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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Annual Radiological Environmental Operating Report

Gentlemen:

Attached is the Annual Radiological Environmental Operating Report for the period of January 1 through December 31, 1999. This report is submitted pursuant to the requirements of Waterford 3 Technical Specification Section 6.9.1.7.

If there are any questions, please contact T.M. Manzella at (504) 739-6882. This submittal does not contain commitments.

Very truly yours,

A handwritten signature in black ink, appearing to read "Everett P. Perkins, Jr.", with a long, sweeping horizontal line extending from the end of the signature.

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EPP/TMM/rtk
Attachment

JE25

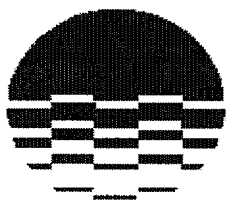
Annual Radiological Operating Report

W3F1-2000-0049

Page 2

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**Annual
Radiological Environmental
Operating Report**

January 1, 1999 - December 31, 1999



**Waterford 3 Steam Electric Station
Entergy Operations, Inc.**

Docket Number 50-382

License Number NPF-38

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ABSTRACT

This report is issued pursuant to Waterford 3 Technical Specification 6.9.1.7. Its purpose is to discuss the Waterford 3 Radiological Environmental Monitoring Program (REMP), present the results of the program for the year 1999, and evaluate the radiological impact on the environment resulting from plant operation.

The Waterford 3 Radiological Environmental Monitoring Program collected data of environmental radioactivity levels around the Waterford 3 nuclear power plant. These levels were determined by analyzing samples of air, water, shoreline soil, fish, vegetation, and milk from various locations around the facility. Based on the evaluation of the environmental data collected, the operation of Waterford 3 exhibited no discernable impact on the levels of radioactivity in the environment during 1999.

TABLE OF CONTENTS

	Page
ABSTRACT	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	vi
1.0 INTRODUCTION	1
1.1 Program and Report Objectives	1
1.2 Plant and Site Description	1
2.0 PROGRAM DESCRIPTION.....	2
2.1 History and Development	2
2.2 Responsibilities.....	2
2.3 Sample Collection and Handling Procedures	2
2.3.1 Direct Radiation Exposure Pathway Samples	3
2.3.2 Airborne Exposure Pathway Samples	3
2.3.3 Waterborne Exposure Pathway Samples	3
2.3.4 Ingestion Exposure Pathway Samples	4
2.4 Analytical Procedures by Environmental Services Laboratory	5
2.4.1 Sample Handling and Treatment	5
2.4.2 Sample Analysis	6
2.4.3 Data Reporting.....	7
2.5 Environmental Dosimetry	7
2.6 Lower Limits of Detection (LLD)	8
2.7 Laboratory Quality Assurance	8
2.7.1 Environmental Service Laboratory	8

TABLE OF CONTENTS (Continued)

	Page
3.0 DISCUSSION OF RESULTS	24
3.1 Direct Radiation Exposure Pathway Analyses	24
3.2 Airborne Exposure Pathway Analyses	24
3.2.1 Airborne Particulate	24
3.2.2 Airborne Iodine	25
3.2.3 Gamma Isotopic	25
3.3 Waterborne Exposure Pathway Analyses	25
3.3.1 Drinking/Surface Water	25
3.3.2 Groundwater	26
3.3.3 Shoreline Sediment	26
3.4 Ingestion Exposure Pathway Analyses	26
3.4.1 Milk	26
3.4.2 Fish	26
3.4.3 Broad Leaf Vegetation	26
3.5 Statistical Analyses	27
3.5.1 Calculation of the Mean and Standard Deviation	27
3.5.2 Comparing Two Sample Population Means	28
3.5.3 TLD Measurements	29
3.5.4 Gross Beta Activity on Air Particulate Filters	29
3.5.5 Gross Beta Activity in Monthly Drinking Water Composites	29
3.6 Deviations from the REMP	29
3.6.1 Unavailable Samples	29
3.6.2 Lack of Sample Continuity	29
3.6.3 Missed Lower Limits of Detection	29
3.7 Land Use Census	29
4.0 CONCLUSIONS	39
APPENDIX A REMP DATA SUMMARY	40
APPENDIX B REMP DATA	47

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

TABLE 2.1	RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP) SUMMARY	10
TABLE 2.2	DESCRIPTION OF REMP SAMPLING LOCATIONS	11
TABLE 2.3	DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS, LOWER LIMIT OF DETECTION (LLD)	18
TABLE 2.4	ENVIRONMENTAL (CROSS CHECK) PROGRAM PARTICIPATION RESULTS	19
TABLE 3.1	1999 DIRECT RADIATION DATA ORGANIZED BY COMPASS DIRECTION AND DISTANCE FROM WATERFORD 3 SES	30
TABLE 3.2	STATISTICAL COMPARISON OF 1999 TLD MEASUREMENTS FROM STATIONS GROUPED BY DISTANCE FROM WATERFORD 3 SES	31
TABLE 3.3	STATISTICAL COMPARISON OF 1999 GROSS BETA ACTIVITY MEASUREMENTS ON AIR PARTICULATE FILTERS FROM WATERFORD 3 SES	32
TABLE 3.4	STATISTICAL COMPARISON OF 1999 GROSS BETA ACTIVITY MEASUREMENTS IN DRINKING/SURFACE WATER SAMPLES FROM WATERFORD 3 SES	33
TABLE 3.5	SUMMARY OF 1999 REMP DEVIATIONS	34
TABLE 3.6	1998 LAND USE CENSUS RESULTS	35

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES (continued)

TABLE A-1	RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY	41
TABLE B-1	QUARTERLY TLD DOSE RATES	48
TABLE B-2	AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES: GROSS BETA AND IODINE-131 ANALYSES	49
TABLE B-3	AIR PARTICULATE FILTERS: GAMMA ISOTOPIC ANALYSES	54
TABLE B-4	DRINKING/SURFACE WATER: IODINE-131 ANALYSES	55
TABLE B-5	DRINKING/SURFACE WATER: GROSS BETA ANALYSES	58
TABLE B-6	DRINKING/SURFACE WATER: GAMMA ISOTOPIC ANALYSES	61
TABLE B-7	DRINKING/SURFACE WATER: TRITIUM ANALYSES	64
TABLE B-8	GROUNDWATER: TRITIUM AND GAMMA ISOTOPIC ANALYSES	65
TABLE B-9	SHORELINE SOIL: GAMMA ISOTOPIC ANALYSES	66
TABLE B-10	MILK: IODINE-131 AND GAMMA ISOTOPIC ANALYSES	67
TABLE B-11	FISH: GAMMA ISOTOPIC ANALYSES	70
TABLE B-12	BROAD LEAF VEGETATION: IODINE-131 AND GAMMA ISOTOPIC ANALYSES	72

TABLE OF CONTENTS (Continued)

Page

LIST OF FIGURES

FIGURE 2.1	REMP SAMPLES WITHIN 2 MILES OF WATERFORD 3	21
FIGURE 2.2	REMP SAMPLES WITHIN 10 MILES OF WATERFORD 3	22
FIGURE 2.3	REMP SAMPLES WITHIN 50 MILES OF WATERFORD 3	23
FIGURE 3.1	DIRECT RADIATION DOSE COMPARISON	36
FIGURE 3.2	GROSS BETA AIR PARTICULATE COMPARISON	37
FIGURE 3.3	GROSS BETA DRINKING/SURFACE WATER COMPARISON	38

1.0 INTRODUCTION

This report describes the Radiological Environmental Monitoring Program (REMP) for the Waterford 3 Steam Electric Station and discusses the results obtained during the calendar year 1999. The results discussed in this report were used to evaluate the radiological environmental impact from the operation of Waterford 3. The submission of this report to the Nuclear Regulatory Commission (NRC) fulfills the requirements pursuant to Waterford 3 Technical Specification 6.9.1.7.

1.1 Program and Report Objectives

The objective of the monitoring program is to evaluate the radiological environmental impact of the plant. In order to conduct this evaluation, the data analyses and interpretations contained in this report fulfill the following specific objectives:

- identifies any radioactive materials or radiation in the environment associated with plant operation,
- compares the results obtained during the reporting period with past and pre-operational data and identifies any trends associated with accumulation of radioactivity in the environment; and,
- verifies compliance with federal regulatory requirements

1.2 Plant and Site Description

Waterford 3 employs a pressurized water reactor for the production of approximately 1153 gross (1104 net) megawatts of electricity. The station uses a flow of water obtained from and discharged to the Mississippi River for condenser cooling. On March 4, 1985, the unit achieved initial criticality.

The plant is located on the west bank of the Mississippi River at river mile 129.6 between Baton Rouge and New Orleans, Louisiana. The site is in the northwestern section of St. Charles Parish, approximately three miles southeast of the St. John the Baptist Parish boundary, between Killona and Taft. The Mississippi River is the closest prominent natural feature. Other features include Lac des Allemands, about 5.5 miles southwest of the site, and Lake Pontchartrain, about 7 miles northeast of the site.

Most of the man-made features are located on the narrow strip of land between the Mississippi River and the wetlands. Specifically, several industrial facilities include Waterford 1 and 2 Steam Electric Station (0.4 miles northwest), Little Gypsy Steam Electric Station (0.8 miles northeast), IMC Agrico, a fertilizer manufacturer (0.6 miles east southeast), Oxychem Chemical Company (0.8 miles east southeast), and Union Carbide, a chemical manufacturer (1.2 miles east southeast).

Major urban centers in the region include New Orleans (approximately 25 miles east) and Baton Rouge (approximately 50 miles west-northwest). Communities near the site in St. Charles Parish include Killona (0.9 miles west northwest), Montz (1.0 miles north), Norco (2.5 miles east), Hahnville (3.7 miles east southeast), and Destrehan (6.3 miles east southeast). LaPlace (4.7 miles north) is located in St. John the Baptist Parish.

2.0 PROGRAM DESCRIPTION

A general summary of the REMP is given in Table 2.1. Brief descriptions and locations of the sampling stations are presented in Table 2.2. In addition, station locations are illustrated in Figures 2.1 through 2.3. A more detailed description of the REMP is provided below.

2.1 History and Development

The Waterford 3 REMP evolved from the Pre-Operational Environmental Radiological Surveillance (PERS) program (1978-1982) and was initiated in April of 1983. Equipment, procedures, techniques, and sampling locations used during the pre-operational survey were incorporated into the operational program. Further, the environmental data collected during the first two years of the REMP (1983 and 1984), prior to initial criticality, were used to supplement the baseline established during the PERS Program.

2.2 Responsibilities

Waterford 3 personnel are responsible for implementing and ensuring that the REMP complies with federal regulatory, Technical Specification, and Offsite Dose Calculation Manual (ODCM) requirements. Responsibilities of Waterford 3 personnel include collecting (with the exception of fish samples), preparing, and shipping of environmental samples; conducting environmental dosimetry measurements; reviewing reports of analytical results; preparing and submitting the Annual Radiological Environmental Operating Report (AREOR) and other relevant reports to the NRC.

The Environmental Services Laboratory at the River Bend Nuclear Station located in St. Francisville, Louisiana, is responsible for performing radiological analyses, conducting initial data review, preparing reports of analytical results, and overseeing laboratory quality assurance and control.

The Fisheries Co-Operative Extension Service of Louisiana State University is responsible for the collection of fish samples.

The TLD Process Laboratory at Waterford 3 is responsible for analyzing Panasonic multi-element thermoluminescent dosimeters (TLDs).

2.3 Sample Collection and Handling Procedures

Sample type, location, collection frequency, and the analyses performed are summarized in Tables 2.1 and 2.2. The information contained in these tables is based on requirements specified on Attachments 7.13 and 7.14 of the Waterford 3 ODCM. Location maps of the sampling are illustrated in Figures 2.1 through 2.3. Any station deviations during 1999 are discussed in Section 3.6.

The environmental samples are classified into four general categories according to exposure pathways: direct radiation exposure, airborne exposure, waterborne exposure, and ingestion exposure. Sample collection and handling procedures are described in the following sections. The descriptions are intended to provide a procedural overview rather than a step-by-step description.

2.3.1 Direct Radiation Exposure Pathway Samples

Integrated external gamma exposure, determined by using Panasonic multi-element TLDs, was measured at thirty-one locations as follows:

- an inner ring of stations; one in each of the sixteen meteorological sectors in the general area of the site boundary;
- an outer ring of stations; one in ten of the sixteen meteorological sectors in the six to eight kilometer range from the site; and,
- the balance placed in areas of special interest (e.g., population centers, schools, etc.) with one area serving as a control

The TLDs were exchanged quarterly and analyzed by the TLD Process Laboratory at Waterford 3.

2.3.2 Airborne Exposure Pathway Samples

Samples of airborne particulate and radioiodine were collected at four indicator locations (APG-1, APQ-1, APP-1, and APC-1) and one control location (APE-30). Low-volume air pumps and flow totalizers in weatherproof shelters provided continuous air sampling.

Using the sampling devices described above, airborne particulate samples were obtained on a filter and collected biweekly by Waterford 3 personnel for shipment to the laboratory for gross beta analysis. The filters were composited quarterly by the laboratory for isotopic analysis by gamma spectroscopy.

Airborne iodine sampling was done in conjunction with air particulate sampling using a charcoal cartridge. The cartridges were collected bi-weekly by Waterford 3 personnel for shipment to the laboratory for Iodine-131 analysis by gamma spectroscopy.

2.3.3 Waterborne Exposure Pathway Samples

Drinking and Surface Water

Because the plant discharges into the Mississippi River, which is the major source of drinking water in the vicinity of Waterford 3, water samples taken from the Mississippi River were designated as both drinking and surface water samples.

Composite drinking/surface water samples were obtained every four (4) weeks using automatic composite samplers placed at two indicator locations (DWG-2/SWG-2, DWE-5/SWE-5) and one control location (DWP-7/SWP-7). Hydrochloric acid and sodium iodide was added to each sample prior to Iodine-131 analysis by gamma spectroscopy. Samples were composited quarterly for gross beta, gamma spectroscopy and tritium analyses.

Groundwater

Due to the high water table resulting from shallow aquifers in the vicinity of the site, drainage canal sampling represents groundwater discharge. Groundwater was obtained quarterly by grab sampling from one sampling location (GWK-1). Hydrochloric acid and sodium iodide was added to each sample prior to analysis by gamma spectroscopy. Samples collected for tritium analysis were not acidified.

Shoreline Sediment

Samples were obtained semi-annually from two sampling locations. SHWE-3 is downstream of the plant on the shoreline of the Mississippi River, and SHWK-1 is on the shoreline of the 40-Arpent canal. The samples were shipped without further processing to the laboratory for gamma spectroscopy analyses.

2.3.4 Ingestion Exposure Pathway Samples

Milk

Milk samples were collected monthly from one indicator location (MKQ-5). Although one additional indicator location was identified (MKQ-1), no samples were available from this location during 1999 (see Section 3.6). Milk samples were required monthly at one control location (MKQ-45), however, since the dairy went out of business, another control milk location (MKR-50) was added to the REMP. Shortly thereafter, milk samples became unavailable at this location due to batch mixing in the tank from several sources of milk prior to sample collection, thus eliminating the identification of the sample with a specific location. As a result, another control milk location is currently being sought. Louisiana Radiation Protection Division personnel performed sampling of the control locations. Formaldehyde was added as a preservative to all milk samples, and sodium iodide was added prior to analysis for Iodine-131. Both Iodine-131 and gamma spectroscopy analyses were performed by the laboratory.

