

## **Radioactive Effluent Release Report for 2009**

# **Brunswick Steam Electric Plant Radioactive Effluent Release Report January 1 through December 31, 2009**

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Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Facility: Brunswick Steam Electric Plant  
Licensee: Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc.

1. Regulatory Limits

A. Fission and activation gases (ODCM 7.3.8)

(1) Calendar Quarter<sup>1</sup>

(a)  $\leq 10$  mrad gamma

(b)  $\leq 20$  mrad beta

(2) Calendar Year

(a)  $\leq 20$  mrad gamma

(b)  $\leq 40$  mrad beta

B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.9)

(1) Calendar Quarter<sup>1</sup>

(a)  $\leq 15$  mrem to any organ

(2) Calendar Year

(a)  $\leq 30$  mrem to any organ

C. Liquid Effluents (ODCMS 7.3.4)

(1) Calendar Quarter<sup>2</sup>

(a)  $\leq 3$  mrem to total body

(b)  $\leq 10$  mrem to any organ

(2) Calendar Year

(a)  $\leq 6$  mrem to total body

(b)  $\leq 20$  mrem to any organ

2. Maximum permissible concentration and dose rates which determine maximum instantaneous release rates.

A. Fission and activation gases (ODCMS 7.3.7.a)

(1)  $\leq 500$  mrem/year to total body

(2)  $\leq 3000$  mrem/year to the skin

B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.7.b)

(1)  $\leq 1500$  mrem/year to any organ

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NOTE: Dose calculations are determined in accordance with the ODCM

<sup>1</sup> Used for percent of ODCMS limit determination in Attachment 2, Table 1A

<sup>2</sup> Used for percent of ODCMS limit determination in Attachment 2, Table 2A

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Effluent and Waste Disposal Report Supplemental Information

C. Liquid effluents (ODCMS 7.3.3)

The concentration of radioactive material released in liquid effluents to unrestricted areas after dilution in the discharge canal shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10 CFR 20.1001 - 20.2401 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to the value given in the ODCM specifications.

(1) Tritium: limit =  $1.00\text{E-}03 \mu\text{Ci/ml}^3$

(2) Dissolved and entrained noble gases: limit =  $2.00\text{E-}04 \mu\text{Ci/ml}^3$

3. Measurements and Approximations of Total Radioactivity

A. Fission and activation gases

Analyses for specific radionuclides in representative grab samples by gamma spectroscopy.

B. Iodines

Analysis for specific radionuclides collected on charcoal cartridges by gamma spectroscopy.

C. Particulates

Analysis for specific radionuclides collected on filter papers by gamma spectroscopy.

D. Liquid Effluents

Analysis for specific radionuclides of individual releases by gamma spectroscopy.

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<sup>3</sup> Used as applicable limits for Attachment 2, Table 2A

Nuclear counting statistics are reported utilizing 1-sigma error. Total error where reported represents a best effort to approximate the total of all individual and sampling errors.

Attachment 1  
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4. Batch Releases

A. Liquid

(1) Number of batch releases:	2.62E+02
(2) Total time period for batch releases:	3.61E+04 Minutes
(3) Maximum time period for a batch release:	2.37E+02 Minutes
(4) Average time period for a batch release:	1.38E+02 Minutes
(5) Minimum time period for a batch release:	1.30E+01 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream:	8.05E+05 Gallons per Minute

B. Gaseous

(1) Number of batch releases:	0.00E+00
(2) Total time period for batch releases:	0.00E+00 Minutes
(3) Maximum time period for a batch release:	0.00E+00 Minutes
(4) Average time period for a batch release:	0.00E+00 Minutes
(5) Minimum time period for a batch release:	0.00E+00 Minutes

5. Abnormal Releases<sup>4</sup>

A. Liquid

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

B. Gaseous

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

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<sup>4</sup> There were no abnormal releases that exceeded 10 CFR 20 or 10 CFR 50 limits. See pages 5-6 for a discussion of release events that occurred.

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Summary

Tritium levels in excess of Nuclear Energy Institute (NEI) voluntary reporting criteria were confirmed to be present in onsite shallow groundwater wells on June 13, 2007. The NRC was notified, reference Event Number 43420. Immediate corrective actions were taken to perform additional sampling of areas surrounding the Storm Drain Stabilization Pond (SDSP) and to reconfigure the Turbine Building HVAC airwash system. The reconfiguration of the turbine building airwash system was done to eliminate the designed pathway of tritiated water to the Storm Drain Collection Basin (SDCB) and the SDSP. Additional corrective actions included installing monitoring wells at various locations to determine groundwater flow and checking for the presence of tritium in surrounding groundwater. There has been no indication that tritium has migrated offsite to drinking water supplies. The SDSP is also contributing to the offsite dose via the airborne pathway due to evaporation. Increased sampling of the SDSP has been instituted and monthly calculations of the airborne release are being performed. In addition, tritium has been found in the onsite tidally influenced marsh area near the SDSP. These release points are discussed in more detail below and include the associated dose to the public.

Discussion of releases from the Storm Drain Collector Basin

Due to heavy rain events and maintenance, the SDCB was released directly to the discharge canal on twelve occasions in 2009. The SDCB is a permitted release point during periods of inclement weather to protect plant personnel and equipment. Approximately  $1.80\text{E}+06$  gallons containing  $5.71\text{E}-02$  curies of tritium and  $8.79\text{E}-05$  curies of Co-60 were released. This resulted in an estimated maximum organ dose to the individual's GI-Tract of  $1.50\text{E}-05$  mrem and a Total Body dose of  $1.83\text{E}-06$  mrem. The volume released was not included in the average diluted concentration determination or in the volume of waste released on Attachment 2, Table 2A. The tritium and Co-60 released was included in the quarterly summary on Attachment 2, Table 2A and the dose is included in the Annual Dose Summary, Attachment 7.

Discussion of releases from the Storm Drain Stabilization Pond

Approximately  $5.26\text{E}+07$  gallons containing  $4.25\text{E}+00$  curies of tritium were released from the SDSP to the intake canal during this reporting period. This resulted in an estimated maximum dose to the individual of  $7.37\text{E}-06$  mrem. The SDSP is a permitted release point. The volume released was not included in the average diluted concentration determination or in the volume of waste released on Attachment 2, Table 2A. The tritium released is included in the quarterly summary on Attachment 2, Table 2A and the dose is included in the Annual Dose Summary, Attachment 7.

Discussion of water evaporation from the Storm Drain Stabilization Pond

There was  $4.54\text{E}+07$  gallons of tritiated water released via evaporation from the SDSP in 2009. This yields  $3.89\text{E}+00$  curies of tritium released to the atmosphere as a ground release. The nearest resident to the pond is in the northwest sector at approximately 0.3 miles. The maximum exposed individuals at that location received a calculated dose of  $1.19\text{E}-03$  mrem via the inhalation pathway in 2009. Only inhalation dose was determined because the exposed individuals do not have a garden and also do not have any milk or meat animals at this location. The curies of tritium released from the SDSP evaporation are included in Attachment 2, Table 1A. The dose is included in the Annual Dose Summary, Attachment 7.

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Discussion of releases from the Marsh to Nancy's Creek

Samples are routinely analyzed from the marsh areas that drain into Nancy's Creek during falling tides. The marsh areas are all on company owned property. The marsh land is under the influence of high and low tides and releases to Nancy's Creek, which is offsite. This constitutes a release point for evaluation (curies released, volume, offsite dose impact, etc). The sampling program consists of weekly sampling and analysis at eight locations.

All gamma analyses performed in 2009 were less than the Lower Limit of Detection (LLD). There were 416 tritium analyses performed, which resulted in 157 positive tritium results. The minimum concentration detected from the 157 positive results was  $2.33\text{E-}07$   $\mu\text{Ci/ml}$  and the maximum concentration was  $4.24\text{E-}05$   $\mu\text{Ci/ml}$ . Using the average concentration of  $1.49\text{E-}06$   $\mu\text{Ci/ml}$ , two high tides per day, the area of the marsh at high tide, 365 days, and a conservative factor of 2, it is calculated that  $5.37\text{E+}07$  gallons were released to Nancy's Creek containing  $3.02\text{E-}01$  curies of tritium. This yielded a Total Body dose of  $2.90\text{E-}03$  mrem to an adult from eating fish and  $7.13\text{E-}04$  mrem from eating invertebrate (shrimp, crabs, etc.) for a total dose of  $3.61\text{E-}03$  mrem. The curies released are included in Attachment 2, Table 2A and the dose is included in the Annual Dose Summary, Attachment 7.

