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Gentlemen:

River Bend Station - Unit 1
Docket No. 50-458

Enclosed is the Annual Radiological Environmental Operating Report for 1989. This report is submitted in accordance with Subsection 6.9.1.7 of Appendix A (Technical Specifications) to River Bend Station License Number NPF-47.

Sincerely,

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Manager-Oversight
River Bend Nuclear Group

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Enclosure

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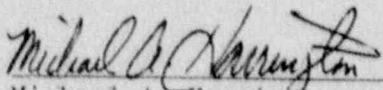
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

RIVER BEND STATION


FOR THE OPERATING PERIOD

January 1, 1989 - December 31, 1989

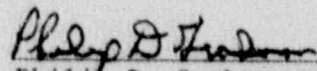
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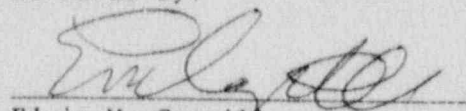
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Abstract

During 1989 a land use census and radiological environmental monitoring were conducted in the vicinity of River Bend Station (RBS). As part of the monitoring program, the RBS Environmental Services Group participated in an interlaboratory comparison program with 97.5 percent of analytical results within control limits. The land use census revealed one salient change in receptor locations since 1988. Fifteen monitoring exceptions occurred, 9 involving Technical Specification requirements, although none had significant impact on program quality. Although well below the required detection limits, slightly elevated (relative to baseline data) levels of Cesium-137 were sporadically measured in both indicator and control media; these concentrations were presumably attributable to the 1986 incident at Chernobyl, Russia. The only measurable increases in concentrations of radio-nuclides or levels of radiation, attributable to plant operation, in the vicinity of RBS during 1989 appear to have been expected low levels in the liquid Discharge Line. These levels were barely above the required LLDs and hence substantially below Technical Specification reporting levels. Thus the 1989 Radiological Environmental Monitoring Program substantiated the adequacy of source control and effluent monitoring at River Bend Station.

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1.0 INTRODUCTION

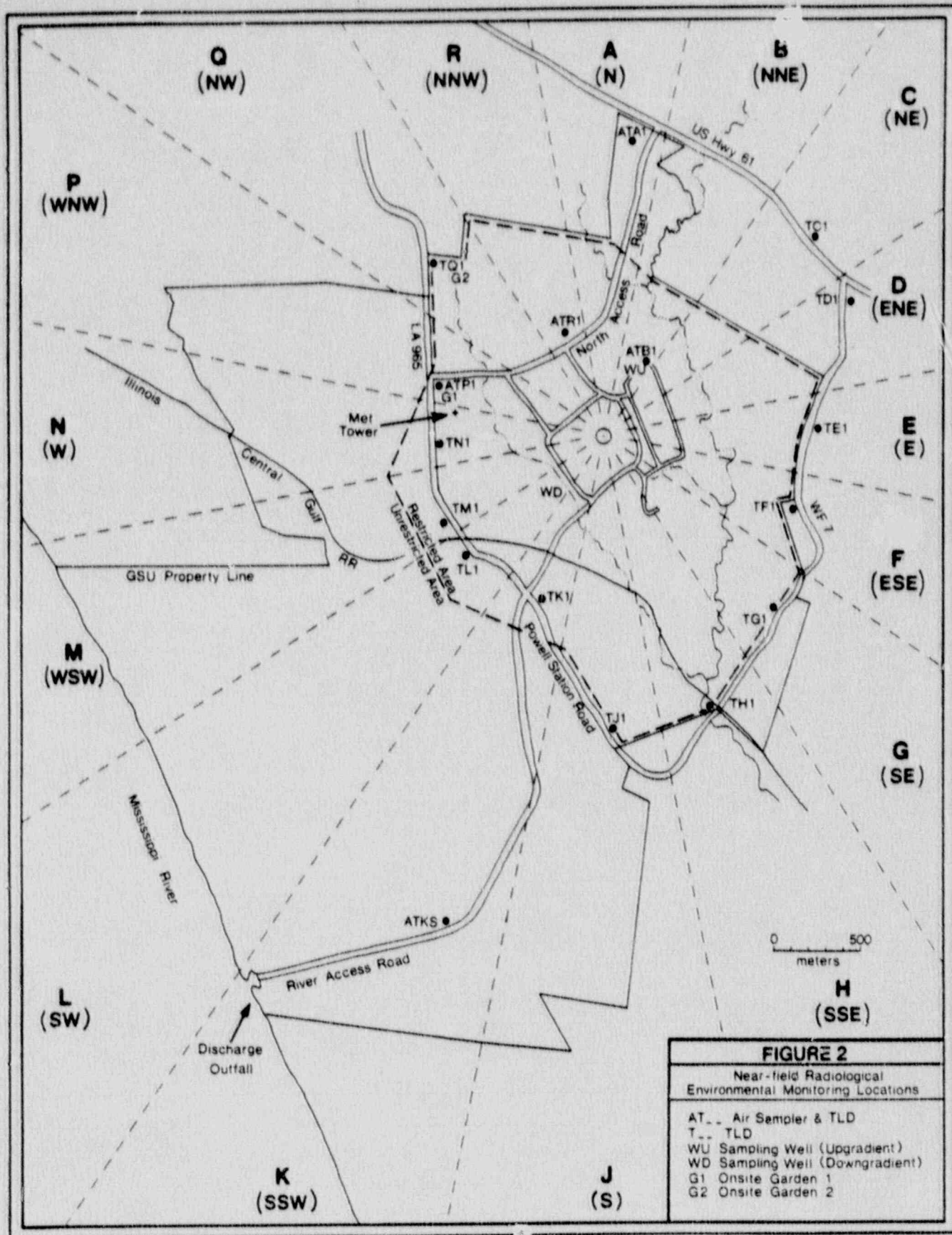
This Annual Radiological Environmental Operating Report for the period of January 1 through December 31, 1989, is submitted in accordance with Technical Specification 6.9.1.7 of Appendix A to River Bend Station License Number NPF-47.

River Bend Station (RBS) is a 936 MWe General Electric boiling water reactor located in West Feliciana Parish, Louisiana, 4.1 km southeast of St. Francisville (Figure 1). Waste heat from RBS is dissipated via a closed cycle system using four mechanical draft cooling towers which draw makeup water from the Mississippi River, 3.3 (air) km to the west. Blowdown from the normal cooling tower system dilutes low-level liquid radioactive waste and is discharged to the Mississippi River through a 4.4-km buried pipe located downstream of the intake structure (Fig. 2). Gaseous radioactive effluents are released through the main plant exhaust duct, the fuel building exhaust duct, and the radwaste building exhaust duct.

The area within a 16-km radius of RBS includes substantial portions of West Feliciana, East Feliciana, and Pointe Coupee parishes, as well as small portions of East and West Baton Rouge parishes. Most of the land in this area is devoted, in about equal proportions, to forests and agriculture (pasture, various crops). Wetlands, streams/lakes, and urban/improved lands comprise the remainder of the immediate vicinity of the plant. Besides St. Francisville, (4.1 km northwest), human population centers near RBS are New Roads (10 km southwest) and Jackson (12 km northeast). Industrial facilities in the immediate vicinity of RBS are Lambert Redi-Mix Company (1.8-km north-northeast); James River Corporation Paper Mill (5 km south); Big Cajun No. 2 Power Station (5 km southwest); and the Corps of Engineers concrete casting yard (5 km west).

The area within an 80-km radius of RBS contains portions or all of 19 Louisiana parishes and five Mississippi counties. This area has generally the same makeup as that of the immediate vicinity of RBS, although wetlands, agricultural lands, and urban/improved lands are relatively more extensive (at the expense of forested lands) in the southwestern and southeastern quadrants. Baton Rouge, centered at about 38 km southeast, is the only large city in the general vicinity of RBS.

During 1989, radiological environmental monitoring in the vicinity of RBS was performed by the Gulf States Utilities Company (GSU) Environmental Services Group, with support from the Plant Staff Radiological Programs Section in air sampler maintenance/calibration and reading/annealing of thermoluminescence dosimeters.



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2.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

2.1 Purpose/Bases

The Radiological Environmental Monitoring Program (REMP) was established to provide representative measurements of radiation and of radioactive materials, resulting from RBS operation, in those exposure pathways and for those radionuclides that lead to the highest potential exposures of members of the public. The REMP implements Section IV.B.2 of Appendix I of 10CFR50 and thereby supplements the radioactive effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways.

The REMP applies the concepts of indicator vs. control and preoperational vs. operational intercomparisons to verify the adequacy of source controls and resultant human radiation doses. In addition to 10CFR50, Appendix I, the program is based on guidance provided in the Nuclear Regulatory Commission's Radiological Branch Technical Position, Revision 1, November 1979, as well as NRC Regulatory Guides 4.1 and 4.15.

2.2 Environmental Radiation Exposure Pathways

Elements of the REMP monitor indications of the impacts of gaseous (airborne) and liquid effluents released from River Bend Station. The specific methods used in monitoring the pathways by which these effluents could lead to human exposure, based on existing demographic information, are:

HUMAN EXPOSURE PATHWAYS

(A) <u>Airborne Pathway</u>	<u>Monitoring Media</u>
Immersion Dose	Air Samples (Particulates and Radioiodines)
Ingestion (Ingestion) Dose	Vegetation/Food Crop Samples Air Samples
(B) <u>Direct Exposure Pathway</u>	<u>Monitoring Media</u>
External Dose	Thermoluminescence Dosimetry (TLD) Area Monitors

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(C) Waterborne Pathway

Monitoring Media

Ingestion (Internal) Dose

Surface Water Samples
Groundwater Sample
Drinking Water Samples
Fish/Invertebrate Samples
Shoreline Sediment Samples

Immersion (External) Dose

Surface Water Samples
Shoreline Sediment Samples

Site-related dispersion characteristics, demography, hydrology, land use, anticipated source terms, and the exposure pathways outlined above were considered in the selection of the sample media, sampling and analysis frequencies, sampling/measurement locations, and types of analyses. These criteria were used to establish both the preoperational and operational phases of the REMP.

The program that evolved during the preoperational (baseline) monitoring phase, incorporating all of the elements in the RBS Technical Specifications (3/4.12.1, 3/4.12.2, 3/4.12.3) plus special study criteria, is illustrated in Table 1 and Figures 1 and 2.

2.3 Land Use Census for 1989

The annual land use census was conducted during the 1989 growing season in accordance with RBS Technical Specification 3/4.12.2. Table 2 summarizes the results and notes changes in nearest receptor locations within 8 km from those identified in the Radiological Environmental Operating Report for 1988.

As in previous years, the 1989 census identified residences within 8 km of the RBS reactor containment in all sectors except L (SW). In sector E (E), the garden identified in 1988 was discontinued, and the newly-listed garden in this sector is farther in range. The gardens identified in sectors P (WNW) and Q (NW) are the onsite gardens established in the sectors with the highest calculated annual average ground-level D/Q. These gardens are REMP indicator locations for broadleaf vegetation (Table 1, Fig. 2).

No dairy animals were found within 8 km of RBS during the 1989 census. Historically, there had never been enough dairy sites to accommodate the minimum RBS Technical Specification requirements for analysis of milk (3 locations within 5 km), so monitoring of broadleaf vegetation has been performed from the outset.

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TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(Page 1 of 5)

<u>Exposure Pathway and/or Sample</u>	<u>Sample Point Description, Distance, and Direction</u>	<u>Sampling and Collection Frequency</u>	<u>Type and Frequency of Analyses</u>
Airborne Particulates and Radioiodines	Samples from 9 locations: INDICATOR STATIONS		
	AA1. River Bend Training Center; 1.7 km N.	Continuous air sampler with filter collection weekly or as required by dust loading, whichever is more frequent.	Charcoal cartridge: analysis weekly for radioiodine. Particulate sampler: gross beta activity following filter changes; composite for gamma isotopic quarterly.
	AR1. River Bend Station North Access Road at Gate #3; 0.8 km NNW.	"	"
	AP1. Near River Bend Station Onsite Garden #1; 0.9 km WNW.	"	"
	AQS2. St. Francis Substation on US Hwy. (Bus.) 61 in St. Francisville; 5.8 km NW (nearest community location).	"	"
	CONTROL AND SPECIAL INTEREST STATIONS (1)		
	ALC. Parlange Power Center in Oscar; 20 km SW (Control).	"	"
	AB1. River Bend Station cooling tower yard; 0.5 km NNE. (1, 2)	"	"
	AKS. River Bend Station River Access Road; 2.8 km SSW. (1, 2)	"	"
	AGS. CSU Service Center compound in Zachary; 17 km SE. (1, 2)	"	"
	AHS. Roof of CSU Office Building, North Blvd., Baton Rouge; 40 km SSE. (1, 2)	"	"
	Measurements from 44 locations: INDICATOR STATIONS		
	TA1. River Bend Training Center; 1.7 km N.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly. (3)	Gamma dose monthly and quarterly. (3)
	TA2. CSU Utility pole #246 at Jct. of LA Hwy. 10 and West Feliciana Parish Road (WF) 2 in Elm Park; 8 km N.	"	"
Direct Radiation	TB1. River Bend Station cooling tower yard; 0.5 km NNE.	"	"
	TB2. Stub pole at Jct. LA Hwy. 965 and Audubon Lane (WF 17); 5 km NNE.	"	"
	TC1. Stub pole at Jct. US Hwy. 61 and Old Highway 61; 1.7 km NE.	"	"
	TC2. Stub pole along LA Hwy. 966, 0.6 km S. of Jct. LA Hwys. 966 and 965; 7 km NE.	"	"
	TD1. Stub pole along WF 7, 150 m S. of Jct. WF 7 and US Hwy. 61; 1.6 km ENE.	"	"

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TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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<u>Exposure Pathway and/or Sample</u>	<u>Sample Point Description, Distance, and Direction</u>	<u>Sampling and Collection Frequency</u>	<u>Type and Frequency of Analyses</u>
Direct Radiation (continued)	TD2. Stub pole along LA Hwy. 966, 4 km S. of Jct. LA Hwys. 966 and 965; 6.3 km ENE.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly. (3)	Gamma dose monthly and quarterly. (3)
	TE1. Stub pole along WF 7, 1 km S. of Jct. WF 7 and US Hwy. 61; 1.3 km E.	"	"
	TE2. Gravel Power Center on LA Hwy. 68, 2 km N. of Jct. LA Hwys. 68 and 964; 10 km E.	"	"
	TF1. Stub pole along WF 7, 1.6 km S. of Jct. WF 7 and US Hwy. 61; 1.3 km ESE.	"	"
	TF2. On LA Hwy. 954, 0.6 km N. of Jct. LA 954 and US Hwy. 61; 6 km ESE.	"	"
	TG1. Stub pole along WF 7, 2 km S. of Jct. WF 7 and US Hwy. 61; 1.6 km SE.	"	"
	TG2. Telephone pole at gate to Marathon Tank Farm on US Hwy. 61 near Delombre; 7.5 km SE.	"	"
	TH1. Stub pole at Illinois Central Gulf RR crossing of WF 7 (near Grants Bayou); 1.7 km SSE.	"	"
	TH2. First telephone pole on LA Hwy. 964 N. of entrance to James River Corporation paper mill; 5.5 km SSE.	"	"
	TJ1. Stub pole near River Bend Station gate #23 on LA Hwy. 965; 1.5 km S.	"	"
	TJ2. Large tree along River Road, 100 m N. of James River Corporation intake structure; 5.6 km S.	"	"
	TK1. GSU utility pole #L10178 on LA Hwy. 965, 20 m S. of RBS River Access Road; 0.9 km SSW.	"	"
	TK2. Stub pole at Jct. LA Hwys. 414 and 415; 8 km SSW.	"	"
	TL1. Second utility pole on LA Hwy. 965 S. of former ICG RR crossing; 1.0 km SW.	"	"
	TL2. Second utility pole along LA Hwy. 415 E. of Louisiana and Arkansas RR crossing (near Patin's Dike); 9.5 km SW.	"	"
	TM1. First utility pole on LA Hwy. 965 N. of former ICG RR crossing; 0.9 km WSW.	"	"
	TM2. Utility pole along LA Hwy. 951, about 3 km S. of Jct. LA Hwys. 951 and 10; 4.2 km WSW.	"	"
	TN1. Utility pole along LA Hwy. 965, between RBS gates #13 and #14, 0.2 km W.	"	"
	TN2. Utility pole with electrical meter near west bank ferry landing (LA Hwy. 10); 6 km W.	"	"

