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April 26, 2000

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station
Docket No. 50-416
License No. NPF-29
1999 Grand Gulf Nuclear Station (GGNS) Annual Radiological
Environmental Operating Report (AREOR)

GNRO-2000/00031

Gentlemen:

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, 1999 through December 31, 1999.

If you have any questions or require additional information concerning this report, please contact Ms. Linda A. Patterson at (601) 437-6252, or this office at (601) 437-6685.

Yours truly,

A handwritten signature in black ink, appearing to read "J. Roberts".

JCR/MJL

attachment: 1999 Annual Radiological Environmental Operating Report
cc: (See Next Page)

April 26, 2000
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Page 2 of 2

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GRAND GULF NUCLEAR STATION
1999 ANNUAL
RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT

SUMMARY

The Annual Radiological Environmental Operating Report (AREOR) presents Grand Gulf Nuclear Station (GGNS) Environmental Surveillance Program (ESP) data obtained through analyses of environmental samples collected for the period January 1, 1999 through December 31, 1999. The AREOR fulfills the requirements of GGNS Technical Specification 5.6.2.

Environmental Surveillance Program

GGNS established the ESP in 1978 before the station became operational (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, vegetation, sediment and fish, as well as measuring radiation directly. GGNS also samples milk if milk-producing animals are present within five miles of the plant.

The ESP includes sampling indicator and control locations within an 18-mile radius of the plant. The ESP 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 1999, 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 1999 data, in many cases, showed undetectable radiation levels in the environment and near background level in significant pathways associated with GGNS.

Harmful Effects or Irreversible Damage

The ESP monitoring did not detect any harmful effects or evidence of irreversible damage in 1999. 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 ODCM Specifications Table 6.12.1-2 when averaged over any calendar quarter, due to GGNS effluents. Therefore, 1999 results did not trigger any Radiological Monitoring Program Special Reports.

Radioactivity Not Attributable To GGNS

The GGNS ESP detected radioactivity attributable to other sources twice. These include the 25th Chinese nuclear test explosion in 1980, and the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant in 1986.

Comparison To Federal and State Programs

GGNS personnel compared ESP 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) 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 have compared to those from the GGNS ESP. GGNS TLD results continue to remain similar to the historical average and continue to verify that plant operation is not affecting the ambient radiation levels in the environment.

The MSDH and the GGNS ESP entail similar radiological environmental monitoring program requirements. These programs include collocated air samples and splitting or sharing sample media such as vegetation, water, sediment, and fish. Both programs have obtained similar results over previous years.

Sampling Deviations

Milk

The ESP did not include milk sampling within five miles (8 km) of GGNS in 1999 due to unavailability. ODCM Specifications require collection of milk

Sampling Deviations

Milk, Continued

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.

Air Samplers

The following air sample locations had reduced run times due to power outages or mechanical problems. Required Lower Limits of Detection (LLDs) were achieved in all cases.

LOCATION	SAMPLE PERIOD	RUN TIME (hh:mm)	PROBLEM DESCRIPTION
AS1-PG	2/2 -2/9	166:02	Power outage ¹
	9/21 - 9/28	166:39	Power outage ²
	11/16 - 11/23	166:25	Power outage ³
AS3-61VA	5/18 - 5/25	166:00	Weather outage ⁴
AS7-UH	2/2 -2/9	166:07	Power outage ⁵
	3/2 - 3/9	161:40	Weather outage ⁶
	3/30 - 4/6	165:31	Weather outage ⁷
	6/22 - 6/29	167:07	Power outage ⁸
	7/20 - 7/27	167:34	Weather outage ⁹
	8/3 - 8/10	166:09	Weather outage ¹⁰
	9/21 - 9/28	166:42	Power outage ¹¹
	11/2 - 11/9	169:47	Sampler failed ¹²

¹ Sample period shortened by 01:54

² Sample period shortened by 01:16

³ Sample period shortened by 00:34

⁴ Sample period shortened by 02:04

⁵ Sample period shortened by 01:53

⁶ Sample period shortened by 06:11

⁷ Sample period shortened by 01:32

⁸ Sample period shortened by 00:30

⁹ Sample period shortened by 00:20

¹⁰ Sample period shortened by 01:46

¹¹ Sample period shortened by 01:24

¹² Sample period shortened by 84:53, indicated time was 169:47

Sampling Deviations

Air Samplers, Continued

Air sampler [AS] serial number #3672 was in service at location AS1PG from July 15 – December 29, 1999. When the AS was retrieved from the field, the “as found” calibration data exceeded the acceptable tolerance [-13% to -20% vs. tolerance of $\pm 10\%$]. Condition Report 1999-2026 was generated. Data collected during the period was evaluated. GGNS REMP air sampling protocol ensures minimum detectable activities are routinely well below the LLD requirements of ODCM Table 6.12.1-3. When the flow bias was taken into account, data collected at AS1PG would not have exceeded the required LLD for Iodine-131 or gamma activity. Gross beta activity is normally detected at all locations. When the flow bias was taken into account, the AS1PG gross beta results for the period continue to compare favorably with other locations.

Air samples were collected 99.6 % of the available collection period. Sample failures and power outages occurred infrequently and did not affect the overall effectiveness of the air monitoring program.

Surface Water

Analysis of one surface water sample from the Mississippi River Downstream [MRDOWN] location for the first quarter 1999 failed to meet the LLD requirement for Iodine-131 specified in ODCM Table 6.12.1-3. The MDA achieved was ≤ 16.8 pCi/L vs. a requirement of ≤ 15 pCi/L. A delay in sample shipment resulted in sample decay and LLD exceedance. The effort to achieve the Iodine-131 LLD produced detection levels well beyond requirements for the remaining radionuclides listed in ODCM Table 6.12.1-3. Absence of these radionuclides above their detection levels provides a high level of confidence that plant related radioactivity was not present in the sample.

GGNS personnel conducted all other ESP activities as required by ODCM Specifications without exception.

Program Modifications

GGNS made no REMP modifications during 1999.

Unavailable Results

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

Attachments

Attachment I contains results of air, water, vegetation, sediment, and thermoluminescent dosimeter (TLDs) samples collected in 1999. TLDs were analyzed by Waterford III Dosimetry. All remaining samples were analyzed by the River Bend Station (RBS) Environmental Laboratory. Attachment I also contains RBS' participation in the interlaboratory comparison program during 1999. Attachment II contains results of any samples collected at special interest areas by GGNS personnel and analyzed by the RBS Environmental Laboratory. Any samples identified with a "GG" prefix are duplicates collected and analyzed in addition to the routine ESP.

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SECTION 1.0

INTRODUCTION

1.1 Environmental Surveillance Program Purpose and Design Criteria

GGNS established the ESP to minimize any associated radiation endangerment to human health or the environment by ensuring that plant operating controls function properly. The ESP purpose involves:

- Evaluating environmental sampling procedures, equipment and techniques.
- Measuring radiation levels and their variations in environmental media in the area surrounding the plant.
- Determining average levels of radiation and radioactive material in various environmental media.
- Detecting effects, if any, of GGNS operation on the environmental radiation levels and concentrations.

The ESP design criteria includes:

- 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 Dose Pathways Associated with GGNS

Figure 1-1 shows potential exposure pathways that could occur as a result of a nuclear power plant. However, direct dose from gaseous effluent and thyroid dose from ingesting milk involves the most

significant environmental dose pathways from a nuclear power station. GGNS operations have little, if any, impact on these pathways due to very low levels of radiation released, remote location and absence of milking animals within five miles of GGNS. In addition, the GGNS Final Environmental Report lists the first use of drinking water from the Mississippi River as more than 200 miles downstream. Therefore, GGNS operations have little, if any, impact on this pathway.

1.3 Pathways Monitored

The ESP includes the sampling program for monitoring airborne, waterborne, ingestion and direct radiation pathways as required by Table 6.12.1-1 in the ODCM. GGNS may supplement this program with additional sampling in order to provide a comprehensive and well-balanced program. Tables 1-1 through 1-4 provide a description of the GGNS ESP sample locations. Only sample locations required by the ODCM are keyed to Figures 1-2 and 1-3 as shown in the Tables. Section 2.0 of this report provides a discussion of sampling results during the reporting period and Section 3.0 provides a summary of results for the monitored exposure pathways.

1.4 Program Description

1.4.1 Air Particulate and Radioiodine

The GGNS ESP utilized three continuous air samplers to provide gross beta, gamma and radioiodine activity measurements by the airborne exposure pathway. These air samplers met the requirements of ODCM Specification 6.12.1, as follows:

- ❑ One close to the SITE BOUNDARY having the highest calculated annual average ground level D/Q
- ❑ One in the vicinity of a community having the highest calculated annual average ground level D/Q (Port Gibson)
- ❑ One from a control location 15 - 30 km (10 - 20 miles) distance (Vicksburg, MS).

GGNS personnel placed air samplers approximately one meter above the ground in weatherproof houses, with a 47-millimeter glass fiber filter in the intake line of the vacuum pump and a 2 x 1-inch charcoal cartridge located directly downstream. GGNS personnel maintained air flow at 1.25 cubic feet per minute. They changed filters and cartridges weekly and had them analyzed for gross beta radionuclides and radioiodine activity, respectively. The analytical laboratory analyzed quarterly composites of air filters for gamma radionuclides.

1.4.2 Thermoluminescent Dosimetry

The GGNS ESP measured ambient radiation in the environment surrounding GGNS with 40 TLDs to provide a quantitative measurement of the area radiation levels.

They collected dosimeters quarterly and used the following criteria in establishing TLD locations:

- ❑ ODCM Specification 6.12.1 requires 24 TLDs, positioned as outlined below:
 - Eight TLDs located in the general areas of the site boundary.
 - Eight TLDs located approximately 3 to 5 miles from the site.
 - Eight TLDs located in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.
- ❑ Sixteen permanent TLD stations at the protected area boundary.
- ❑ The remaining three TLDs utilized as duplicates at varying locations.

1.4.3 Milk

ODCM Specifications require the following:

- Quarterly sampling frequency for indicator locations, when available, with sampling of the control location only occurring when indicator locations are present.

If required, control samples are collected from a location > 8 km (>5 miles) from the plant (Alcorn State University Dairy) to establish background data. However, the ESP did not include milk animals in the reporting period within 8 km (5 miles) of GGNS due to unavailability. Therefore, Section 1.4.5 of this report addresses the unavailability of milk samples within the vicinity of GGNS.

1.4.4 Surface Water and Groundwater

The GGNS ESP measured waterborne radiation in the environment by sampling surface and ground water.

GGNS personnel sampled surface water from the Mississippi River quarterly at points upstream (control) and downstream (indicator) of the plant discharge during the reporting period.

GGNS personnel also collected an annual downstream (indicator) sample during a liquid radwaste discharge.

GGNS personnel sampled groundwater annually from two locations, onsite from GGNS Construction Well(s) (indicator) and offsite from Port Gibson City (control), during the reporting period. They collected samples in labeled containers and had them analyzed for gamma radionuclides and tritium.

