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United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

Shearon Harris Nuclear Power Plant
Docket No. 50-400

Subject: Annual Radioactive Effluent Release Report

Ladies and Gentlemen:

In accordance with Harris Nuclear Plant (HNP) Technical Specification 6.9.1.4, Carolina Power & Light Company is providing the enclosed Annual Radioactive Effluent Release Report for 2012.

If you have any questions regarding this submittal, please contact me at (919) 362-3137.

Sincerely,

[signature]

DHC/mgw

Enclosure

c: Mr. J. D. Austin (NRC Senior Resident Inspector, HNP)
Mr. V. M. McCree (NRC Regional Administrator, Region II)
Ms. A. T. Billoch Colón (NRC Project Manager, HNP)

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NRR

Carolina Power & Light Company

Shearon Harris Nuclear Power Plant

Docket No. 50-400

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2012, through December 31, 2012

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Introduction

This Annual Radioactive Effluent Release Report is prepared in accordance with Shearon Harris Nuclear Power Plant's Operational Requirements - Offsite Dose Calculation Manual (ODCM), Appendix F Section F.2, and Technical Specification 6.9.1.4, Operating License No. NPF-63.

The Harris Nuclear Power Plant (HNP) achieved initial criticality on January 3, 1987. This report covers the period from January 1, 2012, to December 31, 2012. During this period, the plant operated in Cycle 17 and Cycle 18.

Discussion

1. Protection Standards

The main objective in the control of radiation is to ensure that any exposure is kept not only within regulatory limits, but As Low As Reasonably Achievable (ALARA). The ALARA concept applies to reducing radiation exposure both to workers at Harris Nuclear Plant and to the general public. "Reasonably Achievable" means that radiation exposure reduction is based on sound environmental practices, economic decisions, and operating practices. By practicing ALARA, Harris Nuclear Plant and Progress Energy Carolinas, Inc. minimize health risk, environmental detriment, and ensure that exposures are maintained well below regulatory limits.

2. Sources of Radioactivity Released

During normal operations of a nuclear power station, most of the fission products are retained within the fuel and fuel cladding. However, small quantities of radioactive fission and activation products are present in the primary coolant water. The types of radioactive material released are noble gases, carbon-14, iodines and particulates, and tritium.

The noble gas fission products in the primary coolant are collected by a system designed for collection and storage for radioactive decay prior to release.

Small releases of radioactivity in liquids may occur from equipment associated with the primary coolant system. These liquids are collected and processed for radioactivity removal prior to release.

3. Noble Gas

Some of the fission products released in airborne effluents are radioactive isotopes of noble gases, such as krypton and xenon. Noble gases are by nature inert and do not concentrate in humans or other organisms; therefore internal exposure is negligible. Their contribution to human radiation exposure is as an external exposure. Xenon-133 and Xenon-135, with half-lives of approximately 5 days and 9 hours respectively, are the major isotopes released. Half-life is defined as the time required for a radioactive isotope to lose 50 percent of its radioactivity by decay. Noble gases are readily dispersed in the atmosphere.

4. Iodines and Particulates

The annual release of iodines and particulates is small. Factors such as chemical reactivity and solubility in water, combined with high processing efficiencies, minimize their discharge. The main contribution of radioactive iodine to human exposure is to the thyroid gland, where the body concentrates iodine. The principal radioactive particulates are Cobalt-58, Cobalt-60, and Nickel-63 which contribute to internal exposure of tissues such as the muscle, liver, and intestines. These particulates can also be a source of exposure if deposited on the ground.

5. Tritium

Tritium, a radioactive isotope of hydrogen, is the predominant radionuclide in liquid and gaseous effluents. Tritium is produced in the reactor coolant as a result of neutron interaction with deuterium (also a hydrogen isotope) and boron, both of which are present in the primary coolant. Tritium contributes very little radiation exposure to the human body, and when it is inhaled or ingested, is dispersed throughout the body until eliminated.

6. Carbon-14

The concentration and offsite dose from carbon-14 has been estimated by using a calculation approach, assuming typical or maximum values for the various calculation parameters. The carbon-14 source term is based on measurements at 10 operational power plants and is documented in NUREG-0017 Rev 1. The 7.3 Curies carbon-14 source term in NUREG-0017 Rev 1 assumes an 80% capacity factor. The calculation normalizes the carbon-14 source term to actual electrical capacity for the entire year. For 2012, 7.86 Curies of gaseous carbon-14 was released. Due to the reducing environment of a Pressured Water Reactor only 30% of the carbon-14 is assumed to be released in the Carbon Dioxide form, dose is not expected from other forms (methane, etc). The resultant offsite doses were based upon this source term and the dose calculations described in Reg. Guide 1.109. The max individual was a child residing at the 2.2 mile N location. The dose to the bone includes the inhalation dose of 1.88E-02 mrem, the garden pathway dose of 5.50E-01 mrem, and meat pathway dose of 8.30E-02 mrem. The child would receive a total of 6.52E-01 mrem dose to the bone and a total body dose of 1.30 E-01 in the calendar year 2012.

7. Processing and Monitoring

Effluents are strictly controlled and monitored to ensure that radioactivity released to the environment is minimal and within regulatory limits. Effluent control includes the operation of radiation monitoring systems, in-plant and environmental sampling and analyses, quality assurance programs for both in-plant and environmental sampling and analyses, and procedures that address effluent and environmental monitoring.

The plant radiation monitoring system has monitors that are designed to ensure that releases are below regulatory limits. Each instrument provides indication of the amount of radioactivity present and is equipped with alarms and indicators in the control room. The alarm setpoints are set lower than the ODCM Operational Requirements to ensure the limits are not exceeded. If a monitor alarms, a release from a tank is automatically suspended. Additionally, batch releases are sampled and analyzed in the laboratory prior to discharge. The sampling and analysis done in the laboratory provides a more sensitive and precise method of determining effluent composition than in-plant monitoring instruments.

The plant has a meteorological tower, which is linked to computers that record the meteorological data. The meteorological data and the release data can be used to assess the dose to the public. The doses reported in this report use five-year average (2003 through 2007) data from the onsite meteorological program.

In addition to in-plant equipment the company maintains a Radiological Environmental Monitoring Program, which consists of devices used to constantly sample the air and water in the environment. The samples collected from the surrounding environment are analyzed to determine any presence of radioactive material in the environment.

