

**Florida  
Power**

CORPORATION

Crystal River Unit 3  
Docket No. 50-302

April 30, 1992  
3F0492-14

U.S. Nuclear Regulatory Commission  
Attn: Document Control Room  
Washington, D.C. 20555

Subject: Annual Radiological Environmental Operating Report

Dear Sir:

Florida Power Corporation hereby submits the 1991 Annual Radiological Environmental Operating Report in compliance with Crystal River Unit 3's Technical Specification, Appendix A, Section 6.9.1.5(c). The report contains the data obtained from the radiological environmental surveillance program conducted for the Crystal River site for 1991.

Sincerely,

G. L. Boldt  
Vice President  
Nuclear Production

GLB/REF:ff

Attachment

xc: Regional Administrator, Region II  
Senior Resident Inspector  
NRR Project Manager

9205130259 911231  
PDR ADOCK 05000302  
R PDR

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

1991

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

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Radiochemistry & Environmental Specialist

Approved By W.S. [Signature]  
Manager, Site Nuclear Services

Date 4/28/92

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## INTRODUCTION

This report is submitted as required by Technical Specification 6.9.1.5(c) to Crystal River Facility Operating License No. DPR-72. In accordance with this specification, the following information must be included in this report:

- Summaries
- Interpretations
- Unachievable LLOs, and
  - An analysis of trends of the results of the radiological environmental studies and previous annual reports.
  - An assessment of any observed impact of plant operation on the environment.

**NOTE:** If harmful effects or evidence of irreversible damage are detected by the monitoring, the Report shall provide an analysis of the problem and a planned course of action to alleviate the problem.

- Summarized and tabulated results, in the format of Regulatory Guide 4.8 (December 1975), of all radiological environmental samples taken during the report period.

**NOTE:** If some results are not available for inclusion, the report shall note and explain the reason for the missing results. The missing results shall be submitted as soon as possible in a supplementary report.

- A summary description of the REMP.
- A map of all sampling locations keyed to a table giving distances and directions from the reactor.
- Unavailability of milk or fresh leafy vegetable samples required by Table 3.12-1 of Technical Specifications.
- The results of land-use censuses.
- Results of Interlaboratory Comparison Program.



## I. SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The analytical results of the Crystal River Unit 3 (CR-3) operational Radiological Environmental Monitoring Program (REMP) for 1991 are contained in this report. The operational program began on January 1, 1977 just prior to initial criticality, which was achieved on January 14, 1977.

Sampling of the facility environs is performed by the State of Florida Department of Health and Rehabilitative Services (FDHRS), Office of Radiation Control. The State also performs the required analyses, participates in the Environmental Protection Agency's (EPA's) Interlaboratory Comparison Program, and performs the annual land-use census.

Sample station locations are given in Table I-1 and Figures I-2, -3, and -4. Sample frequency and analysis type may be determined from Table I-2. Figure I-1 illustrates the relevant exposure pathways.

Except for air sample gross beta results and direct radiation measurements, most of the analytical results are below the lower limit of detection (LLD) of the sample. Sample LLDs are generally much lower than the required "a priori" LLD. When measurable results are reported, the values are also usually less than the required "a priori" LLD.

The results of the 1991 REMP have been compared to previous years' results. This comparison, in part illustrated by the trend graphs<sup>1</sup> of Section IV, shows no evidence of increasing radionuclide buildup in any of the sample media. Additionally, these results verify the effectiveness of in-plant measures for controlling radioactive releases. When combined with dose calculation results<sup>2</sup> (based upon actual release data and a hypothetical individual residing at the Site Boundary), the REMP data indicate that the environmental impact of CR-3's operation is not significant.

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<sup>1</sup>Trend graphs illustrate the mean measured concentration of a particular radionuclide for the year. When measurable results are not obtained, the highest sample LLD is plotted.

<sup>2</sup>For 1991 releases, the whole body dose commitment to the maximum individual was calculated to be 0.13 mrem.

TABLE I-1  
 FLORIDA POWER CORP. - CR3 - 1991  
 SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	DISTANCE
TLD	C60	N	4400 FT.
	C61	NNE	4400
	C62	NE	5300
	C63	ENE	4400
	C64	E	4400
	C65	ESE	1740
	C66	SE	1600
	C67	SSE	1480
	C68	S	1500
	C69	SSW	1780
	C41	SW	2100
	C70	WSW	4400
	C71	WNW	3500
	C72	NW	2400
	C73	NNW	2000
	C27	W	3400
	C18	N	5.2 MI.
	C03	NNE	5.3
	C04	NE	6.3
	C74	ENE	5.5
	C75	E	4.2
	C76	ESE	5.4
	C08	SE	3.5
	C77	SSE	3.2
	C09	S	3.2
	C78	WSW	4.1
	C14G	W	2.8
C01	NW	4.9	
C79	NNW	5.0	
C47-Control	ESE	80	

TABLE I-1 (CONT'D)  
 FLORIDA POWER CORP. - CR3 - 1991  
 SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	DISTANCE
AIR	C07	ESE	7.5 MI.
	C18	N	5.2
	C40	E	3.5
	C41	SW	0.4
	C46	N	0.4
	C47-Control	ESE	80
WATER SEAWATER	C14H	NW	0.1
	C14G	W	2.8
	C13-Control	WSW	3.4
GROUND WATER	C40-Control	E	3.5
DRINKING WATER	C07-Control	ESE	7.5
	C10-Control	ESE	5.9
	C18-Control	N	5.2
SHORELINE SEGMENT	C09-Control	S	3.2
	C14H	NW	0.1
	C14M	W	1.2
	C14G	W	2.8
FISH & OYSTERS	C29	N	2.0
	C30-Control	WSW	3.6
VEGETATION	C48A	N	0.8
	C48B	NNE	0.8
	C47-Control	ESE	80
WATERMELON	C04	ENE	6.3
CITRUS	C19	ENE	8.5

TABLE I-2  
 FLORIDA POWER CORP. - CR3 - 1991  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD <sup>(1)</sup>
TLD	30	Quarterly	γ Dose	---
Air Iodine	6	Weekly	I-131	0.07 pCi/m <sup>3</sup>
Air Particulate	6	Weekly	Gross B	0.01
		Quarterly	γ Spec :	
			Cs-134	0.05
			Cs-137	0.06
Seawater	3	Monthly	Tritium	3000 pCi/L
		Monthly	γ Spec :	
			Mn-54	15
			Fe-59	30
			Co-58	15
			Co-60	15
			Zn-65	30
			Zr-Nb-95	15
			I-131	1
			Cs-134	15
	Cs-137	18		
	Ba-La-140	15		

(1) The maximum "a priori" LLD

TABLE I-2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1991  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD
Ground Water	1	Semiannual	Tritium	2000 pCi/L
		Semiannual	γ Spec : (2)	(2)
Drinking Water	3	Quarterly	Tritium	
		Quarterly	γ Spec : (2)	(2)
Shoreline Sediment	4	Semiannual	γ Spec :	
			Cs-134	150 pCi/kg
			Cs-137	180
Carnivorous Fish and Oysters	2	Quarterly	γ Spec :	
			Mn-54	130 pCi/kg
			Fe-59	260
			Co-58	130
			Co-60	130
			Zn-65	260
			Cs-134	130
Cs-137	150			

(2) Same as Seawater γ Spec

TABLE I-2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1991  
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD
Broad Leaf Vegetation	3	Monthly (3)	γ Spec :	
			I-131	60 pCi/kg
			Cs-134	60
Citrus	1	Annual (4)	γ Spec :	
			(5)	(5)
Watermelon	1	Annual (4)	γ Spec :	
			(5)	(5)

