1983 ANNUAL ENVIRONMENTAL RADIOLOGICAL MONITORING REPORT FOR ANO-1 and ANO-2

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1.0 INTRODUCTION

This report summarizes the Environmental Radiological Monitoring Program conducted for the Arkansas Nuclear One-Units 1 and 2 during the calendar year 1983. All sample analyses and data interpretation were performed by the staff of Arkansas Power and Light Company.

1.1 PLANT AND LOCATION

Arkansas Nuclear One - Units 1 and 2 are both lighwater cooled pressurized water nuclear reactors located approximately 5.0 miles west of Russellville, Arkansas. ANO Unit 1 began commercial operation in December 1974 and the second unit at the same site, ANO Unit 2, followed in March 1980. Lake Dardanelle is the source of the circulating cooling water for ANO Unit 1, and ANO Unit 2 is cooled by a cooling tower, also dependent upon Lake Dardanelle water.

1.2 ENVIRONMENTAL MONITORING PROGRAM

The Environmental Monitoring Program was established based upon the Environmental Technical Specifications for ANO Unit 1. These specifications have remained essentially the same, except for the addition and deletion of sampling stations where milk, ground water, or food products are collected. The 1983 Environmental Radiological Monitoring Report is governed by present environmental technical specifications. The 1983 report includes summaries, interpretations, and statistical evaluation of the

of the results of the radiological environmental surveillance activities at ANO. Table 1-1 details the surveillance program listing sample type, frequency of collection, and the method of analysis used. Table 1-2 lists the sample location and type of samples collected at each location.

1.3 CONTROL LOCATIONS

During the calendar year 1983, the following locations were designated as control stations along with the respective sample type and analysis.

a) AP&L's Substation at Danville, Arkansas (Station #7)
   1) Air Particulate
   2) Air Iodine
   3) Precipitation
   4) Vegetation
   5) Soil
   6) TLD

b) Piney Creek Area (Station #16)
   1) Lake Water
   2) Bottom Sediment
   3) Aquatic Biota (including fish)

c) R. A. Young's Dairy (Station #23)
   1) Milk
   2) Vegetation

2.0 INTERPRETATIONS AND CONCLUSIONS

Data collected from radiological analyses of environmental samples collected in the area surrounding the ANO facility indicate no detectable environmental impact in excess of design objectives as a result of liquid and gaseous discharges from the ANO site during 1983. Also, no non-routine environmental radiological monitoring reports resulting from analyses of environmental samples were submitted to the U.S. NRC during 1983.

Sample types that indicated activation or fission-produced radioisotopes present are discussed in the paragraphs below:

2.1 SAMPLES ASSOCIATED WITH AIR MONITORING

None of the 311 samples collected from indicator locations for radioiodine in air (using activated charcoal filters) indicated iodine-131 activities greater than the lower limit of detection, which is 0.050 pCi per cubic meter of air.

Also, none of the 84 monthly composites of air particulate filters collected in the calendar year 1983, including the control air particulate samples from Danville, Arkansas indicated the presence of radioactive fission or activation products.

TLD data collected for the calendar year 1983 is divided into two categories. The first category includes the lithium fluoride (LiF) TLDs which were collected and read quarterly, and the second category includes LiF TLDs which were collected and read semi-annually in 1983. The quarterly TLD data for 1983 indicated a total yearly average dose for the forty-three indicator locations to be 70 mrem

per year compared to the total yearly average dose of 63 mrem for 1982. The control location at Danville, Arkansas (109° - 19.3 miles) indicated a total dose, based upon quarterly TLD's, of 56 mrem per year for 1983 compared to 59 mrem per year for 1982. Table 2.1.1 lists the total yearly average dose for the indicator location for the calendar years of 1981, 1982, and 1983 compared to the total dose of background radiation (control station), also based upon quarterly TLD reports.

The difference between the indicator locations and the control location for quarterly TLDs results is not statistically significant. The standard deviation for the indicator locations is 5.1 mrem annual dose. For a one sample t-test, (i.e., a single control compared to all indicator locations), a t-value of 1.72 is obtained. This t-value does not indicate a significant difference between the control and indicator locations at the 95% confidence level. A t-value of greater than 2.06 would be necessary to indicate a significant difference.

Factors other than statistical fluctuations that may affect the variation in recorded dose include variations of up to 15% in response of the TLD chips to the same radiation exposure, different soil types at monitoring locations, and varying heights above ground level for TLD placement.

The TLDs collected every six months during 1983 indicated slightly lower readings than the quarterly TLDs, which is consistent with TLD readings recorded in 1982, 1981, and 1980. The lower dose

measurement for the dosimeters deployed in the field for six months compared to the quarterly readings is attributed to "fading" of the lithium fluoride chips. The TLDs collected every six months indicated a total yearly average dose for the indicator locations of 57 mrem, compared to 48 mrem per year for 1982. The six-month TLD's are located at six indicator locations and one control location. The control location indicated a total dose, base upon TLDs collected and read semi-annually, of 58 mrem.

The small difference in six month TLD data between indicator locations and control location is not significant. The standard deviation for the indicator locations is 7.5 mrem annual dose. A t value of 0.05 is calculated for a single sample t-test comparing the indicator locations to the control. At the 95% confidence level at t value of greater than 2.18 would be necessary to indicate any statistically significant difference.

None of the 98 rain samples collected and analyzed in 1983, as in 1982, indicated the presence of radioactive fission or activation products. Analyses performed were gamma spectrometry and gross beta.

2.2 SAMPLES ASSOCIATED WITH WATER MONITORING

Lake water samples are collected from five different sample sites in Lake Dardanelle monthly, plus the Arkansas Department of Health and Arkansas Power and Light Company split a surface water sample from the ANO Discharge Canal monthly. Each laboratory analyzes the sample for gamma emitters. The surface water sample with maximum quantities of plant related radionuclides was collected from the ANO Discharge Canal. This surface water grab sample was collected by and split

with the Arkansas Department of Health on January 17, 1983. The iodine-131 detected in the grab sample had a concentration of 3.8 E-8 µCi per milliliter, and the value listed in 10 CFR 20 Appendix B, Table II, Column 2, is 3E-07 µCi per milliliter. The 10 CFR 20 concentration limit given above is for liquids in unrestricted areas. The measured quantity was well below the 10 CFR 20 limit.

Other radioisotopes determined in grab samples from the ANO Discharge Canal include Cobalt-58, Cobalt-60, Xenon-133 and Cesium-137.

As in previous years, bottom sediments collected from the ANO Discharge Canal (0.1 mile 180°) during 1983 indicated the greatest concentration of radionuclides attributable to ANO operations. To determine the maximum dose to the skin of an individual (a teenager) and the maximum whole body dose exposure from sediments, dose calculations were performed according to the mathematical model for determining external dose from sediment given by U.S. Nuclear Regulatory Commission Regulatory Guide 1.109. Tables 2.2.1 and Table 2.2.2 give the results of these calculations for samples collected from the ANO Discharge Canal in February and August 1983. The maximum external dose to the skin from sediments for all measurable radionuclides was approximately 0.2 mrem per year, and the maximum whole body dose was approximately 0.15 mrem per year.

According to ANO Technical Specifications, the design objectives for the dose to the whole body or any organ of an individual is 5 mrem per year as the result of release of liquid wastes. The value of

0.20 mrem per year for maximum whole body dose or maximum external dose to skin of a teenager is well within the design objective criteria.

The 1983 fish samples collected include the three categories listed in previous annual environmental radiological reports: 1) bottom feeder fish, usually buffalo and carp, 2) carnivorous fish, usually catfish, crappie and bass, and 3) plankton feeder fish, usually shad. Edible portions of bottom feeder fish and carnivorous fish and whole plankton feeder fish are analyzed by gamma spectrometry for radionuclides. The highest level of reactor-produced radionuclides attributed to operations at ANO were found in whole plankton feeder fish collected September 9, 1983 from the ANO Discharge Canal (0.1 mile 180°).

Dose calculations based upon the plankton feeder fish radioisotope concentrations were performed according to the mathematical model for determining maximum total dose to total body from fish consumption given by the U.S. NRC Regulatory Guide 1.109. Although, shad are forage for carnivorous fish species, for this calculation it was assumed that shad serve as human food. Table 2.2.9 identifies the radioisotopes found in the plankton feeder fish, the amount of radioactivity present, and the contribution of the total maximum calculated dose for either whole body or specific body organs. According to these calculations, the maximum dose to adults to total body from plankton feeder fish consumption is about 1.0 mrem per year. The value of 1.0 mrem per year is well within the design objective criteria of 5 mrem per unit as defined in the ANO Technical Specifications for liquid wastes.