1.4.5 Vegetation

During the reporting period, GGNS personnel collected broadleaf vegetation samples quarterly for measurement of radioactivity by the ingestion exposure pathway, due to the unavailability of milk samples within five miles of GGNS as follows:

- One kind of broadleaf vegetation grown nearest either of two different offsite locations with highest anticipated annual average ground level D/Q. GGNS met this requirement by collecting from two garden locations inside the SITE BOUNDARY, Sectors J and H. These sampling locations provided a more conservative assessment of doses due to the higher deposition rates (D/Qs) than would be measured at offsite sampling locations.
- Control samples of each of the similar types of onsite vegetation 15-30 km from the site. GGNS met this requirement by maintaining a garden at in Sector K at Alcorn State University or collecting vegetation from a location near the university.

The ESP prefers green-leafy vegetables suitable for human consumption as the primary source of broadleaf vegetation. At times, GGNS personnel may collect samples of any vegetation with relatively broad leaves on which airborne radioactive particulate material might be deposited, due to unavailability of green-leafy vegetables suitable for human consumption. They had the raw samples analyzed for gamma radionuclides and Iodine-131.

1.4.6 Sediment

During the reporting period, GGNS personnel collected sediment samples annually at the following locations:

- Downstream of the barge slip in the vicinity of the Hamilton Lake outfall (indicator). Two samples were collected in this area due to recent work on the dam at the Hamilton Lake outfall.
- Upstream from the GGNS discharge (Upper Grand Gulf Landing - control).
- The ESP utilized additional samples from the barge slip (indicator) as part of the special sampling provision.

GGNS personnel collected sediment samples near the shoreline from the top one-inch layer of sediment. They then discarded foreign objects and transferred the samples to clean, labeled containers for gamma radionuclide analyses.

1.4.7 Fish

During the reporting period, GGNS personnel collected fish in the Mississippi River at the following locations:

- Downstream of the GGNS discharge point into the Mississippi River (indicator location)
- Upstream of the GGNS discharge point into the Mississippi River uninfluenced by plant operations (control).

GGNS personnel collected fish for measurement of radioactivity by the ingestion exposure pathway. The fish were collected by net, trotline, or purchased from commercial fishermen. GGNS personnel may accompany commercial fishermen, when purchasing samples, to ensure representative and valid samples are from required locations. GGNS personnel collected a sufficient amount from each location to provide a minimum of 1000 grams (wet weight) of eviscerated fish sample. Samples were analyzed for gamma radionuclides.

1.4.8 Special Samples

GGNS personnel collected special samples occasionally from nonroutine ESP locations to provide supplementary data and to address areas of special interests. Sample media may include sediment, water, milk, fish, meat and vegetation and may be analyzed for gamma radionuclides, Iodine-131, tritium or gross beta radionuclides, depending upon current interest.

1.4.9 Land Use Census

GGNS conducts a bi-annual land use census as described in ODCM Specification 6.12.2. This census identifies changes in uses of land in unrestricted areas surrounding GGNS which would require modifications to the ESP or ODCM. The land use census identified important criteria in each of the 16 meteorological sectors, such as nearest:

- Residence.
- Animal milked for human consumption.
- Garden of greater than 50 m² (500 ft²) producing broadleaf vegetation.

GGNS personnel conduct the land use census by:

- 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 map, measuring distances to GGNS and recording results on surveillance data sheets.
- Comparing current census results to previous results.
- Contacting the Claiborne County Agent for verification of nearest dairy animals.

The most recent land use census was begun in last quarter 1999 and completed in first quarter 2000.

TABLE 1-1

AIR SAMPLE LOCATIONS

AIR SAMPLER NUMBER	FIGURE	LOCATION
AS-1 PG	1-2	Southeast of GGNS at the Port Gibson City Barn (Sector G, Radius 5.5 Miles)
AS-3 61VA	1-3	North-northeast of GGNS on Hwy 61, North of the Vicksburg Airport (Section B, Radius 18 Miles)
AS-7 UH	1-2	South-southeast of GGNS at the IBEW Union Hall (Section H, Radius 0.5 Miles)

TABLE 1-2
TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
M-00	Maintained in lead shield during the exposure period	NOT SHOWN	—	—
M-01	Across the road from Lake Claiborne Entry Gate	1-2	E	3.5
M-07	AS-1 PG, Port Gibson City Barn	1-3	G	5.5
M-09	Warner Tully Y-Camp	1-2	D	3.5
M-10	Grand Gulf Military Park	1-2	A	1.5
M-14 (Control)	AS-3-61VA, Hwy 61, North (Control) of Vicksburg Airport	1-3	B	18.0
M-16	Meteorological Tower	1-2	A	0.9
M-17	South Side, Grand Gulf Road	1-2	C	0.5
M-19	Eastern SITE BOUNDARY Property line, NNE of HWSA	1-2	E	0.5
M-21	Near Former Training Center Building on Bald Hill Road	1-2	J	0.4
M-22	Former RR Entrance Crossing On Bald Hill Road	1-2	G	0.5
M-23	Gin Lake Road 50 Yards North of Heavy Haul Road on Power Pole	1-2	Q	0.5
M-25	Radial Well Number 1	1-2	N	1.6
M-28	Former Glodjo Residence	1-2	L	0.9
M-31	Duplicate TLD Installed Quarterly At Varying Locations	Not Shown	—	—
M-32	Duplicate TLD Installed Quarterly At Varying Locations	Not Shown	—	—
M-33 (Control)	Newellton, Louisiana Water Tower	1-3	P	12.5
M-36	Curve on HW 608, Point Nearest GGNS at Power Pole	1-2	P	5.0
M-38	Lake Bruin State Park, Entrance Road	1-3	M	9.5
M-39	St. Joseph, Louisiana, Aux. Water Tank	1-3	M	13.0
M-40	Headly Drive, Near River Port Entrance	1-2	M	2.3
M-48	0.4 Miles South on Mount Gomer Road on West Side	1-2	K	4.8
M-49	Fork in Bessie Weathers Road/Shaifer Road	1-2	H	4.5
M-50	Panola Hunting Club Entrance	1-3	B	5.3
M-55	Near Ingelside Karnac Ferry Road/Ashland Road Intersection	1-2	D	5.0
M-57	Hwy 61, Behind the Welcome to Port Gibson Sign at Glensdale Subdivision	1-2	F	4.5
M-60	Duplicate TLD Installed Quarterly at Varying Locations	Not Shown	—	—
M-61	Protected Area Fence	Not Shown	D	Onsite

TABLE 1-2

TLD LOCATIONS (CONTINUED)

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
M-62	Protected Area Fence	Not Shown	E	Onsite
M-63	Protected Area Fence	Not Shown	N	Onsite
M-64	Protected Area Fence	Not Shown	M	Onsite
M-65	Protected Area Fence	Not Shown	L	Onsite
M-66	Protected Area Fence	Not Shown	K	Onsite
M-67	Protected Area Fence	Not Shown	J	Onsite
M-68	Protected Area Fence	Not Shown	H	Onsite
M-69	Protected Area Fence	Not Shown	G	Onsite
M-70	Protected Area Fence	Not Shown	F	Onsite
M-71	Protected Area Fence	Not Shown	C	Onsite
M-72	Protected Area Fence	Not Shown	B	Onsite
M-74	Protected Area Fence	Not Shown	P	Onsite
M-76	Protected Area Fence	Not Shown	A	Onsite
M-77	Protected Area Fence	Not Shown	R	Onsite
M-81	Administration Building	Not Shown	Q	Onsite
M-94	Sector R Near Meteorological Tower	1-2	R	0.8

TABLE 1-3

MILK AND WATER LOCATIONS

	FIGURE	LOCATION
MILK (CONTROL LOCATION)		
ALCONT	1-3	Located South-southwest of GGNS at Alcorn State (sector K, Radius 10.5 Miles)
SURFACE WATER		
UPSTREAM	1-2	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 (Sector Q-R, 1.8 Miles)
DOWNSTREAM	1-2	At least 5000 ft downstream of the GGNS discharge point into the Mississippi River near Radial Well No. 1 (Section N, 1.6 Miles)
MS River Downstream	1-2	Downstream of the GGNS discharge point into the Mississippi River near Radial Well No. 5 (Sector Q-P, 1.3 Miles)
GROUNDWATER		
PGWELL	1-2	Port Gibson Wells – Take from distribution system or one of the five wells (Sector G, Radius 5.0 Miles)
Construction Water Well	1-2	GGNS Construction Water Well – Taken from distribution system or the well (Sector P, Radius 0.4 Miles)

TABLE 1-4

VEGETATION, SEDIMENT AND FISH LOCATIONS

	FIGURE	LOCATION
VEGETATION		
Broadleaf Vegetation	1-2	South of GGNS near former Training Center on Bald Hill Road (Sector J, 0.4 Miles)
	1-2	South-southeast of GGNS between the former Training Center and the IBEW Union Hall on Bald Hill Road (Sector H, 0.4 Miles)
	1-3	Alcorn State University south-southwest of GGNS (Sector K, 10.5 Miles) when available, otherwise a location 15-30 km distant
SEDIMENT		
SEDHAM	1-2	Downstream of the GGNS discharge point in the Mississippi River near Hamilton Lake outlet (Sector N, 1.6 Miles)
SEDCONT	1-2	Upstream of the GGNS discharge point in the Mississippi River (Minimum of 100 yds)
FISH		
Fish and Invertebrates	1-2	Downstream of the GGNS discharge point into the Mississippi River
	1-2	Upstream of the GGNS discharge point in the Mississippi River uninfluenced by plant operations

