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April 16, 1992

U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Annual Radiological Environmental Operating Report for 1991

GNRO-92/00041

Gentlemen:

In accordance with the Grand Gulf Nuclear Station Unit 1 Technical Specifications 6.9.1.6 and 6.9.1.7, attached is the Annual Radiological Environmental Operating Report for the period January 1, 1991 through December 31, 1991.

Yours truly,

WTC/GWR/mtc
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GRAND GULF NUCLEAR STATION

1991 ANNUAL RADIOLOGICAL ENVIRONMENTAL

OPERATING REPORT

SUMMARY

The Annual Radiological Environmental Operating Report (AREOR) provides Grand Gulf Nuclear Station (GGNS) Environmental Surveillance Program (ESP) data obtained through analyses of environmental samples collected for the period January 1, 1991 through December 31, 1991. The AREOR fulfills the requirements of GGNS Technical Specifications 6.9.1.6 and 6.9.1.7.

ENVIRONMENTAL SURVEILLANCE PROGRAM

GGNS established the Environmental Surveillance Program (ESP) six years before the station became operational to provide data on background radiation and radioactivity normally present in the area. ESP personnel monitor radiation and radioactivity around GGNS within an 18-mile radius. GGNS has continued to monitor the environment for 14 years by sampling air, milk, water, vegetation, sediment and fish, as well as measuring radiation directly.

ESP personnel collect samples from indicator and control locations. Indicator locations are within five miles of the site, and are expected to show any increases or buildup of radioactivity that might occur due to station operation. Control locations are farther away from the station, and are expected to indicate the presence of only naturally occurring radioactivity. Indicator results are compared with controls and preoperational results. This allows ESP personnel to assess any impact GGNS operation might have had on the surrounding environment.

In 1991, ESP personnel collected and analyzed 1700 radiological environmental samples for radioactivity. GGNS compared radionuclide concentrations measured at indicator locations to concentrations at control locations and those measured in previous studies, and they concluded that no significant relationship exists between GGNS operation and effect on the environs surrounding the plant. Radiation levels in the environment were undetectable in many cases, and near background levels in significant pathways associated with GGNS. Therefore, ESP personnel concluded that GGNS operation has had no harmful effects nor resulted in any irreversible damage to the environment.

ATTACHMENTS

Attachment I contains results of air, milk, water, vegetation, sediment and fish samples collected in 1991 and analyzed by Entergy Services, Inc., System Chemistry, formerly Arkansas Power & Light's Technical Analysis Section. Results of System Chemistry's participation in the Environmental Protection Agency (EPA) Interlaboratory Comparison Program are also con ined in Attachment I.

Attachment II contains results of thermoluminescent dosimeters (TLDs) collected in 1991 and analyzed by Teledyne Isotopes. Results of Teledyne's participation in the International Intercomparison of Environmental Dosimeters are also included.

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SECTION 1.0

INTRODUCTION

INTRODUCTION

1.1 RADIATION

People are always subjected to natural radiation. This radiation exposure comes from the sun, naturally occurring radioactive materials present in the earth, structures we inhabit, food and water we consume, the air we breathe, and our bodies are, themselves, radioactive. The levels of natural or background radiation vary greatly from location to location. Man-made sources such as X-rays, radiation for medical purposes, fallout from nuclear explosives testing, and radioactive materials from nuclear power plants contribute additional radiation. However, as shown in Figure 1-1, an individual receives the major portion (99%) of dose from natural background and other sources, with nuclear power plants contributing the least.

1.2 BENEFITS OF RADIATION

Uranium used in nuclear power plays an important part in meeting today's electricity needs, and will continue to serve as an important source of energy well into the future. In addition, other uses of radiation have brought tremendous benefits to our everyday lives during the past 20 or 30 years. Radioisotopes and controlled radiation are used to sterilize medical supplies, to improve food preservation, in industrial processes, in medical science, and in the study of environmental pollution, agriculture and hydrology. Medical diagnosis and treatment is the main source of public exposure to man-made radiation but the benefit in terms of human lives and health is enormous.

1.3 SAFETY OF RADIATION

Radiation and the safety of radiation command considerable public attention. Although it is not generally realized, safety regulations for radioactive materials are much stricter than for other dangerous substances. For example, in the case of coal, it has been estimated that in Pennsylvania 30,000 miners died in the mines between 1870 and 1950, an average of about one man a day for 80 years. If the nuclear power industry were compared to this toll, one could see how the safety history would be uniquely encouraging.

In addition, radioactive elements gradually lose their radioactivity and toxicity with time. Other non-radioactive materials, such as arsenic, remain toxic forever. It was reported that three years after an accidental dioxin chemical release in Seveso, Italy, in 1976, the dioxin deposited in the region showed no signs of diminishing. These examples demonstrate how the safety of radiation tends to be viewed separately from other, and sometimes greater safety hazards.

1.4 PURPOSE AND DESIGN CRITERIA OF THE ENVIRONMENTAL SURVEILLANCE PROGRAM (ESP)

Grand Gulf Nuclear Station established the Environmental Surveillance Program (ESP) to minimize any associated radiation endangerment to human health or the environment by ensuring the proper function of plant operating controls.

The purpose of the ESP is:

- To evaluate environmental sampling procedures, equipment and techniques
- To measure radiation levels and their variations in environmental media in the area surrounding the plant
- To determine average levels of radiation and radioactive material in various environmental media
- To detect effects, if any, of GGNS operation on the environmental radiation levels and concentrations.

The design criteria for the ESP are:

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

1.5 DOSE PATHWAYS ASSOCIATED WITH GGNS

Figure 1-2 shows potential exposure pathways that could occur as a result of a nuclear power plant. However, the most significant environmental dose pathways from a nuclear power station are direct dose from gaseous effluent and thyroid dose due to the ingestion of milk. GGNS operations have little, if any, impact on these pathways due to the very low levels of radiation released, the remote location of the station and the absence of milking animals within five miles of GGNS. Since first use of Mississippi River as drinking water is more than 200 miles downstream, GGNS operations have little, if any, impact on this pathway.

1.6 PATHWAYS MONITORED

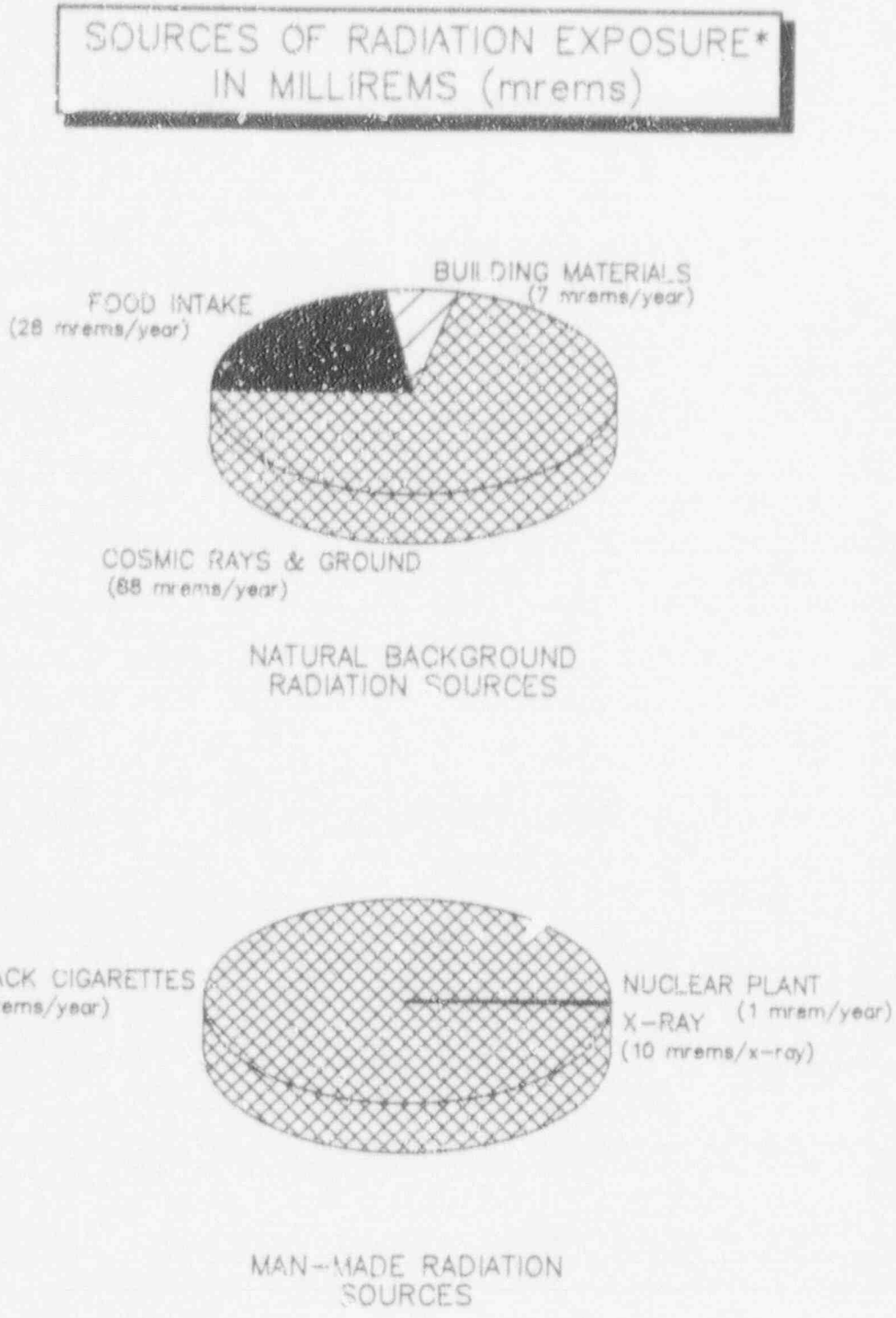
ESP personnel monitor and implement the required sampling program for airborne, waterborne, ingestion and direct radiation pathways as required by GGNS Technical Specifications. This program is supplemented with additional sampling in order to provide a comprehensive and well-balanced program. Figures 1-3, 1-4 and 1-5 show sample locations where exposure pathways are monitored. Section 2.0 of this report contains sampling location tables and discusses 1991 sampling results.

1.7 PREVIOUS DATA COMPARISON

Environmental Surveillance Program personnel observed no significant changes between 1991 results and those from previous years. Results remained at levels similar to those of previous years. Such results confirm that GGNS effluent controls and equipment are performing satisfactorily.

FIGURE 1-1

SOURCES OF RADIATION EXPOSURE



* SOURCE : NATIONAL ACADEMY OF SCIENCES, COMMITTEE ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATION, (BEIR REPORT) 1980

FIGURE 1-2

EXPOSURE PATHWAYS

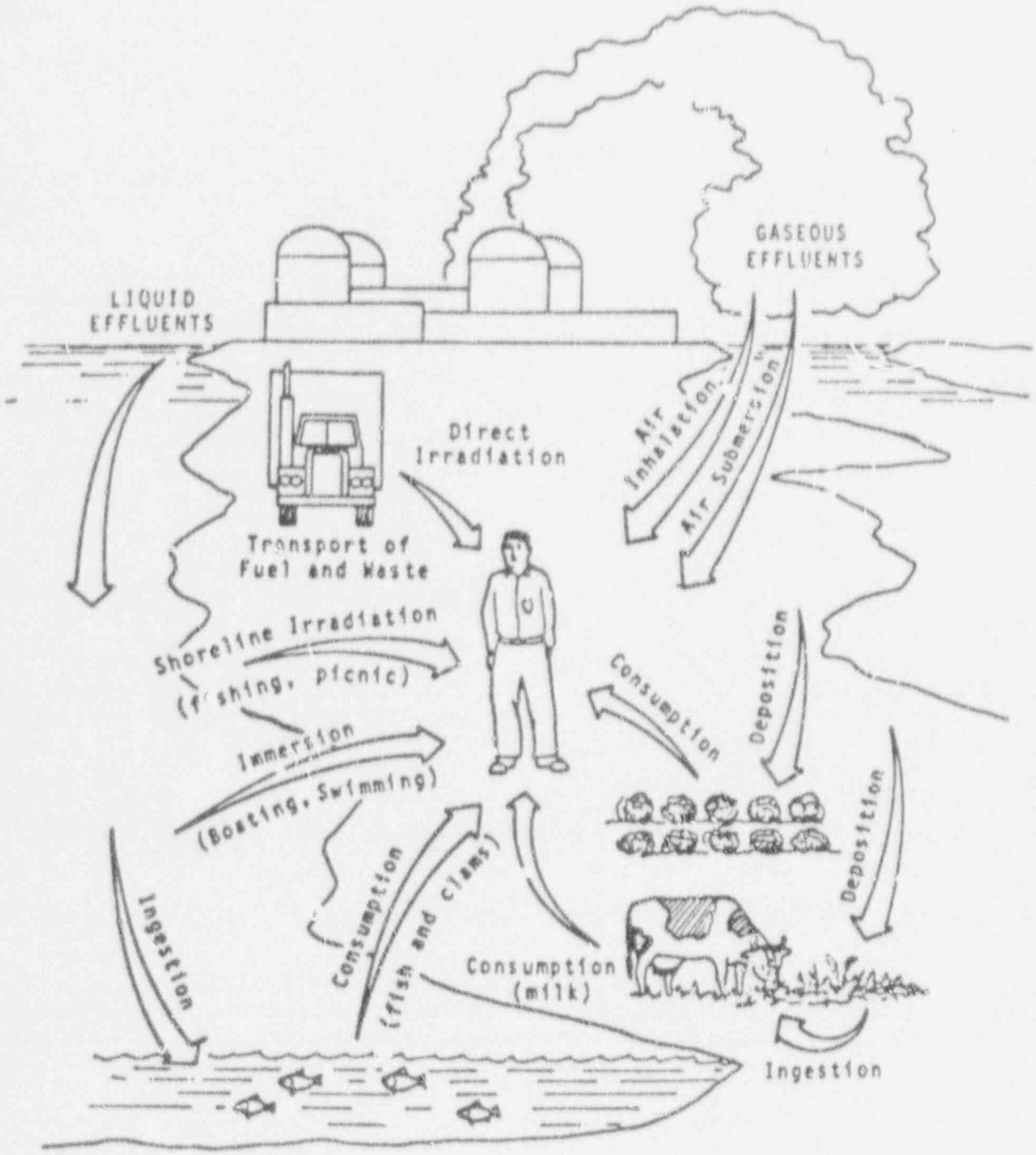


FIGURE 1-3

SAMPLE COLLECTION SITES

(5-MILE MAP)

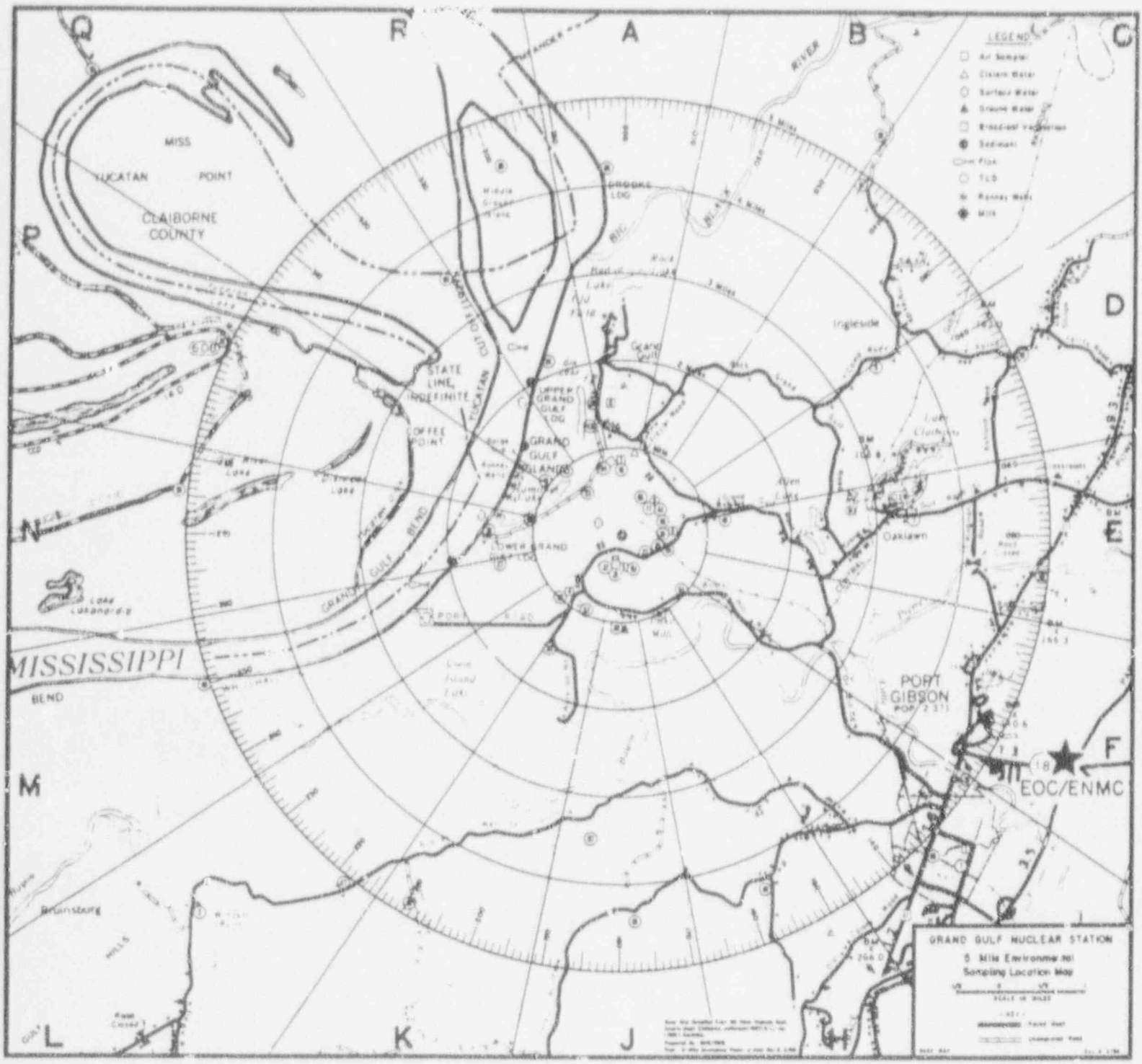
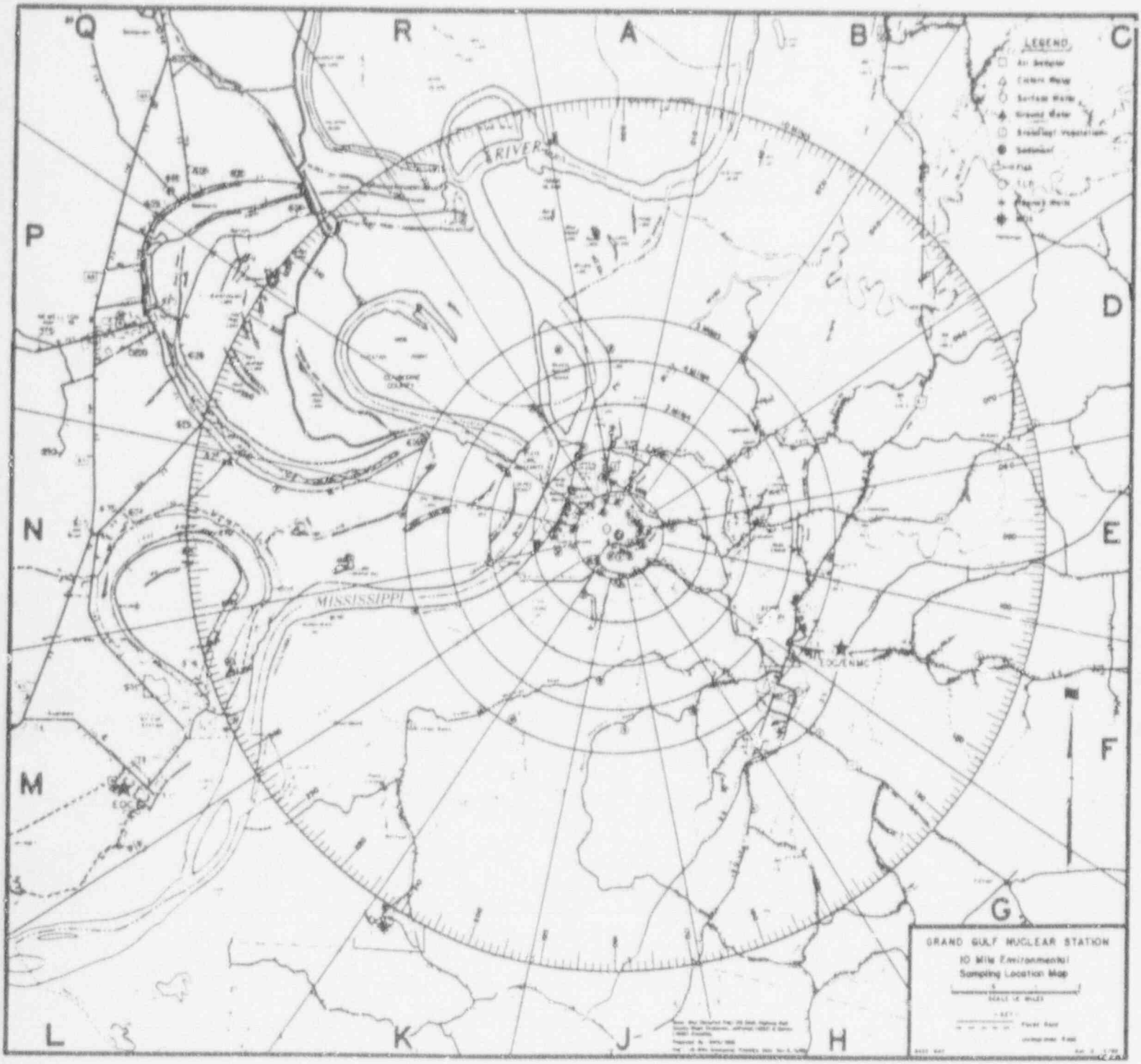
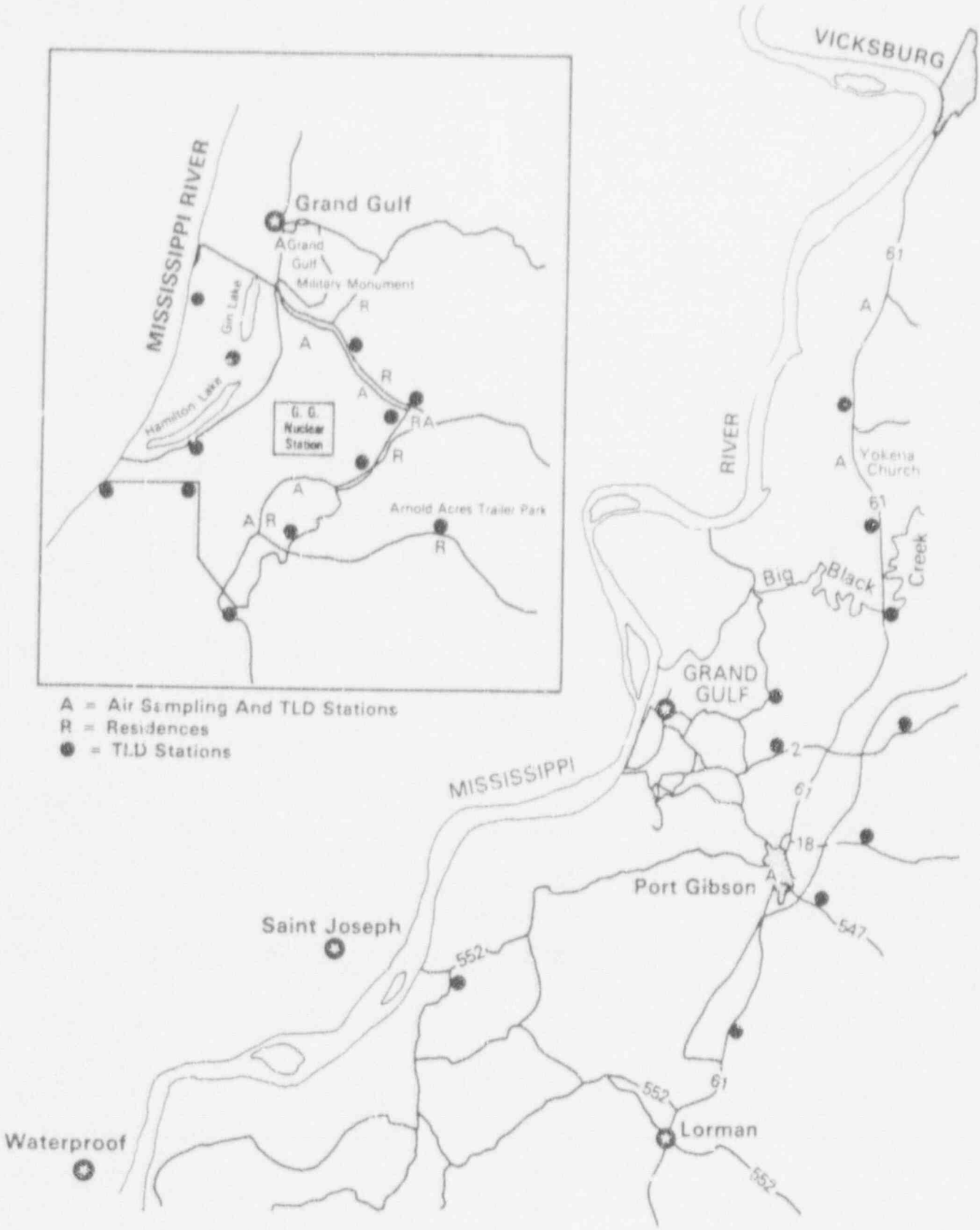


FIGURE 1-4

SAMPLE COLLECTION SITES

(10-MILE MAP)





GRAND GULF NUCLEAR STATION	ENVIRONMENTAL MONITORING LOCATIONS FIGURE 1-5

SECTION 2.0

ENVIRONMENTAL SURVEILLANCE PROGRAM

- INTERPRETATIONS AND TRENDS OF RESULTS
- DEVIATIONS FROM THE ESP
- PROGRAM DESCRIPTION

2.1 AIR PARTICULATES AND RADIOIODINES

NOTE: Analytical results are presented in Tables 1.1 through 1.15 of Attachment I and summarized in Section 4.0.

2.1.1 INTERPRETATIONS AND TRENDS OF RESULTS

Air particulate and Iodine-131 results for 1991 were similar to those obtained in previous years of the operational and preoperational ESP. Results from 1991 indicate the airborne exposure pathway has not been affected by the operation of GGNS and that airborne concentrations continue to be at background levels.

Gross beta concentrations shown in Figure 2-1 emphasize that GGNS has had no influence on ambient radiation levels. This figure shows 1991 monthly average results compared to preoperational results and 1978 through 1991 yearly average results for indicator locations compared to controls. Values were equivalent over the period.

Environmental Surveillance Program personnel also made an independent verification of the accuracy of GGNS results through the use of Mississippi State Department of Health, Louisiana Nuclear Energy Division and GGNS collocated air sampling stations. Figure 2-2 indicates the ESP collects consistent, valid data based on the similarity of results.

2.1.2 DEVIATIONS FROM THE ESP

An air sample was missed at AS-1 PG located in Port Gibson on April 23, 1991 due to the air sampler unit not being restarted. ESP personnel revised air sample collection procedure to allow collection while air sampler unit remains operational. This problem did not recur in 1991, and no other deviations occurred.

2.1.3 PROGRAM DESCRIPTION

The GGNS Environmental Surveillance Program used eleven continuous air samplers to provide gross beta, gamma and radioiodine activity measurements by the airborne exposure pathway. These air samplers ranged in distances from 0 to 18 miles (Figures 1-3 through 1-5, Table 2-1). Five air samplers met the requirements of GGNS Technical Specification 4.12.1, located as follows:

- Three near the SITE BOUNDARY in areas of the highest calculated annual average groundlevel D/Q values
- One in a community that has the highest calculated annual average groundlevel D/Q value (Port Gibson)
- One in a control location (Vicksburg, MS).

The remaining six air samplers were in areas which provide additional data for the ESP.

The air samplers were one meter above the ground in weatherproof houses, with a 2-inch glass fiber filter in the intake line of the vacuum pump and a 2 x 1-inch charcoal cartridge located directly downstream. Air flow was 1.25 cubic feet per minute. ESP personnel changed filters and cartridges weekly and had them analyzed for gross beta radionuclides and radioiodine activity, respectively. Quarterly composites of air filters underwent gamma analysis.

