Entergy

Entergy Operations, Inc.
P. O. Box 756
Port Gibson, MS 39150

James J Nadeau
Manager, Regulatory Assurance
Grand Gulf Nuclear Station
Tel. (601) 437-2103

GNRO-2014/00037

April 30, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Grand Gulf Nuclear Station (GGNS) 2013 Annual Radioactive Effluent Release Report (ARERR)
Grand Gulf Nuclear Station (GGNS), Unit 1
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Attached is the GGNS Annual Radioactive Effluent Release Report (ARERR) for the period January 1, 2013 through December 31, 2013. This report is submitted in accordance with the requirements of 10CFR50.36a(a)(2) and the GGNS Technical Specification (TS) 5.6.3. The ARERR also complies with the GGNS Offsite Dose Calculation Manual (ODCM).

This letter does not contain any commitments.

If you have questions or require additional information concerning this report, please contact Richard Sumrall at (601) 437-2115.

Sincerely,

JJN/ras

Attachments: 2013 Annual Radioactive Effluent Release Report
cc: (See next page)

cc: NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Marc L. Dapas (w/2)
Regional Administrator, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

U. S. Nuclear Regulatory Commission
ATTN: Mr. Alan Wang, NRR/DORL (w/2)
Mail Stop OWFN 8 B1
Washington, DC 20555-0001

Mr. B. J. Smith
Director, Division of Radiological Health
Mississippi State Department of Health
Division of Radiological Health
3150 Lawson Street
Jackson, MS 39213

Dr. Mary Currier, M.D., M.P.H
State Health Officer
Mississippi Department of Health
P.O. Box 1700
Jackson, MS 39215-1700

Attachment to

GNRO-2014/00037

2013 Annual Radioactive Effluent Release Report

ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION

ANNUAL
RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2013 - December 31, 2013

Dennis Jackson / 4-9-14

Prepared By

[signature] / 4/28/14

Reviewed By

Keith O'Neal / 4/29/14

Approved By

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

I. INTRODUCTION

This Annual Radioactive Effluent Release Report (ARERR) for the period of January 1 through December 31, 2013, is submitted in accordance with Technical Specifications, Section 5.6.3, of Grand Gulf Nuclear Station (GGNS) License No. NPF-29 and base on data provided by GGNS. The monitoring of radioactive effluents is referenced in Offsite Dose Calculation Manual (ODCM) Appendix A, Sections 6.11 and 6.12.

Airborne discharges at GGNS are considered ground-level releases. All liquid and airborne discharges to the environment were analyzed in accordance with ODCM requirements. All effluent releases were within the concentration and total release limits specified by the ODCM. Projected offsite doses were within the dose limits specified by the ODCM.

The summation of all known gaseous releases during the reporting period is reported in Table 1A.

Elevated gaseous releases are not applicable at GGNS as reported in Table 1B.

The summation of all known ground-level gaseous release during the reporting period is reported in Table 1C.

The radioactive gaseous sampling and analysis program implemented at GGNS is described in Table 1D.

The summation of all liquid releases during the reporting period is reported in Table 2A

The continuous and batch mode liquid releases are reported in Table 2B.

The radioactive liquid waste sampling and analysis program implemented at GGNS is described in Table 2C.

Solid radioactive waste and irradiated fuel shipments during the reporting period are summarized in Table 3.

Groundwater Protection Initiative (GPI) well sample tritium results which are not included in the AREOR are included as Attachment I to the ARERR.

The annual summary of meteorological data (joint frequency distribution) will be maintained on site. The option to maintain meteorological data on site is in accordance with ODCM Administrative Controls Section 5.6.3. This data shall be provided to the Nuclear Regulatory Commission (NRC) upon request.

II. DETAILED INFORMATION

A. Regulatory Limits

1. 10CFR20 Limits

a. Fission and Activation Gases - The release rate limit at any time for noble gases to areas at or beyond the site boundary shall be such that:

D_{tb} = average total body dose rate in the current year (mrem/yr)

$= \overline{X/Q}\, \Sigma_i K_i\, Q_i' \leq 500$ mrem/yr

D_s = average skin dose rate in the current year (mrem/yr)

$= \overline{X/Q}\, \Sigma_i\, (L_i + 1.1\, M_i)\, Q_i' \leq 3000$ mrem/yr

where the terms are defined in the GGNS ODCM.

b. Radioiodines, Tritium and Particulates - The release rate limit for the sampling period for all radioiodines, tritium and radioactive materials in particulate form with half-lives greater than 8 days shall be such that:

D_o = average organ dose rate in current year (mrem/yr)

$= \Sigma_i\, W\, P_i\, \overline{Q'_i} \leq 1500$ mrem/yr

where the terms are defined in the GGNS ODCM.

c. Liquid Effluents - The concentration of radioactive materials released in liquid effluents to unrestricted areas from the site shall not exceed at any time ten times the values specified in 10CFR20, Appendix B, Table 2, Column 2. The concentration of dissolved or entrained noble gases, released in liquid effluents to unrestricted areas from all reactors at the site, shall be limited to 2×10^{-4} microcuries/ml total activity.

II. DETAILED INFORMATION (CONT'D)

2. 10CFR50, Appendix I Limits

a. Fission and Activation Gases - The dose from noble gases in gaseous effluents to areas at or beyond the site boundary shall be such that:

D_γ = air dose due to gamma emissions from noble gases

$$= 3.17 \times 10^{-8} \Sigma_i M_i \overline{X/Q'} Q_i \leq 5 \text{ mrad/qtr}$$

$$\leq 10 \text{ mrad/yr}$$

D_β = air dose due to beta emissions from noble gases

$$= 3.17 \times 10^{-8} \Sigma_i N_i \overline{X/Q'} Q_i \leq 10 \text{ mrad/qtr}$$

$$\leq 20 \text{ mrad/yr}$$

where the terms are defined in the GGNS ODCM.

b. Radioiodines, Tritium and Particulates - The dose to an individual from tritium, I-131, I-133 and radioactive material in particulate form with half-lives greater than 8 days in gaseous effluents shall be such that:

D_p = dose to an individual from tritium, I-131, I-133 and radionuclides in particulate form with half-lives greater than 8 days (mrem)

$$= 3.17 \times 10^{-8} \Sigma_i R_i W' Q_i \leq 7.5 \text{ mrem/qtr Any Organ}$$

$$\leq 15 \text{ mrem/yr Any Organ}$$

where the terms are defined in the GGNS ODCM.

c. Liquid Effluents - The dose from radioactive materials in liquid effluents shall be such that:

$$D_{Tau} = \sum_i [A_{iTau} \sum_{l=1}^{m} \Delta t_l C_{il} F_l] \leq 1.5 \text{ mrem/qtr Total Body}$$

$$\leq 5 \text{ mrem/qtr Any Organ}$$

$$\leq 3 \text{ mrem/yr Total Body}$$

$$\leq 10 \text{ mrem/yr Any Organ}$$

where the terms are defined in the GGNS ODCM.

