

GULF STATES UTILITIES COMPANY



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Gentlemen:

River Bend Station - Unit 1
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Enclosed is the Annual Radiological Environmental Operating Report for 1991. 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,

A handwritten signature in black ink, appearing to read "W.H. Odell".

W. H. Odell
Manager - Oversight
River Bend Nuclear Group

LAE/MAH/re

Enclosure

cc: Mr. Robert D. Martin, Regional Administrator
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

NRC Resident Inspector
P.O. Box 1051
St. Francisville, LA 70775

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RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

RIVER BEND STATION

FOR THE OPERATING PERIOD

January 1, 1991 - December 31, 1991

Compiled by:

m Reed Jr

McGehee Reed
Rad. Environmental Analyst

Edited by:

Michael A. Harrington
Michael A. Harrington
Supvr. - Environmental Services

Reviewed by:

Edwin M. Cargill
Edwin M. Cargill
Director - Radiological Programs

Approved by:

Philip D. Graham 4/27/92
Philip D. Graham
Plant Manager

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Abstract

During 1991, 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 5 salient changes in receptor locations since 1990. Twelve monitoring exceptions occurred out of a total effort of 1,996 samples collected and 2,488 subsequent analyses performed. Nine of these exceptions involved Technical Specification requirements, but 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 radionuclide activity or levels of radiation above baseline levels in the vicinity of RBS during 1991, which are attributed to plant operation, are the expected low levels in the liquid discharge line. The levels of activity measured in environmental media and in the liquid discharge were below the required levels of detection, and therefore substantially below Technical Specification reporting levels. Thus the 1991 Radiological Environmental Monitoring Program substantiated the adequacy of source control and effluent monitoring at River Bend Station.

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1.0 INTRODUCTION

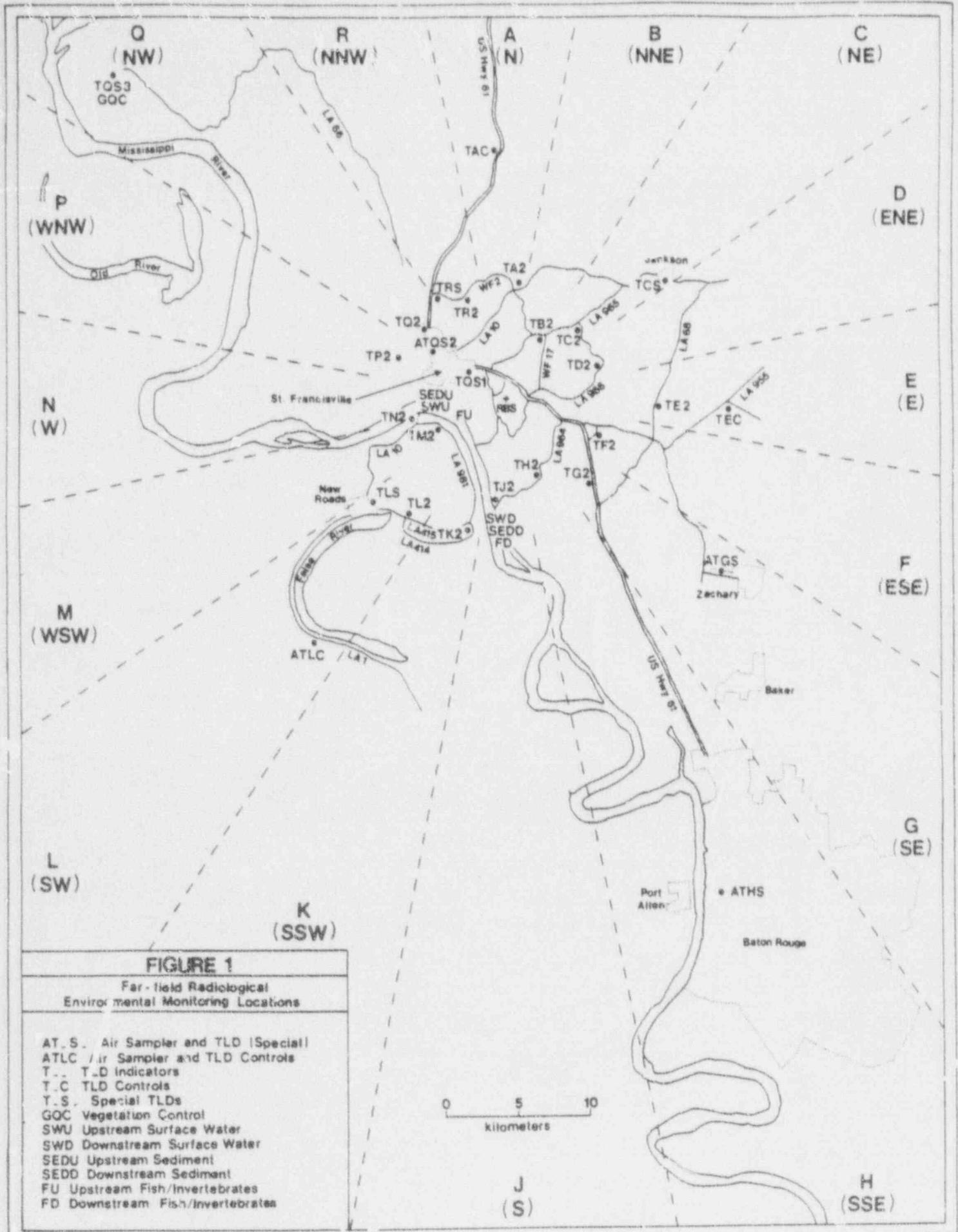
This Annual Radiological Environmental Operating Report for the period of January 1 through December 31, 1991, is submitted in accordance with Technical Specification 6.9.1.7 of Appendix A to River Bend Station License Number NPF-47.

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 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 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 all or portions 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 1991, 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 maintaining/calibrating air samplers and in reading/annealing thermoluminescence dosimeters.



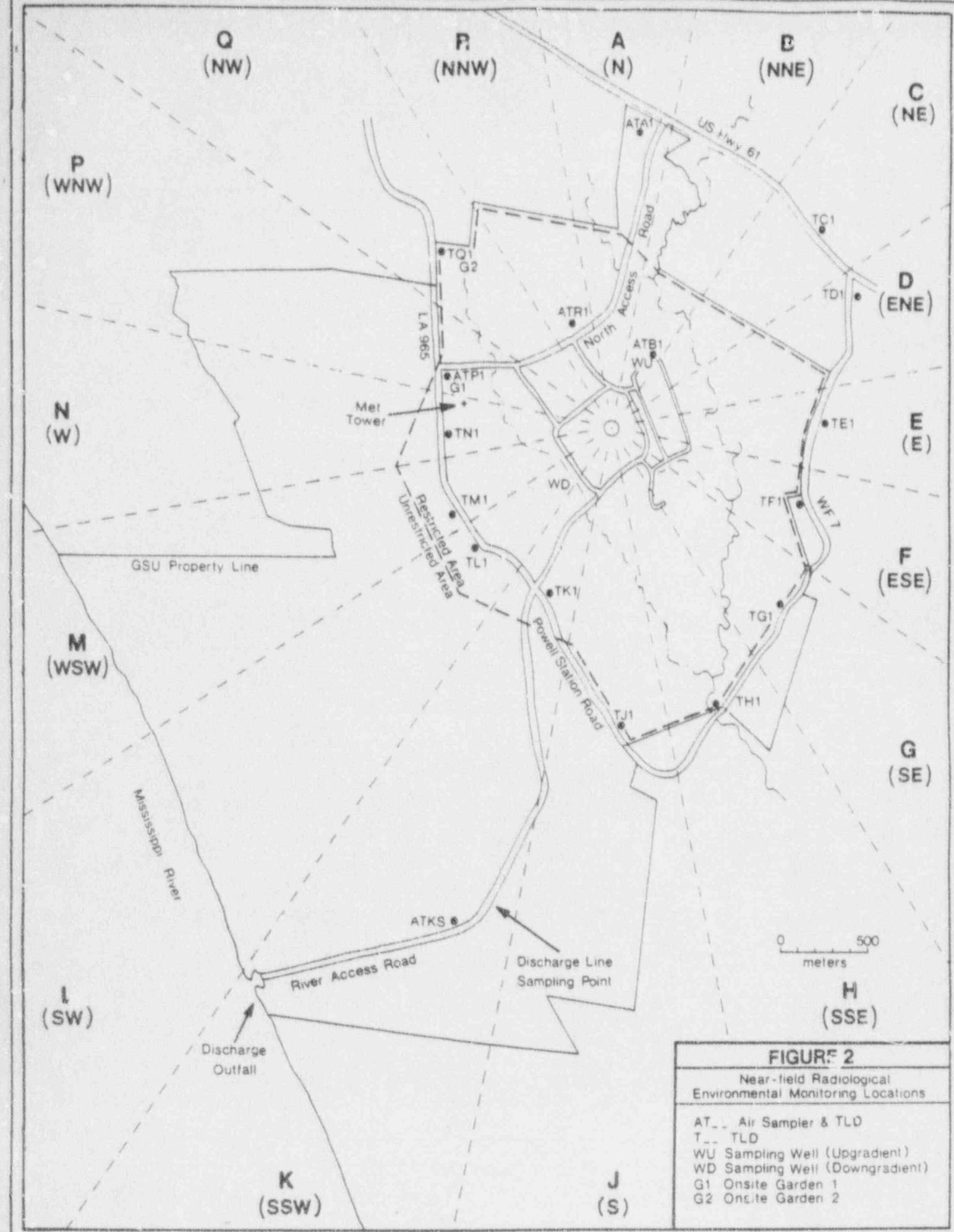


FIGURE 2

Near-field Radiological Environmental Monitoring Locations

- AT -- Air Sampler & TLD
- T -- TLD
- WU Sampling Well (Upgradient)
- WD Sampling Well (Downgradient)
- G1 Onsite Garden 1
- G2 Onsite Garden 2

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2.0 RADIOPHYSICAL 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 (external)	Air Samples (Particulates and Radioiodines)
Ingestion Dose (internal)	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) <u>Waterborne Pathway</u>	<u>Monitoring Media</u>
Ingestion Dose (internal)	Surface Water Samples Groundwater Sample Drinking Water Samples Fish/Invertebrate Samples Shoreline Sediment Samples
Immersion Dose (external)	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 incorporates 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, and is illustrated in Table 1 and Figures 1 and 2.

2.3 Land Use Census for 1991

The annual land use census, which implements Section IV.B.3 of Appendix I of 10CFR50, was conducted during the 1991 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 1990.

The 1991 census identified residences within 8 km of the RBS reactor containment in all sectors except L (SW) and M (WSW). The nearest resident in sector P (WNW) was at 3.5 km in 1991 versus 3.7 km in 1990. The nearest resident in sector Q (NNW) was 1.4 km, versus 1.3 km in 1990. 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 1991 census; milk goats were located at 9 km in sector A (N). Historically, there had never been enough dairy sites to accommodate the minimum RBS Technical Specification requirements for analysis of milk, so monitoring of broadleaf vegetation has been performed from the outset.

GSU began a survey of meat animals within the 8 km radius of RBS during the 1990 census. This initial survey identified beef herds in all sectors except L (SW). During the 1991 census, meat animals were located in sector L (SW) at 4.6 km. Other changes in 1991 include meat animals in sector A (N) at 3.0 km versus 1.9 km in 1990, and in sector R (NNW) at 3.0 km versus 2.4 km in 1990.

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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>
Airborne Particulates and Radionuclides	Samples from 9 locations: INDICATOR STATIONS		
	AAL. 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 filter: analysis weekly for gross beta and gamma isotopic activity (3) following filter changes. Composite particulate filters: analysis quarterly for gamma isotopic activity.
	ARL. River Bend Station North Access Road across from plant entrance; 0.8 km NNE.	"	"
	API. Near River Bend Station Onsite Garden #1; 0.9 km NNN.	"	"
	AQS2. St. Francis Substation on US Hwy. (Bus.) 61 in St. Francisville; 5.5 km NW (nearest community location).	"	"
	CONTROL AND SPECIAL INTEREST STATIONS (1)		
	ALC. Parlane Power Center in Oscar; 20 km SW (Control).	"	"
	ABL. River Bend Station cooling tower yard; 0.5 km NNE. (2)	"	"
	AKS. River Bend Station River Access Road; 2.8 km SSW. (2)	"	"
	AGS. GSU Service Center compound in Zachary; 17 km SE. (2)	"	"
	AHS. Roof of GSU Office Building, North Blvd., Baton Rouge; 40 km SSE. (2)	"	"
Direct Radiation	Measurements from 44 locations: INDICATOR STATIONS		
	TAL. River Bend Training Center; 1.7 km N.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly. (3)	Gamma dose monthly and quarterly. (3)
	TAZ. GSU Utility pole #246 at Jct. of La. Hwy. 10 and West Feliciana Parish Road (WF) 2 in Elm Park; 8 km N.	"	"
	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)
	TEL. 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 Delambre; 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; 5.8 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. 981, about 3 km S. of Jct. La. Hwys. 981 and 10; 4.2 km WSW.	"	"
	TN1. Utility pole along La. Hwy. 965, between RBS gates #13 and #14, 0.9 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	TPL. Near River Bend Station onsite Garden #1; 0.9 km WNW. 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 across from plant entrance; 0.6 km NNW. TR2. Tree along north side of WF 2, past Jacock Road, about 1.8 km E. of Jct. WF 2 and US Hwy. 61; 5 km NNW.	Thermoluminescence dosimeters (TLDs); deployment/retrieval monthly and quarterly. (3)	Gamma dose monthly and quarterly. (3)
	CONTROL AND SPECIAL INTEREST STATIONS (1)	"	"
TAC.	Telephone pole along US Hwy. 61 about 200 m N. of Hamilton Station Water Tower, near Wakefield; 18 km N.	"	"
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. (2)	"	"
TLC.	Parlange Power Center in Oscar; 20 km SW.	"	"
TCS.	Utility pole at gate to East Louisiana State Hospital in Jackson; 12.3 km NE.	"	"
TGS.	GSU Service Center pound in Zachary; 17 km SE.	"	"
THS.	Roof of GSU Office building, North Blvd., Baton Rouge; 40 km SSE.	"	"
TKS.	RBS River Access ad; 2.8 km SSW. (2)	"	"
TLS.	Utility pole near False River Academy sign at edge of New Roads; 9.9 km SW.	"	"
TQS1.	Utility pole opposite West Feliciana Hospital, near Jct. US Hwy 61 and Ferdinand Street; 4 km NW	"	"
TQS2.	St. Francis Substation on US Hwy. (Business) 61 in St. Francisville; 5.8 km NW.	"	"
TQS3.	Utility pole at Louisiana State Penitentiary dairy, near Angola; 35 km NW. (2)	"	"
TRS.	Stub pole at Jct. of WF 2 and US Hwy. 61, near Bains (West Feliciana High School); 9.2 km NWW. (2)	"	"