FIGURE 1-1
EXPOSURE PATHWAYS

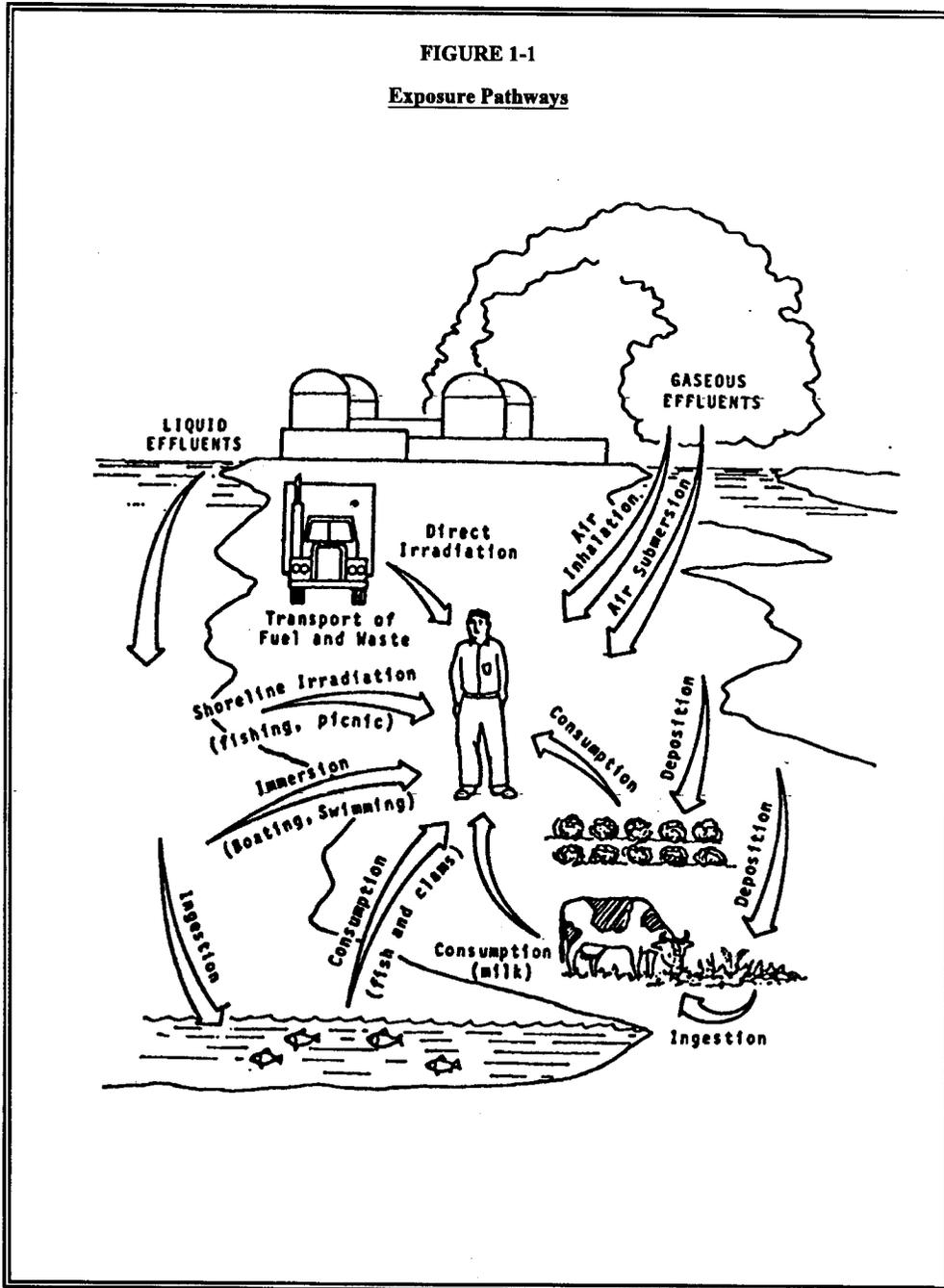


FIGURE 1-2

SAMPLE COLLECTION SITES – 5 MILE MAP

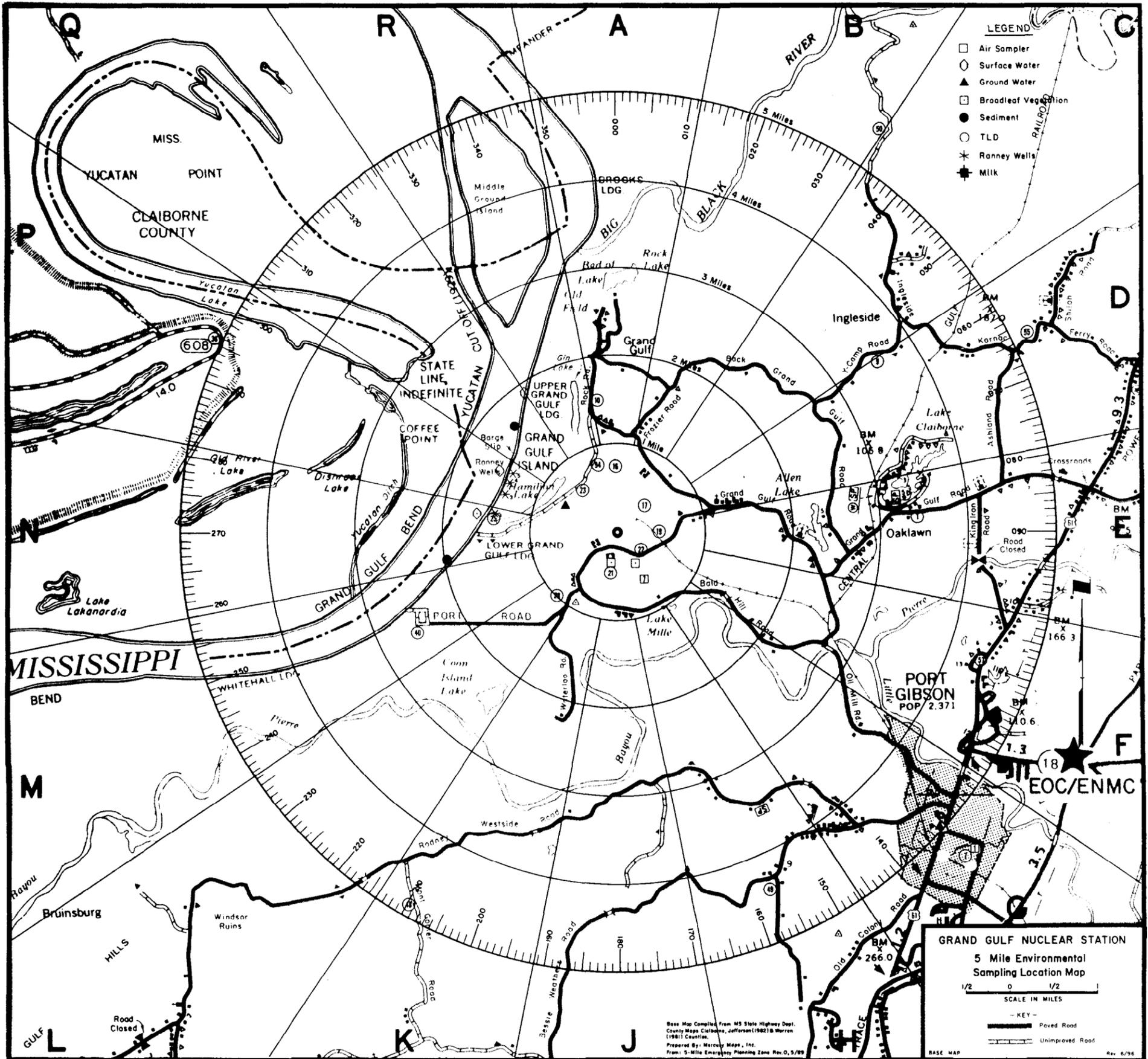
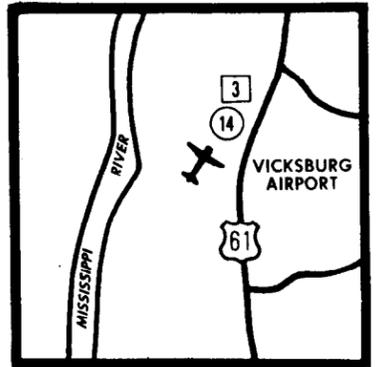
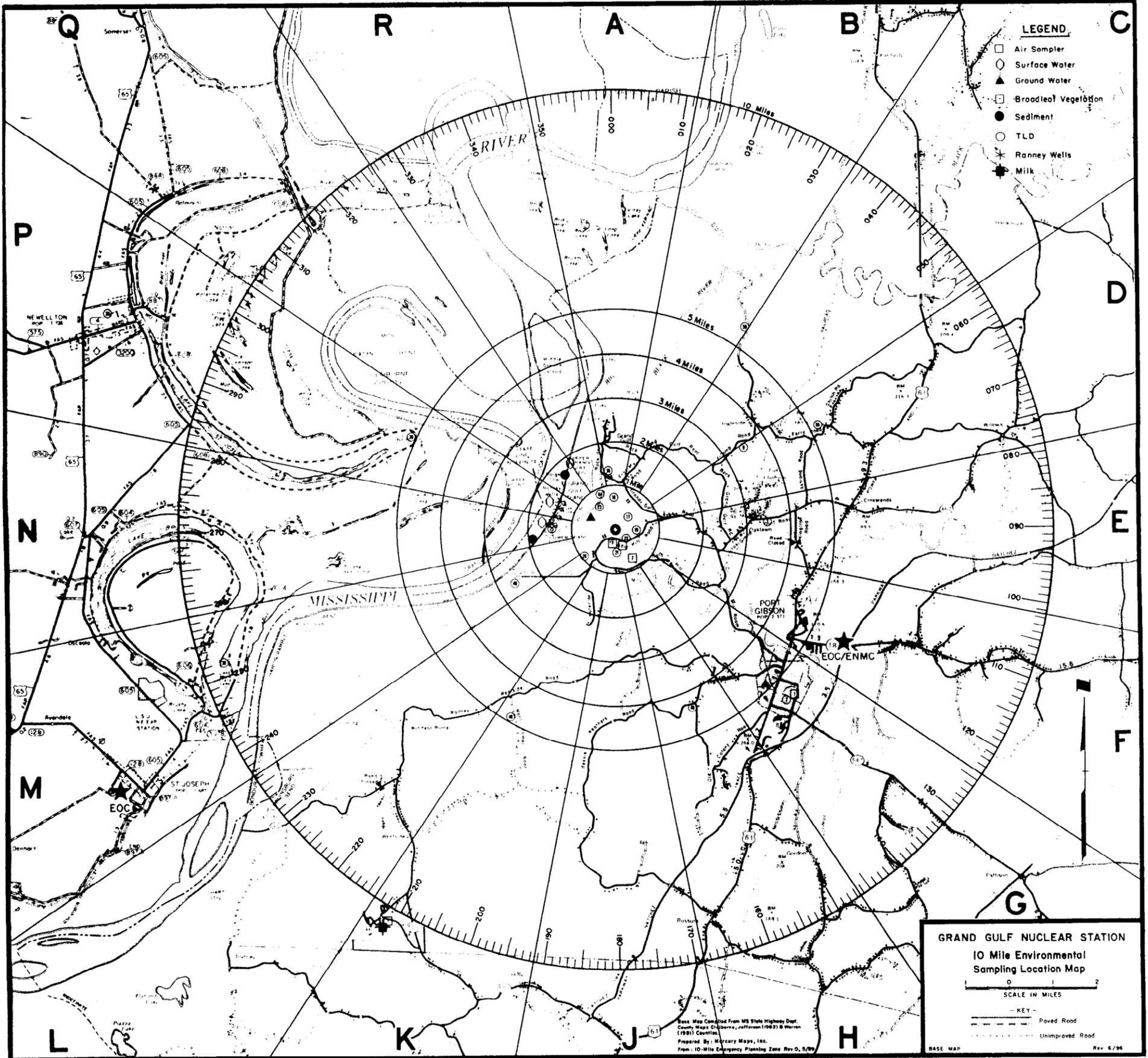


FIGURE 1-3

SAMPLE COLLECTION SITES – 10 MILE MAP



18 MILES FROM GRAND GULF
TO VICKSBURG AIRPORT



SECTION 2.0
ENVIRONMENTAL SURVEILLANCE PROGRAM
(INTERPRETATIONS AND TRENDS OF RESULTS)

2.1 Air Particulate and Radioiodine Sample Results

GGNS did not detect any gamma 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 ESP detected radioactivity in this pathway attributable to other sources twice. These include the 25th Chinese nuclear test explosion in 1980, and the radioactive plume 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.

Gross beta concentrations during the reporting period for indicator locations ranged from 0.012 - 0.063 pCi/m³ with a mean of 0.025 pCi/m³ as compared to the control location which ranged from 0.013 - 0.062 pCi/m³ with a mean of 0.025 pCi/m³. This further emphasizes that the airborne pathway continues to remain at background levels.