Tables 2.2.3 through 2.2.10 identifies all radioisotopes found in the eight fish samples collected and analyzed in 1983. According to dose calculations given in U.S. NRC Regulatory Guide 1.109, the carnivorous sample fish collected from the ANO Discharge Canal on October 9, 1983 revealed the highest dose from edible fish samples collected in 1983. The calculated maximum organ dose was 0.51 mrem per year.

In addition to the fish samples described above, edible portions of fish were collected by the Arkansas Department of Health. Edible portions of fish collected from the ANO Discharge Canal November 8, 1983 contained the highest levels of reactor-produced radionuclides for these split fish samples. In Table 2.2.3 and 2.2.4, dose calculations were performed according to the mathematical model given by U.S. NRC Regulatory Guide 1.109. The highest calculated dose to adults from consumption of fish split with the Arkansas Department of Health is 0.5 mrem per year, which is also well within the design objective criteria of 5 mrem per year per unit.

Table No. 2.2.11 is a listing of concentrations of radionuclides detected in fish samples split with the Arkansas Department of Health collected during the calendar years 1978, 1979, 1980, 1981, and 1983. Figures 2.2.1 and 2.2.1 graphically depict the Cs-134 and Cs-137 concentrations given in Table 2.2.11.

The Spearman rank-correlation test was applied to the Cs-134 and Cs-137 activity concentrations in sport fish tissue given in Table 2.2.11. Date of sample collection and activity concentration were ranked and the correlation calculated to determine if a significant increase in

activity concentration has occurred during the five year period of 1978 through 1983. The calculated Spearman ranked-correlation coefficient for Cs-134 is 0.393. At the 95% confidence level the Spearman coefficient would have to be greater than 0.714 for seven observations to indicate a positive correlation of Cs-134 activity concentration with increasing time. Similiarly, the Spearman coefficient for Cs-137 is 0.430 and at the 95% confidence level the coefficient would have to be greater than 0.564 for ten observations to indicate a positive correlation of Cs-137 activity concentration with increasing time. (William Volk, Applied Statistics for Engineers, 2nd Edition, McGraw-Hill, New York, 1969, p. 366-368).

Whole mollusks samples were collected in April and October 1983. Samples of live mollusks caged in the ANO Discharge Canal (0.1 mile 180°) indicated reactor-produced radionuclides present. Reactor-produced radionuclides found include Cobalt-58, Cobalt-60, Cesium-134, and Cesium-137. Radionuclide concentrations in mollusks are comparable to fish concentrations discussed above.

2.3 SAMPLES ASSOCIATED WITH TERRESTRIAL MONITORING

Milk samples were collected by the split with the Arkansas Department of Health in all twelve months of 1983. Three indicator locations for collection of milk at dairies and one control location, the R. A. Young Dairy (12.0 miles 73°), were active during 1983.

Monthly milk samples are analyzed for Iodine-131 by concentrating the iodine with anion exchange resin and counting the concentrated iodine sample in a low-background alpha/beta counting system. No I-131 was detected in any milk samples collected in 1983.

In determining gamma emitters in milk samples, cesium-137 was detected in two samples collected from R.A. Young Dairy, the control dairy.

Strontium-89 and strontium-90 analyses in milk produced average strontium activities at indicator locations equivalent to 1982 and 1981 levels. Average strontium activity for indicator locations during 1983, as in 1982 was also less than that determined for the control location.

Vegetation samples were divided into two categories in 1983, pasturage vegetation and garden products vegetation. Of the 39 pasturage samples collected and analyzed in 1983, cesium-137 was the only gamma-emitting radionuclide determined in 3 pasturage samples.

Garden products vegetation was collected in June, July, and August 1983 from two separate gardens. Garden vegetation collected and analyzed included cabbage, lettuce, and tomatoes. No gamma-emitting radionuclides were detected in any garden products vegetation during 1983.

Soil samples were collected in May and October 1983 from seven sampling stations each time. Cesium-137 was detected in thirteen of the fourteen soil samples. International fallout is the probable source of this radionuclide. Maganese-54 was detected in the sample taken in the spring at sampling site no. 3 (0.4 mile-4°) nowever, only cesium-137 was detected at this location during the October 1983 sampling period.

2.4 SAMPLES NOT COLLECTED IN 1983

Caged mollusks were sampled in 1983 as representatives of benthic organisms. It is impossible to place a cage at location 15, the Dardanelle Dam area, because of the water depth. Naturally occurring benthos are not present in quantities sufficient for analysis, therefore, no benthic organisms were analyzed at sample station No. 15.

Also, most of the caged mollusks in the ANO Discharge Canal collected in October 1983 were dead upon retrieval and only the shells remained. Gamma analysis was performed on the shells of these dead mollusks.

The net used for collection of plankton samples became inoperable during the August 1983 plankton sampling, and only one plankton sample was collected and analyzed during the second half of 1983. To correct this, a pump has been purchased to collect and filter plankton samples in 1984.

During the week of December 18-24, 1983, a severe winter storm prevented the collection of air filters and air iodine cartridges from sample stations number 5 and number 7, the control location. The air filter pumps continued to operate at these two locations, and the air filter samples and air iodine cartridges represented two weeks collection of air particulates and air iodine. Also, precipitation samples were frozen at the other two precipitation sample stations and were not collected until December 28, 1983.

Forty-four lithium fluoride thermoluminescent dosimeters (TLDs) are placed in the environment around ANO, most within a 10 mile

radius of the plant boundary and are recovered and read every three months. TLDs which were missing when TLD retrieval was conducted include TLD No. 36 for the First Quarter 1983, TLDs No. 3 and 27 for the Second Quarter 1983, TLD No. 25 for the Third Quarter 1983, and TLD Nos. 13 and 25 for the Fourth Quarter 1983.

A rain sample, 022383PN05 was accidentally disposed before gamma analysis was performed, however, gross alpha and gross beta analyses were performed.

2.5 COMPARISON OF RESULTS OF EPA CROSS-CHECK PROGRAM

The Technical Analysis Section of Arkansas Power and Light Company participates in the U.S. Environmental Protection Agency's Environmental Radioactivity Laboratory Intercomparison Studies Program. The major objective of this program is to assist laboratories involved in environmental radiation measurements to develop and maintain both an intra-laboratory and an inter-laboratory quality control program. This is partially accomplished through a laboratory intercomparison studies program involving environmental media (milk, water and air) and a variety of radionuclides with activities at or near environmental levels.

During the calendar year 1983, the following sample types were received and analyzed:

1) Gross Alpha-Beta in Water - A one-liter sample for the analysis of gross alpha and gross beta activity.
2) Gamma in Water - A one-liter sample containing chromium-51, zinc-65, cobalt-60, ruthenium-106, cesium-134 and cesium-137.

3) Tritium in Water - A four-liter sample containing tritium.

4) Iodine-131 in Water - A four-liter sample containing iodine-131.

5) Strontium in Water - A one-liter sample containing strontium-89 and strontium-90.

6) EPA Blind in Water - A one-liter blind sample containing a mixture of radionuclides.

7) Milk - Four-liter milk sample containing potassium, strontium-89, strontium-90, iodine-131, cesium-137 and barium-140.

8) Air - a two-inch diameter air filter is distributed quarterly for gross alpha, gross beta, cesium-137 and strontium-90 analyses.

9) Low-level Water - A four-liter sample containing very low quantities of I-131.

10) Low-Level Milk - A four-liter sample containing very low quantities of I-131.

A report listing the results of the analysis containing the laboratory standard deviation, calculation of the normalized range, normalized deviation, sample standard deviation, and the grand average of all laboratories is mailed after each participating laboratory performs there independent determinations for each radionuclide involved in the study.

Table 2.5.1 lists the various analyses that are performed, the radioactivity levels found in the EPA cross-check samples, and one standard deviation for a single determination.

If the Technical Analysis Section Environmental Laboratory results differ from the unknown results given by more than 3 standard deviations in the EPA cross-check reports, the instrument and procedure are checked for error.

Table 2.5.2 lists the types of EPA cross-check samples received, the total number of analyses performed, and the average sample standard deviation, based upon three independent determinations for each radionuclide in each sample.

Most of the results were well within two standard deviations of the known values supplied by the U.S. EPA. The May 1983 EPA strontium-90 determination in water has been lower than the EPA values, and new efficiency curves were determined for strontium-90 in 1983. The September 1983 strontium in water was analyzed within two standard deviations for both strontium-89 and strontium-90.