Discussion of release from Pipe Outfall at Well ESS-24

Water was found leaking from a pipe near Well ESS-24 into the intake canal on December 29, 2008. The pipe was grouted and the release was secured on February 18, 2009. Samples were obtained for tritium analysis and the maximum tritium activity was  $3.67\text{E-}05$   $\mu\text{Ci/ml}$ . Using the maximum flow rate of 1,500 ml/min, it is calculated that  $2.80\text{E+}04$  gallons were released containing  $3.89\text{E-}03$  curies of tritium in 2009. This resulted in an estimated maximum dose to the individual of  $5.83\text{E-}09$  mrem. The curies released are included in Attachment 2, Table 2A and the dose is included in the Annual Dose Summary, Attachment 7.

Discussion of Ground Water Monitoring

The BSEP ground water sampling and analysis program has grown into a significant surveillance program over the past few years. Wells have been installed around the SDSP, in the Protected Area (PA), and throughout the Owner Controlled Area (OCA). By the end of 2009 the ground water program included approximately 117 monitoring wells. Forty of these wells are listed in the ODCM and are addressed in the Radiological Environmental Monitoring Report (REMP). The monitoring wells that are not covered in the ODCM will be discussed below. These wells consist of shallow and intermediate wells in different locations around the OCA and PA and are used to evaluate ground water movement. Several gamma analyses were performed and all results were less than LLD. Below are the tritium results and maps showing the well location for the wells that are not included in the ODCM:

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Shallow Wells for Plant Site						
Well Name	Number of Samples in 2009	Number of Positive Samples in 2009	Average Pos Act (pCi/L)	Minimum Pos Act (pCi/L)	Maximum Pos Act (pCi/L)	Depth of Well (ft)
ESS-3C	12	11	8.52E+02	3.34E+02	1.70E+03	14
ESS-5C	1	0	<LLD	<LLD	<LLD	17
ESS-2D	1	0	<LLD	<LLD	<LLD	15
ESS-12C	9	5	3.27E+02	2.44E+02	4.28E+02	15
ESS-14	1	0	<LLD	<LLD	<LLD	22
ESS-15C	1	0	<LLD	<LLD	<LLD	15
ESS-32C	1	0	<LLD	<LLD	<LLD	35
ESS-33C	1	0	<LLD	<LLD	<LLD	25
ESS-34C	1	0	<LLD	<LLD	<LLD	22
ESS-35C	1	0	<LLD	<LLD	<LLD	20
ESS-36C	1	0	<LLD	<LLD	<LLD	22
ESS-37C	1	0	<LLD	<LLD	<LLD	30
ESS-38C	7	1	5.17E+02	5.17E+02	5.17E+02	15
ESS-39C	7	0	<LLD	<LLD	<LLD	20
ESS-40C	1	0	<LLD	<LLD	<LLD	30
ESS-41C	1	0	<LLD	<LLD	<LLD	27
ESS-42C	1	0	<LLD	<LLD	<LLD	30
ESS-43C	1	0	<LLD	<LLD	<LLD	17
ESS-44C	1	0	<LLD	<LLD	<LLD	14
ESS-45C	1	0	<LLD	<LLD	<LLD	21
ESS-46C	1	0	<LLD	<LLD	<LLD	18



Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Shallow Wells for Plant Site						
Well Name	Number of Samples in 2009	Number of Positive Samples in 2009	Average Pos Act (pCi/L)	Minimum Pos Act (pCi/L)	Maximum Pos Act (pCi/L)	Depth of Well (ft)
ESS-47C	1	0	< LLD	< LLD	< LLD	20
ESS-48C	1	0	< LLD	< LLD	< LLD	18
ESS-49C	1	0	< LLD	< LLD	< LLD	19
ESS-50C	1	0	< LLD	< LLD	< LLD	22
ESS-51C	2	0	< LLD	< LLD	< LLD	22
ESS-54C	1	0	< LLD	< LLD	< LLD	24
ESS-55C	1	0	< LLD	< LLD	< LLD	38
ESS-56C	1	0	< LLD	< LLD	< LLD	32
ESS-57C	1	0	< LLD	< LLD	< LLD	30
ESS-58C	1	0	< LLD	< LLD	< LLD	19
ESS-59C	1	0	< LLD	< LLD	< LLD	18
ESS-60C	1	0	< LLD	< LLD	< LLD	19
ESS-61C	1	0	< LLD	< LLD	< LLD	28
ESS-62C	1	0	< LLD	< LLD	< LLD	20
ESS-63C	1	0	< LLD	< LLD	< LLD	29
ESS-64C	1	0	< LLD	< LLD	< LLD	21
ESS-65C	1	0	< LLD	< LLD	< LLD	15
ESS-66C	1	0	< LLD	< LLD	< LLD	20
ESS-67C	13	6	3.97E+02	2.68E+02	4.90E+02	25
ESS-68C	1	0	< LLD	< LLD	< LLD	19
ESS-69C	1	0	< LLD	< LLD	< LLD	30

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Effluent and Waste Disposal Report Supplemental Information

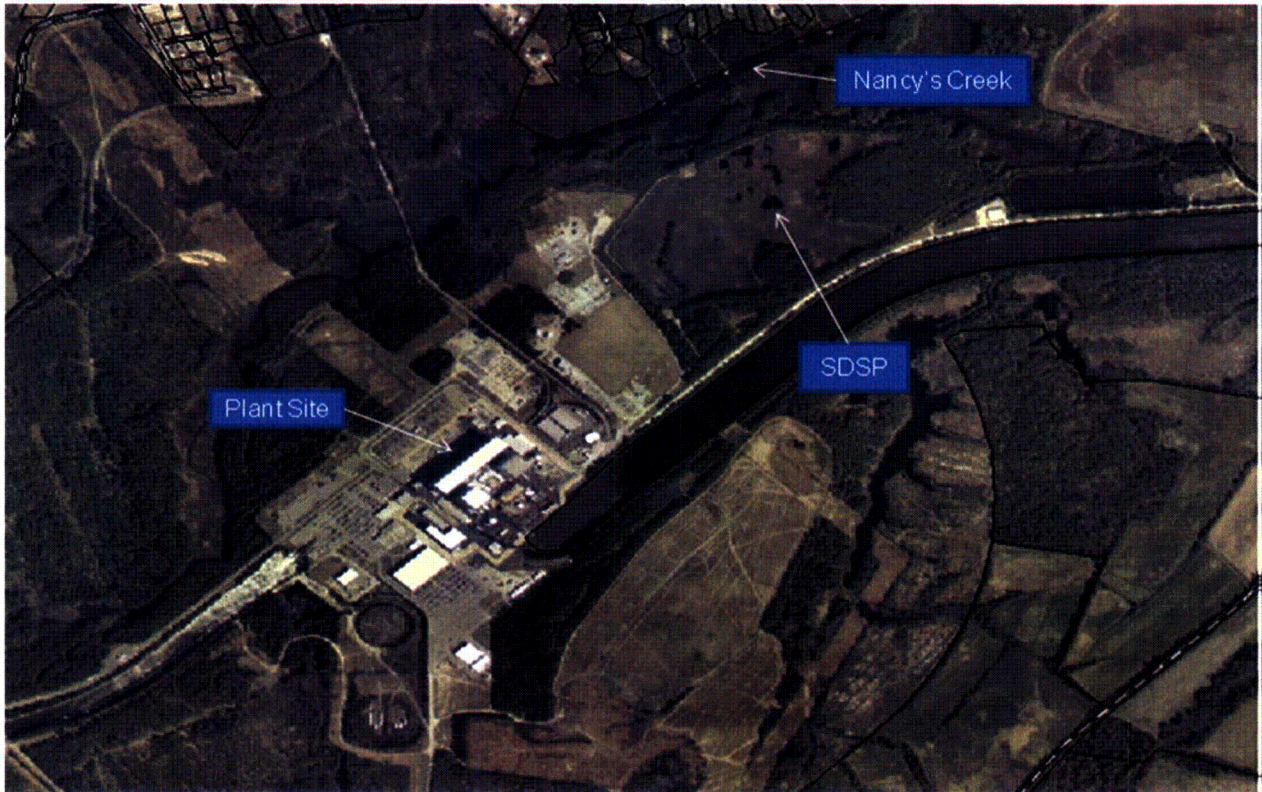
Shallow Wells for Plant Site						
Well Name	Number of Samples in 2009	Number of Positive Samples in 2009	Average Pos Act (pCi/L)	Minimum Pos Act (pCi/L)	Maximum Pos Act (pCi/L)	Depth of Well (ft)
ESS-70C	1	0	< LLD	< LLD	< LLD	19
ESS-71C	1	0	< LLD	< LLD	< LLD	19
ESS-72C	1	0	< LLD	< LLD	< LLD	18
ESS-73C	13	1	2.62E+02	2.62E+02	2.62E+02	15
ESS-74C	1	0	< LLD	< LLD	< LLD	20
ESS-STAB	12	12	4.91E+04	3.38E+04	6.58E+04	31
ESS-MW-1	9	7	3.96E+02	2.48E+02	6.78E+02	24
MWPA-100C	5	3	3.56E+02	2.54E+02	4.44E+02	30
MWPA-101C	5	5	1.34E+03	6.36E+02	3.41E+03	30
MWPA-102C	5	5	4.94E+03	3.49E+03	9.29E+03	30
MWPA-103C	5	0	< LLD	< LLD	< LLD	30
MWPA-104C	5	5	2.54E+04	1.11E+04	3.45E+04	29
MWPA-105C	5	5	3.62E+03	2.41E+03	4.82E+03	30
MWPA-106C	5	4	5.33E+02	3.68E+02	6.80E+02	29
MWPA-107C	6	6	3.18E+03	1.31E+03	4.62E+03	29
MWPA-108C	5	4	3.53E+02	2.54E+02	4.72E+02	29
MWPA-109C	5	2	4.35E+02	2.87E+02	5.84E+02	29
MWPA-110C	5	4	4.04E+02	3.00E+02	5.69E+02	29
MWPA-111C	5	5	2.73E+04	2.42E+04	3.08E+04	30
MWPA-112C	5	5	1.00E+04	8.19E+03	1.21E+04	34
MWPA-113C	5	1	4.05E+02	4.05E+02	4.05E+02	25