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TABLE 1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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Exposure Pathway and/or Sample	Sample Point Description, Distance, and Direction	Sampling and Collection Frequency	Type and Frequency of Analyses
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, tritium (3) and gross beta analysis (5). Quarterly composite: tritium analysis.
	SWD. Mississippi River about 4 km downstream from RBS liquid discharge, near paper mill.	Flow-weighted composited monthly and quarterly.	
	DL. RBS liquid discharge line at blowdown control structure along River Access Road.		
	DRINKING WATER (6)		
	Nearest downstream water supply: IH-10 bridge in Baton Rouge, 33.9 km downstream from RBS liquid discharge; or People's Water Service Company in Donaldsonville, 138 river km downstream from RBS liquid discharge.	Weekly grabs composited over monthly and quarterly periods.	Monthly composite: gamma isotopic, tritium (3) and gross beta analysis (5). Quarterly composite: tritium analysis.
	GROUNDWATER		
	WD. Upland Terrace Aquifer well downgradient from plant, about 470 m SW.	Quarterly grab.	Gross beta, gamma isotopic and tritium analyses quarterly. (5)
	WD. Upland Terrace Aquifer well upgradient from plant, about 470 m NNE (control).		
	SHORELINE SEDIMENT		
	SE. East shore of Mississippi River about 4 km downstream from plant, near paper mill.	Semiannual grab.	Gamma isotopic analysis semiannually.
	SEBU. East shore of Mississippi River about 4 km upstream from plant, near La. Hwy. 10 ferry. (2)		
Ingestion	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 semiannually or seasonally.
	PU. 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 of highest calculated ground-level D/Q; 1 km WNW and 1.1 km NW.	Monthly during growing season.	Gamma isotopic and I-131 analyses monthly.
	GOC. 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/analysis not required by RBS Technical Specifications and ODCM, drinking water pathway exists due to extreme distance to nearest intake. The upstream surface water sampling location (SWU) used as a "control" for drinking water analyses comparisons.
- (7) Preferred species are river shrimp (Macrobrachium ohione), blue catfish (Ictalurus furcatus), and freshwater drum (Aplodinotus grunniens); if these 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)	Nearest Meat Animal	Range (km)
A (N)	Jones	1.5	Jones	1.5	-	-	Daniel, H. ²	3.0
B (NNE)	Dreher	1.6	Harvey	1.8	-	-	Harvey	1.8
C (NE)	Magee	1.5	Magee	1.5	-	-	Daniel, H.	1.7
D (ENE)	Lambert	1.4	Daniel, E.I.	1.6	-	-	Lambert	1.4
E (E)	Bickham	2.2	-	-	-	-	Daniel, E.I.	1.2
F (ESE)	Sheiton	3.4	Eisworth	3.6	-	-	Daniel, E.I.	1.2
G (SE)	Hillie	6.6	Hillie	6.6	-	-	Bickham	3.5
H (SSE)	Koffman	1.7	Koffman	1.7	-	-	Daniel, E.I.	3.9
I (S)	Bliss	1.8	Bliss	1.8	-	-	Daniel, E.I.	3.5
K (BSW)	Guillory	7.4	Guillory	7.4	-	-	Daniel, E.I.	3.5
L (SW)	-	-	-	-	-	-	Bergeron ³	4.6
M (WSW)	-	-	-	-	-	-	Langois	5.0
N (W)	Lacost	6.1	-	-	-	-	Langois	5.0
P (WNW)	Green ¹	3.5	GSU #1	1.0	-	-	Hardovin	7.4
Q (NW)	Leet ²	1.4	GSU #2	1.1	-	-	Cavin	1.3
R (NNW)	Young	1.7	Monroe	3.0	-	-	Vessel ²	3.0

¹ The 1991 receptor location was nearer than the receptor location listed in 1990.

² The 1991 receptor location was farther than the receptor location listed in 1990.

³ There was no receptor location listed for 1990.

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2.4 Interlaboratory Comparison Program Results for 1991

The Environmental Services Group participated in the U.S. Environmental Protection Agency (USEPA) Laboratory Intercomparison Program during 1991 in accordance with RBS Technical Specification 3/4.12.3. RBS results (Table 3) were within the control limits for the normalized range (precision) for all analyses, and within the USEPA "known" value (accuracy) for all but one analysis, namely, the gross beta in air filters (3/29/91). The discrepancy for the gross beta in air filters 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 at this time, the results for the cross-check media for "milk" are included as a gauge for the "food" sample analyses (i.e., vegetation and fish) performed by RBS.

2.5 Program Exceptions

Certain samples and analyses were inadvertently omitted or unavoidably altered during the 1991 operating period, out of a total effort of 1,996 samples collected and 2,488 subsequent analyses performed. 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.

Air Particulates and Radioiodines:

Calibration records for two air samplers showed one sampler's deployment flow rate as 45 liters per minute and the other sampler's flow rate as 70 liters per minute. Both had been issued as calibrated to the 40-45 liter per minute range usually used for environmental sampling. The flow rates measured upon retrieval showed both flow rates as 70 liter per minute. In both cases, the analyses performed were conservative since larger air sample volumes were collected and counted than was used in the calculation of results. The required limits of detection for I-131, Cs-134 & Cs-137 were met when using total volumes based on the 40-45 liter per minute certification, and therefore would be met if volumes based on a 70 liter per minute certification were used in the calculations.

Brief storm-related power outages impacted one indicator air sampler (AA1) in November and December, and two control samplers (AHS, AGS) in October and November. From 8 percent to 86 percent of each of the expected sample volumes was lost due to the power outages, or associated equipment malfunctions. At one control location, AGS, the required detection limit for I-131 was not achieved due to insufficient air sample volume having been collected. During the period 10/28/91 to 11/4/91, the indicator sampler (AA1) missed 65% of the week-long sample, but was downwind of RBS airborne releases (according to the wind direction joint frequencies) only 5% of this period. During the period 11/25/91 to 12/2/91, this same sampler missed 8% of the week-long sample, but was downwind of RBS airborne releases (per joint frequencies) for 49% of this period. Although the samplers at AGS and AHS were occasionally downwind of RBS, they are too far from RBS to collect plant

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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 ^d
AIR FILTER (pCi/filter)	3/29/91	Beta	124.00±10.4	140.33 ^f	+8.72	0.095	130.11±13.6
	3/29/91	Cs-137	40.00±8.70	46.33	+2.19	1.570	44.61±7.62
	8/30/91	Beta	92.00±17.3	108.33	+2.83	0.059	95.54±9.04
	8/30/91	Cs-137	30.00±8.70	37.00	+2.42	0.581	32.48±3.38
MILK ^e	4/26/91	I-131	60.00±10.40	53.33	-1.92	0.197	61.17±5.79
	4/26/91	Cs-137	49.00±8.70	50.00	+0.35	0.236	51.35±3.73
	4/26/91	K (nat)	1650.00±144.0	1638.67	-0.24	0.370	1633.09±162.22
WATER (pCi/liter)	1/25/91	Beta	5.00±6.55	6.67	+0.58	0.118	6.30±1.51
	2/08/91	Co-60	40.00±8.70	44.67	+1.62	0.118	40.04±2.87
	2/08/91	Zn-65	149.00±26.00	175.00	+3.00	0.551	149.71±10.68
	2/08/91	Ru-106	186.00±33.00	199.00	+1.19	0.839	191.53±9.93
	2/08/91	Ba-133	75.00±13.9	82.00	+1.52	0.148	74.14±5.86
	2/08/91	Cs-134	8.00±8.35	8.67	+0.23	0.118	8.09±1.98
	2/08/91	Cs-137	8.00±8.35	9.00	+0.35	0.236	9.06±1.59
	2/15/91	I-131	75.00±13.9	75.67	+0.14	0.222	77.00±5.89
	2/22/91	H-3	4418±766.8	4333.00	-0.33	0.092	4437.54±932.79
	4/16/91	Beta	115.00±29.5	107.00	-0.52	1.147	108.60±13.87
	4/16/91	Cs-134	24.00±8.70	24.33	+0.12	0.118	22.96±2.06
	4/16/91	Cs-137	25.00±8.70	27.33	+0.81	0.119	25.49±2.81
	5/17/91	Beta	46.00±8.70	41.67	-1.50	0.236	44.73±7.73
	6/07/91	Co-60	10.00±8.70	10.00	+0.00	0.236	10.69±2.32
	6/07/91	Zn-65	108.00±19.1	118.33	+1.63	0.913	109.54±8.13
	6/07/91	Ru-106	149.00±26.00	143.33	-0.65	2.020	141.48±14.08
	6/07/91	Ba-133	62.00±10.40	62.33	+0.10	0.886	61.37±5.45
	6/07/91	Cs-134	15.00±8.70	13.33	-0.58	0.354	14.20±2.02
	6/07/91	Cs-137	14.00±8.70	15.00	+0.35	0.709	15.37±1.96
	6/21/91	H-3	12480±2165	12154.67	-0.45	0.016	12434.92±940.81
	8/09/91	I-131	20.00±10.4	16.00	-1.15	0.197	20.96±3.02
	9/20/91	Beta	20.00±8.70	19.67	-0.12	0.236	20.30±3.68
	10/04/91	Co-60	29.00±8.70	29.67	+0.23	0.118	29.83±1.00
	10/04/91	Zn-65	73.00±12.10	79.00	+1.48	0.253	74.57±6.64
	10/04/91	Ru-106	199.00±34.70	188.67	-0.59	0.384	184.21±20.92
	10/04/91	Ba-133	98.00±17.30	99.00	+0.17	0.177	95.56±7.44
	10/04/91	Cs-134	10.00±8.70	9.33	-0.23	0.118	9.93±1.82
	10/04/91	Cs-137	10.00±8.70	10.33	+0.12	0.118	10.86±1.81
	10/19/91	H-3	2454.00±610.70	2663.33	+1.03	0.379	2531.91±338.52
	10/22/91	Beta	65.00±17.3	51.67	-2.31	0.236	55.53±7.72
	10/22/91	Cs-134	10.00±8.70	9.67	-0.12	0.118	9.58±1.22
	10/22/91	Cs-137	11.00±8.70	12.00	+0.35	0.236	12.45±1.55
	10/22/91	Co-60	20.00±8.70	20.67	+0.23	0.118	20.22±2.13

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 discontinued the cross-check media "Food" for 1989. Although milk sampling and analysis by RBS is not performed, 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 KBS. The units for the nuclides I-131 and Cs-137 are pCi/liter, and for the element K is mg/liter.
- (f) The results reported to USEPA were above the control limits; refer to the program exceptions.

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TABLE 4
MONITORING PROGRAM EXCEPTIONS

Sample Type	Period	Location	Exception/Reason
AIR Particulates and Radioiodines	11/05/90 ~ 04/29/91	AHS*	Calibration records showed deployment flow rate as 45 liters per minute and retrieval flow rate as 70 liters per minute.
"	03/21 ~ 04/08/91	AAI	Calibration records showed deployment flow rate as 70 liters per minute and retrieval flow rate as 70 liters per minute.
"	10/14 ~ 10/21/91	AGS*	About 86% of weekly sample volume not collected due to equipment malfunction. LLD for I-131 was not achieved.
"	10/28 ~ 11/04/91	AAI	About 6% of weekly sample volume not coll. due to power outage.
"	11/04 ~ 11/11/91	AHS*	About 67% of weekly sample volume not collected due to equipment malfunction.
"	11/25 ~ 12/02/91	AAI	About 8% of weekly sample volume not collected due to power outage.
USEPA Cross-check: Gross Beta on Air Filter	03/29/91	N/A	Results reported exceeded control limits due to smaller distance between crosscheck sample and detector than that used for air filter samples.
Direct Radiation (TLD)	February	TCS,TH1	No monthly data reported due to damaged TLD badges; removed damaged TLDs from service.
"	2nd Quarter	TQS2	TLD badge not exposed for 7 days of period due to error in collecting badges.
"	2nd Quarter	TP2	No data for period due to TLD badges missing/stolen.
"	4th Quarter	TCS	No data for period due to TLD badges missing/stolen.

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

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related emissions (and are thus designated as control locations). RBS is reviewing methods for determining more precisely when, during the week-long sample period, power outages or equipment failures occur so that comparison with wind direction joint frequencies will document the extent to which required sampling was achieved.

Direct Radiation (TLD)

Data for two missing quarterly TLD badges at locations (TP2, TCS) was replaced with the corresponding data from the monthly badges retrieved from those locations. Monthly data for two TLD locations (TS, TH1) was lost due to damaged and/or unreadable badges.

USEPA Cross-check - Gross Beta on Air Filters

Gross beta analysis for the 3/29/91 USEPA cross-check air filters exceeded the control limits for accuracy. The above-control-limit result is thought to be caused by the difference in counting efficiency resulting from the distribution of activity on the surface of the much thicker EPA filter. The gross beta activity analysis on RBS air filter samples uses a gas-flow proportional detector. The air filter calibration standard used by RBS is prepared on a glass fiber filter by the supplier to emulate the uniform distribution of source material across the face of a typical air filter sample. The USEPA's cross-check air filter is prepared by depositing the "known" amount of activity (source material) on the surface of a styrofoam wafer. This styrofoam wafer is much thicker than the glass fiber filter media used by RBS for air sampling, thereby positioning the activity of the simulated air filter closer to the counting instrument's detector when this wafer is processed as an air sample. This results in a higher count rate for the cross-check sample's activity than would result from the same activity on a glass fiber filter. To reduce RBS's high bias for accuracy on air filters within the USEPA cross-check program, a special sample holder has been devised to position the surface of the cross-check air filter sample at the same distance from the detector as that distance used for air filter samples.

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.

