Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 501 858 5000

0CAN050305

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U. S. Nuclear Regulatory Commission
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Mail Station OP1-17
Washington, DC 20555

Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Annual Radiological Environmental Operating Report for 2002

Dear Sir or Madam:

Arkansas Nuclear One (ANO), Units 1 and 2, Technical Specifications 5.6.2 and 6.9.4, respectively, require the submittal of an annual radiological environmental operating report for the previous calendar year by May 15 of each year. Attached is the annual radiological environmental operating report for ANO for the year 2002. The radionuclides detected by the radiological environmental monitoring program during 2002 were significantly below regulatory limits; therefore, ANO plant operations during 2002 had no harmful effects nor resulted in any irreversible damage to the environment. This report fulfills the reporting requirements referenced above. This submittal contains no commitments. Should you have any questions regarding this submittal, please contact Natalie Mosher at (479) 858-4635.

Sincerely,

Sherrie R. Cotton

Sherrie R. Cotton
Director, Nuclear Safety Assurance

SRC/nbm
Attachment

IE25

cc: Mr. Ellis W. Merschoff
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

Mr. John Minns
NRR Project Manager Region IV/ANO-1
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Mr. Thomas W. Alexion
NRR Project Manager Region IV/ANO-2
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ARKANSAS NUCLEAR ONE - UNITS 1 AND 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2002

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Summary

The Annual Radiological Environmental Operating Report presents data obtained through analyses of environmental samples collected for Arkansas Nuclear One's (ANO's) Radiological Environmental Monitoring Program (REMP) for the period January 1, 2002 through December 31, 2002. This report fulfills the requirements of ANO Unit 1 Technical Specification 5.6.2 and Unit 2 Technical Specification 6.9.4. During 2002 as in previous years, ANO detected radionuclides attributable to plant operations at the discharge location (Station 8). ANO personnel routinely monitor results from this area in order to note any trends. Their review of results from this area indicates the following:

- Tritium levels in the surface water media continue to be below regulatory reporting limits.

- Cobalt-60 and Cesium-137 levels in the sediment media are not demonstrating any consistent increase in comparison to previous years. Review indicates that 2002 levels are less than that of the historical average (1990 – 2001).

Gross beta concentrations at the Station 14 (City of Russellville) indicator drinking water location continue to remain at previous operational background measurements and similar to the levels detected at the Station 57 (City of Danville) control drinking water location.

Radiological Environmental Monitoring Program

ANO established the REMP prior to the station becoming operational (1974) to provide data on background radiation and radioactivity normally present in the area. ANO has continued to monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring radiation directly. ANO also samples milk if milk-producing animals are present commercially within five miles of the plant.

The REMP includes sampling indicator and control locations within an approximately 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. ANO personnel compare indicator results with control and preoperational results to assess any impact ANO operation might have had on the surrounding environment.

In 2002, ANO personnel collected environmental samples for radiological analysis. They compared results of indicator locations with control locations and previous studies, and concluded that overall no significant relationship exists between ANO operation and effect on the plant environs. Review of 2002 data, in many cases, revealed undetectable radiation levels in the environment and near background level in significant pathways associated with ANO.

Harmful Effects or Irreversible Damage

The REMP monitoring did not detect any harmful effects or evidence of irreversible damage in 2002. Therefore, no analysis or planned course of action to alleviate problems was necessary.

Reporting Levels

ANO's review indicates that no samples equaled or exceeded reporting levels for radioactivity concentration in environmental samples, as outlined in Units 1 and 2 Offsite Dose Calculation Manual (ODCM) Table 2.6-3, when averaged over any calendar quarter, due to ANO effluents. Therefore, 2002 results did not trigger any Radiological Monitoring Program Special Reports.

Radioactivity Not Attributable to ANO

The ANO REMP detected radioactivity attributable to other sources twice. These include the 25th Chinese nuclear test explosion in 1980, and the radioactivity plume release due to reactor core degradation at the Chernobyl Nuclear Power Plant in 1986. Prior to 1981, the ANO REMP detected radioactivity resulting from nuclear weapons testing, with Cesium-137 continuing to be periodically detected in certain pathways.

Comparison to Federal and State Programs

ANO 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 Direct Radiation Monitoring Network and the Arkansas Department of Health (ADH).

The NRC TLD Network Program was discontinued in 1998. Historically these results have compared to those from the ANO REMP. ANO 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 ADH and the ANO REMP entail similar radiological environmental monitoring program requirements. These programs include collocated air samples and splitting or sharing sample media such as water, sediment and fish. 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 ANO in 2002 due to unavailability. ANO Units 1 and 2 ODCM require collection of milk samples if available commercially within 8 km (5 miles) of the plant. ANO personnel collected vegetation samples to monitor the ingestion pathway, as specified in the ODCM, because of milk unavailability.

- **Required Lower Limit of Detection (LLD) Values**

All LLDs during this reporting period were within the acceptable limits required by Table 2.6-2 of the ANO Units 1 and 2 ODCM.

- **Air Samples**

Listed below are air sampler deviations that occurred during 2002 due to electrical failures (power loss and pump failure). These deviations did not result in a missed sample and no LLD values were exceeded. As described in footnote (a) to ANO Units 1 and 2 ODCM Table 2.6-1, deviations are permitted from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

Station	Sampling Period	Comment
2	02/26/2002 – 03/12/2002	5.7 hours lost during sampling period.
6	11/05/2002 - 11/19/2002	Timer reading "0" at collection. Flow calculated.
7	04/09/2002 - 04/23/2002	158.2 hours lost during sampling period.
	04/23/2002 - 05/07/2002	Hour meter reading "0". Run time calculated.
	05/07/2002 - 05/21/2002	3.0 hours lost during sampling period.
56	02/26/2002 – 03/12/2002	5.7 hours lost during sampling period.
	10/08/2002 - 10/22/2002	Pump idle at collection. Station ran 339.4 hours.
	12/03/2002 – 12/17/2002	2.0 hours lost during sampling period.

- **Missed Samples**

Air particulate and radioiodine samples were missed at the following locations due to pump failures that occurred during the sampling period:

- Air Sample Station 2 (Indicator) during the sampling periods of June 4, 2002 through June 18, 2002 and July 30, 2002 through August 13, 2002.

- Air Sample Station 6 during the sampling period of May 7, 2002 through May 21, 2002.

One first quarter TLD (Station 150) was missed during 2002 due to vandalism. This loss was an isolated instance that did not recur during the year and was replaced with a new TLD by ANO personnel once discovered. The recovery rate for TLDs during 2002 was 99% (95 of 96).

Although these were isolated instances that were corrected by ANO personnel once discovered, footnote (a) to ANO Units 1 and 2 ODCM Table 2.6-1 allows deviations from the required sampling schedule due to malfunction of sampling equipment and other legitimate reasons.

- **Unavailable Results**

ANO received analytical results in adequate time for inclusion in this report. In addition, ANO's review identified no missing results.

Program Modifications

ANO made no modifications to the REMP during 2002.

Attachments

Attachment 1 contains results of air, TLD, water, sediment, fish, and food products samples collected in 2002. TLDs were analyzed by Waterford-3 Dosimetry. All remaining samples were analyzed by River Bend Station's (RBS) Environmental Laboratory. Attachment 1 also contains RBS' participation in the interlaboratory comparison program during 2002. Attachment 2 contains dose calculations performed for sediment using a generalized equation from Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I."

1.0 Introduction

1.1 Radiological Environmental Monitoring Program

ANO 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:

- 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 ANO.

- 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 are monitored as required by the ANO ODCM. A description of the ANO REMP utilized to monitor the exposure pathways is described in Table 1.1 and shown in Figures 1-1 and 1-2.

Section 2.0 of this report provides a discussion of 2002 sampling results with Section 3.0 providing a summary of results for the monitored exposure pathways.