Fish

Fish samples were collected annually from the Mississippi River at one indicator location (FH-2) and one control location (FH-1). A contractor performed the sampling by netting. Subsequently, the fish were segregated by species and location prior to Waterford 3 receiving the samples. The samples were shipped frozen to the laboratory for gamma spectroscopy analyses.

Broad leaf vegetation

The Technical Requirements Manual (TRM), Table 3.12-1, requires that broad leaf vegetation be sampled from three locations in the event milk samples are unavailable. Since milk samples were collected from only one sampling location, broad leaf vegetation samples were collected monthly at two indicator locations (BLQ-1 and BLB-1) and one control location (BLK-15). During the 1999 reporting period, another control location (BLE-20) was added in sector E to comply with the TRM requirement to be located in the least prevalent wind direction. Sampling will continue at the current control location (BLK-15) until sample availability is determined in sector E. The samples were shipped without further processing to the laboratory for Iodine-131 and gamma spectroscopy analyses.

2.4 Analytical Procedures by Environmental Services Laboratory

2.4.1 Sample Handling and Treatment

The laboratory staff receives and stores samples upon arrival. Environmental samples frequently require preparation prior to analysis, depending on media and analysis type.

Water Samples

Generally, field personnel acidify one-gallon water samples with hydrochloric acid and sodium iodide unless otherwise directed by the analytical laboratory. Tritium samples are not acidified and are stored in glass bottles under refrigeration until analyses can be performed.

Air Samples

The laboratory handles air filters to avoid disturbing any particulate deposition on the air particulate filter. They normally receive air filters in plastic petri dish containers that aid in transporting heavy dust loaded filters.

Milk Samples

The laboratory refrigerates milk samples until analyzed. They add a preservative (formaldehyde), if analyses are delayed for more than a few days to inhibit bacterial growth and retard spoilage. Unless frozen or shipped on ice, milk samples analyzed for Iodine-131 require an addition of 100 mls of formaldehyde, of which field personnel normally add 10 mls prior to shipment, to avoid binding of the iodine that may occur with smaller levels of formaldehyde.

Soil and Bottom Sediment Samples

The laboratory dries, grinds, and sieves soil and sediment samples before analyses. The lab then mixes the samples to ensure a homogeneous mixture.

Other Samples

The laboratory preserves perishable samples by refrigeration or freezing. Vegetation and other samples may require drying, pulverizing or ashing before or after analyses for long-term storage.

2.4.2 Sample Analysis

Gross Beta Analysis

Air Samples

The laboratory counts air filters for 100 minutes, or until the required LLDs are achieved. This analysis is performed with a low-background alpha-beta counter at least 24 hours after collection to allow for the decay of short-lived isotopes, such as radon and thoron daughters.

Water Samples

This analysis measures overall beta radionuclides in water samples. It involves evaporating a suitable aliquot of sample (usually 100 mls) in a beaker and then drying the beaker residue in a 47mm stainless steel planchet under heat lamps or on a hot plate. The lab counts the plancheted samples for 200 minutes in a low-background alpha-beta counting system. Activity calculation includes a self-absorption attenuation factor (referred to as a salt density curve) for counter efficiency based on weight of residue on each planchet.

Tritium Analysis

Water Samples

The laboratory typically adds six mls of water to 12 mls of liquid scintillation cocktail in a 20 ml vial and inserts the vial into a liquid scintillation spectrometer for a 60 minute count.

Iodine-131 Analysis

Water Samples

The laboratory mixes four liters or more of the sample with a stable iodine carrier solution and then stirs the sample with an anion exchange resin to remove iodine from the sample. The resin is then transferred to a 250 ml micro-marinelli beaker and counted in a shielded intrinsic Germanium detector until the required LLDs are achieved.

Gamma Isotopic Analysis

Milk and Water Samples

The laboratory fills a 3.7 liter marinelli beaker with a representative aliquot of the sample and counts for a minimum of 60 minutes, or until the required LLDs are achieved, in a shielded intrinsic Germanium detector using gamma spectroscopy analysis software.

Vegetation and Fish Samples

The laboratory loads a maximum quantity of undried vegetation, food or garden crop sample into a tared 1 liter marinelli beaker and weighs it. The sample is then counted for 30 minutes, or until the required LLDs are achieved, in a shielded intrinsic Germanium detector as described above. The laboratory loads as much as possible (up to the total sample) of the dried edible portion of a fish sample into a tarred 0.5 liter marinelli beaker, or a lab-tech petri dish, depending on fish quantity, and weighs. The sample is then counted for a minimum of 30 minutes in a shielded intrinsic Germanium detector as described above.

Soil and Sediment Samples

The laboratory dries soil and sediment at a temperature of 110-135°C in a convection oven, sifts the sample through a #20 mesh sieve, then loads the sample into a tared 1.0 liter marinelli beaker and weighs it. The sample is then counted for 30 minutes, or until the required LLDs are achieved, in a shielded intrinsic Germanium detector as described above.

Charcoal Cartridge Samples

The laboratory counts each charcoal cartridge separately by positioning each on the face of the detector in a converted one-half liter marinelli used as a holder. Each sample is counted for a minimum of 30 minutes or until LLDs is achieved.

Air Particulate Samples

The laboratory stacks six to seven air particulate filters, for a quarterly composite for each field station, one on top of another in a covered plastic petri dish. The composite sample is counted for 30 minutes, or until the required LLDs are achieved, in a shielded intrinsic Germanium detector as described above.

2.4.3 Data Reporting

The laboratory calculates the mean of analytical results as follows:

$$\bar{X} = \sum X_i / n$$

where:

$\bar{X}$	=	Mean
$\sum X_i$	=	Sum of Individual sample results
n	=	Number of sample results

The lab rounds off calculated values by inspection of digits to the right of the third reported significant digit, with values less than five rounded down and values equal to or greater than five rounded up.

The laboratory reports gross beta and tritium analytical results, less than a two sigma counting error, as less-than-LLD value for that sample. The lab reports analytical results, greater than the two sigma counting error, along with associated two sigma counting error, as a plus or minus (+) term.

The laboratory considers calendar quarters and a quarterly composite to be composed of six to seven bi-weekly aliquots or samples, such as air particulate filters, or three to four monthly aliquots or samples, such as drinking water.

2.5 Environmental Dosimetry

Panasonic Model UD-814 TLDs that contain one lithium borate and three calcium sulfate phosphor elements are used for environmental dosimetry. However, only the calcium sulfate phosphor elements are used for analysis. For placement in the field, two annealed dosimeters are placed inside a plastic bag and mounted in an aluminum frame. The dosimeters are inspected monthly and exchanged quarterly for analysis by using a Panasonic Automatic TLD Reader, Model UD-710A.

2.6 Lower Limits of Detection (LLD)

The minimum sensitivities for the analytical procedures are reflected by the LLD values presented in Table 4.12-1 of the TRM. The LLDs are a priori estimates based on assumed sample volumes, counting times, detector efficiencies, etc. Analyses that could not achieve these lower limits of detection are discussed in Section 3.6.

2.7 Laboratory Quality Assurance

2.7.1 Environmental Service Laboratory

During 1999, the Environmental Service Laboratory at the River Bend Station (RBS) participated in a Radiological Interlaboratory Comparison Cross Check Program. This program satisfies the requirements of the Waterford 3 ODCM, Section 5.7.2, for participation in an interlaboratory comparison program. The program performs analyses on various sample media typically found in the REMP. As a result of participation in the program, an objective measure of analytical precision and accuracy was obtained. In the event that results obtained were not within control limits (three standard deviations), an investigation was conducted to determine the cause, and corrective actions were taken. Table 2.4 lists the 1999 results of the laboratory's participation in the cross check program.

In the 1999 cross check program, eight sample analysis results were outside the control limits. These eight sample results are:

First Quarter

- E1660-125 (Analytics) of 03/18/99 Fe-59
- E1661-125 (Analytics) of 03/18/99 Mn-54
- E1661-125 (Analytics) of 03/18/99 Fe-59

Third Quarter

- E1883-125 (Analytics) of 09/23/99 Cr-51
- E1883-125 (Analytics) of 09/23/99 Fe-59
- E1884-125 (Analytics) of 09/23/99 Cr-51
- E1884-125 (Analytics) of 09/23/99 Fe-59

Fourth Quarter

- E2002-125 (Analytics) of 12/09/99 Fe-59

Program Exceptions

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

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

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

High bias cross check results in previous years were attributed to coincidence summing effects of Y-88 and Co-60 on the efficiency curve in the effected regions. To minimize these effects, RBS added two additional nuclide lines (Mn-54 and Zn-65) to the calibration source mix for waters prior to 1999. During the 1999 cross check analyses, high bias results for Fe-59 continued, indicating the need for further investigation. Gamma spectroscopy vendors have been consulted to resolve this problem, and correction actions continue. Efficiency calibration anomalies resulting in high biases are being addressed by correcting the measured efficiencies of gamma rays from Y-88 and Co-60 for cascade summing effects. A multiplicative correction factor to convert measured gamma-ray efficiency with summing effects to an efficiency with no summing effects is currently in progress.

Impact Statement

Results out of control limits were conservatively biased, therefore there is no impact on past data. Environmental samples are analyzed and reported with a ninety-five percent confidence level that the analytical result with its associated error encompasses the "true" value. Ninety-two percent of RBS environmental cross check results were within control limits for accuracy and precision during 1999.

TABLE 2.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP) SUMMARY ^a			
SAMPLE TYPE	LOCATION	ANALYSIS	FREQUENCY
DIRECT RADIATION	A-2, B-1, C-1, D-2, E-1, F-2, G-2, H-2, J-2, K-1, L-1, M-1, N-1, P-1, Q-1, R-1, A-5, B-4, D-5, E-5, F-4, G-4, H-6, P-6, Q-5, R-6, F-9, G-9, E-15, J-15, E-30	Gamma Dose	Quarterly
AIR RADIOIODINE AND PARTICULATES	APG-1, APQ-1, APP-1, APC-1, APE-30	Gross Beta I-131	Biweekly
		Gamma Isotopic	Quarterly Composite
DRINKING WATER ^b SURFACE WATER	DWG-2, DWE-5, DWP-7 SWG-2, SWE-5, DWP-7	H-3 Gamma Isotopic Gross Beta	Quarterly Composite
		I-131	Four Week Composite
GROUND WATER	GWK-1	H-3 Gamma Isotopic	Quarterly
SHORELINE SEDIMENT	SHWK-1, SHWE-3	Gamma Isotopic	Semi-Annually
MILK	MKQ-1, MKQ-5, MKQ-45, MKR-50	Gamma Isotopic I-131	Monthly
BROAD LEAF	BLQ-1, BLB-1, BLK-15, BLE-20	Gamma Isotopic I-131	Monthly and when milk samples are not collected
FISH	FH-1, FH-2	Gamma Isotopic	In season or annually

a. Based on requirements of Waterford 3 SES Offsite Dose Calculation Manual, Section 5.7.

b. Drinking and surface water samples are identical.

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
DIRECT RADIATION (TLD)			
A-2	(East bank) Located on a utility pole on River Road (LA 628) at the south corner of the Zephrin L. Perriloux Fire Station (Station 5) in Montz, La.	1.1	N
B-1	(East bank) On fence enclosing the transmission tower 0.3 miles west (up-river) from Little Gypsy. Access from River Road (LA 628). TLDs are located at SW corner of fence enclosure.	0.8	NNE
C-1	(East bank) On fence enclosing the Little Gypsy Cooling Water Intake. Access is from River Road (LA 628) across from Little Gypsy Steam Electric Station entrance. TLDs are on the south side (inside) of the Cooling Water Intake fence enclosure, directly opposite the entrance gate.	0.8	NE
D-2	(East bank) Located approximately 0.3 miles east of Little Gypsy Power Station. Access from River Road (LA 628). TLDs are attached to a stop sign post located at the peak of the levee on the west entrance road through the Bonne Carre Spillway.	1.1	ENE
E-1	(West bank) Located on utility pole along River Road (LA 18) approximately 0.3 miles east of Waterford 3 plant entrance. Access from LA 18. TLDs are on the third utility pole east of the construction entrance road.	0.2	E
F-2	(West bank) Located on fence enclosure surrounding the LP&L sub station on LA 3142. Access from LA 3142 approximately 0.2 miles south of LA 18. TLDs are on the southeast corner of the fence enclosure	1.1	ESE

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
DIRECT RADIATION (TLD)			
G-2	(West bank) Located on utility pole on east side of LA 3142 (Next to Union Carbide Star Plant Gate 3). Access from LA 3142 approximately 0.2 miles north of railroad overpass.	1.2	SE
H-2	(West bank) Located on fence enclosure to shell road off of LA3142. Access from LA 3142 south of railroad overpass on east side of LA 3142. TLDs are on the south side of the gate for shell road (just south of Texaco pipeline station).	1.2	SSE
J-2	(West bank) Located on northeast corner of fence enclosing Texaco valve station south of LA 3127. Access from LA 3127, approximately 0.6 miles west of LA 3127/3142 intersection.	1.3	S
K-1	(West bank) Located on stop sign at entrance to Entergy Training Center. Access from LA 3127, approximately 1.3 miles west of LA 3127/3142 intersection.	1.0	SSW
L-1	(West bank) Located on fence of Gate 97 entrance off of LA 3127, approximately 1.6 miles west of LA 3127/3142 intersection. (Gate 97 is an access road for Waterford 3.)	1.0	SW
M-1	(West bank) Located on south gate into the Waterford 1 and 2 fuel oil storage tank enclosure. Access is through the Waterford 1 and 2 access road.	0.7	WSW
N-1	(West bank) Located on a pole at the end of Short Street in Killona near the railroad track south of the Killona Elementary School.	0.9	W
P-1	(West bank) Located on Short Street, in Killona. TLD is inside fence at air sample station APP-1.	0.8	WNW

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
DIRECT RADIATION (TLD)			
Q-1	(West bank) Located on fence enclosing air sample station APQ-1 approximately 0.5 miles west of Waterford 1 and 2 on River Road (LA 18).	0.8	NW
R-1	(West bank) Located on fence enclosure for Waterford 1 and 2 Cooling Water Intake Structure. Access is from River Road (LA 18) opposite Waterford 1 and 2. TLDs are on the southwest corner of fence.	0.5	NNW
A-5	(East bank) Located on utility pole just east of the Shady Nook Trailer Park on Hwy 61 in LaPlace. TLDs are on second utility pole east of trailer park on north side of Hwy 61 (eastern end of LaPlace).	4.5	N
B-4	(East bank) Located on utility pole guidewire west of shell access road to South Central Bell transmission tower on south side of Hwy 61. Transmission tower is just east of weigh station at St. John/St. Charles Parish line. TLDs are on the first utility pole east of access road.	3.8	NNE
D-5	(East bank) Located on fence gate on shell access road to Big 3 Chemical Plant. Shell access road is approximately 0.1 miles west of Hwy 61/48 intersection (at black and yellow gate). TLDs are on fence gate 0.1 miles north on shell access road from Hwy 61.	4.2	ENE
F-4	(West bank) Located on utility pole behind blonde brick house on Aquarius St. in Hahnville. Access from River Road (LA 18) and turn onto Oak St. Follow Oak St. to Hickory St., turn right on Hickory St. and follow to Aquarius St. and turn left. Blonde brick house is on the west side of Aquarius Street.	3.5	ESE
E-5	(East bank) Located on the Norco Substation fence enclosure. Access from River Road (LA-48) onto Wesco St. (adjacent to Norco Shell Chemical Plant), take Wesco St. to the dead end. TLDs are located on sixth fence post south of the north substation gate.	4.2	E