TABLE 2-1

AIR SAMPLE COLLECTION SITES

AIR SAMPLE NUMBER	LOCATION
*AS-1 PG	Southeast of GGNS at the Port Gibson City Barn (Sector G, Radius 5.5 miles)
AS-2 61N	North-northeast of GGNS on Hwy. 61, across from the Yokena Church (Sector B, Radius 13 miles)
*AS-3 61VA	North-northeast of GGNS on Hwy. 61, north of the Vicksburg Airport (Sector B, Radius 18 miles)
AS-4 GJOE	Southwest of GGNS, Glodjo property on Bald Hill Road (Sector L, Radius 0.9 miles)
AS-5 TC	South of GGNS behind the Support Services Center (Sector J, Radius 0.4 miles)
*AS-6 RS	Northeast of GGNS, south side of Grand Gulf Road (Sector C, Radius 0.5 miles)
*AS-7 MT	North of GGNS, located next to the Meteorological Tower (Sector A, Radius 0.8 miles)
*AS-8 WR	East of GGNS, located at former site of Maggie Jackson's trailer on Bald Hill Road near the eastern SITE BOUNDARY (Sector E, Radius 0.6 miles)
AS-9 GGMP	North of GGNS, located in Grand Gulf Military Park (Sector A, Radius 1.5 miles)
AS-10 NLT	West-northwest of GGNS, located at Newellton, Louisiana (Sector P, Radius 12.5 miles)
AS-11 STJ	West-southwest of GGNS, located at St. Joseph, Louisiana (Sector M, Radius 13.0 miles)

* Technical Specification requirements

FIGURE 2-1

AIR SAMPLES, GROSS BETA CONCENTRATIONS

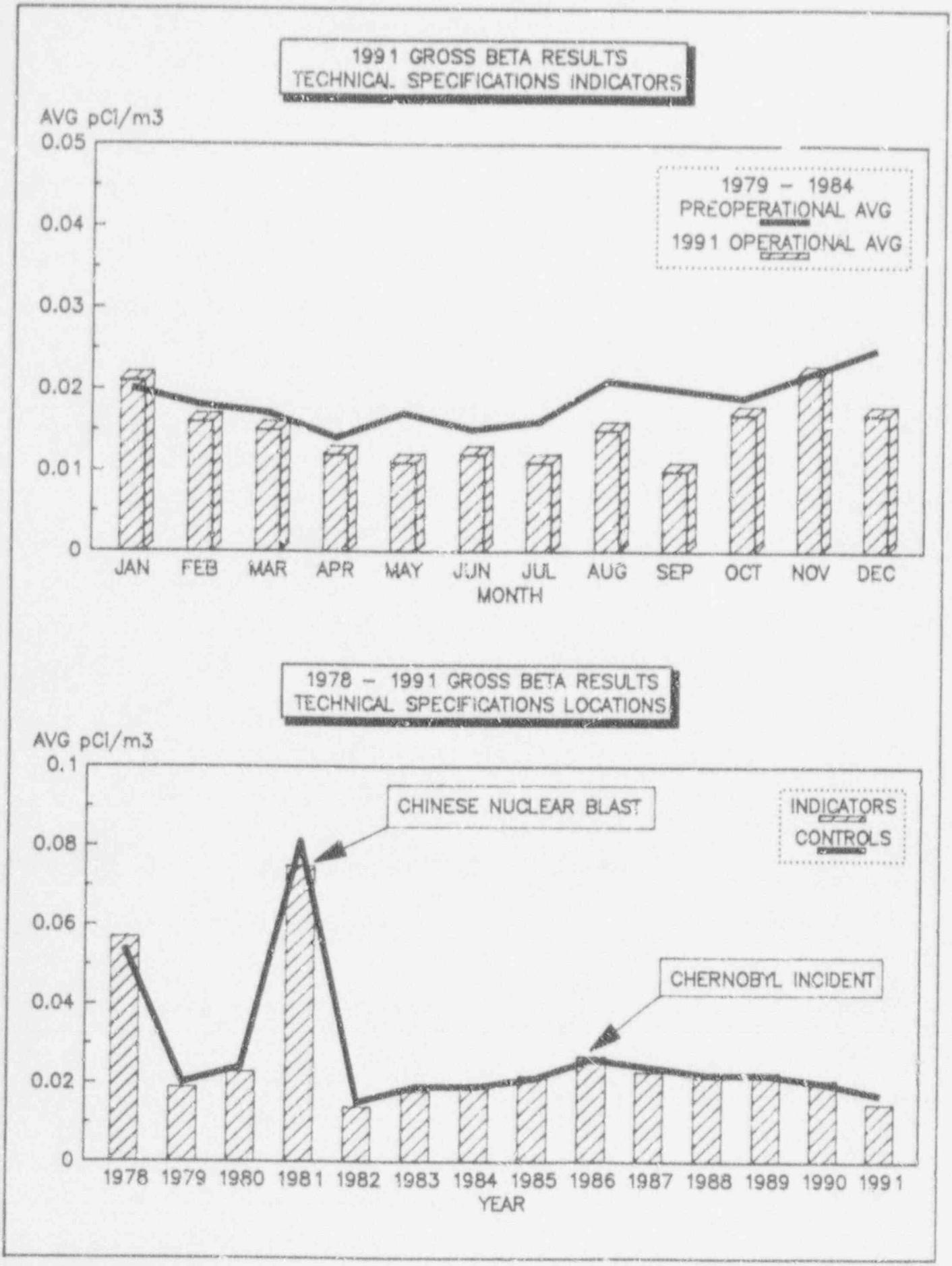
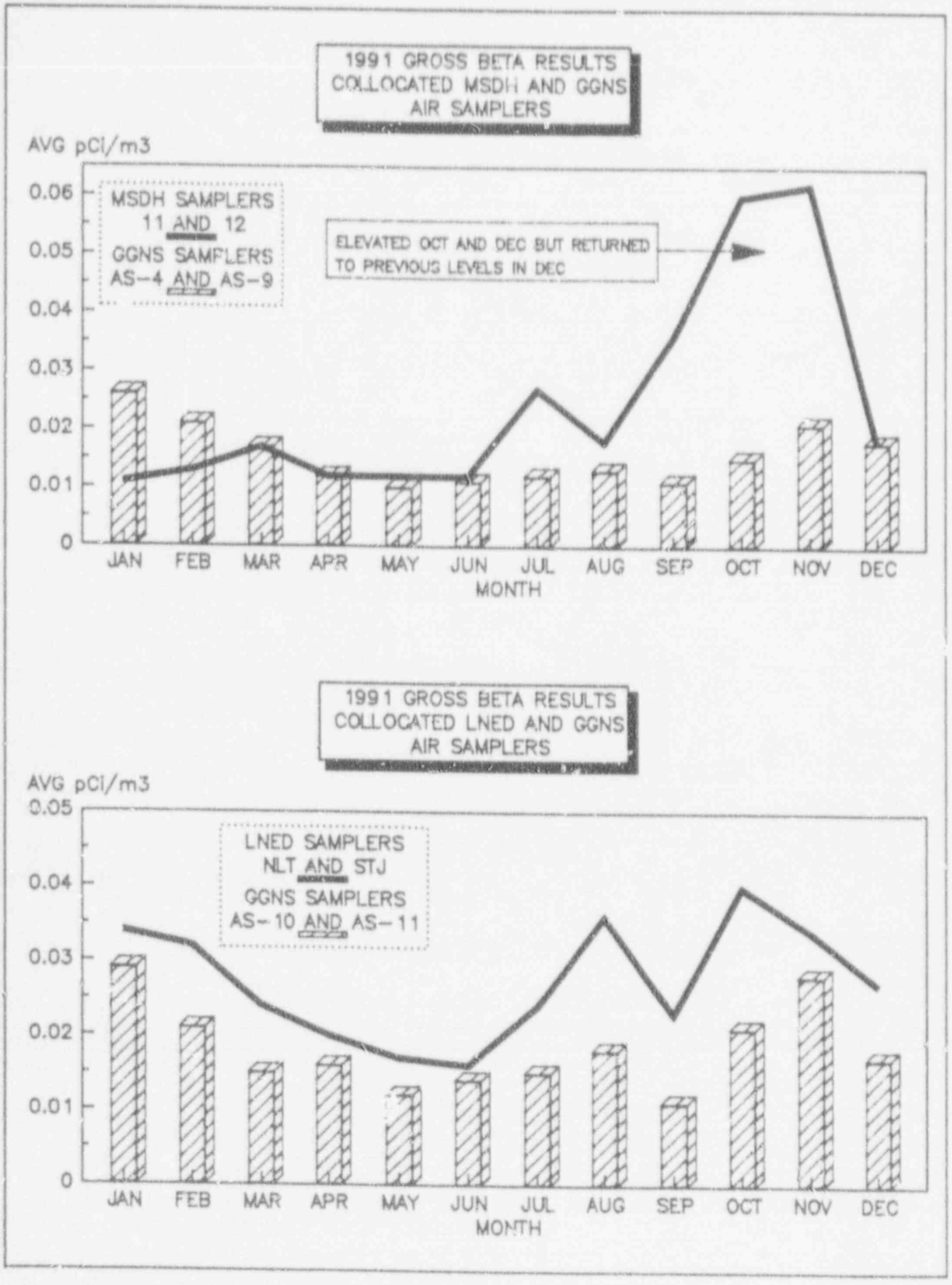


FIGURE 2-2

AIR SAMPLES COLLOCATED



2.2 THERMOLUMINESCENT DOSIMETRY (TLD)

NOTE #1: Analytical results are presented in Attachment II and summarized in Section 4.0.

2.2.1 INTERPRETATIONS AND TRENDS OF RESULTS

Gamma radiation dose in 1991 was similar to that obtained in previous years as illustrated in Table 2-2. This indicates that the ambient radiation levels remained at or near background and have been uninfluenced by the operation of GGNS.

Figure 2-3, which further represents this conclusion, shows 1991 quarterly average results compared to 1979-1984 preoperational data and 1979 - 1991 annual quarterly average results for indicator locations compared to the Vicksburg control. This figure indicates that ambient radiation levels have remained at or near background levels.

As in previous years, Environmental Surveillance Program personnel performed an independent verification of the accuracy of GGNS TLD results through the use of NRC and GGNS collocated TLDs. Figure 2-4 presents NRC and GGNS collocated TLD results and indicates the ESP collects consistent, valid data based on the similarity of TLD results.

2.2.2 DEVIATIONS FROM THE ESP

Due to vandalism or flooding from the Mississippi River during 1991, ESP personnel were unable to find eleven TLDs required by GGNS Technical Specifications. In addition, ESP personnel were unable to place two TLDs in the field due to river flooding during the first quarter of 1991. TLD losses of this type are characteristic of other TLD programs. The 1991 recovery rate for TLDs required by GGNS Technical Specifications was 93% (149 of 160) and is comparable with other TLD programs.

2.2.3 PROGRAM DESCRIPTION

Environmental Surveillance Program personnel measured ambient radiation in the environment surrounding GGNS with 94 TLD cards (calcium sulfate:dysprosium phosphor dosimeters) to provide a quantitative measurement of the area radiation levels. Environmental Surveillance Program personnel placed these environmental TLDs at distances from 0 to 18 miles (Figures 1-3 through 1-5, Table 2-3).

ESP personnel collected dosimeters quarterly.

The criteria used in establishing TLD locations are:

- o GGNS Technical Specification 4.12.1 requires 40 TLDs to be positioned as outlined below:
  - An inner ring of 16 stations in the general area of the site boundary with one TLD in each meteorological sector
  - An outer ring of 16 stations approximately in the 3- to 5-mile range with one TLD in each meteorological sector
  - Eight TLDs located in special interest areas such as population centers and residences or utilized as controls.
- o Twenty-four permanent TLD stations at the protected area boundary.
- o The remaining 30 TLDs in areas away from the GGNS site. These TLDs gather supplemental and supporting data for determining direct radiation dose.

In summary, the TLD locations are as follows:

	No. of Locations
o Technical Specifications requirement	
- Inner Ring	16
- Outer Ring	16
- Population Centers & Controls	8
o Protected Area Boundary	24
o Supplemental Data	30
Total	94

TABLE 2-2

1985-1991 AVERAGE TLD DOSE RATES

Year	Inner Ring, 2-Mile Radius (mR/Qtr)	Outer Ring, 6-Mile Radius (mR/Qtr)	Special Interest Areas (mR/Qtr)	Control (M-14) (mR/Qtr)	On-Site (Protected Area Boundary) (mR/Qtr)	Supplemental Locations (mR/Qtr)
1985	16.1	16.6	17.0	20.1	20.0	18.2
1986	18.6	18.3	18.4	19.8	21.3	19.6
1987	18.3	17.7	17.9	18.8	21.8	18.7
1988	17.8	16.7	17.3	17.5	22.8	17.8
1989	18.0	17.6	18.5	18.2	20.9	18.6
1990	17.2	17.0	17.6	17.5	20.7	17.9
1991	18.1	17.9	17.8	18.0	23.7	18.2

TABLE 2-3

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
M-00	Maintained in lead shield during the exposure period	--	--
*M-01	Across the road from the Lake Claiborne entry gate	E	3.5
M-02	Windsor Ruins entry gate	L	7.0
M-03	Hwy. 61 across from P.G. Country Club entrance	H	7.0
M-04	Hwy. 547 between twin power poles	G	6.5
M-05	Hwy. 18, 5 miles east of Hwy. 61	F	9.0
M-06	REA pole east of Willows beyond Campbell Church, Miss. Hwy. 462	D	10.0
*M-07	Port Gibson City Barn, AS-1	G	5.5
M-08	West side Big Black River, south entrance	C	8.5
*M-09	Tree adjacent to Warner Tully Camp entrance	D	3.5
*M-10	Grand Gulf Military Park entrance gate	R	1.5
M-11	Hwy. 61, 3 miles north of Big Black River at twin tower	C	10.5
M-12	Hwy. 61 at AS-2-61 across from Yokena Church	B	13.0
M-13	West side of Hwy. 61, Letourneau Hill	B	15.0
*M-14 (CONTROL)	Hwy. 61, AS-3-61VA, north of Vicksburg Airport	B	18.0

* Technical Specification requirements

TABLE 2-3

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
M-15	Barge slip (south edge)	P	1.5
*M-16	AS-7-MT, Meteorological Tower	A	0.8
M-17	AS-6-RS, Grand Gulf Road	C	0.5
*M-18	Former railroad crossing eastern SITE BOUNDARY	F	0.5
M-19	Behind burn pit on fence at eastern SITE BOUNDARY	E	0.5
M-20	Eastern SITE BOUNDARY behind hazardous waste storage area	F	0.5
M-21	AS-5-TC, Support Services Center	J	0.4
M-22	100 yards south of former RR entrance crossing on west side	G	0.5
M-23	County Road/Heavy Haul Road 50 yards north on power pole	Q	0.5
M-24	Upper Grand Gulf Landing	R	2.2
*M-25	Hamilton Lake boat launch	N	1.0
M-26	Hamilton Lake outfall	N	1.5
*M-27	South point SITE BOUNDARY 200 yards along property line	M	1.5
*M-28	AS-4-GJOE, Glodjo residence	L	0.9
M-29	In sharp curve of Waterloo Road to Waterloo Plantation	K	1.5
*M-30	Arnold Acres Trailer Park (inactive) entrance	J	1.1
M-31	Duplicate TLD installed quarterly at varying locations	--	--
M-32	Duplicate TLD installed quarterly at varying locations	--	--

* Technical Specification requirements

TABLE 2-3

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
*M-33	Newellton, Louisiana, Water Tower	P	12.5
M-34	Levee at end of County Road at Point Pleasant, Louisiana	R	8.0
M-35	Amacker Landing - Lake Yucatan	Q	8.0
*M-36	Curve on 608, point nearest GGNS at power pole	P	5.0
M-37	Winter Quarters Home	N	8.0
*M-38	Lake Bruin State Park, second pole	M	9.5
*M-39	St. Joseph, Louisiana, Aux. Water Tank	M	13.0
*M-40	International Paper Road, 5 miles from site	M	5.0
*M-41	Heavy Haul Road-J pipe on concrete block	P	1.0
*M-42	Heavy Haul Road north iron gate	Q	1.0
*M-43	Gin Lake entrance	R	1.2
*M-44	Truck bypass on Grand Gulf Road	C	0.5
*M-45	Old Visitor Center gate	D	0.5
*M-46	Church yard across from Grand Gulf/Bald Hill Roads intersection	E	1.0
*M-47	Bridge 0.6 miles west of Rodney Westside Road/ Mont Gomer Road intersection, north side	L	5.2
*M-48	Property line fence 0.4 miles on Mont Gomer Road on west side	K	4.8

* Technical Specification requirements

TABLE 2-3

Page 4 of 6

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
*M-49	Fork in Weathers Road	H	4.5
*M-50	Panola Hunting Club entrance	B	5.5
*M-51	Power pole, 0.5 miles on gravel road to Big Black on west side	C	4.8
*M-52	Power pole, Bald Hill Road	K	1.0
*M-53	Arnold Acres property fence past inactive trailer park	H	1.1
*M-54	Bottom of curve past Arnold's house	G	1.0
*M-55	Behind Bonner's Beauty Shop at MSDH air sampler	D	5.0
*M-56	Hwy. 61 at "All Creatures Veterinary Hospital"	G	5.0
*M-57	Hwy. 61, behind the Welcome to Port Gibson sign at Glensdale Subdivision	F	4.5
*M-58	Hwy. 61, Big Bayou Pierre bridge, southeast end	E	5.0
*M-59	Off levee at Winter Quarters Hunting Camp	N	5.1
M-60	Duplicate TLD installed quarterly at varying locations	--	--
M-61	Protected area fence by vehicle entrance gate	P	Onsite
M-62	Protected area fence northeast corner parking lot	N	Onsite
M-63	Protected area fence middle parking lot	N	Onsite

* Technical Specification requirements

TABLE 2-3

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
M-64	Protected area fence southeast corner parking lot	M	Onsite
M-65	South protected area fence behind warehouse	L	Onsite
M-66	South protected area fence across from cooling tower	K	Onsite
M-67	South protected area fence east end	J	Onsite
M-68	East protected area fence across from chlorination tank	H	Onsite
M-69	East protected area fence near electric bus	G	Onsite
M-70	North fence behind Turbine Building	F	Onsite
M-71	133' elevation railway bay	C	Onsite
M-72	133' elevation railway bay	B	Onsite
M-73	Corner of fence outside Control Building	P	Onsite
M-74	Midway of north fence	P	Onsite
M-75	Corner in fence in front of Maintenance Shop	A	Onsite
M-76	Southeast corner SSW Basins	A	Onsite
M-77	Protected area fence beside Maintenance Shop	R	Onsite
M-78	Outside vault in Admin. Bldg.	Q	Onsite
M-79	Wall in Central Records (middle)	Q	Onsite

TABLE 2-3

Page 6 of 6

TLD LOCATIONS

TLD NO.	LOCATION	SECTOR	MILE
M-80	Wall in Central Records, old library location	Q	Onsite
M-81	Inside Admin. Bldg., 2nd floor, northeast wall	Q	Onsite
M-82	Tech Support area	Q	Onsite
M-83	Tech Support secretary's office	Q	Onsite
M-84	Security Island	P	Onsite
M-85	Lee Electric Building across from Port Gibson High School	G	5.2
*M-86	Bechtel gate north SITE BOUNDARY	B	0.5
M-87	Intersection of Rodney Westside Road & transmission line	J	3.5
*M-88	River mile marker 409.5	A	4.2
*M-89	Middle Ground Island	R	4.4
*M-90	Across from Middle Ground Island	Q	3.5
*M-91	Transmission line by pond	J	4.5
M-92	Fence behind orchard	K	0.4
M-93	Underground cable sign	H	0.4
M-94	Sector R garden	R	0.8

* Technical Specification requirements

FIGURE 2-3

TLDs, RADIATION DOSE

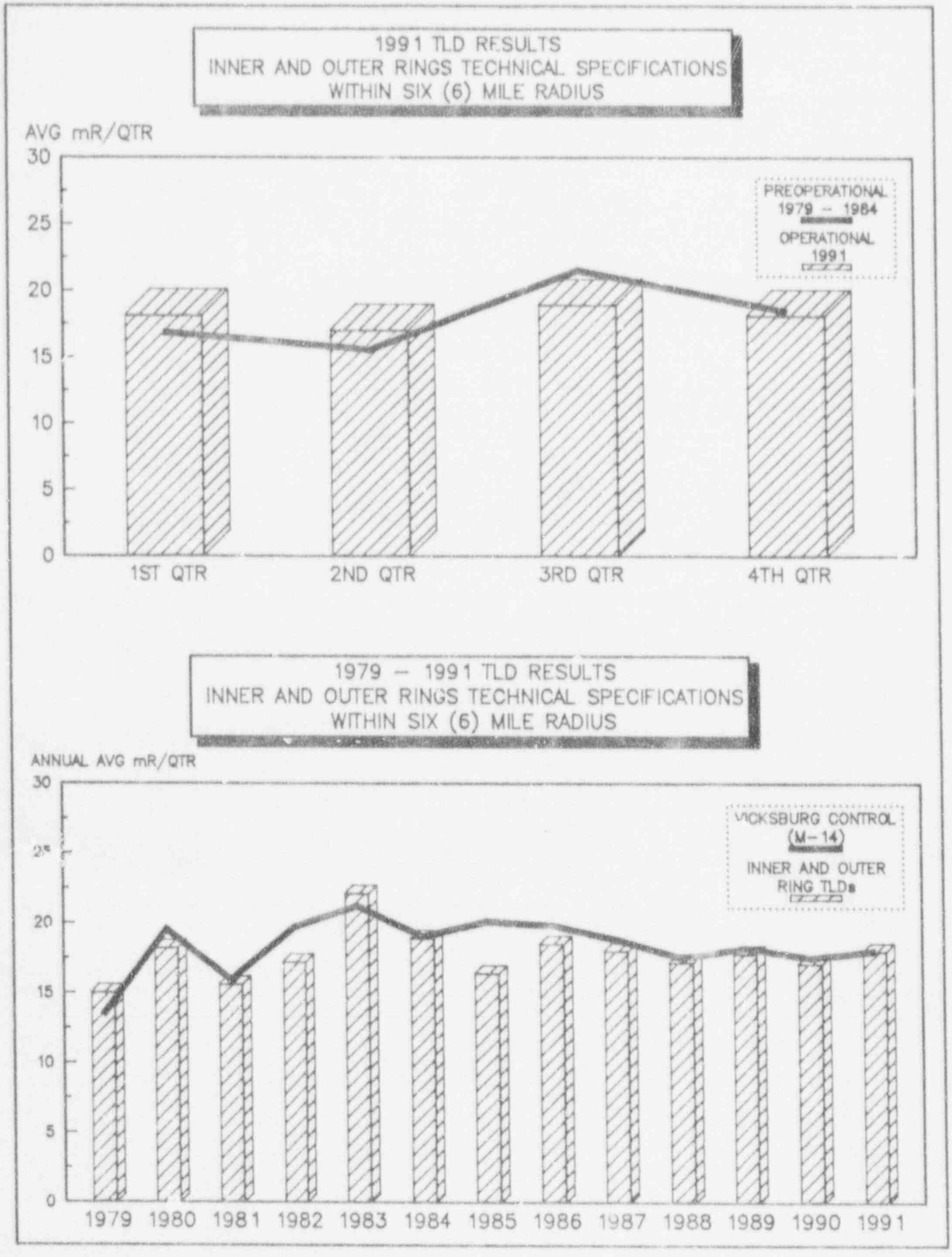
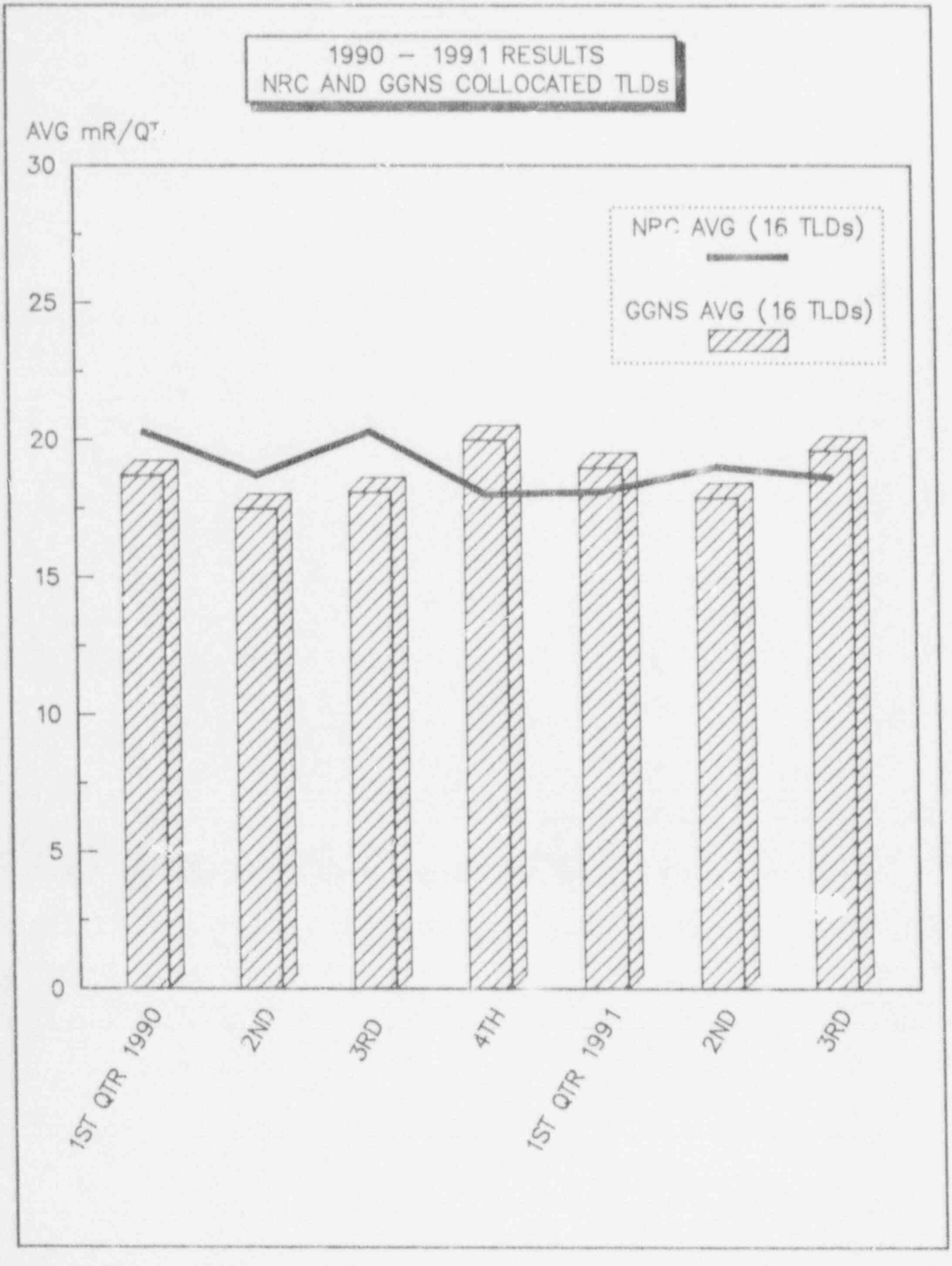


FIGURE 2-4


1990 – 1991 RESULTS
NRC AND GGNS COLLOCATED TLDs
AVG mR/QT
30
25
20
15
10
5
0
NRC AVG (16 TLDs)
GGNS AVG (16 TLDs)
1ST QTR 1990
2ND
3RD
4TH
1ST QTR 1991
2ND
3RD

2.3 MILK

NOTE #1: Analytical results are presented in Table 5.1 of Attachment I and summarized in Section 4.0.

2.3.1 INTERPRETATIONS AND TRENDS OF RESULTS

Milk samples within five miles of the GGNS site were unavailable in 1991 due to the absence of milking animals. Therefore, milk samples from the Alcorn State University control location were collected and analyzed for Iodine-131 and gamma radionuclides. As in previous years, no radioactivity attributable to GGNS was detected in milk samples.

The ingestion pathway shown in Technical Specification Table 3.12.1-1 specifies the frequency and location for obtaining milk samples. If milk sampling is not performed, Table 3.12.1-1 provides for the use of a food product pathway as an alternative. This alternative was utilized in 1991 and is described in Section 2.5 of this report.

2.3.2 DEVIATIONS FROM THE ESP

As noted above, milk samples were unavailable within five miles (8 km) of GGNS in 1991. Therefore, ESP personnel reduced sampling frequency at the Alcorn State University control location to semiannually until such time that milk samples become available within five miles (8 km) of GGNS.

Because of milk unavailability, ESP personnel collected vegetation samples to monitor the ingestion pathway, as specified in Technical Specification 3.12.1-1.

2.3.3 PROGRAM DESCRIPTION

GGNS Technical Specifications required sample collection from milking animals in three locations within a five km distance having the highest dose potential. If there were none, then one

sample was required from milking animals in each of three areas, between five to eight km, where doses were calculated to be greater than one mrem per year. Also required was one control sample at a distance of 15-30 km.

A control milk sample was collected semiannually from the Alcorn State University Dairy (Figure 1-4, Table 2-4) to establish background data. However, milk animals were unavailable in 1991 within eight km (five miles) of GGNS. Therefore, Section 2.5, Vegetation, addresses the unavailability of milk samples within the vicinity of GGNS.

TABLE 2-4

MILK SAMPLING LOCATIONS

Alcorn State University*	Located south-southwes of GGNS (Sector K, Radius 10.5 miles)

* Technical Specification requirements

NOTE

Collected semiannually when milk samples are not available within 5 miles (8 km) of GGNS; required semimonthly when animals are on pasture, monthly at other times, if milk samples become available within 5 miles (8 km) of GGNS.

2.4 WATER

NOTE #1: Analytical results are presented in Tables 2.1 through 4.6 of Attachment I and summarized in Section 4.0.

2.4.1 INTERPRETATIONS AND TRENDS OF RESULTS

Environmental Surveillance Program personnel sampled cistern water, surface water and groundwater as required during 1991. Analytical results were similar to those reported in previous years.

Cistern Water

Cistern water samples were collected and analyzed for gross beta radionuclides, Iodine-131, tritium and gamma radionuclides. As in previous years, concentrations continue to be at background levels.

Surface Water

Surface water samples were collected and analyzed for tritium and gamma radionuclides. As in previous years, concentrations continued to be at background levels.

Tritium levels for Discharge Basin surface water ranged from 819-1340 pCi/l with a mean of 1109 pCi/l. This activity is attributed to plant operating levels and radwaste discharges in 1991. Tritium results from 1985 through 1991 for the Discharge Basin are provided in Figure 2-5.

Tritium at the upstream and downstream Mississippi River locations continues to be at background levels.

Groundwater

Groundwater samples were collected quarterly and analyzed for gamma radionuclides and tritium. As in previous years, concentrations continue to be at background levels.

2.4.2 DEVIATIONS FROM THE ESI

Water samples required by GGNS Technical Specifications were collected and analyzed during 1991 without exception.

2.4.3 PROGRAM DESCRIPTION

Water samples were collected in the vicinity of GGNS for the measurement of radioactivity by the waterborne exposure pathway. Samples were collected in clean, labelled containers which were rinsed with the sample media prior to collection.

Cistern water was sampled monthly at two locations, an indicator location near the site (McGee Cistern) and a control location (Willis Cistern) (Figure 1-3, Table 2-5). Cistern water was analyzed monthly for gross beta radionuclides, Iodine-131 and gamma radionuclides. In addition, a composite was analyzed quarterly for tritium.

Surface water samples from the Mississippi River were collected monthly at points upstream (control location) and downstream (indicator location) of the plant discharge (Figure 1-3, Table 2-5). Surface water was analyzed monthly for gamma radionuclides and a composite was analyzed quarterly for tritium.

An additional surface water sample was taken from the GGNS Discharge Basin. A sample was composited monthly with an automatic sampler that collected a preset volume at hourly intervals. This sample was analyzed monthly for gamma radionuclides and a composite was analyzed quarterly for tritium.

Groundwater was sampled quarterly from three sources (Figures 1-3 and 1-4, Table 2-5). The two sources fulfilling the Technical Specifications requirement were the Arnold Acres Well (indicator location) and the Port Gibson City Well (control location). The other source was a well serving Lake Bruin State Park in Louisiana. Groundwater was analyzed quarterly for gamma radionuclides and tritium.

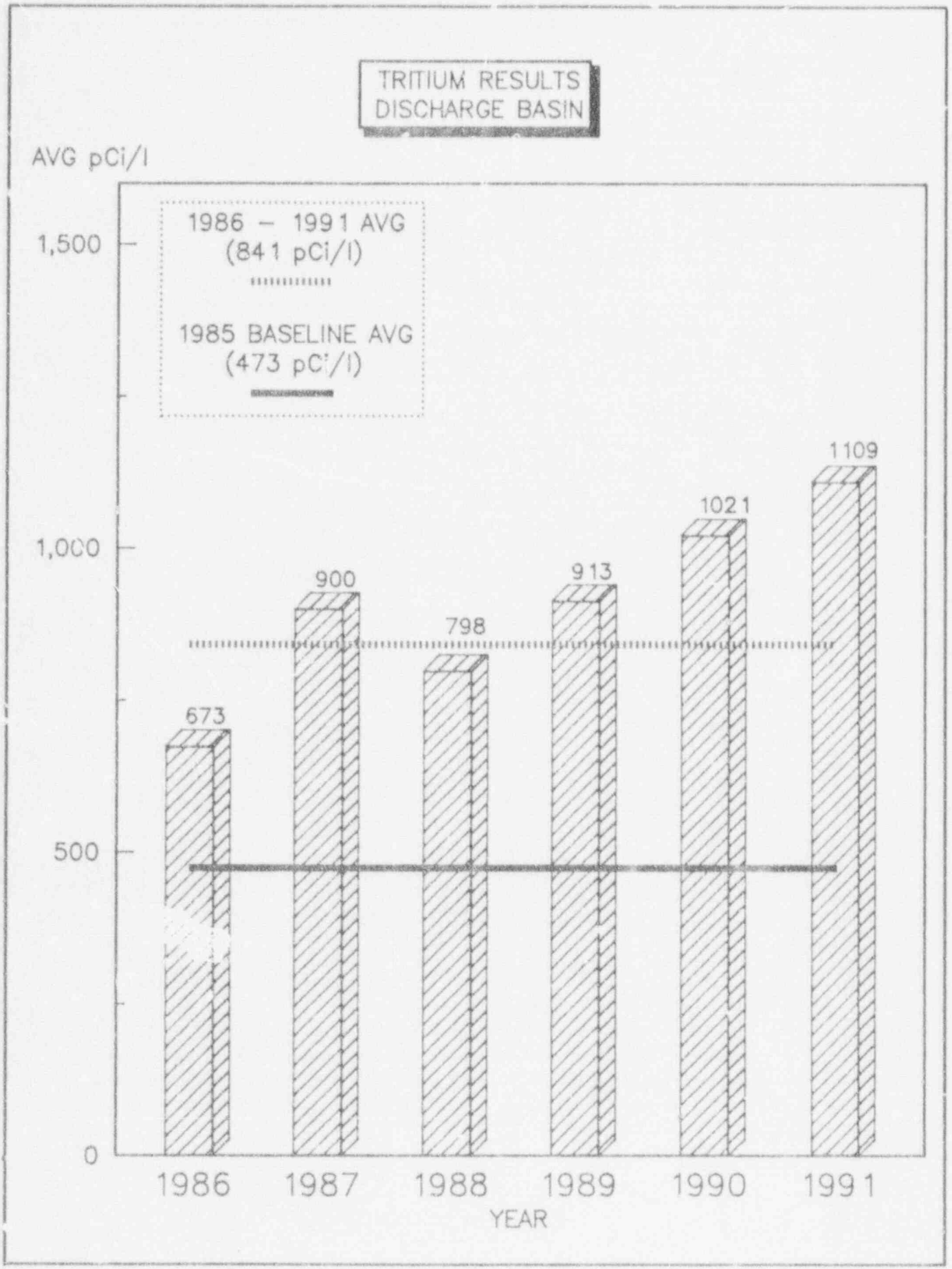
TABLE 2-5

WATER SAMPLING LOCATIONS

	CISTERN WATER
McGee Cistern*	Located north of GGNS at the McGee house (Sector A, Radius 0.9 miles)
Willis Cistern*	Located at the C. E. Willis house east-northeast of GGNS across from the Shiloh Baptist Church (Sector D, Radius 6 miles)
	GROUNDWATER
PGWELL*	Port Gibson Wells - Taken from distribution system or one of the five wells (Sector G, Radius 5.0 miles)
AAWELL*	Arnold Acres Trailer Park, inactive (Sector J, Radius 1.1 miles)
LAKE BRUIN	Taken from faucet at the bath house in Lake Bruin State Park, Louisiana (Sector M, Radius 9.5 miles)
	SURFACE WATER
Upstream*	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)
Downstream*	5000 ft downstream of the GGNS discharge point into the Mississippi River near Radial Well No. 1 (Sector N)
Discharge Basin*	West-northwest of GGNS in parking lot (Sector P, Radius 0.3 miles)

*Technical Specification requirements

FIGURE 2-5


TRITIUM RESULTS
DISCHARGE BASIN
AVG pCi/l
1986 – 1991 AVG
(841 pCi/l)
1985 BASELINE AVG
(473 pCi/l)
1,500
1,000
500
0
673
900
798
913
1021
1109
1986
1987
1988
1989
1990
1991
YEAR

2.5 VEGETATION

NOTE #1: Analytical results are presented in Tables 6.1 through 6.3a of Attachment I and summarized in Section 4.0.