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TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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<u>Exposure Pathway and/or Sample</u>	<u>Sample Point Description, Distance, and Direction</u>	<u>Sampling and Collection Frequency</u>	<u>Type and Frequency of Analyses</u>
Direct Radiation	TP1. Near River Bend Station onsite Garden #1; 0.9 km WNW.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly. (3)	Gamma dose monthly and quarterly. (3)
	TP2. Stub pole about 1.5 km N. of former ICG RR trestle on Tunica Street, western outskirts of St. Francisville; 7.3 km WNW.	"	"
	TQ1. GSU property sign along LA Hwy. 965 about 1 km N. of RBS North Access Road; 1.4 km NW.	"	"
	TQ2. GSU pole at Jct. of North Commerce and American Beauty Streets, St. Francisville; 6.9 km NW.	"	"
	TR1. RBS North Access Road at Gate #3; 0.8 km NNW.	"	"
	TR2. Stub pole along WF 2 at Jacock Road, about 1.8 km E. of Jct. WF 2 and US Hwy. 61; 5 km NNW.	"	"
	CONTROL AND SPECIAL STATIONS (1)		
	TAC. Telephone pole along US Hwy. 61 about 200 m N. of Hamilton Station Water Tower, near Wakefield; 18 km N (control).	"	"
	TEC. Stub pole at Jct. of LA Hwy. 955 and Midway Road, 4.8 km N. of Jct. LA Hwys. 955 and 964; 16 km E. (1, 2)	"	"
	TLC. Parlange Power Center in Oscar; 20 km SW (control).	"	"
	TQS1. Behind Pentecostal Church (opposite West Feliciana Hospital) near Jct. US Hwy. 61 and Ferdinand Street; 4 km NW. (1)	"	"
	TQS2. St. Francis Substation on US Hwy. (Bus.) 61 in St. Francis- ville; 5.8 km NW. (1)	"	"
	TLS. Utility pole near False River Academy sign at edge of New Roads; 9.9 km SW. (1)	"	"
	TCS. Utility pole at gate to East Louisiana State Hospital in Jackson; 12.3 km NE. (1)	"	"
	TGS. GSU Service Center compound in Zachary; 17 km SE. (1)	"	"
	THS. Roof of GSU Office Build- ing, North Blvd., Baton Rouge; 40 km SSE. (1)	"	"
	TKS. RBS River Access Road; 2.8 km SSW. (1, 2)	"	"
	TQS3. Utility pole at Louisiana State Penitentiary dairy, near Angola; 35 km NW. (1, 2)	"	"
	TRS. Stub pole at Jct. of WF 2 and US Hwy. 61, near Bains (West Feliciana High School); 9.2 km NNW. (1, 2)	"	"

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TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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<u>Exposure Pathway and/or Sample</u>	<u>Sample Point Description, Distance, and Direction</u>	<u>Sampling and Collection Frequency</u>	<u>Type and Frequency of Analyses</u>
Waterborne	SURFACE WATER (4)		
	SWU. Mississippi River about 4 km upstream from the RBS liquid discharge, near LA Hwy. 10 ferry crossing.	Weekly grabs composited over monthly and quarterly periods.	Monthly composite: gamma isotopic and gross beta analyses. (5) Quarterly composite: tritium analysis.
	SWD. Mississippi River about 4 km downstream from RBS liquid discharge, near paper mill.	"	"
	Discharge line. At blowdown control structure along RBS River Access Road.	Hourly grabs composited monthly and quarterly.	Monthly composite: gamma isotopic and gross beta analyses. (5) Quarterly composite: tritium analysis.
	DRINKING WATER (6)		
	Nearest downstream water supply, People's Water Service Company in Donaldsonville; 138 river km downstream from RBS liquid discharge.	Weekly grabs composited over monthly and quarterly periods.	"
	GROUNDWATER		
	WD. Upland Terrace Aquifer well downgradient from plant, about 470 m SW.	Quarterly grab.	Gross beta, gamma isotopic and tritium analyses quarterly. (5)
	WU. Upland Terrace Aquifer well upgradient from plant, about 470 m NNE (control).	"	"
	SHORELINE SEDIMENT		
Ingestion	SEDD. East shore of Mississippi River about 4 km downstream from plant, near paper mill.	Semiannual grab.	Gamma isotopic analysis semiannually.
	SEDU. East shore of Mississippi River about 4 km upstream from plant, near LA Hwy. 10 ferry. (2)	"	"
	FISH AND INVERTEBRATES		
	FD. One sample of each of three commercially and/or recreationally important species from downstream area influenced by RBS liquid discharge. (7)	Semiannually or seasonally when available.	Gamma isotopic analysis on edible portions semi-annually or seasonally.
	FU. One sample of each of three commercially and/or recreationally important species from upstream area not influenced by RBS liquid discharge (control). (7)	"	"
	PRODUCE (8)		
	G1/G2. Two samples of each of three different kinds of leafy vegetables from onsite gardens near the site boundary in areas of highest calculated average ground-level D/Q; 1 km WNW and 1.1 km NW.	Monthly during growing season.	Gamma isotopic and I-131 analyses monthly.
	GQC. One sample of each of three different kinds of leafy vegetables from LA State Penitentiary at Angola; 35 km NW (control).	"	"

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TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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NOTES:

- (1) For purposes of data summary, comparisons, and discussion, the sampling locations designated as "Special Interest" are treated as indicator stations if they are within 16 km of RBS and control stations if they are beyond 16 km.
- (2) Sample/measurement location not required by RBS Technical Specifications (not identified in ODCM).
- (3) Sampling and/or analysis frequency greater than required by RBS Technical Specifications and ODCM.
- (4) The upstream (control) sample is taken at a distance beyond influence of the plant discharge. The downstream (indicator) sample is taken in an area beyond but near the mixing zone.
- (5) Gross beta analysis not required by RBS Technical Specifications and ODCM.
- (6) Drinking water sampling/analyses not required by RBS Technical Specifications and ODCM. (No drinking water pathway exists due to extreme distance to nearest intake). The upstream surface water sampling location (SWU) is used as a "control" for drinking water analyses comparisons.
- (7) Preferred species are river shrimp (Macrobracium ohione), blue catfish (Ictalurus furcatus), and freshwater drum (Aplodinotus grunniens); if catfish and drum are unavailable, other edible species may be substituted.
- (8) No irrigation pathway exists due to the extreme distance of nearest domestic water intake (see Note 6); leafy vegetables are sampled and analyzed because of limited availability of milk samples.

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TABLE 2
RESULTS OF LAND USE CENSUS

Sector	Nearest Residence	Range (km)	Nearest Garden	Range (km)	Nearest Dairy	Range (km)
A (N)	Jones	1.8	Jones	1.8	-	-
B (NNE)	Dreher	1.6	Harvey	1.8	-	-
C (NE)	Magee	1.5	Magee	1.5	-	-
D (ENE)	Lambert	1.4	Daniel	1.6	-	-
E (E)	Bickham	2.2	White ¹	3.4	-	-
F (ESE)	Shelton	3.4	Bickham	3.5	-	-
G (SE)	Mills	6.6	Mills	6.6	-	-
H (SSE)	Koffman	1.7	-	-	-	-
J (S)	Bliss	1.8	Bliss	1.8	-	-
K (SSW)	Guillory	7.4	Landry	7.4	-	-
L (SW)	-	-	-	-	-	-
M (WSW)	Harris	4.3	-	-	-	-
N (W)	Lacost	6.1	-	-	-	-
P (WNW)	Scott	4.1	GSU #1	1.0	-	-
Q (NW)	Leet	1.3	GSU #2	1.1	-	-
R (NNW)	Johnston	1.6	Monroe	3.0	-	-

¹ The 1989 receptor location was farther than the receptor location listed in the 1988 REMP Report.

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2.4 Interlaboratory Comparison Program Results for 1989

The Environmental Services Group participated in the U.S. Environmental Protection Agency (USEPA) Laboratory Intercomparison Program during 1989 in accordance with RBS Technical Specification 3/4.12.3. RBS results (Table 3) were within the warning limits for the normalized range (precision) for all analyses, and within the USEPA "known" value (accuracy) for all but one analysis. The discrepancy for the gross beta in water for 5/12/89 is discussed below. The USEPA discontinued the cross-check media for "food" in 1989, and although milk sampling and analysis is not required of RBS, the results for the cross-check media for "milk" are included as a gauge for the "food" sample (i.e., vegetation and fish) analyses performed by RBS.

2.5 Program Exceptions

Certain samples and analyses were inadvertently omitted or unavoidably altered during the 1989 operating period. These exceptions and the reasons for the omissions/alterations are delineated in Table 4 in accordance with Technical Specification requirements. Corrective actions and impacts on program quality are discussed below.

Brief storm-related power outages impacted three indicator air samplers (AA1, AP1, AR1) and two special interest air samplers (AB1, AKS) in February, August, October, November and December. Mechanical failure further impacted AB1 during March. About 3 percent of each of the expected sample volumes was lost due to the power outages as well as the mechanical failure. Extensive maintenance activities in the power substation in St. Francisville resulted in the average loss of about 6 percent of the expected sample volumes for AQS₂ over a 10 week period from May to July. These losses are not deemed to have had a significant impact on program quality.

Limited variety in the crops available at the state penitentiary (GQC) resulted in failure to obtain four out of 36 required control samples of broadleaf vegetation during 1989. This did not significantly impact program quality.

Abnormally high river stages during the peak abundance period for river shrimp (i.e., July/August) made collecting areas inaccessible to shrimp collection gear. Repeated efforts to obtain shrimp from both above and below RBS during August, September, and October did not produce enough specimens from which to prepare a sample for counting. To partially compensate for the absence of shrimp, additional fish samples were obtained in autumn 1989.

Tritium activities had been calculated (for the years 1986, 1987, and 1988) using net counts derived from "unquenched" background counts instead of "quenched" background counts. This resulted in calculated tritium activities that were higher than actual activities. The tritium activities for the affected years were recalculated and are included in Appendix A.

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TABLE 3

USEPA INTERCOMPARISON (CROSS-CHECK) PROGRAM PARTICIPATION RESULTS

SAMPLE TYPE (units)	DATE	ANALYSIS	USEPA "KNOWN" VALUE ^a	RBS VALUE	RBS N-DEV ^b	RBS N-RANGE ^c	AVERAGE RESULT (All Participants) ^d
AIR FILTER (pCi/filter)	3/31/89	Beta	62.00±8.66	68.67	+2.31	0.474	63.14±8.21
	3/31/89	Cs-137	20.00±8.66	21.33	+0.46	0.237	21.31±3.87
	8/25/89	Beta	(=11) ^e	12.00	-	-	-
	8/25/89	I-131	(=153) ^e	5.67	-	-	-
	8/25/89	Cs-137	10.00±8.66	10.67	+0.23	0.118	10.79±1.96
MILK ^f	4/28/89	I-131	(=4.00) ^e	5.00	-	-	-
	4/28/89	Cs-137	50.00±8.66	51.33	+0.46	0.118	49.86±3.14
	4/28/89	K-40	1600.00±138.56	1699.33	+2.15	0.555	1645.58±119.14
WATER (pCi/liter)	1/20/89	Beta	4.00±8.66	6.33	+0.81	0.118	5.41±1.78
	2/10/89	Cr-51	235.00±41.57	236.33	+0.10	0.247	232.71±20.25
	2/10/89	Co-60	10.00±8.66	9.67	-0.12	0.118	10.65±2.09
	2/10/89	Zn-65	159.00±27.71	165.00	+0.65	0.148	160.15±11.79
	2/10/89	Ru-106	178.00±31.18	165.67	-1.19	0.230	171.19±15.12
	2/10/89	Cs-134	10.00±8.66	10.00	0.00	0.000	9.73±1.89
	2/10/89	Cs-137	10.00±8.66	10.33	+0.12	0.118	10.74±1.89
	2/17/89	I-131	106±19.05	99.00	-1.10	0.108	106.20±7.19
	2/24/89	H-3	2754±616.61	2553	-0.82	0.839	2722.29±274.56
	4/18/89	Beta	57.00±8.66	57.00	0.00	0.829	50.42±7.45
	4/18/89	Cs-134	20.00±8.66	19.00	-0.35	0.000	19.12±2.71
	4/18/89	Cs-137	20.00±8.66	20.00	0.00	0.000	20.24±2.29
	5/12/89	Beta	50.00±8.66	60.33	+3.58	0.711	50.31±8.02
	6/9/89	Co-60	31.00±8.66	32.67	+0.58	0.118	31.04±2.87
	6/9/89	Zn-65	165.00±29.44	180.67	+1.60	0.035	166.87±11.46
	6/9/89	Ru-106	128.00±22.52	127.00	-0.13	0.228	123.31±13.64
	6/9/89	Ba-133	49.00±8.66	49.00	0.00	0.474	47.58±5.12
	6/9/89	Cs-134	39.00±8.66	37.00	-0.69	0.000	37.26±3.29
	6/9/89	Cs-137	20.00±8.66	19.67	-0.12	0.355	20.92±2.23
	6/23/89	H-3	4503±779.42	4068	-1.67	0.143	4491.17±384.13
	8/4/89	I-131	83.00±13.86	80.67	-0.51	0.222	84.41±7.58
	9/22/8	Beta	6.00±8.66	8.00	+0.69	0.237	6.70±1.83
	10/6/89	Co-60	30.00±8.66	34.33	+1.50	0.118	30.49±2.49
	10/6/89	Zn-65	129.00±22.52	144.33	+2.04	0.228	128.71±8.78
	10/6/89	Ru-106	161.00±27.71	163.00	+0.22	1.210	152.74±13.57
	10/6/89	Ba-133	59.00±10.39	62.00	+0.87	0.000	57.72±5.09
	10/6/89	Cs-134	29.00±8.66	28.33	-0.23	0.118	27.34±2.83
	10/6/89	Cs-137	59.00±8.66	66.67	+2.66	0.118	61.37±4.48
	10/20/89	H-3	3496±630.47	3421	-0.36	0.127	3471.07±369.08
	10/31/89	Beta	32.00±8.66	35.00	+1.04	0.237	30.61±3.99
	10/31/89	Cs-134	5.00±8.66	4.67	-0.12	0.118	5.15±1.39
	10/31/89	Cs-137	5.00±8.66	4.00	-0.35	0.237	5.93±1.71

NOTES:

- (a) USEPA "known" values are listed with a range reflecting control (3 sigma) limits.
- (b) The normalized deviation from the "known" value is computed by USEPA from the deviation and the standard error of the mean; +2.000 is the warning limit and +3.000 is the control limit.
- (c) The normalized range is computed by USEPA from the mean range, the control limit, and the standard error of the range; +2.000 is the warning limit and +3.000 is the control limit.
- (d) The grand average of all participants' results (excluding outliers) is listed with the experimental (calculated) sigma for all laboratories.
- (e) USEPA unable to certify the "known" activity of the I-131 in milk and both the I-131 and gross beta activities on air filters; the activities listed as "known" are USEPA estimates and are listed here only for comparison.
- (f) USEPA discontinued the cross-check media "Food" for 1989. Although milk sampling and analysis by RBS is not required, the cross-check samples of milk were analyzed, and the data included as a gauge of the "food" sample (i.e. vegetation, fish) analyses performed by RBS.

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TABLE 4
MONITORING PROGRAM EXCEPTIONS

Sample Type	Period	Location	Exception/Reason
Air Particulates and Radioiodines	1/30 - 2/6/89	AB1*, AR1	About 2% of normal weekly sample volume not collected due to power failure.
	3/13 - 3/20/89 3/20 - 3/27/89	AB1*	About 3% of normal weekly sample volume not obtained due to mechanical failure of air compressor.
	5/8 - 7/10/89	AQS2	About 6% (average) of normal weekly sample volumes during the 10-week sample period not obtained due to power outages resulting from maintenance activities in the substation where this sampler is located.
	7/31 - 8/7/89	AA1, AB1*, AR1, AKS*, AP1	About 2% of normal weekly sample volume not collected due to power failure.
	10/9 - 10/16/89	AKS*	About 35% of normal weekly sample volume not collected due to power failure.
	11/6 - 11/13/89	AA1, AB1*, AR1, AKS*, AP1	About 1% of normal weekly sample volume not collected due to power failure.
Broadleaf Vegetation	12/26 - 1/2/90	AA1	About 10% of normal weekly sample volume not collected due to power failure.
	February, March, April, May	GQC	Only two (2) of three (3) samples obtained due to limited availability.
	August	GQC	Although three (3) samples of vegetation were collected, two had to be combined as one sample for sufficient mass to meet IIB requirements.
Fish and Invertebrates	Summer/Fall 1989	FD, FU	Abnormally high river stages during the peak abundance period (July/August) for river shrimp made collection areas inaccessible to collection gear.
Water, all Tritium Activity Calculations	1986, 1987, 1988	All	Tritium activities were calculated using net area counts derived from unquenched background counts instead of quenched background counts, resulting in calculated activities higher than actual activities.
USEPA Cross-check, Gross Beta in Water	5/12/89	N/A	The cross-check sample concentrate was diluted to 3 liters instead of 4 liters before digestion and evaporation of the aliquots was performed.