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

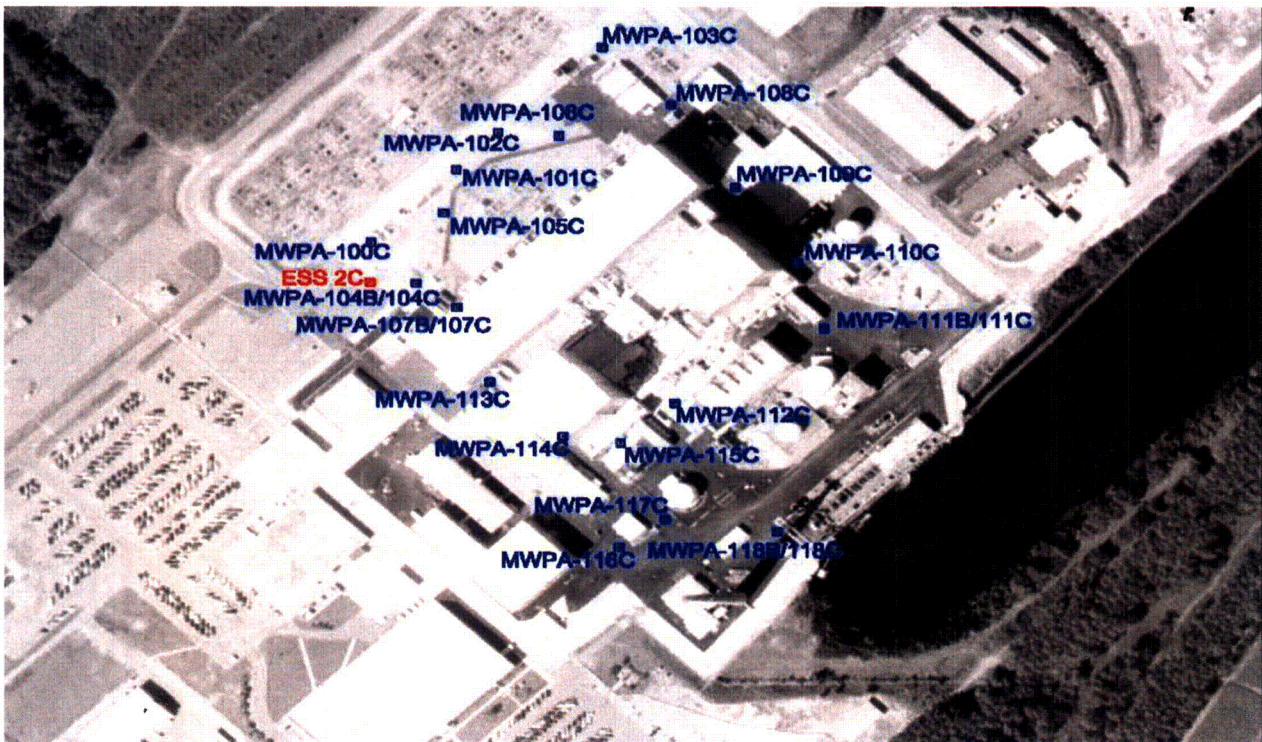
Shallow Wells for Plant Site						
Well Name	Number of Samples in 2009	Number of Positive Samples in 2009	Average Pos Act (pCi/L)	Minimum Pos Act (pCi/L)	Maximum Pos Act (pCi/L)	Depth of Well (ft)
MWPA-114C	5	4	5.12E+02	2.92E+02	6.60E+02	30
MWPA-115C	5	5	2.74E+04	2.49E+04	3.13E+04	34
MWPA-116C	5	5	< LLD	< LLD	< LLD	30
MWPA-117C	6	5	1.37E+03	1.05E+03	1.59E+03	30
MWPA-118C	5	1	3.83E+02	3.83E+02	3.83E+02	30

Intermediate Wells for Plant Site						
Well Name	Number of Samples in 2009	Number of Positive Samples in 2009	Average Pos Act (pCi/L)	Minimum Pos Act (pCi/L)	Maximum Pos Act (pCi/L)	Depth of Well (ft)
ESS-38B	7	0	< LLD	< LLD	< LLD	55
ESS-39B	7	2	5.35E+02	4.90E+02	5.79E+02	55
ESS-51B	2	0	< LLD	< LLD	< LLD	45
ESS-52B	2	0	< LLD	< LLD	< LLD	51
ESS-53B	2	0	< LLD	< LLD	< LLD	76
MWPA-104B	5	5	2.74E+04	2.55E+04	3.09E+04	59
MWPA-111B	5	5	2.91E+03	2.38E+03	3.19E+03	59
MWPA-107B	5	5	5.13E+04	3.72E+04	6.30E+04	60
MWPA-118B	5	0	< LLD	< LLD	< LLD	60

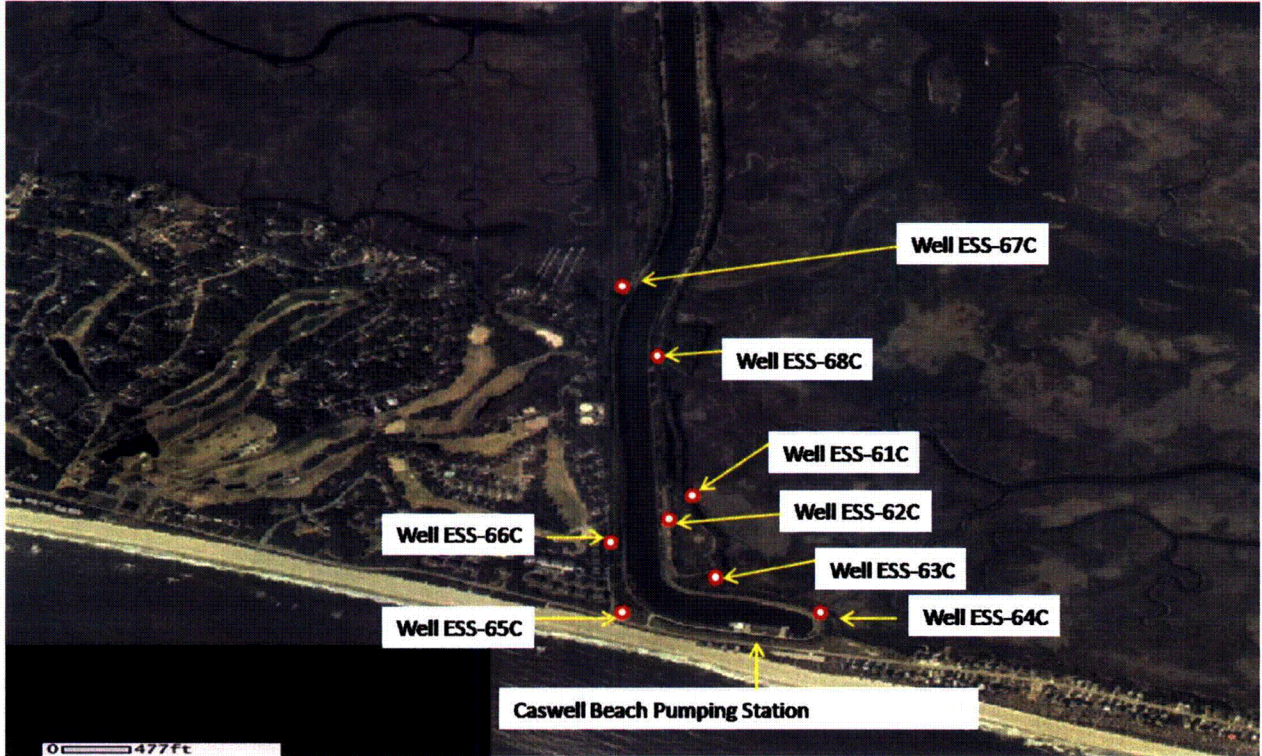
Attachment 1  
Effluent and Waste Disposal Report Supplemental Information  
Overview of Plant Site, SDSP, and Nancy's Creek