2.5.1 INTERPRETATIONS AND TRENDS OF RESULTS

Vegetation samples were collected and analyzed for gamma radionuclides and Iodine-131. As in previous years, concentrations continue to remain at background levels.

2.5.2 DEVIATIONS FROM THE ESP

Vegetation samples required by GGNS Technical Specifications were collected and analyzed during 1991 without exception.

2.5.3 PROGRAM DESCRIPTION

Since milk samples were unavailable within five miles of GGNS, broadleaf vegetation samples were collected monthly for the measurement of radioactivity by the ingestion exposure pathway. Samples of three different kinds of broadleaf vegetation grown nearest each of two different offsite locations with the highest anticipated annual average groundlevel D/Q were required.

Environmental Surveillance Program personnel met vegetation sampling requirements by maintaining two gardens inside the SITE BOUNDARY, Sectors J and R. These sampling locations (Figure 1-3, Table 2-6) provided a more conservative assessment of doses due to the higher deposition rates (D/Qs) than would be measured at offsite sampling locations.

The GGNS Technical Specifications also required control samples of each of the similar types of onsite vegetation 15-30 km from the site. To fulfill this requirement, a control vegetation sample location has been established in Sector K at Alcorn State University (Table 2-6).

The preferred source of broadleaf vegetation was green-leafy vegetables suitable for human consumption. If such vegetables were not available, samples of any vegetation with relatively broad leaves on which airborne radioactive particulate material might be deposited were sampled. The raw samples were then analyzed for gamma radionuclides and Iodine-131.

TABLE 2-6

VEGETATION SAMPLING LOCATIONS

Broadleaf Vegetation*	South of GGNS near the Support Service Center (Sector J, 0.4 miles)
	North-northwest of GGNS near the Meteorological Tower (Sector R, 0.8 miles)
	Alcorn State University south-southwest of GGNS (Sector K, 10.5 miles) when available, otherwise a location 15-30 km distant

* Technical Specification requirements

2.6 SEDIMENT

NOTE #1: Analytical results are presented in Table 8.1 of Attachment I and summarized in Section 4.0.

2.6.1 INTERPRETATIONS AND TRENDS OF RESULTS

Sediment samples were collected and analyzed for gamma radionuclides. Results for upstream and downstream locations continue to remain at background levels. Results for barge slip locations are discussed below.

An analytical results summary for 1985 through 1991 barge slip sediment samples, which includes semiannual and special samples, is provided in Table 2-7. These radionuclides were not detected prior to 1985, and their presence may be attributed to buildup of very small amounts of particulates.

As shown in Table 2-7, radionuclide concentrations in barge slip sediment appear to be stabilizing. However, as shown in Figure 2-6, previous sampling of the barge slip sediment revealed a wide range of activity. No definite correlation between radionuclide concentrations and plant operating levels, effluent releases or river elevation has been found by ESP personnel.

2.6.2 DEVIATIONS FROM THE ESP

Sediment samples required by GGNS Technical Specifications were collected and analyzed during 1991 without exception.

2.6.3 PROGRAM DESCRIPTION

Sediment samples were collected semiannually at the following locations (Figure 1-3, Table 2-8):

- River shoreline where the plant effluent is discharged (Barge Slip)
- Downstream of the barge slip in the vicinity of the Hamilton Lake outfall (indicator location)
- Upstream from the influence of GGNS discharges (Upper Grand Gulf Landing)

The only sediment sample required by GGNS Technical Specifications is the downstream location (indicator). The upstream location would be classified as a control and the barge slip as an indicator.

Sediment samples were collected near the shoreline from the top one-inch layer of sediment. After foreign objects were discarded, the samples were transferred to clean, labelled containers. The samples were then analyzed for gamma radionuclides.

TABLE 2-7

1985 - 1991 BARGE SLIP SEDIMENT ANALYTICAL SUMMARY

Radionuclide	1985 Mean (pCi/kg)	1986 Mean (pCi/kg)	1987 Mean (pCi/kg)	1988 Mean (pCi/kg)	1989 Mean (pCi/kg)	1990 Mean (pCi/kg)	1991 Mean (pCi/kg)	1985 - 1991 Range (pCi/kg)
Cesium-134	N/A*	N/A*	87	109	104	N/A*	N/A*	72 - 131
Cesium-137	240	99	189	142	159	124	145	34 - 414
Cobalt-58	493	98	103	82	56	39	59	13 - 1050
Cobalt-60	487	263	799	628	736	424	1171	74 - 2878
Chromium-51	N/A*	N/A*	1454	777	199	853	307	168 - 1994
Manganese-54	1293	837	2205	480	734	258	1252	10 - 11240

* None detected

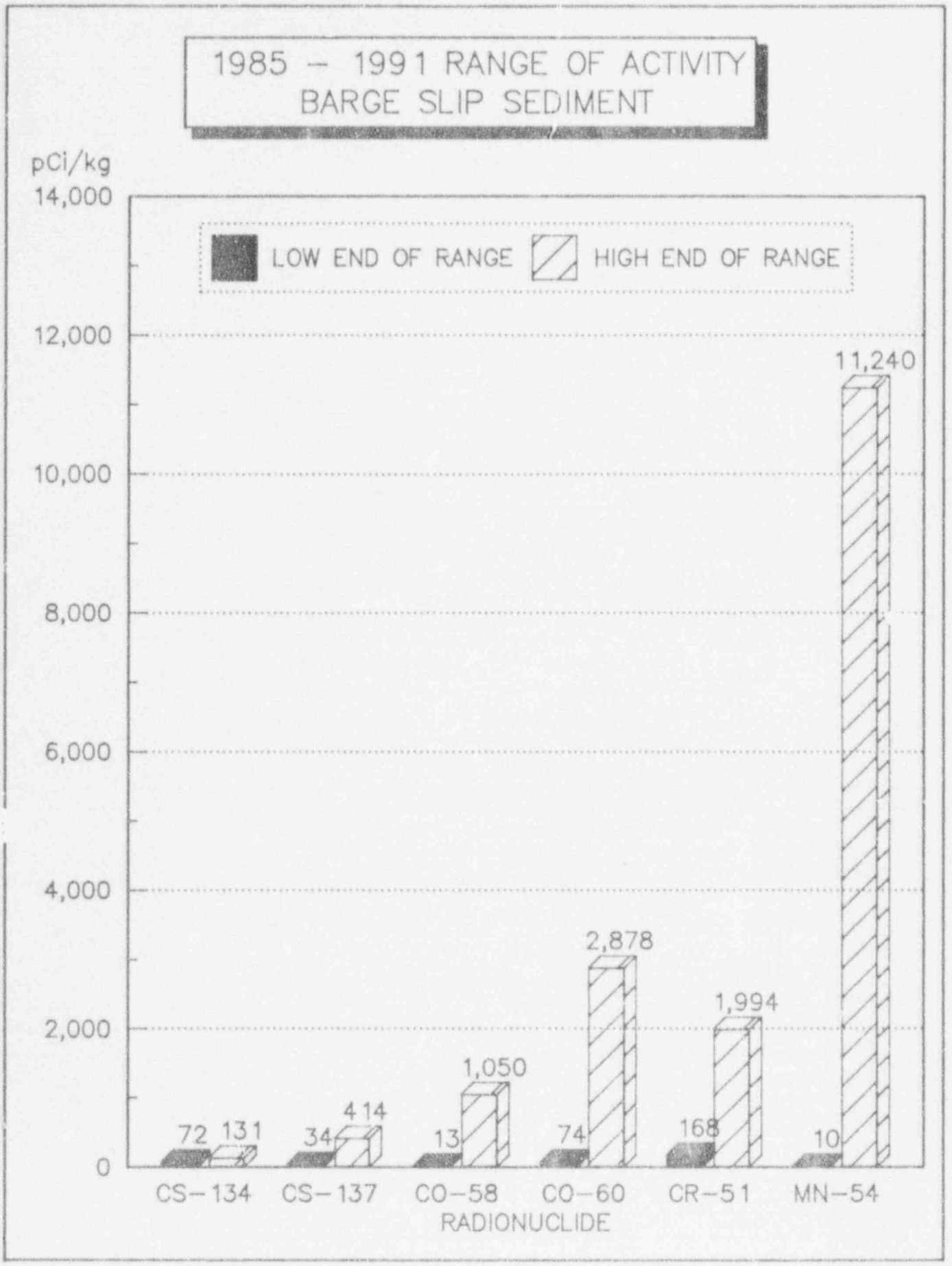
TABLE 2-8

SEDIMENT SAMPLING LOCATIONS

SEDHAM*	Downstream of the GGNS discharge point into the Mississippi River in the vicinity of the boat landing near Hamilton Lake outfall (Sector N, 2 miles)
SEDBAR	Barge slip (Sector Q, 1.5 miles)
SEDCONT	Upstream from the GGNS discharge point into the Mississippi River in the vicinity of Upper Grand Gulf Landing (Sector R, 2 miles)

* Technical Specification requirements

FIGURE 2-6


1985 – 1991 RANGE OF ACTIVITY
BARGE SLIP SEDIMENT
pCi/kg
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
LOW END OF RANGE
HIGH END OF RANGE
72
131
34
414
13
1,050
74
2,878
168
1,994
10
11,240
CS–134
CS–137
CO–58
CO–60
CR–51
MN–54
RADIONUCLIDE

2.7 FISH

NOTE #1: Analytical results are presented in Tables 7.1 and 7.2 of Attachment I and summarized in Section 4.0.

2.7.1 INTERPRETATIONS AND TRENDS OF RESULTS

Fish samples were collected semiannually from two locations and analyzed for gamma radionuclides. Analytical results for fish in 1991 and previous years have shown no data which was attributable to the operation of GGNS.

2.7.2 DEVIATIONS FROM THE ESP

Fish samples required by GGNS Technical Specifications were collected and analyzed during 1991 without exception.

2.7.3 PROGRAM DESCRIPTION

Fish were collected semiannually in the Mississippi River at the following locations (Figure 1-3, Table 2-9):

- Minimum of 1000 yards upstream from the GGNS barge slip (control location)
- Minimum of 2000 but less than 6000 yards downstream from the GGNS barge slip (indicator location)

Fish can be collected by net, trotline, electroshock or purchase from commercial fishermen. If samples were purchased from a commercial fisherman, ESP personnel accompanied the fisherman to ensure samples were collected from the required locations.

A sufficient amount was collected from each location to provide a minimum of 1000 grams (wet weight) of eviscerated fish sample. The samples were then analyzed for gamma radionuclides.

TABLE 2-9

FISH SAMPLING LOCATIONS

Commercially or Recreationally Important Species*	Downstream of the GGNS discharge point into the Mississippi River
	Upstream of the GGNS discharge point into the Missirsippi River uninfluenced by plant operations

* Technical Specification requirements

2.8 SPECIAL SAMPLES

NOTE: Analytical results are presented in Tables 9.1 through 12.1 of Attachment I and summarized in Section 4.0.

2.8.1 INTERPRETATIONS AND TRENDS OF RESULTS

Thirteen special samples were collected during 1991 and analyzed for gamma radionuclides. Descriptions of special samples collected and discussion of results are provided below.

- o Surface Water - Seven samples from three locations in 1991 to provide supplemental information about GGNS effluent and site background radioactive concentrations. A discussion follows.
  - One sample from Outfall 007 - Plant-related radionuclides not detected.
  - Three samples from Outfall 010 - Plant-related radionuclides not detected.
  - Three samples from Barge Slip - Plant-related radionuclides not detected.
- o Sediment - Three sediment samples from two locations to provide supplemental information about GGNS effluents and site background radiation levels. A discussion follows.
  - Two samples from the GGNS barge slip - Results discussed in Section 2.6.
  - One sample at influent end of Sediment Basin B - Plant-related radionuclides not detected.
- o Raw Sewage - Two samples from Unit 1 Sewage Plant (Outfall 010) - Small concentrations of Manganese-54 and Cobalt-60 present. Section 4.0 summarizes the results.
- o Meat - One sample of venison at Bucksnort Hunting Camp - Plant-related radionuclides not detected.

2.8.2 DEVIATIONS FROM THE ESP

Special samples are not a part of the GGNS Technical Specifications requirement. Therefore, deviations from the ESP do not apply.

2.8.3 PROGRAM DESCRIPTION

Special samples were occasionally taken from locations which were not part of the routine ESP 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.

2.9 ANNUAL LAND USE CENSUS

2.9.1 INTERPRETATIONS AND TRENDS OF RESULTS

Although some minor changes occurred from 1990 to 1991, as shown in Table 2-10, there was no need to modify the ESP. Also, there was no identified location which yielded a calculated dose or dose commitment greater than those currently being calculated.

Results of the 1991 Land Use Census indicated land uses in the zero to 5-mile rea surrounding GGNS have remained basically the same as those reported in the 1989 and 1990 Annual Land Use Census. Table 2-11 presents the 1991 Land Use Census data sheets.

2.9.2 DEVIATIONS FROM THE ESP

ESP personnel conducted the Annual Land Use Census as required by GGNS Technical Specifications during 1991 without exception.

2.9.3 PROGRAM DESCRIPTION

ESP personnel conducted an Annual Land Use Census, as required by GGNS Technical Specification 3.12.2. The purpose of the census was to identify changes in uses of land in unrestricted areas surrounding GGNS which would require modifications to the ESP or Offsite Dose Calculation Manual (ODCM). The most important criteria during the census were to determine location, in each of the 16 meteorological sectors, of the nearest:

- Residence
- Animal milked for human consumption
- Garden of greater than 50 m^2 (500 ft^2) producing broadleaf vegetation.

The method for conducting the 1991 Land Use Census was as follows:

- o Environmental Surveillance Program (ESP) personnel conducted field surveys in each meteorological sector out to five miles in order to locate the nearest resident, milk animal and garden.

- o ESP personnel used telephone confirmation in several instances when personal contact could not be made.

- o As a result of these surveys, the following information was obtained/confirmed in each meteorological sector:

  - Nearest permanent residence
  - Nearest unoccupied residence
  - Nearest garden and approximate size
  - Nearest milking animal.

- o ESP personnel identified locations on the map, measured distances to GGNS and recorded results on data sheets.

- o ESP personnel compared 1991 Census results to 1990 Census results.

TABLE 2-10

1990-1991 LAND USE CENSUS CHANGES

SECTOR	PARAMETER	1990 DATA*	1991 DATA*	REASON FOR CHANGE
D	Size Nearest Broadleaf Garden	John H. Jackson 250	John H. Jackson ~ 100	John H. Jackson grew a smaller garden
G	Nearest Occupied Residence	Buckner (David McGee) 3.1	Buckner (Irvin Errington) 3.1	House now rented by I. Errington (Former Buckner property)
G	Nearest Broadleaf Garden	Buckner (S. Lowe) 1000 (Grapes)	Buckner (D. Doyle) ~ 1000 (grapes)	Former Buckner property sold to D. Doyle
H	Nearest Broadleaf Garden	N. Noble 70	L.C. Jones ~ 100	N. Noble ill & no longer grows garden
J	Size Nearest Broadleaf Garden	GGNS (ENV) 2500	*GGNS (ENV) ~ 410	Size measured by R. Buckley & W. Guider
L	Nearest Broadleaf Garden	Papa Johns Bait shop 150	Glodjo (Buddy Roddey) ~	Property in Buddy Roddey's name and he grew a smaller garden
P	Nearest Occupied Residence	None	Wallace Watson	House now occupied by W. Watson
P	Nearest Broadleaf Garden	None	Wallace Watson ~ 50	Garden grown by W. Watson
R	Nearest Broadleaf Garden	GGNS (ENV) 2500	GGNS (ENV) ~ 380	Size measured by R. Buckley & W. Guider

* Distances in kilometers

TABLE 2-11
Page 1 of 5
1991 LAND USE CENSUS

PARAMETER			SECTOR A	SECTOR B	SECTOR C	SECTOR D
I.	Nearest Occupied Residence	a. Distance (km)	1.5	1.2	1.1	4.3
		b. Name	Elizabeth McGee	Prince Dotson	Lanell Frazier	Ethel M. Ryals
		c. Address	Rt. 2, Box 391	Rt 2, Box 392	P. O. Box 33	Rt 2, Box 372B
		d. Number of Occupants	Port Gibson, MS	Port Gibson, MS	Port Gibson, MS	Port Gibson, MS
			1	2	3	6
II.	Nearest Unoccupied Residence	a. Distance (km)	None	None	None	None
III.	Nearest Milk Animal	a. Distance (km)	None	None	None	None
		b. Owner's Name				
		c. Address				
IV.	Nearest Broadleaf Garden	a. Distance (km)	2.6	None	1.1	4.5
		b. Owner's Name	Michael Presson		Lanell Frazier	John H. Jackson
		c. Address	Rt 2, Box 377		P. O. Box 33	Rt 2, Box 171A
		d. Garden Size (r^2)	Port Gibson, MS		Port Gibson, MS	Port Gibson, MS
			~ 50		~ 50	~ 100*
V.	Census Comparison:	a. Is the nearest occupied residence in the same location as last census?	Yes	Yes	Yes	Yes
		b. Is the nearest milk animal in the same location as last census?	N/A	N/A	N/A	N/A
		c. Is the nearest broadleaf garden in the same location as last census?	Yes	N/A	Yes	Yes

*Changed since 1990 census.

TABLE 2-11
Page 2 of 5
1991 LAND USE CENSUS

PARAMETER		SECTOR E	SECTOR F	SECTOR G	SECTOR H
I. Nearest Occupied Residence	a. Distance (km)	1.0	7.0	3.1	1.8
	b. Name	Roy Rogers	Dykes Cupstid	Irvin Errington *	John Nichols
	c. Address	P. O. Box 783	Rt 2. Box 156	Rt 2. Box 415	P. O. Box 417
	d. Number of Occupants	Port Gibson, MS 2	Port Gibson, MS 4	Port Gibson, MS 2	Port Gibson, MS 4
II. Nearest Unoccupied Residence	a. Distance (km)	None	None	None	None
III. Nearest Milk Animal	a. Distance (km)	None	None	None	None
	b. Owner's Name				
	c. Address				
IV. Nearest Broadleaf Garden	a. Distance (km)	1.3	7.8	3.4	6.7
	b. Owner's Name	Hiram Wells	Gerald Baker	Buckner (David Doyle) *	L. C. Jones *
	c. Address	Rt 2. Box 399A	Rt 2. Box 172	Rt 2. Box 416A	P. O. Box 174
	d. Garden Size (m^2)	Port Gibson, MS ~ 100	Port Gibson, MS ~ 50	Port Gibson, MS ~ 1000 (Grapes)	Port Gibson, MS ~ 100
V. Census Comparison:	a. Is the nearest occupied residence in the same location as last census?	Yes	Yes	Yes	Yes
	b. Is the nearest milk animal in the same location as last census?	N/A	N/A	N/A	N/A
	c. Is the nearest broadleaf garden in the same location as last census?	Yes	Yes	Yes	No

*Changed since 1990 census.

TABLE 2-11
Page 3 of 5
1991 LAND USE CENSUS

PARAMETER		SECTOR J	SECTOR K	SECTOR L	SECTOR M
I. Nearest Occupied Residence	a. Distance (km)	5.0	3.5	1.4	None
	b. Name	Steve Price	Jim Cassell, Jr	Glodjo (Buddy Roddey)	
	c. Address	Rt 1, Box 412D	Rt 2, Box 404	Rt 2, Box 401	
	d. Number of Occupants	Port Gibson, MS 2	Port Gibson, MS 4	Port Gibson, MS 4	
II. Nearest Unoccupied Residence	a. Distance (km)	3.8 Bill Cassell House	None	None	None
III. Nearest Milk Animal	a. Distance (km)	None	None	None	None
	b. Owner's Name				
	c. Address				
IV. Nearest Broadleaf Garden	a. Distance (km)	0.6	3.5	1.4	None
	b. Owner's Name	GGNS (Env)	Jim Cassell, Jr	Glodjo * (Buddy Roddey)	
	c. Address	P. O. Box 756	Rt 2, Box 404	Rt 2, Box 401	
	d. Garden Size (m^2)	Port Gibson, MS ~ 410*	Port Gibson, MS ~ 50	Port Gibson, MS ~ 100*	
V. Census Comparison:	a. Is the nearest occupied residence in the same location as last census?	Yes	Yes	Yes	N/A
	b. Is the nearest milk animal in the same location as last census?	N/A	N/A	N/A	N/A
	c. Is the nearest broadleaf garden in the same location as last census?	Yes	Yes	Yes	N/A

*Changed since 1990 census.

TABLE 2-11
Page 4 of 5
1991 LAND USE CENSUS

PARAMETER		SECTOR N	SECTOR P	SECTOR Q	SECTOR R
I. Nearest Occupied Residence	a. Distance (km)	None	7.7	None	1.7
	b. Name		Wallace Watson*		Christin Roddey
	c. Address		P. O. Box 312		Rt 2. Box 390
	d. Number of Occupants		St. Joseph, LA		Port Gibson, MS
			5		2
II. Nearest Unoccupied Residence	a. Distance (km)	2.6 Bucksnort Camp	6.9 Dr. Cobb Hunting Camp	None	None
III. Nearest Milk Animal	a. Distance (km)	None	None	None	None
	b. Owner's Name				
	c. Address				
IV. Nearest Broadleaf Garden	a. Distance (km)	None	7.7	None	1.2
	b. Owner's Name		Wallace Watson*		GGNS (ENV)
	c. Address		P. O. Box 312		P. O. Box 756
	d. Garden Size (m^2)		St. Joseph, LA		Port Gibson, MS
			~ 50		~ 380*
V. Census Comparison:	a. Is the nearest occupied residence in the same location as last census?	N/A	No	N/A	Yes
	b. Is the nearest milk animal in the same location as last census?	N/A	N/A	N/A	N/A
	c. Is the nearest broadleaf garden in the same location as last census?	N/A	No	N/A	Yes

*Changed since 1990 census.

1991 LAND USE CENSUS

VI. Remarks: _____

Census conducted by: Warren Gruber / 11-15-91
Signature / Date

VII. Review:

a. Comparison of previous and present locations:

[ ] No differences

[X] Differences

[ ] Significant

[X] Insignificant

b. Calculations:

[X] Not required

[ ] Required

Completed by: Warren Gruber / 11-21-91
Signature / Date

III. Reviewed/Approved: Rick Buckley for / 11-29-91
Supervisor, Environmental Services / Date

SECTION 3.0

ANALYTICAL PROGRAM TECHNICAL DESCRIPTION

3.1 SAMPLE HANDLING AND TREATMENT

Once a representative sample is received by analytical laboratory, laboratory staff is responsible for properly treating and storing the sample. Environmental samples frequently require treatment prior to analysis. Treatment of the sample after it is received depends on sample and analyses to be performed.

3.1.1 Water Samples

Generally, one-gallon water samples were acidified with five ml of concentrated HCl acid when collected. Samples for tritium analyses should not be stored in polyethylene bottles for more than 3 or 4 months because water can evaporate through polyethylene.

3.1.2 Air Filters

Air filters were handled with care when heavy dust loadings were observed because particulate matter is easily removed from filter. Air filters were normally received by laboratory in plastic containers; some extremely low-level analyses required analysis of the container as well as sample.

3.1.3 Milk

Milk samples were usually refrigerated until analyses could be performed. If analyses were delayed for more than a few days, a preservative (formaldehyde) was added to inhibit bacterial growth and retard spoilage. Milk samples analyzed for Iodine-131 had 100 ml formaldehyde added, of which 40 ml is normally added prior to shipment by customer, to avoid binding of the iodine that may occur with smaller levels of formaldehyde.

3.1.4 Soil and Bottom Sediment

Soil and sediment samples were dried, pulverized and sieved before analysis. To ensure a homogeneous sample, thorough mixing was required.

3.1.5 Other Samples

Perishable samples were preserved by refrigeration or freezing. Vegetation and other samples may need to be dried, pulverized or ashed before or after analysis for long-term storage.

3.2 ANALYSIS OF AIR SAMPLES FOR GROSS ALPHA/BETA RADIONUCLIDES

Air filters were counted in a low-background alpha-beta counter at least 24 hours after collection in order to allow for decay of short-lived materials such as radon and thoron.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

ALPHA RESULT (pCi/m3) $= [(N/T)-(B/t)]/(2.22 \cdot V \cdot E)$

BETA RESULT (pCi/m3) $= [(N/T)-(B/t)-(r)(N/T)]/(2.22 \cdot V \cdot E)$

TWO SIGMA ERROR (pCi/m3) $= 1.96 \sqrt{(N/T^2)+(B/t^2)}/(2.22 \cdot V \cdot E)$

LLD (pCi,m3) $= 4.66 \sqrt{(B)}/(2.22 \cdot V \cdot E \cdot t)$

where:

N	=	Gross counts of sample
T	=	Number of minutes sample was counted
B	=	Counts of blank
t	=	Number of minutes blank was counted
2.22	=	dpm/pCi
V	=	Sample aliquot size (cubic meters)
E	=	Counting efficiency
r	=	Ratio of alpha counts in beta counting (cross-talk)

3.3 ANALYSIS OF WATER SAMPLES FOR GROSS ALPHA/BETA RADIONUCLIDES

Section 3.3 describes process used to measure overall alpha-beta radionuclides of water samples without identifying specific radioactive isotope present. No chemical separation techniques were involved. Two hundred ml of sample was evaporated in a beaker at approximately 100°C. The residue was transferred and dried in a 2-inch stainless steel planchet.

The planchets were counted for 100 minutes in a low-background alpha-beta counting system. Calculation of activity includes a self-absorption correction factor for counter efficiency based on weight of residue on each planchet.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

$$\text{ALPHA RESULT (pCi/l)} = [(N/T)-(B/t)]/(2.22 \cdot V \cdot E)$$

$$\text{BETA RESULT (pCi/l)} = [(N/T)-(B/t)-(r)(N/T)]/(2.22 \cdot V \cdot E)$$

$$\text{TWO SIGMA ERROR (pCi/l)} = 1.96 \sqrt{(N/T^2)+(B/t^2)}/(2.22 \cdot V \cdot E)$$

$$\text{LLD (pCi/l)} = 4.66 \sqrt{(B)}/(2.22 \cdot V \cdot E \cdot t)$$

where:

N	=	Gross counts of sample
T	=	Number of minutes sample was counted
B	=	Counts of blank
t	=	Number of minutes blank was counted
2.22	=	dpm/pCi
V	=	Sample aliquot size (liters)
E	=	Counting efficiency
r	=	Ratio of alpha counts in beta counting (cross-talk)

If net activity (N/T-B/t) was equal to or less than counting error, the activity on collection date was below limits of detection and was designated less than the lower limit of detection (LLD).

3.4 ANALYSIS OF WATER SAMPLES FOR TRITIUM

Five milliliters of water was added to 15 ml of liquid scintillation solution in a 25 ml vial. The sample was inserted into a liquid scintillation spectrometer and counted for 300-500 minutes.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

$$\text{RESULT (pCi/l)} = [(N/T)-(B/t)]/[(2.22 \cdot V \cdot E)\exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR (pCi/l)} = 1.96\sqrt{(N/T^2)+(B/t^2)}/[(2.22 \cdot V \cdot E)\exp(-\lambda \Delta t_2)]$$

$$\text{LLD (pCi/l)} = \frac{4.66\sqrt{B}}{2.22 \cdot E \cdot V \cdot t \cdot \exp(-\lambda \Delta t_2)}$$

where:

N	= Gross counts of sample
T	= Number of minutes sample was counted
B	= Counts of blank
t	= Number of minutes blank was counted
2.22	= dpm/pCi
V	= Sample aliquot size (l)
E	= Counting efficiency
$\exp(-\lambda \Delta t_2)$	= Decay correction where Δt_2 is time elapsed between collection of sample and date of counting.

3.5 ANALYSIS OF SAMPLES FOR IODINE-131

Up to four liters of sample was thoroughly mixed with a stable iodine carrier solution. The sample was then passed through an anion exchange resin column to remove iodine from the sample. The iodine was then stripped from the resin with a sodium hypochlorite solution, reduced with hydroxylamine hydrochloride and extracted into carbon tetrachloride as free iodine. It was then back-extracted into sodium bisulfite solution and was precipitated as silver iodide. The precipitate was weighed to determine chemical yield and mounted on a stainless steel planchet for low-level beta counting. The chemical yield was corrected by measuring the stable iodide content of milk or water with a specific ion electrode.

Calculations of the results, two sigma error and lower limit of detection (LLD) were performed as indicated in the following:

$$\text{RESULT (pCi/l)} = (N/t - B/t)/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR (pCi/l)} = (1.96 \sqrt{(N/t^2)+(B/t^2)})/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

$$\text{LLD (pCi/l)} = (4.66 \sqrt{(B/t^2)})/[(2.22 \cdot E \cdot V \cdot Y)\exp(-\lambda \Delta t_2)]$$

where:

N	= Total counts from sample (counts)
t	= Counting time for sample (min)
B	= Total counts of blank (counts)
2.22	= dpm/pCi
E	= Efficiency of the counter for Iodine I-131 corrected for self absorption effects
V	= Volume of sample analyzed
Y	= Chemical yield of the amount of sample counted
$\exp(-\lambda \Delta t_2)$	= Decay factor from the time of collection to the counting date

3.6 ANALYSIS OF SAMPLES FOR GAMMA RADIONUCLIDES

3.6.1 Milk and Water

A 3.5-liter Marinelli beaker was filled with a representative aliquot of the sample. The sample was then counted for a minimum of 240 minutes, or until required LLDs were achieved, in a shielded Germanium-Lithium (GeLi) detector coupled to a computer-based data acquisition system which performed a pulse height analysis.

A computer software program defined peaks by certain changes in slope of the spectrum. The program also compared energy of each peak with a library of peaks for radionuclide identification and then performed calculation using appropriate fractional gamma ray abundance, half life, detector efficiency and net counts in the peak region.

3.6.2 Vegetation, Food and Garden Crops, and Fish

A maximum quantity of undried vegetation, food or garden crop sample was loaded into a tared 3.5-liter Marinelli beaker and weighed. The sample was then counted for a minimum of 200 minutes, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

As much as possible (up to the total sample) of the edible portion of a fish was loaded into a tared Marinelli beaker and weighed. The sample was then diluted with deionized water to weigh 3.5 kg and counted for a minimum of 240 minutes in a shielded GeLi detector as described in Section 3.6.1.

