.636E+09	.000E+00	.216E+09	.000E+00	.000E+00	.000E+00	.120E+10
ZN--65	.342E+11	.207E+11	.550E+11	.000E+00	.347E+11	.000E+00	.966E+10
SR--89	.943E+09	.330E+11	.000E+00	.000E+00	.000E+00	.000E+00	.128E+10
SR--90	.142E+12	.558E+12	.000E+00	.000E+00	.900E+00	.000E+00	.752E+10
ZR--95	.374E+04	.191E+05	.421E+04	.000E+00	.602E+04	.000E+00	.439E+07
I--131	.743E+09	.130E+10	.131E+10	.432E+12	.215E+10	.000E+00	.116E+09
I--133	.805E+07	.172E+08	.213E+08	.395E+10	.354E+08	.000E+00	.857E+07
CS-134	.388E+11	.112E+12	.184E+12	.000E+00	.570E+11	.205E+11	.992E+09
CS-136	.894E+10	.503E+10	.138E+11	.000E+00	.736E+10	.110E+10	.486E+09
CS-137	.228E+11	.161E+12	.154E+12	.000E+00	.503E+11	.181E+11	.966E+09
BA-140	.341E+08	.584E+09	.511E+06	.000E+00	.167E+06	.305E+06	.296E+09
CE-141	.808E+04	.109E+06	.544E+05	.000E+00	.239E+05	.000E+00	.679E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: COWS MILK (CONTAMINATED FORAGE) AGE GROUP: TEEN (3 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.994E+03	.000E+00	.994E+03	.994E+03	.994E+03	.994E+03	.994E+03
CR--51	.249E+06	.000E+00	.000E+00	.138E+06	.546E+05	.355E+06	.418E+08
MN--54	.139E+08	.000E+00	.700E+08	.000E+00	.209E+08	.000E+00	.144E+09
FE--59	.233E+09	.259E+09	.604E+09	.000E+00	.000E+00	.190E+09	.143E+10
CO--58	.913E+08	.000E+00	.396E+08	.000E+00	.000E+00	.000E+00	.546E+09
CO--60	.313E+09	.000E+00	.139E+09	.000E+00	.000E+00	.000E+00	.181E+10
ZN--65	.170E+11	.105E+11	.365E+11	.000E+00	.234E+11	.000E+00	.155E+11
SR--89	.382E+09	.133E+11	.000E+00	.000E+00	.000E+00	.000E+00	.159E+10
SR--90	.816E+11	.330E+12	.000E+00	.000E+00	.000E+00	.000E+00	.928E+10
ZR--95	.179E+04	.824E+04	.260E+04	.000E+00	.382E+04	.000E+00	.600E+07
I--131	.403E+09	.536E+09	.750E+09	.219E+12	.129E+10	.000E+00	.148E+09
I--133	.366E+07	.708E+07	.120E+08	.168E+10	.211E+08	.000E+00	.908E+07
CS-134	.531E+11	.486E+11	.114E+12	.000E+00	.364E+11	.139E+11	.142E+10
CS-136	.589E+10	.223E+10	.877E+10	.000E+00	.477E+10	.752E+09	.705E+09
CS-137	.310E+11	.669E+11	.890E+11	.000E+00	.303E+11	.118E+11	.127E+10
BA-140	.156E+08	.242E+09	.296E+06	.000E+00	.100E+06	.199E+06	.373E+09
CE-141	.340E+04	.443E+05	.296E+05	.000E+00	.139E+05	.000E+00	.846E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_1

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: COWS MILK (CONTAMINATED FORAGE) AGE GROUP: ADULT (4 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.763E+03	.000E+00	.763E+03	.763E+03	.763E+03	.763E+03	.763E+03
CR--51	.143E+06	.000E+00	.000E+00	.852E+05	.314E+05	.189E+06	.359E+08
MN--54	.802E+07	.000E+00	.420E+08	.000E+00	.125E+08	.000E+00	.129E+09
FE--59	.133E+09	.148E+09	.348E+09	.000E+00	.000E+00	.973E+08	.116E+10
CO--58	.528E+08	.000E+00	.235E+08	.000E+00	.000E+00	.000E+00	.477E+09
CO--60	.181E+09	.000E+00	.820E+08	.000E+00	.000E+00	.000E+00	.154E+10
ZN--65	.986E+10	.685E+10	.218E+11	.000E+00	.146E+11	.000E+00	.137E+11
SR--89	.208E+09	.724E+10	.000E+00	.000E+00	.000E+00	.000E+00	.116E+10
SR--90	.574E+11	.234E+12	.000E+00	.000E+00	.000E+00	.000E+00	.676E+10
ZR--95	.102E+04	.471E+04	.151E+04	.000E+00	.237E+04	.000E+00	.479E+07
I--131	.242E+09	.295E+09	.423E+09	.138E+12	.724E+09	.000E+00	.111E+09
I--133	.205E+07	.388E+07	.674E+07	.991E+09	.118E+08	.000E+00	.606E+07
CS-134	.545E+11	.280E+11	.666E+11	.000E+00	.216E+11	.716E+10	.117E+10
CS-136	.372E+10	.131E+10	.517E+10	.000E+00	.287E+10	.394E+09	.587E+09
CS-137	.331E+11	.369E+11	.505E+11	.000E+00	.171E+11	.569E+10	.977E+09
BA-140	.878E+07	.134E+09	.168E+06	.000E+00	.572E+05	.964E+05	.276E+09
CE-141	.185E+04	.242E+05	.163E+05	.000E+00	.759E+04	.000E+00	.625E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: MEAT (CONTAMINATED FORAGE)