TABLE 5
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/91 - 12/31/91

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 (468)	0.01	0.020 (312/312) 0.002 ~ 0.044	AB1 0.5 km NNE	0.023 (52/52) 0.007 ~ 0.044	0.019 (156/156) 0.002 ~ 0.046	0
	Ba- ¹³⁴ (468)	NONE REQUIRED	0.105 (235/312) 0.045 ~ 0.221	AHS 40 km SSE	0.117 (34/52) 0.069 ~ 0.212	0.107 (104/156) 0.049 ~ 0.212	✓
	K-40 ³ (468)	NONE REQUIRED	0.620 (306/312) 0.251 ~ 1.440	AHS 40 km SSE	0.645 (51/52) 0.340 ~ 1.730	0.623 (155/156) 0.262 ~ 1.730	0
	Cs-134 (468)	0.05	ALL <LLD			ALL <LLD	0
	Cs-137 (468)	0.06	0.011 (8/312) 0.008 ~ 0.014	AGS 17 km SE	0.017 (2/52) 0.014 ~ 0.021	0.015 (4/52) 0.011 ~ 0.021	0
AIR Radioiodine (pCi/m ³)	I-131 (468)	0.07	ALL <LLD			ALL <LLD	0
Direct (TLD) ⁴ (mR Total)	Gamma Monthly (528)		4.25 (454/456) 2.76 ~ 5.38	THS 40 km SSE	5.01 (12/12) 4.64 ~ 5.34	4.46 (72/72) 3.28 ~ 5.34	0
	Gamma Quarterly (176)		12.39 (152/152) 9.19 ~ 15.64	TG1 1.6 km SE	14.33 (4/4) 13.57 ~ 15.13	12.69 (24/24) 9.68 ~ 14.26	0
Surface Water (pCi/liter)	H-3 (12)	3000	7047 (4/81) 5186 ~ 9518	DL	7047 (4/4) 5186 ~ 9518	ALL <LLD	0
	Mn-54 (36)	15	4.62 (11/24) 0.71 ~ 12.4	DL	4.62 (11/12) 0.71 ~ 12.4	ALL <LLD	0
	Co-58 (36)	15	2.26 (5/24) 1.15 ~ 3.09	DL	2.26 (5/12) 1.15 ~ 3.09	ALL <LLD	0
	Fe-59 (36)	30	4.53 (3/24) 3.99 ~ 5.48	DL	4.53 (3/12) 3.99 ~ 5.48	ALL <LLD	0
	Co-60 (36)	15	9.31 (13/24) 0.46 ~ 27.42	DL	10.05 (12/12) 1.58 ~ 27.42	0.95 (1/12)	0
	Zn-65 (36)	30	ALL <LLD			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	2.20 (1/24) (single value)	DL	2.20 (1/12) (single value)	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

TABLE 5
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/91 - 12/31/91

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
Surface Water (pCi/liter) (continued)	La-140 (36)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (36)	4	19.57 (21/24) 3.25 - 72.61	DL	33.90 (12/12) 17.92 - 72.61	4.55 (11/12) 3.19 - 5.86	0
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
	Sb-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
	Cs-134 (8)	15	ALL <LLD			ALL <LLD	0
	Cs-137 (8)	15	ALL <LLD			ALL <LLD	0
	Ba-140 (8)	60	ALL <LLD			ALL <LLD	0
Drinking Water ⁵ (pCi/liter)	La-140 (8)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (8)	4	3.17 (2/4) 3.07 - 3.26	WD 470 m SW	3.17 (2/4) 3.07 - 3.26	ALL <LLD	0
	H-3 (4)	3000	188 (1/4) (single value)	Baton Rouge 53.9 km downstream	188 (1/4)	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

TABLE 5
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/91 - 12/31/91

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.	Max. (f) ² Range	Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Drinking Water ⁵ (pCi/liter) (continued)	Co-60 (12)	15	ALL <LLD	SWU 4 km upstream	0.95 (4/12) (single value)	0.95 (1/12) (single value)	0
	Zn-65 (12)	30	ALL <LLD			ALL <LLD	0
	Nb-95 (12)	15	ALL <LLD			ALL <LLD	0
	Zr-91 (12)	30	ALL <LLD			ALL <LLD	0
	I-131 (12)	15	ALL <LLD			ALL <LLD	0
	Cs-134 (12)	15	ALL <LLD			ALL <LLD	0
	Cs-137 (12)	18	ALL <LLD			LL <LLD	0
	Ba-140 (12)	60	ALL <LLD			ALL <LLD	0
	La-140 (12)	15	ALL <LLD			ALL <LLD	0
	Gross Beta (12)	4	5.05 (8/12) 3.00 - 7.87	Baton Rouge 53.9 km downstream	5.05 (8/12) 3.00 - 7.87	4.55 (11/12) 3.19 - 5.86	0
Shoreline Sediment ⁶ (pCi/kg dry)	Be-7 ³ (4)	NONE REQUIRED	none measured	SEDD 4 km downstream		none measured	N/A
	K-40 ³ (4)	NONE REQUIRED	16788 (2/2) 15292 - 18284		16788 (2/2) 15292 - 18284	11214 (2/2) 2589 - 19838	N/A
	Cs-134 (4)	150	ALL <LLD			ALL <LLD	0
	Cs-137 (4)	180	ALL <LLD	SEDU 3 km upstream	147.0 (1/2) (single value)	147.0 (1/2) (single value)	0
Fish/ Invertebrates (pCi/kg wet)	K-40 ³ (19)	NONE REQUIRED	3809 (9/9) 2398 - 6551	FD 4 km downstream	3809 (9/9) 2398 - 6551	3297 (10/10) 2590 - 5907	0
	Mn-54 (19)	130	ALL <LLD			ALL <LLD	0
	Co-58 (19)	130	ALL <LLD			ALL <LLD	0
	Fe-59 (19)	260	ALL <LLD			ALL <LLD	0
	Co-60 (19)	130	16.1 (1/9) (single value)	FD 4 km downstream	16.1 (1/9) (single value)	ALL <LLD	0
	Zn-65 (19)	260	ALL <LLD		ALL <LLD	0	

TABLE 5
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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River Bend Station
West Feliciana Parish, Louisiana

Docket Number: 50-458
Reporting Period: 1/1/91 - 12/31/91

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.		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Fish/ Invertebrates (pCi/kg wet) (continued)	Cs-134 (19)	130	ALL <LLD			ALL <LLD	0
	Cs-137 (19)	160	ALL <LLD			ALL <LLD	0
Broadleaf Vegetation (pCi/kg wet)	Be-7 ³ (108)	NONE REQUIRED	327 (58/72) 77 - 1316	GQC 35 Km NW	479 (32/36) 96 - 2268	478 (32/36) 96 - 2268	N/A
	K-40 ³ (108)	NONE REQUIRED	2947 (70/72) 536 - 6062	GQC 35 Km NW	4335 (35/36) 323 - 9318	4335 (35/36) 323 - 9318	N/A
	I-131 (108)	60	ALL <LLD			ALL <LLD	0
	Cs-134 (108)	60	ALL <LLD			ALL <LLD	0
	Cs-137 (108)	80	20.4 (4/72) 11.2 - 34.0	G1 0.96 km WNW	20.4 (4/72) 11.2 - 34.0	ALL <LLD	0
	Ba-140 (108)	NONE REQUIRED	none measured			none measured	0

NOTES:

1. Lower Limit of Detection (LLD) as defined in ESS 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. Specific activities 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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3.1.1 Airborne Exposure Pathway - Measurements of radioiodine and other gamma-emitters were all below their respective LLDs -- that is, "undetectable" at the required analytical sensitivities. Noble gases (Kr-87, Xe-133, Xe-135) were detected in air samples throughout the year. Cs-137 was measured in charcoal cartridges 8 times at indicator, and 4 times at control locations, presumably traces of Chernobyl fallout. Gross beta activities averaged 0.020 pCi/m³ at indicator locations and 0.019 pCi/m³ at control locations.

3.1.2 Direct Exposure Pathway - The monthly average gamma ray exposures for indicator and control locations were 4.28 and 4.46 millirem (mR) total, respectively. Quarterly exposures averaged 12.39 mR total at indicator locations and 12.69 mR total at control locations.

3.1.3 Waterborne Exposure Pathway - No gamma-emitters were measured in surface water or in drinking water at levels approaching the Technical Specification LLDs. The gamma emitters Mn-56, Co-58, Fe-55 and Co-60 were measured in a few monthly composite samples from the CWS disc. rge line at concentrations between 0.46 and 27.4 picocuries per liter. Gross beta activities in surface water averaged 3.9 pCi/l in the discharge line and from 3 to 8 pCi/l at all other stations. Tritium (³H) activities in surface water averaged 7,047 pCi/l in the discharge line and were below detection limits at all other locations. Gross beta activities averaged 3.2 pCi/l in the downgradient WD (indicator), and below LLD in upgradient WU (control) groundwater. Besides naturally-occurring gamma emitters, Cs-137 was measured in Mississippi River shoreline up-stream sediment at 147 pCi/kg dry. As in the case of the airborne Cs-137 activity, this slightly elevated level (relative to baseline conditions) is probably attributable to the 1986 incident at Chernobyl, Russia.

3.1.4 Ingestion Exposure Pathway - Specif. activities for radioiodine were below the required LLD in the ingestion pathway monitoring media during 1991. In addition to naturally-occurring gamma emitters, Cs-137 was measured in broadleaf vegetation from one indicator location. The Cs-137 averaged 20.4 pCi/kg wet (<LLD) in vegetation from the onsite garden in Sector P (G1). No Cs-137 was measured in fish samples. Cobalt-60 at 16.1 pCi/kg wet was measured in one sample of downstream fish. These slightly elevated Cs-137 activities, which are two orders of magnitude below those that would be "reportable" if due to RBS releases, are probably attributable to Chernobyl fallout. The Co-60 activity in the downstream fish sample is presumed to be from the station discharge line, and is three orders of magnitude below the level that would be reportable.

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 1991. Gross beta activities on air particulate filters averaged 0.020 pCi/m³ at indicator and 0.019 pCi/m³ at control locations in 1991, compared to 0.03 pCi/m³ at both indicator and control locations during the preoperational phase of the REMP (Appendix B).

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In the direct exposure pathway, the 1991 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 ILDs during 1991 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	1987	1988	1989	1990	1991
Surface Water, Upstream (4 km)	7.80	8.93	9.30	7.78	9.75	4.55
RBS Discharge Line	N/A	21.76	32.38	32.05	40.39	33.90
Surface Water, Downstream (4 km)	8.10	8.59	8.66	7.41	9.52	5.23
Drinking Water (Baton Rouge)	6.50	10.40	8.24	8.23	9.47	5.05
Upgradient Groundwater	6.00	2.22	2.45	3.61	6.03	<2.91
Downgradient Groundwater	4.00	1.95	2.20	3.44	4.73	3.17

WATERBORNE AVERAGE TRITIUM (pCi/l)

	Pre-operational	1987	1988	1989	1990	1991
Surface Water, Upstream (4 km)	<3000	<444	<588	<554	<209	<371
RBS Discharge Line	N/A	1140	2272	3469	20452	7047
Surface Water, Downstream (4 km)	<3000	<604	<592	<554	<209	<374
Drinking Water (Baton Rouge)	<3000	<593	<586	<557	<210	<188
Upgradient Groundwater	<3000	<601	<780	<881	<211	<366
Downgradient Groundwater	<3000	<600	<779	<872	<207	<363

Gross beta activities in the discharge line and surface water samples averaged the same or slightly lower in 1991 than in previous years. As observed in previous years, the annual average gross beta activity for the control station (SWU) averaged the same as that for the indicator location (SWD). The gross beta activity levels in the discharge line sample (DL) seemingly reflect the normal cycles of concentration at which the station cooling towers are operated.

Tritium activities in the discharge line decreased on average from 1990, reflecting the releases already noted in the 1991 Semiannual Radioactive Effluent Release Reports (see also Table 6). These reduced tritium levels reflect a decrease from 1990 due to removal of failed fuel, but represent an increase compared to years prior to 1990, due to more efficient radioactive wastewater treatment and reuse (e.g., boiler makeup). In the RBS boiler-reactor, tritium is produced by ternary fission of the reactor fuel (^{235}U), although only a small fraction of that tritium would diffuse through the fuel's cladding. Tritium is also produced by neutron reactions with certain isotopes of boron, deuterium and lithium when present in the boiler (e.g. as control rod material - boron). The particulates (metals and salts)

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are removed in this treatment leaving the tritium behind as water (e.g., [$^3\text{H}-\text{O}-^1\text{H}$]). When this water is reused as boiler makeup, the tritium concentration in the water increases.

In the ingestion exposure pathway, no gamma emitting nuclides were measured above LLDs during 1991, 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 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 2,947 pCi/kg in indicator vegetation and at an average of 4,335 pCi/kg in control vegetation in 1991, roughly the same levels encountered prior to RBS operation (Appendix B). Another natural nuclide, Be-7, averaged 327 and 479 pCi/kg in indicator and control vegetation samples, respectively, during 1991. 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 1991 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 1991. The 1991 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 1991. 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/ACTIVITIES^a
AND REMP DISCHARGE LINE MONITORING RESULTS

Quantities Released	1st Qtr. 1991	2nd Qtr. 1991	3rd Qtr. 1991	4th Qtr. 1991	Total 1991
Liters, effl.	3.57E+06	2.79E+09	4.23E+06	3.78E+06	2.80E+09
Liters, dil.	1.39E+09	1.57E+09	1.08E+09	9.52E+08	4.99E+09
H-3, Curies	1.027E+01	5.31E+00	8.54E+00	6.44E+00	3.05E+01
Cr-51, Curies	2.77E-02	4.61E-03	1.99E-02	6.35E-02	1.16E-01
Mn-54, Curies	3.98E-03	1.12E-03	2.03E-03	1.62E-02	2.33E-02
Co-58, Curies	1.03E-03	2.81E-04	3.74E-04	4.63E-03	6.32E-03
Fe-59, Curies	1.03E-03	3.54E-04	2.75E-04	5.90E-03	7.56E-03
Co-60, Curies	1.15E-02	2.94E-03	8.45E-03	3.99E-02	6.28E-02
Nb-95, Curies	1.53E-04	3.87E-05	1.66E-05	6.47E-04	8.55E-04
Zr-95, Curies	4.33E-05	2.96E-05	7.66E-05	3.50E-04	4.80E-04
Ba-140, Curies	4.31E-04	3.24E-04	2.00E-04	2.29E-03	3.25E-03

Measured Nuclide	Predicted 1st Qtr. 1991	(Extrapolated) 2nd Qtr. 1991	Specific Activities (pCi/l) 3rd Qtr. 1991	4th Qtr. 1991	Mean 1991	1991 REMP Mean (Range) pCi/l
H-3	7370	1218	7877	6738	5800	7094 (3755-13379) ^b 7047 (5186-9518) ^c
Cr-51	19.9	1.06	18.4	66.4	26.4	32.5 (8.84-72.2)
Mn-54	2.86	0.26	1.87	16.9	5.47	4.62 (0.71-12.4)
Co-58	0.74	0.06	0.35	4.82	1.50	2.26 (1.15-3.09)
Fe-59	0.74	0.08	0.25	6.17	1.81	4.53 (3.99-5.48)
Co-60	8.25	0.67	7.79	41.7	14.6	10.0 (1.58-27.4)

NOTES:

^a Effluent quantities and nuclide activities excerpted from the two 1991 Semiannual Radioactive Effluent Release Reports already submitted.

