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RBG-47563
RBF1-15-0067

Subject: Annual Radiological Environmental Operating Report for 2014
River Bend Station – Unit 1
License No. NPF-47
Docket No. 50-458

Dear Sir or Madam,

Enclosed is the River Bend Station (RBS) Annual Radiological Environmental Operating Report for 2014 for the period January 1, 2014 through December 31, 2014. This report is submitted in accordance with the RBS Technical Specifications, Section 5.6.2

Should you have any questions regarding the enclosed, please contact Mr. Joseph Clark, at (225) 381-4177.

Sincerely,

A handwritten signature in black ink, appearing to be "JAC", written over a horizontal line.

JAC/tjb
enclosure

IE25
NRR

Annual Radioactive Effluent Release Report for 2015 RBG-47563
Page 2 of 2

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RIVER BEND STATION

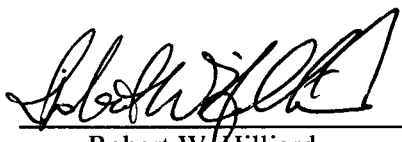
**ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT FOR 2014**

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Summary

The Annual Radiological Environmental Operating Report presents data obtained through analyses of environmental samples collected for the River Bend Station (RBS) Radiological Environmental Monitoring Program (REMP) for the period January 1, 2014 through December 31, 2014. This report fulfills a requirement specified in RBS Technical Requirements Manual (TRM) 5.6.2 as required by Technical Specification 5.6.2 of Appendix A to RBS License Number NPF-47. During 2014, REMP results remained at background levels, as has been the case in previous years.

All required lower limit of detection (LLD) capabilities were achieved in all sample analyses during 2014, as required by the RBS Technical Requirement Manual (TRM). No measurable levels of radiation above baseline levels attributable to River Bend Station operation were detected in the vicinity of RBS. The 2014 Radiological Environmental Monitoring Program thus substantiated the adequacy of source control and effluent monitoring at River Bend Station with no observed impact of plant operations on the environment.

Radiological Environmental Monitoring Program

RBS established the REMP prior to the station's becoming operational (1985) to provide data on background radiation and radioactivity normally present in the area. RBS has continued to monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring direct radiation. RBS also samples milk if milk-producing animals used for human consumption are present within five miles (8 km) of the plant.

The REMP includes sampling indicator and control locations within an approximate 20-mile radius of the plant. The REMP utilizes indicator locations near the site to show any increases or buildup of radioactivity that might occur due to station operation and control locations farther away from the site to indicate the presence of only naturally occurring radioactivity. RBS personnel compare indicator results with control and preoperational results to assess any impact RBS operation might have had on the surrounding environment.

In 2014, environmental samples were collected for radiological analysis. The results of indicator locations were compared with control locations and previous studies. It was concluded that no significant relationship exists between RBS operation and effect on the area around the plant. The review of 2014 data showed radioactivity levels in the environment were undetectable in many locations and near background levels in significant pathways.

Harmful Effects or Irreversible Damage

The REMP monitoring did not detect any harmful effects or evidence of irreversible damage in 2014. Therefore, no analysis or planned course of action to alleviate problems was necessary.

Reporting Levels

River Bend Station reviews indicate that no REMP sample equaled or exceeded reporting levels for radioactivity concentration in environmental samples, as outlined in RBS Technical Requirements Manual Table 3.12.1-2, when averaged over any calendar quarter. Therefore, 2014 results did not require any Radiological Monitoring Program Special Reports.

Radioactivity Not Attributable to RBS

The RBS REMP has detected radioactivity attributable to other sources not associated with the operation of RBS. These instances are summarized as follows:

- ◆ In 2011, I-131 was detected in a control vegetation sample, and indicator and control air sample media, which was credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake.
- ◆ In 1986, following the radioactive plume release due to reactor core degradation at the Chernobyl Nuclear Power Plant, RBS REMP detected I-131 in water, vegetation, and air samples.
- ◆ I-131 was also detected during 1998 in the wastewater treatment plant effluent, which was attributed to the medical treatment of a RBS employee.
- ◆ In 2006, Cs-137 was detected in upstream and downstream Mississippi River sediment samples. This activity was not present in the 2014 samples.

Comparison to Federal and State Programs

RBS personnel compared REMP data to federal and state monitoring programs as results became available. Historically, the programs used for comparison have included the U.S. Nuclear Regulatory Commission (NRC) TLD (Thermoluminescent Dosimeter) Direct Radiation Monitoring Network and the Louisiana Department of Environmental Quality – Office of Environmental Compliance (LDEQ-OEC).

The NRC TLD Network Program was discontinued in 1998. Historically these results have compared to those from the RBS REMP. RBS TLD results continue to remain similar to the historical average and continue to verify that plant operation is not affecting the ambient radiation levels in the environment.

The LDEQ-OEC and the RBS REMP entail similar radiological environmental monitoring program elements. These programs include co-located air samplers, and similar locations for sample media such as water, fish and food products. Both programs have obtained similar results over previous years.

Sample Deviations

◆ Milk

The REMP did not include milk sampling within five miles (8 km) of RBS in 2014 due to unavailability of milk-producing animals used for human consumption. The RBS Technical Requirements Manual requires collection of milk samples if available commercially within 8 km (5 miles) of the plant. RBS personnel collected vegetation samples to monitor the ingestion pathway, as specified in RBS Technical Requirements Manual Table 3.12.1-1, because of milk unavailability.

◆ Sampling Deviations

Listed below are sampling deviations that occurred during 2014. No LLD values were exceeded in the air sampling deviations. As described in footnote (a) to RBS Technical Requirements Manual Table 3.12.1-1, deviations are permitted from the required sampling schedule due to malfunction of equipment or other legitimate reasons.

Station	Sampling Period	Problem Description	Comment
AN1	02/25/14 to 03/11/14	Power Outage	Air sampler location AN1 air sampler timer was short 97.7 hours. (CR-RBS-2014-1188)
AP1	05/20/14 to 06/03/14	Equipment Failure	Air sample pump motor failed. (CR-RBS-2014-2733)

◆ Missed Samples

There were no missed samples in 2014.

◆ Unavailable Results

The results from one air sample at station AP1 were unavailable due to equipment failure. This deviation is noted above.

Program Modifications

RBS made no modifications to the REMP during the year 2014.

Attachments

Attachments 1 through 7 contain results of air, TLD, water, sediment, fish, food products and special samples collected in 2014. River Bend's REMP TLDs were analyzed by Stanford Dosimetry. The Teledyne Brown Engineering Environmental Laboratory analyzed all remaining

samples. Attachment 8 contains Teledyne Brown Engineering's participation in the Interlaboratory Comparison Program during the year 2014.

1. Introduction

1.1. Radiological Environmental Monitoring Program

River Bend Station established the REMP to ensure that plant operating controls properly function to minimize any associated radiation endangerment to human health or the environment. The REMP is designed for the following:

- Analyzing important pathways for anticipated types and quantities of radionuclides released into the environment.
- Considering the possibility of a buildup of long-lived radionuclides in the environment and identifying physical and biological accumulations that may contribute to human exposures.
- Considering the potential radiation exposure to plant and animal life in the environment surrounding RBS.
- Correlating levels of radiation and radioactivity in the environment with radioactive releases from station operation.

1.2. Pathways Monitored

The airborne, direct radiation, waterborne and ingestion pathways, as seen in Figure 1-1, are monitored as required by the RBS Technical Requirements Manual 3.12.1. A description of the RBS REMP sample locations utilized to monitor exposure pathways are described in Table 1.1 and shown in Figures 1-2 and 1-3. RBS may occasionally supplement this program with additional sampling in order to provide a comprehensive and well-balanced program.

Section 2.0 of this report provides a discussion of 2014 sampling results with Section 3.0 providing a summary of results for the monitored exposure pathways.

1.3. Land Use Census

RBS personnel conduct a land use census biannually as required by RBS Technical Requirements Manual 3.12.2. The land use census was performed in 2014. Section 2.8 of this report contains a narrative on the results of the 2014 land use census.

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Airborne	<u>Radioiodine and Particulates</u> 2 samples from close to the 2 SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground level D/Q.	AN1 (0.9 km W) - RBS site Hwy 965; 0.4 km south of Activity Center. AP1 (0.9 km WNW) – Behind River Bend Station Activity Center.	Continuous sampler operation with sample collection every two weeks, or more frequently if required by dust loading.	Radioiodine Canisters – I-131 analysis every two weeks. Air Particulate – Gross beta radioactivity analysis following filter change.
	<u>Radioiodine and Particulates</u> 1 sample from the vicinity of a community having the highest calculated annual average ground level D/Q.	AQS2 (5.8 km NW) - St. Francis Substation on US Hwy. (Bus.) 61 in St. Francisville.		
	<u>Radioiodine and Particulates</u> 1 sample from a control location, as for example 15 - 30 km distance and in the least prevalent wind direction.	AGC (17.0 km SE) – Entergy Service Center compound in Zachary. (Control)		
Direct Radiation	<u>TLDs</u> One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.	TA1 (1.7 km N) - River Bend Training Center. TB1 (0.5 km NNE) - Utility pole near River Bend Station cooling tower yard area. TC1 (1.7 km NE) - Telephone pole at Jct. US Hwy. 61 and Old Highway 61.	Quarterly	mR exposure quarterly.

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<u>TLDs</u> One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.	<p>TD1 (1.6 km ENE) – Stub pole along WF7, 150m S of Jct. WF7 and US Hwy. 61.</p> <p>TE1 (1.3 km E) – Stub pole along WF7, 1 km S of Jct. WF7 and US Hwy. 61.</p> <p>TF1 (1.3 km ESE) – Stub pole along WF7, 1.6 km S of Jct. WF7 and US Hwy. 61.</p> <p>TG1 (1.6 km SE) – Stub pole along WF7, 2 km S of Jct. WF7 and US Hwy. 61.</p> <p>TH1 (1.7 km SSE) – Stub pole at power line crossing of WF7 (near Grants Bayou).</p> <p>TJ1 (1.5 km S) – Stub pole near River Bend Station Gate #23 on Powell Station Road (LA Hwy. 965).</p> <p>TK1 (0.9 km SSW) – Utility pole on Powell Station Road (LA Hwy. 965), 20 m S of River Bend Station River Access Road.</p> <p>TL1 (1.0 km SW) – First utility pole on Powell Station Road (LA Hwy. 965) S of former Illinois Central Gulf RR crossing.</p>	Quarterly	mR exposure quarterly.