AGE GROUP: CHILD (1 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.234E+03	.000E+00	.234E+03	.234E+03	.234E+03	.234E+03	.234E+03
CR--51	.875E+04	.000E+00	.000E+00	.486E+04	.133E+04	.887E+04	.464E+06
MN--54	.213E+07	.000E+00	.806E+07	.000E+00	.224E+07	.000E+00	.672E+07
FE--59	.302E+09	.375E+09	.606E+09	.000E+00	.000E+00	.176E+09	.631E+09
CO--58	.501E+08	.000E+00	.164E+08	.000E+00	.000E+00	.000E+00	.955E+08
CO--60	.204E+09	.000E+00	.693E+08	.000E+00	.000E+00	.000E+00	.384E+09
ZN--65	.621E+09	.375E+09	.999E+09	.000E+00	.629E+09	.000E+00	.175E+09
SR--89	.137E+08	.480E+09	.000E+00	.000E+00	.000E+00	.000E+00	.186E+08
SR--90	.264E+10	.104E+11	.000E+00	.000E+00	.000E+00	.000E+00	.140E+09
ZR--95	.520E+06	.266E+07	.584E+06	.000E+00	.836E+06	.000E+00	.609E+09
I--131	.941E+07	.165E+08	.166E+08	.547E+10	.272E+08	.000E+00	.147E+07
I--133	.269E+00	.574E+00	.710E+00	.132E+03	.118E+01	.000E+00	.286E+00
CS-134	.314E+09	.907E+09	.149E+10	.000E+00	.461E+09	.165E+09	.802E+07
CS-136	.284E+08	.160E+08	.439E+08	.000E+00	.234E+08	.349E+07	.154E+07
CS-137	.188E+09	.133E+10	.128E+10	.000E+00	.416E+09	.150E+09	.799E+07
BA-140	.254E+07	.435E+08	.381E+05	.000E+00	.124E+05	.227E+05	.220E+08
CE-141	.164E+04	.221E+05	.110E+05	.000E+00	.484E+04	.000E+00	.138E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: MEAT (CONTAMINATED FORAGE) AGE GROUP: TEEN (2 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.194E+03	.000E+00	.194E+03	.194E+03	.194E+03	.194E+03	.194E+03
CR--51	.561E+04	.000E+00	.000E+00	.312E+04	.123E+04	.801E+04	.943E+06
MN--54	.139E+07	.000E+00	.700E+07	.000E+00	.209E+07	.000E+00	.143E+08
FE--59	.190E+09	.211E+09	.493E+09	.000E+00	.000E+00	.156E+09	.117E+10
CO--58	.323E+08	.000E+00	.140E+08	.000E+00	.000E+00	.000E+00	.193E+09
CO--60	.131E+09	.000E+00	.583E+08	.000E+00	.000E+00	.000E+00	.760E+09
ZN--65	.405E+09	.250E+09	.868E+09	.000E+00	.555E+09	.000E+00	.367E+09
SR--89	.726E+07	.253E+09	.000E+00	.000E+00	.000E+00	.000E+00	.302E+08
SR--90	.199E+10	.805E+10	.000E+00	.000E+00	.000E+00	.000E+00	.226E+09
ZR--95	.325E+06	.150E+07	.472E+06	.000E+00	.693E+06	.000E+00	.109E+10
I--131	.667E+07	.887E+07	.124E+08	.363E+10	.214E+08	.000E+00	.246E+07
I--133	.160E+00	.309E+00	.524E+00	.732E+02	.920E+00	.000E+00	.397E+00
CS-134	.562E+09	.514E+09	.121E+10	.000E+00	.385E+09	.147E+09	.151E+08
CS-136	.245E+08	.926E+07	.365E+08	.000E+00	.198E+08	.313E+07	.293E+07
CS-137	.335E+09	.724E+09	.963E+09	.000E+00	.328E+09	.127E+09	.137E+08
BA-140	.152E+07	.236E+08	.289E+05	.000E+00	.980E+04	.194E+05	.364E+08
CE-141	.901E+03	.117E+05	.784E+04	.000E+00	.369E+04	.000E+00	.224E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: MEAT (CONTAMINATED FORAGE)

AGE GROUP: ADULT (3 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.325E+03	.000E+00	.325E+03	.325E+03	.325E+03	.325E+03	.325E+03
CR--51	.702E+04	.000E+00	.000E+00	.419E+04	.155E+04	.931E+04	.176E+07
MN--54	.175E+07	.000E+00	.917E+07	.000E+00	.273E+07	.000E+00	.281E+08
FE--59	.238E+09	.264E+09	.621E+09	.000E+00	.000E+00	.174E+09	.207E+10
CO--58	.408E+08	.000E+00	.182E+08	.000E+00	.000E+00	.000E+00	.368E+09
CO--60	.166E+09	.000E+00	.752E+08	.000E+00	.000E+00	.000E+00	.141E+10
ZN--65	.511E+09	.355E+09	.113E+10	.000E+00	.756E+09	.000E+00	.712E+09
SR--89	.862E+07	.300E+09	.000E+00	.000E+00	.000E+00	.000E+00	.482E+08
SR--90	.305E+10	.124E+11	.000E+00	.000E+00	.000E+00	.000E+00	.359E+09
ZR--95	.406E+06	.187E+07	.599E+06	.000E+00	.940E+06	.000E+00	.190E+10
I--131	.875E+07	.107E+08	.153E+08	.501E+10	.262E+08	.000E+00	.403E+07
I--133	.196E+00	.370E+00	.643E+00	.945E+02	.112E+01	.000E+00	.578E+00
CS-134	.126E+10	.647E+09	.154E+10	.000E+00	.498E+09	.165E+09	.269E+08
CS-136	.338E+08	.119E+08	.469E+08	.000E+00	.261E+08	.358E+07	.533E+07
CS-137	.781E+09	.872E+09	.119E+10	.000E+00	.405E+09	.135E+09	.231E+08
BA-140	.187E+07	.285E+08	.358E+05	.000E+00	.122E+05	.205E+05	.587E+08
CE-141	.107E+04	.140E+05	.946E+04	.000E+00	.440E+04	.000E+00	.362E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: LEAFY VEGETABLES — AGE GROUP: CHILD (1 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.400E+04	.000E+00	.400E+04	.400E+04	.400E+04	.400E+04	.400E+04
CR--51	.116E+06	.000E+00	.000E+00	.645E+05	.176E+05	.118E+06	.617E+07
MN--54	.177E+09	.000E+00	.664E+09	.000E+00	.186E+09	.000E+00	.557E+09
FE--59	.318E+09	.395E+09	.639E+09	.000E+00	.000E+00	.185E+09	.665E+09
CO--58	.196E+09	.000E+00	.641E+08	.000E+00	.000E+00	.000E+00	.374E+09
CO--60	.112E+10	.000E+00	.378E+09	.000E+00	.000E+00	.000E+00	.210E+10
ZN--65	.134E+10	.811E+09	.216E+10	.000E+00	.136E+10	.000E+00	.380E+09
SR--89	.102E+10	.357E+11	.000E+00	.000E+00	.000E+00	.000E+00	.138E+10
SR--90	.315E+12	.124E+13	.000E+00	.000E+00	.000E+00	.000E+00	.167E+11
ZR--95	.752E+06	.384E+07	.844E+06	.000E+00	.121E+07	.000E+00	.881E+09
I--131	.815E+08	.143E+09	.143E+09	.474E+11	.235E+09	.000E+00	.128E+08
I--133	.165E+07	.354E+07	.437E+07	.812E+09	.729E+07	.000E+00	.176E+07
CS-134	.538E+10	.155E+11	.255E+11	.000E+00	.790E+10	.284E+10	.138E+09
CS-136	.144E+09	.811E+08	.223E+09	.000E+00	.119E+09	.177E+08	.783E+07
CS-137	.338E+10	.239E+11	.229E+11	.000E+00	.746E+10	.268E+10	.143E+09
BA-140	.160E+08	.275E+09	.241E+06	.000E+00	.783E+05	.143E+06	.139E+09
CE-141	.483E+05	.652E+06	.325E+06	.000E+00	.143E+06	.000E+00	.406E+09