II. DETAILED INFORMATION (CONT'D)

3. 40CFR190 Limits

Doses are calculated for Fission and Activation Gases; Radioiodines and Particulates; and Liquid Effluents according to equations contained in Sections 2.(a), (b), and (c) respectively, with the exception that the limits applied are:

≤25 mrem/yr, Total Body or any Organ except Thyroid

≤75 mrem/yr, Thyroid

≤10 mrad γ/qtr or ≤20 mrad γ/yr, Fission and Activation Gases

≤20 mrad β/qtr or ≤40 mrad β/yr, Fission and Activation Gases

≤15 mrem/qtr or ≤30 mrem/yr, any Organ, Iodine and Particulates

≤3 mrem/qtr or ≤6 mrem/yr, Total Body, Liquid Effluents

≤10 mrem/qtr or ≤20 mrem/yr, any Organ, Liquid Effluents

B. Effluent Concentrations

1. Airborne

The Effluent Concentration Limit (ECL) of radioactive materials in gaseous effluents is limited by the dose rate restrictions given in Section II.A.1.a. In this case, the ECLs are actually determined by the dose factors in Table 2.1-1 of the GGNS ODCM.

2. Liquid

The ECL of radioactive materials in liquid effluents is limited by ten times the values in 10CFR20, Appendix B, Table 2, Column 2. The ECL chosen is the most conservative value of either the soluble or insoluble ECL for each radioisotope.

C. Average Energy

Not applicable for GGNS ODCM Appendix A.

II. DETAILED INFORMATION (CONT'D)

D. Measurements and Approximations of Total Activity

The following discussion details the methods used to measure and approximate the total activity for the following:

Fission and Activation Gases	Particulates
Radioiodines	Liquid Effluents

Tables 1D and 2C give sampling frequencies and Lower Limit of Detection requirements for the analysis of gaseous and liquid effluent streams, respectively.

Values in the attached tables given as zero do not necessarily imply that the radionuclides were not present. A zero indicates that the radionuclide was not present at levels greater than the sensitivity requirements shown in Tables 1D and 2C. For some radionuclides, lower detection levels than required may be readily achievable; when a radionuclide is measured below its stated detection limits, it is reported.

1. For Fission and Activation Gases

At a miniumum, the following noble gases are considered in evaluating gaseous airborne discharges:

Kr-87	Kr-88	Xe-133
Xe-133m	Xe-135	Xe-138

Periodic grab samples from Station effluent streams are analyzed by gamma spectral analysis utilizing high-resolution germanium detectors. (See Table 1D for sampling and analytical requirements.) Isotopic values thus obtained are used for dose release rate calculations due to effluent releases as given in Section II.A.1 of this report. The radionuclides that are detected are used in this computation. When no radionuclides are detected, a historical mixture is used. During the period between grab samples, the amount of radioactivity released is based on the effluent monitor readings. Monitors are assigned a calibration factor based upon the last isotopic analysis, using the following relationship:

$$C_i = U_i \div m$$

where

C_i = isotopic calibration factor for isotope i

U_i = concentration of isotope i in the grab sample in μCi/ml.

m = net monitor reading associated with the effluent stream (determined at the time of grab sampling).

II. DETAILED INFORMATION (CONT'D)

These calibration factors, along with the hourly effluent monitor values and flow rates, are entered into the laboratory computer where the release rates for individual radionuclides are calculated and stored. If no activity is detected in the grab sample, the calibration factor defaults to a historical mixture of Kr-88, Xe-133, Xe-135m, Xe-135, and Xe-138.

2. For Particulates and Radioiodines

At a minimum, the following radioiodines and radioactive materials in particulate form to be considered are:

Zn-65	Mo-99
Mn-54	Cs-134
Fe-59	Cs-137
Co-58	Ce-141
Co-60	Ce-144
Sr-89	I-131
Sr-90	I-133

Other detected radionuclides with half lives greater than 8 days.

3. For Continuous Releases

Continuous sample collection is performed on the continuous release points when releasing (i.e.: Offgas/Radwaste Building, Containment Building, Fuel Handling Area, Turbine Building, and Turbine Building Occasional Release Point). Particulate material is collected by filtration. Radio-iodines are collected by adsorption onto a charcoal filter. Periodically these filters are removed and analyzed by gamma spectral analysis utilizing high-resolution germanium detectors to identify and quantify radioactive materials collected. Particulate filters are then analyzed for gross alpha and Strontium-89/90 as required. Gross alpha is analyzed using a gas flow proportional technique. Strontium-89/90 values are obtained by chemical separation and subsequent counting analysis using gas flow proportional techniques. Tritium samples are collected on molecular sieve and concentrations are determined using distillation and liquid scintillation techniques. During major operational occurrences, the frequency of sampling is increased to satisfy the requirements of footnote "c" of Table 1D, "Radioactive Gaseous Waste Sampling and Analysis," (GGNS ODCM Appendix A, Table 6.11.4-1). Strontium analysis is performed by a qualified contract laboratory. Carbon-14 (C-14) curies are reported in Tables 1A and 1C of this report and based on a constant release rate throughout the year. Activity of 9.5 Curies released per year in gaseous form is used based on:
GGNS Final Safety Analysis Report Table 11.3-9 which utilizes BWR-Gale Code and says, "C-14 Released via Main Condenser Offgas System = 9.5 Ci/Yr." This is assumed to be the total released in gaseous form based on International Atomic Energy Agency Technical Reports Series No. 421, Management of Waste Containing Tritium and Carbon-14 which says, "The following systems have been considered to be release pathways for gaseous 14C from a BWR:" ... "The condenser steam jet air ejector is expected to be the most significant release point (>99% of total 14C release)."

4. For Batch Releases: Gases

Gaseous batch releases are not normally performed at GGNS.