(3) When available  
 (4) During harvest  
 (5) Same as broad leaf vegetation



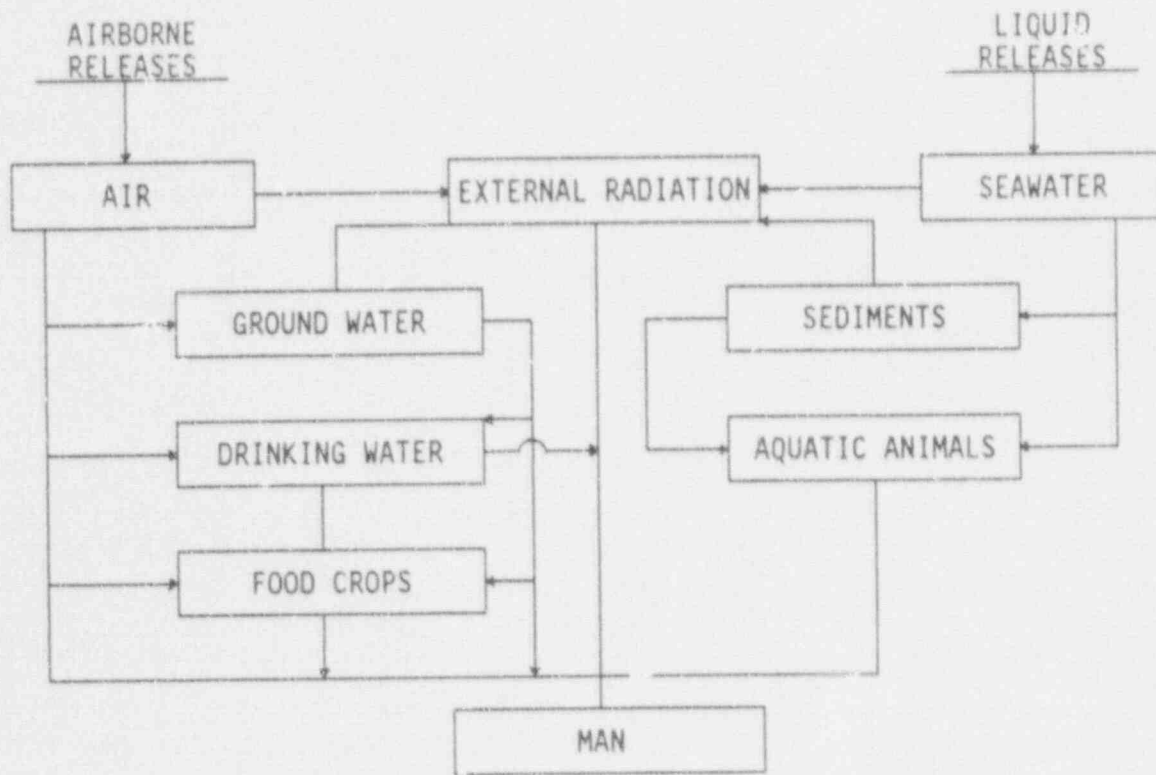


FIGURE I-1: Environmental Media and Exposure Pathways

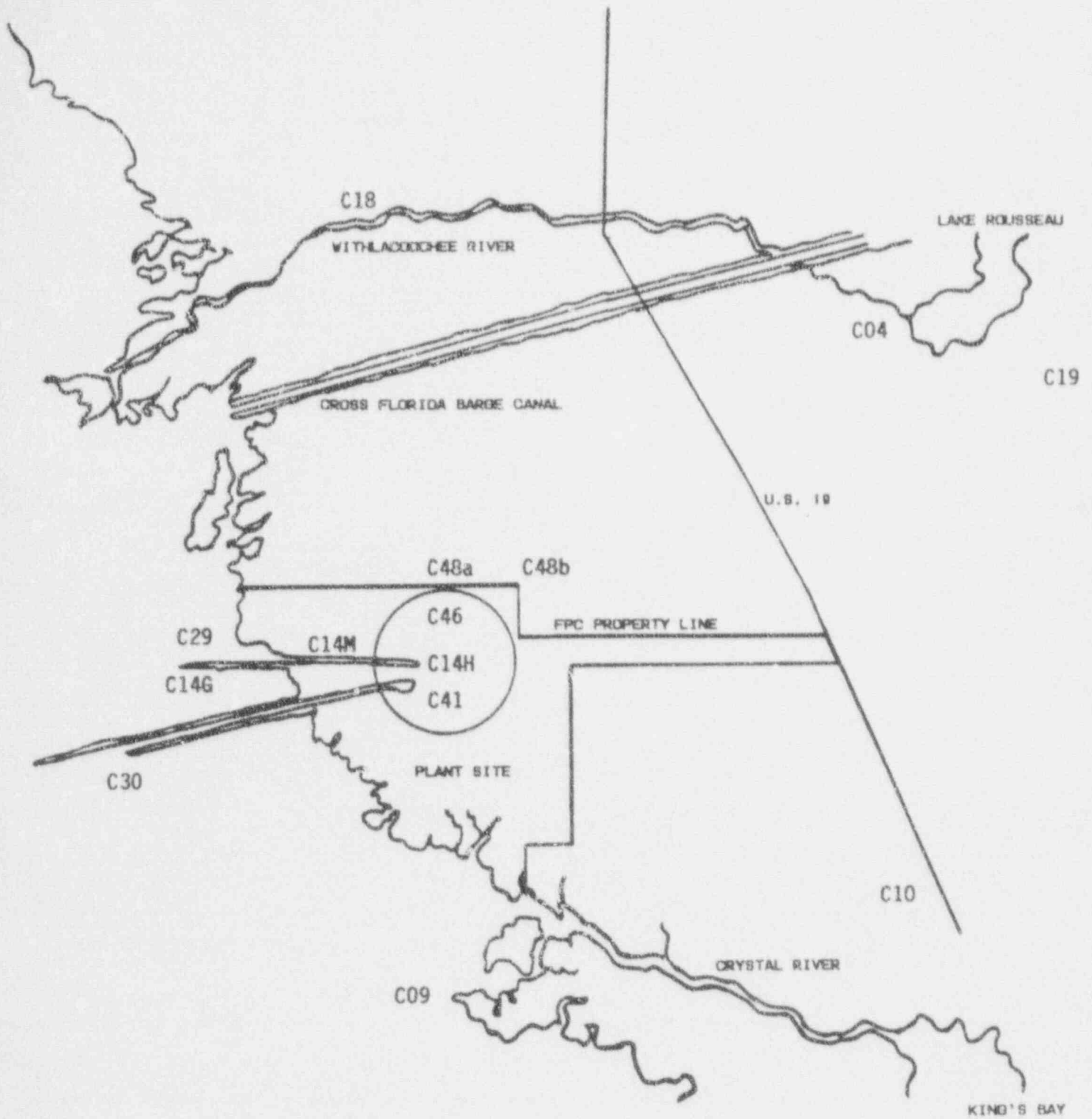


FIGURE I-2: ENVIRONMENTAL MONITORING SAMPLE STATION LOCATIONS

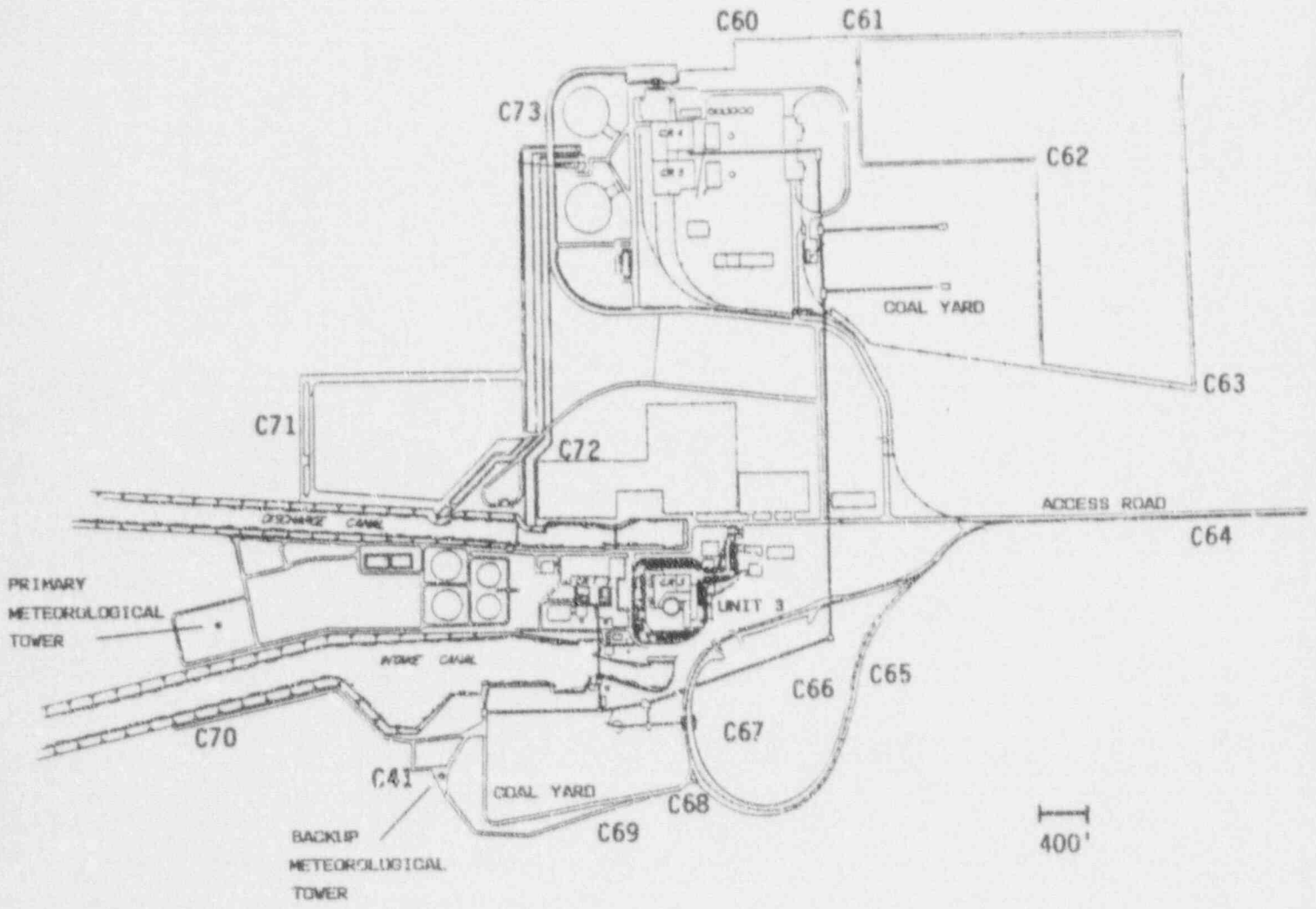


FIGURE I-3: ENVIRONMENTAL MONITORING TLD LOCATIONS (SITE BOUNDARY)

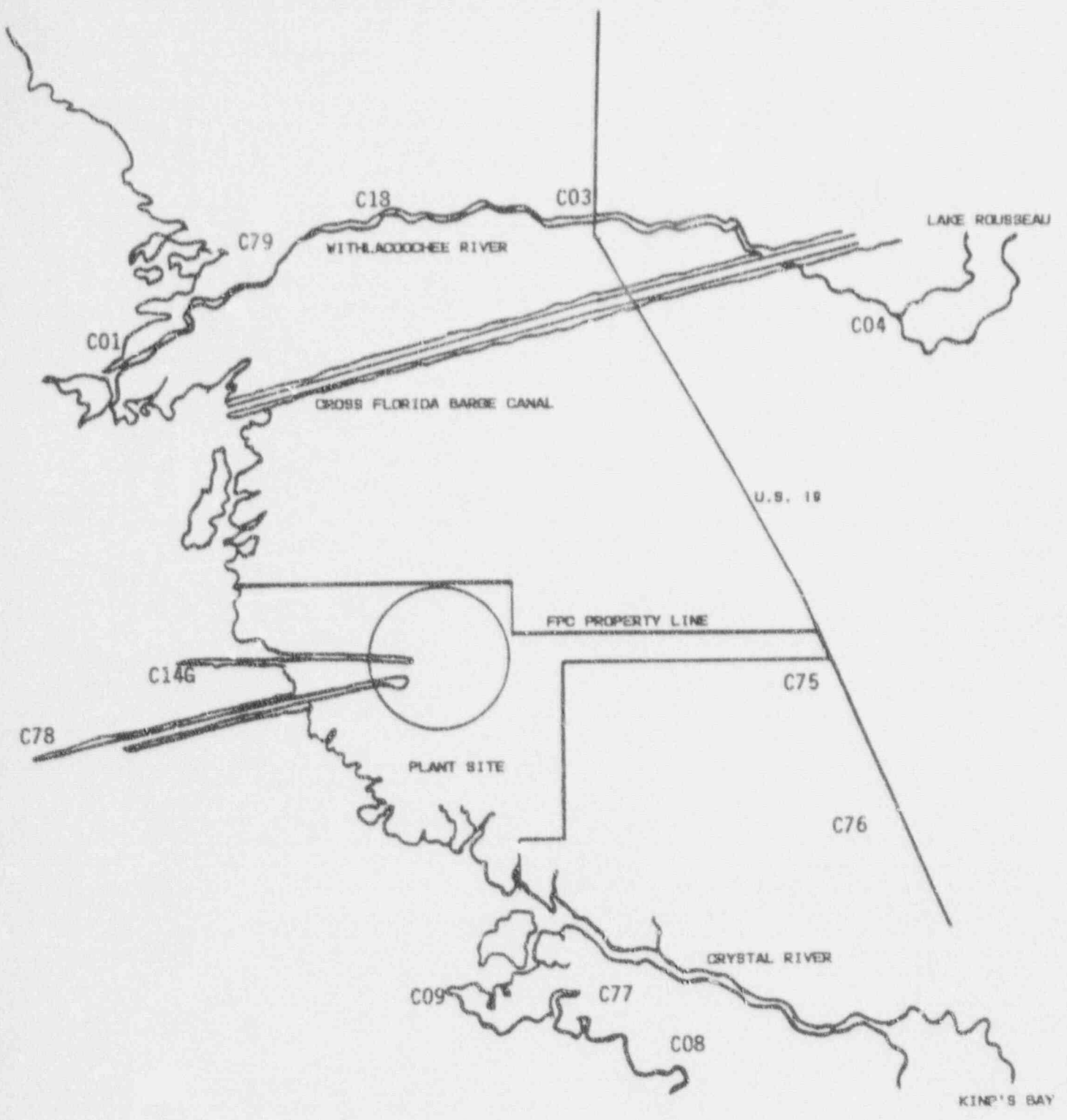


FIGURE I-4: ENVIRONMENTAL MONITORING TLD LOCATIONS (5 MILES)

## II. LAND-USE CENSUS

A land-use census to identify the nearest residences, vegetable gardens, and potential milk-producing animals within a five mile radius of the nuclear plant was conducted in June. The distance in miles and bearing in degrees for each receptor type in each of the sixteen sectors is summarized below.

SECTOR	NEAREST RESIDENCE	NEAREST GARDEN	NEAREST MILK ANIMAL
N	4.4 @ 2°	4.4 @ 2°	**
NNE	3.8 @ 15°	4.5 @ 13°	**
NE	3.8 @ 55°	3.8 @ 55°	**
ENE	3.4 @ 60°	4.4 @ 57°	4.5 @ 75°
E	4.0 @ 92°	4.1 @ 93°	**
ESE	4.2 @ 101°	4.2 @ 101°	**
SE	4.7 @ 133°	*	**
SSE	3.4 @ 150°	*	*
S	*	*	*
SSW	*	*	*
SW	*	*	*
WSW	*	*	*
W	*	*	*
WNW	*	*	*
NW	4.6 @ 319°	*	*
NNW	4.5 @ 338°	4.5 @ 339°	**

\* None

\*\* All sectors around the plant which are not exclusively water or marshland might occasionally have milk-producing animals at the plant boundary. Most of the land adjacent to the plant site is woodland; however, much of the land in the immediate area is pastureland for cattle and a few horses. Stray cattle are often seen in the wooded areas adjacent to the plant site. These cattle are raised for beef or veal. At times there may be fresh females in these herds, but these animals roam freely and are not milked. A few goats have also been located at residences within the survey area. None of these cows or goats are known to be providing milk for human use, and the owners are not willing to make samples of milk available.

