



Crystal River Nuclear Plant  
Docket No. 50-302  
Operating License No. DPR-72

Ref: ITS 5.7.1.1(b)

May 1, 2007  
3F0507-02

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Subject: Crystal River Unit 3 – 2006 Annual Radiological Environmental Operating Report

Dear Sir:

Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., hereby submits the 2006 Annual Radiological Environmental Operating Report for Crystal River Unit 3 (CR-3) in accordance with the CR-3 Improved Technical Specifications, Section 5.7.1.1(b) and Section 6.6 of the Offsite Dose Calculation Manual (ODCM). The data provided in the attached report is consistent with the objectives outlined in the ODCM, and includes all radiological environmental samples taken during the report period from January 1, 2006 through December 31, 2006.

If you have any questions regarding this submittal, please contact Mr. Paul Infanger, Supervisor, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

A handwritten signature in black ink, appearing to read "J. A. Franke".

J. A. Franke  
Plant General Manager

JAF/ff

Attachment

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

Progress Energy Florida, Inc.  
Crystal River Nuclear Plant  
15760 W. Power Line Street  
Crystal River, FL 34428

IE25

**PROGRESS ENERGY FLORIDA, INC.**

**CRYSTAL RIVER UNIT 3**

**DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72**

**ATTACHMENT**

**ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING  
REPORT 2006**

**PROGRESS ENERGY FLORIDA, INC.**

**CRYSTAL RIVER UNIT 3**

**ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT**

**2006**

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## INTRODUCTION

This report is submitted as required by Technical Specification 5.7.1.1(b) to the Crystal River Facility Operating License No. DPR-72, and Section 6.6 of the Offsite Dose Calculation Manual.

The following information is required to be included in this report:

- Data Summaries
- Interpretations
- Unachievable LLDs
- An analysis of trends
- 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 correct it.

- Summarized and tabulated results of all radiological environmental samples taken during the report period, in the format of Radiological Assessment Branch Technical Position, Revision 1, November, 1979

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 Radiological Environmental Monitoring Program
- A map of all sampling locations keyed to a table giving distances and directions from the reactor
- Land-use census results
- Interlaboratory Comparison Program results
- A discussion of airborne sample station availability.
- Results of any unplanned release or spill of radioactive material that could have the potential to contaminate the groundwater as reported to maintain compliance with the groundwater protection initiative.

## I. SUMMARY DESCRIPTION OF THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The analytical results of the Crystal River Unit 3 (CR-3) operational Radiological Environmental Monitoring Program (REMP) for 2006 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, Bureau of Radiation Control. The State also performs the required analyses, participates in the Interlaboratory Comparison Program, and performs the annual land-use census. Prior to 1990, the program was split between the Department of Health and the University of Florida. The transition to the State performing all of the program's sampling and analyses in 1990 is evident in several of the trend graphs, most notably oysters and carnivorous fish, and is due to the State using less sensitive measurement techniques for several of the pathways which were formerly evaluated by the University of Florida.

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 2006 REMP have been compared to previous years' results. This comparison, in part illustrated by the trend graphs of Section IV, shows no evidence of consistent long-term increasing trends in any of the sample media. However, radioactive material is routinely quantified in sediment samples which are taken in the discharge canal near the liquid release discharge point. In general, these results verify the effectiveness of in-plant measures for controlling radioactive releases.

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. LLD and measured values are plotted on the same line to best illustrate any trend. As shown on each graph's legend, any measured value is noted by a text box, unless all values trended are measured values for that particular parameter.

Statistical summary pages are provided for each medium or pathway. Measured values are reported in terms of a mean and range. In addition, the number of measured values versus samples obtained is reported. For example, the following entry

15 (249/256)  
(4 - 35)

in the "All Indicator Locations" column would be interpreted as indicating a mean measured value of 15, with measured values ranging from 4 to 35. (249/256) means that out of 256 samples, 249 were measured values.

TABLE I-1

## PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	APPROX. DISTANCE
			(Miles)
TLD	C60	N	0.88
	C61	NNE	0.92
	C62	NE	1.17
	C63	ENE	0.87
	C64	E	0.80
	C65	ESE	0.33
	C66	SE	0.36
	C67	SSE	0.33
	C68	S	0.27
	C69	SSW	0.31
	C41	SW	0.43
	C70	WSW	0.74
	C71	WNW	0.58
	C72	NW	0.30
	C73	NNW	0.74
	C27	W	0.41
	C18	N	5.3
	C03	NNE	4.89
	C04	NE	5.95
	C74	ENE	5.13
	C75	E	3.99
	C76	ESE	5.61
	C08	SE	5.66
	C77	SSE	3.39
	C09	S	3.23
	C78	WSW	4.59
	C14G	W	2.53
	C01	NW	4.8
	C79	NNW	4.97
	C47-Control	ESE	78
	C07*	ESE	7.67
	C40*	E	3.48
	C46*	N	0.37

\*TLDs not required by ODCM. Deployed at air sample locations.

**TABLE I-1 (CONT'D)**  
**PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006**

**SAMPLE STATION LOCATIONS**

SAMPLE MEDIA	STATION ID	DIRECTION	DISTANCE (Miles)
AIR	C07	ESE	7.7
	C18	N	5.3
	C40	E	3.5
	C41	SW	0.4
	C46	N	0.4
	C47-Control	ESE	78
SEAWATER	C14H	NW	0.1
	C14G	W	2.5
	C13-Control	WSW	4.6
GROUND WATER	C40-Control	E	3.6
DRINKING WATER	C07-Control	ESE	7.4
	C10-Control	ESE	6.0
	C18-Control	N	5.3
SHORELINE SEDIMENT	C09-Control	S	3.2
	C14H	NW	0.1
	C14M	W	1.2
	C14G	W	2.5
FISH & OYSTERS	C29	W	2.5
	C30-Control	WSW	3.4
BROAD LEAF VEGETATION	C48A	N	0.4
	C48B	NNE	0.9
	C47-Control	ESE	78
WATERMELON	C04	NE	13
CITRUS	C19	ENE	9.6