2.2 Thermoluminescent Dosimetry Sample Results

Gamma radiation dose in the reporting period compares to previous years as shown in Figure 2-1. This figure shows 1987 - 1999 annual average results for indicator locations compared to the Vicksburg control. This figure indicates that ambient radiation levels have remained at or near background levels.

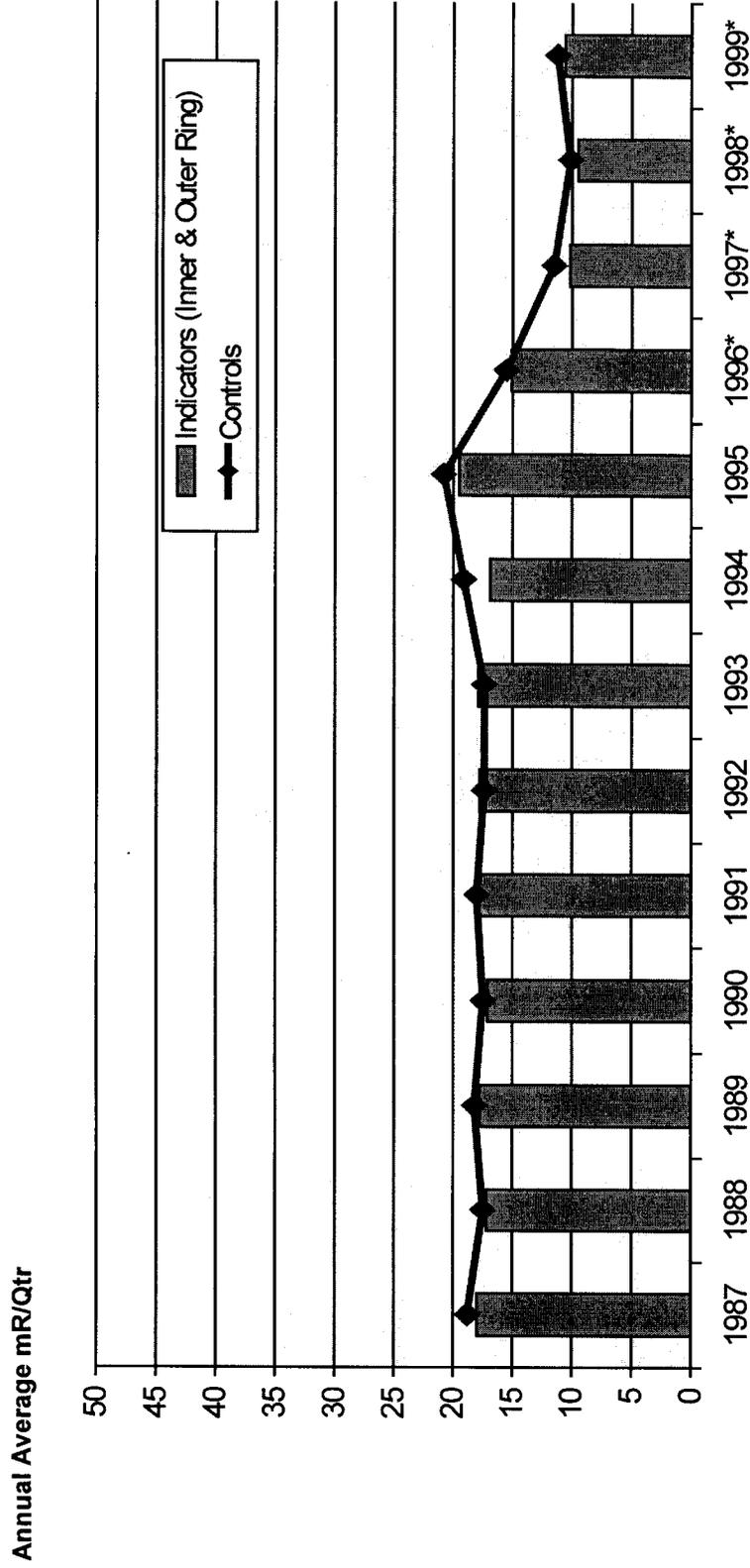
The ESP recorded the following quarterly TLD doses for ODCM Specification locations during the reporting period:

- Inner ring, mean of 10.1 mrem and range of 3.5 – 13.4 mrem
- Outer ring, mean of 11.2 mrem and range of 7.1 – 14.5 mrem
- Special Interest, mean of 9.7 mrem and range of 6.2 – 12.5 mrem
- Control, mean of 11.2 mrem and range of 8.8 – 12.7 mrem.

2.2 Thermoluminescent Dosimetry Sample Results (Continued)

In 1996 GGNS began reporting measured dose as net exposure (field reading less [transit + shield reading]) normalized to 92 days. Through 1995, GGNS had reported measured doses as gross exposure. This reporting change did not affect the program since GGNS relies on comparison of the indicator locations to the control as a measure of plant impact. GGNS' comparison of the inner, outer and special interest TLD results to the control indicates that the ambient radiation levels are unaffected by plant operations. Therefore, levels continue to remain at or near background.

Figure 2-1
TLD Radiation Dose



* Data is net dose [field reading - (transit + shield reading)] normalized to 92 days. Previous doses reported as gross exposure.

2.3 Milk Sample Results

GGNS personnel did not collect milk samples within five miles of the GGNS site in the reporting period due to the absence of milking animals. If milk animals are located within 5 miles of GGNS, samples will be collected from those animals as well as from the control location Alcorn State University. When required, analysis will include Iodine-131 and gamma radionuclides.

2.4 Water Sample Results

Surface Water

Gamma radionuclides remained undetectable in the upstream and downstream Mississippi River location, which is consistent with preoperational and previous operational years. In addition, gamma radionuclides were undetectable in an annual downstream sample collected during a liquid radwaste discharge. Tritium was undetectable in the upstream and downstream Mississippi River locations.

Based on this and review of historical data, GGNS concluded that concentrations continue to remain at or near background levels at these locations.

Groundwater

GGNS did not detect any gamma radionuclides or tritium in groundwater samples during the reporting period. These results are comparable with previous years and indicate that this pathway has not been affected by plant operations.

2.5 Vegetation Sample Results

GGNS did not detect any gamma radionuclides in vegetation samples during the reporting period. Nuclides detected previously at the control and indicator locations are attributed to the Chernobyl accident and weapons testing. These results indicate that this pathway has not been affected by plant operations.

2.6 Sediment Sample Results

Gamma radionuclides were undetectable in the upstream Mississippi River location during the reporting period. Cesium-137 was detected in the downstream (Hamilton Lake) location at an average concentration of 38.3 pCi/kg with a range of 23.4 – 53.2 pCi/kg. Cesium-137 had also been previously detected in the downstream (Hamilton Lake) location at an average concentration of 295.0 pCi/kg during the preoperational years. However, Cs-137 concentrations have decreased and stabilized since this time. GGNS attributes Cs-137 activity at the downstream location to past atmospheric weapons testing. The probability of this location being affected by plant operations is remote due to the enormous dilution and sedimentation factors involved with the Mississippi River.

Cobalt-60 was detected at the barge slip location (SEDBAR) during this reporting period. This sample location supplements the REMP and is collected as a special sample as described in Section 1.4.8. Table 2-1 provides an analytical results summary for 1987 through 1999 barge slip sediment samples. GGNS personnel attribute the presence of radioactivity at this location over previous years to buildup of very small amounts of particulate materials present in liquid discharges. This table shows that radionuclide concentrations in the barge slip sediment are not increasing.

TABLE 2-1

BARGE SLIP SEDIMENT ANALYTICAL SUMMARY *

YEAR	Mn-54	Fe-59	Co-58	Co-60	Cr-51	Cs-134	Cs-137
1987	2205.0	ND**	103.0	799.0	1454.0	87.0	189.0
1988	480.0	ND**	82.0	628.0	777.0	109.0	142.0
1989	734.0	ND**	56.0	736.0	199.0	104.0	159.0
1990	258.0	ND**	39.0	424.0	853.0	ND**	124.0
1991	1252.0	ND**	59.0	1171.0	307.0	ND**	145.0
1992	164.0	ND**	ND**	294.0	ND**	ND**	76.0
1993	1202.0	53.0	143.0	949.0	471.5	ND**	117.5
1994	396.0	ND**	ND**	411.0	ND**	ND**	84.5
1995	148.5	ND**	42.0	245.0	ND**	ND**	82.5
1996	ND**	ND**	ND**	ND**	ND**	ND**	ND**
1997	ND**	ND**	ND**	ND**	ND**	ND**	ND**
1998	ND**	ND**	ND**	41.3	ND**	ND**	ND**
1999	ND**	ND**	ND**	28.1	ND**	ND**	ND**

* Units in picocuries/kilogram

** None detected

2.7 Fish Sample Results

GGNS did not detect any gamma radionuclides in fish samples 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.

2.8 Special Sample Results

During the reporting period, GGNS personnel collected one special sample and analyzed for gamma radionuclides, gross beta radionuclides and/or tritium. Discussion below provides descriptions of special samples collected and their results.

- One sediment sample from the barge slip (SEDBAR) – Cobalt 60 activity detected

Results are summarized in Section 3.0.

2.9 Land Use Census Results

Census frequency was changed from annual to bi-annual in 1996 due to the stability of the land uses in the 0-5 mile area around the plant. The latest census results are included as Table 2-3. Changes identified from the previous census are summarized in Table 2-2. None of the changes identified required a modification to the REMP. The next census will be taken in 2001.

2.10 Interlaboratory Comparison Results

RBS' environmental laboratory analyzed interlaboratory comparison samples for GGNS. Attachment I contains these results. GGNS' review of RBS' interlaboratory comparison indicated that 92% of the sample results for accuracy and precision were within the acceptable control limits of the three normalized deviations. GGNS and RBS' review of sample results outside the acceptable control limits indicated that there was no impact on previous reported data. Attachment I also provides discussion on sample results outside the acceptable control limits.