8. Exposure Pathways

Radiological exposure pathways are the methods by which people may become exposed to radioactive material. The major pathways of concern are those that could cause the highest calculated radiation dose. The projected pathways are determined from the type and amount of radioactive material that may have been released, the environmental transport mechanism, and the use of the environment. Environmental transport mechanisms include, but are not limited to, local hydrology (water) and meteorology (weather).

The release of radioactive gaseous effluents can impact the public via pathways such as external whole body exposure, deposition on plants and soils, and human inhalation. The release of radioactive material in liquid effluents can impact the public via pathways such as drinking water, fish consumption, and direct exposure from the lake at the shoreline and submersion dose while swimming.

Even though radionuclides can reach humans by many different pathways, some radionuclides result in more exposure than others. The critical pathway is the exposure that will provide, for a specific radionuclide, the greatest exposure to a population, or a specific group of the population, called the critical group. The critical group may vary depending on the radionuclides involved, the age and diet of the group, and other cultural factors. The exposure may be received to the whole body or to a specific organ, with the organ receiving the largest fraction of the exposure called the critical organ.

9. Results

The quantities of radioactive gaseous and liquid effluents and solid waste are reported using the format per Regulatory Guide 1.21 (Rev. 1) Appendix B.

The Radioactive Effluent Release Report is a detailed listing of the radioactivity released from the Harris Nuclear Plant during the period from January 1, 2012, through December 31, 2012. The assessment of annual radiation doses to members of the public from radioactive liquid and gaseous effluents from the plant are estimated using the methodology in the ODCM.

During the period of January 1, 2012, through December 31, 2012, the estimated maximum individual offsite dose due to radioactivity released in effluents was:

Liquid Effluents:	Limit
2.32 E-02 mrem, Total Body	3.0 E+00 mrem
3.35 E-02 mrem, Max Organ (GI-LLI)	1.0 E+01 mrem
Gaseous Effluents:	Limit
Noble Gases	
3.01 E-04 mrad, Beta	2.0 E+01 mrad
1.09 E-04 mrad, Gamma	1.0 E+01 mrad
Tritium, Radioiodine 131, 133, and Particulates with greater than an 8 Day Half Life:	
8.09 E-01 mrem, Critical Organ (Lung)	1.5 E+01 mrem(*)
Carbon 14	
6.52 E-01 mrem, Critical Organ (Bone)	1.5 E+01 mrem(*)

(*) Limit applies to Tritium, Radioiodines, and Particulates with greater than an 8-Day Half Life:

These doses are in addition to what is received from natural background in the area surrounding the Harris Nuclear Plant (approximately 300 mrem per year).

Appendix 1: Supplemental Information

I. Regulatory Limits

A. Fission and Activation Gases:

ODCM Operational Requirements Maximum Instantaneous Concentration

Total Body Dose ≤500 mrem/yr

Skin Dose ≤3000 mrem/yr

10CFR20 Limits

Annual Average Concentrations as specified in 10CFR20, Appendix B, Table 2, Column 1. This is based on 100 mrem/yr.

10CFR50, Appendix I

For Calendar Quarter

Gamma Dose ≤5 mrad (Used for calculating percent of applicable limit.)

Beta Dose ≤10 mrad (Used for calculating percent of applicable limit.)

For Calendar Year

Gamma Dose ≤10 mrad

Beta Dose ≤20 mrad

B. Iodine - 131 and 133, Tritium, and Particulates >8 day half-lives:

ODCM Operational Requirements

Maximum Instantaneous Release Rate is and inhalation dose (only) to a child to any organ ≤1500 mrem/yr

10CFR20 Limits

Annual Average Concentrations as specified in 10CFR20, Appendix B, Table 2, Column 1. This is based on 50 mrem/yr.

10CFR50, Appendix I (Organ Doses)

For Calendar Quarter ≤7.5 mrem (Used for calculating percent of applicable limit.)

For Calendar Year ≤15 mrem

C. Liquids:

ODCM Operational Requirements

Maximum Instantaneous Release Rate is ten times the concentrations specified in 10CFR20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases.

ODCM Operational Requirements

For dissolved or entrained noble gases, the concentration shall be limited to 2.00E-04 μCi/ml total activity.

10CFR20 Limits

The annual average concentrations to be less than the concentrations specified in 10CFR20, Appendix B, Table 2, Column 2.(Used for calculating percent of applicable limit.) This is based on 50 mrem/yr.

10CFR50, Appendix I

For Calendar Quarter

Total Body Dose ≤1.5 mrem

Any Organ Dose ≤5 mrem

For Calendar Year

Total Body Dose ≤3 mrem

Any Organ Dose ≤10 mrem

D. Average Energy ($\bar{E}$):

None applicable at HNP. HNP determines dose and dose rate based on actual releases, not on an average energy value.

II. Measurements and Approximations of Total Radioactivity

A. Continuous Gaseous Releases

1. Fission and activation gases

The total activity released is determined from the net activity of gaseous monitors times the total stack flow. The activity of each radionuclide is determined by the fraction of that radioactive gas in the isotopic analysis for that sampling period (typically weekly). If no activity is detected for the sampling period, the mix is based on historical data.

2. Iodines

The activity released as iodine-131, 133, and 135 is based on isotopic analysis of the charcoal cartridge plus the particulate filter times the total vent flow for each sample period (typically weekly).

3. Particulates

The activity released as particulates with half-lives greater than eight days is determined by isotopic analysis of particulate filters times the total vent flow for each sample period. The sample period is at a minimum weekly or more frequently if plant conditions require.

4. Tritium

The activity released as tritium is based on grab sample analysis using liquid scintillation times total stack flow. Grab sampling is typically performed weekly.

5. Carbon-14

The activity released as carbon-14 is calculated using Reg Guide 1.109 methodology and NUREG-0017 (GALE Code).

B. Batch Gaseous Releases

1. Fission and activation gases

The activity released is based on the volume released times the concentration of the individual nuclides obtained from an isotopic analysis of the grab sample taken prior to the release.

2. Iodines

The iodine activity released from Waste Gas Decay Tank (WGDT) batch releases is included in the iodine determination from the continuous releases.

3. Particulates

The particulate activity released from Waste Gas Decay Tank (WGDT) batch releases is included in the particulate determination from the continuous releases.