**TABLE I-2**  
**PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006**  
**SAMPLING AND ANALYSIS PROGRAM**

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD <sup>1</sup>	
TLD	33*	Quarterly	γ Dose	---	
Air Iodine	6	Weekly	I-131	0.07 pCi/m <sup>3</sup>	
Air Particulate	6	Weekly	Gross β	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				
Ground Water	1	Semiannual	Tritium	2000 pCi/L	
		Semiannual	γ Spec :	<sup>2</sup>	
Drinking Water	3	Quarterly	Tritium	2000 pCi/L	
		Quarterly	γ Spec :	<sup>2</sup>	
Shoreline Sediment	4	Semiannual	γ Spec :	Cs-134	150 pCi/kg
			Cs-137	180	

\*Includes 3 stations which are not required by the ODCM

<sup>1</sup>The maximum "a priori" LLD

<sup>2</sup>Same as Seawater γ Spec

<sup>3</sup>When available

<sup>4</sup>During harvest

<sup>5</sup>Same as broad leaf vegetation

**TABLE I-2 (Cont'd)**  
**PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006**  
**SAMPLING AND ANALYSIS PROGRAM**

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD <sup>1</sup>	
Carnivorous Fish and Oysters	2	Quarterly	$\gamma$ Spec :	Mn-54	130 pCi/kg
				Fe-59	260
				Co-58	130
				Co-60	130
				Zn-65	260
				Cs-134	130
				Cs-137	150
Broad Leaf Vegetation	3	Monthly <sup>3</sup>	$\gamma$ Spec :	I-131	60 pCi/kg
				Cs-134	60
				Cs-137	80
Watermelon	1	Annual <sup>4</sup>	$\gamma$ Spec :	<sup>5</sup>	<sup>5</sup>
Citrus	1	Annual <sup>4</sup>	$\gamma$ Spec :	<sup>5</sup>	<sup>5</sup>