Table 2-2
1997-1999 LAND USE CENSUS CHANGES

Sector	Parameter	1997 Data	1999 Data	Reason for Change
A	Nearest Occupied Residence	Resident Ranger	Braden	New nearest residence
A	Nearest Broadleaf Garden	None	Brown	New Garden Location
A	Nearest Unoccupied Residence	H. Gaines	None	None closer than nearest occupied
D	Nearest Occupied Residence	R. Moore	Dotson	New nearest residence
E	Nearest Occupied Residence	Johnnie Haddad	Lenson Johnson	Previous nearest residence moved
F	Nearest Broadleaf Garden	D. Killingsworth	Northside Dr. location	Previous nearest garden uncultivated
G	Nearest Broadleaf Garden	None	Mahoney	Previous nearest garden uncultivated
H	Nearest Broadleaf Garden	Nobles	None	Previous nearest garden uncultivated
K	Nearest Unoccupied Residence	Cassell	Cassell	Residence now occupied
J	Nearest Occupied Residence	Steve Price	6033 Rodney Westside Rd	New nearest residence
J	Nearest Broadleaf Garden	GGNS	6033 Rodney Westside Rd	GGNS garden is used intermittently
R	Nearest Broadleaf Garden	Brown	Roddey	New Garden
All	Distance Units	km	Miles	Consistency with maps

Table 2-3
1999 LAND USE CENSUS RESULTS

Parameter		Sector A	Sector B	Sector C	Sector D
I. Nearest Occupied Residence	a. Distance (mile)	1.2*	1.2	0.7	1.2*
	b. Name	Braden	Mary J. Dotson	Lanell Frazier	Dotson
	c. Address	Box 290K [trailer] Grand Gulf Road Port Gibson, MS	Rt.2 Box 391 Port Gibson, MS	P.O. Box 33 Grand Gulf Road Port Gibson, MS	Rt.2 Box 392 [trailer] Grand Gulf Road Port Gibson, MS
	a. Distance (mile)	None*	None	None	None
II. Nearest Unoccupied Residence	a. Distance	None	None	None	None
	b. Owner's Name	None	None	None	None
III. Nearest Milk Animal	a. Distance (mile)	1.8 * (1)	None	0.7	3.2
	b. Owner's Name	W.A. Brown	None	Lanell Frazier	John L. Jackson
	c. Address	[1st trailer North of GG St.Park] Box 379 Rock Road Port Gibson, MS ≈100	None	P.O. Box 33 Port Gibson, MS	Rt. 2 Box 371E Y-Camp Road Port Gibson, MS
	d. Garden size (m ²)			≈ 100	≈ 200
V. Census Comparison	a. Is nearest occupied residence in same location as last census?	No*	Yes	Yes	No*
	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*	N/A	Yes	Yes

*Denotes change since 1997 census

(1) Located in Sector R in 1997 Census

**Table 2-3
1999 LAND USE CENSUS RESULTS**

Parameter		Sector E	Sector F	Sector G	Sector H
I. Nearest Occupied Residence	a. Distance (mile)	0.8*	2.3	2.1	1.1
	b. Name	Lenson Johnson	Jerrel Smith	David Buckner	David Dowell
	c. Address	Rt. 2 Box 400A Bald Hill Road Port Gibson, MS	Rt. 2 Box 216W Grand Gulf Road Port Gibson, MS	Rt. 2 Box 416A Bald Hill Road Port Gibson, MS	Rt. 2 Box 414 Bald Hill Road Port Gibson, MS
II. Nearest Unoccupied Residence	a. Distance (mile)	None	None	2.0 Hawthorne House	None
III. Nearest Milk Animal	a. Distance	None	None	None	None
	b. Owner's Name	None	None	None	None
IV. Nearest Broadleaf Garden	a. Distance (mile)	0.9	4.9 *	4.0*	None*(1)
	b. Owner's Name	Hiram Wells	Several	D. Mahoney	
	c. Address	Rt. 2 Box 399A Port Gibson, MS	Rt. 2 Box 115/Northside Dr. [street next to Shell Sta. on Hwy 61] Port Gibson, MS	Oil Mill Road Port Gibson, Ms	
V. Census Comparison	d. Garden size (m ²)	≈ 100	≈ 500	≈ 100	
	a. Is nearest occupied residence in same location as last census?	No*	Yes	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?	Yes	No*	No*	No*

* Denotes changes since 1997 Census

(1) GGNS may maintain a site boundary garden in this sector for sampling purposes

Table 2-3
1999 LAND USE CENSUS RESULTS

Parameter		Sector J	Sector K	Sector L	Sector M
I. Nearest Occupied Residence	a. Distance (mile)	2.9 *	2.2	0.8	None
	b. Name	Unknown	Jim Cassell, Jr.	Buddy Roddey	
	c. Address	6033 Rodney Westside Road Port Gibson, MS	Rt.2 Box 404 Waterloo Road Port Gibson, MS	Rt.2 Box 401 Bald Hill Road Port Gibson, MS	
II. Nearest Unoccupied Residence	a. Distance (mile)	None	None*	None	None
III. Nearest Milk Animal	a. Distance	None	None	None	None
IV. Nearest Broadleaf Garden	a. Distance (mile)	2.9 * (1)	2.2 (2)	0.8	None
	b. Owner's Name	Unknown	Jim Cassell, Sr.	Buddy Roddey	
	c. Address	6033 Rodney Westside Road Port Gibson, MS	Rt.2 Box 403 Port Gibson, MS	Rt.2 Box 401 Port Gibson, MS	
V. Census Comparison	d. Garden size (m ²)	≅ 100	≅ 400	≅ 100	
	a. Is nearest occupied residence in same location as last census?	No*	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?	No*	Yes	Yes	N/A

* Denotes change from 1997 Census
 (1) GGNS may maintain a site boundary garden in this sector for sampling purposes.
 (2) Garden is located near residence at 2.2 miles

Table 2-3
1999 LAND USE CENSUS RESULTS

Parameter		Sector N	Sector P	Sector Q	Sector R
I. Nearest Occupied Residence	a. Distance (mile)	None	None	None	1.1
	b. Name				C. Roddey
	c. Address				Rt.2 Box 309 Rock Road Port Gibson,MS
II. Nearest Unoccupied Residence	a. Distance (mile)	1.6 (Bucksnoort Camp)	4.3 (Dr. Cobb Camp)	3.5 (Yucatan Camp)	None
	a. Distance	None	None	None	None
III. Nearest Milk Animal	b. Owner's Name				
	a. Distance (mile)	None	None	None	1.1*
IV. Nearest Broadleaf Garden	b. Owner's Name				C. Roddey
	c. Address				Rt.2 Box 309 Port Gibson,MS
	d. Garden size (m ²)				≅ 100
V. Census Comparison	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*

* Denotes change since 1997 census

SECTION 3.0
ENVIRONMENTAL SURVEILLANCE PROGRAM SUMMARY

3.1 1999 Program Results Summary

Table 3-1 summarizes required ODCM Specification, special and supplemental ESP sample results for the reporting period. GGNS personnel did not use values reported as less than (<) for determining indicator and control location ranges and means. Results from this reporting period are comparable to previous years.

TABLE 3-1

ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
 Location of Facility Claiborne, Mississippi Reporting Period January – December 1999
 (County, State)

Sample Type (Units)	Type & Number of Analyses ^a	(LLD) ^b	Indicator Locations Mean (F) ^c [Range]	Location with Highest Annual Mean Location ^d	Mean(F) ^e [Range]	Control Locations Mean (F) ^c [Range]	Number of Nonroutine Results ^a
Air Particulate ($\mu\text{Ci}/\text{m}^3$)	Gross Beta 156	0.01	0.025 (104/104) [0.012 - 0.063]	AS-1 PG (Sector G, 5.5 mi)	0.026 (52/52) [0.014 - 0.061]	0.025 (52/52) [0.013 - 0.062]	0
	GS 12						
	Cs-134	0.05	All < LLD	N/A	N/A	All < LLD	0
	Cs-137	0.06	All < LLD	N/A	N/A	All < LLD	0
Air Radioiodine ($\mu\text{Ci}/\text{m}^3$)	I-131 156	0.07	All < LLD	N/A	N/A	All < LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma 36	(f)	10.1 (36/36) [3.5 - 13.4]	M-21 (Sector J, 0.4 mi)	11.9 (4/4) [8.5 - 13.4]	N/A	0
Outer Ring TLDs (mR/Qtr)	Gamma 28	(f)	11.2(28/28) [7.1 - 14.5]	M-49 (Sector H, 4.5 mi)	13.0 (4/4) [10.2 - 14.5]	N/A	0
Special Interest TLDs (mR/Qtr)	Gamma 28	(f)	9.7 (28/28) [6.2 - 12.5]	M-01 (Sector E, 3.5 mi)	11.2 (4/4) [8.8 - 12.5]	N/A	0
Control TLDs (mR/Qtr)	Gamma 4	(f)	N/A	N/A	N/A	11.2 (4/4) [8.8 - 12.7]	0

TABLE 3-1

ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
 Location of Facility Claiborne, Mississippi Reporting Period January – December 1999
 (County, State)

Sample Type (Units)	Type & Number of Analyses ^a	(LLD) ^b	Indicator Locations Mean (F) ^c [Range]	Location with Highest Annual Mean Location ^d	Mean(F) ^c [Range]	Control Locations Mean (F) ^c [Range]	Number of Nonroutine Results ^e
Surface Water (pCi/liter)	H-3 9	2000	All < LLD	N/A	N/A	All < LLD	0
	GS 9						
	Mn-54	15	All < LLD	N/A	N/A	All < LLD	0
	Co-58	15	All < LLD	N/A	N/A	All < LLD	0
	Fe-59	30	All < LLD	N/A	N/A	All < LLD	0
	Co-60	15	All < LLD	N/A	N/A	All < LLD	0
	Zn-65	30	All < LLD	N/A	N/A	All < LLD	0
	Nb-95	15	All < LLD	N/A	N/A	All < LLD	0
	Zr-95	30	All < LLD	N/A	N/A	All < LLD	0
	I-131	15	All < LLD ^g	N/A	N/A	All < LLD	0
	Cs-134	15	All < LLD	N/A	N/A	All < LLD	0
	Cs-137	18	All < LLD	N/A	N/A	All < LLD	0
	Ba-140	60	All < LLD	N/A	N/A	All < LLD	0
	La-140	15	All < LLD	N/A	N/A	All < LLD	0

TABLE 3-1
ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
Location of Facility Claiborne, Mississippi Reporting Period January - December 1999
(County, State)

Sample Type (Units)	Type & Number of Analyses ^a	(LLD) ^b	Indicator Locations Mean (F) ^c [Range]	Location with Highest Annual Mean Location ^d	Control Locations Mean (F) ^c [Range]	Number of Nonroutine Results ^e
Sediment (pCi/kg)						
	GS 3					
	Cs-134	150	All < LLD	N/A	All < LLD	0
	Cs-137	180	38.3 (2/2) [23.4 - 53.2]	SEDHAM (new) (Sector N, 1.6 mi)	53.2 (1/1) N/A	0
	H-3	2000	All < LLD	N/A	All < LLD	0
Groundwater (pCi/liter)						
	GS 3					
	Mn-54	15	All < LLD	N/A	All < LLD	0
	Co-58	15	All < LLD	N/A	All < LLD	0
	Fe-59	30	All < LLD	N/A	All < LLD	0
	Co-60	15	All < LLD	N/A	All < LLD	0
	Zn-65	30	All < LLD	N/A	All < LLD	0
	Nb-95	15	All < LLD	N/A	All < LLD	0
	Zr-95	30	All < LLD	N/A	All < LLD	0
	I-131	1	All < LLD	N/A	All < LLD	0
	Cs-134	15	All < LLD	N/A	All < LLD	0
	Cs-137	18	All < LLD	N/A	All < LLD	0
	Ba-140	60	All < LLD	N/A	All < LLD	0
	La-140	15	All < LLD	N/A	All < LLD	0

TABLE 3-1

ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
 Location of Facility Claiborne, Mississippi Reporting Period January – December 1999
 (County, State)

Sample Type (Units)	Type & Number of Analyses ^a	(LLD) ^b	Indicator Locations Mean (F) ^c [Range]	Location with Highest Annual Mean Location ^d	Mean(F) ^e [Range]	Control Locations Mean (F) ^c [Range]	Number of Nonroutine Results ^e
Broadleaf Vegetation (pCi/kg)	GS 8 I-131 Cs-134 Cs-137	60 60 80	All < LLD All < LLD All < LLD	N/A N/A N/A	N/A N/A N/A	All < LLD All < LLD All < LLD	0 0 0
Fish (pCi/kg)	GS 2 Mn-54 Co-58 Fe-59 Co-60 Zn-65 Cs-134 Cs-137	130 130 260 130 260 130 150	All < LLD All < LLD All < LLD All < LLD All < LLD All < LLD All < LLD	N/A N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A N/A	All < LLD All < LLD All < LLD All < LLD All < LLD All < LLD All < LLD	0 0 0 0 0 0 0
Special Sediment (pCi/kg)	GS 1 Co-60 Cs-134 Cs-137	(f) 150 180	28.1 (1/1) N/A <LLD <LLD	SEDBAR / Barge Slip (Sector Q, 1.5 mi.) N/A N/A N/A	28.1 (1/1) N/A N/A N/A	N/A N/A N/A N/A	0 0 0 0

TABLE 3-1
ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
 Location of Facility Claiborne, Mississippi Reporting Period January – December 1999
 (County, State)

Sample Type (Units)	Type & Number of Analyses ^a	(LLD) ^b	Indicator Locations Mean (F) ^c [Range]	Location with Highest Annual Mean Location ^d	Control Locations Mean (F) ^c [Range]	Number of Nonroutine Results ^e
Special Protected Area TLDs (mR/Qtr)	Gamma 64	(f)	26.8 (64/64) [5.7 – 103.8]	M-69 (Sector G, onsite) [34.7 – 103.8]	N/A	0

- a GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.
- b LLD = Required lower limit of detection based on Grand Gulf Nuclear Station ODCM Specification Table 6.12.1-3.
- c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).
- d Locations are specified (1) by name and (2) sector relative to reactor site.
- e 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.
- f LLD not defined in GGNS ODCM Specification Table 6.12.1-3.
- g LLD for I-131 not met in one surface water sample.