^b Results from monthly composites.

^c Results from quarterly composites.

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APPENDIX A

Listings of 1991 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 1991. 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.

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Air Particulate Filter Gross Beta Activity (E-2 pCi/m³) - 1991

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/07/91	3.58	3.00	3.20	3.39	3.00	3.02	3.69	3.69	3.39
01/14/91	2.77	2.68	2.80	2.87	2.60	2.18	2.30	2.80	2.51
01/21/91	2.20	2.39	1.82	2.25	2.13	1.87	2.21	2.61	2.31
01/28/91	2.79	2.66	2.82	2.85	2.89	2.22	2.40	2.65	2.84
02/04/91	2.23	2.13	1.96	1.91	1.96	1.63	2.5	2.01	1.93
02/11/91	2.42	2.52	2.40	2.41	2.56	1.88	2.09	2.70	2.68
02/19/91	2.99	3.10	2.03	2.13	2.60	2.44	2.64	3.08	2.85
02/25/91	2.05	1.93	1.69	1.31	1.45	1.71	1.77	1.87	1.77
03/04/91	2.09	2.02	1.83	1.69	1.69	2.32	1.99	2.13	2.04
03/11/91	3.00	3.07	2.13	0.28	2.60	2.81	2.77	2.94	2.77
03/18/91	1.75	1.93	0.95	0.61	1.51	1.55	1.64	1.77	1.71
03/25/91	2.08	2.11	0.93	0.20	1.81	2.04	2.03	1.67	1.99
04/01/91	2.01	2.26	1.64	0.17	2.00	1.98	1.89	2.38	2.12
04/08/91	1.94	2.41	1.57	0.26	1.81	2.13	1.92	1.97	2.02
04/15/91	1.08	1.58	0.80	0.18	1.25	1.43	1.34	1.45	1.51
04/22/91	0.97	1.47	1.31	0.24	1.31	1.51	1.31	1.52	1.33
04/29/91	1.01	1.72	1.37	1.27	1.33	1.60	1.53	1.73	1.55
05/06/91	1.20	1.98	1.83	1.52	1.64	2.03	1.62	2.06	0.31
05/13/91	0.96	1.56	1.38	1.15	1.23	1.54	1.42	1.35	0.29
05/20/91	0.75	1.41	0.80	0.94	1.03	1.25	1.14	1.21	0.39
05/28/91	0.39	0.67	0.35	0.69	0.59	0.79	0.86	0.85	0.15
06/03/91	0.75	1.83	1.44	1.09	0.90	1.31	1.25	1.38	0.31
06/10/91	1.56	1.35	1.17	1.26	1.21	1.59	1.60	1.60	0.39
06/17/91	0.94	0.71	1.00	0.72	0.58	0.75	0.78	0.78	0.21
06/24/91	1.85	1.44	1.51	1.21	1.44	1.60	1.70	1.69	0.83
07/01/91	1.58	3.20	1.53	1.32	1.49	1.74	2.04	1.93	0.61
07/08/91	1.33	0.89	1.28	0.90	0.98	1.44	1.27	1.31	0.63
07/15/91	1.78	1.43	1.40	1.11	1.44	1.73	1.68	1.55	0.88
07/22/91	3.16	2.23	2.36	2.02	2.14	2.73	2.57	2.56	1.45
07/29/91	1.11	1.52	1.00	1.09	0.97	1.01	1.17	1.32	0.80
08/05/91	3.84	3.69	2.82	2.91	2.94	2.80	3.35	3.52	1.95
08/12/91	1.25	1.31	1.05	1.17	1.00	1.13	1.34	1.23	0.63
08/19/91	2.38	2.27	1.81	1.82	1.77	1.52	2.14	2.21	1.14
08/27/91	3.25	3.27	2.57	2.73	2.51	2.79	3.41	3.00	2.05
09/03/91	0.77	0.90	0.73	0.71	0.62	0.59	0.95	0.72	0.41
09/09/91	1.98	2.37	1.14	1.52	1.04	1.12	1.36	1.43	0.98
09/16/91	2.42	2.46	2.25	2.16	2.03	1.92	2.57	2.42	1.51
09/23/91	2.60	2.96	2.26	2.20	2.22	2.56	2.98	2.79	2.00
09/30/91	2.92	2.85	2.17	2.19	2.15	2.16	2.63	2.76	1.50
10/07/91	2.05	2.17	1.84	1.75	2.04	1.83	2.10	2.08	1.22
10/14/91	4.25	4.36	3.20	2.78	4.00	3.26	4.57	3.82	2.59
10/21/91	3.49	3.97	2.78	2.40	3.38	2.60	3.89	3.37	3.45
10/28/91	2.01	2.41	1.98	1.84	2.02	1.68	1.51	1.74	1.44
11/04/91	2.60	2.60	2.06	2.04	2.43	1.99	2.10	2.52	2.02
11/11/91	3.40	3.68	2.86	2.88	3.47	2.80	2.86	3.60	2.93
11/18/91	4.15	4.39	3.65	3.25	4.17	3.24	3.07	2.67	3.24
11/25/91	2.61	2.54	2.20	2.33	2.64	1.91	2.29	2.45	2.00
12/02/91	1.96	1.97	2.08	1.72	1.83	1.60	1.51	1.73	1.49
12/09/91	2.30	2.86	2.33	1.99	2.58	1.82	2.03	2.51	2.20
12/16/91	1.83	1.95	1.91	1.70	2.05	1.46	1.63	1.84	1.47
12/23/91	1.94	2.15	1.80	1.68	2.04	1.53	1.64	1.66	1.31
12/30/91	3.01	3.40	2.63	2.70	3.51	2.43	2.70	2.77	1.79

NOTE: activities shown are values actually measured.

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Air Particulate Filter Beryllium-7 Activity (E-2 pCi/m³) by Location - 1991

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/07/91	11.60	10.80	0.00	13.60	13.00	8.62			10.90
01/14/91									
01/21/91			7.64						5.71
01/28/91	8.03		9.08		6.42				12.70
02/04/91	12.70	9.28	11.40	14.80	17.20	14.90	9.44	9.23	11.50
02/11/91			9.19		8.69	7.44			8.61
02/19/91	19.10	16.50	9.62	16.50	19.00	15.40		17.30	21.20
02/25/91	7.50	7.26			11.80	9.78			
03/04/91	8.90	6.83	7.50	6.99	6.08		10.40	7.64	11.40
03/11/91	10.10	12.70	10.00		9.24	12.30	15.50	18.90	13.30
03/18/91	12.90	9.06			6.33	9.17	9.35		9.26
03/25/91	11.73	14.40			9.21	8.57	12.00	7.86	8.86
04/01/91	22.10	20.80	10.30		11.90	10.50	16.70	16.80	12.70
04/08/91	9.39	10.60	5.63		11.20	15.30	17.00	11.30	12.70
04/15/91	7.32	11.50			9.40	21.60	11.39	16.60	12.80
04/22/91	6.63	8.14	7.26			12.50			12.00
04/29/91		9.19	7.13	10.20	7.62		8.32	7.74	7.34
05/07/91	6.95	15.70	11.70	10.20	11.40	12.80	10.10	11.40	
05/13/91		10.60	8.83		10.06		13.70	12.60	
05/20/91		12.70	7.55	9.79	8.82		9.39		
05/28/91					5.07		5.90	6.91	5.44
06/03/91			8.77		8.03	19.40	12.20	10.70	
06/10/91	11.20	12.70		9.93	11.20	10.40	13.70	10.80	
06/17/91	9.12	7.68	6.19		6.72		10.80	6.94	
06/24/91		6.11	7.05	12.20	10.10		8.75	11.40	
07/01/91	9.79	8.15	7.45	7.22	10.90		5.97		
07/08/91	9.77	6.60	7.46	6.85	7.54	9.33	7.67		
07/15/91	7.35	7.18	11.80	10.10	10.60	10.00	6.87	8.47	
07/22/91	9.14	5.69		7.65	11.70		6.82	8.49	5.49
07/29/91	9.35	8.59			7.81	7.68			7.04
08/05/91	10.60	8.26	7.37	10.20	11.20	0.00	9.37		
08/12/91	9.37			9.46			6.19		4.89
08/19/91	12.40	7.42	9.66	9.20	7.05	11.20	11.30	9.54	
08/27/91	8.88	8.66	10.40	11.00	10.60	11.80	11.90	10.40	6.93
09/03/91			7.63				9.29		
09/09/91	8.64								
09/16/91	11.70	8.01	10.20	8.42	13.70	7.60	12.30	7.20	6.57
09/23/91	12.40	11.70	8.81	11.10	7.77	8.46	8.70	11.70	9.34
09/30/91	10.10	8.42	6.80	0.00	9.09	6.60	12.80	7.12	6.90
10/07/91	8.44	9.33	9.65	9.61	12.00	10.80	20.50	13.50	
10/14/91	11.70	16.60	11.10	9.93	12.80	11.40	15.60	16.20	
10/21/91	12.20	17.10	9.04	9.33	13.60	10.10	14.90	13.10	
10/28/91	8.97	9.04		12.00	10.20	9.16			9.91
11/04/91		7.61	7.24	8.75	11.40	4.54	6.05	10.80	7.80
11/11/91	11.20	19.70	13.80	9.78	10.40	8.19	10.80	18.20	9.55
11/18/91	7.50	11.80	14.10	11.90	14.40	11.30	9.98		6.94
11/25/91	11.80	15.30	10.90		9.89	10.40			10.50
12/02/91	20.50	12.70	10.50	11.80	14.60	9.86	14.70		
12/09/91	10.20	8.25	8.82		8.47	9.87			9.48
12/16/91	16.60	15.10	12.20	21.80	15.70	13.90	10.30	13.70	10.20
12/23/91	16.80	15.60	15.70	9.66	16.90	12.20	12.10	14.50	12.80
12/30/91	10.30	14.90	15.20	15.50	17.50	16.00	14.70	13.40	10.90

NOTE: Activities shown are values actually

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Air Particulate Filter Cesium-134 Activity (E-2 pCi/m³) by Location - 1991

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/07/91	<2.05	<2.09	<2.06	<2.46	<1.84	<2.12	<2.01	<2.24	<2.13
01/14/91	<1.33	<2.05	<1.44	<1.97	<1.71	<1.30	<1.53	<1.55	<1.69
01/21/91	<1.62	<1.48	<1.65	<1.35	<1.32	<1.12	<1.63	<1.53	<1.61
01/28/91	<1.66	<1.62	<1.38	<1.90	<1.34	<1.40	<1.63	<1.84	<1.49
02/04/91	<1.81	<1.79	<1.80	<1.64	<1.45	<1.52	<1.52	<1.70	<1.58
02/11/91	<1.64	<1.51	<1.67	<1.36	<1.39	<1.46	<1.37	<1.57	<1.33
02/19/91	<1.41	<1.33	<1.16	<1.55	<0.98	<1.24	<1.26	<1.61	<1.40
02/25/91	<2.08	<2.06	<2.30	<1.53	<1.42	<1.90	<1.98	<1.76	<2.04
03/04/91	<1.69	<1.48	<1.65	<1.18	<1.33	<2.39	<1.48	<1.69	<1.34
03/11/91	<1.64	<1.59	<1.56	<1.24	<1.32	<2.26	<1.44	<1.83	<1.39
03/18/91	<1.41	<1.63	<1.41	<1.55	<1.29	<1.65	<1.48	<1.52	<1.43
03/25/91	<1.43	<1.60	<1.45	<1.30	<1.54	<1.82	<1.42	<1.31	<1.66
04/01/91	<1.18	<1.35	<1.45	<1.48	<1.29	<2.17	<1.93	<1.49	<1.49
04/08/91	<1.19	<1.73	<1.73	<1.02	<1.54	<1.99	<1.61	<1.66	<1.39
04/15/91	<2.10	<1.38	<1.65	<1.27	<1.25	<2.36	<1.46	<1.59	<1.49
04/22/91	<2.10	<1.56	<1.59	<1.82	<1.44	<2.08	<1.45	<1.62	<1.45
04/25/91	<1.77	<1.53	<1.64	<1.48	<1.48	<1.99	<1.45	<1.59	<1.40
05/07/91	<1.59	<1.35	<1.43	<1.40	<1.29	<1.81	<1.16	<1.64	<1.24
05/13/91	<2.32	<1.69	<1.95	<1.74	<1.61	<2.51	<1.99	<1.48	<1.91
05/20/91	<1.84	<1.59	<1.51	<1.48	<1.73	<2.14	<1.62	<1.53	<1.48
05/28/91	<1.45	<1.27	<1.22	<1.32	<1.26	<1.46	<1.25	<1.49	<1.23
06/03/91	<2.36	<1.76	<1.70	<2.00	<1.72	<2.55	<1.53	<2.11	<1.67
06/10/91	<1.52	<1.39	<1.36	<1.48	<1.43	<1.66	<1.69	<1.56	<1.65
06/17/91	<1.53	<1.24	<1.63	<1.48	<1.54	<1.74	<1.79	<1.57	<1.35
06/24/91	<1.80	<1.47	<1.63	<1.57	<1.53	<2.28	<1.29	<1.26	<1.43
07/01/91	<1.78	<1.51	<1.39	<1.54	<1.41	<2.18	<1.41	<1.90	<1.61
07/08/91	<1.93	<1.46	<1.72	<1.48	<1.61	<2.08	<1.70	<1.55	<1.37
07/15/91	<1.74	<1.31	<1.77	<1.45	<1.62	<1.73	<1.60	<1.82	<1.30
07/22/91	<1.52	<1.37	<1.36	<1.41	<1.34	<2.54	<1.34	<1.66	<1.12
07/29/91	<2.16	<1.61	<1.54	<1.55	<1.72	<1.33	<1.63	<1.61	<1.61
08/05/91	<1.75	<1.56	<1.34	<1.64	<1.48	<1.65	<1.18	<1.93	<1.10
08/12/91	<1.64	<1.70	<1.30	<1.64	<1.35	<1.46	<1.26	<1.58	<1.27
08/19/91	<1.96	<1.73	<1.20	<1.77	<1.54	<1.55	<1.67	<2.19	<1.54
08/27/91	<1.81	<1.56	<1.44	<1.30	<1.37	<1.28	<1.32	<1.42	<1.10
09/03/91	<2.02	<1.65	<1.60	<1.48	<1.58	<1.39	<1.34	<1.59	<1.29
09/09/91	<2.17	<1.95	<1.89	<1.62	<1.76	<1.89	<1.48	<2.16	<1.52
09/16/91	<1.51	<1.99	<1.41	<1.68	<1.59	<1.56	<1.60	<1.77	<1.40
09/23/91	<1.83	<1.50	<1.60	<1.59	<1.45	<1.68	<1.76	<1.60	<1.73
09/30/91	<1.70	<1.78	<1.38	<1.37	<1.66	<1.55	<1.80	<1.48	<1.42
10/07/91	<1.28	<1.59	<1.30	<1.53	<1.40	<1.29	<1.53	<1.92	<1.54
10/14/91	<1.52	<1.82	<1.39	<1.69	<1.30	<1.52	<1.42	<1.66	<1.40
10/21/91	<1.43	<1.89	<1.55	<1.46	<1.72	<1.22	<1.98	<1.51	<8.28
10/28/91	<1.21	<1.71	<1.49	<1.65	<1.33	<1.44	<1.11	<1.84	<1.48
11/04/91	<4.31	<1.45	<1.39	<1.37	<1.23	<1.40	<1.38	<1.35	<1.37
11/11/91	<1.20	<1.47	<1.25	<1.56	<1.49	<1.21	<1.52	<4.40	<1.39
11/18/91	<1.49	<1.42	<1.39	<1.46	<1.57	<1.13	<1.57	<2.16	<1.59
11/25/91	<1.79	<2.67	<1.84	<1.83	<1.83	<1.71	<1.89	<1.83	<2.10
12/02/91	<2.04	<2.03	<1.88	<1.94	<2.19	<1.72	<1.74	<1.66	<1.88
12/09/91	<1.72	<2.01	<1.99	<1.61	<2.35	<1.40	<2.00	<1.68	<2.00
12/16/91	<1.85	<1.68	<2.09	<1.95	<2.03	<1.70	<1.84	<2.23	<2.19
12/23/91	<1.65	<1.91	<1.80	<1.78	<1.60	<1.70	<1.83	<1.85	<1.65
12/30/91	<2.21	<1.94	<2.01	<1.85	<2.09	<1.36	<1.88	<2.02	<1.92