<sup>1</sup>The maximum "a priori" LLD

<sup>2</sup>Same as Seawater  $\gamma$  Spec

<sup>3</sup>When available

<sup>4</sup>During harvest

<sup>5</sup>Same as broad leaf vegetation

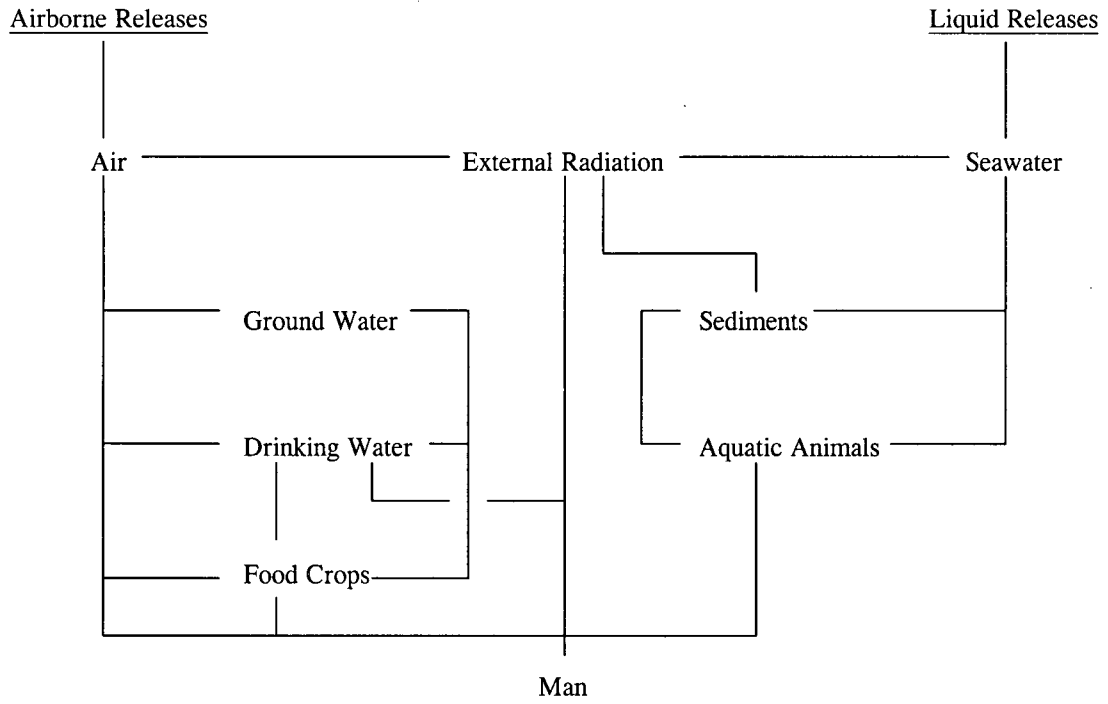


FIGURE I-1: Environmental Media and Exposure Pathways

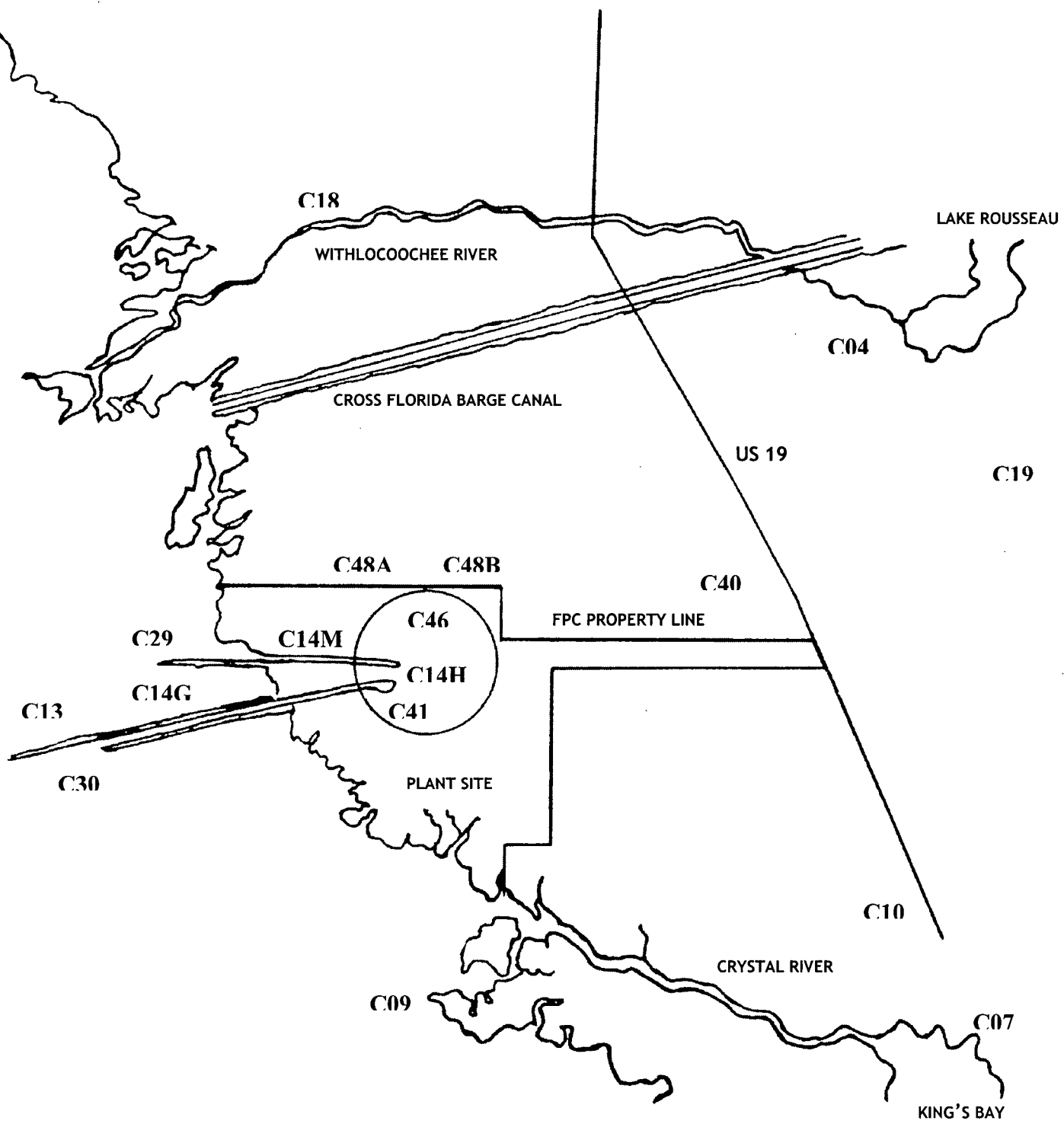


FIGURE I-2: Environmental Monitoring Sample Stations (non-TLDs)



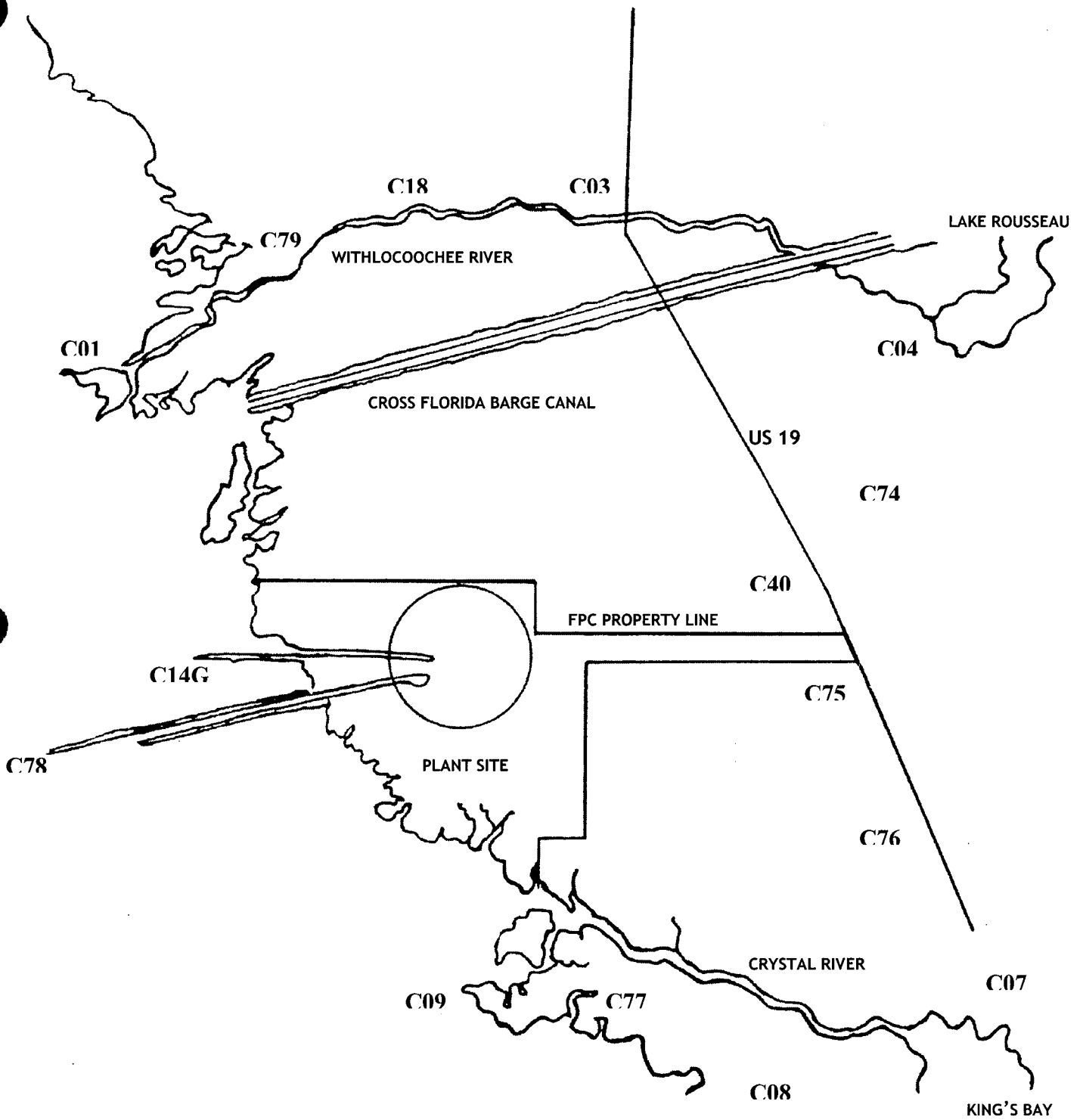


FIGURE I-4: Environmental Monitoring TLD Locations (off site)