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
DIRECT RADIATION (TLD)			
G-4	(West bank) Located on railroad sign northwest side of LA 3160/railroad track intersection. Access from either LA 3127 or River Road (LA 18) onto LA 3160.	3.2	SE
H-6	(West bank) Located on a road sign on the northwest side of the second canal bridge east of LA 3160 along LA 3127.	5.7	SSE
P-6	(West bank) Located on a fence surrounding the Union Pacific communications tower at the LA 640/railroad intersection. Tower is located approximately 500 ft. west from LA 640.	5.5	WNW
Q-5	(West bank) Located on fence along River Road (LA 18) across from the Webre's house.	5.0	NW
R-6	(East bank) Located on lay down yard fence on LA 3223 in LaPlace. Access from Hwy 61 onto Elm St. (LA 3223); take Elm St. to the northeast corner of LA 3223/railroad intersection. TLDs are located on the southeast corner of fence enclosure.	5.3	NNW
F-9	(East bank) Located on entrance gate to Destrehan Substation. Access from River Road (LA 48), approximately 1.5 miles east of Luling-Destrehan bridge, onto Jonathan Street (west of Bunge Corp. Grain Elevator), and proceed to substation gate.	8.2	ESE
G-9	(West bank) Located on back fence of Entergy's District Office in Luling. Access via Ellington St. from either River Road (LA 18); or Second or Third St. from Paul Mallaird Rd. (LA 52) to Ellington St.	8.1	SE
E-15	(East bank) Located on Kenner Substation fence enclosure. Access from either River Road (LA 48) or Hwy 61, turn onto Alliance Ave. TLDs are located at the entrance of the fence enclosure.	11.8	E

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
DIRECT RADIATION (TLD)			
J-15	(West bank) Located on utility pole near the LA 631/Hwy 90 intersection in Des Allemands. TLDs are on the utility pole on east side of LA 631. Access is from LA 631 via shell road.	12.0	S
E-30**	(West bank) Located at Entergy's General Office on Delaronde St. in Algiers. TLDs are on a tree in the courtyard at the south entrance to the building.	27.0	E
AIRBORNE			
APP-1	(West bank) Located in soybean/sugarcane field at northwest corner of Short St. in Killona.	0.8	WNW
APQ-1	(West bank) Located at northwest corner of soybean/sugarcane field on east side of Killona. Access from River Road (LA 18) approximately 0.6 miles east of LA 18/3141 intersection.	0.8	NW
APG-1	(West bank) Located at the north side of the Secondary Meteorological Tower.	0.5	SE
APC-1	(East bank) Located inside the Little Gypsy Cooling Water Intake Structure fence enclosure.	0.8	NE
APE-30**	(West bank) Located on the roof of the Entergy's General Office building on Delaronde St. in Algiers.	27.0	E

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
WATERBORNE			
DWG-2 SWG-2	(West bank) Located at the Union Carbide drinking water canal. Access from LA 3142 through Gate 28.	2.0	SE
DWE-5 SWE-5	(East bank) Located at the St. Charles Parish Waterworks off of River Road (LA 48) near New Sarpy.	4.5	E
DWP-7** SWP-7**	(West bank) Located at the St. John Parish Waterworks off of LA 18 in Edgard.	6.5	WNW
SHWE-3	(West bank) Located at the Foot Ferry Landing off of LA 18 in Taft.	3.0	E
SHWK-1	(West bank) Located at the 40 Arpent Canal south of the Plant.	0.5	SSW
GWK-1	(West bank) Located at 40 Arpent Canal south of the plant. The canal is northwest of the shell road/railroad track intersection.	0.5	SSW

TABLE 2.2

DESCRIPTION OF REMP SAMPLING LOCATIONS			
LOCATION	LOCATION DESCRIPTION	DISTANCE FROM PLANT	METOROLOGICAL DIRECTION
INGESTION			
MKQ-1	(West bank) 1.0 miles west of Waterford 3 SES at the corner of River Road and Post Street in Killona.	1.0	NW
MKQ-5	(West bank) Located at the Webre's house, just across LA 18 from river marker, at the eastern end of Edgard.	5.0	NW
MKQ-45**	(East bank) Located off of I-12 in Denham Springs. Take LA 16 north to LA 1019. Turn right on LA 1019 to LA 1023. Turn left on LA 1023 to 39061 Reinninger Road.	42	NW
MKR-50**	(East bank) Located at 305 Golden Guernsey Lane in Montpelier. La.	50.0	NNW
BLQ-1	(West bank) Located between LA 18 and soybean field on eastern edge of Killona, near air sample station APQ-1.	0.8	NW
BLB-1	(East bank) Located at wooded area at the southwestern corner of the Little Gypsy plant along River Road.	0.8	NNE
BLK-15**	(West bank) Located 3.5 miles SSW of Des Allemands on Hwy. 90.	15	SSW
BLE-20**	(West bank) Located on property of Nine Mile Point in Westwego, La.	20	E
FH-1 **	Upstream of the plant intake structure.	NA*	NA*
FH-2	Downstream of the plant discharge structure.	NA*	NA*

* NA - NOT APPLICABLE

** Control Location

TABLE 2.3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS LOWER LIMIT OF DETECTION (LLD) ^(a)						
ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GAS (pCi/m ³)	FISH (pCi/kg-wet)	MILK (pCi/l)	FOOD PRODUCTS ^(b) (pCi/kg-wet)	SEDIMENT (pCi/kg-dry)
Gross Beta	4	0.01				
H-3	2000					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Zn-65	30		260			
Zr-95	30					
Nb-95	15					
I-131	1	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-140	60			60		
La-140	15			15		

a. From Table 4.12-1 of Waterford 3 SES TRM

b. Applicable to broad leaf vegetation.

TABLE 2.4
ENVIRONMENTAL CROSS-CHECK PROGRAM
PARTICIPATION RESULTS

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

TABLE 2.4 (continued)
ENVIRONMENTAL CROSS-CHECK PROGRAM
PARTICIPATION RESULTS

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

NOTES

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

FIGURE 2.1

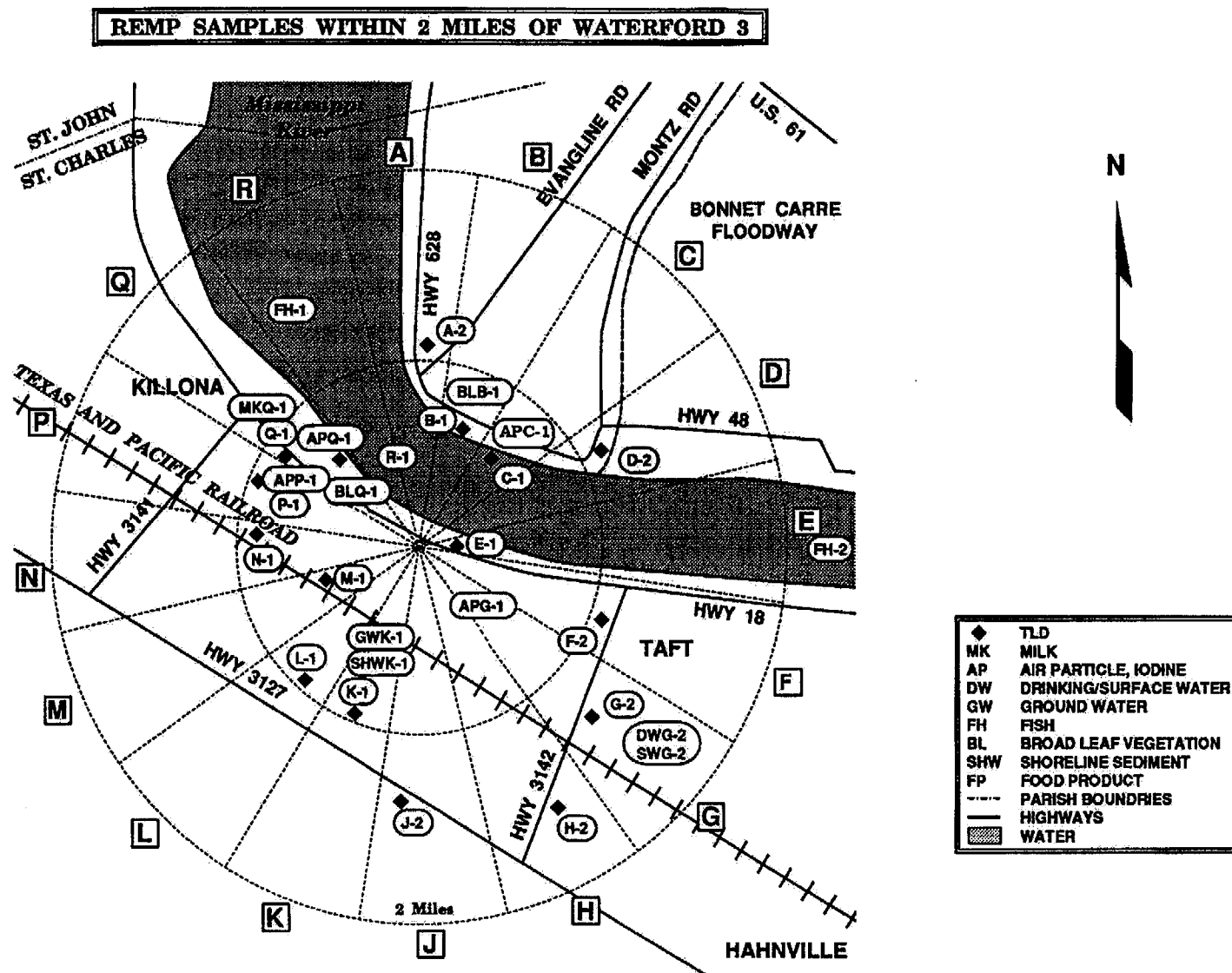


FIGURE 2.2

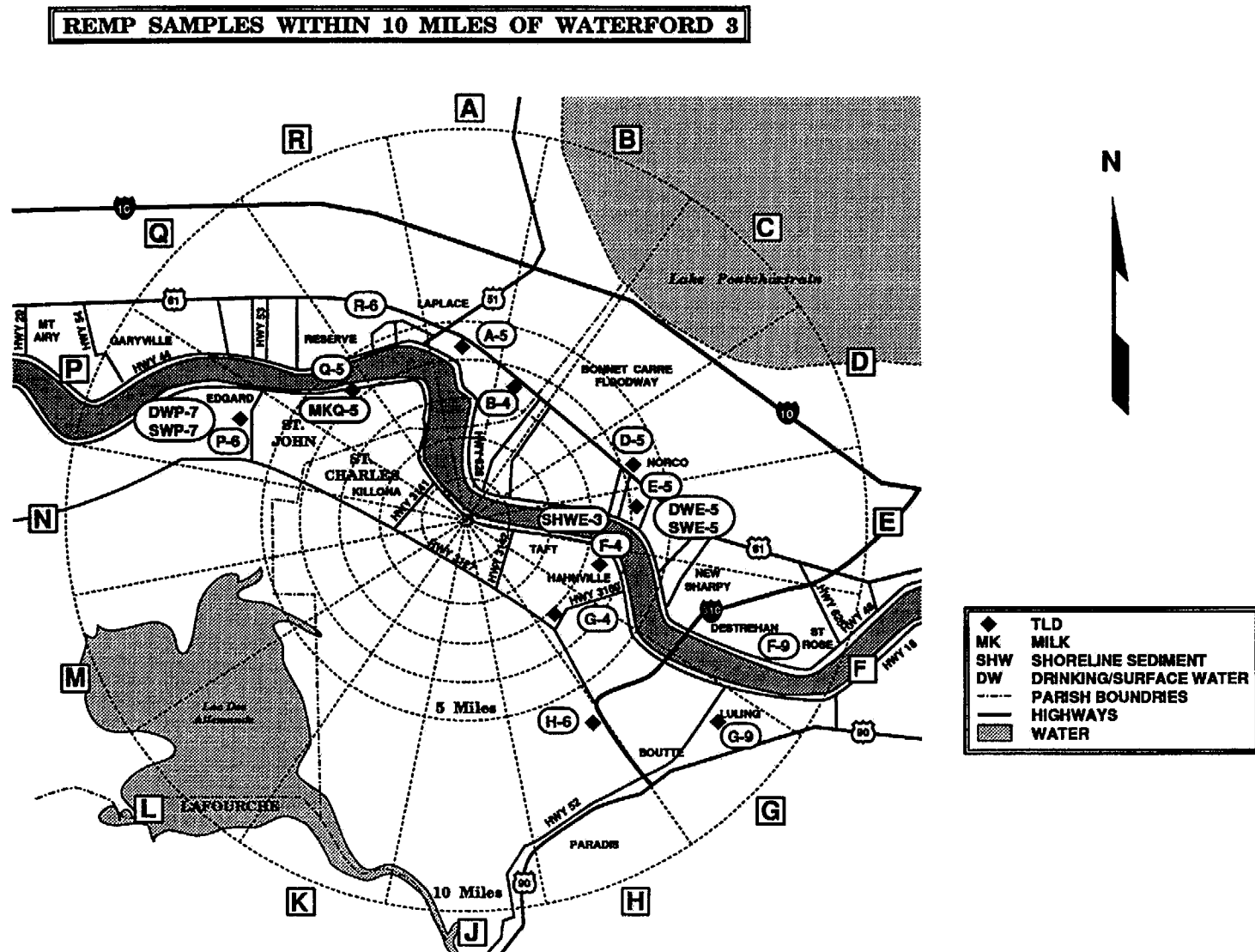
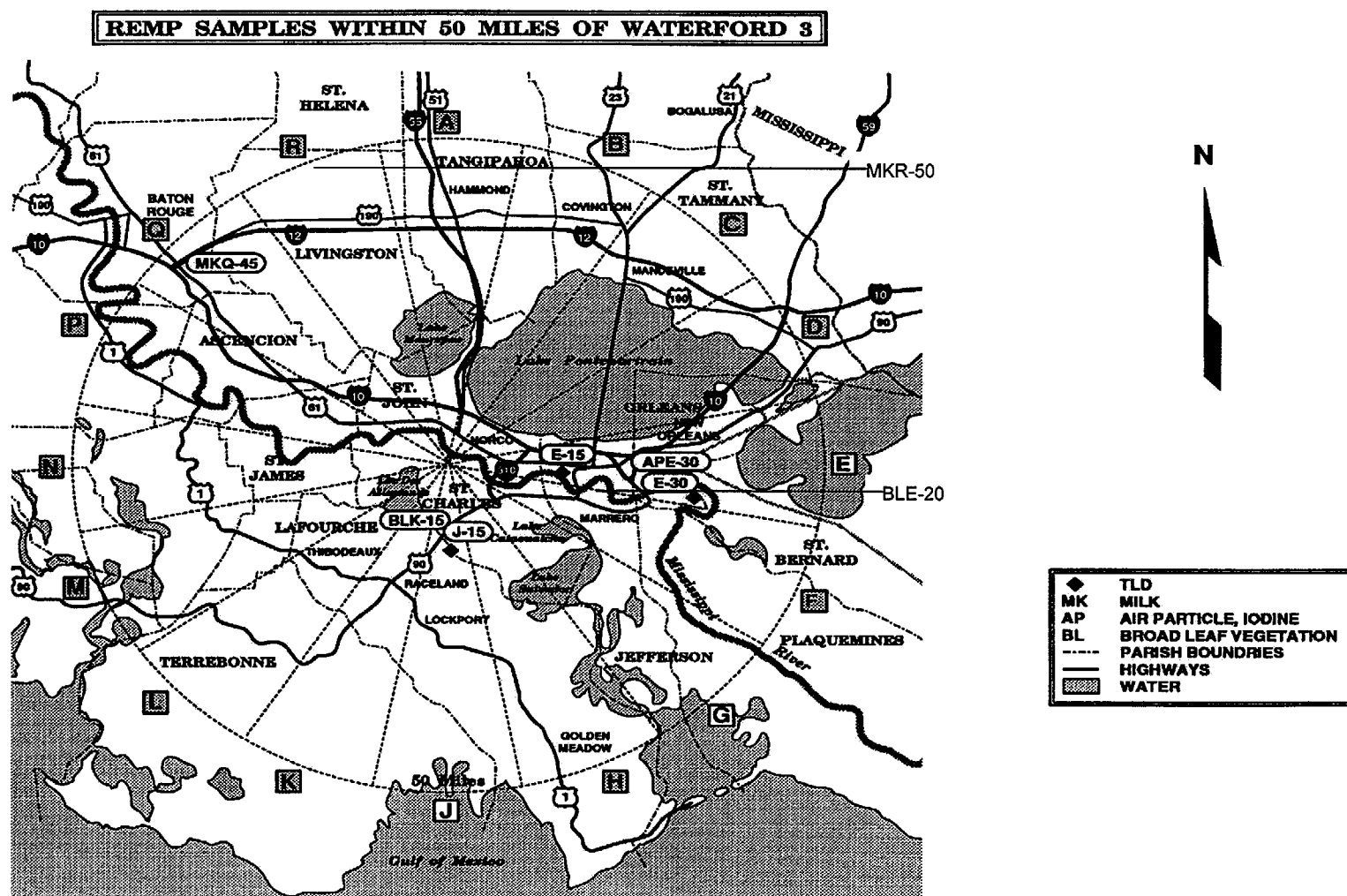