NOTE: Activities indicated are minimum detectable activities (MDAs) under the particular conditions of analyses (i.e., Cs-134 may or may not have been present, but if so, there cannot have been more than the amounts shown), or they are values actually measured.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Air Particulate Filter Cesium-137 Activity (E-2 pCi/m^3) by Location - 1991

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/07/91	<2.36	<2.23	<2.18	<2.67	<2.22	<2.08	<2.15	<2.16	<2.05
01/14/91	<1.65	<1.90	<1.78	<2.12	<1.72	<1.41	<1.94	<1.58	<1.59
01/21/91	<1.80	<1.73	<1.82	<1.95	<1.64	<1.34	<1.51	<1.46	<1.57
01/28/91	<1.71	<1.56	<1.62	<1.51	<1.64	<1.42	<1.57	<1.51	<1.48
02/04/91	<1.66	<1.78	<1.85	<1.51	<1.47	<1.52	<1.60	<1.61	<1.63
02/11/91	<1.34	<1.46	<1.76	<1.41	<1.70	<1.37	<1.40	<1.63	<1.60
02/18/91	<1.61	<1.21	<1.31	<1.40	<1.27	<1.33	<1.41	<1.41	<1.28
02/25/91	<2.32	<1.96	<2.00	<2.02	<1.78	<2.05	<2.03	<1.83	<1.66
03/04/91	<1.80	<1.58	<1.59	<1.49	<1.31	<2.69	<1.65	<1.55	<1.59
03/11/91	<1.54	<1.66	<1.55	<1.59	<1.39	<2.30	<1.44	<1.62	<1.59
03/18/91	<1.65	<1.77	<1.51	<1.62	<1.42	<1.85	<1.69	<1.55	<1.40
03/25/91	<1.46	<1.71	<1.70	<1.43	<1.33	<2.10	<1.62	<1.48	<1.68
04/01/91	<1.10	<1.60	<1.29	<1.61	<1.30	<2.37	<1.66	<1.35	<1.62
04/08/91	<1.29	<1.73	<1.57	<1.32	<1.24	<2.27	<1.48	<1.32	<1.63
04/15/91	<1.82	<1.63	<1.53	<1.45	<1.49	<2.24	<1.80	<1.71	<2.01
04/22/91	<2.02	<1.63	<1.59	<1.38	<1.56	<2.04	<1.33	<1.69	<1.48
04/29/91	<1.95	<1.52	<1.73	<1.52	<1.38	<1.90	<1.58	<1.55	<1.45
05/07/91	<1.79	<1.52	<1.45	<1.53	<1.30	<2.00	<1.35	<1.63	<1.23
05/13/91	<2.32	<1.84	<1.78	<1.95	<1.91	<3.08	<2.07	<1.88	<1.77
05/20/91	<1.98	<1.65	<1.69	<1.66	<1.65	<2.14	<1.94	<1.49	<1.42
05/28/91	<1.65	<1.30	<1.38	<1.44	<1.32	<1.88	<1.50	<1.45	<1.35
06/03/91	<1.87	<1.89	<1.92	<1.91	<1.72	<3.01	<1.71	<1.64	<1.85
06/10/91	<1.62	<1.41	<1.44	<1.51	<1.39	<2.14	<1.52	<1.72	<1.39
06/17/91	<1.69	<1.52	<1.60	<1.52	<1.52	<2.09	<1.63	<1.41	<1.23
06/24/91	<1.80	<1.56	<1.65	<1.51	<1.41	<2.27	<1.33	<1.44	<1.55
07/01/91	<2.11	<1.75	<1.59	<1.63	<1.37	<2.60	<1.90	<1.72	<1.71
07/08/91	<1.78	<1.69	<1.56	<1.45	<1.86	<2.28	<1.76	<1.73	<1.58
07/15/91	<1.92	<1.40	<1.79	<1.44	<1.77	<2.17	<1.64	<2.14	<1.47
07/22/91	<1.48	<1.79	<1.32	<1.49	<1.42	<2.26	<1.61	<1.55	<1.31
07/29/91	<2.43	<1.80	<1.65	<1.57	<1.80	<1.38	<1.78	<1.84	<1.71
08/05/91	<1.82	<1.58	<1.33	<1.57	<1.58	<1.41	<1.21	<2.07	<1.31
08/12/91	<1.58	<1.48	<1.33	<1.57	<1.52	<1.48	<1.32	<1.63	<1.28
08/19/91	<2.19	<1.58	<1.75	<1.79	<1.64	<1.59	<1.91	<2.40	<1.67
08/27/91	<1.83	<1.69	<1.51	<1.48	<1.49	<1.37	<1.58	<1.60	<1.67
09/03/91	<1.61	<1.67	<1.49	<2.03	<1.67	<1.48	<1.56	<2.04	<1.32
09/09/91	<2.35	<2.01	<1.85	<1.77	<1.78	<1.57	<1.96	<2.27	<1.90
09/16/91	<1.64	<1.77	<1.51	<1.86	<1.31	<1.82	<1.59	<1.47	<1.29
09/23/91	<1.62	<1.41	<1.83	<1.54	<1.71	<1.88	<1.90	<1.67	<1.84
09/30/91	<1.73	<2.04	<1.74	<1.42	<1.69	<1.47	<1.70	<1.70	<1.60
10/07/91	<1.59	<1.77	<1.46	<1.58	<1.65	<1.71	<1.65	<1.75	<1.54
10/14/91	<1.74	<1.62	<1.35	<1.67	<1.63	<1.52	<1.69	<1.85	<1.61
10/21/91	<1.63	<2.13	<1.61	<1.45	<1.91	<1.32	<1.75	<1.80	<1.97
10/28/91	<1.58	<1.57	<1.30	<1.79	<1.49	<1.39	<1.52	<1.49	<1.32
11/04/91	<4.23	<1.89	<1.39	<1.59	<1.51	<1.34	<1.42	<1.58	<1.40
11/11/91	<1.69	<1.32	<1.56	<1.49	<1.77	<1.34	<1.65	<3.80	<1.59
11/18/91	<1.74	<1.37	<1.24	<1.60	<1.47	<1.25	<1.64	<2.08	<1.73
11/25/91	<2.26	<2.22	<2.05	<2.14	<1.89	<1.75	<2.31	<2.37	<2.23
12/02/91	<2.28	<1.67	<2.09	<1.99	<2.18	<1.70	<1.51	<2.45	<2.09
12/09/91	<2.00	<1.84	<1.88	<2.05	<2.28	<1.72	<2.08	<2.20	<2.19
12/16/91	<1.83	<2.00	<1.79	<1.88	<2.10	<1.71	<1.87	<2.01	<2.05
12/23/91	<1.96	<2.36	<2.02	<2.28	<1.97	<1.80	<1.74	<1.94	<2.13
12/30/91	<1.98	<1.97	<2.17	<1.83	<1.97	<1.65	<2.13	<2.29	<2.43

NOTE: Activities indicated are minimum detectable activities (MDAs) under the particular conditions of analyses (i.e., Cs-137 may or may not have been present, but if so, there cannot have been more than the amounts shown), or they are values actually measured.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Charcoal Cartridge Potassium-40 Activity (E-2 pCi/m³) by Location - 1991

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	AKS	AP1	AQS2	ALC	AHS	AGS
01/07/91	63.90	72.50	67.80	72.50	74.90	57.60	74.30	74.50	78.20
01/14/91	43.10	46.80	56.10	48.00	32.70	43.70	43.30	48.20	33.80
01/21/91	34.80	42.60	49.20	45.80	50.20	41.90	57.50	34.70	50.10
01/28/91	49.10	42.30	68.60	28.80	47.00	44.60	55.30	34.10	54.80
02/04/91	52.20	67.00	40.30	39.00	60.80	36.00	50.40	50.00	46.70
02/11/91	35.70	45.10	50.00	48.70	43.30	42.80	70.20	41.50	44.10
02/19/91	37.50	33.40	40.90	27.70	38.90	27.70	45.50	19.20	62.50
02/25/91	47.40	0.00	53.00	73.40	0.00	0.00	81.10	34.00	61.30
03/04/91	52.30	29.20	43.80	45.30	32.30	47.20	43.80	44.40	50.00
03/11/91	25.10	43.40	52.20	0.00	39.00	69.90	49.00	43.80	29.30
03/18/91	52.90	59.80	47.50	43.40	52.50	55.20	49.40	45.10	52.60
03/25/91	34.10	69.20	46.90	41.20	50.40	68.20	48.70	54.50	42.60
04/01/91	30.70	57.50	55.90	38.60	54.90	59.60	54.80	46.50	56.70
04/08/91	29.10	56.70	63.30	45.30	35.90	74.50	31.80	0.00	53.80
04/15/91	56.70	48.20	47.80	38.40	47.20	60.70	54.30	49.70	51.00
04/22/91	114.00	59.60	71.60	45.50	64.30	97.10	48.40	64.60	86.50
04/29/91	91.40	75.10	78.50	63.60	88.00	85.60	80.10	75.40	65.10
05/07/91	66.40	51.40	65.30	69.20	76.50	87.30	66.90	58.90	65.70
05/13/91	106.00	74.50	86.70	88.50	94.20	108.00	93.00	91.00	55.80
05/20/91	94.00	61.50	61.60	76.10	62.10	94.90	80.70	72.20	67.50
05/28/91	80.70	62.20	59.60	51.40	73.40	65.40	61.00	51.80	57.30
06/03/91	108.00	101.00	95.70	0.00	115.00	0.00	112.00	105.00	76.20
06/10/91	65.00	83.30	64.30	77.80	67.80	124.00	75.80	72.40	64.50
06/17/91	68.80	55.50	103.00	77.80	78.00	89.40	85.90	68.20	93.80
06/24/91	77.10	83.60	85.20	93.10	68.80	79.00	51.20	50.30	60.40
07/01/91	86.80	75.70	70.00	84.90	82.00	104.00	72.60	72.70	92.30
07/08/91	68.70	56.00	44.00	67.30	105.00	54.80	49.50	53.10	45.60
07/15/91	58.90	65.20	54.60	44.00	74.60	49.10	72.60	84.90	63.40
07/22/91	67.90	40.70	63.60	53.60	66.50	80.10	60.90	60.80	64.90
07/29/91	59.50	71.40	46.60	66.80	56.90	50.90	72.10	66.50	56.80
08/05/91	69.40	45.50	50.50	68.60	75.00	56.40	45.30	80.80	64.00
08/12/91	70.70	60.40	64.60	78.60	65.20	35.20	49.80	72.00	26.20
08/19/91	63.10	73.80	82.70	71.00	54.70	43.30	62.40	106.00	69.70
08/27/91	87.40	53.60	45.50	57.90	48.70	41.60	59.30	52.70	50.30
09/03/91	39.60	60.20	58.80	59.70	76.30	66.20	67.60	60.20	48.10
09/09/91	82.30	64.20	73.00	54.80	77.30	79.40	73.50	55.20	68.80
09/16/91	79.80	41.10	55.90	50.60	43.40	57.90	46.30	60.60	81.90
09/23/91	85.10	80.10	68.10	75.70	46.00	55.60	75.50	66.90	55.20
09/30/91	51.20	50.60	47.40	47.40	73.10	77.40	72.60	72.80	42.50
10/07/91	69.80	48.30	59.10	66.50	74.90	42.70	60.40	58.50	55.60
10/14/91	70.40	72.50	37.70	45.40	53.00	58.20	65.30	66.50	61.70
10/21/91	53.40	61.80	60.90	53.90	65.00	49.40	39.60	52.70	26.00
10/28/91	52.50	55.20	52.40	48.50	67.40	55.40	70.80	49.90	69.20
11/04/91	144.00	77.20	46.80	39.90	56.30	64.50	47.70	71.30	51.60
11/11/91	46.70	3.70	54.20	65.70	58.10	60.80	76.10	173.00	49.10
11/18/91	57.90	50.10	56.20	59.40	76.60	55.50	50.00	71.60	50.60
11/25/91	41.40	64.10	80.80	83.50	43.70	43.70	58.70	66.00	73.60
12/02/91	68.60	63.40	81.90	68.00	53.90	50.00	53.40	56.80	93.50
12/09/91	46.10	58.50	82.10	75.30	70.30	52.70	60.80	76.60	85.30
12/16/91	60.00	57.00	75.80	63.60	78.10	47.70	72.90	78.30	88.20
12/23/91	76.90	71.00	76.70	80.70	71.80	39.20	82.60	92.00	76.30
12/30/91	63.40	106.00	89.00	66.30	71.30	57.30	60.40	81.50	64.80

