Attachment to

W3F1-2011-0033

Annual Radioactive Effluent Release Report – 2010

Entergy

Annual Radioactive Effluent Release Report

January 1, 2010 - December 31, 2010

Waterford 3 SES
Entergy Operations, Inc.

Docket Number 50-382 License Number NPF-38

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1.0 Introduction

This Annual Radioactive Effluent Release Report is submitted as required by Waterford 3 Technical Specification 6.9.1.8. It covers the period from January 1, 2010 through December 31, 2010. Information in this report is presented in the format outlined in Appendix B of Regulatory Guide 1.21 and in Section 5.8.1 of the Offsite Dose Calculation Manual (UNT-005-014).

The information contained in this report includes:

- A summary of the quantities of radioactive liquid and gaseous effluents and solid wastes released from the plant during the reporting period.
- A summary of the meteorological data collected during 2010.
- Assessment of radiation doses due to liquid and gaseous radioactive effluents released during 2010.
- A discussion of Unplanned/Abnormal releases that occurred during the reporting period.
- A submittal of changes to the Offsite Dose Calculation Manual and Process Control Program during this reporting period.
- A discussion of why required radioactive effluent monitoring instrumentation was not returned to service within the time specified.
- A discussion of any instances in which effluent samples were not collected within the required frequency.

2.0 Supplemental Information

2.1 Regulatory Limits

The limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections. These limits are addressed by reference in UNT-005-014, Offsite Dose Calculation Manual, and directly in the Technical Requirements Manual (TRM).

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,
- 3000 mrem/yr to the skin.

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

- During any calendar quarter, Less than or equal to:
  - 5 mrad for gamma radiation; and,
  - 10 mrad for beta radiation.
- During any calendar year, Less than or equal to:
  - 10 mrad for gamma radiation; and,
  - 20 mrad for beta radiation.

2.1.2 Iodines, Particulates with Half Lives > Eight (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:

- During any calendar quarter, less than or equal to:
  - 7.5 mrem to any organ.
- 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 ten times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 µCi/ml.

The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas shall be limited to the following:

During any calendar quarter, less than or equal to:

- 1.5 mrem to the total body; and,
- 5 mrem to any organ, and

During any calendar year, less than or equal to

- 3 mrem to the total body; and,
- 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 over 12 consecutive months shall be limited to less than or equal to:

- 25 mrem to the Total Body or any organ (except thyroid); and,
- 75 mrem to the thyroid

2.2 Maximum Permissible Concentrations

2.2.1 Fission and Activation Gases, Iodines, and Particulates, With Half Lives > Eight (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

Ten times the effluent concentration (EC) values specified in 10 CFR Part 20, Appendix B, Table 2, 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 concentration limit for dissolved and entrained noble gases in liquid effluents.

2.3 Average Energy (E-Bar)

This is not applicable to Waterford 3 effluent specifications. E-Bar is not required to be calculated from effluent release data. The average energy (E-Bar) for the Reactor Coolant System (RCS) is supplied as additional information in the report further below.

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 Technical Requirements Manual (TRM).

2.4.1 Fission and Activation Gases (Noble Gases)

For continuous releases, a gas grab sample was analyzed at least 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 total radioactivity in gaseous effluents was determined from measured concentrations of each radionuclide present and the total volume discharged.

2.4.2 Iodines, Particulates, and Tritium

Iodines and particulates discharged were sampled using a continuous sampler which contained a charcoal cartridge and a particulate filter. Each week the charcoal cartridge and particulate filter were analyzed for gamma emitters using gamma spectroscopy. The determined radionuclide concentrations and effluent volumes discharged were used to calculate the previous week's activity released. The particulate samples were composited and analyzed quarterly for Sr-89 and Sr-90 by a contract laboratory (Gel, Laboratories). Particulate gross alpha activity was measured weekly using alpha scintillation or gas-flow proportional counting techniques. The determined activities were used to estimate effluent concentrations in subsequent releases until the next scheduled analysis was performed. Annual Carbon-14 release estimate was obtained from the Waterford 3 Final Safety Analysis Report. Release of Carbon-14 was assumed to be continuous.

Grab samples of continuous releases were analyzed at least monthly for tritium. Containment purge batch releases are analyzed prior to release. 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 following week's releases. For batch releases, gamma analysis was performed on the sample prior to release.

For both continuous and batch releases, composite samples were analyzed quarterly by a contract laboratory (Gel, Laboratories) for Sr-89, Sr-90, and Fe-55. Samples were composited and analyzed monthly for tritium and gross alpha using liquid scintillation and gas flow proportional counting techniques, respectively. For radionuclides measured in the composite samples, the measured concentrations in the composite samples from the previous month or quarter were used to estimate released quantities of these isotopes in liquid effluents during the current month or quarter when the analysis results became available.

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

2.5 Batch Releases

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

2.6 Unplanned/Abnormal Releases

2.6.1 Unplanned/Abnormal Gaseous Releases

There were no unplanned/abnormal gaseous releases during the reporting period.

2.6.2 Unplanned/Abnormal Liquid Releases

There were no unplanned/abnormal liquid releases during this reporting period.