FIGURE 2.3



3.0 DISCUSSION OF RESULTS

Analytical results for the year 1999 are discussed in this section by exposure pathway, sample type, and analyses performed. Analytical results focusing only on man-made radioactivity are summarized in Appendix A and data for the individual analyses are presented in the tables of Appendix B.

3.1 Direct Radiation Exposure Pathway Analyses

The average exposure rates measured by TLDs at both indicator and control stations were 11, 13, 12, and 12 mrem/standard quarter for the first, second, third, and fourth quarters of 1999, respectively. The average exposure rate of the 118 indicator TLD locations was 12 mrem/standard quarter compared to 11 mrem/standard quarter average exposure rate at the control location. The lowest and highest individual exposure rates were eight mrem/standard quarter and 16 mrem/standard quarter for all locations. Table 3.1 compares the indicator TLD results by directional sector and distance from the facility. A comparison of directional sectors indicates the highest average exposure rate in 1999 is 14 mrem/standard quarter in Sector N.

The average exposure rates during 1999 are consistent with those from the pre-operational program and the previous five years of operation (Figure 3.1). In particular, the pre-operational survey indicates that exposure rates ranged between 11 and 33 mrem/standard quarter with an average of 20 mrem/standard quarter. The range indicated during the previous five years of operation was 7 to 21 mrem/standard quarter with an average exposure rate of 13 mrem/standard quarter.

3.2 Airborne Exposure Pathway Analyses

3.2.1 Airborne Particulate

Gross beta activity was analyzed and results indicate that activity was detected in all 130 samples with a range of 0.006 pCi/m³ (APC-1: 04/12-04/26) to 0.039 pCi/m³ (APP-1, APE-30: 11/08-11/22). The average gross beta activity for the indicator locations was 0.019 pCi/m³ compared to 0.020 pCi/m³ at the control location.

Gross beta activity for the indicator locations during the fourth quarter was 47% higher than the previous three quarters. The gross beta activity for the control location during the fourth quarter was 41% higher than the previous three quarters. In all, the gross beta activity during the fourth quarter was 45% higher than the previous three quarters. Increased activity was caused by fallout from the Japanese nuclear accident. Although fourth quarter activity was higher than the first three quarters of 1999, the airborne gross beta activity results obtained during 1999 are consistent with the results from the pre-operational program and the previous years of operation (Figure 3.2). In the period from 1984 to 1998, the average gross beta activity per year for the indicator locations ranged from 0.003 to 0.128 pCi/m³ with an indicator and control average of 0.019 pCi/m³. Also, the pre-operational survey indicates that in periods not significantly influenced by nuclear weapons testing, the gross beta activity ranged between 0.007 and 0.480 pCi/m³ with an average of 0.080 pCi/m³.

3.2.2 Airborne Iodine

One hundred and thirty (130) air samples were collected from 5 locations and analyzed by gamma spectroscopy for Iodine-131. Results indicate that all measurements were below the calculated LLDs.

3.2.3 Gamma Isotopic

Twenty (20) composite air samples were collected from 5 locations and analyzed for gamma emitters by gamma spectroscopy. Results indicate that all measurements were below the calculated LLDs.

3.3 Waterborne Exposure Pathway Analyses

3.3.1 Drinking/Surface Water

As mentioned previously, drinking water samples also serve as surface water samples for Waterford 3. Therefore, monthly and quarterly gamma spectroscopy and tritium analyses of drinking water also satisfy the surface water sampling requirement.

Thirty-nine (39) composite drinking/surface water samples were collected from 3 locations and analyzed by gamma spectroscopy for Iodine-131. Results indicate that all measurements were below the calculated LLDs.

Gross beta activity was analyzed and results indicate that activity was detected in all twelve composite samples with a range of 2.4 pCi/l (DWE-5: 07/19-09/13) to 5.9 pCi/l (DWP-7: 10/11-12/06) and an average activity of 4.0 pCi/l. The average activity for the control location was 4.5 pCi/l compared to the averages of 3.5 and 3.9 pCi/l for the indicator stations.

Analyses for gross beta in drinking/surface water samples were not performed during the pre-operational survey. However, in order to fulfill comparison requirements, 1999 data were compared to data from 1983 and the previous years of operation. In particular, the period from 1984 to 1998, the average gross beta activity per year for the indicator locations ranged from 1.1 to 60.0 pCi/l with an average of 5.3 pCi/l compared to 4.8 pCi/l at the control location. Similarly, the 1983 survey indicates that in periods not significantly influenced by nuclear weapons testing the gross beta activity ranged between 2.9 and 14.0 pCi/l with an average of 7.0 pCi/l.

Twelve composite drinking/surface water samples were collected from 3 locations and analyzed by gamma spectroscopy for gamma emitters. Results indicate that all measurements were below the calculated LLDs.

Twelve composite drinking/surface water samples were collected from 3 locations and analyzed for tritium. Results indicate that all measurements were below the calculated LLDs.

The pre-operational survey indicates that tritium concentrations in drinking water samples ranged between 70 and 180 pCi/l with an average of 116 pCi/l. Similarly, the range indicated in the previous years of operation was 170 to 545 pCi/l.

3.3.2 Groundwater

Five groundwater samples were collected from one sampling location and analyzed by gamma spectroscopy for tritium and gamma emitters. Results indicate that all measurements were below the calculated LLDs.

Although tritium concentrations in 1999 were below the calculated LLDs, the pre-operational survey indicates that tritium concentration in groundwater samples ranged between 50 and 180 pCi/l with an average of 121 pCi/l. The range indicated in the previous years of operation was 249 to 7224 pCi/l.

3.3.3 Shoreline Sediment

Four shoreline soil samples were collected from two sampling locations and analyzed by gamma spectroscopy for gamma emitters.

Cesium-137, a man-made nuclide, was detected in one sample (SHWK-1, 04-12-99) with a concentration of 84 +/- 23 pCi/kg (dry). No other man-made radionuclides were detected in any of the samples.

The Cesium-137 results obtained during 1999 are consistent with those from the pre-operational program and previous years of operation. In particular, the pre-operational survey indicates that Cesium-137 was detected in 9 of 14 soil samples at concentrations ranging between 30 and 890 pCi/kg(dry) with an average concentration of 164 pCi/kg (dry). Similarly, the range indicated during the previous years of operation was 18 to 142 pCi/kg (dry) with an average activity of 51 pCi/kg (dry). Further, studies in Louisiana indicate that Cesium-137 is commonly found in soils and sediments as a result of atmospheric weapons testing. Because the Cesium-137 levels are consistent with pre-operational values, the Cesium-137 level detected in 1999 is more than likely attributable to weapon testing fallout.

3.4 Ingestion Exposure Pathway Analyses

3.4.1 Milk

Sixteen milk samples were collected from three sampling locations and analyzed by gamma spectroscopy for gamma emitters and Iodine-131. Results indicate that all measurements were below the calculated LLDs.

3.4.2 Fish

Nine fish samples were collected from two locations and the edible portions were analyzed by gamma spectroscopy for gamma emitters. Results indicate that all measurements were below the calculated LLDs.

3.4.3 Broad Leaf Vegetation

Forty-two broad leaf vegetation samples were collected from four locations and analyzed by gamma spectroscopy for gamma emitters and Iodine-131. Results indicate that all measurements were below the calculated LLDs.

3.5 Statistical Analyses

3.5.1 Calculation of the Mean and Standard Deviation

The mean and standard deviation for different groups of analyses are calculated using the following equations:

$$\bar{X} = \sum_{i=1}^n \frac{X_i}{n}$$

and

$$S = \left(\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{(n-1)} \right)^{0.5}$$

where:

$\bar{X}$ = mean of sample population,
 S = standard deviation of sample population,
 n = number of samples in sample population, and
 X_i = value of the i 'th sample.

3.5.2 Comparing Two Sample Population Means

The means of two sample populations are compared for statistical difference using the standard "t" test. The use of the test requires the assumption that the data within the populations are normally distributed and that the true standard deviations of the mean are equal for both populations. The standard "t" test tests the hypothesis that the true means of both populations are equal. The "t" value can be calculated from the equation below (obtained from the CRC Standard Mathematical Tables, 26th Edition (1981)):

$$t = \frac{\bar{X} - \bar{Y}}{\left(\frac{(n_x - 1)s_x^2 + (n_y - 1)s_y^2}{n_x + n_y - 2} \right)^{0.5} \left(\frac{1}{n_x} + \frac{1}{n_y} \right)^{0.5}}$$

where:

t = calculated "t" value,
 $\bar{X}$ = mean of first data set,
 $\bar{Y}$ = mean of second data set,
 n_x = number of variables in first data set,
 s_x = standard deviation of first data set,
 n_y = number of variables in second data set, and
 s_y = standard deviation of second data set.

The calculated "t" value is used to test the hypothesis that the true mean of the first population (m_x) is equal to the true mean of the second population (m_y) assuming that the true standard deviation of both populations are equal ($m_x = m_y$). The calculated "t" value is compared to a tabular "t" value such that:

- a. if $t > t_{\mu, n}$ then reject the hypothesis when $m_x > m_y$,
- b. if $t < -t_{\mu, n}$ then reject the hypothesis when $m_x < m_y$,
- c. if $t > t_{\mu/2, n}$ then reject the hypothesis when $m_x = m_y$,

where $t_{\mu/2, n}$ and $t_{\mu, n}$ are the tabular "t" values, with a preselected error (5%), confidence level $(1 - \mu)$ or $(1 - \mu/2)$, and degrees of freedom $n = n_x + n_y - 2$. Tabular values of the "t" were obtained from the CRC Standard Mathematical Tables, 26th Edition (1981).

3.5.3 TLD Measurements

TLD stations were categorized by distance into three groups: 0-2 miles, 2-5 miles, and > 5 miles from the plant. A statistical analysis using the standard "t" test was performed comparing average exposure rates from 0-2 miles and 2-5 miles to the average exposure rate at > 5 miles. In short, results indicate the average exposure rates 0-2 miles and 2-5 miles from the plant are statistically the same as the average exposure rates > 5 miles from the plant. Table 3.2 summarizes the results of this analysis.

3.5.4 Gross Beta Activity on Air Particulate Filters

The standard "t" test was used to compare average gross beta activity from each indicator station to the average gross beta activity at the control station. The results from this test show the average activity detected at all indicator stations is statistically the same as the average activity detected at the control station. Table 3.3 summarizes the results of this analysis.

3.5.5 Gross Beta Activity in Monthly Drinking Water Composites

The standard "t" test was used to compare average gross beta activity from each indicator station to the average gross beta activity from the control station. The results from this test show average activity detected at the indicator stations are statistically the same as the average activity detected at the control station. Table 3.4 summarizes the results of this analysis.

3.6 Deviations from the REMP

3.6.1 Unavailable Samples

Six milk samples from location MKQ-45 and two milk samples from location MKR-50 were unavailable during the 1999 reporting period. The milk samples from location MKQ-45 were unavailable because the dairy went out of business. The milk samples from location MKR-50 were unavailable due to batch mixing of several sources of milk at the dairy prior to sample collection. Milk samples were not available during the 1999 reporting period from location MKQ-1 since the cows are not currently producing milk for human consumption. (See Table 3.5). With the absence of milk samples at these locations, broad leaf vegetation sampling was performed.

TLDs located at D-2 and K-1 were missing at the time of the quarterly TLD exchange for the first and fourth quarter respectively. The TLDs were in place during the previous monthly inspections.

3.6.2 Lack of Sample Continuity

Six air samples failed to meet the requirement for sample continuity (See Table 3.5).

3.6.3 Missed Lower Limits of Detection

All lower limit of detection requirements was met for 1999.

3.7 Land Use Census

In compliance with the Waterford 3 ODCM and TRM, the land use census is performed biennially. A land use census was not performed in 1999. The results in this report are from the census performed on October 6 and 7, 1998. These results can be found on Table 3.6. The land use census will be performed again in 2000.