3.6.3 Soils and Sediments

Soils and sediments were dried at a low temperature (less than 100°C), loaded into a tared 1.0-liter Marinelli beaker and weighed. The sample was then counted for 240 minutes, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

3.6.4 Charcoal Cartridges

Charcoal cartridges were counted in a Marinelli beaker, with one to four cartridges positioned on the face of a GeLi detector and up to seven cartridges on its side. Each detector was calibrated for both top and side positions and a counting efficiency determined. The Iodine-131 detection limit was determined for each charcoal cartridge, assuming no positive results for Iodine-131, by utilizing smallest volume of air recorded for a cartridge within Marinelli

beaker. If Iodine-131 was observed in the screening count of a set of cartridges, each charcoal cartridge was positioned on face of the detector and then counted separately.

3.6.5 Air Particulate

The 12 to 14 (depending on the calendar quarter) air particulate filters for a quarterly composite for each field station were stacked one on top of another and counted for at least four hours, or until required LLDs were achieved, in a shielded GeLi detector as described in Section 3.6.1.

The calculations of results, two sigma error and lower limit of detection (LLD) in pCi/volume or pCi/mass were performed as indicated in the following:

$$\text{RESULT} = (S-B)/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

$$\text{TWO SIGMA ERROR} = (1.96\ \sqrt{S+B})/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

$$\text{LLD} = (4.66\ \sqrt{B}\ )/[(2.22 \cdot T \cdot E \cdot V \cdot F)\ \exp(-\lambda \Delta t_2)]$$

where:

- S = Area, in counts, of sample peak and background (region of spectrum of interest)
- B = Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak
- 2.22 = dpm/pCi
- T = Length of time in minutes the sample is counted
- E = Detector efficiency for energy of interest and geometry of sample
- V = Sample aliquot size (liters, cubic meters, kilograms, or grams)
- F = Fractional gamma abundance (specific for each emitted gamma)
- $\exp(-\lambda \Delta t_2)$ = Decay factor from the time of collection to the counting date

3.7 THERMOLUMINESCENT DOSIMETERS (TLDs)

Environmental radiation doses were measured using TLD cards impregnated with calcium sulfate:dysprosium phosphor sealed in plastic protective holders. These TLD cards had four main readout areas utilized in calculating dose rates and four reserve areas as a backup dosimeter.

Prior to installation cards were spread out in a single layer on a perforated metal tray and annealed for two hours at 250-260°C. After cooling, the cards were mounted in a card holder, sealed in a plastic protective holder and shipped for placement in the field.

Upon return from the field, TLD cards were read in a Teledyne Isotopes Model 8300 TLD Reader. After readout, cards were annealed again and irradiated with a known dose using a Radium-226 source encapsulated in an iridium needle and then read again to determine the card efficiency. The net exposure was calculated by the computer after in-transit exposure was subtracted.

3.8 DATA REPORTING CONVENTIONS

The mean of analytical results is as follows:

$$\bar{X} = \Sigma Xi / n$$

where: $\bar{X}$ = Mean
Xi = Individual sample results
n = Number of sample results

Rounding of calculated values is accomplished by inspection of digits to the right of last reported digit with values less than 5 rounded down and values greater than 5 rounded up. When value equals 5, reported value is rounded to an even number.

Analytical results which are less than the 2 sigma counting error are reported as less than LLD calculated for that sample. Analytical results greater than the 2 sigma counting error are reported along with associated 2 sigma counting error as a plus or minus ($\pm$) term.

Calendar quarters are considered to be the following time periods:

1ST QUARTER = JAN - MAR
2ND QUARTER = APR - JUN
3RD QUARTER = JUL - SEP
4TH QUARTER = OCT - DEC

SECTION 4.0

ENVIRONMENTAL SURVEILLANCE PROGRAM SUMMARY

4.1 1991 PROGRAM RESULTS SUMMARY*

Results of the ESP for 1991 are summarized in Tables 4-1 and 4-2. Sampling locations required by GGNS Technical Specifications, which are identified in Sections 2.1 through 2.7, were used to develop Table 4-1. Table 4-2 includes all sampling locations, not just those required by Technical Specifications.

Indicator and control locations for Table 4-1 are as designated by GGNS Technical Specifications and summarized in Table 4-3. Indicator and control locations for Table 4-2 are listed in Table 4-4. For determining ranges and means for indicator and control locations, values reported as less than (<) were not used.

* Analytical results were provided by Entergy Services, Inc. (ESI) System Chemistry, formerly Arkansas Power & Light Company's Technical Analysis Section, with exception of thermoluminescent dosimeter analysis provided by Teledyne Isotopes Midwest Laboratory.

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(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Air Particulates (pCi/m^3)	GB 259	0.01	.015 (156/156) [.003 - .038]	AS-7 MT (Sector A, 0.8 mi)	.015 (52/52) [.007 - .029]	.017 (102/103) [.002 - .042]	0
	GS 20			AS-8 WR (Sector E, 0.6 mi)	.015 (52/52) [.003 - .038]		0
	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^3)	I-131 259	0.07	<LLD	N/A	N/A	<LLD	0
TLD (Inner Ring) (mR/Qtr.)	Gamma 58	(f)	18.1 (58/58) [12.4 - 23.8]	M-18 (Sector F, 0.5 mi)	22.4 (4/4) [20.3 - 23.6]	N/A	0
TLD (Outer Ring) (mR/Qtr.)	Gamma 58	(f)	17.9 (58/58) [12.8 - 24.7]	M-55 (Sector D, 5.0 mi)	22.9 (4/4) [21.0 - 24.7]	N/A	0
TLD (Special Interest Areas) (mR/Qtr.)	Gamma 27	(f)	17.8 (27/27) [14.8 - 22.2]	M-01 (Sector E, 3.5 mi)	21.3 (4/4) [20.2 - 22.2]	N/A	0
TLD (Control) (mR/Qtr.)	Gamma 4	(f)	N/A	N/A	N/A	18.0 (4/4) [17.2 - 18.4]	0

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				Location [d]	Mean (F) [Range]		
Cistern Water (pCi/l)	GB 24	4	2.7 (2/12) [0.8 - 4.6]	McGee Cistern (Sector A, 0.9 mi)	2.7 (2/12) [0.8 - 4.6]	2.8 (3/12) [0.9 - 4.8]	0
	I-131 24	1.0	<LLD	N/A	N/A	0.6 (1/12) [N/A]	0
	H-3 8	2000	<LLD	N/A	N/A	<LLD	0
	GS 24						
	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
Surface Water (pCi/l)	H-3 12	2000	935 (5/8) [240-1340]	Discharge Basin (Sector P, 0.3 mi)	1109 (4/4) [819-1340]	<LLD	0
	GS 36						
	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

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				Location [d]	Mean (F) [Range]		
Well Water (pCi/l)	H-3 8	2000	390 (1/4) [N/A]	Arnold Acres (Sector J, 1.1 mi)	390 (1/4) [N/A]	<LLD	0
	GS 8						
	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
Milk (pCi/l)	I-131 2	1.0	N/A	N/A	N/A	<LLD	0
	GS 2						
	Cs-134	15	N/A	N/A	N/A	<LLD	0
	Cs-137	18	N/A	N/A	N/A	<LLD	0
	Ba-140	60	N/A	N/A	N/A	<LLD	0
	La-140	15	N/A	N/A	N/A	<LLD	0
Vegetation (pCi/kg wet)	I-131 108	60	<LLD	N/A	N/A	<LLD	0
	GS 108						
	Cs-134	60	<LLD	N/A	N/A	<LLD	0
	Cs-137	80	<LLD	N/A	N/A	<LLD	0

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Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Fish (pCi/kg wet)	GS 4						
	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
Bottom Sediments (pCi/kg dry)	GS 2						
	Cs-134	150	<LLD	N/A	N/A	N/A	0
	Cs-137	180	70 (1/2) [N/A]	Hamilton Lake (Sector N, 2 mi)	70 (1/2) [N/A]	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 Technical Specification Table 4.12.1-1.
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 Technical Specification Table 4.12.1-1.

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Air Particulates (pCi/m^3)	GB 570	0.01	.015 (312/312) [.003 - .038]	AS-4 GJOE (Sector L, 0.9 mi)	.016 (52/52) [.006 - .036]	.017 (255/258) [.002 - .053]	0
				AS-5 TC (Sector J, 0.4 mi)	.016 (52/52) [.006 - .031]		0
	GS 44						
	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^3)	I-131 570	0.07	<LLD	N/A	N/A	<LLD	0
TLD (0-2 Miles) (mR/Qtr.)	Gamma 201	(f)	29.6 (201/201) [10.0 - 89.2]	M-69 (Sector G, Protected Area Boundary)	82.0 (4/4) [68.6 - 89.2]	N/A	0
TLD (2-6 Miles) (mR/Qtr.)	Gamma 80	(f)	17.9 (80/80) [8.6 - 24.7]	M-55 (Sector D, 5.0 mi)	22.9 (4/4) [21.0 - 24.7]	N/A	0
TLD (> 6 Miles) (mR/Qtr.)	Gamma 61	(f)	N/A	N/A	N/A	18.4 (61/61) [13.9 - 22.9]	0

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Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F) [Range]	Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
Cistern Water (pCi/l)	GB 24	4	2.7 (2/12) [0.8 - 4.6]	McGee Cistern (Sector A, 0.9 mi)	2.7 (2/12) [0.8 - 4.6]	2.8 (3/12) [0.9 - 4.8]	0
	I-131 24	1.0	<LLD	N/A	N/A	0.6 (1/12) [N/A]	0
	H-3 8	2000	<LLD	N/A	N/A	<LLD	0
	GS 24						
	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
Surface Water (pCi/l)	H-3 14	2000	935 (5/10) [240-1340]	Discharge Basin (Sector P, 0.3 mi)	1109 (4/4) [819-1340]	<LLD	0
	GS 43						
	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

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Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F) [Range]	Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
Well Water (pCi/1)	H-3 12	2000	390 (1/4) [N/A]	Arnold Acres (Sector J, 1.1 mi)	390 (1/4) [N/A]	467 (2/8) [233-700]	0
	GS 12						
	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	
	Nb-95	15	<LLD	N/A	N/A	<LLD	
	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
Milk (pCi/1)	I-131 2	1.0	N/A	N/A	N/A	<LLD	0
	GS 2						
	Cs-134	15	N/A	N/A	N/A	<LLD	0
	Cs-137	18	N/A	N/A	N/A	<LLD	0
	Ba-140	60	N/A	N/A	N/A	<LLD	0
	La-140	15	N/A	N/A	N/A	<LLD	0
Vegetation (pCi/kg wet)	I-131 108	60	<LLD	N/A	N/A	<LLD	0
	GS 108						
	Cs-134	60	<LLD	N/A	N/A	<LLD	0
	Cs-137	80	<LLD	N/A	N/A	<LLD	0

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Location of Facility Claiborne, Mississippi Reporting Period January - December 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Fish (pCi/kg wet)	GS 4						
	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
Bottom Sediments (pCi/kg dry)	GS 9						
	Mn-54	(f)	1252 (3/7)) [940-1584]	Barge Slip (Sector Q, 1.5 mi)	1252 (3/4) [940-1584]	<LLD	3*
	Co-58	(f)	59 (2/7) [27-90]	Barge Slip (Sector Q, 1.5 mi)	59 (2/4) [27-90]	<LLD	0
	Co-60	(f)	1171 (3/7) [770-1473]	Barge Slip (Sector Q, 1.5 mi)	1171 (3/4) [770-1473]	<LLD	3*
	Cr-51	(f)	307 (2/7) [284-329]	Barge Slip (Sector Q, 1.5 mi)	307 (2/4) [284-329]	<LLD	2*
	Cs-134	150	<LLD	N/A	N/A	<LLD	0
	Cs-137	180	127 (4/7) [70-221]	Barge Slip (Sector Q, 1.5 mi)	145 (3/4) [93-221]	40 (2/2) [34-45]	0

* Concentrations exceeded ten times the control station value (LLD). Regulatory reporting requirements for nonroutine results have not been established.

Table 4-2
Page 5 of 5

ENVIRONMENTAL MONITORING PROGRAM SUMMARY
(All Samples)

Name of Facility Grand Gulf Nuclear Station Docket No. 50-416
Location of Facility Claiborne, Mississippi Reporting Period January - December 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [Range]	Number of Non-Routine Results [e]
				Location [d]	Mean (F) [Range]		
Meat (pCi/kg wet)	GS 1						
	Fe-59	260	<LLD	N/A	N/A	N/A	0
	Zn-65	260	<LLD	N/A	N/A	N/A	0
	Cs-134	130	<LLD	N/A	N/A	N/A	0
	Cs-137	150	<LLD	N/A	N/A	N/A	0
Raw Sewage (pCi/l)	GS 2						
	Mn-54	15	101 (2/2) [43-159]	Unit 1 Sewage Plant (Sector A, 0.3 mi)	101 (2/2) [43-159]	N/A	0
	Fe-59	30	<LLD	N/A	N/A	N/A	0
	Co-58	15	<LLD	N/A	N/A	N/A	0
	Co-60	15	160 (2/2) [64-255]	Unit 1 Sewage Plant (Sector A, 0.3 mi)	160 (2/2) [64-255]	N/A	0
	Zn-65	30	<LLD	N/A	N/A	N/A	0
	Zr-95	30	<LLD	N/A	N/A	N/A	0
	Nb-95	15	<LLD	N/A	N/A	N/A	0
	Cs-134	15	<LLD	N/A	N/A	N/A	0
	Cs-137	18	<LLD	N/A	N/A	N/A	0
	Ba-140	60	<LLD	N/A	N/A	N/A	0
	La-140	15	<LLD	N/A	N/A	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 Technical Specification Table 4.12.1-1.
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 Technical Specification Table 4.12.1-1.

TABLE 4-3

INDICATOR & CONTROL LOCATIONS
(GGNS Technical Specification Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
· AIR	o Indicators - AS-6 RS	52	52 ea. - Gross Beta, I-131; 4-Gamma
	AS-7 MT	52	52 ea. - Gross Beta, I-131; 4-Gamma
	AS-8 WR	52	52 ea. - Gross Beta, I-131; 4-Gamma
	o Control - AS-1 PG	51	51 ea. - Gross Beta, I-131; 4-Gamma
	AS-3 61VA	52	52 ea. - Gross Beta, I-131; 4-Gamma
· TLDs	o Indicators		
	- Inner Ring M-16, 18, 25, 27, 28, 30, 41, 42, 43, 44, 45, 46, 52, 53, 54, 86	58	58-Gamma
	- Outer Ring M-36, 40, 47, 48, 49, 50, 51, 55, 56, 57, 58, 59, 88, 89, 90, 91	58	58-Gamma
	- Special Interest Areas M-01, 07, 09, 10, 33, 38, 39	27	27-Gamma
	o Control - M-14	4	4-Gamma
· WATER	Cistern		
	o Indicator - McGee	12	12 ea. - Gross Beta, I-131, Gamma; 4-Tritium (H-3)
	o Control - Willis	12	12 ea. - Gross Beta, I-131, Gamma; 4-Tritium (H-3)

TABLE 4-3

INDICATOR & CONTROL LOCATIONS
(GGNS Technical Specification Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
WATER (cont'd)	Surface		
	o Indicators -		
	Downstream Mississippi River	12	4-Tritium (H-3); 12-Gamma
	Discharge Basin	12	4-Tritium (H-3); 12-Gamma
	o Control - Upstream Mississippi River	12	4-Tritium (H-3); 12-Gamma
	Groundwater		
	o Indicator - Arnold Acres	4	4 ea. - Tritium (H-3), Gamma
	o Control - Port Gibson City	4	4 ea. - Tritium (H-3), Gamma
MILK	o Indicator - None	N/A	N/A
	o Control - Alcorn State University	2	2 ea. - I-131, Gamma
VEGETATION	o Indicators -		
	Sector J Garden	36	36 ea. - I-131, Gamma
	Sector R Garden	36	36 ea. - I-131, Gamma
	o Control - Sector K (Alcorn State University)	36	36 ea. - I-131, Gamma

TABLE 4-3

INDICATOR & CONTROL LOCATIONS
(GGNS Technical Specification Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
· FISH	o Indicator - Downstream Mississippi River	2	2-Gamma
	o Control - Upstream Mississippi River	2	2-Gamma
· SEDIMENT	o Indicator - Hamilton Lake (SEDHAM)	2	2-Gamma
	o Control (1) - None	N/A	N/A

(1) A control location was not required by GGNS Technical Specifications, but one was collected upstream of the GGNS discharge into the Mississippi River.

TABLE 4-4

INDICATOR & CONTROL LOCATIONS
(All Samples)

Sample Type	Locations		Total No. of Samples	Total No. & Type of Analyses
AIR	o Indicators	AS-4 GJOE	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-5 TC	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-6 RS	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-7 MT	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-8 WR	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-9 GGMP	52	52 ea. - Gross Beta, I-131; 4-Gamma
	o Controls -	AS-1 PG	51	51 ea. - Gross Beta, I-131; 4-Gamma
		AS-2 61N	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-3 61VA	52	52 ea. - Gross Beta, I-131; 4-Gamma
		AS-10 NLT	51	51 ea. - Gross Beta, I-131; 4-Gamma
		AS-11 STJ	52	52 ea. - Gross Beta, I-131; 4-Gamma
TLDs	o Indicators			
	- 0-2 Miles M-10, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 41, 42, 43, 44, 45, 46, 52, 53, 54, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 86, 92, 93, 94		201	201-Gamma
	- 2-6 Miles M-01, 07, 09, [illegible], 36, 40, 47, 48, 49, 50, 51, 5[illegible]6, 57, 58, 59, 85, 87, 88, 89, 90, 91		80	80-Gamma

TABLE 4-4

INDICATOR & CONTROL LOCATIONS
(All Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
· TLDs (cont'd)	o Controls		
	- >6 Miles M-02, 03, 04, 05, 06, 08, 11, 12, 13, 14, 33, 34, 35, 37, 38, 39	61	61-Gamma
· WATER	Cistern		
	o Indicator - McGee	12	12 ea. - Gross Beta, I-131, Gamma; 4-Tritium (H-3)
	o Control - Willis	12	12 ea. - Gross Beta, I-131, Gamma; 4-Tritium (H-3)
	Surface		
	o Indicators -		
	Downstream Ms. River	12	12-Gamma; 4-Tritium (H-3)
	Discharge Basin	12	12-Gamma; 4-Tritium (H-3)
	Outfall 007 (1)	1	1-Gamma
	Outfall 010 (1)	3	3-Gamma
	Barge Slip (1)	3	3-Gamma; 2-Tritium (H-3)
	o Controls -		
	Upstream Mississippi River	12	12-Gamma; 4-Tritium (H-3)

TABLE 4-4

INDICATOR & CONTROL LOCATIONS
(All Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
WATER (cont'd)	Groundwater		
	o Indicator -		
	Arnold Acres	4	4 ea. - Tritium (H-3), Gamma
	o Controls -		
	Port Gibson City	4	4 ea. - Tritium (H-3), Gamma
	Lake Bruin State Park	4	4 ea. - Tritium (H-3), Gamma
MILK	o Indicator - None	N/A	N/A
	o Control - Alcorn State University	2	2 ea. - I-131, Gamma
VEGETATION	o Indicators -		
	Sector J Garden	36	36 ea. - I-131, Gamma
	Sector R Garden	36	36 ea. - I-131, Gamma
	o Control - Sector K (Alcorn State University)	36	36 ea. - I-131, Gamma
FISH	o Indicator - Downstream Mississippi River	2	2-Gamma
	o Control - Upstream Mississippi River	2	2-Gamma

TABLE 4-4

INDICATOR & CONTROL LOCATIONS
(All Samples)

Sample Type	Locations	Total No. of Samples	Total No. & Type of Analyses
SEDIMENT	o Indicators -		
	Hamilton Lake (SEDHAM)	2	2-Gamma
	Barge Slip (SEDBAR)	2	2-Gamma
	Barge Slip (1)	2	2-Gamma
	Basin B (1)	1	1-Gamma
	o Control - Upstream Mississippi River (SEDCONT)	2	2-Gamma
MEAT	o Indicator - Sector N (Bucksnort Hunting Camp) (1)	1	1-Gamma
	o Control - None	N/A	N/A
SEWAGE	o Indicator - Unit 1 Sewage Plant (Outfall 010) (1)	2	2-Gamma
	o Control - None	N/A	N/A

(1) Special samples

SECTION 5.0

QUALITY CONTROL DATA

5.1 CROSSCHECK PROGRAM RESULTS

Entergy Services, Inc. (ESI) System Chemistry, formerly Arkansas Power & Light's Technical Analysis Section, analyzed Environmental Protection Agency (EPA) crosscheck samples for GGNS. These results are provided in Attachment I, 1991 Environmental Sampling and Analytical Report. ESI System Chemistry's analysis participation, shown in Figure 5-1, indicate that consistent, valid data is reported based on acceptable sample results that fall within the three standard deviation range.

Teledyne Isotopes Midwest Laboratory provided thermoluminescent dosimeter (TLD) analytical capabilities. Attachment II contains the most recent results obtained through Teledyne's participation in the International Intercomparison of Environmental Dosimeters. Results were within the acceptable range of known value.

5.2 DUPLICATE SAMPLES

Results for duplicate samples of water, milk, fish, sediment and vegetation media submitted by GGNS to ESI System Chemistry are included in Attachment I. These results are in the appropriate tables and identified by the suffix (GG) accompanying the laboratory number. Table 5-1 summarizes results of the ESP duplicate sampling for 1991.

A graph presents results for duplicate TLDs from 1990 through 1991 in Figure 5-2. This figure, which is based on averaging the three duplicate and permanent TLD location results, shows that consistent, valid data is being reported based on similarity of results.

Table 5-1
Page 1 of 4
DUPLICATE SAMPLING PROGRAM SUMMARY

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range] For Duplicates	Indicator Locations Mean (F) [c] [Range] For Samples	Control Locations Mean (F) [Range] For Duplicates	Control Locations Mean (F) [Range] For Samples
TLD (0-2 Miles) (mR/Qtr)	Gamma 8	(d)	18.8 (8/8) [15.8 - 22.1]	20.2 (8/8) [15.8 - 23.8]	N/A	N/A
TLD (2-6 Miles) (mR/Qtr)	Gamma 0	(d)	N/A	N/A	N/A	N/A
TLD (>6 Miles) (mR/Qtr)	Gamma 4	(d)	N/A	N/A	16.6 (4/4) [14.2 - 18.4]	17.5 (4/4) [16.1-18.4]
Cistern Water (pCi/l)	GB 4	4	<LLD	<LLD	<LLD	<LLD
	I-131 4	1.0	<LLD	<LLD	0.9 (1/12) [N/A]	<LLD (<0.9)
	H-3 4	2000	<LLD	<LLD	<LLD	<LLD
	GS 4					
	Mn-54	15	<LLD	<LLD	<LLD	<LLD
	Fe-59	30	<LLD	<LLD	<LLD	<LLD
	Co-58	15	<LLD	<LLD	<LLD	<LLD
	Co-60	15	<LLD	<LLD	<LLD	<LLD
	Zn-65	30	<LLD	<LLD	<LLD	<LLD
	Zr-95	30	<LLD	<LLD	<LLD	<LLD
	Nb-95	15	<LLD	<LLD	<LLD	<LLD
	Cs-134	15	<LLD	<LLD	<LLD	<LLD
	Cs-137	18	<LLD	<LLD	<LLD	<LLD
	Ba-140	60	<LLD	<LLD	<LLD	<LLD
	La-140	15	<LLD	<LLD	<LLD	<LLD

Table 5-1
Page 2 of 4
DUPLICATE SAMPLING PROGRAM SUMMARY

Sample Type (Units)	Type and Number a of Analyses	b LLD	Indicator Locations Mean (F) c [Range] For Duplicates	Indicator Locations Mean (F) c [Range] For Samples	Control Locations Mean (F) [Range] For Duplicates	Control Locations Mean (F) [Range] For Samples
Surface Water (pCi/l)	H-3 10	2000	776 (3/6) [290-1280]	767 (3/6) [240-1242]	<LLD	<LLD
	GS 6					
	Mn-54	15	<LLD	<LLD	<LLD	<LLD
	Fe-59	30	<LLD	<LLD	<LLD	<LLD
	Co-58	15	<LLD	<LLD	<LLD	<LLD
	Co-60	15	<LLD	<LLD	<LLD	<LLD
	Zn-65	30	<LLD	<LLD	<LLD	<LLD
	Zr-95	30	<LLD	<LLD	<LLD	<LLD
	Nb-95	15	<LLD	<LLD	<LLD	<LLD
	Cs-134	15	<LLD	<LLD	<LLD	<LLD
	Cs-137	18	<LLD	<LLD	<LLD	<LLD
	Ba-140	60	<LLD	<LLD	<LLD	<LLD
	La-140	15	<LLD	<LLD	<LLD	<LLD
Well Water (pCi/l)	H-3 3	2000	<LLD	<LLD	<LLD	<LLD
	GS 3					
	Mn-54	15	<LLD	<LLD	<LLD	<LLD
	Fe-59	30	<LLD	<LLD	<LLD	<LLD
	Co-58	15	<LLD	<LLD	<LLD	<LLD
	Co-60	15	<LLD	<LLD	<LLD	<LLD
	Zn-65	30	<LLD	<LLD	<LLD	<LLD
	Zr-95	30	<LLD	<LLD	<LLD	<LLD
	Nb-95	15	<LLD	<LLD	<LLD	<LLD
	Cs-134	15	<LLD	<LLD	<LLD	<LLD
	Cs-137	18	<LLD	<LLD	<LLD	<LLD
	Ba-140	60	<LLD	<LLD	<LLD	<LLD
	La-140	15	<LLD	<LLD	<LLD	<LLD
Milk (pCi/l)	I-131 1	1.0	N/A	N/A	<LLD	<LLD
	GS 1					
	Cs-134	15	N/A	N/A	<LLD	<LLD
	Cs-137	18	N/A	N/A	<LLD	<LLD
	Ba-140	60	N/A	N/A	<LLD	<LLD
	La-140	15	N/A	N/A	<LLD	<LLD

Table 5-1
Page 3 of 4
DUPLICATE SAMPLINC PROGRAM SUMMARY

Sample Type (Units)	Type and Number a of Analyses	b LLD	Indicator Locations Mean (F) c [Range] For Duplicates	Indicator Locations Mean (F) c [Range] For Samples	Control Locations Mean (F) [Range] For Duplicates	Control Locations Mean (F) [Range] For Samples
Vegetation (pCi/kg wet)	I-131 12	60	<LLD	<LLD	<LLD	<LLD
	GS 12					
	Cs-134	60	<LLD	<LLD	<LLD	<LLD
	Cs-137	80	<LLD	<LLD	<LLD	<LLD
Fish (pCi/kg wet)	GS 2					
	Mn-54	130	<LLD	<LLD	<LLD	<LLD
	Fe-59	260	<LLD	<LLD	<LLD	<LLD
	Co-58	130	<LLD	<LLD	<LLD	<LLD
	Co-60	130	<LLD	<LLD	<LLD	<LLD
	Zn-65	260	<LLD	<LLD	<LLD	<LLD
	Cs-134	130	<LLD	<LLD	<LLD	<LLD
	Cs-137	150	<LLD	<LLD	<LLD	<LLD
Meat (pCi/kg wet)	GS 1					
	Fe-59	260	<LLD	<LLD	N/A	N/A
	Zn-65	260	<LLD	<LLD	N/A	N/A
	Cs-134	130	<LLD	<LLD	N/A	N/A
	Cs-137	150	<LLD	<LLD	N/A	N/A

Table 5-1
Page 4 of 4
DUPLICATE SAMPLING PROGRAM SUMMARY

Sample Type (Units)	Type and Number a of Analyses	b LLD	Indicator Locations Mean (F) c [Range] For Duplicates	Indicator Locations Mean (F) c [Range] For Samples	Control Locations Mean (F) [Range] For Duplicates	Control Locations Mean (F) [Range] For Samples
Bottom Sediments (pCi/kg dry)	GS 3					
	Mn-54	(d)	139. (1/2) [N/A]	1231 (1/2) [N/A]	<LLD	<LLD
	Co-58	(d)	<LLD	<LLD	<LLD	<LLD
	Co-60	(d)	2084 (1/2) [N/A]	1271 (1/2) [N/A]	<LLD	<LLD
	Cr-51	(d)	358 (1/2) [N/A]	329 (1/2) [N/A]	<LLD	<LLD
	Cs-134	150	<LLD	<LLD	<LLD	<LLD
	Cs-137	180	143 (1/2) N/A	122 (1/2) [N/A]	24 (1/1) [N/A]	34 (1/1) [N/A]

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 Technical Specification Table 4.12.1-1.
c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).
d LLD not defined in GGNS Technical Specification Table 4.12.1-1.