Results from analyses for strontium-90 in EPA milk samples were outside the control limit of 3 standard deviations for the June, 1983 samples. The October, 1983 strontium-90 in milk samples results were outside the warning limit but within the control limit. Investigation in the areas of chemical separation techniques and counting instrument efficiency are continuing in an effort to reduce the degree of disagreement with the EPA values.

TABLE 1-1

SAMPLE TYPE AND ANALYSIS

I. AIR

A. Particulate

1. Continuous 7-day samples, filters changes weekly (Eberline Model RAP-1 sample pumps, Gelman 47 mm glass fiber filters, calibrated to one cubic foot per minute ($0.028m^3$/min) air sampling rate), seven (7) locations.

2. Analyses

a. Gross alpha
b. Gross beta
c. Gamma isotope on a monthly composite (each station) and on high beta levels ($\geq$100 DPM/sample)
d. Radiostrontium on quarterly composite if gamma isotopic analysis shows presence of Cs-137.

B. Iodine 131

1. Continuous 7-day samples, activated charcoal filter trap on inlet of air sampler downstream of particulate filter, changed weekly, seven (7) locations.

2. Analyses

a. Iodine-131

C. Direction Radiation

1. Four (4) thermoluminescent dosimeters (LiF), seven (7) locations.

a. Two (2) thermoluminescent dosimeters (LiF), thirty-seven (37) locations.

2. Analyses

a. Change and readout one set dosimeters quarterly at all 44 locations and one set semi-annually at the first 7 locations.

D. Precipitation

1. Four (4) locations, samples collected weekly (as available).

2. Analyses

a. Gross beta
b. Gamma Isotopic

II. WATER

A. Lake Water

1. Samples (one gallon) monthly from five (5) locations (discharge canal, intake canal, and lake south of plant between discharge and intake). (Sample stations 8, 9, 10, 15, 16)

2. Analyses

a. Gross beta (monthly)
b. Gamma isotopic (monthly if gross beta exceeds 30 pCi/L and on quarterly composites)
c. Tritium (quarterly composites)
d. Radiostrontium (quarterly composites)

B. Bottom Sediments

1. Samples (~Kg) semi-annually from near the same locations as lake water. Station 15 sample to be taken in pool above dam.

2. Analyses

a. Gamma isotopic
b. Radiostrontium (annual composites)

C. Ground Water

1. Samples (one gallon) quarterly from one onsite and two offsite wells.

2. Analyses

a. Gross alpha
b. Gross beta
c. Gamma isotopic
d. Tritium

D. Russellville City Water

1. Samples (one gallon) monthly from system intake.

2. Analyses

a. Gross alpha
b. Gross beta
c. Gamma isotopic
d. Tritium (quarterly composite)
e. Radiostronium (quarterly composite)

E. Aquatic Biota

1. Semi-annual samples are taken as available at or near the same sample points as lake water and bottom sediments. Samples will be as large as practicable not to exceed 2Kg.

2. Analyses

a. Gross beta (plankton)
b. Gamma isotopic (fish flesh, plankton, benthic organisms, aquatic plants)
c. Radiostrontium (benthic organisms, aquatic plants)

F. Fish Bone

1. Annual sample (~500g bone) in the Fall. Sampled as in E.1 above.

2. Analyses

a. Strontium 89-90

III. TERRESTRIAL

A. Milk

1. One gallon samples will be taken monthly from farms or dairies within a ten-mile radius of plant.

2. Analyses

		Frequency
a.	Iodine-131	Monthly
b.	Strontium 89, 90	Quarterly
c.	Gamma isotopic	Monthly

B. Vegetation

1. Samples (~1Kg) of grass and leafy portions of other vegetation in the vicinity of the seven air sampling locations are taken in the Spring, Summer, and Fall seasons.

2. Similar samples of pasturage vegetation of dairies of farms sampled for milk within a ten-mile radius of the plant will be taken at time coinciding with those of 1 above.

3. Food crops and leafy vegetables in the vicinity of the plant shall be collected as available at harvest time.

4. Analyses

   a. Radioiodine (upon collection) by gamma analysis
   b. Gamma isotopic

C. Soil

1. Samples (~1.5 liters) are taken at each of the air sampler sites semi-annually.

2. Analyses

   a. Gamma isotopic
   b. Strontium 89-90 determined annually.

TABLE 1-2

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
1	92° - 0.5 miles	Near Meteorology on site	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer and Fall
2	235° - 0.5 miles	Near AP&L lodge on site	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer and Fall
3	4° - 0.4 miles	South of Hershel Bennet home	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer and Fall
4	171° - 0.4 miles	Near the May Cemetery	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year	1) 7-day continuous-weekly 2) Readout and record at stated frequency 3) Spring and Fall 4) Spring, Summer and Fall

TABLE 1-2 (Cont'd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
5	298° - 8.5 miles	At Ray Walter's residence, Knoxville, Johnson County	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous-weekly 2) Readout and record at state frequency 3) Spring and Fall 4) Spring, Summer and Fall
6	109° - 6.8 miles	At AP&L's Russellville Local Office	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year	1) 7-day continuous-weekly 2) Readout and record at state frequency 3) Spring and Fall 4) Spring, Summer and Fall
7	209° - 19.3 miles	At AP&L's Sub-station in Danville, Yell County	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semi-annually 3) Semi-annually 4) 3 times/year 5) Weekly, as available	1) 7-day continuous weekly 2) Readout and record at state frequency 3) Spring and Fall 4) Spring, Summer and Fall
8	180° - 0.1 miles	Mouth of Discharge Canal	1) Lake Water 2) Aquatic Biota 3) Bottom Sediments	1) Monthly 2) Semi-annually 3) Semi-annually	1) Record status of plant discharge operations 2) Summer and Winter 3) Summer and Winter
9	160° - 1.8 miles	South of Bunker Hill near Main River Channel	1) Lake Water 2) Aquatic Biota 3) Bottom Sediments	1) Monthly 2) Semi-annually 3) Semi-annually	1) Record status of plant discharge operations 2) Summer and Winter 3) Summer and Winter

TABLE 1-2 (Cont'd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
10	90° - 1.0 miles	Mouth of inlet canal	1) Lake Water	1) Monthly	1) Record status of plant discharge operations
			2) Aquatic Biota	2) Semi-annually	2) Summer and Winter
			3) Bottom Sediments	3) Semi-annually	3) Summer and Winter
14	65° - 5.8 miles	Inlet to City Water System from Illinois Bayou	1) City of Russellville Water Supply	1) Monthly	
15	150° - 5.0 miles	Discharge of Dardanelle Dam Pool above Dardanelle Dam	1) Lake Water	1) Monthly	1) Record status of plant discharge operations
			2) Bottom Sediments	2) Semi-annually	
			3) Aquatic Biota	3) Semi-annually	
16	295° - 6.0 miles	Pine Creek Area	1) Lake Water	1) Monthly	
			2) Bottom Sediment	2) Semi-annually	
			3) Aquatic Biota	3) Semi-annually	
19	99° - 5.0 miles	Arkansas Tech. Dairy	1) Milk	1) Monthly	2) Spring, Summer and Fall
			2) Pasturage	2) 3 times/year	
20	290° - 8.0 miles	Odom-Meyers Dairy	1) Milk	1) Monthly	2) Spring, Summer and Fall
			2) Pasturage	2) 3 times/year	
23	73° - 12 miles	R. A. Young Dairy	1) Milk	1) Monthly	2) Spring, Summer and Fall
			2) Pasturage	2) 3 times/year	
29	25° - 7.0 miles	H. Steuber's Dairy	1) Milk	1) Monthly	2) Spring, Summer and Fall
			2) Pasturage	2) 3 times/year	

TABLE 1-2 (Cont'd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
30	160° - 0.8 miles	James Taylor	1) Food Crop Fruit, Flowering and Tubular Vegetables	1) 3 times/year	1) Collected during harvest season
32	155° - 0.8 miles	Clifton Stewart's residence, front yard Russellville	1) Ground Water	1) Quarterly	
			2) Food Crop	2) 3 times/year	2) Alternate for 30 collected during harvest season.
33	98° - 4.8 miles	Quita Lake Recreation Area of Illinois Bayou off Dyke Road Pump near boat ramp	1) Ground Water	1) Quarterly	
Alt.	235° - 3.5 miles	Delaware Recreation area	1) Ground Water	1) Quarterly	
34	295° - 6.6 miles	Flat Rock Recreation area	1) Ground Water	1) Quarterly	
35	35° - 1.2 miles	Tom Cook Residence	1) Leafy and Tuberous Vegetables	1) Seasonal	

TABLE 1-2 (Cont'd)

SAMPLE LOCATION AND SCHEDULE

Sample Station #	Direction and Distance from Plant	Sample Station Location	Sample Types	Sample Frequency	Remarks
36	140° - 0.05 miles	Chemical Pond on ANO Site east of discharge canal	1) Pond Water	1) Quarterly	
			2) Pond Sediment	2) Quarterly	

NOTE: These sample stations will be determined as per Specification 4.2.10 and will be reported in the Operating Report as per Specification 5.6.1

*Alternate Daries may be substituted when those listed are not available.

