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GNRO-2011/00031

April 28, 2011

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Subject: Grand Gulf Nuclear Station (GGNS) 2010 Annual Radiological  
Environmental Operating Report (AREOR)  
Grand Gulf Nuclear Station (GGNS), Unit 1  
Docket No. 50-416  
License No. NPF-29

Dear Sir or Madam:

In accordance with the Grand Gulf Nuclear Station Unit 1 Technical Specification 5.6.2, attached is the Annual Radiological Environmental Operating Report for the period January 1, 2010 through December 31, 2010.

This letter does not contain any commitments.

If you have questions or require additional information concerning these reports, please contact Mr. Richard Scarbrough (601) 437-6978 or Christina Perino at (601) 437-6299.

Sincerely,

A handwritten signature in cursive script, appearing to read "Christina L. Perino".

CLP\RRJ

Attachment: 2010 Annual Radiological Environmental Operating Report

cc: (See Next Page)



cc:

**WITHOUT ATTACHMENT**

NRC Senior Resident Inspector Grand Gulf Nuclear Station Port Gibson, MS 39150
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U.S. Nuclear Regulatory Commission Region Administrator, Region IV ATTN: Mr. Elmo E. Collins, Jr. 612 East Lamar Blvd, Suite 400 Arlington, TX 76011-4125
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U. S. Nuclear Regulatory Commission ATTN: Mr. Alan Wang, NRR/DORL Mail Stop OWFN/8 B1 Washington, DC 20555-0001
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GNRO-2011/00031  
Attachment

**Attachment**

**to**

**GNRO-2011/00031**

**2010 Annual Radiological Environmental Operating Report**

**ENTERGY OPERATIONS, INC.  
GRAND GULF NUCLEAR STATION**

**ANNUAL  
RADIOLOGICAL ENVIRONMENTAL  
OPERATING REPORT**

**January 1, 2010-December 31, 2010**

Glenn W. Bailey , 4/19/11

**Prepared By**

M. Lasseter , 4-19-11

**Reviewed By**

Richard [Signature] , 4-20-11

**Approved By**

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## **Summary**

The Annual Radiological Environmental Operating Report presents data obtained through analyses of environmental samples collected for Grand Gulf Nuclear Station's (GGNS) Radiological Environmental Monitoring Program (REMP) for the period January 1, 2010 through December 31, 2010. This report fulfills the requirements of GGNS Technical Specification 5.6.2.

To supplement the REMP, GGNS personnel collected duplicate Thermoluminescent Dosimeter (TLD) and surface water samples during the reporting period. Special samples collected during the reporting period included surface water and food products.

### **Radiological Environmental Monitoring Program**

GGNS established the REMP in 1978 prior to station operation (1985) to provide data on background radiation and radioactivity normally present in the area. GGNS has continued to monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring radiation directly. GGNS also samples milk if commercial milk production is occurring within five miles of the plant.

The REMP includes sampling indicator and control locations within an 18-mile radius of the plant. The REMP utilizes indicator locations near the site to show any increases or buildup of radioactivity that might occur due to station operation, and control locations farther away from the site to indicate the presence of only naturally occurring radioactivity. GGNS personnel compare indicator results with control and preoperational results to assess any impact GGNS operation might have had on the surrounding environment.

In the current year, GGNS personnel collected environmental samples for radiological analysis. They compared results of indicator locations with control locations and previous studies, and concluded that overall no significant relationship exists between GGNS operation and effect on the plant environs. Their review of current year data, in many cases, showed undetectable radiation levels in the environment and near background levels in significant pathways associated with GGNS.

### **Harmful Effects or Irreversible Damage**

The REMP monitoring did not detect any harmful effects or evidence of irreversible damage in the current year. Therefore, no analysis or planned course of action to alleviate problems was necessary.

### **Reporting Levels**

GGNS' review indicates that no samples equaled or exceeded reporting levels for radioactivity concentration in environmental samples, as outlined in Offsite Dose Calculation Manual (ODCM) Specifications Table 6.12.1-2 when averaged over any calendar quarter, due to GGNS effluents. Therefore, results did not trigger any Radiological Monitoring Program Special Reports.

### **Radioactivity Not Attributable to GGNS**

In previous years, the GGNS REMP detected radioactivity attributable to other sources twice. These include the Chinese nuclear test explosion in 1980, and the radioactive release due to reactor core degradation at the Chernobyl Nuclear Power Plant in 1986.

### **Comparison to Federal and State Programs**

GGNS personnel compared REMP data to federal and state monitoring programs as results became available. Historically, the programs used for comparison have included the U.S. Nuclear Regulatory Commission (NRC) Thermoluminescent Dosimeter (TLD) Direct Radiation Monitoring Network and the Mississippi State Department of Health (MSDH), Division of Radiological Health.

The NRC TLD Network Program was discontinued in 1998. Historically these results compared favorably to those from the GGNS REMP.

The MSDH and the GGNS REMP have similar radiological environmental monitoring program requirements. These programs include concurrent air sampling and sharing sample media such as water, sediment, fish and food products. Both programs have obtained similar results. The results of MSDH's monitoring program for the reporting period compared favorably with the GGNS REMP and did not indicate elevated levels of radiation or radioactivity build-up attributed to plant operations.

## **Sample Deviations**

### **◆ Milk**

The REMP did not include milk sampling within five miles (8 km) of GGNS in the current year due to unavailability. ODCM Specifications require collection of milk samples if available commercially within 8 km (5 miles) of the plant. GGNS personnel collected vegetation samples to monitor the ingestion pathway, as specified in ODCM Specifications Table 6.12.1-1, because of milk unavailability.

### **◆ Required Lower Limit of Detection (LLD) Values**

LLDs during this reporting period were within the acceptable limits required by the ODCM specifications.

◆ **Air Samples**

The following air sample locations had reduced run times due to weather-related outages. As described in footnote (a) to ODCM Specification Table 6.12.1-1, deviations from the required sampling schedule are permitted due to malfunction of sampling equipment and other legitimate reasons. Location AS-1 PG particulate air filter was found with a tear during the 6/29/10-7/6/10 sample period. Gross Beta results for this sample were comparable to samples collected immediately before and after this time period and were consistent with other REMP sample locations.

Sample Location	Date In	Date Out	Run Time Hours	Out-of-service hours	Comments
AS-7 UH	12/29/09	1/5/10	176.06	0.35	Power Outage
AS-7 UH	2/2/10	2/9/10	169.03	6.8	Power Outage
AS-7 UH	2/9/10	2/16/10	167.69	0.87	Power Outage
AS-3 61VA	3/30/10	4/6/10	160.00	0.35	Power Outage
AS-1 PG	7/6/10	7/13/10	162.78	0.18	Power Outage
AS-7 UH	8/17/10	8/24/10	168.28	2.32	Power Outage
AS-1 PG	8/24/10	8/31/10	165.58	0.17	Power Outage

Based on the sample collection period reductions, air samples were collected the following percentages of the available time:

AS-1 PG	99.99%
AS-3 61VA	99.99%
AS-7 UH	99.88%

◆ **Missed Samples**

All required samples were collected in accordance with REMP requirements. No samples were missed.

◆ **Unavailable Results**

GGNS received analytical results in adequate time for inclusion in this report. In addition, GGNS' review identified no missing results.

### **Program Modifications**

No REMP modifications took place during this sampling period.

### **Attachments**

Attachment 1 contains results of TLD, air, water, sediment, fish, food products and special samples collected. TLDs were analyzed by AREVA NP Inc. All other samples were analyzed by River Bend Station's (RBS) Environmental Laboratory. Attachment 1 also contains interlaboratory comparison program results.

## **1.0 Introduction**

### **1.1 Radiological Environmental Monitoring Program**

GGNS established the REMP to ensure that plant operating controls properly function to minimize any associated radiation endangerment to human health or the environment. The REMP is designed for:

- Analyzing important pathways for anticipated types and quantities of radionuclides released into the environment.
- Considering the possibility of a buildup of long-lived radionuclides in the environment and identifying physical and biological accumulations that may contribute to human exposures.
- Considering the potential radiation exposure to plant and animal life in the environment surrounding GGNS.
- Correlating levels of radiation and radioactivity in the environment with radioactive releases from station operation.

### **1.2 Pathways Monitored**

The airborne, direct radiation, waterborne and ingestion pathways, as seen in Figure 1-1, are monitored as required by GGNS ODCM Table 6.12.1-1. A description of the GGNS REMP utilized to monitor the exposure pathways is provided in Table 1.1 and shown in Figures 1-2 and 1-3. GGNS may supplement this program with additional sampling in order to provide a comprehensive and well-balanced program.

Section 2.0 of this report provides a discussion of sampling results with Section 3.0 providing a summary of results for the monitored exposure pathways.

### 1.3 Land Use Census

GGNS personnel conduct a land use census biannually, as required by ODCM Specification 6.12.2. Data for the most recent land use census is included. The purpose of this census is to identify changes in uses of land within five miles of GGNS that would require modifications to the REMP or the ODCM. The most important criteria during this census are to determine location in each sector of the nearest:

- 1) Residence
- 2) Animal milked for human consumption
- 3) Garden of greater than 50 m<sup>2</sup> (500 ft<sup>2</sup>) producing broadleaf vegetation.

GGNS personnel conduct the land use census by:

- Conducting field surveys in each meteorological sector out to five miles in order to confirm:
  - Nearest permanent residence
  - Nearest unoccupied residence
  - Nearest garden and approximate size
  - Nearest milking animal.
- Identifying locations on maps, measuring distances to GGNS and recording results on surveillance data sheets.
- Comparing current land use census results to previous results.
- Contacting the Claiborne County Agent for verification of nearest dairy animals.

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Airborne	<p><b><u>Radioiodine and Particulates</u></b>                      1 sample close to the SITE BOUNDARY having the highest calculated annual average groundlevel D/Q.</p>	<p><b>AS-7 UH (Sector H, Radius 0.5 Miles)</b> – South-southeast of GGNS at the IBEW Union Hall.</p>	<p>Continuous sampler operation with sample collection per 7 days or as required by dust loading, whichever is more frequent</p>	<p>Radioiodine Cannister – I-131; 7 days                       Particulate Sampler – Gross beta radioactivity following filter change, composite (by location) for gamma isotopic; 92 days</p>
	<p><b><u>Radioiodine and Particulates</u></b>                      1 sample from the vicinity of a community having the highest calculated annual average groundlevel D/Q.</p>	<p><b>AS-1 PG (Sector G, Radius 5.5 Miles)</b> – Southeast of GGNS at the Port Gibson City Barn.</p>		
	<p><b><u>Radioiodine and Particulates</u></b>                      1 sample from a control location 15 -30 km (10 - 20 miles) distance.</p>	<p><b>AS-3 61VA (Sector B, Radius 18 Miles)</b> – North-northeast of GGNS on Hwy 61, North of the Vicksburg Airport.</p>		
Direct Radiation	<p><b><u>TLDs</u></b>                      An inner ring of stations in the general areas of the SITE BOUNDARY.</p>	<p><b>M-16 (Sector A, Radius 0.9 Miles)</b> – Meteorological Tower.   <b>M-19 (Sector E, Radius 0.5 Miles)</b> – Eastern SITE BOUNDARY Property line, North-northeast of HWSA.</p>	92 days	Gamma dose; 92 days



**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<p><b>TLDs</b> An inner ring of stations in the general areas of the SITE BOUNDARY.</p>	<p><b>M-21 (Sector J, Radius 0.4 Miles)</b> – Near Former Training Center Building on Bald Hill Road.</p> <p><b>M-22 (Sector G, Radius 0.5 Miles)</b> – Former RR Entrance Crossing On Bald Hill Road.</p> <p><b>M-23 (Sector Q, Radius 0.5 Miles)</b> – Gin Lake Road 50 Yards North of Heavy Haul Road on Power Pole.</p> <p><b>M-25 (Sector N, Radius 1.6 Miles)</b> – Radial Well Number 1.</p> <p><b>M-28 (Sector L, Radius 0.9 Miles)</b> – Former Residence.</p> <p><b>M-94 (Sector R, Radius 0.8 Miles)</b> – Sector R Near Meteorological Tower.</p>	92 days	Gamma dose; 92 days