FIGURE 5-1

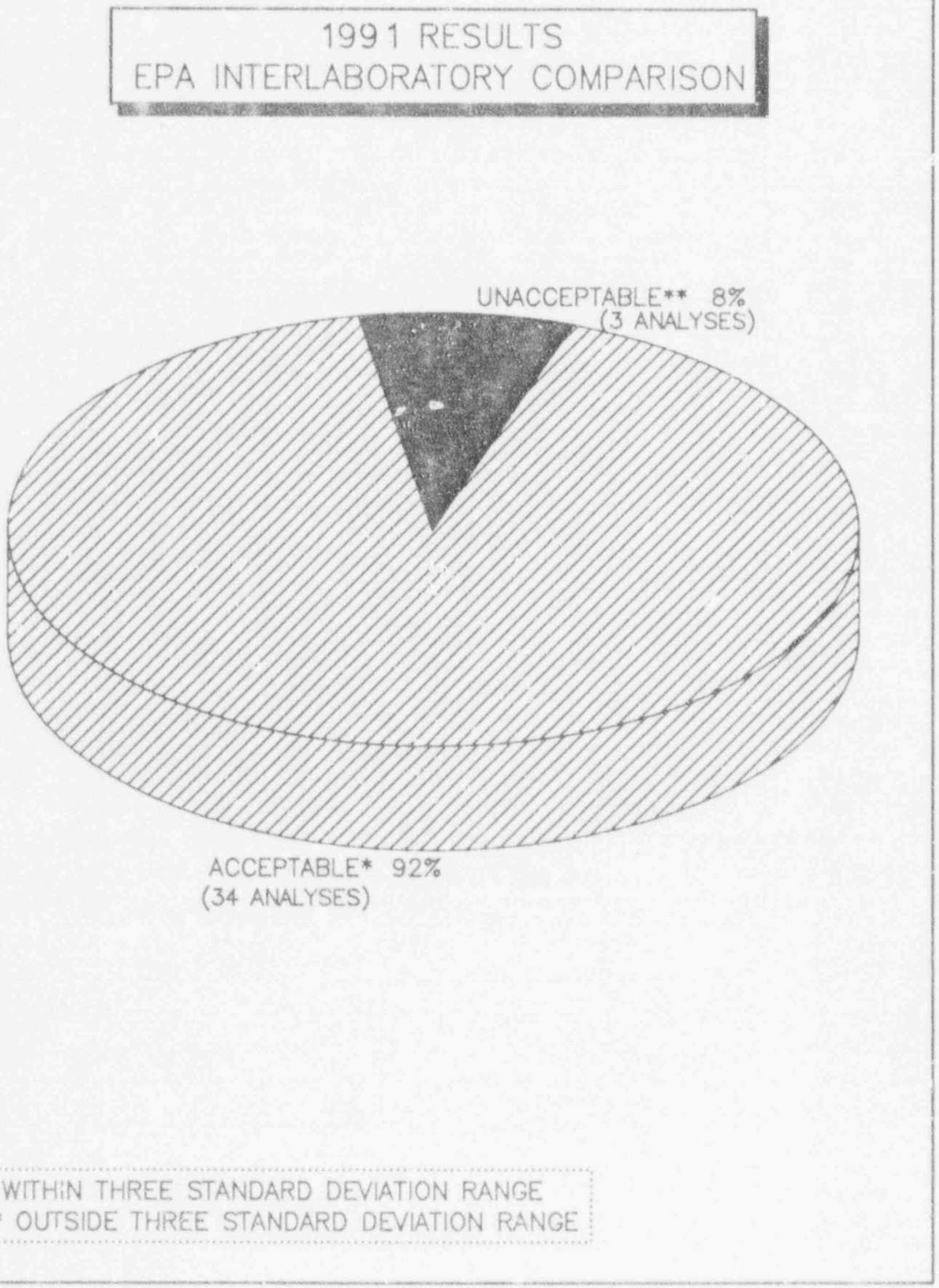
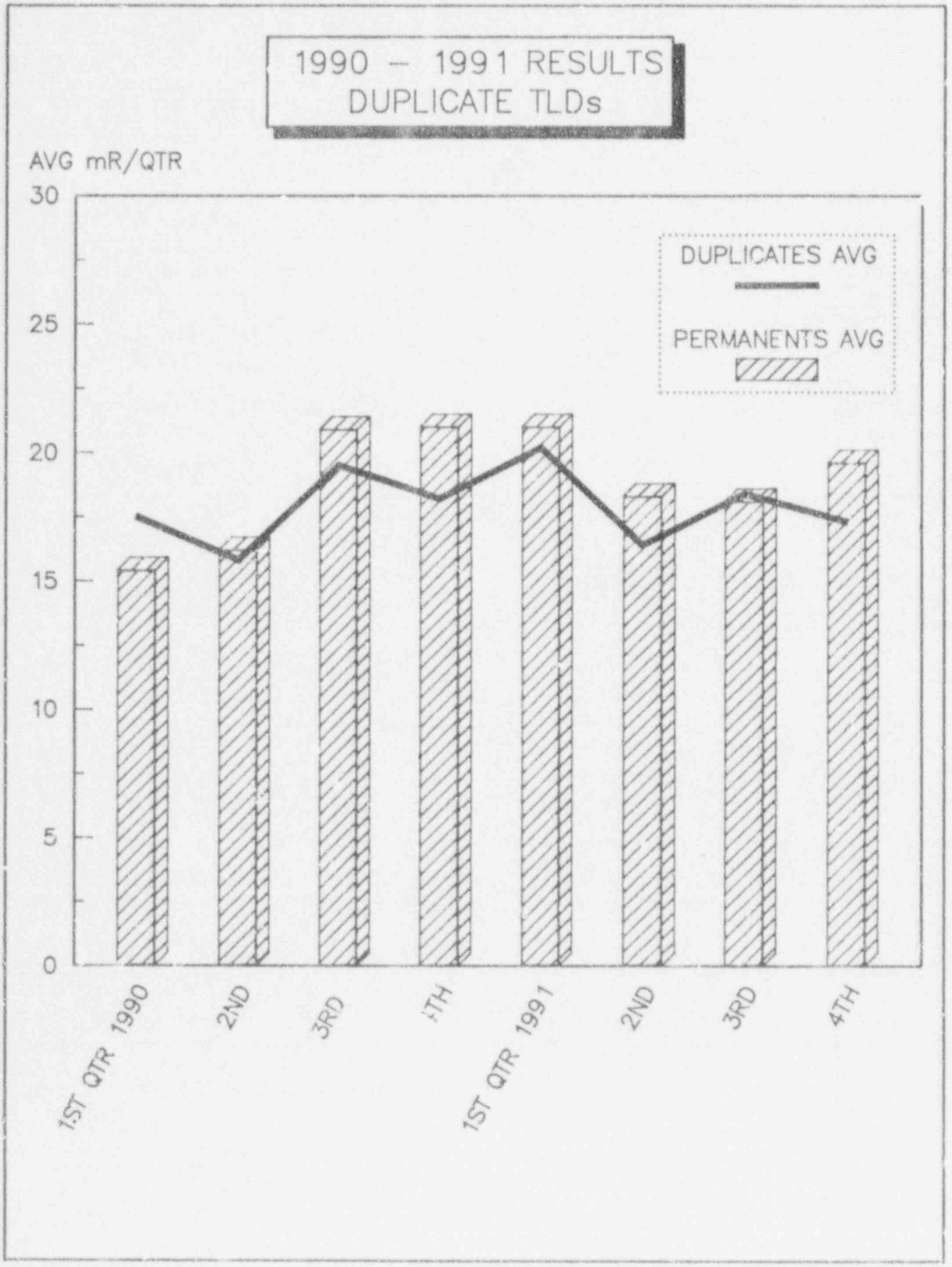

1991 RESULTS
EPA INTERLABORATORY COMPARISON
UNACCEPTABLE** 8%
(3 ANALYSES)
ACCEPTABLE* 92%
(34 ANALYSES)
* WITHIN THREE STANDARD DEVIATION RANGE
** OUTSIDE THREE STANDARD DEVIATION RANGE

FIGURE 5-2


1990 – 1991 RESULTS
DUPLICATE TLDs
AVG mR/QTR
30
25
20
15
10
5
0
DUPLICATES AVG
PERMANENTS AVG
1ST QTR 1990
2ND
3RD
4TH
1ST QTR 1991
2ND
3RD
4TH

SECTION 6.0

1991 SAMPLING AND ANALYTICAL RESULTS

6.1 1991 DATA

Attachments I and II present data obtained by Entergy Services, Inc (ESI) System Chemistry, formerly Arkansas Power and Light's Technical Analysis Section and Teledyne Isotopes Midwest Laboratory on samples collected from January through December 1991. Data was provided by ESI System Chemistry in monthly progress reports with exception of thermoluminescent dosimeters (TLDs). Teledyne Isotopes provided TLD data in quarterly reports.

Data presented in Attachments I and II is comparable to that encountered in previous years.

6.2 LOWER LIMIT OF DETECTION (LLD)

In many analyses, the LLD achieved by ESI System Chemistry was lower than maximum LLD permitted by GGNS Technical Specification Table 4.12.1-1. Factors such as unavoidable small sample size, background fluctuations, presence of interfering radionuclides or other uncontrollable circumstances may cause Technical Specifications' LLD to be unachievable. However, in 1991 all Technical Specification LLDs were achieved.

6.3 REPORTING LEVELS

Radioactivity attributable to GGNS was found in the discharge basin water, sewage sludge and barge slip sediment. However, no reporting levels for radioactivity concentration in environmental samples, as outlined in Technical Specifications Table 3.12.1-2 when averaged over any calendar quarter, were equaled or exceeded due to GGNS effluents. One radionuclide (Chromium-51), which is not listed in GGNS Technical Specifications Table 3.12.1-2, was detected during 1991 in the barge slip sediment. However, the quantity detected was not capable of causing a dose to a member of the public exceeding calendar year limits of Technical Specifications 3.11.1.2 of $\leq$ 3 millirem total

body and ≤ 10 millirem any organ as calculated by the following generalized equation found in Regulatory Guide 1.109, Appendix A:

$$R = (40)\,(C)\,(U)\,(D)\,(W)$$

where:
- R = Annual dose to skin or total body in mrem/year;
- 40 = Area-mass conversion factor given in Appendix A of Regulatory Guide 1.109 in Kg/m^2;
- C = 1991 maximum radionuclide concentration (329) in pCi/kg;
- U = Maximum exposure time given in Table E-5 of Regulatory Guide 1.109 (67 hours for a teenager);
- D = External dose conversion factor for standing on contaminated ground given in Table E-6 of Regulatory Guide 1.109 (2.60 E-10 for skin and 2.20 E-10 for total body) in mrem/hr per pCi/m^2, and
- W = Shore-width factor (0.1) given in Table A-2 of Regulatory Guide 1.109.

The maximum annual dose to a teenager spending 67 hours at the barge slip shoreline was calculated to be approximately .000023 millirem to the skin and .000019 millirem to the total body. Therefore, the radiological impact to environment or public from Chromium-51 is insignificant and no Radiological Monitoring Program Special Reports were required.

6.4 SAMPLING DEVIATIONS

Samples required by GGNS Technical Specification 3.12.1 were collected within the scheduled period unless noted otherwise in Attachments I and II.

Sample deviations at locations required by GGNS Technical Specifications are discussed in Sections 2.1 through 2.7. These sections provide more explanation concerning reasons why samples were missed and describes corrective action where appropriate.

6.5 RADIOACTIVITY NOT ATTRIBUTABLE TO GGNS

Radioactivity attributable to other sources has been detected twice by the GGNS ESE. In early 1980, the 25th Chinese nuclear test explosion was detected. In 1986, the radioactive plume release due to reactor core degradation at Chernobyl Nuclear Power Plant was detected.

6.6 SAMPLING RELOCATION

Sampling locations did not change in 1991. Therefore, there was no need to identify new locations and report circumstances of unavailability in the Semiannual Radioactive Effluent Release Report.

6.7 COMPARISON TO FEDERAL AND STATE PROGRAMS

Data from the GGNS ESP was compared to federal and state monitoring programs as results became available. The federal monitoring program used for comparison was the U.S. Nuclear Regulatory Commission (NRC) TLD Direct Radiation Monitoring Network. The state programs are conducted by the Mississippi State Department of Health, Division of Radiological Health, and the Louisiana Department of Natural Resources, Nuclear Energy Division.

The latest available results from the NRC TLD Network have been comparable to those from the GGNS ESP. These results cover 33 TLD locations, 16 of which are collocated. On the average, collocated TLDs have produced similar results. Prior to 1991, no change in collocated TLD results has been attributed to GGNS operation.

Radiological monitoring by Mississippi and Louisiana agencies entails similar sampling requirements as the GGNS ESP. In many cases air samples and TLDs are collocated, while sample media such as vegetation, water, sediment, fish and milk are shared or split. Through 1991, all three programs have obtained results that are within similar ranges. The only common location where radioactivity attributable to GGNS has been detected is the GGNS barge slip. Barge slip sediment results were above background due to GGNS effluents.

6.8 UNAVAILABLE RESULTS

Analytical contractor results were received in adequate time for inclusion. No missing results were identified during ESP personnel's review of these results.

6.9 HARMFUL EFFECTS OR IRREVERSIBLE DAMAGE

No harmful effects or evidence of irreversible damage were detected by ESP monitoring. Therefore, no analysis or planned course of action to alleviate problems was necessary.

ATTACHMENT 1

1991 ENVIRONMENTAL SAMPLING AND ANALYTICAL REPORT

GRAND GULF
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
December, 1991

PREPARED BY:

SYSTEM CHEMISTRY
ENTERGY SERVICES, INC.

GRAND GULF
ENVIRONMENTAL RADIOLOGICAL MONITORING REPORT

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Summary of Monitoring Results

As in previous samples, plant-related isotopes were detected in the Barge Slip sediment.

The term "GG" ending of lab number denotes a duplicate sample.

Environmental Radiological Monitoring Report

Table No.: 1.1
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-1, PG

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910060	01/02/91	01/08/91	0.042 +/-0.0..	< 0.029
910123	01/08/91	01/15/91	0.027 +/-0.002	< 0.013
910165	01/15/91	01/22/91	0.022 +/-0.002	< 0.014
910202	01/22/91	01/29/91	0.033 +/-0.003	< 0.013
910233	01/29/91	02/05/91	0.025 +/-0.002	< 0.017
910281	02/05/91	02/12/91	0.020 +/-0.002	< 0.015
910327	02/12/91	02/19/91	0.026 +/-0.002	< 0.020
910361	02/19/91	02/26/91	0.016 +/-0.002	< 0.016
910428	02/26/91	03/05/91	0.016 +/-0.002	< 0.014
910477	03/05/91	03/12/91	0.017 +/-0.002	< 0.011
910502	03/12/91	03/19/91	0.023 +/-0.002	< 0.010
910545	03/19/91	03/26/91	0.019 +/-0.002	< 0.010
910628	03/26/91	04/02/91	0.012 +/-0.002	< 0.016
910683	04/02/91	04/09/91	0.014 +/-0.002	< 0.012
910717	04/09/91	04/16/91	0.011 +/-0.002	< 0.011
910753	04/16/91	04/23/91 (1)	NO SAMPLE	
910785	04/23/91	04/30/91	0.010 +/-0.002	< 0.011
910823	04/30/91	05/07/91	0.012 +/-0.002	< 0.013
910867	05/07/91	05/14/91	0.011 +/-0.002	< 0.016
910907	05/14/91	05/21/91	0.005 +/-0.002	< 0.009
910930	05/21/91	05/28/91	0.010 +/-0.002	< 0.014
910976	05/28/91	06/04/91	0.011 +/-0.002	< 0.016
911029	06/04/91	06/11/91	0.014 +/-0.002	< 0.022
911078	06/11/91	06/.. .91	0.011 +/-0.002	< 0.014
911117	06/18/91	06/25/91	0.016 +/-0.002	< 0.009

(1) Unit was not re-started.

= Control Location * = Low Level Analysis

Table No.: 1.1a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-1, PG

Lab No.	Begin Date	End Date		Gross-Beta	I-131
911157	06/25/91	07/02/91		0.014 +/-0.002	< 0.011
911248	07/02/91	07/09/91		0.013 +/-0.002	< 0.010
911283	07/09/91	07/16/91		0.014 +/-0.002	< 0.014
911320	07/16/91	07/23/91		0.018 +/-0.003	< 0.018
911353	07/23/91	07/30/91		0.013 +/-0.002	< 0.012
911387	07/30/91	08/06/91	(2)	0.002 +/-0.003	< 0.018
911428	08/06/91	08/13/91		0.010 +/-0.002	< 0.010
911463	08/13/91	08/20/91		0.020 +/-0.002	< 0.010
911504	08/20/91	08/27/91		0.020 +/-0.002	< 0.012
911534	08/27/91	09/03/91		0.007 +/-0.002	< 0.015
911590	09/03/91	09/10/91		0.013 +/-0.002	< 0.016
911624	09/10/91	09/17/91		0.008 +/-0.002	< 0.009
911661	09/17/91	09/24/91		0.021 +/-0.002	< 0.012
911691	09/24/91	10/01/91		0.014 +/-0.002	< 0.017
911747	10/01/91	10/08/91		0.017 +/-0.002	< 0.016
911793	10/08/91	10/15/91		0.030 +/-0.002	< 0.024
911885	10/15/91	10/22/91		0.032 +/-0.003	< 0.023
911903	10/22/91	10/29/91		0.012 +/-0.002	< 0.014
911965	10/29/91	11/05/91		0.030 +/-0.003	< 0.016
912006	11/05/91	11/12/91		0.031 +/-0.003	< 0.024
912046	11/12/91	11/19/91		0.035 +/-0.003	< 0.010
912075	11/19/91	11/26/91		0.018 +/-0.002	< 0.023
912102	11/26/91	12/03/91		0.014 +/-0.002	< 0.013
912161	12/03/91	12/10/91		0.018 +/-0.002	< 0.019
912195	12/10/91	12/17/91		0.015 +/-0.002	< 0.016

(2) Blown fuse at 122.8 hours run time.

= Control Location * = Low Level Analysis

Table No.: 1.1b

Environmental Radiological Monitoring Report

Date: 01/21/..

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-1, PG

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912223	12/17/91	12/23/91	0.019 +/-0.003	< 0.016
920004	12/23/91	12/31/91	0.025 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.2 Environmental Radiological Monitoring Report Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: AS-2, 61W

Lab No.	Begin Date	End Date		Gross-Beta	I-131
910061	01/02/91	01/08/91		0.036 +/-0.003	< 0.029
910124	01/08/91	01/15/91		0.022 +/-0.002	< 0.013
910166	01/15/91	01/22/91		0.018 +/-0.002	< 0.014
910203	01/22/91	01/29/91		0.029 +/-0.003	< 0.013
910234	01/29/91	02/05/91		0.023 +/-0.002	< 0.017
910282	02/05/91	02/12/91		0.018 +/-0.002	< 0.015
910328	02/12/91	02/19/91		0.021 +/-0.002	< 0.020
910362	02/19/91	02/26/91		0.017 +/-0.002	< 0.018
910429	02/26/91	03/05/91		0.019 +/-0.002	< 0.014
910478	03/05/91	03/12/91		0.016 +/-0.002	< 0.011
910503	03/12/91	03/19/91		0.027 +/-0.002	< 0.010
910546	03/19/91	03/26/91		0.020 +/-0.002	< 0.010
910629	03/26/91	04/02/91		0.015 +/-0.002	< 0.012
910684	04/02/91	04/09/91		0.015 +/-0.002	< 0.012
910718	04/09/91	04/16/91		0.012 +/-0.002	< 0.011
910754	04/16/91	04/23/91		0.010 +/-0.002	< 0.011
910786	04/23/91	04/30/91		0.012 +/-0.002	< 0.011
910824	04/30/91	05/07/91		0.011 +/-0.002	< 0.013
910868	05/07/91	05/14/91		0.015 +/-0.002	< 0.016
910908	05/14/91	05/21/91		0.008 +/-0.002	< 0.009
910931	05/21/91	05/28/91		0.010 +/-0.002	< 0.014
910977	05/28/91	06/04/91		0.010 +/-0.002	< 0.016
911030	06/04/91	06/11/91		0.012 +/-0.002	< 0.022
911079	06/11/91	06/18/91	(1)	0.012 +/-0.002	< 0.014
911118	06/18/91	06/25/91		0.014 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

(1) No flow at collection.

Table No.: 1.2a

Environmental Radiological Monitoring Report

Date: 01/28/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: AS-2, 61N

Lab No	Begin Date	End Date	Gross-Beta	I-131
911158	06/25/91	07/02/91	0.019 +/-0.002	< 0.011
911249	07/02/91	07/09/91	0.008 +/-0.002	< 0.010
911284	07/09/91	07/16/91	0.015 +/-0.002	< 0.014
911321	07/16/91	07/23/91	0.018 +/-0.002	< 0.018
911354	07/23/91	07/30/91	0.012 +/-0.002	< 0.012
911388	07/30/91	08/06/91	0.029 +/-0.003	< 0.018
911429	08/06/91	08/13/91	0.009 +/-0.002	< 0.010
911464	08/13/91	08/20/91	0.020 +/-0.002	< 0.010
911505	08/20/91	08/27/91	0.020 +/-0.002	< 0.012
911535	08/27/91	09/03/91	0.007 +/-0.002	< 0.015
911591	09/03/91	09/10/91	0.009 +/-0.002	< 0.016
911625	09/10/91	09/17/91	0.008 +/-0.002	< 0.009
911662	09/17/91	09/24/91	0.018 +/-0.002	< 0.012
911692	09/24/91	10/01/91	0.014 +/-0.002	< 0.017
911748	10/01/91	10/08/91	0.013 +/-0.002	< 0.016
911794	10/08/91	10/15/91	0.030 +/-0.002	< 0.024
911886	10/15/91	10/22/91	0.020 +/-0.002	< 0.023
911904	10/22/91	10/29/91	0.009 +/-0.002	< 0.014
911966	10/29/91	11/05/91	0.022 +/-0.003	< 0.016
912007	11/05/91	11/12/91	0.029 +/-0.003	< 0.024
912047	11/12/91	11/19/91	0.027 +/-0.002	< 0.010
912076	11/19/91	11/26/91	0.012 +/-0.002	< 0.023
912103	11/26/91	12/03/91	0.011 +/-0.002	< 0.013
912162	12/03/91	12/10/91	0.016 +/-0.002	< 0.019
912196	12/10/91	12/17/91	< 0.004	< 0.016

= Control Location * = Low Level Analysis

Table No.: 1.2b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-2, 61N

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912224	12/17/91	12/23/91	0.019 +/-0.003	< 0.016
920005	12/23/91	12/31/91	0.026 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.3
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-3, 61VA

Lab No.	Begin Date	End Date		Gross-Beta	I-131
910062	01/02/91	01/08/91		0.030 +/-0.003	< 0.029
910125	01/08/91	01/15/91		0.018 +/-0.002	< 0.013
910167	01/15/91	01/22/91		0.013 +/-0.002	< 0.014
910204	01/22/91	01/29/91		0.019 +/-0.002	< 0.013
910235	01/29/91	02/05/91		0.016 +/-0.002	< 0.017
910283	02/05/91	02/12/91		0.015 +/-0.002	< 0.015
910329	02/12/91	02/19/91		0.018 +/-0.002	< 0.020
910363	02/19/91	02/26/91	(1)	< 0.006	7.7HRS RUN
910430	02/26/91	03/05/91		0.014 +/-0.002	< 0.014
910479	03/05/91	03/12/91		0.015 +/-0.002	< 0.011
910504	03/12/91	03/19/91		0.022 +/-0.002	< 0.010
910547	03/19/91	03/26/91		0.016 +/-0.002	< 0.010
910630	03/26/91	04/02/91		0.012 +/-0.002	< 0.016
910685	04/02/91	04/09/91		0.015 +/-0.002	< 0.012
910719	04/09/91	04/16/91		0.011 +/-0.002	< 0.011
910755	04/16/91	04/23/91		0.009 +/-0.002	< 0.011
910787	04/23/91	04/30/91		0.011 +/-0.002	< 0.011
910825	04/30/91	05/07/91		0.010 +/-0.002	< 0.013
910869	05/07/91	05/14/91		0.013 +/-0.002	< 0.016
910909	05/14/91	05/21/91		0.006 +/-0.002	< 0.009
910932	05/21/91	05/28/91		0.009 +/-0.002	< 0.014
910978	05/28/91	06/04/91		0.015 +/-0.002	< 0.016
911031	06/04/91	06/11/91		0.014 +/-0.002	< 0.022
911080	06/11/91	06/18/91		0.003 +/-0.002	< 0.014
911119	06/18/91	06/25/91		0.017 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

(1) Blown fuse at 7.7 hours run time.

Table No.: 1.3A

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: AS-3, 61VA

Lab No.	Begin Date	End Date		Gross-Beta	I-131
911159	06/25/91	07/02/91		0.018 +/-0.002	< 0.011
911250	07/02/91	07/09/91		0.017 +/-0.002	< 0.010
911285	07/09/91	07/16/91		0.015 +/-0.002	< 0.014
911322	07/16/91	07/23/91		0.016 +/-0.002	< 0.018
911355	07/23/91	07/30/91		0.011 +/-0.002	< 0.012
911389	07/30/91	08/06/91	(2)	0.013 +/-0.004	< 0.018
911430	08/06/91	08/13/91		0.014 +/-0.002	< 0.010
911465	08/13/91	08/20/91		0.010 +/-0.002	< 0.010
911506	08/20/91	08/27/91		0.017 +/-0.002	< 0.012
911536	08/27/91	09/03/91		0.005 +/-0.002	< 0.015
911592	09/03/91	09/10/91		0.009 +/-0.002	< 0.016
911626	09/10/91	09/17/91		0.007 +/-0.002	< 0.009
911663	09/17/91	09/24/91		0.016 +/-0.002	< 0.012
911693	09/24/91	10/01/91		0.011 +/-0.002	< 0.017
911749	10/01/91	10/08/91		0.013 +/-0.002	< 0.016
911795	10/08/91	10/15/91		0.030 +/-0.002	< 0.024
911887	10/15/91	10/22/91		0.029 +/-0.002	< 0.023
911905	10/22/91	10/29/91		0.010 +/-0.002	< 0.014
911967	10/29/91	11/05/91		0.020 +/-0.003	< 0.016
912008	11/05/91	11/12/91		0.021 +/-0.003	< 0.024
912048	11/12/91	11/19/91		0.039 +/-0.003	< 0.010
912077	11/19/91	11/26/91		0.012 +/-0.002	< 0.023
912104	11/26/91	12/03/91		0.013 +/-0.002	< 0.013
912163	12/03/91	12/10/91		0.016 +/-0.002	< 0.019
912197	12/10/91	12/17/91		0.013 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

(2) Blown fuse at 90.6 hours run time.

Table No.: 1.3b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-3, 61VA

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912225	12/17/91	12/23/91	0.018 +/- .003	< 0.016
920006	12/23/91	12/31/91	0.024 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.4
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-4, GJOE

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910063	01/02/91	01/08/91	0.036 +/-0.003	< 0.029
910126	01/08/91	01/15/91	0.022 +/-0.002	< 0.013
910168	01/15/91	01/22/91	0.016 +/-0.002	< 0.014
910205	01/22/91	01/29/91	0.025 +/-0.002	< 0.013
910236	01/29/91	02/05/91	0.019 +/-0.002	< 0.017
910284	02/05/91	02/12/91	0.021 +/-0.002	< 0.015
910330	02/12/91	02/19/91	0.022 +/-0.002	< 0.020
910364	02/19/91	02/26/91	0.016 +/-0.002	< 0.016
910431	02/26/91	03/05/91	0.017 +/-0.003	< 0.014
910480	03/05/91	03/12/91	0.019 +/-0.002	< 0.011
910505	03/12/91	03/19/91	0.018 +/-0.002	< 0.010
910548	03/19/91	03/26/91	0.018 +/-0.002	< 0.010
910631	03/26/91	04/02/91	0.014 +/-0.002	< 0.016
910686	04/02/91	04/09/91	0.015 +/-0.002	< 0.012
910720	04/09/91	04/16/91	0.012 +/-0.002	< 0.011
910756	04/16/91	04/23/91	0.009 +/-0.002	< 0.011
910788	04/23/91	04/30/91	0.012 +/-0.002	< 0.011
910826	04/30/91	05/07/91	0.012 +/-0.002	< 0.013
910870	05/07/91	05/14/91	0.014 +/-0.002	< 0.016
910910	05/14/91	05/21/91	0.008 +/-0.002	< 0.009
910933	05/21/91	05/28/91	0.010 +/-0.002	< 0.014
910979	05/28/91	06/04/91	0.011 +/-0.002	< 0.016
911032	06/04/91	06/11/91	0.010 +/-0.002	< 0.022
911081	06/11/91	06/18/91	0.010 +/-0.002	< 0.014
911120	06/18/91	06/25/91	0.012 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

Table No.: 1.4A
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 02/07/92

Location: AS-4, GJOE

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911160	06/25/91	07/02/91	0.014 +/-0.002	< 0.011
911251	07/02/91	07/09/91	0.012 +/-0.002	< 0.010
911286	07/09/91	07/16/91	0.012 +/-0.002	< 0.014
911323	07/16/91	07/23/91	0.011 +/-0.002	< 0.018
911356	07/23/91	07/30/91	0.010 +/-0.002	< 0.012
911390	07/30/91	08/06/91	0.014 +/-0.002	< 0.018
911431	08/06/91	08/13/91	0.008 +/-0.002	< 0.010
911466	08/13/91	08/20/91	0.010 +/-0.002	< 0.010
911507	08/20/91	08/27/91	0.020 +/-0.002	< 0.012
911537	08/27/91	09/03/91	0.006 +/-0.002	< 0.015
911593	09/03/91	09/10/91	0.011 +/-0.002	< 0.016
911627	09/10/91	09/17/91	0.010 +/-0.002	< 0.009
911664	09/17/91	09/24/91	0.019 +/-0.002	< 0.012
911694	09/24/91	10/01/91	0.015 +/-0.002	< 0.017
911750	10/01/91	10/08/91	0.020 +/-0.002	< 0.016
911796	10/08/91	10/15/91	0.017 +/-0.002	< 0.024
911880	10/15/91	10/22/91	0.023 +/-0.002	< 0.023
911906	10/22/91	10/29/91	0.009 +/-0.002	< 0.014
911968	10/29/91	11/05/91	0.019 +/-0.003	< 0.016
912009	11/05/91	11/12/91	0.021 +/-0.003	< 0.024
912049	11/12/91	11/19/91	0.029 +/-0.002	< 0.010
912078	11/19/91	11/26/91	0.012 +/-0.002	< 0.023
912105	11/26/91	12/03/91	0.012 +/-0.002	< 0.013
912144	12/03/91	12/10/91	0.018 +/-0.002	< 0.019
912198	12/10/91	12/17/91	0.016 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

Table No.: 1.4b

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-4, GJOE

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912226	12/17/91	12/23/91	.021 +/-0.003	< 0.016
920007	12/23/91	12/31/91	0.029 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.5
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-5, TC

Lab No.	Begin Date	End Date		Gross-Beta	I-131
910064	01/02/91	01/08/91		0.030 +/-0.003	< 0.029
910127	01/08/91	01/15/91		0.021 +/-0.002	< 0.013
910169	01/15/91	01/22/91	(1)	0.008 +/-0.003	< 0.014
910206	01/22/91	01/29/91		0.022 +/-0.002	< 0.013
910237	01/29/91	02/05/91		0.018 +/-0.002	< 0.017
910285	02/05/91	02/12/91		0.020 +/-0.002	< 0.015
910331	02/12/91	02/19/91		0.022 +/-0.002	< 0.020
910365	02/19/91	02/26/91		0.016 +/-0.002	< 0.016
910432	02/26/91	03/05/91		0.012 +/-0.002	< 0.014
910481	03/05/91	03/12/91		0.016 +/-0.002	< 0.011
910506	03/12/91	03/19/91		0.017 +/-0.002	< 0.010
910540	03/19/91	03/26/91		0.017 +/-0.002	< 0.010
910632	03/26/91	04/02/91		0.012 +/-0.002	< 0.016
910687	04/02/91	04/09/91		0.014 +/-0.002	< 0.012
910721	04/09/91	04/16/91		0.012 +/-0.002	< 0.011
910757	04/16/91	04/23/91		0.006 +/-0.002	< 0.011
910789	04/23/91	04/30/91		0.011 +/-0.002	< 0.011
910827	04/30/91	05/07/91		0.013 +/-0.002	< 0.013
910871	05/07/91	05/14/91		0.013 +/-0.002	< 0.016
910911	05/14/91	05/21/91		0.007 +/-0.002	< 0.009
910934	05/21/91	05/28/91		0.010 +/-0.002	< 0.014
910980	05/28/91	06/04/91		0.012 +/-0.002	< 0.016
911033	06/04/91	06/11/91	(2)	0.007 +/-0.003	< 0.022
911082	06/11/91	06/18/91		0.012 +/-0.002	< 0.014
911121	06/18/91	06/25/91		0.015 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

(1) No flow at collection.
(2) Blown fuse at 99.1 hours run time.

Table No.: 1.5a

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-5, TC

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911161	06/25/91	07/02/91	0.016 +/-0.002	< 0.011
911252	07/02/91	07/09/91	0.011 +/-0.002	< 0.010
911287	07/09/91	07/16/91	0.015 +/-0.002	< 0.014
911324	07/16/91	07/23/91	0.014 +/-0.002	< 0.018
911357	07/23/91	07/30/91	0.012 +/-0.002	< 0.012
911391	07/30/91	08/06/91	0.019 +/-0.002	< 0.018
911432	08/06/91	08/13/91	0.012 +/-0.002	< 0.010
911467	08/13/91	08/20/91	0.018 +/-0.002	< 0.010
911508	08/20/91	08/27/91	0.019 +/-0.002	< 0.012
911538	08/27/91	09/03/91	0.006 +/-0.002	< 0.015
911594	09/03/91	09/10/91	0.012 +/-0.002	< 0.016
911628	09/10/91	09/17/91	0.008 +/-0.002	< 0.009
911665	09/17/91	09/24/91	0.025 +/-0.003	< 0.012
911695	09/24/91	10/01/91	0.009 +/-0.002	< 0.017
911751	10/01/91	10/08/91	0.019 +/-0.002	< 0.016
911797	10/08/91	10/15/91	0.025 +/-0.002	< 0.024
911889	10/15/91	10/22/91	0.031 +/-0.003	< 0.023
911907	10/22/91	10/29/91	0.010 +/-0.002	< 0.014
911969	10/29/91	11/05/91	0.023 +/-0.003	< 0.016
912010	11/05/91	11/12/91	0.024 +/-0.003	< 0.024
912050	11/12/91	11/19/91	0.028 +/-0.002	< 0.020
912079	11/19/91	11/26/91	0.015 +/-0.002	< 0.023
912106	11/26/91	12/03/91	0.012 +/-0.002	< 0.013
912165	12/03/91	12/10/91	0.017 +/-0.002	< 0.019
912199	12/10/91	12/17/91	0.018 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

Table No.: 1.5b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-5, TC

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912227	12/17/91	12/23/91	0.023 +/-0.003	< 0.016
920008	12/23/91	12/31/91	0.025 +/-0.00[illegible]	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.6
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-6, RS

Lab No.	Begin Date	End Date		Gross-Beta	I-131
910065	01/02/91	01/08/91		0.026 +/-0.003	< 0.029
910128	01/08/91	01/15/91		0.012 +/-0.002	< 0.013
910170	01/15/91	01/22/91		0.017 +/-0.002	< 0.014
910207	01/22/91	01/29/91		0.020 +/-0.002	< 0.013
910238	01/29/91	02/05/91		0.014 +/-0.002	< 0.017
910286	02/05/91	02/12/91		0.011 +/-0.002	< 0.015
910332	02/12/91	02/19/91		0.018 +/-0.002	< 0.020
910366	02/19/91	02/26/91	(1)	0.010 +/-0.002	< 0.016
910433	02/26/91	03/05/91		0.019 +/-0.002	< 0.014
910482	03/05/91	03/12/91		0.018 +/-0.002	< 0.011
910507	03/12/91	03/19/91	(2)	0.004 +/-0.002	< 0.010
910550	03/19/91	03/26/91		0.018 +/-0.002	< 0.010
910633	03/26/91	04/02/91		0.015 +/-0.002	< 0.016
910688	04/02/91	04/09/91		0.017 +/-0.002	< 0.012
910722	04/09/91	04/16/91		0.012 +/-0.002	< 0.011
910758	04/16/91	04/23/91		0.009 +/-0.002	< 0.011
910790	04/23/91	04/30/91		0.010 +/-0.002	< 0.011
910828	04/30/91	05/07/91		0.013 +/-0.002	< 0.013
910872	05/07/91	05/14/91		0.015 +/-0.002	< 0.016
910912	05/14/91	05/21/91		0.009 +/-0.002	< 0.009
910935	05/21/91	05/28/91		0.012 +/-0.002	< 0.014
910981	05/28/91	06/04/91		0.009 +/-0.002	< 0.016
911034	06/04/91	06/11/91		0.012 +/-0.002	< 0.022
911083	06/11/91	06/18/91		0.011 +/-0.002	< 0.014
911122	06/18/91	06/25/91		0.018 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

(1) Pump failure at 132.1 hours run time.