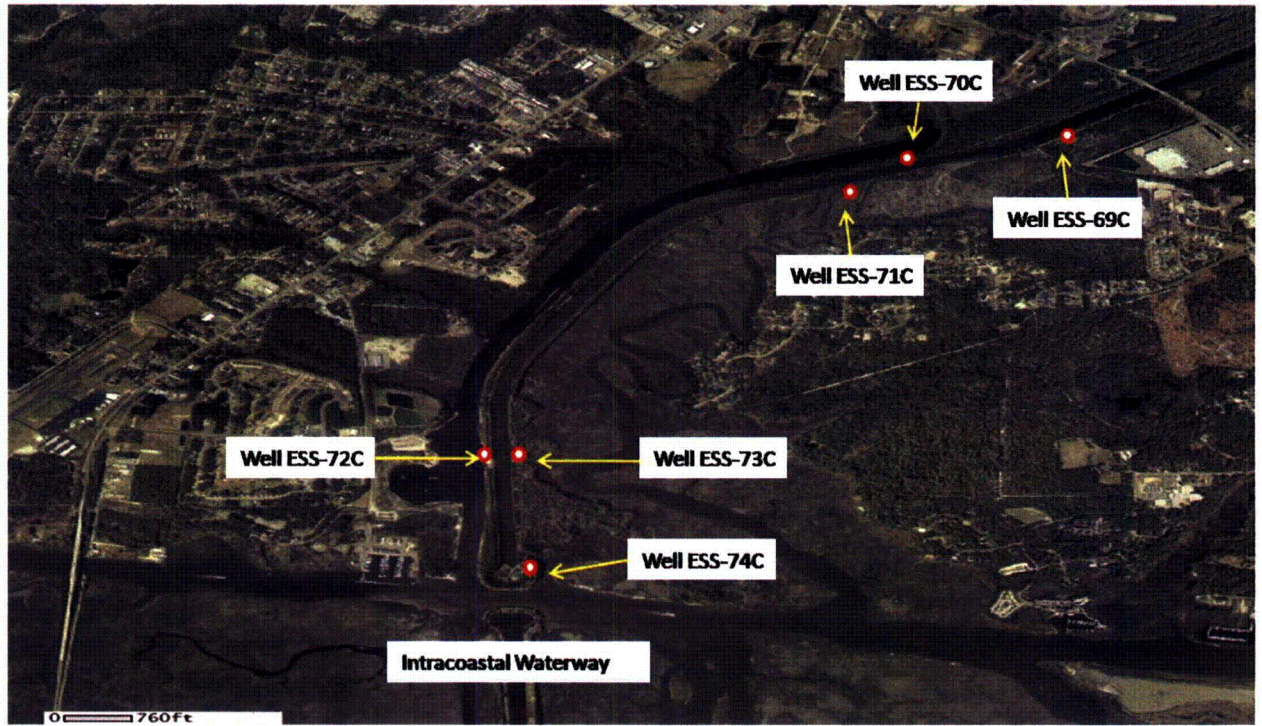
Protected Area Wells



Attachment 1  
Effluent and Waste Disposal Report Supplemental Information  
Area One Wells Near Caswell Beach