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: LEAFY VEGETABLES

AGE GROUP: TEEN (2 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.259E+04	.000E+00	.259E+04	.259E+04	.259E+04	.259E+04	.259E+04
CR--51	.613E+05	.000E+00	.000E+00	.340E+05	.134E+05	.875E+05	.103E+08
MN--54	.900E+08	.000E+00	.454E+09	.000E+00	.135E+09	.000E+00	.931E+09
FE--59	.161E+09	.178E+09	.416E+09	.000E+00	.000E+00	.131E+09	.983E+09
CO--58	.100E+09	.000E+00	.434E+08	.000E+00	.000E+00	.000E+00	.599E+09
CO--60	.560E+09	.000E+00	.249E+09	.000E+00	.000E+00	.000E+00	.324E+10
ZN--65	.685E+09	.423E+09	.147E+10	.000E+00	.940E+09	.000E+00	.622E+09
SR--89	.431E+09	.150E+11	.000E+00	.000E+00	.000E+00	.000E+00	.179E+10
SR--90	.185E+12	.751E+12	.000E+00	.000E+00	.000E+00	.000E+00	.211E+11
ZR--95	.372E+06	.171E+07	.541E+06	.000E+00	.795E+06	.000E+00	.125E+10
I--131	.577E+08	.767E+08	.107E+09	.313E+11	.185E+09	.000E+00	.212E+08
I--133	.100E+07	.194E+07	.329E+07	.459E+09	.577E+07	.000E+00	.249E+07
CS-134	.752E+10	.689E+10	.162E+11	.000E+00	.515E+10	.197E+10	.202E+09
CS-136	.114E+09	.431E+08	.170E+09	.000E+00	.924E+08	.146E+08	.137E+08
CS-137	.469E+10	.101E+11	.135E+11	.000E+00	.459E+10	.178E+10	.192E+09
BA-140	.884E+07	.137E+09	.168E+06	.000E+00	.570E+05	.113E+06	.212E+09
CE-141	.216E+05	.281E+06	.188E+06	.000E+00	.884E+05	.000E+00	.537E+09

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: LEAFY VEGETABLES

AGE GROUP: ADULT (3 OF 3)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.226E+04	.000E+00	.226E+04	.226E+04	.226E+04	.226E+04	.226E+04
CR--51	.462E+05	.000E+00	.000E+00	.276E+05	.102E+05	.613E+05	.116E+08
MN--54	.597E+08	.000E+00	.313E+09	.000E+00	.930E+08	.000E+00	.958E+09
FE--59	.113E+09	.125E+09	.295E+09	.000E+00	.000E+00	.823E+08	.982E+09
CO--58	.686E+08	.000E+00	.306E+08	.000E+00	.000E+00	.000E+00	.621E+09
CO--60	.369E+09	.000E+00	.167E+09	.000E+00	.000E+00	.000E+00	.314E+10
ZN--65	.456E+09	.317E+09	.101E+10	.000E+00	.674E+09	.000E+00	.635E+09
SR--89	.284E+09	.990E+10	.000E+00	.000E+00	.000E+00	.000E+00	.159E+10
SR--90	.148E+12	.605E+12	.000E+00	.000E+00	.000E+00	.000E+00	.175E+11
ZR--95	.254E+06	.117E+07	.375E+06	.000E+00	.589E+06	.000E+00	.119E+10
I--131	.661E+08	.806E+08	.115E+09	.378E+11	.198E+09	.000E+00	.304E+08
I--133	.111E+07	.209E+07	.363E+07	.534E+09	.634E+07	.000E+00	.326E+07
CS-134	.882E+10	.453E+10	.108E+11	.000E+00	.349E+10	.116E+10	.189E+09
CS-136	.120E+09	.422E+08	.167E+09	.000E+00	.927E+08	.127E+08	.189E+08
CS-137	.570E+10	.636E+10	.870E+10	.000E+00	.295E+10	.981E+09	.168E+09
BA-140	.837E+07	.128E+09	.161E+06	.000E+00	.546E+05	.919E+05	.263E+09
CE-141	.150E+05	.196E+06	.133E+06	.000E+00	.616E+05	.000E+00	.507E+09

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: GOATS MILK (CONTAMINATED FORAGE) AGE GROUP: INFANT (1 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.405E+05	.000E+00	.405E+05	.405E+05	.405E+05	.405E+05	.405E+05
CR--51	.966E+05	.000E+00	.000E+00	.630E+05	.138E+05	.123E+06	.281E+07
MN--54	.530E+07	.000E+00	.234E+08	.000E+00	.518E+07	.000E+00	.859E+07
FE--59	.100E+08	.146E+08	.254E+08	.000E+00	.000E+00	.751E+07	.121E+08
CO--58	.360E+08	.000E+00	.145E+08	.000E+00	.000E+00	.000E+00	.362E+08
CO--60	.125E+09	.000E+00	.529E+08	.000E+00	.000E+00	.000E+00	.126E+09
ZN--65	.527E+10	.333E+10	.114E+11	.000E+00	.554E+10	.000E+00	.964E+10
SR--89	.378E+10	.132E+12	.000E+00	.000E+00	.000E+00	.000E+00	.271E+10
SR--90	.325E+12	.128E+13	.000E+00	.000E+00	.000E+00	.000E+00	.159E+11
ZR--95	.705E+03	.408E+04	.994E+03	.000E+00	.107E+04	.000E+00	.495E+06
I--131	.169E+10	.326E+10	.384E+10	.126E+13	.448E+10	.000E+00	.137E+09
I--133	.186E+08	.436E+08	.635E+08	.115E+11	.840E+08	.000E+00	.107E+08
CS-134	.102E+12	.542E+12	.101E+13	.000E+00	.260E+12	.107E+12	.275E+10
CS-136	.324E+11	.295E+11	.867E+11	.000E+00	.345E+11	.706E+10	.132E+10
CS-137	.640E+11	.772E+12	.903E+12	.000E+00	.242E+12	.982E+11	.282E+10
BA-140	.743E+07	.144E+09	.144E+06	.000E+00	.342E+05	.885E+05	.354E+08
CE-141	.186E+04	.260E+05	.158E+05	.000E+00	.488E+04	.000E+00	.818E+07