1.3 Land Use Census

ANO personnel conduct a land use census biannually, as required by ANO Units 1 and Unit 2 ODCM Section 2.6.2. The purpose of this census is to identify changes in uses of land within five miles of ANO that would require modifications to the REMP or ODCM. The most important criteria during this census are to determine location in each sector of the nearest:

1) Residence
2) Animal milked for human consumption
3) Garden of greater than 500 square feet producing broadleaf vegetation *

The method used by ANO personnel for conducting this land use census is as follows:

- ANO personnel conduct door-to-door field surveys and/or aerial surveys in each meteorological sector out to five miles in order to locate the nearest resident and milk animal.

- Consultation with local agricultural authorities is used in instances when personal contact cannot be made.

- As a result of these surveys, the following information is obtained in each meteorological sector:

  1) Nearest permanent residence
  2) Nearest milking animal

- ANO personnel identify locations on the map, measures distances to ANO and records results.

- Locations, if any, are identified which yield a calculated dose or dose commitments greater than those currently calculated in the ODCM.

- ANO personnel compare results to previous census.

* ANO personnel do not perform a garden census since ODCM Section 2.6.2 allows the routine sampling of broadleaf vegetation in the highest D/Q sector near the site boundary in lieu of the garden 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	**Radioiodine and Particulates** 2 samples close to the Site Boundary, in (or near) different sectors with the highest calculated annual average groundlevel D/Q.	**Station 2 (240° - 0.5 miles)** - East of the sewage treatment plant. **Station 56 (273° - 0.4 miles)** – West end of the sewage treatment plant.	Continuous operation of sampler with sample collection as required by dust loading but at least once per 14 days.	Radioiodine Canister – Analyze at least once per 14 days for I-131. Particulate Sampler – Analyze for gross beta radioactivity following filter change.
	Radioiodine and Particulates 1 sample from the vicinity of a community having the highest calculated annual average groundlevel D/Q.	**Station 6 (111° - 7.0 miles)** - Entergy local office in Russellville (305 South Knoxville Avenue).		
	Radioiodine and Particulates 1 sample from a control location 15-30 km (10 – 20 miles) distance.	**Station 7 (209° - 19.3 miles)** – Entergy Supply Yard on Highway 10 in Danville.		
	Radioiodine and Particulates One location sampled voluntarily by ANO.	**Station 1 (90° - 0.6 miles)** - On a pole near the meteorology tower.		
Direct Radiation	**TLDs** 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary	**Station 1 (90° - 0.6 miles)** - On a pole near the meteorology tower. **Station 2 (240° - 0.5 miles)** - East of the sewage treatment plant. **Station 3 (6° - 0.7 miles)** – Junction of Highway 333 and Flatwood Road.	Once per 92 days.	Gamma Dose – Once per 92 days.

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	TLDs 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary	**Station 4 (176° - 0.5 miles) –** West of May Cemetery entrance on south side of the road. **Station 56 (273° - 0.4 miles) -** West end of the sewage treatment plant. **Station 108 (313° - 0.9 miles) -** South on Flatwood Road on a utility pole. **Station 109 (290° - 0.6 miles) -** Utility pole across from the junction of Flatwood Road and Round Mountain Road. **Station 110 (140° - 0.7 miles) -** Bunker Hill Lane on the first utility pole on the left. **Station 145 (30° - 0.6 miles) -** Near west entrance to the RERTC on a utility pole. **Station 146 (50° - 0.6 miles) -** South end of east parking lot at RERTC on a utility pole. **Station 147 (63° - 0.6 miles) -** West side of Bunker Hill Road, approximately 100 yards from intersection with State Highway 333. **Station 148 (122° - 0.5 miles) -** Intersection of Bunker Hill Road with Scott Lane on county road sign post.	Once per 92 days.	Gamma Dose – Once per 92 days.

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	**TLDs** 16 inner ring stations with two or more dosimeters in each meteorological sector in the general area of the Site Boundary	**Station 149 (150° - 0.6 miles)** – On a utility pole on the south side of May Road. **Station 150 (201° - 0.6 miles)** – North side of May Road on a utility pole. **Station 151 (220° - 0.4 miles)** – West side of sewage treatment plant near the lake on a metal post. **Station 152 (338° - 0.8 miles)** – North side of State Highway 333 on a London City limit sign post.	Once per 92 days.	Gamma Dose – Once per 92 days.
	TLDs 8 stations with two or more dosimeters in special interest areas such as population centers, nearby residences, schools, and in 1 – 2 areas to serve as control locations.	**Station 6 (111° - 7.0 miles)** - Entergy local office in Russellville (305 South Knoxville Avenue). **Station 7 (209° - 19.3 miles)** – Entergy Supply Yard on Highway 10 in Danville. **Station 111 (117° - 2.0 miles)** – Marina Road on a utility pole on the left just prior to curve. **Station 116 (320° - 1.9 miles)** - Highway 333 and Highway 64 in London on a utility pole north of the railroad tracks.		

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	**TLDs** 8 stations with two or more dosimeters in special interest areas such as population centers, nearby residences, schools, and in 1 – 2 areas to serve as control locations.	**Station 125 (46° - 9.0 miles)** - College Street on a utility pole at the southeast corner of the red brick school building. **Station 127 (97° - 5.2 miles)** - Arkansas Tech Campus on a utility pole across from Paine Hall. **Station 137 (150° - 8.1 miles)** – On a speed limit sign on the right in front of the Morris R. Moore Arkansas National Guard Armory. **Station 153 (305° - 9.2 miles)** - Knoxville Elementary School near the school entrance gate on a utility pole.	Once per 92 days.	Gamma Dose – Once per 92 days.
Waterborne	**Surface Water** 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 8 (180° - 0.1 miles)** - Plant discharge canal. **Station 10 (90° - 0.5 miles)** – Plant intake canal.	Once per 92 days.	Gamma isotopic and tritium analyses once per 92 days.
	Drinking Water 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 14 (70° - 5.3 miles)** - Russellville city water system from the Illinois Bayou. **Station 57 (208° - 19.5 miles)** - Danville public water supply treatment on Fifth Street.	Once per 92 days.	I-131, gross beta, gamma isotopic and tritium analyses once per 92 days.

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	**Sediment** 1 indicator location (influenced by plant discharge) 1 control location (uninfluenced by plant discharge)	**Station 8 (245° - 0.7 miles)** - Plant discharge canal. **Station 16 (290° - 5.5 miles)** - Panther Bay on south side of Arkansas River across from mouth of Piney Creek.	Once per 365 days.	Gamma isotopic analysis once per 365 days.
Ingestion	**Milk** 1 indicator sample location within 8 km distant if commercially available. 1 control sample location at a distant of >8 km, when an indicator exists.	Currently, no available milking animals within 8 km of ANO.	Once per 92 days.	Gamma isotopic and I-131 analyses once per 92 days.
	Fish 1 sample of commercially and/or recreationally important species in vicinity of plant discharge. 1 sample of same species in area not influenced by plant discharge.	**Station 8 (230° - 0.6 miles)** – Plant discharge canal. **Station 16 (290° - 5.5 miles)** - Panther Bay on south side of Arkansas River across from mouth of Piney Creek.	Once per 365 days.	Gamma isotopic on edible portions once per 365 days.

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	<u>Food Products</u> 1 sample of broadleaf (edible or non-edible) near the Site Boundary from one of the highest anticipated annual average groundlevel D/Q sectors, if milk sampling is not performed. 1 sample location of broadleaf vegetation (edible or non-edible) from a control location 15 – 30 km distant, if milk sampling is not performed.	**Station 13 (278° - 0.5 miles)** - West from ANO toward Gate 4 onto Flatwood Road. **Station 55 (209° - 16.6 miles)** – Intersection of Highway 27 and 154.	Three per 365 days.	Gamma isotopic and I-131 analyses three times per 365 days.