4. Tritium

The activity released as tritium is based on the grab sample analysis using liquid scintillation of each batch times the batch volume.

C. Liquid Releases

1. Fission and Activation Products

The total activity released (excluding tritium, strontium, iron-55, alpha, and nickel-63) is comprised of the sum of the products of the individual radionuclide concentrations in each batch (identified using gamma spectroscopy) times the volume of the batch.

II. Measurements and Approximations of Total Radioactivity

C. Liquid Releases

2. Alpha and Tritium

The alpha activity released is the monthly composite alpha concentration times the volume released for the month.

The tritium activity released is the concentration of tritium in each batch release times the volume of the batch release.

The tritium activity released through the continuous pathways (turbine building drains and secondary waste) is the concentration from monthly composite samples (corrected for makeup water concentrations) times the volume released for the month. Makeup water is from the lake and has detectable tritium.

3. Strontium-89, 90, Iron-55, and Nickel-63

Analyses are performed on quarterly composite samples times the volume released during the quarter to calculate the activity released.

D. Estimated Total Errors

1. Estimated total errors for gaseous effluents are based on uncertainties in counting equipment calibration, counting statistics, vent flow rates, vent sample flow rates, chemical yield factors, and sample losses for such items as charcoal cartridges.
2. Estimated total errors for liquid effluents are based on uncertainties in counting equipment calibration, counting statistics, sampling, and volume determinations.

III. Batch Releases (2012)

A. Liquid Batch Releases

	Jan - June 2012	July - Dec 2012
Number of batch releases	2.40 E+01	1.90 E+01
Total time period for batch releases	1.72 E+04 minutes	1.46 E+04 minutes
Maximum time of a batch release	1.02 E+03 minutes	8.72 E+02 minutes
Average time for a batch release	7.18 E+02 minutes	7.67 E+02 minutes
Minimum Time for a batch release	4.56 E+02 minutes	5.63 E+02 minutes
Average stream flow during periods of release	1.79 E+03 cf/s	8.43 E+02 cf/s

B. Gaseous Batch Releases

	Jan - June 2012	July - Dec 2012
Number of batch releases	2.50 E+01	2.00 E+00
Total time period for batch releases	1.87 E+04 minutes	1.79 E+03 minutes
Maximum time of a batch release	3.01 E+03 minutes	1.21 E+03 minutes
Average time for a batch release	7.50 E+02 minutes	8.94 E+02 minutes
Minimum Time for a batch release	1.54 E+02 minutes	5.73 E+02 minutes

C. Abnormal Releases

a. Liquid

There were no abnormal effluent liquid releases in 2012.

b. Gaseous

There was one unplanned release in 2012. CR 519807 Release from the "H" Waste Gas Decay Tank was due to a leak on the waste gas compressor hydrogen recombiner. The leak was corrected under WO 2049401. A total of 1.72E-02 Curies of Noble Gas and 2.04E-06 Curies of Tritium were released.

Appendix 2: Effluent and Waste Disposal Report
Enclosure 1: Lower Limits of Detection (LLDs)

1. LLDs for Gaseous Effluents

Nuclide	µCi/cc
Gross Alpha	2.46 E-15
H-3	6.02 E-09
Ar-41	1.52 E-08
Kr-85	2.15 E-06
Kr-85m	3.18 E-09
Kr-87	2.72 E-08
Kr-88	2.22 E-08
Xe-131m	1.85 E-07
Xe-133	1.86 E-08
Xe-133m	4.59 E-08
Xe-135	6.02 E-09
Xe-135m	5.89 E-09
Xe-138	4.12 E-07
I-131	3.65 E-14
I-133	9.96 E-13
I-135	6.34 E-12
Cr-51	1.67 E-12
Mn-54	2.31 E-13
Co-58	3.27 E-13
Fe-59	4.22 E-13
Co-60	2.43 E-13
Zn-65	4.57 E-13
Sr-89	1.12 E-14
Sr-90	5.76 E-15
Nb-95	1.58 E-13
Zr-95	2.72 E-13
Mo-99	2.76 E-12
Cs-134	1.61 E-13
Cs-137	1.45 E-13
Ba-140	6.70 E-13
La-140	1.24 E-12
Ce-141	1.38 E-13
Ce-144	8.41 E-13

Enclosure 1: Lower Limits of Detection (LLDs)

2. LLDs for Liquid Effluents

Nuclide	µCi/ml
Gross Alpha	5.44 E-08
H-3	1.89 E-06
Na-24	4.68 E-08
Cr-51	1.16 E-07
Mn-54	2.87 E-08
Fe-55	5.50 E-07
Co-57	1.68 E-08
Co-58	2.82 E-08
Fe-59	6.47 E-08
Co-60	3.88 E-08
Ni-63	1.43 E-07
Zn-65	7.31 E-08
Sr-89	2.71 E-08
Sr-90	1.67 E-08
Nb-95	2.66 E-08
Zr-95	4.75 E-08
Mo-99	2.87 E-07
Tc-99m	2.33 E-08
Ru-106	2.23 E-07
Sb-124	2.18 E-08
Sb-125	5.20 E-08
Sb-126	2.35 E-08
I-131	3.21 E-08
I-133	2.27 E-08
Te-132	1.67 E-08
Xe-133	5.92 E-08
Xe-133m	1.89 E-07
Xe-135	2.46 E-08
Cs-134	2.19 E-08
Cs-137	2.73 E-08
Ba-140	1.08 E-07
La-140	3.89 E-08
Ce-141	2.32 E-08
Ce-144	1.32 E-07

Appendix 2: Effluent and Waste Disposal Report (Continued)

Enclosure 2: Effluents Released

Table 1A: GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error %
A. Fission and activation gases				
1. Total release	Ci	2.77 E-01	2.22 E-02	5.27 E+01
2. Average release rate for period	µCi/sec	3.52 E-02	2.83 E-03	
3. Percent of ODCM Operational Requirement limit	%	2.18 E-03	1.70 E-04	
B. Iodines				
1. Total iodine-131	Ci	0.00 E+00	0.00 E+00	3.04 E+01
2. Average release rate for period	µCi/sec	0.00 E+00	0.00 E+00	
3. Percent of ODCM Operational Requirement limit*	%	2.39 E+00	2.59 E+00	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	0.00 E+00	1.24 E-05	3.38 E+01
2. Average release rate for period	µCi/sec	0.00 E+00	1.58 E-06	
3. Percent of ODCM Operational Requirement limit*	%	2.39 E+00	2.59 E+00	
4. Gross alpha radioactivity	Ci	0.00 E+00	0.00 E+00	
D. Tritium				
1. Total release	Ci	3.52 E+01	3.82 E+01	5.22 E+01
2. Average release rate for period	µCi/sec	4.48 E+00	4.86 E+00	
3. Percent of ODCM Operational Requirement limit*	%	2.39 E+00	2.59 E+00	