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<p><u>TLDs</u> One ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY.</p>	<p>TM1 (0.9 km WSW) - Third utility pole on Powell Station Road (LA Hwy. 965) N of former Illinois Central Gulf RR crossing.</p> <p>TN1 (0.9 km W) – Utility pole along Powell Station Road (LA Hwy. 965), near garden and AN1 air sampler location.</p> <p>TP1 (0.9 km WNW) - Behind River Bend Station Activity Center at AP1 air sampler location.</p> <p>TQ1 (0.6 km NW) – Across from MA-1 on RBS North Access Road.</p> <p>TR1 (0.8 km NNW) – River Bend Station North Access Road across from Main Plant entrance.</p>	Quarterly	mR exposure quarterly.
	<p><u>TLDs</u> The balance of the stations (8) to be placed in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control locations.</p>	<p>TAC (15.8 km N) – Utility pole at Jct. of US Hwy. 61 and LA Hwy. 421, 7.9 km north of Bains. (Control)</p> <p>TCS (12.3 km NE) – Utility pole at gate to East Louisiana State Hospital in Jackson. (Special)</p> <p>TEC (16.0 km E) – Stub pole at jct. of Hwy. 955 and Greenbrier Road, 4.8 km North of Jct. of Hwys 955 and 964. (Control)</p>		

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Direct Radiation	<p><u>TLDs</u> The balance of the stations (8) to be placed in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control locations.</p>	<p>TGS (17.0 km SE) – Entergy Service Center compound in Zachary. (Special)</p> <p>TNS (6.0 km W) – Utility pole with electrical meter at west bank ferry landing (LA Hwy. 10). (Special)</p> <p>TQS1 (4.0 km NW) – Utility pole front of Pentecostal church (opposite West Feliciana Parish Hospital) near Jct. US Hwy. 61 and Commerce Street. (Special)</p> <p>TQS2 (5.8 km NW) – St. Francis Substation on business US Hwy. 61 in St. Francisville. (Special)</p> <p>TRS (9.2 km NNW) - Stub pole at Jct. of US Hwy. 61 and WF2 near Bains (West Feliciana High School). (Special)</p>	Quarterly	mR exposure quarterly.
Waterborne	<p><u>Surface Water</u> 1 sample upstream and 1 sample downstream.</p>	<p>SWU (5.0 km W) - Mississippi River about 4 km upstream from the plant liquid discharge outfall, near LA Hwy. 10 ferry crossing.</p> <p>SWD (7.75 km S) - Mississippi River about 4 km downstream from plant liquid discharge outfall, near paper mill.</p>	Grab samples quarterly	Gamma isotopic analysis, and tritium analysis quarterly.

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Waterborne	<u>Groundwater</u> Samples from 1 or 2 sources only if likely to be affected.	WU (~470 m NNE) - Upland Terrace Aquifer well upgradient from plant. WD (~470 m SW) – Upland Terrace Aquifer well downgradient from plant.	Semiannually	Gamma isotopic and tritium analysis semiannually.
	<u>Sediment From Shoreline</u> 1 sample from downstream area with existing or potential recreational value.	SEDD (7.75 km S) – Mississippi River about 4 km downstream from plant liquid discharge outfall, near paper mill.	Annually	Gamma isotopic analysis annually.
Ingestion	<u>Milk</u> If commercially available, 1 sample from milking animals within 8 km distant where doses are calculated to be greater than 1 mrem per year. 1 sample from milking animals at a control location 15 – 30 km distant when an indicator location exists.	Currently, no available milking animals within 8 km of RBS.	Quarterly when animals are on pasture.	Gamma isotopic and I-131 analysis quarterly when animals are on pasture.
	<u>Fish and Invertebrates</u> 1 sample of a commercially and/or recreationally important species in vicinity of plant discharge area. 1 sample of similar species in area not influenced by plant discharge.	FD (7.75 km S) - One sample of a commercially and/or recreationally important species from downstream area influenced by plant discharge. FU (4.0 km WSW) - One sample of a commercially and/or recreationally important species from upstream area not influenced by plant discharge.	Annually	Gamma isotopic analysis on edible portions annually

Table 1.1
Radiological Environmental Sampling Program

Exposure Pathway	Requirement	Sample Point Description, Distance and Direction	Sampling and Collection Frequency	Type and Frequency Of Analyses
Ingestion	<p><u>Food Products</u> 1 sample of one type of broadleaf vegetation grown near the SITE BOUNDARY location of highest predicted annual average ground level D/Q if milk sampling is not performed.</p> <p>1 sample of similar broadleaf vegetation grown 15 – 30 km distant, if milk sampling is not performed.</p>	<p>GN1 (0.9 km W) – Sampling will be performed in accordance with Table 3.12.1-1 Section 4.a of the Technical Requirements Manual.</p> <p>GQC (32.0 km NW) - One sample of similar vegetables from LA State Penitentiary at Angola. (Control)</p>	Quarterly during the growing season.	Gamma isotopic and I-131 analysis quarterly.