FLORIDA DEPT. OF HRS -- EPA INTERLABORATORY CROSS-CHECK PROGRAM DATA

January through June, 1991

Media	Nuclide	Collection			EPA Units	Normal.	Mean of	N.D.K.	Action
		Mon	Day	Yr	Known	Range	Analyses	Level	Level
FILTER	Alpha	07	29	91	25 pCi/F	0.098	30.67	1.64	
FILTER	Beta	03	29	91	124 pCi/F	0.098	117.33	-1.92	
FILTER	Cs-137	03	29	91	60 pCi/F	0.354	58.33	6.35	1
FILTER	Sr-90	03	29	91	46 pCi/F	0.354	34.33	-1.96	
MILK	I-131	04	26	91	60 pCi/L	0.000	59.00	-0.29	
MILK	Cs-137	04	26	91	49 pCi/L	0.118	50.67	0.58	
MILK	K	04	26	91	1650 mg/L	0.157	1617.00	-0.69	
MILK	Sr-89	04	26	91	32 pCi/L	0.118	11.67	-7.04	2
MILK	Sr-90	04	26	91	32 pCi/L	0.354	14.33	-6.12	3
WATER	Alpha	01	25	91	5 pCi/L	0.118	6.67	0.23	
WATER	Alpha	05	17	91	24 pCi/L	0.098	20.67	-0.96	
WATER	Beta	01	25	91	5 pCi/L	0.118	6.67	0.58	
WATER	Beta	05	17	91	46 pCi/L	0.118	49.33	1.15	
WATER	Co-60	02	08	91	40 pCi/L	0.118	39.33	-0.23	
WATER	Co-60	06	07	91	10 pCi/L	0.000	10.00	0.00	
WATER	Zn-65	02	08	91	149 pCi/L	0.118	145.33	-0.42	
WATER	Zn-65	05	07	91	103 pCi/L	0.215	106.33	-0.26	
WATER	Mo-106	02	08	91	186 pCi/L	0.528	195.00	0.92	
WATER	Ru-106	06	07	91	149 pCi/L	0.591	141.67	-0.85	
WATER	Po-133	02	08	91	75 pCi/L	0.148	71.33	-0.79	
WATER	Ba-133	06	07	91	52 pCi/L	0.098	59.67	-0.57	
WATER	Cs-134	02	08	91	0 pCi/L	0.118	7.33	-0.33	
WATER	Cs-134	06	07	91	15 pCi/L	0.118	14.33	-0.23	
WATER	Cs-137	02	08	91	8 pCi/L	0.000	9.00	0.35	
WATER	Cs-137	06	07	91	14 pCi/L	0.236	15.33	0.46	
WATER	H-3	01	22	91	4416 pCi/L	0.277	4380.33	1.81	
WATER	H-3	06	21	91	12480 pCi/L	0.142	12274.33	-0.29	
WATER	I-131	02	15	91	75 pCi/L	0.148	74.67	-0.67	
WATER	Sr-89	01	11	91	3 pCi/L	0.118	3.67	-0.46	
WATER	Sr-89	05	10	91	39 pCi/L	0.118	31.67	-2.34	
WATER	Sr-90	01	11	91	3 pCi/L	0.236	4.00	-0.35	
WATER	Sr-90	05	10	91	24 pCi/L	0.354	21.67	-0.61	

ACTION LEVEL:

- (1) Cause: Very poor, new calibration of detector.  
Corrective Action: Recalibrate the detector for this nuclide, and, in the future, always compare a new calibration with previous calibrations for similarity.
- (2) Cause: Erroneously over estimated chemical recovery of strontium carrier.  
Corrective Action: Try to improve purity of isolated strontium carrier.
- (3) Cause: Erroneously over estimated chemical recovery of strontium carrier.  
Corrective Action: Try to improve purity of isolated strontium carrier.



FLORIDA DEPT. OF HRS - EPA INTERLABORATORY CROSS-CHECK PROGRAM DATA

July through December, 1991

Media	Nuclide	Collection			EPA Units	Normal. Range	Mean of Analyses	N.D.K.	Action Level
		Mon	Day	Yr	Known				
FILTER	Alpha	08	30	91	25 pCi/F	0.197	32.00	2.02	
FILTER	Beta	08	30	91	92 pCi/F	0.177	89.33	-0.46	
FILTER	Cs-137	08	30	91	30 pCi/F	0.000	34.00	1.39	
FILTER	Sr-90	08	30	91	30 pCi/F	0.236	28.00	-0.69	
MILK	I-131	09	27	91	108 pCi/L	0.161	103.67	-0.58	
MILK	Cs-137	09	27	91	30 pCi/L	0.236	30.67	0.23	
MILK	K	09	27	91	1740 mg/L	0.068	1583.33	-3.12	1
MILK	Sr-89	09	27	91	25 pCi/L	0.354	17.67	-2.54	
MILK	Sr-90	09	27	91	25 pCi/L	0.236	19.00	-2.08	
WATER	Alpha	09	20	91	10 pCi/L	0.236	11.00	0.35	
WATER	Beta	09	20	91	20 pCi/L	0.118	24.33	1.50	
WATER	Co-60	10	04	91	29 pCi/L	0.354	30.33	0.46	
WATER	Zn-65	10	04	91	73 pCi/L	0.422	72.33	-0.16	
WATER	Ru-106	10	04	91	199 pCi/L	0.384	198.00	-0.09	
WATER	Ba-133	10	04	91	98 pCi/L	0.059	93.67	-0.75	
WATER	Cs-134	10	04	91	10 pCi/L	0.118	9.67	-0.12	
WATER	Cs-137	10	04	91	10 pCi/L	0.236	10.67	0.23	
WATER	H-3	10	18	91	2454 pCi/L	0.144	2470.67	0.08	
WATER	I-131	08	09	91	20 pCi/L	0.098	18.33	-0.48	
WATER	Sr-89	09	13	91	49 pCi/L	0.473	46.67	-0.81	
WATER	Sr-90	09	13	91	25 pCi/L	0.118	22.33	-0.92	

NOTES:

Normal.: Normalized range. As defined in "Environmental Radioactivity Laboratory Intercomparison Studies Program Fiscal Year 1981 - 1982", Environmental Monitoring Systems Laboratory, U. S. Environmental Protection Agency, P. O. Box 93478, Las Vegas, Nevada, 89193-1478. EPA-600/4-81-004, February, 1981.

N.D.K.: Normalized deviation of the mean from the known value, as defined in EPA-600/4-81-004.

NDP: No data provided. No data was provided to EPA for inclusion in their report.

NA: Not available. Report containing this data has not yet been received from EPA, Las Vegas.

ACTION LEVEL:

- (1) Cause: Unknown. Examination of the input data, raw counting data, efficiency file, and calculations did not reveal the cause of the problem.  
Corrective Action: None at this time.

#### IV-A. AIRBORNE PATHWAY

Air samples are taken at five locations in the vicinity of the plant. The control location is 80 miles ESE of the plant.

Table IV-A.1 provides a statistical summary of the analytical results for 308 gross beta samples and 309 Iodine samples.

The results for four gross beta and three Iodine samples were not reported for the following reason:

- C41 3/11: Sample not collected due to failed pump.
- C40 5/07: Air hose was left disconnected from previous sample change out.
- C41 10/21: Particulate filter holder was found disconnected; iodine cartridge was collected.
- C41 11/18: Air hose was left disconnected from previous sample change out.

Of 308 particulate samples analyzed for gross beta activity, 305 had measurable activity. The average indicator concentration was 15 pCi/1,000 m<sup>3</sup> with a range of 3 to 37 pCi/1,000 m<sup>3</sup>. The average indicator concentration during 1987 was 16 pCi/1,000 m<sup>3</sup>; 6 pCi/1,000 m<sup>3</sup> for 1988; 15 pCi/1,000 m<sup>3</sup> for 1989; and 15 pCi/1,000 m<sup>3</sup> for 1990.

Three hundred and nine samples were analyzed for Iodine activity, with none having measurable activity.

Tables IV-A.2 and IV-A.3 provide the results for each weekly air sample.

Second Quarter composite data are summarized in Table IV-A.4. Measurable quantities of Cesium were not identified. The highest Cesium LLD was 1.4 pCi/1,000 m<sup>3</sup>.

TABLE IV-A.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE		NAME DISTANCE & BEARING	MEAN RANGE		
AIRBORNE IODINE (pCi/m <sup>3</sup> )	γ Spec 309 1-131	0.024	<LLD		-	-	<LLD	0
AIRBORNE PARTICULATES (pCi/1000m <sup>3</sup> for Gross β, pCi/1000m <sup>3</sup> For γ Spec)	Gross β 308 γ Spec 24	2.5	15 (253/256) (3 - 37)	C46 0.4 @ 355	14 (51/52) (3 - 35)	12 (52/52) (3 - 37)		0
	Cs-134	6.9	<LLD		-	-	<LLD	0
	Cs-137	6.6	<LLD		-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-A.2

FLORIDA POWER CORP. - CR3 - 1991

pCi/m<sup>3</sup> IODINE - 131 IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
01-07	<.02	<.02	<.02	<.02	<.02	<.02
01-14	<.02	<.02	<.02	<.02	<.02	<.02
01-22	<.02	<.02	<.02	<.02	<.02	<.02
01-28	<.03	<.03	<.03	<.03	<.03	<.03
02-04	<.02	<.02	<.02	<.02	<.02	<.02
02-11	<.03	<.03	<.03	<.03	<.03	<.03
02-18	<.03	<.03	<.03	<.03	<.03	<.03
02-25	<.02	<.02	<.02	<.02	<.03	<.02
03-04	<.02	<.02	<.02	<.02	<.02	<.02
03-11	<.03	<.03	<.04	---	<.03	<.04
03-18	<.03	<.03	<.03	<.03	<.03	<.03
03-25	<.03	<.03	<.03	<.03	<.03	<.03
04-01	<.02	<.02	<.02	<.02	<.02	<.02
04-08	<.02	<.02	<.02	<.02	<.02	<.02
04-15	<.07	<.02	<.02	<.02	<.02	<.02
04-22	<.02	<.02	<.01	<.02	<.02	<.02
04-29	<.02	<.02	<.02	<.02	<.02	<.02

TABLE IV-A.2 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1991  
 pCi/m<sup>3</sup> IODINE - 131 IN AIR

COLLECTION DATE	C07	C16	C40	C41	C46	C47
05-07	<.01	<.01	---	<.01	<.01	<.01
05-13	<.02	<.02	<.02	<.02	<.02	<.02
05-21	<.01	<.01	<.01	<.01	<.01	<.01
05-28	<.02	<.02	<.02	<.02	<.02	<.02
06-04	<.02	<.02	<.02	<.02	<.02	<.02
06-10	<.03	<.03	<.03	<.03	<.05	<.03
06-17	<.02	<.02	<.02	<.02	<.02	<.02
06-24	<.02	<.02	<.02	<.02	<.02	<.02
07-01	<.02	<.02	<.02	<.02	<.02	<.02
07-08	<.02	<.02	<.02	<.02	<.02	<.02
07-15	<.02	<.02	<.02	<.02	<.02	<.02
07-22	<.02	<.02	<.02	<.02	<.02	<.02
07-29	<.02	<.02	<.02	<.02	<.02	<.02
08-05	<.01	<.01	<.01	<.01	<.01	<.01
08-12	<.02	<.02	<.02	<.02	<.02	<.02
08-19	<.02	<.02	<.02	<.02	<.02	<.03
08-26	<.02	<.02	<.02	<.02	<.02	<.02

TABLE IV-A.2 (Cont'd)  
 FLORIDA POWER CORP. - FAS - 1991  
 pCi/m<sup>3</sup> IODINE - 131 IN AIR

COLLECTION DATE	C07	C15	C40	C41	C46	C47
09-03	<.02	<.02	<.02	<.02	<.02	<.02
09-09	<.02	<.02	<.02	<.02	<.02	<.02
09-17	<.03	<.03	<.02	<.02	<.03	<.03
09-24	<.02	<.02	<.02	<.02	<.03	<.02
09-30	<.02	<.02	<.02	<.02	<.02	<.02
10-07	<.03	<.03	<.03	<.03	<.03	<.03
10-14	<.02	<.02	<.02	<.02	<.02	<.02
10-21	<.02	<.02	<.02	<.02	<.02	<.02
10-28	<.02	<.02	<.02	<.02	<.02	<.02
11-04	<.03	<.03	<.03	<.03	.03	<.03
11-12	<.02	<.02	<.02	<.02	.02	<.02
11-18	<.02	<.02	<.02	<.02	<.02	<.02
11-25	<.02	<.02	<.02	<.02	<.02	<.02
12-03	<.02	<.02	<.02	<.02	<.02	<.02
12-09	<.04	<.04	<.03	<.03	<.04	<.04
12-16	<.02	<.02	<.02	<.02	<.02	<.02
12-23	<.02	<.02	<.02	<.02	<.02	<.02
12-30	<.02	<.02	<.02	<.02	<.02	<.02



TABLE IV-A.3

FLORIDA POWER CORP. - CR3 - 1991

pCi/1000m<sup>3</sup> GROSS B IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
01-07	7	7	9	10	9	8
01-14	10	16	10	10	11	8
01-22	13	14	16	12	19	14
01-28	16	15	14	13	17	20
02-04	10	12	10	12	11	9
02-11	11	12	13	14	13	12
02-18	20	21	16	19	19	20
02-25	12	12	7	10	16	11
03-04	10	12	13	15	17	11
03-11	15	15	15	--	13	17
03-18	15	13	13	13	18	14
03-25	17	12	19	17	19	20
04-01	14	18	16	18	8	16
04-08	9	9	13	11	12	9
04-15	11	13	16	9	14	12
04-22	11	10	16	11	12	10
04-29	13	17	14	14	15	13