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<p><b><u>TLDs</u></b> An inner ring of stations in the general areas of the SITE BOUNDARY.</p>	<p><b>M-95 (Sector F, Radius 0.5 mi)</b> – Spoils Area, fence of old storage area, near entrance gate</p> <p><b>M-96 (Sector B, Radius 0.7 mi.)</b> – North Gate Fence</p> <p><b>M-97 (Sector D, Radius 0.8 mi.)</b> – Grand Gulf Road entrance gate to spoils area</p> <p><b>M-98 (Sector H, Radius 0.5 mi.)</b> – Bald Hill Road, across from Union Hall in curve</p> <p><b>M-99 (Sector K, Radius 0.4 mi.)</b> – North Fence of old Ball Field near utility pole</p> <p><b>M-100 (Sector C, Radius 0.6 mi.)</b> – Grand Gulf Road</p>	92 days	Gamma dose; 92 days
	<p><b><u>TLDs</u></b> An outer ring approximately 3 to 5 miles from the site.</p>	<p><b>M-36 (Sector P, Radius 5.0 Miles)</b> – Curve on HW 608, Point Nearest GGNS at Power Pole.</p> <p><b>M-40 (Sector M, Radius 2.3 Miles)</b> – Headly Drive, Near River Port Entrance.</p>	92 days	Gamma dose; 92 days

**Table 1.1**

**Radiological Environmental Sampling Program**

<b>Exposure Pathway</b>	<b>Requirement</b>	<b>Sample Point Description, Distance and Direction</b>	<b>Sampling and Collection Frequency</b>	<b>Type and Frequency Of Analyses</b>
Direct Radiation	<p><b><u>TLDs</u></b> An outer ring approximately 3 to 5 miles from the site.</p>	<p><b>M-48 (Sector K, Radius 4.8 Miles)</b> – 0.4 Miles South on Mont Gomer Road on West Side.</p> <p><b>M-49 (Sector H, Radius 4.5 Miles)</b> – Fork in Bessie Weathers Road/Shaifer Road.</p> <p><b>M-50 (Sector B, Radius 5.3 Miles)</b> – Panola Hunting Club Entrance.</p> <p><b>M-55 (Sector D, Radius 5.0 Miles)</b> – Near Ingelside Karnac Ferry Road/Ashland Road Intersection.</p> <p><b>M-57 (Sector F, Radius 4.5 Miles)</b> – Hwy 61, Behind the Welcome to Port Gibson Sign at Glensdale Subdivision.</p>	92 days	Gamma dose; 92 days
	<p><b><u>TLDs</u></b> 8 stations in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control stations.</p>	<p><b>M-01 (Sector E, Radius 3.5 Miles)</b> – Across the road from Lake Claiborne Entry Gate. (Special Interest)</p> <p><b>M-07 (Sector G, Radius 5.5 Miles)</b> – AS-1 PG, Port Gibson City Barn. (Special Interest)</p> <p><b>M-09 (Sector D, Radius 3.5 Miles)</b> – Warner Tully Y-Camp. (Special Interest)</p> <p><b>M-10 (Sector A, Radius 1.5 Miles)</b> – Grand Gulf Military Park. (Special Interest)</p>		

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<p><b>TLDs</b> 8 stations in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control stations</p>	<p><b>M-14 (Sector B, Radius 18.0 Miles)</b> – AS-3-61VA, Hwy 61, North of Vicksburg Airport. (Control)</p> <p><b>M-33 (Sector P, Radius 12.5 Miles)</b> – Newellton, Louisiana Water Tower. (Special Interest)</p> <p><b>M-38 (Sector M, Radius 9.5 Miles)</b> – Lake Bruin State Park, Entrance Road. (Special Interest)</p> <p><b>M-39 (Sector M, Radius 13.0 Miles)</b> – St. Joseph, Louisiana, Auxiliary Water Tank. (Special Interest)</p>	92 days	Gamma dose; 92 days

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Waterborne	<b>Surface Water</b> 1 sample upstream.	<b>MRUP (Sector R, Radius 1.8 Miles)</b> - At least 4500 ft upstream of the GGNS discharge point into the Mississippi River to allow adequate mixing of the Mississippi and Big Black Rivers.	92 days	Gamma isotopic and tritium analyses; 92 days
	1 sample downstream.	<b>MRDOWN (Sector N, Radius 1.6 Miles)</b> - At least 5000 ft downstream of the GGNS discharge point into the Mississippi River near Radial Well No. 1.		
	1 sample downstream during a Liquid Radwaste Discharge.	<b>MRDOWN (Sector P, Radius 1.3 Miles)</b> – Downstream of the GGNS discharge point in the Mississippi River near Radial Well No. 5.	366 days	Gamma isotopic and tritium analyses; 366 days
	1 sample from Outfall 007	<b>OUTFALL 007 (Sector N, Radius 0.2 Miles)</b> – Storm Drain System	31 days	Tritium; 31 days

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Waterborne	<p><b><u>Groundwater</u></b> Samples from 2 sources.</p>	<p><b>PGWELL (Sector G, Radius 5.0 Miles)</b> - Port Gibson Wells – Taken from distribution system or one of the five wells.</p> <p><b>CONSTWELL (Sector Q, Radius 0.4 Miles)</b> – GGNS Construction Water Well – Taken from distribution system or the well.</p>	366 days	Gamma isotopic and tritium analyses; 366 days
	<p><b><u>Sediment From Shoreline</u></b> 1 sample from downstream area.</p> <p>1 sample from upstream area.</p>	<p><b>SEDHAM (Sector N, Radius 1.6 Miles)</b> – Downstream of the GGNS discharge point in the Mississippi River near Hamilton Lake outlet.</p> <p><b>SEDCONT (Minimum of 100 yds)</b> – Upstream of the GGNS discharge point in the Mississippi River.</p>	366 days	Gamma isotopic; 366 days
Ingestion	<p><b><u>Milk</u></b> 1 sample from milking animals within 8 km if milk is available commercially.</p> <p>1 control sample (only if indicator exists) &gt;8 km if milk is available.</p>	<p>Currently, no available milking animals within 8 km of GGNS.</p> <p><b>ALCONT (Sector K, Radius 10.5 Miles)</b> - Located South-southwest of GGNS at Alcorn State University.</p>	92 days when required	Gamma isotopic and I-131; 92 days

**Table 1.1**

**Radiological Environmental Sampling Program**

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Ingestion	<p><b><u>Fish</u></b>                      1 sample in vicinity of GGNS discharge point.</p> <p>1 sample uninfluenced by GGNS discharge.</p>	<p><b>FISHDOWN</b> – Downstream of the GGNS discharge point into the Mississippi River</p> <p><b>FISHUP</b> – Upstream of the GGNS discharge point in the Mississippi River uninfluenced by plant operations.</p>	366 days	Gamma isotopic on edible portion; 366 days
	<p><b><u>Food Products</u></b>                      1 sample of broadleaf vegetation grown in one of two different offsite locations with highest anticipated annual average ground level D/Q if milk sampling is not performed.</p> <p>1 sample of similar vegetation grown 15 – 30 km distant if milk sampling is not performed.</p>	<p><b>VEG-J (Sector J, Radius 0.4 Miles)</b> – South of GGNS near former Training Center on Bald Hill Road.</p> <p><b>VEG-CONT (Sector K, Radius 10.5 Miles)</b> – Alcorn State University south-southwest of GGNS when available, otherwise a location 15-30 km distant.</p>	92 days when available	Gamma isotopic and I-131; 92 days

FIGURE 1-1  
Exposure Pathways

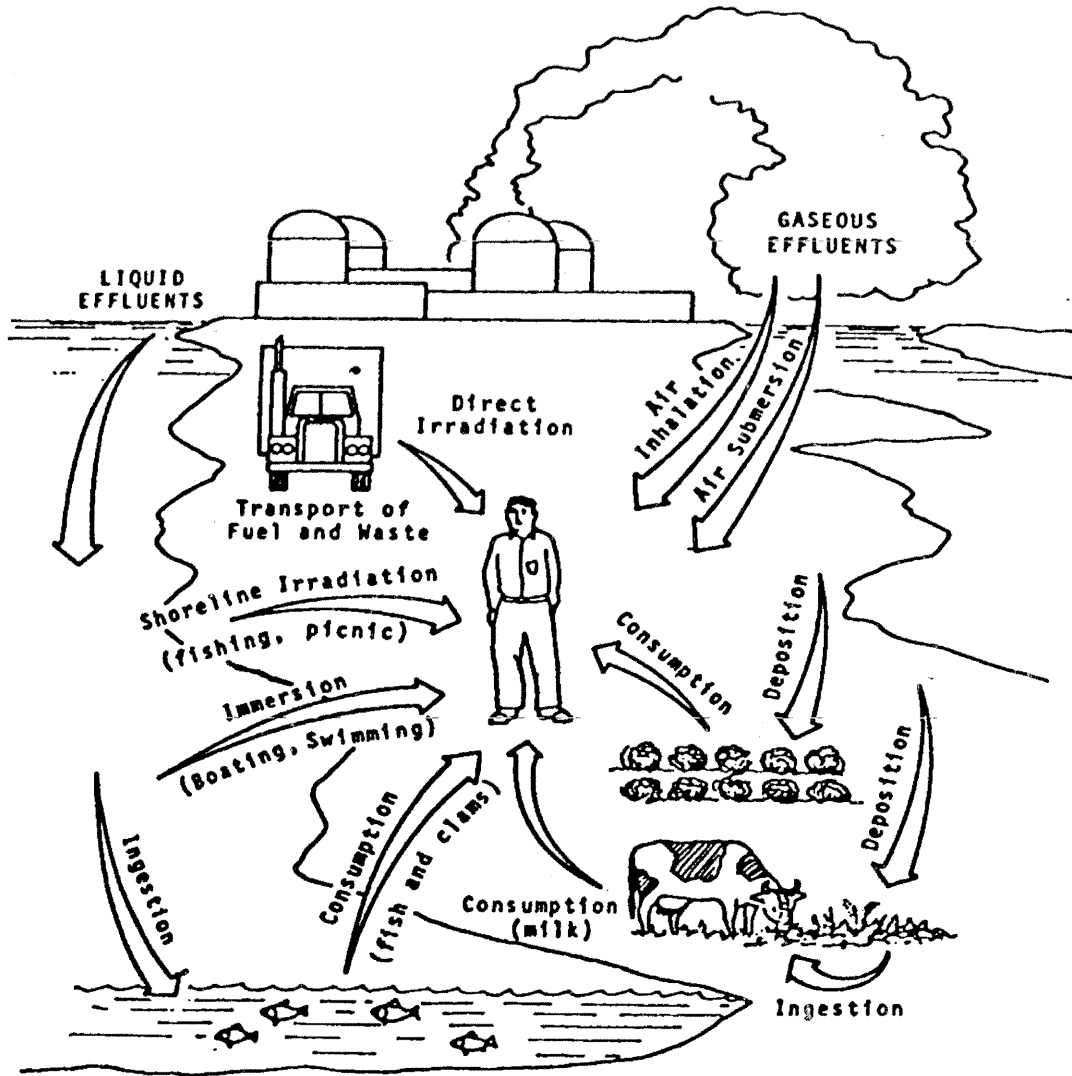




FIGURE 1-2

SAMPLE COLLECTION SITES - NEAR FIELD

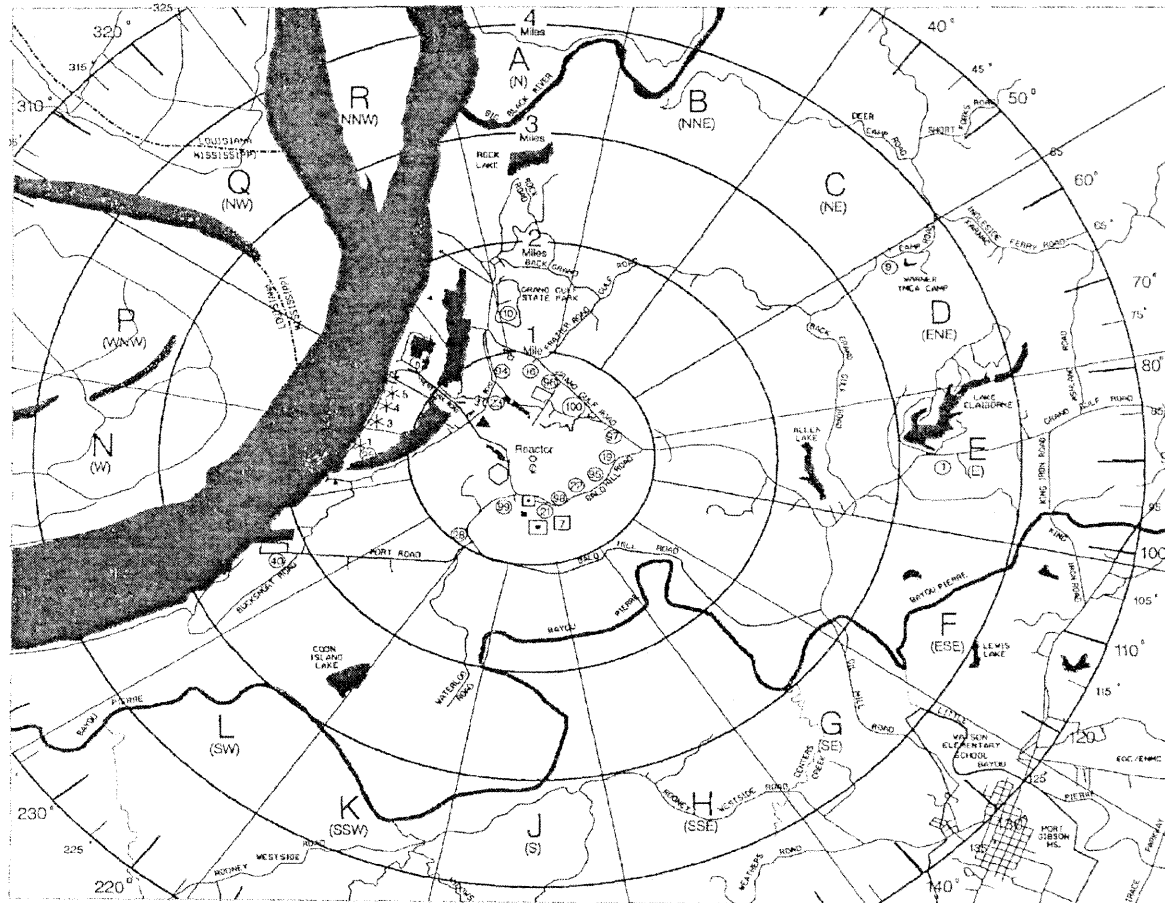
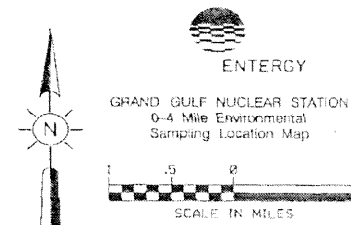
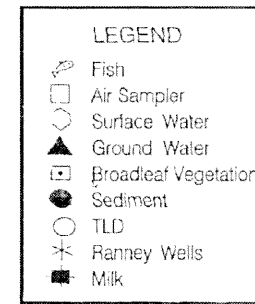