Figure 1-1
Exposure Pathways

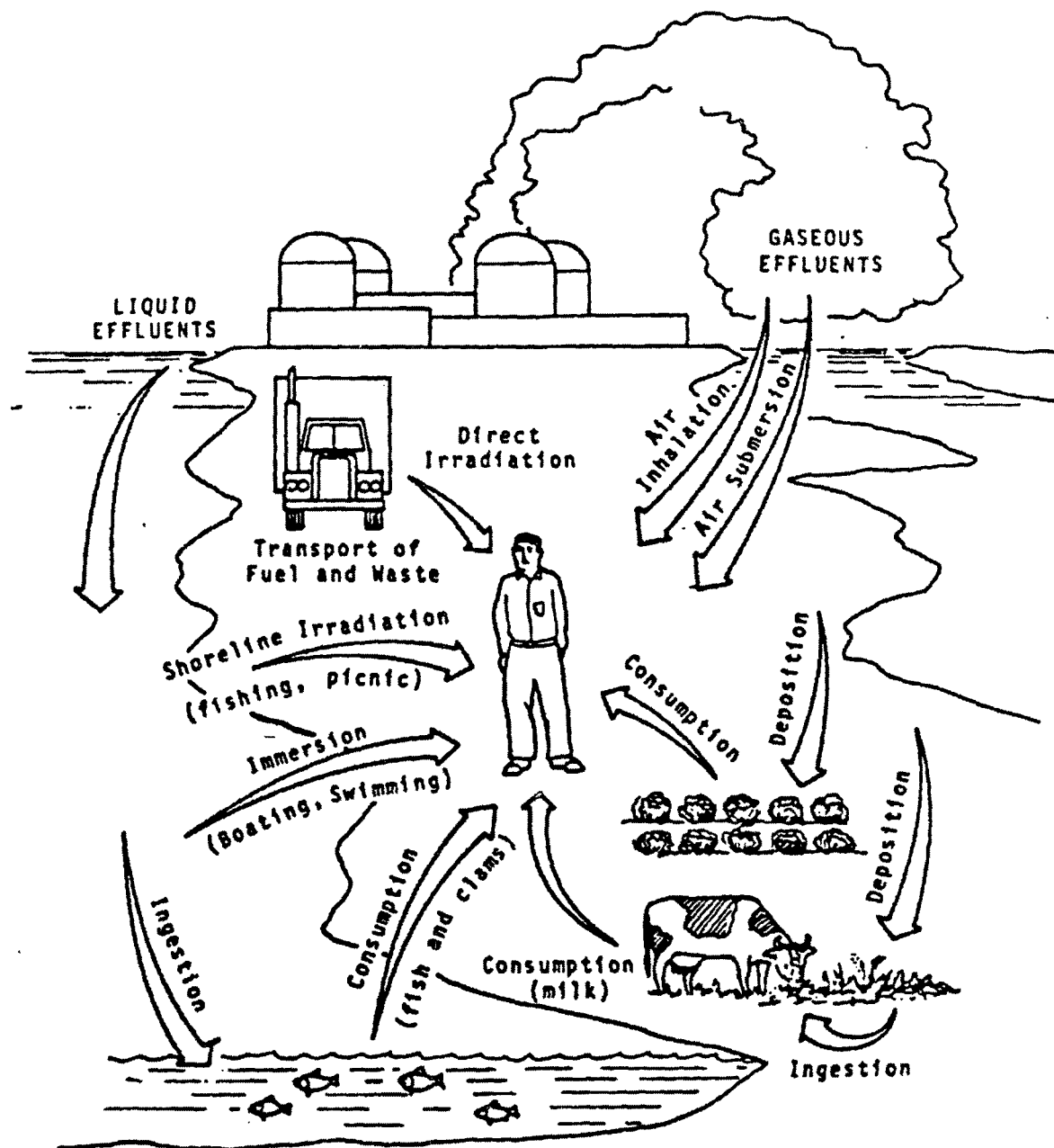


Figure 1-2
Sample Collection Sites – Near Field

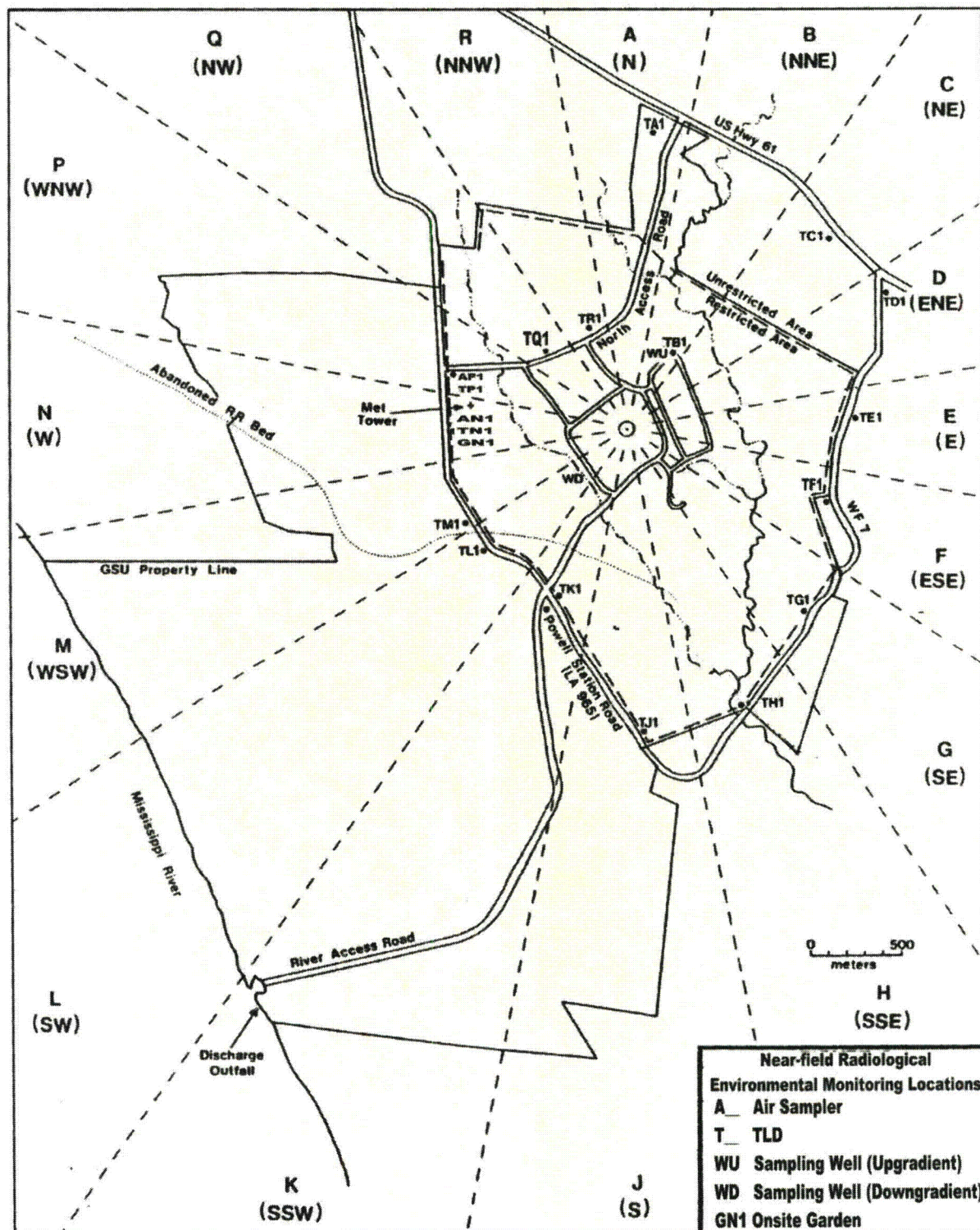
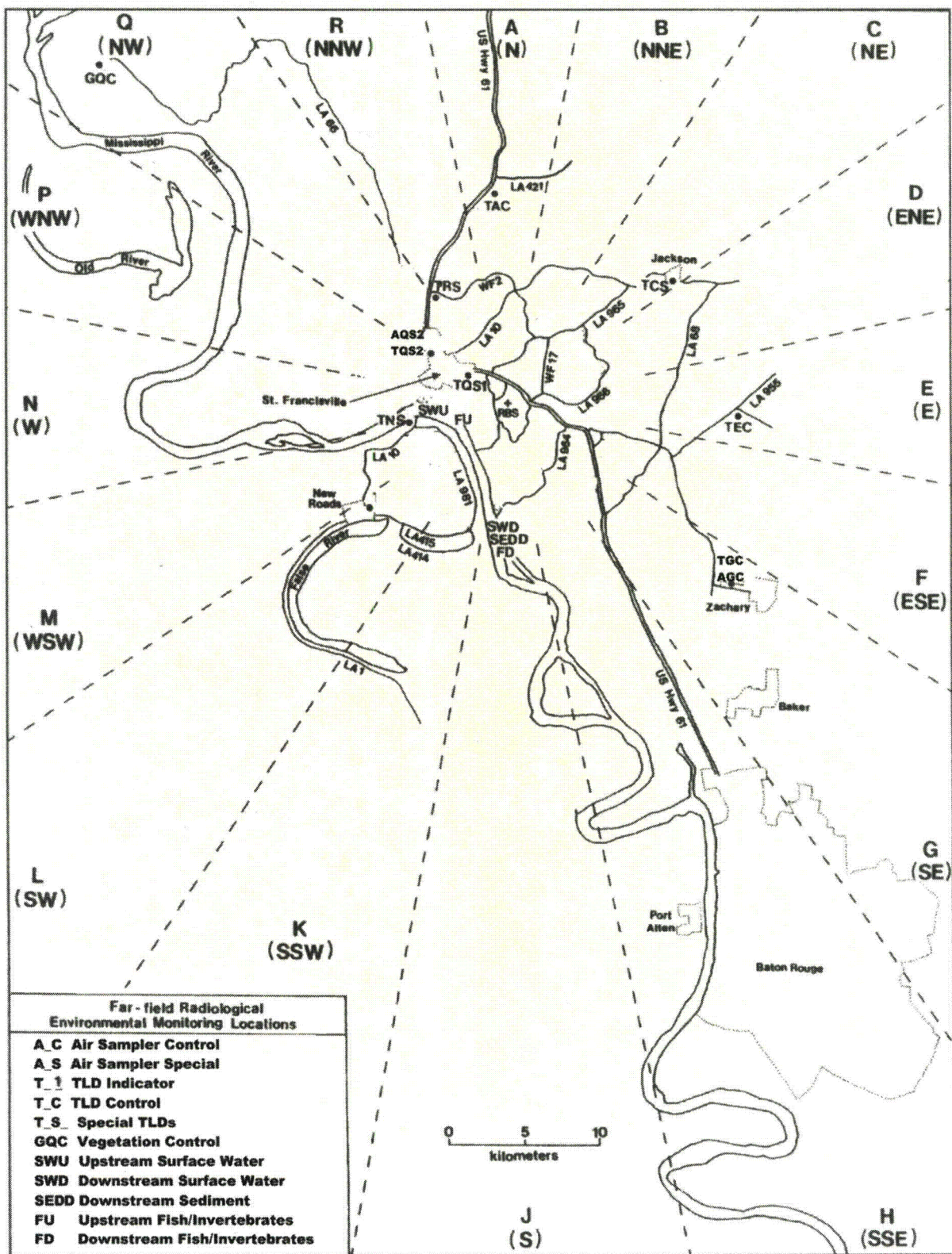


Figure 1-3
Sample Collection Sites – Far Field



2. Interpretation and Trends of Results

Table 3.1 provides a comparison of the indicator and control location mean values for the 2014 data, and indicates that the environment around the plant is unaffected by plant operations.

2.1. Air Particulate and Radioiodine Sample Results

Iodine-131 attributable to RBS was not detected in the radioiodine cartridges during 2014 as has been the case in previous years. Indicator gross beta air particulate results for 2014 were similar to preoperational and operational levels as seen below. Results are reported as annual average pCi/m³ (picocuries per cubic meter). (Attachment 1.1)

<u>Monitoring Period</u>	<u>Result</u>
Preoperational	0.030
2014	0.019
2013	0.019
2012	0.025
2011	0.026
2010	0.024
2009	0.023
2008	0.023

2.2. Thermoluminescent Dosimetry Sample Results

Gamma radiation exposure in the reporting period compares to previous years. Figure 2-1 compares quarterly indicator results for 2014 with control location data from 1986 to 2014. All indicator results were within three-sigma of the control data.

RBS normalizes measured exposure to 90 days and relies on comparison of the indicator locations to the control as a measure of plant impact. RBS's comparison of the indicator and special interest area TLD results to the controls, as seen in Table 3.1, indicates that the ambient radiation levels are unaffected by plant operations. Therefore, levels continue to remain at or near background. (Attachment 2.1)

2.3. Water Sample Results

Analytical results for 2014 surface water and groundwater samples were similar to those reported in previous years.

Surface water samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides and tritium. Gamma radionuclides were below detectable limits at the indicator and control locations. Tritium was also below detectable limits at all locations. Listed below is a comparison of 2014 results from the indicator location as compared to the preoperational and previous operational years. Results are reported as annual average pCi/l (picocuries per liter). (Attachment 3.1)

<u>Radionuclide</u>	<u>2014</u>	<u>2003 – 2013</u>	<u>Preoperational</u>
Gammas	<LLD	<LLD	<LLD
Tritium	<LLD	<LLD	<LLD

Groundwater samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides and tritium. Gamma radionuclides and tritium were below detectable limits at the indicator and control locations. Listed below is a comparison of 2014 results from the indicator location as compared to the preoperational and previous operational years. Results are reported as annual average pCi/l. (Attachment 4.1)

<u>Radionuclide</u>	<u>2014</u>	<u>2003 – 2013</u>	<u>Preoperational</u>
Gammas	<LLD	<LLD	<LLD
Tritium	<LLD	<LLD	<LLD

Based on these comparisons, the operation of RBS had no impact on this pathway during 2014, and levels of radionuclides monitored for this pathway continue to remain similar to those obtained in operational and preoperational years.

2.4. Shoreline Sediment Sample Results

A shoreline sediment sample was collected from the indicator location in 2014 and analyzed for gamma radionuclides. RBS also samples a non-REMP upstream control sediment sample. A review of historical indicator and upstream sediment samples periodically shows Cs-137. No Cs-137 was indicated on the samples in 2014. Therefore, based on these measurements, RBS operations had no significant radiological impact upon the environment or public via this pathway. (Attachment 5.1)

2.5. Milk Sample Results

The REMF did not include milk sampling within five miles (8 km) of RBS in 2014 due to unavailability of milk-producing animals used for human consumption. The RBS Technical Requirements Manual requires collection of milk samples if available commercially within 8 km (5 miles) of the plant. RBS personnel collected vegetation

samples to monitor the ingestion pathway, as specified in RBS Technical Requirements Manual Table 3.12.1-1, because of milk unavailability.

2.6. Food Product Sample Results

Food product samples were collected when available from two locations (indicator and control) in 2014 and analyzed for gamma radionuclides in accordance with Table TRM 3.12.1-1. The 2014 levels attributable to RBS remained undetectable, which is consistent with previous operational years. Therefore, since levels continue to remain at background, it can be concluded that plant operations is not impacting this pathway. (Attachment 6.1)

2.7. Fish and Invertebrate Sample Results

Fish samples were collected from two locations (indicator and control) and analyzed for gamma radionuclides. In 2014, gamma radionuclides were below detectable limits that were consistent with the preoperational and operational monitoring periods. Therefore, based on these measurements, RBS operations had no significant radiological impact upon the environment or public by this pathway. (Attachment 7.1)

2.8. Land Use Census Results

The Land Use Census was conducted in accordance with procedure ESP-8-051, as required by Technical Requirements Manual (TRM) (TR 3.12.2).

A garden census is not conducted pursuant to the note in the TRM (TLCO 3.12.2) that allows the sampling of broadleaf vegetation in the highest calculated average ground-level D/Q sector near site boundary in lieu of the garden census.

The milk animal census identified no milk animals within 8 km (5 miles) of River Bend site. This information was verified by the County Agents from West Feliciana, East Feliciana, and Pointe Coupee parishes.

No resident census changes were noted, as indicated in Table 2.1.

No locations were identified in 2014 that would yield a calculated dose or dose commitment greater than those contained in the TRM (TR 3.11).

Table 2.1 contains data from the most recently completed Land Use Census.

2.9. Interlaboratory Comparison Results

The purpose of the Interlaboratory Comparison Program (ICP) is to confirm the accuracy of results produced by Teledyne Brown Engineering. Samples of various matrices (i.e. soil, water, vegetation, air filters, and milk) are spiked with known amounts of radioactivity by commercial vendors of this service and by departments within the government. TBE participates in three programs. Two are commercial, Analytics Inc. and Environmental Resource Associates (ERA) and one is a government sponsored program, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP). The DOE's Idaho National Engineering Laboratory administers the MAPEP. All three programs are blind performance evaluation studies in which samples with known activities are sent to TBE for analysis. Once analyzed, TBE submits the results to the respective agency for evaluation. The results of these evaluations are published in TBE's quarterly and annual QA reports.

The 2014 Interlaboratory Comparison Program includes all contractually required matrices and analyses TBE supplies to customers and specifically RBS's Technical Requirements Manual 3.12.3. Attachment 8 contains these results.

In reviewing our environmental inter-laboratory crosscheck programs, we identified 1) duplication of efforts on some matrices and isotopes and 2) that we are performing crosscheck samples on some matrices and isotopes that we do not perform for clients. Since the DOE MAPEP is designed to evaluate the ability of analytical facilities to correctly analyze for radiological constituents representative of those at DOE sites, the needed changes were made to the MAPEP program. Therefore, the following isotopes were removed from the MAPEP program:

Soil – gamma – will be provided by Analytics twice per year, starting in 2015. For 2014, one soil gamma is provided by MAPEP, the 2nd soil gamma is provided by Analytics.

AP – gamma – is currently provided by Analytics.

Water – gamma, H-3, Sr-90, uranium, gross alpha and gross beta currently provided by ERA.

MAPEP evaluates non-reported (NR) analyses as failed if they were reported in the previous series.

For the TBE laboratory, 163 out of 169 analyses performed met the specified acceptance criteria. Six analyses (Ni-63, K-40 and I-131 in water, and two Sr-90s and one Gross Alpha in AP samples) did not meet the specified acceptance criteria for the following reasons:

1. Teledyne Brown Engineering's MAPEP March 2014 Ni-63 in water result of 32.7 ± 1.69 Bq/L was overlooked when reporting the data but would have passed the acceptance range of 23.9 – 44.2 Bq/L.