* The Percent of ODCM Operational Requirement limits applies to Iodines, Particulates and Tritium combined, and is calculated using ODCM methodology and parameters. The quarterly ODCM Operational Requirement limit is 7.5 millirem. The most critical organ for both quarters was the Thyroid.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 1A: GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error %
A. Fission and activation gases				
1. Total release	Ci	6.80 E-02	1.86 E-02	5.27 E+01
2. Average release rate for period	µCi/sec	8.55 E-03	2.34 E-03	
3. Percent of ODCM Operational Requirement limit	%	5.20 E-04	1.42 E-04	
B. Iodines				
1. Total iodine-131	Ci	0.00 E+00	0.00 E+00	3.04 E+01
2. Average release rate for period	µCi/sec	0.00 E+00	0.00 E+00	
3. Percent of ODCM Operational Requirement limit*	%	3.09 E+00	2.71 E+00	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	0.00 E+00	0.00 E+00	3.38 E+01
2. Average release rate for period	µCi/sec	0.00 E+00	0.00 E+00	
3. Percent of ODCM Operational Requirement limit*	%	3.09 E+00	2.71 E+00	
4. Gross alpha radioactivity	Ci	0.00 E+00	0.00 E+00	
D. Tritium				
1. Total release	Ci	4.56 E+01	4.00 E+01	5.22 E+01
2. Average release rate for period	µCi/sec	5.73 E+00	5.03 E+00	
3. Percent of ODCM Operational Requirement limit*	%	3.09 E+00	2.71 E+00	

* The Percent of ODCM Operational Requirement limit applies to Iodines, Particulates and Tritium combined, and is calculated using ODCM methodology and parameters. The quarterly ODCM Operational Requirement limit is 7.5 millirem. The most critical organ for both quarters was the lung.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 1B: GASEOUS EFFLUENTS - ELEVATED RELEASES

All releases at Harris Nuclear Power Plant are considered ground releases.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 1C: GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission Gases					
Xenon-131m	Ci	0.00 E+00	0.00 E+00	4.90 E-05	0.00 E+00
Xenon-133	Ci	2.58 E-01	2.22 E-02	1.35 E-02	0.00 E+00
Xenon-133m	Ci	0.00 E+00	0.00 E+00	3.56 E-04	0.00 E+00
Xenon-135	Ci	0.00 E+00	0.00 E+00	4.89 E-03	0.00 E+00
Xenon-135m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-138	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Argon-41	Ci	0.00 E+00	0.00 E+00	7.68 E-05	0.00 E+00
Krypton-85	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Krypton-85m	Ci	0.00 E+00	0.00 E+00	1.98 E-04	0.00 E+00
Krypton-87	Ci	0.00 E+00	0.00 E+00	6.62 E-05	0.00 E+00
Krypton-88	Ci	0.00 E+00	0.00 E+00	2.75 E-04	0.00 E+00
Total for period	Ci	2.58 E-01	2.22 E-02	1.94 E-02	0.00 E+00
2. Iodines					
Iodine-131	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iodine-132	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iodine-133	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iodine-135	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Total for period	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
3. Particulates					
Chromium-51	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Manganese-54	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cobalt-58	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iron-59	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cobalt-60	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Zinc-65	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Strontium-89	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Strontium-90	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Niobium-95	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Zirconium-95	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Molybdenum-99	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cesium-134	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cesium-137	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Barium-140	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Lanthanum-140	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cerium-141	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cerium-144	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Total for period	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1

Note 1 -The particulate and iodine activities released from Waste Gas Decay Tank and Containment Purge batch releases are included in the determinations from the continuous releases.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 1C: GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission Gases					
Xenon-131m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-133	Ci	6.80 E-02	1.84 E-02	0.00 E+00	1.89 E-04
Xenon-133m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-135	Ci	0.00 E+00	0.00 E+00	0.00 E+00	1.20 E-06
Xenon-135m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-138	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Argon-41	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Krypton-85	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Krypton-85m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Krypton-87	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Krypton-88	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Total for period	Ci	6.80 E-02	1.84 E-02	0.00 E+00	1.90 E-04
2. Iodines					
Iodine-131	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iodine-133	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iodine-135	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Total for period	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
3. Particulates					
Chromium-51	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Manganese-54	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cobalt-57	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cobalt-58	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Iron-59	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cobalt-60	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Zinc-65	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Strontium-89	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Strontium-90	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Niobium-95	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Zirconium-95	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Molybdenum-99	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Sn-113	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cesium-134	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cesium-137	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Barium-140	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Lanthanum-140	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cerium-141	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Cerium-144	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1
Total for period	Ci	0.00 E+00	0.00 E+00	Note 1	Note 1

Note 1 -The particulate and iodine activities released from Waste Gas Decay Tank and Containment Purge batch releases are included in the determinations from the continuous releases.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 2A: LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

		Unit	Quarter 1	Quarter 2	Est. Total Error %
A.	**Fission and Activation products**				
1	Total release (not including tritium, gases, alpha)	Ci	1.76 E-03	1.42 E-02	3.28 E+01
2	Average diluted concentration during period	µCi/ml	3.69 E-10	3.45 E-09	
3	Percent of applicable limit	%	6.69 E-01	5.52 E-01	
B.	**Tritium**				
1	Total release	Ci	3.04 E+02	1.98 E+02	5.43 E+01
2	Average diluted concentration during period	µCi/ml	6.37 E-05	4.81 E-05	
3	Percent of applicable limit	%	6.37 E+00	4.81 E+00	
C.	**Dissolved and entrained gases**				
1	Total release	Ci	5.96 E-06	3.76 E-05	3.28 E+01
2	Average diluted concentration during period	µCi/ml	1.25 E-12	9.17 E-12	
3	Percent of applicable limit	%	0.00 E+00	0.00 E+00	
D.	**Gross alpha radioactivity**				
1	Total release	Ci	0.00 E+00	0.00 E+00	3.28 E+01
E.	**Volume of waste released**				
1	Continuous Releases	liters	9.39 E+06	1.26 E+07	2.00 E+01
2	Batch Releases	liters	7.39 E+05	9.39 E+05	2.00 E+01
F.	**Volume of dilution water**				
1	Continuous Releases	liters	4.77 E+09	4.11 E+09	2.00 E+01
2	Batch Releases	liters	4.77 E+09	4.11 E+09	2.00 E+01