FIGURE 3.0-1  
Collection Site Locations  
0-4 Mile Area Map



Grand Gulf Unit 1 3.0-7 Revision 37 02/09

FIGURE 1-3

SAMPLE COLLECTION SITES – FAR FIELD

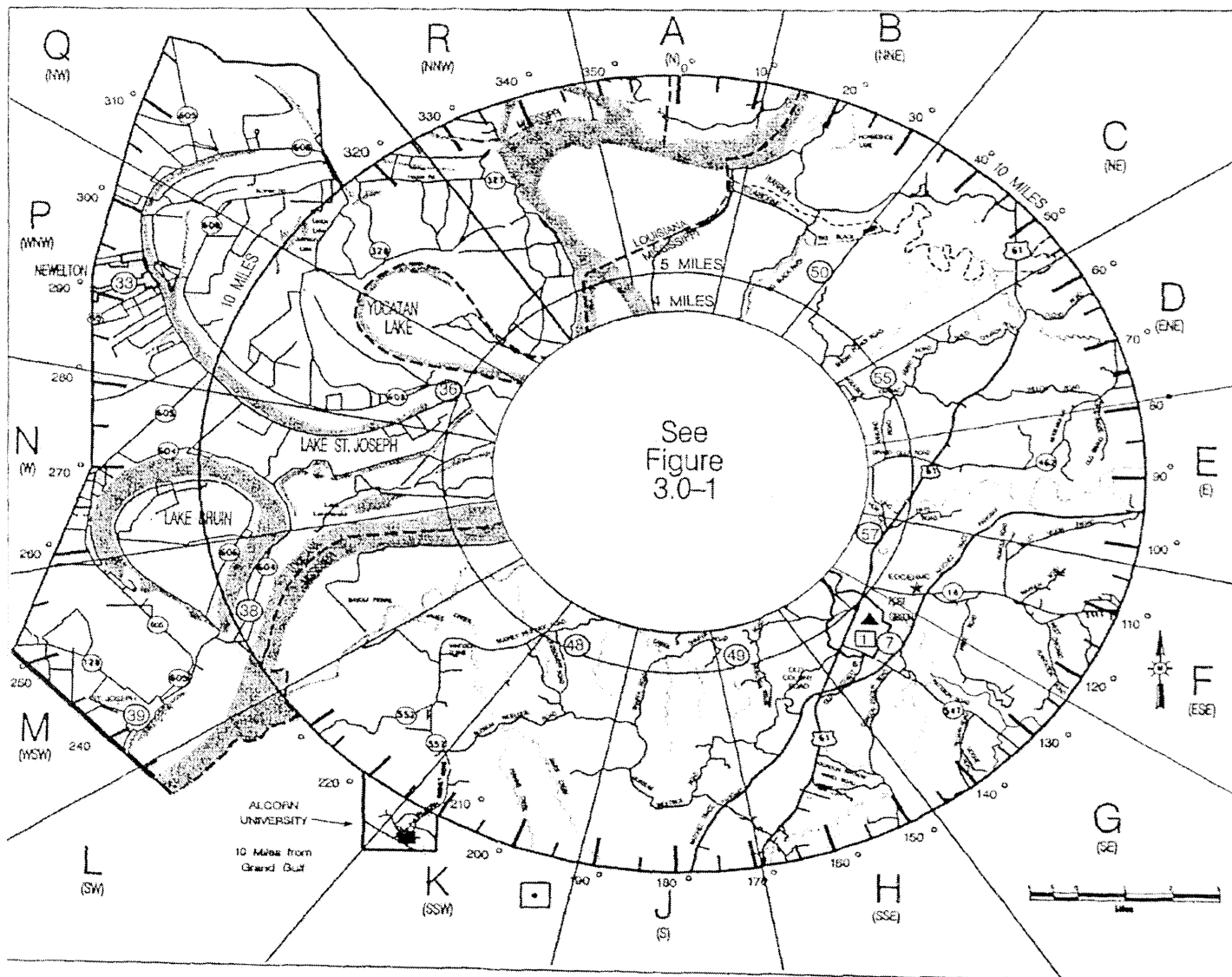
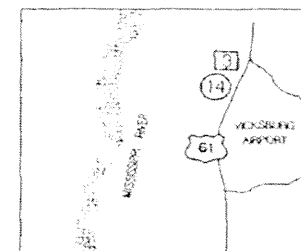
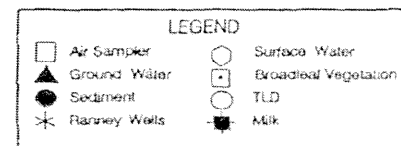


FIGURE 3.0-2

Collection Site Locations, General Area Map  
4-10 Mile Area Map



18 MILES FROM GRAND GULF TO  
VICKSBURG AIRPORT Sector (B)



ENTERGY

GRAND GULF NUCLEAR STATION  
4-10 Mile Environmental  
Sampling Location Map

Grand Gulf, Unit 1 3.0-8 Revision 35 09/07

## **2.0 Interpretation and Trends of Results**

### **2.1 Air Particulate and Radioiodine Sample Results**

GGNS did not detect any plant related gamma emitting radionuclides in the quarterly air particulate composites or Iodine-131 in the radioiodine cartridges during the reporting period, as has been the case in previous years. The REMP detected radioactivity in this pathway attributable to other sources twice. These include the Chinese nuclear test in 1980, and the radioactive release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986. Therefore, the airborne exposure pathway has been unaffected by the operation of GGNS and airborne concentrations continue to be at background levels.

Table 3.1, which includes gross beta concentrations, provides a comparison of the indicator and control means and ranges, and further emphasizes that the airborne pathway continues to remain at background levels. In the absence of plant-related gamma radionuclides, gross beta activity is attributed to naturally occurring radionuclides based on the similar trends seen when comparing results of control and indicator locations.

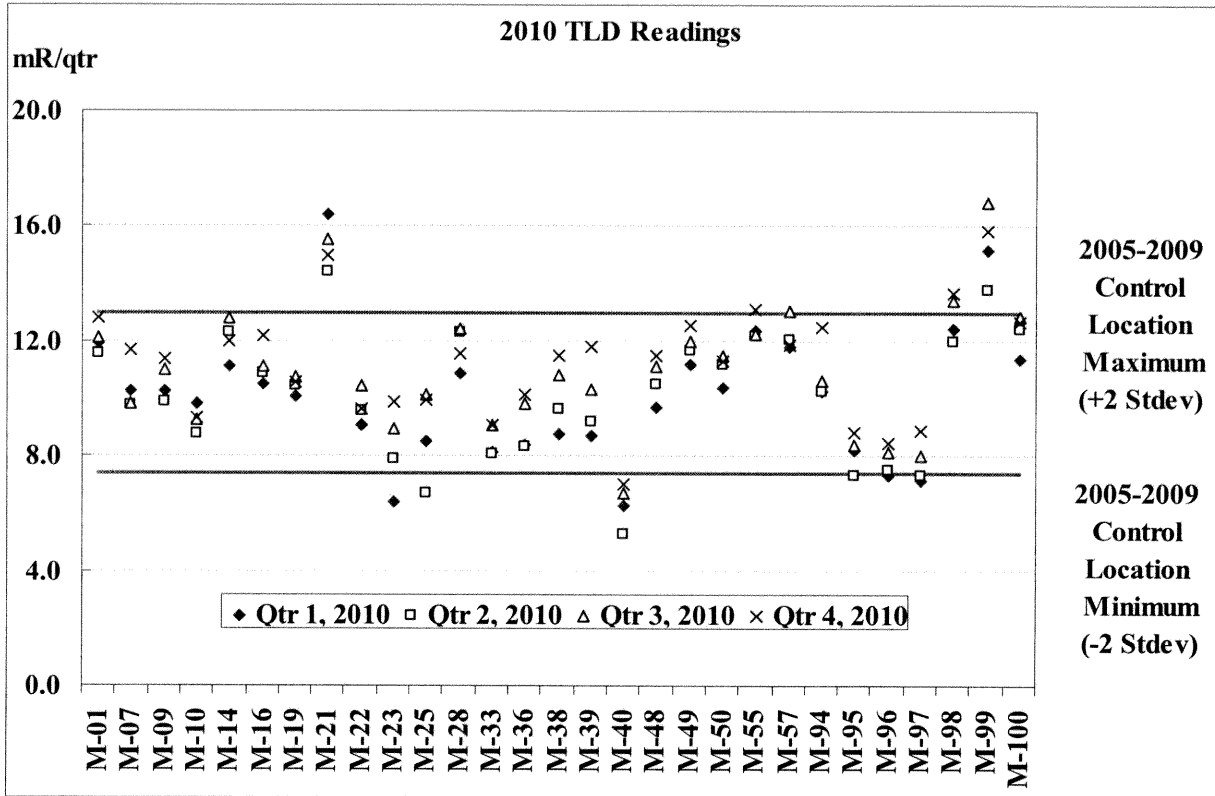
### **2.2 Thermoluminescent Dosimetry Sample Results**

GGNS calculates dose by subtracting shield readings from control and indicator location readings and reports measured dose as net exposure normalized to 92 days. GGNS relies on comparison of the indicator locations to the control location as a measure of plant impact. Gamma radiation dose in the reporting period is compared to control location readings for previous years as shown in Figure 2-1.

GGNS' comparison of the indicator results to the control and to previous indicator results, as seen in Figure 2-1 and Table 3.1, indicates that plant operations had no significant impact on ambient radiation levels during the reporting period.

With the exception of TLD locations M-21 (Sector J, 0.4 miles), M-98 (Sector H, 0.5 miles) and M-99 (Sector K, 0.4 miles) direct radiation levels continue to remain at or near background. The dose rate at these three locations is a result of increased Nitrogen-16 levels associated with hydrogen injection. Hydrogen injection into the feedwater system provides protection against Intergranular Stress Corrosion of plant components. Dose rates at locations M-21 [3.2 millirem per quarter], M-98 [0.8 millirem per quarter] and M-99 [3.3 millirem per quarter] remain well below the limitations of 10CFR20.1301(a)(2) and 10CFR 20.1302(b)(2)(ii).

Figure 2-1



## 2.3 Water Sample Results

**Surface water** samples were collected from three indicator locations (Outfall 007, MRDOWN, and MRDOWN During Discharge) and one control location (MRUP) and analyzed for gamma emitting radionuclides and tritium. Plant related gamma emitting radionuclides undetectable in the upstream and downstream Mississippi River locations, which is consistent with preoperational and previous operational years. Tritium was measured just above the detection level ( $516 \pm 212.55$  pCi/l) in one downstream sample. A duplicate of this sample measured below the detection level. All other upstream and downstream tritium measurements were less than detectable. Storm waters contribute to Outfall 007 and can include tritium as a result of washout and precipitation entrainment of routine, previously monitored gaseous effluents. As a result, tritium is occasionally observed. When detected, tritium was measured at an average (five samples) concentration of  $12613 \pm 367$  pCi/l at the Outfall 007 (indicator) location. The maximum tritium measurement was in February following an approximately six inch snowfall.