TABLE 1-3

TLD LOCATIONS

AP&L-TLD-No.	Location Relative to ANO
1	0.5 miles 92°
2	0.5 miles 235°
3	0.4 miles 4°
4	0.4 miles 171°
5	8.5 miles 298°
6	6.8 miles 109°
7	19.3 miles 209°
8	1.8 miles 313°
9	1.2 miles 308°
10	0.8 miles 136°
11	2.3 miles 108°
12	3.3 miles 60°
13	1.4 miles 48°
14	1.4 miles 24°
15	1.5 miles 343°
16	1.9 miles 315°
17	17.2 miles 305°
18	5.8 miles 291°
19	4.8 miles 313°
20	4.2 miles 338°
21	5.5 miles 338°
22	3.5 miles 12°
23	3.5 miles 48°

TABLE 1-3 (Cont'd)

TLD LOCATIONS

AP&L TLD No.	Location Relative to ANO
24	3.3 miles 62°
25	9.2 miles 47°
26	5.6 miles 78°
27	5.7 miles 103°
28	8.5 miles 115°
29	7.5 miles 118°
30	4.6 miles 245°
31	2.7 miles 253°
32	4.8 miles 274°
33	3.8 miles 231°
34	2.8 miles 207°
35	3.1 miles 186°
36	4.3 miles 166°
37	8.5 miles 152°
38	5.8 miles 195°
39	19.2 miles 178°
40	21.8 miles 151°
41	3.3 miles 134°
42	5.2 miles 127°
43	17.5 miles 106°
44	13.0 miles 314°

TABLE 2.1.1

DIRECT RADIATION MEASURED BY

QUARTERLY LITHIUM FLUORIDE DOSIMETERS INDICATOR LOCATIONS

1981 (mrem/year)	1982 (mrem/year)	1983 (mrem/year)
64	63	70

CONTROL OR BACKGROUND LOCATION

1981 (mrem/year)	1982 (mrem/year)	1983 (mrem/year)
60	59	56

TABLE 2.2.1

CALCULATION OF MAXIMUM ANNUAL DOSE TO MAN FROM BOTTOM SEDIMENT SAMPLE

021983BS08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Dose to Skin (mrem/yr)	Dose to Whole Body (mrem/yr)
Mn-54	72	0.001	0.001
Co-58	278	0.006	0.005
Co-60	1380	0.074	0.063
Cs-134	815	0.031	0.026
Cs-137	4283	0.056	0.048
	TOTAL	0.168	0.143

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$R(mrem/yr) = C(pCi/kg)(40\ Kg/m2) \cdot U(hr/yr) \cdot D(mrem/hr\ per\ pCi/m^2)$

Where: R is the annual dose to an organ or whole body

C is concentration of a particular nuclide,

U is the maximum exposure time (67 hrs. for teen),

D is the dose factor.

TABLE 2.2.2

CALCULATION OF MAXIMUM ANNUAL DOSE TO MAN FROM BOTTOM SEDIMENT SAMPLE

082083BS08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Dose to Skin (mrem/yr)	Dose to Whole Body (mrem/yr)
Mn-54	69	0.001	0.001
Co-58	263	0.006	0.005
Co-60	1184	0.063	0.054
Cs-134	815	0.031	0.026
Cs-137	4102	0.054	0.046
	TOTAL	0.155	0.132

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg})(40\ \text{Kg/m}^2) \cdot U(\text{hr/yr}) \cdot D(\text{mrem/hr per pCi/m}^2)$$

Where: R is the annual dose to an organ or whole body

C is concentration of a particular nuclide,

U is the maximum exposure time (67 hours for teen),

D is the dose factor.

TABLE 2.2.3

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM EDIBLE FISH SAMPLE SPLIT W/ADH

042183FC08-S

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)	
Cs-134	41	0.09	(Liver)
Cs-137	127	0.29	(Liver)
Total		0.38	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

TABLE 2.2.4

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM ANO EDIBLE FISH SAMPLE SPLIT W/ADH

110883FC08-S

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)	
Cs-134	47	0.15	(Liver)
Cs-137	143	0.33	(Liver)
Xe-133	171	*	
Total		0.48	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

*No dose factor for this isotope given in Regulatory Guide 1.109.

TABLE 2.2.5

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM CARNIVOROUS FISH SAMPLE

051783FC08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)		
Cs-58	19	0.01 (GI-LLI)	*	(Liver)
Cs-60	33	0.03 (GI-LLI)	*	(Liver)
Cs-134	42	* (GI-LLI)	0.13	(Liver)
Cs-137	124	0.01 (GI-LLI)	0.28	(Liver)
Nb-95	32	0.01 (GI-LLI)	*	(Liver)
Total		0.06 (GI-LLI)	0.41	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

*Calculated dose for this isotope is less than 0.01 mrem/yr.

TABLE 2.2.6

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM CARNIVOROUS FISH SAMPLE

100983FC08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)			
Co-58	25	0.01	(GI-LLI)	*	(Liver)
Co-60	20	0.02	(GI-LLI)	*	(Liver)
Cs-134	54	*	(GI-LLI)	0.17	(Liver)
Cs-137	150	0.01	(GI-LLI)	0.34	(Liver
Total		0.04		0.51	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

*Calculated dose for this isotope is less than 0.01 mrem/yr.

TABLE 2.2.7

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM BOTTOM FEEDER FISH SAMPLE

051783FB08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)	
Cs-134	25	0.08	(Liver)
Cs-137	69	0.16	(Liver)
Total		0.24	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(mrem/yr) = C(pCi/Kg) \cdot U(Kg/yr) \cdot D(mrem/pCi)$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

TABLE 2.2.8

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM BOTTOM FEEDER FISH SAMPLE

090983FB08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)	
Cs-134	51	0.16	(Liver)
Cs-137	136	0.31	(Liver)
Total		0.47	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

TABLE 2.2.9

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM PLANKTON FEEDER FISH SAMPLE

090983FP08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)			
Co-58	47	0.01	(GI-LLI)	*	(Liver
Co-60	71	0.06	(GI-LLI)	*	(Liver)
Cs-134	103	0.01	(GI-LLI)	0.32	(Liver)
Cs-137	259	0.01	(GI-LLI)	0.59	(Liver)
Total		0.09		0.91	(Liver)

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

*Calculated dose for this isotope is less than 0.01 mrem/yr.

TABLE 2.2.10

CALCULATION OF MAXIMUM ANNUAL DOSE

TO MAN FROM PLANKTON FEEDER FISH SAMPLE

051783FP08

ANO Discharge Canal

Isotope	Activity (pCi/Kg)	Annual Organ Dose to Adult (mrem/yr)				
Co-60	29	0.02	(GI-LLI)	*	(Liver	
Cs-134	32	*	(GI-LLI)	0.10	(Liver)	
Cs-137	97	*	(GI-LLI)	0.22	(Liver)	
Total		0.02	(GI-LLI)	0.32	(Liver)	

NOTE: Dose calculations made according to the guidance of Nuclear Regulatory Commission Regulatory Guide 1.109, using the equation:

$$R(\text{mrem/yr}) = C(\text{pCi/Kg}) \cdot U(\text{Kg/yr}) \cdot D(\text{mrem/pCi})$$

Where: R is the annual dose to an organ or whole body
C is concentration of a particular nuclide,
U is the maximum intake of fish for adult (21 Kg/yr)
D is the dose factor.

*Calculated dose for this isotope is less than 0.01 mrem/yr.