TABLE IV-A.3 (Cont'd)

FLORIDA POWER CORP. - CR3 - 1991

pCi/1000m<sup>3</sup> GROSS 8 IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
05-07	12	12	--	14	<4	13
05-13	17	13	16	17	15	16
05-21	9	8	9	13	3	7
05-28	9	8	10	9	5	7
06-04	16	12	17	13	13	13
06-10	10	10	7	8	10	9
06-17	11	9	12	14	10	9
06-24	11	18	13	12	17	5
07-01	7	10	7	8	10	7
07-08	8	10	6	6	11	7
07-15	11	7	9	8	9	9
07-22	6	7	9	7	11	7
07-29	9	8	8	8	10	6
08-05	4	10	5	6	7	6
08-12	6	5	6	9	8	3
08-19	7	9	13	9	12	9
08-26	10	9	<4	8	11	7

TABLE IV-A.3 (Cont'd)  
 FLORIDA POWER CORP. - CR3 - 1991  
 pCi/1000m<sup>3</sup> GROSS B IN AIR

COLLECTION DATE	C07	C18	C40	C41	C46	C47
09-03	7	10	3	9	9	11
09-09	9	10	8	10	5	7
09-17	18	20	22	15	13	17
09-24	14	16	14	14	19	13
09-30	14	19	14	18	15	14
10-07	5	4	9	8	6	5
10-14	15	23	19	20	24	17
10-21	24	27	26	--	24	19
10-28	11	12	9	14	13	11
11-04	18	20	15	20	19	16
11-12	33	39	28	34	35	37
11-18	21	25	21	--	25	24
11-25	9	15	13	14	12	11
12-03	8	8	8	8	9	5
12-05	12	10	16	18	16	21
12-16	11	8	8	11	12	12
12-23	15	19	20	16	19	17
12-30	12	12	15	13	15	15

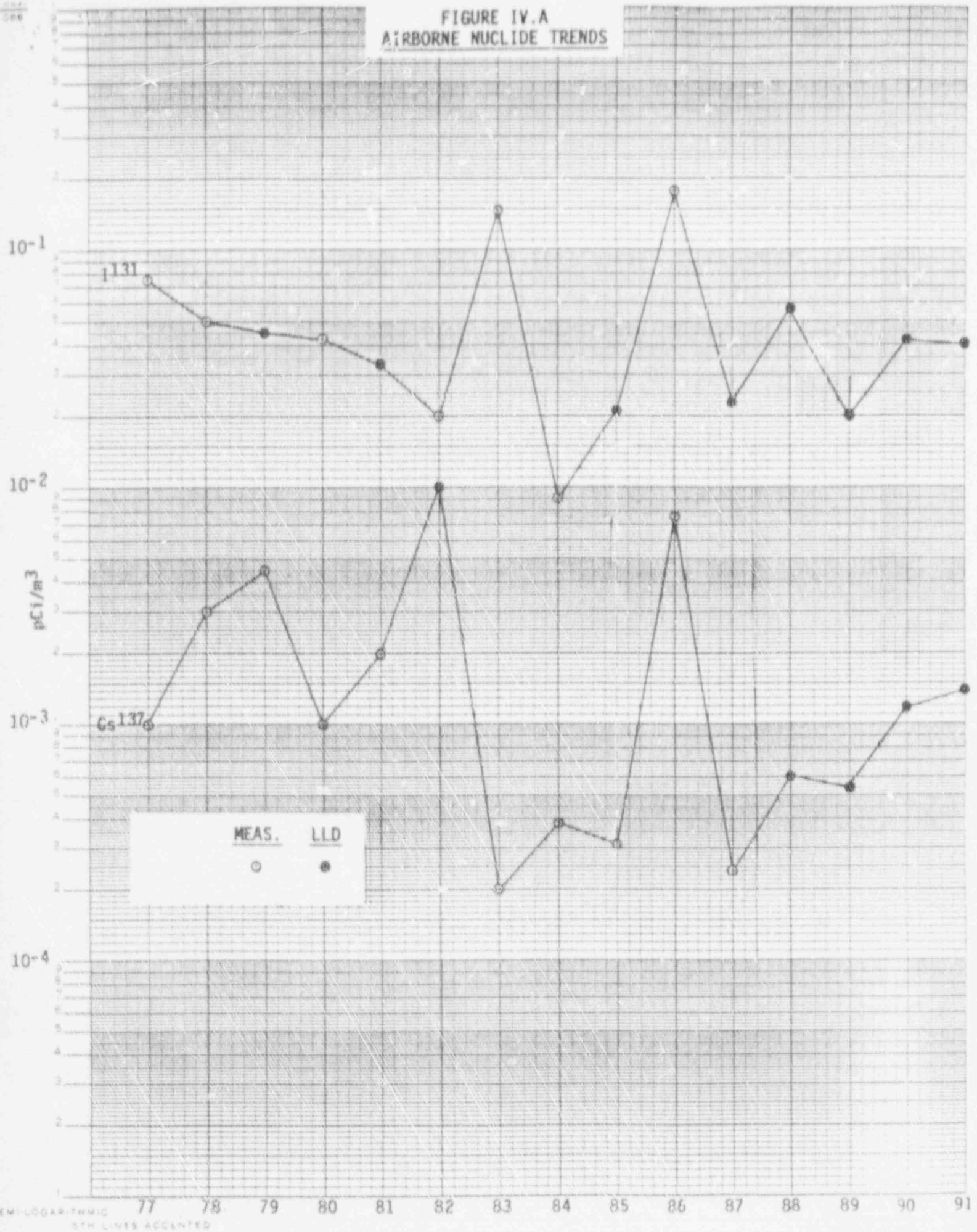
TABLE IV-A.4

FLORIDA POWER CORP. - CR3 - 1991

pCi/100m<sup>3</sup> 7 EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
C07	Be-7	91	73	62	98
	K-40	<22	<20	<17	<20
	Cs-134	<0.7	<1.2	<1.4	<1.4
	Cs-137	<0.9	<1.0	<0.9	<0.5
C18	Be-7	107	90	64	68
	K-40	<19	<14	<16	<24
	Cs-134	<0.8	<1.1	<1.3	<0.9
	Cs-137	<1.0	<0.9	<0.8	<0.8
C40	Be-7	71	72	65	93
	K-40	<24	<18	<21	<12
	Cs-134	<1.0	<1.4	<0.6	<0.8
	Cs-137	<0.7	<0.9	<0.7	<0.9
C41	Be-7	100	96	76	127
	K-40	<19	<21	<19	<17
	Cs-134	<1.3	<1.1	<1.1	<1.1
	Cs-137	<0.8	<1.1	<1.1	<0.7
C46	Be-7	108	75	59	105
	K-40	<21	<17	<19	<19
	Cs-134	<1.0	<1.1	<1.0	<1.4
	Cs-137	<0.7	<1.4	<1.0	<0.9
C47	Be-7	92	71	60	121
	K-40	<19	<20	<17	<21
	Cs-134	<1.1	<0.9	<0.9	<1.3
	Cs-137	<0.9	<0.9	<0.8	<0.7

FIGURE IV.A  
AIRBORNE NUCLIDE TRENDS



SEMI-LOGARITHMIC  
5TH LINES ACCENTED

#### IV-B. DIRECT RADIATION

Direct radiation measurements (using TLDs) were taken at sixteen locations within one mile of the plant, at thirteen locations ranging from 2.8 to 6.3 miles from the plant, and at one control location 80 miles from the site. The highest on-site dose was 97 mrem/yr at station C62 (NNE at 5300 feet). The highest off-site dose was 53 mrem/yr at station C75 (East at 4.2 miles). The control station (C47) dose was 47 mrem/yr. The average for all stations was 53 mrem/yr.

Third quarter results for station C09 and fourth quarter results for station C78 are not available as the TLD packages were missing at collection time. First quarter results for station C61 were rejected due to mechanical failure and possible procedural error during TLD preparation.



TABLE IV-B

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE			
DIRECT RADIATION (mrem/yr)	7 DOSE 117	15	53 (113/116) (39 - 97)	C62 0.9 @ 35°	85 (4/4) (74 - 97)	47 (4/4) (46 - 49)	0	

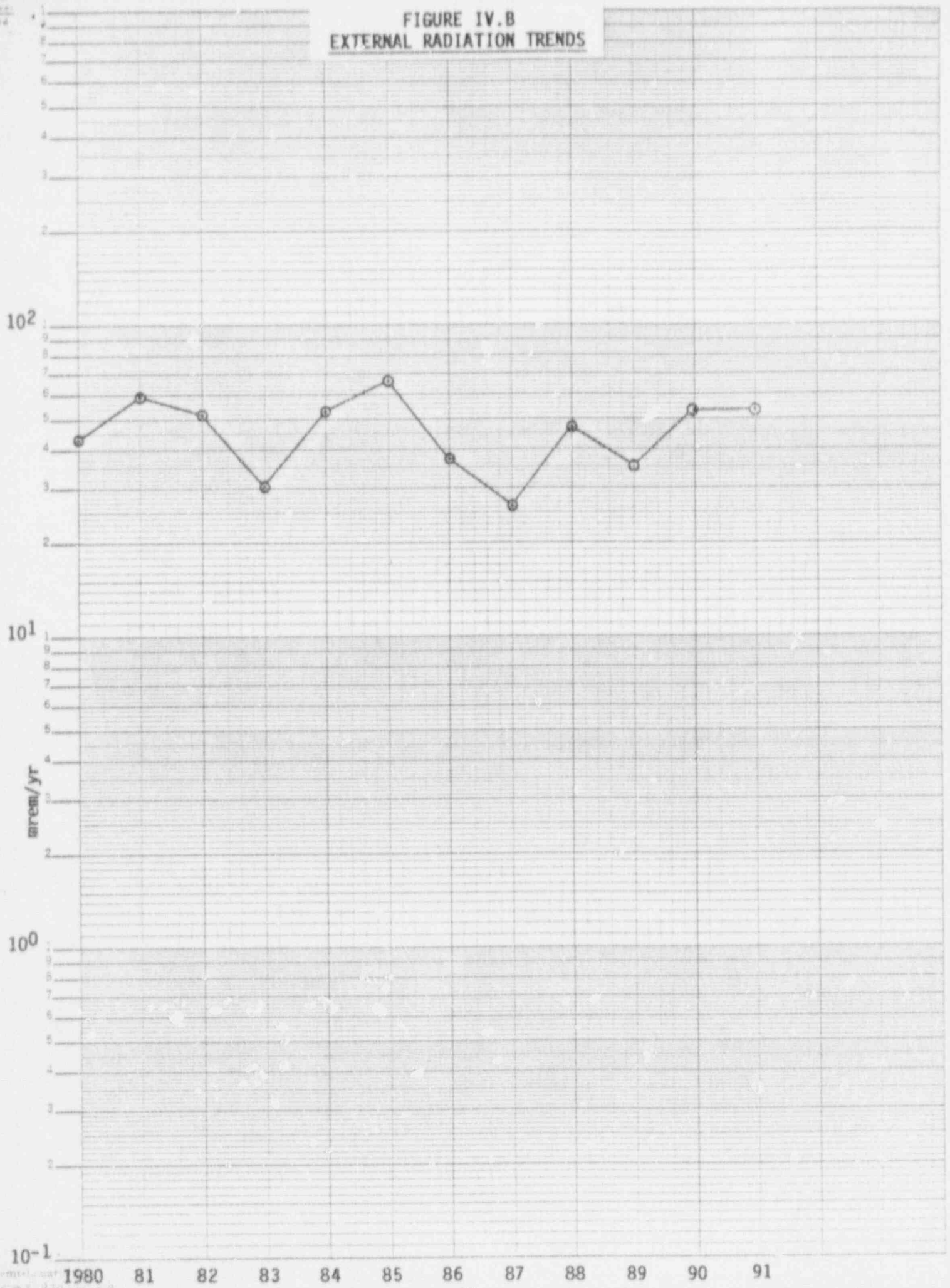
TABLE IV-B.1

FLORIDA POWER CORP. - CR-3 - 1991

mrem/yr  $\gamma$  Dose

TLD STATION	Quarter:	1	2	3	4
C01		46	50	45	46
C03		48	47	45	48
C04		46	46	45	46
C08		43	45	42	46
C09		46	47	--	47
C14G		51	53	49	53
C18		50	53	49	53
C27		60	65	60	62
C41		58	62	58	60
C47 (CONTROL)		46	49	46	46
C60		52	53	49	51
C61		--	55	54	60
C62		74	81	87	97
C63		58	60	52	60
C64		48	53	45	53
C65		53	57	53	60
C66		57	55	55	56
C67		57	54	54	58
C68		57	55	55	57
C69		59	56	57	55
C70		61	58	59	60
C71		80	77	65	67
C72		56	56	52	58
C73		53	52	49	53
C74		40	46	44	46
C75		52	53	49	53
C76		46	50	43	51
C77		40	45	40	46
C78		45	46	44	--
C79		51	51	46	48

FIGURE IV.B  
EXTERNAL RADIATION TRENDS



#### IV-C. WATERBORNE PATHWAY

To evaluate the waterborne pathway, seawater, groundwater, drinking water, and shoreline sediment samples are taken.