II. DETAILED INFORMATION (CONT'D)

5. For Batch Releases: Liquid Effluents

At a minimum, the radionuclides listed below are considered when evaluating liquid effluents:

H-3	Sr-90
Mn-54	Mo-99
Fe-55	I-131
Co-58	Cs-134
Co-60	Cs-137
Fe-59	Ce-141
Zn-65	Ce-144
Sr-89	

Representative pre-release grab samples are obtained and analyzed as required by Table 2C. Isotopic analyses are performed by gamma spectral analysis utilizing high-resolution germanium detectors. Aliquots of each pre-released sample, proportional to the waste volume released, are composited in accordance with the requirements of Table 2C. Strontium-89/90 and Iron-55 values are obtained by individual chemical separations. Strontium-89/90 is analyzed using gas flow proportional techniques. Iron-55 is analyzed using liquid scintillation techniques. Gross alpha is analyzed using a gas flow proportional technique. Tritium concentrations are determined using distillation and liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and analyzed by gamma spectral analysis utilizing high-resolution germanium detectors. Iron and Strontium analyses are performed by a qualified contract laboratory.

E. Batch Releases

1. Liquid

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Year
1. Number of releases	36	40	51	43	170
Time Period (in minutes)					
2. Total for all batches	1.06e+4	1.20E+04	1.53E+04	1.30E+04	5.09E+04
3. Max time for a batch	5.75E+02	3.31E+02	3.30E+02	3.25E+02	5.75E+02
4. Avg time for a batch	2.94E+02	3.01E+02	3.00E+02	3.02E+02	3.00E+02
5. Min time for a batch	1.00E+00	2.70E+02	2.55E+02	2.40E+02	1.00E+00
6. Avg Stream Flow (LPM)	1.76E+04	2.22E+04	2.82E+04	2.85E+04	2.46E+04

2. Gaseous

No batch releases occurred during the report period.

II. DETAILED INFORMATION (CONT'D)

F. Abnormal Releases

1. Liquid

a. Number of Releases: 0

b. Total Activity Released: 0.00E+00 Ci

No abnormal liquid releases were identified for this reporting period.

2. Gaseous

a. Number of Releases: 2

b. Total Activity Released: 3.62E-01 Ci

Two abnormal gaseous releases were identified during the reporting period. Both of the releases occurred when Turbine Building Smoke Exhaust (roof) hatches thought to be closed were found open. Both instances occurred following a planned release. As a conservative measure, it was assumed that the hatches opened immediately after being checked closed and remained open until documentation showed hatches were closed. Applying this assumption yields the following release parameters:
The planned release occurred 10/5/13 01:00 until 10/7/13 19:43.
The first unplanned release started 10/7/13 19:43 and ended 10/9/13 18:11.
CR 2013-6394 was written for the first release.
The second unplanned release started 10/9/13 18:11 and ended 10/10/13 00:06.
CR 2013-6404 was written for second release.
Isotopic concentrations used for the planned release were also used for the unplanned releases since they were essentially a continuation of the planned release.
The activity and doses associated with these releases are included in the Airborne Effluent Dose table in section III.B and in Table 1A and in Table 1C of this report.

G. Estimate of Total Error

1. Liquid

The maximum errors are collectively estimated to be as follows:

	Fission & Activation Products	Tritium	Dissolved & Entrained Gases	Gross Alpha
Sampling %	2.60E+01	2.60E+01	2.60E+01	2.60E+01
Measurement %	6.80E+01	6.50E+01	6.10E+01	9.20E+01
TOTAL %	7.30E+01	7.00E+01	6.60E+01	9.50E+01

II. DETAILED INFORMATION (CONT'D)

Sampling errors include uncertainty associated with mixing, representative sampling and discharge volume. Measurement errors include uncertainty associated with instrument calibration and the preparation and counting of low-activity samples. Counting errors are based on measurements of blank samples. For germanium detectors, the least-readily-detectable radioisotope is used to determine the counting error. Calibration errors are calculated by summing the errors associated with the calibration of a particular instrument with a radioactive source.

The total error is calculated by taking the square root of the sum of the squares of the individual errors.

2. Gaseous

The maximum errors (not including sample line loss) are collectively estimated to be as follows:

	Fission & Activation Products	Iodine	Particulate	Alpha	Gross Tritium
Sampling %	3.20E+01	2.30E+01	2.20E+01	2.20E+01	2.30E+01
Measurement %	6.10E+01	6.70E+01	6.50E+01	1.01E+02	6.20E+01
TOTAL %	6.90E+01	7.10E+01	6.90E+01	1.03E+02	6.60E+01

Sampling errors include uncertainty associated with sample flow, vent flow and monitor calibration.

Measurement and total errors are calculated by the same methods used for liquid effluents.

3. Solid Radioactive Waste

Estimated Total Error % for all waste types is ±2.50E+01. Sampling errors include uncertainty associated with mixing and representative sampling.

H. Solid Radioactive Waste Shipments

See Table 3 for shipment information.

I. Meteorological Data

The data recovery for the reporting period was 99.2%. The predominant wind direction was from the Northeast approximately 11.7% of the time. The predominant stability class was class "D" approximately 30.6% of the time. Average wind speed during the reporting period was approximately 3.9 miles per hour at the 33 foot elevation.

The annual meteorological data (Hourly Average Data or Joint Frequency Distribution) will be maintained on site in a file that shall be provided to the NRC upon request.

J. Radioactive Effluent Monitoring Instrumentation Operability

No instances of reportable inoperability were identified for this reporting period.

II. DETAILED INFORMATION (CONT'D)

K. Annual Sewage Disposal Summary

There were no sewage disposals for this reporting period.

III. RADIATION DOSE SUMMARY

Indicated below is the annual summary of offsite doses attributable to GGNS during 2013. Inspection of the values indicates that GGNS releases were within the 10CFR50, Appendix I, design objectives.

Since there are no other fuel cycle facilities within 8 km of GGNS, 40CFR190 limits were also met during this period.

A. Water-Related Exposure Pathways

The values calculated in this section utilize the information provided in Tables 2A and 2B of this report and the calculation methodology of the ODCM.

Liquid Effluents

Total body dose and critical organ doses are computed for the maximum exposed individual. The maximum dose contribution from liquid effluents is considered to occur in the adult age group via consumption of fish.