3.0 Gaseous Effluents

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A, 1B, and 1C. Note that there were no elevated releases, since all Waterford 3 releases are considered to be at ground level. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

4.0 Liquid Effluents

The quantities of radioactive material released in liquid effluents are summarized in Tables 2A and 2B. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

5.0 Solid Wastes

The summary of radioactive solid wastes shipped offsite for disposal is listed in Table 3. For certain waste forms, Waterford 3 uses volume reduction services provided by a contractor. These waste forms are included in Table 3 and the volumes reported reflect the volume of waste shipped offsite, not final disposal volumes. Final disposal volumes for wastes compacted offsite are available upon request. The estimated total error in % is based upon several statistical uncertainties due to sample counting, efficiency, volume, etc.

6.0 Meteorological Data

In Table 4, the hourly meteorological data from January 1, 2010 through December 31, 2010, is presented in the form of a joint frequency distribution of wind speed, wind direction, and atmospheric stability (hourly data is also available upon request). The standard Pasquill classification scheme, as presented in Regulatory Guide 1.23, is used to determine stability class from differential temperature measurements. The Waterford-3 data recovery results by parameter are as follows:

Differiential Temp.	98.30%
Wind Speed	98.30%
Wind Direction	98.30%
Overall*	98.30%

A. - Simultaneous occurrence of valid data for all three parameters.

Dispersion and deposition values were determined from the 2010 data and used in the assessment of doses due to gaseous effluents released from site during the 2010 period.

7.0 Assessment of Doses

7.1 Dose Due to Gaseous Effluents

7.1.1 Air Doses at the Site Boundary

Air doses from gaseous effluents were evaluated at the closest offsite location that could be occupied continuously during the term of plant operation and that would result in the highest dose. This location was determined by examining the atmospheric dispersion parameters (χ/Q) at the closest offsite locations that could be continuously occupied during plant operation in each of the meteorological sectors surrounding the plant. The location that would have the highest dose would be that location having the most restrictive (largest) χ/Q value.
Based on actual meteorological data collected during 2010, this location was determined to be in the NNE sector (χ/Q = 2.0E-05 sec/m^3) at a distance of 869 meters (0.54 miles) from the reactor building. Doses were assessed at this location in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering only beta and gamma exposures in air due to noble gas. The results of these assessments for the year 2010 are summarized as follows:

Beta air dose: 0.00 mrad

Gamma air dose: 0.00 mrad

The above beta and gamma air doses represent the following percentage of the annual dose limits:

0% of the Beta air dose limit (20 mrad)
0% of the Gamma air dose limit (10 mrad)

Dose calculation results are summarized by quarters in Table 5A. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.1.2 Maximum Organ Dose to the Critical Receptor

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 eight (8) days in gaseous effluents released to areas at and beyond the site boundary was determined for 2010.

An assessment of the maximum organ dose was performed for the critical receptor. The critical receptor was assumed to be located at the nearest residence to the plant having the most restrictive atmospheric dispersion (χ/Q) and deposition (D/Q) parameters. Furthermore, it was assumed that the receptor living at this residence consumed food products that were either raised or produced at this residence.

Using land use census and meteorological data for 2010 the residence with the highest χ/Q value (7.6E-06 sec/m^3) and the highest D/Q value (1.9E-08 m^{-2}) was determined to be in the ENE sector at a distance of 1513 meters (0.94 miles) from the reactor building. The dose calculation was performed in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual considering the inhalation, ground plane exposure, and ingestion pathways. The maximum organ dose to the critical receptor excluding C-14 was determined for historical trending to be:

0.057 mrem to the child thyroid.

This represents 0.4% of the Annual Organ Dose limit (15 mrem).

The maximum organ dose to the critical receptor including C-14 was determined to be:

3.86 mrem to the child bone.

This represents 25.7% of the Annual Organ Dose limit (15 mrem).

Dose calculation results are summarized by quarters in Table 5A. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.2 Doses Due to Liquid Effluents

The annual doses to the maximum exposed individual, an adult, resulting from exposure to liquid effluents released during 2010 from Waterford 3 were:

1.81E-4 mrem to the Total Body.
2.11E-4 mrem to the maximum exposed organ (liver)

The above doses represent the following percentage of the Annual Dose limits:

0.01% of the Total Body Dose Limit (3 mrem), and
0.002% of the Organ Dose Limit (10 mrem).

Dose calculation results are summarized by quarter in Table 5B. The doses were calculated in accordance with the methodology described in the Waterford 3 Offsite Dose Calculation Manual.

7.3 40 CFR Part 190 Dose Evaluation

In accordance with Technical Requirements Manual (TRM), Specification 3/4.11.4, Total Dose, dose evaluations to demonstrate compliance with Surveillance Requirements 4.11.4.1 and 4.11.4.2 of the Technical Requirements Manual (TRM), 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 2010 were any of these limits exceeded; therefore, the evaluation was not required.

7.4 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 would be an employee at the Waterford 1 and 2 fossil fuel plants, located in the NW sector at a distance of approximately 670 meters (0.42 miles) from the reactor building.

The doses for such an individual were determined by scaling the full-time occupancy doses due to airborne effluents by the occupancy time due to a normal working year. Based on an assumed occupancy of 25% (40 hour work week) and the fact that all employees are adults, the calculated doses were determined to be less than:

1.38E-2 mrem to the maximum exposed organ (thyroid)

All doses for receptors inside the site boundary were calculated according to the methodology described in the *Waterford 3 Offsite Dose Calculation Manual considering only the inhalation and ground plane exposure* pathways.