## II. LAND-USE CENSUS

A land-use census was conducted during June and July. The purpose of this census is to identify the nearest residences, vegetable gardens, and potential milk-producing animals within a five mile radius of the nuclear plant. 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 (A)	NEAREST MILK ANIMAL
N	4.46 @ 2°	4.77 @ 2°	*
NNE	3.95 @ 15°	*	*
NE	3.84 @ 54°	*	*
ENE	3.43 @ 60°	*	*
E	2.40 @ 92°	*	*
ESE	4.24 @ 102°		*
SE	4.90 @ 133°	*	*
SSE	3.53 @ 149°	*	*
S	*	*	*
SSW	*	*	*
SW	*	*	*
WSW	*	*	*
W	*	*	*
WNW	*	*	*
NW	4.77 @ 323°	*	*
NNW	4.60 @ 339°	*	*

(A)- Only gardens with an estimated total area of 500 square feet, or more, and producing green leafy vegetables are considered.

\* No suitable sites were located within 5 miles.

**FLORIDA DEPARTMENT OF HEALTH - INTERLABORATORY COMPARISON PROGRAM DATA**

The EPA crosscheck program ceased operation at the end of 1998. To meet the requirements for a crosscheck program, the Florida Department of Health participates in the Department of Energy's Mixed-Analyte Performance Evaluation Program (MAPEP). The following units are used for each of the four media:

Air Filters: Bq/sample  
 Soil: Bq/Kg  
 Vegetation: Bq/sample  
 Water: Bq/L

Analytical performance is based on historical analytical capabilities for individual analyte/matrix pairs.  
 Acceptable performance is designated by an "A".  
 Acceptable with warning is designated by a "W".  
 Performance which is not acceptable is designated by an "N".

**Results for January 2006:**

Media	Nuclide	Result	% Bias	Acceptance Range	Flag
Air	Cs-134	2.92	-0.5	2.05 - 3.81	A
Air	Cs-137	2.58	1.9	1.77 - 3.29	A
Air	Gross Beta	0.444	-7.7	0.24 - 0.72	A
Soil	Co-60	428.93	-4.1	312.97 - 581.23	A
Soil	Cs-137	335.37	-1.3	237.78 - 441.60	A
Vegetation	Co-60	4.10	-9.3	3.16 - 5.88	A
Vegetation	Cs-137	2.84	-7.6	2.15 - 4.00	A
Water	H-3	1039.3	9.2	661.41 - 1238.00	A
Water	Mn-54	328.47	4.3	220.50 - 409.50	A
Water	Co-60	154.50	0.7	107.45 - 199.55	A
Water	Zn-65	242.77	6.4	159.71 - 296.61	A
Water	Cs-134	95.36	0.3	66.57 - 123.63	A

**Results for July 2006:**

Media	Nuclide	Result	% Bias	Acceptance Range	Flag
Air	Cs-134	3.29	4.5	2.20 - 4.09	A
Air	Cs-137	2.03	12.5	1.26 - 2.35	A
Air	Gross Beta	0.39	8.6	0.18 - 0.54	A
Soil	Cs-134	457.75	1.2	316.49 - 587.77	A
Soil	Cs-137	545.2	3.7	368.01 - 683.45	A
Vegetation	Cs-134	6.99	-6.6	5.24 - 9.73	A
Vegetation	Cs-137	5.03	-8.5	3.85 - 7.14	A
Water	H-3	469.59	9.5	300.20 - 557.50	A
Water	Co-60	48.54	2.2	33.20 - 61.80	A
Water	Zn-65	351.5	6.5	231.00 - 429.00	A
Water	Cs-134	166.9	-0.1	116.90 - 217.10	A
Water	Cs-137	326.4	-2.0	233.10 - 432.90	A



#### IV-A. AIRBORNE PATHWAY

Air samples are taken at five locations in the vicinity of the plant. The control location is 78 miles ESE of the plant, at the State Bureau of Radiation Control in Orlando.

Table IV-A.1 provides a statistical summary of the analytical results for 318 gross beta samples and 312 iodine samples.

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

Three hundred eighteen particulate samples were analyzed for gross beta activity, all of which had measurable activity. The average indicator concentration was 19 pCi/1000 m<sup>3</sup> with a range of 4 to 41 pCi/1000 m<sup>3</sup>. The average indicator concentration since 1996 was in the range of 15 to 19 pCi/1000 m<sup>3</sup>. The control location concentration for 2006 averaged 18 pCi/1000 m<sup>3</sup>, with a range of 4 to 35 pCi/1000 m<sup>3</sup>.

Three hundred and twelve samples were analyzed for iodine activity, with none having measurable activity.

Quarterly composite data are summarized in Table IV-A.4. Measurable quantities of cesium were not identified. The highest cesium LLD was 2.3 pCi/1000 m<sup>3</sup> for cesium 134.

There were no missed, lost, or non-collected samples for the year 2006. There were no air sample stations that had any appreciable down time. All 6 sample stations were in service 100% of the time, with exception of filter changes and air pump/gas meter replacements.