2013 Liquid Effluent Dose (mrem)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	TOTAL
Bone	3.31E-02	8.96E-03	3.77E-02	4.25E-03	7.98E-02
Liver	5.89E-02	2.35E-02	6.25E-02	1.20E-02	1.49E-01
Thyroid	2.12E-03	2.21E-03	1.70E-03	1.10E-03	6.72E-03
Kidney	2.63E-02	1.32E-02	2.35E-02	7.38E-03	6.62E-02
Lung	6.90E-03	3.00E-03	7.66E-03	1.37E-03	1.80E-02
GI-LLI	2.24E-02	1.89E-02	1.04E-02	8.71E-03	5.50E-02
Applicable Limit	5	5	5	5	10
Percent of Limit	1.18E+00	4.70E-01	1.25E+00	2.40E-01	1.49E+00
Whole Body	3.49E-02	1.24E-02	4.20E-02	6.47E-03	9.71E-02
Applicable Limit	1.5	1.5	1.5	1.5	3
Percent of Limit	2.33E+00	8.27E-01	2.80E+00	4.31E-01	3.24E+00

B. Airborne-Related Exposure Pathways

The values presented in this section utilize information provided in Tables 1A and 1C of this report and the calculation methodology of the ODCM. Dose and dose rates are computed for locations at the site boundary or at unrestricted areas within the site boundary. Because members of the public may, on occasion, be found within the site boundary, two fishing lakes, the recreational vehicle laydown area, and the GGNS Energy Services Center locations were also evaluated.

Consideration of site boundary locations as well as unrestricted areas within and beyond the site boundary provides assurance that offsite doses will not be substantially underestimated while attempting to provide an accurate dose calculation.

III. RADIATION DOSE SUMMARY (CONT'D)

Doses for a Member of the Public (critical receptor) are computed based on 2013 meteorological data and the most recent land use census, with the most limiting location used.

During normal operations, the dispersion and deposition factors used for dose calculations are from five-year historical annual average meteorological data.

Organ Dose

The maximum organ dose to a MEMBER OF THE PUBLIC from radioiodines, tritium, and particulates was calculated for this report using the most recent land use census and dispersion and deposition parameters from 2013 meteorological data. The critical receptor residence was determined to be located in the southwest sector at a distance of 1432 meters (0.89 miles) from the plant. Pathways considered for use in the organ dose calculations are inhalation, ground plane, grass/cow/meat, and vegetation. There is no grass/cow/milk pathway within five miles of GGNS. It was assumed that the age group receiving the maximum dose lived at the residence and that the receptor consumed food products that were raised or produced at the residence. Doses due to Carbon-14 release were calculated using Electric Power Research Institute, EPRI, methodology and calculation software which was validated on site using Regulatory Guide 1.109. The doses are documented in the following table as two separate entries. The first organ dose entry excludes C-14 while the second entry includes organ dose from tritium, radioiodines, particulates, and C-14.

Average Total Body and Skin Dose Rate

Individual total body and skin dose rates from exposure to a semi-infinite cloud of noble gas are computed for a location in the southwest sector at a distance of 1368 meters (0.85 miles) from the plant. This location corresponds to the highest annual average atmospheric dispersion factor for a location at or within the site boundary based on 2013 meteorological data.

The total body and skin dose rates reported are the quarterly average of the maximum instantaneous dose rates determined daily during the reporting period and represent the maximum possible dose rate received by members of the public.

Air Dose from Gamma and Beta Emissions

Air doses from gaseous effluents were calculated for this report using dispersion parameters from the 2013 meteorological data. The highest dispersion factor for an unrestricted area was in the southwest sector at the site boundary, 1368 meters (0.85 miles) from the plant.

Direct Radiation

Direct radiation dose is calculated by subtracting average doses measured by thermoluminescent dosimeter (TLD) badges located at control locations from average doses measured by TLD badges located near the site boundary. GGNS reported measured doses in 2013 as net exposure normalized to 92 days.

III. RADIATION DOSE SUMMARY (CONT'D)

Carbon-14

Carbon-14 (C-14) is a naturally occurring isotope of carbon. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Carbon-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally or from weapons testing. In recent years, the analytical methods for determining C-14 have improved. Coincidentally the radioactive effluents from commercial nuclear power plants have also decreased to the point that C-14 has emerged as a principal radionuclide in gaseous effluents.

The only significant dose pathway to a member of the public from C-14 release is through consumption of vegetation. Vegetation incorporates C-14 in the form of carbon dioxide (CO_2) during photosynthesis, therefore doses are calculated based on the CO_2 fraction of the carbon released in gaseous form. A CO_2 fraction of 95% is used based on EPRI Technical Report 1021106, "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents". The highest atmospheric dispersion factor for an actual garden based on the land use census was used to determine dose from C-14. Carbon-14 is dispersed as a gas (CO_2) to the garden location, where it is then incorporated into plant material.

Carbon-14 dose is calculated to a MEMBER OF THE PUBLIC for the most age restrictive group (Child) and organ (bone) at the garden location. This C-14 dose is then added to dose from tritium, iodine, and particulates for the same age group and organ. This organ dose is recorded and compared to the limit in the following table.

2013 Airborne Effluent Dose (mrem)					
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	TOTAL
Iodine, Tritium & Particulates (excluding Carbon-14)					
Child (mrem)	2.29E-02	2.11E-02	2.10E-02	3.25E-02	9.74E-02
Organ	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
Applicable Limit	7.5	7.5	7.5	7.5	15
Percent of Limit	3.05E-01	2.81E-01	2.80E-01	4.33E-01	6.50E-01
Iodine, Tritium & Particulates (including Carbon-14)					
Child (mrem)	3.16E+00	3.19E+00	3.23E+00	3.23E+00	1.28E+01
Organ	Bone	Bone	Bone	Bone	Bone
Applicable Limit	7.5	7.5	7.5	7.5	15
Percent of Limit	4.21E+01	4.26E+01	4.30E+01	4.30E+01	8.53E+01
Total Body Dose Rate (mrem/yr)	4.96E-01	7.29E-01	1.99E+00	2.10E-01	
Applicable Limit	500	500	500	500	
Percent of Limit	9.92E-02	1.46E-01	3.98E-01	4.20E-02	
Skin Dose Rate (mrem/yr)	7.78E-01	1.07E+00	3.56E+00	3.22E-01	
Applicable Limit	3000	3000	3000	3000	
Percent of Limit	2.59E-02	3.57E-02	1.19E-01	1.07E-02	
Gamma Air Dose*	2.63E-01	4.22E-01	1.08E+00	1.05E-01	1.87E+00
Applicable Limit	5	5	5	5	10
Percent of Limit	5.26E+00	8.44E+00	2.15E+01	2.11E+00	1.87E+01
Beta Air Dose*	1.31E-01	1.71E-01	9.87E-01	5.46E-02	1.34E+00
Applicable Limit	10	10	10	10	20
Percent of Limit	1.31E+00	1.71E+00	9.87E+00	5.46E-01	6.72E+00
Direct Radiation (mrem)	0.0	0.0	0.3	1.3	1.6

*Measurement units are mrad

IV. OFFSITE DOSE CALCULATION MANUAL/ RADIOACTIVE WASTE TREATMENT SYSTEM CHANGES

A. Offsite Dose Calculation Manual (ODCM)

No revisions to the ODCM were issued during the reporting period.