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: GOATS MILK (CONTAMINATED FORAGE) AGE GROUP: CHILD (2 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.267E+05	.000E+00	.267E+05	.267E+05	.267E+05	.267E+05	.267E+05
CR--51	.609E+05	.000E+00	.000E+00	.338E+05	.924E+04	.618E+05	.323E+07
MN--54	.335E+07	.000E+00	.126E+08	.000E+00	.353E+07	.000E+00	.106E+08
FE--59	.629E+07	.780E+07	.126E+08	.000E+00	.000E+00	.366E+07	.131E+08
CO--58	.222E+08	.000E+00	.727E+07	.000E+00	.000E+00	.000E+00	.424E+08
CO--60	.764E+08	.000E+00	.259E+08	.000E+00	.000E+00	.000E+00	.143E+09
ZN--65	.411E+10	.248E+10	.660E+10	.000E+00	.416E+10	.000E+00	.116E+10
SR--89	.198E+10	.694E+11	.000E+00	.000E+00	.000E+00	.000E+00	.268E+10
SR--90	.297E+12	.117E+13	.000E+00	.000E+00	.000E+00	.000E+00	.158E+11
ZR--95	.449E+03	.230E+04	.505E+03	.000E+00	.722E+03	.000E+00	.527E+06
I--131	.892E+09	.156E+10	.157E+10	.519E+12	.258E+10	.000E+00	.140E+09
I--133	.966E+07	.206E+08	.255E+08	.474E+10	.425E+08	.000E+00	.103E+08
CS-134	.116E+12	.337E+12	.552E+12	.000E+00	.171E+12	.614E+11	.298E+10
CS-136	.268E+11	.151E+11	.415E+11	.000E+00	.221E+11	.329E+10	.146E+10
CS-137	.683E+11	.484E+12	.463E+12	.000E+00	.151E+12	.543E+11	.290E+10
BA-140	.409E+07	.701E+08	.614E+05	.000E+00	.200E+05	.366E+05	.355E+08
CE-141	.970E+03	.131E+05	.653E+04	.000E+00	.286E+04	.000E+00	.815E+07

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: GOATS MILK (CONTAMINATED FORAGE) AGE GROUP: TEEN (3 OF 4)

NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.169E+05	.000E+00	.169E+05	.169E+05	.169E+05	.169E+05	.169E+05
CR--51	.299E+05	.000E+00	.000E+00	.166E+05	.655E+04	.427E+05	.502E+07
MN--54	.167E+07	.000E+00	.841E+07	.000E+00	.251E+07	.000E+00	.172E+08
FE--59	.303E+07	.336E+07	.785E+07	.000E+00	.000E+00	.247E+07	.186E+08
CO--58	.110E+08	.000E+00	.476E+07	.000E+00	.000E+00	.000E+00	.656E+08
CO--60	.376E+08	.000E+00	.167E+08	.000E+00	.000E+00	.000E+00	.217E+09
ZN--65	.205E+10	.126E+10	.439E+10	.000E+00	.281E+10	.000E+00	.186E+10
SR--89	.802E+09	.280E+11	.000E+00	.000E+00	.000E+00	.000E+00	.334E+10
SR--90	.171E+12	.694E+12	.000E+00	.000E+00	.000E+00	.000E+00	.195E+11
ZR--95	.214E+03	.988E+03	.312E+03	.000E+00	.458E+03	.000E+00	.720E+06
I--131	.484E+09	.643E+09	.901E+09	.263E+12	.155E+10	.000E+00	.178E+09
I--133	.440E+07	.850E+07	.144E+08	.201E+10	.253E+08	.000E+00	.109E+08
CS-134	.159E+12	.146E+12	.343E+12	.000E+00	.109E+12	.417E+11	.427E+10
CS-136	.177E+11	.669E+10	.263E+11	.000E+00	.143E+11	.226E+10	.212E+10
CS-137	.930E+11	.201E+12	.267E+12	.000E+00	.909E+11	.353E+11	.380E+10
BA-140	.187E+07	.290E+08	.356E+05	.000E+00	.121E+05	.239E+05	.448E+08
CE-141	.408E+03	.532E+04	.355E+04	.000E+00	.167E+04	.000E+00	.102E+08

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

TABLE 10 (CON'T)

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES, R_i

ENVIRONMENTAL PATHWAY-DOSE CONVERSION FACTORS R(I) FOR GASEOUS DISCHARGES

PATHWAY: GOATS MILK (CONTAMINATED FORAGE) AGE GROUP: ADULT (4 OF 4)