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 2: Effluents Released

Table 2A: LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

		Unit	Quarter 3	Quarter 4	Est. Total Error %
A.	**Fission and Activation products**				
1	Total release (not including tritium, gases, alpha)	Ci	1.49 E-02	1.13 E-03	3.28 E+01
2	Average diluted concentration during period	µCi/ml	3.04 E-09	2.21 E-10	
3	Percent of applicable limit	%	2.85 E-01	3.99 E-02	
B.	**Tritium**				
1	Total release	Ci	1.14 E+02	3.35 E+01	5.43 E+01
2	Average diluted concentration during period	µCi/ml	2.34 E-05	6.54 E-06	
3	Percent of applicable limit	%	2.33 E+00	6.50 E-01	
C.	**Dissolved and entrained gases**				
1	Total release	Ci	0.00 E+00	0.00 E+00	3.28 E+01
2	Average diluted concentration during period	µCi/ml	0.00 E+00	0.00 E+00	
3	Percent of applicable limit	%	0.00 E+00	0.00 E+00	
D.	**Gross alpha radioactivity**				
1	Total release	Ci	0.00 E+00	0.00 E+00	3.28 E+01
E.	**Volume of waste released**				
1	Continuous Releases	liters	1.05 E+07	7.31 E+06	2.00 E+01
2	Batch Releases	liters	1.09 E+06	3.83 E+05	2.00 E+01
F.	**Volume of dilution water**				
1	Continuous Releases	liters	4.89 E+09	5.11 E+09	2.00 E+01
2	Batch Releases	liters	4.89 E+09	5.11 E+09	2.00 E+01

Table 2B: LIQUID EFFLUENTS

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 1	Quarter 2
Sodium-24	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Chromium-51	Ci	0.00 E+00	0.00 E+00	0.00 E+00	6.07 E-05
Manganese-54	Ci	0.00 E+00	0.00 E+00	4.91 E-05	3.48 E-05
Iron-55	Ci	0.00 E+00	0.00 E+00	5.41 E-05	9.09 E-13
Cobalt-57	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cobalt-58	Ci	0.00 E+00	0.00 E+00	1.35 E-05	1.01 E-02
Iron-59	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cobalt-60	Ci	0.00 E+00	0.00 E+00	5.41 E-04	6.62 E-04
Nickel-63	Ci	0.00 E+00	0.00 E+00	1.07 E-03	2.23 E-03
Strontium-89	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Strontium-90	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Zirconium-95	Ci	0.00 E+00	0.00 E+00	0.00 E+00	6.64 E-05
Zirconium-97	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Niobium-95	Ci	0.00 E+00	0.00 E+00	0.00 E+00	1.01 E-04
Niobium-97	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Technicium-99m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Ruthenium-106	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Antimony-124	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Antimony-125	Ci	0.00 E+00	0.00 E+00	0.00 E+00	8.40 E-04
Antimony-126	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Tellurium-132	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-131	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-132	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-133	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cesium-134	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cesium-137	Ci	0.00 E+00	0.00 E+00	2.66 E-05	8.29 E-05
Barium-140	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Lanthanum-140	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cerium-141	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cerium-144	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
TOTAL	Ci	0.00 E+00	0.00 E+00	1.76 E-03	1.41 E-02
Xenon-133	Ci	0.00 E+00	0.00 E+00	5.96 E-06	3.76 E-05
Xenon-133m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-135	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
TOTAL	Ci	0.00 E+00	0.00 E+00	5.96 E-06	3.76 E-05
Tritium	Ci	1.07 E-01	5.07 E-01	3.04 E+02	1.98 E+02

Table 2B: LIQUID EFFLUENTS

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
Sodium-24	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Chromium-51	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Manganese-54	Ci	0.00 E+00	0.00 E+00	5.96 E-06	4.79 E-05
Iron-55	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cobalt-57	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cobalt-58	Ci	0.00 E+00	0.00 E+00	1.19 E-02	4.08 E-04
Iron-59	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cobalt-60	Ci	0.00 E+00	0.00 E+00	9.19 E-04	2.50 E-04
Nickel-63	Ci	0.00 E+00	0.00 E+00	1.99 E-03	3.80 E-04
Strontium-89	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Strontium-90	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Zirconium-95	Ci	0.00 E+00	0.00 E+00	1.75 E-05	0.00 E+00
Zirconium-97	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Niobium-95	Ci	0.00 E+00	0.00 E+00	1.40 E-05	4.27 E-05
Niobium-97	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Technicium-99m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Ruthenium-106	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Antimony-124	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Antimony-125	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Antimony-126	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Tellurium-132	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-131	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-132	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Iodine-133	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cesium-134	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cesium-137	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Barium-140	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Lanthanum-140	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cerium-141	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Cerium-144	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
TOTAL	Ci	0.00 E+00	0.00 E+00	1.49 E-02	1.13 E-03
Xenon-133	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-133m	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Xenon-135	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
TOTAL	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Tritium	Ci	9.63 E-02	9.98 E-02	1.14 E+02	3.34 E+01

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 3: Solid Waste Disposal

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

1. Solid Waste Shipped for Burial or Disposal (WASTE CLASS A)

NOTE: Values reported in Table 3 section 1.A.a, 1.A.b, 1.B.a and 1.B.b refer to radioactive solid waste materials shipped in 2012 to a vendor for processing and subsequent burial.

A. Type of Waste

a. Spent resins.
Note: Waste shipped in 2012 for processing and subsequent burial

Number of Shipments	3
Activity Shipped	6.04 E+01 Curies
Estimated Total Error	96%
Quantity Shipped	1.07 E+01 m^3
Solidification Agent	N/A
Container Type	NRC-Approved Package
Shipment Form	Dewatered, Compacted

b. Dry Active Waste (DAW), mechanical filters, contaminated equipment, etc.
Note: Waste shipped in 2012 for processing and subsequent burial.