TABLE 3.1

1999 DIRECT RADIATION DATA ORGANIZED BY COMPASS DIRECTION AND DISTANCE FROM WATERFORD 3 SES				
BY COMPASS DIRECTION				
SECTOR	COMPASS DIRECTION	AVERAGE DOSE RATE (mrem/std qtr)	STANDARD DEVIATION (mrem/std qtr)	NUMBER IN GROUP
A	N	13	0.99	8
B	NNE	13	1.02	8
C	NE	10	0.53	4
D	ENE	12	1.23	7
E *	E	11	0.69	12
F	ESE	12	0.94	12
G	SE	13	0.69	12
H	SSE	12	0.81	8
J	S	12	0.99	8
K	SSW	13	2.61	3
L	SW	13	1.16	4
M	WSW	12	0.91	4
N	W	14	0.97	4
P	WNW	12	1.11	8
Q	NW	13	1.06	8
R	NNW	11	1.29	8
CONTROL	E	11	1.14	4

BY DISTANCE FROM PLANT			
DISTANCE FROM PLANT (miles)	AVERAGE DOSE RATE (mrem/std qtr)	STANDARD DEVIATION (mrem/std qtr)	NUMBER IN GROUP
0 to 2	12	1.74	62
2 to 5	12	1.72	28
5 *	12	1.39	28
CONTROL	11	1.14	4

* Does not include control station data

TABLE 3.2

STATISTICAL COMPARISON OF 1999 TLD MEASUREMENTS FROM STATIONS GROUPED BY DISTANCE FROM WATERFORD 3 SES			
	Stations Located 0-2 Miles from the Plant	Stations Located 2-5 Miles from the Plant	Stations Located more than 5 Miles from the Plant
Mean (mRem/std.qtr.)	12.26	12.40	11.99
Standard Deviation (mRem/std. qtr.)	1.74	1.72	1.39
Number in Sample	62	28	28
Calculated "t" Value (comparison of stations 0-2 and 2-5 miles from the plant to stations > 5 miles from the plant)	0.73	0.98	NA*
Tabular "t" Value at 95% Confidence($t_{0.025,n}$)	1.991(a)	2.006(a)	NA*

a. Results indicate the mean for stations located 0-2 miles and 2-5 miles from the plant are statistically identical to the mean for stations located more than 5 miles from the plant.

* Not Applicable

TABLE 3.3

STATISTICAL COMPARISON OF 1999 GROSS BETA ACTIVITY MEASUREMENTS ON AIR PARTICULATE FILTERS FROM WATERFORD 3 SES					
SAMPLE STATION	APG-1	APQ-1	APP-1	APC-1	APE-30
Mean (10^{-3}pCi/m³)	18.8	19.4	19.1	17.2	20.1
Standard Deviation (10^{-3}pCi/m³)	5.21	5.16	5.85	5.84	6.01
Number in Sample	26	26	26	26	26
Calculated "t" Value (comparison of the indicator stations to the control station)	0.84	0.44	0.57	1.74	NA*
Tabular "t" Value at 95% Confidence($t_{0.025,n}$)	2.010(a)	2.010(a)	2.010(a)	2.010(a)	NA*

a. Results indicate the mean for the indicator stations is statistically identical to the mean for the control station.

* Not Applicable

TABLE 3.4

STATISTICAL COMPARISON OF 1999 GROSS BETA ACTIVITY MEASUREMENTS IN DRINKING/SURFACE WATER SAMPLES FROM WATERFORD 3 SES			
	DWG-2	DWE-5	DWP-7
Mean (pCi/liter)	3.5	3.9	4.5
Standard Deviation (pCi/liter)	1.1	1.1	1.1
Number in Sample	4	4	4
Calculated "t" Value (comparison of the indicator stations to the control station)	1.28	0.74	NA*
Tabular "t" Value at 95% Confidence($t_{0.025,n}$)	2.447(a)	2.447(a)	NA*

a. Results indicate the mean for the indicator stations is statistically identical to the mean for the control station.

* Not Applicable

TABLE 3.5

SUMMARY OF 1999 REMP DEVIATIONS				
SAMPLE TYPE	ANALYSIS	LOCATION	DATE	EXPLANATION OF DEVIATION
MISSED SAMPLES				
1) Milk	Gamma Isotopic & I-131	MKQ-45	04/99 - 09/99	Sample not available due to dairy going out of business
		MKR-50	11/99 - 12/99	Sample not available due to batch mixing at the dairy
		MKQ-1	01/99 - 12/99	Sample not available due to cows not producing milk for human consumption
2) TLD	Gamma Dose	D-2	01/99 - 04-99	TLDs lost
		K-1	10/99 - 01-00	TLDs lost
LACK OF SAMPLE CONTINUITY				
1) Air	Gross Beta & I-131	APP-1	01-18-99 to 02-01-99	Sample pump tripped
		APC-1	01-18-99 to 02-01-99	Sample pump tripped
		APP-1	02-01-99 to 02-15-99	Flow rate unsatisfactory
		APE-30	08-02-99 to 08-16-99	Sample pump tripped
		APE-30	08-17-99 to 08-30-99	Low volume
		APE-30	08-30-99 to 09-13-99	Low volume
MISSED LLDs				
NONE	N/A*	N/A*	N/A*	N/A*

* Not Applicable

TABLE 3.6
1998 Bi-Annual Land Use Census Results

Sector	Direction	Distance from Plant in Miles					
		Residence	Garden	Milk Cows	Beef Cows	Goats	Food Products
A	N	1.3	1.7	4.6*	4.6	3.5*	4.1
B	NNE	1.1	1.3	^	^	^	1.3
C	NE	0.9	0.9	^	^	^	^
D	ENE	0.9	0.9	^	^	^	^
E	E	2.2	2.2	^	2.3	2.3*	0.3
F	ESE	3.1	2.2	^	2.2	3.5*	0.3
G	SE	4.0	4.1	^	2.4	^	0.3
H	SSE	^	^	^	^	^	0.3
J	S	^	^	^	^	^	0.5
K	SSW	^	^	^	^	^	0.5
L	SW	^	^	^	^	^	0.5
M	WSW	^	1.4	^	1.2	^	0.5
N	W	1.0	1.1	^	1.0	^	0.6
P	WNW	0.9	0.9	^	0.9	0.9*	0.6
Q	NW	0.9	0.9	4.9**	0.9	0.9*	0.6
R	NNW	3.0	3.0	^	4.9	^	2.6

^ Indicates that nothing was found in the Sector within a five mile radius of Waterford 3

* Animals were located at this distance from Waterford 3, but the milk is not currently used for human consumption

** Samples are being obtained from animals at this location (MKQ-5) for the REMP

FIGURE 3.1

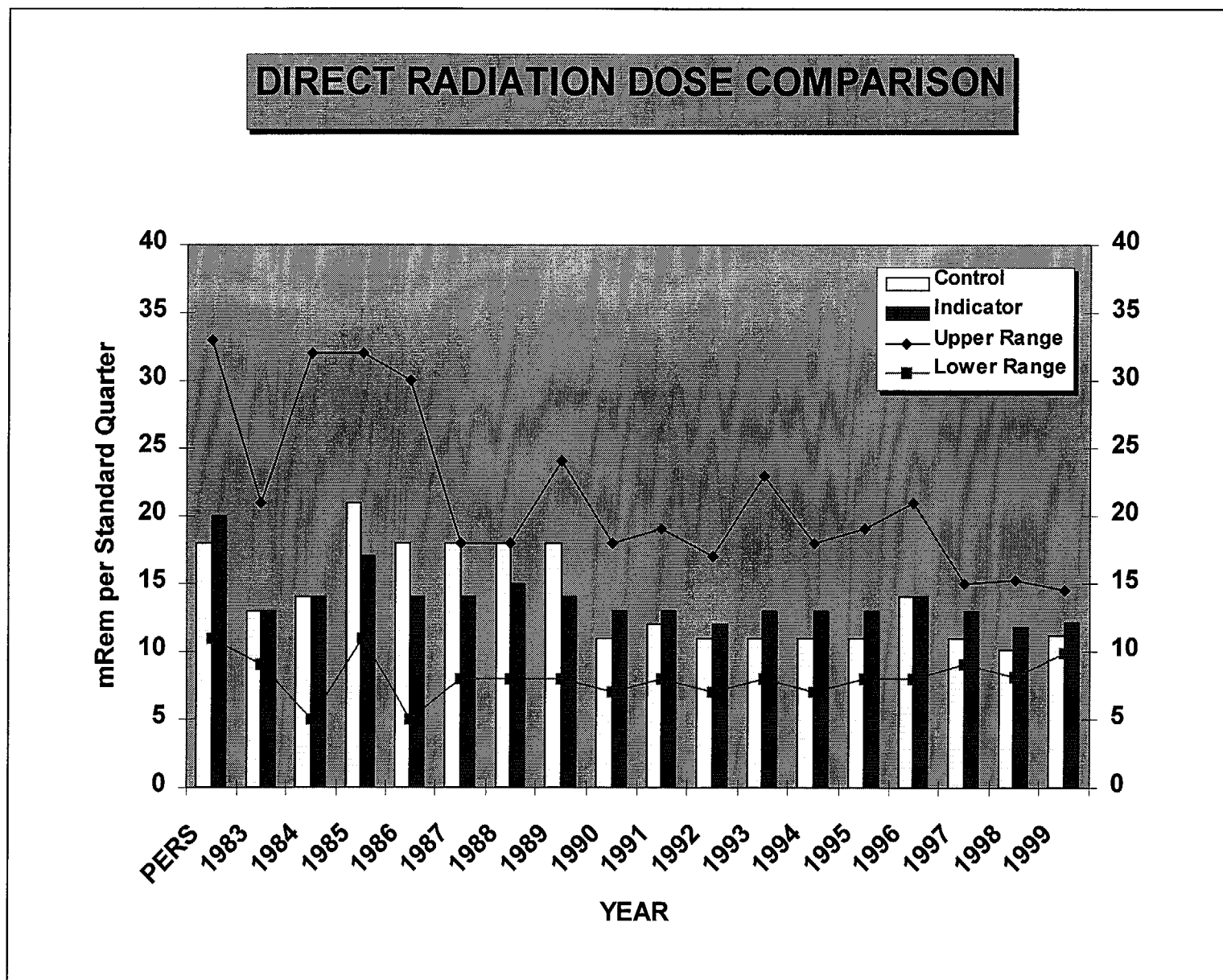


FIGURE 3.2

* Effects from Chernobyl nuclear accident

** Effects from Japanese nuclear accident

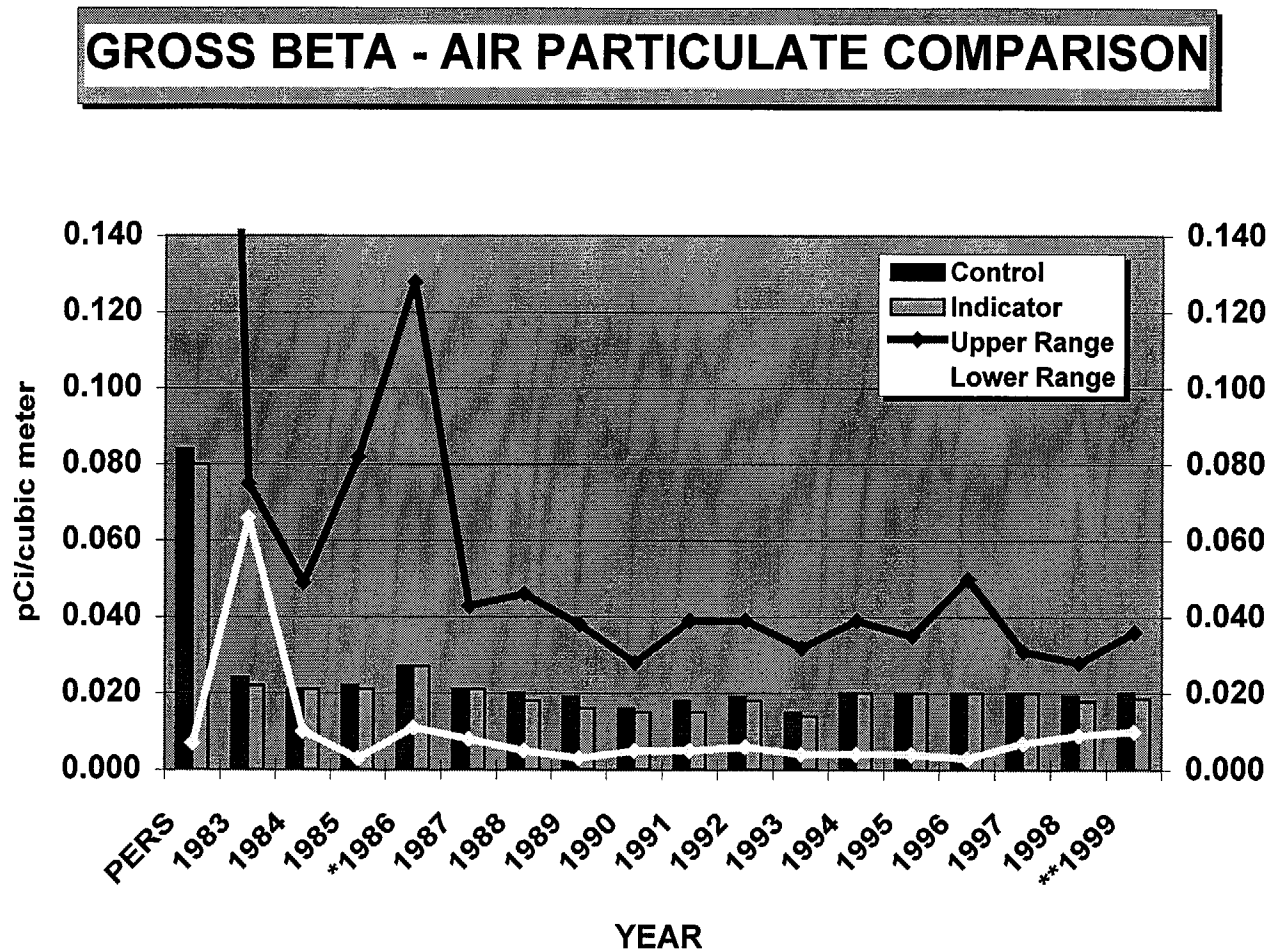
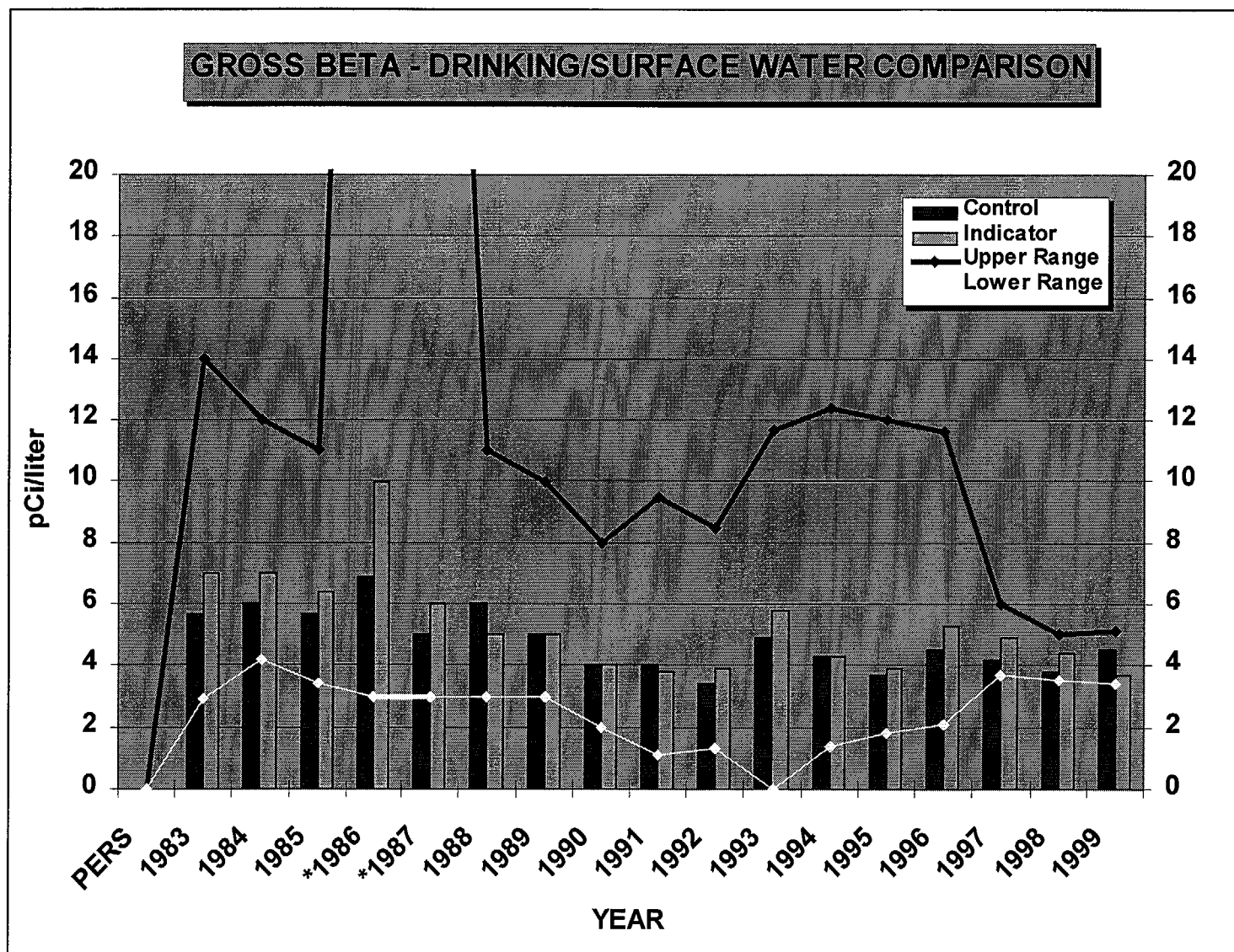