8.0 Related Information

8.1 Changes to the Process Control Program

There were no changes to EN-RW-105 in 2010.

8.2 Changes to the Offsite Dose Calculation Manual

There were minor editorial changes to the ODCM in 2010.

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 Requirements Manual (TRM) Table 3.12-1. Milk is collected, when available, from the control location and one identified sampling location as indicated in UNT-005-014, Offsite Dose Calculation Manual, Attachment 7.13.

8.4 Report of Required Effluent Instrument Inoperability

Technical Requirements Manual (TRM) Specifications 3.3.3.10 and 3.3.3.11 require reporting in the Annual Radioactive Effluent Release Report of why designated inoperable effluent monitoring instrumentation was not restored to operability within the time specified in the Action Statement.

During the reporting period, all instrumentation was restored to operability within the time specified.

8.5 Activity Released Via Secondary Pathways

The following secondary release paths were continuously monitored for radioactivity:

- The Hot Machine Shop Exhaust (AH-35),
- Decontamination Shop Exhaust (AH-34),
- The RAB H&V Equipment Room Ventilation system Exhaust (E-41A and E-41B); and,
- The Switchgear/Cable Vault Area Ventilation System (AH-25).

Continuous sampling for these areas is maintained in order to demonstrate the operability of installed treatment systems and to verify integrity of barriers separating primary and secondary ventilation systems. Sampling for these areas was limited to continuous particulate and iodine sampling and monthly noble gas grab sampling. The activity released via these secondary pathways resulted from routine operations and remained below significant levels.

8.6 Missed Effluent Samples

During the reporting period, no incident occurred for which effluent samples were not sampled and/or analyzed as required by the ODCM/TRM.

8.7 Major Changes to Radioactive Waste Systems

During the reporting period, no major changes were made to any Radioactive Waste Systems. All major changes to Radioactive Waste Systems are included in Waterford 3's FSAR updates.

8.8 Biennial Land Use Census

A land use census was last performed in 2010. The land use census performed in 2010 did not identify the need for any changes to locations being used for effluent dose calculations or radiological environmental sampling.

8.9 Gaseous Storage Tank Total Radioactivity Limit

Technical Specification 3/4.11.2.6 specifies that the quantity of radioactivity contained in each gas storage tank be maintained less than or equal to 8.5E+04 Curies noble gas (considered as Xe-133 equivalent). At no time during the reporting period was this value exceeded.

8.10 Unprotected Outside Tank Total Radioactivity Limit

Technical Specification 3/4.11.1.4 specifies that the quantity of radioactive material contained in each unprotected outdoor tank be maintained less than or equal to 7.85E-04 Curies (excluding tritium and dissolved and entrained noble gases). During this reporting period, there were no instances in which this limit was exceeded.

9.0 Additional Information

9.1 Reactor Coolant System Average Energy (E-Bar)

Reactor Coolant System E-Bar calculations were done on 2/22/10 and 8/16/10 with values of 0.1028 and 0.0355 Mev/disintegration, respectively. Reactor Coolant System E-Bar is supplied for information only and is not used for effluent dose calculations.

9.2 Groundwater Initiative Data

Groundwater wells were monitored at Waterford 3 during 2010 as part of the NEI Groundwater Initiative. Sampling of the three installed wells was conducted on a quarterly basis. All results were less than minimum detectable activity for gamma emitters and tritium during 2010.

10.0 Tables

11.0 Attachments

Copy of UNT-005-014, "Offsite Dose Calculation Manual" Revision 302.

Table 1
Batch Release Summary

Batch Release Summary information for 2010 Report Period.

Report Category : Batch Release Summary
Release Point : All
Type of Release : Batch Liquid and Gaseous
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

Liquid Releases		
Number of Releases	40	
Total Time for All Releases	11712.0	Minutes
Maximum Time for a Release	343.0	Minutes
Average Time for a Release	292.8	Minutes
Minimum Time for a Release	235.0	Minutes
Average Stream Flow	618316	ft^3/s

Gaseous Releases		
Number of Releases	0	
Total Time for All Releases	0	Minutes
Maximum Time for a Release	0	Minutes
Average Time for a Release	0	Minutes
Minimum Time for a Release	0	Minutes

Batch Release Summary information for 2010 by Quarter.

Report Category : Batch Release Summary
Release Point : All
Type of Release : Batch Liquid and Gaseous
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

Liquid Releases

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases	10	12	11	7	
Total Time for All Releases	2804.0	3562.0	3298.0	2048.0	Minutes
Maximum Time for a Release	321.0	343.0	321.0	309.0	Minutes
Average Time for a Release	280.4	296.8	299.8	292.6	Minutes
Minimum Time for a Release	235.0	259.0	269.0	265.0	Minutes
Average Stream Flow	780366	696433	472400	712400	ft^3/s

Gaseous Releases

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Number of Releases	0	0	0	0	
Total Time for All Releases	0	0	0	0	Minutes
Maximum Time for a Release	0	0	0	0	Minutes
Average Time for a Release	0	0	0	0	Minutes
Minimum Time for a Release	0	0	0	0	Minutes