ATTACHMENT I

1999 Environmental Sampling and Analytical Report

AIR SAMPLE AS-1 PG - GGNS

01-Mar-00

LLD (pCi/m ³) AS-1 PG		0.01		
LAB ID	START DATE	END DATE	I-131	GROSS BETA
19990011	12/29/1998	1/5/1999	< 0.016	0.031 +/-0.002
19990044	1/5/1999	1/12/1999	< 0.016	0.023 +/-0.002
19990067	1/12/1999	1/19/1999	< 0.020	0.025 +/-0.002
19990082	1/19/1999	1/26/1999	< 0.012	0.017 +/-0.002
19990099	1/26/1999	2/2/1999	< 0.018	0.018 +/-0.002
19990133	2/2/1999	2/9/1999	< 0.011	0.024 +/-0.002
19990145	2/9/1999	2/16/1999	< 0.018	0.016 +/-0.002
19990170	2/16/1999	2/23/1999	< 0.018	0.025 +/-0.002
19990184	2/23/1999	3/2/1999	< 0.015	0.021 +/-0.002
19990215	3/2/1999	3/9/1999	< 0.014	0.025 +/-0.002
19990237	3/9/1999	3/16/1999	< 0.017	0.018 +/-0.002
19990255	3/16/1999	3/23/1999	< 0.016	0.028 +/-0.002
19990290	3/23/1999	3/30/1999	< 0.019	0.025 +/-0.002
19990313	3/30/1999	4/6/1999	< 0.015	0.021 +/-0.002
19990349	4/6/1999	4/13/1999	< 0.013	0.026 +/-0.002
19990377	4/13/1999	4/20/1999	< 0.017	0.019 +/-0.002
19990406	4/20/1999	4/27/1999	< 0.017	0.021 +/-0.002
19990424	4/27/1999	5/4/1999	< 0.017	0.019 +/-0.002

LLD (pCi/m ³) AS-1 PG		0.01		
LAB ID	START DATE	END DATE	I-131	GROSS BETA
19990439	5/4/1999	5/11/1999	< 0.018	0.024 +/-0.002
19990470	5/11/1999	5/18/1999	< 0.015	0.023 +/-0.002
19990494	5/18/1999	5/25/1999	< 0.015	0.025 +/-0.002
19990528	5/25/1999	6/1/1999	< 0.016	0.020 +/-0.002
19990546	6/1/1999	6/8/1999	< 0.020	0.020 +/-0.002
19990569	6/8/1999	6/15/1999	< 0.018	0.015 +/-0.002
19990597	6/15/1999	6/22/1999	< 0.015	0.024 +/-0.002
19990633	6/22/1999	6/29/1999	< 0.019	0.018 +/-0.002
19990656	6/29/1999	7/6/1999	< 0.016	0.021 +/-0.002
19990697	7/6/1999	7/13/1999	< 0.019	0.014 +/-0.002
19990727	7/13/1999	7/20/1999	< 0.018	0.018 +/-0.002
19990744	7/20/1999	7/27/1999	< 0.015	0.014 +/-0.002
19990764	7/27/1999	8/3/1999	< 0.020	0.018 +/-0.002
19990785	8/3/1999	8/10/1999	< 0.015	0.034 +/-0.003
19990809	8/10/1999	8/17/1999	< 0.017	0.016 +/-0.002
19990832	8/17/1999	8/24/1999	< 0.015	0.036 +/-0.003
19990853	8/24/1999	8/31/1999	< 0.015	0.035 +/-0.003
19990872	8/31/1999	9/7/1999	< 0.016	0.019 +/-0.002
19990905	9/7/1999	9/14/1999	< 0.020	0.027 +/-0.002
19990922	9/14/1999	9/21/1999	< 0.017	0.032 +/-0.002

LLD (pCi/m³) AS-1 PG

LAB ID	START DATE	END DATE	I-131	0.01	GROSS BETA
19990959	9/21/1999	9/28/1999	<0.014		0.032 +/-0.002
19990995	9/28/1999	10/5/1999	<0.014		0.025 +/-0.002
19991034	10/5/1999	10/12/1999	<0.015		0.021 +/-0.002
19991067	10/12/1999	10/19/1999	<0.017		0.047 +/-0.003
19991082	10/19/1999	10/26/1999	<0.016		0.030 +/-0.002
19991108	10/26/1999	11/2/1999	<0.010		0.037 +/-0.003
19991121	11/2/1999	11/9/1999	<0.016		0.035 +/-0.002
19991155	11/9/1999	11/16/1999	<0.017		0.061 +/-0.003
19991171	11/16/1999	11/23/1999	<0.016		0.038 +/-0.003
19991180	11/23/1999	11/30/1999	<0.016		0.040 +/-0.003
19991193	11/30/1999	12/7/1999	<0.020		0.023 +/-0.002
19991247	12/7/1999	12/14/1999	<0.017		0.031 +/-0.002
19991266	12/14/1999	12/21/1999	<0.018		0.026 +/-0.002
19991276	12/21/1999	12/28/1999	<0.016		0.033 +/-0.002

Average:

0.026

Maximum:

0.061

Minimum:

0.014

AIR SAMPLE AS-361VA - GGNS

02-Mar-00

LLD (pCi/m ³) AS-361VA				0.01
LAB ID	START DATE	END DATE	I-131	GROSS BETA
19990012	12/29/1998	1/5/1999	< 0.016	0.031 +/-0.002
19990045	1/5/1999	1/12/1999	< 0.015	0.021 +/-0.002
19990068	1/12/1999	1/19/1999	< 0.017	0.022 +/-0.002
19990083	1/19/1999	1/26/1999	< 0.016	0.020 +/-0.002
19990100	1/26/1999	2/2/1999	< 0.017	0.015 +/-0.002
19990134	2/2/1999	2/9/1999	< 0.016	0.017 +/-0.002
19990146	2/9/1999	2/16/1999	< 0.014	0.017 +/-0.002
19990171	2/16/1999	2/23/1999	< 0.013	0.024 +/-0.002
19990185	2/23/1999	3/2/1999	< 0.019	0.021 +/-0.002
19990216	3/2/1999	3/9/1999	< 0.014	0.021 +/-0.002
19990238	3/9/1999	3/16/1999	< 0.016	0.017 +/-0.002
19990256	3/16/1999	3/23/1999	< 0.015	0.028 +/-0.002
19990291	3/23/1999	3/30/1999	< 0.015	0.026 +/-0.002
19990314	3/30/1999	4/6/1999	< 0.015	0.020 +/-0.002
19990350	4/6/1999	4/13/1999	< 0.016	0.021 +/-0.002
19990378	4/13/1999	4/20/1999	< 0.016	0.020 +/-0.002
19990407	4/20/1999	4/27/1999	< 0.018	0.020 +/-0.002
19990425	4/27/1999	5/4/1999	< 0.016	0.017 +/-0.002

LLD (pCi/m³) AS-361VA

LAB ID	START DATE	END DATE	0.07		0.01	
			I-131		GROSS BETA	
19990440	5/4/1999	5/11/1999	< 0.018		0.025 +/-0.002	
19990471	5/11/1999	5/18/1999	< 0.018		0.023 +/-0.002	
19990495	5/18/1999	5/25/1999	< 0.018		0.024 +/-0.002	
19990529	5/25/1999	6/1/1999	< 0.011		0.023 +/-0.002	
19990547	6/1/1999	6/8/1999	< 0.013		0.021 +/-0.002	
19990570	6/8/1999	6/15/1999	< 0.019		0.015 +/-0.002	
19990598	6/15/1999	6/22/1999	< 0.018		0.024 +/-0.002	
19990634	6/22/1999	6/29/1999	< 0.016		0.021 +/-0.002	
19990657	6/29/1999	7/6/1999	< 0.018		0.024 +/-0.002	
19990698	7/6/1999	7/13/1999	< 0.016		0.013 +/-0.002	
19990728	7/13/1999	7/20/1999	< 0.017		0.021 +/-0.002	
19990745	7/20/1999	7/27/1999	< 0.011		0.017 +/-0.002	
19990765	7/27/1999	8/3/1999	< 0.019		0.020 +/-0.002	
19990786	8/3/1999	8/10/1999	< 0.016		0.033 +/-0.002	
19990810	8/10/1999	8/17/1999	< 0.021		0.017 +/-0.002	
19990833	8/17/1999	8/24/1999	< 0.018		0.042 +/-0.003	
19990854	8/24/1999	8/31/1999	< 0.013		0.038 +/-0.003	
19990873	8/31/1999	9/7/1999	< 0.015		0.021 +/-0.002	
19990906	9/7/1999	9/14/1999	< 0.023		0.026 +/-0.002	
19990923	9/14/1999	9/21/1999	< 0.017		0.034 +/-0.002	

LLD (pCi/m³) AS-361VA

LAB ID	START DATE	END DATE	I-131	GROSS BETA
19990960	9/21/1999	9/28/1999	< 0.019	0.029 +/-0.002
19990996	9/28/1999	10/5/1999	< 0.017	0.025 +/-0.002
19991035	10/5/1999	10/12/1999	< 0.018	0.022 +/-0.002
19991068	10/12/1999	10/19/1999	< 0.017	0.045 +/-0.003
19991083	10/19/1999	10/26/1999	< 0.014	0.030 +/-0.002
19991109	10/26/1999	11/2/1999	< 0.018	0.038 +/-0.003
19991122	11/2/1999	11/9/1999	< 0.013	0.026 +/-0.002
19991156	11/9/1999	11/16/1999	< 0.013	0.062 +/-0.003
19991172	11/16/1999	11/23/1999	< 0.016	0.035 +/-0.002
19991181	11/23/1999	11/30/1999	< 0.011	0.031 +/-0.002
19991194	11/30/1999	12/7/1999	< 0.012	0.026 +/-0.002
19991248	12/7/1999	12/14/1999	< 0.014	0.031 +/-0.002
19991267	12/14/1999	12/21/1999	< 0.015	0.024 +/-0.002
19991277	12/21/1999	12/28/1999	< 0.020	0.034 +/-0.002