FIGURE 1-1

SAMPLE COLLECTION SITES – NEAR FIELD

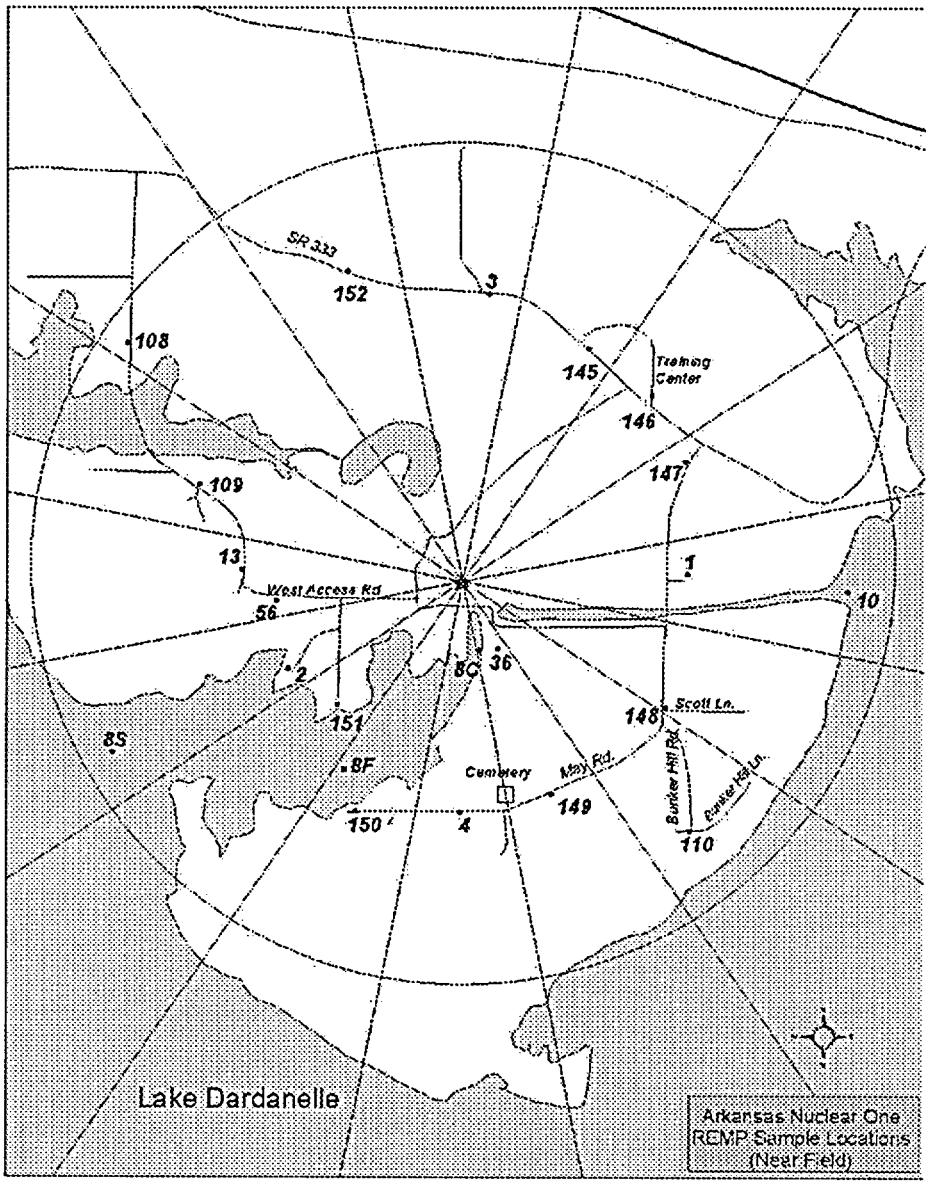
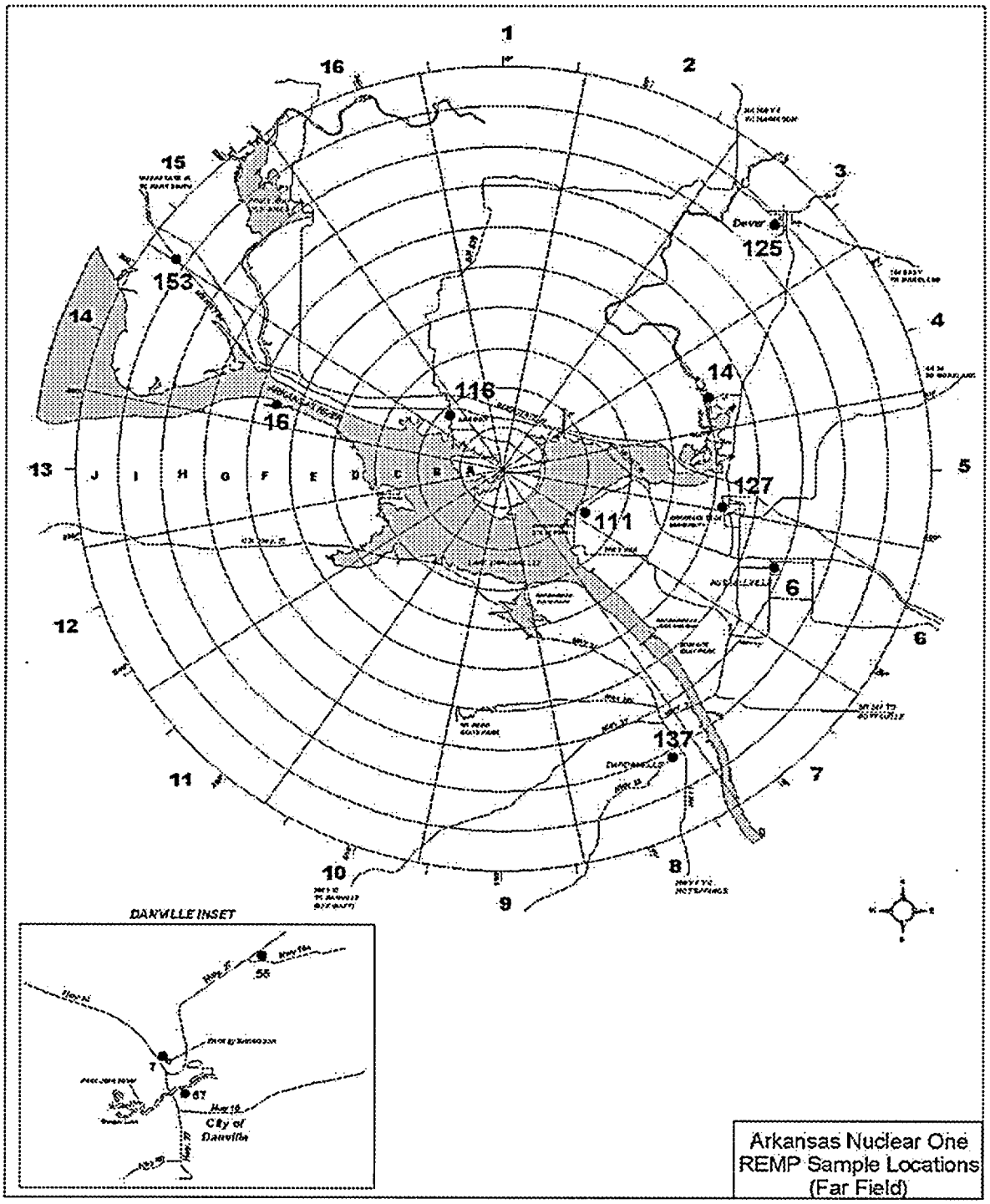


FIGURE 1-2

SAMPLE COLLECTION SITES – FAR FIELD



2.0 Interpretation and Trends of Results

2.1 Air Particulate and Radioiodine Sample Results

Iodine-131 was not detected in the radioiodine cartridges during 2002, as has been the case in previous years. Indicator gross beta air particulate results for 2002 were similar to those background levels obtained in previous years of the operational REMP and well below preoperational levels as seen below. Results are reported as annual average pCi/m^3.