*Sample/measurement is not required by RBS Technical Specifications (not identified in ODCM).

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One US EPA cross-check analysis for gross beta in water, dated 5/12/89, was outside the control limits for accuracy. The sample concentrate had been diluted to 3 liters instead of 4 liters before proceeding with the analysis. The two gross beta analyses before this one and the two subsequent gross beta determinations were well within the warning limits for accuracy.

3.0 INTERPRETATION OF REMP RESULTS

3.1 Summary of Operational REMP Results

Monitoring results for the exposure pathways are itemized in Appendix A and summarized in Table 5, from which measured activities of the naturally-occurring daughters of uranium and thorium are excluded. For purposes of data summary, comparison, and discussion, the sampling locations designated "Special Interest" in Table 1 are treated as indicator stations if they are within 16 km of RBS and control stations if they are beyond 16 km.

3.1.1 Airborne Exposure Pathway - Measurements of radioiodine and other gamma-emitters were all below their respective LLDs -- that is, "undetectable" at the required analytical sensitivities. Gross beta activities averaged 0.025 pCi/m³ at indicator locations and 0.20 pCi/m³ at control locations.

3.1.2 Direct Exposure Pathway - The monthly average gamma ray exposures for indicator and control locations were 4.22 and 4.37 mR total, respectively. Quarterly exposures averaged 1.82 mR total at indicator locations and 12.31 mR total at control locations.

3.1.3 Waterborne Exposure Pathway - No gamma-emitters were measured in water at levels approaching the Technical Specification LLDs, although Mn-54, Co-58, Fe-59, Co-60, and Zn-65 were measured in a few monthly composite samples from the Discharge Line at concentrations between 1 and 70 picocuries per liter. Gross beta activities in surface water averaged 32.05 pCi/l in the Discharge Line and from 7.41 to 8.23 pCi/l at all other stations. Tritium (H-3) activities in surface water averaged 3469 pCi/l in the Discharge Line and were below detection limits at all other locations. Gross beta activities averaged 3.44 and 3.61 pCi/l in the down-gradient (indicator) and up-gradient groundwater, respectively. Besides naturally-occurring gamma-emitters, Cs-137 was measured in Mississippi River shoreline sediment above (50.1 pCi/kilogram dry) and below (99.7 pCi/kg dry) the RBS liquid discharge outfall. As in the case of the airborne Cs-137 activity, these slightly elevated levels (relative to base-line conditions) are probably attributable to the 1986 incident at Chernobyl, Russia.

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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West Feliciana Parish, Louisiana

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Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
				Name	Mean (f) ² Range		
Air Particulate (pCi/m ³)	Gross Beta (468)	0.01	0.025 (312/312) 0.002 - 0.054	AKS 5.8 km NW	0.024 (52/52) 0.002 - 0.054	0.020 (156/156) 0.011-0.023	0
	Be-7 ³ (468)	NONE REQUIRED	11.38 (268/312) 5.34 - 26.50	AA1 1.7 km N	11.70 (43/52) 5.75 - 26.80	10.44 (120/156)	0
	K-40 ³ (468)	NONE REQUIRED	48.93 (309/312) 16.20 - 94.10	AKS 5.8 km NW	52.38 (52/52) 29.90 - 94.10	46.74 (156/156)	0
	Cs-134 (468)	0.05	ALL <LLD			ALL <LLD	0
	Cs-137 (468)	0.06	ALL <LLD			ALL <LLD	0
Air Radioiodine (pCi/m ³)	I-131 (468)	0.07	ALL <LLD			ALL <LLD	0
Direct (TLD) ⁴ (mS Total)	Gamma Monthly (456)		4.22 (456/456) 2.95 - 5.73	TWS 40 km SSE	4.91 (12/12) 4.45 - 5.84	4.37 (72/72) 3.27 - 5.84	0
	Gamma Quarterly (176)		11.82 (152/152) 8.99 - 14.80	TWS 40 km SSE	14.32 (4/4) 13.79 - 14.80	12.31 (24/24) 10.00-14.80	0
Surface Water (pCi/liter)	H-3 (12)	3000	3469 (4/8) 1970 - 5617	Discharge Line	3469 (4/4) 1970 - 5616	ALL <LLD	0
	Mn-54 (36)	15	10.2 (12/36) 1.96 - 33.1	Discharge Line	10.2 (12/12)	ALL <LLD	0
	Co-58 (36)	15	5.11 (9/36) 1.01 - 15.5	Discharge Line	5.11 (9/12) 1.01 - 15.5	ALL <LLD	0
	Fe-59 (36)	30	4.31 (4/36) 2.35 - 8.84	Discharge Line	4.31 (4/12)	ALL <LLD	0
	Co-60 (36)	15	24.5 (12/36) 4.12 - 69.2	Discharge Line	24.5 (12/12) 4.12 - 69.2	ALL <LLD	0
	Zn-65 (36)	30	3.91 (2/36) 3.47 - 4.34	Discharge Line	3.91 (2/12) 3.47 - 4.34	ALL <LLD	0
	Nb-95 (36)	15	ALL <LLD			ALL <LLD	0
	Zr-95 (36)	30	ALL <LLD			ALL <LLD	0
	I-131 (36)	15	ALL <LLD			ALL <LLD	0
	Cs-134 (36)	15	ALL <LLD			ALL <LLD	0
	Cs-137 (36)	18	ALL <LLD			ALL <LLD	0
	Ba-140 (36)	60	ALL <LLD			ALL <LLD	0
	La-140 (36)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (36)	4	19.73 (34/24) 1.48 - 50.78	Discharge Line	32.95 (12/12) 12.86 - 50.78	7.79 (12/12) 4.06 - 12.64	0

TABLE 5

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Medium or Pathway Sampled (Unit of Measurement)	Type and Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Dist./Dir.	Mean (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Groundwater (pCi/liter)	H-3 (8)	3000	ALL <LLD			ALL <LLD	0
	Mn-54 (8)	15	ALL <LLD			ALL <LLD	0
	Co-58 (8)	15	ALL <LLD			ALL <LLD	0
	Fe-59 (8)	30	ALL <LLD			ALL <LLD	0
	Co-60 (8)	15	ALL <LLD			ALL <LLD	0
	Zn-65 (8)	30	ALL <LLD			ALL <LLD	0
	Nb-95 (8)	15	ALL <LLD			ALL <LLD	0
	Zr-95 (8)	30	ALL <LLD			ALL <LLD	0
	I-131 (8)	15	ALL <LLD			ALL <LLD	0
	U-235 (8)	15	ALL <LLD			ALL <LLD	0
	U-238 (8)	15	ALL <LLD			ALL <LLD	0
	Ba-140 (8)	60	ALL <LLD			ALL <LLD	0
	La-140 (8)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (8)	4	3.44 (1/4) (single value)	WU 470 m NNE	3.61 (2/4) 2.97 - 4.25	3.61 (2/4) 2.97 - 4.25	0
Drinking Water ⁵ (pCi/liter)	H-3 (4)	3000	ALL <LLD			ALL <LLD	0
	Mn-54 (12)	15	ALL <LLD			ALL <LLD	0
	Co-58 (12)	15	ALL <LLD			ALL <LLD	0
	Fe-59 (12)	30	ALL <LLD			ALL <LLD	0
	Co-60 (12)	15	0.95 (2/12) 0.82 - 1.07	Donaldsonville 138 km downstream	0.95 (2/12) 0.82 - 1.07	ALL <LLD	0
	Zn-65 (12)	30	ALL <LLD			ALL <LLD	0
	Nb-95 (12)	15	ALL <LLD			ALL <LLD	0
	Zr-95 (12)	30	ALL <LLD			ALL <LLD	0

TABLE 5

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Docket Number: 50-458
Reporting Period: 1/1/89 -12/31/89

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Dist./Dir.	Mean (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Drinking Water ⁵ (pCi/liter) (continued)	I-131 (12)	15	ALL <LLD			ALL <LLD	0
	Cs-134 (12)	15	ALL <LLD			ALL <LLD	0
	Cs-137 (12)	15	ALL <LLD			ALL <LLD	0
	Ba-140 (12)	60	ALL <LLD			ALL <LLD	0
	La-140 (12)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (12)	4	8.23 (11/12) 5.15 - 15.1	Donaldsonville 138 km downstream	8.23 (11/12) 5.15 - 15.1	7.79 (12/12) 4.06 - 12.64	0
Shoreline Sediment ⁶ (pCi/kg dry)	Be-7 ³ (4)	NONE REQUIRED	331 (1/2) single value	SEDD 4 km downstream	331 (1/2) single value	492 (1/2) single value	N/A
	K-40 ³ (4)	NONE REQUIRED	15520 (2/2) 15218 - 15821	SEDU 4 km upstream	15570 (2/2) 15465 - 15675	15570 (2) 15465-15675	N/A
	Cs-134 (4)	150	ALL <LLD			ALL <LLD	0
	Cs-137 (4)	180	99.7 (2/2) 76.4 - 123	SEDD 4 km downstream	99.7 (2/2) 76.4 - 123	50.1 (2/2) 47.8 - 52.3	0
Fish/ Invertebrates (pCi/kg wet)	K-40 ³ (11)	NONE REQUIRED	3122 (6/6) 2514 - 4069	FD 4 km downstream	3122 (6/6) 2514 - 4069	2398 (5/5) 1940 - 3224	0
	Mn-54 (11)	130	ALL <LLD			ALL <LLD	0
	Co-58 (11)	130	ALL <LLD			ALL <LLD	0
	Fe-59 (11)	260	ALL <LLD			ALL <LLD	0
	Co-60 (11)	130	12.3 (1/6) single value	FD 4 km downstream	12.3 (1/6) single value	ALL <LLD	0
	Zn-65 (11)	260	ALL <LLD			ALL <LLD	0
	Cs-134 (11)	130	ALL <LLD			ALL <LLD	0
	Cs-137 (11)	160	2.09 (1/6) single value	FU 4 km upstream	2.74 (1/5) single value	2.74 (1/5) single value	0
Broadleaf Vegetation (pCi/kg wet)	Be-7 ³ (102)	NONE REQUIRED	436 (49/71) 109 - 2111	GQC 35 km NW	592 (13/31) 137 - 3141	592 (13/31) 137 - 3141	N/A

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Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Dist./Dir.	Mean (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Results Reported
Broadleaf Vegetation (pCi/kg wet) (continued)	K-40 ³ (102)	NONE REQUIRED	3801 (70/71) 2244 - 7087	GQC 35 km NW	4579 (31/31) 2128 - 8114	4579 (31/31) 2128 - 8114	N/A
	I-131 (102)	60	ALL <LLD			ALL <LLD	0
	Cs-134 (102)	60	ALL <LLD			ALL <LLD	0
	Cs-137 (102)	80	10.8 (2/71) 6.70 - 14.9	G1 1 km WNW	10.8 (2/71) 6.70 - 14.9	ALL <LLD	0

NOTES:

1. Lower Limit of Detection (LLD) as defined in EBS Technical Specifications (NUREG-1172).
2. Mean and range based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)
3. Concentrations found for certain common and readily-distinguished, naturally occurring nuclides are included to provide perspective. It should also be noted that other gamma-emitting, naturally-occurring nuclides (e.g., primordial-series) are often detected but not reported because of the complexities and uncertainties of specific identification.

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3.1.4 Ingestion Exposure Pathway - Concentrations of radioiodine were below LLD in the ingestion pathway monitoring media during 1989. In addition to naturally-occurring gamma-emitters, Cs-137 was measured in both broadleaf vegetation and fish from the indicator locations, and in fish from the control location. The Cs-137 averaged 10.8 pCi/kg wet (<LLD) in vegetation from the onsite garden in Sector P (G1), a single measurement of 2.09 pCi/kg wet was noted in a downstream fish, and a single measurement of 2.74 pCi/kg wet noted in upstream fish. These slightly elevated Cs-137 concentrations, which are two orders of magnitude below those that would be "reportable" if due to RBS releases, are probably attributable to the Chernobyl incident.

3.2 Comparison of Operational and Baseline REMP Results

Radioiodine and other gamma-emitters in the airborne exposure pathway were not measured at levels above the required LLDs during 1988. Gross beta activities on air particulate filters averaged 0.025 pCi/m³ at indicator and 0.20 pCi/m³ at control locations in 1989, compared to 0.03 pCi/m³ at both indicator and control locations during the preoperational phase of the REMP (Appendix B).

In the direct exposure pathway, the 1989 net average readings for monthly and quarterly TLDs from both indicator and control locations were slightly lower than the corresponding values for the baseline period. Thus far, no appreciable differences have been observed in TLD exposures between indicator and control locations or between the same locations from one year to the next.

In the waterborne exposure pathway, average activities analyzed for required gamma-emitting nuclides were measured below the RBS Technical Specification LLDs during 1989 as had been the case during the preoperational phase (Appendix B). Gross beta and tritium levels in water are compared below:

WATERBORNE AVERAGE GROSS BETA (pCi/l)					
	Pre- operational	1986	1987	1988	1989
Surface Water, Upstream (4 km)	7.80	5.76	8.93	9.30	7.79
RBS Discharge Line	N/A	10.10	21.76	32.38	32.05
Surface Water, Downstream (4 km)	8.10	5.69	8.59	8.66	7.41
Drinking Water (Donaldsonville)	6.80	5.66	10.40	8.24	8.23
Upgradient Groundwater	6.00	2.25	2.22	2.45	3.61
Downgradient Groundwater	4.00	2.61	1.95	2.20	3.44

WATERBORNE AVERAGE TRITIUM (pCi/l)					
	Pre- operational	1986	1987	1988	1989
Surface Water, Upstream (4 km)	<3000	<452	<444	<588	<554
RBS Discharge Line	N/A	1023	1140	2272	3469
Surface Water, Downstream (4 km)	<3000	<454	<604	<592	<554
Drinking Water (Donaldsonville)	<3000	<462	<593	<586	<557
Upgradient Groundwater	<3000	<446	<601	<780	<881
Downgradient Groundwater	<3000	<448	<600	<779	<872

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Gross beta activities in the Discharge Line and Surface Water samples averaged slightly higher in 1988 and 1989 than in previous years, although the levels remained well below reporting levels established in the RBS Technical Specifications. Moreover, the activities apparently reflect (at least in part) a slight general increase in levels of beta-emitting materials in the Mississippi River because the control location (SWU) had a higher average than the indicator location (SWD).

Tritium activities in the Discharge Line actually increased on average, reflecting the releases already noted in the 1989 Semiannual Radioactive Effluent Release Reports (see also Table 6). In previous years, most RBS interlaboratory comparison program results for tritium in water, although acceptable, had been near the lower warning limit for the USEPA "known value." More recently, RBS changed scintillation cocktails and adopted the use of a quadratic (vs. linear) quench curve for efficiency calibrations. Although still biased very slightly low (Table 3), RBS results are now well within the warning limits for accuracy.

It should be noted that Discharge Line monitoring results are based on composites of hourly aliquots of equal volume, rather than on flow-weighted hourly grabs. While it may be argued that the long-term averages are fairly representative, it can be seen that the sampling requirement would be truly representative only if RBS liquid discharges were continuous at a constant rate, which is not the case (see also the discussion of liquid effluents under Section 3.3 below).

In the ingestion exposure pathway, no gamma-emitting nuclides were measured above LLDs during 1989, and there appear to have been no increases in radionuclide concentrations attributable to RBS operation in food/forage media over baseline levels (Appendix B). Slight increases in Cs-137 levels in some fish and broadleaf vegetation samples, presumably related to residues of the Chernobyl accident fallout, were discussed in Section 3.1.4 (above). Naturally-occurring K-40 was measured at an average of 3801 pCi/kg in indicator vegetation and at an average of 4579 pCi/kg in control vegetation in 1989, roughly the same levels encountered prior to RBS operation (Appendix B). Another natural nuclide, Be-7, averaged 436 and 892 pCi/kg in indicator and control vegetation samples, respectively, during 1989. Although presumably present, Be-7 was not quantified during the preoperational phase for comparison.