1. Monthly seawater grab samples are taken at two locations in the discharge canal and at one control location near the mouth of the intake canal. Of twenty-four indicator samples, nine had a measurable amount of Tritium at an average level of 597 pCi/L. Seven samples taken at the control location, C13, indicated measurable amounts of Tritium at an average level of 172 pCi/L.

Gamma spectral analysis was performed on thirty-six samples. For the required radionuclides, there were no measured activities.

2. Semiannual groundwater samples are taken at one location, station 540. Gamma spectral and Tritium analyses are performed on both samples. All results were less than the LLD. Since plant startup, all results, except for the results of one 1985 Tritium analysis, have been less than LLD. As indicated by Figure IV-C.2, the 1985 Tritium value of 170 pCi/L is less than the typical LLD, and much less than the required "a priori" LLD of 2,000 pCi/L.
3. Quarterly drinking water samples are drawn from three locations: the Crystal River Public Water Plant (C07), the Indian Water Public Water Supply (C10), and the Yankeetown City Well (C18). All samples were collected and analyzed for gamma emitters and Tritium. None of the samples yielded measurable activities for Tritium or the required gamma emitters.
4. Semiannual shoreline sediment samples are taken at three indicator locations in the discharge canal (C14H, C14M, C14G) and one control location (C09) at Fort Island Gulf Beach. Of the eight samples analyzed, four had measurable amounts of Cs-137. Cobalt-60 was identified in all six indicator samples taken in the discharge canal. (See Table IV-C.4.a.) Cobalt-58 was identified in two of the six discharge canal samples. No other gamma emitters attributable to CR-3 were found in measurable quantities.

TABLE IV-C.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CLAY COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN	CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS	
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		MEAN RANGE
SEA WATER (pCi/L)	Tritium 36  γ Spec 36	230	597 (9/24) (86 - 2913)	C14G 2.8 @ 270	795 (6/12) (142 - 2913)	172 (7/12) (102 - 358)	0
	Mn-54	4	<LLD	-	-	<LLD	0
	Fe-59	8	<LLD	-	-	<LLD	0
	Co-58	4	<LLD	-	-	<LLD	0
	Co-60	4	<LLD	-	-	<LLD	0
	Zn-65	8	<LLD	-	-	<LLD	0
	Zr-Nb-95	7	<LLD	-	-	<LLD	0
	I-131	5	<LLD	-	-	<LLD	0
	Cs-134	5	<LLD	-	-	<LLD	0
	Cs-137	4	<LLD	-	-	<LLD	0
	Ba-La-140	11	<LLD	-	-	<LLD	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-C.1.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/L  $\gamma$  EMITTERS AND TRITIUM IN SEAWATER

STATION	MONTH	H-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C13	JAN	106 $\pm$ 47	270 $\pm$ 32	<4	<10	<3	<5	<10	<7	<6	<4	<5	<6
	FEB	261 $\pm$ 56	242 $\pm$ 35	<4	<8	<3	<5	<8	<7	<5	<4	<4	<4
	MAR	<147	168 $\pm$ 33	<4	<9	<4	<6	<8	<7	<5	<4	<5	<5
	APR	<169	285 $\pm$ 32	<3	<8	<4	<4	<7	<7	<5	<3	<4	<6
	MAY	102 $\pm$ 41	216 $\pm$ 34	<3	<8	<3	<5	<6	<7	<5	<4	<4	<8
	JUN	111 $\pm$ 42	321 $\pm$ 34	<4	<8	<3	<4	<7	<7	<5	<4	<4	<6
	JUL	<132	279 $\pm$ 37	<3	<7	<3	<4	<7	<7	<4	<5	<4	<7
	AUG	109 $\pm$ 44	293 $\pm$ 41	<4	<6	<4	<4	<9	<5	<3	<3	<4	<10
	SEP	<137	297 $\pm$ 35	<3	<10	<4	<3	<11	<6	<5	<4	<4	<4
	OCT	<156	272 $\pm$ 38	<4	<8	<4	<4	<10	<6	<6	<4	<4	<5
	NOV	358 $\pm$ 49	200 $\pm$ 33	<4	<7	<3	<5	<7	<6	<4	<4	<4	<9
	DEC	160 $\pm$ 44	216 $\pm$ 32	<4	<8	<4	<4	<6	<8	<5	<4	<4	<5
C14G	JAN	176 $\pm$ 49	273 $\pm$ 37	<3	<12	<4	<5	<9	<9	<6	<4	<5	<6
	FEB	148 $\pm$ 54	258 $\pm$ 40	<4	<7	<3	<5	<8	<5	<5	<4	<5	<6
	MAR	<157	193 $\pm$ 36	<5	<9	<4	<5	<8	<8	<5	<4	<5	<9
	APR	705 $\pm$ 61	252 $\pm$ 36	<4	<8	<4	<5	<10	<7	<4	<4	<4	<7
	MAY	<127	251 $\pm$ 36	<3	<6	<3	<5	<9	<6	<4	<4	<4	<6
	JUN	2913 $\pm$ 92	340 $\pm$ 38	<4	<9	<4	<5	<8	<7	<4	<4	<4	<6
	JUL	<132	267 $\pm$ 36	<3	<10	<4	<4	<8	<7	<5	<4	<4	<6
	AUG	<137	188 $\pm$ 35	<4	<8	<4	<5	<7	<7	<4	<5	<3	<9
	SEP	<137	196 $\pm$ 37	<3	<8	<4	<4	<7	<6	<6	<4	<4	<6
	OCT	142 $\pm$ 45	254 $\pm$ 32	<4	<9	<4	<4	<9	<8	<6	<4	<4	<4
	NOV	688 $\pm$ 57	219 $\pm$ 32	<4	<8	<4	<4	<8	<8	<4	<4	<4	<6
	DEC	<132	192 $\pm$ 32	<4	<6	<4	<4	<7	<8	<5	<3	<4	<4

TABLE IV-L.1a (CONT'D)

FLORIDA POWER CORP. - CR3 - 1991

pCi/L  $\gamma$  EMITTERS AND TRITIUM IN SEAWATER

STATION	MONTH	H-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C14H	JAN	<145	281 $\pm$ 35	<4	<9	<4	<5	<11	<6	<6	<4	<4	<6
	FEB	198 $\pm$ 55	261 $\pm$ 34	<3	<7	<4	<5	<9	<5	<5	<4	<4	<5
	MAR	<138	275 $\pm$ 37	<4	<6	<5	<4	<8	<6	<5	<5	<4	<4
	APR	<142	184 $\pm$ 30	<4	<7	<4	<4	<8	<7	<4	<4	<5	<7
	MAY	<142	224 $\pm$ 33	<3	<8	<4	<5	<8	<7	<5	<5	<4	<5
	JUN	<128	249 $\pm$ 38	<3	<7	<4	<4	<9	<7	<4	<3	<3	<7
	JUL	<132	275 $\pm$ 37	<4	<9	<3	<5	<8	<5	<6	<4	<4	<6
	AUG	<137	159 $\pm$ 29	<3	<8	<3	<4	<7	<8	<4	<5	<4	<9
	SEP	<137	206 $\pm$ 35	<4	<7	<4	<5	<8	<7	<5	<4	<4	<6
	OCT	<136	257 $\pm$ 34	<4	<9	<4	<6	<10	<7	<5	<4	<5	<7
	NOV	319 $\pm$ 49	255 $\pm$ 35	<3	<8	<5	<5	<7	<6	<4	<4	<4	<6
	DEC	86 $\pm$ 42	218 $\pm$ 33	<4	<7	<4	<5	<8	<6	<7	<4	<4	<4



FIGURE IV-C.1  
SEAWATER NUCLIDE TRENDS

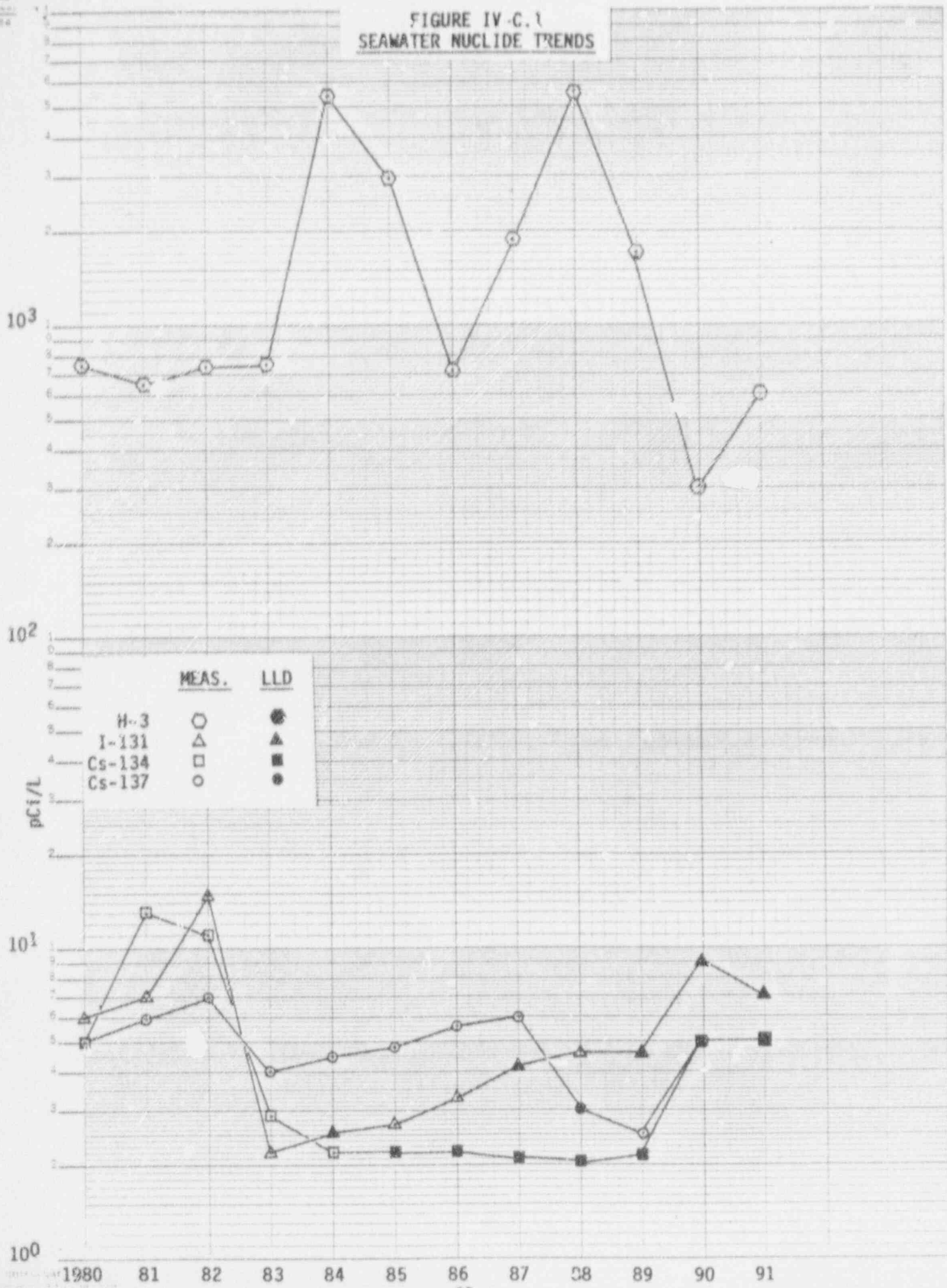


TABLE IV-C.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY  
 CRYSTAL RIVER UNIT 3                      DOCKET NO. 5-302  
 CITRUS COUNTY, FLORIDA                      JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE		NAME DISTANCE & BEARING	MEAN RANGE		
GROUND WATER (pCi/L)	Tritium 2	250	None	-	-	<LLD	0	
	γ Spec 2							
	Mn-54	4	None	-	-	<LLD	0	
	Fe-59	8	None	-	-	<LLD	0	
	Co-58	4	None	-	-	<LLD	0	
	Co-60	4	None	-	-	<LLD	0	
	Zn-65	8	None	-	-	<LLD	0	
	Zr-Nb-95	7	None	-	-	<LLD	0	
	I-131	5	None	-	-	<LLD	0	
	Cs-134	5	None	-	-	<LLD	0	
Cs-137	4	None	-	-	<LLD	0		
Ba-La-140	11	None	-	-	<LLD	0		