TABLE 2.2.11

COMPARISON OF GAMMA-EMITTING RADIONUCLIDES IN SPORT FISH FROM THE ANO DISCHARGE CANAL

Radionuclide	Date and Activity (pCi/Kg)									
	May 78	Oct 78	June 79	Oct 79	May 80	Dec 81	July 82	Dec 82	Apr 83	Nov 83
Co-58		13		46						
Cs-134		40	29	19			58	24	41	47
Cs-137	65	95	86	41	12	18	141	75	127	143
Xe-133										171

TABLE 2.5.2 STANDARD DEVIATIONS FROM KNOWN VALUES OF EPA CROSS-CHECK SAMPLES

Sample Type	Analyses Performed	Total No. Analyses Performed	Number of Standard Deviations from Known Value			
1. Gross Alpha Gross Beta in Water			Nov. 82	Mar. 83	Jul. 83	Nov. 83
	Gross Alpha	12	-0.6	-0.2	2.0	1.3
	Gross Beta	12	-3.3	-0.3	-0.3	1.5
2. Gamma in Water			Feb. 83	June 83	Oct. 83	
	Chromiun-51	9	1.5	-0.8	-1.5	
	Zinc-65	9	0	0	0.1	
	Cobalt-60	9	0	-1.0	-0.3	
	Ruthenium-106	9	0.9	-1.0	-2.3	
	Cesium-134	9	0	-1.7	-0.3	
	Cesium-137	9	0.2	0	0	
3. Tritium in Water			Apr. 83	Aug. 83	Dec. 83	
	H-3	9	0.6	-0.4	0.5	
4. Iodine-131 in Water			Jan. 83	May 83	Sept. 83	
	Iodine-131	9	-0.8	-0.1	-0.5	
5. Strontium in Water			Jan. 83	May 83	Sept. 83	
	Strontium-89	9	-2.6	2.5	0.5	
	Strontium-90	9	-0.8	-5.5	-1.9	
6. EPA Blind in Water			May 83	Nov. 83		
	Gross Alpha	6	1.7	-0.8		
	Gross Beta	6	-0.8	-0.8		
	Strontium-89	6	-1.4	-0.8		
	Strontium-90	6	-1.5	-1.9		
	Cobalt-60	6	-0.8	-0.3		
	Cesium-134	6	-1.5	-0.5		
	Cesium-137	6	0.3	0.2		

TABLE 2.5.2 STANDARD DEVIATIONS FROM KNOWN VALUES OF EPA CROSS-CHECK SAMPLES (Cont'd)

Sample Type	Analyses Performed	Total No. Analyses Performed	Number of Standard Deviations from Known Value		
7. Milk			Feb. 83	June 83	Oct. 83
	Strontium-89	6	See 1	-0.1	-0.1
	Strontium-90	6	See 1	-3.5	-2.7
	Potassium	9	-1.4	1.3	0.5
	Iodine-131	9	-0.9	-0.7	-1.4
	Cesium-137	9	-0.2	-0.6	0.1
	Barium-140	9	NA	NA	NA
8. Air Filter			Nov. 82	Mar. 83	Aug. 83
	Gross Alpha	9	0	0.5	0.3
	Gross Beta	9	-1.0	-1.8	-0.6
	Cesium-137	9	0	0.1	-0.3
	Strontium-90	9	0.8	0	0.8
9. Low-Level Water			Jan. 82	June 82	
	Iodine-131	6	-0.1	-0.2	
10. Low-Level Milk			July 82		
	Iodine-131	3	0.1		

[1]Strontium analysis not performed because sample clabbered.

Fig. 2.2.1

Cs-134 In Edible Fish Samples

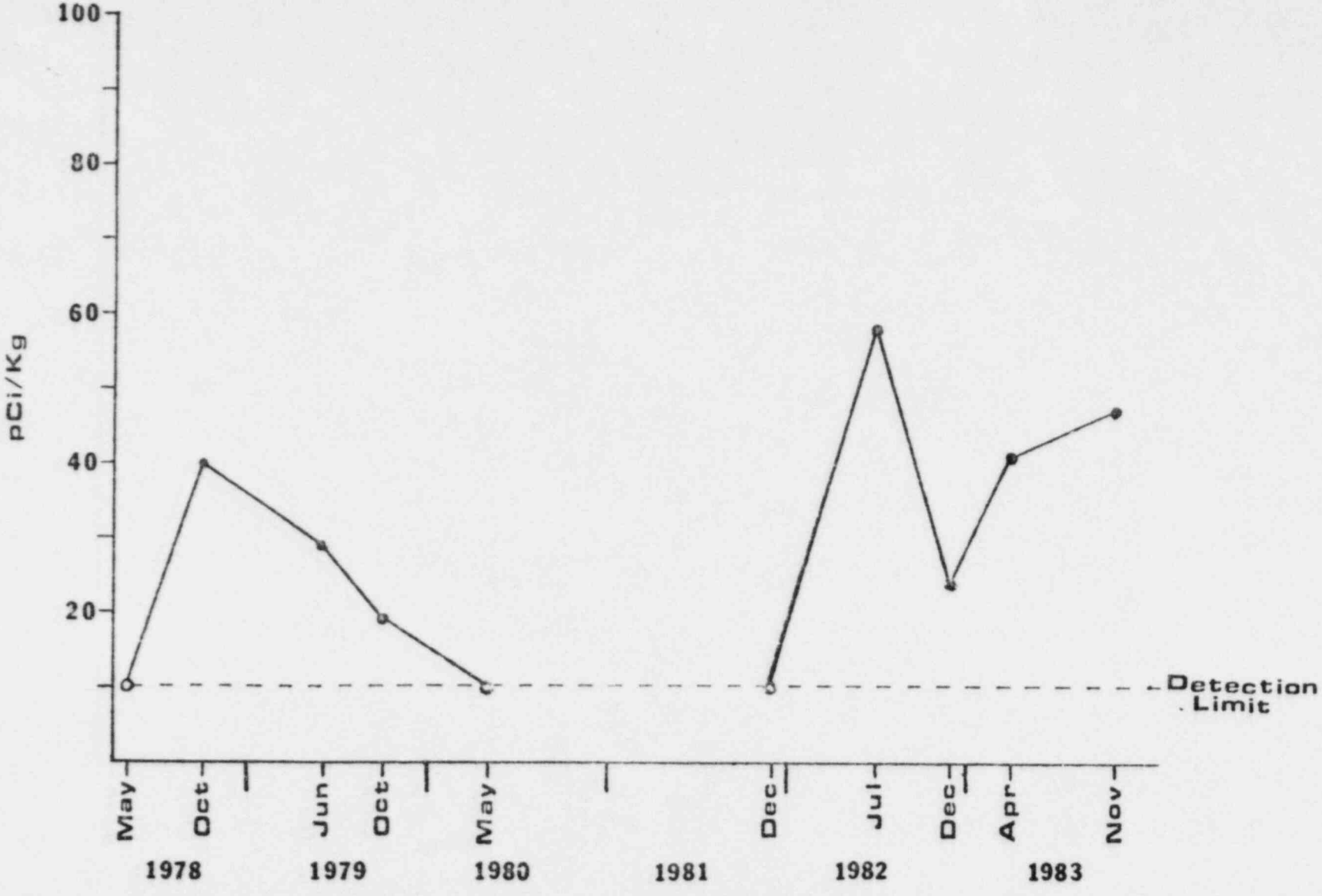
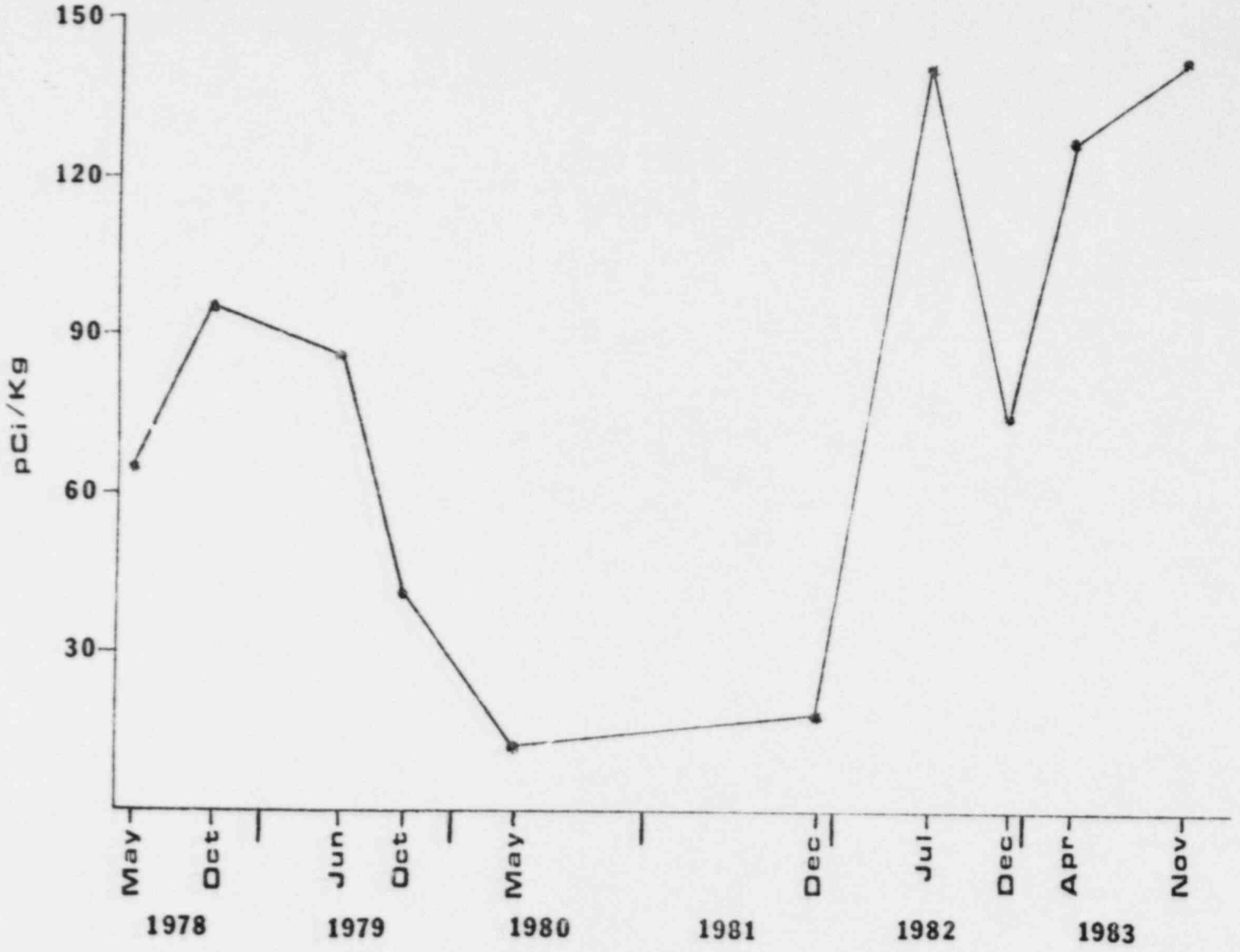