Two ODCM revisions performed in 2012 were found not to have all the required reviews. The changes shown below received final reviews in 2013 with no changes made to the revisions. Revisions 38 and 39 of the ODCM were issued in 2012. The revisions included:

Description of Change(s)	Revision Number	Month/Year of Change	Affected Page Number(s)
Revise 6.3.9 to add condition E. Condition E is to acknowledge that as long as flow is monitored and measured, there is no need to suspend dilution flow activities LBDCR 12- 012	38	03/2012	i, ia, vii, viib, A-14
Revise Table 6.3.10-1 Section 3B to include note h. Note h is to acknowledge ≤4 Turbine Building roof hatches may be open in Modes 4 and 5. LDCR 2012-017	39	03/2012	i, vii, viia, viib, 2.0-35, A-26, A-28, A-39, A-41

B. Radioactive Waste Treatment Systems

No major changes were made to the liquid or gaseous radwaste treatment systems during this reporting period.

TABLE 1A
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES
JANUARY – DECEMBER 2013

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
1. Total Release	Ci	1.20E+02	1.86E+02	1.54E+03	7.42E+01	1.92E+03
2. Avg. Release Rate	uCi/sec	1.54E+01	2.37E+01	1.94E+02	9.34E+00	6.09E+01
3. Percent of TS Limit						
a. Gamma Air	%	5.26E+00	8.44E+00	2.15E+01	2.11E+00	1.87E+01
b. Beta Air	%	1.31E+00	1.71E+00	9.87E+00	5.46E-01	6.72E+00
Iodine-131						
1. Total Release	Ci	3.03E-04	5.98E-05	1.73E-04	7.81E-04	1.32E-03
2. Avg. Release Rate	uCi/sec	3.90E-05	7.61E-06	2.18E-05	9.82E-05	4.17E-05
3. Percent of TS Limit	%	8.26E-02	1.63E-02	4.72E-02	2.13E-01	1.80E-01
Particulates Half Life >= 8 days						
1. Total Release	Ci	8.40E-05	8.83E-06	1.55E-05	5.46E-05	1.63E-04
2. Avg. Release Rate	uCi/sec	1.08E-05	1.12E-06	1.95E-06	6.86E-06	5.17E-06
3. Percent of TS Limit	%	1.67E-02	1.03E-02	6.95E-03	2.31E-02	2.85E-02
Tritium						
1. Total Release	Ci	8.26E+00	1.02E+01	9.05E+00	7.88E+00	3.54E+01
2. Avg. Release Rate	uCi/sec	1.06E+00	1.30E+00	1.14E+00	9.92E-01	1.12E+00
3. Percent of TS Limit	%	2.06E-01	2.55E-01	2.26E-01	1.97E-01	4.42E-01
Carbon 14						
1. Total Release	Ci	2.34E+00	2.37E+00	2.39E+00	2.39E+00	9.50E+00
2. Avg. Release Rate	uCi/sec	3.01E-01	3.01E-01	3.01E-01	3.01E-01	3.01E-01
Gross Alpha						
1. Total Release	Ci	4.92E-08	1.34E-07	6.99E-08	7.70E-08	3.30E-07
2. Avg. Release Rate	uCi/sec	6.33E-09	1.71E-08	8.79E-09	9.68E-09	1.05E-08

TABLE 1B
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS – ELEVATED RELEASES
JANUARY – DECEMBER 2013

(Not Applicable – GGNS Releases Are Considered Ground-Level)

TABLE 1C
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS – GROUND-LEVEL RELEASE-CONTINUOUS
JANUARY – DECEMBER 2013

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
AR-41	Ci	1.17E+01	2.99E+01	1.31E+01	8.38E+00	6.31E+01
KR-85M	Ci	1.51E+01	3.06E+01	1.64E+01	6.93E+00	6.90E+01
KR-87	Ci	1.31E+01	7.38E+00	1.12E+01	7.20E-01	3.24E+01
KR-88	Ci	3.20E+01	5.09E+01	6.13E+01	1.01E+01	1.54E+02
KR-89	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	Ci	2.48E+01	3.96E+01	6.83E+02	2.65E+01	7.74E+02
XE-135	Ci	2.00E+01	2.44E+01	6.49E+02	1.90E+01	7.12E+02
XE-135M	Ci	2.35E+00	2.86E+00	8.83E+01	2.16E+00	9.57E+01
XE-137	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-138	Ci	5.32E-01	6.49E-01	1.73E+01	4.90E-01	1.89E+01
Totals for Period...	Ci	1.20E+02	1.86E+02	1.54E+03	7.42E+01	1.92E+03
Iodines						
I-131	Ci	3.03E-04	5.98E-05	1.73E-04	7.81E-04	1.32E-03
I-133	Ci	7.13E-04	4.21E-04	3.31E-04	1.08E-03	2.54E-03
I-135	Ci	4.63E-04	3.64E-04	0.00E+00	1.51E-04	9.78E-04
Totals for Period...	Ci	1.48E-03	8.44E-04	5.04E-04	2.01E-03	4.84E-03
Particulates Half Life >= 8 days						
AG-110M	Ci	6.43E-06	0.00E+00	0.00E+00	1.19E-06	7.63E-06
BA-140	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	Ci	2.62E-06	4.36E-06	0.00E+00	8.51E-06	1.55E-05
CO-60	Ci	3.38E-05	0.00E+00	2.25E-06	1.71E-05	5.32E-05
CR-51	Ci	0.00E+00	0.00E+00	0.00E+00	3.45E-06	3.45E-06
CS-134	Ci	4.38E-07	0.00E+00	0.00E+00	0.00E+00	4.38E-07
CS-137	Ci	4.03E-06	0.00E+00	6.32E-07	0.00E+00	4.67E-06
FE-55	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN-54	Ci	1.23E-05	1.83E-06	1.12E-06	1.92E-05	3.45E-05
RU-106	Ci	2.43E-06	6.13E-07	1.12E-05	0.00E+00	1.42E-05
SR-89	Ci	6.86E-07	1.49E-06	0.00E+00	0.00E+00	2.17E-06
SR-90	Ci	1.97E-07	5.34E-07	3.55E-07	0.00E+00	1.09E-06
ZN-65	Ci	2.10E-05	0.00E+00	0.00E+00	5.07E-06	2.61E-05
Totals for Period...	Ci	8.40E-05	8.83E-06	1.55E-05	5.46E-05	1.63E-04
Other						
H-3	Ci	8.26E+00	1.02E+01	9.05E+00	7.88E+00	3.54E+01
C-14	Ci	2.34E+00	2.37E+00	2.39E+00	2.39E+00	9.50E+00
ALPHA	Ci	4.92E-08	1.34E-07	6.99E-08	7.70E-08	3.30E-07