3.3 Comparison of REMP Results with Operating Controls

The only measurable increases in concentrations of radionuclides or levels of radiation, attributable to plant operation, in the vicinity of RBS during 1989 appear to have been the expected low levels in the liquid Discharge Line. The indicator vs. control comparisons for airborne gross beta activity (Section 3.1.1; Table 5 and Appendix A) corroborate the reports of limited or no releases of particulates or radioiodine in 1989. The 1989 TLD data (Section 3.1.2; Table 5 and Appendix A) showed no appreciable differences in direct radiation exposures between indicator and control locations. Excerpted liquid effluent data from the two Semiannual Radioactive Effluent Release Reports are listed in Table 6 along with the corresponding Discharge Line analytical data for those nuclides which were measured by the REMP during 1989. These nuclide activities were well below the NRC reporting levels, but are listed here for comparison to substantiate the adequacy of source control and effluent monitoring at River Bend Station.

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TABLE 6

SUMMARY COMPARISON OF LIQUID EFFLUENT QUANTITIES/CONCENTRATIONS^a
AND REMP DISCHARGE LINE MONITORING RESULTS

Quantities Released	1st Qtr. 1989	2nd Qtr. 1989	3rd Qtr. 1989	4th Qtr. 1989	Total 1989
Liters of Effluent	5.84E+06	1.05E+07	7.69E+06	5.74E+06	13.43E+06
Liters of Dilution	1.26E+09	1.18E+09	1.20E+09	1.24E+09	2.44E+09
Curies of H-3	1.48E+00	2.23E+00	5.63E+00	6.65E+00	12.28E+00
Curies of Cr-51	4.48E-01	3.18E-02	1.25E-01	1.39E-01	2.64E-01
Curies of Mn-54	2.55E-02	2.53E-02	1.77E-02	9.56E-03	27.26E-03
Curies of Co-58	1.45E-02	7.83E-03	3.29E-03	3.71E-03	7.00E-03
Curies of Fe-59	8.55E-03	3.42E-03	1.89E-03	2.23E-03	4.12E-03
Curies of Co-60	6.12E-02	6.37E-02	3.78E-02	2.78E-02	6.56E-02
Curies of Zn-65	4.07E-03	3.27E-03	1.18E-03	1.03E-03	2.21E-03

Measured Nuclide	Predicted (Extrapolated) Concentrations (pCi/l)					1989 REMP Mean (Range) pCi/l
	1st Qtr. 1989	2nd Qtr. 1989	3rd Qtr. 1989	4th Qtr. 1989	Mean 1989	
H-3	1169	1873	4662	5338	3261	3471(982-8083) ^b 3469(1970-5618) ^c
Cr-51	354	26.7	104	116	150	149 (15.5-372)
Mn-54	20.1	21.3	14.7	7.67	15.9	10.2(1.96-33.1)
Co-58	11.5	6.58	2.72	2.97	5.94	5.11(1.01-15.5)
Fe-59	6.75	2.87	1.56	1.79	3.24	4.31(2.35-6.64)
Co-60	48.3	53.5	31.3	22.3	38.9	24.5(4.12-69.2)
Zn-65	3.22	2.75	0.98	0.83	1.95	3.91(3.47-4.34)

^a Effluent quantities and nuclide concentrations excerpted from the two 1989 Semiannual Radioactive Effluent Release Reports already submitted.

^b Results from monthly composites.

^c Results from quarterly composites.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1989

APPENDIX A

Listings of 1989 REMP Results

The following tables list individual analytical results and direct measurements of radiation (TLD exposures) recorded by the Radiological Environmental Monitoring Program (REMP) during 1989. Concentrations measured for certain common and readily-distinguished, naturally-occurring nuclides are included to provide perspective. It should be noted that other gamma-emitting, naturally-occurring nuclides (e.g., primordial series) were often detected but are not listed because of the complexities and uncertainties of specific identifications.

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Air Particulate Filter Gross Beta Activity (E-2 pCi/m³)

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	Q2	ALC	AHS	AGS
01/09/89	3.11	3.65	3.02	3.92	3.00	2.95	2.96	0.65	2.69
01/16/89	1.03	1.42	1.46	1.26	1.14	1.33	1.27	1.03	1.29
01/23/89	4.34	4.69	3.95	3.53	3.42	3.71	3.39	0.57	0.51
01/30/89	2.74	2.39	2.75	2.57	2.64	2.82	2.30	0.19	0.25
02/06/89	2.45	2.67	2.10	1.90	2.06	2.04	1.85	1.31	1.48
02/13/89	3.05	3.31	3.07	2.88	2.92	3.15	2.01	0.72	0.27
02/21/89	2.02	1.88	1.74	1.64	1.63	1.54	1.58	0.45	0.21
02/27/89	1.98	3.25	3.24	2.94	3.02	3.11	3.23	1.53	2.43
03/06/89	1.70	1.57	1.70	1.49	1.59	1.84	1.54	1.82	1.69
03/13/89	2.50	2.39	2.60	2.52	2.55	2.92	2.56	0.85	1.38
03/20/89	5.22	3.23	3.45	1.63	3.49	3.75	3.80	3.23	3.39
03/27/89	1.44	1.71	1.44	0.54	1.42	1.69	1.51	0.54	1.33
04/03/89	2.01	1.96	1.88	1.42	1.77	1.83	1.60	1.88	1.58
04/10/89	1.84	2.18	1.89	0.23	1.86	1.95	1.87	1.51	1.82
04/17/89	2.21	2.49	2.65	0.26	2.63	2.81	2.44	6.53	0.30
04/24/89	2.36	2.68	2.65	0.24	2.79	2.79	2.65	0.29	0.33
05/01/89	2.73	2.78	2.83	0.25	2.79	2.82	2.55	0.39	0.26
05/08/89	3.77	3.46	3.32	2.81	2.73	3.19	3.50	0.40	0.77
05/15/89	2.14	2.47	2.34	2.32	2.28	2.34	2.41	0.38	2.03
05/22/89	1.90	2.13	2.16	2.09	2.12	1.99	2.08	1.80	1.73
05/30/89	3.24	3.19	3.65	3.39	3.32	3.26	2.70	3.07	2.82
06/05/89	1.15	1.29	1.38	1.41	1.42	1.27	1.11	1.36	1.15
06/12/89	1.81	1.62	1.97	2.21	2.25	2.32	1.92	2.17	2.00
06/19/89	2.44	2.13	2.38	2.53	2.48	2.45	2.29	2.12	2.31
06/26/89	1.78	1.78	2.08	1.90	1.96	1.93	1.71	1.72	1.65
07/03/89	1.29	1.35	1.37	1.50	1.47	1.87	1.66	1.55	1.51
07/10/89	1.50	1.38	1.49	1.39	1.54	1.79	1.46	1.72	1.45
07/17/89	1.32	1.36	1.40	1.43	1.33	1.43	1.25	1.24	1.42
07/24/89	1.99	1.83	1.95	0.85	2.01	2.22	1.93	1.85	1.92
07/31/89	1.60	1.43	1.49	1.55	1.36	1.60	1.38	1.37	1.29
08/07/89	1.78	1.77	1.85	1.78	1.57	1.95	1.55	1.60	1.61
08/14/89	3.12	3.20	3.29	3.37	3.90	3.26	3.15	3.04	3.20
08/21/89	3.68	3.95	4.08	3.90	3.94	3.68	2.91	3.13	3.57
08/28/89	1.70	1.58	1.64	1.59	1.46	1.71	1.26	1.15	1.44
09/05/89	1.89	2.04	1.52	1.76	1.95	1.86	1.65	1.56	1.79
09/11/89	1.30	1.29	0.92	1.61	1.29	1.22	1.14	0.90	1.09
09/18/89	2.17	2.37	1.98	2.53	2.22	2.28	1.89	1.47	2.01
09/25/89	3.39	3.61	2.59	3.65	3.50	3.33	3.06	2.63	3.09
10/02/89	2.07	2.19	1.99	2.16	2.34	2.18	2.14	1.44	1.95
10/09/89	4.83	4.58	4.33	5.36	4.76	4.90	3.66	3.35	4.58
10/16/89	3.97	4.22	2.06	5.14	4.18	5.22	2.62	2.91	3.55
10/23/89	2.43	2.72	1.68	2.71	2.44	2.47	2.45	1.56	2.46
10/30/89	3.09	4.17	2.21	4.06	3.90	3.89	3.29	2.27	3.49
11/06/89	3.31	4.21	2.63	4.28	3.86	4.00	3.48	2.34	4.31
11/13/89	1.89	2.84	1.29	2.87	2.45	2.78	2.31	1.48	2.47
11/20/89	2.59	2.96	1.24	2.93	2.85	2.30	2.67	1.73	3.05
11/27/89	2.59	3.01	3.88	2.80	2.66	2.55	2.33	2.34	2.23
12/04/89	<0.22	3.35	0.45	3.39	3.37	2.94	2.71	3.18	3.03
12/11/89	0.24	2.19	0.34	1.85	2.06	1.85	1.71	2.01	1.76
12/18/89	3.36	4.29	1.00	4.01	3.49	3.88	3.74	3.82	3.43
12/26/89	3.92	3.83	3.70	4.56	4.12	3.93	3.72	3.90	4.06
01/02/90	2.74	2.77	2.51	2.64	2.55	2.56	1.71	2.83	2.28

Concentrations shown are actually-measured values.

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Air Particulate Filter Beryllium-7 Activity (E-2 pCi/m³) by Location - 1989

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/09/89	11.20	9.92	11.20	23.40	17.60	14.50	12.90		12.00
01/16/89					5.73				7.11
01/23/89	17.20	11.80	7.58	14.10	10.80	10.30	9.36		
01/30/89	16.60	17.60	16.50	12.30	13.10	20.30	10.70		
02/06/89	8.91	7.04	7.97	7.33	7.99		6.48		10.70
02/13/89	9.52	15.80	9.09	9.43	15.90	11.70	9.87		
02/21/89		6.89	7.01	5.63	8.09	8.24	7.96		
02/27/89	8.73	11.10	15.20	11.50	15.20	12.80	15.20	8.09	
03/06/89	9.85	8.37	6.52		8.70		9.08	8.95	
03/13/89	17.10	12.20	19.70	12.10	9.61	12.80	16.80		9.61
03/20/89	14.20	20.60		12.50	15.80	14.30	19.60	17.40	17.40
03/27/89	9.80			5.34	8.14				
04/03/89	13.40	13.60	13.59	12.70	12.60	16.30	15.20	17.00	12.70
04/10/89	10.00	14.00	11.90		9.32	12.00	14.30	14.60	11.10
04/17/89	10.90	15.10	16.10		10.90	14.40	11.60		
04/24/89	9.17	16.40	17.30		10.70	13.00	16.00		
05/01/89	26.80	17.60	12.50		17.20	10.30	21.20		
05/08/89	13.50	10.70	18.00	11.60	13.40	11.70	11.20		
05/15/89	14.50	17.40	16.20	14.20	13.50	10.40	12.50		15.90
05/22/89	9.26	13.30	10.70	7.00	10.90	10.50	12.80	13.50	10.30
05/30/89	10.10	14.80	18.30	12.60	26.40	13.70	10.60	11.20	10.10
06/05/89	11.90	9.16	10.30	10.30	13.90	11.20	8.29	7.92	7.29
06/12/89	8.76	7.11	10.60	7.43	9.36		9.89	6.72	7.80
06/19/89	7.04	7.19	10.80	7.92	10.00	8.90	10.60	9.84	7.90
06/26/89	15.50	12.00	10.60	11.40	6.73	14.30	10.40	8.83	8.80
07/03/89	8.64		7.39	11.20	9.43	8.86	6.37	6.78	5.91
07/10/89			6.61	8.27	8.73	6.75		8.69	6.49
07/17/89	8.52	6.83	12.90	9.31	11.50	11.10	10.20	5.48	8.09
07/24/89	12.50	6.82	13.70		7.81	9.01	5.50	10.10	9.47
07/31/89	11.50	11.10	12.50	8.08	10.60		10.30	10.90	14.50
08/07/89		6.75	13.30	10.50	6.94		6.19		12.10
08/14/89	12.90	14.60	12.00	12.50	17.90	11.70	14.00	13.20	12.20
08/21/89	7.66	8.52	9.80	11.80	13.60	8.19	10.30	6.29	
08/28/89		6.48	10.40	9.32	7.11		6.50	5.90	5.61
09/05/89	7.13	10.00		6.11	11.30	9.51	8.66	6.47	8.31
09/11/89			8.64	6.72	6.98		8.17	6.03	9.07
09/18/89	11.80	8.69	7.07		6.70	12.10	6.19	5.38	10.40
09/25/89	13.30	17.60	6.97	11.10	16.10	11.90	14.50	10.50	13.50
10/02/89			7.20			6.23			6.08
10/09/89	13.80	9.31	8.94	10.10	11.20	12.30	9.89	9.09	12.10
10/16/89	15.00	19.20	10.90	12.10	16.70	13.20	13.50	14.90	17.70
10/23/89	11.00	11.60	6.79	11.10	13.50	9.82	10.40		9.46
10/30/89	12.40	14.90	6.20	18.40	18.90	13.30	12.50	7.17	10.90
11/06/89	5.75	10.40	7.93	9.02	8.92	6.36	6.96		13.20
11/13/89	10.30	11.30		11.60	10.70	11.20	12.60		10.60
11/20/89	13.40	12.70	5.55	15.60	8.76	12.60	13.70	4.97	14.10
11/27/89	9.35	8.54		8.89	12.40	14.10	15.80	6.53	7.90
12/04/89		8.71		12.10	10.70	6.01	5.54		9.63
12/11/89		10.00		10.00	10.50	10.80	11.30	13.20	12.20
12/18/89	9.68	10.30		13.00	12.00	10.00	9.79	11.90	11.50
12/26/89	16.50	8.89	12.30	13.30	10.10	12.10	13.10	11.10	7.91
01/02/90	8.03		7.00	11.80	11.40	10.20	5.54	7.34	9.61

Concentrations shown are actually-measured values.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Air Particulate Filter Cesium-134 Activity (E-2 pCi/m³) by Location - 1989