TABLE IV-A.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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		
AIRBORNE IODINE (pCi/m <sup>3</sup> )	γ Spec 312 I-131	0.02	<LLD	-	<LLD	0
AIRBORNE PARTICULATES (pCi/1000m <sup>3</sup> for Gross β, pCi/1000m <sup>3</sup> for γ Spec)	Gross β 318 γ Spec 24 Cs-134 Cs-137	6.4	19 (318/318) (4-41)	C18 5.2 @ 0°	19 (52/52) (9-34)	18 (52/52) (4-35)
		1.4	<LLD	-	<LLD	0
		1.1	<LLD	-	<LLD	0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-A.2

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Jan-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10-Jan-06	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01
17-Jan-06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24-Jan-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
31-Jan-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
07-Feb-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
14-Feb-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28-Feb-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
06-Mar-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
13-Mar-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
21-Mar-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27-Mar-06	<0.02	<0.02	<0.02	<0.02	<0.03	<0.02

TABLE IV-A.2 (Cont'd)

## PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
04-Apr-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
11-Apr-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
17-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
25-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
02-May-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
09-May-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
16-May-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
23-May-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
30-May-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
05-Jun-06	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
12-Jun-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
20-Jun-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27-Jun-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE IV-A.2 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Jul-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11-Jul-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18-Jul-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
25-Jul-06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
01-Aug-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
07-Aug-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
15-Aug-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
22-Aug-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
29-Aug-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
05-Sep-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
12-Sep-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
19-Sep-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
25-Sep-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

TABLE IV-A.2 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Oct-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
09-Oct-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
17-Oct-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24-Oct-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30-Oct-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
07-Nov-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
14-Nov-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
21-Nov-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
29-Nov-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
05-Dec-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12-Dec-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19-Dec-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26-Dec-06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

TABLE IV-A.3

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/1000m<sup>3</sup> GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Jan-06	20	25	24	23	22	25
10-Jan-06	30	31	23	28	25	24
17-Jan-06	15	11	15	18	19	17
24-Jan-06	15	13	13	11	13	14
31-Jan-06	14	16	20	14	15	14
07-Feb-06	18	19	15	18	15	15
14-Feb-06	24	17	22	23	10	15
22-Feb-06	17	14	17	14	16	16
28-Feb-06	20	18	20	22	21	24
06-Mar-06	22	26	21	24	25	24
13-Mar-06	20	15	24	23	18	21
21-Mar-06	23	21	20	20	15	22
27-Mar-06	15	18	15	13	17	19
Average:	19	19	19	19	18	19

TABLE IV-A.3 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/1000m<sup>3</sup> GROSS  $\beta$  IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
04-Apr-06	19	20	14	18	21	17
11-Apr-06	21	20	12	15	16	18
17-Apr-06	16	12	21	16	17	21
25-Apr-06	14	20	13	15	18	19
02-May-06	16	20	15	23	18	17
09-May-06	25	27	28	20	25	26
16-May-06	16	18	14	18	10	21
23-May-06	21	17	20	20	15	18
30-May-06	24	24	18	22	20	21
05-Jun-06	23	20	9	19	23	15
12-Jun-06	26	27	23	4	20	16
20-Jun-06	17	14	14	15	14	16
27-Jun-06	7	9	14	15	11	9
Average:	19	19	16	17	18	18



TABLE IV-A.3 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/1000m<sup>3</sup> GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Jul-06	20	19	16	19	21	14
11-Jul-06	11	10	15	12	8	9
18-Jul-06	8	11	12	10	10	9
25-Jul-06	10	15	17	16	15	13
01-Aug-06	16	16	21	19	17	16
07-Aug-06	19	23	23	18	23	22
15-Aug-06	12	12	12	15	13	22
22-Aug-06	11	11	11	14	10	14
29-Aug-06	8	12	9	11	5	4
05-Sep-06	18	18	14	15	14	8
12-Sep-06	13	14	14	16	14	10
19-Sep-06	22	23	21	22	23	24
25-Sep-06	29	25	30	25	24	26
Average:	15	16	16	16	15	15

TABLE IV-A.3 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/1000m<sup>3</sup> GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Oct-06	35	43	30	41	35	35
09-Oct-06	29	20	22	28	27	17
17-Oct-06	23	25	18	25	26	25
24-Oct-06	24	23	24	23	21	25
30-Oct-06	25	28	25	25	28	27
07-Nov-06	21	20	19	15	20	19
14-Nov-06	30	34	21	26	30	28
21-Nov-06	28	28	31	29	22	26
29-Nov-06	11	15	12	14	15	12
05-Dec-06	23	24	17	18	16	11
12-Dec-06	25	25	26	25	26	24
19-Dec-06	19	19	17	19	16	18
26-Dec-06	9	15	15	18	18	16
Average:	23	24	21	23	23	22