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-C.2.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/L  $\gamma$  EMITTERS AND TRITIUM IN GROUND WATER

STATION	NUCLIDE	FIRST HALF	SECOND HALF
C4C	H-3	<164	<137
	Mn-54	<4	<3
	Fe-59	<5	<8
	Co-58	<4	<4
	Co-60	<4	<4
	Zn-65	<8	<10
	Zr-Nb-95	<7	<6
	I-131	<5	<4
	Cs-134	<4	<5
	Cs-137	<5	<5
	Ba-La-140	<6	<10
	K-40	<57	<62

FIGURE IV-C.2  
GROUND WATER NUCLIDE TRENDS

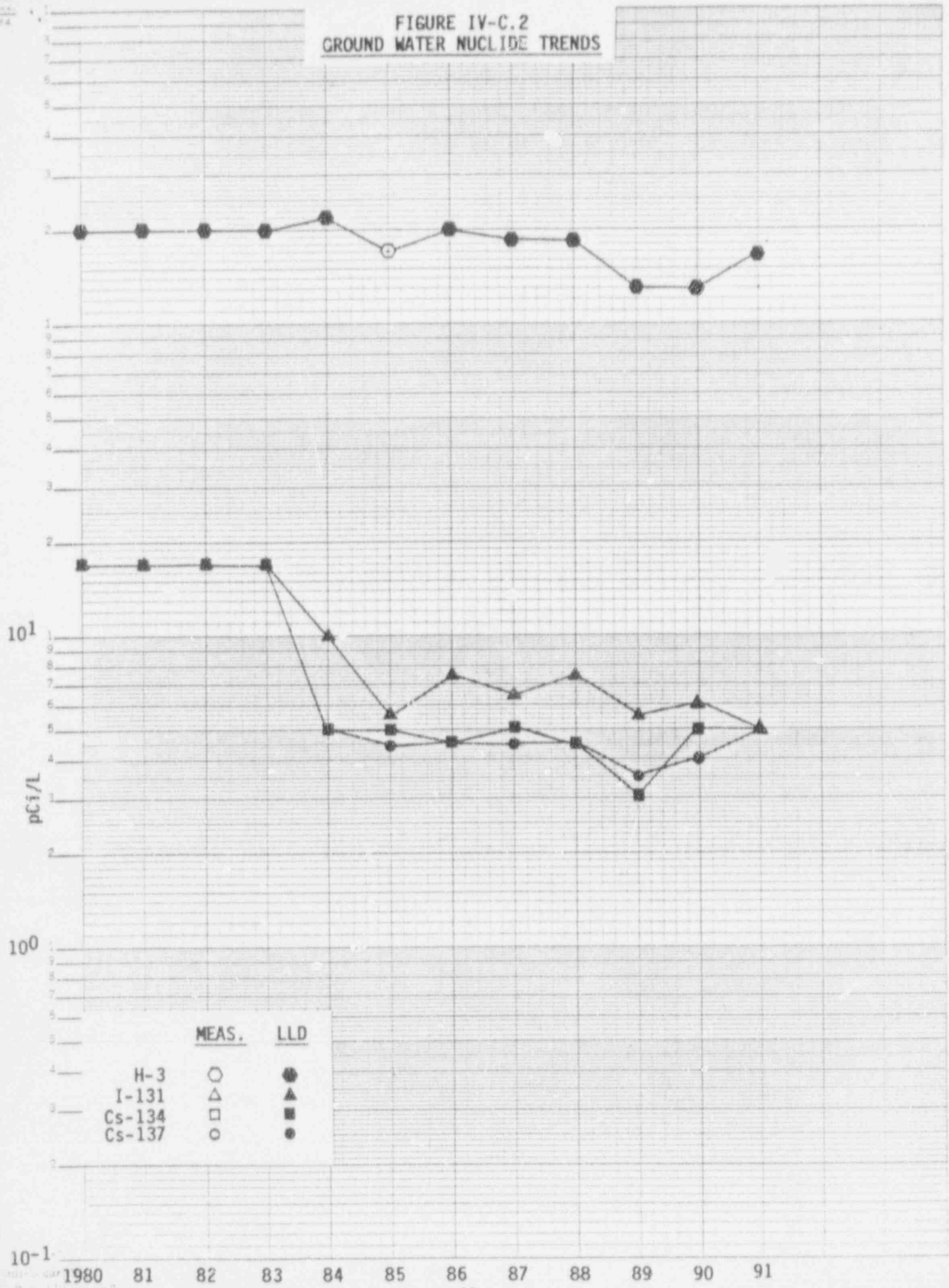


TABLE IV-C.3

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN	CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS	
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE		MEAN RANGE
DRINKING WATER (pCi/L)	Tritium 12	270	None	-	-	<LLD	0
	γ Spec 12						
	Mn-54	4	None	-	-	<LLD	0
	Fe-59	8	None	-	-	<LLD	0
	Co-58	4	None	-	-	<LLD	0
	Co-60	4	None	-	-	<LLD	0
	Zn-65	8	None	-	-	<LLD	0
	Zr-Nb-95	7	None	-	-	<LLD	0
	I-131	5	None	-	-	<LLD	0
	Cs-134	5	None	-	-	<LLD	0
Cs-137	4	None	-	-	<LLD	0	
Ba-La-140	11	None	-	-	<LLD	0	

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-C.3.a

FLORIDA POWER CORP. - CC3 - 1991

pCi/L ± EMITTERS AND TRITIUM IN DRINKING WATER

STATION	DATE	K-3	K-40	Mn-54	Fe-59	Co-58	Co-60	Zr-65	Zn-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C07	01-07	<145	<66	<3	<8	<3	<4	<8	<6	<4	<5	<5	<7
	04-02	<145	50 ± 22	<3	<6	<4	<3	<10	<5	<4	<4	<4	<7
	07-18	<172	<55	<4	<8	<4	<3	<9	<6	<4	<3	<4	<10
	10-07	<142	<48	<4	<7	<4	<3	<6	<7	<4	<4	<4	<8
C10	01-07	<145	<66	<4	<9	<5	<3	<6	<6	<5	<4	<4	<8
	04-02	<145	<71	<4	<6	<3	<5	<10	<8	<5	<4	<4	<7
	07-18	<132	<53	<5	<9	<4	<5	<9	<7	<5	<5	<5	<10
	10-07	<136	<61	<4	<10	<4	<5	<9	<7	<6	<4	<4	<8
C18	01-07	<145	<64	<4	<6	<3	<4	<9	<5	<5	<4	<3	<7
	04-01	<145	<61	<4	<9	<4	<4	<9	<5	<5	<3	<4	<5
	07-18	<132	<57	<4	<6	<4	<4	<9	<6	<4	<4	<4	<9
	10-07	<136	<63	<3	<8	<4	<5	<6	<7	<5	<5	<3	<4



FIGURE IV-C.3  
DRINKING WATER NUCLIDE TRENDS

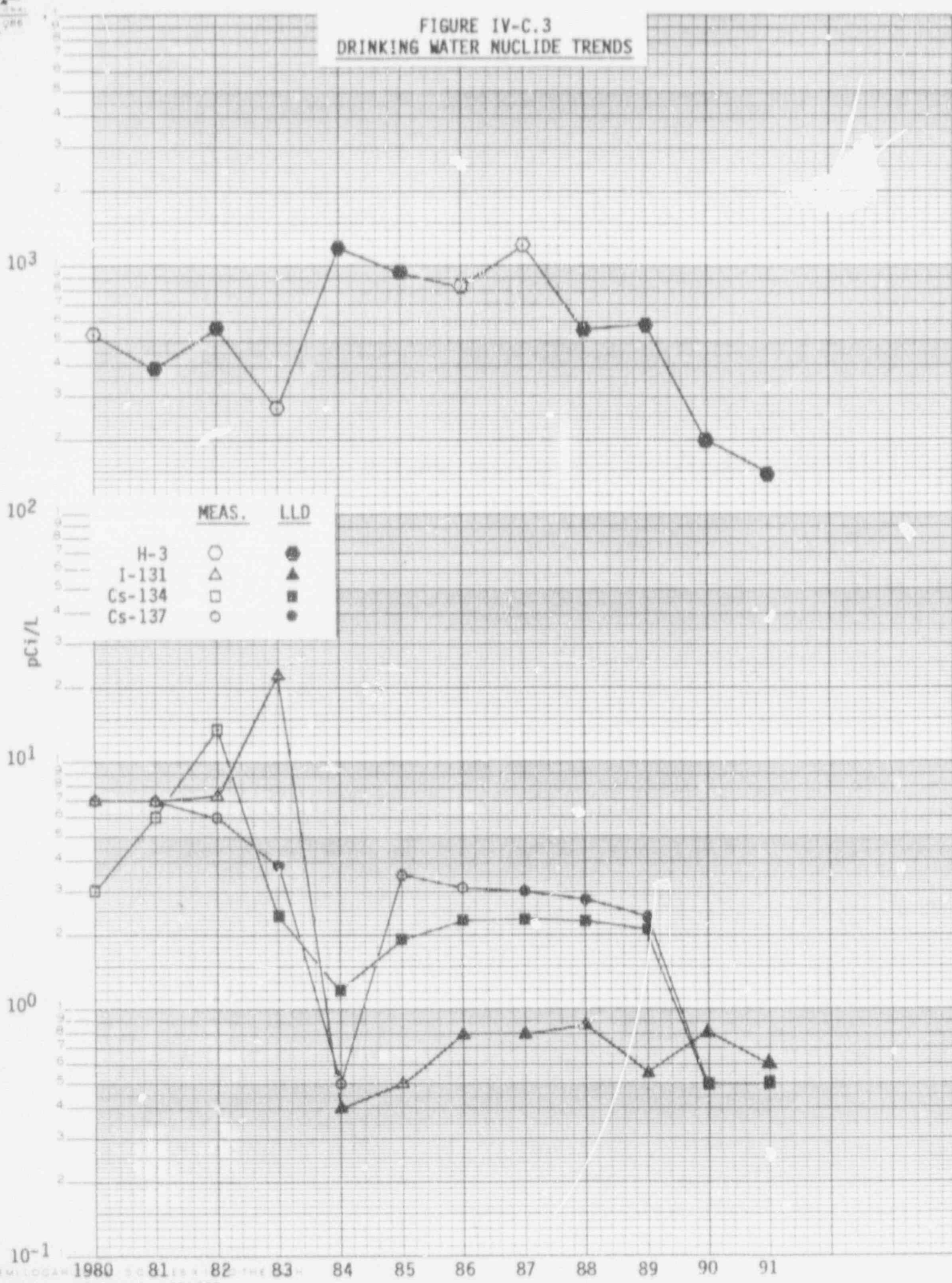




TABLE IV-C-4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE	MEAS RANGE			
SHORELINE SEDIMENT (pCi/kg)	7 Spec B Cs-134 Cs-137	14	<LLD				<LLD	0	0
		12	38 (4/6) (27 - 48)	C14H 0.1 @ 315'	43 (1/2)		<LLD	0	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-C.4.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg  $\gamma$  EMITTERS IN SHORELINE SEDIMENT

STATION	PERIOD	Cs-134	Cs-137	Co-58	Co-60	K-40	Rn-226
C09(1)	First Half	<11	<11	<7	<9	398 $\pm$ 58	296 $\pm$ 9
	Second Half	<10	<9	<9	<8	390 $\pm$ 61	292 $\pm$ 8
C14H	First Half	<20	43 $\pm$ 7	38 $\pm$ 6	93 $\pm$ 7	616 $\pm$ 86	1179 $\pm$ 26
	Second Half	<18	<14	<13	49 $\pm$ 5	439 $\pm$ 73	1260 $\pm$ 20
C14M	First Half	<21	35 $\pm$ 7	130 $\pm$ 12	378 $\pm$ 12	866 $\pm$ 96	958 $\pm$ 22
	Second Half	<19	48 $\pm$ 6	<16	236 $\pm$ 10	678 $\pm$ 91	1035 $\pm$ 26
C14G	First Half	<16	27 $\pm$ 8	<16	104 $\pm$ 7	344 $\pm$ 83	1123 $\pm$ 25
	Second Half	<14	<14	<13	30 $\pm$ 5	<271	1094 $\pm$ 20