FIGURE 3.3

* Effects from Chernobyl nuclear accident



4.0 CONCLUSIONS

The radiological environmental data collected during 1999 is consistent with the data obtained during the previous years of plant operation (1985-98), the first two years of the REMP prior to Waterford 3 initial criticality (1983-84), and the Pre-Operational Environmental Radiological Surveillance (PERS) Program (1978-82). The only man-made radionuclide detected in the routine environmental samples analyzed during 1999 was Cesium-137.

Cesium-137 was detected in one shoreline soil sample. Studies in Louisiana indicate that Cesium-137 is commonly found in soils and sediments as a result of fallout from nuclear weapons testing. In addition, the detected concentration was consistent with pre-operational levels and the levels detected in the previous years of operation. Further, the concentration detected was lower than the required LLD and well below levels requiring notification.

In conclusion, based on the evaluation of the REMP data collected during 1999 the operation of Waterford 3 had no discernable radiological impact on the environment.

APPENDIX A

REMP DATA SUMMARY

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Waterford 3 SES Docket No. 50-382

Location of Facility: St. Charles, Louisiana
(Parish, State)

Reporting Period: January 1 to December 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES		LOWER LIMIT OF DETECTION ^a PERFORMED	ALL INDICATOR LOCATIONS MEAN ^b (RANGE) ^b (LLD)	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION (RANGE) ^b		CONTROL LOCATION MEAN ^b (RANGE) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
1. Direct Radiation (mrem/Std. qtr.)	TLD	122	(c)	12(118/120) (10-14)	G-2 1.2 miles SE	14(4/4) (12-16)	E-30 11(4/4) (10-13)	0
2. Airborne Particulate (10 ⁻³ pCi/m ³)	Gross Beta	130	10	19(104/104) (10-36)	APQ-1 0.8 miles NW	19(26/26) (8-35)	APE-30 20(26/26) (10-39)	0
	Gamma	20	(d)	<LLD (0/20) (-)	N/A	N/A	APE-30 <LLD(0/4) (-)	0
3. Airborne Iodine (10 ⁻³ pCi/m ³)	I-131	130	70	<LLD (0/104) (-)	N/A	N/A	APE-30 <LLD (0/26)	0

NOTE: Footnotes at end of table.

TABLE A-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Waterford 3 SES Docket No. 50-382

Location of Facility: St. Charles, Louisiana
(Parish, State)

Reporting Period: January 1 to December 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES		LOWER LIMIT OF DETECTION ^a PERFORMED	ALL INDICATOR LOCATIONS MEAN ^b (RANGE) ^b (LLD)	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION (RANGE) ^b		CONTROL LOCATION MEAN ^b (RANGE) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
4. Drinking/ Surface Water (pCi/l)	Gross Beta	12	4	3.7 (8/8) (2.4-5.2)	DWE-5 4.5 miles E	3.9 (4/4) (2.4-5.2)	DWP-7 4.5 (4/4) (2.9-5.9)	0
	I-131	39	1	<LLD (0/26) (-)	N/A	N/A	DWP-7 <LLD(0/13) (-)	0
	Gamma (Cs-137)	12	(d) 18	< LLD (0/8) (-)	N/A	N/A	DWP-7 <LLD(0/4) (-)	0
	Tritium	12	2000	< LLD (0/8) (-)	N/A	N/A	DWP-7 <LLD(0/4) (-)	0

NOTE: Footnotes at end of table.

TABLE A-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Waterford 3 SES Docket No. 50-382

Location of Facility: St. Charles, Louisiana
(Parish, State)

Reporting Period: January 1 to December 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES	LOWER LIMIT OF DETECTION ^a PERFORMED	ALL INDICATOR LOCATIONS MEAN ^b (RANGE) ^b (LLD)	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION (RANGE) ^b	CONTROL LOCATION MEAN ^b (RANGE) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS	
5. Groundwater (pCi/l)	Gamma 5	(d)	<LLD (0/5) (-)	N/A	N/A	NONE	0
	Tritium 5	2000	<LLD (0/5) (-)	N/A	N/A	NONE	0
6. Shoreline Water Sediment (pCi/kg-dry)	Gamma 4 Cs-137	(d) 180	84(1/4) (84)	SHWK-1 0.5 miles SSW	84(1/4) (84)	NONE	0

NOTE: Footnotes at end of table.

TABLE A-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Waterford 3 SES Docket No. 50-382

Location of Facility: St. Charles, Louisiana
(Parish, State)

Reporting Period: January 1 to December 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES		LOWER LIMIT OF DETECTION ^a PERFORMED	ALL INDICATOR LOCATIONS MEAN ^b (RANGE) ^b (LLD)	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION (RANGE) ^b		CONTROL LOCATION MEAN ^b (RANGE) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
7. Milk (pCi/l)	I-131	16	1	<LLD (0/12) (-)	N/A	N/A	MKQ-45 MKR-50 <LLD (0/4) (-)	0
	Gamma Cs-137	16	18	<LLD (0/12) (-)	N/A	N/A	MKQ-45 MKR-50 <LLD (0/4) (-)	0
8. Fish (pCi/kg-wet)	Gamma	9	(d)	<LLD (0/4) (-)	N/A	N/A	FH-1 <LLD (0/5) (-)	0

NOTE: Footnotes at end of table.

TABLE A-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: Waterford 3 SES Docket No. 50-382

Location of Facility: St. Charles, Louisiana
(Parish, State)

Reporting Period: January 1 to December 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES		LOWER LIMIT OF DETECTION ^a PERFORMED	ALL INDICATOR LOCATIONS MEAN ^b (RANGE) ^b (LLD)	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION (RANGE) ^b		CONTROL LOCATION MEAN ^b (RANGE) ^b	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
9. Broad Leaf Vegetation (pCi/kg- wet)	I-131	42	60	<LLD (0/26) (-)	N/A	N/A	BLK-15 BLE-20 <LLD(0/16) (-)	0
	Gamma	42	(d)	<LLD (0/26) (-)	N/A	N/A	BLK-15 BLE-20 <LLD(0/16) (-)	0

NOTE: Footnotes at end of table.

TABLE A-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

FOOTNOTES

^aNominal Lower Limit of Detection (LLD) as defined in the Waterford 3 TRM

^bMean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis. (Range based on annual averages)

^cLower Limit of Detection (LLD) not defined in Waterford 3 TRM

^dLower Limit of Detection (LLD) for individual radionuclides using gamma spectroscopy are given in Waterford 3 TRM

APPENDIX B

REMP DATA

TABLE B-1

QUARTERLY TLD DOSE RATES (mRem / Standard Quarter)								
Location	Compass Direction	Distance	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average	Stdev
A-2	N	1.10	12	14	14	14	13	0.99
A-5	N	4.50	11	13	13	13	12	1.00
B-1	NNE	0.80	12	13	13	14	13	0.79
B-4	NNE	3.80	12	15	15	14	14	1.36
C-1	NE	0.80	9	10	10	10	10	0.53
D-2	ENE	1.10		14	13	13	13	0.19
D-5	ENE	4.20	10	13	12	13	12	1.06
E-1	E	0.20	10	12	10	11	11	0.83
E-5	E	4.20	10	12	11	11	11	0.90
E-15	E	11.80	10	12	11	11	11	0.51
F-2	ESE	1.10	11	13	12	12	12	0.91
F-4	ESE	3.50	14	16	12	11	13	1.88
F-9	ESE	8.20	11	13	10	15	12	1.78
G-2	SE	1.20	14	16	12	15	14	1.48
G-4	SE	3.20	10	12	12	11	11	0.75
G-9	SE	8.10	11	12	15	12	12	1.61
H-2	SSE	1.20	12	14	11	13	12	1.12
H-6	SSE	5.70	11	13	13	12	12	0.96
J-2	S	1.30	11	13	11	12	12	0.80
J-15	S	12.00	11	14	12	14	13	1.22
K-1	SSW	1.00	10	13	16		13	2.61
L-1	SW	1.00	12	15	13	13	13	1.16
M-1	WSW	0.70	11	13	11	12	12	0.91
N-1	W	0.90	13	15	13	14	14	0.97
P-1	WNW	0.80	8	11	13	10	11	1.86
P-6	WNW	5.50	12	14	12	13	13	0.74
Q-1	NW	0.80	11	13	14	12	12	1.33
Q-5	NW	5.00	13	15	9	15	13	2.26
R-1	NNW	0.50	9	12	14	11	11	1.81
R-6	NNW	5.30	10	13	11	11	11	1.07
Indicator MEAN			11	13	12	12	12	1.66
Control (E-30)	E	27.00	10	11	11	13	11	1.14
Control / Indicator MEAN			11	13	12	12	12	1.65

TABLE B-2
AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES
GROSS BETA AND IODINE-131 ANALYSIS
INDICATOR SAMPLE
APG-1

COLLECTION: BI-WEEKLY

UNITS: pCi/m³

Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07	Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07
19990014	12-21-98	01-06-99	0.0244 +/- 0.0016	< 0.013	19991037	09-27-99	10-11-99	0.0166 +/- 0.0015	< 0.020
19990056	01-06-99	01-18-99	0.0171 +/- 0.0017	< 0.016	19991077	10-11-99	10-25-99	0.0272 +/- 0.0019	< 0.017
19990102	01-18-99	02-01-99	0.0182 +/- 0.0015	< 0.047	19991124	10-25-99	11-08-99	0.0223 +/- 0.0018	< 0.018
19990152	02-01-99	02-15-99	0.0165 +/- 0.0015	< 0.016	19991165	11-08-99	11-22-99	0.0343 +/- 0.0021	< 0.015
19990198	02-15-99	03-01-99	0.0176 +/- 0.0016	< 0.012	19991196	11-22-99	12-06-99	0.0255 +/- 0.0019	< 0.017
19990229	03-01-99	03-14-99	0.0174 +/- 0.0016	< 0.018	19991260	12-06-99	12-20-99	0.0229 +/- 0.0018	< 0.014
19990280	03-14-99	03-29-99	0.0196 +/- 0.0015	< 0.015					
19990352	03-29-99	04-12-99	0.0177 +/- 0.0015	< 0.015					
19990397	04-12-99	04-26-99	0.0189 +/- 0.0016	< 0.015					
19990442	04-26-99	05-10-99	0.0149 +/- 0.0014	< 0.014					
19990503	05-10-99	05-24-99	0.0175 +/- 0.0016	< 0.016					
19990549	05-24-99	06-07-99	0.0141 +/- 0.0015	< 0.015					
19990610	06-07-99	06-22-99	0.0118 +/- 0.0013	< 0.016					
19990668	06-22-99	07-06-99	0.0158 +/- 0.0016	< 0.015					
19990717	07-06-99	07-19-99	0.0113 +/- 0.0014	< 0.015					
19990759	07-19-99	08-02-99	0.0103 +/- 0.0013	< 0.018					
19990800	08-02-99	08-16-99	0.0197 +/- 0.0016	< 0.013					
19990848	08-16-99	08-30-99	0.0173 +/- 0.0015	< 0.011					
19990886	08-30-99	09-13-99	0.0150 +/- 0.0014	< 0.015					
19990954	09-13-99	09-27-99	0.0242 +/- 0.0018	< 0.017					

TABLE B-2 (continued)

**AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES
GROSS BETA AND IODINE-131 ANALYSIS
INDICATOR SAMPLE**

APQ-1

COLLECTION: BI-WEEKLY

UNITS: pCi/m³

Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07	Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07
19990015	12-21-98	01-06-99	0.0276 +/- 0.0018	< 0.015	19991038	09-27-99	10-11-99	0.0142 +/- 0.0013	< 0.013
19990057	01-06-99	01-18-99	0.0200 +/- 0.0019	< 0.016	19991078	10-11-99	10-25-99	0.0244 +/- 0.0016	< 0.016
19990103	01-18-99	02-01-99	0.0193 +/- 0.0017	< 0.018	19991125	10-25-99	11-08-99	0.0231 +/- 0.0016	< 0.016
19990153	02-01-99	02-15-99	0.0193 +/- 0.0017	< 0.013	19991166	11-08-99	11-22-99	0.0354 +/- 0.0019	< 0.012
19990199	02-15-99	03-01-99	0.0180 +/- 0.0016	< 0.016	19991197	11-22-99	12-06-99	0.0250 +/- 0.0017	< 0.016
19990230	03-01-99	03-14-99	0.0179 +/- 0.0016	< 0.014	19991261	12-06-99	12-20-99	0.0193 +/- 0.0015	< 0.013
19990281	03-14-99	03-29-99	0.0199 +/- 0.0015	< 0.014					
19990353	03-29-99	04-12-99	0.0203 +/- 0.0016	< 0.014					
19990398	04-12-99	04-26-99	0.0171 +/- 0.0015	< 0.016					
19990443	04-26-99	05-10-99	0.0175 +/- 0.0015	< 0.014					
19990504	05-10-99	05-24-99	0.0180 +/- 0.0016	< 0.015					
19990550	05-24-99	06-07-99	0.0166 +/- 0.0015	< 0.013					
19990611	06-07-99	06-22-99	0.0142 +/- 0.0013	< 0.016					
19990669	06-22-99	07-06-99	0.0160 +/- 0.0015	< 0.015					
19990718	07-06-99	07-19-99	0.0109 +/- 0.0013	< 0.015					
19990760	07-19-99	08-02-99	0.0084 +/- 0.0011	< 0.012					
19990801	08-02-99	08-16-99	0.0204 +/- 0.0015	< 0.012					
19990949	08-16-99	08-30-99	0.0215 +/- 0.0016	< 0.014					
19990887	08-30-99	09-13-99	0.0179 +/- 0.0015	< 0.015					
19990955	09-13-99	09-27-99	0.0222 +/- 0.0016	< 0.018					

