



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 20 1987

MEMORANDUM FOR: Jose A. Calvo, Director
Project Directorate IV
Division of Reactor Projects III, IV, V
and Special Projects
Office of Nuclear Reactor Regulation

FROM: LeMoine J. Cunningham, Acting Chief
Radiation Protection Branch
Division of Radiation Protection
and Emergency Preparedness
Office of Nuclear Reactor Regulation

SUBJECT: SUGGESTED RESPONSE TO MR. STEVE SHOEMAKER
(EDO 2716)

In response to Bob Lee's request, enclosed is a draft response to Mr. Steve Shoemaker regarding his concern about the safe operation of Arkansas Nuclear One.

A handwritten signature in cursive script, appearing to read "LeMoine J. Cunningham".

LeMoine J. Cunningham, Acting Chief
Radiation Protection Branch
Division of Radiation Protection
and Emergency Preparedness
Office of Nuclear Reactor Regulation

Enclosure: Draft Response

cc: R. W. Starostecki
R. S. Lee

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket Nos. 50-313
50-368

Mr. Steve Shoemaker
Route 1, Box 199
Fayetteville, AR 72701

Dear Mr. Shoemaker:

By letter dated April 1, 1987, Congressman John Paul Hammerschmidt has relayed your concerns to us about the safe operation of Arkansas Power and Light Company's (AP&L) two nuclear power reactors at the Arkansas Nuclear One facility. In particular, he noted that you do not believe that the Arkansas Nuclear One reactors are operating safely because you have observed giant cancers on some fish.

In response to your concerns, we have reviewed the operations at Arkansas Nuclear One and are not aware of any abnormal radiation levels in this area. The quantities of radioactive material that are released from the Arkansas Nuclear One facility are controlled to levels far below the amounts which would cause abnormalities (such as a higher risk of cancer) in fish. Samples of liquids are routinely taken and measured prior to their release from Arkansas Nuclear One. In addition, levels of radioactivity are routinely measured in the environment around the facility. The results of these measurements are recorded in reports that are available at the Public Document Room located at the Tomlinson Library at Arkansas Technical University, Russellville, Arkansas. Enclosed for your information is a copy of AP&L's most recent "Semiannual Radiological Effluent Report," AP&L's "Annual Environmental Monitoring Report," and the Arkansas Department of Health's "1985 Environmental Monitoring Report" (Enclosures 1 through 3, respectively).

We have also discussed your observations with Mr. Dale James and Mr. Robert West at AP&L. They have informed us that they are not aware of any abnormalities in the fish in that area with one exception. Excessive curvature of the spine was observed in one type of fish, the gizzard shad, about 10 years ago. AP&L studied this condition and concluded that the excessive curvature is most likely due to a pesticide used in farming.

In summary, we believe that Arkansas Nuclear One is being operated in a safe manner, and that a shutdown of the facility is not justified. If you wish to discuss AP&L's study of the gizzard shad, Mr. Dale James, AP&L, can be reached at 501-377-5923.

Sincerely,

Victor Stello, Jr.
Executive Director for Operations

Enclosures: See page 2

Mr. Steve Shoemaker

2

Enclosures:

1. Semiannual Effluent Report dtd 3/2/87
2. AP&L's Annual Environmental Monitoring Report for 1985
3. Arkansas Department of Health's 1985 Environmental Monitoring Report, as revised

cc: Congressman John Paul Hammerschmidt
Mr. Dale James, AP&L



ARKANSAS POWER & LIGHT COMPANY

POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

March 2, 1987

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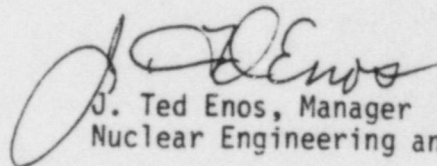
U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Semiannual Radiological Effluent Release Report

Gentlemen:

In accordance with 10CFR50.36a(a)(2), Arkansas Nuclear One Unit-1 Technical Specification 6.12.2.6, and Arkansas Nuclear One Unit-2 Technical Specification 6.9.3 enclosed is the Semiannual Radiological Effluent Release Report for the third and fourth quarters of 1986. In addition, the required yearly data is enclosed.

Very truly yours,



J. Ted Enos, Manager
Nuclear Engineering and Licensing

JTE:MCS:mb

Enclosure

~~87Ø316Ø251~~ 37pp.

Summary of the Quantities of Radioactive Liquid and Gaseous Effluents and
Solid Waste Release from ANO.

ARKANSAS POWER AND LIGHT COMPANY PAGE 1 OF 4
 ARKANSAS NUCLEAR ONE : UNIT 1
 REPORT CATEGORY : SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER
 TYPE OF ACTIVITY : ALL LIQUID EFFLUENTS
 REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4 OF 1986

TYPE OF EFFLUENT	UNIT	QUARTER 3 HOURS 4345-6552	QUARTER 4 HOURS 6553-8760	EST. TOTAL ERROR %
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A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE (NOT INCLUDING TRITIUM, GASES, ALPHA)	CURIES	1.28E 00	2.10E 00	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	4.23E-09	1.03E-08	
3. PERCENT OF APPLICABLE LIMIT	%	1.41E 00	3.44E 00	

B. TRITIUM

1. TOTAL RELEASE	CURIES	1.61E 01	2.79E 01	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	5.35E-09	1.37E-07	
3. PERCENT OF APPLICABLE LIMIT	%	1.78E-03	4.56E-03	

C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	CURIES	1.42E 02	4.55E-02	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	4.72E-07	2.23E-10	
3. PERCENT OF APPLICABLE LIMIT	%	2.36E-01	1.12E-04	

D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	CURIES	1.81E-04	0.00E-01	0.00E-01
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E. WASTE VOL RELEASED (PRE-DILUTION)	GAL	3.58E 06	2.18E 06	0.00E-01
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F. VOLUME OF DILUTION WATER USED	GAL	7.96E 10	5.38E 10	0.00E-01
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		: CONTINUOUS RELEASES :	BATCH	RELEASES :	
	: UNIT :	: QUARTER 3 :	: QUARTER 4 :	: QUARTER 3 :	: QUARTER 4 :
	:	: HOURS :	: HOURS :	: HOURS :	: HOURS :
NUCLIDE	:	: 4345-6552 :	: 6553-8760 :	: 4345-6552 :	: 6553-8760 :
ALL NUCLIDES					
H-3	: CURIES	: 0.00E-01	: 0.00E-01	: 1.61E 01	: 2.79E 01
C-14	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NA-24	: CURIES	: 0.00E-01	: 0.00E-01	: 1.01E-03	: 2.11E-04
P-32	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CR-51	: CURIES	: 0.00E-01	: 0.00E-01	: 6.84E-03	: 5.74E-02
MN-54	: CURIES	: 0.00E-01	: 0.00E-01	: 2.58E-03	: 5.17E-03
MN-56	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
FE-55	: CURIES	: 0.00E-01	: 0.00E-01	: 8.94E-02	: 1.44E-02
FE-59	: CURIES	: 0.00E-01	: 0.00E-01	: 8.33E-04	: 1.49E-03
CO-58	: CURIES	: 0.00E-01	: 0.00E-01	: 1.31E-01	: 5.37E-01
CO-60	: CURIES	: 0.00E-01	: 0.00E-01	: 8.86E-02	: 6.62E-02
NI-63	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NI-65	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CU-64	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
ZN-65	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
ZN-69	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 4.30E-05
BR-83	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
BR-84	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
BR-85	: CURIES	: 0.00E-01	: 0.00E-01	: 3.01E-04	: 0.00E-01
BR-86	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
RB-88	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
RB-89	: CURIES	: 0.00E-01	: 0.00E-01	: 1.25E-02	: 0.00E-01
SR-89	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
SR-91	: CURIES	: 0.00E-01	: 0.00E-01	: 1.53E-04	: 0.00E-01
SR-92	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
Y-90	: CURIES	: 0.00E-01	: 0.00E-01	: 1.05E-04	: 3.18E-04
Y-91M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
Y-91	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 1.32E-06
Y-92	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
Y-93	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
ZR-95	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
ZR-97	: CURIES	: 0.00E-01	: 0.00E-01	: 1.37E-03	: 1.95E-03
NB-95	: CURIES	: 0.00E-01	: 0.00E-01	: 2.30E-04	: 1.41E-04
MO-99	: CURIES	: 0.00E-01	: 0.00E-01	: 2.44E-03	: 4.50E-03
TC-99M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TC-101	: CURIES	: 0.00E-01	: 0.00E-01	: 1.80E-04	: 0.00E-01
RU-103	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
RU-105	: CURIES	: 0.00E-01	: 0.00E-01	: 9.12E-04	: 1.25E-03
RU-106	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
AG-110M	: CURIES	: 0.00E-01	: 0.00E-01	: 2.29E-03	: 5.88E-04
TE-125M	: CURIES	: 0.00E-01	: 0.00E-01	: 4.61E-03	: 1.74E-02
TE-127M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TE-127	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TE-129M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TE-129	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TE-131M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01

		: CONTINUOUS RELEASES :		BATCH RELEASES :	
NUCLIDE	: UNIT	: QUARTER 3	: QUARTER 4	: QUARTER 3	: QUARTER 4 :
	:	: HOURS	: HOURS	: HOURS	: HOURS
	:	:	:	:	:
	:	: 14345-6552	: 6553-8760	: 14345-6552	: 6553-8760

ALL NUCLIDES CONTINUED

TE-131	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TE-132	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 4.81E-04
I-130	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
I-131	: CURIES	: 0.00E-01	: 0.00E-01	: 2.07E-01	: 2.28E-02
I-132	: CURIES	: 0.00E-01	: 0.00E-01	: 2.45E-06	: 0.00E-01
I-133	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
I-134	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
I-135	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CS-134	: CURIES	: 0.00E-01	: 0.00E-01	: 1.42E-06	: 0.00E-01
CS-136	: CURIES	: 0.00E-01	: 0.00E-01	: 2.36E-01	: 7.61E-02
CS-137	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 8.69E-05
CS-138	: CURIES	: 0.00E-01	: 0.00E-01	: 4.60E-01	: 1.09E-01
SA-139	: CURIES	: 0.00E-01	: 0.00E-01	: 1.23E-06	: 2.53E-04
SA-140	: CURIES	: 0.00E-01	: 0.00E-01	: 6.50E-05	: 2.82E-05
SA-141	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 3.90E-05
SA-142	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
LA-140	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
LA-142	: CURIES	: 0.00E-01	: 0.00E-01	: 5.94E-04	: 8.61E-04
CE-141	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CE-143	: CURIES	: 0.00E-01	: 0.00E-01	: 2.04E-04	: 6.38E-05
CE-144	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
FR-143	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
FR-144	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
ND-147	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
W-187	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NP-239	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
KR-83M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
KR-85M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
KR-85	: CURIES	: 0.00E-01	: 0.00E-01	: 1.18E-02	: 0.00E-01
KR-87	: CURIES	: 0.00E-01	: 0.00E-01	: 4.46E-01	: 0.00E-01
KR-88	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 5.12E-05
KR-89	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 1.20E-04
KR-90	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
XE-131M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
XE-133M	: CURIES	: 0.00E-01	: 0.00E-01	: 1.27E 00	: 2.72E-02
XE-133	: CURIES	: 0.00E-01	: 0.00E-01	: 1.42E 00	: 0.00E-01
XE-135M	: CURIES	: 0.00E-01	: 0.00E-01	: 1.38E 02	: 1.80E-02
XE-135	: CURIES	: 0.00E-01	: 0.00E-01	: 8.25E-04	: 0.00E-01
XE-137	: CURIES	: 0.00E-01	: 0.00E-01	: 9.95E-01	: 1.40E-04
XE-138	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
AR-41	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
SR-90	: CURIES	: 0.00E-01	: 0.00E-01	: 1.08E-04	: 1.69E-05
G ALPHA	: CURIES	: 0.00E-01	: 0.00E-01	: 5.53E-04	: 2.76E-04
OTHER	: CURIES	: 0.00E-01	: 0.00E-01	: 1.81E-04	: 0.00E-01
BE-7	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
K-40	: CURIES	: 0.00E-01	: 0.00E-01	: 6.34E-04	: 3.66E-04
	: CURIES	: 0.00E-01	: 0.00E-01	: 5.06E-04	: 5.31E-04

		: CONTINUOUS RELEASES :		BATCH RELEASES :	
NUCLIDE	: UNIT	: QUARTER 3	: QUARTER 4	: QUARTER 3	: QUARTER 4
	:	: HOURS	: HOURS	: HOURS	: HOURS
	:	: 4345-6552	: 6553-8760	: 4345-6552	: 6553-8760

ALL NUCLIDES CONTINUED

CO-56	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CO-57	: CURIES	: 0.00E-01	: 0.00E-01	: 1.46E-04	: 5.32E-04
SE-75	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 1.63E-03
SR-85	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
Y-88	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NB-94	: CURIES	: 0.00E-01	: 0.00E-01	: 6.56E-05	: 0.00E-01
NB-97	: CURIES	: 0.00E-01	: 0.00E-01	: 5.63E-04	: 1.62E-04
MO-90	: CURIES	: 0.00E-01	: 0.00E-01	: 5.74E-04	: 0.00E-01
CO-109	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 1.03E-06
CO-113M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
SN-113	: CURIES	: 0.00E-01	: 0.00E-01	: 1.95E-04	: 5.35E-04
SB-122	: CURIES	: 0.00E-01	: 0.00E-01	: 1.56E-03	: 4.11E-04
SB-124	: CURIES	: 0.00E-01	: 0.00E-01	: 4.25E-04	: 5.32E-02
SB-125	: CURIES	: 0.00E-01	: 0.00E-01	: 2.23E-02	: 1.12E 00
SB-127	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 5.12E-04
SA-133	: CURIES	: 0.00E-01	: 0.00E-01	: 1.43E-06	: 0.00E-01
CE-139	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
EU-152	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
HG-203	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
SB-214	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 3.82E-05
BI-214	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
KA-226	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TH-228	: CURIES	: 0.00E-01	: 0.00E-01	: 1.17E-04	: 0.00E-01
U-235	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TOTAL FOR PERIOD		: CURIES	: 0.00E-01	: 0.00E-01	: 1.60E 02 : 3.00E 01 :

	:	ARKANSAS POWER AND LIGHT COMPANY	PAGE	1	OF	4
REPORT CATEGORY	:	ARKANSAS NUCLEAR ONE : UNIT 1				
TYPE OF ACTIVITY	:	SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER				
REPORTING PERIOD	:	ALL AIRBORNE EFFLUENTS				
	:	QUARTER # 3 AND QUARTER # 4 OF 1986				

	:	UNIT	:	QUARTER 3	:	QUARTER 4	:	EST. TOTAL
	:		:	HOURS	:	HOURS	:	ERROR %
TYPE OF EFFLUENT	:		:	4345-6552	:	6553-8760	:	

A. FISSION AND ACTIVATION GASES

1. TOTAL RELEASE	:	CURIES	:	4.90E 02	:	2.06E-01	:	0.00E-01
2. AVERAGE RELEASE RATE FOR PERIOD	:	UCI/SEC	:	6.23E 01	:	2.62E-02	:	
3. PERCENT OF APPLICABLE LIMIT	:	%	:	8.72E-01	:	3.66E-04	:	

B. RADIOIODINES

1. TOTAL IODINE-131	:	CURIES	:	2.28E-03	:	3.51E-04	:	0.00E-01
2. AVERAGE RELEASE RATE FOR PERIOD	:	UCI/SEC	:	2.90E-04	:	4.46E-05	:	
3. PERCENT OF APPLICABLE LIMIT	:	%	:	8.11E-04	:	1.25E-04	:	

C. PARTICULATES

1. PARTICULATES (HALF-LIVES > 8 DAYS)	:	CURIES	:	5.58E-05	:	8.69E-05	:	0.00E-01
2. AVERAGE RELEASE RATE FOR PERIOD	:	UCI/SEC	:	7.09E-06	:	1.11E-05	:	
3. PERCENT OF APPLICABLE LIMIT	:	%	:	1.99E-05	:	3.10E-05	:	
4. GROSS ALPHA RADIOACTIVITY	:	CURIES	:	0.00E-01	:	0.00E-01	:	

D. TRITIUM

1. TOTAL RELEASE	:	CURIES	:	1.06E 00	:	2.43E 00	:	0.00E-01
2. AVERAGE RELEASE RATE FOR PERIOD	:	UCI/SEC	:	1.35E-01	:	3.09E-01	:	
3. PERCENT OF APPLICABLE LIMIT	:	%	:	1.89E-04	:	4.33E-04	:	

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760

FISSION GASES

KR-83M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85M	CURIES	0.00E-01	0.00E-01	1.68E-02	0.00E-01
KR-85	CURIES	0.00E-01	0.00E-01	1.61E 01	1.54E-01
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	1.24E-02	0.00E-01
KR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M	CURIES	0.00E-01	0.00E-01	3.18E 00	1.48E-02
XE-133M	CURIES	0.00E-01	0.00E-01	1.67E 00	0.00E-01
XE-133	CURIES	0.00E-01	0.00E-01	4.55E 02	3.71E-02
XE-135M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-135	CURIES	0.00E-01	0.00E-01	1.42E 01	0.00E-01
XE-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	4.90E 02	2.06E-01

IODINES

I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	2.28E-03	3.51E-04
I-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	6.66E-06	0.00E-01
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	2.29E-03	3.51E-04

PARTICULATES

H-3	CURIES	0.00E-01	0.00E-01	1.06E 00	2.43E 00
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NA-24	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-51	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-54	CURIES	0.00E-01	0.00E-01	4.87E-06	9.91E-06
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-60	CURIES	0.00E-01	0.00E-01	3.59E-05	3.78E-05
NI-63	CURIES	0.00E-01	0.00E-01	2.38E-06	2.16E-05
NI-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760

PARTICULATES CONTINUED

ZN-69	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-91	CURIES	0.00E-01	0.00E-01	1.63E-07	0.00E-01
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-99	CURIES	0.00E-01	0.00E-01	3.96E-07	0.00E-01
TC-99M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-101	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-105	CURIES	0.00E-01	0.00E-01	0.00E-01	3.59E-06
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AG-110M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-125M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-136	CURIES	0.00E-01	0.00E-01	2.28E-06	0.00E-01
CS-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-138	CURIES	0.00E-01	0.00E-01	4.36E-06	1.27E-05
BA-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760

PARTICULATES CONTINUED

PR-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ND-147	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NP-239	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-90	CURIES	0.00E-01	0.00E-01	6.06E-10	6.52E-08
G ALPHA	CURIES	0.00E-01	0.00E-01	1.81E-07	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE-7	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
K-40	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-57	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE-75	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE-94	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE-97	CURIES	0.00E-01	0.00E-01	3.39E-07	0.00E-01
NO-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-109	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-113M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BN-113	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-122	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-124	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-125	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-133	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
EU-152	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
HG-203	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PB-214	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BI-214	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KA-226	CURIES	0.00E-01	0.00E-01	0.00E-01	1.30E-06
TH-228	CURIES	0.00E-01	0.00E-01	5.24E-06	0.00E-01
U-235	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD		CURIES	0.00E-01	0.00E-01	1.06E 00
					2.43E 00

: ARKANSAS POWER AND LIGHT COMPANY PAGE 1 OF 4
 : ARKANSAS NUCLEAR ONE : UNIT 2
 : SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER
 : ALL LIQUID EFFLUENTS
 : QUARTER # 3 AND QUARTER # 4 OF 1986

REPORT CATEGORY
 TYPE OF ACTIVITY
 REPORTING PERIOD

TYPE OF EFFLUENT	UNIT	QUARTER 3 HOURS	QUARTER 4 HOURS	EST. TOTAL ERROR %
		4345-6552	6553-8760	

A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE (NOT INCLUDING TRITIUM, GASES, ALPHA)	CURIES	1.60E 00	4.41E-01	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	5.30E-09	2.17E-09	
3. PERCENT OF APPLICABLE LIMIT	%	1.77E 00	7.22E-01	