(2) No flow at collection.

Location: 6, RS

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911162	06/25/91	07/02/91 (2)	0.009 +/-0.002	< 0.011
911253	07/02/91	07/09/91	0.010 +/-0.002	< 0.010
911288	07/09/91	07/16/91	0.012 +/-0.002	< 0.014
911325	07/16/91	07/23/91	0.014 +/-0.002	< 0.018
911358	07/23/91	07/30/91	0.010 +/-0.002	< 0.012
911397	07/30/91	08/06/91	0.020 +/-0.002	< 0.018
911433	08/06/91	08/13/91	0.009 +/-0.002	< 0.010
911468	08/13/91	08/20/91	0.013 +/-0.002	< 0.010
911509	08/20/91	08/27/91	0.020 +/-0.002	< 0.012
911539	08/27/91	09/03/91	0.005 +/-0.002	< 0.015
911595	09/03/91	09/10/91	0.013 +/-0.002	< 0.016
911629	09/10/91	09/17/91	0.006 +/-0.002	< 0.009
911666	09/17/91	09/24/91	0.017 +/-0.002	< 0.012
911696	09/24/91	10/01/91	0.010 +/-0.002	< 0.017
911752	10/01/91	10/08/91	0.013 +/-0.002	< 0.016
911798	10/08/91	10/15/91	0.022 +/-0.002	< 0.024
911890	10/15/91	10/22/91	0.025 +/-0.002	< 0.023
911908	10/22/91	10/29/91	0.008 +/-0.002	< 0.014
911970	10/29/91	11/05/91	0.024 +/-0.003	< 0.016
912011	11/05/91	11/12/91	0.016 +/-0.003	< 0.024
912051	11/12/91	11/19/91	0.028 +/-0.002	< 0.010
912080	11/19/91	11/26/91	0.011 +/-0.002	< 0.023
912107	11/26/91	12/03/91	0.010 +/-0.002	< 0.013
912166	12/03/91	12/10/91	0.012 +/-0.002	< 0.019
912200	12/10/91	12/17/91	0.014 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

(2) No flow at collection.

Table No.: 1.6b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-6, RS

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912228	12/17/91	12/23/91	0.017 +/-0.003	< 0.016
920009	12/23/91	12/31/91	0.024 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.7
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-7, MT

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910066	01/02/91	01/08/91	0.022 +/-0.003	< 0.029
910129	01/08/91	01/15/91	0.012 +/-0.002	< 0.013
910171	01/15/91	01/22/91	0.011 +/-0.002	< 0.014
910208	01/22/91	01/29/91	0.014 +/-0.002	< 0.013
910239	01/29/91	02/05/91	0.012 +/-0.002	< 0.017
910287	02/05/91	02/12/91	0.010 +/-0.002	< 0.015
910333	02/12/91	02/19/91	0.016 +/-0.002	< 0.020
910367	02/19/91	02/26/91	0.008 +/-0.002	< 0.016
910434	02/26/91	03/05/91	0.014 +/-0.002	< 0.014
910483	03/05/91	03/12/91	0.016 +/-0.002	< 0.011
910508	03/12/91	03/19/91	0.020 +/-0.002	< 0.010
910551	03/19/91	03/26/91	0.013 +/-0.002	< 0.010
910634	03/26/91	04/02/91	0.014 +/-0.002	< 0.016
910689	04/02/91	04/09/91	0.015 +/-0.002	< 0.012
910723	04/09/91	04/16/91	0.013 +/-0.002	< 0.011
910759	04/16/91	04/23/91	0.008 +/-0.002	< 0.011
910791	04/23/91	04/30/91	0.011 +/-0.002	< 0.011
910829	04/30/91	05/07/91	0.013 +/-0.002	< 0.013
910873	05/07/91	05/14/91	0.014 +/-0.002	< 0.016
910913	05/14/91	05/21/91	0.007 +/-0.002	< 0.009
910936	05/21/91	05/28/91	0.009 +/-0.002	< 0.014
910982	05/28/91	06/04/91	0.013 +/-0.002	< 0.016
911035	06/04/91	06/11/91	0.009 +/-0.002	< 0.022
911084	06/11/91	06/18/91	0.009 +/-0.002	< 0.014
911123	06/18/91	06/25/91	0.016 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

Location: AS-7, MT

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911163	06/25/91	07/02/91	0.014 +/-0.002	< 0.011
911254	07/02/91	07/09/91	0.009 +/-0.002	< 0.010
911289	07/09/91	07/16/91	0.015 +/-0.002	< 0.014
911326	07/16/91	07/23/91	0.012 +/-0.002	< 0.018
911359	07/23/91	07/30/91	0.012 +/-0.002	< 0.012
911393	07/30/91	08/06/91	0.020 +/-0.002	< 0.018
911434	08/06/91	08/13/91	0.013 +/-0.002	< 0.010
911469	08/13/91	08/20/91	0.014 +/-0.002	< 0.010
911510	08/20/91	08/27/91	0.019 +/-0.002	< 0.012
911540	08/27/91	09/03/91	0.007 +/-0.002	< 0.015
911596	09/03/91	09/10/91	0.013 +/-0.002	< 0.016
911630	09/10/91	09/17/91	0.008 +/-0.002	< 0.009
911667	09/17/91	09/24/91	0.018 +/-0.002	< 0.012
911697	09/24/91	10/01/91	0.011 +/-0.002	< 0.017
911753	10/01/91	10/08/91	0.013 +/-0.002	< 0.016
911799	10/08/91	10/15/91	0.027 +/-0.002	< 0.024
911891	10/15/91	10/22/91	0.029 +/-0.002	< 0.023
911909	10/22/91	10/29/91	0.011 +/-0.002	< 0.014
911971	10/29/91	11/05/91	0.026 +/-0.003	< 0.016
912012	11/05/91	11/12/91	0.026 +/-0.003	< 0.024
912052	11/12/91	11/19/91	0.029 +/-0.002	< 0.010
912081	11/19/91	11/26/91	0.015 +/-0.002	< 0.023
912108	11/26/91	12/03/91	0.013 +/-0.002	< 0.013
912167	12/03/91	12/10/91	0.017 +/-0.002	< 0.019
912201	12/10/91	12/17/91	0.013 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

Table No.: 1.7b

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location. AS-7, MT

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912239	12/17/91	12/23/91	0.020 +/-0.003	< 0.016
920010	12/23/91	12/31/91	0.029 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.8
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AC-8, WR

Lab No.	Collection Start	End Date	Gross-Beta	I-131
910067	01/02/91	01/08/91	0.038 +/-0.003	< 0.029
910130	01/08/91	01/15/91	0.023 +/-0.002	< 0.013
910172	01/15/91	01/22/91	0.021 +/-0.002	< 0.014
910209	01/22/91	01/29/91	0.026 +/-0.003	< 0.013
910240	01/29/91	02/05/91	0.021 +/-0.002	< 0.017
910288	02/05/91	02/12/91	0.024 +/-0.002	< 0.015
910334	02/12/91	02/19/91	0.026 +/-0.002	< 0.020
910368	02/19/91	02/26/91	0.017 +/-0.002	< 0.016
910435	02/26/91	03/05/91	0.013 +/-0.002	< 0.014
910484	03/05/91	03/12/91	0.017 +/-0.002	< 0.011
910509	03/12/91	03/19/91	0.016 +/-0.002	< 0.010
910552	03/19/91	03/26/91	0.015 +/-0.002	< 0.010
910635	03/26/91	04/02/91	0.013 +/-0.002	< 0.016
910690	04/02/91	04/09/91	0.015 +/-0.002	< 0.012
910724	04/09/91	04/16/91	0.008 +/-0.002	< 0.011
910760	04/16/91	04/23/91	0.006 +/-0.002	< 0.011
910792	04/23/91	04/30/91	0.008 +/-0.002	< 0.011
910830	04/30/91	05/07/91	0.011 +/-0.002	< 0.013
910874	05/07/91	05/14/91	0.012 +/-0.002	< 0.016
910914	05/14/91	05/21/91	0.007 +/-0.002	< 0.009
910937	05/21/91	05/28/91	0.009 +/-0.002	< 0.014
910985	05/28/91	06/04/91	0.012 +/-0.002	< 0.016
911036	06/04/91	06/11/91	0.008 +/-0.002	< 0.022
911085	06/11/91	06/18/91	0.010 +/-0.002	< 0.014
911124	06/18/91	06/25/91	0.015 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

Table No.: 1.8a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-8, WR

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911164	06/25/91	07/02/91 (1)	0.013 +/-0.002	< 0.011
911255	07/02/91	07/09/91	0.006 +/-0.002	< 0.010
911290	07/09/91	07/16/91	0.009 +/-0.002	< 0.014
911327	07/16/91	07/23/91	0.012 +/-0.002	< 0.018
911360	07/23/91	07/30/91	0.011 +/-0.002	< 0.012
911394	07/30/91	08/06/91	0.016 +/-0.002	< 0.018
911435	08/06/91	08/13/91	0.007 +/-0.002	< 0.010
911470	08/13/91	08/20/91	0.010 +/-0.002	< 0.010
911511	08/20/91	08/27/91	0.019 +/-0.002	< 0.012
911547	08/27/91	09/03/91	0.003 +/-0.002	< 0.015
911597	09/03/91	09/10/91	0.011 +/-0.002	< 0.016
911631	09/10/91	09/17/91	0.006 +/-0.002	< 0.009
911668	09/17/91	09/24/91	0.016 +/-0.002	< 0.012
911695	09/24/91	10/01/91	0.009 +/-0.002	< 0.017
911753	10/01/91	10/08/91	0.014 +/-0.002	< 0.016
911800	10/08/91	10/15/91	0.026 +/-0.002	< 0.024
911892	10/15/91	10/22/91	0.024 +/-0.002	< 0.023
911910	10/22/91	10/29/91	0.010 +/-0.002	< 0.014
911972	10/29/91	11/05/91	0.020 +/-0.003	< 0.016
912013	11/05/91	11/12/91	0.022 +/-0.003	< 0.024
912053	11/12/91	11/19/91	0.028 +/-0.002	< 0.010
912082	11/19/91	11/26/91	0.014 +/-0.002	< 0.023
912109	11/26/91	12/03/91	0.012 +/-0.002	< 0.013
912168	12/03/91	12/10/91	0.016 +/-0.002	< 0.019
912202	12/10/91	12/17/91	0.015 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

(1) Blown fuse at 144.1 hours run time.

Table No.: 1.8b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-8, WR

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912230	12/17/91	12/23/91	0.018 +/-0.003	< 0.016
920011	12/23/91	12/31/91	0.026 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-9, GGMP

Lab No.	Begin. Date	End Date		Gross-Beta	I-131
910068	01/02/91	01/08/91		0.038 +/-0.003	< 0.029
910131	01/08/91	01/15/91		0.024 +/-0.002	< 0.013
910173	01/15/91	01/22/91		0.016 +/-0.002	< 0.014
910210	01/22/91	01/29/91		0.028 +/-0.003	< 0.013
910241	01/29/91	02/05/91		0.018 +/-0.002	< 0.017
910289	02/05/91	02/12/91		0.018 +/-0.002	< 0.015
910335	02/12/91	02/19/91	(1)	0.038 +/-0.004	< 0.020
910369	02/19/91	02/26/91		0.0[illegible] +/-0.002	< 0.016
910436	02/26/91	03/05/91		0.015 +/-0.002	< 0.014
910485	03/05/91	03/12/91		0.017 +/-0.002	< 0.011
910510	03/12/91	03/19/91		0.017 +/-0.002	< 0.010
910553	03/19/91	03/26/91		0.014 +/-0.002	< 0.010
910636	03/26/91	04/02/91		0.011 +/-0.002	< 0.016
910691	04/02/91	04/09/91		0.014 +/-0.002	< 0.012
910725	04/09/91	04/16/91		0.012 +/-0.002	< 0.011
910761	04/16/91	04/23/91		0.008 +/-0.002	< 0.011
910793	04/23/91	04/30/91		0.008 +/-0.002	< 0.011
910831	04/30/91	05/07/91		0.011 +/-0.002	< 0.013
910875	05/07/91	05/14/91		0.011 +/-0.002	< 0.016
910915	05/14/91	05/21/91		0.008 +/-0.002	< 0.009
910938	05/21/91	05/28/91		0.007 +/-0.002	< 0.014
910984	05/28/91	06/04/91		0.011 +/-0.002	< 0.016
911037	06/04/91	06/11/91		0.010 +/-0.002	< 0.022
911086	06/11/91	06/18/91		0.010 +/-0.002	< 0.014
911125	06/18/91	06/25/91		0.011 +/-0.002	< 0.009

= Control Location * = Low Level Analysis

(1) No flow at collection.

Table No.: 1.9a
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-9, GGMP

Lab No.	Begin Date	End Date	Gross-Beta	I-131
911165	06/25/91	07/02/91	0.016 +/-0.002	< 0.011
911256	07/02/91	07/09/91	0.008 +/-0.002	< 0.010
911291	07/09/91	07/16/91	0.010 +/-0.002	< 0.014
911328	07/16/91	07/23/91	0.011 +/-0.002	< 0.018
911361	07/23/91	07/30/91	0.008 +/-0.002	< 0.012
911395	07/30/91	08/06/91	0.016 +/-0.002	< 0.018
911436	08/06/91	08/13/91	0.007 +/-0.002	< 0.010
911471	08/13/91	08/20/91	0.009 +/-0.002	< 0.010
911512	08/20/91	08/27/91	0.014 +/-0.002	< 0.012
911542	08/27/91	09/03/91	0.004 +/-0.002	< 0.015
911598	09/03/91	09/10/91	0.010 +/-0.002	< 0.016
911632	09/10/91	09/17/91	0.005 +/-0.002	< 0.009
911669	09/17/91	09/24/91	0.016 +/-0.002	< 0.012
911699	09/24/91	10/01/91	0.004 +/-0.002	< 0.017
911755	10/01/91	10/08/91	0.012 +/-0.002	< 0.016
911801	10/08/91	10/15/91	0.017 +/-0.002	< 0.024
911893	10/15/91	10/22/91	0.017 +/-0.002	< 0.023
911911	10/22/91	10/29/91	0.008 +/-0.002	< 0.014
911973	10/29/91	11/05/91	0.015 +/-0.003	< 0.016
912014	11/05/91	11/12/91	0.018 +/-0.003	< 0.024
912054	11/12/91	11/19/91	0.022 +/-0.002	< 0.010
912083	11/19/91	11/26/91	0.012 +/-0.002	< 0.023
912110	11/26/91	12/03/91	0.009 +/-0.002	< 0.013
912169	12/03/91	12/10/91	0.008 +/-0.002	< 0.019
912203	12/10/91	12/17/91	0.012 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

Table No.: 1.9b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-9, GGMP

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912231	12/17/91	12/23/91	0.015 +/-0.003	< 0.016
920012	12/23/91	12/31/91	0.020 +/-0.002	< 0.026

= Control Location * = Low Level Analysis

Table No.: 1.10

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Air Samples,(Beta,I-131)

Collection: Continuous with Weekly Exchange

Units: pCi/M**3

Location: AS-10, HLT

Lab No.	Begin Date	End Date		Gross-Beta	I-131
910101	12/31/90	01/08/91		0.053 +/-0.003	< 0.018
910138	01/08/91	01/15/91		0.028 +/-0.003	< 0.014
910182	01/15/91	01/22/91		0.022 +/-0.002	< 0.023
910212	01/22/91	01/28/91		0.030 +/-0.003	< 0.014
910272	01/28/91	02/05/91		0.018 +/-0.002	< 0.026
910323	02/05/91	02/12/91		0.028 +/-0.002	< 0.028
910347	02/12/91	02/19/91		0.025 +/-0.002	< 0.018
910371	02/19/91	02/25/91	(1)	0.019 +/-0.002	< 0.013
910461	02/25/91	03/05/91		0.012 +/-0.002	< 0.017
910492	03/05/91	03/11/91		0.018 +/-0.002	< 0.017
910517	03/11/91	03/18/91		0.013 +/-0.003	< 0.014
910581	03/18/91	03/25/91		0.014 +/-0.002	< 0.018
910673	03/25/91	04/02/91		0.016 +/-0.002	< 0.017
910705	04/02/91	04/08/91		0.019 +/-0.003	< 0.028
910733	04/08/91	04/15/91		0.013 +/-0.002	< 0.016
910768	04/15/91	04/22/91		0.015 +/-0.002	< 0.015
910801	04/22/91	04/29/91		0.015 +/-0.00	< 0.019
910847	04/29/91	05/06/91		0.016 +/-0.002	< 0.023
910879	05/06/91	05/13/91		0.013 +/-0.002	< 0.012
910939	05/13/91	05/21/91		0.009 +/-0.002	< 0.025
910956	05/21/91	05/29/91		0.009 +/-0.002	< 0.018
910999	05/29/91	06/03/91		0.018 +/-0.003	< 0.028
911054	06/03/91	06/11/91		0.011 +/-0.002	< 0.016
911114	06/11/91	06/19/91		0.012 +/-0.002	< 0.013
911148	06/19/91	06/24/91		0.019 +/-0.003	< 0.026

= Control Location * = Low Level Analysis

(1) No flow at collection.

Location: AS-10, NLT

Lab No.	Begin Date	End Date		Gross-Beta	I-131
911226	06/24/91	07/01/91		0.017 +/-0.002	< 0.024
911268	07/01/91	07/08/91		0.010 +/-0.002	< 0.019
911301	07/08/91	07/16/91		0.018 +/-0.002	< 0.010
911350	07/16/91	07/23/91		0.016 +/-0.002	< 0.015
911362	07/23/91	07/29/91		0.012 +/-0.002	< 0.022
911401	07/29/91	08/05/91		0.021 +/-0.002	< 0.017
911439	08/05/91	08/12/91		0.010 +/-0.002	< 0.016
911498	08/12/91	08/21/91		0.019 +/-0.002	< 0.018
911516	08/21/91	08/26/91		0.020 +/-0.004	< 0.028
911554	08/26/91	09/03/91		0.009 +/-0.002	< 0.014
911409	09/03/91	09/09/91		0.006 +/-0.002	< 0.017
911633	09/09/91	09/16/91		0.010 +/-0.002	< 0.014
911688	09/16/91	09/24/91		0.017 +/-0.002	< 0.022
911700	09/24/91	09/30/91	(2)	0.016 +/-0.004	< 0.017
911765	09/30/91	10/08/91		0.020 +/-0.002	< 0.015
911802	10/08/91	10/15/91		0.033 +/-0.003	< 0.024
911894	10/15/91	10/22/91		0.027 +/-0.002	< 0.023
911919	10/22/91	10/29/91		0.006 +/-0.002	< 0.017
911974	10/29/91	11/05/91		0.022 +/-0.003	< 0.016
912023	11/05/91	11/12/91		0.026 +/-0.003	< 0.024
912055	11/12/91	11/19/91		0.032 +/-0.003	< 0.010
912084	11/19/91	11/26/91		0.014 +/-0.002	< 0.023
912111	11/26/91	12/03/91	(3)	NO SAMPLE	
912170	12/03/91	12/10/91		0.020 +/-0.002	< 0.019
912204	12/10/91	12/17/91		0.012 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

(2) Blown fuse at 93.5 hours run time.

(3) Pump failure.

Table No.: 1.10b
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-10, NL

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912232	12/17/91	12/23/91	0.017 +/-0.003	< 0.016
920029	12/23/91	12/31/91	0.024 +/-0.003	< 0.027

= Control Location * = Low Level Analysis

Table No.: 1.11
Sample: Air Samples,(Beta,I-131)
Collection: Continuous with Weekly Exchange
Units: pCi/M**3

Location: AS-11, STJ

Lab No.	Begin Date	End Date	Gross-Beta	I-131
910102	01/02/91	01/08/91	0.038 +/-0.003	< 0.018
910139	01/08/91	01/15/91	0.022 +/-0.002	< 0.014
910183	01/15/91	01/22/91	0.017 +/-0.002	< 0.023
910213	01/22/91	01/29/91	0.024 +/-0.002	< 0.014
910273	01/29/91	02/05/91	0.015 +/-0.002	< 0.026
910324	02/05/91	02/12/91	0.022 +/-0.002	< 0.028
910348	02/12/91	02/19/91	0.021 +/-0.002	< 0.018
910372	02/19/91	02/26/91	0.017 +/-0.002	< 0.013
910462	02/26/91	03/05/91	0.012 +/-0.002	< 0.017
910493	03/05/91	03/12/91	0.021 +/-0.002	< 0.017
910518	03/12/91	03/18/91	0.011 +/-0.002	< 0.014
910582	03/18/91	03/26/91	0.015 +/-0.002	< 0.018
910674	03/26/91	04/02/91	0.015 +/-0.002	< 0.017
910706	04/02/91	04/09/91	0.017 +/-0.002	< 0.028
910734	04/09/19	04/16/91	0.015 +/-0.002	< 0.016
910769	04/16/91	04/23/91	0.012 +/-0.002	< 0.015
910802	04/23/91	04/29/91	0.016 +/-0.002	< 0.019
910848	04/29/91	05/07/91	0.016 +/-0.002	< 0.023
910880	05/07/91	05/14/91	0.012 +/-0.002	< 0.012
910940	05/14/91	05/21/91	0.011 +/-0.002	< 0.025
910957	05/21/91	05/29/91	0.008 +/-0.002	< 0.018
911000	05/29/91	06/04/91	0.016 +/-0.002	< 0.028
911055	06/04/91	06/11/91	0.012 +/-0.002	< 0.016
911115	06/11/91	06/18/91	0.010 +/-0.002	< 0.013
911149	06/18/91	06/25/91	0.015 +/-0.002	< 0.026

= Control Location * = Low Level Analysis

Location: AS-11, STJ

Lab No.	Begin Date	End Date		Gross-Beta	I-131
911227	06/25/91	07/01/91		0.015 +/-0.002	< 0.024
911269	07/01/91	07/09/91		0.011 +/-0.002	< 0.019
911302	07/09/91	07/16/91		0.018 +/-0.002	< 0.010
911351	07/16/91	07/23/91		0.016 +/-0.002	< 0.015
911363	07/23/91	07/30/91		0.014 +/-0.002	< 0.022
911402	07/30/91	08/05/91		0.023 +/-0.003	< 0.017
911440	08/05/91	08/13/91		0.015 +/-0.002	< 0.016
911499	08/13/91	08/21/91		0.016 +/-0.002	< 0.018
911517	08/21/91	08/27/91		0.019 +/-0.003	< 0.028
911555	08/27/91	09/03/91	(1)	0.005 +/-0.002	< 0.014
911610	09/03/91	09/10/91	(2)	< 0.006	< 0.017
911634	09/10/91	09/17/91	(2)	0.002 +/-0.002	< 0.01
911689	09/17/91	09/24/91		0.014 +/-0.002	< 0.0
911701	09/24/91	09/30/91		0.013 +/-0.003	< 0.01
911766	09/30/91	10/08/91		0.015 +/-0.002	< 0.015
911803	10/08/91	10/15/91		0.030 +/-0.002	< 0.024
911895	10/15/91	10/22/91		0.022 +/-0.002	< 0.023
911920	10/22/91	10/29/91		0.011 +/-0.002	< 0.017
911975	10/29/91	11/05/91		0.026 +/-0.003	< 0.016
912024	11/05/91	11/12/91		0.050 +/-0.004	< 0.024
912056	11/12/91	11/19/91		0.034 +/-0.003	< 0.010
912085	11/19/91	11/26/91		0.018 +/-0.002	< 0.023
912112	11/26/91	12/03/91		0.012 +/-0.002	< 0.013
912171	12/03/91	12/10/91		0.020 +/-0.002	< 0.019
912205	12/10/91	12/17/91		0.017 +/-0.002	< 0.016

= Control Location * = Low Level Analysis

(1) No flow at collection.

(2) No flow during collection period.

Table No.: 1.11b
Sample: Air Samples,(Beta,I-131)
Collection.. Continuous with Weekly Exchange
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AS-11, STJ

Lab No.	Begin Date	End Date	Gross-Beta	I-131
912233	12/17/91	12/23/91	0.019 +/-0.003	< 0.016
920030	12/23/91	12/31/91	0.011 +/-0.002	< 0.027

= Control Location * = Low Level Analysis

Table No.: 1.12
Sample: Air Samples,(Gamma)
Collection: Quarterly Composite of Weekly Samples
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location	Lab No.	Begin Date	End Date	Cs-134	Cs-137
AS-1, PG	910588	01/02/91	03/26/91	< 0.0008	< 0.0007
AS-2, 61W	910589	01/02/91	03/26/91	< 0.0008	< 0.0007
AS-3, 61VA	910590	01/02/91	03/26/91	< 0.0016	< 0.0013
AS-4, GJOE	910591	01/02/91	03/26/91	< 0.0008	< 0.0007
AS-5, TC	910592	01/02/91	03/26/91	< 0.0015	< 0.0012
AS-6, RS	910593	01/02/91	03/26/91	< 0.0015	< 0.0012
AS-7, MT	910594	01/02/91	03/26/91	< 0.0010	< 0.0008
AS-8, WR	910595	01/02/91	03/26/91	< 0.0008	< 0.0007
AS-9, GGMP	910596	01/02/91	03/26/91	< 0.0012	< 0.0008
AS-10, NLT	910597	12/31/90	03/25/91	< 0.0011	< 0.0009
AS-11, STJ	910598	01/02/91	03/26/91	< 0.0013	< 0.0011

= Control Location * = Low Level Analysis

Table No.: 1.13

Environmental Radiological Monitoring Report

Sample: Air Samples,(Gamma)

Collection: Quarterly Composite of Weekly Samples

Units: pCi/M**3

Location	Lab No.	Begin Date	End Date	Cs-134	[illegible]
AS-1, PG	911203	03/26/91	07/02/91	[illegible]	[illegible]010
AS-2, 61W	911204	[illegible]	07/02/91	[illegible]	0.0007
AS-3, 61VA	911205	03/[illegible]/91	07/02/91	< 0.0013	< 0.0011
AS-4, GJOE	911206	03/26/91	07/02/91	< 0.0009	< 0.0006
AS-5, TC	911207	03/[illegible]/91	07/02/91	< 0.0011	< 0.0009
AS-6, RS	911208	03/26/[illegible]	07/02/91	< 0.0013	< 0.0012
AS-7, MT	911209	03/26/91	07/02/91	< 0.0007	< 0.0008
AS-8, WR	911210	03/26/91	07/02/91	< 0.0011	< 0.0008
AS-9, GGMP	911211	03/26/91	07/02/91	< 0.0014	< 0.0012
AS-10, NLT	911212	03/25/91	07/01/91	< 0.0013	< 0.0012
AS-11, STJ	911213	03/26/91	07/01/91	< 0.0012	< 0.0011

= Control Location * = Low Level Analysis

Sample: Air Samples,(Gamma)
Collection: Quarterly Composite of Weekly Samples
Units: pCi/M**3

Location	Lab No.	Begin Date	End Date	Cs-134	Cs-137
AS-1, PG	911852	07/02/91	10/01/91	< 0.0010	< 0.0008
AS-2, 61N	911853	07/02/91	10/01/91	< 0.0011	< 0.0007
AS-3, 61VA	911854	07/02/91	10/01/91	< 0.0015	< 0.0012
AS-4, GJOE	911855	07/02/91	10/01/91	< 0.0007	< 0.0007
AS-5, TC	911856	07/02/91	10/01/91	< 0.0010	< 0.0008
AS-6, RS	911857	07/02/91	10/01/91	< 0.0014	< 0.0010
AS-7, HT	911858	07/02/91	10/01/91	< 0.0008	< 0.0007
AS-8, WR	911859	07/02/91	10/01/91	< 0.0011	< 0.0007
AS-9, GGMP	911860	07/02/91	10/01/91	< 0.0014	< 0.0013
AS-10, HLT	911861	07/01/91	09/30/91	< 0.0015	< 0.0012
AS-11, STJ	911862	07/01/91	09/30/91	< 0.0012	< 0.0011

= Control Location * = Low Level Analysis

Table No.: 1.15
Sample: Air Samples,(Gamma)
Collection: Quarterly Composite of Weekly Samples
Units: pCi/M**3

Environmental Radiological Monitoring Report

Date: 01/21/92

Location	Lab No.	Begin Date	End Date	Cs-134	Cs-137
AS-1, PG	920144	10/01/91	12/31/91	< 0.0010	< 0.0009
AS-2, 61M	920145	10/01/91	12/31/91	< 0.0012	< 0.0010
AS-3, 61VA	920146	10/01/91	12/31/91	< 0.0016	< 0.0015
AS-4, GJOE	920147	10/01/91	12/31/91	< 0.0011	< 0.0010
AS-5, TC	920148	10/01/91	12/31/91	< 0.0013	< 0.0010
AS-6, RS	920149	10/01/91	12/31/91	< 0.0018	< 0.0015
AS-7, MT	920150	10/01/91	12/31/91	< 0.0010	< 0.0010
AS-8, WR	920151	10/01/91	12/31/91	< 0.0013	< 0.0011
AS-9, GGMP	920152	10/01/91	12/31/91	< 0.0011	< 0.0009
AS-10, ALT	920153	09/30/91	12/31/91	< 0.0012	< 0.0010
AS-11, STJ	920154	09/30/91	12/31/91	< 0.0012	< 0.0001

= Control Location * = Low Level Analysis

Table No.: 2.1
Sample: Cistern Water,(Beta,I-131,Gamma)
Collection: Monthly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/23/92

Location: WILLIS CISTERN

Lab. No.	Collection Date	Beta	I-131*	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
910072	01/07/91	< 2.2	< 0.3	< 3	< 3	< 4	< 3	< 6	< 3	< 6	< 3	< 3	< 10	< 4
910270	02/08/91	4.8+/-1.7	< 0.4	< 3	< 3	< 4	< 3	< 6	< 3	< 6	< 3	< 3	< 10	< 4
910475	03/11/91	< 3.2	0.6 +/-0.3	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 7	< 3
910695	04/12/91	< 3.4	< 0.3	< 2	< 2	< 4	< 2	< 6	< 2	< 9	< 2	< 2	< 7	< 9
910865	05/12/91	< 3.4	< 0.3	< 2	< 2	< 3	< 2	< 4	< 2	< 5	< 2	< 2	< 9	< 3
911041	06/11/91	< 3.2	< 0.3	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 3	< 2	< 9	< 2
911043 GG	06/11/91	< 3.0	< 0.2	< 3	< 3	< 4	< 3	< 7	< 4	< 8	< 4	< 4	< 14	< 4
911266	07/11/91	< 2.9	< 0.4	< 2	< 2	< 2	< 2	< 3	< 2	< 3	< 2	< 2	< 7	< 4
911438	08/13/91	< 3	< 0.3	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 2	< 2	< 8	< 2
911599	09/12/91	< 3.4	< 0.2	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 2	< 2	< 7	< 2
911820	10/14/91	2.6+/-0.9	< 0.4	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 9	< 4
912025	11/13/91	0.9 +/-0.8	< 0.3	< 2	< 2	< 2	< 6	< 4	< 2	< 4	< 2	< 2	< 8	< 3
912176	12/13/91	< 1.5	< 0.9	< 3	< 2	< 4	< 3	< 6	< 3	< 5	< 3	< 2	< 11	< 3
912178GG	12/13/91	< 1.5	0.9 +/-0.8	< 2	< 2	< 3	< 2	< 5	< 3	< 5	< 3	< 2	< 11	< 3