Number of Shipments	6
Activity Shipped	4.50 E-01 Curies
Estimated Total Error	96%
Quantity Shipped	2.68 E+02 m^3
Solidification Agent	N/A
Container Type	NRC-Approved Package
Shipment Form	Dewatered, Compacted

c. Irradiated components, control rods, etc.

No waste of this type was shipped during this report period.

d. Other (Describe)

No waste of this type was shipped during this report period.

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

1. Solid Waste Shipped for Burial or Disposal (WASTE CLASS A)

B. Estimate of Major Nuclide Composition (by type of Waste)

a. Spent Radwaste Bead Resin

Note: Waste shipped in 2012 for processing and subsequent burial.

Class A Resin Totals

Nuclide	Percent Composition	Total Activity (Curies)
C-14	1.87E-02	1.13E-02
Ce-144	1.07E-01	6.46E-02
Co-57	1.25E-01	7.55E-02
Co-58	5.72E+00	3.46E+00
Co-60	5.77E+00	3.49E+00
Cr-51	6.62E-02	4.00E-02
Cs-137	1.62E+00	9.81E-01
Fe-55	4.80E+01	2.90E+01
Fe-59	1.01E-01	6.10E-02
H-3	1.60E-01	9.66E-02
I-129	1.67E-03	1.01E-03
Mn-54	1.78E+01	1.07E+01
Nb-95	1.52E-01	9.21E-02
Ni-63	7.23E+00	4.37E+00
Sb-125	1.17E-01	7.04E-02
Sn-113	1.33E-01	8.01E-02
Sr-89	4.00E-02	2.42E-02
Sr-90	1.75E-02	1.06E-02
Tc-99	9.28E-03	5.61E-03
Zr-95	2.48E-01	1.50E-01
Be-7	1.25E+01	7.58E+00
Zn-65	6.64E-02	4.01E-02
Totals:	1.00E+02	6.04E+01

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 3: Solid Waste Disposal

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

1. Solid Waste Shipped for Burial or Disposal (WASTE CLASS A)

B. Estimate of Major Nuclide Composition (by type of Waste)

b. Dry Active Waste (DAW), mechanical filters, contaminated equipment, etc.

Note: Waste shipped in 2012 for processing and subsequent burial.

Class A DAW Totals

Nuclide	Percent Composition	Total Activity (Curies)
C-14	2.81E-01	1.26E-03
Ce-144	2.52E-01	1.13E-03
Cm-242	1.29E-04	5.80E-07
Cm-243	1.86E-04	8.35E-07
Co-57	9.63E-02	4.33E-04
Co-58	1.07E+01	4.81E-02
Co-60	1.68E+01	7.56E-02
Cr-51	1.87E+00	8.42E-03
Cs-137	9.16E-02	4.12E-04
Fe-55	4.34E+00	1.95E-02
Fe-59	3.10E-01	1.39E-03
H-3	5.32E-01	2.39E-03
Mn-54	5.09E+00	2.29E-02
Nb-95	3.27E+01	1.47E-01
Ni-63	3.48E+00	1.56E-02
Pu-238	4.95E-04	2.22E-06
Pu-239	3.23E-04	1.45E-06
Sb-125	3.59E+00	1.62E-02
Sn-113	1.27E+00	5.72E-03
Tc-99	2.48E-01	1.11E-03
I-129	3.96E-01	1.78E-03
Cs-134	2.50E-02	1.13E-04
Ag-110m	1.91E-02	8.58E-05
Zr-95	1.79E+01	8.05E-02
Totals:	1.00E+02	4.50E-01

C. Solid Waste Disposal

Number of Shipments	9
Mode of Transportation	Truck
Destination	Energy Solutions & Studsvik

Note: Waste shipped in 2012 for processing and subsequent burial

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

2. Solid Waste Shipped for Burial or Disposal (WASTE CLASS B)

NOTE: Values reported in Table 3 section 2.A.a and 2.B.a refer to radioactive solid waste materials shipped in 2012 to a vendor for processing and subsequent burial.

A. Type of Waste

a. Spent resins.

Note: Waste shipped in 2012 for processing and subsequent burial

Number of Shipments	1
Activity Shipped	1.62 E+01 Curies
Estimated Total Error	96%
Quantity Shipped	2.97 E+00 m^3
Solidification Agent	N/A
Container Type	NRC-Approved Package
Shipment Form	Dewatered, Compacted

b. Dry Active Waste (DAW), mechanical filters, contaminated equipment, etc.

No waste of this type was shipped during this report period.

c. Irradiated components, control cods, etc.

No waste of this type was shipped during this report period.

d. Other (Describe)

No waste of this type was shipped during this report period.

Appendix 2: Effluent and Waste Disposal Report (Continued)
Enclosure 3: Solid Waste Disposal

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

2. Solid Waste Shipped for Burial or Disposal (WASTE CLASS B)

B. Estimate of Major Nuclide Composition (by type of Waste)

a. Spent Resins

Class B Resin Totals

Nuclide	Percent Composition	Total Activity (Curies)
C-14	3.75E-02	6.07E-03
Ce-144	9.95E-02	1.61E-02
Co-57	1.13E-01	1.83E-02
Co-58	2.76E-01	4.47E-02
Co-60	1.00E+01	1.62E+00
Cs-137	1.04E+01	1.69E+00
Fe-55	1.62E+01	2.62E+00
H-3	6.49E-02	1.05E-02
I-129	2.74E-03	4.43E-04
Mn-54	5.48E+00	8.87E-01
Ni-63	5.62E+01	9.09E+00
Sb-125	1.01E+00	1.64E-01
Sr-90	4.01E-02	6.49E-03
Tc-99	8.10E-03	1.31E-03
Totals:	1.00E+02	1.62E+01

C. Solid Waste Disposal

Number of Shipments	1
Mode of Transportation	Truck
Destination	Studsvik/Waste Control Specialist

Note: Waste shipped in 2012 for processing and subsequent burial

Table 3: SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

3. Solid Waste Shipped for Burial or Disposal (WASTE CLASS C)

A. Type of Waste

a. Spent Resins, Filter Sludges, Evaporator Bottoms, etc.