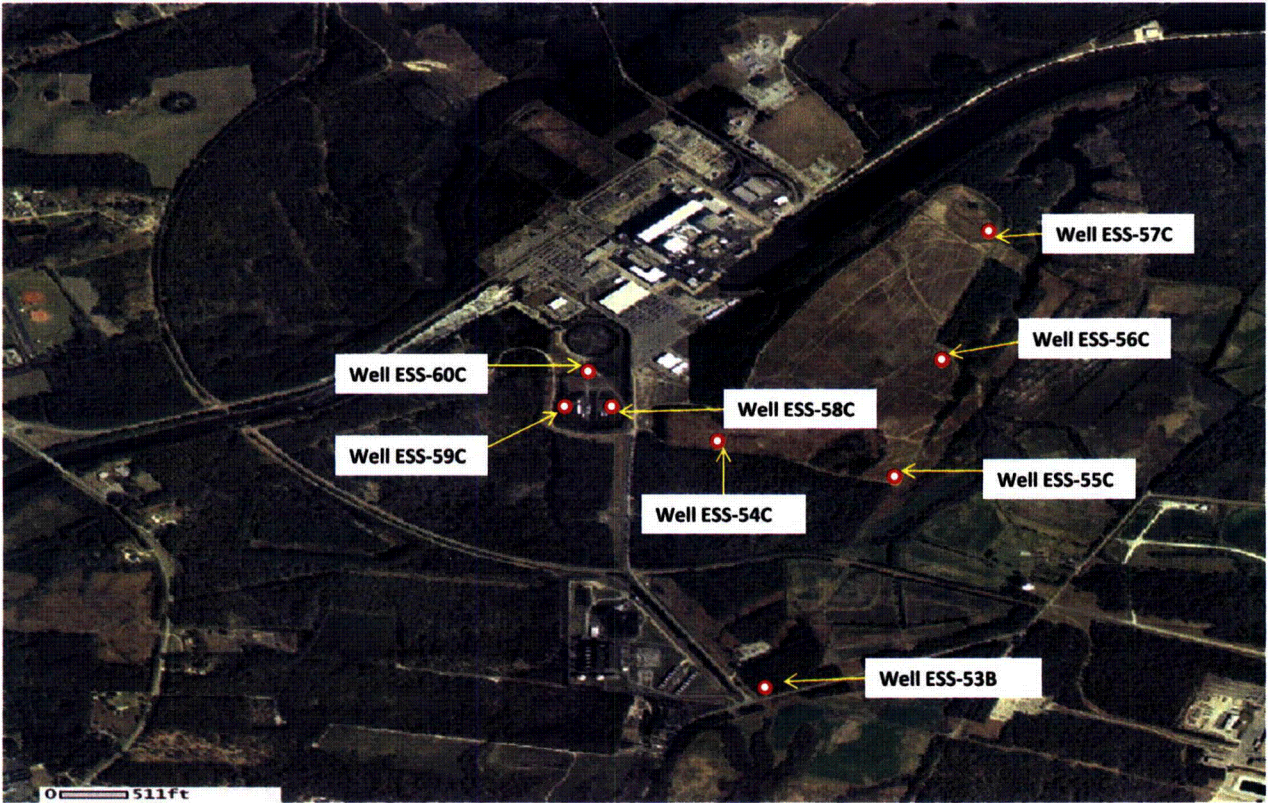


Area 2 Wells Near Intracoastal Waterway

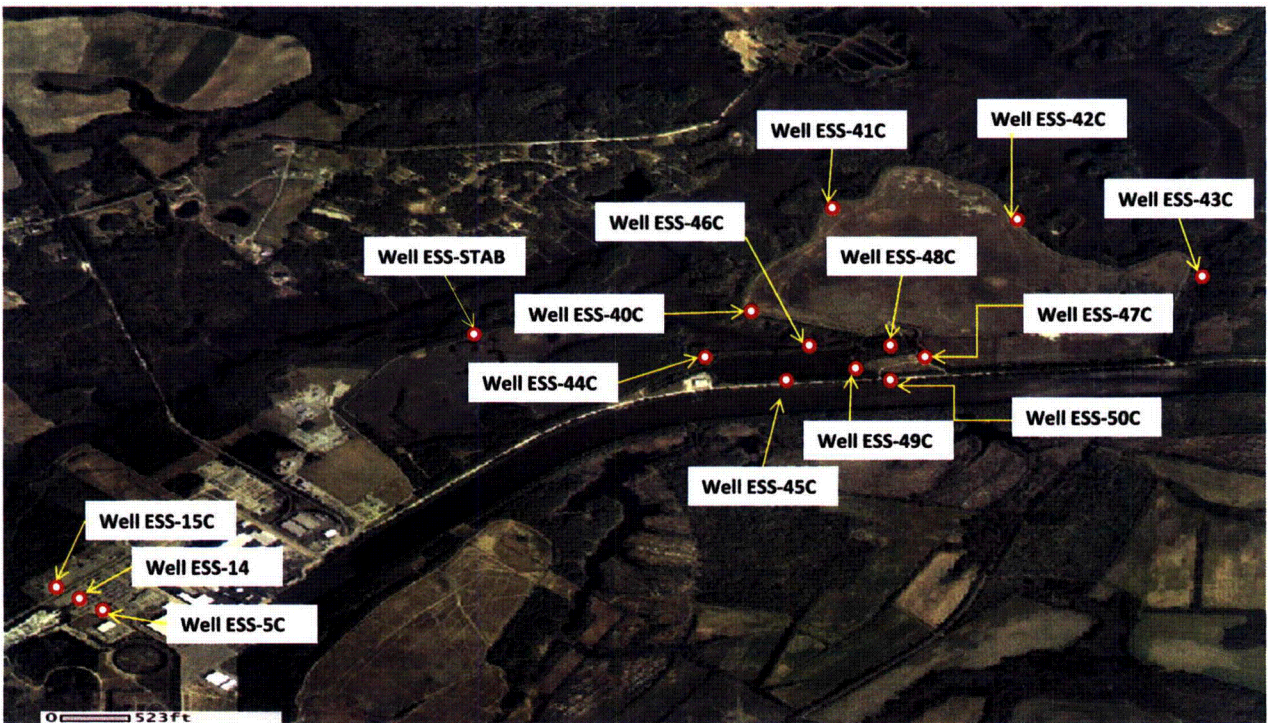


Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Area 3 and Area 4 Near Plant

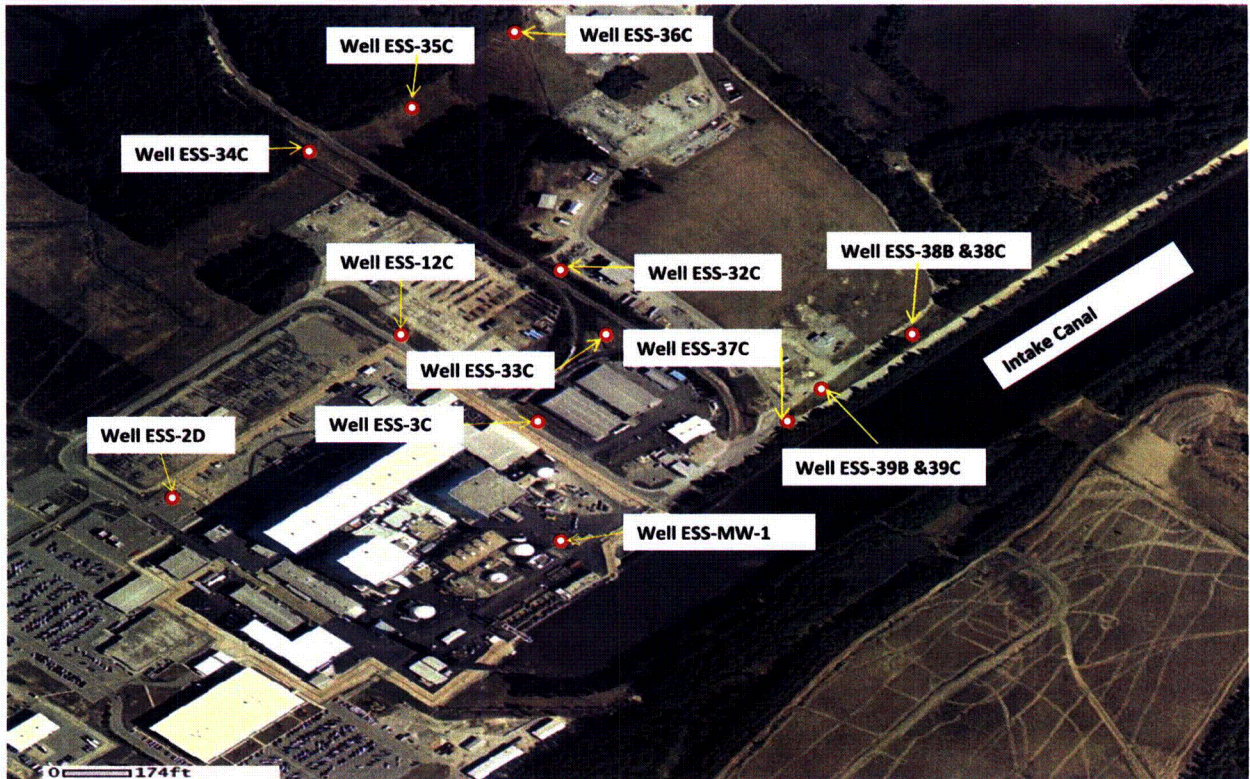


Area 5, Area 6, and Area 10 Wells in OCA

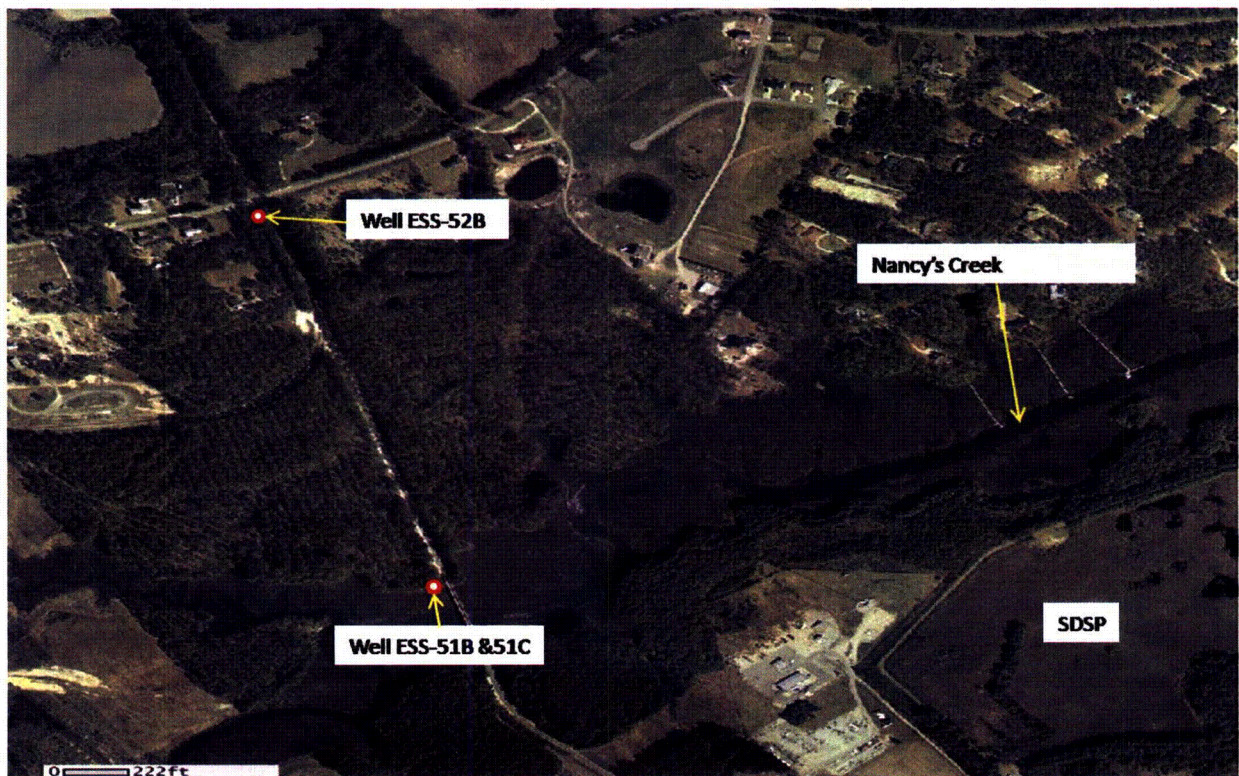


Attachment 1  
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Area 8 and Area 11 Wells in OCA