2. Teledyne Brown Engineering's MAPEP March 2014 K-40 in water result of 1.63 ± 2.49 Bq/L was overlooked when reporting the data but would have passed the false positive test. NCR 14-04
3. Teledyne Brown Engineering's ERA November 2014 I-131 in water result of 15.8 pCi/L was lower than the known value of 20.3 pCi/L, failing below the lower acceptance limit of 16.8. The result was evaluated as failed with a found to known ratio of 0.778. No cause could be found for the slightly low result. All ERA I-131 evaluations since 2004 have been acceptable. NCR 14-08
4. Teledyne Brown Engineering's MAPEP March 2014 Sr-90 in AP result of 0.822 Bq/sample was lower than the known value of 1.18 Bq/sample, failing below the lower acceptance limit of 0.83 Bq/sample. The rerun result was still low, but fell within the lower acceptance range of 0.836. The rerun result was statistically the same number as the original result. No cause could be found for the slightly low results. NCR 14-04
5. Teledyne Brown Engineering's MAPEP September 2014 Sr-90 in AP result of 0.310 Bq/sample was lower than the known value of 0.703 Bq/sample. The gravimetric yield of 117% was very high (we normally see yields of 60% to 70 %) and could account for the low activity. NCR 14-09
6. Teledyne Brown Engineering's MAPEP September 2014 Gr-Alpha in AP result of 0.153 Bq/sample was lower than the known value of 0.53 Bq/sample. The AP sample was counted on the wrong side. The AP was flipped over and recounted with acceptable results. NCR 14-09

Table 2-1
Land Use Census Results
2014

Item #	Sector	Nearest Residence	Range (km)	Nearest Milk Animal	Range (km)	Comment #
1	A (N)	5498 Hwy 61 St.Francisville, LA 70775	1.9	-	-	
2	B (NNE)	4549 Old Hwy 61 St.Francisville, LA 70775	1.4	-	-	
3	C (NE)	4553 Old Hwy 61 St.Francisville, LA 70775	1.5	-	-	
4	D (ENE)	12657 Powell Station Rd. St.Francisville, LA 70775	1.4	-	-	
5	E (E)	4635 Hwy 61 St.Francisville, LA 70775	2.4	-	-	
6	F (ESE)	12019 Fairview Way Jackson, LA 7748	2.6	-	-	
7	G (SE)	3319 Hwy 964 Jackson, LA 70748	3.7	-	-	
8	H (SSE)	11813 Powell Station Rd. St.Francisville, LA 70775	1.7	-	-	
9	J (S)	11649 Powell Station Rd. St.Francisville, LA 70775	1.8	-	-	
10	K (SSW)	8909 Hwy 981 New Roads, LA 70760	6.6	-	-	
11	L (SW)			-	-	1
12	M (WSW)	10933 Cajun 2 Rd. New Roads, LA 70760	5.1	-	-	
13	N (W)			-	-	1
14	P (WNW)	10426 Old Field Rd. St.Francisville, LA 70775	3.7	-	-	
15	Q (NW)	9537 Hwy 965 St.Francisville, LA 70775	1.3	-	-	
16	R (NNW)	9794 Hwy 965 St.Francisville, LA 70775	1.6	-	-	

#	Comment
1	No residence located within 8 km.

FIGURE 2-1
TLD Indicator Results (2014) Versus Control Data (1986-2014)

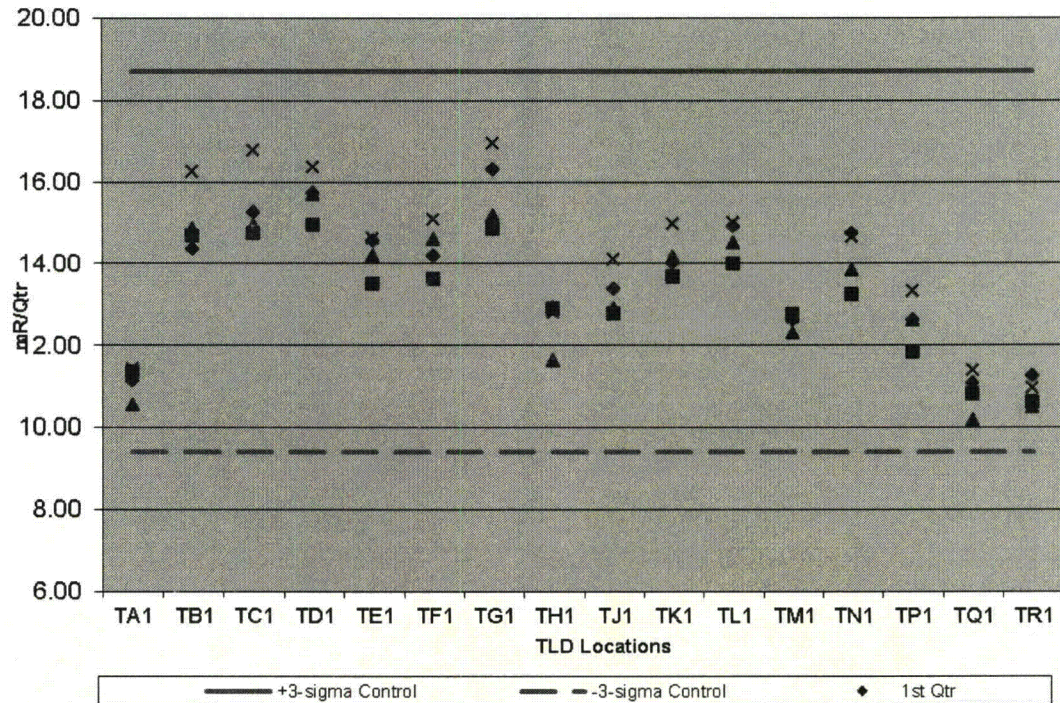
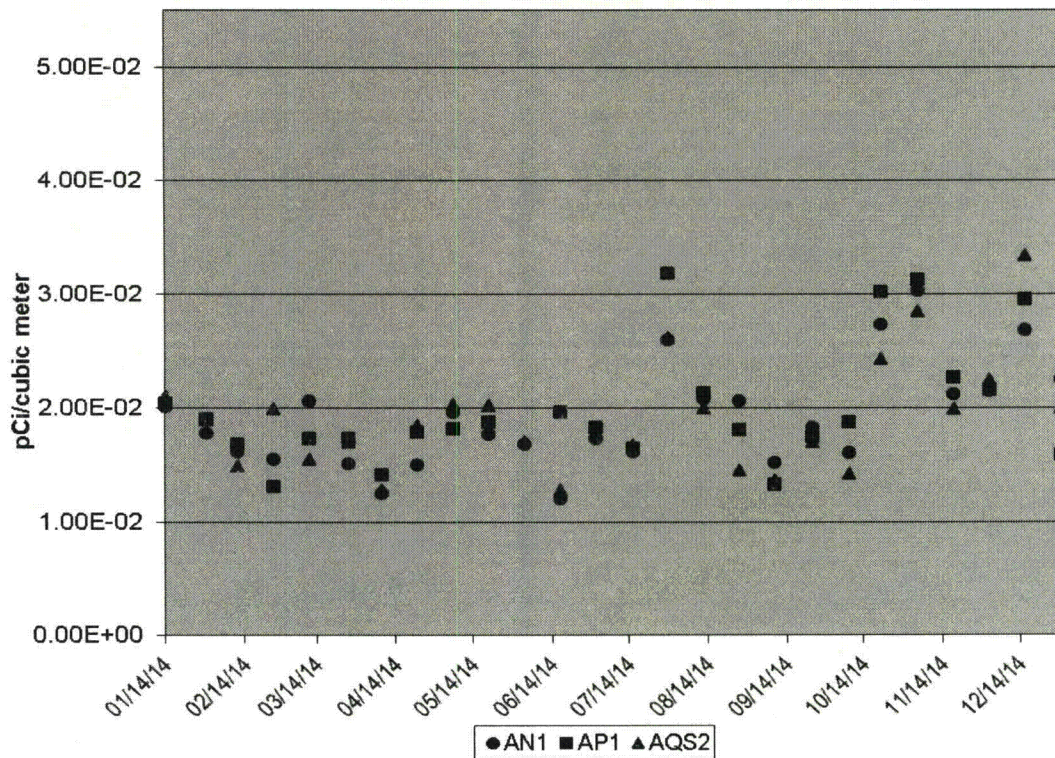


FIGURE 2-2
Gross Beta Indicator Results (2014)



3. Radiological Environmental Monitoring Program Summary

3.1. 2014 Program Results Summary

Table 3.1 summarizes the 2014 REMP results. RBS personnel did not use values reported as less than the lower limit of detection (<LLD) when determining ranges and means for indicator and control locations.

Table 3.1

Environmental Radiological Monitoring Program Summary

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2014 to December 31 2014

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean Name Mean(2) Range(2)		Control Location Mean(2) Range(2)	No. of Reportable Occurrences
Air Particulate (pCi/m ³)	GR-B	103	0.01	0.019 (77/77) (0.012/0.033)	AP1 (0.9 km WNW)	0.020 (25/25) (0.013/0.032)	0.019 (26/26) (0.010/0.031)	0
Air Iodine (pCi/m ³)	I-131	103	0.07	ND(0/77) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/26) (ND-ND)	0
Indicators TLDs (mR/Quarter)	Gamma Dose Quarterly	64	NA	13.6 (64/64) (10.2/16.9)	TG1 (1.6 km SE)	15.8 (4/4) (14.9/16.9)	NA	0
Special Interest TLDs (mR/Quarter)	Gamma Dose Quarterly	24	NA	14.3 (24/24) (12.4/16.7)	TGS (17.0 km SE)	16.0 (4/4) (15.4/16.7)	NA	0
Control TLDs (mR/Quarter)	Gamma Dose Quarterly	8	NA	NA	TAC (15.8 km N)	15.8 (4/4) (15.2/16.6)	15.0 (8/8) (13.4/16.6)	0
Surface Water (pCi/L)	H-3	10	2000	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Mn-54	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Co-58	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Fe-59	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2014 to December 31 2014

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean(2) Range(2)	No. of Reportable Occurrences	
				Name	Mean(2) Range(2)			
Surface Water (cont'd) (pCi/L)	Co-60	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Zn-65	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Nb-95	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Zr-95	10	30	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	I-131	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Cs-134	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Cs-137	10	18	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	Ba-140	10	60	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
	La-140	10	15	ND(0/5) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/5) (ND-ND)	0
Ground Water (pCi/L)	H-3	4	2000	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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 (County/State)

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					Name	Mean(2) Range(2)		
Ground Water (cont'd) (pCi/L)	Mn-54	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Co-58	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Fe-59	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Co-60	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Zn-65	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Nb-95	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Zr-95	4	30	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	I-131	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Cs-134	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Cs-137	4	18	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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					Name	Mean(2) Range(2)		
Shoreline Sediment (pCi/kg,dry)	Ba-140	4	60	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	La-140	4	15	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	Mn-54	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Co-58	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Fe-59	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Co-60	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Zn-65	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Nb-95	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Zr-95	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	I-131	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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 (County/State)

Docket No. 50-458
 Reporting Period January 1 2014 to December 31 2014

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					Name	Mean(2) Range(2)		
Shoreline Sediment (cont'd) (pCi/kg,dry)	Cs-134	2	150	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Cs-137	2	180	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	Ba-140	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
	La-140	2	NA	ND(0/1) (ND)	NA	NA(0/0) (ND)	ND(0/1) (ND)	0
Food Products (pCi/kg,wet)	Mn-54	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Co-58	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Fe-59	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Co-60	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Zn-65	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Nb-95	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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					Name	Mean(2) Range(2)		
Food Products (cont'd) (pCi/kg,wet)	Zr-95	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	I-131	8	60	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Cs-134	8	60	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Cs-137	8	80	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	Ba-140	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	La-140	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
Fish (pCi/kg,wet)	Mn-54	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Co-58	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Fe-59	2	260	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Co-60	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0

TABLE 3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility River Bend Station
 Location of Facility St. Francisville, Louisiana
 (County/State)

Docket No. 50-458
 Reporting Period January 1 2014 to December 31 2014

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	<u>Location with Highest Annual Mean</u>		Control Location Mean(2) Range(2)	No. of Reportable Occurrences
					Name	Mean(2) Range(2)		
Fish (cont'd) (pCi/kg,wet)	Zn-65	2	260	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Nb-95	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Zr-95	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	I-131	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Cs-134	2	130	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Cs-137	2	150	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	Ba-140	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0
	La-140	2	NA	ND(0/1) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/1) (ND)	0

(1) LLD = Required lower limit of detection based on RBS Technical Requirements Manual Table 3.12.1-3.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

(3) ND = Non Detectable.