WEEK ENDING	INDICATOR LOCATIONS					CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AQS2	ALC	AHS	AGS
01/09/89	<1.85	<1.59	<1.67	<1.80	<1.77	<1.40	<1.55	<1.83
01/16/89	<1.38	<1.23	<1.44	<1.03	<1.13	<1.38	<1.64	<1.54
01/23/89	<1.50	<1.37	<1.40	<1.10	<1.32	<1.33	<1.44	<1.53
01/30/89	<1.64	<1.28	<1.25	<1.40	<1.16	<1.27	<1.65	<1.47
02/06/89	<1.69	<1.39	<1.48	<1.14	<1.36	<1.26	<1.45	<1.51
02/13/89	<1.54	<1.48	<1.20	<1.19	<1.36	<1.04	<1.61	<1.43
02/21/89	<1.28	<1.00	<1.16	<1.27	<1.16	<1.31	<1.41	<1.27
02/27/89	<1.73	<1.52	<1.51	<1.50	<1.59	<1.53	<1.98	<1.69
03/06/89	<1.58	<1.26	<1.37	<1.21	<1.31	<1.43	<1.82	<1.63
03/13/89	<1.55	<1.20	<1.25	<1.32	<1.29	<1.25	<1.62	<1.51
03/20/89	<1.43	<1.49	<1.35	<1.33	<1.13	<1.35	<1.78	<1.44
03/27/89	<1.62	<1.63	<1.37	<1.62	<1.31	<1.29	<1.92	<1.57
04/03/89	<1.57	<1.29	<1.53	<1.17	<1.59	<1.37	<1.65	<1.66
04/10/89	<1.62	<1.10	<1.31	<1.32	<1.29	<1.18	<1.81	<1.59
04/17/89	<1.79	<1.36	<1.27	<1.39	<1.43	<1.30	<1.69	<1.39
04/24/89	<1.55	<1.30	<1.22	<1.67	<1.43	<1.24	<1.67	<1.46
05/01/89	<1.50	<1.39	<1.33	<1.33	<1.35	<1.31	<1.41	<1.44
05/08/89	<1.48	<1.38	<1.46	<1.60	<1.47	<1.36	<1.48	<1.45
05/15/89	<1.56	<1.37	<1.24	<1.62	<1.29	<1.36	<1.69	<1.29
05/22/89	<1.27	<1.41	<1.26	<1.47	<1.39	<1.27	<1.75	<1.26
05/30/89	<1.14	<1.14	<1.21	<1.36	<1.48	<1.08	<1.18	<1.22
06/05/89	<1.62	<1.57	<1.66	<1.74	<1.58	<1.43	<1.61	<1.62
06/12/89	<1.32	<1.15	<1.24	<1.59	<1.41	<1.26	<1.46	<1.14
06/19/89	<1.43	<1.24	<1.41	<1.40	<1.32	<1.26	<1.35	<1.36
06/26/89	<1.33	<1.60	<1.16	<1.56	<1.52	<1.26	<1.18	<1.43
07/03/89	<1.21	<1.24	<1.44	<1.42	<1.47	<1.35	<1.06	<1.34
07/10/89	<1.46	<1.49	<1.45	<1.37	<1.30	<1.21	<1.26	<1.30
07/17/89	<1.48	<1.51	<1.21	<1.59	<1.38	<1.35	<1.32	<1.23
07/24/89	<1.25	<1.34	<1.25	<1.37	<1.43	<1.37	<1.26	<1.33
07/31/89	<1.57	<1.43	<1.33	<1.52	<1.42	<1.10	<1.21	<1.24
08/07/89	<1.46	<1.38	<1.54	<1.49	<1.41	<1.23	<1.33	<1.54
08/14/89	<1.49	<1.52	<1.47	<1.50	<1.32	<0.98	<1.01	<1.24
08/21/89	<1.44	<1.48	<1.41	<1.49	<1.41	<1.37	<1.37	<1.72
08/28/89	<1.37	<1.64	<1.28	<1.35	<1.18	<1.21	<1.41	<1.48
09/05/89	<1.13	<1.39	<1.07	<1.41	<1.18	<0.91	<1.00	<1.14
09/11/89	<1.54	<1.85	<1.54	<1.92	<1.57	<1.41	<1.59	<1.59
09/18/89	<1.32	<1.63	<1.43	<1.60	<1.41	<1.12	<1.27	<1.41
09/25/89	<1.36	<1.71	<1.41	<1.67	<1.48	<0.97	<1.40	<1.26
10/02/89	<1.55	<1.83	<1.61	<2.05	<1.35	<1.32	<1.28	<1.17
10/09/89	<1.29	<1.58	<1.47	<1.66	<1.32	<1.07	<1.30	<1.39
10/16/89	<1.39	<1.64	<1.37	<2.57	<1.28	<1.10	<1.24	<1.34
10/23/89	<1.35	<1.47	<1.64	<1.68	<1.32	<1.25	<1.42	<1.53
10/30/89	<1.31	<1.45	<1.36	<1.81	<1.41	<0.99	<1.19	<1.25
11/06/89	<1.29	<1.47	<1.27	<2.02	<1.32	<1.13	<1.06	<1.40
11/13/89	<1.32	<1.65	<1.32	<1.76	<1.23	<1.08	<1.24	<1.40
11/20/89	<1.46	<1.77	<1.40	<2.20	<1.35	<1.18	<1.23	<1.51
11/27/89	<1.54	<1.46	<1.42	<1.79	<1.29	<1.34	<1.28	<1.40
12/04/89	<1.80	<1.66	<1.77	<2.07	<1.37	<1.31	<1.62	<1.49
12/11/89	<1.64	<1.66	<1.55	<1.91	<1.29	<1.30	<1.75	<1.39
12/18/89	<1.73	<1.63	<1.36	<1.65	<1.22	<1.39	<1.74	<1.35
12/26/89	<1.60	<1.48	<1.25	<1.94	<1.18	<1.16	<1.30	<1.35
01/02/90	<1.86	<1.87	<1.33	<1.95	<1.29	<1.22	<1.54	<1.32

Concentrations indicated are minimum detectable activities (MDAs) under the particular conditions of analyses; that is, Cs-134 may or may not have been present, but if so, there cannot have been more than the amounts shown.

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Air Particulate Filter Cesium-137 Activity (pCi/m³) by Location - 1989

WEEK ENDING	INDICATOR LOCATION					CONTROL CATION			
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/09/89	<2.03	<1.75	<1.78	<1.86	<1.75	<1.62	<1.86	<1.95	<1.51
01/16/89	<1.57	<1.40	<1.37	<1.41	<1.41	<1.67	<1.41	<1.64	<1.66
01/23/89	<1.88	<1.53	<1.46	<1.52	<1.33	<1.61	<1.53	<1.58	<1.44
01/30/89	<1.36	<1.36	<1.13	<1.37	<1.39	<1.87	<1.46	<1.34	<1.55
02/06/89	<1.87	<1.32	<1.54	<1.51	<1.32	<1.74	<1.31	<1.70	<1.73
02/13/89	<1.53	<1.55	<1.33	<1.25	<1.15	<1.35	<1.42	<1.56	<1.65
02/21/89	<1.62	<1.32	<1.30	<1.22	<1.34	<1.47	<1.22	<1.38	<1.26
02/27/89	<1.89	<1.56	<1.51	<1.95	<1.47	<1.95	<1.42	<2.03	<1.87
03/06/89	<1.71	<1.27	<1.34	<1.27	<1.29	<1.57	<1.53	<1.78	<1.93
03/13/89	<1.60	<1.42	<1.39	<1.33	<1.17	<1.72	<1.12	<1.78	<1.66
03/20/89	<1.49	<1.31	<1.61	<1.37	<1.18	<1.61	<1.33	<2.04	<1.27
03/27/89	<1.79	<1.89	<1.42	<1.67	<1.20	<1.52	<1.30	<1.83	<1.63
04/03/89	<1.88	<1.49	<1.47	<1.46	<1.37	<1.47	<1.29	<1.79	<1.58
04/10/89	<1.35	<1.61	<1.48	<1.19	<1.48	<1.49	<1.39	<1.77	<1.67
04/17/89	<1.51	<1.41	<1.22	<1.37	<1.43	<1.45	<1.31	<1.87	<1.34
04/24/89	<1.44	<1.37	<1.31	<1.24	<1.47	<1.49	<1.23	<1.82	<1.45
05/01/89	<1.32	<1.41	<1.45	<1.18	<1.20	<1.60	<1.28	<1.57	<1.29
05/08/89	<1.80	<1.35	<1.43	<1.59	<1.28	<1.42	<1.27	<1.77	<1.32
05/15/89	<1.33	<1.41	<1.23	<1.53	<1.53	<1.70	<1.18	<1.71	<1.48
05/22/89	<1.27	<1.46	<1.55	<1.57	<1.29	<1.76	<1.33	<2.20	<1.31
05/30/89	<1.30	<1.17	<1.27	<1.36	<1.19	<1.64	<1.15	<1.45	<1.15
06/05/89	<1.85	<1.59	<1.54	<1.98	<1.60	<1.73	<1.42	<1.47	<1.74
06/12/89	<1.39	<1.48	<1.31	<1.65	<1.37	<1.62	<1.44	<1.37	<1.25
06/19/89	<1.55	<1.27	<1.23	<1.52	<1.37	<1.29	<1.45	<1.43	<1.40
06/26/89	<1.59	<1.70	<1.37	<1.66	<1.51	<2.50	<1.30	<1.46	<1.45
07/03/89	<1.52	<1.69	<1.39	<1.52	<1.35	<1.89	<1.45	<1.20	<1.58
07/10/89	<1.32	<1.44	<1.34	<1.21	<1.42	<1.58	<1.12	<1.27	<1.43
07/17/89	<1.52	<1.52	<1.15	<1.42	<1.29	<1.48	<1.39	<1.38	<1.30
07/24/89	<1.50	<1.66	<1.41	<1.35	<1.03	<1.55	<1.32	<1.61	<1.40
07/31/89	<1.66	<1.74	<1.49	<1.52	<1.57	<1.23	<1.29	<1.56	<1.30
08/07/89	<1.57	<1.64	<1.58	<1.70	<1.26	<1.63	<1.35	<1.38	<1.67
08/14/89	<1.83	<1.75	<1.72	<1.80	<1.57	<1.35	<1.19	<0.91	<1.28
08/21/89	<1.66	<1.31	<1.44	<1.75	<1.47	<1.90	<1.44	<1.52	<1.72
08/28/89	<1.67	<1.80	<1.65	<1.24	<1.52	<1.76	<1.16	<1.17	<1.78
09/05/89	<1.41	<1.45	<1.20	<1.62	<1.16	<1.46	<0.97	<0.97	<1.37
09/11/89	<1.77	<2.07	<1.57	<2.08	<1.65	<1.81	<1.56	<1.77	<1.78
09/18/89	<1.56	<1.86	<1.37	<2.12	<1.23	<1.63	<1.17	<1.34	<1.40
09/25/89	<1.59	<1.81	<1.55	<1.91	<1.26	<1.61	<1.35	<1.39	<1.39
10/02/89	<1.75	<1.45	<1.61	<2.07	<1.44	<1.70	<1.34	<1.28	<1.69
10/09/89	<1.35	<1.58	<1.51	<2.31	<1.17	<1.79	<1.26	<1.24	<1.23
10/16/89	<1.14	<1.67	<1.58	<3.10	<1.31	<1.35	<0.98	<1.33	<1.38
10/23/89	<1.46	<1.63	<1.40	<1.71	<1.35	<1.37	<1.17	<1.24	<1.64
10/30/89	<1.24	<1.71	<1.70	<1.91	<1.42	<1.39	<1.10	<1.21	<1.62
11/06/89	<1.42	<1.84	<1.39	<1.89	<1.24	<1.82	<1.17	<1.21	<1.73
11/13/89	<1.69	<1.75	<1.67	<2.16	<1.39	<1.32	<1.27	<1.14	<1.27
11/20/89	<1.66	<1.67	<1.35	<2.06	<1.23	<1.39	<1.05	<1.34	<1.42
11/27/89	<1.45	<1.82	<1.33	<1.59	<1.22	<1.36	<1.41	<1.21	<1.43
12/04/89	<1.91	<1.96	<1.47	<2.17	<1.43	<1.27	<1.25	<1.68	<1.49
12/11/89	<1.77	<1.69	<1.79	<2.17	<1.22	<1.46	<1.35	<1.46	<1.39
12/18/89	<1.95	<1.80	<1.55	<2.44	<1.43	<1.63	<1.47	<1.64	<1.45
12/26/89	<1.78	<1.51	<1.12	<1.92	<1.27	<1.47	<1.22	<1.43	<1.16
01/02/90	<1.85	<1.95	<1.58	<2.31	<1.27	<1.48	<1.45	<1.60	<1.39

Concentrations indicated are minimum detectible activities (MDAs) under the particular conditions of analyses; that is, Cs-137 may or may not have been present, but if so, there cannot have been more than the amounts shown.

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Charcoal Cartridge Potassium-40 Activity (E-2 pCi/m³) by Location - 1989

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/09/89	92.00	70.10	61.90	30.20	56.20	36.90	58.00	39.40	43.00
01/16/89	46.90	48.10	50.40	34.70	40.70	31.20	41.70	50.70	50.20
01/23/89	49.80	48.40	47.60	38.80	29.80	50.60	40.50	32.00	38.20
01/30/89	55.20	45.50	51.90	42.90	32.90	50.80	33.40	65.90	48.50
02/06/89	46.40	42.10	36.20	29.90	40.60	47.70	50.60	45.90	47.90
02/13/89	38.90	50.00	33.50	51.00	41.20	48.70	33.00	40.90	44.00
02/21/89	47.50	38.50	41.90	30.60	42.10	42.20	47.30	67.60	43.60
02/27/89	46.80	35.70	44.70	54.10		68.00	63.80	54.40	40.30
03/06/89	70.10	52.50	38.40	40.70	44.30	50.20	45.90	66.30	57.80
03/13/89	62.80	38.00	45.40	35.60	43.80	58.80	54.40	58.20	46.50
03/20/89	59.70	74.30	43.40	52.00	57.10	60.60	57.90	57.50	64.90
03/27/89	35.50	66.70	45.00	47.20	32.20	49.40	33.50	73.50	49.90
04/03/89	65.60	47.20	54.50	46.50	48.50	46.70	37.30	56.80	51.00
04/10/89	36.20	57.80	43.90	43.40	54.90	48.60	50.20	50.90	50.40
04/17/89	49.50	16.20	25.80	44.90	48.30	45.80	36.80	50.90	35.70
04/24/89	48.70	43.50	49.70	52.60	39.00	57.10	35.00	48.40	45.10
05/01/89	42.00	43.50	42.90	36.40	43.30	41.90	44.70	56.90	37.20
05/08/89	32.10	37.50	41.30	51.80	41.60	57.50	45.30	52.70	37.40
05/15/89	46.20	31.50	42.10	47.30	45.60	60.80	31.90	61.90	43.30
05/22/89	43.20	42.90	32.70	48.80	63.80	60.00	34.40	48.00	39.80
05/30/89	61.90	29.73	45.50	54.40	56.80	47.70	41.30	42.80	48.60
06/05/89	38.60	63.20	56.90	44.60	47.50	55.40	45.60	45.30	57.30
06/12/89	31.30	41.60	48.30	44.30	51.60	42.00	54.50	48.90	58.70
06/19/89	60.90	53.20	63.90	54.60	36.80	57.90	46.10	53.50	47.40
06/26/89	47.90	54.90	53.80	44.80	43.90	41.40	49.60	48.70	44.40
07/03/89	48.80	52.90	43.60	60.80	67.60	81.50	41.60	50.90	31.80
07/10/89	34.30	49.70	41.10	52.90	61.00	49.30	31.90	44.40	52.00
07/17/89	36.40	40.10	52.30	30.20	40.70	60.70	49.20	46.30	43.40
07/24/89	48.30	45.70	52.20	49.30	56.10	51.60	46.70	52.90	40.30
07/31/89	58.40	56.20	35.00	50.50	44.50	45.40	27.90	51.90	52.10
08/07/89	55.70	51.30	40.20	46.60	61.10	50.90	42.10	28.80	52.50
08/14/89	39.50	41.50	41.80	33.10	50.10	51.90	29.30	48.70	48.30
08/21/89	47.40	40.70	49.00	58.10	50.20	32.40	49.00	44.40	54.30
08/28/89	48.30	35.00	52.00	40.20	38.50	63.30	36.20	44.50	43.50
09/05/89	33.20	41.60	20.70	51.40	46.20	25.00	31.30	66.50	33.80
09/11/89	40.80	80.00	63.50	57.20	54.50	67.80	56.70	37.60	65.60
09/18/89	32.10	78.50	50.30	89.50	59.20	48.50	41.80	49.20	47.70
09/25/89	49.60	38.30	51.80	50.70	29.90	42.80	29.80	46.50	53.30
10/02/89	47.60	42.00	64.70	54.30	60.20	54.50	27.80	40.60	44.80
10/09/89	58.90	46.80	43.30	58.60	49.10	48.80	32.30	61.80	65.40
10/16/89	51.30	49.70	45.70	80.70	37.40	43.20	38.80	37.70	48.70
10/23/89	55.90	56.00	47.80	51.60	57.10	51.20	27.20	29.00	38.40
10/30/89	20.30	66.80	44.60	71.50	35.40	40.40	41.80	31.60	39.80
11/06/89	59.40	47.70	43.00	65.00	25.70	40.80	42.50	40.10	42.90
11/13/89	31.90	49.70	51.90	69.30			23.90	51.60	50.30
11/20/89	65.80	61.30	36.20	62.60	45.30	54.60	38.70	50.30	58.10
11/27/89	53.60	60.50	45.90	40.20	55.30	34.20	67.20	85.30	48.90
12/04/89	45.00	31.60	53.40	79.20	36.10	42.20	49.90	35.40	46.80
12/11/89	57.90	49.70	38.40	76.00	45.00	51.30	56.30	54.50	56.40
12/18/89	80.60	50.30	54.50	94.10	57.20	67.40	53.10	58.90	60.30
12/26/89	46.00	53.30	49.80	63.90	40.50	43.40	41.60	51.00	39.30
01/02/90	52.80	46.00	53.10	84.10	47.90	48.70	40.40	35.30	59.50

Concentrations shown are actually-measured values.