Table 1A
Annual Summation of All Releases by Quarter
All Airborne Effluents

Report Category : Summation of All Releases
Type of Activity : All Airborne Effluents
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Gases						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E+01
2. Average Release Rate for Period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Radioiodines						
1. Total Iodine-131	Curies	5.77E-06	0.00E+00	0.00E+00	1.24E-07	1.50E+01
2. Average Release Rate for Period	uCi/sec	7.41E-07	0.00E+00	0.00E+00	1.57E-08	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Particulates						
1. Particulates (Half-lives > 8 Days)	Curies	9.60E-06	2.04E-06	2.27E-06	2.81E-06	1.50E+01
2. Average Release Rate for Period	uCi/sec	1.23E-06	2.59E-07	2.86E-07	3.54E-07	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
4. Gross Alpha Radioactivity	Curies	8.27E-07	4.29E-07	1.51E-06	1.21E-06	1.50E+01
5. Carbon-14	Curies	2.53E+00	2.53E+00	2.53E+00	2.53E+00	
D. Tritium						
1. Total Release	Curies	1.74E+01	1.67E+01	1.47E+01	1.08E+01	1.50E+01
2. Average Release Rate for Period	uCi/sec	2.23E+00	2.12E+00	1.85E+00	1.35E+00	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	

Table 1B
Annual Airborne Continuous Elevated and Ground Level Releases
Totals for Each Nuclide Released

Report Category : Airborne Continuous Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioiodines									
I-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-06	0.00E+00	0.00E+00	3.67E-08
I-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.77E-08
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-06	0.00E+00	0.00E+00	1.24E-07
Particulates									
H-3	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E+01	1.67E+01	1.47E+01	1.08E+01
Br-82			Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00 0.00E+00									
Co-58	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-06	1.09E-07	0.00E+00	0.00E+00
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-07	0.00E+00	2.06E-07	1.04E-07
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-07
Cs-134	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.99E-06	8.62E-07	8.64E-07	7.15E-07
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-06	1.07E-06	1.20E-06	1.54E-06
Fe-59	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-07	0.00E+00	1.14E-09	0.00E+00
La-140	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-07	0.00E+00	0.00E+00	0.00E+00
Os-185	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-07	0.00E+00	0.00E+00	0.00E+00
Os-191	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-06	0.00E+00	0.00E+00	0.00E+00
Ru-103	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-07	0.00E+00	0.00E+00	0.00E+00
Zr-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-07	0.00E+00	0.00E+00	0.00E+00
Gralpha	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.27E-07	4.29E-07	1.51E-06	1.21E-06
C-14	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.53E+00	2.53E+00	2.53E+00	2.53E+00
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E+01	1.92E+01	1.72E+01	1.33E+01

Table 1C
Annual Airborne Batch Elevated and Ground Level Releases
Totals for Each Nuclide Released

Report Category : Airborne Batch Elevated and Ground Level Releases.
: Totals for Each Nuclide Released.
Type of Activity : Fission Gases, Iodines, and Particulates
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

		Elevated Releases				Ground Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fission and Activation Gases									
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioiodines									
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates									
H-3	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2A
Annual Summation of All Releases by Quarter
All Liquid Effluents

Report Category : Summation of All Releases
Type of Activity : All Liquid Effluents
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est.Total Error %
A. Fission and Activation Products						
1. Total Release (Not Including Tritium, Gases, and Alpha	Curies	2.00E-03	2.82E-03	1.53E-03	2.50E-04	1.50E+01
2. Average Diluted Concentration During Period	uCi/sec	7.08E-11	8.36E-11	3.49E-11	1.26E-11	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
B. Tritium						
1. Total Release	Curies	5.51E+01	3.18E+01	3.01E+01	2.60E+01	1.50E+01
2. Average Diluted Concentration During Period	uCi/sec	1.95E-06	9.41E-07	6.86E-07	1.32E-06	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
C. Dissolved and Entrained Gases						
1. Total Release	Curies	1.85E-03	9.47E-06	4.43E-06	8.19E-06	1.50E+01
2. Average Diluted Concentration During Period	uCi/sec	6.55E-11	2.80E-13	1.01E-13	4.14E-13	
3. Percent of Applicable Limit	%	n/a	n/a	n/a	n/a	
D. Gross Alpha Radioactivity						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E+01
E. Waste Volume Released (Pre-Dilution)	Liters	1.36E+07	1.27E+07	1.59E+07	9.01E+06	1.50E+01
F. Volume of Dilution Water Used	Liters	2.83E+10	3.38E+10	4.38E+10	1.98E+10	1.50E+01

Table 2B
Annual Liquid Continuous and Batch Releases
Totals for Each Nuclide Released

Report Category : Liquid Continuous and Batch Releases.
: Totals for Each Nuclide Released.
Type of Activity : All Radionuclides
Period Start Time : 01-jan-2010 00:00:00
Period End Time : 31-dec-2010 23:59:59