B. TRITIUM

1. TOTAL RELEASE	CURIES	9.98E 01	1.82E 01	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	3.31E-07	8.91E-08	
3. PERCENT OF APPLICABLE LIMIT	%	1.10E-02	2.97E-03	

C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	CURIES	3.49E-02	6.36E-02	0.00E-01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	1.16E-10	3.13E-10	
3. PERCENT OF APPLICABLE LIMIT	%	5.76E-03	1.56E-04	

D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	CURIES	3.18E-05	0.00E-01	0.00E-01
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E. WASTE VOL RELEASED (PRE-DILUTION)	GAL	4.06E 05	3.20E 05	0.00E-01
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F. VOLUME OF DILUTION WATER USED	GAL	7.96E 10	5.38E 10	0.00E-01
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		: CONTINUOUS RELEASES :				BATCH RELEASES :	
NUCLIDE	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
		HOURS	HOURS	HOURS	HOURS		
		4345-6552	6553-8760	4345-6552	6553-8760		
ALL NUCLIDES							
H-3	CURIES	0.00E-01	0.00E-01	9.98E 01	1.82E 01		
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
NA-24	CURIES	0.00E-01	0.00E-01	2.21E-04	0.00E-01		
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
CR-51	CURIES	0.00E-01	0.00E-01	7.03E-02	1.58E-02		
MN-54	CURIES	0.00E-01	0.00E-01	9.72E-03	2.60E-03		
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
FE-55	CURIES	0.00E-01	0.00E-01	4.91E-03	6.31E-04		
FE-59	CURIES	0.00E-01	0.00E-01	1.19E-03	1.87E-03		
CO-58	CURIES	0.00E-01	0.00E-01	4.92E-01	5.62E-02		
CO-60	CURIES	0.00E-01	0.00E-01	2.61E-02	5.55E-02		
NI-63	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
NI-65	CURIES	0.00E-01	0.00E-01	1.26E-04	0.00E-01		
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
ZN-65	CURIES	0.00E-01	0.00E-01	1.74E-04	0.00E-01		
ZN-69	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
AB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
AB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
KB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
SR-91	CURIES	0.00E-01	0.00E-01	2.05E-04	2.08E-03		
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
Y-90	CURIES	0.00E-01	0.00E-01	2.43E-04	2.12E-04		
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
Y-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
ZR-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
ZR-97	CURIES	0.00E-01	0.00E-01	1.27E-02	6.34E-03		
NB-95	CURIES	0.00E-01	0.00E-01	5.50E-05	7.47E-05		
MO-99	CURIES	0.00E-01	0.00E-01	2.02E-02	1.08E-02		
TC-99M	CURIES	0.00E-01	0.00E-01	1.16E-04	0.00E-01		
TC-101	CURIES	0.00E-01	0.00E-01	2.28E-04	2.91E-05		
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
KU-105	CURIES	0.00E-01	0.00E-01	2.53E-03	8.36E-04		
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
AG-110M	CURIES	0.00E-01	0.00E-01	9.18E-04	5.22E-03		
TE-125M	CURIES	0.00E-01	0.00E-01	8.86E-03	1.23E-02		
TE-127M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
TE-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
TE-129M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01		

		: CONTINUOUS RELEASES :		BATCH RELEASES :	
NUCLIDE	: UNIT	: QUARTER 3	: QUARTER 4	: QUARTER 3	: QUARTER 4 :
	:	: HOURS	: HOURS	: HOURS	: HOURS
	:	: 4345-6552	: 6553-8760	: 4345-6552	: 6553-8760 :

ALL NUCLIDES CONTINUED

TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	7.89E-05	1.05E-04
I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	6.10E-03	1.50E-03
I-132	CURIES	0.00E-01	0.00E-01	2.62E-04	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	6.33E-05	3.79E-04
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-136	CURIES	0.00E-01	0.00E-01	2.18E-01	6.27E-02
CS-137	CURIES	0.00E-01	0.00E-01	5.74E-04	0.00E-01
CS-138	CURIES	0.00E-01	0.00E-01	4.51E-01	1.66E-01
BA-139	CURIES	0.00E-01	0.00E-01	1.30E-03	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-141	CURIES	0.00E-01	0.00E-01	1.59E-04	0.00E-01
BA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-142	CURIES	0.00E-01	0.00E-01	4.43E-04	9.79E-04
DE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
DE-143	CURIES	0.00E-01	0.00E-01	4.98E-05	0.00E-01
DE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-143	CURIES	0.00E-01	0.00E-01	5.76E-04	1.89E-04
PR-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ND-147	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NP-239	CURIES	0.00E-01	0.00E-01	0.00E-01	8.46E-04
KR-83M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85	CURIES	0.00E-01	0.00E-01	1.91E-05	0.00E-01
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-133M	CURIES	0.00E-01	0.00E-01	4.05E-03	0.00E-01
XE-133	CURIES	0.00E-01	0.00E-01	9.27E-05	3.87E-04
XE-133	CURIES	0.00E-01	0.00E-01	3.00E-02	5.95E-02
XE-135M	CURIES	0.00E-01	0.00E-01	1.44E-04	0.00E-01
XE-135	CURIES	0.00E-01	0.00E-01	3.45E-04	3.71E-03
XE-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	1.87E-04	3.46E-05
SR-90	CURIES	0.00E-01	0.00E-01	7.58E-05	1.31E-04
G ALPHA	CURIES	0.00E-01	0.00E-01	3.18E-05	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BE-7	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
K-40	CURIES	0.00E-01	0.00E-01	6.09E-04	7.54E-05

		: CONTINUOUS RELEASES :		BATCH		RELEASES :	
NUCLIDE	: UNIT	: QUARTER 3	: QUARTER 4	: QUARTER 3	: QUARTER 4	: QUARTER 3	: QUARTER 4
	:	: HOURS	: HOURS	: HOURS	: HOURS	: HOURS	: HOURS
	:	: 4345-6552	: 6553-8760	: 4345-6552	: 6553-8760	: 4345-6552	: 6553-8760

ALL NUCLIDES CONTINUED

CO-56	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CO-57	: CURIES	: 0.00E-01	: 0.00E-01	: 7.48E-04	: 2.71E-04	: 0.00E-01	: 0.00E-01
SE-75	: CURIES	: 0.00E-01	: 0.00E-01	: 4.19E-05	: 0.00E-01	: 0.00E-01	: 0.00E-01
SR-85	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
Y-88	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NB-94	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
NB-97	: CURIES	: 0.00E-01	: 0.00E-01	: 3.67E-04	: 2.52E-04	: 0.00E-01	: 0.00E-01
MO-90	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CD-109	: CURIES	: 0.00E-01	: 0.00E-01	: 1.11E-03	: 0.00E-01	: 0.00E-01	: 0.00E-01
CO-113M	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
SN-113	: CURIES	: 0.00E-01	: 0.00E-01	: 2.19E-03	: 4.73E-03	: 0.00E-01	: 0.00E-01
SB-122	: CURIES	: 0.00E-01	: 0.00E-01	: 3.69E-05	: 1.13E-04	: 0.00E-01	: 0.00E-01
SB-124	: CURIES	: 0.00E-01	: 0.00E-01	: 5.05E-02	: 2.09E-03	: 0.00E-01	: 0.00E-01
SB-125	: CURIES	: 0.00E-01	: 0.00E-01	: 2.12E-01	: 2.80E-02	: 0.00E-01	: 0.00E-01
SB-127	: CURIES	: 0.00E-01	: 0.00E-01	: 1.38E-04	: 1.49E-04	: 0.00E-01	: 0.00E-01
SA-133	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
CE-139	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
EU-152	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
RG-203	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
PS-214	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
BI-214	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
RA-226	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TH-228	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
U-235	: CURIES	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01	: 0.00E-01
TOTAL FOR PERIOD	: CURIES	: 0.00E-01	: 0.00E-01	: 1.01E 02	: 1.87E 01	: 0.00E-01	: 0.00E-01

: ARKANSAS POWER AND LIGHT COMPANY PAGE 1 OF 4
 : ARKANSAS NUCLEAR ONE : UNIT 2
 : SEMIANNUAL SUMMATION OF ALL RELEASES BY QUARTER
 : ALL AIRBORNE EFFLUENTS
 : QUARTER # 3 AND QUARTER # 4 OF 1986

REPORT CATEGORY
 TYPE OF ACTIVITY
 REPORTING PERIOD

	UNIT	QUARTER 3	QUARTER 4	EST. TOTAL
		HOURS	HOURS	ERROR %
TYPE OF EFFLUENT		4345-6552	6553-8760	

A. FISSION AND ACTIVATION GASES

1. TOTAL RELEASE	:CURIES	: 4.01E 02	: 7.87E 01	: 0.00E-01:
2. AVERAGE RELEASE RATE FOR PERIOD	:UCI/SEC	: 5.10E 01	: 1.00E 01	:
3. PERCENT OF APPLICABLE LIMIT	: %	: 7.14E-01	: 1.40E-01	:

B. RADIOIODINES

1. TOTAL IODINE-131	:CURIES	: 5.98E-05	: 1.96E-06	: 0.00E-01:
2. AVERAGE RELEASE RATE FOR PERIOD	:UCI/SEC	: 7.59E-06	: 2.49E-07	:
3. PERCENT OF APPLICABLE LIMIT	: %	: 2.12E-03	: 6.96E-07	:

C. PARTICULATES

1. PARTICULATES(HALF-LIVES>8 DAYS)	:CURIES	: 1.70E-05	: 7.26E-06	: 0.00E-01:
2. AVERAGE RELEASE RATE FOR PERIOD	:UCI/SEC	: 2.16E-06	: 9.38E-07	:
3. PERCENT OF APPLICABLE LIMIT	: %	: 6.06E-06	: 2.62E-06	:
4. GROSS ALPHA RADIOACTIVITY	:CURIES	: 0.00E-01	: 0.00E-01	:

D. TRITIUM

1. TOTAL RELEASE	:CURIES	: 7.86E-01	: 4.45E-01	: 0.00E-01:
2. AVERAGE RELEASE RATE FOR PERIOD	:UCI/SEC	: 9.99E-02	: 5.66E-02	:
3. PERCENT OF APPLICABLE LIMIT	: %	: 1.40E-04	: 7.92E-05	:

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760

FISSION GASES

KR-83M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-85	CURIES	0.00E-01	0.00E-01	3.65E 01	6.68E-02
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-131M	CURIES	0.00E-01	0.00E-01	3.99E 01	7.75E 01
XE-133M	CURIES	0.00E-01	0.00E-01	5.57E 00	0.00E-01
XE-133	CURIES	0.00E-01	0.00E-01	4.82E 01	1.06E 00
XE-135M	CURIES	0.00E-01	0.00E-01	2.71E 02	0.00E-01
XE-135	CURIES	0.00E-01	0.00E-01	0.00E-01	1.97E-02
XE-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	4.01E 02	7.87E 01

IODINES

I-130	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	0.00E-01	5.96E-05	1.96E-06
I-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	7.01E-07	0.00E-01
I-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	6.03E-05	1.96E-06

PARTICULATES

H-3	CURIES	0.00E-01	0.00E-01	7.86E-01	4.45E-01
C-14	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NA-24	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
P-32	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CR-51	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-54	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	0.00E-01	7.12E-06	1.38E-06
CO-60	CURIES	0.00E-01	0.00E-01	1.02E-06	2.67E-06
NI-63	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NI-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CU-64	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760
PARTICULATES CONTINUED					
ZN-69	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-83	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-84	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-86	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-91	CURIES	0.00E-01	0.00E-01	8.42E-07	4.50E-08
SR-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-91	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-92	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-93	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZR-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RB-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-99	CURIES	0.00E-01	0.00E-01	6.92E-07	0.00E-01
TC-99M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-101	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-103	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-105	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
RU-106	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AG-110M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-125M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-129	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-131	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TE-132	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-136	CURIES	0.00E-01	0.00E-01	7.70E-08	2.79E-07
CS-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-138	CURIES	0.00E-01	0.00E-01	1.93E-06	1.36E-06
BA-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
LA-142	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

NUCLIDE	UNIT	ELEVATED		GROUND	
		BATCH	RELEASES	BATCH	RELEASES
		QUARTER 3 HOURS	QUARTER 4 HOURS	QUARTER 3 HOURS	QUARTER 4 HOURS
		4345-6552	6553-8760	4345-6552	6553-8760

PARTICULATES CONTINUED

PR-143	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PR-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ND-147	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NP-239	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-90	CURIES	0.00E-01	0.00E-01	8.56E-11	1.29E-08
G ALPHA	CURIES	0.00E-01	0.00E-01	1.72E-07	1.10E-07
OTHER	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE-7	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
K-40	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-56	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-57	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE-75	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Y-88	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NB-94	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NB-97	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-90	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CD-109	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CD-113M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SN-113	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-122	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-124	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-125	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SB-127	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-133	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-139	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
EU-152	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
HG-203	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
PB-214	CURIES	0.00E-01	0.00E-01	1.41E-06	2.22E-06
BI-214	CURIES	0.00E-01	0.00E-01	4.44E-06	1.04E-05
KA-226	CURIES	0.00E-01	0.00E-01	1.04E-06	0.00E-01
TH-228	CURIES	0.00E-01	0.00E-01	4.12E-06	1.50E-06
U-235	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	0.00E-01	7.86E-01	4.45E-01

SOLID WASTE REPORT

(P. 8. 1. 2. 1.)

ACKNOWLEDGE NUCLEAR ONE

DOCKET NUMBER 50-513

EFFLUENT AND WASTE DISPOSAL REPORT

REPORT PERIOD: 7/1/84 - 11/30/86

REPORT GENERATION DATE: 12/1/87

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED DEFENSE FOR BURIAL OR DISPOSAL
(NOT IRRADIATED FUEL)

1. TYPE OF WASTE UNIT 6 MONTH PER. ERROR, %

TYPE OF WASTE	UNIT	6 MONTH PER.	ERROR, %
SPENT FEEDING FILTER <i>cartridges</i>	M-43	5.00E+01	
EVAPORATOR BOTTOM, ETC.	01	5.00E+01	2.00E+00
DRY COMPRESSIBLE WASTE,	M-43	5.00E+00	
CONTAMINATED EQUIP., ETC.	01	5.00E+01	2.00E+00

2. ESTIMATE OF MAJOR NUCLEIDE COMPOSITION (BY TYPE OF WASTE)

A.

NUCLEIDE	%	VALUE
AM-241	%	4.00E-04
C-14	%	7.10E-01
CE-144	%	5.00E-01
CM-241	%	5.00E-01
CM-244	%	4.00E-04
CO-58	%	5.00E+01
CO-60	%	3.20E+00
CS-134	%	1.40E+01
CS-137	%	1.00E+01
FE-55	%	1.00E+00
H-3	%	2.10E+01
I-125	%	3.00E-02
NR-95	%	1.00E-01
NR-93M	%	5.00E-07
NI-57	%	5.40E-02
NI-59	%	7.00E-01
PU-238	%	7.60E-04
PU-239	%	8.90E-04
PU-241	%	2.60E-02
SB-124	%	9.10E-02
SR-90	%	3.30E+00
TC-99	%	5.00E-02
ZR-95	%	9.10E-02

B.

NUCLEIDE	%	VALUE
AM-241	%	3.90E-03
C-14	%	1.30E+00
CE-144	%	7.70E-01
CM-241	%	7.00E-03
CM-244	%	4.20E-03
CO-58	%	4.40E+00
CO-60	%	1.20E+01
CS-134	%	1.40E+01

MI-57	%	4.45E+00
MI-57	%	8.30E-02
MI-57	%	1.45E-01
PL-CTB	%	3.78E+00
PL-CTB	%	7.60E-03
PL-CTB	%	3.10E-03
PL-CTB	%	2.44E-01
PL-CTB	%	9.32E+00
PL-CTB	%	1.41E-01

3. SOLID WASTE DISPOSITION

SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
6	UNSHIELDED VAN/TRUCK	HANFORD

B. IRRADIATED FUEL SHIPMENTS DISPOSITION

SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
NONE		

A. 1. Totals for Solid waste shipped offsite for burial or disposal over 12 month period.

Spent resins, filter cartridges, evaporator bottoms, etc.	8.33 E+01 m ³ 2.17 E+02 Ci
Dry compressible waste, contaminated equip., etc.	3.76 E+01 m ³ 1.25 E+00 Ci

A. 3.	Shipments	Mode of Transportation	Destination
	6	unshielded Van/Truck	HANFORD
	11	CASK shipment (Type A)	HANFORD

Changes to the Offsite Dose Calculation Manual and Process Control Program.

There were no changes to the Offsite Dose Calculation Manual (ODCM) or the Process Control Program in 1986.

Unplanned Releases to Unrestricted Areas.

There were three unplanned effluent releases during 1986.

The first occurred on September 4, 1986. Waste Gas Decay Tank T-18A had been filled with nitrogen for a pressure test. The tank had been sampled and a release permit was ready when it was discovered that the tank pressure had decreased from 22 lbs to 2 lbs in 4 hours. The cause of the release has not yet been determined. No release limits were exceeded and no mitigating actions were taken. The calculated gamma air dose from this release was $3.4653\text{E-}08$ MRAD, which is $6.931\text{E-}09\%$ of the quarterly dose limit.

The second release occurred on September 6, 1986. While performing a gaseous dump on Waste Gas Decay Tank T-18A the waste control operator noted that Waste Gas Hold-up Tanks T18 B&D were decreasing in pressure also. It was determined that the outlet valves on T18 B&D were leaking. This leakage was due to debris being caught between the valve seat faces. The valves were disassembled and the seats repaired. No release limits were exceeded and no mitigating actions were taken. The calculated gamma air dose from this release was $2.5787\text{E-}08$ MRAD, which is $5.157\text{E-}09\%$ of the quarterly dose limit.

The third release occurred on September 20, 1986. A turbine building trench dump was begun without a sample being taken. When this was recognized a chemist was called to take a sample of the water remaining in the trench. This occurrence was due to personnel error. No release limits were exceeded and no mitigating actions were taken. The calculated total body dose from the release was $3.92\text{E-}05$ MREM. This is $2.613\text{E-}05\%$ of the quarterly dose limit.

Meteorological Data

The 1986 hourly meteorological data will be retained for NRC review in lieu of including a summary in this report.