In addition to the tritium samples required by the REMP, five special surface water samples for gamma were collected at the Outfall 007 location. Plant related gamma emitting radionuclides remained undetectable in these samples.

Based on review of results and historical data, GGNS concluded that plant operations had no significant impact on this pathway during the reporting period.

**Groundwater** samples were collected from two locations (indicator and control) and analyzed for gamma emitting radionuclides and tritium. Indicator includes three wells located on site property. GGNS did not detect any plant related gamma emitting radionuclides in groundwater samples during the reporting period. One Indicator well (Construction Well #1) measured just above the detection level ( $738 \pm 186$  pCi/L ) in the third quarter sample. All previous and subsequent samples for Indicator and Control samples were less than detectable for tritium.

Based on review of results and historical data, GGNS concluded that plant operations had no significant impact on this pathway during the reporting period.

## 2.4 Sediment Sample Results

Sediment samples were collected from two ODCM Specification locations (indicator and control) and analyzed for gamma emitting radionuclides. In this reporting period, plant related gamma emitting radionuclides were below detectable concentrations in the upstream (control) and downstream (indicator) locations.

## 2.5 Milk Sample Results

GGNS personnel did not collect milk samples within five miles of the site in the reporting period due to the absence of milking animals. Since there are no dairies within five miles of GGNS, and based on non-detectable radioiodine and gamma radionuclides in air and vegetation samples, it is concluded GGNS' operation had no impact on this pathway.

## **2.6 Fish Sample Results**

Fish samples were collected from two locations (indicator and control) and analyzed for gamma emitting radionuclides. GGNS did not detect any plant related gamma emitting radionuclides in fish samples (edible portions) during the reporting period, as has been the case in preoperational and previous operational years. These results indicate that this pathway has not been affected by plant operations.

## **2.7 Food Product Sample Results**

**Vegetation** samples were collected from control and indicator locations when available and analyzed for Iodine-131 and gamma emitting radionuclides. GGNS did not detect any plant related Iodine-131 or gamma emitting radionuclides in vegetation samples during the reporting period. Nuclides detected previously at the control and indicator locations are attributed to the Chernobyl release and atmospheric weapons testing. These results indicate that this pathway has not been affected by plant operations.

**Special** venison was collected on the GGNS property to supplement the REMP. GGNS did not detect any plant related gamma emitting radionuclides in this venison sample during the reporting period.

## **2.8 Land Use Census Results**

Results from the Land Use Census performed October 5-12, 2010 are included in this report. Methods utilized include: visual surveys, door to door surveys, telephone interviews, GPS, Aerial Photography, and consultation with the local county agent concerning dairy production in Claiborne County.

During the survey the following information was obtained:

- 1) location of occupied and unoccupied residence
- 2) location of dairy production
- 3) location of gardens.

Changes from the previous Land Use Census were evaluated and the differences were compared to the locations and assumptions used in calculations for compliance with the Offsite Dose Calculation Manual (ODCM), LCO 6.11.6. It was determined that the locations and assumptions currently used in ODCM are more conservative than any of the changes. Determinations from the most recent Land Use Census results are:

- Because of downwind location and/or distance from the site, in no case will the occupancy of an existing unoccupied residence cause any existing ODCM critical receptor calculation results to be less conservative.
- No additional sampling locations are required as the onsite vegetation sampling location (Sector J, 0.4 miles) is more conservative than changes identified in the land use census.
- Cattle are raised for human consumption (most notably Sector H, J, and K). GGNS uses the Grass/Cow/Meat pathway.
- The milk pathway does not need to be activated because no commercial dairy production is occurring within 5 miles, as referenced by ODCM Table 6.12.1-1.
- Sectors M, N, P, and Q are remote areas in which the primary use is hunting. Area was surveyed by vehicle and aerial photographs.
- Gardens, regardless of size, were included in the census data.

**Table 2.1  
Land Use Census Results**

Parameter		Sector A*	Sector B*	Sector C	Sector D
<b>I. Nearest Occupied Residence</b>	a. Distance (mile)	0.98	1.52	0.67	2.57
	b. Degrees from true north	354.0	21.9	42.1	60.5
<b>II. Nearest Unoccupied Residence (closer than occupied residence)</b>	a. Distance (mile)	0.94	0.83	None	None
	b. Degrees from true north	8	15.1		
<b>III. Nearest Milk Animal</b>	a. Distance	None	None	None	None
<b>IV. Nearest Broadleaf Garden</b>	a. Distance (mile)	1.80	1.52	0.67 <sup>2</sup>	2.86
	b. Garden size (ft <sup>2</sup> )	≈ 100	≈ 4050	≈ 1250	≈ 500
	c. Degrees from true north	353	21.9	42.1	59.7
<b>V. Census Comparison</b>	a. Is nearest occupied residence in same location as last census?	Yes	No	Yes	Yes
	b. Is nearest milk animal in same location as last census?	N/A	N/A	N/A	N/A
	c. Is nearest broadleaf garden in same location as last census?	No	Yes <sup>1</sup>	Yes	Yes

<sup>1</sup>Property was inaccessible. Retained previous garden location. Located no other gardens in sector.

<sup>2</sup>Currently not planted. Retained due to potential to plant. Next nearest garden @4.53 mi, 49 degrees ≈200 ft<sup>2</sup>

\* Change from last census, see attached table of Land Use Census Changes



**Table 2.1  
Land Use Census Results**

Parameter		Sector E	Sector F*	Sector G*	Sector H*
<b>I. Nearest Occupied Residence</b>	a. Distance (mile)	0.83	2.25	3.71	1.11
	b. Degrees from true north	95.1	101.5	132	152.5
<b>II. Nearest Unoccupied Residence (closer than occupied residence)</b>	a. Distance (mile)	None	None	2.10	1.08
	b. Degrees from true north			129.7	152.5
<b>III. Nearest Milk Animal</b>	a. Distance	None	None	None	None
<b>IV. Nearest Broadleaf Garden</b>	a. Distance (mile)	0.89	4.53	3.39	4.39
	b. Garden size (ft <sup>2</sup> )	≈1000	≈100	≈3.2E5 <sup>1</sup>	≈ 200
	c. Degrees from true north	86.9	113	129	155
<b>V. Census Comparison</b>	a. Is nearest occupied residence in same location as last census?	Yes	Yes	No	Yes
	b. Is nearest milk animal in same location as last census?	N/A	N/A	N/A	N/A
	c. Is nearest broadleaf garden in same location as last census?	Yes	No	No	No

<sup>1</sup> Melon and Tomato fields, not broadleaf.

\* Change from last census, see attached table of Land Use Census Changes

**Table 2.1  
Land Use Census Results**

<b>Parameter</b>		<b>Sector J</b>	<b>Sector K</b>	<b>Sector L</b>	<b>Sector M</b>
<b>I. Nearest Occupied Residence</b>	a. Distance (mile)	3.16	2.23	0.89	None
	b. Degrees from true north	174.3	196.9	219.7	
<b>II. Nearest Unoccupied Residence (closer than occupied residence)</b>	a. Distance (mile)	None	None <sup>1</sup>	None	None
<b>III. Nearest Milk Animal</b>	a. Distance	None	None	None	None
<b>IV. Nearest Broadleaf Garden</b>	a. Distance (mile)	3.16	2.23	0.89	None
	b. Garden size (ft <sup>2</sup> )	≈ 500	≈ 2500	≈ 50	
	c. Degrees from true north	174.3	196.9	219.7	
<b>V. Census Comparison</b>	a. Is nearest occupied residence in same location as last census?	Yes	Yes	Yes	N/A
	b. Is nearest milk animal in same location as last census?	N/A	N/A	N/A	N/A
	c. Is nearest broadleaf garden in same location as last census?	Yes	Yes	Yes	N/A

<sup>1</sup>Hunting Lodge @1.64 miles / 206 degrees, no permanent residents [Information Only]

**Table 2.1  
Land Use Census Results**

Parameter		Sector N	Sector P*	Sector Q*	Sector R*
<b>I. Nearest Occupied Residence</b>	a. Distance (mile)	None	None	None	1.11
	b. Degrees from true north				346.1
<b>II. Nearest Unoccupied Residence (closer than occupied residence)</b>	a. Distance (mile)	1.61 Bucksnot Camp (Info Only)	None <sup>1</sup>	None <sup>2</sup>	None
<b>III. Nearest Milk Animal</b>	a. Distance	None	None	None	None
<b>IV. Nearest Broadleaf Garden</b>	a. Distance (mile)	None	None	None	None
	b. Garden size (ft <sup>2</sup> )				
	c. Degrees from true north				
<b>V. Census Comparison</b>	a. Is nearest occupied residence in same location as last census?	N/A	N/A	N/A	Yes
	b. Is nearest milk animal in same location as last census?	N/A	N/A	N/A	N/A
	c. Is nearest broadleaf garden in same location as last census?	N/A	N/A	N/A	No

<sup>1</sup>Previous [2008] residence @4.83 miles appeared uninhabitable

<sup>2</sup>Previous [2008] location not present

\* Change from last census, see attached table of Land Use Census Changes

### Land Use Census Changes

SECTOR	PARAMETER	2008 Data	2010 Data	Reason for Change
A	Nearest Broadleaf Garden	1.78miles, 352.2 degrees	1.80 miles, 353 degrees	No Garden at 2008 location, new location listed
B	Nearest Unoccupied Residence	None	0.83 miles, 15.1 degrees	2008 Nearest Occupied Residence now Unoccupied
B	Nearest Occupied Residence	0.83 miles, 15.1 degrees	1.52 miles, 21.9 degrees	New Nearest Occupied residence
F	Nearest Broadleaf Garden	4.05 miles, 114.3 degrees	4.53 miles, 113 degrees	No Garden at 2008 location, new location listed
G	Nearest Unoccupied Residence	1.93 Miles	2.10 miles, 129.7 degrees	2008 Residence appeared uninhabitable, new location listed
G	Nearest Occupied Residence	2.10 miles, 129.7 degrees	2.71 miles, 132 degrees	2008 Nearest Occupied Residence now Unoccupied
G	Nearest Broadleaf Garden	3.81 miles, 129.1 degrees	3.39 miles, 129 degrees	No Garden at 2008 location, new location listed
H	Nearest Broadleaf Garden	1.11 miles, 152.5 degrees	4.39 miles, 155 degrees	No Garden at 2008 location, new location listed
P	Nearest Unoccupied Residence	4.83 Miles	None	2008 Residence appeared uninhabitable
Q	Nearest Unoccupied Residence	3.5 miles	None	2008 Nearest Unoccupied Residence not present
R	Nearest Broadleaf Garden	1.46 miles, 342.9 degrees	None	No Garden at 2008 location

## **2.9 Interlaboratory Comparison Results**

River Bend Station (RBS) Environmental Laboratory analyzed interlaboratory comparison samples to fulfill the requirements of the ODCM Specifications 6.12.1. Attachment 1, Radiological Environmental Monitoring Report, contains these results in Table 9.1. GGNS' review of RBS' interlaboratory comparison indicated that 100% of results were within control limits for accuracy, and 100% of results were within control limits for precision.

Areva analyzed interlaboratory comparison Thermoluminescent Dosemeters and 100% of the results passed precision and bias criteria.

### **3.0 Radiological Environmental Monitoring Program Summary**

#### **3.1 Program Results Summary**

Table 3.1 summarizes the REMP results. GGNS personnel did not use values reported as less than the lower limit of detection (<LLD) when determining ranges and means for indicator and control locations.