TABLE B-2 (continued)

AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES
GROSS BETA AND IODINE-131 ANALYSIS
INDICATOR SAMPLE

APP-1

COLLECTION: BI-WEEKLY

UNITS: pCi/m³

Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07	Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07
19990016	12-21-98	01-06-99	0.0223 +/- 0.0014	< 0.015	19991039	09-27-99	10-11-99	0.0175 +/- 0.0014	< 0.015
19990058	01-06-99	01-18-99	0.0179 +/- 0.0016	< 0.012	19991079	10-11-99	10-25-99	0.0264 +/- 0.0017	< 0.014
* 19990104	01-18-99	02-01-99	0.0194 +/- 0.0056	< 0.067	19991126	10-25-99	11-08-99	0.0249 +/- 0.0017	< 0.019
19990154	02-01-99	02-15-99	0.0159 +/- 0.0015	< 0.014	19991167	11-08-99	11-22-99	0.0387 +/- 0.0020	< 0.015
19990200	02-15-99	03-01-99	0.0164 +/- 0.0014	< 0.013	19991198	11-22-99	12-06-99	0.0274 +/- 0.0017	< 0.016
19990231	03-01-99	03-14-99	0.0172 +/- 0.0015	< 0.010	19991262	12-06-99	12-20-99	0.0222 +/- 0.0016	< 0.011
19990282	03-14-99	03-29-99	0.0190 +/- 0.0014	< 0.012					
19990354	03-29-99	04-12-99	0.0194 +/- 0.0015	< 0.014					
19990399	04-12-99	04-26-99	0.0165 +/- 0.0014	< 0.016					
19990444	04-26-99	05-10-99	0.0158 +/- 0.0013	< 0.014					
19990505	05-10-99	05-24-99	0.0168 +/- 0.0014	< 0.009					
19990551	05-24-99	06-07-99	0.0160 +/- 0.0014	< 0.010					
19990612	06-07-99	06-22-99	0.0120 +/- 0.0012	< 0.014					
19990670	06-22-99	07-06-99	0.0161 +/- 0.0014	< 0.012					
19990719	07-06-99	07-19-99	0.0111 +/- 0.0013	< 0.012					
19990761	07-19-99	08-02-99	0.0105 +/- 0.0012	< 0.012					
19990802	08-02-99	08-16-99	0.0208 +/- 0.0015	< 0.012					
19990850	08-16-99	08-30-99	0.0186 +/- 0.0014	< 0.011					
19990888	08-30-99	09-13-99	0.0135 +/- 0.0012	< 0.011					
19990956	09-13-99	09-27-99	0.0254 +/- 0.0016	< 0.013					

* low volume

TABLE B-2 (continued)

AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES
GROSS BETA AND IODINE-131 ANALYSIS
INDICATOR SAMPLE

APC-1

COLLECTION: BI-WEEKLY

UNITS: pCi/m³

Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07	Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07
19990017	12-21-98	01-06-99	0.0221 +/- 0.0015	< 0.012	19991040	09-27-99	10-11-99	0.0153 +/- 0.0013	< 0.013
19990059	01-06-99	01-18-99	0.0179 +/- 0.0017	< 0.015	19991080	10-11-99	10-25-99	0.0264 +/- 0.0017	< 0.016
* 19990105	01-18-99	02-01-99	0.0160 +/- 0.0055	< 0.069	19991127	10-25-99	11-08-99	0.0205 +/- 0.0015	< 0.015
19990155	02-01-99	02-15-99	0.0112 +/- 0.0018	< 0.022	19991168	11-08-99	11-22-99	0.0334 +/- 0.0019	< 0.009
19990201	02-15-99	03-01-99	0.0156 +/- 0.0013	< 0.015	19991199	11-22-99	12-06-99	0.0250 +/- 0.0016	< 0.014
19990232	03-01-99	03-14-99	0.0148 +/- 0.0014	< 0.012	19991263	12-06-99	12-20-99	0.0226 +/- 0.0016	< 0.013
19990283	03-14-99	03-29-99	0.0169 +/- 0.0013	< 0.009					
19990355	03-29-99	04-12-99	0.0182 +/- 0.0014	< 0.015					
19990400	04-12-99	04-26-99	0.0055 +/- 0.0010	< 0.013					
19990445	04-26-99	05-10-99	0.0148 +/- 0.0012	< 0.012					
19990506	05-10-99	05-24-99	0.0159 +/- 0.0014	< 0.011					
19990552	05-24-99	06-07-99	0.0154 +/- 0.0013	< 0.012					
19990613	06-07-99	06-22-99	0.0115 +/- 0.0011	< 0.013					
19990671	06-22-99	07-06-99	0.0150 +/- 0.0013	< 0.012					
19990720	07-06-99	07-19-99	0.0102 +/- 0.0012	< 0.013					
19990762	07-19-99	08-02-99	0.0089 +/- 0.0011	< 0.012					
19990803	08-02-99	08-16-99	0.0198 +/- 0.0014	< 0.012					
19990851	08-16-99	08-30-99	0.0179 +/- 0.0014	< 0.014					
19990889	08-30-99	09-13-99	0.0135 +/- 0.0012	< 0.013					
19990957	09-13-99	09-27-99	0.0236 +/- 0.0016	< 0.011					

* low volume

TABLE B-2 (continued)

AIR PARTICULATE FILTERS AND CHARCOAL CARTRIDGES
GROSS BETA AND IODINE-131 ANALYSIS
CONTROL SAMPLE

APE-30

COLLECTION: BI-WEEKLY

UNITS: pCi/m³

Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07	Lab No.	Begin Date	End Date	Gross Beta LLD = 0.01	I-131 LLD = 0.07
19990018	12-21-98	01-06-99	0.0250 +/- 0.0017	< 0.014	19991041	09-27-99	10-11-99	0.0144 +/- 0.0014	< 0.013
19990060	01-06-99	01-18-99	0.0221 +/- 0.0019	< 0.016	19991081	10-11-99	10-25-99	0.0277 +/- 0.0018	< 0.011
19990106	01-18-99	02-01-99	0.0183 +/- 0.0016	< 0.015	19991128	10-25-99	11-08-99	0.0236 +/- 0.0017	< 0.019
19990156	02-01-99	02-15-99	0.0174 +/- 0.0016	< 0.018	19991169	11-08-99	11-22-99	0.0387 +/- 0.0021	< 0.013
19990202	02-15-99	03-01-99	0.0188 +/- 0.0017	< 0.019	19991200	11-22-99	12-06-99	0.0278 +/- 0.0018	< 0.019
19990233	03-01-99	03-14-99	0.0169 +/- 0.0017	< 0.016	19991264	12-06-99	12-20-99	0.0230 +/- 0.0017	< 0.015
19990284	03-14-99	03-29-99	0.0205 +/- 0.0016	< 0.016					
19990356	03-29-99	04-12-99	0.0196 +/- 0.0016	< 0.019					
19990401	04-12-99	04-26-99	0.0167 +/- 0.0016	< 0.016					
19990446	04-26-99	05-10-99	0.0167 +/- 0.0015	< 0.016					
19990507	05-10-99	05-24-99	0.0165 +/- 0.0016	< 0.019					
19990553	05-24-99	06-07-99	0.0162 +/- 0.0016	< 0.012					
19990614	06-07-99	06-22-99	0.0130 +/- 0.0014	< 0.014					
19990672	06-22-99	07-06-99	0.0180 +/- 0.0016	< 0.018					
19990721	07-06-99	07-19-99	0.0125 +/- 0.0015	< 0.016					
19990763	07-19-99	08-02-99	0.0100 +/- 0.0013	< 0.014					
19990804	08-02-99	08-16-99	0.0272 +/- 0.0103	< 0.060					
19990852	08-17-99	08-30-99	0.0203 +/- 0.0024	< 0.031					
19990890	08-30-99	09-13-99	0.0153 +/- 0.0020	< 0.025					
19990958	09-13-99	09-27-99	0.0259 +/- 0.0020	< 0.016					

TABLE B-3
AIR PARTICULATE FILTERS
GAMMA ISOTOPIC ANALYSIS

COLLECTION: QUARTERLY

UNITS: pCi/m³

SAMPLE LOCATION	LAB NO.	BEGIN DATE	END DATE	Cs-134 LLD 0.05	Cs-137 LLD 0.06
APG-1	19990344	01-06-99	03-29-99	< 0.0027	< 0.0021
	19990678	04-12-99	06-22-99	< 0.0020	< 0.0015
	19991014	07-06-99	09-27-99	< 0.0021	< 0.0023
	19991285	10-11-99	12-20-99	< 0.0021	< 0.0020
APQ-1	19990345	01-06-99	03-29-99	< 0.0020	< 0.0019
	19990679	04-12-99	06-22-99	< 0.0021	< 0.0024
	19991015	07-06-99	09-27-99	< 0.0012	< 0.0016
	19991286	10-11-99	12-20-99	< 0.0029	< 0.0023
APR-1	19990346	01-06-99	03-29-99	< 0.0023	< 0.0019
	19990680	04-12-99	06-22-99	< 0.0020	< 0.0024
	19991016	07-06-99	09-27-99	< 0.0017	< 0.0020
	19991287	10-11-99	12-20-99	< 0.0020	< 0.0013
APC-1	19990347	01-06-99	03-29-99	< 0.0025	< 0.0017
	19990681	04-12-99	06-22-99	< 0.0013	< 0.0006
	19991017	07-06-99	09-27-99	< 0.0017	< 0.0014
	19991288	10-11-99	12-20-99	< 0.0021	< 0.0008
APL-30	19990348	01-06-99	03-29-99	< 0.0019	< 0.0019
	19990682	04-12-99	06-22-99	< 0.0023	< 0.0027
	19991018	07-06-99	09-27-99	< 0.0032	< 0.0018
	19991289	10-11-99	12-20-99	< 0.0021	< 0.0022

TABLE B-4

DRINKING/SURFACE WATER IODINE-131 ANALYSIS

INDICATOR SAMPLE

DWG/SWG-2

COLLECTION: EVERY FOUR WEEKS

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	I-131* LLD = 1
19990020	12-07-98	01-06-99	<0.89
19990108	01-06-99	02-01-99	<0.72
19990204	02-01-99	03-01-99	<0.90
19990286	03-01-99	03-29-99	<0.82
19990403	03-29-99	04-26-99	<0.89
19990509	04-26-99	05-24-99	<0.83
19990616	05-24-99	06-22-99	<0.81
19990723	06-22-99	07-19-99	<0.90
19990806	07-19-99	08-16-99	<0.89
19990892	08-16-99	09-13-99	<0.80
19991043	09-13-99	10-11-99	<0.87
19991130	10-11-99	11-08-99	<0.89
19991202	11-08-99	12-06-99	<0.84

*Low Level Analysis

TABLE B-4 (continued)

DRINKING/SURFACE WATER IODINE-131 ANALYSIS

INDICATOR SAMPLE

DWE WE-5

COLLECTION: EVERY FOUR WEEKS

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	I-131* LLD = 1
19990021	12-07-98	01-06-99	<0.89
19990109	01-06-99	02-01-99	<0.88
19990205	02-01-99	03-01-99	<0.90
19990286	03-01-99	03-29-99	<0.90
19990404	03-29-99	04-26-99	<0.78
19990510	04-26-99	05-24-99	<0.76
19990617	05-24-99	06-22-99	<0.88
19990724	06-22-99	07-19-99	<0.71
19990807	07-19-99	08-16-99	<0.83
19990893	08-16-99	09-13-99	<0.87
19991044	09-13-99	10-11-99	<0.90
19991131	10-11-99	11-08-99	<0.89
19991203	11-08-99	12-06-99	<0.84

*Low Level Analysis

TABLE B-4 (continued)

DRINKING/SURFACE WATER IODINE-131 ANALYSIS

CONTROL SAMPLE

DWP WP-7

COLLECTION: EVERY FOUR WEEKS

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	I-131* LLD = 1
19990019	12-07-98	01-06-99	<0.86
19990107	01-06-99	02-01-99	<0.89
19990203	02-01-99	03-01-99	<0.90
19990285	03-01-99	03-29-99	<0.85
19990402	03-29-99	04-26-99	<0.89
19990508	04-26-99	05-24-99	<0.86
19990615	05-24-99	06-22-99	<0.83
19990722	06-22-99	07-19-99	<0.90
19990805	07-19-99	08-16-99	<0.85
19990891	08-16-99	09-13-99	<0.82
19991042	09-13-99	10-11-99	<0.89
19991129	10-11-99	11-08-99	<0.88
19991201	11-08-99	12-06-99	<0.89

* Low Level Analysis

TABLE B-5
DRINKING/SURFACE WATER GROSS BETA ANALYSIS

INDICATOR SAMPLE

DWG WG-2

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	BETA LLD = 4
19990293	01-06-99	03-29-99	2.42 +/- 2.04
19990620	05-24-99	06-22-99	2.49 +/- 2.24
19990896	07-19-99	09-13-99	4.10 +/- 1.12
19991206	10-11-99	12-06-99	4.94 +/- 2.26

* Low level analysis

TABLE B-5 (continued)

DRINKING/SURFACE WATER GROSS BETA ANALYSIS

INDICATOR SAMPLE

DWE SWE-5

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	BETA LLD = 4
19990294	01-06-99	03-29-99	5.22 +/- 2.22
19990621	05-24-99	06-22-99	3.49 +/- 2.27
19990897	07-19-99	09-13-99	2.36 +/- 1.01
19991207	10-11-99	12-06-99	4.52 +/- 2.15

* Low level analysis

TABLE B-5 (continued)

DRINKING/SURFACE WATER GROSS BETA ANALYSIS

CONTROL SAMPLE

DWP/SWP-7

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	BETA LLD = 4
19990289	01-06-99	03-29-99	2.85 +/- 2.01
19990619	05-24-99	06-22-99	4.26 +/- 2.33
19990895	07-19-99	09-13-99	4.91 +/- 1.01
19991205	10-11-99	12-06-99	5.86 +/- 2.26

* Low level analysis

TABLE B-6

DRINKING/SURFACE WATER GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

DWG-2

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	Mn-54 LLD=15	Co-58 LLD=15	Fe-59 LLD=30	Co-60 LLD=15	Zn-65 LLD=30	Nb-95 LLD=15	Zr-95 LLD=30	Cs-134 LLD=15	Cs-137 LLD=18	Ba-140 LLD=60	La-140 LLD=15
19990293	01-06-99	03-29-99	<2.17	<1.98	<4.33	<2.31	<4.55	<2.29	<3.93	<2.32	<2.28	<9.01	<2.95
19990620	04-26-99	06-22-99	<4.20	<3.66	<7.70	<6.07	<5.93	<3.58	<6.46	<3.74	<3.44	<13.6	<5.19
19990896	07-19-99	09-13-99	<5.66	<5.31	<10.9	<4.35	<5.87	<4.41	<7.09	<5.69	<5.50	<19.8	<3.41
19991206	10-11-99	12-06-99	<4.81	<4.67	<11.7	<3.82	<7.90	<4.26	<5.68	<5.20	<4.94	<21.4	<10.7