Radiation Doses Due to Radiological Effluent

ARKANSAS POWER AND LIGHT COMPANY
ARKANSAS NUCLEAR ONE
1987: 2:18:10:39:14
GASEOUS RADIOACTIVE WASTE DATA FILE
CUMULATIVE DOSE DATA

** UNIT ~~20~~ ** QUARTER 1 OF 1986 **
DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	5.9933E-04
TOTAL DOSE (MREM) FOR LIVER	:	1.6241E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.4758E-03
TOTAL DOSE (MREM) FOR THYROID	:	1.1791E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	1.8181E-03
TOTAL DOSE (MREM) FOR LUNG	:	1.2298E-03
TOTAL DOSE (MREM) FOR GI-LLI	:	1.2594E-03
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	2.9840E-02
SKIN DOSE TOTAL (MREM)	:	7.3352E-02
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	3.5705E-02
TOTAL BETA AIRDOSE (MRAD)	:	1.0772E-01

** UNIT 1 ** QUARTER 2 OF 1986 **
DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	1.3248E-03
TOTAL DOSE (MREM) FOR LIVER	:	1.1341E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	9.1143E-04
TOTAL DOSE (MREM) FOR THYROID	:	1.4396E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	1.2994E-03
TOTAL DOSE (MREM) FOR LUNG	:	4.9970E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	5.2565E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	2.4149E-03
SKIN DOSE TOTAL (MREM)	:	5.7030E-03
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	2.8754E-03
TOTAL BETA AIRDOSE (MRAD)	:	8.2431E-03

** UNIT 1 ** QUARTER 3 OF 1986 **
DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	1.6968E-03
TOTAL DOSE (MREM) FOR LIVER	:	2.3725E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.5999E-03
TOTAL DOSE (MREM) FOR THYROID	:	4.9031E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	3.2481E-03
TOTAL DOSE (MREM) FOR LUNG	:	7.4870E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	8.6780E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	1.4255E-02
SKIN DOSE TOTAL (MREM)	:	3.5554E-02
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	1.6807E-02
TOTAL BETA AIRDOSE (MRAD)	:	4.8808E-02

** UNIT 1 ** QUARTER 4 OF 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	8.8158E-04
TOTAL DOSE (MREM) FOR LIVER	:	2.3580E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.0150E-03
TOTAL DOSE (MREM) FOR THYROID	:	7.7911E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	2.3050E-03
TOTAL DOSE (MREM) FOR LUNG	:	1.8650E-03
TOTAL DOSE (MREM) FOR GI-LLI	:	1.8693E-03
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	1.3087E-06
SKIN DOSE TOTAL (MREM)	:	2.1709E-05
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	1.6030E-06
TOTAL BETA AIRDOSE (MRAD)	:	3.1543E-05

** UNIT 1 ** TOTALS FOR 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	4.5025E-03
TOTAL DOSE (MREM) FOR LIVER	:	7.4887E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	6.0021E-03
TOTAL DOSE (MREM) FOR THYROID	:	8.3009E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	8.6706E-03
TOTAL DOSE (MREM) FOR LUNG	:	4.3432E-03
TOTAL DOSE (MREM) FOR GI-LLI	:	4.5221E-03
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	4.6511E-02
SKIN DOSE TOTAL (MREM)	:	1.1463E-01
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	5.5389E-02
TOTAL BETA AIRDOSE (MRAD)	:	1.6480E-01

ARKANSAS POWER AND LIGHT COMPANY
ARKANSAS NUCLEAR ONE
1987: 2:18:10:39:53
GASEOUS RADIOACTIVE WASTE DATA FILE
CUMULATIVE DOSE DATA

** UNIT 2: ** QUARTER 1 OF 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	5.7907E-04
TOTAL DOSE (MREM) FOR LIVER	:	7.6100E-04
TOTAL DOSE (MREM) FOR TOTAL BODY	:	3.6133E-04
TOTAL DOSE (MREM) FOR THYROID	:	4.9568E-03
TOTAL DOSE (MREM) FOR KIDNEY	:	4.5666E-04
TOTAL DOSE (MREM) FOR LUNG	:	3.3619E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	2.8630E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	5.2321E-02
SKIN DOSE TOTAL (MREM)	:	1.1930E-01
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	5.8739E-02
TOTAL BETA AIRDOSE (MRAD)	:	1.2237E-01

** UNIT 2 ** QUARTER 2 OF 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	1.2542E-04
TOTAL DOSE (MREM) FOR LIVER	:	5.4422E-04
TOTAL DOSE (MREM) FOR TOTAL BODY	:	4.7820E-04
TOTAL DOSE (MREM) FOR THYROID	:	1.7573E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	5.6837E-04
TOTAL DOSE (MREM) FOR LUNG	:	4.4720E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	4.4637E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	4.3240E-02
SKIN DOSE TOTAL (MREM)	:	1.7453E-01
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	5.0519E-02
TOTAL BETA AIRDOSE (MRAD)	:	2.3928E-01

** UNIT 2 ** QUARTER 3 OF 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	1.2611E-04
TOTAL DOSE (MREM) FOR LIVER	:	5.9736E-04
TOTAL DOSE (MREM) FOR TOTAL BODY	:	5.4065E-04
TOTAL DOSE (MREM) FOR THYROID	:	1.3203E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	6.3202E-04
TOTAL DOSE (MREM) FOR LUNG	:	5.1711E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	5.1732E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	7.6564E-02
SKIN DOSE TOTAL (MREM)	:	1.1216E-01
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	8.2801E-02
TOTAL BETA AIRDOSE (MRAD)	:	2.6161E-02

** UNIT 2 ** QUARTER 4 OF 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	8.4570E-05
TOTAL DOSE (MREM) FOR LIVER	:	3.5939E-04
TOTAL DOSE (MREM) FOR TOTAL BODY	:	3.2753E-04
TOTAL DOSE (MREM) FOR THYROID	:	7.3855E-04
TOTAL DOSE (MREM) FOR KIDNEY	:	3.4326E-04
TOTAL DOSE (MREM) FOR LUNG	:	3.2308E-04
TOTAL DOSE (MREM) FOR GI-LLI	:	3.2031E-04
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	7.2405E-04
SKIN DOSE TOTAL (MREM)	:	4.9982E-03
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	1.2184E-03
TOTAL BETA AIRDOSE (MRAD)	:	8.5231E-03

** UNIT 2 ** TOTALS FOR 1986 **

DOSE FROM RADIOIODINES, PARTICULATES, AND TRITIUM
AT CONTROLLING LOCATION:

TOTAL DOSE (MREM) FOR BONE	:	9.1516E-04
TOTAL DOSE (MREM) FOR LIVER	:	2.2620E-03
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.7077E-03
TOTAL DOSE (MREM) FOR THYROID	:	3.6472E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	2.0003E-03
TOTAL DOSE (MREM) FOR LUNG	:	1.6236E-03
TOTAL DOSE (MREM) FOR GI-LLI	:	1.5703E-03
NOBLE GAS DOSE AT SITE BOUNDARY:		
TOTAL BODY DOSE TOTAL (MREM)	:	1.7285E-01
SKIN DOSE TOTAL (MREM)	:	4.1099E-01
NOBLE GAS AIRDOSE AT SITE BOUNDARY:		
TOTAL GAMMA AIRDOSE (MRAD)	:	1.9328E-01
TOTAL BETA AIRDOSE (MRAD)	:	3.9634E-01

ARKANSAS POWER AND LIGHT
ARKANSAS NUCLEAR ONE
1987: 2:18:10:40:50
LIQUID RADIOACTIVE WASTE DATA FILE
CUMULATIVE DOSE DATA

** UNIT 1 ** QUARTER 1 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	2.1944E-01
TOTAL DOSE (MREM) FOR LIVER	:	3.5590E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.6193E-01
TOTAL DOSE (MREM) FOR THYROID	:	1.4566E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	1.1832E-01
TOTAL DOSE (MREM) FOR LUNG	:	4.3268E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	1.0150E-01

** UNIT 1 ** QUARTER 2 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	2.5256E-01
TOTAL DOSE (MREM) FOR LIVER	:	4.1410E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.9973E-01
TOTAL DOSE (MREM) FOR THYROID	:	2.2706E-03
TOTAL DOSE (MREM) FOR KIDNEY	:	1.3782E-01
TOTAL DOSE (MREM) FOR LUNG	:	4.8152E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	1.1361E-02

** UNIT 1 ** QUARTER 3 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	3.2076E-01
TOTAL DOSE (MREM) FOR LIVER	:	4.8860E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	3.7079E-01
TOTAL DOSE (MREM) FOR THYROID	:	1.0002E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	1.6297E-01
TOTAL DOSE (MREM) FOR LUNG	:	5.4881E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	3.7551E-02

** UNIT 1 ** QUARTER 4 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	1.4666E-01
TOTAL DOSE (MREM) FOR LIVER	:	2.4960E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.8486E-01
TOTAL DOSE (MREM) FOR THYROID	:	1.7760E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	8.2752E-02
TOTAL DOSE (MREM) FOR LUNG	:	9.7279E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	1.0244E-01

** UNIT 1 ** TOTALS FOR 1986 **

TOTAL DOSE (MREM) FOR BONE	:	9.3941E-01
TOTAL DOSE (MREM) FOR LIVER	:	1.5082E 00
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.1173E 00
TOTAL DOSE (MREM) FOR THYROID	:	1.3462E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	5.0185E-01
TOTAL DOSE (MREM) FOR LUNG	:	2.4358E-01
TOTAL DOSE (MREM) FOR GI-LLI	:	2.5285E-01

ARKANSAS POWER AND LIGHT
ARKANSAS NUCLEAR ONE
1987: 2:18:10:41:10
LIQUID RADIOACTIVE WASTE DATA FILE
CUMULATIVE DOSE DATA

** UNIT 2 ** QUARTER 1 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	2.1703E-01
TOTAL DOSE (MREM) FOR LIVER	:	3.5036E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.5098E-01
TOTAL DOSE (MREM) FOR THYROID	:	1.8286E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	1.1699E-01
TOTAL DOSE (MREM) FOR LUNG	:	4.0379E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	6.6462E-02

** UNIT 2 ** QUARTER 2 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	2.2595E-01
TOTAL DOSE (MREM) FOR LIVER	:	3.7176E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.6745E-01
TOTAL DOSE (MREM) FOR THYROID	:	9.3927E-02
TOTAL DOSE (MREM) FOR KIDNEY	:	1.2451E-01
TOTAL DOSE (MREM) FOR LUNG	:	4.2381E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	2.0930E-02

** UNIT 2 ** QUARTER 3 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	2.8252E-01
TOTAL DOSE (MREM) FOR LIVER	:	4.6448E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	3.3469E-01
TOTAL DOSE (MREM) FOR THYROID	:	2.2652E-03
TOTAL DOSE (MREM) FOR KIDNEY	:	1.5482E-01
TOTAL DOSE (MREM) FOR LUNG	:	5.8662E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	2.0731E-01

** UNIT 2 ** QUARTER 4 OF 1986 **

TOTAL DOSE (MREM) FOR BONE	:	1.8662E-01
TOTAL DOSE (MREM) FOR LIVER	:	2.9621E-01
TOTAL DOSE (MREM) FOR TOTAL BODY	:	2.1086E-01
TOTAL DOSE (MREM) FOR THYROID	:	1.2897E-03
TOTAL DOSE (MREM) FOR KIDNEY	:	9.8953E-02
TOTAL DOSE (MREM) FOR LUNG	:	3.4672E-02
TOTAL DOSE (MREM) FOR GI-LLI	:	1.9573E-01

** UNIT 2 ** TOTALS FOR 1986 **

TOTAL DOSE (MREM) FOR BONE	:	9.1212E-01
TOTAL DOSE (MREM) FOR LIVER	:	1.4828E 00
TOTAL DOSE (MREM) FOR TOTAL BODY	:	1.0640E 00
TOTAL DOSE (MREM) FOR THYROID	:	1.1577E-01
TOTAL DOSE (MREM) FOR KIDNEY	:	4.9527E-01
TOTAL DOSE (MREM) FOR LUNG	:	1.7609E-01
TOTAL DOSE (MREM) FOR GI-LLI	:	4.9043E-01

Radiation Dose to the Public Due to Activities Inside the Site Boundary

ARKANSAS NUCLEAR ONE
1986 CUMULATIVE DOSE DATA PUBLIC ACTIVITIES INSIDE THE SITE BOUNDARY
(MREM)

	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	SKIN
UNIT-1:								
AIRBORNE RELEASES:								
I-131, PART. AND H-3	2.0E-03	3.3E-03	2.6E-03	3.6E-01	3.7E-03	1.9E-03	2.0E-03	
NOBLE GASES			2.0E-02					3.0E-01
LIQUID RELEASES:								
FISH	9.4E-01	1.5E+00	1.1E+00	1.4E-01	5.0E-01	2.4E-01	2.5E-01	
SEDIMENT			1.4E-02					1.9E-01
UNIT-1 TOTAL	9.4E-01	1.5E+00	1.1E+00	5.0E-01	5.1E-01	2.6E-01	2.5E-01	5.0E-01
UNIT-2								
AIRBORNE RELEASES:								
I-131, PART. AND H-3	4.0E-04	9.9E-04	7.5E-04	1.6E-02	3.7E-04	7.1E-04	6.9E-04	
NOBLE GASES			7.6E-02					1.8E-01
LIQUID RELEASES:								
FISH	7.1E-01	1.5E+00	1.1E+00	1.2E-01	5.0E-01	1.8E-01	4.9E-01	
SEDIMENT			1.4E-02					1.7E-02
UNIT-2 TOTAL	7.1E-01	1.5E+00	1.2E+00	1.3E-01	5.0E-01	1.8E-01	4.9E-01	2.0E-01
STATION TOTAL	1.9E+00	3.0E+00	2.3E+00	6.3E-01	1.0E+00	4.2E-01	7.5E-01	2.5E-01

Changes to the Radioactive Waste Systems

A contract (D-135-A) was awarded to the Duratek Corporation to process ANO-1 liquid radwaste. This contract took effect November 3, 1986 for a period of one year. The Duratek Enhanced Volume Reduction processing System is a shielded skid mounted unit composed of (1) filtration vessel, (5) ion exchange vessels, and associated piping.



Enclosure 2

ARKANSAS POWER & LIGHT COMPANY

POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

April 28, 1986

0CAN048603

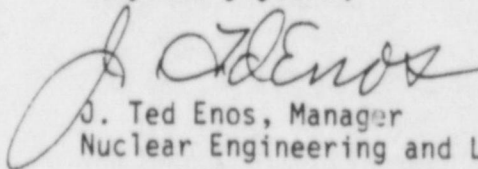
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

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:

In accordance with Arkansas Nuclear One - Units 1 and 2 Environmental Technical Specification 5.6.1, and Regulatory Guide 10.1 Item 177, enclosed is the Annual Environmental Monitoring Report.

Very truly yours,



J. Ted Enos, Manager
Nuclear Engineering and Licensing

JTE/RJS/sg

Enclosure

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

86-5286114
840 pg.

ARKANSAS POWER AND LIGHT COMPANY

TECHNICAL ANALYSIS SECTION

900 CENTER STREET

LITTLE ROCK, ARKANSAS 72203

(501) 370-8870

TITLE: 1985 ANNUAL ENVIRONMENTAL RADIOLOGICAL
MONITORING REPORT FOR ANO-1 AND ANO-2

TABLE OF CONTENTS

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1.0. INTRODUCTION	1
2.0. INTERPRETATIONS AND CONCLUSIONS	3
3.0. PROGRAM TECHNICAL DESCRIPTION	60
4.0 LAND USE SURVEY	77

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 1985. All samples 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 light water cooled pressurized water 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, section 4.3 and Unit 2, section 3/4 12. These sections became effective January 1, 1985. Some of the program requirements changed were a reduction in fish sampling sites, deletion of precipitation sampling, increase in the number of TLD locations, addition of an annual land use survey and required participation in an analytical cross check program. Many of the aspects of the program, which are no longer required, were

continued in 1985 and all data is included in this report. Table 1.2.1 details the surveillance program listing sample type, frequency of collection, and the method of analysis used. Table 1.2.2 lists the sample location and type of samples collected at each location. TLD locations are given in Table 1.2.3. Figure 1.2.1 gives the aquatic biota (fish) sampling areas. Figures 1.2.2 and 1.2.3 depict the location of the plant site.

1.3 CONTROL LOCATIONS

During the calendar year 1985, 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)

Milk

d) H. Hollis Garden (Station #40)

Food Products

2.0 INTERPRETATIONS AND CONCLUSIONS

Data collected from radiological analyses, of environmental samples collected in the area surrounding the ANO facility, indicates no dose to the general public in excess of design objectives as a result of liquid and gaseous discharges from the ANO site during 1985. Also, no non-routine environmental radiological monitoring reports resulting from analyses of environmental samples were submitted to the U.S. NRC during 1985. Reporting levels are given in Table 2.0.1.

TABLE 1.2.1
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 (0.028m³/min) air sampling rate), seven (7) locations.
2. Analyses
 - a. Gross alpha
 - b. Gross beta, analyzed 24 hours after filter change*
 - c. Gamma isotope on quarterly composite (each station) and on high beta levels (>10 X control)*
 - 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.
 - a. Four (4) thermoluminescent dosimeters (LiF), seven (7) locations. (six month integrated dose)
 - b. Two (2) thermoluminescent dosimeters (LiF), thirty-seven (37) locations. (three month integrated dose)*
2. Analyses
 - a. Change and readout one set dosimeters quarterly at all 44 locations* and one set semiannually at the first 7 locations.

D. Precipitation

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

TABLE 1.2.1 (cont)

SAMPLE TYPE AND ANALYSIS

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)
 - a. The discharge and intake canals samples shall be composited from daily samples.*
- 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) semiannually 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 three locations.
- 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.

TABLE 1.2.1 (cont)

SAMPLE TYPE AND ANALYSIS

2. Analyses

- a. Gross alpha
- b. Gross beta
- c. Gamma isotopic*
- d. Tritium (quarterly composite)*
- e. Radiostronium (quarterly composite)
- f. Iodine-131*

E. Aquatic Biota

- 1. Semiannual samples are taken as available at the discharge and intake canals. Samples will be as large as practicable not to exceed 2Kg.

2. Analyses

- a. Gamma isotopic (fish flesh*)

III. TERRESTRIAL

A. Milk

- 1. One gallon samples will be taken monthly from four locations, either 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.

TABLE 1.2.1 (cont)

SAMPLE TYPE AND ANALYSIS

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

One sample of each of the following classes of food products:

1. Fruits*
 2. Flowering Vegetable*
 3. Tuber Vegetable*
4. Analyses
 - a. Gamma isotopic analysis on edible portions
 5. One sample of broadleaf vegetation collected at harvest time and analyzed for I-131.*

C. Soil

1. Samples (~1.5 liters) are taken at each of the air sampler sites semiannual.
2. Analyses
 - a. Gamma isotopic
 - b. Strontium 89-90 determined annually

*Technical Specification Requirement, Section 4.30 "Radiological Environmental Monitoring Program, Unit 1. (RETS)

TABLE 1.2.2

SAMPLE LOCATION AND SCHEDULE

<u>Sample Station #</u>	<u>Direction and Distance from Plant</u>	<u>Sample Station Location</u>	<u>Sample Types</u>	<u>Sample Frequency</u>	<u>Remarks</u>
1	92° - 0.5 miles	Near Meteorology Tower on site	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semiannually 3) Semiannually 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 site	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation	1) Weekly 2) Quarterly 2) Semiannually 3) Semiannually 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) Semiannually 3) Semiannually 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) Semiannually 3) Semiannually 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 1.2.2 (cont)

SAMPLE LOCATION AND SCHEDULE

<u>Sample Station #</u>	<u>Direction and Distance from Plant</u>	<u>Sample Station Location</u>	<u>Sample Types</u>	<u>Sample Frequency</u>	<u>Remarks</u>
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) Semiannually 3) Semiannually 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) Semiannually 3) Semiannually 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 Sub-station in Danville, Yell County	1) Air Sample 2) TLD 3) Soil Sample 4) Vegetation 5) Precipitation	1) Weekly 2) Quarterly 2) Semiannually 3) Semiannually 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) Semiannually 3) Semiannually	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) Semiannually 3) Semiannually	1) Record status of plant discharge operations 2) Summer and Winter 3) Summer and Winter

TABLE 1.2.2 (cont)

SAMPLE LOCATION AND SCHEDULE

<u>Sample Station #</u>	<u>Direction and Distance from Plant</u>	<u>Sample Station Location</u>	<u>Sample Types</u>	<u>Sample Frequency</u>	<u>Remarks</u>
10	90° - 1.0 miles	Mouth of inlet Canal	1) Lake Water 2) Aquatic Biota 3) Bottom Sediments	1) Monthly 2) Semiannually 3) Semiannually	1) Record status of plant discharge operations 2) Summer and Winter 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 2) Bottom Sediments 3) Aquatic Biota	1) Monthly 2) Semiannually 3) Semiannually	1) Record status of plant discharge operations
16	295° - 6.0 miles	Piney Creek Area	1) Lake Water 2) Bottom Sediment 3) Aquatic Biota	1) Monthly 2) Semiannually 3) Semiannually	
19	99° - 5.0 miles	Arkansas Tech. Dairy	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer and Fall
20	290° - 8.0 miles	Odom-Meyers Dairy	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer and Fall
23	73° - 12 miles	R. A. Young Dairy	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer and Fall
29	25° - 7.0 miles	Harold Steuber Dairy	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	1) Alternate to station #37 2) Spring, Summer, Fall

TABLE 1.2.2 (cont)

SAMPLE LOCATION AND SCHEDULE

<u>Sample Station #</u>	<u>Direction and Distance from Plant</u>	<u>Sample Station Location</u>	<u>Sample Types</u>	<u>Sample Frequency</u>	<u>Remarks</u>
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) Collected during harvest season
33	98° - 4.8 miles	Ouita 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	
37	0° - 7.5 miles	Lawrence Steuber's Dairy	1) Milk 2) Pasturage	1) Monthly 2) 3 times/year	2) Spring, Summer and Fall

TABLE 1.2.2 (cont)

SAMPLE LOCATION AND SCHEDULE

<u>Sample Station #</u>	<u>Direction and Distance from Plant</u>	<u>Sample Station Location</u>	<u>Sample Types</u>	<u>Sample Frequency</u>	<u>Remarks</u>
38	2.2 mi - 310°	Ronnie Jones Residence	One sample of each of the following food products 1) Fruits 2) Flowering Vegetables 3) Tubular Vegetables	At time of harvest	
39	0.5 mi - 270°	Tom Shivers Residence	One sample of each of the following food products 1. Fruits 2. Flowering Vegetables 3. Tubular Vegetables	At time of harvest	
40	4 mi - 180°	Horace Hollis Residence	One sample of each of the following food products 1. Fruits 2. Flowering Vegetables 3. Tubular Vegetables	At time of harvest	If all three of food products are not available, other sample stations may be substituted

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 Dairies may be substituted when those listed are not available.