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: Grand Gulf Nuclear Station Docket No: 50-416  
 Location of Facility: Claiborne County, Mississippi Reporting Period: January - December 2010

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Air Particulates (pCi/m <sup>3</sup> )	GB 158	0.01	0.032 ( 106 / 106 ) [ 0.013 - 0.385 ]	AS-3 VA (Sector B, 18 mi )	0.036 ( 54 / 54 ) [ 0.013 - 0.385 ]	0.027 ( 52 / 52 ) [ 0.014- 0.046 ]	1
	GS 12						
	Cs-134	0.05	<LLD	N/A	N/A	<LLD	0
	Cs-137	0.06	<LLD	N/A	N/A	<LLD	0
Airborne Iodine ( pCi/m <sup>3</sup> )	I-131 156	0.07	<LLD	N/A	N/A	<LLD	0
Inner Ring TLDS ( mR/Qtr )	Gamma 56	(f)	10.8 ( 56 / 56 ) [ 6.4-16.8 ]	M-99 (Sector K, 0.4 mi.)	15.4 ( 4 / 4 ) [ 13.8-16.8 ]	N/A	0
Outer Ring TLDS ( mR/Qtr )	Gamma 28	(f)	10.5 ( 28 / 28 ) [ 5.3 - 13.1 ]	M-55 (Sector D, 5.0 mi.)	12.5 ( 4 / 4 ) [ 12.2-13.1 ]	N/A	0
Special Interest TLDS ( mR/Qtr )	Gamma 28	(f)	10.2 ( 28 / 28 ) [ 8.1 - 12.8 ]	M-01 (Sector E, 3.5 mi. )	12.1 ( 4 / 4 ) [ 11.6-12.8 ]	N/A	0
Control TLDS ( mR/Qtr )	Gamma 4	(f)	N/A	N/A	N/A	12.1 ( 4 / 4 ) [ 11.1-12.8 ]	0

**TABLE 3.1**

**Radiological Environmental Monitoring Program Summary**

Name of Facility: Grand Gulf Nuclear Station      Docket No: 50-416  
 Location of Facility: Claiborne County, Mississippi      Reporting Period: January - December 2010

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Location Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Surface Water ( pCi/l )	H-3      27	3000	10597 ( 6/22 ) [ 383-57446 ]	Outfall 007 ( Sector N, Radius 0.2 mi.)	12613 ( 5 / 16 ) [383-57446]	<LLD	1
	GS      13						
	I-131	15	<LLD	N/A	N/A	<LLD	0
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0



TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: Grand Gulf Nuclear Station      Docket No: 50-416  
 Location of Facility: Claiborne County, Mississippi      Reporting Period: January - December 2010

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Locations Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Groundwater ( pCi/l )	H-3      14	2000	738 (1/12) [ N/A ]	Construction Well #1 (Sector Q, Radius 0.4 mi)	738 (1/12) [ N/A ]	<LLD	0
	I-131    4	1	<LLD	N/A	N/A	<LLD	0
	GS      14						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0
Sediment ( pCi/kg )	GS      2						
	Cs-134	150	<LLD	N/A	N/A	<LLD	0
	Cs-137	180	<LLD	N/A	N/A	<LLD	0

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: Grand Gulf Nuclear Station      Docket No: 50-416  
 Location of Facility: Claiborne County, Mississippi      Reporting Period: January - December 2010

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Location Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Fish ( pCi/kg )	GS      2						
	Mn-54	130	<LLD	N/A	N/A	<LLD	0
	Fe-59	260	<LLD	N/A	N/A	<LLD	0
	Co-58	130	<LLD	N/A	N/A	<LLD	0
	Co-60	130	<LLD	N/A	N/A	<LLD	0
	Zn-65	260	<LLD	N/A	N/A	<LLD	0
	Cs-134	130	<LLD	N/A	N/A	<LLD	0
Cs-137	150	<LLD	<LLD	N/A	N/A	<LLD	0
Food Products/Vegetation ( pCi/kg )	I-131      8	60	<LLD	N/A	N/A	<LLD	0
	GS      8						
	Cs-134	60	<LLD	N/A	N/A	<LLD	0
	Cs-137	80	<LLD	N/A	N/A	<LLD	0

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: Grand Gulf Nuclear Station      Docket No: 50-416  
 Location of Facility: Claiborne County, Mississippi      Reporting Period: January - December 2010

Sample Type ( Units )	Type & Number of Analyses <sup>a</sup>	LLD <sup>b</sup>	Indicator Location Mean ( F ) <sup>c</sup> [ Range ]	Location with Highest Annual Mean		Control Locations Mean ( F ) <sup>c</sup> [ Range ]	Number of Nonroutine Results <sup>e</sup>
				Location <sup>d</sup>	Mean ( F ) <sup>c</sup> [ Range ]		
Surface Water (Special) ( pCi/l )	GS      5						
	I-131	15	<LLD	N/A	N/A	<LLD	0
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
La-140	15	<LLD	N/A	N/A	<LLD	0	
Venison (Special Food Product) ( pCi/kg)	GS      1						
	Mn-54	130	<LLD	N/A	N/A	<LLD	0
	Fe-59	260	<LLD	N/A	N/A	<LLD	0
	Co-58	130	<LLD	N/A	N/A	<LLD	0
	Co-60	130	<LLD	N/A	N/A	<LLD	0
	Zn-65	260	<LLD	N/A	N/A	<LLD	0
	Cs-134	130	<LLD	N/A	N/A	<LLD	0
Cs-137	150	<LLD	N/A	N/A	<LLD	0	

<sup>a</sup> GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.

<sup>b</sup> LLD = Required lower limit of detection based on GGNS ODCM Table 6.12.1-3.

<sup>c</sup> Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis (F).

<sup>d</sup> Where applicable, locations are specified by name, distance from reactor site and meteorological sector.

<sup>e</sup> Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

<sup>f</sup> LLD is not defined in GGNS ODCM Table 6.12.1-3.

**Attachment 1**

**Radiological Monitoring Report**

**Summary of Monitoring Results**

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Table 1.1  
Sample Type: Air Particulate Filter and Radioiodine Cartridge  
Analysis: Gross Beta and I-131  
Units: pCi/m<sup>3</sup>

**AIR SAMPLE AS-1 PG - GGNS Nearest Community**

LLD (pCi/m <sup>3</sup> ) AS-1 PG			0.07	0.01
LAB ID	START DATE	END DATE	I-131	GROSS BETA
20100007	12/29/2009	1/6/2010	< 0.020	0.038 +/- 0.0011
20100024	1/6/2010	1/12/2010	< 0.023	0.041 +/- 0.0013
20100037	1/12/2010	1/19/2010	< 0.024	0.036 +/- 0.0011
20100056	1/19/2010	1/26/2010	< 0.019	0.022 +/- 0.0009
20100070	1/26/2010	2/2/2010	< 0.020	0.027 +/- 0.0010
20100099	2/2/2010	2/9/2010	< 0.021	0.024 +/- 0.0009
20100121	2/9/2010	2/16/2010	< 0.031	0.028 +/- 0.0010
20100194	2/16/2010	2/23/2010	< 0.021	0.016 +/- 0.0010
20100233	2/23/2010	3/2/2010	< 0.034	0.035 +/- 0.0011
20100264	3/2/2010	3/9/2010	< 0.021	0.024 +/- 0.0009
20100313	3/9/2010	3/16/2010	< 0.020	0.014 +/- 0.0009
20100354	3/16/2010	3/23/2010	< 0.029	0.016 +/- 0.0006
20100372	3/23/2010	3/30/2010	< 0.018	0.017 +/- 0.0006
20100401	3/30/2010	4/6/2010	< 0.016	0.024 +/- 0.0007
20100415	4/6/2010	4/13/2010	< 0.020	0.022 +/- 0.0009
20100444	4/13/2010	4/20/2010	< 0.023	0.028 +/- 0.0010
20100459	4/20/2010	4/27/2010	< 0.029	0.022 +/- 0.0009
20100476	4/27/2010	5/4/2010	< 0.015	0.021 +/- 0.0009

LLD (pCi/m <sup>3</sup> )	AS-1 PG			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20100504		5/4/2010	5/11/2010	< 0.017	0.024 +/- 0.0009
20100566		5/11/2010	5/18/2010	< 0.020	0.021 +/- 0.0009
20100587		5/18/2010	5/25/2010	< 0.019	0.016 +/- 0.0009
20100659		5/25/2010	6/1/2010	< 0.017	0.028 +/- 0.0010
20100711		6/1/2010	6/8/2010	< 0.030	0.014 +/- 0.0010
20100743		6/8/2010	6/16/2010	< 0.021	0.024 +/- 0.0009
20100799		6/16/2010	6/16/2010		0.385 +/- 0.1074 <sup>1</sup>
20100800		6/16/2010	6/16/2010		0.187 +/- 0.0494
20100812		6/16/2010	6/22/2010	< 0.019	0.019 +/- 0.0010
20100834		6/22/2010	6/29/2010	< 0.021	0.013 +/- 0.0007
20100859		6/29/2010	7/6/2010	< 0.013	0.015 +/- 0.0008
20100883		7/6/2010	7/13/2010	< 0.014	0.022 +/- 0.0009
20100902		7/13/2010	7/20/2010	< 0.028	0.020 +/- 0.0009
20100930		7/20/2010	7/27/2010	< 0.018	0.023 +/- 0.0010
20100940		7/27/2010	8/3/2010	< 0.017	0.024 +/- 0.0010
20100981		8/3/2010	8/10/2010	< 0.019	0.025 +/- 0.0010
20101068		8/10/2010	8/17/2010	< 0.031	0.023 +/- 0.0009
20101130		8/17/2010	8/24/2010	< 0.018	0.018 +/- 0.0009
20101147		8/24/2010	8/31/2010	< 0.019	0.024 +/- 0.0010
20101183		8/31/2010	9/7/2010	< 0.031	0.028 +/- 0.0010

<sup>1</sup>Result biased high due to small sample volume

LLD (pCi/m <sup>3</sup> )	AS-1 PG			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20101212		9/7/2010	9/15/2010	< 0.022	0.021 +/-0.0009
20101239		9/15/2010	9/21/2010	< 0.033	0.041 +/-0.0013
20101257		9/21/2010	9/28/2010	< 0.017	0.034 +/-0.0011
20101280		9/28/2010	10/5/2010	< 0.020	0.029 +/-0.001
20101300		10/5/2010	10/12/2010	< 0.019	0.047 +/-0.0013
20101324		10/12/2010	10/19/2010	< 0.013	0.047 +/-0.0012
20101381		10/19/2010	10/26/2010	< 0.017	0.050 +/-0.0013
20101416		10/26/2010	11/3/2010	< 0.022	0.025 +/-0.0009
20101448		11/3/2010	11/9/2010	< 0.034	0.027 +/-0.0012
20101487		11/9/2010	11/16/2010	< 0.032	0.028 +/- 0.0010
20101537		11/16/2010	11/23/2010	< 0.028	0.034 +/- 0.0011
20101547		11/23/2010	11/30/2010	< 0.035	0.032 +/-0.0011
20101559		11/30/2010	12/7/2010	< 0.021	0.036 +/- 0.0011
20101611		12/7/2010	12/14/2010	< 0.055	0.036 +/- 0.0012
20101620		12/14/2010	12/21/2010	< 0.036	0.030 +/- 0.0011
20101629		12/21/2010	12/29/2010	< 0.017	0.034 +/- 0.0010
<b>Average:</b>					0.036
<b>Maximum:</b>					0.385
<b>Minimum:</b>					0.013



Table 1.1

Sample Type: Air Particulate Filter and Radioiodine Cartridge

Analysis: Gross Beta and I-131

Units: pCi/m<sup>3</sup>

**AIR SAMPLE AS-3 61VA - GGNS – Control**

LLD (pCi/m <sup>3</sup> )	AS-3 61VA			0.07	0.01
LAB ID	START DATE	END DATE		I-131	GROSS BETA
20100008	12/28/2009	1/5/2010		< 0.026	0.041 +/- 0.0011
20100025	1/5/2010	1/12/2010		< 0.018	0.042 +/- 0.0012
20100038	1/12/2010	1/18/2010		< 0.027	0.042 +/- 0.0013
20100057	1/18/2010	1/25/2010		< 0.017	0.022 +/- 0.0009
20100071	1/25/2010	2/1/2010		< 0.028	0.028 +/- 0.0010
20100100	2/1/2010	2/9/2010		< 0.023	0.027 +/- 0.0009
20100122	2/9/2010	2/16/2010		< 0.022	0.029 +/- 0.0010
20100195	2/16/2010	2/23/2010		< 0.020	0.014 +/- 0.0010
20100234	2/23/2010	3/1/2010		< 0.040	0.035 +/- 0.0013
20100265	3/1/2010	3/9/2010		< 0.019	0.025 +/- 0.0009
20100314	3/9/2010	3/16/2010		< 0.014	0.015 +/- 0.0009
20100355	3/16/2010	3/22/2010		< 0.022	0.018 +/- 0.0007
20100373	3/22/2010	3/30/2010		< 0.018	0.021 +/- 0.0006
20100402	3/30/2010	4/5/2010		< 0.021	0.028 +/- 0.0008
20100416	4/5/2010	4/12/2010		< 0.019	0.023 +/- 0.0009
20100445	4/12/2010	4/20/2010		< 0.021	0.030 +/- 0.0010
20100460	4/20/2010	4/27/2010		< 0.023	0.021 +/- 0.0009
20100477	4/27/2010	5/4/2010		< 0.017	0.019 +/- 0.0009