Fig. 2.2.2

Cs-137 In Edible Fish Samples



DETECTION LIMITS

	Air Particulate pCi/m^3	Fish pCi/kg	Aquatic Organisms pCi/kg	Veg. Terrest pCi/kg	Soil Bot. Sed. pCi/kg	Water pCi/l	Milk pCi/l
H^3	---	---	---	---	---	280	---
Be^7	7×10^{-2}	200	200	200	400	80	150
K^{40}	10^{-1}	300	300	300	500	100	200
Mn^{54}	10^{-2}	50	50	50	70	10	20
Co^{58}	10^{-2}	50	50	50	70	10	20
Fe^{59}	2×10^{-2}	100	100	100	130	20	40
Co^{60}	10^{-2}	50	50	50	70	10	20
Zn^{65}	2×10^{-2}	100	100	100	130	20	40
Sr^{89}		25	25	25	25	5	5
Sr^{90}		5	5	5	5	1	1
Zr^{95}-Nb^{95}	5×10^{-3}	30	30	30	50	5	10
Ru^{106}	2×10^{-2}	70	70	70	100	15	30
I^{131}(a)	10^{-2}	50	50	50	70	10	20
I^{131}(b)						0.5	0.5
Cs^{134}	10^{-2}	50	50	50	70	10	20

DETECTION LIMITS (Cont'd)

	Air Particulate pCi/m^3	Fish pCi/kg	Aquatic Organisms pCi/kg	Veg. Terrest pCi/kg	Soil Bot. Sed. pCi/kg	Water pCi/l	Milk pCi/l
Cs^{137}	10^{-2}	50	50	50	70	10	20
Ba^{140} La^{140}	10^{-2}	50	50	50	70	10	20
Ce^{144}	5×10^{-2}	200	200	200	300	40	80

(a) Gamma Isotopic Analysis

(b) Radiochemical Separation

SURVEY OF MILK-PRODUCING ANIMALS WITHIN AN

AREA OF TEN (10) MILES OF ARKANSAS NUCLEAR ONE

August 10-11, 1983

In accordance with Environmental Technical Specification 4.2.10, a survey was conducted August 10-11, 1983 to determine the location of animals which produce milk for human consumption. Milk-producing animals (milk cows) are divided into two categories defined as:

1. Class A Dairies - Dairies in which milk is intended primarily for human consumption as Grade A milk.
2. Individual Milk Cows - Family cows in which the milk is intended primarily for home use.

CLASS A DAIRES WITHIN A 10-MILE RADIUS OF ANO

	Dairy	No. of Cows	Azimuth-Distance
1.	Ark Tech Univ. Dairy	48	99 ° - 5.0
2.	Bill Harms Dairy	60	21° - 7.75
3.	R. Meyer Dairy	50	290 ° - 8.0
4.	R. A. Young Dairy (CONTROL)	50	73 ° - 12.0
5.	Harold Steuber	80	25 ° - 7.0
6.	Lawrence Steuber	60	358 ° - 7.5
7.	Buddy Boxnick	60	23° - 7.0
8.	Robberson Dairy	70	183° - 10.5
9.	Cloyce Ragsdale	40	45° - 10.2
10.	Wayne Pritchard	30	43° - 10.5

INDIVIDUAL MILK COWS

	Name	No. of Cows	Azimuth-Distance
1.	Bobby Steuber	1	346° - 8.3

INDIVIDUAL MILK COWS

Name	No. of Cows	Azimuth-Distance
1. Bobby Steuber	1	346° - 8.3

Also, garden vegetation from the James Taylor garden and near Tom Cook's residence was collected June 7, 1983.

SURVEY OF MILK-PRODUCING ANIMALS WITHIN AN

AREA OF TEN (10) MILES OF ARKANSAS NUCLEAR ONE

June 7-8, 1983

In accordance with Environmental Technical Specification 4.2.10, a survey was conducted June 7-8, 1983 to determine the location of animals which produce milk for human consumption. Milk-producing animals (milk cows) are divided into two categories defined as:

1. Class A. Dairies - Dairies in which milk is intended primarily for human consumption as Grade A milk.
2. Individual Milk Cows - Family cows in which the milk is intended primarily for home use.

CLASS A DAIRIES WITHIN A 10-MILE RADIUS OF ANO

	Dairy	No. of Cows	Azimuth-Distance
1.	Ark Tech Univ. Dairy	50	99° - 5.0
2.	Bill Harms Dairy	60	21° - 7.75
3.	R. Meyer Dairy	49	290° - 8.0
4.	R. A. Young Dairy (CONTROL)	48	73° - 12.0
5.	Harold Steuber	80	22° - 7.0
6.	Lawrence Steuber	60	358° - 7.5
7.	Buddy Boxnick	60	23° - 7.0
8.	Robberson Dairy	80	183° - 10.5
9.	Cloyce Ragsdale	30	45° - 10.2
10.	Wayne Pritchard	30	43° - 10.5
11.	Hudson Dairy	40	80° - 14.0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
I. AIR							
A. Particulate (pCi/m^3) (E-3)	GROSS A 363	3.	6.9 (304/311) (2.1 - 17.8)	# 6 6.8 109	7.6 (51/52) (2.9 - 17.8)	7.2 (48/52) (3.3 - 16.9)	0
	GROSS B 363	2.	24.2 (311/311) (6.2 - 52.6)	# 3 0.4 4	25.5 (52/52) (6.2 - 51.9)	24.7 (51/52) (9.9 - 54.1)	0
	GAMMA 84		<LLD	-	<LLD	<LLD	0
	SR-89 28	3.	1.4 (7/ 24) (0.3 - 2.6)	# 5 8.5 298	2.6 (1/ 4)	<LLD	0
	SR-90 28	0.6	1.3 (2/ 24) (0.6 - 2.0)	# 6 6.8 109	1.3 (2/ 4) (0.6 - 2.0)	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG) MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
1. AIR						
B. I-131 by Gamma (pCi/m^3)	GAMMA 362	0.1	<LLD	-	<LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) DIR. (DEG) MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
I. AIR						
	TLDS 170	S.	17.5 (162/166)	# 23	23.8 (4/ 4)	14.0 (4/ 4)	0
C. Direct Radiation			(11.0 - 39.5)	3.5 48	(14.5 - 36.5)	(13.5 - 14.5)	
(mrem/quarter)							
I. AIR	TLDS 13	S.	28.7 (11/ 11)	#6	31.6 (2/ 2)	28.9 (2/ 2)	0
			(20.3 - 41.5)	6.8 109	(21.6 - 41.5)	(24.7 - 33.0)	
C. Direct Radiation							
(mrem/6 months)							