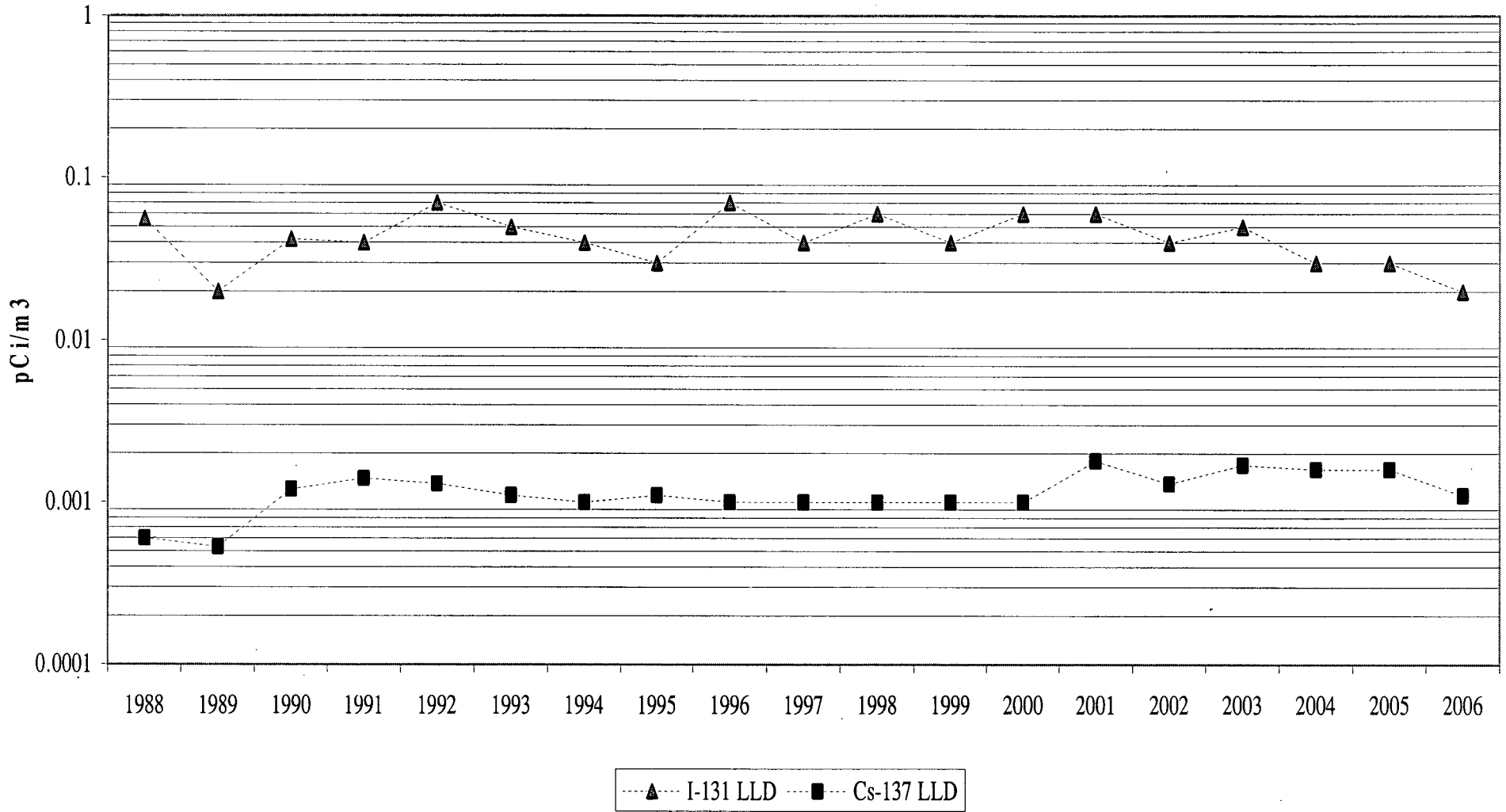
TABLE IV-A.4

## PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/1000m<sup>3</sup>  $\gamma$  EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
C07	Be-7	213	206	139	177
	K-40	<18	<19	<23	<15
	Cs-134	<1.3	<1.2	<1.4	<1.1
	Cs-137	<0.7	<1.0	<1.2	<0.8
C18	Be-7	155	204	156	183
	K-40	<18	<25	<20	<17
	Cs-134	<1.1	<2.1	<1.0	<1.8
	Cs-137	<1.1	<1.3	<0.9	<1.7
C40	Be-7	186	168	124	184
	K-40	<18	<26	<25	<21
	Cs-134	<1.5	<2.3	<1.4	<0.9
	Cs-137	<0.9	<1.5	<1.3	<0.9
C41	Be-7	177	177	148	191
	K-40	<16	<32	<16	<15
	Cs-134	<1.5	<2.1	<1.4	<1.2
	CS-137	<1.2	<1.1	<0.9	<1.1
C46	Be-7	193	221	138	196
	K-40	<21	<16	<23	<20
	Cs-134	<1.4	<1.3	<1.0	<1.5
	Cs-137	<1.1	<0.8	<0.7	<0.9
C47	Be-7	228	205	152	185
	K-40	<22	<26	<21	<16
	Cs-134	<1.9	<1.5	<1.1	<1.0
	Cs-137	<1.4	<1.4	<0.7	<0.6

Airborne



## IV-B. DIRECT RADIATION

Direct radiation measurements (using TLDs) were taken at seventeen locations (stations C60 through C73 and station C27) within one mile of the plant, at fifteen locations ranging from 2.8 to 6.3 miles from the plant, and at one control location 78 miles from the site. One-hundred and thirty-two TLDs were collected during 2006.

Table IV-B provides a statistical summary of the analytical results for 132 TLDs sampled throughout the year.

Table IV-B.1 provides the results of the individual TLD measurements.

The highest on-site dose was 102 mrem/yr at station C71 (WNW at 3600 feet). Station C71 was relocated in 1992 due to construction of the helper cooling towers on the former site. The new location has a higher background radiation level due to being closer to the storage pond for Units 4 & 5 fly ash, which produces a higher external radiation component than normal levels of natural background. The second highest on-site dose was 65 mrem/yr at station C65 (ESE at 1740 feet).

The highest off-site dose was 58 mrem/yr at station C40 (east at 3.5 miles). The control station (C47) dose was 49 mrem/yr. The average for all stations (except control) was 53 mrem/yr for 2006, 54 mrem/yr for 2005, and 58 mrem/yr for 2004. Direct radiation results are similar to previous years and show no change of significance.

TABLE IV-B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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)	γ DOSE 132	15	53 (128/128) (33 - 109)	C71 0.6 @ 296°	102 (4/4) (97 - 103)	49 (4/4) (48 - 53)	0