Monitoring Period	Result
Preoperational	0.05
1997 – 2001	0.02
2002	0.02

Table 3.1, which includes gross beta concentrations, provides a comparison of the indicator and control means, and further emphasizes that the airborne pathway continues to remain at background levels.

2.2 Thermoluminescent Dosimetry Sample Results

ANO reports measured dose as net exposure (field reading less [transit + shield reading]) normalized to 92 days and relies on comparison of the indicator locations to the control as a measure of plant impact. Gamma radiation dose in the reporting period was compared to historical control location readings for previous years as shown in Figure 2-1.

ANO's comparison of the results to the control indicates that the ambient radiation levels are unaffected by plant operations. Although one of the quarterly readings for TLD Station 1 shown in Figure 2-1 was slightly above the historical maximum control location value of 10.0 mrem/quarter, it was within the upper (+) three standard deviation range of 11.6 mrem for the control. Therefore, levels continue to remain at or near background.

2.3 Water Sample Results

Analytical results for 2002 surface water and drinking water samples were similar to those reported in previous years.

Surface water samples were collected and analyzed for gamma radionuclides and tritium. Gamma radionuclides were below detectable limits which is typically consistent with that of previous operational years. Tritium continues to be detected at the indicator location. However, the levels detected were within the range that has

typically been seen at this location as shown below. Results are reported as annual average pCi/l.

Monitoring Period	Concentration
1997 – 2001 Minimum Value	777.8
2002 Value	829.8
1997 – 2001 Maximum Value	2070.0
Preoperational Value	200.0

ANO personnel have noted no definable trends associated with the tritium levels at the discharge location. Levels detected during 2002 and previous operational years have been well below regulatory reporting limits and are typical of historical averages. Therefore, the operation of ANO had no impact on this pathway during 2002 and levels of radionuclides remain similar to those obtained in operational years.

Drinking water samples were collected from two locations (indicator and control). Although ANO personnel utilize Station 14 (City of Russellville) as an indicator location due to the potential for the pathway to exist, the City of Russellville has not withdrawn water from Lake Dardanelle in the past several years.

Drinking water samples were analyzed for gross beta radionuclides, Iodine-131, gamma radionuclides and tritium. Gamma radionuclides, Iodine-131 and tritium concentrations were below detectable limits at the indicator and control locations, which is consistent with preoperational and operational years. In addition, gross beta concentrations at the indicator and control locations are similar as shown in Table 3.1. Listed below is a comparison of 2002 indicator results to preoperational and operational years. Results are reported as annual average pCi/l.

Radionuclide	2002	1997 – 2001	Preoperational
Gross Beta	1.05	3.18	2.0
Iodine-131	<LLD	<LLD	<LLD
Gammas	<LLD	<LLD	<LLD
Tritium	<LLD	335.0	200.0

Based on this comparison, the operation of ANO had no impact on this pathway during 2002 and radionuclides monitored for this pathway continue to remain at background levels.

2.4 Sediment Sample Results

Sediment samples were collected from two locations in 2002 and analyzed for gamma radionuclides. As in previous years, radionuclides (Cobalt-60 & Cesium-137) attributable to ANO were detected in the discharge sediment. However, ANO personnel have noted no definable trends associated with these levels at the discharge location. Levels detected during 2002 are typical of historical averages seen at this location. Since reporting levels for radionuclides in sediment have not been established, an evaluation of potential dose to the public from this media was performed as shown in Attachment 2. The annual maximum dose from all radionuclides to the skin and total body was <0.01 millirem.

Design objectives given in 10CFR50, Appendix I for liquid effluents are annual doses of ≤3 millirem total body and ≤10 millirem any organ. The values of <0.01 millirem for the skin and total body are well within the design objective criteria. Therefore, the level of radionuclides detected in 2002 had no significant impact on the environment or public.

2.5 Milk Sample Results

Milk samples were not collected during 2002 due to the unavailability of indicator locations within 8-km of ANO. Since there are no dairies within five miles of the ANO site, it is concluded ANO's operation had no impact on this pathway in 2002.

2.6 Fish Sample Results

Fish samples were collected from two locations and analyzed for gamma radionuclides. In 2002, gamma radionuclides were below detectable limits, which is consistent with the preoperational monitoring period and operational results since 1997. Therefore, based on these measurements, ANO operations had no significant radiological impact upon the environment or public by this pathway.

2.7 Food Product Sample Results

Food product samples were collected when available from two locations in 2002 and analyzed for Iodine-131 and gamma radionuclides. The 2002 levels remained undetectable, as has been the case in previous years. Therefore, since levels continue to remain at background, it can be concluded that plant operations is not impacting this pathway.

2.8 Land Use Census Results

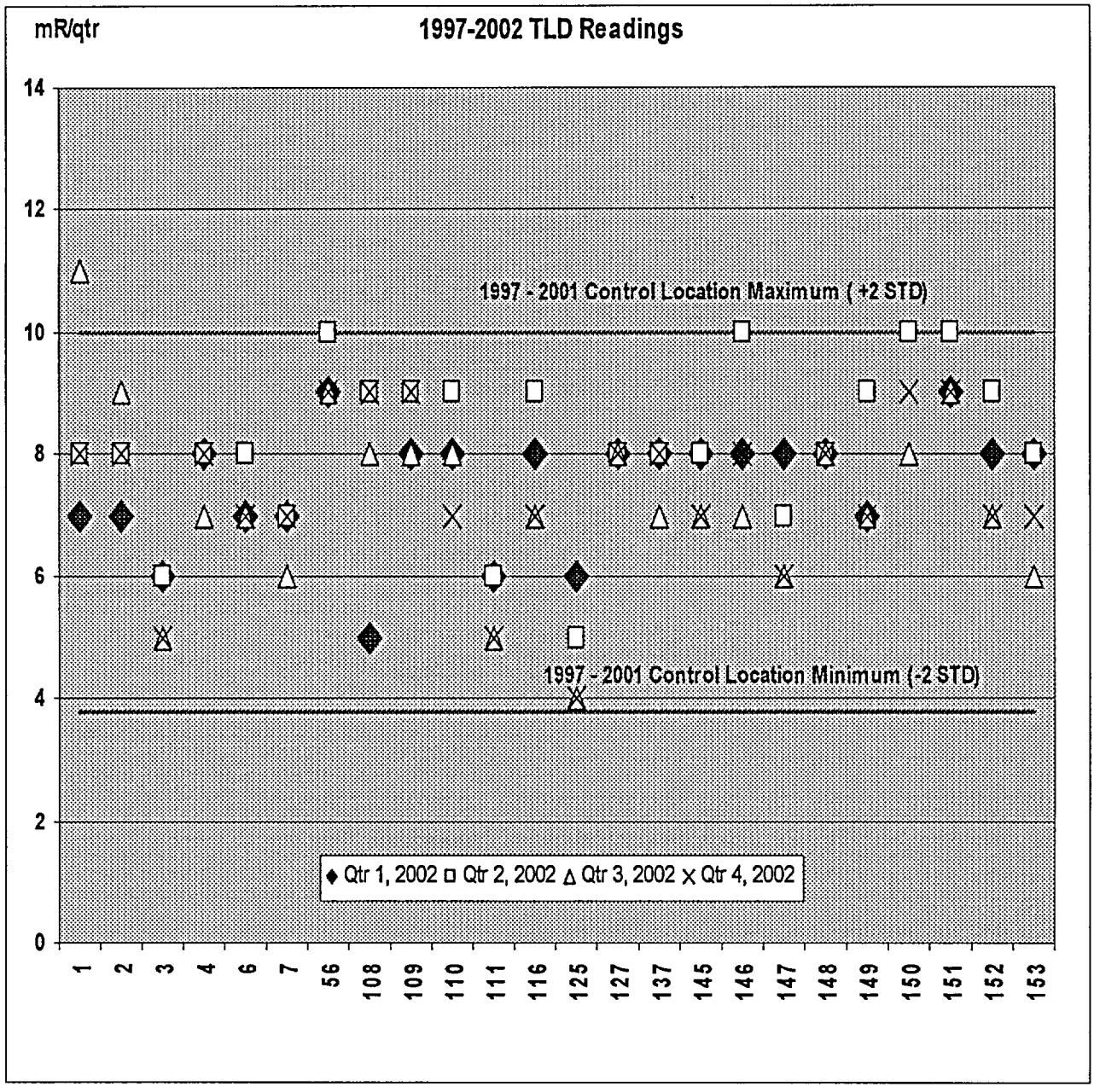
ANO personnel conduct a land use census biannually. The most recent land use census was conducted in 2001. Therefore, a census was not required for this reporting year.