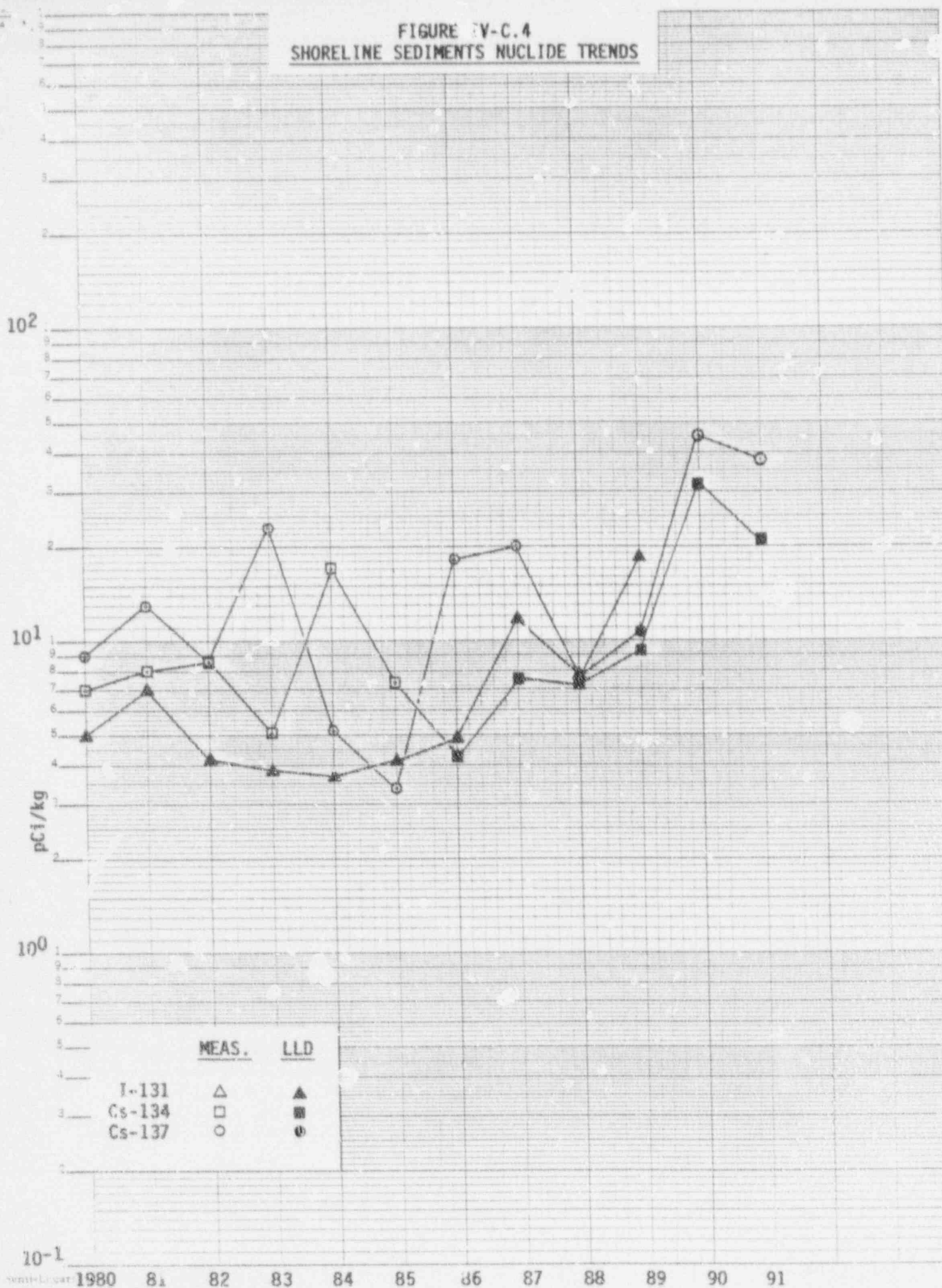
(1) C09 is the control station at Ft. Gulf Island Beach. C14H, M, & G are discharge canal stations.

(2) Mn-54 identified at 25  $\pm$  12 pCi/kg; Ag-110m identified at 35  $\pm$  6 pCi/kg.

first half samples taken 2-08-91.

second half samples taken 8-12-91.

FIGURE IV-C.4  
SHORELINE SEDIMENTS NUCLIDE TRENDS



#### IV-D. INGESTION PATHWAY

To evaluate the ingestion pathway, fish, oysters, citrus, and watermelon samples are taken.

1. Quarterly carnivorous fish samples were taken at two locations: C29 at the end of the discharge canal, and C30, the control location near the mouth of the intake canal. None of the required radionuclides were found in measurable quantities. The highest Cs-137 LLD for station C29 is 18 pCi/kg.
2. Quarterly oyster samples were taken at the same locations as fish samples, C29 and C30. Of the isotopes required to be evaluated for, none were found in measurable quantities, although Ag-110m was identified at a level of 540 pCi/Kg in the first quarter sample.
3. Monthly broadleaf vegetation samples were taken at two indicator locations, C48a and C48b, and one control location, C47. Sixteen of twenty-four indicator samples had measurable amounts of Cs-137 with an average concentration of 52 pCi/kg and a range of 19 to 109 pCi/kg. All control station samples had measurable amounts of Cs-137 with an average of 147 pCi/kg and a range of 29 to 109 pCi/kg.
4. Annual watermelon and citrus (oranges) samples are taken at stations C04 and C19, respectively. Cesium-137 was measured in the citrus sample at a level of 7 pCi/kg.

TABLE IV-D.1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE		NAME DISTANCE & BEARING	MEAN RANGE		
CARNIVOROUS FISH (pCi/kg)	7 Spec 8							
	Mn-54	9	<LLD	-	-	<LLD	0	
	Fe-59	16	<LLD	-	-	<LLD	0	
	Co-58	9	<LLD	-	-	<LLD	0	
	Co-60	10	<LLD	-	-	<LLD	0	
	Zn-65	17	<LLD	-	-	<LLD	0	
	Cs-134	9	<LLD	-	-	<LLD	0	
	Cs-137	9	<LLD	-	-	<LLD	0	

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.1.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg  $\gamma$  EMITTERS IN CARNIVOROUS FISH

STATION	QUARTER	Mn-54	Co-58	Co-60	Fe-59	Zn-65	Cs-134	Cs-137	K-40
C29	1	<12	<11	<16	<28	<32	<13	<18	3501
	2	<12	<10	<16	<21	<28	<13	<12	2726
	3	<17	<11	<20	<39	<36	<15	<15	2277
	4	<9	<10	<12	<24	<22	<11	<12	,865
C30	1	<18	<17	<21	<39	<42	<19	<18	2050
	2	<14	<12	<15	<26	<31	<14	<16	1721
	3	<22	<24	<28	<45	<51	<25	<26	3136
	4	<11	<11	<12	<26	<27	<12	<11	2712



FIGURE IV-D.1  
 INGESTION PATHWAY (CARNIVOROUS FISH)  
 NUCLIDE TRENDS

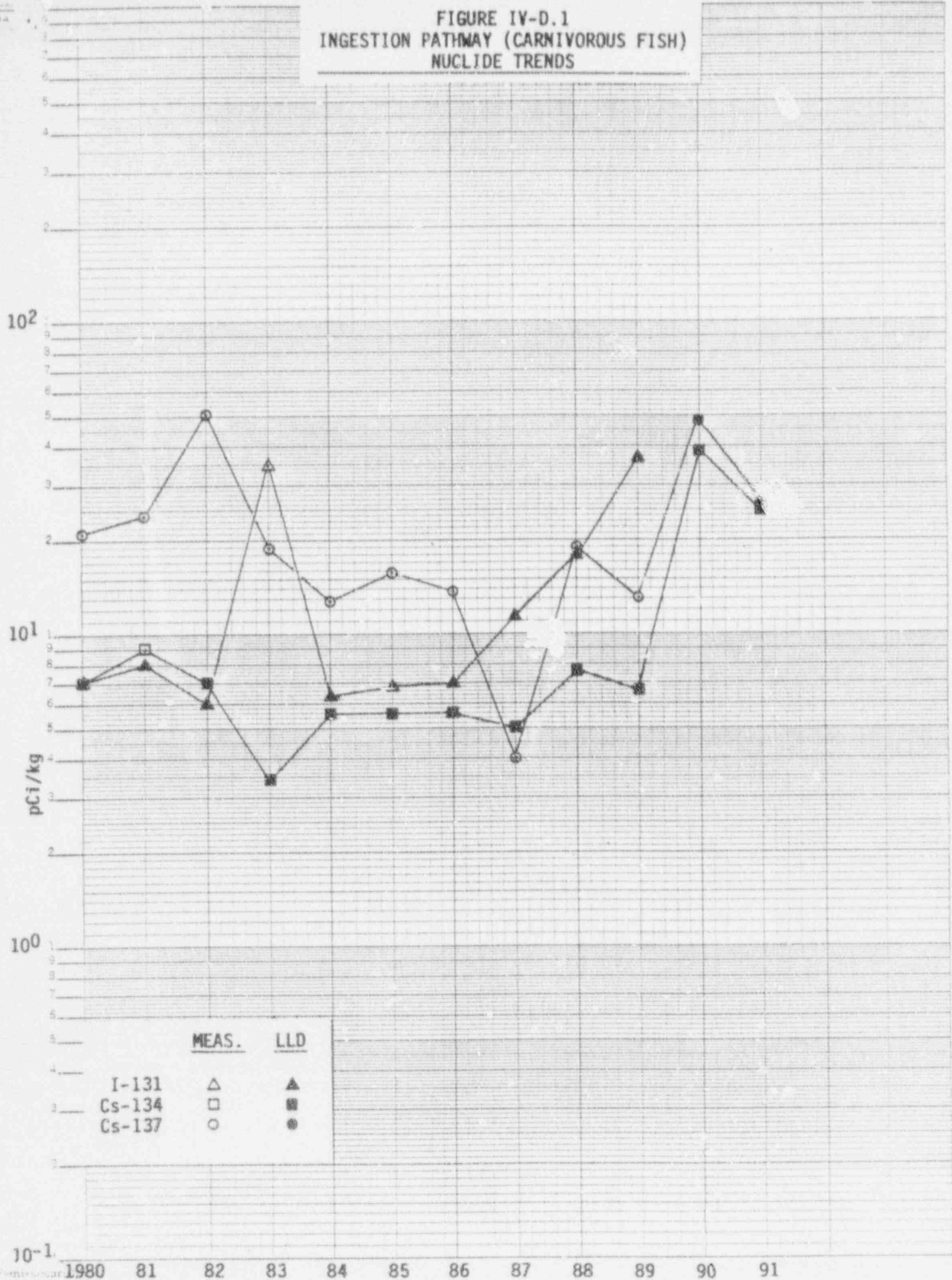




TABLE IV-D.2

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	MIL INDICATOR LOCATIONS		LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE		NAME DISTANCE & BEARING	MEAN RANGE		
OYSTERS (pCi/kg)	γ Spec B							
	Mn-54	9	<LLD	-	-	<LLD		0
	Fe-59	16	<LLD	-	-	<LLD		0
	Co-58	9	<LLD	-	-	<LLD		0
	Co-60	10	<LLD	-	-	<LLD		0
	Zn-65	17	<LLD	-	-	<LLD		0
	Cs-134	9	<LLD	-	-	<LLD		0
	Cs-137	9	<LLD	-	-	<LLD		0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.2.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg  $\gamma$  EMITTERS IN OYSTERS

STATION	QUARTER	Mn-54	Ce-58	Co-60	Fe-59	Zn-65	Cs-134	Cs-137	K-40
C29	1	<19	<23	<20	<47	<46	<21	<24	1263
	2	<30	<28	<50	<63	<81	<44	<48	1608
	3	<70	<68	<100	<128	<179	<90	<92	<1585
	4	<40	<37	<47	<72	<75	<40	<43	1685
C30	1	<13	<13	<24	<31	<35	<17	<17	1739
	2	<25	<29	<29	<57	<57	<32	<29	1768
	3	<34	<34	<46	<74	<65	<32	<35	1578
	4	<36	<43	<42	<73	<83	<46	<32	1088