Area 9 Wells in OCA



Attachment 2  
Effluent and Waste Disposal Data

Table 1A	Gaseous Effluents - Summation of all Releases
Table 1B	Gaseous Effluents - Elevated Releases
Table 1C	Gaseous Effluents - Ground Level Releases
Table 2A	Liquid Effluents - Summation of all Releases
Table 2B	Liquid Effluents - Batch Mode
	Lower Limits of Detection
Table 3A	Solid Waste and Irradiated Fuel Shipments - Waste Class A
Table 3B	Solid Waste and Irradiated Fuel Shipments - Waste Class B
Table 3C	Solid Waste and Irradiated Fuel Shipments - Waste Class C



Attachment 2  
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents – Summation of all Releases

**A. FISSION AND ACTIVATION GASES**

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total release	Ci	2.98E+02	1.35E+02	1.39E+02	1.25E+02	4.50E+01
2. Average release rate for period	µCi/sec	3.83E+01	1.71E+01	1.75E+01	1.57E+01	NA
3. Percent of ODCM limit	%	6.07E-01	1.39E-01	1.11E-01	6.77E-02	NA

**B. IODINES**

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total Iodine - 131 release	Ci	1.72E-02	5.16E-03	1.23E-02	8.15E-03	3.50E+01
2. Average release rate for period	µCi/sec	2.21E-03	6.57E-04	1.55E-03	1.03E-03	NA

**C. PARTICULATES**

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total release	Ci	4.09E-03	1.88E-03	1.92E-03	1.34E-03	3.50E+01
2. Average release rate for period	µCi/sec	5.26E-04	2.39E-04	2.42E-04	1.69E-04	NA
3. Gross Alpha	Ci	≤ LLD	2.41E-08	≤ LLD	1.41E-07	3.50E+01

**D. TRITIUM**

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total release	Ci	7.32E+01	5.47E+01	5.22E+01	5.70E+01	3.00E+01
2. Average release rate for period	µCi/sec	9.42E+00	6.96E+00	6.57E+00	7.17E+00	NA

Attachment 2  
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents – Summation of all Releases

E. IODINE-131, IODINE-133, TRITIUM AND PARTICULATES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
1. Total release	Ci	7.33E+01	5.48E+01	5.24E+01	5.71E+01
2. Average release rate for period	μCi/sec	9.43E+00	6.97E+00	6.59E+00	7.18E+00
3. Percent of ODCM limit	%	1.21E+00	3.11E-01	6.89E-01	4.93E-01

Attachment 2  
Effluent and Waste Disposal Data

Table 1B: Gaseous Effluents – Elevated Releases  
Continuous Release

Nuclides Released

1. FISSION GASES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
argon-41	Ci	≤ LLD	4.83E-02	≤ LLD	≤ LLD
krypton-85m	Ci	7.32E-01	1.64E+00	≤ LLD	≤ LLD
krypton-87	Ci	4.72E+00	2.39E+00	≤ LLD	≤ LLD
krypton-88	Ci	≤ LLD	4.14E+00	≤ LLD	≤ LLD
xenon-133	Ci	1.35E+01	2.55E+00	≤ LLD	≤ LLD
xenon-133m	Ci	≤ LLD	< LLD	≤ LLD	≤ LLD
xenon-135	Ci	1.44E+01	3.31E+01	9.58E+00	9.73E+00
xenon-135m	Ci	5.57E+01	1.87E+01	3.59E+01	3.49E+01
xenon-137	Ci	3.08E+01	4.84E-01	1.01E+01	≤ LLD
xenon-138	Ci	1.30E+02	5.88E+01	7.62E+01	6.91E+01
<u>total for period</u>	Ci	<u>2.50E+02</u>	<u>1.22E+02</u>	<u>1.32E+02</u>	<u>1.14E+02</u>

2. GASEOUS IODINES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
iodine-131	Ci	1.08E-02	4.29E-03	1.09E-02	6.65E-03
iodine-132	Ci	5.23E-02	3.17E-02	1.07E-01	5.03E-02
iodine-133	Ci	7.87E-02	3.78E-02	1.09E-01	5.85E-02
iodine-134	Ci	1.17E-01	6.13E-02	2.58E-01	1.01E-01
iodine-135	Ci	1.20E-01	6.04E-02	1.89E-01	9.48E-02
<u>total for period</u>	Ci	<u>3.79E-01</u>	<u>1.95E-01</u>	<u>6.73E-01</u>	<u>3.11E-01</u>

3. PARTICULATES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
chromium-51	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
manganese-54	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-58	Ci	≤ LLD	3.03E-06	≤ LLD	≤ LLD
cobalt-60	Ci	7.50E-06	2.60E-05	4.40E-06	3.49E-06
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	7.23E-05	1.89E-04	2.65E-05	1.47E-04
strontium-90	Ci	4.40E-07	1.12E-06	3.85E-07	7.00E-07
niobium-95	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-134	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-137	Ci	≤ LLD	1.56E-06	≤ LLD	≤ LLD
barium-140	Ci	5.39E-04	4.59E-04	6.54E-04	3.56E-04
lanthanum-140	Ci	9.29E-04	8.19E-04	1.20E-03	6.19E-04
<u>total for period</u>	Ci	<u>1.55E-03</u>	<u>1.50E-03</u>	<u>1.88E-03</u>	<u>1.13E-03</u>

4. TRITIUM

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
hydrogen-3	Ci	1.95E+01	1.81E+01	2.56E+01	2.05E+01

Attachment 2  
Effluent and Waste Disposal Data

Table 1C: Gaseous Effluents – Ground Level Releases  
Continuous Release

Nuclides Released

1. FISSION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
krypton-85m	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
krypton-87	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
krypton-88	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
xenon-133	Ci	3.57E+00	6.71E+00	5.72E-01	5.48E-01
xenon-135	Ci	5.52E+00	3.02E-01	3.24E+00	1.10E+01
xenon-135m	Ci	1.24E+01	≤ LLD	≤ LLD	≤ LLD
xenon-137	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
<u>xenon-138</u>	Ci	2.59E+01	6.01E+00	3.79E+00	≤ LLD
total for period	Ci	4.75E+01	1.30E+01	7.60E+00	1.15E+01

2. GASEOUS IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	6.39E-03	8.71E-04	1.45E-03	1.50E-03
iodine-132	Ci	2.08E-02	8.90E-03	1.74E-02	1.94E-02
iodine-133	Ci	2.50E-02	8.18E-03	1.43E-02	1.50E-02
iodine-134	Ci	4.38E-02	1.07E-02	4.37E-02	4.52E-02
<u>iodine-135</u>	Ci	3.70E-02	9.43E-03	2.86E-02	2.53E-02
total for period	Ci	1.33E-01	3.81E-02	1.05E-01	1.06E-01

3. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
chromium-51	Ci	2.70E-05	1.57E-05	5.44E-06	1.72E-05
manganese-54	Ci	2.57E-06	5.28E-06	≤ LLD	≤ LLD
cobalt-58	Ci	1.38E-05	6.06E-06	8.19E-06	3.84E-05
cobalt-60	Ci	1.68E-04	1.26E-04	1.82E-05	4.29E-05
zinc-65	Ci	2.96E-06	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	2.98E-04	7.66E-05	5.40E-06	7.91E-05
strontium-90	Ci	1.51E-06	4.98E-07	≤ LLD	6.47E-07
cesium-134	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-137	Ci	1.60E-07	1.48E-06	≤ LLD	≤ LLD
barium-140	Ci	6.90E-04	6.11E-05	≤ LLD	1.38E-05
lanthanum-140	Ci	1.34E-03	8.50E-05	≤ LLD	2.49E-05
<u>cerium-141</u>	Ci	1.59E-09	≤ LLD	≤ LLD	≤ LLD
total for period	Ci	2.54E-03	3.78E-04	3.72E-05	2.17E-04

4. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
hydrogen-3	Ci	5.28E+01	3.50E+01	2.57E+01	3.61E+01

Attachment 2  
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents – Summation of all Releases

**A. FISSION AND ACTIVATION PRODUCTS (NOTE 1)**

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release (excluding tritium, gases, and alpha)	Ci	8.24E-04	7.20E-03	2.79E-03	8.14E-04	4.00E+01
2. Average diluted concentration  (NOTE 2)	µCi/ml	6.50E-11	2.00E-10	7.88E-11	3.16E-11	NA
3. Percent of applicable limit	%	4.93E-03	1.60E-02	5.20E-03	2.59E-03	NA

**B. TRITIUM (NOTE 1)**

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	5.62E+01	6.67E+01	4.05E+01	4.74E+01	4.50E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	4.43E-06	1.85E-06	1.14E-06	1.84E-06	NA
3. Percent of applicable limit	%	4.43E-01	1.85E-01	1.14E-01	1.84E-01	NA

**C. DISSOLVED AND ENTRAINED GASES (NOTE 1)**

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	1.05E-02	1.21E-02	6.16E-03	1.29E-02	4.00E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	8.29E-10	3.36E-10	1.74E-10	5.00E-10	NA
3. Percent of applicable limit	%	4.15E-04	1.68E-04	8.70E-05	2.50E-04	NA

**D. GROSS ALPHA RADIOACTIVITY**

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD	4.00E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases

NOTE 2: Does not include rainwater (i.e. Storm Drain Collector Basin and/or Storm Drain Stabilization Pond)

Attachment 2  
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents – Summation of all Releases

E. VOLUME OF WASTE RELEASED (NOTE 2)

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume	liters	2.71E+06	5.38E+06	4.64E+06	3.41E+06	1.50E+01

F. VOLUME OF DILUTION WATER

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume (used during release for average diluted concentration)	liters	1.27E+10	3.61E+10	3.54E+10	2.58E+10	1.50E+01

G. VOLUME OF COOLING WATER DISCHARGED FROM PLANT

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume	liters	3.38E+11	4.54E+11	5.10E+11	4.70E+11	1.50E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases

NOTE 2: Does not include rainwater (i.e. Storm Drain Collection Basin and/or Storm Drain Stabilization Pond)

Attachment 2  
Effluent and Waste Disposal Data

Table 2B: Liquid Effluents - Batch Mode

Nuclides Released

1. FISSION AND ACTIVATION PRODUCTS

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
chromium-51	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
manganese-54	Ci	1.54E-05	3.16E-04	5.35E-05	4.76E-06
iron-55	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-58	Ci	≤ LLD	2.41E-04	1.19E-05	≤ LLD
iron-59	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-60	Ci	3.54E-04	6.10E-03	2.10E-03	4.50E-04
zinc-65	Ci	1.48E-06	2.10E-04	4.85E-05	≤ LLD
strontium-89	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-90	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
niobium-95	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
zirconium-95	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
molybdenum-99	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
iodine-131	Ci	3.31E-04	7.20E-05	1.76E-04	1.36E-04
iodine-133	Ci	3.53E-05	1.54E-04	3.94E-04	1.41E-04
iodine-135	Ci	≤ LLD	≤ LLD	≤ LLD	3.22E-06
cesium-134	Ci	7.00E-06	6.56E-06	1.72E-07	3.22E-06
cesium-137	Ci	8.07E-05	1.05E-04	1.15E-05	7.61E-05
barium-140	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
lanthanum-140	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cerium-141	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cerium-144	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
<u>total for period</u>	Ci	<u>8.24E-04</u>	<u>7.20E-03</u>	<u>2.79E-03</u>	<u>8.14E-04</u>

2. DISSOLVED AND ENTRAINED GASES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
xenon-133	Ci	1.94E-03	2.08E-03	1.13E-03	2.27E-03
xenon-135	Ci	8.57E-03	1.00E-02	5.04E-03	1.06E-02
xenon-135m	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
<u>total for period</u>	Ci	<u>1.05E-02</u>	<u>1.21E-02</u>	<u>6.16E-03</u>	<u>1.29E-02</u>

Attachment 2  
Effluent and Waste Disposal Data  
Lower Limits of Detection

Units:  $\mu\text{Ci/ml}$

1. LIQUID RELEASES

Alpha	2.02E-08
H-3	2.68E-06
H-3	2.43E-07*
Mn-54	1.65E-08
Fe-55	1.13E-07
Co-58	1.35E-08
Fe-59	5.10E-08
Co-60	2.71E-08
Zn-65	4.00E-08
Sr-89	1.51E-08
Sr-90	1.17E-08
Mo-99	1.57E-07
I-131	1.30E-08
I-135	6.52E-08
Cs-134	2.35E-08
Cs-137	1.76E-08
Ce-141	2.48E-08
Ce-144	9.42E-08
Kr-85	4.74E-06
Kr-87	3.63E-08
Kr-88	4.49E-08
Xe-133	3.79E-08
Xe-133m	1.23E-07
Xe-135	1.49E-08
Xe-135m	6.31E-08
Xe-138	1.91E-07

2. GASEOUS RELEASES

Ar-41	8.26E-09
Kr-85m	5.69E-09
Kr-87	2.13E-08
Kr-88	2.74E-08
Xe-133	1.78E-08
Xe-133m	4.87E-08
Xe-135	7.13E-09
Xe-135m	1.05E-07
Xe-137	7.44E-07
Xe-138	2.20E-07

3. IODINES AND PARTICULATES

Alpha	1.07E-15
H-3	9.13E-11
Cr-51	9.74E-13
Mn-54	5.70E-13
Co-58	6.41E-13
Fe-59	1.69E-12
Co-60	2.78E-13
Zn-65	2.98E-12
Sr-89	2.89E-15
Sr-90	8.48E-16
Mo-99	7.61E-12
I-131	7.21E-13
Cs-134	8.50E-13
Cs-137	9.60E-13
Ce-141	9.92E-13
Ce-144	4.53E-12

NOTES:

1. The above values represent typical "a priori" LLDs for isotopes where values of " $\leq$  LLD" are indicated in Tables 1A, 1B, 1C, 2A, and 2B. Also included are isotopes specified in ODCMS 7.3.3 and 7.3.7.
2. Where activity for any nuclide is reported as " $\leq$  LLD," that nuclide is considered not present and the LLD activity listed is not considered in the summary data.

\*Tritium LLD value for ground water monitoring.



Attachment 2  
Effluent and Waste Disposal Data

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

Waste Class A

1. <u>Total volume shipped</u> (cubic meters)	1.21E+03
Total curie quantity (estimated)	6.03E+01

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup>	4.81E+01	
	Curies	5.71E+01	1.00E+01
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup>	1.16E+03	
	Curies	3.22E+00	1.00E+01
c. Irradiated components	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
d. Others (describe)	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

a.	H-3	1.10E+00 %	
	Fe-55	2.20E+01 %	
	Co-60	5.20E+01 %	
	Ni-63	1.50E+01 %	
	Cs-134	1.40E+00%	
	Cs-137	7.80E+00 %	
b.	Fe-55	1.90E+01 %	
	Co-60	6.20E+01 %	
	Ni-63	5.50E+00 %	
	Cs-137	1.30E+01 %	
c.	N/A		
d.	N/A		

NOTE:

Solid Radioactive Waste listed above was shipped for processing to various waste processing services or directly shipped to a licensed disposal facility.

Attachment 2  
Effluent and Waste Disposal Data

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin	Dewatered	Type A or GDP	1.10E+01
b. Dry active waste	Compacted/ Non-compacted	Type A or GDP	2.60E+01
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1.60E+01	Highway	Oak Ridge, TN
1.00E+00	Highway	Richland, WA
1.10E+01	Rail	Clive, UT
6.00E+00	Highway	Ashford, AL
3.00E+00	Highway	Erwin, TN

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

Attachment 2  
Effluent and Waste Disposal Data

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

Waste Class B

1. <u>Total volume shipped</u> (cubic meters)	2.27E+00
Total curie quantity (estimated)	2.30E+02

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup> Curies	2.27E+00 2.30E+02	1.00E+01
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup> Curies	0.00E+00 0.00E+00	N/A
c. Irradiated components	meters <sup>3</sup> Curies	0.00E+00 0.00E+00	N/A
d. Others (describe)	meters <sup>3</sup> Curies	0.00E+00 0.00E+00	N/A

3. Estimate of major radionuclides composition

a.	Mn-54	2.80E+00 %
	Fe-55	2.30E+01 %
	Co-58	2.40E+00 %
	Co-60	6.20E+01 %
	Ni-63	9.40E-01 %
	Zn-65	6.80E+00 %
	Cs-137	7.10E-01 %
b.	N/A	
c.	N/A	
d.	N/A	

NOTE:

Solid Radioactive Waste was shipped to a waste processor for processing and then transported for storage pending future disposal by the processor.