Average:

0.025

Maximum:

0.062

Minimum:

0.013

AIR SAMPLE AS-7UH - GGNS

02-Mar-00

LLD (pCi/m ³)	AS-7UH	START DATE	END DATE	I-131	0.07	0.01	GROSS BETA
LAB ID							
19990013		12/29/1998	1/5/1999	< 0.015			0.035 +/-0.003
19990046		1/5/1999	1/12/1999	< 0.014			0.025 +/-0.002
19990069		1/12/1999	1/19/1999	< 0.016			0.025 +/-0.002
19990084		1/19/1999	1/26/1999	< 0.017			0.021 +/-0.002
19990101		1/26/1999	2/2/1999	< 0.016			0.015 +/-0.002
19990135		2/2/1999	2/9/1999	< 0.017			0.022 +/-0.002
19990147		2/9/1999	2/16/1999	< 0.017			0.018 +/-0.002
19990172		2/16/1999	2/23/1999	< 0.016			0.024 +/-0.002
19990186		2/23/1999	3/2/1999	< 0.018			0.018 +/-0.002
19990217		3/2/1999	3/9/1999	< 0.016			0.021 +/-0.002
19990239		3/9/1999	3/16/1999	< 0.018			0.016 +/-0.002
19990257		3/16/1999	3/23/1999	< 0.018			0.025 +/-0.002
19990292		3/23/1999	3/30/1999	< 0.015			0.025 +/-0.002
19990315		3/30/1999	4/6/1999	< 0.016			0.018 +/-0.002
19990351		4/6/1999	4/13/1999	< 0.018			0.023 +/-0.002
19990379		4/13/1999	4/20/1999	< 0.015			0.018 +/-0.002
19990408		4/20/1999	4/27/1999	< 0.018			0.018 +/-0.002
19990426		4/27/1999	5/4/1999	< 0.015			0.018 +/-0.002

LLD (pCi/m³) AS-7UH

LAB ID	START DATE	END DATE	I-131	0.07	0.01	GROSS BETA
19990441	5/4/1999	5/11/1999	< 0.015			0.019 +/-0.002
19990472	5/11/1999	5/18/1999	< 0.016			0.019 +/-0.002
19990496	5/18/1999	5/25/1999	< 0.016			0.021 +/-0.002
19990530	5/25/1999	6/1/1999	< 0.014			0.018 +/-0.002
19990548	6/1/1999	6/8/1999	< 0.014			0.018 +/-0.002
19990577	6/8/1999	6/15/1999	< 0.017			0.014 +/-0.002
19990599	6/15/1999	6/22/1999	< 0.014			0.023 +/-0.002
19990635	6/22/1999	6/29/1999	< 0.014			0.017 +/-0.002
19990658	6/29/1999	7/6/1999	< 0.014			0.020 +/-0.002
19990699	7/6/1999	7/13/1999	< 0.019			0.012 +/-0.002
19990729	7/13/1999	7/20/1999	< 0.015			0.017 +/-0.002
19990746	7/20/1999	7/27/1999	< 0.017			0.016 +/-0.002
19990766	7/27/1999	8/3/1999	< 0.015			0.021 +/-0.002
19990787	8/3/1999	8/10/1999	< 0.017			0.032 +/-0.002
19990811	8/10/1999	8/17/1999	< 0.014			0.018 +/-0.002
19990834	8/17/1999	8/24/1999	< 0.017			0.035 +/-0.002
19990855	8/24/1999	8/31/1999	< 0.018			0.035 +/-0.003
19990874	8/31/1999	9/7/1999	< 0.014			0.017 +/-0.002
19990907	9/7/1999	9/14/1999	< 0.020			0.022 +/-0.002
19990924	9/14/1999	9/21/1999	< 0.016			0.030 +/-0.002

LLD (pCi/m ³)	AS-7UH	START DATE	END DATE	I-131	GROSS BETA
19990961		9/21/1999	9/28/1999	< 0.011	0.027 +/-0.002
19990997		9/28/1999	10/5/1999	< 0.017	0.025 +/-0.002
19991036		10/5/1999	10/12/1999	< 0.013	0.019 +/-0.002
19991069		10/12/1999	10/19/1999	< 0.013	0.041 +/-0.003
19991084		10/19/1999	10/26/1999	< 0.017	0.027 +/-0.002
19991110		10/26/1999	11/2/1999	< 0.014	0.036 +/-0.003
19991123		11/2/1999	11/9/1999	< 0.029	0.018 +/-0.003
19991157		11/9/1999	11/16/1999	< 0.017	0.063 +/-0.003
19991173		11/16/1999	11/23/1999	< 0.018	0.036 +/-0.003
19991182		11/23/1999	11/30/1999	< 0.015	0.039 +/-0.003
19991195		11/30/1999	12/7/1999	< 0.016	0.022 +/-0.002
19991249		12/7/1999	12/14/1999	< 0.018	0.031 +/-0.002
19991268		12/14/1999	12/21/1999	< 0.012	0.025 +/-0.002
19991278		12/21/1999	12/28/1999	< 0.021	0.037 +/-0.003

Average: 0.024
Maximum: 0.063
Minimum: 0.012

AIR PARTICULATE FILTER QUARTERLY COMPOSITES (GAMMA) - GGNS

01-Mar-00

LLD (pCi/m³)

LAB ID	LOCATION	DATE	0.05		0.06	
			CS-134	CS-137	CS-134	CS-137
19990341	AS-1 PG	2/12/1999	< 0.002	< 0.001	< 0.002	< 0.001
19990342	AS-3 61VA	2/12/1999	< 0.001	< 0.001	< 0.002	< 0.001
19990343	AS-7 UH	2/12/1999	< 0.001	< 0.001	< 0.002	< 0.001
19990675	AS-1 PG	5/14/1999	< 0.002	< 0.001	< 0.002	< 0.001
19990676	AS-3 61VA	5/14/1999	< 0.002	< 0.002	< 0.002	< 0.002
19990677	AS-7 UH	5/14/1999	< 0.001	< 0.001	< 0.001	< 0.001
19991019	AS-1 PG	8/13/1999	< 0.002	< 0.001	< 0.001	< 0.001
19991020	AS-3 61VA	8/13/1999	< 0.002	< 0.001	< 0.001	< 0.001
19991021	AS-7 UH	8/13/1999	< 0.002	< 0.001	< 0.001	< 0.001
19991301	AS-1 PG	11/12/1999	< 0.001	< 0.001	< 0.002	< 0.001
19991302	AS-3 61VA	11/12/1999	< 0.001	< 0.001	< 0.001	< 0.001
19991303	AS-7 UH	11/12/1999	< 0.002	< 0.002	< 0.002	< 0.002

SURFACE WATER SAMPLES (H-3) - GGNS

02-Mar-00

LLD (pCi/l)	SURFACE WATER H-3	2000	
LAB ID	LOCATION	DATE	TRITIUM
19990009	MR DOWN	1/5/1999	< 473.0
19990010	MR UP	1/5/1999	< 472.0
19990319	MR DOWN	4/6/1999	< 482.0
19990320	MR UP	4/6/1999	< 483.0
19990694	MR DOWN	7/6/1999	< 485.0
19990695	MR UP	7/6/1999	< 483.0
19991009	MR DOWN	10/5/1999	< 543.0
19991011	MR UP	10/5/1999	< 547.0
19991104	MR DOWN	10/28/1999	< 528.0

GROUND WATER SAMPLES (H-3) - GGNS

02-Mar-00

LLD (pCi/l) **2000**

LAB ID	LOCATION	DATE	TRITIUM
19990776	PGWELL	8/3/1999	< 490.00
19990777	CONSTWELL #3	8/4/1999	< 491.00
19990778	CONSTWELL #4	8/4/1999	< 484.00

GROUND WATER SAMPLES (GAMMA) - GGNS

02-Mar-00

LLD (pCi/l)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15
LAB ID	LOCATION	DATE	MIN-54	CO-58	FE-59	CO-60	ZN-65	NB-95	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140					
19990776	PCWELL	8/3/1999	<5.66	<12.00	<4.46	<9.94	<5.86	<11.40	<0.89	<5.23	<5.83	<23.50	<9.07						
19990777	CONSTWELL #3	8/4/1999	<7.50	<13.20	<5.79	<16.20	<5.76	<6.54	<0.84	<5.71	<4.97	<18.80	<9.54						
19990778	CONSTWELL #4	8/4/1999	<4.11	<3.96	<9.68	<3.98	<5.11	<6.02	<0.90	<3.49	<4.21	<17.70	<5.80						

VEGETATION SAMPLES (GAMMA) - GGNS

02-Mar-00

LLD (pCi/kg)	VEGETATION	60	60	80	
LAB ID	LOCATION	DATE	I-131	CS-137	
			CS-134		
19990070	VEG-CONT	1/18/1999	< 46.50	< 52.10	< 46.60
19990071	VEG-H	1/18/1999	< 31.90	< 36.70	< 24.10
19990430	VEG-CONT	5/4/1999	< 52.40	< 52.10	< 51.00
19990431	VEG-J	5/4/1999	< 53.70	< 59.80	< 50.70
19990756	VEG-CONT	7/27/1999	< 43.00	< 56.80	< 54.90
19990757	VEG-J	7/27/1999	< 46.30	< 21.60	< 36.90
19991106	VEG-J	10/28/1999	< 54.60	< 31.50	< 38.80
19991107	VEG-CONT	11/2/1999	< 48.30	< 55.30	< 66.10

FISH SAMPLES - GGNS

02-Mcr-00

LLD (pCi/kg)	130	130	260	130	260	130	260	130	260
LAB ID	LOCATION	DATE	MN-54	C0-58	FE-59	CO-60	ZN-65	CS-134	CS-137
19990830	FISH UP	8/17/199	< 24.40	< 18.80	< 67.40	< 36.00	< 47.90	< 17.60	< 14.60
19990831	FISH DOWN	8/12/199	< 28.90	< 22.60	< 59.80	< 23.40	< 65.30	< 19.10	< 25.70

SEDIMENT SAMPLES - GGNS

10-Mar-00

LAB ID	LOCATION	DATE	CS-134	150	180	N/A
19990914	SEDHAM OLD	9/20/1999	< 23.80		23.40	+/-10.6
19990915	SEDCONT	9/20/1999	< 25.90		< 33.80	
19990916	SEDHAM NEW	9/20/1999	< 33.90		53.20	+/-15.3

Sample Type: Thermoluminescent Dosimeters
 Collection: Quarterly
 Analysis: Direct Radiation
 Units: mrem/Qtr

Location: Inner Ring, Within General Area of Site Boundary (ODCM Specifications)