2.9 Interlaboratory Comparison Results

RBS' Environmental Laboratory analyzed interlaboratory comparison samples for ANO to fulfill the requirements of ANO Units 1 and 2 ODCM Section 2.6.3. Attachment 1, 2002 Radiological Environmental Monitoring Report, contains these results. ANO's review of RBS' interlaboratory comparison indicated that 98% of the sample results for accuracy and precision were within the acceptable control limits of the three normalized deviations. For those sample results outside the acceptable control limits, ANO's and RBS's review indicated no impact on previously reported data. Attachment 1 also provides additional discussion regarding sample results outside the acceptable control limits.

Figure 2-1

TLD Radiation Dose



3.0 Radiological Environmental Monitoring Program Summary

3.1 2002 Program Results Summary

Table 3.1 summarizes the 2002 REMP results. ANO 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

Radiological Environmental Monitoring Program Summary

Name of Facility: ANO - Units 1 and 2 **Docket No: 50-313 and 50-368**
Location of Facility: Pope County, Arkansas **Reporting Period: January - December 2002**

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine Results [c]
				Location [d]	Mean (F) [c] [Range]		
Air Particulates (pCi/m^3)	GB 132	0.01	0.02 (79 / 79) [0.004 – 0.05]	Station 2 (240°, 0.5 mi)	0.03 (25 / 25) [0.02 - 0.04]	0.03 (53 / 53) [0.02 - 0.04]	0
Airborne Iodine (pCi/m^3)	I-131 132	0.07	<LLD	N/A	N/A	<LLD	0
Inner Ring TLDs (mR/Qtr)	Gamma 63	(f)	7.9 (63 / 63) [5.0 – 11.0]	Station 56 (273°, 0.4 mi)	9.3 (4 / 4) [9.0 – 10.0]	N/A	0
				Station 151 (220°, 0.4 mi)	9.3 (4 / 4) [9.0 – 10.0]	N/A	
Special Interest TLDs (mR/Qtr)	Gamma 28	(f)	6.9 (28 / 28) [4.0 – 9.0]	Station 127 (97°, 5.2 mi)	8.0 (4 / 4) [N/A]		0
Control TLD (mR/Qtr)	Gamma 4	(f)	N/A	N/A	N/A	6.8 (4 / 4) [6.0 – 7.0]	0

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: ANO - Units 1 and 2 Docket No: 50-313 and 50-368
Location of Facility: Pope County, Arkansas Reporting Period: January - December 2002

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Location Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Surface Water (pCi/l)	H-3 8	3000	829.8 (4 / 4) [333.0 – 1683.0]	Station 8 (180°, 0.1 mi)	829.8 (4 / 4) [333.0 – 1683.0]	<LLD	0
	GS 24						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	I-131	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: ANO - Units 1 and 2 Docket No: 50-313 and 50-368
Location of Facility: Pope County, Arkansas Reporting Period: January - December 2002

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Drinking Water (pCi/1)	GB 8	4	1.05 (1 / 4) [N/A]	Station 14 (70°, 5.3 mi)	1.05 (1 / 4) [N/A]	2.69 (2 / 4) [2.12 – 3.26]	0
	I-131 8	1.0	<LLD	N/A	N/A	<LLD	0
	H-3 8	2000	<LLD	N/A	N/A	<LLD	0
	GS 8						
	Mn-54	15	<LLD	N/A	N/A	<LLD	0
	Fe-59	30	<LLD	N/A	N/A	<LLD	0
	Co-58	15	<LLD	N/A	N/A	<LLD	0
	Co-60	15	<LLD	N/A	N/A	<LLD	0
	Zn-65	30	<LLD	N/A	N/A	<LLD	0
	Zr-95	30	<LLD	N/A	N/A	<LLD	0
	Nb-95	15	<LLD	N/A	N/A	<LLD	0
	Cs-134	15	<LLD	N/A	N/A	<LLD	0
	Cs-137	18	<LLD	N/A	N/A	<LLD	0
	Ba-140	60	<LLD	N/A	N/A	<LLD	0
	La-140	15	<LLD	N/A	N/A	<LLD	0

TABLE 3.1

Radiological Environmental Monitoring Program Summary

Name of Facility: ANO - Units 1 and 2 Docket No: 50-313 and 50-368
Location of Facility: Pope County, Arkansas Reporting Period: January - December 2002

Sample Type (Units)	Type & Number of Analyses [a]	LLD [b]	Indicator Location Mean (F) [c] [Range]	Location with Highest Annual Mean		Control Locations Mean (F) [c] [Range]	Number of Nonroutine Results [e]
				Location [d]	Mean (F) [c] [Range]		
Bottom Sediment (pCi/kg)	GS 2						
	Co-60	(f)	60.2 (1 / 1) [N/A]	Station 8 (245°, 0.7 mi)	60.2 (1 / 1) [N/A]	<LLD	0
	Cs-134	150	<LLD	N/A	N/A	<LLD	0
	Cs-137	180	1170.0 (1 / 1) [N/A]	Station 8 (245°, 0.7 mi)	1170.0 (1 / 1) [N/A]	<LLD	0
Fish (pCi/kg)	GS 2						
	Mn-54	130	<LLD	N/A	N/A	<LLD	0
	Fe-59	260	<LLD	N/A	N/A	<LLD	0
	Co-58	130	<LLD	N/A	N/A	<LLD	0
	Co-60	130	<LLD	N/A	N/A	<LLD	0
	Zn-65	260	<LLD	N/A	N/A	<LLD	0
	Cs-134	130	<LLD	N/A	N/A	<LLD	0
	Cs-137	150	<LLD	N/A	N/A	<LLD	0
Food Products (pCi/kg)	I-131 6	60	<LLD	N/A	N/A	N/A	0
	GS 6						
	Cs-134	60	<LLD	N/A	N/A	N/A	0
	Cs-137	80	<LLD	N/A	N/A	N/A	0

[a] GB = Gross beta; I-131 = Iodine-131; H-3 = Tritium; GS = Gamma scan.

[b] LLD = Required lower limit of detection based on ANO Units 1 and 2 ODCM Tables 2.6-2.

[c] Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis (F).

[d] Locations are specified (1) by name and (2) degrees relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

[f] LLD is not defined in ANO Units 1 and 2 ODCM Tables 2.6-2.