NOTE: Activities shown are values actually measured.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Charcoal Cartridge Iodine-131 Activity (E-2 pCi/m³) - 1991

WEEK ENDING	INDICATOR LOCATION						CONTROL LOCATION		
	AA1	AB1	AR1	AQS	AP1	AQS2	ALC	AHS	AGS
01/07/91	<2.54	<2.44	<2.28	<2.61	<2.05	<2.19	<2.49	<2.40	<2.22
01/14/91	<1.67	<1.98	<2.07	<1.51	<1.70	<1.41	<1.52	<1.72	<1.65
01/21/91	<1.63	<1.71	<1.94	<1.81	<1.44	<1.23	<1.64	<1.54	<2.00
01/28/91	<1.67	<1.85	<1.81	<1.75	<1.61	<1.30	<1.75	<1.88	<1.89
02/04/91	<1.77	<1.71	<1.71	<1.75	<1.58	<1.41	<1.85	<1.84	<1.97
02/11/91	<1.68	<1.62	<1.48	<1.84	<1.55	<1.53	<1.84	<1.88	<2.07
02/19/91	<1.62	<1.50	<1.55	<1.33	<1.37	<1.37	<1.78	<1.63	<1.58
02/25/91	<1.86	<1.94	<1.84	<1.70	<1.77	<2.10	<2.06	<2.08	<2.07
03/04/91	<1.73	<1.43	<1.38	<1.57	<1.31	<2.12	<2.02	<1.78	<1.70
03/11/91	<1.60	<1.48	<1.67	<1.73	<1.47	<2.43	<1.77	<1.62	<1.66
03/18/91	<1.66	<1.66	<1.49	<1.64	<1.31	<1.91	<1.83	<1.82	<1.51
03/25/91	<1.18	<1.83	<1.48	<1.61	<1.35	<2.22	<1.75	<1.65	<1.64
04/01/91	<1.14	<1.53	<1.66	<1.29	<1.50	<2.12	<1.87	<1.98	<1.83
04/08/91	<1.12	<1.81	<1.76	<1.46	<1.56	<2.25	<1.63	<1.79	<1.78
04/15/91	<1.94	<1.77	<1.58	<1.63	<1.45	<2.49	<1.70	<1.91	<1.79
04/22/91	<2.16	<1.89	<1.71	<1.53	<1.43	<1.99	<1.77	<1.72	<1.80
04/29/91	<2.08	<1.69	<1.71	<1.65	<1.50	<2.29	<2.16	<1.68	<1.65
05/07/91	<1.87	<1.54	<1.60	<1.33	<1.59	<2.06	<1.58	<1.52	<1.47
05/13/91	<2.34	<2.10	<2.06	<2.01	<2.29	<2.82	<2.04	<2.24	<1.72
05/20/91	<1.93	<1.66	<1.91	<1.76	<1.63	<2.55	<1.60	<1.86	<1.77
05/28/91	<1.38	<1.56	<1.53	<1.68	<1.59	<1.95	<1.43	<1.84	<1.51
06/03/91	<2.53	<1.98	<2.24	<1.85	<1.91	<2.27	<2.10	<2.07	<2.05
06/10/91	<1.99	<1.79	<1.59	<1.81	<1.61	<2.39	<1.83	<1.83	<1.82
06/17/91	<1.85	<1.40	<1.61	<1.39	<1.68	<2.30	<1.67	<1.95	<1.88
06/24/91	<2.21	<1.95	<2.03	<1.83	<1.62	<2.16	<1.69	<1.84	<1.91
07/01/91	<2.05	<1.58	<1.44	<1.66	<1.69	<2.27	<2.13	<2.38	<1.97
07/08/91	<1.72	<1.64	<1.52	<1.83	<1.58	<1.46	<1.80	<1.88	<1.57
07/15/91	<1.88	<1.48	<2.32	<1.64	<1.67	<2.20	<1.70	<1.98	<1.60
07/22/91	<1.87	<1.54	<1.68	<1.82	<1.53	<2.21	<1.89	<1.93	<1.66
07/29/91	<1.94	<1.67	<1.62	<1.79	<1.50	<1.58	<1.83	<2.08	<1.58
08/05/91	<1.97	<1.94	<1.73	<1.55	<1.49	<1.86	<1.56	<1.86	<1.67
08/12/91	<1.96	<1.94	<1.71	<1.63	<1.73	<1.85	<1.62	<1.71	<1.71
08/19/91	<1.73	<1.82	<1.85	<1.93	<1.79	<1.63	<2.40	<2.41	<2.17
08/27/91	<1.46	<1.52	<1.39	<1.44	<1.46	<1.50	<1.75	<1.93	<1.53
09/03/91	<1.96	<1.87	<1.71	<1.64	<1.86	<1.62	<1.81	<2.04	<1.84
09/09/91	<2.01	<2.12	<1.69	<2.02	<1.79	<2.05	<2.28	<2.38	<1.63
09/16/91	<1.81	<1.77	<1.62	<1.60	<1.67	<1.63	<1.82	<2.02	<1.88
09/23/91	<1.84	<1.89	<2.00	<2.05	<1.85	<1.63	<1.72	<2.19	<1.86
09/30/91	<1.82	<1.77	<1.69	<1.68	<1.63	<1.86	<1.75	<1.69	<2.23
10/07/91	<1.60	<1.84	<1.65	<1.77	<1.64	<1.42	<1.92	<1.96	<1.67
10/14/91	<1.70	<1.85	<1.92	<1.86	<1.91	<1.79	<1.96	<1.88	<1.87
10/21/91	<1.61	<1.75	<1.61	<1.80	<1.66	<1.62	<1.99	<2.16	<8.57
10/28/91	<1.60	<1.89	<1.46	<1.84	<1.62	<1.53	<1.71	<1.76	<1.78
11/04/91	<6.24	<1.34	<1.53	<1.80	<1.47	<1.53	<1.78	<1.71	<1.79
11/11/91	<1.70	<1.59	<1.56	<1.39	<1.62	<1.54	<1.68	<4.70	<1.74
11/18/91	<1.77	<1.60	<1.62	<1.65	<1.71	<1.23	<1.64	<1.99	<2.12
11/25/91	<1.81	<1.62	<1.77	<2.02	<1.75	<1.67	<1.80	<2.13	<1.90
12/02/91	<1.76	<1.85	<1.95	<1.68	<1.72	<1.69	<1.90	<1.76	<2.02
12/09/91	<1.36	<1.85	<1.61	<1.62	<1.95	<1.52	<1.59	<2.00	<2.43
12/16/91	<1.60	<1.77	<1.62	<1.72	<1.88	<1.46	<1.95	<2.12	<2.07
12/23/91	<1.73	<1.89	<1.74	<1.91	<1.96	<1.42	<1.73	<1.74	<1.85
12/30/91	<1.84	<1.81	<1.53	<1.83	<1.82	<1.59	<1.72	<2.02	<1.76

NOTE: Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specifications (that is, I-131 may or may not be present, but if so, there cannot have been more present than the amounts noted).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Charcoal Cartridge Cesium-137 Activity (E-2 pCi/m³) by Location - 1991

WEEK ENDING	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	AA1	AB1	AR1	KS	AP1	AQS2	ALC	AHS	AGS
01/07/91									
01/14/91									
01/21/91									
01/28/91									
02/04/91									
02/11/91									
02/19/91									
02/25/91									
03/04/91									
03/11/91									
03/18/91									
03/25/91									
04/01/91									
04/08/91									
04/15/91									
04/22/91			1.21				1.30		
04/29/91									
05/07/91									
05/13/91									
05/20/91									
05/28/91									
06/03/91									
06/10/91						0.95			
06/17/91			0.79						
06/24/91									
07/01/91									
07/08/91									
07/15/91									
07/22/91						0.82			
07/29/91									
08/05/91									
08/12/91									
08/19/91									1.35
08/27/91									
09/03/91									
09/09/91									
09/16/91									
09/23/91									
09/30/91									
10/07/91									
10/14/91									
10/21/91							1.47		2.08
10/28/91									
11/04/91									
11/11/91								1.09	
11/18/91			0.99						
11/25/91									
12/02/91									
12/09/91									
12/16/91		1.35				1.38			
12/23/91									
12/30/91									

NOTE: Activities shown are values actually measured.

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Normalized Gamma-Ray Exposure Summary (mR)
 Quarter 1, Thermoluminescence Dosimeter Results for 1991

<u>INDICATOR STATION</u>	<u>1ST QTR</u>	<u>2ND QTR</u>	<u>3RD QTR</u>	<u>4TH QTR</u>
TA1	13.05	13.36	11.86	11.84
TA2	13.75	13.90	15.64	13.12
TB1	13.95	13.97	13.80	13.07
TB2	14.87	13.90	14.66	13.60
TC1	13.65	13.66	13.20	12.63
TC2	11.02	11.03	12.02	10.80
TCS	11.22	11.32	11.83	12.55
TD1	13.35	12.55	14.37	13.00
TD2	12.44	12.12	13.29	11.82
TE1	13.15	12.95	13.49	12.72
TE2	11.33	10.63	9.58	10.12
TF1	13.15	11.54	13.10	11.97
TF2	14.16	12.91	13.20	12.45
TG1	15.13	13.97	14.66	13.57
TG2	13.45	12.02	12.02	11.96
TH1	10.48	11.74	10.65	10.38
TH2	12.58	12.64	11.93	11.09
TJ1	12.63	12.65	11.63	11.03
TJ2	10.68	10.88	10.90	10.57
TK1	13.05	11.84	13.49	11.88
TK2	12.74	12.21	13.20	12.74
TKS	11.57	11.08	10.90	10.94
TL1	11.77	11.54	13.64	12.04
TL2	11.43	11.23	11.83	10.03
TLS	14.66	13.01	14.37	12.54
TM1	11.57	11.64	11.19	10.52
TM2	14.26	12.81	14.37	13.61
TN1	13.65	13.36	12.93	12.41
TN2	11.53	10.24	10.95	10.32
TP1	14.04	13.56	13.12	13.17
TP2	12.13	12.98	12.41	12.25
TQ1	12.86	11.63	12.45	11.75
TQ2	13.15	11.72	12.41	11.50
TQS1	13.45	13.42	13.67	13.28
TQS2	12.84	11.36	11.49	11.13
TR1	9.20	9.21	9.35	9.19
TR2	13.04	11.22	12.61	11.96
TRS	15.07	14.19	13.39	13.03
 <u>CONTROL STATION</u>				
TAC	14.26	12.91	12.71	12.54
TEC	13.25	12.91	13.39	12.83
TGS	12.24	13.40	13.29	12.06
THS	14.06	13.80	13.49	13.80
TLC	11.83	10.43	9.68	10.41
TQS3	13.85	12.21	12.61	12.51

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Normalized Gamma-Ray Exposure Summary (mR)
 Monthly Thermoluminescence Dosimeter Results for 1991

<u>INDI-CATOR</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	4.15	4.43	4.86	4.41	4.21	4.42	4.27	4.46	4.57	4.38	4.33	4.03
TA2	4.97	4.83	4.50	4.98	4.82	4.78	5.07	5.16	4.88	5.02	4.95	4.44
TB1	5.34	4.84	4.45	4.74	4.47	4.64	4.47	5.07	5.19	5.02	5.16	4.30
TB2	5.34	4.62	4.93	4.68	4.36	4.89	5.17	5.25	4.88	5.20	4.74	4.35
TC1	4.34	4.74	5.07	4.41	4.47	4.64	4.47	4.19	4.45	4.85	4.52	4.39
TC2	4.34	3.65	3.75	4.28	4.18	3.92	3.97	4.07	3.95	4.05	3.88	3.28
TCS	3.61		3.64	4.24	3.59	3.60	3.87	3.89	3.64	4.05	4.74	3.76
TD1	4.43	4.22	5.07	4.84	4.12	5.31	5.27	4.90	4.98	5.11	4.84	4.39
TD2	4.61	4.19	3.86	4.18	4.14	4.99	4.77	4.60	3.95	4.40	4.52	3.76
TE1	3.79	4.74	4.45	4.41	3.86	4.42	4.57	4.46	4.66	4.94	4.52	4.12
TE2	3.52	3.44	3.86	3.93	3.59	3.71	3.77	4.07	3.85	3.96	3.66	3.09
TF1	4.52	4.32	3.83	4.20	4.30	4.66	4.07	4.10	4.88	4.77	4.52	3.94
TF2	4.61	4.62	4.29	4.45	4.74	4.24	4.37	4.62	4.78	4.84	4.72	4.09
TG1	4.97	5.36	4.86	4.74	5.00	4.98	4.87	5.07	5.09	5.11	4.95	4.39
TG2	4.03	4.43	4.50	5.38	4.03	4.19	4.37	4.62	4.26	4.58	4.52	3.96
TH1	4.97		3.62	3.34	3.50	3.42	3.97	3.57	3.80	3.91	3.77	3.12
TH2	4.22	4.22	3.89	3.88	4.21	4.35	4.27	4.07	3.64	4.40	4.63	3.76
TJ1	4.34	3.91	4.66	4.30	4.03	3.76	4.27	3.84	4.13	4.34	4.31	3.66
TJ2	3.43	3.60	3.62	3.83	3.59	3.49	3.93	3.57	3.80	4.08	3.45	3.30
TK1	4.88	4.12	4.14	4.20	4.12	4.09	4.07	5.16	4.02	4.51	4.41	3.85
TK2	5.15	4.08	4.50	4.58	4.18	4.24	4.59	5.16	5.30	5.02	4.52	4.15
TKS	4.15	4.22	4.45	4.20	3.77	4.03	4.03	3.84	3.91	4.25	3.99	3.66
TL1	4.34	4.12	4.55	4.20	3.68	3.76	4.17	4.90	3.85	4.84	4.31	3.85
TL2	3.61	3.98	4.07	3.68	3.64	3.60	3.72	3.80	3.70	3.79	3.77	3.57
TLS	4.97	4.51	4.82	4.78	3.91	4.67	4.39	4.71	4.55	4.93	4.63	4.15
TM1	4.06	4.01	3.93	3.77	3.86	3.87	3.77	3.66	3.54	4.05	3.66	3.48
TM2	4.43	4.62	4.93	4.38	4.64	5.10	4.49	4.71	4.55	5.19	4.84	4.73
TN1	4.79	4.63	4.55	5.06	4.56	4.42	4.87	4.81	4.57	4.84	5.06	4.30
TN2	3.34	3.55	3.43	3.86	3.27	3.06	3.81	3.80	3.59	3.87	4.09	3.28
TP1	5.06	4.63	4.66	4.41	4.39	4.76	4.97	4.72	4.47	4.93	4.64	3.85
TP2	4.25	4.40	4.29	.28	4.39	4.31	4.37	4.37	4.77	4.84	4.54	4.12
TQ1	4.70	4.01	4.14	4.63	4.03	3.64	4.27	4.46	4.26	4.56	4.43	3.94
TQ2	4.43	4.19	4.29	4.06	3.77	3.76	4.47	4.46	3.91	4.40	4.33	3.66
TQS1	4.43	4.08	4.71	4.32	4.45	4.56	4.66	4.81	4.77	5.02	4.53	4.21
TQS2	4.06	4.30	3.75	3.64	3.98	3.71	3.52	3.84	4.23	4.14	3.92	3.75
TR1	3.70	3.19	3.41	3.66	2.89	2.76	2.87	3.22	3.02	3.56	3.20	2.85
TR2	4.15	4.40	4.71	4.28	4.83	3.76	4.67	4.63	4.45	4.49	4.09	3.96
TRS	4.34	4.08	4.82	4.78	4.65	4.53	4.47	4.72	4.88	4.84	4.63	4.05