		Continuous Releases				Batch Releases			
Nuclide	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
All Nuclides									
H-3	Curies	7.51E-02	2.00E-01	3.41E-01	2.48E-01	5.51E+01	3.16E+01	2.97E+01	2.58E+01
Ag-110m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-05	2.17E-05	0.00E+00	0.00E+00
Co-58	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E-04	9.48E-05	3.85E-05	1.35E-05
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.05E-04	1.70E-05	8.45E-05	6.19E-06
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-05	0.00E+00	0.00E+00	0.00E+00
Cs-134	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-06	4.75E-06	3.71E-06	0.00E+00
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.58E-06	2.15E-06	4.31E-06	0.00E+00
Fe-55	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	2.50E-03	1.31E-03	2.04E-04
Fe-59	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-05	0.00E+00	0.00E+00	0.00E+00
Kr-85	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-03	0.00E+00	0.00E+00	0.00E+00
Mn-54	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-05	3.53E-06	1.64E-05	0.00E+00
Mo-99	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.72E-06	0.00E+00	0.00E+00	0.00E+00
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-04	3.81E-06	3.14E-05	0.00E+00
Sb-125	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E-05	1.79E-04	1.68E-05	2.63E-05
Xe-131m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-04	0.00E+00	0.00E+00	0.00E+00
Xe-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.47E-06	4.43E-06	8.19E-06
Zr-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.86E-05	0.00E+00	2.28E-05	0.00E+00
Total for Period	Curies	7.51E-02	2.00E-01	3.41E-01	2.48E-01	5.51E+01	3.16E+01	2.97E+01	2.58E+01

Table 3
Solid Waste Shipped Offsite for Burial or Disposal

SUMMARY BY MAJOR WASTE TYPES

Waste Stream : Resins, Filters, and Evaporator Bottoms ♦

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	% Error (Ci)
A	8.70E+02	2.46E+01	1.35E+01	+/- 25%
B	1.40E+02	3.96E+00	2.68E+01	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
ALL	1.01E+03	2.86E+01	4.04E+01	+/- 25%

Waste Stream : Dry Active Waste ♣

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	1.25E+04	3.55E+02	4.00E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	1.25E+04	3.55E+02	4.00E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste (Combined Packages)

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	5.00E+02	1.42E+01	1.01E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	5.00E+02	1.42E+01	1.01E-01	+/-25%

Waste Stream : Sum of All 4 Categories

Waste Class	Volume Ft^3	Volume M^3	Curies Shipped	%Error (Ci)
A	1.39E+04	3.94E+02	1.40E+01	+/-25%
B	1.40E+02	3.96E+00	2.68E+01	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
ALL	1.40E+04	3.98E+02	4.09E+01	+/-25%

♣ Activity determined by estimations

♦ Activity determined by measurements

Table 3

Estimate of major nuclide composition (by waste type)

Waste Stream : Resins, Filters, and Evap Bottoms

Nuclide Name	Percent Abundance	Curies
H-3	1.866%	7.53E-01
Be-7	0.007%	2.74E-03
C-14	0.092%	3.71E-02
Cr-51	0.021%	8.62E-03
Mn-54	0.843%	3.40E-01
Fe-55	16.428%	6.63E+00
Co-57	0.010%	4.19E-03
Co-58	0.636%	2.57E-01
Co-60	3.054%	1.23E+00
Ni-63	26.764%	1.08E+01
Sr-89	0.042%	1.69E-02
Sr-90	0.146%	5.89E-02
Zr-95	0.029%	1.18E-02
Nb-95	0.067%	2.70E-02
Sb-125	3.145%	1.27E+00
Cs-134	6.802%	2.75E+00
Cs-137	40.008%	1.62E+01
Ce-144	0.026%	1.06E-02
Pu-238	0.000%	1.23E-04
Pu-239	0.000%	4.52E-05
Pu-241	0.010%	3.94E-03
Am-241	0.000%	9.58E-05
Cm-242	0.000%	2.79E-09
Cm-243	0.001%	3.27E-04
Cm-244	0.000%	1.56E-04

Table 3

Estimate of major nuclide composition (by waste type)

Waste Stream : Dry Active Waste

Nuclide Name	Percent Abundance	Curies
H-3	0.948%	3.79E-03
C-14	0.196%	7.83E-04
Mn-54	3.525%	1.41E-02
Fe-55	26.895%	1.07E-01
Co-57	0.099%	3.96E-04
Co-58	5.164%	2.06E-02
Co-60	3.799%	1.52E-02
Ni-59	0.037%	1.49E-04
Ni-63	21.658%	8.65E-02
Sr-89	0.116%	4.62E-04
Sr-90	0.088%	3.51E-04
Zr-95	0.067%	2.67E-04
Nb-95	0.159%	6.37E-04
Tc-99	0.001%	3.54E-06
Sb-125	0.583%	2.33E-03
Cs-134	12.844%	5.13E-02
Cs-137	23.780%	9.50E-02
Ce-144	0.037%	1.49E-04
Pu-238	0.000%	2.87E-07
Pu-239	0.000%	3.81E-08
Pu-240	0.000%	3.81E-08
Pu-241	0.001%	5.98E-06
Pu-242	0.000%	5.67E-08
Am-241	0.000%	2.64E-07
Cm-242	0.000%	7.09E-08
Cm-243	0.001%	3.76E-06
Cm-244	0.001%	3.75E-06

Table 3

Estimate of major nuclide composition (by waste type)

Waste Stream : Irradiated Components

N/A - None Shipped in 2010.