LLD (pCi/m <sup>3</sup> )	AS-3 61VA			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20100505		5/4/2010	5/11/2010	< 0.015	0.022 +/- 0.0009
20100567		5/11/2010	5/18/2010	< 0.015	0.019 +/- 0.0009
20100588		5/18/2010	5/25/2010	< 0.014	0.016 +/- 0.0008
20100660		5/25/2010	6/1/2010	< 0.018	0.026 +/- 0.0010
20100712		6/1/2010	6/8/2010	< 0.025	0.014 +/- 0.0010
20100744		6/8/2010	6/15/2010	< 0.031	0.026 +/- 0.0010
20100813		6/15/2010	6/22/2010	< 0.020	0.019 +/- 0.0009
20100835		6/22/2010	6/28/2010	< 0.022	0.018 +/- 0.0010
20100860		6/28/2010	7/6/2010	< 0.016	0.017 +/- 0.0008
20100884		7/6/2010	7/13/2010	< 0.019	0.023 +/- 0.0010
20100903		7/13/2010	7/21/2010	< 0.023	0.021 +/- 0.0009
20100931		7/21/2010	7/27/2010	< 0.016	0.022 +/- 0.0010
20100941		7/27/2010	8/2/2010	< 0.024	0.019 +/- 0.0011
20100982		8/2/2010	8/9/2010	< 0.017	0.028 +/- 0.0010
20101069		8/9/2010	8/17/2010	< 0.018	0.023 +/- 0.0009
20101131		8/17/2010	8/23/2010	< 0.020	0.015 +/- 0.0009
20101148		8/23/2010	8/30/2010	< 0.018	0.026 +/- 0.001
20101184		8/30/2010	9/7/2010	< 0.020	0.026 +/- 0.0009
20101213		9/7/2010	9/14/2010	< 0.025	0.021 +/- 0.0009
20101240		9/14/2010	9/20/2010	< 0.029	0.046 +/- 0.0014

LLD (pCi/m <sup>3</sup> )	AS-3 61VA			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20101258		9/20/2010	9/28/2010	< 0.016	0.035 +/-0.0011
20101281		9/28/2010	10/4/2010	< 0.019	0.032 +/-0.0012
20101301		10/4/2010	10/12/2010	< 0.012	0.040 +/-0.0011
20101325		10/12/2010	10/18/2010	< 0.018	0.045 +/-0.0013
20101382		10/18/2010	10/27/2010	< 0.011	0.043 +/-0.0011
20101417		10/27/2010	11/2/2010	< 0.025	0.027 +/-0.0011
20101449		11/2/2010	11/9/2010	< 0.029	0.023 +/-0.001
20101488		11/9/2010	11/15/2010	< 0.023	0.029 +/- 0.0011
20101538		11/15/2010	11/24/2010	< 0.025	0.030 +/- 0.0009
20101548		11/24/2010	11/29/2010	< 0.037	0.034 +/-0.0013
20101560		11/29/2010	12/7/2010	< 0.019	0.035 +/- 0.0010
20101612		12/7/2010	12/14/2010	< 0.045	0.034 +/- 0.0012
20101621		12/14/2010	12/21/2010	< 0.026	0.030 +/- 0.0011
20101630		12/21/2010	12/27/2010	< 0.021	0.037 +/- 0.0012
<b>Average:</b>					0.027
<b>Maximum:</b>					0.046
<b>Minimum:</b>					0.014

Table 1.1

Sample Type: Air Particulate Filter and Radioiodine Cartridge

Analysis: Gross Beta and I-131

Units: pCi/m<sup>3</sup>**AIR SAMPLE AS-7 - GGNS – Indicator**

LLD (pCi/m <sup>3</sup> )	AS-7UH		0.07	0.01
LAB ID	START DATE	END DATE	I-131	GROSS BETA
20100009	12/29/2009	1/5/2010	< 0.026	0.036 +/- 0.0011
20100026	1/5/2010	1/12/2010	< 0.013	0.036 +/- 0.0012
20100039	1/12/2010	1/19/2010	< 0.021	0.030 +/- 0.0011
20100058	1/19/2010	1/26/2010	< 0.016	0.018 +/- 0.0008
20100072	1/26/2010	2/2/2010	< 0.020	0.026 +/- 0.0010
20100101	2/2/2010	2/9/2010	< 0.021	0.025 +/- 0.0010
20100123	2/9/2010	2/16/2010	< 0.023	0.029 +/- 0.0011
20100196	2/16/2010	2/23/2010	< 0.021	0.016 +/- 0.0010
20100235	2/23/2010	3/2/2010	< 0.029	0.033 +/- 0.0011
20100266	3/2/2010	3/9/2010	< 0.019	0.027 +/- 0.0010
20100315	3/9/2010	3/16/2010	< 0.016	0.016 +/- 0.0009
20100356	3/16/2010	3/23/2010	< 0.023	0.017 +/- 0.0006
20100374	3/23/2010	3/30/2010	< 0.016	0.018 +/- 0.0006
20100403	3/30/2010	4/6/2010	< 0.020	0.027 +/- 0.0007
20100417	4/6/2010	4/13/2010	< 0.013	0.023 +/- 0.0009
20100446	4/13/2010	4/20/2010	< 0.027	0.030 +/- 0.0010
20100461	4/20/2010	4/27/2010	< 0.019	0.022 +/- 0.0009
20100478	4/27/2010	5/4/2010	< 0.016	0.022 +/- 0.0009

LLD (pCi/m <sup>3</sup> )	AS-7UH			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20100506		5/4/2010	5/11/2010	< 0.017	0.026 +/- 0.0010
20100568		5/11/2010	5/18/2010	< 0.014	0.020 +/- 0.0009
20100589		5/18/2010	5/25/2010	< 0.014	0.017 +/- 0.0008
20100661		5/25/2010	6/1/2010	< 0.010	0.028 +/- 0.0010
20100713		6/1/2010	6/8/2010	< 0.027	0.014 +/- 0.0010
20100745		6/8/2010	6/15/2010	< 0.024	0.024 +/- 0.0009
20100814		6/15/2010	6/22/2010	< 0.014	0.019 +/- 0.0009
20100836		6/22/2010	6/29/2010	< 0.018	0.013 +/- 0.0008
20100861		6/29/2010	7/6/2010	< 0.019	0.015 +/- 0.0008
20100885		7/6/2010	7/13/2010	< 0.014	0.021 +/- 0.0009
20100904		7/13/2010	7/20/2010	< 0.025	0.019 +/- 0.0009
20100932		7/20/2010	7/27/2010	< 0.018	0.024 +/- 0.0009
20100942		7/27/2010	8/3/2010	< 0.017	0.025 +/- 0.0011
20100983		8/3/2010	8/10/2010	< 0.017	0.026 +/- 0.0010
20101070		8/10/2010	8/17/2010	< 0.025	0.024 +/- 0.0010
20101132		8/17/2010	8/24/2010	< 0.018	0.018 +/- 0.0009
20101149		8/24/2010	8/31/2010	< 0.018	0.023 +/-0.001
20101185		8/31/2010	9/7/2010	< 0.028	0.028 +/- 0.0010
20101214		9/7/2010	9/14/2010	< 0.029	0.020 +/-0.0009
20101241		9/14/2010	9/21/2010	< 0.026	0.045 +/-0.0012

LLD (pCi/m <sup>3</sup> )	AS-7UH			0.07	0.01
LAB ID		START DATE	END DATE	I-131	GROSS BETA
20101259		9/21/2010	9/28/2010	< 0.019	0.034 +/-0.0011
20101282		9/28/2010	10/5/2010	< 0.024	0.029 +/-0.001
20101302		10/5/2010	10/12/2010	< 0.021	0.047 +/-0.0012
20101326		10/12/2010	10/19/2010	< 0.016	0.052 +/-0.0013
20101383		10/19/2010	10/26/2010	< 0.017	0.050 +/-0.0013
20101418		10/26/2010	11/2/2010	< 0.025	0.027 +/-0.0010
20101450		11/2/2010	11/9/2010	< 0.026	0.026 +/-0.0011
20101489		11/9/2010	11/17/2010	< 0.025	0.030 +/- 0.0009
20101539		11/17/2010	11/23/2010	< 0.033	0.039 +/- 0.0012
20101549		11/23/2010	11/30/2010	< 0.028	0.034 +/-0.0011
20101561		11/30/2010	12/7/2010	< 0.021	0.039 +/- 0.0012
20101613		12/7/2010	12/14/2010	< 0.046	0.034 +/- 0.0012
20101622		12/14/2010	12/21/2010	< 0.030	0.032 +/- 0.0011
20101631		12/21/2010	12/29/2010	< 0.015	0.034 +/- 0.0010
<b>Average:</b>					0.027
<b>Maximum:</b>					0.052
<b>Minimum:</b>					0.013

Table 1.2

Sample Type: **Air Particulate Filter**

Analysis: Gamma Isotopic

Units: pCi/m<sup>3</sup>**AIR PARTICULATE FILTER QUARTERLY COMPOSITES (GAMMA) – GGNS**

LLD (pCi/m <sup>3</sup> )			0.05	0.06
LAB ID	LOCATION	DATE	CS-134	CS-137
20100404	AS-1 PG	2/12/2010	< 0.005	< 0.003
20100405	AS-3 61VA	2/12/2010	< 0.005	< 0.004
20100406	AS-7 UH	2/12/2010	< 0.004	< 0.003
20100851	AS-1 PG	5/14/2010	< 0.004	< 0.006
20100852	AS-3 61VA	5/14/2010	< 0.005	< 0.003
20100853	AS-7 UH	5/15/2010	< 0.005	< 0.003
20101290	AS-1 PG	8/17/2010	< 0.003	< 0.003
20101291	AS-3 61VA	8/16/2010	< 0.005	< 0.005
20101292	AS-7 UH	8/17/2010	< 0.005	< 0.004
20101667	AS-1 PG	11/13/2010	< 0.003	< 0.003
20101668	AS-3 61VA	11/12/2010	< 0.003	< 0.002
20101669	AS-7 UH	11/13/2010	< 0.003	< 0.004

Table 2.1

Sample Type: **Thermoluminescent Dosimeters**

Analysis: Gamma Dose

Units: mrem/Qtr

<b>Inner Ring - Within General Area of Site Boundary (ODCM Specifications)</b>					
<b>Station</b>	<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Annual Mean</b>
M-16	10.5	10.9	11.1	12.2	11.2
M-19	10.1	10.4	10.7	10.5	10.4
M-21	16.4	14.4	15.5	15.0	15.3
M-22	9.0	9.6	10.4	9.6	9.7
M-23	6.4	7.9	8.9	9.9	8.3
M-25	8.5	6.7	10.1	9.9	8.8
M-28	10.9	12.3	12.4	11.6	11.8
M-94	10.2	10.3	10.6	12.5	10.9
M-95	8.2	7.4	8.4	8.8	8.2
M-96	7.4	7.5	8.1	8.5	7.9
M-97	7.2	7.3	8.0	8.9	7.8
M-98	12.5	12.0	13.4	13.7	12.9
<b>M-99*</b>	15.1	13.8	16.8	15.9	15.4
M-100	11.3	12.4	12.9	12.7	12.3

\*Location with highest annual mean

<b>Outer Ring – Approximately Three (3) to Five (5) Miles from the Site (ODCM Specifications)</b>					
<b>Station</b>	<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Annual Mean</b>
M-36	8.4	8.3	9.8	10.1	9.2
M-40	6.3	5.3	6.7	7.0	6.3
M-48	9.7	10.5	11.1	11.5	10.7
M-49	11.2	11.7	12.0	12.5	11.8
M-50	10.4	11.2	11.5	11.3	11.1
<b>M-55*</b>	12.4	12.2	12.3	13.1	12.5
M-57	11.8	12.1	13.1	11.9	12.2

\* Location with highest annual mean.