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) DIR. (DEG) MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
1. AIR						
	GROSS A 98	3.	4.4 (5/ 72)	# 3	4.8 (4/24)	5.3 (2/26)	0
D. Precipitation			(2.7 - 5.7)	0.4 4	(2.7 - 5.7)	(3.7 - 6.8)	
(pCi/l)							
	GROSS B 98	2.	4.8 (27/ 72)	# 1	6.6 (7/24)	4.1 (6/26)	0
			(1.9 - 14.2)	0.5 92	(3.5 - 12.1)	(2.0 - 8.5)	
	GAMMA 98		<LLD	-	<LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (M') & DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
A. Lake Water (PCi/l)	GROSS A 61	3.	4.7 (4/ 49) (2.9 - 7.0)	9 1.8 160	7.0 (1/12)	<LLD	0
	GROSS B 61	2.	4.4 (37/ 49) (2.4 - 7.4)	15 5.0 150	4.8 (10/12) (3.3 - 7.1)	4.6 (4/12) (3.7 - 5.4)	0
	GAMMA 33						
	CO-58	10.	13.9 (1/ 29)	8 0.1 180	13.9 (1/17)	<LLD	0
	CO-60	10.	15.1 (1/ 29)	8 0.1 180	15.1 (1/17)	<LLD	0
	CS-137	10.	6.6 (1/ 29)	8 0.1 180	6.6 (1/17)	<LLD	0
	SR-89 20	5.	6.4 (1/ 16)	15 5.0 150	6.4 (1/ 4)	<LLD	0
	SR-90 20	2.	1.1 (4/ 16) (1.1 - 1.2)	8 0.1 180	1.2 (1/ 4)	1.1 (1/ 4)	0
	H-3 20	280.	<LLD	-	<LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) & DIR. (DEG) MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER						
B. Bottom Sediments	GAMMA 10					
	MN-54	70.	54.7 (4/ 8) (28.8 - 72.0)	8 0.1 180 (68.8 - 72.0)	45.0 (1/ 2)	0
	CO-58	70.	130.7 (6/ 8) (19.0 - 277.6)	8 0.1 180 (263.1 - 277.6)	126.3 (1/ 2)	0
	CO-60	70.	615.8 (8/ 8) (88.1 - 1380.0)	8 0.1 180 (1184.0 - 1380.0)	191.5 (2/ 2) (161.8 - 221.2)	0
	CS-134	70.	416.0 (8/ 8) (82.2 - 815.0)	8 0.1 180 (814.6 - 815.0)	155.9 (2/ 2) (124.7 - 187.1)	0
	CS-137	60.	2106.2 (8/ 8) (304.7 - 4283.0)	8 0.1 180 (4102.0 - 4283.0)	732.0 (2/ 2) (697.8 - 766.3)	0
Sr-89/90 activity units are in pCi/g of sediment ash	SR-89 5		<LLD	- <LLD	<LLD	0
	SR-90 5		<LLD	- <LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
C. Ground Water	GROSS A 12	3.	4.6 (3/ 12) (3.7 - 6.2)	#34 6.6 295	5.0 (2/ 4) (3.8 - 6.2)	<LLD	0
(pCi/l)	GROSS B 12	2.	2.0 (1/ 12)	#33 4.8 98	2.0 (1/ 4)	<LLD	0
	H-3 12	280.	<LLD	-	<LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # OF ANALYSIS	TYPE	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI)	DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER									
D. Russellville City Water	GROSS A	24	3.	3.2 (1/ 12)	#14 5.8	65	3.2 (1/12)	<LLD	0
(pCi/l)	GROSS B	24	2.	3.9 (4/ 12) (2.7 - 6.0)	#14 5.8	65	3.9 (4/12) (2.7 - 6.0)	4.6 (4/12) (3.7 - 5.4)	0
	SR-89	8	5.	4.4 (1/ 4)	#14 5.8	65	4.4 (1/ 4)	<LLD	0
	SR-90	8	2.	<LLD	-		<LLD	1.1 (1/ 4)	0
	H-3	8	200.	<LLD	-		<LLD	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
	GAMMA 10						
E. Aquatic Biota	CO-58	50.	22.0 (2/ 8) (19.0 - 25.0)	# 8 0.1 180	22.0 (2/ 2) (19.0 - 25.0)	<LLD	0
I.) Carnivorous Fish							
(Wet Weight) (pCi/Kg)	CO-60	50.	26.8 (2/ 8) (20.4 - 33.2)	# 8 0.1 180	26.8 (2/ 2) (20.4 - 33.2)	<LLD	0
	NB-95	30.	32.6 (1/ 8)	# 8 0.1 180	32.6 (1/ 2)	<LLD	0
	CS-134	50.	26.2 (5/ 8) (10.3 - 54.4)	# 8 0.1 180	48.0 (2/ 2) (41.6 - 54.4)	<LLD	0
	CS-137	50.	62.8 (8/ 8) (27.1 - 149.6)	# 8 0.1 180	136.8 (2/ 2) (124.0 - 149.6)	7.7 (1/ 2)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS (COUNTY, STATE) REPORTING PERIOD JAN. - DEC.,1983

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
E. Aquatic Biota	GAMMA 10						
	CS-134	50.	26.1 (5/ 8) (17.1 - 50.9)	0.1 B 180	38.1 (2/ 2) (25.2 - 50.9)	LLD	0
2.) Bottom Feeder Fish							
(Wet Weight) (PCi/kg)	CS-137	50.	52.3 (8/ 8) (16.1 - 135.6)	0.1 B 180	102.5 (2/ 2) (69.3 - 135.6)	LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) & DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
	GAMMA 10						
E. Aquatic Biota	CO-58	50.	47.0 (1/ 8) (0.1 - 180)	# 8 0.1 180	47.0 (1/ 2)	<LLD	0
3.) Plankton Feeder Fish (Wet Weight) (pCi/kg)	CO-60	50.	49.9 (2/ 8) (28.8 - 71.0)	# 8 0.1 180	49.9 (2/ 2) (28.8 - 71.0)	<LLD	0
	CS-134	50.	48.1 (3/ 8) (9.5 - 102.7)	# 8 0.1 180	67.3 (2/ 2) (32.0 - 102.7)	<LLD	0
	CS-137	50.	61.1 (8/ 8) (14.3 - 259.0)	# 8 0.1 180	178.0 (2/ 2) (97.0 - 259.0)	9.3 (2/ 2) (6.6 - 11.9)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
	GAMMA 3						
E. Aquatic Biota	XE-133		171.2 (1/ 3)	# 8 0.1 180	171.2 (1/ 2)	<LLD	0
4.) Edible Portion of carnivorous fish split with Ark. Dept. of Health	CS-134	60.	38.3 (3/ 3) (26.4 - 47.2)	# 8 0.1 180	44.3 (2/ 2) (41.3 - 47.2)	<LLD	0
	CS-137	50.	109.7 (3/ 3) (59.4 - 142.6)	# 8 0.1 180	134.9 (2/ 2) (127.1 - 142.6)	7.7 (1/ 2)	0
(Wet Weight) (pCi/kg)							

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) & DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
	GAMMA 8						
	CO-58	50.	12.5 (2/ 6)	# 8	12.5 (2/ 2)	<LLD	0
E. Aquatic Biota			(7.8 - 17.2)	0.1 180	(7.8 - 17.2)		
S.) Molluscs							
	CO-60	50.	61.9 (1/ 6)	# 8	61.9 (1/ 2)	<LLD	0
				0.1 180			
(Wet weight of whole molluscs)							
	CS-134	50.	56.1 (1/ 6)	# 8	56.1 (1/ 2)	<LLD	0
(pCi/Kg)				0.1 180			
	CS-137	50.	83.2 (2/ 6)	# 8	83.2 (2/ 2)	<LLD	0
			(12.4 - 154.0)	0.1 180	(12.4 - 154.0)		