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Charcoal Cartridge Iodine-131 Activity (E-2 pCi/m³)

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/09/89	<2.20	<1.90	<1.71	<1.77	<1.72	<1.91	<1.74	<1.72	<1.98
01/16/89	<1.77	<1.60	<1.51	<1.26	<1.45	<1.59	<1.28	<1.63	<1.66
01/23/89	<1.48	<1.40	<1.38	<1.44	<1.41	<1.34	<1.45	<1.62	<1.61
01/30/89	<1.44	<1.56	<1.35	<1.28	<1.49	<1.78	<1.37	<1.52	<1.66
02/06/89	<1.54	<1.43	<1.39	<1.37	<1.30	<1.64	<1.31	<1.47	<2.03
02/13/89	<1.63	<1.45	<1.28	<1.24	<1.39	<1.40	<1.40	<1.61	<1.40
02/21/89	<1.58	<1.19	<1.16	<1.21	<1.34	<1.28	<1.40	<1.21	<1.60
02/27/89	<1.75	<1.78	<1.76	<1.40	<1.87	<1.72	<1.75	<2.07	<1.98
03/06/89	<1.84	<1.34	<1.57	<1.50	<1.36	<1.53	<1.43	<1.98	<1.79
03/13/89	<1.66	<1.26	<1.41	<1.30	<1.64	<1.63	<1.56	<1.83	<1.84
03/20/89	<1.60	<1.39	<1.38	<1.52	<1.65	<1.49	<1.56	<1.90	<1.93
03/27/89	<1.79	<1.70	<1.34	<1.38	<1.22	<1.48	<1.61	<1.64	<1.88
04/03/89	<2.02	<1.53	<1.61	<1.47	<1.59	<1.91	<1.27	<1.97	<1.67
04/10/89	<1.47	<1.53	<1.46	<1.48	<1.73	<1.67	<1.40	<1.71	<1.95
04/17/89	<1.42	<1.31	<1.47	<1.55	<1.52	<1.60	<1.33	<1.63	<1.67
04/24/89	<1.65	<1.36	<1.46	<1.57	<1.54	<1.33	<1.80	<1.72	<1.79
05/01/89	<1.50	<1.28	<1.57	<1.19	<1.43	<1.60	<1.39	<1.66	<1.62
05/08/89	<1.49	<1.47	<1.52	<1.60	<1.37	<1.81	<1.56	<1.88	<1.77
05/15/89	<1.53	<1.56	<1.44	<1.57	<1.47	<1.59	<1.54	<1.90	<1.32
05/22/89	<1.53	<1.37	<1.22	<1.81	<1.38	<1.58	<1.42	<2.23	<1.31
05/30/89	<1.20	<1.46	<1.34	<1.41	<1.36	<1.60	<1.29	<1.36	<1.45
06/05/89	<1.39	<1.77	<1.54	<1.82	<1.62	<1.84	<1.34	<1.48	<1.64
06/12/89	<1.34	<1.32	<1.40	<1.37	<1.46	<1.59	<1.50	<1.33	<1.48
06/19/89	<1.28	<1.46	<1.48	<1.42	<1.39	<1.56	<1.36	<1.57	<1.97
06/26/89	<1.51	<1.40	<1.39	<1.32	<1.32	<2.43	<1.25	<1.54	<1.42
07/03/89	<1.38	<1.53	<1.47	<1.53	<1.47	<2.13	<1.48	<1.52	<1.57
07/10/89	<1.42	<1.35	<1.44	<1.50	<1.31	<1.39	<1.43	<1.51	<1.90
07/17/89	<1.62	<1.41	<1.44	<1.57	<1.48	<1.52	<1.59	<1.27	<1.27
07/24/89	<1.34	<1.50	<1.46	<1.67	<1.19	<1.62	<1.39	<1.47	<1.52
07/31/89	<1.41	<1.38	<1.36	<1.43	<1.45	<1.41	<1.45	<1.31	<1.60
08/07/89	<1.69	<1.50	<1.35	<1.40	<1.55	<1.37	<1.48	<1.27	<1.71
08/14/89	<1.63	<1.53	<1.35	<1.49	<1.75	<1.48	<1.17	<1.50	<1.21
08/21/89	<1.58	<1.63	<1.64	<1.55	<1.71	<1.86	<1.28	<1.50	<1.48
08/28/89	<1.31	<1.31	<1.26	<1.54	<1.59	<1.45	<1.27	<1.22	<1.54
09/05/89	<1.34	<1.43	<1.33	<1.54	<1.27	<1.58	<1.23	<1.31	<1.44
09/11/89	<1.32	<1.92	<1.91	<2.35	<1.70	<1.90	<1.48	<1.61	<2.03
09/18/89	<1.45	<1.66	<1.52	<1.90	<1.47	<1.64	<0.99	<1.35	<1.43
09/25/89	<1.48	<1.66	<1.40	<2.15	<1.49	<1.44	<0.99	<1.28	<1.54
10/02/89	<1.54	<1.51	<1.52	<1.81	<1.56	<1.74	<1.19	<1.40	<1.60
10/09/89	<1.51	<1.49	<1.59	<1.99	<1.72	<1.86	<1.21	<1.51	<1.61
10/16/89	<1.43	<1.60	<1.59	<2.94	<1.50	<1.45	<1.23	<1.26	<1.54
10/23/89	<1.60	<1.72	<1.72	<1.95	<1.47	<1.44	<1.24	<1.20	<1.37
10/30/89	<1.51	<1.70	<1.41	<1.83	<1.36	<1.34	<1.05	<1.30	<1.46
11/06/89	<1.52	<1.92	<1.66	<1.94	<1.43	<1.34	<1.12	<1.25	<1.83
11/13/89	<1.35	<1.56	<1.43	<1.71	<1.35	<1.50	<1.43	<1.23	<1.49
11/20/89	<1.65	<1.75	<1.42	<2.01	<1.45	<1.36	<1.19	<1.24	<1.49
11/27/89	<1.59	<1.53	<1.53	<1.99	<1.55	<1.38	<1.29	<1.20	<1.44
12/04/89	<1.36	<1.99	<1.73	<1.79	<1.36	<1.53	<1.77	<2.25	<1.91
12/11/89	<1.86	<1.81	<1.74	<1.98	<1.49	<1.23	<1.53	<1.73	<2.17
12/18/89	<1.18	<1.73	<1.55	<2.08	<1.45	<1.38	<1.73	<1.85	<1.86
12/26/89	<1.84	<1.51	<1.60	<1.85	<1.33	<1.34	<1.16	<1.62	<1.61
01/02/90	<1.83	<1.54	<2.04	<2.41	<1.53	<1.58	<1.39	<1.55	<1.82

Concentrations indicated are minimum detectible activities (MDAs) under the particular conditions of analyses; that is, I-131 may or may not have been present, but if so, there cannot have been more than the amounts shown.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Normalized Gamma-Ray Exposure Summary (mR)
Quarterly Thermoluminescence Dosimeter Results for 1989

INDICATOR STATION	1ST QTR	2ND QTR	3RD QTR	4TH QTR
TA1	12.70	11.85	13.18	12.47
TA2	14.80	14.04	13.32	13.13
TB1	13.67	12.27	13.11	11.74
TB2	13.67	13.72	14.29	13.23
TC1	12.63	12.44	13.42	12.83
TC2	11.10	11.30	10.89	11.27
TCS	11.67	11.07	11.35	9.80
TD1	14.22	12.63	12.85	12.86
TD2	13.27	12.08	12.42	11.47
TE1	13.27	12.21	13.22	13.05
TE2	11.85	10.93	10.55	10.29
TF1	12.66	11.25	11.99	12.47
TF2	13.54	12.21	12.82	13.62
TG1	14.78	12.28	12.99	14.70
TG2	12.90	11.89	11.85	13.10
TH1	10.44	10.02	10.85	10.73
TH2	11.55	11.73	11.22	11.47
TJ1	12.50	11.66	11.42	11.70
TJ2	11.59	11.58	11.42	10.29
TK1	12.33	11.54	11.05	11.31
TK2	13.90	11.78	13.38	13.42
TKS	10.71	11.78	10.64	12.28
TL1	12.63	12.70	12.09	11.89
TL2	11.17	9.97	10.15	11.07
TLS	13.94	12.27	14.13	12.74
TM1	11.65	10.11	10.75	10.64
TM2	14.27	13.01	14.70	14.79
TN1	13.61	12.18	13.09	13.44
TN2	10.97	10.30	10.47	10.01
TP1	13.98	12.79	13.49	13.74
TP2	12.96	12.41	12.84	12.93
TQ1	12.05	12.15	13.52	12.09
TQ2	12.50	12.12	11.57	10.98
TQS1	13.64	13.52	13.02	12.65
TQS2	12.24	11.23	11.16	11.31
TR1	9.60	9.11	9.55	8.99
TR2	12.54	11.80	13.06	11.47
TRS	13.47	12.31	12.89	12.05
CONTROL STATION				
TAC	12.27	11.47	12.79	13.03
TEC	13.31	11.41	12.22	12.64
TGS	12.34	11.98	13.51	12.05
THS	14.34	14.35	14.80	13.79
TLC	11.47	10.00	11.30	10.49
TQS3	11.52	10.69	11.19	12.38

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Normalized Gamma-Ray Exposure Summary (mR)
Monthly Thermoluminescence Dosimeter Results for 1989

<u>INDI- CATOR STATION</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
TA1	4.76	4.16	4.58	4.50	4.26	3.75	3.86	4.72	3.99	4.71	4.20	4.51
TA2	4.20	5.24	4.56	5.11	4.98	4.40	4.34	5.18	4.89	4.66	4.82	4.84
TB1	4.55	5.16	4.73	5.11	4.97	4.32	4.96	5.08	4.34	4.77	4.22	3.70
TB2	4.77	5.04	4.84	4.90	4.80	4.83	4.49	5.27	4.86	5.16	4.82	4.12
TC1	4.34	4.55	4.61	4.71	4.80	4.04	4.27	4.82	5.02	5.23	4.14	4.42
TC2	3.77	4.00	3.99	4.22	3.80	3.67	4.79	4.37	3.54	5.73	3.83	3.60
TCS	3.94	4.00	4.15	3.72	3.77	3.46	4.04	3.79	3.26	3.66	3.41	3.42
TD1	4.69	4.63	4.55	4.81	4.94	4.10	4.68	4.95	4.67	4.98	4.76	4.26
TD2	4.34	4.83	4.51	4.22	5.09	4.34	4.31	4.37	4.39	4.93	4.45	4.60
TE1	4.03	4.59	4.36	4.32	4.87	3.95	4.16	4.95	4.33	5.23	4.24	4.17
TE2	3.45	3.73	3.69	3.79	4.48	3.65	3.82	3.82	3.58	3.80	3.45	3.60
TF1	4.34	4.69	4.33	3.74	4.26	3.88	4.34	4.57	4.86	4.56	4.14	4.09
TF2	4.09	4.52	4.72	4.36	4.55	4.36	4.27	4.53	5.04	4.83	4.73	4.74
TG1	4.66	5.27	4.83	5.09	4.87	4.58	4.42	5.18	4.67	5.03	4.45	5.23
TG2	4.09	4.63	4.54	4.04	4.16	3.74	4.23	4.86	4.43	4.27	4.09	3.70
TH1	3.65	3.88	3.30	3.23	3.83	3.40	3.57	4.02	3.77	3.56	3.83	3.29
TH2	3.88	4.02	3.84	3.72	4.48	4.45	4.01	4.40	3.86	3.80	4.14	3.96
TJ1	3.68	4.77	4.39	4.06	4.11	3.67	4.23	4.21	4.08	3.80	4.03	4.26
TJ2	3.31	3.91	3.58	3.43	4.16	3.03	3.57	4.57	3.30	3.90	3.83	3.42
TK1	3.86	4.31	4.20	4.09	4.12	3.95	3.68	4.57	3.73	4.03	4.14	3.47
TK2	4.07	4.91	4.56	4.44	4.58	4.25	4.06	4.73	4.42	5.06	4.45	4.43
TKS	3.41	4.23	3.98	4.01	4.45	3.83	3.84	4.43	3.73	4.38	3.83	3.69
TL1	3.83	4.63	4.20	4.37	4.16	4.19	4.27	4.76	4.11	4.40	3.93	4.17
TL2	3.76	4.13	3.65	3.36	3.68	3.03	3.56	3.92	3.76	3.83	3.64	3.60
TLS	4.61	5.59	4.60	4.36	4.65	4.13	4.34	4.44	4.52	4.96	4.45	4.43
TM1	3.34	3.73	3.52	3.72	3.93	3.40	3.38	4.47	3.45	3.80	3.41	3.56
TM2	4.55	5.12	4.78	4.82	4.70	4.53	4.55	5.17	4.76	4.60	4.82	4.63
TN1	4.45	4.91	4.11	4.22	4.45	4.15	4.46	4.86	4.36	4.26	4.66	4.09
TN2	3.58	3.84	3.46	3.43	3.74	3.35	3.42	4.00	3.38	3.75	3.38	3.91
TP1	4.41	5.01	4.43	4.99	4.67	4.34	4.27	4.76	4.83	4.70	4.66	4.09
TP2	4.09	4.45	4.29	4.50	4.12	3.97	4.20	4.72	3.86	4.66	4.03	3.69
TQ1	4.27	4.48	3.89	3.74	4.01	3.78	3.87	4.28	4.08	4.43	4.55	3.82
TQ2	4.45	4.20	4.08	3.93	4.27	3.97	3.78	4.53	3.98	4.20	3.93	3.87
TQS1	4.48	5.04	4.56	4.82	4.48	4.22	4.90	5.01	4.17	4.61	4.60	4.24
TQS2	3.72	4.37	3.96	4.07	4.29	3.87	3.95	3.91	3.70	4.35	3.47	4.05
TR1	3.06	3.59	3.36	3.15	3.13	2.89	3.27	3.21	3.05	3.42	3.00	2.95
TR2	4.13	4.00	4.20	4.18	4.29	3.80	3.92	4.47	4.11	4.53	3.82	4.01
TRS	4.59	4.62	4.63	4.36	4.67	4.37	4.31	5.25	3.96	4.76	4.27	3.91
<u>CONTROL STATION</u>												
TAC	4.37	4.73	4.72	4.29	4.65	4.13	4.53	4.95	4.36	4.73	4.36	4.63
TEC	4.16	4.45	4.33	4.33	4.45	3.83	3.90	4.57	4.45	4.56	4.00	4.32
TGS	4.10	4.98	4.63	4.93	4.84	3.87	4.81	5.39	4.49	4.66	4.09	4.12
THS	5.07	5.84	5.15	4.76	5.38	4.78	4.60	5.11	4.60	4.46	4.45	4.74
TLC	3.72	4.34	3.99	3.58	4.38	3.28	3.42	3.89	3.27	3.82	3.84	3.39

RIVER BEND STATION
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Gross Beta Activities (pCi/liter) in Water Samples - 1989

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DISCHARGE LINE	WD	SWU	WU	BLANK ¹
JAN	8.93	15.10	33.50		8.46		<2.84
FEB	9.55	8.28	25.79		6.26		<2.74
MAR	7.53	6.64	40.66	<2.39	5.27	<2.37	<2.30
APR	7.19	6.15	50.78		5.51		<3.64
MAY	9.66	12.31	12.86		10.60		<3.44
JUN	5.88	9.02	27.09	<2.83	7.55	2.97	<2.71
JUL	8.02	5.15	33.66		8.31		<0.62
AUG	6.73	6.45	40.39		8.85		<3.15
SEP	9.07	9.87	40.89	3.44	12.64	4.25	3.15
OCT	6.18	5.80	28.05		9.39		<3.45
NOV	5.69	5.80	31.88		6.62		3.03
DEC	4.48	<3.36	19.01	<2.51	4.06	<2.48	<2.42

¹Distilled, deionized well water (laboratory reagent water).

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from Discharge Line are composites of hourly grabs; samples from WD and WU are quarterly grabs.

Concentrations are actually-measured values whereas those indicated as "<" are minimum detectable activities (MDA's; that is, gross beta activities may or may not have been present, but if so, there cannot have been more than the amounts shown).

RIVER BEND STATION
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Tritium Activities (pCi/liter) in Monthly Water Samples - 1989

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK ¹
	SWD	DW	LINE	WD			
JAN	<626	<636	982	<635	<629	<639	<635
FEB	<768	<783	2158	<743	<731	<746	<736
MAR	<860	<869	3539	<872	<848	<881	<869
APR	<543	<544	2686	<540	<540	<542	<534
MAY	<152	<153	1315	<154	<152	<153	<151
JUN	254	<221	1704	<224	<222	<226	<225
JUL	<179	<173	4046	<178	<174	<175	<175
AUG	<188	<186	5055	<188	<189	<189	<182
SEP	<111	<111	3448	<111	<112	<111	<110
OCT	<195	<194	3631	<193	<194	<192	<193
NOV	<206	<206	5008	<207	<204		<206
DEC	<217	<219	8083	<219	<217	<222	<219

Tritium Activities (pCi/liter) in Quarterly Water Samples - 1989

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK ¹
	SWD	DW	LINE	WD			
QTR1	<554	<557	2212	<872	<554	<881	<541
QTR2	<154	<154	1970	<540	<154	<542	<152
QTR3	<112	<112	4076	<188	<112	<189	<110
QTR4	<221	<220	5618	<219	<218	<222	<222

¹Distilled, deionized well water (laboratory reagent water).