Table 2.2

Sample Type: **Thermoluminescent Dosimeters**

Analysis: Gamma Dose

Units: mrem/Qtr

<b>Special Interest Areas – Population Centers &amp; Schools (ODCM Specifications)</b>					
<b>Station</b>	<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Annual Mean</b>
<b>M-01*</b>	11.9	11.6	12.1	12.8	12.1
M-07	10.3	9.7	9.8	11.7	10.4
M-09	10.2	9.9	11.0	11.4	10.6
M-10	9.8	8.7	9.2	9.3	9.3
M-33	8.1	8.1	9.1	9.1	8.6
M-38	8.8	9.7	10.8	11.5	10.2
M-39	8.7	9.2	10.3	11.8	10.0

\* **Location with highest annual mean.**

Table 2.3

Sample Type: **Thermoluminescent Dosimeters**

Analysis: Gamma Dose

Units: mrem/Qtr

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**Special Interest Areas – Control (ODCM Specifications)**

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<b>Station</b>	<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Annual Mean</b>
M-14	11.1	12.3	12.8	12.0	12.1

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Table 3.1

Sample Type: **Surface Water**

Analysis: Gamma Isotopic

Units: pCi/l

**SURFACE WATER SAMPLES (GAMMA) - GGNS**

LLD/LIQUID (pCi/l)			15	15	30	15	30	15	30	15	15	18	60	15
LAB ID	LOCATION	DATE	MN-54	CO-58	FE-59	CO-60	ZN-65	NB-95	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140
20100189	MRUP	2/18/2010	< 5.37	< 5.13	< 11.19	< 5.24	< 13.25	< 6.64	< 9.54	< 13.60	< 6.12	< 5.85	< 33.44	< 12.02
20100190	MRUP GG	2/18/2010	< 5.04	< 5.22	< 9.89	< 4.88	< 11.80	< 6.13	< 9.31	< 13.92	< 5.28	< 5.03	< 28.70	< 11.09
20100192	MRDOWN	2/18/2010	< 4.43	< 4.01	< 11.37	< 5.00	< 11.16	< 4.97	< 7.18	< 13.09	< 4.64	< 4.14	< 28.65	< 10.40
20100193	MRDOWN GG	2/18/2010	< 4.20	< 5.09	< 9.41	< 5.03	< 8.79	< 5.43	< 8.97	< 12.96	< 4.99	< 4.63	< 32.71	< 9.09
20100508	MRUP	5/11/2010	< 7.79	< 6.35	< 18.05	< 7.95	< 16.50	< 7.46	< 15.59	< 14.96	< 9.22	< 8.61	< 33.46	< 12.94
20100510	MR DOWN	5/11/2010	< 7.15	< 8.92	< 14.15	< 8.48	< 18.33	< 9.72	< 11.83	< 10.99	< 9.14	< 8.06	< 37.70	< 14.06
20101077	MRUP	8/17/2010	< 5.85	< 6.19	< 14.43	< 6.87	< 13.24	< 9.18	< 11.66	< 11.59	< 6.65	< 6.20	< 31.50	< 14.45
20101079	MRUP GG	8/17/2010	< 7.50	< 7.23	< 9.31	< 6.49	< 16.49	< 10.24	< 13.67	< 12.22	< 8.72	< 7.95	< 35.08	< 14.49
20101081	MRDOWN	8/17/2010	< 10.42	< 11.07	< 18.94	< 7.31	< 22.62	< 10.94	< 16.34	< 14.64	< 11.00	< 10.75	< 45.34	< 12.80
20101083	MRDOWN GG	8/17/2010	< 7.36	< 8.18	< 16.93	< 6.98	< 17.51	< 10.65	< 13.42	< 14.80	< 10.35	< 8.99	< 37.84	< 11.04

LLD/LIQUID (pCi/l)			15	15	30	15	30	15	30	15	15	18	60	15
LAB ID	LOCATION	DATE	MN-54	CO-58	FE-59	CO-60	ZN-65	NB-95	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140
20101413	MRUP	11/1/2010	< 4.99	< 5.44	< 14.55	< 6.15	< 12.63	< 7.80	< 11.99	< 11.66	< 6.13	< 6.12	< 30.00	< 11.89
20101414	MRDOWN	11/1/2010	< 6.19	< 6.64	< 15.31	< 6.95	< 14.10	< 8.44	< 12.71	< 12.42	< 7.20	< 8.27	< 29.97	< 12.78
20101415	MRDOWN*	11/1/2010	< 8.14	< 8.40	< 16.06	< 8.64	< 14.17	< 7.72	< 9.74	< 14.75	< 7.37	< 8.56	< 33.52	< 14.34

“GG” – indicates duplicate sample.

\* Annual Sample collected during liquid discharge

Table 3.2

Sample Type: Surface Water

Analysis: Tritium

Units: pCi/l

**SURFACE WATER SAMPLES (TRITIUM) – GGNS**

LLD ( pCi/l)	SURFACE WATER H-3		2000	
LAB ID	LOCATION	DATE	TRITIUM	
20100188	MRUP	2/18/2010	< 581	
20100191	MRDOWN	2/18/2010	< 578	
20100507	MRUP	5/11/2010	< 480	
20100509	MR DOWN	5/11/2010	< 483	
20101076	MRUP	8/17/2010	< 474	
20101078	MRUP GG	8/17/2010	< 459	
20101080	MR DOWN	8/17/2010	516	+/- 212.55
20101082	MR DOWN GG	8/17/2010	< 401	
20101413	MRUP	11/1/2010	< 439	
20101414	MRDOWN	11/1/2010	< 429	
20101415	MRDOWN*	11/1/2010	< 427	
20100036	OUTFALL 007	1/18/2010	1,872	+/- 272.05
20100262 <sup>1</sup>	OUTFALL 007	2/17/2010	57,446	+/- 903.59
20100270	OUTFALL 007	3/11/2010	< 577	
20100271	OUTFALL 007	3/15/2010	383	+/- 230.59
20100432	OUTFALL 007	4/14/2010	< 472	
20100463	OUTFALL 007	4/22/2010	< 529	
20100553	OUTFALL 007	5/17/2010	< 482	
20100760	OUTFALL 007	6/17/2010	< 502	
20100891	OUTFALL 007	7/20/2010	< 492	
20101118	OUTFALL 007	8/19/2010	< 369	
20101119	OUTFALL 007 GG	8/19/2010	< 369	
20101242	OUTFALL 007	9/20/2010	< 411	
20101388	OUTFALL 007	10/25/2010	< 457	
20101456	OUTFALL 007	11/8/2010	< 367	
20101550	OUTFALL 007	11/23/2010	2,643	+/- 241.83
20101614	OUTFALL 007	12/16/2010	723	+/- 186.09

<sup>1</sup>Following approximately six inch snowfall

\* Annual Sample collected during liquid discharge

“GG” – indicates duplicate sample.

Table 3.2

Sample Type: Surface Water

Analysis: Tritium

Units: pCi/l

**SURFACE WATER SAMPLES (TRITIUM) – GGNS**

LLD ( pCi/l)	SURFACE WATER H-3		2000	
LAB ID	LOCATION	DATE	TRITIUM	
20100188	MRUP	2/18/2010	< 581	
20100191	MRDOWN	2/18/2010	< 578	
20100507	MRUP	5/11/2010	< 480	
20100509	MR DOWN	5/11/2010	< 483	
20101076	MRUP	8/17/2010	< 474	
20101078	MRUP GG	8/17/2010	< 459	
20101080	MR DOWN	8/17/2010	516	+/- 212.55
20101082	MR DOWN GG	8/17/2010	< 401	
20101413	MRUP	11/1/2010	< 439	
20101414	MRDOWN	11/1/2010	< 429	
20101415	MRDOWN*	11/1/2010	< 427	
20100036	OUTFALL 007	1/18/2010	1,872	+/- 272.05
20100262 <sup>1</sup>	OUTFALL 007	2/17/2010	57,446	+/- 903.59
20100270	OUTFALL 007	3/11/2010	< 577	
20100271	OUTFALL 007	3/15/2010	383	+/- 230.59
20100432	OUTFALL 007	4/14/2010	< 472	
20100463	OUTFALL 007	4/22/2010	< 529	
20100553	OUTFALL 007	5/17/2010	< 482	
20100760	OUTFALL 007	6/17/2010	< 502	
20100891	OUTFALL 007	7/20/2010	< 492	
20101118	OUTFALL 007	8/19/2010	< 369	
20101119	OUTFALL 007 GG	8/19/2010	< 369	
20101242	OUTFALL 007	9/20/2010	< 411	
20101388	OUTFALL 007	10/25/2010	< 457	
20101456	OUTFALL 007	11/8/2010	< 367	
20101550	OUTFALL 007	11/23/2010	2,643	+/- 241.83
20101614	OUTFALL 007	12/16/2010	723	+/- 186.09

<sup>1</sup>Following approximately six inch snowfall

\* Annual Sample collected during liquid discharge

“GG” – indicates duplicate sample.

Table 4.1

Sample Type: **Groundwater**

Analysis: Gamma Isotopic

Units: pCi/l

**GROUND WATER SAMPLES (GAMMA) - GGNS**

LLD (pCi/l)			15	15	30	15	30	15	30	15	15	18	60	15
LAB ID	LOCATION	DATE	MN-54	CO-58	FE-59	CO-60	ZN-65	NB-95	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140
20100222	CONSTWELL1	3/1/2010	< 7.53	< 7.23	< 14.75	< 7.38	< 13.88	< 8.65	< 11.20	< 12.40	< 7.29	< 6.90	< 30.45	< 11.88
20100223	CONSTWELL3	3/1/2010	< 6.41	< 7.47	< 16.05	< 6.44	< 14.74	< 9.01	< 10.37	< 14.63	< 7.95	< 6.80	< 40.36	< 14.61
20100224	CONSTWELL4	3/1/2010	< 6.22	< 7.24	< 13.52	< 10.33	< 18.91	< 9.94	< 14.30	< 14.85	< 7.85	< 7.26	< 41.48	< 11.09
20100724	CONSTWELL1	6/9/2010	< 7.21	< 7.32	< 14.98	< 8.47	< 14.93	< 8.80	< 12.41	< 11.81	< 6.86	< 7.19	< 28.63	< 12.18
20100725	CONSTWELL3	6/9/2010	< 6.78	< 8.45	< 12.03	< 6.97	< 16.24	< 7.79	< 13.20	< 10.21	< 6.60	< 8.73	< 31.13	< 12.28
20100726	CONSTWELL4	6/9/2010	< 6.23	< 8.27	< 14.99	< 6.91	< 16.72	< 8.10	< 15.83	< 11.70	< 8.11	< 8.14	< 38.46	< 13.50
20101247	CONSTWELL1	9/23/2010	< 11.98	< 12.14	< 24.98	< 11.79	< 26.88	< 11.51	< 20.68	< 14.17	< 13.02	< 9.24	< 43.01	< 14.82
20101248	CONSTWELL3	9/23/2010	< 8.86	< 7.59	< 16.44	< 6.31	< 15.79	< 10.40	< 11.22	< 11.22	< 8.21	< 8.05	< 27.14	< 13.76
20101249	CONSTWELL4	9/23/2010	< 9.01	< 9.01	< 17.15	< 8.44	< 20.58	< 11.51	< 15.80	< 12.52	< 9.86	< 8.50	< 37.94	< 14.21
20101250	PGWELL	9/23/2010	< 10.55	< 7.49	< 14.00	< 6.57	< 17.71	< 12.73	< 12.22	< 11.03	< 7.73	< 9.25	< 35.53	< 14.03
20101552	CONSTWELL1	11/30/2010	< 8.60	< 7.13	< 12.28	< 6.86	< 12.13	< 8.28	< 14.00	< 13.20	< 6.45	< 7.61	< 34.01	< 13.61
20101553	CONSTWELL3	11/30/2010	< 7.58	< 8.42	< 14.42	< 7.81	< 18.78	< 10.04	< 12.80	< 14.88	< 7.72	< 7.41	< 37.34	< 11.84
20101554	CONSTWELL4	11/30/2010	< 6.57	< 5.89	< 13.60	< 6.30	< 13.75	< 7.30	< 11.85	< 0.13.63	< 6.72	< 5.70	< 34.88	< 12.26
20101555	PGWELL	11/30/2010	< 6.87	< 7.26	< 17.18	< 4.62	< 11.29	< 8.33	< 11.18	< 0.14.76	< 6.85	< 7.22	< 37.22	< 12.47

Table 4.2  
 Sample Type: Groundwater  
 Analysis: Tritium  
 Units: pCi/l

### GROUND WATER SAMPLES ( TRITIUM) - GGNS

LLD (pCi/l)			2000
LAB ID	LOCATION	DATE	TRITIUM
20100210	CONSTWELL1	3/1/2010	< 582.09
20100211	CONSTWELL3	3/1/2010	< 580.58
20100212	CONSTWELL4	3/1/2010	< 578.83
20100721	CONSTWELL1	6/9/2010	< 479.68
20100722	CONSTWELL3	6/9/2010	< 478.94
20100723	CONSTWELL4	6/9/2010	< 477.10
20101247	CONSTWELL1	9/23/2010	737.98 +/- 186
20101248	CONSTWELL3	9/23/2010	< 407.05
20101249	CONSTWELL4	9/23/2010	< 407.59
20101250	PGWELL	9/23/2010	< 445.27
20101552	CONSTWELL1	11/30/2010	< 372.64
20101553	CONSTWELL3	11/30/2010	< 371.47
20101554	CONSTWELL4	11/30/2010	< 367.89
20101555	PGWELL	11/30/2010	< 348.20