CONTROL
STATION

TAC	4.61	4.08	4.18	4.98	4.47	4.20	4.77	4.54	4.55	4.49	4.74	4.15
TEC	4.34	4.08	4.18	4.24	4.74	4.35	4.47	4.53	3.95	4.76	4.41	4.05
TGS	4.61	4.51	4.50	4.38	4.55	3.92	4.59	5.25	4.13	4.58	4.74	5.02
THS	5.34	4.94	4.82	4.88	5.00	4.89	5.07	5.25	4.98	5.20	5.16	4.64
TLC	3.88	3.76	3.96	3.98	3.36	3.92	3.91	4.25	3.80	3.96	3.66	3.28
TQS3	4.97	4.73	4.93	4.78	3.94	4.42	4.27	4.81	4.45	4.59	4.63	3.98

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gross Beta Activities (pCi/liter) in Water Samples - 1991

<u>SAMPLING PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>		
	<u>SWD</u>	<u>DW</u>	<u>DL</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>	<u>BLANK¹</u>
JAN	<2.82	<2.82	23.87		5.13		<2.25
FEB	6.69	5.11	34.68	3.26	5.45	<2.91	<2.22
MAR	3.28	<2.73	23.55		3.19		<2.18
APR	4.12	3.78	17.92		4.65		<1.84
MAY	5.93	4.58	20.47	3.07	<2.57	<2.57	<2.05
JUN	<3.20	4.53	20.94		4.00		<2.56
JUL	6.05	7.87	28.25		5.14		<1.89
AUG	4.52	5.15	50.77	<2.46	5.86	<2.46	<1.96
SEP	<2.57	4.07	44.74		3.23		<2.05
OCT	4.40	6.88	32.21		3.85		<2.02
NOV	5.51	5.57	72.61	<2.52	4.66	<2.52	<2.02
DEC	6.53	3.00	37.19		4.87		<2.02

NOTE: ¹distilled, deionized well water (laboratory reagent water).

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from DL are composites of flow-weighted grabs. Samples from WU and WD are quarterly grabs.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis (that is, gross beta activity may or may not have been present, but if so, there cannot have been more present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Tritium Activities (pCi/liter) in Monthly Water Samples - 1991

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DL	WD	SWU	WU	BLANK ¹
JAN	<186	<184	10128	<185	<185	<184	<185
FEB	300	<186	6044	<186	<187	<187	<188
MAR	<182	<182	13379	<182	<183	<184	<183
APR	<191	<188	3775	<189	<188	<188	<190
MAY	<180	<179	5977	<178	<179	<180	<183
JUN	<184	<179	5206	<185	<179	<180	<180
JUL	<181	<181	5509	<181	<182	<182	<182
AUG	<376	<376	9169	<363	<374	<366	<359
SEP	<357	<359	8533	<359	<360	<360	<356
OCT	<330	<331	4680	<329	<331	<331	<337
NOV	<344	<355	5996	<349	<344	<353	<341
DEC	<349	<348	6729	<348	<349	<350	<348

Tritium Activities (pCi/liter) in Quarterly Water Samples - 1991

SAMPLING PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS		
	SWD	DW	DL	WD	SWU	WU	BLANK ¹
QTR1	<193	<192	9518	<186	<189	<187	<184
QTR2	<178	188	5186	<189	<184	<188	<180
QTR3	<360	<360	7602	<363	<361	<366	<357
QTR4	<374	<371	5882	<349	<371	<353	<374

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

Samples from SWD, DW, and SWU are composites of weekly grabs; samples from DL are composites of flow-weighted grabs; the samples from WD and WU are monthly grabs.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis (that is, tritium may or may not have been present, but if so, there cannot have been more present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1991

BERYLLIUM-7

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN				9.89		
APR				27.20		

POTASSIUM-40

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	19.70	16.10	25.30		17.90	
FEB	13.40	14.20	8.20	11.80	19.70	14.70
MAR	16.40	9.43	2.00		16.10	
APR	14.70	16.70			14.10	
MAY		17.10	9.90	13.89	13.80	23.88
JUN	13.00	16.90	6.70		22.30	
JUL	14.60	16.70	9.20		18.60	
AUG	16.90	14.60	3.60	11.10	14.10	10.80
SEP	14.90	11.70	8.20		10.70	
OCT	15.80	20.90	7.10		13.10	11.70
NOV	14.60	17.30	9.90	16.00	16.50	
DEC	11.10		6.70		16.20	

CHROMIUM-51

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN						
FEB				24.70		
MAR				20.60		
APR				8.84		
MAY						
JUN						
JUL						
AUG				38.40		
SEP				9.91		
OCT				23.70		
NOV				61.40		
DEC				72.20		

NOTE: Activities shown are values actually measured, whereas those indicated as "*<*" are minimum detectable activities under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1991

MANGANESE-54

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWU	DW	DL	WD	SWU	WU
JAN	<1.80	<1.75	1.46		<1.76	
FEB	<1.68	<1.64	3.02	<1.75	<1.79	<1.76
MAR	<1.80	<1.68	6.23		<1.79	
APR	<1.72	<1.77	2.32		<1.68	
MAY	<1.39	<1.54	0.90	<1.64	<1.50	<1.66
JUN	<1.69	<1.73	0.71		<1.66	
JUL	<1.77	<1.34	0.71		<1.85	
AUG	<1.67	<1.81	1.16	<1.50	<1.60	<1.49
SEP	<1.80	<1.62	<1.78		<1.49	
OCT	<1.67	<1.74	11.58		<1.78	
NOV	<1.74	<1.65	10.30	<1.59	<1.65	<1.60
DEC	<1.52	<1.48	12.40		<1.54	

COBALT-58

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWU	DW	DL	WD	SWU	WU
JAN	<1.97	<1.92	<2.40		<1.79	
FEB	<2.02	<2.06	1.15	<1.91	<2.21	<1.86
MAR	<1.85	<1.73	1.33		<1.89	
APR	<2.15	<2.05	<2.31		<1.97	
MAY	<1.91	<2.04	<2.00	<1.69	<1.78	<1.82
JUN	<1.84	<2.07	<2.05		<1.90	
JUL	<2.20	<1.89	<1.84		<2.16	
AUG	<1.77	<1.90	<2.17	<1.69	<1.80	<1.60
SEP	<1.85	<1.97	<2.00		<1.87	
OCT	<2.24	<2.20	2.68		<2.21	
NOV	<2.03	<1.89	3.04	<1.80	<2.00	<1.84
DEC	<1.72	<1.97	3.09		<1.73	

IRON-59

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWU	DW	DL	WD	SWU	WU
JAN	<4.61	<4.45	<4.95		<5.04	
FEB	<4.13	<4.94	<5.13	<4.23	<4.94	<4.55
MAR	<4.12	<3.84	<6.35		<3.95	
APR	<4.40	<4.31	<5.25		<4.30	
MAY	<4.55	<4.04	<5.17	<3.82	<4.58	<3.74
JUN	<4.42	<4.85	<4.81		<4.66	
JUL	<5.22	<4.68	<5.04		<5.35	
AUG	<4.08	<4.68	<6.07	<3.96	<4.18	<4.14
SEP	<4.68	<4.16	<4.4		<4.15	
OCT	<4.95	<4.85	5.40		<5.74	
NOV	<5.04	<4.56	3.99	<4.04	<4.87	<4.31
DEC	<3.99	<4.26	4.11		<4.50	

NOTE: Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1991

COBALT-60

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DL</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	0.46	<1.70	7.36		<1.92	
FEB	<1.79	<1.90	6.86	<1.83	<2.05	<1.88
MAR	<1.77	<1.73	14.40		<1.96	
APR	<1.79	<1.94	4.25		<1.87	
MAY	<1.42	<1.59	4.15	<1.59	<1.64	<1.73
JUN	<1.66	<1.79	1.58		0.95	
JUL	<1.70	<1.50	2.58		<1.79	
AUG	<1.74	<2.03	2.03	<1.69	<1.81	<1.86
SEP	<1.77	<1.84	2.81		<1.81	
OCT	<1.86	<1.75	26		<1.86	
NOV	<1.79	<1.54	2.05	<1.67	<1.75	<1.66
DEC	<1.65	<1.60	2.05		<1.83	

ZINC-65

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DL</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<3.28	<3.82	<4.62		<3.75	
FEB	<3.58	<3.49	<4.43	<3.58	<4.26	<4.10
MAR	<3.60	<3.80	<5.35		<3.95	
APR	<3.91	<3.78	<4.13		<3.82	
MAY	<2.86	<3.13	<3.87	<3.50	<3.37	<3.73
JUN	<3.74	<3.81	<5.77		<3.70	
JUL	<3.60	<2.99	<3.29		<4.12	
AUG	<3.73	<4.14	<5.21	<3.41	<3.48	<3.37
SEP	<3.76	<3.74	<4.15		<3.67	
OCT	<4.17	<3.67	<5.29		<3.81	
NOV	<4.30	<3.59	<6.73	<3.55	<3.48	<3.29
DEC	<3.47	<3.50	<10.1		<3.41	

NIOBIUM-95

<u>PERIOD</u>	<u>INDICATOR LOCATIONS</u>				<u>CONTROL LOCATIONS</u>	
	<u>SWD</u>	<u>DW</u>	<u>DL</u>	<u>WD</u>	<u>SWU</u>	<u>WU</u>
JAN	<2.65	<2.55	<2.87		<2.52	
FEB	<2.55	<2.67	<2.80	<2.18	<2.55	<2.36
MAR	<2.13	<2.14	<3.03		<2.95	
APR	<2.72	<2.88	<3.04		<2.52	
MAY	<2.62	<2.85	<3.07	<2.10	<2.81	<2.17
JUN	<2.50	<3.00	<2.75		<2.87	
JUL	<2.91	<2.81	<3.91		<3.25	
AUG	<2.34	<2.52	<3.57	<2.05	<2.41	<2.28
SEP	<2.40	<2.21	<2.48		<2.29	
OCT	<3.05	<2.84	<3.74		<3.28	
NOV	<2.87	<2.39	<4.35	<2.25	<2.77	<2.54
DEC	<2.29	<2.41	<5.67		<2.36	

NOTE:

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1991

ZIRCONIUM-95

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<3.45	<3.56	<3.98			
FEB	<3.53	<3.79	<4.04	<3.31	<3.57	
MAR	<3.17	<3.43	<4.48		<3.79	<3.52
APR	<3.74	<3.50	<3.73		<3.54	
MAY	<3.29	<3.45	<3.61	<3.24	<3.36	
JUN	<3.50	<3.61	<3.51		<3.53	<3.16
JUL	<3.77	<3.16	<3.64		<3.57	
AUG	<3.04	<3.71	<4.61	<3.02	<4.38	
SEP	<3.67	<3.40	<3.35		<3.29	<3.23
OCT	<3.83	<3.53	<4.44		<3.41	
NOV	<3.89	<3.44	<5.85	<3.08	<3.82	
DEC	<3.31	<3.34	<8.34		<3.65	<3.15

IODINE-131

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<3.56	<3.98	<3.91		<3.73	
FEB	<3.73	<4.01	<3.60	<1.51	<5.78	<2.06
MAR	<2.07	<2.79	<3.09		<2.06	
APR	<3.89	<4.33	<4.64		<4.23	
MAY	<6.83	<11.9	<7.32	<1.71	<7.07	<1.84
JUN	<5.77	<7.67	<7.95		<4.79	
JUL	<9.31	<13.2	<14.3		<8.68	
AUG	<3.66	<3.67	<8.10	<1.81	<5.20	<1.78
SEP	<2.72	<2.96	<2.94		<2.56	
OCT	<7.03	<8.14	<6.87		<7.65	
NOV	<3.31	<4.94	2.20	<3.13	<3.22	<2.81
DEC	<2.19	<4.77	<4.64		<2.23	

CESIUM-134

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.60	<1.55	<1.89		<1.77	
FEB	<1.57	<1.62	<1.99	<1.64	<1.81	<1.88
MAR	<1.68	<1.53	<2.32		<1.82	
APR	<1.79	<1.71	<1.90		<1.61	
MAY	<1.31	<1.38	<1.49	<1.59	<1.54	<1.76
JUN	<1.51	<1.66	<1.45		<1.54	
JUL	<1.64	<1.28	<1.41		<1.78	
AUG	<1.51	<1.78	<2.01	<1.55	<1.56	<1.56
SEP	<1.73	<1.58	<1.53		<1.56	
OCT	<1.62	<1.51	<1.98		<1.54	
NOV	<1.83	<1.41	<2.66	<1.38	<1.65	<1.59
DEC	<1.52	<1.46	<4.34		<1.55	

NOTE:

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RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/liter) in Water by Location - 1991