(4) NA = Not Applicable.

Attachment 1 through 7

Data Tables

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES - INDICATOR LOCATION

LOCATION NUMBER AGC					
COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/31/13	01/14/14	7.93E+02	CU.M	2.48E-02 ± 2.55E-03	L.T. 4.38E-02
01/14/14	01/30/14	8.93E+02	CU.M	1.94E-02 ± 2.08E-03	L.T. 2.69E-02
01/30/14	02/11/14	6.64E+02	CU.M	1.68E-02 ± 2.32E-03	L.T. 3.83E-02
02/11/14	02/25/14	8.41E+02	CU.M	9.53E-03 ± 1.53E-03	L.T. 2.87E-02
02/25/14	03/11/14	7.74E+02	CU.M	1.46E-02 ± 2.25E-03	L.T. 3.72E-02
03/11/14	03/26/14	8.41E+02	CU.M	1.68E-02 ± 1.98E-03	L.T. 1.00E-02
03/26/14	04/08/14	7.04E+02	CU.M	1.43E-02 ± 2.13E-03	L.T. 3.07E-02
04/08/14	04/22/14	7.23E+02	CU.M	1.52E-02 ± 2.07E-03	L.T. 4.69E-02
04/22/14	05/06/14	8.16E+02	CU.M	1.89E-02 ± 2.23E-03	L.T. 3.44E-02
05/06/14	05/20/14	8.10E+02	CU.M	1.94E-02 ± 2.17E-03	L.T. 2.38E-02
05/20/14	06/03/14	8.12E+02	CU.M	1.51E-02 ± 2.01E-03	L.T. 3.22E-02
06/03/14	06/17/14	7.77E+02	CU.M	1.21E-02 ± 1.81E-03	L.T. 2.50E-02
06/17/14	07/01/14	7.46E+02	CU.M	1.81E-02 ± 2.33E-03	L.T. 2.92E-02
07/01/14	07/15/14	7.60E+02	CU.M	1.70E-02 ± 2.09E-03	L.T. 4.33E-02
07/15/14	07/29/14	7.50E+02	CU.M	2.15E-02 ± 2.34E-03	L.T. 1.32E-02
07/29/14	08/12/14	7.55E+02	CU.M	2.09E-02 ± 2.36E-03	L.T. 2.78E-02
08/12/14	08/26/14	7.53E+02	CU.M	1.54E-02 ± 2.96E-03	L.T. 3.13E-02
08/26/14	09/09/14	7.58E+02	CU.M	1.24E-02 ± 1.85E-03	L.T. 3.72E-02
09/09/14	09/24/14	8.13E+02	CU.M	1.59E-02 ± 2.09E-03	L.T. 2.41E-02
09/24/14	10/08/14	7.70E+02	CU.M	1.65E-02 ± 2.43E-03	L.T. 2.56E-02
10/08/14	10/21/14	6.95E+02	CU.M	2.23E-02 ± 4.30E-03	L.T. 4.92E-02
10/21/14	11/04/14	7.22E+02	CU.M	2.84E-02 ± 2.83E-03	L.T. 2.72E-02
11/04/14	11/18/14	6.83E+02	CU.M	2.53E-02 ± 2.72E-03	L.T. 4.97E-02
11/18/14	12/02/14	6.53E+02	CU.M	2.20E-02 ± 2.54E-03	L.T. 3.77E-02
12/02/14	12/16/14	6.28E+02	CU.M	3.12E-02 ± 3.14E-03	L.T. 5.00E-02
12/16/14	12/30/14	6.10E+02	CU.M	2.07E-02 ± 2.64E-03	L.T. 2.08E-02

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES - INDICATOR LOCATION

LOCATION NUMBER AN1					
COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/31/13	01/14/14	8.70E+02	CU.M	2.01E-02 ± 2.22E-03	L.T. 4.00E-02
01/14/14	01/30/14	9.69E+02	CU.M	1.78E-02 ± 1.91E-03	L.T. 2.49E-02
01/30/14	02/11/14	7.32E+02	CU.M	1.62E-02 ± 2.16E-03	L.T. 3.48E-02
02/11/14	02/25/14	9.10E+02	CU.M	1.55E-02 ± 1.81E-03	L.T. 2.65E-02
02/25/14	03/11/14	6.25E+02	CU.M	2.06E-02 ± 2.91E-03	L.T. 4.62E-02
03/11/14	03/26/14	9.78E+02	CU.M	1.51E-02 ± 1.73E-03	L.T. 2.22E-02
03/26/14	04/08/14	8.44E+02	CU.M	1.25E-02 ± 1.81E-03	L.T. 2.56E-02
04/08/14	04/22/14	9.06E+02	CU.M	1.50E-02 ± 1.81E-03	L.T. 3.74E-02
04/22/14	05/06/14	9.02E+02	CU.M	1.96E-02 ± 2.14E-03	L.T. 3.11E-02
05/06/14	05/20/14	8.86E+02	CU.M	1.77E-02 ± 1.98E-03	L.T. 2.18E-02
05/20/14	06/03/14	8.16E+02	CU.M	1.68E-02 ± 2.09E-03	L.T. 3.21E-02
06/03/14	06/17/14	7.77E+02	CU.M	1.20E-02 ± 1.81E-03	L.T. 9.74E-03
06/17/14	07/01/14	7.29E+02	CU.M	1.73E-02 ± 2.32E-03	L.T. 3.00E-02
07/01/14	07/15/14	7.42E+02	CU.M	1.62E-02 ± 2.08E-03	L.T. 4.45E-02
07/15/14	07/29/14	7.50E+02	CU.M	2.59E-02 ± 2.55E-03	L.T. 3.42E-02
07/29/14	08/12/14	7.02E+02	CU.M	2.08E-02 ± 2.45E-03	L.T. 3.00E-02
08/12/14	08/26/14	6.79E+02	CU.M	2.06E-02 ± 3.41E-03	L.T. 3.48E-02
08/26/14	09/09/14	7.00E+02	CU.M	1.52E-02 ± 2.11E-03	L.T. 4.05E-02
09/09/14	09/24/14	8.06E+02	CU.M	1.83E-02 ± 2.22E-03	L.T. 2.45E-02
09/24/14	10/08/14	7.48E+02	CU.M	1.61E-02 ± 2.46E-03	L.T. 2.65E-02
10/08/14	10/21/14	6.75E+02	CU.M	2.73E-02 ± 4.55E-03	L.T. 5.10E-02
10/21/14	11/04/14	7.41E+02	CU.M	3.03E-02 ± 2.87E-03	L.T. 1.03E-02
11/04/14	11/18/14	7.94E+02	CU.M	2.12E-02 ± 2.24E-03	L.T. 4.25E-02
11/18/14	12/02/14	7.76E+02	CU.M	2.15E-02 ± 2.29E-03	L.T. 3.15E-02
12/02/14	12/16/14	7.44E+02	CU.M	2.68E-02 ± 2.67E-03	L.T. 4.23E-02
12/16/14	12/30/14	7.45E+02	CU.M	2.24E-02 ± 2.41E-03	L.T. 4.07E-02

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES - INDICATOR LOCATION

LOCATION NUMBER AP1					
COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/31/13	01/14/14	8.11E+02	CU.M	2.04E-02 ± 2.33E-03	L.T. 1.67E-02
01/14/14	01/30/14	9.14E+02	CU.M	1.91E-02 ± 2.04E-03	L.T. 2.63E-02
01/30/14	02/11/14	6.83E+02	CU.M	1.68E-02 ± 2.28E-03	L.T. 3.73E-02
02/11/14	02/25/14	8.10E+02	CU.M	1.31E-02 ± 1.79E-03	L.T. 2.98E-02
02/25/14	03/11/14	8.01E+02	CU.M	1.73E-02 ± 2.33E-03	L.T. 3.60E-02
03/11/14	03/26/14	8.70E+02	CU.M	1.73E-02 ± 1.97E-03	L.T. 2.50E-02
03/26/14	04/08/14	7.51E+02	CU.M	1.41E-02 ± 2.03E-03	L.T. 2.87E-02
04/08/14	04/22/14	7.89E+02	CU.M	1.79E-02 ± 2.11E-03	L.T. 1.67E-02
04/22/14	05/06/14	7.86E+02	CU.M	1.82E-02 ± 2.25E-03	L.T. 3.57E-02
05/06/14	05/20/14	8.06E+02	CU.M	1.88E-02 ± 2.15E-03	L.T. 2.39E-02
05/20/14*	06/03/14*				
06/12/14	06/17/14	2.79E+02	CU.M	1.96E-02 ± 4.12E-03	L.T. 4.72E-02
06/17/14	07/01/14	7.11E+02	CU.M	1.83E-02 ± 2.41E-03	L.T. 3.08E-02
07/01/14	07/15/14	7.06E+02	CU.M	1.65E-02 ± 2.15E-03	L.T. 4.68E-02
07/15/14	07/29/14	7.14E+02	CU.M	3.18E-02 ± 2.87E-03	L.T. 3.59E-02
07/29/14	08/12/14	7.19E+02	CU.M	2.13E-02 ± 2.44E-03	L.T. 2.93E-02
08/12/14	08/26/14	7.17E+02	CU.M	1.81E-02 ± 3.18E-03	L.T. 3.30E-02
08/26/14	09/09/14	7.19E+02	CU.M	1.33E-02 ± 1.96E-03	L.T. 2.14E-02
09/09/14	09/24/14	7.68E+02	CU.M	1.75E-02 ± 2.24E-03	L.T. 2.57E-02
09/24/14	10/08/14	7.21E+02	CU.M	1.88E-02 ± 2.65E-03	L.T. 2.75E-02
10/08/14	10/21/14	6.66E+02	CU.M	3.02E-02 ± 4.68E-03	L.T. 5.16E-02
10/21/14	11/04/14	7.41E+02	CU.M	3.12E-02 ± 2.90E-03	L.T. 2.66E-02
11/04/14	11/18/14	7.94E+02	CU.M	2.26E-02 ± 2.36E-03	L.T. 4.25E-02
11/18/14	12/02/14	7.59E+02	CU.M	2.16E-02 ± 2.32E-03	L.T. 3.23E-02
12/02/14	12/16/14	7.70E+02	CU.M	2.95E-02 ± 2.68E-03	L.T. 4.09E-02
12/16/14	12/30/14	8.37E+02	CU.M	1.59E-02 ± 1.94E-03	L.T. 3.62E-02