Attachment 1

2002 Radiological Monitoring Report

Summary of Monitoring Results

TABLE OF CONTENTS

Table 1.1
Sample Type: **Air Particulate**
Analysis: Gross Beta
Units: pCi/m^3

Start Date	End Date	Station 1 (Indicator)	Station 2 (Indicator)	Station 56 (Indicator)	Station 6 (Control)	Station 7 (Control)
Required LLD →		**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
12/18/2001	01/02/2002	0.004	0.03	0.02	0.03	0.03
01/02/2002	01/15/2002	0.03	0.03	0.03	0.03	0.03
01/15/2002	01/29/2002	0.02	0.02	0.02	0.02	0.02
01/29/2002	02/12/2002	0.02	0.02	0.02	0.02	0.02
02/12/2002	02/26/2002	0.02	0.02	0.02	0.02	0.02
02/26/2002	03/12/2002	0.02	0.02	0.02	0.02	0.02
03/12/2002	03/26/2002	0.02	0.02	0.02	0.02	0.02
03/26/2002	04/09/2002	0.02	0.02	0.02	0.02	0.02
04/09/2002	04/23/2002	0.02	0.02	0.02	0.02	0.03
04/23/2002	05/07/2002	0.02	0.02	0.02	0.02	0.02
05/07/2002	05/21/2002	0.02	0.02	0.02	*	0.02
05/21/2002	06/04/2002	0.02	0.02	0.02	0.02	0.02
06/04/2002	06/18/2002	0.02	*	0.02	0.02	0.02
06/18/2002	07/02/2002	0.02	0.02	0.02	0.02	0.02
07/02/2002	07/16/2002	0.03	0.03	0.02	0.03	0.03
07/16/2002	07/30/2002	0.02	0.02	0.02	0.02	0.02
07/30/2002	08/13/2002	0.03	*	0.03	0.03	0.03
08/13/2002	08/27/2002	0.02	0.02	0.02	0.02	0.02
08/27/2002	09/10/2002	0.03	0.03	0.03	0.03	0.03
09/10/2002	09/24/2002	0.03	0.03	0.02	0.03	0.03
09/24/2002	10/08/2002	0.03	0.03	0.02	0.03	0.03
10/08/2002	10/22/2002	0.03	0.03	0.02	0.03	0.03
10/22/2002	11/05/2002	0.03	0.03	0.03	0.02	0.02
11/05/2002	11/19/2002	0.04	0.04	0.04	0.04	0.04
11/19/2002	12/03/2002	0.03	0.03	0.03	0.03	0.03
12/03/2002	12/17/2002	0.05	0.04	0.04	0.04	0.04
12/17/2002	12/31/2002	0.03	0.03	0.03	0.03	0.03

* Sample missed. See AREOR "Summary" for explanation.

Table 1.2
Sample Type: Radioiodine Cartridge
Analysis: Iodine-131
Units: pCi/m^3

Start Date	End Date	Station 1 (Indicator)	Station 2 (Indicator)	Station 56 (Indicator)	Station 6 (Control)	Station 7 (Control)
Required LLD →		0.07	0.07	0.07	0.07	0.07
12/18/2001	01/02/2002	<0.01	<0.01	<0.02	<0.01	<0.01
01/02/2002	01/15/2002	<0.02	<0.02	<0.02	<0.02	<0.01
01/15/2002	01/29/2002	<0.01	<0.01	<0.01	<0.01	<0.01
01/29/2002	02/12/2002	<0.01	<0.01	<0.01	<0.01	<0.01
02/12/2002	02/26/2002	<0.02	<0.02	<0.02	<0.02	<0.02
02/26/2002	03/12/2002	<0.02	<0.01	<0.02	<0.02	<0.02
03/12/2002	03/26/2002	<0.01	<0.01	<0.01	<0.01	<0.01
03/26/2002	04/09/2002	<0.01	<0.02	<0.01	<0.01	<0.01
04/09/2002	04/23/2002	<0.02	<0.01	<0.02	<0.02	<0.04
04/23/2002	05/07/2002	<0.01	<0.01	<0.01	<0.01	<0.01
05/07/2002	05/21/2002	<0.02	<0.02	<0.02	*	<0.02
05/21/2002	06/04/2002	<0.01	<0.01	<0.01	<0.01	<0.01
06/04/2002	06/18/2002	<0.01	*	<0.01	<0.01	<0.01
06/18/2002	07/02/2002	<0.01	<0.01	<0.01	<0.02	<0.02
07/02/2002	07/16/2002	<0.01	<0.01	<0.01	<0.01	<0.01
07/16/2002	07/30/2002	<0.01	<0.01	<0.01	<0.01	<0.01
07/30/2002	08/13/2002	<0.02	*	<0.01	<0.02	<0.02
08/13/2002	08/27/2002	<0.02	<0.02	<0.02	<0.02	<0.02
08/27/2002	09/10/2002	<0.02	<0.01	<0.02	<0.02	<0.02
09/10/2002	09/24/2002	<0.01	<0.01	<0.02	<0.02	<0.02
09/24/2002	10/08/2002	<0.01	<0.02	<0.02	<0.02	<0.02
10/08/2002	10/22/2002	<0.02	<0.01	<0.02	<0.02	<0.01
10/22/2002	11/05/2002	<0.01	<0.02	<0.02	<0.02	<0.01
11/05/2002	11/19/2002	<0.01	<0.01	<0.01	<0.01	<0.01
11/19/2002	12/03/2002	<0.02	<0.02	<0.01	<0.02	<0.01
12/03/2002	12/17/2002	<0.02	<0.02	<0.02	<0.02	<0.01
12/17/2002	12/31/2002	<0.02	<0.02	<0.02	<0.02	<0.02

* Sample missed. See AREOR "Summary" for explanation

Table 2.1
Sample Type: Thermoluminescent Dosimeters
Analysis: Gamma Dose
Units: mrem/Qtr

Inner Ring (Indicators)					
Station	1st Qtr '02 (mrem)	2nd Qtr '02 (mrem)	3rd Qtr '02 (mrem)	4th Qtr '02 (mrem)	Annual Mean '02 (mrem)
3	6.0	6.0	5.0	5.0	5.5
145	8.0	8.0	7.0	7.0	7.5
146	8.0	10.0	7.0	8.0	8.3
147	8.0	7.0	6.0	6.0	6.8
1	7.0	8.0	11.0	8.0	8.5
148	8.0	8.0	8.0	8.0	8.0
110	8.0	9.0	8.0	7.0	8.0
149	7.0	9.0	7.0	7.0	7.5
4	8.0	8.0	7.0	8.0	7.8
150	*	10.0	8.0	9.0	9.0
151 **	9.0	10.0	9.0	9.0	9.3
2	7.0	8.0	9.0	8.0	8.0
56 **	9.0	10.0	9.0	9.0	9.3
109	8.0	9.0	8.0	9.0	8.5
108	5.0	9.0	8.0	9.0	7.8
152	8.0	9.0	7.0	7.0	7.8

* Sample missed. See AREOR "Summary" for explanation
** Station with highest annual mean.

Table 2.2
Sample Type: Thermoluminescent Dosimeters
Analysis: Gamma Dose
Units: mrem/Qtr

Special Interest Areas - (Population Centers & Schools)					
Station	1st Qtr '02 (mrem)	2nd Qtr '02 (mrem)	3rd Qtr '02 (mrem)	4th Qtr '02 (mrem)	Annual Mean '02 (mrem)
6	7.0	8.0	7.0	7.0	7.3
111	6.0	6.0	5.0	5.0	5.5
116	8.0	9.0	7.0	7.0	7.8
125	6.0	5.0	4.0	4.0	4.8
127 *	8.0	8.0	8.0	8.0	8.0
137	8.0	8.0	7.0	8.0	7.8
153	8.0	8.0	6.0	7.0	7.3

* Station with highest annual mean.