= Control Location * = Low Level Analysis

Location: WILLIS CISTERN

Lab. No.	Begin Date	End Date	H-3
910512	01/07/91	03/11/91	< 350
911050	04/12/91	06/11/91	< 490
911051 GG	04/12/91	06/11/91	< 490
911601	07/11/91	09/12/91	< 350
912192	10/14/91	12/13/91	< 360
912193GG	10/14/91	12/13/91	< 360

Table No.: 2.3 Environmental Radiological Monitoring Report Date: 01/21/92

Sample: Cistern Water,(Beta,I-131,Gamma)

Collection: Monthly

Units: pCi/L

Location: MCGEE CISTERN

Lab. No.	Collection Date	Beta	I-131*	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
910073	01/07/91	< 2.3	< 0.3	< 2	< 2	< 3	< 2	< 4	< 3	< 6	< 2	< 2	< 12	< 3
910271	02/08/91	4.6+/-1.6	< 0.4	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 2	< 2	< 9	< 3
910476	03/11/91	< 3.2	< 0.3	< 2	< 2	< 2	< 2	< 3	< 2	< 4	< 2	< 2	< 9	< 3
910696	04/12/91	< 3.3	< 0.3	< 2	< 2	< 3	< 2	< 5	< 2	< 11	< 3	< 2	< 9	< 11
910866	05/12/91	< 3.3	< 0.3	< 2	< 2	< 3	< 2	< 5	< 2	< 5	< 3	< 2	< 9	< 3
911042	06/11/91	< 2.9	< 0.3	< 2	< 2	< 4	< 2	< 6	< 2	< 4	< 2	< 2	< 7	< 2
911044 GG	06/11/91	< 2.9	< 0.3	< 2	< 2	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 7	< 2
911267	07/11/91	< 2.9	< 0.4	< 2	< 2	< 3	< 2	< 5	< 2	< 5	< 3	< 2	< 9	< 3
911437	08/13/91	< 3	< 0.3	< 2	< 1	< 2	< 2	< 3	< 2	< 3	< 2	< 2	< 6	< 2
911600	09/12/91	< 3.5	< 0.2	< 2	< 2	< 2	< 2	< 3	< 2	< 3	< 2	< 2	< 6	< 3
911821	10/14/91	< 1.3	< 0.3	< 2	< 2	< 3	< 2	< 5	<	< 5	< 3	< 2	< 12	< 3
912026	11/13/91	0.8 +/-0.8	< 0.3	< 2	< 2	< 3	< 2	< 5	< 3	< 5	< 3	< 2	< 10	< 4
912177	12/13/91	< 1.5	< 1	< 3	< 3	< 4	< 3	< 6	< 3	< 7	< 3	< 3	< 14	< 5
912179GG	12/13/91	< 1.5	< 0.9	< 2	< 2	< 3	< 2	< 5	< 2	< 4	< 2	< 2	< 8	< 3

= Control Location * = Low Level Analysis

Table No.: 2.4
Sample: Cistern Water, (H-3)
Collection: Quarterly composite.
Units: pCi/L

Location: MCGEE CISTERN

Lab. No.	Begin Date	End Date	H-3
910513	01/07/91	03/11/91	< 350
911052	04/12/91	06/1[illegible]	< 490
911053 GG	04/12/91	06/1[illegible]1	< 490
911602	07/11/91	09/12/91	< 350
912190	10/[illegible]/91	12/13/91	< 360
912191GG	10/[illegible]/91	12/13/91	< 360

= Control Location * = Low Level Analysis

Table No.: 3.1

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Ground Water,(H-3,Gamma)

Collection: Quarterly

Units: pCi/L

Location: PGWELL P. Gibson

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910037	01/02/91	< 350	< 4	< 4	< 6	< 3	< 8	< 9	< 4	< 8	< 5	< 4	< 19	< 7
910637	04/01/91	< 280	< 1	< 2	< 2	< 2	< 3	< 3	< 2	< 2	< 2	< 2	< 6	< 11
911214	07/01/91	< 490	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 4	< 3	< 2	< 11	< 4
911717	09/30/91	< 350	< 2	< 2	< 3	< 2	< 5	< 5	< 2	< 4	< 2	< 2	< 11	< 3
911720GG	09/30/91	< 350	< 4	< 4	< 6	< 4	< 10	< 10	< 5	< 9	< 5	< 4	< 25	< 6

= Control Location * = Low Level Analysis

Table No.: 3.2
Sample: Ground Water,(H-3,Gamma)
Collection: Quarterly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: AAWELL,Arnold Acr

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910038	01/02/91	390 +/-210	< 3	< 3	< 4	< 3	< 6	< 6	< 3	< 4	< 3	< 2	< 11	< 4
910638	04/01/91	< 300	< 2	< 2	< 3	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 3
911215	07/01/91	< 490	< 2	< 2	< 2	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 9	< 3
911718	09/30/91	< 350	< 2	< 2	< 2	< 2	< 4	< 3	< 2	< 3	< 2	< 2	< 8	< 3
911721GG	09/30/91	< 350	< 3	< 3	< 4	< 4	< 6	< 6	< 3	< 6	< 3	< 3	< 15	< 8

= Control Location * = Low Level Analysis

Table No.: 3.3
Sample: Ground Water,(H-3,Gamma)
Collection: Quarterly
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: Lake Bruin Well

Lab. No.	Collection Date	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910039	01/02/91	700 +/-21	< 2	< 2	< 2	< 2	< 3	< 3	< 2	< 3	< 2	< 2	< 7	< 2
910639	04/01/91	233 +/-180	< 3	< 3	< 4	< 4	< 7	< 8	< 4	< 4	< 4	< 3	< 15	< 5
911216	07/01/91	< 490	< 4	< 4	< 6	< 4	< 9	< 10	< 4	< 9	< 5	< 4	< 23	< 6
911722	09/30/91	< 350	< 2	< 2	< 2	< 2	< 3	< 3	< 2	< 3	< 2	< 2	< 9	< 4
911722GG	09/30/91	< 350	< 4	< 4	< 5	< 5	< 8	< 9	< 4	< 9	< 4	< 4	< 20	< 7

= Control Location * = Low Level Analysis

Table No.: 4.1
Sample: Surface Water, Grab (Gamma)
Collection: Monthly.
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: MISS. RIVER UP

Lab. No.	Collection Date	Mn-54	Fe 59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910040	01/02/9*	< 2	< 3	< 2	< 2	< 5	< 5	< 2	< 5	< 3	< 2	< 13	< 4
910261	02/05/91	< 4	< 5	< 4	< 4	< 9	< 9	< 4	< 6	< 4	< 4	< 16	< 6
910446	03/05/91	< 2	< 3	< 2	< 2	< 6	< 4	< 2	< 3	< 2	< 2	< 8	< 3
910651	04/02/91	< 3	< 4	< 3	< 3	< 6	< 7	< 4	< 6	< 4	< 3	< 16	< 6
910810	05/02/91	< 2	< 3	< 2	< 2	< 4	< 5	< 2	< 4	< 2	< 2	< 11	< 4
910989	06/04/91	< 2	< 2	< 2	< 2	< 4	< 4	< 2	< 2	< 2	< 2	< 7	< 2
910990 GG	06/04/91	< 3	< 4	< 3	< 4	< 8	< 8	< 4	< 5	< 4	< 4	< 10	< 4
911217	07/02/91	< 2	< 2	< 2	< 2	< 4	< 2	< 2	< 3	< 2	< 2	< 8	< 9
911396	08/06/91	< 2	< 3	< 2	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 3
911548	09/03/91	< 3	< 4	< 3	< 3	< 7	< 8	< 3	< 5	< 4	< 3	< 14	< 4
911713 *	10/01/91	< 4	< 4	< 4	< 4	< 9	< 9	< 4	< 7	< 4	< 4	< 20	< 5
911994	11/05/91	< 2	< 3	< 2	< 2	< 5	< 5	< 2	< 4	< 2	< 2	< 12	< 4
912113	12/03/91	< 2	< 3	< 2	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 3
912115GG	12/03/91	< 1	< 2	< 1	< 2	< 3	< 3	< 2	< 2	< 2	< 1	< 6	< 3

= Control Location * = Low Level Analysis

Table No.: 4.2
Sample: Surface Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Location: MISS. RIVER UP

Lab. No.	Begin Date	End Date	H-3
910447	01/02/91	03/05/91	< 350
910450 GG	01/02/91	03/05/91	< 350
910985	04/02/91	06/04/91	< 490
910987 GG	04/02/91	06/04/91	< 490
911550	07/02/91	09/03/91	< 350
911551GG	07/02/91	09/03/91	< 350
912117	10/01/91	12/03/91	< 360
912119GG	10/01/91	12/03/91	< 360

= Control Location * = Low Level Analysis

Table No.: 4.3
Sample: Surface water, Grab (Gamma)
Collection: Monthly.
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: MISS. RIVER DOWN

Lab. No.	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910041	01/02/91	< 4	< 5	< 4	< 4	< 8	< 9	< 4	< 8	< 4	< 4	< 20	< 7
910262	02/05/91	< 2	< 3	< 2	< 2	< 5	< 4	< 2	< 4	< 2	< 2	< 10	< 3
910448	03/05/91	< 2	< 2	< 2	< 2	< 3	< 3	< 2	< 3	< 2	< 2	< 7	< 2
910652	04/02/91	< 2	< 3	< 3	< 3	< 5	< 5	< 3	< 4	< 3	< 2	< 12	< 10
910811	05/02/91	< 2	< 3	< 2	< 2	< 4	< 5	< 3	4	< 2	< 2	< 10	< 3
910991	06/04/91	< 2	< 3	< 2	< 3	< 4	< 3	< 2	< 2	< 2	< 2	< 6	< 2
910992 GG	06/04/91	< 4	< 6	< 4	< 5	< 9	< 9	< 4	< 7	< 5	< 4	< 20	< 5
911218	07/02/91	< 2	< 3	< 2	< 2	< 5	< 5	< 2	< 4	< 2	< 2	< 11	< 3
911397	08/06/91	< 2	< 3	< 2	< 2	< 3	< 3	< 2	< 2	< 2	< 2	< 6	< 2
911549	09/03/91	< 2	< 2	< 2	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 8	< 2
911714	10/01/91	< 2	< 3	< 2	< 2	< 4	< 5	< 2	< 4	< 2	< 2	< 11	< 3
911995	11/05/91	< 2	< 2	< 2	< 2	< 4	< 4	< 2	< 3	< 2	< 2	< 9	< 3
912114	12/03/91	< 3	< 4	< 3	< 3	< 7	< 8	< 3	< 5	< 4	< 4	< 15	< 4
912116GG	12/03/91	< 2	< 3	< 2	< 2	< 5	< 5	< 3	< 4	< 3	< 2	< 10	< 3

= Control Location * = Low Level Analysis

Table No.: 4.4
Sample: Surface Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: MISS. RIVER DOWN

Lab. No.	Begin Date	End Date	H-3
910449	01/02/91	03/05/91	240 +/-210
910451 GG	01/02/91	03/05/91	290 +/-210
910986	04/02/91	06/04/91	< 490
910988 GG	04/02/91	06/04/91	< 490
911552	07/02/91	09/03/91	< 350
911553GG	07/02/91	09/03/91	< 350
912118	10/01/91	12/03/91	< 360
912120GG	10/01/91	12/03/91	< 360

= Control Location * = Low Level Analysis

Location: DISCHARGE BASIN

Lab. No.	Begin Date	End 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
910259	12/31/90	01/31/91	< 3	< 3	< 4	< 3	< 6	< 3	< 6	< 7	< 3	< 3	< 14	< 5
910397	01/31/91	02/28/91	< 3	< 3	< 3	< 3	< 5	< 3	< 5	< 4	< 3	< 2	< 9	< 3
910640	02/28/91	04/01/91	< 2	< 2	< 2	< 3	< 5	< 2	< 5	< 4	< 3	< 2	< 12	< 4
910797	04/01/91	05/01/91	< 3	< 3	< 4	< 4	< 7	< 4	< 8	< 6	< 4	< 3	< 17	< 5
910955	05/01/91	05/31/91	< 2	< 2	< 3	< 2	< 5	< 2	< 5	< 3	< 2	< 2	< 10	< 3
911150	05/31/91	06/28/91	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 3	< 2	< 2	< 9	< 3
911151 GG	05/31/91	06/28/91	< 2	< 2	< 2	< 2	< 3	< 2	< 3	< 3	< 2	< 2	< 7	< 5
911371	06/28/91	07/31/91	< 2	< 2	< 2	< 2	< 4	< 2	< 3	< 2	< 2	< 2	< 7	< 3
911547	07/31/91	08/30/91	< 1	< 2	< 2	< 2	< 3	< 2	< 3	< 3	< 2	< 2	< 7	< 4
911715	08/30/91	09/30/91	< 2	< 3	< 3	< 2	< 5	< 3	< 5	< 6	< 3	< 3	< 13	< 5
911948	09/30/91	10/30/91	< 2	< 2	< 3	< 2	< 4	< 2	< 4	< 3	< 2	< 2	< 8	< 3
912121	10/30/91	12/03/91	< 2	< 3	< 4	< 3	< 5	< 3	< 6	< 4	< 3	< 2	< 12	< 4
920027	12/03/91	12/31/91	< 2	< 2	< 8	< 3	< 5	< 3	< 5	< 4	< 3	< 2	< 13	< 4
920028GG	12/03/91	12/31/91	< 3	< 3	< 4	< 4	< 6	< 4	< 7	< 6	< 4	< 3	< 16	< 4

Table No.: 4.6
Sample: Surface Water,(H-3)
Collection: Quarterly Composite
Units: pCi/L

Location: DISCHARGE BASIN

Lab. No.	Begin Date	End Date	H-3
910641	12/31/90	04/01/91	1340 +/-190
911152	04/01/91	06/28/91	1242 +/- 310
911153 GG	04/01/91	06/28/91	1280 +/- 310
911716	06/28/91	09/30/91	1035 +/-210
920158	09/30/91	12/31/91	819 +/-230
920159GG	09/30/91	12/31/91	757 +/-230

= Control Location * = Low Level Analysis

Table No.: 5.1
Sample: Milk (I-131*, Gamma)
Collection: Semiannually
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: ALCORN STATE

Lab No.	Collection Date	I-131*	Cs-134	Cs-137	Ba-140	La-140
910941	05/29/91	< 0.3	< 3	< 2	< 8	< 2
912146	12/09/91	< 0.3	< 3	< 2	< 8	< 3
912147GG	12/09/91	< 0.3	< 3	< 3	< 10	< 3

= Control Location * = Low Level Analysis

Table No.: 6.1
Sample: Vegetation: Broadleaf,(I-131,Gamma)
Collection: Monthly when available.
Units: pCi/Kg

Location: SECTOR K, 17 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
910018	01/02/91	BROCOLLI	< 22	< 15	< 13
910019	01/02/91	TURNIP GREENS	< 21	< 14	< 13
910020	01/02/91	CABBAGE	< 20	< 15	< 14
910216	02/04/91	KALE	< 18	< 16	< 15
910217	02/04/91	CABBAGE	< 17	< 16	< 12
910218	02/04/91	COLLARDS	< 18	< 17	< 13
910406	03/04/91	KALE	< 19	< 17	< 13
910407	03/04/91	SWISS CHARD	< 18	< 21	< 18
910408	03/04/91	COLLARDS	< 14	< 17	< 17
910409 GG	03/04/91	COLLARDS	< 18	< 16	< 15
910664	04/08/91	[illegible]RDS	< 25	< 25	< 19
910665	04/08/91	[illegible] CHARD	< 26	< 28	< 23
910666	04/08/91	KALE	< 19	< 17	< 13
910838	05/08/91	SWISS CHARD	< 15	< 17	< 14
910839	05/08/91	CABBAGE	< 14	< 13	< 14
910840	05/08/91	LETTUCE	< 28	< 34	< 25
911009	06/07/91	COLLARDS	< 17	< 15	< 11
911010	06/07/91	CABBAGE	< 28	< 23	< 19
911011	06/[illegible]/91	SWISS CHARD	< 18	< 14	< 11
911012 GG	06/[illegible]/91	SWISS CHARD	< 6	< 6	< 5

= Control Location * = Low Level Analysis

Sample: Vegetation: Broadleaf,(I-131,Gamma)
Collection: Monthly when available.
Units: pCi/Kg

Location: SECTOR K, 17 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911238	07/08/91	AMARANTH	< 17	< 22	< 16
911239	07/08/91	SWISS CHARD	< 16	< 16	< 12
911240	07/08/91	COLLARDS	< 25	< 21	< 19
911411	08/12/91	Collards	< 18	< 21	< 16
911412	08/12/91	AMARANTH LEAVES	< 16	< 17	< 15
911413	08/12/91	SOKO	< 32	< 31	< 26
911567	09/09/91	FLA MUSTARDS	< 10	< 9	< 7
911568	09/09/91	AMARANTH	< 30	< 28	< 27
911569 GG	09/09/91	AMARANTH	< 24	< 23	< 19
911570	09/09/91	COLLARDS	< 14	< 13	< 10
911571 GG	09/09/91	COLLARDS	< 17	< 16	< 14
911756	10/09/91	COLLARDS	< 18	< 19	< 15
911757	10/09/91	TURNIP GREENS	< 30	< 24	< 25
911758	10/09/91	HOT PEPPERS	< 29	< 30	< 24
911985	11/08/91	COLLARDS	< 23	< 18	< 18
911986	11/08/91	RAPE	< 46	< 29	< 31
911987	11/08/91	MUSTARDS	< 34	< 27	< 24
912137	12/09/91	COLLARDS	< 20	< 17	< 16
912138	12/09/91	RAPE	< 27	< 28	< 25
912139	12/09/91	MUSTARD	< 26	< 22	< 19

= Control Location * = Low Level Analysis

Table No.: 6.2
Sample: Vegetation: Broadleaf,(I-131,Gamma)
Collection: Monthly when available.
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: SECTOR J, 0.6 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
910021	01/02/91	BROCOLLI	< 25	< 19	< 19
910022	01/02/91	COLLARDS	< 22	< 17	< 13
910023	01/02/91	PAK CHOY	< 26	< 17	< 16
910219	02/04/91	COLLARDS	< 17	< 16	< 15
910220	02/04/91	SWISS CHARD	< 22	< 24	< 22
910221	02/04/91	TURNIP GREENS	< 14	< 14	< 11
910410	03/04/91	FLA MUSTARDS	< 30	< 26	< 21
910411	03/04/91	SWISS CHARD	< 19	< 19	< 18
910412	03/04/91	COLLARDS	< 24	< 24	< 20
910413 GG	03/04/91	COLLARDS	< 23	< 20	< 16
910667	04/08/91	COLLARDS	< 17	< 16	< 15
910668	04/08/91	SWISS CHARD	< 25	< 27	< 23
910669	04/08/91	CANNA LEAVES	< 18	< 22	< 16
910841	05/08/91	SWISS CHARD	< 17	< 16	< 12
910842	05/08/91	CABBAGE	< 18	< 18	< 13
910843	05/08/91	LETTUCE	< 23	< 22	< 21
911013	06/07/91	SUNFLOWER LVS	< 28	< 21	< 18
911014	06/07/91	KALE	< 9	< 7	< 6
911015	06/07/91	SWISS CHARD	< 17	< 13	< 11
911016 GG	06/07/91	SWISS CHARD	< 13	< 11	< 9

= Control Location * = Low Level Analysis

Table No.: 6.2a
Sample: Vegetation: Broadleaf,(I-131,Gamma)
Collection: Monthly when available.
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: SECTOR J, 0.6 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911241	07/08/91	SWISS CHARD	< 14	< 13	< 14
911242	07/08/91	SUNFLOWER LVS	< 22	< 22	< 21
911243	07/08/91	ZUCCHINI LEAVES	< 22	< 20	< 19
911414	08/12/91	SQUASH LEAVES	< 16	< 20	< 17
911415	08/12/91	SUNFLOWER LVS	< 19	< 17	< 15
911416	08/12/91	SWISS CHARD	< 12	< 13	< 11
911572	09/09/91	SQUASH LEAVES	< 29	< 27	< 23
911573	09/09/91	SWISS CHARD	< 16	< 16	< 13
911574 GG	09/09/91	SWISS CHARD	< 13	< 13	< 10
911575	09/09/91	FLA BL MUSTARD	< 25	< 21	< 20
911576 GG	09/09/91	FLA BL MUSTARD	< 14	< 13	< 11
911759	10/09/91	COLLARDS	< 18	< 15	< 14
911760	10/09/91	FLA BL MUSTARDS	< 15	< 14	< 15
911761	10/09/91	PAK CHOI	< 16	< 16	< 14
911988	11/08/91	COLLARDS	< 46	< 32	< 27
911989	11/08/91	SWISS CHARD	< 18	< 16	< 14
911990	11/08/91	BROCCOLI	< 40	< 31	< 29
912140	12/09/91	BROCCOLI	< 27	< 24	< 20
912141	12/09/91	TURNIP GREENS	< 23	< 19	< 17
912142	12/09/91	COLLARDS	< 20	< 20	< 16

= Control Location * = Low Level Analysis

Location: SECTOR R, 1.2 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
910024	01/02/91	BROCOLLI	< 34	< 29	< 25
910025	01/02/91	CABBAGE	< 19	< 16	< 14
910026	01/02/91	COLLARDS	< 25	< 20	< 15
910222	02/04/91	TURNIP GREENS	< 17	< 18	< 15
910223	02/04/91	COLLARDS	< 24	< 22	< 19
910224	02/04/91	CABBAGE	< 10	< 8	< 7
910414	03/04/91	TURNIP GREENS	< 30	< 26	< 22
910415	03/04/91	KALE	< 20	< 20	< 16
910416	03/04/91	COLLARDS	< 24	< 25	< 17
910417 GG	03/04/91	COLLARDS	< 26	< 24	< 21
910670	04/08/91	RAPE	< 21	< 24	< 22
910671	04/08/91	MUSTARD	< 17	< 19	< 18
910672	04/08/91	CABBAGE	< 15	< 14	< 12
910844	05/08/91	SWISS CHARD	< 6	< 6	< 5
910845	05/08/91	CABBAGE	< 15	< 13	< 10
910846	05/08/91	LETTUCE	< 24	< 27	< 23
911017	06/07/91	BEET LEAVES	< 15	< 13	< 12
911018	06/07/91	SWISS CHARD	< 19	< 15	< 14
911019	06/07/91	LETTUCE	< 32	< 28	< 24
911020 GG	06/07/91	LETTUCE	< 13	< 11	< 11

= Control Location * = Low Level Analysis

Table No.: 6.3a

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Vegetation: Broadleaf,(I-131,Gamma)

Collection: Monthly when available.

Units: pCi/Kg

Location: SECTOR R, 1.2 KM

Lab No.	Collection Date	Sample type	I-131	Cs-134	Cs-137
911244	07/08/91	PHOTINIA LEAVES	< 21	< 21	< 16
911245	07/08/91	SWISS CHARD	< 21	< 19	< 18
911246	07/08/91	CRD.PEA LEAVES	< 22	< 24	< 20
911417	08/12/91	SWISS CHARD	< 17	< 16	< 15
911418	08/12/91	MUSTARD GREENS	< 14	< 14	< 14
911419	08/12/91	SQUASH LEAVES	< 23	< 20	< 19
911577	09/09/91	CURLY MUSTARD	< 14	< 16	< 14
911578	09/09/91	SWISS CHARD	< 16	< 13	< 12
911579 GG	09/09/91	SWISS CHARD	< 14	< 12	< 11
911580	09/09/91	FLA BL MUSTARD	< 14	< 13	< 13
911581 GG	09/09/91	FLA BL MUSTARD	< 12	< 13	< 13
911762	10/09/91	CABBAGE	< 33	< 32	< 28
911763	10/09/91	FLA BL MUSTARD	< 18	< 14	< 15
911764	10/09/91	COLLARDS	< 16	< 18	< 15
911991	11/08/91	CABBAGE	< 20	< 18	< 13
911992	11/08/91	RUTABAGA	< 22	< 16	< 16
911993	11/08/91	CAULIFLOWER LVS	< 21	< 20	< 18
912143	12/09/91	BROCCOLI	< 15	< 14	< 12
912144	12/09/91	CABBAGE	< 15	< 12	< 12
912145	12/09/91	SWISS CHARD	< 32	< 28	< 22

= Control Location * = Low Level Analysis

Table No.: 7.1
Sample: Fish Samples,(Gamma)
Collection: Semiannually
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: MISS. RIVER UP

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
910971	06/03/91	CATFISH	< 20	< 22	< 31	< 22	< 50	< 24	< 23
910972 GG	06/03/91	CATFISH	< 7	< 7	< 10	< 10	< 16	< 8	< 6
912174	12/12/91	BUFFALO	< 8	< 9	< 12	< 9	< 19	< 9	< 8

= Control Location * = Low Level Analysis

Table No.: 7.2
Sample: Fish Samples,(Gamma)
Collection: Semiannually
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: MISS. RIVER DOWN

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
910973	06/03/91	CATFISH	< 12	< 11	< 17	< 13	< 30	< 14	< 12
910974 GG	06/03/91	CATFISH	< 11	< 11	< 17	< 11	< 28	< 11	< 10
912175	12/12/91	BUFFALO	< 13	< 14	< 20	< 13	< 33	< 16	< 14

= Control Location * = Low Level Analysis

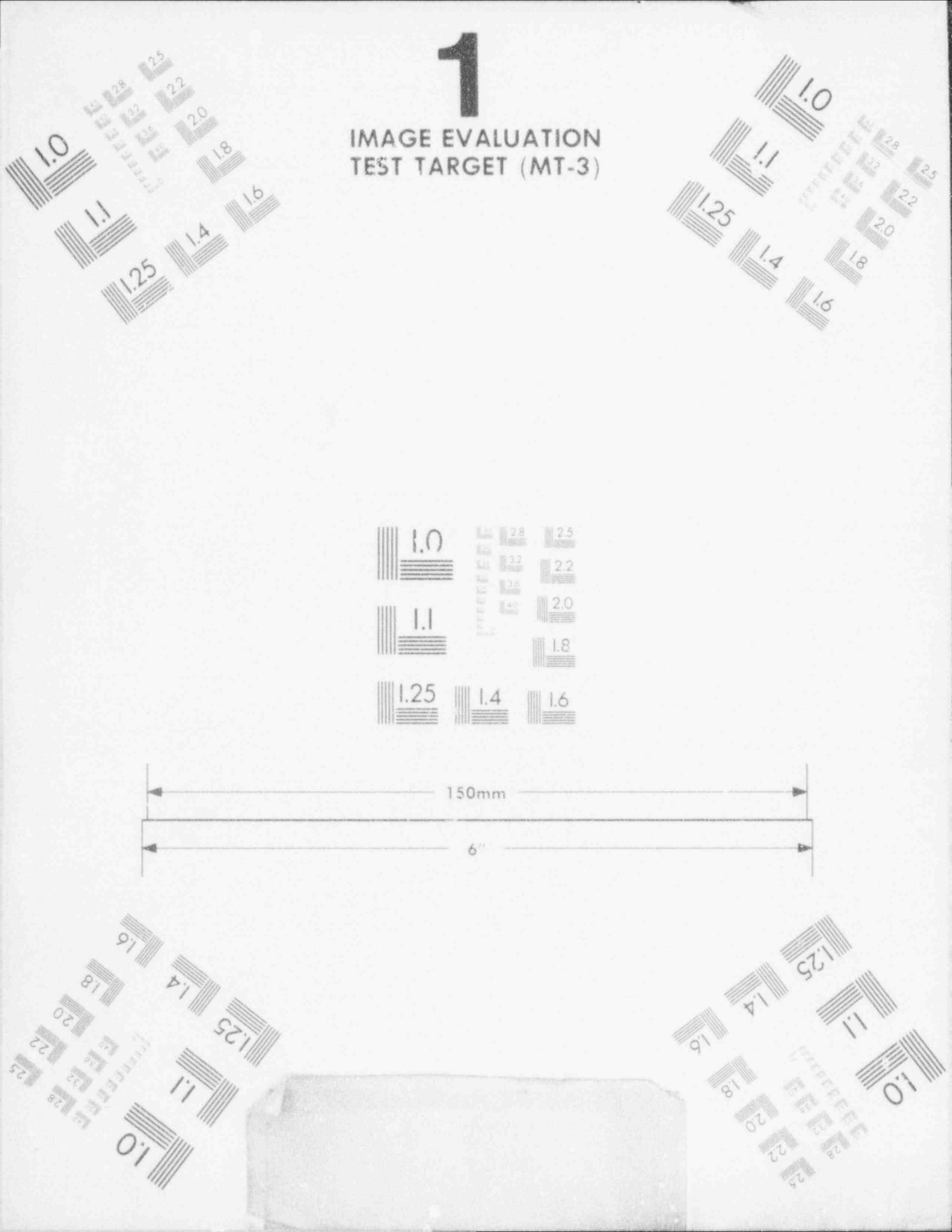
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IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"

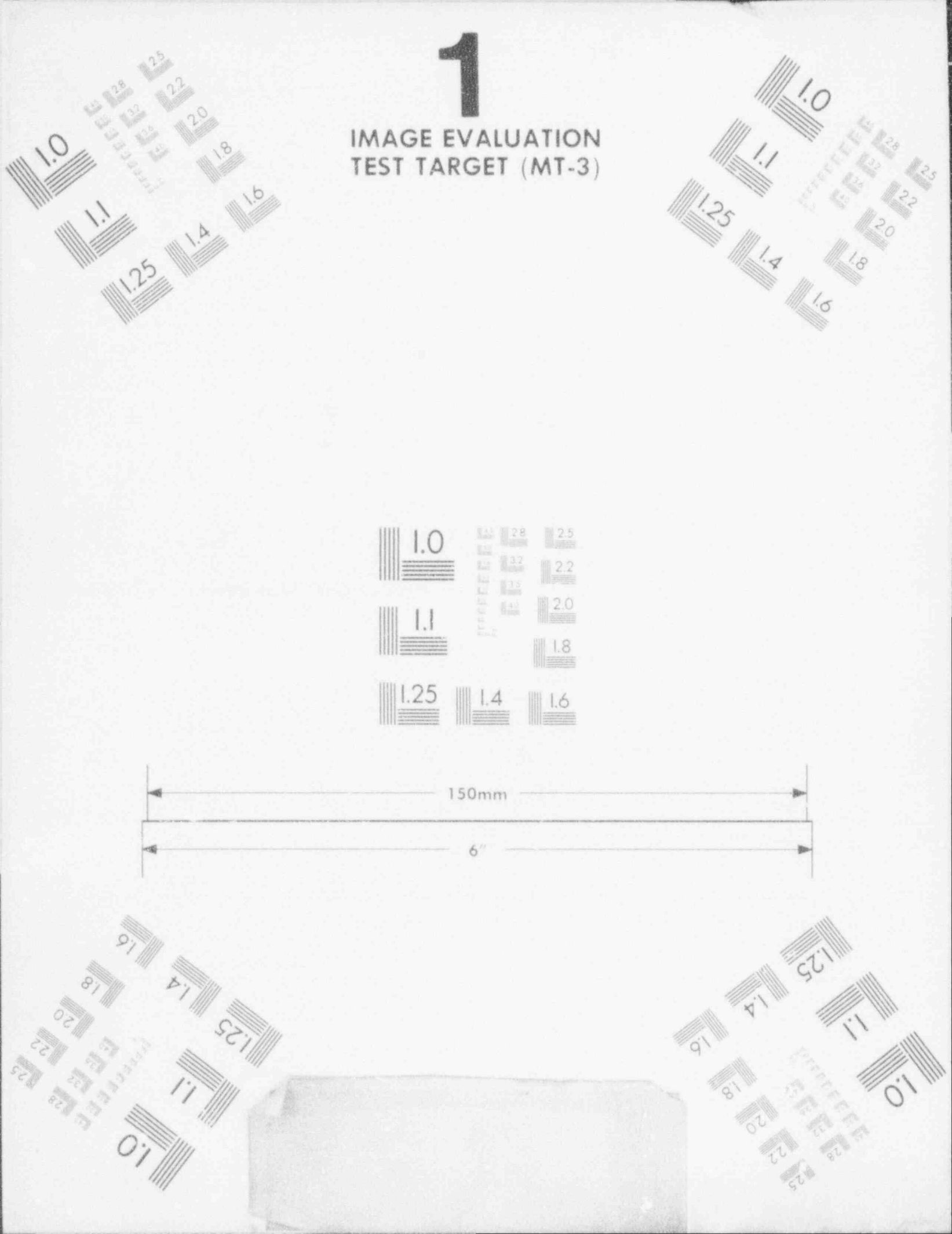
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IMAGE EVALUATION
TEST TARGET (MT-3)
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1.1
1.25
1.4
1.6
2.0
2.2
2.5
2.8
3.2
3.5
4.0
1.8
150mm
6"