TABLE B-6 (continued)

DRINKING/SURFACE WATER GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

DWE/WE-5

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	Mn-54 LLD=15	Co-58 LLD=15	Fe-59 LLD=30	Co-60 LLD=15	Zn-65 LLD=30	Nb-95 LLD=15	Zr-95 LLD=30	Cs-134 LLD=15	Cs-137 LLD=18	Ba-140 LLD=60	La-140 LLD=15
19990294	01-06-99	03-29-99	<3.80	<4.12	<5.91	<4.53	<8.68	<5.19	<5.68	<3.39	<4.33	<12.0	<7.54
19990621	04-26-99	06-22-99	<2.84	<2.38	<5.81	<3.28	<6.81	<3.17	<4.94	<3.37	<2.73	<11.7	<3.51
19990897	07-19-99	09-13-99	<4.61	<4.02	<10.7	<3.69	<11.4	<4.36	<8.72	<5.81	<6.07	<20.2	<7.59
19991207	10-11-99	12-06-99	<3.41	<3.89	<9.08	<4.45	<10.1	<4.56	<7.80	<5.12	<4.28	<22.1	<8.28

TABLE B-6 (continued)

DRINKING/SURFACE WATER GAMMA ISOTOPIC ANALYSIS

CONTROL SAMPLE

~~DWP~~ WP-7

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	BEGIN DATE	END DATE	Mn-54 LLD=15	Co-58 LLD=15	Fe-59 LLD=30	Co-60 LLD=15	Zn-65 LLD=30	Nb-95 LLD=15	Zr-95 LLD=30	Cs-134 LLD=15	Cs-137 LLD=18	Ba-140 LLD=60	La-140 LLD=15
19990289	01-06-99	03-29-99	<2.66	<2.21	<5.35	<2.79	<4.28	<2.38	<4.55	<2.33	<2.54	<9.24	<3.14
19990619	04-26-99	06-22-99	<2.94	<3.35	<5.39	<3.07	<5.08	<4.37	<5.74	<3.63	<2.96	<14.1	<2.88
19990895	07-19-99	09-13-99	<4.52	<4.07	<8.58	<2.66	<8.03	<4.60	<6.31	<4.41	<4.37	<18.9	<7.53
19991205	10-11-99	12-06-99	<2.04	<3.37	<6.83	<4.20	<6.62	<3.98	<6.66	<4.32	<4.20	<17.8	<8.10

TABLE B-7

DRINKING/SURFACE WATER TRITIUM ANALYSIS

COLLECTION: QUARTERLY

UNITS: pCi/liter

SAMPLE LOCATION	LAB NO.	BEGIN DATE	END DATE	H-3 LLD=2000
DWG WG-2	19990293	01-06-99	03-29-99	<487.77
	19990620	04-26-99	06-22-99	<492.60
	19990896	07-19-99	09-13-99	<522.00
	19991206	10-11-99	12-06-99	<522.00
DWE WE-5	19990294	01-06-99	03-29-99	<486.44
	19990621	04-26-99	06-22-99	<494.09
	19990897	07-19-99	09-13-99	<520.51
	19991207	10-11-99	12-06-99	<539.84
DWP WP-7	19990289	01-06-99	03-29-99	<487.28
	19990619	04-26-99	06-22-99	<493.98
	19990895	07-19-99	09-13-99	<527.00
	19991205	10-11-99	12-06-99	<540.06

TABLE B-8
GROUND WATER
TRITIUM AND GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

GW K-1

COLLECTION: QUARTERLY

UNITS: pCi/liter

LAB NO.	COLLECTION DATE	H-3 LLD=2000	Mn-54 LLD=15	Co-58 LLD=15	Fe-59 LLD=30	Co-60 LLD=15	Zn-65 LLD=30	Nb-95 LLD=15	Zr-95 LLD=30	Cs-134 LLD=15	Cs-137 LLD=18	Ba-140 LLD=60	La-140 LLD=15
19990061	01-18-99		< 4.87	< 5.47	< 11.6	< 4.44	< 14.6	< 5.89	< 9.65	< 5.84	< 5.97	< 25.3	< 8.37
19990062	01-18-99	< 470.56											
19990063 *	01-18-99		< 5.70	< 4.27	< 8.07	< 6.29	< 8.78	< 5.58	< 7.24	< 6.12	< 5.00	< 16.0	< 4.59
19990064 *	01-18-99	< 471.53											
19990357	04-12-99		< 5.37	< 3.93	< 9.26	< 5.12	< 6.19	< 5.28	< 6.69	< 6.70	< 4.24	< 18.5	< 7.53
19990358	04-12-99	< 482.48											
19990673	07-06-99		< 5.98	< 5.67	< 11.3	< 6.83	< 11.3	< 7.77	< 6.46	< 6.10	< 5.30	< 27.4	< 8.33
19990674	07-06-99	< 481.96											
19991062	10-18-99		< 6.11	< 5.61	< 5.96	< 5.35	< 11.7	< 4.31	< 7.49	< 4.96	< 4.06	< 19.1	< 6.09
19991062	10-18-99	< 529.00											

* Duplicate

TABLE B-9
SHORELINE SOIL
GAMMA ISOTOPIC ANALYSIS
INDICATOR SAMPLES

SHWK-1 SHWE-3

COLLECTION: SEMI-ANNUAL

UNITS: pCi/kg

SAMPLE LOCATION	LAB NO.	COLLECTION DATE	Mn-54	Co-58	Co-60	Cs-134 LLD=150	Cs-137 LLD=180
SHWK-1	19990359	04-12-99	<47.8	<45.5	<50.9	<46.1	84.2 +/- 23.0
	19991063	10-18-99	<32.7	<25.9	<28.8	<28.6	<36.6
SHWE-3	19990360	04-12-99	<42.2	<36.3	<38.2	<40.3	<48.1
	19991064	10-18-99	<44.5	<34.1	<35.6	<40.8	<54.9

TABLE B-10

**MILK
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS**

INDICATOR SAMPLE

MK Q-5

COLLECTION: MONTHLY WHEN ANIMALS ARE ON PASTORE

UNITS: pCi/liter

LAB NO.	COLLECTION DATE	I-131* LLD= 1	Cs-134 LLD= 15	Cs-137 LLD= 18	Ba-140 LLD= 60	La-140 LLD= 15
19990065	01-19-99	<0.89	<6.62	<4.74	<22.0	<9.91
19990148	02-17-99	<0.72	<6.79	<8.23	<22.9	<8.84
19990234	03-15-99	<0.83	<7.52	<6.88	<22.7	<8.97
19990376	04-20-99	<0.88	<6.94	<8.25	<18.9	<8.38
19990467	05-18-99	<0.61	<5.13	<5.16	<18.1	<5.09
19990564	06-14-99	<0.89	<6.69	<6.12	<19.1	<6.80
19990726	07-20-99	<0.87	<7.56	<7.04	<23.6	<6.75
19990799	08-17-99	<0.70	<7.83	<9.07	<22.9	<1.90
19990918	09-21-99	<0.63	<6.46	<6.29	<25.4	<7.17
19991065	10-19-99	<0.62	<8.39	<6.79	<26.3	<6.58
19991146	11-16-99	<0.77	<6.14	<5.92	<24.1	<6.93
19991265	12-21-99	<0.83	<8.37	<7.27	<26.6	<8.34

* Low Level Analysis

TABLE B-10 (continued)

MILK
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS
CONTROL SAMPLE

MK-45

COLLECTION: MONTHLY WHEN ANIMALS ARE ON PASTORE

UNITS: pCi/liter

LAB NO.	COLLECTION DATE	I-131* LLD= 1	Cs-134 LLD= 15	Cs-137 LLD= 18	Ba-140 LLD= 60	La-140 LLD= 15
19990066	01-19-99	<0.74	<6.93	<7.18	<18.2	<4.88
19990149	02-16-99	<0.87	<7.63	<7.60	<23.5	<10.4
19990236	03-16-99	<0.68	<8.53	<10.7	<21.5	<10.9
No Sample	04-20-99	n/a	n/a	n/a	n/a	n/a
No Sample	05-18-99	n/a	n/a	n/a	n/a	n/a
No Sample	06-14-99	n/a	n/a	n/a	n/a	n/a
No Sample	07-20-99	n/a	n/a	n/a	n/a	n/a
No Sample	08-17-99	n/a	n/a	n/a	n/a	n/a
No Sample	09-21-99	n/a	n/a	n/a	n/a	n/a

* Low Level Analysis

TABLE B-10 (continued)

MILK
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS

CONTROL SAMPLE

MKR-50

COLLECTION: MONTHLY WHEN ANIMALS ARE ON PASTORE

UNITS: pCi/liter

LAB NO.	COLLECTION DATE	I-131* LLD= 1	Cs-134 LLD= 15	Cs-137 LLD= 18	Ba-140 LLD= 60	La-140 LLD= 15
19991066	10-18-99	<0.80	<5.94	<5.43	<22.6	<8.77
No Sample	11-16-99	n/a	n/a	n/a	n/a	n/a
No Sample	12-21-99	n/a	n/a	n/a	n/a	n/a

* Low Level Analysis

TABLE B-11
FISH
GAMMA ISOTOPIC ANALYSIS
CONTROL SAMPLE

FI-1

COLLECTION: ANNUAL

UNITS: pCi/kg (dry)

SPECIES	LAB NO.	COLLECTION DATE	Mn-54 LLD=130	Co-58 LLD=130	Fe-59 LLD=260	Co-60 LLD=130	Zn-65 LLD=260	Cs-134 LLD=130	Cs-137 LLD=150
Buffalo	19991093	10-14-99	<26.7	<23.1	<63.6	<26.9	<85.6	<11.8	<20.4
Carp	19991096	10-14-99	<29.3	<26.2	<59.2	<36.4	<61.0	<25.1	<24.7
Catfish	19991092	10-14-99	<38.5	<26.9	<110.0	<41.6	<83.4	<28.8	<33.0
Shad	19991095	10-14-99	<49.2	<45.9	<158.0	<65.6	<132.0	<44.1	<52.2
Mullet	19991094	10-14-99	<29.0	<25.1	<78.1	<33.2	<77.5	<36.4	<29.4

TABLE B-11 (continued)

FISH
GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

FI-2

COLLECTION: ANNUAL

UNITS: pCi/kg (dry)

SPECIES	LAB NO.	COLLECTION DATE	Mn-54 LLD=130	Co-58 LLD=130	Fe-59 LLD=260	Co-60 LLD=130	Zn-65 LLD=260	Cs-134 LLD=130	Cs-137 LLD=150
Buffalo	19991148	11-05-99	<13.6	<8.93	<32.1	<15.1	<33.6	<13.9	<9.75
Carp	19991150	11-05-99	<15.4	<22.7	<32.2	<19.9	<38.4	<16.9	<18.9
Catfish	19991147	11-05-99	<14.8	<13.0	<36.6	<19.2	<32.3	<12.2	<11.8
Mullet	19991149	11-05-99	<19.2	<17.1	<42.0	<16.2	<31.7	<11.9	<11.2

TABLE B-12
BROAD LEAF VEGETATION
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

BLQ-1

COLLECTION: MONTHLY

UNITS: pCi/kg (wet)

LAB NO.	COLLECTION DATE	I-131 LLD= 60 (pCi/kg wet)	CS-134 LLD= 60 (pCi/kg wet)	CS-137 LLD= 80 (pCi/kg wet)
19990047	01-11-99	<57.5	<42.4	<56.6
19990130	02-08-99	<45.9	<58.4	<37.1
19990226	03-09-99	<51.2	<46.4	<52.9
19990316	04-05-99	<53.5	<49.3	<51.3
19990427	05-03-99	<48.3	<46.9	<47.8
19990535	06-01-99	<59.7	<53.4	<53.7
19990636	06-28-99	<48.3	<58.9	<59.6
19990747	07-26-99	<52.6	<39.8	<33.6
19990841	08-23-99	<57.6	<52.7	<64.5
19990919	09-20-99	<59.4	<47.3	<46.5
19991058	10-18-99	<59.9	<57.0	<55.2
19991151	11-15-99	<59.7	<53.1	<51.4
19991250	12-13-99	<54.2	<53.1	<55.7

TABLE B-12 (continued)
BROAD LEAF VEGETATION
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS

INDICATOR SAMPLE

BLB-1

COLLECTION: MONTHLY

UNITS: pCi/kg (wet)

LAB NO.	COLLECTION DATE	I-131 LLD= 60 (pCi/kg wet)	CS-134 LLD= 60 (pCi/kg wet)	CS-137 LLD= 80 (pCi/kg wet)
19990048	01-11-99	<57.6	<54.6	<35.8
19990131	02-08-99	<37.0	<39.0	<63.3
19990227	03-09-99	<58.3	<55.7	<50.4
19990317	04-05-99	<59.3	<51.2	<48.6
19990428	05-03-99	<57.7	<42.7	<30.6
19990536	06-01-99	<52.1	<58.7	<43.7
19990637	06-28-99	<59.8	<41.6	<49.0
19990748	07-26-99	<59.7	<42.1	<55.4
19990842	08-23-99	<59.1	<55.4	<45.3
19990920	09-20-99	<46.0	<49.4	<51.3
19991059	10-18-99	<58.5	<57.8	<60.0
19991152	11-15-99	<57.2	<33.6	<52.4
19991251	12-13-99	<48.1	<57.3	<53.7

TABLE B-12 (continued)
BROAD LEAF VEGETATION
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS

CONTROL SAMPLE

BLK-15

COLLECTION: MONTHLY

UNITS: pCi/kg (wet)

LAB NO.	COLLECTION DATE	I-131 LLD= 60 (pCi/kg wet)	CS-134 LLD= 60 (pCi/kg wet)	CS-137 LLD= 80 (pCi/kg wet)
19990049	01-11-99	<43.0	<47.5	<43.7
19990132	02-08-99	<54.1	<31.9	<34.6
19990228	03-09-99	<42.3	<47.8	<40.4
19990318	04-05-99	<59.4	<50.3	<53.5
19990429	05-03-99	<58.5	<49.3	<67.2
19990537	06-01-99	<54.9	<41.7	<46.5
19990638	06-28-99	<46.7	<53.6	<35.2
19990749	07-26-99	<54.1	<37.9	<57.2
19990843	08-23-99	<59.8	<50.0	<51.7
19990921	09-20-99	<51.6	<58.2	<53.5
19991060	10-18-99	<46.3	<51.7	<40.4
19991153	11-15-99	<53.0	<57.5	<76.6
19991252	12-13-99	<38.7	<39.9	<32.6

TABLE B-12 (continued)
BROAD LEAF VEGETATION
IODINE-131 AND GAMMA ISOTOPIC ANALYSIS

CONTROL SAMPLE

BLE-20

COLLECTION: MONTHLY

UNITS: pCi/kg (wet)

LAB NO.	COLLECTION DATE	I-131 LLD= 60 (pCi/kg wet)	CS-134 LLD= 60 (pCi/kg wet)	CS-137 LLD= 80 (pCi/kg wet)
19991061	10-18-99	<58.1	<53.9	<51.0
19991154	11-15-99	<55.4	<52.3	<46.1
19991253	12-13-99	<47.8	<35.1	<33.6