TABLE IV-B.1

## PROGRESS ENERGY FLORIDA, INC. - CR-3 - 2006

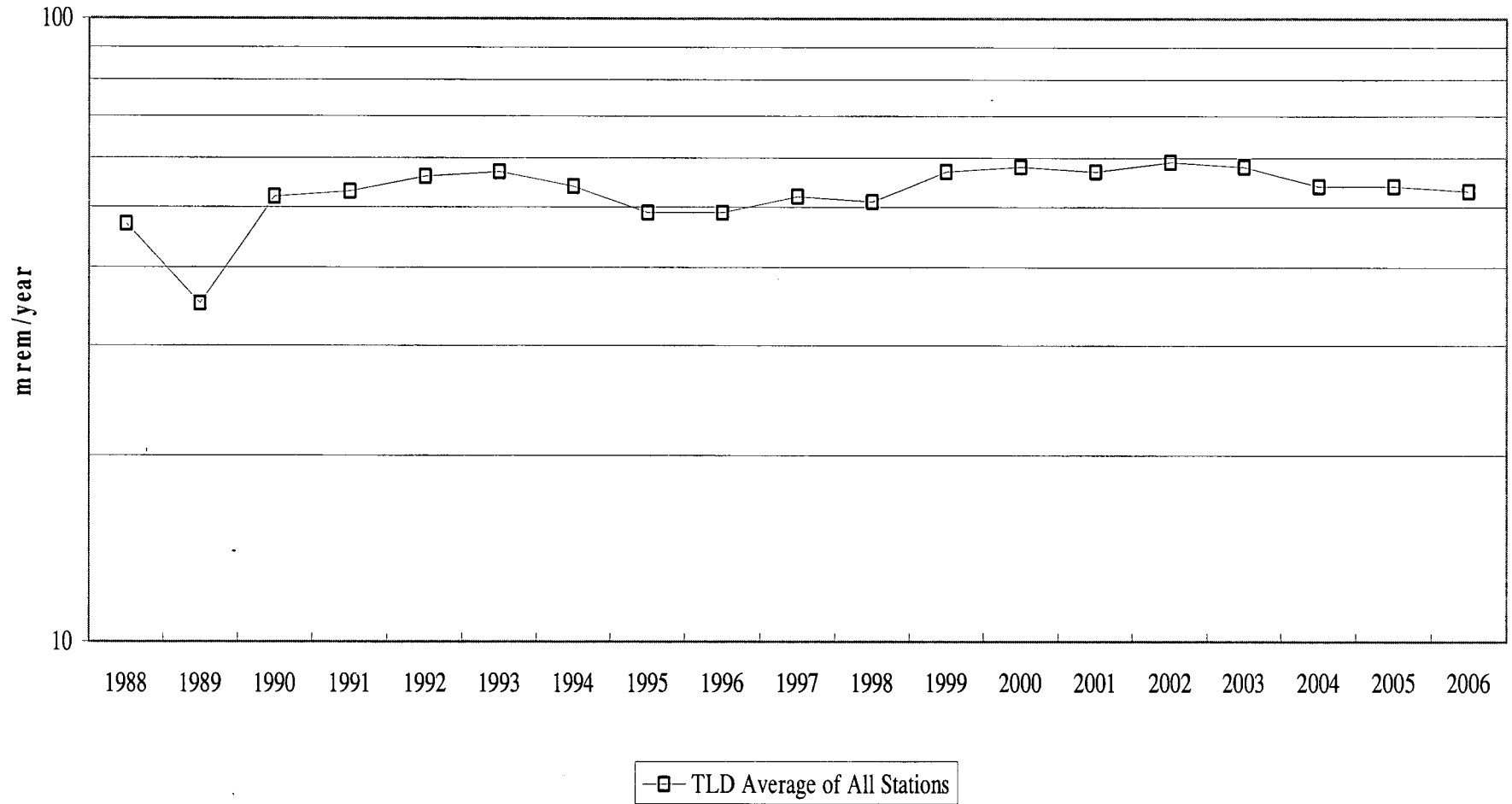
mrem/yr  $\gamma$  Dose

TLD STATION	Quarter	1	2	3	4
CO1		43	44	42	41
CO3		43	39	43	41
CO4		42	38	40	41
CO7*		41	42	41	41
CO8		41	43	41	40
CO9		44	41	43	42
C14G		53	57	49	48
C18		50	51	46	45
C27		63	63	60	60
C40*		60	57	58	56
C41		55	57	51	55
C46*		50	53	52	51
C47 (CONTROL)		49	52	48	49
C60		53	54	52	53
C61		55	58	53	56
C62		62	67	57	60
C63		56	60	55	62
C64		57	56	47	54
C65		68	71	60	62
C66		55	56	51	55
C67		54	56	49	53
C68		58	57	50	59
C69		64	61	57	61
C70		63	57	56	59
C71		100	109	97	103
C72		62	63	58	59
C73		53	51	52	52
C74		43	40	41	39
C75		51	52	55	49
C76		51	48	43	49
C77		38	33	36	38
C78		47	42	40	43
C79		52	53	44	48

\*TLDs not required by the ODCM.

Quarterly values are multiplied by 4 to obtain an equivalent yearly dose.

### Direct Radiation





#### IV-C. WATERBORNE PATHWAY

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

1. Monthly seawater grab samples are taken at two locations in the discharge canal (C14G and C14H) and at one control location (C13) near the mouth of the intake canal. Of twenty-four indicator samples, two had measurable tritium at an average concentration of 445pCi/L as compared to eleven measurable samples containing tritium with an average of 1067 pCi/L in 2005. The sample with the highest concentration of tritium, 689 pCi/L, was obtained in December at station C14G near the mouth of the discharge canal. The seawater tritium activity is consistent with the concentration of tritium in the liquid waste stream and the release times of waste tanks. Two control station samples contained tritium at an average concentration of 272 pCi/L. The 2005 control station results averaged 135 pCi/L.

Gamma spectral analysis was performed on thirty-six samples, none of which showed measurable amounts of the gamma emitters of interest.

Table IV-C.1 provides a statistical summary of the seawater tritium and gamma spectroscopy results.

Table IV-C.1.a provides the results of the monthly samples.

2. Semiannual ground water samples are taken at one location, station C40, located approximately 3.5 miles east of CR-3. Gamma spectral and tritium analyses are performed on both samples. All results were less than the detection limits. Since plant startup, all results, except for the results of one 1985 tritium analysis, have been less than LLD. The required sensitivity for measuring tritium in ground water is 2000 pCi/L. Analysis of ground water in the vicinity of CR-3 is done at a sensitivity of approximately 130 pCi/L for tritium and less than 10 pCi/L for select gamma emitters.

Table IV-C.2 provides a statistical summary of the groundwater tritium and gamma spectroscopy results.

Table IV-C.2.a provides the results of the semi-annual samples.