Special Interest Areas – (Control)					
Station	1st Qtr '02 (mrem)	2nd Qtr '02 (mrem)	3rd Qtr '02 (mrem)	4th Qtr '02 (mrem)	Annual Mean '02 (mrem)
7	7.0	7.0	6.0	7.0	6.8

Table 3.1
Sample Type: Surface Water
Analysis: Gamma Isotopic
Units: pCi/l

Location	Start Date	End Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	Required LLD →		15	30	15	15	30	30	15	15	15	18	60	15
Station 8 (Indicator)	12/31/2001	01/31/2002	<3.47	<8.25	<3.51	<4.40	<6.95	<5.03	<4.05	<5.33	<3.32	<3.22	<17.50	<5.15
Station 10 (Control)	12/31/2001	01/31/2002	<2.33	<5.56	<3.34	<2.96	<5.86	<4.71	<3.19	<3.98	<2.75	<2.86	<8.72	<4.50
Station 8 (Indicator)	01/31/2002	02/28/2002	<3.16	<8.04	<4.41	<3.47	<5.02	<5.11	<5.57	<9.80	<4.26	<4.12	<21.20	<5.51
Station 10 (Control)	01/31/2002	02/28/2002	<2.80	<6.66	<2.87	<2.78	<7.49	<4.20	<4.06	<8.08	<3.55	<2.39	<20.30	<6.63
Station 8 (Indicator)	02/28/2002	03/31/2002	<2.80	<6.68	<3.14	<3.29	<6.42	<6.65	<3.50	<5.35	<3.80	<3.65	<14.10	<5.09
Station 10 (Control)	02/28/2002	03/31/2002	<2.87	<5.24	<1.88	<2.94	<5.14	<4.94	<2.70	<4.49	<3.33	<2.97	<12.50	<3.15
Station 8 (Indicator)	03/31/2002	04/30/2002	<4.70	<7.40	<4.35	<2.90	<6.88	<5.58	<4.49	<14.40	<4.25	<4.22	<29.70	<10.90
Station 10 (Control)	03/31/2002	04/30/2002	<4.22	<5.93	<4.28	<3.94	<9.13	<6.77	<5.52	<12.50	<3.89	<3.25	<23.80	<10.50
Station 8 (Indicator)	04/30/2002	05/31/2002	<3.68	<5.89	<3.75	<3.63	<7.29	<7.27	<3.50	<6.27	<3.71	<3.31	<15.80	<5.05
Station 10 (Control)	04/30/2002	05/31/2002	<3.19	<5.69	<3.30	<3.23	<4.91	<4.48	<3.36	<4.55	<3.01	<3.20	<14.10	<4.87
Station 8 (Indicator)	05/31/2002	06/30/2002	<4.42	<7.29	<2.72	<3.20	<9.44	<8.02	<4.89	<9.39	<3.64	<3.96	<21.60	<7.07
Station 10 (Control)	05/31/2002	06/30/2002	<3.31	<7.47	<3.71	<1.77	<6.85	<5.57	<3.83	<7.16	<3.04	<2.83	<16.20	<7.09

Table 3.1
Sample Type: Surface Water
Analysis: Gamma Isotopic
Units: pCi/l

Location	Start Date	End Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
	Required LLD →		15	30	15	15	30	30	15	15	15	18	60	15
Station 8 (Indicator)	06/30/2002	07/31/2002	<3.24	<6.74	<3.66	<3.55	<9.49	<5.09	<2.90	<4.25	<4.21	<3.29	<15.50	<5.43
Station 10 (Control)	06/30/2002	07/31/2002	<3.01	<5.25	<2.85	<2.88	<5.98	<5.74	<3.08	<4.49	<3.57	<3.36	<11.90	<5.63
Station 8 (Indicator)	07/31/2002	08/31/2002	<3.89	<8.64	<3.46	<3.45	<6.92	<4.90	<5.04	<9.33	<3.98	<3.98	<20.80	<5.68
Station 10 (Control)	07/31/2002	08/31/2002	<2.90	<7.34	<2.91	<3.05	<6.98	<5.25	<3.46	<6.57	<2.75	<3.01	<17.80	<4.49
Station 8 (Indicator)	08/31/2002	09/30/2002	<3.57	<6.52	<4.34	<3.41	<8.33	<5.64	<3.63	<7.97	<3.54	<2.90	<17.90	<6.69
Station 10 (Control)	08/31/2002	09/30/2002	<2.84	<6.45	<3.13	<2.62	<5.02	<5.64	<3.51	<6.02	<3.20	<2.97	<15.90	<6.74
Station 8 (Indicator)	09/30/2002	10/31/2002	<3.69	<5.81	<2.96	<3.39	<6.86	<6.28	<4.21	<5.68	<2.99	<3.27	<14.60	<6.20
Station 10 (Control)	09/30/2002	10/31/2002	<3.06	<4.48	<2.47	<3.22	<5.31	<4.15	<3.51	<4.07	<2.92	<3.50	<13.30	<4.42
Station 8 (Indicator)	10/31/2002	12/02/2002	<4.85	<9.59	<5.98	<5.83	<4.65	<7.23	<4.99	<6.22	<5.22	<5.03	<22.30	<9.32
Station 10 (Control)	10/31/2002	12/02/2002	<2.49	<7.08	<3.75	<4.02	<8.85	<6.17	<5.90	<5.00	<4.86	<6.30	<23.20	<7.15
Station 8 (Indicator)	12/02/2002	12/31/2002	<3.40	<5.92	<3.36	<3.24	<8.40	<6.38	<3.88	<8.70	<3.43	<3.26	<18.40	<6.31
Station 10 (Control)	12/02/2002	12/31/2002	<3.02	<6.03	<2.89	<3.33	<6.66	<4.78	<3.58	<7.00	<3.38	<3.12	<15.90	<7.02

Table 3.2
Sample Type: Surface Water
Analysis: Tritium
Units: pCi/l

Location	Begin Date	End Date	H-3
		Required LLD →	3000
Station 8 (Indicator)	12/31/2001	03/31/2002	1,683.0
Station 10 (Control)	12/31/2001	03/31/2002	<528.0
Station 8 (Indicator)	03/31/2002	06/30/2002	333.0
Station 10 (Control)	03/31/2002	06/30/2002	<573.0
Station 8 (Indicator)	06/30/2002	09/30/2002	888.0
Station 10 (Control)	06/30/2002	09/30/2002	<573.0
Station 8 (Indicator)	09/30/2002	12/31/2002	415.0
Station 10 (Control)	09/30/2002	12/31/2002	<595.0

Table 4.1
Sample Type: **Drinking Water**
Analysis: Gross Beta, Iodine-131 and Gamma Isotopic
Units: pCi/l

Location	Collection Date	Gross Beta	I-131	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
Required LLD →		4.0	1.0	15	30	15	15	30	30	15	15	18	60	15
Station 14 (Indicator)	03/15/2002	<3.10	<0.81	<3.18	<6.33	<3.09	<4.76	<9.80	<7.35	<4.46	<3.83	<3.65	<18.40	<6.55
Station 57 (Control)	03/15/2002	3.26	<0.90	<4.17	<6.63	<4.29	<3.77	<6.53	<6.61	<3.76	<4.10	<5.21	<18.30	<6.59
Station 14 (Indicator)	06/20/2002	<4.17	<0.90	<3.46	<7.10	<3.30	<4.10	<7.58	<5.18	<3.59	<3.40	<3.91	<14.30	<6.17
Station 57 (Control)	06/18/2002	<4.75	<0.89	<3.76	<7.23	<3.49	<3.79	<8.63	<6.06	<2.95	<3.76	<3.53	<19.60	<4.94
Station 14 (Indicator)	09/10/2002	1.05	<0.89	<3.88	<7.04	<4.07	<3.92	<8.37	<5.59	<3.93	<3.58	<4.03	<17.30	<4.69
Station 57 (Control)	09/10/2002	2.12	<0.87	<3.37	<7.31	<4.22	<3.36	<7.42	<6.59	<3.81	<3.75	<3.81	<15.80	<5.78
Station 14 (Indicator)	12/10/2002	<1.67	<0.88	<3.19	<6.74	<3.14	<3.40	<7.53	<5.75	<3.47	<3.15	<3.31	<16.40	<5.03
Station 57 (Control)	12/10/2002	<1.71	<0.86	<2.94	<5.65	<3.31	<2.93	<3.57	<5.20	<2.93	<3.15	<3.12	<9.81	<4.79