No waste of this type was shipped during this report period.

b. Dry Active Waste (DAW), Mechanical Filters, Contaminated Equipment, etc.

No waste of this type was shipped during this report period.

c. Irradiated Components, Control Rods, etc.

No waste of this type was shipped during this report period.

d. Other (Describe)

No waste of this type was shipped during this report period.

B. Estimate of Major Nuclide Composition (by type of Waste)

a. Spent Resins, Filter Sludges, Evaporator Bottoms, etc.

No waste of this type was shipped during this report period.

b. Dry Active Waste (DAW), Mechanical Filters, Contaminated Equipment, etc.

No waste of this type was shipped during this report period.

Appendix 3: Changes to the Offsite Dose Calculation Manual (ODCM) Technical Specifications 6.14.c

There were no changes to the ODCM during 2012

Appendix 4: Changes to the Environmental Monitoring Program

Enclosure 1: Environmental Monitoring Program

Offsite Dose Calculation Manual Operational Requirement 3.12.1.c

There were no changes to the REMP during 2012.

Enclosure 2: Land Use Census

Offsite Dose Calculation Manual Operational Requirements 3.12.2.a and 3.12.2.b

A Land Use Census was completed in September 2012. The changes observed in the 2012 Land Use Census from the previous year survey were as follows: a garden was found this year in the SE and NW sectors. No gardens were found this year in the NNE, NE, ENE, E, SSE, S, SW, W, and WNW sectors. No meat animals were found this year in the NNE, NE, E, SSE, S, SSW, W, and the WNW sectors. The resident in the S sector has again been included in the data although they are technically just outside the 5-mile radius, because of historical prevailing winds.

Appendix 5: Additional Operational Requirements
Enclosure 1: Inoperability of Liquid Effluent Monitors
ODCM Operational Requirement 3.3.3.10.b

Radioactivity Liquid Effluent Monitors Providing Alarms and Automatic Termination of Release were reviewed for operability during 2012 by the Condition Reporting Process pursuant to ODCM Operational Requirement 3.3.3.10.b.

- Turbine Building Floor Drain effluent radiation monitor (REM-01MB-3528) was not restored to operable status within 30 days. The monitor was removed from service on 4/18/12 and restored 5/18/12 to facilitate repair to the Oily Waste Separator. (CR 537703)
- The 3/27/12 to 4/3/12 the weekly Turbine Building Drain Composite sample was not collected due to equipment failure of the compositor. The compositor was declared inoperable and grab samples were obtained every 12 hour. (CR 528361)

Enclosure 2: Inoperability of Gaseous Effluent Monitors
ODCM Operational Requirement 3.3.3.11.b

Radioactivity Gaseous Effluent Monitors Providing Alarms and Automatic Termination of Release were reviewed for operability during 2012 by the Condition Reporting Process pursuant to ODCM Operational Requirement 3.3.3.11.b. None were inoperable for greater than 30 continuous days during the reporting period.

Enclosure 3: Unprotected Outdoor Tanks Exceeding Limits
Technical Specification 3.11.1.4.

No unprotected outdoor tank exceeded the Technical Specification limit of 10 Curies, excluding tritium or dissolved noble gases during this report period.

Enclosure 4: Gas Storage Tanks Exceeding Limits
PLP-114, Attachment 5, Operational Requirement 1.1

No gas storage tank exceeded the PLP-114, Attachment 5 Operational Requirement limit of 1.05 E+05 Curies during this report period.

Enclosure 5: Groundwater Samples taken in support of Groundwater Protection Initiative NEI 07-07 Industry Groundwater Protection Initiative – Final Guidance Document, Objective 2.4

Samples were taken at various locations throughout the plant in support of the Groundwater Protection Initiative. Samples included: excavation activities, Storm Drains, Vaults and Yard Drains that could potentially affect groundwater. Per NEI 07-07 the results of the Groundwater Monitoring Wells were included in the REMP and are not listed in this report.

Two excavation samples showed low levels of tritium.

- On 8/16/12 water was sampled in a trench adjacent to the Waste Neutralization Basin Flash Mixer Pipe with a concentration of 1,984 pCi/L. This was the location of a previously identified, reported (1/2010), and repaired leak. (CR 555583).
- On 9/12/12 water was sampled in a trench adjacent to the Waste Neutralization Pipe with a concentration of 3,951 pCi/L. (CR 561161)

On 10/16/12 a leak was identified on the 8 inch fiberglass waste neutralization flashing mixing tank return pipe. Approximately 15,000 gallons of water containing a low level of tritium (10,760 pCi/L) leaked into the surrounding soil. The leak was stopped and a repair was performed. The affected area was located approximately 50 feet south of the Water Treatment Building, within the plant's site boundary. Immediate remedial actions involving the affected area included: pumping the water from the saturated ground back into the waste neutralization basin, removal of the tritiated soil, and sampling of soil in the area for tritium and gamma analysis. The event was voluntarily communicated to the State and NRC per NEI 07-07 (CR 567023).

Appendix 6: Major Modifications to Radwaste System
ODCM Operational Requirement F.3

No major modifications were made to the Radwaste System during this report period.

Appendix 7: Meteorological Data
ODCM Operational Requirement F.2

As allowed by the Footnote to ODCM Operational Requirement F.2, the annual summary of meteorological data will be retained electronically on file. This data will be provided to the NRC upon request.

Appendix 8: Assessment of Radiation Doses
ODCM Operational Requirement F.2

An Assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site for each calendar quarter for the calendar year of this report, along with an annual total of each effluent pathway is in pursuant to the Operational Requirement F.2. Since 10CFR50, Appendix I is more restrictive than 40CRF190 for a single unit site, the assessment for 40CFR190 is performed when any of the 10CFR50, Appendix I limits are exceeded by a factor of 2 using LADTAP, XOQDOQ, and GASPAR II (NRC computer codes). The ODCM software is more conservative and is used for annual effluent dose assessment for demonstration of compliance with 10CFR50, Appendix I and 40CFR190.

Gaseous

The dose from the gaseous pathway is based on the highest calculated five-year average (2003 through 2007) relative concentration (X/Q) and deposition factor ((D/Q) for particulates) at the most restrictive location at the site boundary. The dose from the carbon-14 is based on the most restrictive garden.