Table 3

Estimate of major nuclide composition (by waste type)

Waste Stream : Other Waste (Combined Packages)

Nuclide Name	Percent Abundance	Curies
H-3	1.538%	1.56E-03
C-14	0.293%	2.96E-04
Mn-54	2.925%	2.96E-03
Fe-55	39.818%	4.03E-02
Co-57	0.036%	3.67E-05
Co-58	2.340%	2.37E-03
Co-60	3.397%	3.44E-03
Ni-63	19.796%	2.01E-02
Sr-89	0.158%	1.60E-04
Sr-90	0.077%	7.82E-05
Zr-95	0.107%	1.09E-04
Nb-95	0.254%	2.58E-04
Sb-125	0.643%	6.51E-04
Cs-134	12.552%	1.27E-02
Cs-137	16.035%	1.62E-02
Ce-144	0.027%	2.77E-05
Cm-243	0.001%	1.46E-06
Cm-244	0.001%	1.46E-06

Table 3

Estimate of major nuclide composition (by waste type)

Waste Stream : Sum of All 4 Categories

Nuclide Name	Percent Abundance	Curies
H-3	1.856%	7.59E-01
Be-7	0.007%	2.74E-03
C-14	0.093%	3.82E-02
Cr-51	0.021%	8.62E-03
Mn-54	0.875%	3.57E-01
Fe-55	16.589%	6.78E+00
Co-57	0.011%	4.63E-03
Co-58	0.685%	2.80E-01
Co-60	3.062%	1.25E+00
Ni-59	0.000%	1.49E-04
Ni-63	26.697%	1.09E+01
Sr-89	0.043%	1.75E-02
Sr-90	0.145%	5.93E-02
Zr-95	0.030%	1.22E-02
Nb-95	0.068%	2.79E-02
Tc-99	0.000%	3.54E-06
Sb-125	3.114%	1.27E+00
Cs-134	6.875%	2.81E+00
Cs-137	39.790%	1.63E+01
Ce-144	0.026%	1.08E-02
Pu-238	0.000%	1.24E-04
Pu-239	0.000%	4.53E-05
Pu-240	0.000%	3.81E-08
Pu-241	0.010%	3.94E-03
Pu-242	0.000%	5.67E-08
Am-241	0.000%	9.61E-05
Cm-242	0.000%	7.37E-08
Cm-243	0.001%	3.33E-04
Cm-244	0.000%	1.62E-04

Table 3

Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport Services	Energy Solutions
10	Hittman Transport Services	Energy Solutions Bear Creek
3	Hittman Transport Services	Studsvik Processing Facility LLC-Erwin

Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS A

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	0	1	20	8	0	0	0	0	30
NNE	0	0	0	0	1	9	15	1	0	0	0	0	26
NE	0	0	0	0	0	19	49	5	0	0	0	0	73
ENE	0	0	0	0	0	1	8	1	0	0	0	0	10
E	0	0	0	0	0	1	2	2	0	0	0	0	5
ESE	0	0	0	0	0	2	3	3	3	0	0	0	11
SE	0	0	0	0	0	2	14	8	3	0	0	0	27
SSE	0	0	0	0	0	1	18	27	0	0	0	0	46
S	0	0	0	0	0	1	10	10	0	0	0	0	21
SSW	0	0	0	0	0	0	9	0	0	0	0	0	9
SW	0	0	0	0	0	3	3	0	0	0	0	0	6
WSW	0	0	0	0	0	1	2	3	0	0	0	0	6
W	0	0	0	0	0	0	9	5	0	0	0	0	14
WNW	0	0	0	0	0	0	8	7	0	0	0	0	15
NW	0	0	0	0	0	0	6	8	1	0	0	0	15
NNW	0	0	0	0	2	1	31	10	2	0	0	0	46
Total	0	0	0	1	3	42	207	98	9	0	0	0	360

Number of calms for A Stability: 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS B

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	4	6	9	3	1	0	0	0	24
NNE	0	0	0	0	2	10	2	1	0	0	0	0	15
NE	0	0	0	1	1	18	40	3	0	0	0	0	63
ENE	0	0	0	0	0	4	2	0	0	0	0	0	6
E	0	0	0	0	1	0	3	1	0	0	0	0	5
ESE	0	0	0	0	0	0	6	2	0	0	0	0	8
SE	0	0	0	0	0	1	14	8	1	0	0	0	24
SSE	0	0	0	0	1	8	18	11	0	0	0	0	38
S	0	0	0	0	0	9	14	5	0	0	0	0	28
SSW	0	0	0	0	0	3	7	1	0	0	0	0	11
SW	0	0	0	0	2	13	7	0	0	0	0	0	22
WSW	0	0	0	0	1	5	5	3	0	0	0	0	14
W	0	0	0	1	1	2	7	5	0	0	0	0	16
WNW	0	0	0	0	0	2	10	2	0	0	0	0	14
NW	0	0	0	0	1	0	10	3	0	0	0	0	14
NNW	0	0	0	0	3	6	11	11	0	0	0	0	31
Total	0	0	0	3	17	87	165	59	2	0	0	0	333

Number of calms for B Stability: 0

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS C

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	2	8	12	12	4	1	1	0	0	40
NNE	0	0	0	1	4	10	10	0	0	0	0	0	25
NE	0	0	0	0	2	23	64	4	0	0	0	0	93
ENE	0	0	0	0	0	6	11	1	0	0	0	0	18
E	0	0	0	0	0	2	2	3	0	0	0	0	7
ESE	0	0	0	0	1	2	12	3	0	0	0	0	18
SE	0	0	0	0	1	4	32	13	0	0	0	0	50
SSE	0	0	0	0	0	9	28	9	0	0	0	0	46
S	0	0	0	0	0	10	27	11	0	0	0	0	48
SSW	0	0	0	0	3	13	13	4	0	0	0	0	33
SW	0	0	0	1	3	9	8	3	0	0	0	0	24
WSW	0	0	0	2	5	17	7	1	0	0	0	0	32
W	0	0	0	1	2	8	7	7	0	0	0	0	25
WNW	0	0	0	0	4	11	9	2	0	0	0	0	26
NW	0	0	0	1	1	4	8	1	0	0	0	0	15
NNW	0	0	0	0	4	10	17	15	3	0	0	0	49
Total	0	0	0	8	38	150	267	81	4	1	0	0	549