TABLE 1D

ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
Radioactive Gaseous Waste Sampling and Analysis Program
JANUARY – DECEMBER 2013

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)[a]
A. (1) Radwaste Building Ventilation Exhaust	31 Days Grab Sample (f)	31 Days	Principal Gamma Emitters (b,e) H-3	$1x10^{-4}$ $1X10^{-6}$
(2) Fuel Handling Area Ventilation Exhaust	Continuous (d)(f)	7 Days (c) Charcoal Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
(3) Containment Ventilation Exhaust	Continuous (d)(f)	7 Days (c) Particulate Sample	Principal Gamma Emitters (e) (I-131, Others)	$1x10^{-11}$
(4A) Turbine Building Ventilation Exhaust	Continuous (d)(f)	31 Days Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
(4B) Turbine Building Occasional Release Point(g) (when in service)	Continuous (d)(f)	92 Days Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
	Continuous (f)	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	$1x10^{-6}$
B. (1) Offgas Post Treatment Exhaust, whenever there is flow	31 Days Grab Sample (f)	31 Days	Principal Gamma Emitters (e)	$1x10^{-4}$
(2) Standby Gas Treatment A Exhaust, whenever there is flow	31 Days Grab Sample (f)	31 Days	Principal Gamma Emitters(e)	$1x10^{-4}$
(3) Standby Gas Treatment B Exhaust, whenever there is flow	31 Days Grab Sample (f)	31 Days	Principal Gamma Emitters(e)	$1x10^{-4}$

NOTE: Footnotes indicated are listed in GGNS ODCM, Appendix A, Table 6.11.4-1.

TABLE 2A
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES
JANUARY – DECEMBER 2013

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
1. Total Release	Ci	1.72E-02	1.73E-02	1.32E-02	3.67E-03	5.14E-02
2. Avg. Diluted Conc.	uCi/ml	9.06E-08	6.41E-08	3.01E-08	9.80E-09	4.04E-08
3. Percent of Limit	%	2.33E+00	8.28E-01	2.80E+00	4.32E-01	3.06E+00
Tritium						
1. Total Release	Ci	1.99E+01	2.45E+01	2.42E+01	1.68E+01	8.54E+01
2. Avg. Diluted Conc.	uCi/ml	1.05E-04	9.05E-05	5.54E-05	4.50E-05	6.72E-05
3. Percent of Limit	%	1.05E+00	9.05E-01	5.54E-01	4.50E-01	6.72E-01
Dissolved and Entrained Gases						
1. Total Release	Ci	2.35E-04	8.60E-04	1.97E-04	2.08E-04	1.50E-03
2. Avg. Diluted Conc.	uCi/ml	1.24E-09	3.18E-09	4.52E-10	5.55E-10	1.18E-09
3. Percent of Limit	%	6.20E-04	1.59E-03	2.26E-04	2.78E-04	5.90E-04
Gross Alpha Radioactivity						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	9.71E-06	9.71E-06
Volume of liquid waste	liters	3.55E+06	4.14E+06	5.29E+06	4.48E+06	1.75E+07
Volume of dil. water	liters	1.87E+08	2.66E+08	4.31E+08	3.70E+08	1.25E+09

TABLE 2B
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – CONTINUOUS AND BATCH MODES
JANUARY – DECEMBER 2013

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
AG-110M	Ci	2.38E-03	3.43E-03	4.29E-04	4.87E-04	6.73E-03
AS-76	Ci	5.02E-05	3.56E-05	7.32E-05	3.24E-04	4.83E-04
AU-199	Ci	0.00E+00	0.00E+00	0.00E+00	3.86E-06	3.86E-06
BA-140	Ci	0.00E+00	0.00E+00	1.30E-05	0.00E+00	1.30E-05
CO-58	Ci	3.88E-04	4.12E-04	3.41E-04	1.03E-04	1.24E-03
CO-60	Ci	5.41E-04	5.90E-04	5.60E-04	5.25E-04	2.22E-03
CR-51	Ci	2.12E-03	4.44E-05	1.02E-04	2.61E-04	2.53E-03
CS-134	Ci	5.85E-06	0.00E+00	5.67E-05	0.00E+00	6.26E-05
CS-137	Ci	1.41E-04	2.67E-05	2.78E-04	1.57E-05	4.62E-04
FE-55	Ci	5.86E-03	3.89E-03	0.00E+00	0.00E+00	9.75E-03
FE-59	Ci	7.11E-05	0.00E+00	0.00E+00	0.00E+00	7.11E-05
I-131	Ci	0.00E+00	6.03E-06	4.49E-06	0.00E+00	1.05E-05
LA-140	Ci	3.33E-05	9.90E-06	0.00E+00	0.00E+00	4.32E-05
MN-54	Ci	7.76E-04	9.86E-04	5.56E-04	3.84E-04	2.70E-03
NA-24	Ci	1.33E-04	0.00E+00	8.74E-05	0.00E+00	2.20E-04
PT-195M	Ci	0.00E+00	0.00E+00	5.40E-05	3.84E-05	9.24E-05
RB-88	Ci	3.50E-03	6.28E-03	8.28E-03	8.67E-04	1.89E-02
RU-106	Ci	2.02E-04	5.22E-04	9.58E-04	1.17E-04	1.80E-03
SB-124	Ci	1.93E-04	1.78E-04	3.91E-04	6.17E-05	8.24E-04
SB-125	Ci	8.07E-05	8.57E-05	5.87E-04	2.39E-05	7.77E-04
SE-75	Ci	5.09E-06	0.00E+00	1.54E-05	0.00E+00	2.05E-05
SR-91	Ci	0.00E+00	0.00E+00	4.61E-06	0.00E+00	4.61E-06
SR-92	Ci	1.23E-04	3.02E-04	5.61E-05	7.16E-05	5.52E-04
TC-99M	Ci	1.28E-05	0.00E+00	0.00E+00	4.15E-06	1.69E-05
W-187	Ci	9.75E-07	3.97E-06	0.00E+00	0.00E+00	4.95E-06
ZN-65	Ci	5.02E-04	4.86E-04	2.41E-04	3.74E-04	1.60E-03
ZN-69M	Ci	3.07E-06	0.00E+00	4.70E-05	4.32E-06	5.44E-05
ZR-95	Ci	0.00E+00	0.00E+00	1.53E-05	0.00E+00	1.53E-05
ZR-97	Ci	8.53E-05	3.94E-05	0.00E+00	0.00E+00	1.25E-04
Totals for Period...	Ci	1.72E-02	1.73E-02	1.32E-02	3.67E-03	5.14E-02
Tritium						
H-3	Ci	1.99E+01	2.45E+01	2.42E+01	1.68E+01	8.54E+01
Totals for Period...	Ci	1.99E+01	2.45E+01	2.42E+01	1.68E+01	8.54E+01
Dissolved and Entrained Gases						
XE-133	Ci	1.83E-04	5.41E-04	1.33E-04	1.48E-04	1.00E-03
XE-135	Ci	5.23E-05	3.19E-04	6.45E-05	5.99E-05	4.95E-04
Totals for Period...	Ci	2.35E-04	8.60E-04	1.97E-04	2.08E-04	1.50E-03
Gross Alpha Radioactivity						
ALPHA	Ci	0.00E+00	0.00E+00	0.00E+00	9.71E-06	9.71E-06
Totals for Period...	Ci	0.00E+00	0.00E+00	0.00E+00	9.71E-06	9.71E-06