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-16	7.9	11.2	11.1	12.3	10.6
M-17	7.6	10.7	10.2	11.7	10.0
M-19	6.8	10.9	10.6	11.1	9.9
M-21*	8.5	13.2	12.4	13.4	11.9
M-22	6.4	10.3	8.9	9.8	8.9
M-23	6.7	10.8	9.9	10.3	9.4
M-25	3.5	8.1	9.5	10.8	8.0
M-28	8.5	12.3	11.4	12.4	11.2
M-94	9.0	11.4	11.7	11.9	11.0

Location: Outer Ring, Approximately Three (3) to Five (5) miles from the Site (ODCM Specifications)

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-36	7.1	10.5	9.2	10.4	9.3
M-40	7.9	11.3	10.7	12.2	10.6
M-48	8.4	11.9	10.8	12.3	10.8
M-49*	10.2	14.2	13.2	14.5	13.0
M-50	8.3	11.8	11.3	11.6	10.8
M-55	8.8	12.6	11.3	13.1	11.4
M-57	9.5	13.8	12.2	13.8	12.3

Location: Duplicate TLDs

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-31	9.3	10.7	11.5	13.0	11.1
M-32	9.1	10.2	10.1	9.3	9.7
M-60	6.7	13.8	11.3	13.1	11.2

* Location with highest annual mean

Sample Type: Thermoluminescent Dosimeters
 Collection: Quarterly
 Analysis: Direct Radiation
 Units: mrem/Qtr

Location: Protected Area Boundary TLDs

Location	1 st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-61	30.6	56.5	50.0	25.3	40.6
M-62	32.1	69.3	64.7	24.0	47.5
M-63	9.7	16.2	14.0	12.1	13.0
M-64	10.6	20.5	20.5	12.1	15.9
M-65	9.7	16.9	16.3	11.1	13.5
M-66	12.2	20.4	20.1	12.1	16.2
M-67	13.7	20.5	19.3	14.7	17.0
M-68	35.8	81.8	72.4	31.2	55.3
M-69*	47.7	98.9	103.8	34.7	71.3
M-70	41.2	90.0	95.3	29.0	63.9
M-71	12.8	27.8	26.0	12.3	19.7
M-72	11.6	18.8	19.7	11.8	15.5
M-74	6.6	11.3	10.5	8.4	9.2
M-76	8.2	15.8	15.2	8.4	11.9
M-77	5.7	9.8	10.0	7.6	8.3
M-81	8.6	10.9	10.0	10.8	10.1

Location: Shield TLD

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-00	6.7	6.6	7.3	6.6	6.8

Location: Control TLD

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-14	8.8	12.6	10.8	12.7	11.2

* Location with highest annual mean

Sample Type: Thermoluminescent Dosimeters
Collection: Quarterly
Analysis: Direct Radiation
Units: mrem/Qtr

Location: Special Interest TLDs (ODCM Specifications)

Location	1st Qtr '99 (mrem)	2nd Qtr '99 (mrem)	3rd Qtr '99 (mrem)	4th Qtr '99 (mrem)	Mean '99 (mrem)
M-01*	8.8	12.0	11.5	12.5	11.2
M-07	8.5	11.7	10.9	12.0	10.8
M-09	7.3	10.4	9.5	10.8	9.5
M-10	6.2	8.6	7.9	9.2	8.0
M33	6.7	9.3	8.6	9.1	8.4
M-38	7.1	11.4	10.3	10.5	9.8
M-39	7.2	11.2	9.7	11.7	10.0

* Location with highest annual mean

ENVIRONMENTAL (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

Sample Type (units)	Study	Date	Analysis	"Known" Value ^a	RBS Value	RBS N-DEV ^b	RBS N-RANGE ^c
Air Filter (pCi/filter)	E1885-125	9/23/99	BETA	49.0 ± 8.66	48.7	-0.09	0.071
Charcoal Cartridge (pCi/cartridge)	E1759-125	6/24/99	I-131	76 ± 13.2	76.8	0.17	0.155
	E2001-125	12/9/99	I-131	86.0 ± 14.9	87.9	0.38	0.192
Water (pCi/liter)	E1662-125	3/18/99	BETA	201 ± 52.2	179	-1.24	0.059
	E1660-125	3/18/99	CR-51	398 ± 34.5	381	-1.48	1.929
			MN-54	152 ± 13.2	162	2.35	0.233
			FE-59	79 ± 8.66	87.8	3.06 ^d	0.307
			CO-60	181 ± 15.7	182	0.19	0.653
			ZN-65	195 ± 33.8	196	0.06	0.424
			I-131	91 ± 15.8	84.3	-1.28	0.591
			CS-134	114 ± 9.87	107	-2.13	0.725
			CS-137	240 ± 20.8	240	0.00	0.345
			CE-141	177 ± 15.3	186	1.83	0.734
	E1661-125 (Duplicate)	3/18/99	CR-51	398 ± 34.5	377	-1.86	0.416
			MN-54	152 ± 13.2	165	3.04 ^d	0.311
			FE-59	79 ± 8.66	93.9	5.15 ^d	1.890
			CO-60	181 ± 15.7	184	0.64	0.457
			ZN-65	195 ± 33.8	212	1.54	0.091
			I-131	91 ± 15.8	86.0	-0.95	0.149
			CS-134	114 ± 9.87	106	-2.43	0.207
			CS-137	240 ± 20.8	242	0.24	0.098
	CE-141	177 ± 15.3	187	1.96	0.601		
	E1760-125	6/24/99	H-3	9349 ± 1619	9427	0.15	0.028
	E1883-125	9/23/99	CR-51	184 ± 15.9	200	3.07 ^d	2.311
			MN-54	210 ± 18.2	224	2.31	0.113
			FE-59	94.0 ± 8.66	106	4.16 ^d	0.591
CO-60			159 ± 13.8	166	1.60	0.371	
ZN-65			202 ± 35	205	0.26	0.439	
I-131			77.0 ± 13.3	79.3	0.52	0.061	
CS-134			119 ± 10.3	116	-0.78	0.397	
CS-137			268 ± 23.2	281	1.68	0.309	
CE-141	244 ± 21.1	248	0.52	0.290			

ENVIRONMENTAL (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

Sample Type (units)	Study	Date	Analysis	"Known" Value ^a	RBS Value	RBS N-DEV ^b	RBS N-RANGE ^c
	E1884-125 (Duplicate)	9/23/99	CR-51	184 ± 15.9	204	3.77 ^d	0.642
			MN-54	210 ± 18.2	223	2.20	0.169
			FE-59	94.0 ± 8.66	107	4.62 ^d	0.709
			CO-60	159 ± 13.8	163	0.94	0.669
			ZN-65	202 ± 35	199	-0.23	0.175
			I-131	77.0 ± 13.3	76.7	-0.07	0.453
			CS-134	119 ± 10.3	117	-0.49	0.397
			CS-137	268 ± 23.2	280	1.59	0.485
			CE-141	244 ± 21.1	249	0.71	0.726
Sediment (pCi/gram)	E2002-125	12/9/99	CR-51	0.845± 0.027	0.864	0.79	1.097
			MN-54	0.292± 0.025	0.314	2.61	0.129
			Co-58	0.319± 0.028	0.313	-0.63	0.448
			FE-59	0.274± 0.024	0.300	3.24 ^d	0.172
			CO-60	0.383± 0.033	0.410	2.46	0.154
			ZN-65	0.541± 0.094	0.558	0.55	0.158
			CS-134	0.363± 0.031	0.345	-1.69	0.260
			CS-137	0.407± 0.035	0.391	-1.34	0.360
CE-141	0.306± 0.027	0.322	1.77	0.954			

NOTES:

- (a) The "known" values are listed with a range reflecting control (3 sigma) limits.
- (b) The normalized deviation from the "known" value is computed from the deviation and the standard error of the mean; ±2.000 is the warning limit and ±3.000 is the control limit. This is a measure of accuracy of the analytical methods.
- (c) The normalized range is computed from the mean range, the control limit, and the standard error of the range; +2.000 is the warning limit and +3.000 is the control limit. This is a measure of precision of the analytical methods.
- (d) The results reported were out of the control limits.

Environmental (CROSS-CHECK) Program Exceptions

There were eight results out of control limits (3 sigma) for accuracy in the 1999 cross check program. Of these eight results, all were analyzed by gamma spectroscopy (8 nuclides in two matrices). Seven of the results in question were in liquid cross check samples; one in a sediment sample. All eight results in question were bias high.

There was one nuclide, Fe-59, slightly biased high (+3.24) in sediment. Previous history had a low bias with a slight upward trend indicated by previous results of sediment analysis. Prior to 1999, all Fe-59 results in sediments have been within warning limits. Fe-59 was also biased high (+3.06, +5.15, +4.16, +4.62) in four water analyses. Trending of past Fe-59 cross check results in waters indicates a high bias, upward trend. Cr-51 was biased high (+3.07 & +3.77) in the last two water analyses this year. Trending of past Cr-51 results in water indicates a low bias with a slight downward trend. Mn-54 was biased high (+3.04) in one water sample. Past results for Mn-54 indicate bias high with a slight upward trend.

The third quarter water samples (sample and duplicate) were analyzed three times each, per detector, to note any statistical variation between detectors. This resulted in twelve analyses each for the sample and duplicate. No obvious variations were noted in the average nuclide results between detectors.

Investigation of high biased results in the past indicated it was due to coincidence summing effects of Y-88 and Co-60 on the efficiency curve in the affected regions. To minimize the coincidence summing effects on the efficiency curve, RBS committed to adding two additional nuclide lines (Mn-54 and Zn-65) to the calibration source mix for waters. This action has been completed and the most recent efficiency curves included the non-summing nuclides. In addition, a multiplicative correction factor to convert the measured gamma-ray efficiency with summing effects to an efficiency with no summing effects needs to be established. An efficiency curve (equation) is generated with no summing effects by deleting the Y-88 and Co-60 peaks and using only the gamma ray efficiencies with no summing effects, including Mn-54 and Zn-65. For the 1173 keV Co-60 gamma ray the correction factor would be the ratio of the calculated non-summing efficiency at 1173 keV to the measured efficiency at 1173 keV. This approach for correcting the measured efficiencies of gamma rays from Y-88 and Co-60 for cascade summing effects is in progress.

There is no impact assessed on past data indicated by these cross check program results; considered to be conservative. Environmental samples are analyzed and reported with a ninety-five percent confidence level that the analytical result with its associated error encompasses the "true" value. Ninety-two percent of RBS environmental cross check results were within control limits for accuracy and precision during 1999.

ATTACHMENT II

1999 Special Sample Results

SPECIAL SAMPLES (GAMMA) - GGNS

31-Mar-00 Part I

LLD FISH/MEAT/SEDIMENT (pCi/kg)	130	130	260	130	260			
LLD LIQUID (pCi/l)	15	15	30	15	30			
LAB ID	LOCATION	DATE	MN-54	C0-58	FE-59	CO-60	ZN-65	NB-95
19990917	SEDBAR	9/20/99				28.10	+/-11.0	

SPECIAL SAMPLES (GAMMA) - GGNS

31-Mar-00

Part II

LLD FISH/MEAT/SEDIMENT (pCi/kg)	130	150						
LLD LIQUID (pCi/l) SPECIAL	15	18						
LAB ID	LOCATION	DATE	ZR-95	I-131	CS-134	CS-137	BA-140	LA-140
19990917	SEDBAR	9/20/99			< 22.60	< 33.10		