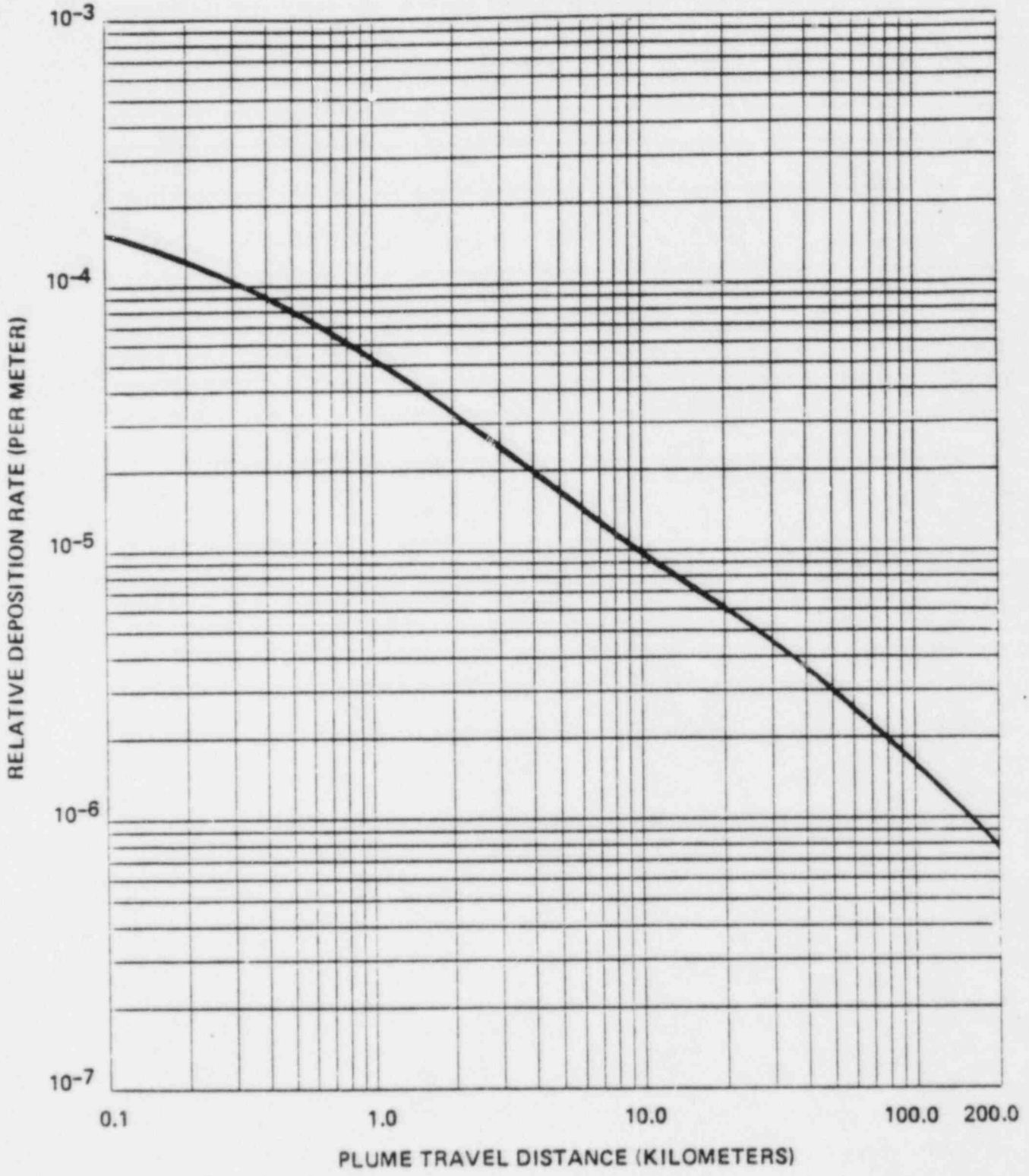
NUCLIDE	ORGAN DOSE FACTORS (SQ.METER-MREM/YR PER UCI/SEC)						
	TOTAL BODY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI
H----3	.130E+05	.000E+00	.130E+05	.130E+05	.130E+05	.130E+05	.130E+05
CR--51	.171E+05	.000E+00	.000E+00	.102E+05	.377E+04	.227E+05	.430E+07
MN--54	.963E+06	.000E+00	.505E+07	.000E+00	.150E+07	.000E+00	.155E+08
FE--59	.174E+07	.193E+07	.453E+07	.000E+00	.000E+00	.127E+07	.151E+08
CO--58	.633E+07	.000E+00	.282E+07	.000E+00	.000E+00	.000E+00	.573E+08
CO--60	.217E+08	.000E+00	.984E+07	.000E+00	.000E+00	.000E+00	.185E+09
ZN--65	.118E+10	.823E+09	.262E+10	.000E+00	.175E+10	.000E+00	.165E+10
SR--89	.436E+09	.152E+11	.000E+00	.000E+00	.000E+00	.000E+00	.244E+10
SR--90	.121E+12	.491E+12	.000E+00	.000E+00	.000E+00	.000E+00	.142E+11
ZR--95	.123E+03	.565E+03	.181E+03	.000E+00	.284E+03	.000E+00	.575E+06
I--131	.291E+09	.355E+09	.507E+09	.166E+12	.869E+09	.000E+00	.134E+09
I--133	.247E+07	.465E+07	.809E+07	.119E+10	.141E+08	.000E+00	.727E+07
CS-134	.163E+12	.840E+11	.200E+12	.000E+00	.647E+11	.215E+11	.350E+10
CS-136	.112E+11	.393E+10	.155E+11	.000E+00	.863E+10	.118E+10	.176E+10
CS-137	.992E+11	.111E+12	.151E+12	.000E+00	.514E+11	.171E+11	.293E+10
BA-140	.105E+07	.161E+08	.202E+05	.000E+00	.687E+04	.116E+05	.331E+08
CE-141	.223E+03	.290E+04	.196E+04	.000E+00	.911E+03	.000E+00	.750E+07

BASED ON 1 UCI/SEC RELEASE RATE OF EACH ISOTOPE I AND A VALUE OF 1 FOR X/Q, DEPLETED X/Q AND RELATIVE DEPOSITION

FIGURE 7

Relative Deposition for Ground-Level Releases

(All Atmospheric Stability Classes)



Obtained from Regulatory Guide 1.111 (March, 1976)

TABLE 11

ANNUAL AVERAGE DISPERSION PARAMETERS AT OR BEYOND THE UNRESTRICTED AREA BOUNDARY

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) SECTOR	DISTANCE IN MILES 0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	3.048E-05	9.309E-06	4.858E-06	2.456E-06	9.926E-07	5.451E-07	3.518E-07	2.490E-07	1.875E-07	1.476E-07	1.201E-07
SSW	3.794E-05	1.150E-05	5.967E-06	3.009E-06	1.215E-06	6.672E-07	4.307E-07	3.049E-07	2.296E-07	1.807E-07	1.471E-07
SW	5.098E-05	1.532E-05	7.903E-06	3.975E-06	1.603E-06	8.810E-07	5.698E-07	4.040E-07	3.046E-07	2.401E-07	1.956E-07
WSW	5.144E-05	1.546E-05	7.917E-06	3.987E-06	1.613E-06	8.904E-07	5.782E-07	4.111E-07	3.108E-07	2.455E-07	2.003E-07
W	2.860E-05	8.634E-06	4.461E-06	2.258E-06	9.176E-07	5.069E-07	3.289E-07	2.338E-07	1.766E-07	1.394E-07	1.137E-07
WNW	5.389E-05	1.633E-05	8.485E-06	4.300E-06	1.748E-06	9.644E-07	6.245E-07	4.431E-07	3.343E-07	2.636E-07	2.148E-07
NW	7.591E-05	2.274E-05	1.159E-05	5.815E-06	2.344E-06	1.296E-06	8.452E-07	6.032E-07	4.573E-07	3.621E-07	2.961E-07
NNW	9.608E-05	2.847E-05	1.429E-05	7.113E-06	2.847E-06	1.577E-06	1.035E-06	7.421E-07	5.649E-07	4.488E-07	3.681E-07
N	7.963E-05	2.360E-05	1.182E-05	5.898E-06	2.372E-06	1.316E-06	8.636E-07	6.192E-07	4.713E-07	3.744E-07	3.071E-07
NNE	7.231E-05	2.140E-05	1.070E-05	5.331E-06	2.140E-06	1.188E-06	7.797E-07	5.594E-07	4.260E-07	3.385E-07	2.778E-07
NE	6.576E-05	1.937E-05	9.590E-06	4.749E-06	1.894E-06	1.051E-06	6.928E-07	4.984E-07	3.805E-07	3.030E-07	2.490E-07
ENE	7.052E-05	2.072E-05	1.023E-05	5.062E-06	2.020E-06	1.123E-06	7.408E-07	5.336E-07	4.076E-07	3.248E-07	2.672E-07
E	5.367E-05	1.578E-05	7.791E-06	3.852E-06	1.533E-06	8.515E-07	5.618E-07	4.046E-07	3.091E-07	2.463E-07	2.026E-07
ESE	4.982E-05	1.476E-05	7.381E-06	3.659E-06	1.456E-06	8.062E-07	5.298E-07	3.803E-07	2.898E-07	2.305E-07	1.892E-07
SE	4.662E-05	1.398E-05	7.121E-06	3.563E-06	1.430E-06	7.885E-07	5.137E-07	3.663E-07	2.776E-07	2.197E-07	1.796E-07
SSE	4.549E-05	1.375E-05	7.088E-06	3.560E-06	1.430E-06	7.864E-07	5.097E-07	3.620E-07	2.734E-07	2.157E-07	1.760E-07