TABLE 2C
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM
JANUARY – DECEMBER 2013

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)(a)
A. Batch Waste Release Tanks (c)	Prior to Release Each Batch	Prior to Release Each Batch	Principal Gamma Emitters (d) I-131	$\frac{5x10^{-7}}{1X10^{-6}}$
	Prior to Release One Batch /M	31 Days	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
	Prior to Release Each Batch	31 Days Composite (b)	H-3 Gross Alpha	$\frac{1x10^{-5}}{1x10^{-7}}$
	Prior to Release Each Batch	92 Days Composite (b)	Sr-89, Sr-90 Fe-55	$\frac{5x10^{-8}}{1x10^{-6}}$
B. SSW Basin (Before Blowdown)	Prior to Release Each Blowdown	Prior to Release Each Batch	Principal Gamma Emitters (d) I-131	$\frac{5x10^{-7}}{1x10^{-6}}$

NOTE: Footnotes indicated are listed in GGNS ODCM, Appendix A, Table 6.11.1-1.

TABLE 3
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS
JANUARY – DECEMBER 2013

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

1. Type of Waste	Unit	Class A	Class B	Class C	Est. Total Error %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3 Ci	1.30E+02 6.03E+01	0.00E+00 0.00E+00	0.00E+00 0.00E+00	+/- 25%
b. Dry compressible waste, contaminated equipment, etc.	m^3 Ci	4.12E+02 8.38E-02	0.00E+00 0.00E+00	0.00E+00 0.00E+00	+/- 25%
c. Irradiated components, control rods, etc.	m^3 Ci	0.00E+00 0.00E+00	0.00E+00 0.00E+00	0.00E+00 0.00E+00	+/- 25%
d. Other: Condensate Pre-Coat Septa Bundle	m^3 Ci	0.00E+00 0.00E+00	0.00E+00 0.00E+00	0.00E+00 0.00E+00	+/- 25%

TABLE 3
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS
JANUARY – DECEMBER 2013 (Cont)

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.

Isotope (greater than 1%)	Percent	Curies
Co-60	17	1.03E+01
Cs-137	1.4	8.40E-01
Fe-55	42.4	2.56E+01
Fe-59	1	5.60E-01
Mn-54	17	1.05E+01
Zn-65	17.7	1.07E+01

b. Dry Compressible waste, contaminated equipment, etc.

Isotope (greater than 1%)	Percent	Curies
Co-60	42.6	3.57E-02
Cr-51	5.8	4.9E-03
Fe-55	11.8	9.9E-03
Fe-59	3.2	2.7E-03
Mn-54	27.3	2.3E-02
Zn-65	5.1	4.3E-03
Ag-110m	1	8.5E-04
Co-58	1.5	1.3E-03

c. Irradiated components, control rods, etc.

None

d. Other: N/A

TABLE 3
ENTERGY OPERATIONS, INC.
GRAND GULF NUCLEAR STATION UNIT 1

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS
JANUARY – DECEMBER 2013 (Cont)

3. Solid Waste Disposition

Number of Shipments	Destination Name	City	State	Mode of Transportation
13	EnergySolutions(Duratek), LLC	Oak Ridge	TN	Hittman
3	EnergySolutions – Gallaher Road Facility	Oak Ridge	TN	Hittman
1	Studsvik	Erwin	TN	Hittman

NRC Class	Disposal Volume(ft^3)	Description	Number of Containers	Waste Type Description
A	205.8	215 Poly liner	22	Bead resin
A	1040	20' SEALAND	14	20FT Sealand
A	202.2	ES-210 (solidification)	3	Stainless Steel Liner CPS/RWCU-B

B. Irradiated Fuel Shipments (Disposition)

NUMBER OF SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
None	N/A	N/A

ATTACHMENT I

Nuclear Energy Institute, NEI, Groundwater Protection Initiative Sample Results

JANUARY – DECEMBER 2013

GPI Ground Water samples are collected onsite from dewatering wells, DW; monitoring wells, MW; observation wells, OW; sump wells, SW; and one piezometer location, P. Samples were analyzed for tritium and those not reported in AREOR are reported below. Analyses are to the Lower Level of Detection (LLD) values for the GGNS Radiological Environmental Monitoring Program.

No dose to the public is attributed to ground water since wells with results above MDA are bounded by wells which are <MDA. Results are shown in the table below.

All results were less than Reporting Levels of GGNS-ODCM table 6.12.1-2.