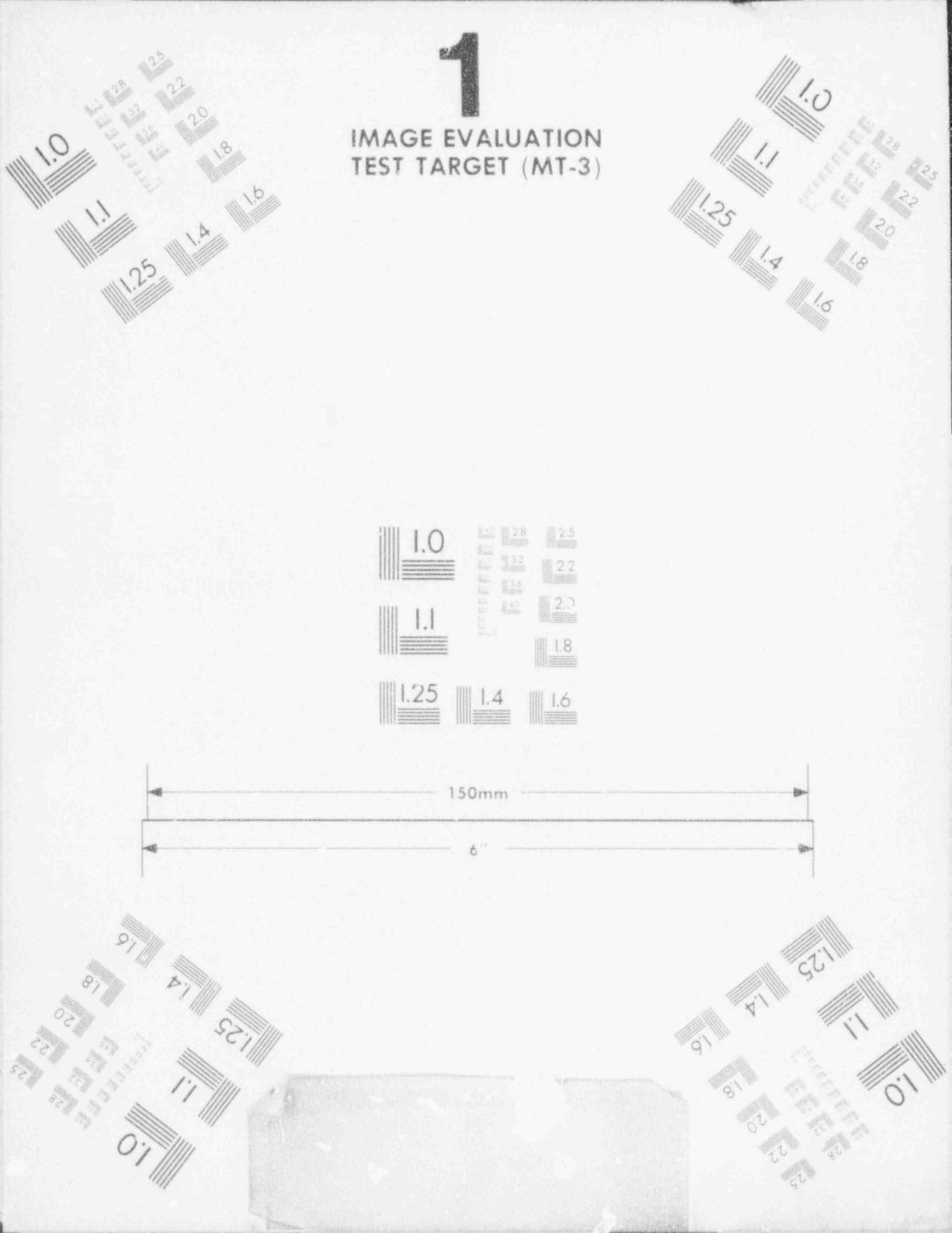
1
IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"

Table No.: 8.1

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Sediment, (Gamma)

Collection: Semiannually

Units: pCi/kg

Location	Lab No.	Collection Date	Cr-51	Mn-54	Co-58	Co-60	Cs-134	Cs-137
SEDBAR,Barge slip	910995	06/04/91	329+/-120	1231+/-30	< 19	1271+/-31	< 21	122+,-14
SEDBAR,Barge slip	910996 GG	06/04/91	358+/-140	1391+/-29	< 19	2084+/-32	< 20	143+/-13
SEDBAR,Barge slip	912123	12/03/91	<142	< 17	< 16	< 17	< 22	< 15
SEDCONT, Upstream	910993	06/04/91	< 99	< 12	< 12	< 14	< 15	34 +/-13
SEDCONT, Upstream	910994 GG	06/04/91	< 92	< 10	< 10	< 9	< 12	24 +/- 8
SEDCONT, Upstream	912122	12/03/91	< 63	< 7	< 7	< 7	< 9	45+/-7
SEDHAM,Hamilton L	910997	06/04/91	< 82	< 10	< 9	< 9	< 13	< 8
SEDHAM,Hamilton L	910998 GG	06/04/91	< 154	< 15	< 15	< 14	< 20	< 13
SEDHAM,Hamilton L	91212[illegible]	[illegible]/03/91	<100	< 12	< [illegible]	< 11	< 15	70+/-10

= Control Location * = Low Level Analysis

Table No.: 9.1 Environmental Radiological Monitoring Report Date: 01/21/92

Sample: Special surface water,grab. (Gamma)

Collection: As requested.

Units: pCi/L

Location: Outfall #007

Lab. No.	Collection Date	Mn-54	Fe-59	Co-58	Co-60	I-131	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
910214	01/30/91	< 2	< 2	< 2	< 2	< 2	< 2	< 3	< 2	< 2	< 2	< 6	< 2

= Control Location * = Low Level Analysis

Table No.: 9.Z

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Special surface water,grab. (Gamma)

Collection: As requested.

Units: pCi/L

Location: BARGE SLIP

Lab. No.	Collection Date	Mn-54	Fe-59	Co-58	Co-60	I-131	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
910042	01/02/91	< 4	< 6	< 5	< 4	< 11	< 9	< 8	< 5	< 4	< 4	< 22	< 9
910258	02/05/91	< 4	< 5	< 4	< 4	< 8	< 8	< 9	< 4	< 4	< 3	< 18	< 7
910452	03/05/91	< 2	< 3	< 2	< 2	< 4	< 5	< 5	< 3	< 2	< 2	< 9	< 3

= Control Location * = Low Level Analysis

Table No.: 9.3
Sample: Special surface water,(H-3)
Collection: As requested.
Units: pCi/L

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: BARGE SLIP

Lab. No.	Collection Date	H-3
910258	02/05/91	< 350
910452	03/05/91	< 350

= Control Location * = Low Level Analysis

Table No.: 9.4

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Special surface water,sewage eff;(Gamma)

Collection: As requested.

Units: pCi/L

Location: Outfall #010

Lab. No.	Collection 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
910260	02/06/91	< 3	< 3	< 4	< 3	< 6	< 3	< 6	< 4	< 3	< 3	< 13	< 4
911685	09/27/91	< 2	< 2	< 3	< 3	< 5	< 3	< 5	< 3	< 3	< 2	< 10	< 3
911767	10/10/91	< 2	< 2	< 3	< 2	< 4	< 3	< 5	< 4	< 3	< 2	< 11	< 4

= Control location * = Low Level Analysis

Table No.: 10.1
Sample: Special sediment, (Gamma)
Collection: As requested.
Units: pCi/Kg

Environmental Radiological Monitoring Report

Date: 01/21/92

Location: BARGE SLIP

Lab No.	Collection Date	Cr-51	Mn-54	Co-58	Co-60	Cs-134	Cs-137
910263	02/05/91	< 354	1584+/-53	90 +/-30	1473+/-55	< 39	221+/-30
910453	03/05/91	284+/-84	940+/-20	27 +/- 9	770+/-20	< 14	93 +/-10

= Control Location * = Low Level Analysis

Sample: Special sediment, (Gamma)
Collect on: As requested.
Units: pCi/Kg

Location: Basin B

Lab No.	Collection Date	Cr-51	Mn-54	Co-58	Co-60	Cs-134	Cs-137
910215	01/30/91	< 111	< 10	< 10	< 10	< 12	< 9

Table No.: 11.1

Environmental Radiological Monitoring Report

Date: 01/21/92

Sample: Special waste water, raw sewage;(Gamma)

Collection: As requested.

Units: pCi/L

Location: UNIT 1

Lab. No.	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
910307	02/05/91	43 +/-11	< 12	< 8	64 +/- 9	< 16	< 15	< 9	< 19	< 8	< 7	< 50	< 18
910499	03/14/91	159+/-13	< 13	< 10	255+/-17	< 20	< 20	< 11	< 13	< 12	< 9	< 39	< 10

= Control Location * = Low Level Analysis

Table No.: 12.1
Sample: Special animal meat. (Gamma)
Collection: As requested.
Units: pCi/kg

Environmental Radiological Monitoring Report

Date: 01/28/92

Location: BUCKSNORT CAMP

Lab No.	Collection Date	Sample type	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
912072	11/25/91	VENISON	< 6	< 7	< 11	< 8	< 16	< 8	< 7
912073GG	11/25/91	VENISON GG	< 7	< 7	< 10	< 7	< 16	< 8	< 7

= Control Location * = Low Level Analysis

EPA CROSS CHECK RESULTS

EPA PREP DATE	DATE EPA ISSUED RESULTS	MEDIA	NUCLIDE	EPA RESULTS	AP&L RESULTS	NORM DEV KNOWN
4th Qtr. 1190 CC36036-74	1/11/91	Analytic, Inc. Iodine Cartridge (uCi/cc)	I-131	3.18E-2	3.43E-2	1.08 Ratio
02/08/91	04/15/91	Water (pCi/L)	Co-60	40.0	40.67	0.23
			Zn-65	149.0	145.67	-0.38
			Ru-106	186.0	196.67	0.97
			Cs-134	8.0	9.00	0.35
			Cs-137	8.0	9.00	0.35
			Ba-133	75.0	85.33	2.24
02/22/91	04/16/91	Water (pCi/L)	H-3	4418.0	4613.33	0.77
03/29/91	07/19/91	Air Filter (pCi/Filter)	Beta	124.0	122.33	-0.40
			Cs-137	40.0	59.33	6.70**[1]
05/17/91	07/22/91	Water (pCi/L)	Beta	46.0	47.00	0.35
04/16/91	07/25/91	Water Blind B (pCi/L)	Beta	115.0	73.33	-4.25**[2]
			Cs-134	24.0	23.33	-0.23
			Cs-137	25.0	25.67	0.23
06/07/91	09/11/91	Water (pCi/L)	Co-60	10.0	10.33	0.12
			Zn-65	108.0	106.00	-0.31
			Ru-106	149.0	146.00	-0.35
			Cs-134	15.0	14.67	-0.12
			Cs-137	14.0	14.67	0.23
			Ba-133	62.0	63.67	0.48
06/30/91	11/15/91	Air Filter (pCi/Filter)	Beta	92.0	93.67	0.29
			Cs-137	30.0	30.00	0
09/09/91	10/25/91	Water (pCi/L)	I-131	20.0	17.67	-0.67
10/04/91	12/02/91	Water (pCi/L)	Co-60	29.0	28.00	-0.35
			Zn-65	73.0	73.33	0.08
			Ru-106	199.0	194.00	-0.43
			Cs-134	10.0	9.67	-0.12
			Cs-137	10.0	10.33	0.12
			Ba-133	98.0	100.00	0.35

EPA CROSS CHECK RESULTS

EPA PREP DATE	DATE EPA ISSUED RESULTS	MEDIA	NUCLIDE	EPA RESULTS	AP&L RESULTS	NORM DEV KNOWN
10/18/91	12/05/91	Water (pCi/L)	H-3	2454.0	2336.67	-0.58
09/27/91	01/03/92	Milk (pCi/L)	I-131	108.0	102.00	-0.94
			Cs-137	30.0	30.33	0.12
			K	1740.0	1570.00	-3.38 **3
10/22/91	01/24/92	Water Blind B (pCi/L)	Beta	65.0	52.00	-2.25
			Cs-134	10.0	11.00	0.35
			Cs-137	11.0	11.00	0.00
			Co-60	20.0	20.33	0.12

**1 A new efficiency curve was constructed using a blank EPA plastic air filter. Efficiencies calculated using this air filter geometry were approximately 30% higher than previous geometries using air particulate filters.

**2 Blind water samples contain several isotopes which have different beta energies. The efficiency curve for beta in water was constructed using Cs-137. Because the strontium isotopes have different beta energies than Cs-137, the results may not always agree with the standard beta in water efficiency using only Cs-137.

**3 The results submitted by System Chemistry for Total Potassium (K) were less than the lower control unit established by EPA for this sample. System Chemistry will investigate possible sources of error within the gamma spectrometer efficiency curves and the calculations used to convert K-40 measurements into Total Potassium results. The results of these investigations will be included in the next monthly report.

It should be noted that the mean result submitted by 63 laboratories whose results were included in the Grand Average was 1.5 standard deviations below the value used by the EPA as the "known value" for Total Potassium for this cross-check sample. Of the results classified as outside the control limits by EPA, 17 were outside of the lower control limit set by the EPA while only 3 results were outside of the higher control limit. The submitted results were drastically shifted below the EPA established "known value". A request will be made to EPA to recheck the published "known value" for Total Potassium of this sample. Results of this inquiry will be included in the next monthly report after receipt of a reply from the EPA.

The U.S. EPA was contacted and confirmed that the "known value" for Total Potassium was correct. An independent experiment was developed to measure Total Potassium using a known mass on Potassium Nitrate dissolved in 3.5L of water. The experimented value was calculated to be 0.993 of the theoretical value.

ATTACHMENT II

1991 THERMOLUMINESCENT DOSIMETRY REPORT

GRAND GULF NUCLEAR STATION

Table 1. Gamma Radiation, as Measured by TLDs, 1991.
(Required by Technical Specification 3.12.1)

Inner Ring, Within Two (2) Mile Radius

Location	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Annealed:	12-11-90	03-06-91	06-07-91	09-09-91
Date Read:	04-05-91	07-09-91	10-10-91	01-10-92
	Average mR/Quarter			
M-16	19.5±0.7	17.3±0.7	20.0±0.6	19.2±0.9
M-18	23.8±1.2	20.3±0.5	23.7±1.4	21.6±0.5
M-25	13.9±0.3	13.4±0.4	19.4±0.5	20.0±0.5
M-27	ND[a]	13.9±0.6	21.4±0.3	20.0±1.0
M-28	19.4±1.1	18.3±0.7	19.0±1.1	19.7±0.7
M-30	15.3±0.6	12.4±0.5	15.0±0.7	13.2±1.0
M-41	ND[a]	ND[b]	18.0±0.9	15.0±0.6
M-42	13.7±0.8	13.9±0.5	20.7±0.9	18.6±0.7
M-43	ND[b]	17.[illegible]±0.6	19.4±1.5	18.5±0.6
M-44	15.0±0.6	[illegible]	15.0±0.4	14.9±0.4
M-45	18.8±0.9	17.5±0.4	19.3±0.6	18.8±0.3
M-46	16.6±0.4	17.1±0.7	16.3±0.7	17.6±0.5
M-52	20.9±1.4	18.0±1.1	20.5±0.5	18.6±1.3
M-53	20.4±0.6	19.4±0.8	ND[b]	20.1±0.9
M-54	19.4±1.2	15.4±0.5	19.6±0.9	17.1±1.0
M-86	19.3±0.4	19.8±0.4	20.8±0.6	19.8±0.5
Mean ± s.d.	18.2±3.0	16.7±2.5	19.2±2.4	18.3±2.2

[a] ND = TLD not used due to river flooding.
[b] ND = No data; TLD lost in the field.

The error given is the probable counting error at the 95% confidence level (2 sigma).

Approved by L. G. Huebner Date 1/15/92
L. G. Huebner
General Manager

GRAND GULF NUCLEAR STATION

Table 1. Gamma Radiation, as Measured by TLDs, 1991.
(Required by Technical Specification 3.12.1)

Outer Ring, Within six (6) Mile Radius

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Annealed:	12-11-90	03-06-91	06-07-91	09-09-91
Date Read:	04-05-91	07-09-91	10-10-91	01-10-92
Location	Average mR/Quarter			
M-36	18.5±0.7	17.1±0.5	19.2±1.0	ND[a]
M-40	18.6±0.8	18.8±0.5	20.3±0.7	20.3±0.7
M-47	15.4±0.9	ND[a]	14.2±0.9	14.0±0.5
M-48	16.8±0.9	16.5±0.4	16.7±1.2	17.1±0.3
M-49	20.2±1.0	18.2±0.5	20.2±0.6	18.8±0.4
M-50	19.6±0.8	18.0±1.2	19.7±0.6	18.6±1.2
M-51	20.8±1.1	19.4±1.1	20.4±0.8	19.6±1.0
M-55	24.0±1.0	21.0±0.7	24.7±1.3	21.9±0.6
M-56	19.3±0.7	19.6±0.6	ND[a]	20.1±0.4
M-57	20.4±1.2	20.2±0.4	20.4±0.8	21.6±0.4
M-58	16.2±0.3	14.7±0.6	16.3±0.4	14.5±0.5
M-59	13.3±0.7	12.8±0.4	ND[a]	18.9±1.1
M-88	ND[a]	14.3±0.6	15.2±0.5	14.6±0.6
M-89	12.8±0.6	13.6±0.6	15.9±0.6	15.7±0.5
M-90	14.4±0.5	ND[a]	16.6±0.6	13.7±0.6
M-91	19.0±0.9	17.2±1.2	19.3±1.1	17.2±1.1
Mean ± s.d.	18.0±3.1	17.2±2.6	18.5±2.8	17.8±2.8

[a] ND = No data; TLDs lost in the field.

The error given is the probable counting error at the 95% confidence level (2 sigma).

Approved by L. G. Huebner Date 1/15/92

L. G. Huebner
General Manager

GRAND GULF NUCLEAR STATION

Table 1. Gamma Radiation, as Measured by TLDs, 1991.
(Required by Technical Specification 3.12.1)

	Special Interest Areas			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Annealed:	12-11-90	03-06-91	06-07-91	09-09-91
Date Read:	04-05-91	07-09-91	10-10-91	01-10-92
Location	Average mR/Quarter			
M-01	21.7±0.3	20.2±2.1	21.2±0.8	22.2±0.6
M-07	19.0±1.0	18.2±0.8	19.3±0.6	20.5±0.9
M-09	15.8±0.4	16.6±0.5	17.0±0.8	17.2±0.6
M-10	14.8±0.6	15.1±0.6	15.5±0.8	16.5±0.6
M-33	18.4±0.6	17.0±1.1	18.6±0.8	18.3±1.3
M-38	15.7±0.9	17.5±0.7	16.7±1.1	19.5±0.5
M-39	18.0±0.6	15.3±0.5	16.1±0.8	ND[a]
Mean ± s.d.	17.6±2.4	17.1±1.8	17.8±2.0	19.0±2.1
CONTROL				
M-14	18.4±0.8	17.2±1.0	18.4±0.9	18.1±1.2
SHIELD				
M-00	5.5±0.3	5.9±0.5	6.2±0.3	6.0±0.3

[a] ND = no data; TLDs lost in the field.

The error given is the probable counting error at the 95% confidence level (2 sigma).

Approved by L. G. Huebner Date 1/15/92

L. G. Huebner
General Manager

GRAND GULF NUCLEAR STATION

Table 1. Gamma Radiation, as Measured by TLDs, 1991.
(Not required by Technical Specification 3.12.1)

On-Site

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Annealed:	12-11-90	03-06-91	06-07-91	09-09-91
Date Read:	04-05-91	07-09-91	10-10-91	01-10-92
Location	Average mR/Quarter			
M-61	17.1±0.5	15.0±0.6	16.2±0.4	15.8±0.3
M-62	18.2±1.1	15.5±0.4	17.8±1.2	17.2±1.0
M-63	21.6±0.8	21.8±0.9	20.9±1.1	22.1±0.8
M-64	20.9±1.2	17.4±0.5	20.7±0.8	19.8±0.8
M-65	31.6±0.8	20.1±1.0	20.9±0.6	17.8±0.9
M-66	25.0±0.9	20.5±0.6	24.6±1.4	22.8±0.5
M-67	23.6±0.6	19.6±0.6	21.4±0.3	22.0±0.4
M-68	52.7±2.5	36.7±0.8	48.7±0.7	43.7±1.8
M-69	84.8±2.0	68.6±2.3	85.4±1.4	89.2±1.2
M-70	68.4±1.4	54.9±2.0	66.1±3.1	66.2±2.5
M-71	28.6±1.3	10.2±0.4	10.3±0.6	10.0±0.3
M-72	17.8±0.5	15.8±0.9	11.4±0.3	ND[a]
M-73	18.2±0.5	19.6±0.5	20.9±0.4	20.3±0.6
M-74	17.6±0.9	18.9±0.6	21.6±1.0	21.2±0.5
M-75	15.1±0.8	15.6±0.6	18.0±1.1	17.0±0.4
M-76	15.3±0.7	17.8±0.7	18.1±1.4	18.4±1.0
M-77	17.7±0.7	16.0±0.9	17.9±0.9	16.4±0.6
M-78	13.0±0.7	13.7±0.4	13.5±0.8	14.0±1.1
M-79	15.6±0.9	14.8±0.8	16.5±0.9	13.5±1.0
M-80	17.5±0.4	15.9±0.7	18.5±0.5	15.0±0.4
M-81	18.0±0.6	16.5±0.7	18.0±0.5	ND[a]
M-82	15.4±0.5	18.4±1.0	18.4±0.6	14.0±0.7
M-83	13.8±0.6	13.0±0.5	13.5±0.4	ND[a]
M-84	17.0±0.7	15.6±0.4	17.0±0.8	12.5±0.7
Mean ± s.d.	24.2±18.0	21.3±13.5	24.0±17.7	24.2±19.3

[a] ND = no data; TLDs lost in the field.

The error given is the probable counting error at the 95% confidence level (2 sigma).

Approved by L G Huebner Date 1/15/92
L. G. Huebner
General Manager

GRAND GULF NUCLEAR STATION

Table 1. Gamma Radiation, as Measured by TLDs, 1991.
(Not required by Technical Specification 3.12.1)

Additional Locations, Within Fifteen (15) Mile Radius

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Annealed:	12-11-90	03-06-91	06-07-91	09-09-91
Date Read:	04-05-91	07-09-91	10-10-91	01-10-92
Location	Average mR/Quarter			
M-02	ND[b]	19.5±1.0	17.9±1.2	22.4±0.6
M-03	19.3±0.9	18.9±1.2	19.7±1.1	20.6±0.5
M-04	21.0±0.7	18.4±0.6	22.2±0.8	21.4±0.3
M-05	19.8±0.8	18.8±1.0	19.8±0.3	21.2±0.4
M-06	20.1±1.1	17.5±1.0	20.3±1.0	19.8±1.1
M-08	14.7±0.7	14.2±0.7	14.7±0.4	14.8±0.4
M-11	18.3±0.4	17.7±0.4	18.2±0.6	19.5±0.8
M-12	18.1±1.3	16.4±0.8	16.5±0.8	16.9±0.6
M-13	17.5±0.5	16.6±0.4	17.5±0.5	17.6±0.5
M-15	13.0±0.5	11.8±0.5	14.3±0.5	14.9±0.6
M-17	19.2±0.5	ND[b]	19.2±0.6	15.4±0.3
M-19	20.9±1.1	17.6±0.6	20.3±0.5	19.1±0.6
M-20	15.7±0.5	16.3±0.5	14.6±0.5	16.7±0.3
M-21	21.3±0.9	19.6±0.7	20.6±0.5	21.4±0.4
M-22	22.3±0.3	18.7±0.4	22.5±0.4	20.3±0.3
M-23	17.3±1.0	17.1±0.7	19.1±0.5	19.8±0.6
M-24	ND[a]	ND[b]	8.6±0.5	14.7±0.6
M-26	14.2±0.5	ND[b]	18.7±0.4	17.2±0.4
M-29	19.6±1.1	18.2±0.6	20.4±1.0	19.7±0.9
M-34	22.9±0.8	20.0±0.6	22.2±1.0	21.4±0.4
M-35	ND[a]	13.9±0.4	19.0±0.9	17.6±0.3
M-37	15.7±0.9	19.2±0.8	21.1±0.6	20.2±0.7
M-85	17.7±0.7	15.9±0.8	17.9±0.2	15.6±0.4
M-87	20.6±1.1	16.2±0.6	20.8±0.5	17.4±0.8
M-92	16.3±1.1	14.7±0.6	16.5±0.9	14.8±0.6
M-93	20.4±0.7	19.7±0.9	21.6±1.2	19.7±0.6
M-94	15.8±0.4	12.9±0.6	15.8±0.3	12.7±0.4
Mean ± s.d.	18.4±2.7	17.1±2.3	18.5±3.1	18.2±2.6
DUPLICATE TLDs				
M-31	22.1±1.1	14.2±0.6	21.9±0.8	16.2±0.6
M-32	20.0±0.7	18.5±1.0	17.5±0.9	16.2±0.3
M-60	18.4±0.8	16.6±0.4	15.8±0.6	19.5±0.7
Mean ± s.d.	20.2±1.9	16.4±2.2	18.4±3.2	17.3±1.9

[a] ND = TLD not used due to river flooding.
[b] ND = No data; TLDs lost in the field.

The error given is the probable counting error at the 95% confidence level (2 sigma).

Approved by K G Huebner Date 1/15/92
L. G. Huebner
General Manager

APPENDIX A

INTERNATIONAL INTERCOMPARISON

OF

ENVIRONMENTAL DOSIMETERS

Table A-2. Crosscheck program results, thermoluminescent dosimeters (TLDs).

Lab Code	TLD Type	Measurement	mR		
			Teledyne Result ±2 [a]	Known Value[c]	Average ±2σ[d] (All Participants)
2nd International Intercomparison[b]					
115-2	CaF_2:Mn Bulb	Field	17.0±1.9	17.1	16.4±7.7
		Lab	20.8±4.1	21.3	18.8±7.6
3rd International Intercomparison[e]					
115-3	CaF_2:Mn Bulb	Field	30.7±3.2	34.9±4.8	31.5±3.0
		Lab	89.6±6.4	91.7±14.6	86.2±24.0
4th International Intercomparison[f]					
115-4	CaF_2:Mn Bulb	Field	14.1±1.1	14.1±1.4	16.0±9.0
		Lab (Low)	9.3±1.3	12.2±2.4	12.0±7.4
		Lab (High)	40.4±1.4	45.8±9.2	43.9±13.2
5th International Intercomparison[g]					
115-5A	CaF_2:Mn Bulb	Field	31.4±1.8	30.0±6.0	30.2±14.6
		Lab at beginning	77.4±5.8	75.2±7.6	75.8±40.4
		Lab at the end	96.6±5.8	88.4±8.8	90.7±31.2
115-5B	LiF-100 Chips	Field	30.3±4.8	30.0±6.0	30.2±14.6
		Lab at beginning	81.1±7.4	75.2±7.6	75.8±40.4
		Lab at the end	85.4±11.7	88.4±8.8	90.7±31.2
7th International Intercomparison[h]					
115-7A	LiF-100 Chips	Field	75.4±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	80.0±3.5	79.9±4.0	77.9±27.6
		Lab (Cs-137)	66.6±2.5	75.0±3.8	73.0±22.2

Table A-2. (continued)

Lab Code	TLD Type	Measurement	mR: Teledyne Result ±2 [a]	mR: Known Value [c]	mR: Average ±2σ [d] (All Participants)
115-7B	CaF_2:Mn Bulbs	Field	71.5±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	84.8±6.4	79.9±4.0	77.9±27.6
		Lab (Cs-137)	78.8±1.6	75.0±3.8	73.0±22.2
115-7C	$CaSO_4$:Dy Cards	Field	76.8±2.7	75.8±6.0	75.1±29.8
		Lab (Co-60)	82.5±3.7	79.9±4.0	77.9±27.6
		Lab (Cs-137)	79.0±3.2	75.0±3.8	73.0±22.2
8th International Intercomparison [i]					
115-8A	LiF-100 Chips	Field Site 1	29.5±1.4	29.7±1.5	28.9±12.4
		Field Site 2	11.3±0.8	10.4±0.5	10.1±9.06
		Lab (Cs-137)	13.7±0.9	17.2±0.9	16.2±6.8
115-8B	CaF_2:Mn Bulbs	Field Site 1	32.3±1.2	29.7±1.5	28.9±12.4
		Field Site 2	9.0±1.0	10.4±0.5	10.1±9.0
		Lab (Cs-137)	15.8±0.9	17.2±0.9	16.2±6.8
115-8C	$CaSO_4$:Dy Cards	Field Site 1	32.3±0.7	29.7±1.5	28.9±12.4
		Field Site 2	10.6±0.6	10.4±0.5	10.1±9.0
		Lab (Cs-137)	18.1±0.8	17.2±0.9	16.2±6.8
Teledyne Testing [j]					
89-1	LiF-100 Chips	Lab	21.0±0.4	22.4	--
89-2	Teledyne $CaSO_4$:Dy Cards	Lab	20.9±1.0	20.3	--

Table A-2. (continued)

Lab Code	TLD Type	Measurement	mR: Teledyne Result ±2 [a]	mR: Known Value[c]	mR: Average ±2σ[d] (All Participants)
Teledyne Testing[j]					
90-1[k]	Teledyne $CaSO_4$:Dy Cards	Lab	20.6±1.4	19.6	--
90-1[l]	Teledyne $CaSO_4$:Dy Cards	Lab	100.8±4.3	100.0	--

[a] Lab result given is the mean ±2 standard deviations of three determinations.
[b] Second International Intercomparison of Environmental Dosimeters conducted in April of 1976 by the Health and Safety Laboratory (GASL), New York, New York, and the School of Public Health of the University of Texas, Houston, Texas.
[c] Value determined by sponsor of the intercomparison using continuously operated pressurized ion chamber.
[d] Mean ±2 standard deviations of results obtained by all laboratories participating in the program.
[e] Third International Intercomparison of Environmental Dosimeters conducted in summer of 1977 by Oak Ridge National Laboratory and the School of Public Health of the University of Texas, Houston, Texas.
[f] Fourth International Intercomparison of Environmental Dosimeters conducted in summer of 1979 by the School of Public Health of the University of Texas, Houston, Texas.
[g] Fifth International Intercomparison of Environmental Dosimeter conducted in fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.
[h] Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.
[i] Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.
[j] Chips were submitted in September 1989 and cards wre submitted in November 1989 to Teledyne Isotopes, Inc., Westwood, NJ for irradiation.
[k] Cards were irradiated by Teledyne Isotopes, Inc., Westwood, NJ on June 19, 1990.
[l] Cards were irradiated by Dosimetry Associates, Inc., Northville, MI on October 30, 1990.