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) BEARING	DISTANCE IN MILES 5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.003E-07	5.320E-08	3.522E-08	2.079E-08	1.435E-08	1.078E-08	8.544E-09	7.024E-09	5.931E-09	5.111E-09	4.476E-09
SSW	1.228E-07	6.524E-08	4.323E-08	2.554E-08	1.765E-08	1.327E-08	1.052E-08	8.657E-09	7.313E-09	6.306E-09	5.524E-09
SW	1.635E-07	8.718E-08	5.791E-08	3.435E-08	2.379E-08	1.793E-08	1.424E-08	1.173E-08	9.923E-09	8.564E-09	7.510E-09
WSW	1.677E-07	8.987E-08	5.990E-08	3.568E-08	2.478E-08	1.871E-08	1.488E-08	1.227E-08	1.039E-08	8.975E-09	7.875E-09
W	9.518E-08	5.090E-08	3.387E-08	2.012E-08	1.395E-08	1.051E-08	8.348E-09	6.877E-09	5.816E-09	5.019E-09	4.400E-09
WNW	1.796E-07	9.569E-08	6.352E-08	3.762E-08	2.602E-08	1.957E-08	1.553E-08	1.278E-08	1.080E-08	9.309E-09	8.156E-09
NW	2.484E-07	1.340E-07	8.970E-08	5.375E-08	3.747E-08	2.837E-08	2.262E-08	1.869E-08	1.585E-08	1.371E-08	1.205E-08
NNW	3.096E-07	1.686E-07	1.137E-07	6.872E-08	4.821E-08	3.667E-08	2.934E-08	2.432E-08	2.068E-08	1.793E-08	1.578E-08
N	2.582E-07	1.405E-07	9.467E-08	5.719E-08	4.009E-08	3.048E-08	2.438E-08	2.020E-08	1.717E-08	1.488E-08	1.310E-08
NNE	2.336E-07	1.274E-07	8.588E-08	5.195E-08	3.645E-08	2.773E-08	2.220E-08	1.840E-08	1.564E-08	1.356E-08	1.194E-08
NE	2.098E-07	1.150E-07	7.785E-08	4.735E-08	3.334E-08	2.543E-08	2.040E-08	1.694E-08	1.443E-08	1.253E-08	1.104E-08
ENE	2.252E-07	1.237E-07	8.383E-08	5.106E-08	3.599E-08	2.748E-08	2.205E-08	1.832E-08	1.561E-08	1.356E-08	1.195E-08
E	1.707E-07	9.379E-08	6.358E-08	3.873E-08	2.731E-08	2.085E-08	1.674E-08	1.391E-08	1.185E-08	1.029E-08	9.076E-09
ESE	1.592E-07	8.697E-08	5.873E-08	3.561E-08	2.503E-08	1.906E-08	1.527E-08	1.267E-08	1.078E-08	9.356E-09	8.243E-09
SE	1.506E-07	8.117E-08	5.433E-08	3.255E-08	2.270E-08	1.718E-08	1.370E-08	1.133E-08	9.606E-09	8.311E-09	7.303E-09
SSE	1.472E-07	7.872E-08	5.241E-08	3.117E-08	2.164E-08	1.633E-08	1.298E-08	1.071E-08	9.063E-09	7.828E-09	6.868E-09

CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES .5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	4.780E-06	1.119E-06	3.622E-07	1.898E-07	1.209E-07	5.567E-08	2.113E-08	1.084E-08	7.042E-09	5.119E-09
SSW	5.883E-06	1.370E-06	4.434E-07	2.325E-07	1.481E-07	6.826E-08	2.596E-08	1.334E-08	8.678E-09	6.315E-09
SW	7.805E-06	1.809E-06	5.865E-07	3.084E-07	1.969E-07	9.114E-08	3.490E-08	1.802E-08	1.176E-08	8.576E-09
WSW	7.846E-06	1.820E-06	5.946E-07	3.146E-07	2.016E-07	9.385E-08	3.622E-08	1.880E-08	1.230E-08	8.987E-09
W	4.409E-06	1.033E-06	3.383E-07	1.788E-07	1.145E-07	5.317E-08	2.043E-08	1.056E-08	6.893E-09	5.026E-09
WNW	8.367E-06	1.967E-06	6.426E-07	3.385E-07	2.162E-07	1.000E-07	3.822E-08	1.967E-08	1.281E-08	9.322E-09
NW	1.150E-05	2.649E-06	8.686E-07	4.627E-07	2.980E-07	1.397E-07	5.451E-08	2.850E-08	1.873E-08	1.373E-08
NNW	1.425E-05	3.231E-06	1.063E-06	5.713E-07	3.704E-07	1.755E-07	6.959E-08	3.682E-08	2.437E-08	1.795E-08
N	1.181E-05	2.686E-06	8.866E-07	4.766E-07	3.089E-07	1.463E-07	5.792E-08	3.060E-08	2.024E-08	1.490E-08
NNE	1.069E-05	2.426E-06	8.003E-07	4.308E-07	2.794E-07	1.325E-07	5.260E-08	2.784E-08	1.843E-08	1.358E-08
NE	9.612E-06	2.154E-06	7.107E-07	3.846E-07	2.505E-07	1.196E-07	4.790E-08	2.553E-08	1.697E-08	1.254E-08
ENE	1.026E-05	2.297E-06	7.597E-07	4.121E-07	2.687E-07	1.285E-07	5.164E-08	2.758E-08	1.835E-08	1.357E-08
E	7.814E-06	1.745E-06	5.762E-07	3.124E-07	2.037E-07	9.746E-08	3.918E-08	2.093E-08	1.393E-08	1.030E-08
ESE	7.367E-06	1.657E-06	5.437E-07	2.931E-07	1.903E-07	9.047E-08	3.604E-08	1.914E-08	1.270E-08	9.367E-09
SE	7.063E-06	1.619E-06	5.281E-07	2.809E-07	1.807E-07	8.467E-08	3.301E-08	1.726E-08	1.135E-08	8.322E-09
SSE	7.001E-06	1.617E-06	5.244E-07	2.767E-07	1.771E-07	8.225E-08	3.165E-08	1.641E-08	1.073E-08	7.839E-09