Number of calms for C Stability: 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS D

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	1	2	12	25	72	111	69	11	0	0	0	303
NNE	1	0	2	13	27	52	78	16	0	0	0	0	189
NE	0	0	1	15	19	94	176	21	5	1	0	0	332
ENE	0	1	0	3	11	24	62	11	1	0	0	0	113
E	0	0	0	2	3	14	24	5	0	0	0	0	48
ESE	0	0	0	0	6	6	48	27	2	0	0	0	89
SE	0	0	0	3	6	12	107	68	8	0	0	0	204
SSE	0	1	1	4	10	45	139	61	2	0	0	0	263
S	0	0	1	2	16	35	81	77	32	0	0	0	244
SSW	0	0	0	7	11	19	36	17	6	0	0	0	96
SW	0	0	0	6	29	29	27	9	0	0	0	0	100
WSW	0	0	1	18	22	43	35	3	0	0	0	0	122
W	0	1	1	12	27	34	46	16	0	0	0	0	137
WNW	0	0	1	9	10	21	26	5	0	0	0	0	72
NW	0	0	4	8	15	25	43	18	1	0	0	0	114
NNW	0	0	2	6	16	53	81	114	23	0	0	0	295
Total	1	4	16	120	253	578	1120	537	91	1	0	0	2721

Number of calms for D Stability: 0

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS E

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	2	6	10	19	110	82	2	0	0	0	0	231
NNE	0	1	4	7	17	63	66	8	1	0	0	0	167
NE	0	1	2	8	24	69	90	11	0	0	0	0	205
ENE	0	1	0	8	13	21	52	15	2	0	0	0	112
E	0	1	2	7	8	36	28	2	1	0	0	0	85
ESE	1	5	1	5	6	36	134	26	0	0	0	0	214
SE	0	0	2	3	13	83	120	5	0	0	0	0	226
SSE	0	2	5	12	39	156	64	3	0	0	0	0	281
S	0	2	1	29	41	90	53	2	0	0	0	0	218
SSW	2	2	4	33	32	34	23	0	0	0	0	0	130
SW	1	4	7	29	42	38	17	0	0	0	0	0	138
WSW	0	2	8	58	47	30	10	0	0	0	0	0	155
W	1	4	13	49	26	12	6	0	0	0	0	0	111
WNW	0	3	8	30	31	24	5	0	0	0	0	0	101
NW	0	4	4	15	35	47	38	1	0	0	0	0	144
NNW	0	2	0	14	17	46	48	8	0	0	0	0	135
Total	5	36	67	317	410	895	836	83	4	0	0	0	2653

Number of calms for E Stability: 0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS F

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	6	7	12	20	25	2	0	0	0	0	0	72
NNE	0	0	7	3	9	15	0	0	0	0	0	0	34
NE	1	1	3	6	3	11	6	0	0	0	0	0	31
ENE	2	1	3	8	5	5	2	1	0	0	0	0	27
E	1	0	1	4	2	4	2	0	0	0	0	0	14
ESE	1	4	3	0	1	2	3	0	0	0	0	0	14
SE	0	3	3	4	13	20	9	0	0	0	0	0	52
SSE	0	0	2	20	54	88	4	0	0	0	0	0	168
S	1	2	13	61	66	23	2	0	0	0	0	0	168
SSW	1	8	21	85	37	4	0	0	0	0	0	0	156
SW	2	7	18	71	26	2	0	0	0	0	0	0	126
WSW	2	9	44	58	15	1	0	0	0	0	0	0	129
W	6	9	25	63	15	0	0	0	0	0	0	0	118
WNW	2	10	9	33	16	1	0	0	0	0	0	0	71
NW	1	9	8	10	10	6	0	0	0	0	0	0	44
NNW	2	4	7	15	7	12	2	0	0	0	0	0	49
Total	22	73	174	453	299	219	32	1	0	0	0	0	1273

Number of calms for F Stability: 0

Table 4
Joint Frequency Distribution of Meteorological Data

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS 01/01/2010 00:00:00 TO 12/31/2010 23:59:59 PASQUILL CLASS G

Wind Speed (M/S) at 10-m Level

Wind Direction	.22-.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	4	5	5	3	1	0	0	0	0	0	0	19
NNE	1	2	4	4	1	0	0	0	0	0	0	0	12
NE	2	1	3	2	1	1	0	0	0	0	0	0	10
ENE	1	1	0	1	0	0	0	0	0	0	0	0	3
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	1	0	2	0	0	0	0	0	0	0	0	0	3
SE	1	1	1	3	0	1	0	0	0	0	0	0	7
SSE	0	3	3	6	9	9	1	0	0	0	0	0	31
S	1	4	13	25	18	3	0	0	0	0	0	0	64
SSW	4	14	18	67	28	1	0	0	0	0	0	0	132
SW	7	16	22	36	19	0	0	0	0	0	0	0	100
WSW	7	32	36	28	1	0	0	0	0	0	0	0	104
W	6	33	32	33	4	0	0	0	0	0	0	0	108
WNW	4	16	13	15	8	0	0	0	0	0	0	0	56
NW	4	10	7	12	1	0	0	0	0	0	0	0	34
NNW	2	6	8	14	1	1	0	0	0	0	0	0	32
Total	42	143	167	251	94	17	1	0	0	0	0	0	715