TABLE 1.2.3

TLD LOCATIONS

<u>AP&L-TLD-NO.</u>	<u>Location Relative to ANO</u>
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°
110	0.8 miles 136°
111	2.3 miles 108°
112	3.3 miles 60°
113	1.4 miles 48°
114	1.4 miles 24°
115	1.5 miles 343°
116	1.9 miles 315°
117	17.2 miles 305°
118	5.8 miles 291°
119	4.8 miles 314°
120	4.2 miles 338°

TABLE 1.2.3 (cont)

TLD LOCATIONS

<u>AP&L-TLD-NO.</u>	<u>Location Relative to AND</u>
121	5.5 miles 338°
122	3.5 miles 12°
123	3.5 miles 48°
124	3.3 miles 62°
125	9.2 miles 47°
126	5.6 miles 78°
127	5.7 miles 103°
128	8.5 miles 115°
129	7.5 miles 118°
130	4.6 miles 245°
131	2.7 miles 253°
132	4.8 miles 274°
133	3.8 miles 231°
134	2.8 miles 207°
135	3.1 miles 186°
136	4.3 miles 166°
137	8.5 miles 152°
138	5.8 miles 195°
139	19.2 miles 178°
140	21.8 miles 151°
141	3.3 miles 134°
142	5.2 miles 127°
143	17.5 miles 106°
144	13.0 miles 314°

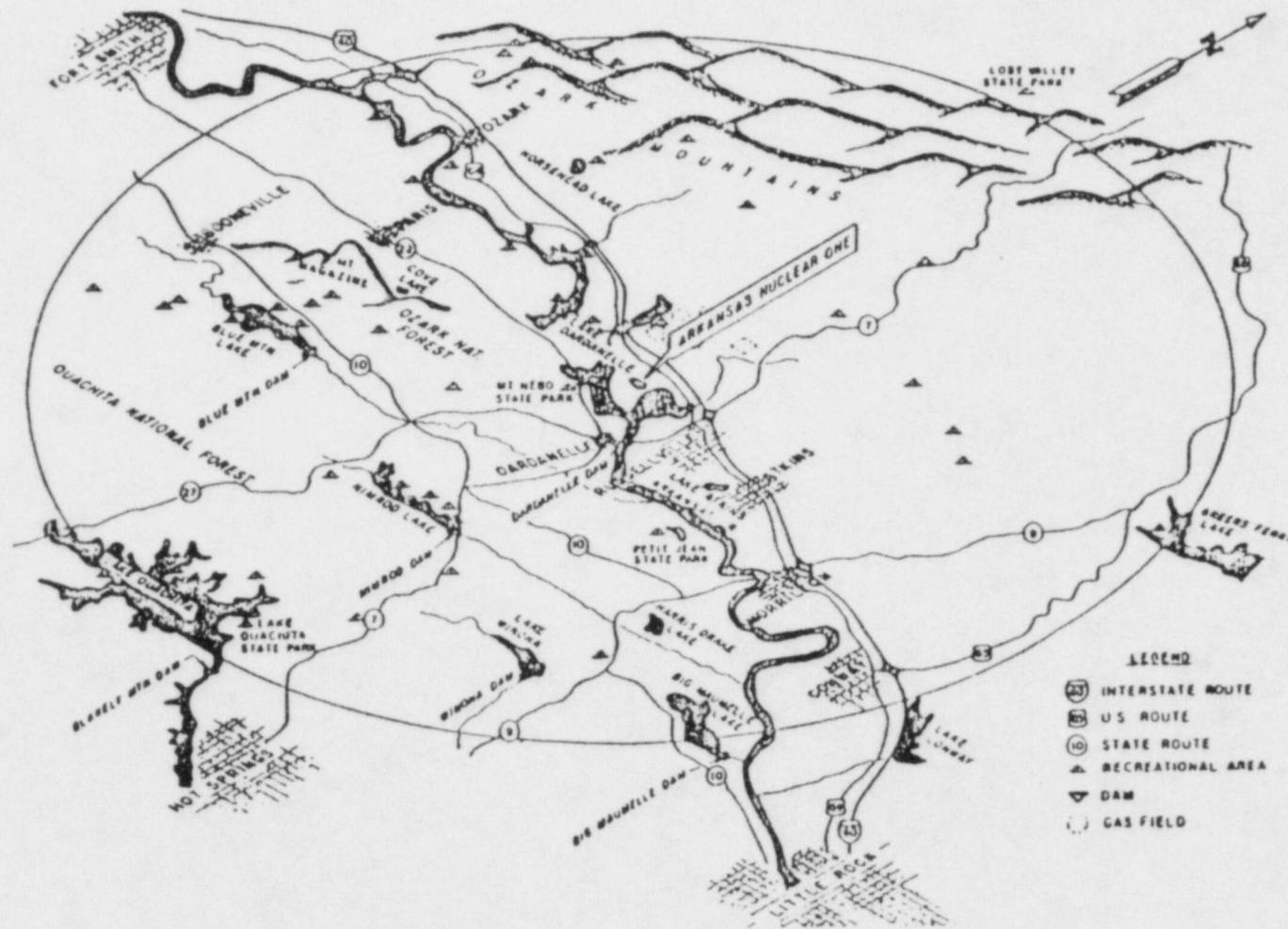


FIGURE 1.2.2 AREA WITHIN 50 MILES OF ARKANSAS NUCLEAR ONE

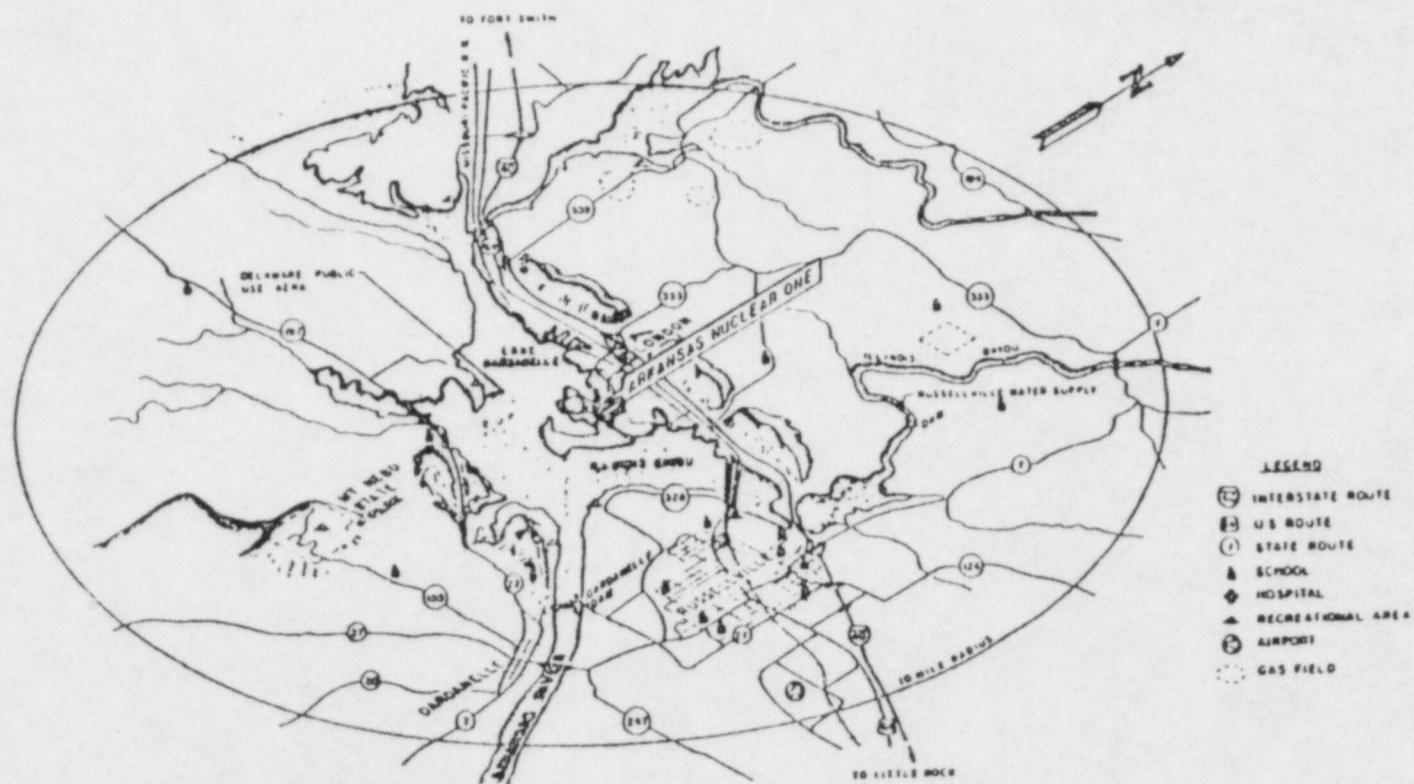


FIGURE 1.2.3 AREA WITHIN 10 MILES OF ARKANSAS NUCLEAR ONE

2.1 SAMPLES ASSOCIATED WITH AIR MONITORING

Also, none of the 84 monthly composites of air particulate filters analyzed in the calendar year 1985, including the control air particulate samples from Danville, Arkansas indicated the presence of radioactive fission or activation products.

None of the 312 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 0.070 pCi per cubic meter of air.

TLD data collected for the calendar year 1985 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 semiannually. The quarterly TLD data for 1985 indicated a total yearly average dose for the forty-three indicator locations to be 61 mrem per year compared to the total yearly average dose of 68 mrem for 1984. The control location at Danville, Arkansas (209° - 19.3 miles) indicated a total dose, based upon quarterly TLDs, of 57 mrem per year for 1985 compared to 67 mrem for 1984. Table 2.1.1 lists the total yearly average dose for the indicator location for the calendar years of 1980, 1981, 1982, 1983, 1984 and 1985 compared to the total dose of background radiation (control station).

The difference between the indicator locations and the control location for 1985 quarterly TLDs results is not statistically significant. The standard deviation for the indicator locations is 5.8 mrem annual dose. For a one sample t-test, (i.e., a single control compared to all indicator locations), a t-value of 0.84 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 1.96 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 1985 indicated slightly lower readings than the quarterly TLDs, which is consistent with TLD readings recorded in previous years. 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 56 mrem, compared to 56 mrem in 1984. The six-month TLDs are located at six indicator locations and one control location. The control location indicated a total dose, based upon TLDs collected and read semiannually, of 55 mrem, compared to 61 mrem in 1984.

The small difference in six month 1985 TLD data between indicator locations and control location is not significant. The standard deviation for the indicator locations is 2.64 mrem annual dose. A t-value of 0.66 is calculated for a single sample t-test comparing the indicator locations to the control. At the 95% confidence level a t-value of greater than 2.20 would be necessary to indicate any statistically significant difference.

None of the 109 rain samples collected and analyzed in 1985 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 and Piney Bay monthly. Each laboratory analyzes the sample for gamma emitting isotopes. No surface water samples with measurable quantities of plant related gamma-emitting radioisotopes were collected during 1985. Tritium was detected in approximately one half of the Discharge Canal samples, but the maximum concentration observed was only 4% of the reporting level for drinking water sources. Sr-89 and 90 were observed in comparable concentrations at indicator and control locations.

As in previous years, bottom sediments collected from the ANO Discharge Canal (0.1 mile 180°) during 1985 radioisotopes attributable to ANO operations. To determine 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 March and September 1985. The maximum external dose to the skin from sediments for all measurable radionuclides was approximately 0.20 mrem per year and the maximum whole body dose was approximately 0.17 mrem per year from the March 1985 sample.

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 values of 0.17 mrem per year for maximum whole body dose and 0.20 mrem per year for maximum external dose to skin of a teenager is well within the design objective criteria.

No reactor produced gamma emitting isotopes were detected in ground water samples collected during 1985. One tritium analysis of ground water produced a positive result, however, the two sigma counting error represented 93% of the tritium concentration.

No reactor produced gamma emitting isotopes were detected in drinking water samples collected during 1985. Strontium 89 and 90 concentrations in the drinking water were comparable to the control

location. Positive Iodine 131 results were obtained in approximately on half the samples, however, the maximum I-131 concentration was less than the required Lower Limit of Detection. Positive results in these concentrations contain a high percentage of counting error.

The 1985 fish samples collected include the two categories: 1) catfish sample, and 2) bass and crappie samples. Edible portions of these fish samples are analyzed by gamma spectrometry for radioisotopes. The highest level of reactor-produced radioisotopes attributed to operations at ANO were found in bass and crappie fish collected September 3, 1985 from the ANO Discharge Canal (0.1 mile 180°).

Dose calculations based upon the bass and crappie fish radioisotope concentrations were found 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. Tables 2.2.7 and 2.2.8 identify the radioisotopes found in the bass and crappie 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 bass and crappie fish consumption is about 0.5 mrem per year to the liver. The value of 0.5 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 2.2.8 identifies all radioisotopes found in six fish samples collected and analyzed in 1985.

In addition to the fish samples described above, edible portions of fish were collected by the Arkansas Department of Health, on May 10 and October 10, 1985. 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 0.36 mrem per year (liver).

Table 2.2.9 is a listing of concentrations of radionuclides detected in sport fish tissue samples split with the Arkansas Department of Health collected during the calendar years 1978, 1979, 1980, 1981, 1982, 1983, 1984, and 1985. Figures 2.2.1 and 2.2.2 graphically depict the Cs-134 and Cs-137 concentrations given in Table 2.2.9.

FIGURE 2.2.1
CS-134 IN SPORT FISH TISSUE

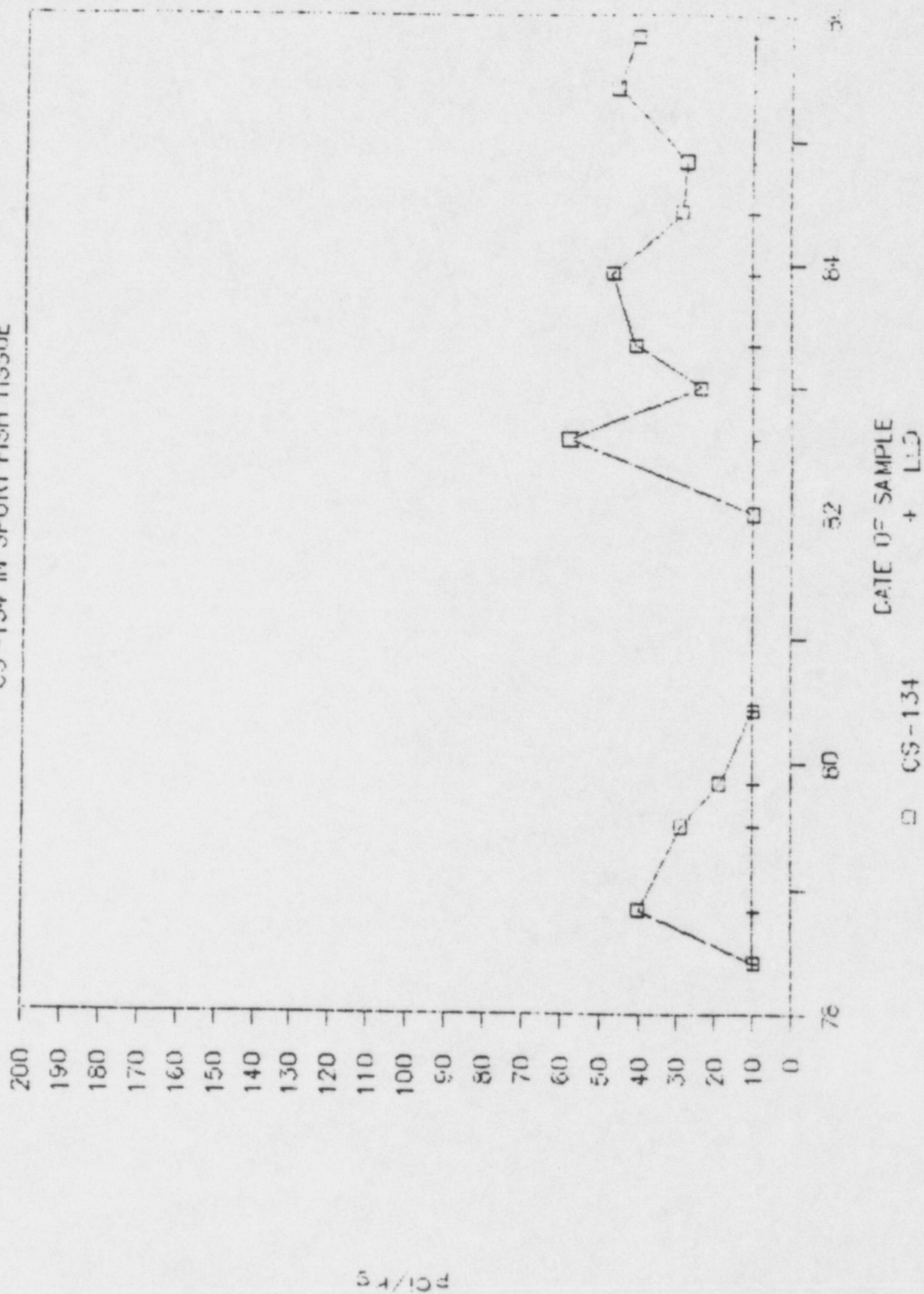
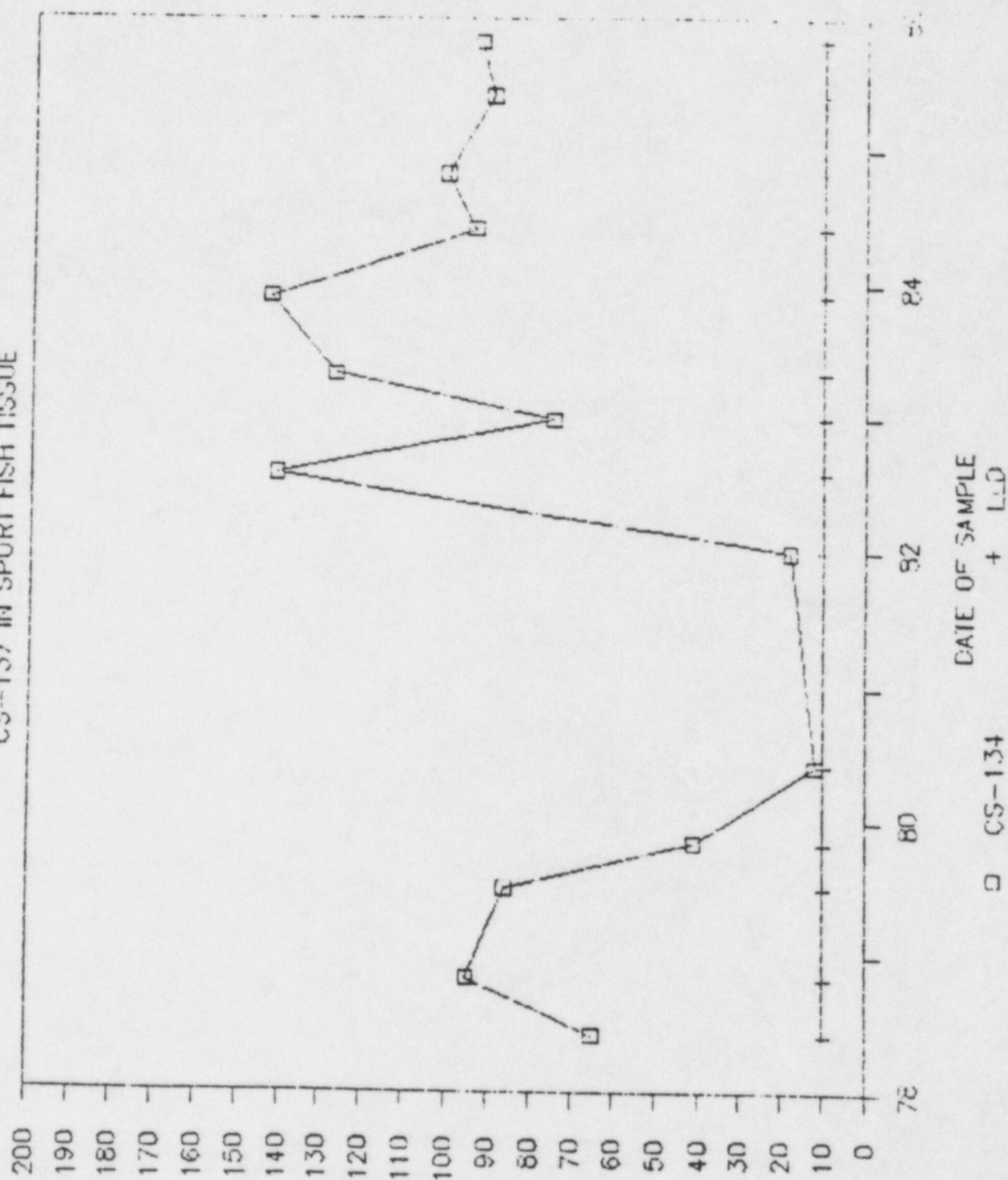