* Pump seized, volume could not be determined. CR-RBS-2014-02733

ATTACHMENT 1.1
RIVER BEND STATION
AIRBORNE PARTICULATE AND CHARCOAL CARTRIDGES - INDICATOR LOCATION

LOCATION NUMBER AQS2					
COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (pCi/cu.m.)	CHARCOAL FILTER I-131 (pCi/cu.m.)
12/31/13	01/14/14	8.56E+02	CU.M	2.10E-02 ± 2.28E-03	L.T. 4.07E-02
01/14/14	01/30/14	9.56E+02	CU.M	1.90E-02 ± 1.98E-03	L.T. 2.52E-02
01/30/14	02/11/14	7.42E+02	CU.M	1.49E-02 ± 2.07E-03	L.T. 3.43E-02
02/11/14	02/25/14	8.65E+02	CU.M	1.99E-02 ± 2.07E-03	L.T. 1.08E-02
02/25/14	03/11/14	8.10E+02	CU.M	1.55E-02 ± 2.22E-03	L.T. 3.56E-02
03/11/14	03/26/14	9.19E+02	CU.M	1.70E-02 ± 1.89E-03	L.T. 2.36E-02
03/26/14	04/08/14	8.18E+02	CU.M	1.28E-02 ± 1.86E-03	L.T. 2.65E-02
04/08/14	04/22/14	8.60E+02	CU.M	1.85E-02 ± 2.04E-03	L.T. 3.96E-02
04/22/14	05/06/14	8.18E+02	CU.M	2.03E-02 ± 2.29E-03	L.T. 3.43E-02
05/06/14	05/20/14	8.08E+02	CU.M	2.02E-02 ± 2.21E-03	L.T. 2.39E-02
05/20/14	06/03/14	8.16E+02	CU.M	1.71E-02 ± 2.10E-03	L.T. 3.21E-02
06/03/14	06/17/14	8.03E+02	CU.M	1.28E-02 ± 1.82E-03	L.T. 2.42E-02
06/17/14	07/01/14	8.00E+02	CU.M	1.78E-02 ± 2.22E-03	L.T. 1.06E-02
07/01/14	07/15/14	8.14E+02	CU.M	1.67E-02 ± 2.00E-03	L.T. 4.05E-02
07/15/14	07/29/14	8.03E+02	CU.M	2.61E-02 ± 2.46E-03	L.T. 3.19E-02
07/29/14	08/12/14	8.09E+02	CU.M	2.00E-02 ± 2.22E-03	L.T. 2.60E-02
08/12/14	08/26/14	8.07E+02	CU.M	1.45E-02 ± 2.77E-03	L.T. 2.93E-02
08/26/14	09/09/14	8.27E+02	CU.M	1.37E-02 ± 1.83E-03	L.T. 3.43E-02
09/09/14	09/24/14	8.93E+02	CU.M	1.70E-02 ± 2.03E-03	L.T. 2.21E-02
09/24/14	10/08/14	8.56E+02	CU.M	1.42E-02 ± 2.16E-03	L.T. 2.31E-02
10/08/14	10/21/14	7.83E+02	CU.M	2.43E-02 ± 3.94E-03	L.T. 4.39E-02
10/21/14	11/04/14	8.13E+02	CU.M	2.84E-02 ± 2.64E-03	L.T. 2.42E-02
11/04/14	11/18/14	8.01E+02	CU.M	1.99E-02 ± 2.22E-03	L.T. 4.25E-02
11/18/14	12/02/14	8.14E+02	CU.M	2.24E-02 ± 2.27E-03	L.T. 1.27E-02
12/02/14	12/16/14	7.98E+02	CU.M	3.34E-02 ± 2.85E-03	L.T. 3.94E-02
12/16/14	12/30/14	8.08E+02	CU.M	2.00E-02 ± 2.16E-03	L.T. 3.75E-02

ATTACHMENT 2.1
RIVER BEND STATION
THERMOLUMINESCENT DOSIMETERS (TLD)
mR/Qtr

Sample Nuclide	Location	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	TA1	11.1	11.3	10.5	11.4	11.1 ± 0.4
	TAC	15.9	15.2	15.6	16.6	15.8 ± 0.6
	TB1	14.4	14.7	14.9	16.3	15.0 ± 0.8
	TC1	15.3	14.7	14.9	16.8	15.4 ± 0.9
	TCS	13.6	12.8	12.4	13.1	13.0 ± 0.5
	TD1	15.7	15.0	15.7	16.4	15.7 ± 0.6
	TE1	14.6	13.5	14.2	14.6	14.2 ± 0.5
	TEC	14.5	13.4	14.0	15.1	14.2 ± 0.7
	TF1	14.2	13.6	14.6	15.1	14.4 ± 0.6
	TG1	16.3	14.9	15.2	16.9	15.8 ± 1.0
	TGS	16.0	15.4	15.8	16.7	16.0 ± 0.5
	TH1	12.9	12.9	11.6	12.8	12.6 ± 0.6
	TJ1	13.4	12.8	12.9	14.1	13.3 ± 0.6
	TK1	14.0	13.7	14.2	15.0	14.2 ± 0.6
	TL1	14.9	14.0	14.5	15.0	14.6 ± 0.5
	TM1	12.6	12.7	12.3	12.7	12.6 ± 0.2
	TN1	14.7	13.2	13.8	14.6	14.1 ± 0.7
	TNS	13.6	13.1	12.4	13.9	13.2 ± 0.7
	TP1	12.6	11.8	12.6	13.3	12.6 ± 0.6
	TQ1	11.1	10.8	10.2	11.4	10.9 ± 0.5
	TR1	11.3	10.6	10.5	11.0	10.8 ± 0.3
	TRS	14.9	15.0	14.4	14.4	14.7 ± 0.3
	TQS1	16.3	15.1	15.8	16.3	15.8 ± 0.6
	TQS2	13.0	12.6	12.8	13.0	12.9 ± 0.2
Average/Quarter		14.0 ± 1.6	13.5 ± 1.4	13.6 ± 1.7	14.4 ± 1.8	
Range		(11.1-16.3)	(10.6-15.4)	(10.2-15.8)	(11-16.9)	
Detection/Total		23/23	23/23	23/23	23/23	

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

LOCATION SWD

DATE COLLECTED	01/08/13	04/08/13	07/03/13	10/08/13
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 6.01E+02	L.T. 5.40E+02	L.T. 5.52E+02	L.T. 6.79E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 4.54E+00	L.T. 4.53E+00	L.T. 3.48E+00	L.T. 4.91E+00
CO-58	L.T. 4.89E+00	L.T. 4.28E+00	L.T. 3.67E+00	L.T. 4.52E+00
FE-59	L.T. 9.95E+00	L.T. 8.54E+00	L.T. 7.96E+00	L.T. 1.05E+01
CO-60	L.T. 4.03E+00	L.T. 3.91E+00	L.T. 3.19E+00	L.T. 4.27E+00
ZN-65	L.T. 9.54E+00	L.T. 7.67E+00	L.T. 7.88E+00	L.T. 8.98E+00
NB-95	L.T. 5.10E+00	L.T. 4.73E+00	L.T. 4.82E+00	L.T. 5.35E+00
ZR-95	L.T. 6.93E+00	L.T. 8.69E+00	L.T. 7.17E+00	L.T. 9.29E+00
I-131	L.T. 9.02E+00	L.T. 1.40E+01	L.T. 1.24E+01	L.T. 1.37E+01
CS-134	L.T. 4.69E+00	L.T. 4.67E+00	L.T. 3.70E+00	L.T. 4.57E+00
CS-137	L.T. 4.30E+00	L.T. 4.81E+00	L.T. 4.10E+00	L.T. 4.64E+00
BA-140	L.T. 2.46E+01	L.T. 3.24E+01	L.T. 2.82E+01	L.T. 2.95E+01
LA-140	L.T. 7.00E+00	L.T. 1.03E+01	L.T. 7.94E+00	L.T. 1.04E+01

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

LOCATION SWD DUP

DATE COLLECTED 07/22/14

RADIOCHEMICAL ANALYSIS:

H-3 L.T. 5.52E+02

GAMMA SPECTRUM ANALYSIS:

MN-54	L.T. 3.48E+00
CO-58	L.T. 3.67E+00
FE-59	L.T. 7.96E+00
CO-60	L.T. 3.19E+00
ZN-65	L.T. 7.88E+00
NB-95	L.T. 4.82E+00
ZR-95	L.T. 7.17E+00
I-131	L.T. 1.24E+01
CS-134	L.T. 3.70E+00
CS-137	L.T. 4.10E+00
BA-140	L.T. 2.82E+01
LA-140	L.T. 7.94E+00

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

LOCATION SWU

DATE COLLECTED	01/13/14	04/24/14	07/22/14	10/23/14
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 5.96E+02	L.T. 5.27E+02	L.T. 5.66E+02	L.T. 6.68E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 5.61E+00	L.T. 4.90E+00	L.T. 3.54E+00	L.T. 4.22E+00
CO-58	L.T. 4.83E+00	L.T. 5.51E+00	L.T. 3.78E+00	L.T. 5.01E+00
FE-59	L.T. 1.41E+01	L.T. 1.42E+01	L.T. 7.94E+00	L.T. 9.08E+00
CO-60	L.T. 6.06E+00	L.T. 5.07E+00	L.T. 3.54E+00	L.T. 5.20E+00
ZN-65	L.T. 1.12E+01	L.T. 1.09E+01	L.T. 8.15E+00	L.T. 9.67E+00
NB-95	L.T. 5.71E+00	L.T. 4.95E+00	L.T. 4.04E+00	L.T. 4.47E+00
ZR-95	L.T. 9.61E+00	L.T. 8.73E+00	L.T. 6.94E+00	L.T. 9.08E+00
I-131	L.T. 1.06E+01	L.T. 1.48E+01	L.T. 1.30E+01	L.T. 1.41E+01
CS-134	L.T. 5.02E+00	L.T. 4.99E+00	L.T. 4.14E+00	L.T. 4.22E+00
CS-137	L.T. 5.83E+00	L.T. 4.81E+00	L.T. 3.80E+00	L.T. 4.60E+00
BA-140	L.T. 2.98E+01	L.T. 3.24E+01	L.T. 2.79E+01	L.T. 3.19E+01
LA-140	L.T. 1.04E+01	L.T. 1.20E+01	L.T. 7.26E+00	L.T. 8.20E+00

ATTACHMENT 3.1
RIVER BEND STATION
SURFACE WATER
pCi/L

LOCATION SWU DUP

DATE COLLECTED 10/23/14

RADIOCHEMICAL ANALYSIS:

H-3 L.T. 6.68E+02

GAMMA SPECTRUM ANALYSIS:

MN-54	L.T. 4.22E+00
CO-58	L.T. 5.01E+00
FE-59	L.T. 9.08E+00
CO-60	L.T. 5.20E+00
ZN-65	L.T. 9.67E+00
NB-95	L.T. 4.47E+00
ZR-95	L.T. 9.08E+00
I-131	L.T. 1.41E+01
CS-134	L.T. 4.22E+00
CS-137	L.T. 4.60E+00
BA-140	L.T. 3.19E+01
LA-140	L.T. 8.20E+00