	1ST Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Total
Noble Gas Gamma Dose (mrad)	8.07 E-05	5.72 E-06	1.75 E-05	4.78 E-06	1.09 E-04
10CFR50 Appendix I Limit (mrad)	5.00 E+00	5.00 E+00	5.00 E+00	5.00 E+00	1.00 E+01
Noble Gas Beta Dose (mrad)	2.18 E-04	1.70 E-05	5.20 E-05	1.42 E-05	3.01 E-04
10CFR50 Appendix I Limit (mrad)	1.00 E+01	1.00 E+01	1.00 E+01	1.00 E+01	2.00 E+01
Critical Organ Dose for I-131, I-133, Particulates, & H3 With T1/2 > 8 days (mrem)	1.79 E-01	1.94 E-01	2.32 E-01	2.03 E-01	8.09 E-01
Critical Organ Dose for C-14 Dose (mrem)	1.63 E-01	1.63 E-01	1.63 E-01	1.63 E-01	6.52 E-01
Total Critical Organ Dose (mrem)	3.42 E-01	3.57 E-01	3.95 E-01	3.66 E-01	1.46 E+00
10CFR50 Appendix I Limit (mrem)	7.5 E+00	7.5 E+00	7.5 E+00	7.5 E+00	1.50 E+01

Appendix 8: Assessment of Radiation Doses (Continued)
ODCM Operational Requirement F.2

Liquid

The dose from the liquid pathway is based on fish consumption from Harris Lake (parts of the lake are within the site boundary) plus drinking water from Lillington.

	1ST Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Total
Total Body Dose (mrem)	1.00 E-02	8.28 E-03	4.28 E-03	5.99 E-04	2.32 E-02
10CFR50 Appendix I Limit (mrem)	1.50 E+00	1.50 E+00	1.50 E+00	1.50 E+00	3.00 E+00
Critical Organ Dose (mrem)	1.02 E-02	1.62 E-02	5.85 E-03	1.51 E-03	3.35 E-02
10CFR50 Appendix I Limit (mrem)	5.00 E+00	5.00 E+00	5.00 E+00	5.00 E+00	1.00 E+01

40CFR190 Uranium Fuel Cycle Dose Calculation Results

The 40CFR190 effluent dose analysis to the maximum exposed individual from liquid and gas releases includes the dose from noble gases (i.e. total body and skin)

Maximum Total Body Dose = 8.32 E-01 mrem
Maximum Location: 1.33 Miles, South-SouthWest Sector
Critical Age: Child
Liquid Effluent Dose = 2.32 E-02 mrem
Gas Effluent Dose = 8.09 E-01 mrem
40CFR190 Limit = 25

Maximum Organ Dose = 1.46 E+00 mrem
Maximum Location: 1.33 Miles, South-SouthWest Sector
Critical Age: Child
Critical Organ: Bone
Liquid Effluent Dose = 3.35 E-02 mrem
Gas Effluent Dose = 1.46 E+00 mrem
40CFR190 Limit = 75 mrem (thyroid), 25 mrem (all other organs)

Appendix 8: Assessment of Radiation Doses (Continued)
ODCM Operational Requirement F.2

Doses Due to Direct Radiation from the Harris Nuclear Plant:

Ongoing Environmental TLD Dose measurements show that the offsite Direct Radiation Dose is negligible. Components considered include Radwaste storage onsite and the Old Steam Generator Storage Facility.

Doses from Return/Re-use of Previously Discharged Radioactive Effluents:

1. Tritium dose from drinking water to the worker at the Wake County Fire Training Center for 2012 is equal to 1.78 E-01 mrem.
2. The highest annual tritium dose due to the cooling tower operation at HNP is received by a child residing at the 2.2 mile N location. This dose includes the inhalation pathway dose of 3.11 E-04 mrem, the garden pathway dose of 1.12 E-03 mrem, and the meat pathway dose of 6.48 E-05 mrem. The child would receive a total of 1.49 E-03 mrem dose in the calendar year 2012.
   1st Quarter Dose = 3.02 E-04 mrem
   2nd Quarter Dose = 1.98 E-04 mrem
   3rd Quarter Dose = 5.07 E-04 mrem
   4th Quarter Dose = 4.85 E-04 mrem
3. Tritium dose to the nearest resident from lake evaporation is equal to 1.60 E-01 mrem. This dose includes inhalation pathway dose of 3.32 E-02 mrem, the garden pathway dose of 1.20 E-01 mrem, and meat pathway dose of 7.00E-03 mrem. This resident is a child living in the SSW sector at a distance of 4 miles.
   1st Quarter Dose = 2.65 E-02 mrem
   2nd Quarter Dose = 5.46 E-02 mrem
   3rd Quarter Dose = 5.22 E-02 mrem
   4th Quarter Dose = 2.67 E-02 mrem

Appendix 9: Corrections to Previous Annual Reports

Corrections to 2011 Annual Radiological Effluent Release Report (CR 563843)

There were 4 unplanned Waste Gas Decay Tank releases in 2011 and the 2011 Annual Radiological Effluent Release Report Appendix 1 Section III.C.b. failed to include a description of those releases.

- CR 450249, Release from "J" Waste Gas Decay Tank was due to leak of the waste gas compressor. The leak was corrected under WO 1896184. A total of 9.96E-02 Curies of Noble Gas and 1.931E+01 Curies of Tritium were released.
- CR 457376, Release from the "I" Waste Gas Decay Tank was due to an incomplete valve seating of isolation valve. When the "I" WGDT valves were tightened and snooped there was no evidence of leakage. A total of 2.60E-02 Curies of Noble Gas and 6.32E+0 Curies of Tritium were released.
- CR 480784, Release from the "I" Waste Gas Decay Tank was due to an incomplete valve seating isolation valve. The clutch of the valve was adjusted under WO 1966482. A total of 4.46E-02 Curies of Noble Gas and 1.79E+1 Curies of Tritium were released.
- CR 482470, Release from the "I" Waste Gas Decay Tank was due to leak of the waste gas compressor. The leak was corrected under WO 1969237. A total of 4.41E-2 Curies of Noble Gas and 7.55E-6 Curies of Tritium were released.

Appendix 8 Gaseous – incorrectly reported Critical Organ Dose for C-14 Dose (mrem) as 0.752E-01. The actual value should have been 7.52E-01.