LOCATION		DATE	TRITIUM (pCi/L)	GAMMA (pCi/L)
DW-01		13-Feb-13	10070	<MDA
DW-01		8-May-13	7523	<MDA
DW-01		14-Aug-13	7236	<MDA
DW-01		4-Dec-13	2411	<MDA
DW-01	DUP	4-Dec-13	2584	<MDA
DW-07		14-Feb-13	9035	<MDA
DW-07		8-May-13	9106	<MDA
DW-07		14-Aug-13	7937	<MDA
DW-07		5-Dec-13	5461	<MDA
DW-08		13-Aug-13	<531.6	<MDA
MW-01		13-Feb-13	<534.9	<MDA
MW-01		8-May-13	<571.8	<MDA
MW-01		13-Aug-13	<540	<MDA
MW-01		4-Dec-13	<514.1	<MDA
MW-01	DUP	4-Dec-13	<509.4	<MDA
MW-1007C		14-Nov-13	<515.7	<MDA
MW-1009C		6-Dec-13	<511.1	<MDA
MW-100B		4-Dec-13	<420.9	<MDA
MW-1012C		15-Nov-13	<518	<MDA
MW-101B		6-Dec-13	<508	<MDA
MW-1020C		13-Nov-13	<515.7	<MDA

ATTACHMENT I

Nuclear Energy Institute, NEI, Groundwater Protection Initiative Sample Results

JANUARY – DECEMBER 2013 (Cont)

LOCATION		DATE	TRITIUM (pCi/L)	GAMMA (pCi/L)
MW-1024C		6-Dec-13	<426	<MDA
MW-1027C		6-Dec-13	<438.4	<MDA
MW-102B		4-Dec-13	<479.8	<MDA
MW-103B		13-Feb-13	<520.2	<MDA
MW-103B		4-Dec-13	<509.5	<MDA
MW-1042C		14-Nov-13	<516.6	<MDA
MW-1042C	DUP	14-Nov-13	<512.4	<MDA
MW-104B		13-Feb-13	<522.2	<MDA
MW-104B		5-Dec-13	<499.9	<MDA
MW-105B		12-Feb-13	1107	<MDA
MW-105B		7-May-13	<569.3	<MDA
MW-105B	DUP	7-May-13	<570.3	<MDA
MW-105B		13-Aug-13	495.2	<MDA
MW-105B		4-Dec-13	765.7	<MDA
MW-105B	DUP	4-Dec-13	652.4	<MDA
MW-106B		14-Feb-13	<525.5	<MDA
MW-106B		8-May-13	<560.4	<MDA
MW-106B		14-Aug-13	<552.1	<MDA
MW-106B		4-Dec-13	<497.3	<MDA
MW-107B		12-Feb-13	2822	<MDA
MW-107B	DUP	12-Feb-13	2604	<MDA
MW-107B		7-May-13	1590	<MDA
MW-107B		14-Aug-13	1780	<MDA
MW-107B		5-Dec-13	1334	<MDA
MW-1082C		6-Dec-13	<495.1	<MDA
MW-108B		13-Feb-13	1235	<MDA
MW-108B		7-May-13	845.3	<MDA
MW-108B		13-Aug-13	1083	<MDA
MW-108B		5-Dec-13	1560	<MDA
MW-109B		13-Feb-13	976.9	<MDA
MW-109B		7-May-13	542.5	<MDA
MW-109B		13-Aug-13	705	<MDA
MW-109B		5-Dec-13	1094	<MDA

ATTACHMENT I

Nuclear Energy Institute, NEI, Groundwater Protection Initiative Sample Results

JANUARY – DECEMBER 2013 (Cont)

LOCATION		DATE	TRITIUM (pCi/L)	GAMMA (pCi/L)
MW-110B		12-Feb-13	<521.3	N/A
MW-110B		13-Feb-13	N/A	<MDA
MW-110B		8-May-13	<577.6	<MDA
MW-110B		14-Aug-13	<546.4	<MDA
MW-110B		5-Dec-13	<509.5	<MDA
MW-111B		13-Feb-13	10120	<MDA
MW-111B		8-May-13	2497	<MDA
MW-111B	DUP	8-May-13	2270	<MDA
MW-111B		14-Aug-13	1480	<MDA
MW-111B	DUP	14-Aug-13	1245	<MDA
MW-111B		4-Dec-13	1137	<MDA
MW-112B		13-Feb-13	<500.6	<MDA
MW-112B		7-May-13	<371.1	<MDA
MW-112B		13-Aug-13	<534.1	<MDA
MW-112B		4-Dec-13	<508.9	<MDA
MW-1134C		5-Dec-13	<494.5	<MDA
MW-113B		13-Feb-13	<526.5	<MDA
MW-113B		4-Dec-13	<422.6	<MDA
MW-114B		13-Feb-13	2684	<MDA
MW-114B	DUP	13-Feb-13	2391	<MDA
MW-114B		8-May-13	1238	<MDA
MW-114B		14-Aug-13	3984	<MDA
MW-114B		5-Dec-13	2983	<MDA
MW-115B		13-Feb-13	3087	<MDA
MW-115B		7-May-13	2254	<MDA
MW-115B		14-Aug-13	978.4	<MDA
MW-115B		4-Dec-13	582.9	<MDA
MW-116B		13-Feb-13	<536.9	<MDA
MW-116B		7-May-13	<512.8	<MDA
MW-116B		14-Aug-13	<530.6	<MDA
MW-116B		4-Dec-13	<504.9	<MDA
MW-118B		13-Feb-13	1159	<MDA
MW-118B		8-May-13	1831	<MDA
MW-118B		14-Aug-13	1156	<MDA
MW-118B		4-Dec-13	718.7	<MDA
MW-119B		19-Dec-13	<500.2	<MDA

ATTACHMENT I

Nuclear Energy Institute, NEI, Groundwater Protection Initiative Sample Results

JANUARY – DECEMBER 2013 (Cont)

LOCATION		DATE	TRITIUM (pCi/L)	GAMMA (pCi/L)
MW-120B		8-May-13	<559.9	<MDA
MW-120B		14-Aug-13	<553.7	<MDA
MW-120B	DUP	14-Aug-13	<555.3	<MDA
MW-120B		4-Dec-13	<424.4	<MDA
MW-121B		19-Dec-13	<503.6	<MDA
OW-209B		12-Feb-13	2538	<MDA
OW-209B		7-May-13	1144	<MDA
OW-209B		14-Aug-13	<516.7	<MDA
OW-209B		4-Dec-13	638.9	<MDA
P-05		14-Nov-13	<516.1	<MDA
SW-103A		8-May-13	<575.5	<MDA
SW-103A		14-Aug-13	<555.8	<MDA
SW-103B		13-Feb-13	<525.1	<MDA
SW-103B		5-Dec-13	<504.7	<MDA

(<MDA = less than minimum detectable activity)
(DUP = separate sample collected and analyzed)
(N/A = not analyzed