CESIUM-137

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<1.63	<1.69	<1.87		<1.78	
FEB	<1.74	<1.68	<2.00	<1.81	<1.89	<1.88
MAR	<1.78	<1.66	<2.30		<1.81	
APR	<1.84	<1.78	<1.9		<1.72	
MAY	<1.39	<1.64	<1.44	<1.60	<1.54	<1.65
JUN	<1.63	<1.69	<1.48		<1.72	
JUL	<1.73	<1.30	<1.47		<1.80	
AUG	<1.58	<1.91	<2.08	<1.58	<1.54	<1.60
SEP	<1.88	<1.71	<1.76		<1.61	
OCT	<1.81	<1.49	<2.08		<1.88	
NOV	<1.83	<1.44	<2.72	<1.36	<1.72	<1.64
DEC	<1.54	<1.67	<4.62		<1.67	

BARIUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<17.8	<19.9	<21.5		<20.1	
FEB	<17.1	<21.5	<20.4	<11.6	<23.3	<13.2
MAR	<13.0	<13.2	<19.3		<14.9	
APR	<19.8	<20.7	<20.7		<18.7	
MAY	<31.3	<27.6	<33.4	<12.8	<30.7	<13.2
JUN	<20.8	<28.6	<29.2		<19.5	
JUL	<33.4	<34.4	<37.3		<13.4	
AUG	<15.6	<17.2	<31.6	<13.9	<21.6	<12.7
SEP	<17.7	<14.5	<17.4		<13.7	
OCT	<30.4	<27.3	<31.3		<31.0	
NOV	<20.1	<23.9	<31.8	<18.9	<27.0	<19.7
DEC	<17.6	<22.5	<25.5		<18.7	

LANTHANUM-140

PERIOD	INDICATOR LOCATIONS				CONTROL LOCATIONS	
	SWD	DW	DL	WD	SWU	WU
JAN	<6.82	<7.70	<8.94		<8.54	
FEB	<7.34	<8.40	<8.12	<4.87	<11.1	<5.36
MAR	<4.66	<5.19	<8.06		<6.47	
APR	<8.58	<8.89	<8.76		<7.20	
MAY	<11.1	<10.4	<13.6	<4.68	<12.4	<5.96
JUN	<8.32	<12.6	<11.9		<8.93	
JUL	<13.8	<12.8	<14.7		<16.4	
AUG	<6.47	<7.00	<12.6	<6.34	<9.79	<5.60
SEP	<7.99	<5.64	<6.81		<5.69	
OCT	<12.5	<10.4	<11.5		<12.3	
NOV	<9.36	<10.4	<9.97	<7.35	<11.6	<8.85
DEC	<6.03	<8.58	<10.9		<8.14	

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RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclides in Sediment (pCi/kg dry) by Location - 1991

POTASSIUM-40

<u>PERIOD</u>	<u>DOWNSTREAM</u>	<u>UPSTREAM</u>
JUN	15292.00	2589.00
NOV	18254.00	19838.00

CESIUM-134

<u>PERIOD</u>	<u>DOWNSTREAM</u>	<u>UPSTREAM</u>	<u>DOWNSTREAM</u>	<u>UPSTREAM</u>
JUN	<25.50	<17.50	<26.30	<17.50
NOV	<31.90	<35.70	<38.00	147.00

Gamma-Emitting Nuclides in Fish (pCi/kg wet) by Location - 1991

POTASSIUM-40

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	#1	#2	#3	#4	#1	#2	#3	#4
JUN	2803	2398			2782			
AUG	3209	3025	6159	6551	2998	3846	3051	3318
DEC	3224	3514	3394		3267	2751	2590	2849
								5907

MANGANESE-54

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	#1	#2	#3	#4	#1	#2	#3	#4
JUN	<3.37	<6.37			<8.52			
AUG	<9.35	<12.4	<31.4	<29.7	<11.6	<12.9	<10.2	<28.1
DEC	<16.3	<31.5	<27.0		<20.8	<27.7	<21.4	<35.1

IRON-59

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	#1	#2	#3	#4	#1	#2	#3	#4
JUN	<9.91	<14.6			<23.6			
AUG	<35.8	<52.	<131	<208	<42.3	<54.6	<38.7	<128
DEC	<73.1	<101	<84.9		<62.4	<90.7	<75.5	<88.8
								<244

COBALT-58

<u>PERIOD</u>	<u>DOWNSTREAM</u>				<u>UPSTREAM</u>			
	#1	#2	#3	#4	#1	#2	#3	#4
JUN	<3.55	<6.09			<8.95			
AUG	<12.1	<17.4	<39.5	<57.7	<13.7	<18.1	<12.9	<39.5
DEC	<19.6	<33.2	<30.3		<20.1	<33.2	<25.7	<70.6

NOTE: Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which analyses are required by RBS Technical Specification (that is, the nuclides may or may not have been present, but if so, there cannot have been more present than the amounts listed).

RIVER BEND STATION
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Gamma-Emitting Nuclides in Fish (pCi/kg wet) by Location - 1991

PERIOD <u>#6</u>	DOWNSTREAM				COBALT-60				UPSTREAM			
	#1	#2	#3	#4	#1	#2	#3	#4	#5			
JUN	<4.19	<7.93										
AUG	<10.9	<14.6	<38.9	16.1								
<35.0												
DEC	<24.7	<36.8	<35.0									

PERIOD <u>#6</u>	DOWNSTREAM				ZINC-65				UPSTREAM			
	#1	#2	#3	#4	#1	#2	#3	#4	#5			
JUN	<9.86	<17.0										
AUG	<25.9	<30.3	<82.4	<78.7								
<90.0												
DEC	<51.0	<77.9	<70.7									

PERIOD <u>#6</u>	DOWNSTREAM				CESIUM-134				UPSTREAM			
	#1	#2	#3	#4	#1	#2	#3	#4	#5			
JUN	<2.69	<5.35										
AUG	<7.14	<9.83	<25.9	<25.8								
<29.5												
DEC	<15.5	<28.8	<24.5									

PERIOD <u>#6</u>	DOWNSTREAM				CESIUM-137				UPSTREAM			
	#1	#2	#3	#4	#1	#2	#3	#4	#5			
JUN	<3.23	<6.30										
AUG	<8.22	<10.5	<27.0	<26.8								
<28.4												
DEC	<19.1	<28.4	<25.5									

NOTE: Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation by Location - 1991

BERYLLIUM-7

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY	#2	#3
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	482	78	82	517	144	202	678	121	337
FEB	110		526	113	140	831	217	204	459
MAR	205	316	102	95	341		342	435	284
APR		362	566	176	196	567	193	139	168
MAY	159	211	120	175	404	295	2059	1864	2269
JUN		128	1054	136	37	795	1070	1565	1766
JUL	323	755	703	86	150	697	513	354	233
AUG	192	452	1316	865	331	123	99	392	
SEP	682	141	77	217	96	320	598	119	110
OCT			293				324	288	
NOV		293	234		245		288	96	316
DEC		199		141	181	120			122

POTASSIUM-40

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY	#2	#3
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN		1689	2342		2305	2082	3290	2979	2875
FEB	2440	1980	2678	2354	2028	2916	2856	2794	3005
MAR	4330	2339	1758	3363	4508	2136	3152	6007	4335
APR	3443	2744	4075	2953	2359	4380		4922	7186
MAY	4205	152	3757	3828	4326	4096	9318	7111	7739
JUN	4083	1073	4406	3562	2361	3176	3837	5590	5927
JUL	2493	4138	4663	1813	4066	3872	2680	6331	5769
AUG	2946	1960	2704	2868	1456	2362	5232	3899	5186
SEP	2360	3738	2683	3161	1092	4015	4459	4146	4249
OCT	2186	2704	2617	1550	6175	1919	5495	3630	5127
NOV	1521	836	2903	3433	1507	3498	6346	2895	6962
DEC	3198	3387	1981	1481	3836	2871	3663	2652	1857

IODINE-131

PERIOD	INDICATOR LOCATIONS						CONTROL LOCATIONS		
	RBS GARDEN #1			RBS GARDEN #2			ANGOLA PENITENTIARY	#2	#3
	#1	#2	#3	#1	#2	#3	#1	#2	#3
JAN	<18.3	<18.3	<21.2	<18.3	<15.9	<19.7	<21.0	<19.0	<19.0
FEB	<20.7	<21.2	<24.9	<20.5	<17.5	<24.5	<19.7	<17.7	<16.9
MAR	<36.0	<22.0	<23.6	<27.8	<23.8	<21.1	<19.6	<22.1	<20.7
APR	<23.6	<25.5	<22.1	<19.7	<24.8	<22.0	<32.4	<24.6	<23.7
MAY	<22.2	<17.6	<18.6	<22.8	<16.2	<16.6	<34.5	<27.7	<33.4
JUN	<23.1	<17.6	<20.5	<23.2	<26.0	<18.7	<26.0	<23.4	<24.1
JUL	<20.8	<24.9	<18.7	<21.5	<26.5	<25.1	<16.3	<21.5	<19.0
AUG	<23.3	<21.0	<29.5	<31.1	<21.9	<30.4	<28.6	<26.6	<29.7
SEP	<20.4	<23.8	16.7	<19.7	<19.9	<20.1	<25.2	<24.1	<26.0
OCT	<20.9	<31.5	<24.6	<25.4	<38.4	<24.6	<25.3	<25.6	<27.1
NOV	<24.8	<22.5	<28.3	<23.3	<27.4	<30.4	<23.8	<17.9	<26.2
DEC	<24.8	<28.6	<30.9	<25.1	<26.2	<31.6	<25.2	<23.3	<16.6

NOTE: Sampling requirement for vegetation is one sample of each of three different types from each location per month.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
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Gamma-Emitting Nuclide Activity (pCi/kg wet) in Broadleaf Vegetation by Location - 1991

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	<21.9	<19.4	<23.4	<22.7	<19.4	<19.5	<28.0	<18.8	<21.9
FEB	<26.8	<22.7	<26.9	<20.2	<19.8	<27.3	<22.7	<18.6	<16.0
MAR	<35.4	<24.6	<20.7	<24.8	<20.7	<20.3	<20.6	<24.4	<23.5
APR	<24.2	<20.6	<21.1	<17.5	<26.0	<23.1	<33.1	<22.1	<24.5
MAY	<23.4	<20.2	<22.5	<25.7	<19.9	<19.2	<29.3	<25.9	<27.9
JUN	<22.7	<18.1	<22.3	<24.3	<23.1	<15.8	<26.7	<23.9	<27.1
JUL	<20.6	<23.5	<22.4	<18.6	<24.7	<23.7	<16.5	<17.4	<21.2
AUG	<21.6	<22.8	<24.	<28.1	<20.6	<22.9	<26.4	<20.1	<28.2
SEP	<22.2	<23.0	<18.6	<20.8	<22.0	<23.5	<27.9	<23.2	<25.0
OCT	<24.6	<25.9	<22.9	<23.0	<34.8	<27.6	<27.9	<24.0	<24.5
NOV	<22.7	<26.1	<24.9	<23.1	<26.8	<26.0	<25.5	<19.3	<28.0
DEC	<27.8	<26.4	<30.3	<26.8	<30.6	<31.8	<24.2	<25.2	<14.2

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	<24.1	<22.2	<26.1	<22.4	<18.3	<23.4	<29.0	<23.7	<25.5
FEB	<24.8	<28.7	<27.9	<21.6	<19.2	<28.0	<22.0	<17.4	<21.2
MAR	<40.7	<24.3	<25.9	<29.7	<25.7	<22.2	<21.6	<24.8	<25.2
APR	18.1	<30.2	<28.9	<19.9	<26.7	<26.0	<37.8	<23.8	<20.8
MAY	<24.3	<20.9	<23.0	<23.0	<20.4	<15.9	<35.5	<27.8	<29.7
JUN	11.2	<19.9	18.3	<26.0	<29.2	<18.9	<29.9	<27.3	<31.5
JUL	<26.1	<31.0	<23.0	<22.7	<27.6	<30.4	<15.5	<22.9	<23.3
AUG	<26.8	<26.8	<25.5	<30.3	<24.6	<28.5	<30.9	<24.4	<32.4
SEP	34.0	<27.3	<19.7	<21.7	<24.8	<21.7	<29.2	<37.3	<31.9
OCT	<29.1	<46.0	<27.2	<27.8	<38.4	<30.1	<29.3	<26.1	<31.9
NOV	<25.0	<31.3	<40.4	<25.0	<32.3	<30.9	<26.9	<20.2	<30.0
DEC	<23.5	<35.7	<39.4	<33.8	<29.8	<33.5	<33.0	<18.5	<4.7

NOTE: Sampling requirement for vegetation is one sample of each of three different types from each location per month.

Activities shown are values actually measured, whereas those indicated as "<" are minimum detectable activities (MDAs) under the particular conditions of analysis of nuclides for which 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 present than the amounts listed).

RIVER BEND STATION
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 1991

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 (752/7591) 0.01 - 0.09	AQS2 5.8 km NW	0.03 (146/158) 0.0 - 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 (1086)	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 (241)	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
	Zr-65 (63)	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 RADILOGICAL 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		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
				Dist./Dir	Mean(f) ² Range		
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 (18)	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.	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	Donaldsonville 135 km downstream	6.8 (28/28) 3 - 12	7.8 (24/26) 5 - 13	
Shoreline Sediment (pCi/kg dry)	K-40 ⁶ (2)	NONE REQUIRED	13.7E3 (2/2) (11.4-15.9)E3	SEDD 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	180	ALL <LLD		ALL <LLD	N/A	
Milk (pCi/liter)	K-40 ⁶ (18)	NONE	1313 (8/9) 1179 - 1475	MFZ 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	
Fish/ Invertebrates (pCi/kg wet)	I-131 (82)	15	ALL <LLD		ALL <LLD ⁷	N/A	
	K-40 ⁶ (6)	NONE REQUIRED	9037 (2/2) 6320 - 11754	FD 4 km downstream	9037 (2/2) 6320 - 11754	7840 (4/4) 4177 - 11435	N/A
	Mn-54 (15)	130	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.		Control Locations Mean (f) ² Range	Number of Nonroutine Reported Results
Fish/ Invertebrates (continued)	Co-58 (15)	130	ALL <LLD			ALL <LLD	N/A
	Fe-59 (15)	260	ALL <LLD ⁸			ALL <LLD ⁸	N/A
	No-60 (15)	130	ALL <LLD			ALL <LLD	N/A
	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	G2 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 <LLD			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 downgradient (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 are 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).