Attachment 2  
Effluent and Waste Disposal Data

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin & Filters	Dewatered	Type B	1.00E+00
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1.00E+00	Highway	Erwin, TN

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

Attachment 2  
Effluent and Waste Disposal Data

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

Waste Class C

1. <u>Total volume shipped</u> (cubic meters)	0.00E+00
Total curie quantity (estimated)	0.00E+00

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
c. Irradiated components	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	1.00E+01
d. Others (describe)	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

- a. N/A
- b. N/A
- c. N/A
- d. N/A

NOTE:

No Waste Class C material or spent fuel was shipped offsite for storage or disposal during the reporting period.

Attachment 2  
Effluent and Waste Disposal Data

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin & Filters	Dewatered	N/A	N/A
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0.00E+00	N/A	N/A

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0.00E+00	N/A	N/A

Attachment 3  
Environmental Monitoring Program

Enclosure 1: Milk and Vegetable Sample Location

Enclosure 2: Land Use Census

Attachment 3  
Environmental Monitoring Program  
Enclosure 1: Milk and Vegetable Sample Location

No milk animals are located in the area evaluated by the last Land Use Census, therefore, no milk sampling locations were available during this time period.



Attachment 3  
Environmental Monitoring Program

Enclosure 2: Land Use Census

The 2009 Land Use Census did not identify any locations that are reportable in the Radioactive Effluent Release Report for 2009.

The following is a summary of the nearest resident and garden locations identified within five miles of the plant for each of the 16 meteorological sectors. No milk animals were found within five miles of the plant.

<u>Direction</u>	<u>Residence</u>	<u>Garden</u>
NNE	0.8 miles	0.9 miles
NE	None	None
ENE	None	None
E	None	None
ESE	1.4 miles	1.4 miles
SE	None	None
SSE	2.1 miles	None
S	1.1 miles	2.0 miles
SSW	1.2 miles	2.0 miles
SW	1.1 miles	1.6 miles
WSW	1.2 miles	1.2 miles
W	0.9 miles	0.9 mile
WNW	0.9 miles	None
NW	0.9 miles	1.0 miles
NNW	0.8 miles	0.9 miles
N	0.7 miles	None

**Attachment 4  
Effluent Instrumentation**

**Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation**

**Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation**

**Enclosure 3: Liquid Hold-Up Tank**

**Attachment 4  
Effluent Instrumentation**

**Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation**

No Radioactive Liquid Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.

**Attachment 4  
Effluent Instrumentation**

**Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation**

**No Radioactive Gaseous Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.**

Attachment 4  
Effluent Instrumentation  
Enclosure 3: Liquid Hold-Up Tank

No Liquid Hold-Up Tank exceeded the 10-Curie limit of ODCMS 7.3.6 during this reporting period.

## Attachment 5

### Major Modification To The Radioactive Waste Treatment Systems

In accordance with ODCMS 7.5.1, major changes to the liquid, gaseous, and solid Radioactive Waste Treatment Systems shall be reported to the NRC as part of the Radioactive Effluent Release Report or as part of the Updated Final Safety Analysis Report (UFSAR) update. Any major modifications to the radioactive waste treatment systems will be submitted with the UFSAR in accordance with 10 CFR 50.71(e). No changes have been made during this reporting period.

## Attachment 6

### Meteorological Data

Per Technical Specification 5.6.3 and ODCMS 7.4.2, the annual summary of meteorological data collected over the calendar year has been retained in a file and is available for NRC review upon request.

Attachment 7

Annual Dose Assessment

**Liquid Effluents**

Critical Age: Adult

Controlling location for liquid releases: SW sector at 0.1 miles<sup>(1)</sup>

Supplemental Dose*	SDSP	Marsh <sup>(1)</sup>	Pipe	Total
mrem	7.37E-06	3.61E-03	5.83E-09	3.62E-03

\*Reference page 5-6 of Supplemental Information

	Routine ODCM Dose (mrem)	Supplemental Dose (mrem)	SDCB Supplemental Dose (mrem)	Total Dose (mrem)	Limit (mrem)
GI-LLI	2.37E-03	3.62E-03	1.50E-05	6.00E-03	2.00E+01
Bone	2.31E-04	0.00E+00	0.00E+00	2.31E-04	2.00E+01
Liver	1.16E-03	3.62E-03	8.75E-07	4.78E-03	2.00E+01
Lung	3.55E-04	3.62E-03	8.32E-08	3.97E-03	2.00E+01
Total Body	8.61E-04	3.62E-03	1.83E-06	4.48E-03	6.00E+00
Thyroid	9.17E-04	3.62E-03	8.32E-08	4.54E-03	2.00E+01
Kidney	8.24E-04	3.62E-03	8.32E-08	4.44E-03	2.00E+01

**Gaseous Effluents**

Noble Gas:

Critical Age: Infant

Controlling location: ENE sector at 0.7 mile

	Routine ODCM Dose (mrad)	Limit (mrad)
Gamma	9.24E-02	2.00E+01
Beta	4.74E-02	4.00E+01

Iodine, Particulates, and Tritium:

Critical Age: Infant

Controlling location: NE sector at 4.75 mile, assuming a cow milk pathway<sup>(2)</sup>

	Routine ODCM Dose (mrem)	Supplemental Dose (mrem) <sup>(2)</sup>	Total Dose (mrem)	Limit (mrem)
Thyroid	4.04E-01	1.19E-03	4.05E-01	3.00E+01
Kidney	6.24E-03	1.19E-03	7.43E-03	3.00E+01
Liver	6.02E-03	1.19E-03	7.21E-03	3.00E+01
Total Body	5.27E-03	1.19E-03	6.46E-03	3.00E+01
Skin	4.76E-03	1.19E-03	5.95E-03	3.00E+01
GI-LLI	4.80E-03	1.19E-03	5.99E-03	3.00E+01
Lung	4.75E-03	1.19E-03	5.94E-03	3.00E+01
Bone	1.42E-03	0.00E+00	1.42E-03	3.00E+01

<sup>(1)</sup> Dose from the Marsh was calculated based on guidance from Regulatory Guide 1.109 assuming a fish and invertebrate ingestion pathway for an adult.

<sup>(2)</sup> Gaseous effluent supplemental dose is from the SDSP evaporation. The controlling location for the SDSP evaporation is the NW sector at approximately 0.3 miles assuming inhalation pathway only, since no garden is present. The critical age is a teen. Reference page 5 of supplemental information.



## Attachment 8

### Off-Site Dose Calculation Manual (ODCM) And Process Control Program (PCP) Revisions

**The PCP was not revised during the report period.**

**ODCM Revision 33 was effective on December 18, 2009. The ODCM Revision 33 changes are as follows:**

1. Revised Condition I of ODCM 7.3.2 to extend the completion time for Function 6 of Table 7.3.2-1 (Main Condenser Air Ejector Noble Gas Radioactivity Monitor) from 72 hours to 30 days. Additionally, the requirement to perform a compensatory grab sample during the 30 day completion time was added.
2. Table 7.3.2-1, Pages 1-2, under Main Stack Monitoring System and Turbine Building Ventilation Monitoring System Function f. Mid/High Range Sampler Flow Rate Measurement Device, Test Requirement 7.3.2.6, perform Channel Functional Test every 92 days was added.
3. The following typographical errors in the first sentence of the third paragraph of B 7.3.2-1 were corrected:  
1(2)-D12-K601A changed to 1(2)-D12-RM-K601A  
1(2)-D12-K601B changed to 1(2)-D12-RM-K601B
4. A typographical error in the last paragraph of B 7.3.2-2 was corrected. 1/2-CAC-AT-264 was corrected to 1/2-CAC-AT-1264.

Enclosure 2  
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**Offsite Dose Calculation Manual**  
**Revision 33**