ATTACHMENT 4.1
RIVER BEND STATION
GROUNDWATER
pCi/L

	LOCATION GWD		LOCATION GWU	
DATE COLLECTED	04/09/14	10/24/14	04/09/14	10/24/14
RADIOCHEMICAL ANALYSIS:				
H-3	L.T. 5.10E+02	L.T. 6.74E+02	L.T. 5.09E+02	L.T. 6.64E+02
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 4.19E+00	L.T. 4.50E+00	L.T. 4.55E+00	L.T. 4.79E+00
CO-58	L.T. 3.88E+00	L.T. 4.06E+00	L.T. 5.22E+00	L.T. 4.67E+00
FE-59	L.T. 9.94E+00	L.T. 9.03E+00	L.T. 9.32E+00	L.T. 8.20E+00
CO-60	L.T. 5.41E+00	L.T. 3.94E+00	L.T. 5.35E+00	L.T. 4.40E+00
ZN-65	L.T. 8.98E+00	L.T. 7.95E+00	L.T. 7.83E+00	L.T. 1.05E+01
NB-95	L.T. 4.13E+00	L.T. 5.16E+00	L.T. 4.83E+00	L.T. 5.48E+00
ZR-95	L.T. 7.88E+00	L.T. 7.71E+00	L.T. 7.29E+00	L.T. 9.57E+00
I-131	L.T. 6.77E+00	L.T. 1.17E+01	L.T. 7.44E+00	L.T. 1.28E+01
CS-134	L.T. 3.51E+00	L.T. 3.86E+00	L.T. 4.21E+00	L.T. 4.87E+00
CS-137	L.T. 5.14E+00	L.T. 4.64E+00	L.T. 5.14E+00	L.T. 4.97E+00
BA-140	L.T. 1.85E+01	L.T. 2.48E+01	L.T. 2.34E+01	L.T. 2.89E+01
LA-140	L.T. 8.40E+00	L.T. 6.58E+00	L.T. 8.92E+00	L.T. 1.04E+01

ATTACHMENT 5.1
RIVER BEND STATION
SHORELINE SEDIMENT
 pCi/kg, dry

	LOCATION SEDD	LOCATION SEDU
DATE COLLECTED	08/19/14	08/19/14
GAMMA SPECTRUM ANALYSIS:		
MN-54	L.T. 5.05E+01	L.T. 6.22E+01
CO-58	L.T. 5.40E+01	L.T. 6.89E+01
FE-59	L.T. 1.22E+02	L.T. 1.29E+02
CO-60	L.T. 4.34E+01	L.T. 6.02E+01
ZN-65	L.T. 1.11E+02	L.T. 1.08E+02
NB-95	L.T. 5.41E+01	L.T. 7.53E+01
ZR-95	L.T. 9.13E+01	L.T. 1.23E+02
I-131	L.T. 1.02E+02	L.T. 1.33E+02
CS-134	L.T. 4.48E+01	L.T. 5.87E+01
CS-137	L.T. 6.28E+01	L.T. 6.11E+01
BA-140	L.T. 2.49E+02	L.T. 3.44E+02
LA-140	L.T. 5.80E+01	L.T. 5.94E+01

ATTACHMENT 6.1
RIVER BEND STATION
FOOD PRODUCTS
pCi/kg, wet

LOCATION GN1

DATE COLLECTED	01/21/14	04/24/14	07/22/14	10/23/14
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 2.72E+01	L.T. 2.10E+01	L.T. 2.90E+01	L.T. 1.19E+01
CO-58	L.T. 3.41E+01	L.T. 2.28E+01	L.T. 2.71E+01	L.T. 1.35E+01
FE-59	L.T. 6.24E+01	L.T. 4.72E+01	L.T. 6.06E+01	L.T. 3.31E+01
CO-60	L.T. 3.70E+01	L.T. 2.80E+01	L.T. 3.26E+01	L.T. 1.47E+01
ZN-65	L.T. 5.61E+01	L.T. 4.45E+01	L.T. 7.51E+01	L.T. 3.34E+01
NB-95	L.T. 3.27E+01	L.T. 2.60E+01	L.T. 2.66E+01	L.T. 1.49E+01
ZR-95	L.T. 5.30E+01	L.T. 4.29E+01	L.T. 4.95E+01	L.T. 2.20E+01
I-131	L.T. 5.45E+01	L.T. 3.88E+01	L.T. 5.27E+01	L.T. 4.55E+01
CS-134	L.T. 2.62E+01	L.T. 1.97E+01	L.T. 3.39E+01	L.T. 1.26E+01
CS-137	L.T. 3.51E+01	L.T. 2.41E+01	L.T. 3.51E+01	L.T. 1.25E+01
BA-140	L.T. 1.51E+02	L.T. 1.10E+02	L.T. 1.40E+02	L.T. 1.00E+02
LA-140	L.T. 4.53E+01	L.T. 3.66E+01	L.T. 4.23E+01	L.T. 3.09E+01

ATTACHMENT 6.1
RIVER BEND STATION
FOOD PRODUCTS
pCi/kg, wet

LOCATION GQC

DATE COLLECTED	03/11/14	06/24/14	09/09/14	11/18/14
GAMMA SPECTRUM ANALYSIS:				
MN-54	L.T. 1.53E+01	L.T. 2.19E+01	L.T. 1.88E+01	L.T. 1.45E+01
CO-58	L.T. 1.84E+01	L.T. 1.74E+01	L.T. 2.17E+01	L.T. 1.58E+01
FE-59	L.T. 3.28E+01	L.T. 4.41E+01	L.T. 5.52E+01	L.T. 4.10E+01
CO-60	L.T. 1.78E+01	L.T. 1.84E+01	L.T. 2.15E+01	L.T. 1.45E+01
ZN-65	L.T. 3.91E+01	L.T. 3.96E+01	L.T. 5.35E+01	L.T. 3.77E+01
NB-95	L.T. 1.61E+01	L.T. 2.01E+01	L.T. 2.58E+01	L.T. 1.66E+01
ZR-95	L.T. 2.79E+01	L.T. 3.55E+01	L.T. 4.32E+01	L.T. 2.70E+01
I-131	L.T. 2.73E+01	L.T. 3.39E+01	L.T. 5.36E+01	L.T. 5.61E+01
CS-134	L.T. 1.77E+01	L.T. 1.77E+01	L.T. 2.52E+01	L.T. 1.38E+01
CS-137	L.T. 2.01E+01	L.T. 1.93E+01	L.T. 2.16E+01	L.T. 1.55E+01
BA-140	L.T. 7.91E+01	L.T. 9.55E+01	L.T. 1.25E+02	L.T. 1.17E+02
LA-140	L.T. 2.51E+01	L.T. 2.17E+01	L.T. 4.10E+01	L.T. 3.00E+01

ATTACHMENT 7.1
RIVER BEND STATION
FISH
pCi/kg, wet

	LOCATION FD	LOCATION FU
DATE COLLECTED	06/20/14	08/25/14
GAMMA SPECTRUM ANALYSIS:		
MN-54	L.T. 4.39E+01	L.T. 4.67E+01
CO-58	L.T. 4.65E+01	L.T. 4.72E+01
FE-59	L.T. 9.74E+01	L.T. 9.76E+01
CO-60	L.T. 3.74E+01	L.T. 5.01E+01
ZN-65	L.T. 7.89E+01	L.T. 7.68E+01
NB-95	L.T. 5.18E+01	L.T. 4.38E+01
ZR-95	L.T. 8.95E+01	L.T. 8.97E+01
I-131	L.T. 3.48E+02	L.T. 2.50E+02
CS-134	L.T. 3.84E+01	L.T. 3.41E+01
CS-137	L.T. 4.18E+01	L.T. 4.61E+01
BA-140	L.T. 5.55E+02	L.T. 4.73E+02
LA-140	L.T. 1.87E+02	L.T. 1.25E+02

Attachment 8

**Teledyne Brown Engineering's Interlaboratory Comparison Program
Tables**

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 1 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2014	E10854	Milk	Sr-89	pCi/L	95.1	91.7	1.04	A
			Sr-90	pCi/L	10.9	15.1	0.72	W
	E10855	Milk	I-131	pCi/L	96.6	98.5	0.98	A
			Ce-141	pCi/L	112	119	0.94	A
			Cr-51	pCi/L	449	491	0.91	A
			Cs-134	pCi/L	186	210	0.89	A
			Cs-137	pCi/L	250	253	0.99	A
			Co-58	pCi/L	248	268	0.93	A
			Mn-54	pCi/L	292	297	0.98	A
			Fe-59	pCi/L	230	219	1.05	A
			Zn-65	pCi/L	312	323	0.97	A
			Co-60	pCi/L	321	337	0.95	A
	E10857	AP	Ce-141	pCi	53.0	53.9	0.98	A
			Cr-51	pCi	232	223	1.04	A
			Cs-134	pCi	100	95.3	1.05	A
			Cs-137	pCi	122	115	1.06	A
			Co-58	pCi	122	121	1.01	A
			Mn-54	pCi	135	135	1.00	A
			Fe-59	pCi	111	99.3	1.12	A
			Zn-65	pCi	140	147	0.95	A
			Co-60	pCi	187	153	1.22	W
	E10856	Charcoal	I-131	pCi	74.1	76.4	0.97	A
	E10858	Water	Fe-55	pCi/L	2090	1760	1.19	A
June 2014	E10913	Milk	Sr-89	pCi/L	85.9	91.3	0.94	A
			Sr-90	pCi/L	13.8	14.5	0.95	A
	E10914	Milk	I-131	pCi/L	86.5	90.9	0.95	A
			Ce-141	pCi/L	111	124	0.90	A
			Cr-51	pCi/L	255	253	1.01	A
			Cs-134	pCi/L	147	162	0.91	A
			Cs-137	pCi/L	123	120	1.03	A
			Co-58	pCi/L	105	112	0.94	A
			Mn-54	pCi/L	155	156	0.99	A
			Fe-59	pCi/L	106	102	1.04	A
			Zn-65	pCi/L	251	252	1.00	A
			Co-60	pCi/L	218	224	0.97	A
	E10916	AP	Ce-141	pCi	95.1	92.6	1.03	A
			Cr-51	pCi	215	190	1.13	A
			Cs-134	pCi	122	122	1.00	A
			Cs-137	pCi	95.1	89.8	1.06	A
			Co-58	pCi	88.7	84.1	1.05	A
			Mn-54	pCi	115	116	0.99	A
			Fe-59	pCi	72.6	76.7	0.95	A
			Zn-65	pCi	193	189	1.02	A
			Co-60	pCi	179	168	1.07	A
	E10915	Charcoal	I-131	pCi	85.6	85.2	1.00	A

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 2 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2014	E10917	Water	Fe-55	pCi/L	1680	1810	0.93	A
September 2014	E10946	Milk	Sr-89	pCi/L	90.7	96.9	0.94	A
			Sr-90	pCi/L	14.0	16.4	0.85	A
	E10947	Milk	I-131	pCi/L	92.0	97.6	0.94	A
			Ce-141	pCi/L	117	126	0.93	A
			Cr-51	pCi/L	281	288	0.98	A
			Cs-134	pCi/L	141	158	0.89	A
			Cs-137	pCi/L	186	193	0.96	A
			Co-58	pCi/L	137	143	0.96	A
			Mn-54	pCi/L	138	142	0.97	A
			Fe-59	pCi/L	162	158	1.03	A
			Zn-65	pCi/L	75.2	73.0	1.03	A
			Co-60	pCi/L	286	297	0.96	A
	E10949	AP	Ce-141	pCi	97.8	82.1	1.19	A
			Cr-51	pCi	212	188	1.13	A
			Cs-134	pCi	106	103	1.03	A
			Cs-137	pCi	131	126	1.04	A
			Co-58	pCi	85.7	93.0	0.92	A
			Mn-54	pCi	92.8	92.3	1.01	A
			Fe-59	pCi	113	103	1.10	A
			Zn-65	pCi	53.2	47.5	1.12	A
			Co-60	pCi	202	193	1.05	A
	E10948	Charcoal	I-131	pCi	83.9	89.8	0.93	A
	E10950	Water	Fe-55	pCi/L	2010	1720	1.17	A
	E10951	Soil	Ce-141	pCi/g	0.208	0.186	1.12	A
			Cr-51	pCi/g	0.398	0.425	0.94	A
			Cs-134	pCi/g	0.216	0.233	0.93	A
			Cs-137	pCi/g	0.398	0.365	1.09	A
			Co-58	pCi/g	0.197	0.211	0.93	A
			Mn-54	pCi/g	0.242	0.209	1.16	A
			Fe-59	pCi/g	0.238	0.233	1.02	A
			Zn-65	pCi/g	0.117	0.108	1.08	A
			Co-60	pCi/g	0.447	0.438	1.02	A
December 2014	E11078	Milk	Sr-89	pCi/L	85.7	95.7	0.90	A
			Sr-90	pCi/L	12.9	15.6	0.83	A
	E11079	Milk	I-131	pCi/L	85.9	95.1	0.90	A
			Ce-141	pCi/L	205	219	0.94	A
			Cr-51	pCi/L	402	406	0.99	A
			Cs-134	pCi/L	156	164	0.95	A
			Cs-137	pCi/L	194	198	0.98	A
			Co-58	pCi/L	122	130	0.94	A
			Mn-54	pCi/L	220	225	0.98	A
			Fe-59	pCi/L	183	175	1.05	A
			Zn-65	pCi/L	287	297	0.97	A
			Co-60	pCi/L	224	235	0.95	A

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2014	E11081	AP	Ce-141	pCi	96.4	102	0.95	A
			Cr-51	pCi	171	190	0.90	A
			Cs-134	pCi	73.1	76.9	0.95	A
			Cs-137	pCi	99.0	92.6	1.07	A
			Co-58	pCi	57.5	60.8	0.95	A
			Mn-54	pCi	107	105	1.02	A
			Fe-59	pCi	74.2	81.6	0.91	A
			Zn-65	pCi	144	139	1.04	A
			Co-60	pCi	114	110	1.04	A
	E11080	Charcoal	I-131	pCi	93.5	98.2	0.95	A
	E11082	Water	Fe-55	pCi/L	1760	1970	0.89	A

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable, reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning, reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable, reported result falls outside the ratio limits of < 0.70 and > 1.30.

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2014	14-MaW30	Water	Am-241	Bq/L	0.764	0.720	0.504 - 0.936	A
			Cs-134	Bq/L	20.7	23.1	16.2 - 30.0	A
			Cs-137	Bq/L	28.0	28.9	20.2 - 37.6	A
			Co-57	Bq/L	26.5	27.5	19.3 - 35.8	A
			Co-60	Bq/L	15.6	16.0	11.2 - 20.8	A
			H-3**	Bq/L	NR	321	225 - 417	N (3)
			Mn-54	Bq/L	13.5	13.9	9.7 - 18.1	A
			Ni-63	Bq/L	NR	34.0	23.8 - 44.2	N (3)
			Pu-238	Bq/L	0.911	0.828	0.580 - 1.076	
			Pu-239/240	Bq/L	0.751	0.676	0.473 - 0.879	
			K-40	Bq/L	NR		(1)	N (3)
			Sr-90**	Bq/L	NR	8.51	5.96 - 11.06	N (3)
			U-234/233**	Bq/L	NR	0.225	0.158 - 0.293	N (3)
			U-238**	Bq/L	NR	1.45	1.02 - 1.89	N (3)
			Zn-65	Bq/L	-0.201		(1)	A
	14-MaS30	Soil	Cs-134	Bq/kg	2.02		(1)	A
			Cs-137	Bq/kg	1300	1238	867 - 1609	A
			Co-57	Bq/kg	1069	966	676 - 1256	A
			Co-60	Bq/kg	1.32	1.22	(2)	A
			Mn-54	Bq/kg	1510	1430	1001 - 1859	A
			K-40	Bq/kg	669	622	435 - 809	A
			Sr-90	Bq/kg	4.14		(1)	A
			Zn-65	Bq/kg	763	695	487 - 904	A
	14-RdF30	AP	Cs-134**	Bq/sample	NR	1.91	1.34 - 2.48	N (3)
			Cs-137**	Bq/sample	NR	1.76	1.23 - 2.29	N (3)
			Co-57**	Bq/sample	NR		(1)	N (3)
			Co-60**	Bq/sample	NR	1.39	0.97 - 1.81	N (3)
			Mn-54**	Bq/sample	NR		(1)	N (3)
			Sr-90	Bq/sample	0.8220	1.18	0.83 - 1.53	N (3)
			Zn-65**	Bq/sample	NR		(1)	N (3)
	14-GrF30	AP	Gr-A	Bq/sample	0.606	1.77	0.53 - 3.01	A
			Gr-B	Bq/sample	0.7507	0.77	0.39 - 1.16	A
	14-RdV30	Vegetation	Cs-134	Bq/sample	5.96	6.04	4.23 - 7.85	A
			Cs-137	Bq/sample	5.06	4.74	3.32 - 6.16	A
			Co-57	Bq/sample	11.8	10.1	7.1 - 13.1	A
			Co-60	Bq/sample	7.34	6.93	4.85 - 9.01	A
			Mn-54	Bq/sample	8.95	8.62	6.03 - 11.21	A
			Sr-90	Bq/sample	1.23	1.46	1.02 - 1.90	A
			Zn-65	Bq/sample	8.91	7.86	5.50 - 10.22	A

DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2014	14-MaW31	Water	Am-241	Bq/L	0.705	0.88	0.62 - 1.14	A
			Cs-134***	Bq/L	NR		(1)	N (4)
			Cs-137***	Bq/L	NR	18.4	12.9 - 23.9	N (4)
			Co-57***	Bq/L	NR	24.7	17.3 - 32.1	N (4)
			Co-60***	Bq/L	NR	12.4	8.7 - 16.1	N (4)
			Mn-54***	Bq/L	NR	14.0	9.8 - 18.2	N (4)
			Ni-63	Bq/L	24.07	24.6	17.2 - 32.0	A
			Pu-238	Bq/L	0.591	0.618	0.433 - 0.803	A
			Pu-239/240	Bq/L	0.0153	0.0048	(2)	A
			K-40***	Bq/L	NR	161	113 - 209	N (4)
			Zn-65***	Bq/L	NR	10.9	7.6 - 14.2	N (4)
	14-MaS31	Soil	Cs-134***	Bq/kg	NR	622	435 - 809	N (4)
			Cs-137***	Bq/kg	NR		(1)	N (4)
			Co-57***	Bq/kg	NR	1116	781 - 1451	N (4)
			Co-60***	Bq/kg	NR	779	545 - 1013	N (4)
			Mn-54***	Bq/kg	NR	1009	706 - 1312	N (4)
			K-40***	Bq/kg	NR	824	577 - 1071	N (4)
			Sr-90	Bq/kg	694	858	601 - 1115	A
			Zn-65***	Bq/kg	NR	541	379 - 703	N (4)
	14-RdF31	AP	Sr-90	Bq/sample	0.310	0.703	0.492 - 0.914	N (4)
	14-GrF31	AP	Gr-A	Bq/sample	0.153	0.53	0.16 - 0.90	N (4)
			Gr-B	Bq/sample	0.977	1.06	0.53 - 1.59	A
September 2014	14-RdV31	Vegetation	Cs-134	Bq/sample	7.31	7.38	5.17 - 9.59	A
			Cs-137	Bq/sample	8.93	8.14	5.70 - 10.58	A
			Co-57	Bq/sample	10.8	9.2	6.4 - 12.0	A
			Co-60	Bq/sample	6.31	6.11	4.28 - 7.94	A
			Mn-54	Bq/sample	7.76	7.10	4.97 - 9.23	A
			Sr-90	Bq/sample	0.738	0.85	0.60 - 1.11	A
			Zn-65	Bq/sample	7.16	6.42	4.49 - 8.35	A

* The MAPEP cross check isotope list has been reduced due to duplication of effort or analysis not being performed for clients.

** Starting 2014, these nuclides will no longer be part of the TBE cross check program due to duplication of effort or analysis not being performed for clients. MAPEP evaluates non-reported analyses as failed if they were reported in the previous series.

*** All future gamma cross check samples for these isotopes will be provided by Analytics.

(1) False positive test.

(2) Sensitivity evaluation.

(3) **Water, Ni-63** overlooked when reporting, but the result of 32.7 +/- 1.69 would have passed the acceptance criteria. NCR 14-04

Water, the non-detected **K-40** was overlooked when reporting, but would have passed the false positive test. NCR 14-04

AP, Sr-90 rerun was within the low range of the acceptance criteria. The original and rerun results were statistically the same. No cause could be identified for the slightly low Sr-90 activity. NCR 14-04

For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-04

(4) **AP, Sr-90** gravimetric yield was very high at 117%. Could indicate larger than normal amounts of calcium in the AP. A second fuming HNO₃ separation would be required to remove the excess calcium; The Gross Alpha AP was counted on the wrong side; The **AP Uranium** raw data contained extraneous counts in front of the uranium peak which were included in the standard Region of Interest (ROI). The ROI was modified on the rerun to exclude the extraneous counts and the result fell within the acceptance limits. NCR 14-09

AP, Gr-Alpha was counted on the wrong side. When flipped over and recounted the results were acceptable. NCR 14-09

For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-09

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

**ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2014	RAD-97	Water	Sr-89	pCi/L	38.25	36.7	27.5 - 43.6	A
			Sr-90	pCi/L	24.65	26.5	19.2 - 30.9	A
			Ba-133	pCi/L	89.1	87.9	74.0 - 96.7	A
			Cs-134	pCi/L	45.55	44.3	35.5 - 48.7	A
			Cs-137	pCi/L	91.15	89.1	80.2 - 101	A
			Co-60	pCi/L	65.10	64.2	57.8 - 73.1	A
			Zn-65	pCi/L	244	235	212 - 275	A
			Gr-A	pCi/L	45.65	61.0	31.9 - 75.8	A
			Gr-B	pCi/L	27.95	33.0	21.4 - 40.7	A
			I-131	pCi/L	23.75	25.7	21.3 - 30.3	A
			U-Nat	pCi/L	9.61	10.2	7.95 - 11.8	A
			H-3	pCi/L	8435	8770	7610 - 9650	A
	MRAD-20	Filter	Gr-A	pCi/filter	28.0	46.0	15.4 - 71.4	A
November 2014	RAD-99	Water	Sr-89	pCi/L	30.4	31.4	22.8 - 38.1	A
			Sr-90	pCi/L	18.6	21.8	15.6 - 25.7	A
			Ba-133	pCi/L	46.8	49.1	40.3 - 54.5	A
			Cs-134	pCi/L	88.0	89.8	73.7 - 98.8	A
			Cs-137	pCi/L	99.0	98.8	88.9 - 111	A
			Co-60	pCi/L	92.5	92.1	82.9 - 104	A
			Zn-65	pCi/L	325	310	279 - 362	A
			Gr-A	pCi/L	29.9	37.6	19.4 - 48.1	A
			Gr-B	pCi/L	27.5	27.4	17.3 - 35.3	A
			I-131	pCi/L	15.8	20.3	16.8 - 24.4	N (1)
			U-Nat	pCi/L	5.74	5.80	4.34 - 6.96	A
			H-3	pCi/L	6255	6880	5940 - 7570	A
	MRAD-21	Filter	Gr-A	pCi/filter	27.3	36.9	12.4 - 57.3	A

(1) The **Iodine-131** was evaluated as failed with a ratio of 0.778. No cause could be found for the slightly low activity. TBE would evaluate this as acceptable with warning. A rerun was not possible due to I-131 decay. All ERA Iodine-131 evaluations since 2004 have been acceptable. NCR 14-08

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.