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from Discharge Line are composites of hourly grabs; samples from WD and WU are monthly grabs (none obtained at WU in November; the license requirement for sampling is quarterly).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Tritium Activities (pCi/liter) in Monthly Water Samples - 1988

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK ¹
	SWD	DW	LINE	WD			
JAN	<619	<616	1155	<620	<615	<617	<612
FEB	<781	<782	1569	<779	<780	<780	<775
MAR	<576	<581	716	<567	<577	<553	<571
APR	<579	<575	912	<574	<579	<576	<571
MAY	<561	<557	880	<559	<558	<557	<552
JUN	<556	<559	1970	<558	<557	<556	<550
JUL	<551	<552	3834	<553	<552		<541
AUG	<551	<551	3900	<547	<546	<547	<542
SEP	<556	<561	3290	<555	<556	<557	<549
OCT	<568	<565	5467	<570	<568	<568	<563
NOV	<565	<555	2318	<553	<558	<555	<547
DEC	<565	<565	2613	<567	<570	<566	<558

Tritium Activities (pCi/liter) in Quarterly Water Samples - 1988

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK ¹
	SWD	DW	LINE	WD			
QTR1	<565	<563	1005	<779	<564	<780	<547
QTR2	<567	<566	1275	<574	<570	<576	<548
QTR3	<566	<570	3635	<555	<570	<557	<564
QTR4	<592	<586	3173	<570	<588	<568	<577

¹Distilled, deionized well water (laboratory reagent water).

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from Discharge Line are composites of hourly grabs; samples from WD and WU are monthly grabs (none obtained at WU in July; the license requirement for sampling is quarterly).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Tritium Activity (pCi/liter) in Quarterly Water Samples - 1987

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK ¹
	SWD	DW	LINE	WD			
QTR1	<444	<445	791	<442	<444	<442	<442
QTR2	<483	<447	1799	<477	<478	<476	<475
QTR3	<475	<477	995	<484	<480	<478	<475
QTR4	<604	<593	973	<600	<602	<601	<592

Tritium Activities (pCi/liter) in Quarterly Water Samples - 1986

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	DISCHARGE				SWU	WU	BLANK
	SWD	DW	LINE	WD			
QTR1	<454	<449	<452	<446	<452	<446	<442
QTR2	<448	<462	851	<448	<443	<440	<449
QTR3	<441	<442	1368	<446	<435	<443	<433
QTR4	448	<444	849	<442	<445	<438	<438

¹Distilled, deionized well water (laboratory reagent water).

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from Discharge Line are composites of hourly grabs; samples from WD and WU are quarterly grabs.

**RIVER BEND STATION
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Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1989

BERYLLIUM-7

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN			9.73			
OCT			6.08			

POTASSIUM-40

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN		26.70	21.80		12.40	
FEB	12.80	21.60	16.80		11.60	
MAR	13.60	14.10	17.00	17.20	17.70	
APR	15.60	18.00	20.00		15.00	
MAY	24.50	17.40	7.05		18.50	
JUN	22.70	9.86	13.20	11.90	16.40	7.49
JUL	15.20	15.90	19.10		14.50	
AUG	10.90	16.30	22.70		17.50	
SEP	13.40	14.40	34.50	17.50	18.00	13.80
OCT	14.40	18.00	31.60		17.20	
NOV	15.60	16.40	31.50		15.60	
DEC	17.80	14.80	25.00	16.50	20.70	20.60

CHROMIUM-51

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN			372.00			
FEB			353.00			
MAR			313.00			
APR			107.00			
MAY						
JUN			15.50			
JUL			27.60			
AUG			136.00			
SEP			49.80			
OCT			83.10			
NOV			85.90			
DEC			92.90			

Concentrations are actually-measured values, whereas those indicated as "<" are minimum detectable activities (MDAs) of nuclides for which the analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

**RIVER BEND STATION
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Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location -1989

MANGANESE-54

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<2.54	<2.03	2.66		<2.29	
FEB	<2.03	<2.46	4.46		<1.72	
MAR	<1.62	<1.82	21.20	<2.21	<1.79	<2.45
APR	<1.56	<1.63	33.10		<1.47	
MAY	<1.63	<1.76	3.14		<1.83	
JUN	<1.74	<1.67	8.40	<1.58	<1.73	<1.52
JUL	<1.64	<1.78	17.54		<1.67	
AUG	<1.69	<1.75	15.32		<1.68	
SEP	<1.72	<1.52	1.96	<1.68	<1.48	<1.56
OCT	<1.46	<1.61	2.82		<1.75	
NOV	<1.79	<1.62	5.79		<1.72	
DEC	<1.89	<1.69	6.02	<1.65	<1.71	<1.73

COBALT-58

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<2.97	<2.30	<2.88		<2.45	
FEB	<2.33	<2.76	4.19		<1.90	
MAR	<1.85	<1.81	12.60	<2.40	<2.00	<2.33
APR	<1.79	<1.84	15.50		<1.70	
MAY	<2.01	<2.04	1.24		<2.08	
JUN	<1.74	<1.96	3.59	<1.49	<1.82	<1.60
JUL	<1.64	<1.83	2.75		<1.57	
AUG	<1.69	<1.83	2.29		<1.76	
SEP	<1.74	<1.85	<1.97	<1.55	<1.69	<1.59
OCT	<1.70	<1.76	<2.08		<1.70	
NOV	<1.74	<1.94	1.01		<1.98	
DEC	<2.04	<2.08	2.80	<1.73	<2.00	<1.84

IRON-59

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<6.03	<5.45	<6.99		<5.64	
FEB	<4.84	<6.52	<6.33		<4.22	
MAR	<4.04	<4.47	5.62	<4.62	<4.52	<5.10
APR	<3.81	<4.15	6.64		<3.76	
MAY	<4.41	<4.80	<4.84		<4.59	
JUN	<4.02	<4.84	<6.06	<3.39	<4.33	<3.36
JUL	<3.89	<4.18	2.35		<3.76	
AUG	<4.24	<4.29	<5.36		<3.76	
SEP	<4.21	<4.11	<4.12	<3.44	<4.12	<3.60
OCT	<3.68	<4.29	<4.35		<3.68	
NOV	<4.89	<4.83	<4.43		<4.33	
DEC	<4.55	<4.96	2.64	<3.93	<4.49	<4.37

Concentrations are actually-measured values, whereas those indicated as "<" are minimum detectable activities (MDAs) of nuclides for which the analyses are required by RBS Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location -1989

COBALT-60

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<2.97	<2.21	5.52		<2.49	
FEB	<2.12	<2.63	13.90		<1.66	
MAR	<1.74	<0.88	50.60	<2.57	<2.06	<2.84
APR	<1.89	<1.73	69.20		<1.74	
MAY	<0.87	<1.84	9.52		<1.71	
JUN	<1.83	<1.86	28.52	<1.76	<1.35	<1.84
JUL	<1.73	<1.87	38.12		<1.76	
AUG	<2.60	1.07	32.36		<1.92	
SEP	<1.75	<2.09	4.12	<1.87	<1.68	<2.49
OCT	<1.81	<1.90	7.09		<1.87	
NOV	<1.92	0.82	16.22		<1.81	
DEC	<1.93	<1.86	18.80	<1.71	<1.83	<1.83

ZINC-65

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<4.80	<4.70	<5.43		<5.22	
FEB	<4.69	<4.96	<5.62		<3.82	
MAR	<3.66	<3.88	3.47	<4.99	<4.17	<5.23
APR	<3.85	<3.67	4.34		<3.56	
MAY	<3.75	<3.86	<4.46		<3.73	
JUN	<3.91	<4.12	<4.98	<3.57	<3.97	<3.62
JUL	<3.65	<3.65	<5.31		<3.96	
AUG	<3.65	<3.86	<4.92		<3.76	
SEP	<3.84	<3.65	<3.91	<3.52	<3.63	<4.15
OCT	<3.68	<3.39	<3.87		<3.89	
NOV	<3.85	<3.59	<4.23		<4.12	
DEC	<4.08	<3.97	<4.44	<3.86	<3.62	<3.96

NIOBIUM-95

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<3.24	<2.92	<3.66		<2.97	
FEB	<2.56	<3.28	<3.36		<2.25	
MAR	<2.16	<2.88	<2.96	<2.50	<2.41	<2.68
APR	<2.30	<2.07	<3.01		<2.05	
MAY	<2.50	<2.58	<2.62		<2.60	
JUN	<2.05	<2.75	<3.26	<1.47	<2.51	<1.75
JUL	<1.73	<2.10	<2.51		<1.99	
AUG	<2.32	<2.30	<2.56		<2.12	
SEP	<2.23	<2.36	<2.14	<1.82	<2.03	<1.84
OCT	<1.87	<2.35	<2.09		<2.03	
NOV	<2.35	<2.58	<2.21		<2.59	
DEC	<2.58	<2.58	<2.65	<2.20	<2.54	<2.47

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**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location -1989

ZIRCONIUM-95

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<5.03	<3.95	<5.25		<4.97	
FEB	<3.89	<4.37	<4.45		<3.36	
MAR	<3.14	<3.38	<4.29	<4.10	<3.85	<4.34
APR	<3.37	<3.11	<4.40		<3.04	
MAY	<3.33	<3.74	<3.69		<3.78	
JUN	<3.32	<3.64	<4.31	<2.77	<3.59	<2.84
JUL	<2.88	<3.47	<3.75		<3.00	
AUG	<3.35	<3.36	<3.70		<3.20	
SEP	<3.43	<3.21	<3.07	<2.88	<2.97	<3.23
OCT	<2.74	<3.51	<3.01		<3.27	
NOV	<3.58	<3.48	<3.43		<3.82	
DEC	<3.73	<3.66	<3.63	<2.96	<3.39	<3.48

IODINE-131

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<2.29	<2.61	<2.61		<2.49	
FEB	<2.28	<2.41	<2.25		<2.61	
MAR	<2.11	<3.53	<2.40	<0.66	<1.98	<0.71
APR	<1.75	<2.51	<1.81		<1.77	
MAY	<2.72	<3.49	<2.51		<3.58	
JUN	<1.88	<3.46	<1.73	<0.65	<1.93	<0.71
JUL	<1.36	<2.86	<1.50		<1.56	
AUG	<2.06	<4.03	<2.25		<2.05	
SEP	<1.85	<3.21	<1.88	<1.24	<3.37	<1.27
OCT	<1.39	<2.93	<1.37		<1.55	
NOV	<2.05	<6.64	<1.92		<2.32	
DEC	<1.83	<3.56	<1.94	<1.25	<3.84	<1.18

CESIUM-134

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DISCHARGE</u> <u>LINE</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<2.27	<2.00	<2.42		<2.21	
FEB	<1.96	<2.28	<2.34		<1.50	
MAR	<1.58	<1.67	<2.40	<2.31	<1.72	<2.38
APR	<1.53	<1.53	<2.36		<1.59	
MAY	<1.62	<1.57	<1.76		<1.67	
JUN	<1.54	<1.54	<1.81	<1.52	<1.64	<1.64
JUL	<1.49	<1.65	<1.96		<1.51	
AUG	<1.43	<1.60	<1.96		<1.63	
SEP	<1.73	<1.59	<1.61	<1.83	<1.54	<1.81
OCT	<1.58	<1.52	<1.77		<1.51	
NOV	<1.82	<1.53	<1.65		<1.68	
DEC	<1.75	<1.75	<1.80	<1.57	<1.63	<1.70

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**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location -1989

CESIUM-137

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<2.45	<2.12	<2.85		<2.22	
FEB	<2.04	<2.41	<2.50		<1.61	
MAR	<1.68	<1.80	<2.49	<2.21	<1.91	<2.51
APR	<1.70	<1.60	<2.44		<1.56	
MAY	<1.81	<1.87	<1.86		<1.88	
JUN	<1.79	<1.76	<2.10	<1.58	<1.76	<1.80
JUL	<1.50	<1.81	<2.14		<1.74	
AUG	<1.87	<1.62	<1.83		<1.74	
SEP	<1.81	<1.54	<1.60	<1.74	<1.55	<1.75
OCT	<1.55	<1.53	<1.85		<1.72	
NOV	<1.78	<1.62	<1.77		<1.78	
DEC	<1.85	<1.67	<1.90	<1.66	<1.49	<1.84

BARIUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<19.20	<19.00	<21.30		<19.40	
FEB	<15.60	<18.10	<19.00		<15.60	
MAR	<14.70	<18.70	<16.50	<10.20	<17.00	<11.20
APR	<12.40	<14.00	<14.60		<12.70	
MAY	<15.60	<18.30	<13.50		<17.50	
JUN	<10.70	<17.70	<22.50	< 5.47	<16.10	< 5.45
JUL	< 9.47	<14.40	<10.50		< 9.96	
AUG	<13.50	<18.60	<14.20		<12.40	
SEP	<13.80	<15.40	<13.80	< 7.90	<13.80	< 8.97
OCT	< 9.53	<17.00	< 9.36		< 9.98	
NOV	<17.20	<22.60	<12.90		<19.10	
DEC	<17.80	<20.50	<17.60	<11.80	<18.90	<13.70

LANTHANUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DISCHARGE LINE	WD	SWU	WU
JAN	<7.12	<7.82	<9.65		<7.00	
FEB	<5.71	<7.09	<7.12		<6.41	
MAR	<6.10	<7.67	<5.07	<4.45	<7.00	<5.21
APR	<4.92	<5.12	<5.03		<4.67	
MAY	<7.12	<7.79	<5.33		<7.66	
JUN	<5.41	<8.00	<8.70	<2.19	<6.38	<2.55
JUL	<3.64	<6.19	<4.27		<4.21	
AUG	<5.54	<7.73	<4.60		<5.25	
SEP	<5.67	<5.86	<5.36	<3.48	<5.05	<3.56
OCT	<3.77	<6.68	<3.74		<4.35	
NOV	<7.56	<8.91	<4.92		<8.10	
DEC	<7.98	<8.56	<6.71	<4.93	<7.53	<4.82

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RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclides in Sediment (pCi/kg dry) by Location - 1989

PERIOD	BERYLLIUM-7		POTASSIUM-40		COBALT-60	
	DOWNSTREAM	UPSTREAM	DOWNSTREAM	UPSTREAM	DOWNSTREAM	UPSTREAM
JUN		492.00	15218.00	15465.00		
NOV	331.00		15821.00	15675.00	76.40	

PERIOD	CESIUM-134		CESIUM-137	
	DOWNSTREAM	UPSTREAM	DOWNSTREAM	UPSTREAM
JUN	<15.10	<11.30	123.00	47.80
NOV	<14.60	<12.80	76.40	52.30

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Fish by Location - 1989

PERIOD	POTASSIUM-40							
	#1	DOWNSTREAM #2	#3	#4	#1	UPSTREAM #2	#3	#4
MAR	2794	3265						
APR					3224			
NOV	3250	4069	2514	2837	2207	1940	2675	1942

PERIOD	MANGANESE-54							
	#1	DOWNSTREAM #2	#3	#4	#1	UPSTREAM #2	#3	#4
MAR	< 3.22	<24.80						
APR					< 3.73			
NOV	<17.40	<16.10	< 4.03	<17.70	< 3.24	<13.60	<16.60	<15.70

PERIOD	IRON-59							
	#1	DOWNSTREAM #2	#3	#4	#1	UPSTREAM #2	#3	#4
MAR	< 9.11	<47.8						
APR					<10.00			
NOV	<44.00	<39.90	<11.80	<52.80	< 9.30	<36.10	<47.80	<42.60

PERIOD	COBALT-58							
	#1	DOWNSTREAM #2	#3	#4	#1	UPSTREAM #2	#3	#4
MAR	< 3.52	<21.20						
APR					< 3.64			
NOV	<17.60	<17.10	< 4.27	<20.90	< 3.06	<13.20	<19.90	<19.20

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**RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Fish by Location - 1989

COBALT-60

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>
MAR	< 4.11	12.30						
APR					< 4.61			
NOV	<21.30	<17.80	< 5.16	<21.00	< 3.93	<16.40	<21.50	<18.70

ZINC-65

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>
MAR	< 9.81	<51.30						
APR					<10.20			
NOV	<43.50	<42.20	<12.30	<41.70	< 8.69	<34.50	<44.40	<40.60

CESIUM-134

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>
MAR	< 2.82	<19.70						
APR					< 2.95			
NOV	<16.50	<15.10	< 3.67	<16.00	< 2.46	<13.90	<16.70	<14.70

CESIUM-137

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>	<u>#1</u>	<u>#2</u>	<u>#3</u>	<u>#4</u>
MAR	< 3.20	<20.30						
APR					< 3.35			
NOV	<19.40	<16.00	2.09	<16.70	2.74	<13.40	<17.00	<15.40

Concentrations are actually-measured values, whereas those indicated as "<" are minimum detectable activities (MDAs) of nuclides for which the analyses are required by REL Technical Specifications (that is, the nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

RIVER BEND STATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation by Location - 1989

BERYLLIUM-7

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	370.00	403.00		154.00	315.00	124.00			
FEB	502.00	197.00		269.00	396.00	213.00			
MAR		370.00	452.00		166.00	32.00	339.00	669.00	
APR	122.00	255.00	108.00		325.00	125.00			
MAY		561.00	283.00	640.00	461.00				
JUN	349.00	535.00		46.00	368.00		322.00		
JUL			2111.00			34.00	647.00	396.00	1449.00
AUG	1094.00	1536.00	1505.00	165.00	208.00	162.00	554.00	830.00	3141.00
SEP	1214.00	354.00	126.00	116.00		127.00	620.00	1999.00	
OCT									
NOV		818.00	161.00	165.00	414.00				137.00
DEC	287.00	387.00	148.00	212.00	706.00				200.00

POTASSIUM-40

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	4290.00	3620.00	2540.00	4370.00	3010.00	2520.00	2520.00	4060.00	4150.00
FEB	560.00	4420.00	2975.00	5240.00	4038.00	3788.00	2340.00	2320.00	
MAR	2525.00	3032.00	3168.00	1603.00	3511.00	3127.00	5920.00	6341.00	
APR	3355.00	3261.00	3061.00	3584.00	4053.00	1460.00	4398.00	3490.00	
MAY		2695.00	3181.00	3760.00	4704.00		3126.00	2486.00	
JUN	2244.00	5854.00	3691.00	3133.00	7187.00	2731.00	6342.00	5635.00	7790.00
JUL	2364.00	3097.00	4329.00	3531.00	2731.00	2714.00	5596.00	6570.00	4320.00
AUG	3863.00	2800.00	3872.00	3971.00	2610.00	3339.00	5114.00	7218.00	
SEP	2950.00	4057.00	4821.00	3452.00	4342.00	5824.00	6088.00	4345.00	4976.00
OCT	3267.00	3570.00	3315.00	4598.00	3588.00	3040.00	4005.00	2825.00	5678.00
NOV	1771.00	4682.00	3571.00	4189.00	4679.00	3440.00	3127.00	3678.00	3701.00
DEC	5330.00	3323.00	5831.00	3719.00	5768.00	5551.00	3386.00	4866.00	2120.00

Zinc-69m

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JUL					9.66				

Sampling requirement for vegetation is one sample of each of three different types from each location per month. Due to lack of availability, only two control samples were obtained in February, March, April, May, and August; while only two samples were available from G2 during May.