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # OF ANALYSIS	TYPE	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI) # DIR. (DEG) MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER							
	GROSS A 6		5.	32.6 (2/ 5) (11.8 - 53.4)	# 8 0.1 180 53.4 (1/ 1)	<LLD	0
E. Aquatic Biota							
6.) Plankton	GROSS B 6		.	32.5 (2/ 5) (11.2 - 53.9)	# 8 0.1 180 53.9 (1/ 1)	6.4 (1/ 1)	0
(filtered & dried)							
	GAMMA 7						
(pCi/l)	CS-137 6		50.	5.6 (1/ 6)	# 8 0.1 180 5.6 (1/ 2)	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # OF ANALYSIS	TYPE	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. (MI)	DIR. (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER									
	SR-89	4	2.0	2.2 (1/ 3)	#10 1.0	90	2.2 (1/ 1)	<LLD	0
E. Aquatic Biota									
	SR-90	4	0.3	4.0 (3/ 3)	#10 1.0	90	9.3 (1/ 1)	3.7 (1/ 1)	0
Mollusk Shells				(1.1 - 9.3)					
(pCi/g of ash)									

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # OF ANALYSIS	TYPE	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
II. WATER								
	SR-89	5	2.0	2.7 (1/ 4)	#10	2.7 (1/ 1)	<LLD	0
F. Fish Bone					1.0 90			
1.) Carnivorous Fish								
	SR-90	5	0.3	1.4 (3/ 4)	#15	2.2 (1/ 1)	1.4 (1/ 1)	0
(pCi/g c* ash)				(0.9 - 2.2)	5.0 150			

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
/I. WATER							
	SR-89 5	2.	4.1 (1/ 4)	#15	4.1 (1/ 1)	<LLD	0
F. Fish Zone				5.0 150			
2.) Bottom Feeder Fish							
	SR-90 5	0.3	1.4 (3/ 4)	# 8	1.7 (1/ 1)	1.6 (1/ 1)	0
(pCi/g of ash)			(0.9 - 1.7)	0.1 180			

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
11. WATER							
	SR-89 5	2.	2.3 (1/ 4)	#10	2.3 (1/ 1)	<LLD	0
F. Fish Bone				1.0 90			
3.) Plankton Feeder Fish							
	SR-90 5	0.3	1.0 (2/ 4)	# 9	1.1 (1/ 1)	<LLD	0
(pCi/g of ash)			(0.8 - 1.1)	1.8 180			

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME	DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
11. WATER								
G. Lake Water Split with Ark. Dept. of Health (pCi/l)	GAMMA 11							
	CO-58	10.	15.5 (2/ 11) (13.5 - 17.5)	8	0.1 180	15.5 (2/11) (13.5 - 17.5)	<LLD	0
	CO-60	10.	12.5 (2/ 11) (10.6 - 14.3)	8	0.1 180	12.5 (2/11) (10.6 - 14.3)	<LLD	0
	I-131	10.	37.8 (1/ 11)	8	0.1 180	37.8 (1/11)	<LLD	0
	XE-133	80.	99.4 (2/ 11) (61.5 - 137.3)	8	0.1 180	99.4 (2/11) (61.5 - 137.3)	<LLD	0
	CS-137	10.	6.8 (2/ 11) (6.4 - 7.2)	8	0.1 180	6.8 (2/11) (6.4 - 7.2)	<LLD	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	LOCATION WITH HIGHEST ANNUAL MEAN MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
III. TERRESTRIAL							
A. Milk	GAMMA 51 CS-137	15.	<LLD		<LLD	6.4 (2/13) (4.5 - 8.4)	0
(PCi/l)							
I-131 by chemical separation	I-131 51	0.5	<LLD	-	<LLD	<LLD	0
	SR-89 51	5.	3.0 (21/ 38) (1.6 - 5.0)	#29 8.0 11	3.2 (7/12) (1.7 - 5.0)	4.0 (13) (2.0 - 7.0)	0
	SR-90 51	2.	3.1 (36/ 38) (1.0 - 5.6)	#29 8.0 11	3.8 (12/12) (1.4 - 5.6)	3.8 (13/13) (2.1 - 5.4)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL # TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
III. TERRESTRIAL							
B. Vegetation (Dry Weight) (pCi/kg)	GAMMA 33 CS-137	50.	156.0 (2/ 27) (154.0 - 158.0)	#20 8.0 290	158.0 (1/ 3)	74.8 (1/ 6)	0
B. Vegetation (pCi/kg)	GAMMA 7		<LLD	-	<LLD	<LLD	0
1. Food Crops including Cabbage, Tomatoes, Lettuce.							

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-368

LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC.,1983

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NNR
III. TERRESTRIAL							
C. Soil (Dry Weight) (pCi/kg)	GAMMA 14 MN-54	70.	6.6 (1/ 12)	# 3 0.4 4	6.6 (1/ 2)	<LLD	0
	CS-137	70.	462.9 (12/ 12) (141.3 - 917.0)	# 1 0.5 92	906.5 (2/ 2) (896.0 - 917.0)	309.9 (1/ 2)	0
	SR-89 7	0.5	0.8 (1/ 6)	# 5 8.5 298	0.8 (1/ 1)	<LLD	0
Sr-89/90 Activity units are in pCi/g of soil ash	SR-90 7	0.2	0.18 (3/ 6) (0.15 - 0.21)	# 2 0.5 235	0.2 (1/ 1)	<LLD	0

CHEM-042-00
(2/22/84)
WP84161

1983 ANO CHEMICAL USAGE
(Qty. Used lbs.)

Chemical (lbs)	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Unit #1													
Sulf. Acid 66 Baume	0	0	73,354	6,418	126,457	99,040	36,044	48,278	73,232	21,105	33,293	230,093	747,314
Sodium Hydroxide 50%	0	0	51,439	46,299	47,514	32,320	55,858	107,830	83,525	138,364	131,932	210,025	905,106
Ammonium Hydroxide	0	0	2,992	2,618	1,122	17,578	2,012	14,960	20,196	10,225	14,212	5,236	91,151
Hydrazine 35%	0	0	6,750	5,063	2,457	9,788	1,575	3,600	900	0	900	2,700	33,751
Sodium Nitrite	450	200	325	475	200	450	425	550	250	200	75	250	3,850
Borax	0	50	50	100	50	50	50	100	500	50	50	50	1,100
Boron	0	801	1,316	915	2,574	1,373	1,029	858	1,258	0	57	114	10,295
Lithium Hydroxide	0	0	0	2.2	0	6.6	4.4	4.4	0	0	0	0	17.6
Unit #2													
Sulf. Acid 66 Baume	5,389	35,318	70,542	17,035	123,310	5,717	21,060	11,456	5,785	0	0	0	295,612
Cooling Tower Acid													
Sulf. Acid 66 Baume	11,273	90,039	161,457	97,645	715,546	254,057	297,677	412,929	297,037	0	0	0	2,337,660
Sodium Hydroxide 50%	22,083	23,798	16,961	54,434	25,444	16,733	22,678	32,054	19,259	0	0	0	23,444
Ammonium Hydroxide	4,813	1,178	3,635	5,071	3,949	7,989	5,520	6,923	2,805	0	0	0	41,883
Hydrazine 35%	1,350	1,350	2,250	1,688	2,475	3,263	1,575	3,600	900	0	0	0	18,451
Sodium Nitrite	450	200	325	475	200	450	425	550	250	200	450	2,700	6,675
Borax	100	50	50	100	50	50	50	100	500	50	0	50	1,150
Boron	858	972	229	114	114	229	114	572	858	172	1,834	686	6,752
Lithium Hydroxide	0	2.2	0	4.4	0	0	2.2	4.4	0	0	2.2	2.2	17.6
Cooling Tower													
Calgon (CL-2490)	11,543	11,880	33,165	13,306	20,790	36,838	26,512	16,731	37,620	0	0	0	208,385
Calgon (CL-5)	520	650	2,340	1,300	1,560	3,380	520	1,820	0	0	0	260	14,430
Unit #1 & #2													
Chlorine	0	0	2,000	2,000	1,000	120	4,000	4,000	4,000	8,000	10,000	4,000	39,120
Detergents	16	17	17	17	17	17	17	18	17	34	32	17	238

DMB

ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

May 1, 1984

ØCANØ584Ø2

Mr. John T. Collins
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Annual Environmental Monitoring Report

Gentlemen:

Enclosed is the Arkansas Nuclear One Annual Environmental Monitoring Report for Arkansas Nuclear One - Units 1 and 2. This report is submitted for the calendar year 1983 in accordance with Environmental Technical Specification 5.6.1.

The Annual Chemical Usage Report is submitted for the portion of the year prior to March 11, 1983. The Technical Specification requiring this report was deleted by Amendment #72 dated March 11, 1983.

Very truly yours,

John R. Marshall
Manager, Licensing

JRM:RJS:ac

Attachment

cc: Mr. Richard C. DeYoung
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Norman M. Haller, Director
Office of Management & Program Analysis
U. S. Nuclear Regulatory Commission
Washington, DC 20555

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