Number of calms for G Stability: 3

Total valid hours for all stablities = 8607
Total invalid hours for all stablities = 0

Table 5A

Doses Due to Gaseous Radioactive Effluents

Doses due to Noble Gases (mRad or mrem)

Age Group : All

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Total-body	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Skin	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Air Beta	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Air Gamma	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Doses due to Radioiodines/Particulates/Tritium Excluding C-14 (mrem)

Age Group : Adult

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	7.66E-05	2.46E-05	2.92E-05	3.13E-05	1.62E-04
Liver	1.03E-02	9.85E-03	8.70E-03	6.37E-03	3.53E-02
Total-body	1.03E-02	9.84E-03	8.69E-03	6.37E-03	3.52E-02
Thyroid	1.09E-02	9.82E-03	8.67E-03	6.35E-03	3.57E-02
Kidney	1.03E-02	9.83E-03	8.68E-03	6.35E-03	3.51E-02
Lung	1.03E-02	9.82E-03	8.67E-03	6.35E-03	3.51E-02
Gi-lli	1.03E-02	9.82E-03	8.67E-03	6.35E-03	3.51E-02
Skin	3.75E-05	1.19E-05	1.60E-05	1.62E-05	8.16E-05

Age Group : Teen

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.07E-04	3.44E-05	3.98E-05	4.33E-05	2.24E-04
Liver	1.17E-02	1.12E-02	9.86E-03	7.23E-03	4.00E-02
Total-body	1.17E-02	1.11E-02	9.83E-03	7.20E-03	3.98E-02
Thyroid	1.25E-02	1.11E-02	9.81E-03	7.19E-03	4.06E-02
Kidney	1.17E-02	1.11E-02	9.83E-03	7.20E-03	3.98E-02
Lung	1.16E-02	1.11E-02	9.82E-03	7.19E-03	3.98E-02
Gi-lli	1.16E-02	1.11E-02	9.82E-03	7.18E-03	3.97E-02
Skin	3.75E-05	1.19E-05	1.60E-05	1.62E-05	8.16E-05

Age Group : Child

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	2.06E-04	6.67E-05	7.48E-05	8.31E-05	4.31E-04
Liver	1.63E-02	1.55E-02	1.36E-02	1.00E-02	5.54E-02
Total-body	1.61E-02	1.54E-02	1.36E-02	9.95E-03	5.50E-02
Thyroid	1.77E-02	1.54E-02	1.36E-02	9.94E-03	5.66E-02
Kidney	1.61E-02	1.54E-02	1.36E-02	9.96E-03	5.51E-02
Lung	1.61E-02	1.54E-02	1.36E-02	9.94E-03	5.50E-02
Gi-lli	1.61E-02	1.54E-02	1.36E-02	9.93E-03	5.49E-02
Skin	3.75E-05	1.19E-05	1.60E-05	1.62E-05	8.16E-05

Age Group : Infant

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	1.98E-04	6.24E-05	7.01E-05	7.77E-05	4.08E-04
Liver	7.51E-03	7.03E-03	6.22E-03	4.58E-03	2.53E-02
Total-body	7.29E-03	6.96E-03	6.15E-03	4.50E-03	2.49E-02
Thyroid	1.09E-02	6.96E-03	6.14E-03	4.52E-03	2.86E-02
Kidney	7.34E-03	6.98E-03	6.16E-03	4.52E-03	2.50E-02
Lung	7.29E-03	6.96E-03	6.15E-03	4.51E-03	2.49E-02
Gi-lli	7.27E-03	6.96E-03	6.14E-03	4.50E-03	2.49E-02
Skin	3.75E-05	1.19E-05	1.60E-05	1.62E-05	8.16E-05

Table 5A (continued)

Critical Dose due to Radioiodines/Particulates/Tritium Including C-14 (mrem)

Age Group : Child

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	9.65E-01	9.65E-01	9.65E-01	9.65E-01	3.86E+00
Total-body	1.93E-01	1.93E-01	1.93E-01	1.93E-01	7.71E-01

Table 5B
Doses Due to Liquid Radioactive Effluents

Cumulative Dose Information for 2010 (mrem)

Age Group : Adult

Organ	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year Total
Bone	2.53E-05	2.07E-05	1.60E-05	7.89E-07	6.27E-05
Liver	8.71E-05	5.50E-05	4.51E-05	2.38E-05	2.11E-04
Total-body	7.45E-05	4.51E-05	3.74E-05	2.34E-05	1.81E-04
Thyroid	4.91E-05	2.52E-05	2.05E-05	2.32E-05	1.18E-04
Kidney	6.05E-05	3.30E-05	2.77E-05	2.32E-05	1.45E-04
Lung	5.45E-05	3.12E-05	2.44E-05	2.35E-05	1.34E-04
Gi-lli	7.74E-05	3.12E-05	2.76E-05	2.39E-05	1.60E-04

ATTACHMENT 11.1

Copy of UNT-005-014, "Offsite Dose Calculation Manual" Revision 302.