Concentrations are actually-measured values whereas those indicated as "<" are minimum detectable activities (MDA's) of nuclides for which analyses are required by RBS Technical Specifications (that is, nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

RIVER BEND STATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation by Location - 1989

IODINE-131

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	<21.80	<23.20	<21.20	<22.30	<24.30	<21.20	<22.20	<22.80	<22.60
FEB	<26.20	<26.50	<28.90	<23.40	<24.50	<26.20	<26.60	<22.90	
MAR	<26.80	<27.80	<28.60	<28.40	<25.90	<20.60	<37.20	<33.50	
APR	<28.30	<29.10	<30.10	<31.40	<29.80	<25.70	<23.20	<25.40	
MAY	<25.30	<25.90	<21.70	<25.80	<26.40		<25.80	<24.90	
JUN	<26.10	<26.90	<25.50	<25.50	<28.60	<26.80	<37.00	<37.20	<30.60
JUL	<25.50	<26.30	<27.70	<28.90	<24.30	<28.00	<29.70	<26.80	<28.30
AUG	<28.10	<28.30	<31.80	<29.00	<23.00	<28.80	<23.70	<57.00	
SEP	<25.10	<29.90	<23.40	<25.10	<27.30	<27.00	<3.00	<28.50	<26.50
OCT	<29.50	<26.60	<28.10	<30.70	<22.80	<34.60	<24.00	<24.10	<27.20
NOV	<31.60	<21.60	<30.00	<24.60	<27.10	<25.20	<28.10	<33.50	<34.60
DEC	<26.50	<14.90	<26.60	<24.50	<20.60	<35.40	<30.10	<29.80	<34.30

CESIUM-134

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	<23.30	<25.70	<28.40	<24.10	<26.80	<25.70	<26.20	<29.40	<26.60
FEB	<34.90	<27.30	<30.10	<30.40	<24.60	<27.20	<29.10	<24.20	
MAR	<28.90	<25.10	<33.50	<30.50	<31.00	<24.70	<30.80	<28.70	
APR	<30.40	<36.10	<31.20	<31.00	<32.10	<27.80	<27.70	<28.90	
MAY	<26.00	<27.80	<28.30	<29.20	<25.20		<29.10	<25.80	
JUN	<29.90	<28.00	<27.90	<31.30	<27.20	<30.50	<39.40	<35.30	<34.50
JUL	<28.40	<29.80	<27.90	<31.80	<31.40	<29.30	<32.50	<30.30	<27.30
AUG	<31.70	<35.60	<30.80	<32.60	<30.50	<27.70	<28.80	<58.80	
SEP	<31.10	<28.90	<30.20	<30.80	<33.30	<27.20	<25.30	<28.30	<28.50
OCT	<29.70	<33.90	<25.90	<34.20	<26.40	<29.00	<25.70	<26.50	<27.90
NOV	<35.10	<26.80	<30.40	<34.40	<29.80	<27.80	<26.90	<28.30	<31.10
DEC	<30.00	<15.70	<28.40	<29.90	<27.00	<40.10	<27.70	<28.20	<25.40

CESIUM-137

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	<23.60	<28.40	<29.90	<25.30	<33.70	<25.20	<29.60	<25.50	<32.74
FEB	<34.40	<30.30	<30.80	<27.90	<24.20	<27.60	<35.00	<27.70	
MAR	<35.50	<32.50	<33.20	<30.00	<27.60	<22.00	<36.20	<29.10	
APR	<37.50	<33.40	<34.20	<34.00	<33.30	<30.40	<31.20	<28.60	
MAY	<37.10	<14.90	<31.00	<31.60	<30.00		<36.20	<29.20	
JUN	<32.50	<31.20	<36.90	<31.20	<40.00	<31.20	<35.20	<40.20	<36.50
JUL	<32.90	<33.30	<35.80	<32.30	<32.50	<30.80	<36.50	<27.20	<31.70
AUG	<36.60	<34.40	<35.60	<32.10	<31.80	<30.40	<37.70	<64.10	
SEP	<32.00	<40.00	<34.70	<30.90	<33.40	<30.20	<28.80	<29.30	<29.40
OCT	<32.80	<34.90	<32.20	<32.30	<29.50	<36.70	<26.10	<31.80	<32.80
NOV	<38.40	<38.20	<35.90	<34.50	<31.20	<30.30	<29.80	<33.60	<37.20
DEC	<29.70	<6.70	<29.00	<30.30	<28.60	<41.10	<29.30	<32.70	<29.20

Sampling requirement for vegetation is one sample of each of three different types from each location per month. Due to lack of availability, only two control samples were obtained in February, March, April, May, and August; while only two samples were available from G2 during May.

Concentrations are actually-measured values whereas those indicated as "<" are minimum detectable activities (MDA's) of nuclides for which analyses are required by RBS Technical Specifications (that is, nuclides may or may not have been present, but if so, there cannot have been more than the amounts noted).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1989

APPENDIX B

Summary of Preoperational REMP (Baseline) Results

Table B.1 summarizes the results of preoperational radiological environmental monitoring from January, 1983, through October, 1985. Further details are available in the respective annual reports (1983, 1984, and 1985).

TABLE B.1

PREOPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
(Page 1 of 4)

River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/83 -10/31/85

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Dist./Dir.	Mean (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Air Particulate (pCi/m ³)	Gross Beta (1086)	0.01	0.03 (752/759) 0.01 - 0.09	AQS2 5.8 km NW	0.03(146/158) 0.01 - 0.09	0.03 (326/327) 0.01 - 0.08	N/A
	Cs-134 (95)	0.05	ALL <LLD			ALL <LLD	N/A
	Cs-137 (95)	0.06	ALL <LLD			ALL <LLD	N/A
Air Radioiodine (pCi/m ³)	I-131 (1056)	0.07	ALL <LLD			ALL <LLD	N/A
Direct (TLD) (mR Total)	Gamma Monthly (1214)		6.8 (1018/1064) 0.7 - 19.3	TM2 4.2 km WSW	7.8 (27/28) 3.2 - 16.2	6.7(139/150) 0 - 27.8	N/A
	Gamma Quarterly (472)		19.0 ³ (404/418) 6.8 - 32.1	TG1 1.6 km SE	27.5 ³ (11/11) 12.2 - 27.6	18.9 ³ (51/54) 6.5 - 23.5	N/A
Surface Water (pCi/liter)	H-3 (24)	2000	ALL <LLD			ALL <LLD	N/A
	Mn-54 (68)	15	ALL <LLD			ALL <LLD	N/A
	Co-58 (68)	15	ALL <LLD			ALL <LLD	N/A
	Fe-59 (68)	30	ALL <LLD			ALL <LLD	N/A
	Co-60 (68)	15	ALL <LLD			ALL <LLD	N/A
	Zn-65 (68)	30	ALL <LLD			ALL <LLD	N/A
	Nb-95 (68)	15	ALL <LLD			ALL <LLD	N/A
	Zr-95 (68)	30	ALL <LLD			ALL <LLD	N/A
	I-131 (68)	15	ALL <LLD			ALL <LLD	N/A
	Cs-134 (68)	15	ALL <LLD			ALL <LLD	N/A
	Cs-137 (68)	18	ALL <LLD			ALL <LLD	N/A
	Ba-140 (68)	60	ALL <LLD			ALL <LLD	N/A
	La-140 (68)	15	ALL <LLD			ALL <LLD	N/A
	Gross Beta (52)	4	8.1 (23/26) 4 - 12	SWD 4 km downstream	8.1 (23/26) 4 - 12	7.8 (24/26) 5 - 13	N/A

TABLE B.1

PREOPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
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Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
				Name	Mean (f) ²		
Groundwater ⁴ (pCi/liter)	H-3 (24)	2000	ALL <LLD			ALL <LLD	N/A
	Mn-54 (22)	15	ALL <LLD			ALL <LLD	N/A
	Co-58 (22)	15	ALL <LLD			ALL <LLD	N/A
	Fe-59 (22)	30	ALL <LLD			ALL <LLD	N/A
	Co-60 (22)	15	ALL <LLD			ALL <LLD	N/A
	Zn-65 (22)	30	ALL <LLD			ALL <LLD	N/A
	Nb-95 (22)	15	ALL <LLD			ALL <LLD	N/A
	Zr-95 (22)	30	ALL <LLD			ALL <LLD	N/A
	I-131 (22)	15	ALL <LLD			ALL <LLD	N/A
	Cs-134 (22)	15	ALL <LLD			ALL <LLD	N/A
	Cs-137 (22)	18	ALL <LLD			ALL <LLD	N/A
	Ba-140 (22)	60	ALL <LLD			ALL <LLD	N/A
	La-140 (22)	15	ALL <LLD			ALL <LLD	N/A
Drinking Water ⁵ (pCi/liter)	Gross Beta (15)	4	4 (5/12) 2 - 8	WD 470 m SW	4 (5/12) 2 - 8	6 (2/3) 3 - 9	N/A
	H-3 (15)	2000	ALL <LLD			ALL <LLD	N/A
	Mn-54 (40)	15	ALL <LLD			ALL <LLD	N/A
	Co-58 (40)	15	ALL <LLD			ALL <LLD	N/A
	Fe-59 (40)	30	ALL <LLD			ALL <LLD	N/A
	Co-60 (40)	15	ALL <LLD			ALL <LLD	N/A
	Zn-65 (40)	30	ALL <LLD			ALL <LLD	N/A
	Nb-95 (40)	15	ALL <LLD			ALL <LLD	N/A

TABLE B.1

PREOPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/83 -10/31/85

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Dist./Dir.	Mean (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Drinking Water ⁵ (pCi/liter) (continued)	Zr-95 (40)	30	ALL <LLD			ALL <LLD	N/A
	I-131 (40)	15	ALL <LLD			ALL <LLD	N/A
	Cs-134 (40)	15	ALL <LLD			ALL <LLD	N/A
	Cs-137 (40)	18	ALL <LLD			ALL <LLD	N/A
	Ba-140 (40)	60	ALL <LLD			ALL <LLD	N/A
	La-140 (40)	15	ALL <LLD			ALL <LLD	N/A
	Gross Beta (54)	4	6.8 (28/28) 3 - 12	Donaldson-ville 138 km downstream	6.8 (28/28) 3 - 12	7.8 (24/26) 5 - 13	N/A
Shoreline Sediment (pCi/kg dry)	K-40 ⁶ (2)	NONE REQUIRED	13.7E3 (2/2) (11.4-15.9)E3	SED 4 km downstream	13.7E3 (2/2) (11.4-15.9)E3	NOT REQUIRED	N/A
	Cs-134 (4)	150	ALL <LLD			ALL <LLD	N/A
	Cs-137 (4)	180	ALL <LLD			ALL <LLD	N/A
Milk (pCi/liter)	K-40 ⁶ (18)	NONE	1313 (8/9) 1179 - 1475	MF2 6 km ESE	1313 (8/9) 1179 - 1475	1318 (7/9) 1196 - 1409	N/A
	I-131 (81)	1	ALL <LLD			ALL <LLD ⁷	N/A
	Cs-134 (82)	15	ALL <LLD			ALL <LLD ⁷	N/A
	Cs-137 (82)	18	ALL <LLD			ALL <LLD ⁷	N/A
	Ba-140 (82)	60	ALL <LLD			ALL <LLD ⁷	N/A
	La-140 (82)	15	ALL <LLD			ALL <LLD ⁷	N/A
Fish/ Invertebrates (pCi/kg wet)	K-40 ⁶ (6)	NONE REQUIRED	9037 (2/2) 6320 - 11754	FD 4 km downstream	9037 (2/2) 6320 - 11754	7840 (4/4) 4177 - 11438	N/A
	Mn-54 (15)	130	ALL <LLD			ALL <LLD	N/A
	Co-58 (15)	130	ALL <LLD			ALL <LLD	N/A
	Fe-59 (15)	260	ALL <LLD ⁸			ALL <LLD ⁸	N/A

TABLE B.1

PREOPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/83 -10/31/85

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection ¹ (LLD)	All Indicator Stations Mean (f) ² Range	Location with Highest Annual Mean Name Mean (f) ² Dist./Dir. Range		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Fish/ Invertebrates	Co-60 (15)	130	ALL <LLD			ALL <LLD	N/A
(continued)	Zn-65 (15)	260	ALL <LLD			ALL <LLD	N/A
	Cs-134 (15)	130	ALL <LLD			ALL <LLD	N/A
	Cs-137 (15)	150	ALL <LLD			ALL <LLD	N/A
Broadleaf Vegetation (pCi/kg wet)	K-40 ⁶ (11)	NONE REQUIRED	3368 (6/10) 1398 - 5389	C2 1.1 km NW	3368 (6/10) 1398 - 5389	3768 single value	N/A
	I-131 (75)	60	ALL <LLD ⁷			ALL <LLD	N/A
	Cs-134 (76)	60	ALL <LDD			ALL <LLD	N/A
	Cs-137 (76)	80	97 (4/43) 59 - 120	G1 1 km WNW	97 (4/43) 59 - 120	ALL <LLD	N/A

NOTES:

1. Lower Limit of Detection (LLD) as defined in RBS Technical Specifications (NUREG-1172).
2. Mean and range based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)
3. For each of the TLD locations in 1985, a value equal to 1/3 of its 4th Quarter gamma dose is used to simulate a "quarterly" measurement for October, 1985.
4. Beginning in January, 1985, groundwater was sampled from one upgradient (WU - control) and one down-gradient (WD - indicator) well; previously groundwater was sampled from construction dewatering wells.
5. The upstream surface water sampling location (SWU) is used as a "control" for drinking water comparisons.
6. The values for K-40 were derived from the (then) incipient in-house analytical program.
7. The values listed for the control location for milk were derived from the (then) incipient in-house analytical program. Training of personnel in calibration and analytical methods delayed sample preparation and counting. As a result, the required LLDs were not met in 2 out of 8 I-131 analyses; 1 out of 9 Cs-134 analyses; 1 out of 9 Cs-137 analyses; 2 out of 9 Ba-140 analyses; and 4 out of 9 La-140 analyses. Similarly, the required LLD for I-131 in broadleaf vegetation was not met in 1 out of 11 analyses. (See discussion of Program Exceptions in Preoperational Radiological Environmental Monitoring Report for 1985.)
8. The LLD for one downstream fish sample (catfish, analyzed in-house) was 265 pCi/kg (wet). The LLD for one upstream fish sample (largemouth bass, analyzed in-house) was 263 pCi/kg (wet).