FIGURE 2.2.2
CS-137 IN SPORT FISH TISSUE



Concentration of Cs-134 and Cs-137 in edible portions of fish have stabilized over the past three years.

2.3 SAMPLES ASSOCIATED WITH TERRESTRIAL MONITORING

Milk samples were collected by with split with the Arkansas Department of Health in all twelve months of 1985. The milk sampling program consisted of three indicator locations for and one control location, the R. A. Young Dairy (12.0 miles 73°), during 1985.

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. Control and indicator locations Iodine I-31 concentrations. All positive I-131 results were below the required Lower Level of Detection.

No gamma emitting radionuclides were detected by gamma spectrometry in milk samples collected in 1985, including the R.A. Young Dairy, the control dairy.

Strontium-89 and Strontium-90 analyses in milk identified average strontium activities at indicator locations similar to the results for the control location.

Vegetation samples were divided into two categories in 1985, pasturage vegetation and garden products vegetation. Of the 38 pasturage samples collected and analyzed in 1985, Cesium-137 was the only gamma emitting

radionuclide determined in pasturage samples. Cesium-137 was detected in three samples from indicator locations and in no control samples from Danville, AR. Twenty-five garden products vegetation samples were collected in 1985 from four gardens. Garden vegetation collected and analyzed included cabbage, head lettuce, tomatoes, potatoes, cantaloupes, cucumbers, peppers, greens, turnips, and leaf lettuce. No gamma emitting radionuclides were detected in any garden products vegetation during 1985.

Soil samples were collected in May and November 1985 from seven sampling stations each time. Cesium-137 was detected in all 14 soil samples. Due to its wide spread presence international fallout is the probable source of this fission produced radionuclide.

2.4 SAMPLES NOT COLLECTED IN 1985

Quarterly TLDs missing upon retrieval in 1985 include:

First Quarter 1985 - TLD Station No. 35

Second Quarter 1985 - TLD Station No. 5

Fourth Quarter 1985 - TLD Station Nos. 33, 37, and 41

Air sampling equipment was not functional upon site visits to collect weekly air particulate and air iodine samples at the following dates and locations:

March 13, 1985 - Sample Station No. 5

May 15, 1985 - Sample Station No. 4

July 3, 1985 - Sample Stations No. 4, 5, 7

September 11, 1985 - Sample Station No. 5

October 30, 1985 - Sample Stations No. 1 and 4

November 13, 1985 - Sample Station No. 7

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 1985, 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 twenty-five ml sample containing tritium.

- 4) Iodine-131 in Water - 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, and cesium-137.
- 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 three 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 by more than 3 standard deviations from the known results given in the EPA cross-check reports, the instrument and procedure are checked for error.

Table 2.5.2 lists the date of preparation, types of EPA cross-check samples received, the total number of analyses performed, the average sample standard deviation based upon three independent determinations for each radionuclide in each sample, and the number of standard deviations the AP&L lab differed from the known value.

Most of the results were well within three standard deviations of the known values supplied by the U.S. EPA.

Gross beta results in EPA air filters differed from the known values by approximately 3 standard deviations in the March 29 and August 30, 1985, samples. The mixture of isotopes in the EPA sample produces a different beta energy mix compared to the calibration source used by AP&L. New air filter efficiency curves will include Sr-90 and Cs-137 to compensate for the energy differences.

TABLE 1.4

AQUATIC SAMPLING LOCATIONS AND FREQUENCIES

<u>Sample Type</u>	<u>Sample Frequency</u>	<u>Sample Station # *</u>
Plankton	Quarterly	Areas A, B, C, D
Benthic Organisms	Quarterly	Areas A, B, C, D

*Sample Station Numbers used by Ark. Tech University for sampling purposes.

TABLE 2.1.1

ANNUAL DIRECT RADIATION MEASURED BY
LITHIUM FLOURIDE DOSIMETERS (mrem/year)

<u>Year</u>	<u>Indicator Locations</u>		<u>Control Location</u>	
	Quarterly Readings	Semi-Annual Readings	Quarterly Readings	Semi-Annual Reading
1980	68	52	68	48
1981	64	52	60	54
1982	63	48	59	44
1983	70	57	56	58
1984	58	56	67	61
1985	61	56	57	55

TABLE 2.2.1

CALCULATION OF MAXIMUM ANNUAL DOSE TO MAN FROM BOTTOM SEDIMENT SAMPLE

U30285BS08

(3/02/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Dose to Skin (mrem/yr)</u>	<u>Dose to Whole Body (mrem/yr)</u>
Mn-54	55	0.001	0.001
Co-58	212	0.005	0.004
Co-60	1843	0.099	0.084
Cs-134	808	0.030	0.026
Cs-137	4560	0.060	0.051
	TOTAL	0.195	0.166

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 2.2.2

CALCULATION OF MAXIMUM ANNUAL DOSE TO MAN FROM BOTTOM SEDIMENT SAMPLE

092185BS08

(9/21/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Dose to Skin (mrem/yr)</u>	<u>Dose to Whole Body (mrem/yr)</u>
Co-58	55	0.001	0.001
Co-60	1035	0.055	0.047
Cs-134	599	0.022	0.019
Cs-137	3136	0.041	0.035
	TOTAL	0.119	0.102

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

101085FC08-S

(10/10/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-134	41	0.13 (Liver)
Cs-137	93	0.21 (Liver)
TOTAL		0.34 (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 AND EDIBLE FISH SAMPLE SPLIT W/ADH

051085FC08-S

(05/10/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-134	34	0.10 (Liver)
Cs-137	90	<u>0.20</u> (Liver)
Total		0.30 (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 2.2.5

CALCULATION OF MAXIMUM ANNUAL DOSE
TO MAN FROM CATFISH SAMPLE

042785FC08

(4/27/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-137	46	<u>0.10</u> (Liver)
Total		0.10 (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 2.2.6

CALCULATION OF MAXIMUM ANNUAL DOSE
TO MAN FROM CATFISH SAMPLE

090385FC08

(9/3/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Actiivty (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-134	50	0.16 (Liver)
Cs-137	134	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 2.2.7

CALCULATION OF MAXIMUM ANNUAL DOSE
TO MAN FROM BASS AND CRAPPIE FISH SAMPLE

042785FC08

(4/27/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-137	54	<u>0.12</u> (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 2.2.8

CALCULATION OF MAXIMUM ANNUAL DOSE
TO MAN FROM BASS AND CRAPPIE FISH SAMPLE

090385TFC08

(9/3/85)

ANO Discharge Canal

<u>Isotope</u>	<u>Activity (pCi/Kg)</u>	<u>Annual Organ Dose to Adult (mrem/yr)</u>
Cs-134	47	0.15 (Liver)
Cs-137	150	0.34 (Liver)
Total		0.49 (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

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

<u>Date</u>	Radioactivity Concentration (pCi/kg)		
	<u>Cs-134</u>	<u>Cs-137</u>	<u>Xe-133</u>
May, 1980	ND	12	ND
Dec., 1981	ND	18	ND
July, 1982	58	141	ND
Dec., 1982	24	75	ND
Apr., 1983	41	123	ND
Nov., 1983	47	143	171
May, 1984	29	94	266
Oct., 1984	28	101	ND
May, 1985	46	90	ND
Oct., 1985	41	93	ND

ND = Not Detected

TABLE 2.5.1 LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES

Analysis	Level	One Standard Deviation for Single Determination
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5 pCi/liter 5% of known value
Strontium-89	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5 pCi/liter 5% of known value
Strontium-90	2 to 30 pCi/liter or kg >30 pCi/liter or kg	1.5 pCi/liter 5% of known value
Potassium	≥ 0.1 g/liter or kg	5% of known value
Gross Alpha	≤ 20 pCi/liter >20 pCi/liter	5 pCi/liter 25% of known value
Gross Beta >100 pCi/liter	≤ 100 pCi/liter 5% of known value	5 pCi/liter
Tritium	<4,000 pCi/liter >4,000 pCi/liter	1σ (pCi/liter) = $169.85 \times (\text{known})^{0.933}$ 10% of known value
Radium-226, Radium-228	≤ 0.1 pCi/liter	15% of known value
Iodine-131	≤ 55 pCi/liter >55 pCi/liter	6 pCi/liter 10% of known value

TABLE 2.5.1
EPA CROSS CHECK RESULTS

EPA PREP <u>DATE</u>	DATE EPA <u>ISSUED RESULTS</u>	<u>MEDIA</u>	<u>NUCLIDE</u>	EPA <u>RESULTS</u>	AP&L <u>RESULTS</u>	NORM DEV <u>KNOWN</u>	WARNING <u>ACTION</u>
01/08/85	04/08/85	Water	Gross γ			-0.3	
		(pCi/l)	Gross B	15	16	0.2	
02/08/85	05/01/85	Water	Cr-51	48	56	2.8	
		(pCi/l)	Co-60	20	19 $\pm$ 1.4	-0.2	
			Zn-65	55	57 $\pm$ 2.9	0.7	
			Ru-106	25	LT 30 *	---	
			Cs-134	35	35 $\pm$ 1.6	0.0	
			Cs-137	25	26 $\pm$ 1.4	0.5	
02/15/85	04/19/85	Water	H-3	3796	3923 $\pm$	0.6	
		(pCi/l)					
02/29/85	06/11/85	Milk	I-131	9	9	0.0	
		(pCi/l)					
03/29/85	08/06/85	Air Part	Gross α	10	10	0.23	
		(pCi/m ³)	Gross B	36	25	-3.81	-3.81
				15			
			Cs-137	6	5	-0.34	
04/05/85	07/25/85	Water	I-131	7.5	7	-1.08	
		(pCi/l)					
04/12/85	06/14/85	Water	H-3	3559	3440	-0.6	
		(pCi/l)					

TABLE 2.5.1 (cont)
EPA CROSS CHECK RESULTS

EPA PREP	DATE EPA			EPA	AP&L	NORM DEV	WARNING
<u>DATE</u>	<u>ISSUED RESULTS</u>	<u>MEDIA</u>	<u>NUCLIDE</u>	<u>RESULTS</u>	<u>RESULTS</u>	<u>KNOWN</u>	<u>ACTION</u>
04/19/85	08/09/85	Water (pCi/l)	Gross α	32	21	-3.81	-3.81
			Gross B	72	65	-2.31	
			CO-60	15	14	-0.34	
			CS-134	15	14	-0.34	
			CS-137	12	14	0.23	
05/24/85	08/07/85	Water (pCi/l)	Gross α	12	7	-1.73	
			Gross B	11	11	-0.39	
06/07/85	08/08/85	Water (pCi/l)	Cr-51	44	44	0.11	
			CO-60	14	14	0.23	
			Zn-65	47	49	0.92	
			Ru-106	62	57	-1.61	
			Cs-134	35	33	-0.58	
			Cs-137	20	21	0.34	
06/28/85	10/10/85	Milk (pCi/l)	Sr-89	11	10.3	-0.23	
			Sr-90	11	9.7	-1.54	
			I-131	11	12.3	0.38	
			Cs-137	11	11.7	0.23	
			K	1525	1563.3	0.87	
08/09/85	10/10/85	Water (pCi/l)	I-131	33	35.7	0.77	
08/30/85	12/31/85	Air Filter (pCi/m ³)	Gross α	13	13.3	0.11	
			Gross B	44	34.3	-3.35	-3.35
			Sr-90	18	16.3	-1.92	
			Cs-137	8	7.7	-0.11	
09/06/85	12/23/85	Water (pCi/l)	Sr-89	20	21	0.34	
			Sr-90	7	9	2.31	

TABLE 2.5.1 (cont)
EPA CROSS CHECK RESULTS

EPA PREP	DATE EPA			EPA	AP&L	NORM DEV	WARNING
<u>DATE</u>	<u>ISSUED RESULTS</u>	<u>MEDIA</u>	<u>NUCLIDE</u>	<u>RESULTS</u>	<u>RESULTS</u>	<u>KNOWN</u>	<u>ACTION</u>
09/20/85	12/18/85	Water	Gross A	8	5	-1.03	
		(pCi/l)	Gross B	8	10.7	0.92	
10/04/85	01/09/86	Water	Cr-51	21	LT30 *	---	
		(pCi/l)	Co-60	20	20.7	0.23	
			Zn-65	19	21	0.69	
			Ru-106	20	LT30	---	
			Cs-134	20	20.3	0.11	
			Cs-137	20	20	0	
10/11/85	12/23/85	Water	H-3	1974	1913	-0.30	
		(pCi/l)					
10/21/85	04/21/86	Water	Gross A	52	33	-2.53	
		(pCi/l)	Gross B	8.7	66	-3.12	
			Sr-89	27	29	0.58	
			Sr-90	9	8.5	-0.77	
			Co-60	18	19.5	0.58	
			Cs-134	18	18	0.00	
			Cs-137	18	18.5	0.23	
10/25/85	04/14/86	Milk	Cs-137	56	57	0.34	
		(pCi/l)	Sr-89	48	60.5	4.39	4.39
			Sr-90	26	26	0.0	
			I-131	42	44.5	0.67	
			K	1570	1715	3.90	3.90
11/22/85	04/14/86	Water	Gross A	10	10.5	0.11	
		(pCi/l)	Gross B	13	13	0.0	
12/06/86	04/14/86	Water	I-131	45	54.7	2.79	
		(pCi/l)					

*LT = Less Than

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AND-1 AND AND-2 DOCKET NO. 50-313 AND 50-353
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN	CONTROL LOCATION MEAN RANGE	NR
				NAME DIST & DIR. (MI) (DEG)		
A Particulate (pCi/m)	Gross A 364	0.003	0.0019 (0.00065 - 0.010)	0.2 0.5	0.0021 (0.00075 - 0.010)	0.0019 (0.0007 - 0.0056)
	Gross B 364	0.002	0.016 (0.006 - 0.043)	0.2 0.5	0.016 (0.005 - 0.043)	0.015 (0.003 - 0.044)
Air sampler not functioning for 8 samples when sample collection bade all samples analyzed	Gamma 94		LLD	-	LLD	
	Sr-89 28	0.002	0.006 (0.001 - 0.022)	0.1 0.5	0.013 (0.002 - 0.022)	0.007 (0.002 - 0.022)
	Sr-90 23	0.004	0.0003 (0.0002 - 0.0007)	0.5 2.5	0.0007 (0.0002 - 0.0007)	0.0002 (0.0002 - 0.0007)

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-369
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATION MEAN RANGE	NMR
				NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE		
1 Air							
B. 1-131 by Gamma	Gamma	364	0.05	(LLD	-	(LLD	(LLD
(pCi/m)							
*Air sampler not functioning for 7 samples when sample collection bade. All sample analyzed.							

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AMO-1 AND AMO-2 DOCKET NO. 50-313 AND 50-358
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN - DEC, 1985
(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)	CONTROL LOCATION MEAN RANGE	NNS
I. Air						
C. Direct Radiation (mrem/quarter)	TLDS	171	5. 15.3 (167/167) (11.0 - 22.0)	0 124 3.3 62 (17.0 - 21.0)	18.0 (4/4) 14.3 (4/4) (13.0 - 15.0)	0
I. Air						
C. Direct Radiation (mrem/6 months)	TLDS	14	5. 29.0 (12/12) (26.0 - 31.0)	0 1 0.5 92 (28.0 - 30.0)	29.0 (2/2) 27.5 (2/2) (27.0 - 28.0)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AHO-1 AND AHO-2 DOCKET NO. 50-313 AND 50-368
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(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)	CONTROL LOCATION MEAN RANGE	MMR
I Air						
D Precipitation	Gross A 109	3.	1.4 (6/81) (1.0 - 2.1)	3 0.4 4	1.5 (15/25) (1.0 - 2.1)	1.0 (4/29) (1.0 - 1.1)
	Gross B 109	5.	4.2 (39/81) (2.1 - 20.0)	5 8.5 298	5.3 (15/25) (2.1 - 20.0)	3.7 (13/28) (2.6 - 6.4)
	Gamma 109		<LLD	-	<LLD	<LLD

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AMO-1 AND AMO-2 DOCKET NO. 50-313 AND 50-363
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN	CONTROL LOCATION MEAN RANGE	NMR	
				NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE		
Water							
A. Lake Water	Gross A	65	3.	1.3 (3/52)	8 10 1.4 (1/12)	0.7 (1/15)	0
(pCi/l)				(1.0 - 1.4)	1.0 90		
	Gross B	65	5.	4.4 (33/52)	8 7 5.0 (3/13)	3.5 (7/13)	0
				(2.4 - 12.)	1.8 160 (2.6 - 5.5)	(1.2 - 4.9)	
	Gamma	44		(LLD)	- (LLD)	(LLD)	0
	Sr-89	20	5.	2.8 (4/16)	8 15 3.4 (2/4)	3.2 (1/4)	0
				(2.2 - 4.2)	5.0 150 (2.6 - 4.2)		
	Sr-90	20	1.	1.0 (7/16)	8 9 1.2 (2/4)	1.3 (1/4)	0
				(0.7 - 1.2)	1.8 150 (1.1 - 1.2)		
	H-3	56	400.	564 (15/52)	8 3 573 (15/28)	(LLD)	0
				(209. - 1127.)	0.1 180 (209. - 1127.)		