Table 4.3

Sample Type: Groundwater

Analysis: Iodine

Units: pCi/l

### **GROUND WATER SAMPLES (Iodine-131) - GGNS**

<b>LLD(pCi/l)</b>			<b>1.0</b>
<b>LAB ID</b>	<b>LOCATION</b>	<b>DATE</b>	<b>I-131</b>
20101552	CONSTWELL 1	11/30/2010	< 0.89
20101553	CONSTWELL 3	11/30/2010	< 0.90
20101554	CONSTWELL 4	11/30/2010	< 0.88
20101555	PG WELL	11/30/2010	< 0.90

Table 5.1

Sample Type: Sediment

Analysis: Gamma Isotopic

Units: pCi/kg

### **SEDIMENT SAMPLES (GAMMA) - GGNS**

<b>LLD (pCi/KG)</b>			<b>150</b>	<b>180</b>
<b>LAB ID</b>	<b>LOCATION</b>	<b>DATE</b>	<b>CS-134</b>	<b>CS-137</b>
20101484	SEDHAM	11/10/2010	< 21.56	< 23.45
20101485	SEDCONT	11/10/2010	< 21.23	< 28.07

Table 6.1

Sample Type: **Fish**

Analysis: Gamma Isotopic

Units: pCi/kg

**FISH SAMPLES (GAMMA) - GGNS**

LLD (pCi/kg)			130	130	260	130	260	130	150
LAB ID	LOCATION	DATE	MN-54	C0-58	FE-59	CO-60	ZN-65	CS-134	CS-137
20101482	FISHUP	11/10/2010	< 15.96	< 17.62	< 60.32	< 26.82	< 61.94	< 20.67	< 17.74
20101483	FISHDOWN	11/10/2010	< 16.37	< 23.43	< 66.34	< 26.71	< 66.33	< 21.51	< 15.98

Table 7.1

Sample Type: **Food Products**

Analysis: Iodine-131 and Gamma Isotopic

Units: pCi/kg

**VEGETATION SAMPLES (GAMMA) - GGNS**

LLD (pCi/kg)			60	60	80
LAB ID	LOCATION	DATE	I-131	CS-134	CS-137
20100231	VEG-CONT	3/2/2010	< 58.35	< 42.22	< 38.84
20100232	VEG-J	3/2/2010	< 58.22	< 45.18	< 46.27
20100668	VEG-CONT	6/3/2010	< 58.17	< 40.04	< 36.04
20100669	VEG-J	6/3/2010	< 48.90	< 59.81	< 49.33
20101205	VEG-CONT	9/13/2010	< 43.98	< 33.78	< 34.83
20101206	VEG-J	9/13/2010	< 55.57	< 35.75	< 52.37
20101457	VEG-CONT	11/9/2010	< 53.80	< 36.19	< 39.17
20101458	VEG-J	11/9/2010	< 58.90	< 45.19	< 39.58

Table 8.1

Sample Type: **Special Samples**

Analysis: Gamma Isotopic

Units: pCi/kg

**SPECIAL SURFACE WATER SAMPLES (GAMMA) – GGNS**

LLD/LIQUID (pCi/l)			15	15	30	15	30	15	30	15	15	18	60	15
LAB ID	LOCATION	DATE	MN-54	C0-58	FE-59	CO-60	ZN-65	NB-95	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140
20100270	OUTFALL 007	3/11/2010	< 12.13	< 11.65	< 18.80	< 12.34	< 23.53	< 10.10	< 21.32	< 12.51	< 12.18	< 12.57	< 48.87	< 14.16
20100272	OUTFALL 007	3/15/2010	< 10.58	< 9.82	< 17.77	< 11.91	< 20.84	< 14.30	< 20.81	< 14.74	< 13.23	< 6.15	< 45.45	< 12.86
20100554	OUTFALL 007	5/17/2010	< 13.14	< 9.89	< 18.28	< 10.07	< 15.89	< 10.41	< 9.41	< 10.96	< 12.27	< 10.95	< 43.90	< 7.40
20101242	OUTFALL 007	9/20/2010	< 11.75	< 8.25	< 14.76	< 8.51	< 26.02	< 13.63	< 14.01	< 14.38	< 8.33	< 8.32	< 44.53	< 13.84
20101456	OUTFALL 007	11/8/2010	< 6.50	< 6.28	< 10.24	< 6.59	< 12.49	< 7.00	< 11.31	< 12.33	< 6.26	< 6.16	< 30.12	< 12.02

**SPECIAL FOOD PRODUCT SAMPLES (GAMMA) – GGNS**

LLD (pCi/kg)			130	130	260	130	260	130	150
LAB ID	LOCATION	DATE	MN-54	C0-58	FE-59	CO-60	ZN-65	CS-134	CS-137
20101306	VENISON	10/13/2010	< 16.61	< 16.00	< 41.87	< 24.51	< 45.62	< 16.56	< 13.77

Table 9.1

Sample Type: **Interlaboratory Comparison**

Analysis: Gross Beta, Tritium, Iodine-131 and Gamma Isotopic

**RIVER BEND STATION****ENVIRONMENTAL (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS**

<b>Analytcs E7024-125</b>	<b>Gamma in Water</b>						
<b>Nuclide</b>	<b>RBS Mean pCi/L</b>	<b>RBS 1-s pCi/L</b>	<b>Ref Lab Value pCi/L</b>	<b>Ref Lab Uncertainty pCi/L</b>	<b>Resolution</b>	<b>RBS/Ref Lab Ratio</b>	<b>Pass/ Fail</b>
<b>I-131</b>	74.9	5.30	72.2	1.21	59.7	1.04	Pass
<b>Ce-141</b>	268	7.10	263	4.40	59.8	1.02	Pass
<b>Cr-51</b>	418	1.66	364	6.08	59.9	1.15	Pass
<b>Cs-134</b>	182	4.80	179	2.99	59.9	1.02	Pass
<b>Cs-137</b>	168	5.20	159	2.66	59.8	1.06	Pass
<b>Co-58</b>	145	6.30	144	2.40	60.0	1.01	Pass
<b>Mn-54</b>	222	5.60	209	3.49	59.9	1.06	Pass
<b>Fe-59</b>	151	8.70	138	2.31	59.7	1.09	Pass
<b>Zn-65</b>	266	9.80	256	4.27	60.0	1.04	Pass
<b>Co-60</b>	185	4.60	185	3.08	60.1	1.00	Pass

<b>Analytcs E7025-125</b>	<b>Gross Beta in Water</b>						
<b>Nuclide</b>	<b>RBS Mean pCi/L</b>	<b>RBS 1-s pCi/L</b>	<b>Ref Lab Value pCi/L</b>	<b>Ref Lab uncertainty pCi/L</b>	<b>Resolution</b>	<b>RBS/Ref Lab Ratio</b>	<b>Pass/ Fail</b>
<b>Cs-137</b>	270	9.90	260	4.35	59.8	1.04	Pass

<b>Analytcs E7026-125</b>	<b>I-131 cartridge</b>						
<b>Nuclide</b>	<b>RBS Mean pCi/each</b>	<b>RBS 1-s pCi/each</b>	<b>Ref Lab Value pCi/each</b>	<b>Ref Lab uncertainty pCi/each</b>	<b>Resolution</b>	<b>RBS/Ref Lab Ratio</b>	<b>Pass/ Fail</b>
<b>I-131</b>	84.5	3.70	85.6	1.43	59.9	0.99	Pass

RIVER BEND STATION

ENVIRONMENTAL (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

Analytics E7027-125		Gamma in Milk					
Nuclide	RBS Mean pCi/L	RBS 1-s pCi/L	Ref Lab Value pCi/L	Ref Lab uncertainty pCi/L	Resolution	RBS/Ref Lab Ratio	Pass/Fail
I-131	75.7	2.80	74.0	1.24	59.7	1.02	Pass
Ce-141	257	5.20	261	4.36	59.9	0.98	Pass
Cr-51	364	17.7	361	6.03	59.9	1.01	Pass
Cs-134	176	1.40	178	2.97	59.9	0.99	Pass
Cs-137	163	6.00	158	2.64	59.8	1.03	Pass
Co-58	142	1.00	143	2.38	60.1	0.99	Pass
Mn-54	209	9.20	207	3.46	59.8	1.01	Pass
Fe-59	154	0.80	137	2.29	59.8	1.12	Pass
Zn-65	256	9.40	254	4.24	59.9	1.01	Pass
Co-60	176	10.2	183	3.06	59.8	0.96	Pass

Analytics E7111-125 *		Gross Beta filter					
Nuclide	RBS Mean pCi/filter	RBS 1-s pCi/filter	Ref Lab Value pCi/filter	Ref Lab uncertainty pCi/filter	Resolution	RBS/Ref Lab Ratio	Pass/Fail
Cs-137	60.5	0.33	54.0	0.902	59.9	1.12	Pass

Analytics E7255-125 **		H-3 in water					
Nuclide	RBS Mean pCi/L	RBS 1-s pCi/L	Ref Lab Value pCi/L	Ref Lab uncertainty pCi/L	Resolution	RBS/Ref Lab Ratio	Pass/Fail
H-3	3568	224.5	4020	67.2	59.8	0.89	Pass

Analytics E7256-125 **		Gamma Filter					
Nuclide	RBS Mean pCi/filter	RBS 1-s pCi/filter	Ref Lab Value pCi/filter	Ref Lab Uncertainty pCi/filter	Resolution	RBS/Ref Lab Ratio	Pass/Fail
Ce-141	101.6	3.6	99.5	1.66	59.9	1.02	Pass
Cr-51	173.0	16.4	179	2.98	60.1	0.97	Pass
Cs-134	71.8	3.5	71.1	1.19	59.7	1.01	Pass
Cs-137	75.7	2.5	72.2	1.21	59.7	1.05	Pass
Co-58	59.1	2.2	56.3	0.940	59.9	1.05	Pass
Mn-54	99.8	3.8	91.3	1.52	60.1	1.09	Pass
Fe-59	79.8	1.3	69.7	1.16	60.1	1.14	Pass
Zn-65	158.2	11.4	156	2.60	60.0	1.01	Pass
Co-60	132.3	1.3	130	2.18	59.6	1.02	Pass

RIVER BEND STATION

ENVIRONMENTAL (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

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<b>Analytics E7257-125 **</b>	<b>Gamma Soil</b>						
<b>Nuclide</b>	<b>RBS Mean pCi/g</b>	<b>RBS 1-s pCi/g</b>	<b>Ref Lab Value pCi/g</b>	<b>Ref Lab Uncertainty pCi/g</b>	<b>Resolution</b>	<b>RBS/Ref Lab Ratio</b>	<b>Pass/ Fail</b>
<b>Ce-141</b>	0.478	0.012	0.486	0.00812	59.9	0.98	Pass
<b>Cr-51</b>	0.848	0.031	0.872	0.0146	59.7	0.97	Pass
<b>Cs-134</b>	0.325	0.026	0.347	0.00579	59.9	0.94	Pass
<b>Cs-137</b>	0.465	0.003	0.443	0.00740	59.9	1.05	Pass
<b>Co-58</b>	0.270	0.009	0.275	0.00459	59.9	0.98	Pass
<b>Mn-54</b>	0.445	0.015	0.446	0.00745	59.9	1.00	Pass
<b>Fe-59</b>	0.350	0.015	0.340	0.00568	59.9	1.03	Pass
<b>Zn-65</b>	0.778	0.014	0.761	0.0127	59.9	1.02	Pass
<b>Co-60</b>	0.637	0.011	0.638	0.0107	59.6	1.00	Pass



Table 9.2  
 Sample Type: **Interlaboratory Comparison**  
 Analysis: Environmental Dosimeters

**AREVA  
 PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED E-LAB INTERNAL  
 CRITERIA  
 JANUARY – DECEMBER 2010(1), (2)**

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	84	100	100

(1) This table summarizes results of tests conducted by E-LAB and the Third-party tester.  
 (2) Environmental dosimeter results are free in air.

**SUMMARY OF THIRD PARTY DOSIMETER TESTING  
 JANUARY – DECEMBER 2010(1), (2)**

Dosimeter Type	Exposure Period	ANSI Category	% (Bias ± SD)*
Panasonic Environmental	FH 2010	II	-2.2 ± 1.1
Panasonic Environmental	SH 2010	II	-1.5 ± 1.4

(1) Performance criteria are the same as the internal criteria.  
 (2) Results are expressed as the delivered exposure for environmental TLD. ANSI HPS N13.29-1995 (Draft) Category II, High energy photons (Cs-137 or Co-60).

**PERCENTAGE OF MEAN DOSIMETER ANALYSES (N=6) WHICH PASSED TOLERANCE  
 CRITERIA  
 JANUARY – DECEMBER 2010(1), (2)**

Dosimeter Type	Number of Evaluations	% Passed Tolerance Limit
Panasonic Environmental <sup>(2)</sup>	14	100

(1) This table summarizes results of tests conducted by E-LAB and the Third-party tester.  
 (2) Environmental dosimeter results are free in air.