TABLE 12

AVERAGE ANNUAL DEPOSITION PARAMETERS FOR AREAS AT OR BEYOND UNRESTRICTED AREA BOUNDARY

********** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS **********

DIRECTION FROM SITE	DISTANCES IN MILES 0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	1.059E-07	3.582E-08	1.839E-08	8.744E-09	3.141E-09	1.558E-09	9.172E-10	6.006E-10	4.226E-10	3.132E-10	2.413E-10
SSW	1.500E-07	5.072E-08	2.604E-08	1.238E-08	4.447E-09	2.205E-09	1.299E-09	8.503E-10	5.983E-10	4.434E-10	3.417E-10
SW	2.136E-07	7.222E-08	3.708E-08	1.763E-08	6.332E-09	3.140E-09	1.849E-09	1.211E-09	8.519E-10	6.313E-10	4.865E-10
WSW	1.650E-07	5.580E-08	2.865E-08	1.362E-08	4.893E-09	2.426E-09	1.429E-09	9.355E-10	6.583E-10	4.878E-10	3.759E-10
W	8.788E-08	2.972E-08	1.526E-08	7.254E-09	2.606E-09	1.292E-09	7.609E-10	4.982E-10	3.506E-10	2.598E-10	2.002E-10
WNW	1.835E-07	6.204E-08	3.185E-08	1.514E-08	5.440E-09	2.698E-09	1.588E-09	1.040E-09	7.319E-10	5.424E-10	4.180E-10
NW	2.144E-07	7.249E-08	3.722E-08	1.769E-08	6.356E-09	3.152E-09	1.856E-09	1.215E-09	8.551E-10	6.337E-10	4.884E-10
NNW	2.242E-07	7.582E-08	3.893E-08	1.851E-08	6.648E-09	3.297E-09	1.941E-09	1.271E-09	8.945E-10	6.629E-10	5.108E-10
N	1.643E-07	5.557E-08	2.853E-08	1.356E-08	4.872E-09	2.416E-09	1.423E-09	9.316E-10	6.555E-10	4.858E-10	3.743E-10
NNE	1.368E-07	4.627E-08	2.376E-08	1.129E-08	4.057E-09	2.012E-09	1.185E-09	7.756E-10	5.458E-10	4.045E-10	3.117E-10
NE	1.119E-07	3.786E-08	1.944E-08	9.240E-09	3.319E-09	1.646E-09	9.692E-10	6.346E-10	4.466E-10	3.309E-10	2.550E-10
ENE	9.912E-08	3.352E-08	1.721E-08	8.182E-09	2.939E-09	1.458E-09	8.582E-10	5.620E-10	3.954E-10	2.930E-10	2.258E-10
E	8.609E-08	2.911E-08	1.495E-08	7.106E-09	2.552E-09	1.266E-09	7.453E-10	4.880E-10	3.434E-10	2.545E-10	1.961E-10
ESE	9.069E-08	3.067E-08	1.575E-08	7.486E-09	2.689E-09	1.334E-09	7.852E-10	5.142E-10	3.618E-10	2.681E-10	2.066E-10
SE	1.225E-07	4.144E-08	2.128E-08	1.011E-08	3.633E-09	1.802E-09	1.061E-09	6.947E-10	4.888E-10	3.623E-10	2.792E-10
SSE	1.601E-07	5.413E-08	2.779E-08	1.321E-08	4.746E-09	2.354E-09	1.386E-09	9.075E-10	6.386E-10	4.733E-10	3.647E-10

DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	1.917E-10	8.517E-11	5.160E-11	2.608E-11	1.578E-11	1.058E-11	7.583E-12	5.694E-12	4.427E-12	3.537E-12	2.887E-12
SSW	2.715E-10	1.206E-10	7.305E-11	3.692E-11	2.235E-11	1.498E-11	1.074E-11	8.062E-12	6.268E-12	5.007E-12	4.087E-12
SW	3.865E-10	1.717E-10	1.040E-10	5.257E-11	3.182E-11	2.133E-11	1.529E-11	1.148E-11	8.925E-12	7.129E-12	5.819E-12
WSW	2.987E-10	1.327E-10	8.037E-11	4.062E-11	2.459E-11	1.648E-11	1.181E-11	8.870E-12	6.896E-12	5.509E-12	4.496E-12
W	1.591E-10	7.066E-11	4.280E-11	2.163E-11	1.309E-11	8.779E-12	6.291E-12	4.724E-12	3.673E-12	2.934E-12	2.395E-12
WNW	3.321E-10	1.475E-10	8.935E-11	4.516E-11	2.734E-11	1.833E-11	1.313E-11	9.861E-12	7.667E-12	6.125E-12	4.999E-12
NW	3.880E-10	1.724E-10	1.044E-10	5.277E-11	3.194E-11	2.142E-11	1.534E-11	1.152E-11	8.959E-12	7.156E-12	5.841E-12
NNW	4.059E-10	1.803E-10	1.092E-10	5.520E-11	3.341E-11	2.240E-11	1.605E-11	1.205E-11	9.373E-12	7.486E-12	6.110E-12
N	2.974E-10	1.321E-10	8.003E-11	4.045E-11	2.448E-11	1.642E-11	1.176E-11	8.832E-12	6.867E-12	5.486E-12	4.478E-12
NNE	2.476E-10	1.100E-10	6.664E-11	3.368E-11	2.039E-11	1.367E-11	9.794E-12	7.354E-12	5.718E-12	4.568E-12	3.728E-12
NE	2.026E-10	9.001E-11	5.452E-11	2.756E-11	1.668E-11	1.118E-11	8.013E-12	6.017E-12	4.679E-12	3.737E-12	3.050E-12
ENE	1.794E-10	7.970E-11	4.828E-11	2.440E-11	1.477E-11	9.902E-12	7.095E-12	5.328E-12	4.143E-12	3.309E-12	2.701E-12
E	1.558E-10	6.921E-11	4.193E-11	2.119E-11	1.283E-11	8.600E-12	6.162E-12	4.627E-12	3.598E-12	2.874E-12	2.346E-12
ESE	1.641E-10	7.292E-11	4.417E-11	2.233E-11	1.351E-11	9.060E-12	6.492E-12	4.875E-12	3.790E-12	3.028E-12	2.471E-12
SE	2.218E-10	9.852E-11	5.968E-11	3.017E-11	1.826E-11	1.224E-11	8.772E-12	6.587E-12	5.121E-12	4.091E-12	3.339E-12
SSE	2.897E-10	1.287E-10	7.797E-11	3.941E-11	2.385E-11	1.599E-11	1.146E-11	8.604E-12	6.690E-12	5.344E-12	4.362E-12

********** RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS **********

DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES .5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.798E-08	3.683E-09	9.613E-10	4.318E-10	2.443E-10	9.393E-11	2.717E-11	1.077E-11	5.751E-12	3.560E-12
SSW	2.545E-08	5.214E-09	1.361E-09	6.113E-10	3.458E-10	1.330E-10	3.847E-11	1.525E-11	8.143E-12	5.040E-12
SW	3.624E-08	7.424E-09	1.938E-09	8.704E-10	4.924E-10	1.894E-10	5.478E-11	2.171E-11	1.159E-11	7.176E-12
WSW	2.800E-08	5.736E-09	1.497E-09	6.726E-10	3.805E-10	1.463E-10	4.233E-11	1.678E-11	8.959E-12	5.545E-12
W	1.491E-08	3.055E-09	7.975E-10	3.582E-10	2.026E-10	7.792E-11	2.254E-11	8.934E-12	4.771E-12	2.953E-12
WNW	3.114E-08	6.378E-09	1.665E-09	7.477E-10	4.230E-10	1.627E-10	4.706E-11	1.865E-11	9.960E-12	6.165E-12
NW	3.638E-08	7.452E-09	1.945E-09	8.737E-10	4.943E-10	1.901E-10	5.499E-11	2.179E-11	1.164E-11	7.203E-12
NNW	3.805E-08	7.794E-09	2.035E-09	9.139E-10	5.170E-10	1.988E-10	5.752E-11	2.280E-11	1.217E-11	7.535E-12
N	2.789E-08	5.712E-09	1.491E-09	6.697E-10	3.789E-10	1.457E-10	4.215E-11	1.671E-11	8.921E-12	5.522E-12
NNE	2.322E-08	4.756E-09	1.242E-09	5.576E-10	3.155E-10	1.213E-10	3.510E-11	1.391E-11	7.428E-12	4.598E-12
NE	1.900E-08	3.891E-09	1.016E-09	4.563E-10	2.581E-10	9.926E-11	2.872E-11	1.138E-11	6.078E-12	3.762E-12
ENE	1.682E-08	3.446E-09	8.995E-10	4.040E-10	2.285E-10	8.789E-11	2.543E-11	1.008E-11	5.381E-12	3.331E-12
E	1.461E-08	2.992E-09	7.812E-10	3.509E-10	1.985E-10	7.633E-11	2.208E-11	8.752E-12	4.674E-12	2.893E-12
ESE	1.539E-08	3.153E-09	8.230E-10	3.696E-10	2.091E-10	8.042E-11	2.326E-11	9.220E-12	4.924E-12	3.048E-12
SE	2.080E-08	4.260E-09	1.112E-09	4.994E-10	2.825E-10	1.087E-10	3.143E-11	1.246E-11	6.653E-12	4.118E-12
SSE	2.717E-08	5.565E-09	1.453E-09	6.524E-10	3.691E-10	1.419E-10	4.106E-11	1.627E-11	8.691E-12	5.379E-12

ODCM TECHNICAL SPECIFICATIONS
CROSS-REFERENCE (TABLE 13)

Tech Spec Section	ODCM Section	Dose Calculation Methodology
3.3.3.10 3.11.1.1 4.11.1.1.2	8.7	Determination of Alarm/Trip Setpoints for Liquid Monitors
3.3.3.11 3.11.2.1 3.11.2.4 4.11.2.4.1	8.13	Determination of Alarm/Trip Setpoints for Gaseous Monitors
3.11.1.1 4.11.1.1.1 3.11.1.2 4.11.1.2 3.11.1.3 4.11.1.3.1	8.6	Liquid Effluents
3.11.2.1 4.11.2.1.3 4.11.2.4.1	8.10	Gaseous Effluents (Dose rate due to Noble Gases, Radioiodines, Particulates, and Radionuclides with half-lives greater than 8 days.)
3.11.2.1 3.11.2.2 4.11.2.2	8.11	Noble Gases
3.11.2.3 4.11.2.3	8.12	Radioiodines, Particulates, and Radionuclides with half-lives greater than 8 days
3.11.4 4.11.4.1 4.11.4.1	8.15	Total Dose (40CFR190)
3.12.1 4.12.1	8.2	Radiological Environmental Monitoring
3.12.3 4.12.3	8.3	Interlaboratory Comparison Program

LOUISIANA POWER & LIGHT / 142 DELARONDE STREET
P. O. BOX 6008 • NEW ORLEANS, LOUISIANA 70174 • (504) 366-2345
MIDDLE SOUTH UTILITIES SYSTEM

February 26, 1986

W3P86-0040
A4.05
QA

Mr. Robert D. Martin
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Semiannual Radioactive Effluent Release Report

Dear Mr. Martin:

Enclosed is the subject report on effluent releases which covers the period of July 1 to December 31, 1985. This report is submitted per Section 6.9.1.8 in the Waterford 3 Technical Specifications (NUREG-1117) of Appendix A to Facility Operating License No. NPF-38 and pursuant to 10 CFR 50.36a(a)(2).

Very truly yours,

K.W. Cook
Nuclear Support & Licensing Manager

KWC:GEW:ssf

Enclosure

cc (w/enclosure): NRC, Director, Office of I&E
NRC, Document Control Desk, Washington, D.C.

cc (w/o enclosure): G.W. Knighton, NRC-NRR
J.H. Wilson, NRC-NRR
NRC Resident Inspectors Office
B.W. Churchill
W.M. Stevenson

IE25
1/1