Table 4.2
Sample Type: Drinking Water
Analysis: Tritium
Units: pCi/l

Location	Collection Date	H-3
	Required LLD →	2000
Station 14 (Indicator)	03/15/2002	<536.00
Station 57 (Control)	03/15/2002	<536.00
Station 14 (Indicator)	06/20/2002	<561.00
Station 57 (Control)	06/18/2002	<584.00
Station 14 (Indicator)	09/10/2002	<580.00
Station 57 (Control)	09/10/2002	<577.00
Station 14 (Indicator)	12/10/2002	<582.00
Station 57 (Control)	12/10/2002	<581.00

Table 5.1
Sample Type: Sediment
Analysis: Gamma Isotopic
Units: pCi/kg

Location	Collection Date	Co-60	Cs-134	Cs-137
	Required LLD →	NA	150	180
Station 8 (Indicator)	10/02/2002	60.2	<123.0	1170.0
Station 16 (Control)	10/02/2002	<79.8	<111.0	<88.2

Table 6.1
Sample Type: Fish
Analysis: Gamma Isotopic
Units: pCi/kg

Location	Collection Date	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Cs-134	Cs-137
	Required LLD →	130	260	130	130	260	130	150
Station 8 (Indicator)	10/24/2002	<14.10	<61.10	<20.40	<14.60	<33.40	<11.10	<14.10
Station 16 (Control)	09/09/2002	<15.00	<123.0	<19.50	<17.90	<41.20	<10.10	<14.10

Table 7.1
Sample Type: Food Products
Analysis: Iodine-131 and Gamma Isotopic
Units: pCi/kg

Location	Collection Date	I-131	Cs-134	Cs-137
	Required LLD →	60	60	80
Station 13 (Indicator)	06/20/2002	<53.0	<30.0	<33.9
Station 55 (Control)	06/20/2002	<59.4	<38.0	<42.0
Station 13 (Indicator)	07/02/2002	<56.1	<31.3	<32.2
Station 55 (Control)	07/02/2002	<57.2	<35.5	<31.4
Station 13 (Indicator)	08/02/2002	<58.8	<33.6	<32.8
Station 55 (Control)	08/02/2002	<54.0	<54.8	<38.1

Table 8.1
Sample Type: **Interlaboratory Comparison**
Analysis: Gross Beta, Iodine-131 and Gamma Isotopic

Sample Type (units)	Study	Date	Analysis	Known Value [a]	RBS Value	RBS N-Dev [b]	RBS N-Range [c]
Charcoal Cartridge (pCi/cartridge)	E3236-125	06/13/02	I-131	94.0 ± 16.28	93.4	-0.12	0.358
Water	E3049-125	03/14/02	BETA	130 ± 22.5	137	0.98	0.273
(pCi/liter)	E3047-125	03/14/02	CR-51	198 ± 34.3	209	0.96	0.776
			MN-54	166 ± 28.7	177	1.11	0.605
			FE-59	86.0 ± 14.9	97.8	2.37	0.103
			CO-60	117 ± 20.3	116	-0.10	0.252
			ZN-65	164 ± 28.4	176	1.27	0.432
			I-131	61.0 ± 10.6	58.7	-0.65	0.271
			CS-134	91.0 ± 15.8	89.8	-0.23	0.032
			CS-137	197 ± 34.1	196	-0.06	0.120
			CE-141	242 ± 41.9	241	-0.05	0.024
	E3048-125	03/14/02	CR-51	198 ± 34.3	204	0.52	0.955
	(Duplicate)		MN-54	166 ± 28.7	179	1.36	0.320
			FE-59	86.0 ± 14.9	96.4	2.09	1.264
			CO-60	117 ± 20.3	113	-0.64	0.404
			ZN-65	164 ± 28.4	176	1.30	0.864
			I-131	61.0 ± 10.6	62.7	0.47	0.504
			CS-134	91.0 ± 15.8	89.0	-0.37	0.435
			CS-137	197 ± 34.1	202	0.41	0.420
			CE-141	242 ± 41.9	243	0.05	0.073
	E3235-125	06/13/02	H-3	6970 ± 1207	7298	0.82	0.217

Table 8.1
Sample Type: **Interlaboratory Comparison**
Analysis: Tritium and Gamma Isotopic

Sample Type (units)	Study	Date	Analysis	Known Value [a]	RBS Value	RBS N-Dev [b]	RBS N-Range [c]
Air Filter	E3323-125	09/12/02	BETA	69.0 ± 11.95	73.4	1.11	0.094
(pCi/filter)	E3382-125	09/12/02	CR-51	171 ± 29.6	178	0.68	1.105
			MN-54	115 ± 19.9	132	2.61	0.308
			CO-58	73.0 ± 12.6	77.2	1.00	0.372
			FE-59	67.0 ± 11.6	80.8	3.57[d]	0.062
			CO-60	112 ± 19.4	124	1.86	0.422
			ZN-65	141 ± 24.4	156	1.84	0.628
			CS-134	99.0 ± 17.2	99.4	0.08	0.024
			CS-137	95.0 ± 16.5	103	1.46	0.249
			CE-141	120 ± 20.8	133	1.83	0.148
Sediment	E3383-125	09/12/02	CR-51	0.354 ± 0.061	0.366	0.603	0.818
(pCi/gram)			MN-54	0.238 ± 0.041	0.266	2.038	0.347
			CO-58	0.151 ± 0.026	0.159	0.956	0.196
			FE-59	0.138 ± 0.024	0.150	1.464	0.300
			CO-60	0.232 ± 0.040	0.243	0.846	0.229
			ZN-65	0.293 ± 0.051	0.330	2.207	0.403
			CS-134	0.205 ± 0.036	0.204	-0.056	0.288
			CS-137	0.282 ± 0.049	0.323	2.539	0.105
			CE-141	0.249 ± 0.043	0.272	1.577	0.735

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.

Interlaboratory Comparison Program Exceptions

There was one result outside the control limits for accuracy in the 2002 cross check program participation studies. This result was in a gamma isotopic analysis of an air particulate filter sample.

The study result outside the control limits for accuracy was in the analysis of the nuclide Fe-59 in sample study 3382-125 of 09/12/2002. RBS normalized-deviation for the analysis was +3.57 with control limits of ±3.00. This high bias result is considered conservative and is considered as having no impact on past results of the program. The bias high result for Fe-59 is contributed to coincidence summing effects. A coincidence summing correction was employed in the past, but was discontinued due to the production of non-conservative low-bias results. Fe-59 results were all within control limits in other cross check samples for the year 2002.

There is no impact accessed on previously reported data due to these results. 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-six percent of RBS environmental crosscheck results were within control limits for accuracy and precision during 2002.

ATTACHMENT 2

Sediment Dose Calculations

Sediment Dose Calculations

Dose calculation for the discharge sediment was performed using generalized equation found in Regulatory Guide 1.109, Appendix A as follows:

R = (40) × (C) × (U) × (D) × (W)

R = Annual dose to skin or total body in mrem/year;

40 = Area-mass conversion factor given in Appendix A of Regulatory Guide 1.109 in Kg/m^2;

C = 2002 maximum radionuclide concentration in pCi/kg;

U = Maximum exposure time given in Table E-5 of Regulatory Guide 1.109 (67 hours for teenager);

D = External dose conversion factor for standing on contaminated ground given in Table E-6 of Regulatory Guide 1.109 in mrem/hr per pCi/m^2, and

W = Shore-width factor (0.1) given in Table A-2 of Regulatory Guide 1.109.

(Dose from Sediment in Millirem/Year)

Radionuclide	2002 Maximum Concentration	Conversion Factor For Skin	Total Skin Dose	Conversion Factor For Total Body	Total Body Dose
Co-60	60.2	2.00 E-08	3.23 E-04	1.70 E-08	2.74 E-04
Cs-137	1170.0	4.90 E-09	1.54 E-03	4.20 E-09	1.32 E-03
TOTAL			**1.86 E-03**		**1.59 E-03**