NAME OF FACILITY AND NO-1 AND ANDO-2 DOCKET NO. 50-313 AND 50-368
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(COUNTY, STATE)

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ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AND-1 AND AND-2 DOCKET NO 50-313 AND 50-368
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(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	14	3.0	(LLD	(LLD	(LLD	0
	Gross B	14	5.3 (2.2 - 6.4)	0 34 295	4.3 (2.2 - 6.4)	(LLD	0
	Gamma	15	(LLD	-	(LLD	(LLD	2
	H-3	19	400.172.2 (1/19)	0 32 115	172.2 (1/19)	(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., 1985
(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	NNT
II. Water							
D. Russellville City Water	Gross A 28	3.	1.3 (1/15)	0 14	1.3 (1/15)	1.1 (2/13)	0
				5.8 65		(1.0 - 1.2)	
	Gross E 28	5.	3.5 (5/15)	0 14	3.5 (5/15)	3.9 (6/13)	0
			(2.4 - 4.3)	5.8 65	(2.5 - 4.3)	(3.1 - 4.9)	
	Gamma 28		(LLD)	-	(LLD)	(LLD)	0
	I-131 12	1.	0.25 (7/12)	0 14	0.25 (7/12)	(LLD)	0
			(0.2 - 0.5)	5.8 65	(0.2 - 0.5)		
	H-3 17	400.	(LLD)	-	(LLD)	(LLD)	0
	Sr-89 8	5.	3.1 (1/4)	0 14	3.1 (1/4)	3.2 (1/4)	0
				5.8 65			
	Sr-90 8	1.	1.0 (2/4)	0 14	1.0 (2/4)	1.3 (1/4)	0
			(0.9 - 1.2)	5.8 65	(0.9 - 1.2)		

DOCKET NO. 50-313 AND 50-369

REPORTING PERIOD JAN. - DEC., 1985

(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN	CONTROL LOCATION MEAN RANGE	KMR
				NAME DIST. & DIR. (MI) (DEG)	MEAN RANGE	
II. Water						
E. Aquatic Biota	Gamma	8				
	Cs-134	10.	48.2 (2/4)	0 0	48.2 (2/4)	(LLD) 0
			(46.8 - 49.6)	0.1 180	(46.8 - 49.6)	
1.) Carnivorous Fish						
	Cs-137	10.	77.2 (4/4)	0 8	77.2 (3/4)	52.7 (3/4) 0
			(33.0 - 149.5)	0.1 180	(33.0 - 147.5)	(33.0 - 65.1)
(Wet Weight) (pCi/kg)						

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-358
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(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) (DEC)	CONTROL LOCATION MEAN RANGE	NHR
II Water						
E. Aquatic Biota	Gamma 2					
2) Edible portion of carnivorous fish split with Ark. Dept. of Health	Cs-134	10.	44.0 (2/2) (41.4 - 46.5)	8 E 180	44.0 (2/2) (41.4 - 46.5)	See section II.2.1
	Cs-137	10.	91.6 (2/2) (90.4 - 92.7)	8 E 180	91.6 (2/2) (90.4 - 92.7)	See section II.2.1
(Wet Weight) (pCi/kg)						

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-369
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC. 1985
(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							
F. Lake Water Split with Ark. Dept. of Health	Gamma	24	(LLD)	-	(LLD)	(LLD)	0
(pCi/l)	H-3	27	400. 472 (9/15) (187. - 670.)	0.9 180	472. (9/15) (187. - 670.)	250. (1/12)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY ANO-1 AND ANO-2 DOCKET NO. 50-313 AND 50-369
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(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							
A. Milk	Gamma	50	(LLD	-	(LLD	(LLD	0
	I-131	49	1.0 0.35 (17/37) (0.1 - 1.0)	0 19 0.5 99	0.4 (6/12) (0.1 - 1.0)	0.35 (6/12) (0.2 - 0.5)	0
	Sr-89	32	1.5 1.5 (8/24) (0.8 - 3.6)	0 19 0.5 99	2.0 (5/9) (0.8 - 3.6)	1.5 (1/9)	0
	Sr-90	32	5. 4.0 (24/24) (1.2 - 5.4)	0 37 7.5 358	4.3 (3/8) (3.2 - 6.9)	3.8 (3/3) (2.0 - 7.9)	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., 1985
(COUNTY, STATE)

MEDIUM OR PATHWAY (UNIT OF MEASUREMENT)	TOTAL & TYPE OF ANALYSIS	LLD	ALL IND. LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST ANNUAL MEAN		CONTROL LOCATION MEAN RANGE	NNR
				NAME	MEAN		
				DIST. & DIR.	RANGE		
				(MI) (DEG)			
III. Terrestrial							
B. Vegetation	Gamma 38						
1. Pasturage	Cs-137 50.	72.6 (3/31)	0.2 129.0 (1/3)	0.5 235		<LLD	0
(Dry Weight)							
B. Vegetation	Gamma 25	<LLD			<LLD	<LLD	0
1. Food Crops							
including							
Cantalopes							
Cucumbers							
Cabbage							
New Potatoes							
Potatoes							
Lettuce							
Greens							
Turnips							
Tomatoes							

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
NAME OF FACILITY AND-1 AND AND-2 DOCKET NO. 50-313 AND 50-348
LOCATION OF FACILITY POPE, ARKANSAS REPORTING PERIOD JAN. - DEC., 1985
(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	NKS
III. Terrestrial							
C. Soil	Gamma	14					
(pCi/kg)	Mn-54	25.	19.3 (3/12) (13.8 - 26.8)	# 2 0.5 235	26.8 (1/12)	(LLD)	0
	Cs-137	30.	308.9 (12/12) (40.5 - 952.6)	# 4 0.4 171	496.5 (2/2) (40.5 - 952.3)	287.0 (2/2) (230.1 - 343.9)	0
Sr-89/90 Activity Units are in Ci/g of soil sh.	Sr-89	7	1.5 1.4 (2/6) (1/0 - 1.8)	# 5 8.5 298	1.2 (1/1)	0.6 (1/1)	0
	Sr-90	7	0.3 0.3 (6/6) (0.1 - 0.3)	# 4 0.4 171	0.5 (1/1)	0.1 (1/1)	0

3.0 PROGRAM TECHNICAL DESCRIPTION

3.1 SAMPLE HANDLING AND TREATMENT

Once a representative sample is collected and delivered to the laboratory, the laboratory staff is responsible for properly treating and storing the sample. Often samples collected in an environmental survey require treatment because they are not physically ready for analysis. Treatment of the sample after it is received depends on the sample itself and the analyses to be performed on it. Most treatment and handling techniques have been established and well known for many years.

Water Samples

Generally, water samples are acidified when collected. Samples for tritium analyses should not be stored in polyethylene bottles for more than 3 or 4 months because water can evaporate through the polyethylene. If the samples are to be stored for any length of time, carrier or complexing agents should be added to prevent adsorption of trace metals on the storage containers.

Air Filters

The air filter must be handled with care when heavy dust loadings is observed because particulate matter is easily removed from the filter. Air filters are often received by the laboratory in plastic envelopes; some extremely low-level analyses may require analysis of the envelope in which the sample arrived as well as the sample itself.

Milk

Milk samples are usually refrigerated until analyses can be performed. If the analyses will be delayed for more than a few days, a preservative (formalin) is added to inhibit bacterial growth and retard spoilage. Milk samples that are to be analyzed for I-131 I have 100 ml formalin added to avoid binding of the iodine that may occur with smaller levels of formalin.

Soil and Bottom Sediments

Soil samples are dried, pulverized, and sieved before analysis. Further thorough mixing is required to ensure a homogeneous sample.

Other Samples

Perishable samples are preserved by refrigeration or freezing. Vegetation and other samples may need to be dried, pulverized, or ashed before analysis, and after analysis for long-term storage.

3.2 GROSS BETA ANALYSIS OF SAMPLES

Air Particulates

At least 24 hours after collection, allowing for the radon isotopes and radon daughter products to decay, the filters are counted in a low background alphabeta counter.

Calculations of the results, the two sigma error and the lower limit of detection (LLD).

$$\text{ALPHA RESULT (pCi/m}^3\text{)} = [(N_A/T_A) - (B_A/t_A)]/(2.22 \cdot V \cdot E)$$

$$\text{BETA RESULT (pCi/m}^3\text{)} = [(N_B/T_B) - (B_B/t_B) - (r)(N_A/T_A)]/2.22 \cdot V \cdot E$$

$$\text{TWO SIGMA ERROR (pCi/m}^3\text{)} = 2\sqrt{(N/T^2) + (B/t^2)}/(2.22 \cdot V \cdot E)$$

$$\text{LLD (pCi/m}^3\text{)} = 4.66\sqrt{(B)}/(2.22 \cdot V \cdot E \cdot t)$$

where: N_A = Gross Alpha counts of sample

N_B = Gross beta counts of sample

B_A = Counts of blank (alpha)

B_B	=	Counts of blank (beta)
E	=	Counting efficiency
r	=	ratio of alpha counts in beta counting (cross-talk)
T	=	Number of minutes sample was counted
t	=	Number of minutes blank was counted
V	=	Sample aliquot size (cubic meters)
2.22	=	dpm/pCi

3.3 DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA ACTIVITY IN WATER SAMPLES

(SUSPENDED AND DISSOLVED PORTIONS)

This describes the process used to measure the overall alpha and beta radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved. Two hundred ml of the sample is evaporated in a beaker at approximately 100°C. The residue is transferred and dried and in a 2-inch stainless steel planchet.

The planchets are counted for 100 minutes in a low-background alpha-beta counting system. Calculation of activity includes a self-absorption correction for counter efficiency based on the weight of residue on each planchet.

CALCULATION OF THE SAMPLE ACTIVITY OR OF THE MDA

$$\text{ALPHA RESULT (pCi/l)} = [(N_A/T_A) - (B_A/t_A)] / (2.2 \cdot V \cdot E)$$

$$\text{BETA RESULT (pCi/l)} = [(N_B/T_b) - (B_B/t_B) - (r)(N_A/T_A)] / (2.22 \cdot V \cdot E)$$

$$\text{TWO SIGMA ERROR (pCi/l)} = 2\sqrt{(N/T^2) + (B/t^2)} / (2.22 \cdot V \cdot E)$$

$$\text{LLD (pCi/l)} = 4.66\sqrt{(B)} / (2.22 \cdot V \cdot E \cdot t)$$

where:

N	=	total counts from sample (counts)
T	=	counting time for sample (minutes)
B/t	=	background rate of counter (cpm)
2.22	=	$\frac{\text{dpm}}{\text{pCi}}$
r	=	ratio of gross counts in beta counting (cross-talk)
V	=	volume of sample analyzed (liters)
E	=	efficiency of the counter

If the net activity ($N/T - B/t$) is equal to or is less than the counting error, the activity on the collection date is below the limits of detection and is designated less than the Lower Limit of Detection (LLD)

3.4 ANALYSIS OF WATER SAMPLES FOR TRITIUM

Five milliliters of water is added to 15 ml of liquid scintillation solution in a 25 ml vial. The sample is inserted into a Liquid Scintillation Spectrometer and counted for 500 minutes.

Calculations of the results, the two sigma error and the lower limit of detection (LLD).

$$\text{RESULT (pCi/l)} = [(N/T) - (B/t_b)] / (2.22 \cdot V \cdot E) \exp(-\lambda \Delta t_2)$$

$$\text{TWO SIGMA ERROR (pCi/l)} = \frac{2\sqrt{(N/T^2) + (B/t_b^2)}}{(2.22 \cdot V \cdot E)}$$

$$\text{LLD (pCi/l)} = \frac{4.66\sqrt{B}}{2.22 \cdot E \cdot V \cdot t_b}$$

where:

N	=	Gross counts of sample
B	=	Counts of blank
E	=	Counting efficiency
T	=	Number of minutes sample was counted
t _b	=	Number of minutes blank was counted
V	=	Sample aliquot size (l)
exp(-λΔt ₂)	=	Decay correction where Δt ₂ is time elapsed between collection of sample and date of counting.

3.5 ANALYSIS OF SAMPLES FOR IODINE-131

Milk or Water

Up to four liters of sample are thoroughly mixed with a stable iodine carrier solution. The sample is then allowed to flow through an anion exchange resin column to remove iodine from the sample. The iodine is then stripped from the resin with sodium hypochlorite solution, is reduced with hydroxylamine hydrochloride and is extracted into carbon tetrachloride as free iodine. It is then back-extracted into sodium bisulfite solution and is precipitated as silver iodide. The precipitate is weighed for chemical yield and is mounted on a stainless steel planchet for low-level beta counting. The chemical yield is corrected by measuring the stable iodide content of the milk or the water with a specific ion electrode.

Calculations of the results, two sigma error and the lower limit of detection (LLD) in pCi/l:

RESULT	$= (N/\Delta t - B) / 2.22 \cdot E \cdot V \cdot Y \cdot \exp(-\lambda \Delta t_2)$
TWO SIGMA ERROR	$= (2 \sqrt{(N/\Delta t^2 + B/\Delta t)}) \div (2.22 \cdot E \cdot V \cdot Y \cdot \exp(-\lambda \Delta t_2))$
LLD	$= (4.66 \sqrt{B/\Delta t}) \div (2.22 \cdot E \cdot V \cdot Y \cdot \exp(-\lambda \Delta t_2))$

where:	N	= total counts from sample (counts)
	Δt	= counting time for sample (min)
	B	= background rate of counter (cpm)
	2.22	= dpm/pCi
	V	= volume or weight of sample analyzed
	Y	= chemical yield of the mount of sample counted
	$\exp(-\lambda \Delta t_2)$	= decay factor from the time of collection to the counting date

E = efficiency of the counter for I-131,
corrected for self absorption effects

3.6 GAMMA SPECTROMETRY OF SAMPLES

Milk and Water

A 3.5 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for a minimum of 420 minutes with a shielded Germanium detector coupled to a multi-channel analyzer.

Vegetation, Food and Garden Crops, and Fish

A maximum quantity of a vegetation, food, or garden crop sample, without drying, is loaded into a tared 3.5 liter Marinelli beaker and weighed. The sample is then counted for a minimum of 420 minutes with a shielded Germanium detector coupled to a computer-based data acquisition system which performs pulse height analysis. As much as possible (up to the total sample) of the edible portion of a fish is loaded into a tared Marinelli beaker and weighed. The sample is then counted for a minimum of 420 minutes with a shielded Germanium detector coupled to a computer-based data acquisition system which performs pulse height analysis.

Soils and Sediments

Soils and sediments are dried at low temperature, less than 100°C. The soil or sediment is loaded into a tared, standard 1.0 liter Marinelli beaker and weighed. The sample is then counted for at least four hours with a shielded Germanium detector coupled to a multi-channel analyzer.

3.7 CHARCOAL CARTRIDGES

Charcoal cartridges are counted in a Marinelli Beaker, with one cartridge positioned on the face of a Germanium detector and up to six cartridges on the side of the Germanium detector. Each Germanium detector is calibrated for both positions. The detection limit is determined for I-131 of each charcoal cartridge, assuming no positive results for I-131, for each unique cartridge from the volume of air which passed through it. If Iodine-131 is observed in the screening count of a set of cartridges, each charcoal cartridge is then counted separately, positioned on the face of the detector. A separate counting geometry has also been established for each Germanium detector.

Air Particulate

The four or five (depending on) calendar month) air particulate filters for a monthly composite for each field station are stacked one on top of another and then counted for at least four hours with a shielded Germanium detector coupled to a multi-channel analyzer.

A computer software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional

gamma ray abundance, half life, detector efficiency, and net counts in the peak region. The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume or pCi/mass:

$$\text{RESULT} = (S-B)/(2.22 \cdot T \cdot E \cdot V \cdot F)$$

$$\text{TWO SIGMA ERROR} = (2\sqrt{S+B})/(2.22 \cdot T \cdot E \cdot V \cdot F)$$

$$\text{LLD} = (4.66\sqrt{B})/(2.22 \cdot T \cdot E \cdot V \cdot F)$$

where:

S	= Area, in counts, of sample peak and background (region of spectrum of interest)
B	= Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak.
T	= length of time in minutes the samples was counted
2.22	= dpm/pCi
E	= detector efficiency for energy of interest and geometry of sample
V	= sample aliquot size (liters, cubic meters, kilograms, or grams)
F	= Fractional gamma abundance (specific for each emitted gamma)

3.8 TERMINOLOGY OF QUALITY CONTROL OF DATA

mean: The sum of the test results divided by the number of results taken; that is, $\bar{X} = \sum_{i=1}^n X_i / n$, where $\bar{X}$ = mean, X_i = individual result,

and n = number of results

precision: A measure of the reproducibility among replicate observations.

variance: The sum of the squares of deviations of the test results from the mean after division by one less than the total number of

results; that is,
$$\text{VAR} = \frac{\sum_{i=1}^n (\bar{X} - X_i)^2}{(n - 1)}.$$

standard deviation: The square root of the variance; that is,

$$\sigma = (\text{VAR})^{1/2} = \left[\frac{\sum_{i=1}^n (\bar{X} - X_i)^2}{(n - 1)} \right]^{1/2}$$

range: The difference between the highest test result and the lowest test results in a set of observations.

accuracy: A measure of the agreement between observed and accepted values.

systematic error: Errors that may be traced to the personal errors of the analyst, instrumental errors, errors that are inherent in the analytical methodology, or a combination of these. Accuracy is a measure of this type of error.

random error: The necessity for making estimations is inherent in the process of collecting data for the measurement of any quantity. For this reason, any measurement will be uncertain, in an amount that depends on the relative magnitude of the estimations involved in its evaluation. Careful experimental design can reduce this uncertainty; however, small irreducible variations will remain. Since radioactive decay is a random process, any counting measurement will have a random error associated with it. Precision measures this type of variability or error.

bias: The difference between the average of a set of test results and the accepted value. Bias usually is indicated only when a consistent difference is observed over time and can be corrected for by the application of appropriate correction factors. Bias is a measure of the systematic error.

3.9 LLD CALCULATION

The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% confidence.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66(s_b)}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume)

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

E is the counting efficiency (as counts per transformation)

V is the sample size (in units of mass or volume)

2.22 is the number of transformation per minute per picocurie

Y is the fractional radiochemical yield (when applicable)

λ is the radioactive decay constant for the particular radionuclide

Δt is the elapsed time between sample collection and analysis

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the sample (e.g., potassium-40 in milk samples). (See Table 3.9.1)

TABLE 3.9.1

MAXIMUM VALUES OF THE LOWER LIMITS OF DETECTION (LLD)

<u>Analyses</u>	<u>Water</u> <u>(pCi/l)</u>	<u>Airborne Particulate</u> <u>or Gas</u> <u>(pCi/m³)</u>	<u>Fish</u> <u>(pCi/kg/wet)</u>	<u>Milk</u> <u>(pCi/l)</u>	<u>Food Products</u> <u>(pCi/kg,wet)</u>	<u>Sediment</u> <u>(pCi/kg,dry)</u>
gross beta	4 ^(a)	1 x 10 ⁻²				
³ H	(1000 ^(a))					
⁵⁴ Mn	15		130			
⁵⁹ Fe	30		260			
^{58,60} Co	15		130			
⁶⁵ Zn	30		260			
⁹⁵ Zr-Nb	15					
¹³¹ I	1 ^{*(a)}	7 x 10 ⁻²		1	60 ^(b)	
^{134,137} Cs	15(10 ^(a)),18	1 x 10 ⁻²	130,150	15,18	60,80	150,180
¹⁴⁰ Ba-La	15			15		

*For Monthly grab samples

(a) LLD for drinking water

(b) LLD for leafy vegetables

4.0 1985 LAND USE SURVEY

In accordance with Technical Specification 3/4 12.2 for ANO Unit-2, a land use survey has been conducted and a garden has been located in each of the 16 meteorological sectors surrounding Arkansas Nuclear One (ANO). The distances for 15 of the gardens range from 0.65 miles to 4.8 miles from the plant site. These gardens meet the 5-mile requirement as outlined in the Tech Spec. A milk animal survey was conducted inside 5 miles of ANO were observed. Milk animal locations are given in Table 3 and 4. Residences nearest ANO within each section are given in Table 2.