FIGURE IV-D.2  
 INGESTION PATHWAY (OYSTERS) NUCLIDE TRENDS

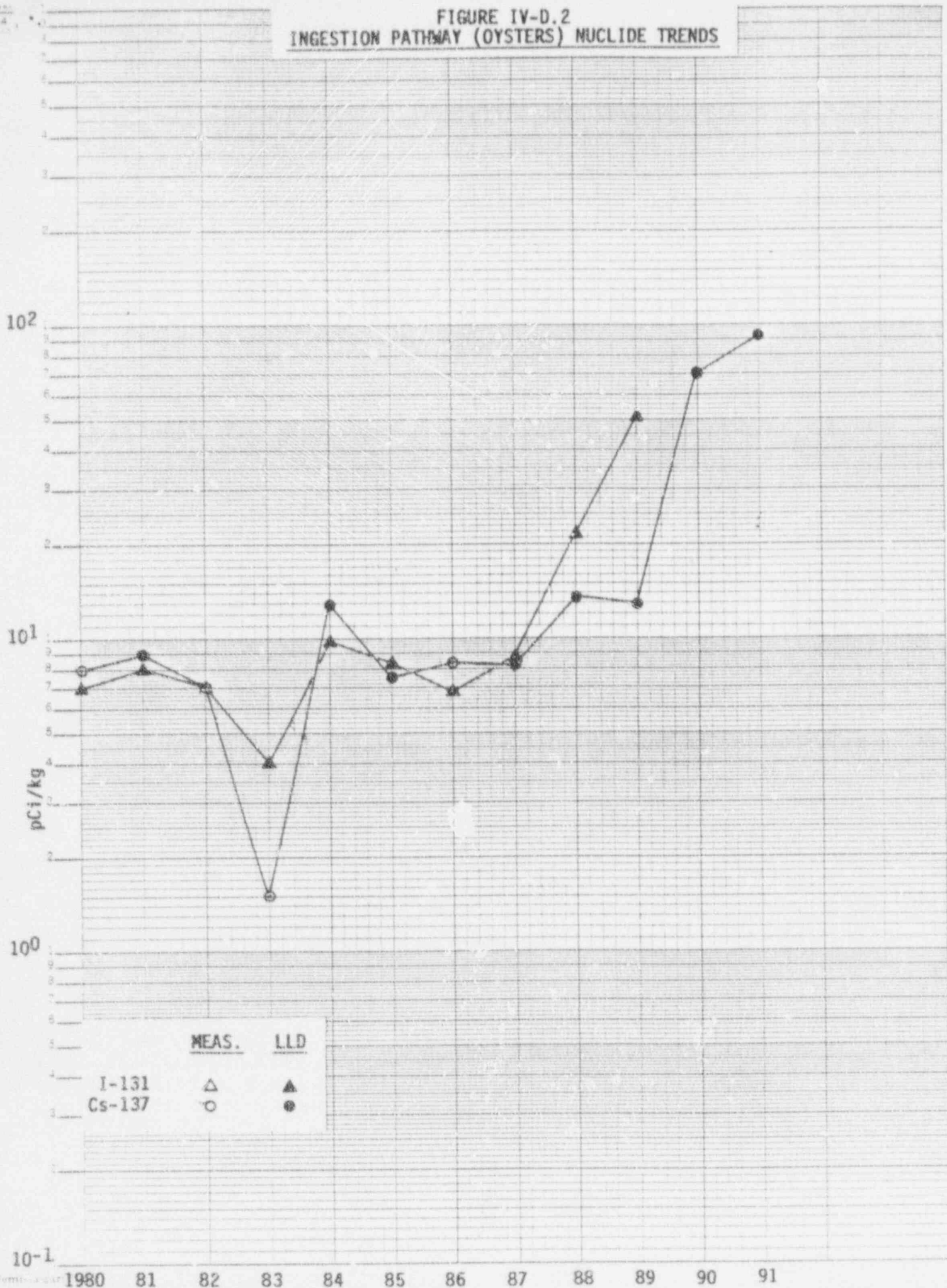


TABLE IV-D.3

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE	MEAN RANGE	
VEGETATION (pCi/kg)	γ Spec 36						
	I-131	9	<LLD	-	-	<LLD	0
	Cs-134	8	<LLD	-	-	<LLD	0
	Cs-137	8	52 (16/24) (19 - 109)	C47 80 @ 110'	147 (12/12) (29 - 321)	147 (12/12) (29 - 321)	0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.3.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg OF  $\gamma$  EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C47	JAN	<19	<21	126 $\pm$ 13	2510 $\pm$ 194
	FEB	<14	<21	39 $\pm$ 9	4208 $\pm$ 224
	MAR	<16	<12	29 $\pm$ 6	2882 $\pm$ 178
	APR	<12	<17	71 $\pm$ 9	3122 $\pm$ 197
	MAY	<16	<17	321 $\pm$ 17	3531 $\pm$ 207
	JUN	<14	<16	92 $\pm$ 10	2686 $\pm$ 164
	JUL	<10	<10	223 $\pm$ 11	2643 $\pm$ 131
	AUG	<18	<10	166 $\pm$ 12	3195 $\pm$ 174
	SEP	<14	<15	217 $\pm$ 13	2622 $\pm$ 171
	OCT	<13	<12	85 $\pm$ 8	3485 $\pm$ 145
	NOV	<19	<21	283 $\pm$ 19	3519 $\pm$ 238
	DEC	<17	<19	108 $\pm$ 12	3485 $\pm$ 210
C48A	JAN	<13	<14	79 $\pm$ 11	2736 $\pm$ 174
	FEB	<18	<16	74 $\pm$ 10	2369 $\pm$ 173
	MAR	<19	<11	<13	2439 $\pm$ 153
	APR	<15	<20	<24	1679 $\pm$ 169
	MAY	<16	<12	19 $\pm$ 6	3531 $\pm$ 207
	JUN	<13	<17	41 $\pm$ 9	3414 $\pm$ 196
	JUL	<13	<12	40 $\pm$ 10	4429 $\pm$ 210
	AUG	<18	<12	90 $\pm$ 11	4410 $\pm$ 218
	SEP	<11	<10	<17	1252 $\pm$ 121
	OCT	<15	<15	25 $\pm$ 7	2742 $\pm$ 163
	NOV	<12	<13	19 $\pm$ 6	2483 $\pm$ 171
	DEC	<19	<15	<18	1554 $\pm$ 172

TABLE IV-D.3.a (CONT'D)

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg OF  $\gamma$  EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C48B	JAN	<17	<15	80 $\pm$ 11	2666 $\pm$ 207
	FEB	<18	<18	<40	1985 $\pm$ 182
	MAR	<24	<16	<16	3746 $\pm$ 198
	APR	<9	<12	<16	2387 $\pm$ 146
	MAY	<16	<12	36 $\pm$ 8	4211 $\pm$ 210
	JUN	<15	<16	26 $\pm$ 8	3683 $\pm$ 202
	JUL	<11	<13	<10	4856 $\pm$ 191
	AUG	<15	<16	80 $\pm$ 11	4426 $\pm$ 271
	SEP	<12	<19	109 $\pm$ 12	3893 $\pm$ 193
	OCT	<18	<13	37 $\pm$ 9	2559 $\pm$ 174
	NOV	<17	<19	56 $\pm$ 12	3846 $\pm$ 233
	DEC	<23	<18	22 $\pm$ 8	2253 $\pm$ 181



FIGURE IV-D.3  
VEGETATION NUCLIDE TRENDS

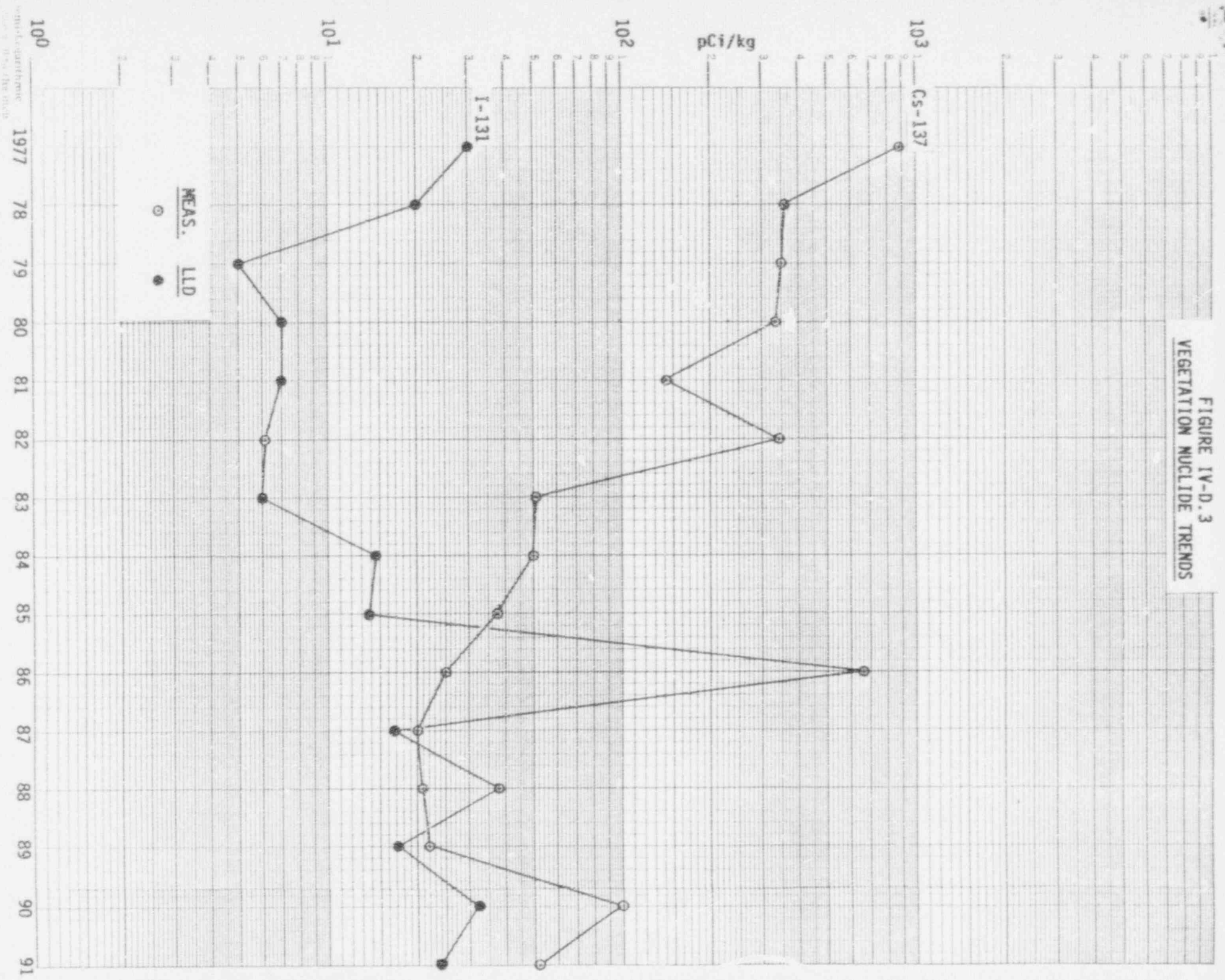




TABLE IV-D.4

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 5-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 1991

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup>	<u>ALL INDICATOR LOCATIONS</u>	<u>LOCATION WITH HIGHEST MEAN</u>		<u>CONTROL LOCATION</u>		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME DISTANCE & BEARING	MEAN RANGE	MEAN RANGE		
WATERMELON (pCi/kg)	7 Spec 1							
	I-131	9	<LLD	-	-	None		0
	Cs-134	8	<LLD	-	-	None		0
	Cs-137	8	<LLD	-	-	None		0
CITRUS (pCi/kg)	7 Spec 1							
	I-131	9	<LLD	-	-	None		0
	Cs-134	8	<LLD	-	-	None		0
	Cs-137	8	7 (1/1)	C19 8.5 @ 65°	7 (1/1)	None		0

(1) The "a priori" LLD which meets or exceeds the requirements of Table 4.12-1 of CR-3 Technical Specifications.

TABLE IV-D.4.a

FLORIDA POWER CORP. - CR3 - 1991

pCi/kg OF  $\gamma$  EMITTERS IN WATERMELON AND CITRUS

STATION	DATE	I-131	Cs-134	Cs-137	K-40
C04 - Watermelon	06-04	<6	<5	<6	1310
C19 - Citrus	01-07	<19	<6	7	1461