A relative deposition rate in units of reciprocal square meters (m^{-2}) has been calculated for each garden using the methodology outlined in Reg. Guide 1.111. From Figure 6 of this Reg. Guide, a relative deposition in m^{-1} vs distance from the plant was obtained. An assumption of a ground level release was made in the absence of any data to support an elevated release. This should provide a conservative estimate of the deposition rates at locations close to the point of release (the plant site). Wind frequency values are from the ANO-1 FSAR Table 2-16. This represents the fraction of the total annual release transported into the sector assuming a uniform wind field. It is also assumed that the effluent concentration in a given sector is uniform across the sector at a given distance. Table 1 presents the relative deposition rates for each garden location. Also presented are the values used to calculate the deposition rate.

During a given time period the source term will be equal for all locations of interest. Therefore, a comparison of projected deposition at each location can be made by comparison of each location's deposition rate.

The two gardens with the highest deposition rate (sectors 13,W and 8,SSE) are already being sampled as indicator locations. The third location serves as a control. Therefore, no change in Food Product sampling sites is necessary.

TABLE 4.0.1

Sector	Distance	(Downwind		Relative	
	of Garden	Relative	Wind	Arc	Deposition
	From Plant	Deposition	Frequency	Length	Rate (m^{-2})
	(km) r	(m^{-1}) RD	F	(m) S	d(r, θ)
1 N	2.40	2.8 E-5	.069	943.2	2.05 E-9
2 NNE	2.00	3.3 E-5	.028	786.0	1.18 E-9
3 NE	2.30	3 E-5	.022	905.1	7.29 E-10
4 ENE	1.24	4.5 E-5	.033	488.3	3.40 E-9
5 E	1.04	5.2 E-5	.063	408.7	8.02 E-9
6 ESE	4.48	1.8 E-5	.062	1760.6	6.34 E-10
7 SE	3.84	2.2 E-5	.054	1509.1	7.87 E-10
8 SSE	1.03	8.0 E-5	.047	393.0	9.56 E-9
9 S	5.12	1.6 E-5	.027	2012.2	2.15 E-10
10 SSW	4.64	1.7 E-5	.034	1823.5	3.12 E-10
11 SW	4.8	1.65 E-5	.046	1886.4	4.02 E-10
12 WSW	5.28	1.6 E-5	.070	2075.0	5.40 E-10
13 W	0.81	9.5 E-5	.146	318.0	4.36 E-8
14 WNW	2.88	2.5 E-5	.092	1131.8	2.03 E-9
15 NW	1.60	3.8 E-5	.063	628.8	3.81 E-9
16 NNW	2.88	2.5 E-5	.067	1131.8	1.48 E-9

Relative deposition is read from Reg. Guide 1.111 Figure 6.

Wind frequency is taken from FSAR-1, Table 2-16

Formula for relative deposition rate = $\frac{RD * F}{S}$

TABLE 4.0.2

NEAREST RESIDENCE TO ANO PER SECTOR

<u>SECTOR</u>	<u>DISTANCE (Miles)</u>
1 N	1.4
2 NNE	1.2
3 NE	0.9
4 ENE	0.9
5 E	1.0
6 ESE	0.9
7 SE	0.9
8 SSE	1.3
9 S	0.9
10 SSW	0.8
11 SW	3.4
12 WSW	0.8
13 W	1.0
14 WNW	0.8
15 NW	1.1
16 NNW	1.4

TABLE 4.0.3
SURVEY OF MILK-PRODUCING ANIMALS WITHIN AN
AREA OF TEN (10) MILES OF ARKANSAS NUCLEAR ONE
JUNE 27-28, 1985

In accordance with Environmental Technical Specification 4.2.10, a survey was conducted June 27-28, 1985 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

<u>Dairy</u>	<u>No. of Cows</u>	<u>Azimuth-Distance</u>
1. Ark Tech Univ. Dairy	50	99° - 5.0
2. Bill Harms Dairy	60	21° - 7.75
3. R. Meyer Dairy	59	290° - 8.0
4. R. A. Young Dairy (CONTROL)	44	73° - 12.0
5. Harold Steuber	~50	25° - 7.0
6. Lawrence Steuber	44	358° - 7.5
7. Buddy Boxnick	60	23° - 7.0

TABLE 4.0.4
 SURVEY OF MILK-PRODUCING ANIMALS WITHIN AN
 AREA OF TEN (10) MILES OF ARKANSAS NUCLEAR ONE
 AUG. 29-30, 1985

In accordance with Environmental Technical Specification 4.2.10, a survey was conducted August 29-30, 1985 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 TEN (10)-MILE RADIUS OF ANO

	<u>Dairy</u>	<u>No. of Cows</u>	<u>Azimuth-Distance</u>
1.	Ark Tech Univ. Dairy	48	99° - 5.0
2.	Bill Harms Dairy	~50	21° - 7.75
3.	R. Meyer Dairy	50	290° - 8.0
4.	R. A. Young Dairy (CONTROL)	52	73° - 12.0
5.	Harold Steuber	~60	25° - 7.0
6.	Lawerence Steuber	48	0° - 7.5
7.	Buddy Boxnick	50	23° - 7.0

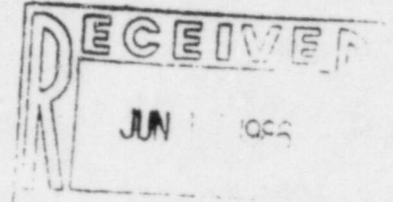


BILL CLINTON
GOVERNOR

Arkansas DEPARTMENT OF HEALTH

4815 WEST MARKHAM STREET • LITTLE ROCK, ARKANSAS 72201
TELEPHONE AC 501 661-2000

BEN N. SALTZMAN M.D.
DIRECTOR



June 9, 1986

Robert D. Martin, Regional Administrator
Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Dear Mr. Martin,

Enclosed are the revised pages for the environmental monitoring report for cooperative agreement NRC-05-83-667 activities around Arkansas Nuclear One during calendar year 1985. These pages include data from the licensee which was not available for the original report.

Should you have any questions, do not hesitate to contact me.

Sincerely,

E.F. Wilson, Director
Division of Radiation Control and Emergency Management

EFW/TT

Enclosures

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ARKANSAS NUCLEAR ONE
1985
ENVIRONMENTAL MONITORING REPORT

ARKANSAS DEPARTMENT OF HEALTH
Division of Radiation Control and Emergency Management

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ARKANSAS NUCLEAR ONE
1985
ENVIRONMENTAL MONITORING REPORT

This report summarizes analytical results of environmental samples collected around Arkansas Nuclear One commercial nuclear power plant in Russellville, Arkansas, during calendar year 1985. This report is in accordance with the requirements specified in the NRC - State of Arkansas Cooperative Agreement Number NRC-31-83-667.

Numerical results are reported when the estimated lower limit of detection (LLD) is equalled or exceeded. When the analysis indicated that the LLD was not achieved, there is a notation to that effect in the report. Refer to the tables included as Attachment 1 for a listing of the estimated LLDs.

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ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Surface Water, split
Location:	AND Discharge
Distance and Direction:	0.65 miles, 257°
Frequency:	Monthly
Type of Analysis:	Gamma Isotopic

Results (pCi/l)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan 24	Cs-137: 8.3 ± 3.3	
Feb 25		
Mar 19	All other samples below LLD	All samples below LLD
Apr 2		
May 6		
Jun 3		
Jul 8		
Aug 5		
Sep 3		
Oct 9		
Nov 6		
Dec 4		

Type of Analysis:	Tritium
Frequency:	Quarterly Composite

Results (pCi/l)

<u>Quarter</u>	<u>State</u>	<u>Licensee</u>
Jan - Mar	340 ± 180	404.5 ± 156.5
Apr - Jun	Below LLD	Below LLD
Jul - Sep	700 ± 200	549.3 ± 153.2
Oct - Dec	500 ± 200	494.0 ± 154.0

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Surface Water, split
Location:	Big Piney Creek (Control)
Distance and Direction:	6.1 miles, 290°
Frequency:	Monthly
Type of Analysis:	Gamma Isotopic

Results (pCi/l)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan 23	Except as noted below, all samples below LLD	All samples below LLD
Feb 25		
Mar 20		
Apr 2		
May 6	Cs-137: 6.1 ± 2.5	
Jun 3		
Jul 8		
Aug 5		
Sep 3		
Oct 9		
Nov 6		
Dec 4		

Type of Analysis:	Tritium
Frequency:	Quarterly Composite

Results (pCi/l)

<u>Quarter</u>	<u>State</u>	<u>Licensee</u>
Jan - Mar	Below LLD	All samples
Apr - Jun	Below LLD	below LLD
Jul - Sep	Below LLD	
Oct - Dec	Below LLD	

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ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Vegetation, split
Location: Apr -	Clifton Stewart Garden,
	Russellville, AR
Sep -	Shivers Cove, West end
	of AND
Distance and Direction:	Clifton Stewart Garden -
	1 mile, 135°
	Shivers Cove - 0.8 miles,
	300°
Frequency:	Semi-annually
Type of Analysis:	Gamma Isotopic, including
	radioiodine

Results (pCi/lq)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Apr 29	Below LLD	Below LLD
Sep 24	Below LLD	Below LLD

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium: Silt, split
Location: AND Discharge, 1/4 mile
below mouth
Distance and Direction: 1.0 mile, 90°
Frequency: Annually
Type of Analysis: Gamma Isotopic

Results (pCi/kg)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Mar 2	Co-60: 2050 ± 80	Co-58: 212 ± 9.8
	Cs- 134: 360 ± 130	Co-60: 1840 ± 21
	Cs- 137: 5530 ± 120	Cs-134: 808 ± 12.3
		Cs-137: 456 ± 25.7

Sample Pathway or Medium: Fish, split sample
Location: AND Discharge
Distance and Direction: 0.42 miles, 192°
Frequency: Semi-annually
Type of Analysis: Gamma Isotopic

Results (pCi/kg)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
May 10	Cs-137: 80 ± 11	Cs-137: 90.4 ± 3.4
Oct 10	Cs-137: 133 ± 24	Cs-137: 92.74 ± 3.4

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Milk, split
Location:	Arkansas Tech University Dairy
Distance and Direction:	5 miles, 99°
Frequency:	Monthly
Type of Analysis:	Gamma Isotopic

Results (pCi/l)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan 30	All samples	All samples
Feb 19	below LLD	below LLD
Mar 21		
Apr 10		
May 6		
Jun 17		
Jul 17		
Aug 12		
Sep 3		
Oct 9		
Nov 12		
Dec 4		

Type of Analysis:	Radioiodine
Frequency:	Monthly

Results (pCi/l)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan 30	All samples	All samples
Feb 19	below LLD	below LLD
Mar 21		
Apr 10		
May 6		
Jun 17		
Jul 17		
Aug 12		
Sep 3		
Oct 9		
Nov 12		
Dec 4		

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne Particulate, Duplicate
Location:	Danville (control)
Distance and Direction:	21 miles, 205°
Frequency:	Monthly composite
Type of Analysis:	Gamma Isotopic

Results (pCi/m³)

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan	All samples	All samples
Feb	below LLD	below LLD
Mar		
Apr		
May		
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne-Particulate, Duplicate
Location:	ANO Weather Station
Distance and Direction:	0.65 miles, 90°
Frequency:	Monthly Composite
Type of Analysis:	Gamma Isotopic

<u>Sample Date</u>	<u>State</u>	<u>Licensee</u>
Jan	All samples	All samples
Feb	below LLD	below LLD
Mar		
Apr		
May		
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne-Charcoal Cartridge
	Duplicate sample
Location:	AND Weather Station
Distance and Direction:	0.65 miles, 90°
Frequency:	Weekly
Type of Analysis:	Radioiodine

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Jan 3	NA	Jan 2	All samples
9		9	below LLD
16	NA	16	
21		23	
29		30	
Feb 4	NA	Feb 6	
11		13	
19		20	
25		27	
Mar 4	NA	Mar 6	
11		13	
19	Except as noted,	20	
25	all samples below	27	
Apr 2	LLD	Apr 3	
9		10	
15		17	
22		24	
29		29	
May 6		May 5	
13		15	
20		22	
28		29	
Jun 3		Jun 5	
10		12	
17		19	
24		26	
Jul 1		Jul 3	
8		10	
17		17	
22		24	
31		31	
Aug 5		Aug 7	
12		14	
19		21	

ARKANSAS NUCLEAR ONE
January through December, 1985

(continued)

Sample Pathway or Medium:	Airborne-Charcoal Cartridge Duplicate sample
Location:	AND Weather Station
Distance and Direction:	0.65 miles, 90°
Frequency:	Weekly
Type of Analysis:	Radioiodine

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> <u>(pCi/m³)</u>	<u>Sample Date</u>	<u>Results</u> <u>(pCi/m³)</u>
Aug 26	Except as noted, all samples below LLD	Aug 28	All samples below LLD
Sep 3		Sep 4	
10		11	
17		18	
24		25	
Oct 3		Oct 2	
9		9	
15		16	
23		23	
29		30	
Nov 6	NA	Nov 6	
13		13	
21		20	
26		27	
Dec 4		Dec 4	
11		11	
18		18	
23		26	

NOTE 1: Licensee sample analyses did show Cs-137 in the 7 sample composite analysis, but not in the individual filter analysis. There seems to have been some Cs-137 contamination in the charcoal used to manufacture those filters. An overnight count of 10 blank (unused) cartridges on March 28, 1986, also showed Cs-137, tending to confirm this.

NOTE 2: State sample on Nov 21 not collected due to absence of spare radioiodine cartridges and failure to replenish sampling kit supplies.

NOTE 3: State samples in Jan - Mar not collected due to operator error. On these occasions, the sample collected on the subsequent week was therefore a two week cumulative sample.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne-Charcoal Cartridge
	Duplicate
Location:	Danville
Distance and Direction:	21 miles, 205°
Frequency:	Weekly
Type of Analysis:	Radioiodine

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Jan 3		Jan 2	All samples
9	NA	9	below LLD
16		16	
21		23	
29		30	
Feb 4	NA	Feb 6	
11		13	
19		20	
25		27	
Mar 4		Mar 6	
11	NA	13	
19		20	
25		27	
Apr 2	Except as noted,	Apr 3	
9	all samples below	10	
15	LLD	17	
22		24	
29		29	
May 6		May 5	
13		15	
20		22	
28		29	
Jun 3		Jun 5	
10		12	
17		19	
24		26	
Jul 1		Jul 3	
8		10	
17		17	
22		24	
31		31	
Aug 5		Aug 7	
12		14	
19		21	

ARKANSAS NUCLEAR ONE
January through December, 1985

(continued)

Sample Pathway or Medium:	Airborne-Charcoal Cartridge Duplicate
Location:	Danville
Distance and Direction:	21 miles, 205°
Frequency:	Weekly
Type of Analysis:	Radioiodine

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Aug 26		Aug 28	
Sep 3		Sep 4	
10		11	
17	Except as noted,	18	All samples
24	all samples below	25	below LLD
Oct 3	LLD	Oct 2	
9		9	
15		16	
23		23	
29		30	
Nov 6		Nov 6	
13		13	
21	NA	20	
26		27	
Dec 4		Dec 4	
11		11	
18		18	
23		26	

NOTE 1: Licensee sample analyses did show Cs-137 in the 7 sample composite analysis, but not in the individual filter analysis. There seems to have been some Cs-137 contamination in the charcoal used to manufacture those filters. An overnight count of 10 blank (unused) cartridges on March 28, 1986, also showed Cs-137, tending to confirm this.

NOTE 2: State sample on Nov 21 not collected due to absence of spare radioiodine cartridges and failure to replenish sampling kit supplies.

NOTE 3: State samples in Jan - Mar not collected due to operator error. On these occasions, the sample collected on the subsequent week was therefore a two week cumulative sample.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne-Particulate, duplicate
Location:	ANO Weather Station
Distance and Direction:	0.65 miles, 90°
Frequency:	Weekly
Type of Analysis:	Gross Beta

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Jan 3	NA	Jan 2	16.56 ± 1.047E-03
9	16.0 ± 0.4E-03	9	20.96 ± .7712E-03
16	NA	16	17.37 ± .7306E-03
21	19.0 ± 1.0E-03	23	19.6 ± 2.429E-03
29	17.0 ± 1.0E-03	30	16.65 ± .6414E-03
Feb 4	NA	Feb 6	23.42 ± 2.138E-03
11	17.0 ± 1.0E-03	13	36.02 ± 2.506E-03
19	20.0 ± 1.4E-03	20	12.29 ± .7628E-03
25	10.1 ± 1.3E-03	27	11.42 ± 7.755E-03
Mar 4	NA	Mar 6	10.89 ± 1.576E-03
11	14.0 ± 0.9E-03	13	13.86 ± .7371E-03
19	21.9 ± 1.8E-03	20	10.46 ± 1.729E-03
25	11.0 ± 1.3E-03	27	8.161 ± .6619E-03
Apr 2	14.5 ± 1.1E-03	Apr 3	13.00 ± 1.834E-03
9	23.7 ± 1.5E-03	10	8.821 ± .9060E-03
15	29.7 ± 1.9E-03	17	10.17 ± 1.621E-03
22	25.0 ± 2.0E-03	24	11.51 ± .5836E-03
29	15.0 ± 1.3E-03	May 1	5.940 ± .6165E-03
May 6	43.0 ± 2.0E-03	8	16.27 ± 1.846E-03
13	23.8 ± 1.6E-03	15	11.60 ± .5545E-03
20	28.7 ± 1.7E-03	22	5.533 ± 1.301E-03
28	21.0 ± 1.0E-03	29	11.00 ± 1.742E-03
Jun 3	43.0 ± 2.2E-03	Jun 5	11.95 ± 1.819E-03
10	22.9 ± 1.6E-03	12	7.070 ± 1.562E-03
17	40.0 ± 2.0E-03	19	10.57 ± 1.705E-03
24	39.0 ± 2.0E-03	26	15.41 ± 1.902E-03
Jul 1	21.0 ± 2.0E-03	Jul 3	13.50 ± 1.699E-03
8	20.0 ± 0.6E-03	10	10.90 ± 1.592E-03
17	21.0 ± 1.4E-03	17	16.34 ± 1.789E-03
22	22.0 ± 2.1E-03	24	15.20 ± 1.833E-03
31	19.0 ± 1.4E-03	31	13.09 ± 1.663E-03
Aug 5	24.0 ± 2.1E-03	Aug 7	15.07 ± 1.868E-03
12	22.0 ± 2.0E-03	14	21.20 ± 2.042E-03
19	18.0 ± 2.0E-03	21	9.825 ± 1.642E-03
26	33.0 ± 2.0E-03	28	22.49 ± 2.080E-03
Sep 3	21.0 ± 1.0E-03	Sep 4	21.34 ± 2.064E-03

ARKANSAS NUCLEAR ONE
January through December, 1985

(continued)

Sample Pathway or Medium:	Airborne-Particulate, duplicate
Location:	AND Weather Station
Distance and Direction:	0.65 miles, 90°
Frequency:	Weekly
Type of Analysis:	Gross Beta

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Sep 10	12.0 ± 1.0E-03	Sep 11	12.38 ± 1.886E-03
17	19.0 ± 1.0E-03	18	22.47 ± 2.056E-03
24	17.0 ± 1.0E-03	25	12.72 ± 1.851E-03
Oct 3	20.7 ± 1.3E-03	Oct 2	18.45 ± 2.002E-03
9	22.0 ± 1.5E-03	9	16.05 ± 1.985E-03
15	17.5 ± 1.3E-03	16	16.29 ± 1.586E-03
23	15.6 ± 1.1E-03	23	18.30 ± 1.981E-03
29	19.6 ± 1.4E-03	30	4.677 ± 2.934E-03
Nov 6	21.0 ± 1.0E-03	Nov 6	23.69 ± 2.230E-03
13	25.0 ± 2.0E-03	13	19.31 ± 2.152E-03
21	18.0 ± 1.0E-03	20	13.32 ± 2.001E-03
26	27.0 ± 1.0E-03	27	19.52 ± 2.012E-03
Dec 4	21.0 ± 1.0E-03	Dec 4	25.83 ± 2.246E-03
11	37.0 ± 2.0E-03	11	38.85 ± 2.672E-03
18	31.0 ± 2.0E-03	18	30.48 ± 2.380E-03
23	34.0 ± 1.0E-03	26	No specific report *

* Licensee annual report for 1985 lists a range of 6 - 44 E-03 pCi/m³ with a mean of 16 E-03 pCi/m³.

NOTE 1: State samples in Jan - Mar not collected due to operator error. On these occasions, the sample collected on the subsequent week was therefore a two week cumulative sample.

NOTE 2: Except for three July samples and samples collected in Sep - Oct, when there were equipment problems creating delays in counting, the typical time lag between collection and counting was 2 to 5 days for the state. For the Licensee, this time lag varied from approximately 2 weeks to approximately 2 months.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Airborne-Particulate, duplicate
Location:	Danville (control)
Distance and Direction:	21 miles, 205°
Frequency:	Weekly
Type of Analysis:	Gross Beta

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/l ¹⁰⁰)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Jan 3	16.0 ± 0.4E-03	Jan 2	16.88 ± 9.484E-04
11	NA	9	18.19 ± 2.028E-03
16	16.0 ± 1.0E-03	16	17.26 ± 7.260E-04
21	20.0 ± 1.9E-03	23	23.30 ± 2.220E-03
29	15.0 ± 1.4E-03	30	13.98 ± 2.164E-03
Feb 4	NA	6	18.92 ± 6.412E-04
11	19.0 ± 1.0E-03	13	34.95 ± 2.649E-03
19	15.8 ± 1.3E-03	20	10.38 ± 7.960E-04
25	12.2 ± 1.4E-03	27	12.14 ± 6.690E-04
Mar 4	NA	Mar 6	8.842 ± 7.201E-04
11	11.9 ± 0.9E-03	13	10.73 ± 7.419E-04
19	14.9 ± 1.4E-03	20	8.720 ± 1.704E-03
25	10.0 ± 1.3E-03	27	10.67 ± 6.717E-04
Apr 2	14.1 ± 1.2E-03	Apr 3	15.18 ± 1.917E-03
9	25.3 ± 1.7E-03	10	9.687 ± 7.050E-04
15	25.3 ± 1.9E-03	17	8.614 ± 7.270E-04
22	23.0 ± 2.0E-03	24	9.413 ± 1.490E-03
29	14.5 ± 1.4E-03	May 1	7.875 ± 6.180E-04
May 6	46.0 ± 2.0E-03	8	11.71 ± 1.670E-03
13	22.7 ± 1.6E-03	15	14.91 ± 1.889E-03
20	46.0 ± 2.0E-03	22	6.011 ± 1.320E-03
28	21.0 ± 1.0E-03	29	14.11 ± 1.896E-03
Jun 3	47.4 ± 2.3E-03	Jun 5	11.55 ± 1.765E-03
10	25.5 ± 1.6E-03	12	9.988 ± 1.685E-03
17	47.0 ± 2.1E-03	19	11.45 ± 1.635E-03
24	52.0 ± 2.0E-03	26	6.705 ± 1.558E-03
Jul 1	21.0 ± 2.0E-03	Jul 3	3.042 ± 1.207E-03
8	20.0 ± 0.7E-03	10	10.62 ± 1.577E-03
17	24.0 ± 1.6E-03	17	16.30 ± 1.884E-03
22	27.0 ± 2.0E-03	24	13.99 ± 1.741E-03
31	22.0 ± 1.6E-03	31	13.08 ± 7.259E-04
Aug 5	24.0 ± 2.4E-03	Aug 7	16.60 ± 1.870E-03
12	21.0 ± 2.0E-03	14	18.71 ± 1.998E-03
19	21.0 ± 2.0E-03	21	12.92 ± 1.749E-03
26	60.2 ± 3.0E-03	28	20.24 ± 2.014E-03
Sep 3	27.0 ± 2.0E-03	Sep 4	21.00 ± 2.053E-03
10	13.0 ± 1.0E-03	11	11.49 ± 1.845E-03
17	23.0 ± 2.0E-03	18	19.45 ± 2.080E-03

ARKANSAS NUCLEAR ONE
January through December, 1985

(continued)

Sample Pathway or Medium:	Airborne-Particulate, duplicate
Location:	Danville (control)
Distance and Direction:	21 miles, 205°
Frequency:	Weekly
Type of Analysis:	Gross Beta

<u>State</u>		<u>Licensee</u>	
<u>Sample Date</u>	<u>Results</u> (pCi/m ³)	<u>Sample Date</u>	<u>Results</u> (pCi/m ³)
Sep 24	17.0 ± 1.0E-03	Sep 25	15.26 ± 1.940E-03
Oct 3	17.1 ± 1.1E-03	Oct 2	19.68 ± 2.047E-03
9	23.7 ± 1.6E-03	9	17.58 ± 2.046E-03
15	16.3 ± 1.3E-03	16	16.82 ± 1.948E-03
23	16.0 ± 1.1E-03	23	15.92 ± 1.900E-03
29	17.3 ± 1.4E-03	30	17.76 ± 2.052E-03
Nov 6	20.0 ± 1.0E-03	Nov 6	22.31 ± 2.235E-03
13	23.0 ± 2.0E-03	13	31.09 ± 4.043E-03
21	15.0 ± 1.0E-03	20	12.02 ± 2.733E-03
26	28.0 ± 1.0E-03	27	26.95 ± 2.528E-03
Dec 4	19.0 ± 1.0E-03	Dec 4	19.40 ± 2.099E-03
11	37.0 ± 2.0E-03	11	44.53 ± 2.510E-03
18	29.0 ± 2.0E-03	18	36.16 ± 2.539E-03
23	26.0 ± 1.0E-03	26	No specific report *

* Licensee annual report lists a range of 3 - 44 E-03 pCi/m³ with a mean of 16 E-03 pCi/m³.

NOTE 1: State samples in Jan - Mar not collected due to operator error. On these occasions, the sample collected on the subsequent week was therefore a two week cumulative sample.

NOTE 2: Except for three July samples and samples collected in Sep - Oct, when there were equipment problems creating delays in counting, the typical time lag between collection and counting was 2 to 5 days for the state. For the Licensee, this time lag varied from approximately 2 weeks to approximately 2 months.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium: Direct Radiation
Environmental TLDs
Frequency: Quarterly
Type of Analysis: Integrated Exposure

Co-located Sites

<u>Site Number</u>			<u>Distance and Direction</u>	
<u>State</u>	<u>Licensee</u>	<u>NRC</u>	<u>Miles</u>	<u>Degrees</u>
A1	3	1	0.4	4
B3	13	5	1.5	53
D3	23	6	3.6	37
A5	1	9	0.5	92
C6	11	11	2.1	122
F6	27	43	5.2	105
H6	--	39	6.0	112
E7	42	14	4.9	130
A8	4	17	0.4	171
I8	37	40	8.0	147
F10	38	20	5.8	195
A11	2	21	2.1	122
C12	31	23	2.8	257
E12	30	24	4.5	243
F13	32	26	4.3	263
B15b	16	29	1.9	326
E16	20	32	4.2	335

- NOTES: 1) Each of the three (3) systems utilize a different TLD material:
State - $\text{CaF}_2(\text{Mn})$
Licensee - LiF
NRC - $\text{CaSO}_4(\text{Tm})$ and $\text{Li}_2\text{B}_4\text{O}_7(\text{Cu})$
- 2) All results are standardized to 90 days per quarter, except as noted.
- 3) Distance and direction are shown as linear distance from AND with North defined as zero degrees.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Direct Radiation Environmental TLDs
Frequency:	Quarterly
Type of Analysis:	Integrated Exposure
Sample Date:	Quarter 1

<u>State</u>		<u>Licensee</u>		<u>NRC</u>	
<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>
B3	15.13	13	13	5	19.2
A1	16.05	3	14	1	16.8
A11	17.65	2	15	21	19.8
B15b	16.73	16	14	29	17.5
E16	13.97	20	13	32	16.2
D3	15.53	23	13	6	16.1
A8	14.67	4	13	17	17.5
A5	16.60	1	16	9	17.6
F6	18.37	27	15	43	18.6
H6	16.37	--	--	39	17.7
F10	13.11	38	14	20	20.7
I8	16.48	37	20	40	18.6
E-7	17.76	42	14	14	15.5
C6	16.14	11	16	11	16.7
E12	17.05	30	13	24	16.9
C12	17.38	31	13	23	15.0
F13	18.96	32	16	26	16.9

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium:	Direct Radiation Environmental TLDs
Frequency:	Quarterly
Type of Analysis:	Integrated Exposure
Sample Date:	Quarter 2

<u>State</u>		<u>Licensee</u>		<u>NRC</u>	
<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>
B3	19.38	13	22	5	20.2
A1	16.48	3	14	1	21.5
A11	20.10	2	16	21	24.1
B15b	17.47	16	15	29	21.0
E16	16.74	20	NA *	32	19.2
D3	16.21	23	14	6	20.7
A8	16.32	4	14	17	20.3
A5	18.55	1	17	9	24.0
F6	17.30	27	18	43	23.8
H6	16.92	--	--	39	22.4
F10	16.41	38	14	20	18.6
I8	18.12	37	17	40	20.9
E7	15.18	42	15	14	20.2
C6	17.14	11	14	11	20.1
E12	17.91	30	15	24	20.2
C12	17.54	31	13	23	20.2
F13	18.81	32	17	26	21.6

NOTE: Gross data for NRC results. No net data was available.

* Machine malfunction caused loss of data.

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium: Direct Radiation
Environmental TLDs
Frequency: Quarterly
Type of Analysis: Integrated Exposure
Sample Date: Quarter 3

<u>State</u>		<u>Licensee</u>		<u>NRC</u>	
<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>
B3	16.02	13	11	5	18.2
A1	16.11	3	13	1	16.9
A11	18.49	2	17	21	18.0
B15b	17.84	16	14	29	16.6
E16	14.63	20	11	32	14.2
D3	16.08	23	16	6	15.6
A8	19.67	4	14	17	16.1
A5	22.98	1	17	9	17.4
F6	21.05	27	15	43	17.0
H6	21.34	--	--	39	16.4
F10	14.43	38	12	20	17.5
I8	NA *	37	17	40	NA **
E7	15.37	42	13	14	13.8
C6	14.45	11	14	11	15.3
F13	16.04	32	15	26	17.1
C12	15.60	31	11	23	21.2
E12	13.86	30	14	24	15.1

* Missing TLD
** Missing or damaged TLD

ARKANSAS NUCLEAR ONE
January through December, 1985

Sample Pathway or Medium: Direct Radiation
Environmental TLDs
Frequency: Quarterly
Type of Analysis: Integrated Exposure
Sample Date: Quarter 4

<u>State</u>		<u>Licensee</u>		<u>NRC</u>	
<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>	<u>Site</u>	<u>Results</u> <u>(mR)</u>
B3	18.91	13	19	5	23.1
A1	18.57	3	13	1	23.0
A11	20.78	2	15	21	25.1
B15b	19.82	16	16	29	23.7
E16	17.84	20	14	32	21.2
D3	16.28	23	16	6	23.5
A8	17.66	4	15	17	23.6
A5	20.09	1	15	9	25.1
F6	19.11	27	18	43	25.0
H6	18.63	--	--	39	23.8
F10	15.62	38	16	20	21.2
I8	19.63	37	NA *	40	24.1
E7	16.71	42	16	14	24.2
C6	17.83	11	13	11	21.8
C12	17.44	31	16	23	14.9
E12	17.20	30	19	24	21.1
F13	18.80	32	17	26	22.9

NOTE: Gross data for NRC RESULTS. No net data was available.

* Missing TLD

ATTACHMENT 1

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSES

ESTIMATED LOWER LIMIT OF DETECTION (LLD)

STATE

<u>Isotope</u>	<u>Water</u> (pCi/l)	<u>Airborne</u> (pCi/m ³)	<u>Flesh</u> (pCi/kg)	<u>Milk</u> (pCi/l)	<u>Vegetation</u> (pCi/kg)	<u>Silt</u> (pCi/kg)
K	---	---	---	200	---	---
Mn-54	3	6E-03	18	3	18	18
Fe-59	6	1.2E-02	30	6	30	30
Co-58	3	6E-03	17	3	17	17
Co-60	4	9E-03	21	4	21	21
Zn-65	8	1.5E-02	39	8	39	39
Zr-95	6	1.1E-02	32	6	32	32
Nb-95	3	6E-03	17	3	17	17
I-131	0.1	6E-03	24	0.1	24	24
Cs-134	3	5E-03	17	3	17	17
Cs-137	4	8E-03	24	4	24	24
La-140/ Ba-140	14	2.3E-02	73	14	73	73
Ce-144	31	4.0E-02	138	31	138	138
Ru105	34	6.0E-02	191	34	191	191
H-3	280	---	---	--	---	---
Gross Pota	---	2.0E-03				

Sample size to attain LLD:

Water	3.5 l
Airborne	300 m ³
Flesh	1 kg
Milk	3.5 l
Vegetation	1 kg
Silt	1 kg

ATTACHMENT 1 (Page 2)

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSES

ESTIMATED LOWER LIMIT OF DETECTION (LLD)

LICENSEE

<u>Isotope</u>	<u>Water</u> (pCi/l)	<u>Airborne</u> (pCi/m ³)	<u>Flesh</u> (pCi/kg)	<u>Milk</u> (pCi/l)	<u>Vegetation</u> (pCi/kg)	<u>Silt</u> (pCi/kg)
K	100	1E-01	300	200	300	500
Mn-54	10	1E-02	50	20	50	70
Fe-59	20	2E-02	100	40	100	130
Co-58	10	1E-02	50	20	50	70
Co-60	10	1E-02	50	20	50	70
Zn-65	20	2E-02	100	40	100	130
Zr-95	5	5E-03	30	10	30	50
Nb-95	5	5E-03	30	10	30	50
I-131	0.5	1E-02	50	0.5	50	70
Cs-134	10	1E-02	50	20	70	70
Cs-137	10	1E-02	50	20	50	70
La-140/ Ba-140	10	1E-02	50	20	50	70
Ce-144	40	5E-02	200	80	200	300
Ru-105	15	2E-02	70	30	70	100
H-3	280	---	--	--	--	--
Gross Beta	---	?				

Sample size to attain LLD:

Water	3.5 l
Airborne	300 m ³
Flesh	1 kg
Milk	3.5 l
Vegetation	1 kg
Silt	1 kg

ATTACHMENT 2

SUMMARY OF RESULTS - EPA CROSSCHECK PROGRAM

July 1984 - June 1985

SAMPLE MEDIUM: Water

<u>Type</u> <u>Analysis</u>	<u>Number of</u> <u>Samples</u>		<u>Within</u> <u>Limits</u>		<u>Outside</u> <u>Limits</u>		<u>Unavailable</u>	
	<u>std</u>	<u>blind</u>	<u>std</u>	<u>blind</u>	<u>std</u>	<u>blind</u>	<u>std</u>	<u>blind</u>
Alpha	6	2	5	1	0	0	1	1
Beta	6	2	5	1	0	0	1	1
Cr-51	3	0	1	0	0	0	2	0
Zr-65	3	0	1	0	0	0	2	0
Ru-106	3	0	1	0	0	0	2	0
I-131	1	0	1	0	0	0	0	0
Cs-134	3	2	0	1	1	0	2	1
Cs-137	3	2	1	1	0	0	2	1
Co-60	3	2	1	1	0	0	2	1
I-131(beta)	2	0	2	0	0	0	0	0
Tritium	6	0	5	0	0	0	1	0
Ra-226	4	2	3	0	0	1	1	1
Ra-228	4	2	1	0	2	1	1	1
Uranium	2	2	1	1	1	0	0	1
Sr-89	3	2	0	1	2	0	1	1
Sr-90	3	2	1	1	1	0	1	1

SAMPLE MEDIUM: Milk

<u>Type</u> <u>Analysis</u>	<u>Number of</u> <u>Samples</u>	<u>Within</u> <u>Limits</u>	<u>Outside</u> <u>Limits</u>	<u>Unavailable</u>
Sr-89	2	1	0	1
Sr-90	2	0	1	1
I-131(beta)	1	1	0	0
K	2	1	0	1
Cs-137	2	1	0	1

ATTACHMENT 2 (Page 2)

SUMMARY OF RESULTS - EPA CROSSCHECK PROGRAM

July 1984 - June 1985

SAMPLE MEDIUM: Fiber Filter

<u>Type</u> <u>Analysis</u>	<u>Number of</u> <u>Samples</u>	<u>Within</u> <u>Limits</u>	<u>Outside</u> <u>Limits</u>	<u>Unavailable</u>
Alpha	3	2	0	1
Beta	3	1	1	1
Sr-90	3	1	1	1
Cs-137	3	2	0	1

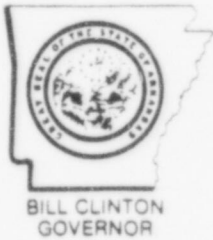
Error limits for EPA crosscheck samples are ± 3.0 . Deviation calculated as:

$$\frac{x_1 - x}{s(N)^{-1/2}}$$

x_1 = ADH Lab results
 x = EPA value
 s = Expected deviation
 (1 standard deviation
 for 1 analysis)
 N = Number of samples

NOTE 1: Crosscheck program results available from laboratory on state fiscal year basis only. Calendar year tabulations not performed.

NOTE 2: Some unavailable data was due to equipment malfunction in Oct 1984. The remaining unavailable data resulted from final results of crosscheck program not being available at the time the program report was compiled.



Arkansas **DEPARTMENT OF HEALTH**

4815 WEST MARKHAM STREET • LITTLE ROCK, ARKANSAS 72201
TELEPHONE AC 501 661-2000

BEN N. SALTZMAN, M.D.
DIRECTOR

April 17, 1986

APR 21 1986

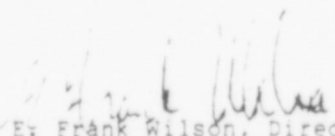
Robert D. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Dear Mr. Martin:

Enclosed is the environmental monitoring report for cooperative agreement NRC-05-83-667 activities around Arkansas Nuclear One during calendar year 1985.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,


Fr. Frank Wilson, Director
Division of Radiation Control and
Emergency Management Programs

EFW:MAS:wvs

Enclosures

86-399

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