3. Quarterly drinking water samples are drawn from three locations: the Crystal River City Hall (C07), the Days Inn Motel (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 of tritium or the required gamma emitters. The measurement sensitivity for drinking water samples are the same as those for ground water samples.

Table IV-C.3 provides a statistical summary of the drinking water tritium and gamma spectroscopy results.

Table IV-C.3.a provides the results of the quarterly samples.

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. The plant discharge canal is the primary liquid effluent release pathway from CR-3. Of the six indicator samples, three had measurable amounts of cesium-137 and two had measurable amounts of cobalt-60. The average cobalt-60 concentration at the indicator locations was 230 pCi/L. Cobalt-60 was not detected in 2005 samples (The average cobalt-60 concentration at the indicator locations ranged from 30 to 389 pCi/L from 1998 through 2004). The average cesium-137 concentration at the indicator locations was 55 pCi/L. These results are similar to previous years' results. None of the samples taken at Fort Island Gulf Beach, the control location, indicated measurable amounts of cobalt or cesium.

Table IV-C.4 provides a statistical summary of the shoreline sediment gamma spectroscopy results.

Table IV-C.4.a provides the results of the semi-annual samples.

5. There were no unmonitored spills or releases of radioactive material in 2006 that could have the potential to contaminate the groundwater per the guidelines of the groundwater protection initiative.

TABLE IV-C.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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	MEAN RANGE			
SEAWATER (pCi/L)	Tritium 36 γ Spec 36	135	445 (2/24) (200-689)	C14G 2.5 @ 270°	689 (1/2) (181-7041)	272 (2/12) (104-439)	0	
	Mn-54	4	<LLD	-	-	<LLD	0	
	Fe-59	9	<LLD	-	-	<LLD	0	
	Co-58	5	<LLD	-	-	<LLD	0	
	Co-60	5	<LLD	-	-	<LLD	0	
	Zn-65	10	<LLD	-	-	<LLD	0	
	Zr-Nb-95	8	<LLD	-	-	<LLD	0	
	I-131	6	<LLD	-	-	<LLD	0	
	Cs-134	5	<LLD	-	-	<LLD	0	
	Cs-137	5	<LLD	-	-	<LLD	0	
	Ba-La-140	12	<LLD	-	-	<LLD	0	

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-C.1.a

## PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	MONTH	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C13	JAN	<148	230±31	<4	<3	<7	<4	<8	<7	<4	<5	<4	<6
	FEB	<155	203±37	<4	<5	<9	<5	<10	<8	<5	<4	<5	<15
	MAR	<154	175±27	<3	<4	<7	<4	<9	<7	<4	<4	<4	<7
	APR	<146	281±29	<3	<4	<6	<4	<7	<6	<4	<4	<4	<6
	MAY	<145	267±30	<3	<3	<7	<4	<7	<6	<4	<5	<3	<11
	JUN	<145	217±27	<4	<3	<5	<3	<7	<6	<5	<3	<4	<9
	JUL	<135	302±28	<3	<2	<8	<4	<8	<7	<5	<4	<3	<5
	AUG	<140	221±37	<4	<4	<8	<4	<8	<7	<4	<5	<4	<10
	SEP	<141	495±27	<2	<2	<5	<3	<6	<4	<2	<3	<3	<7
	OCT	<146	223±24	<2	<2	<4	<2	<4	<3	<2	<2	<2	<5
	NOV	<142	289±28	<3	<3	<7	<3	<7	<7	<5	<4	<4	<5
	DEC	439±31	266±38	<4	<3	<8	<5	<9	<7	<5	<5	<4	<7
C14G	JAN	<148	222±27	<4	<3	<6	<4	<9	<6	<4	<4	<3	<8
	FEB	<155	258±36	<3	<3	<6	<4	<8	<6	<4	<4	<4	<10
	MAR	<154	219±30	<3	<3	<8	<4	<7	<5	<4	<4	<3	<8
	APR	<146	250±32	<3	<3	<7	<4	<8	<5	<4	<4	<4	<6
	MAY	<145	184±32	<3	<4	<6	<4	<7	<6	<4	<4	<4	<10
	JUN	<145	174±32	<3	<3	<7	<4	<8	<6	<4	<4	<3	<7
	JUL	<135	256±28	<3	<3	<7	<4	<8	<6	<5	<4	<4	<4
	AUG	<140	243±28	<3	<3	<6	<4	<6	<6	<4	<4	<4	<7
	SEP	<141	345±31	<3	<3	<6	<4	<8	<6	<4	<4	<4	<12
	OCT	<146	263±32	<4	<3	<9	<4	<8	<8	<3	<4	<4	<9
	NOV	<142	266±29	<3	<3	<7	<4	<6	<5	<5	<3	<3	<5
	DEC	689±33	325±34	<3	<3	<7	<4	<7	<5	<3	<4	<4	<7

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

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	MONTH	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zr-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C14H	JAN	<148	234±27	<4	<4	<7	<4	<7	<5	<4	<4	<4	<7
	FEB	<155	297±31	<3	<4	<7	<4	<8	<5	<4	<4	<4	<9
	MAR	<154	237±26	<3	<3	<8	<3	<9	<5	<4	<4	<3	<6
	APR	<148	266±31	<3	<3	<8	<4	<7	<5	<4	<4	<4	<4
	MAY	<145	244±32	<4	<3	<6	<4	<8	<6	<4	<4	<4	<11
	JUN	<145	217±28	<3	<4	<7	<3	<6	<6	<5	<4	<4	<9
	JUL	<135	285±29	<4	<2	<6	<3	<7	<6	<6	<5	<4	<4
	AUG	<140	253±30	<4	<4	<6	<4	<8	<5	<5	<4	<3	<6
	SEP	<141	255±15	<2	<1	<3	<2	<4	<3	<2	<2	<2	<3
	OCT	<146	263±13	<1	<1	<3	<2	<3	<2	<1	<2	<1	<3
	NOV	<142	267±23	<2	<2	<5	<3	<6	<5	<4	<3	<2	<3
	DEC	200±28	298±33	<3	<4	<7	<4	<9	<6	<5	<4	<4	,9

# Seawater

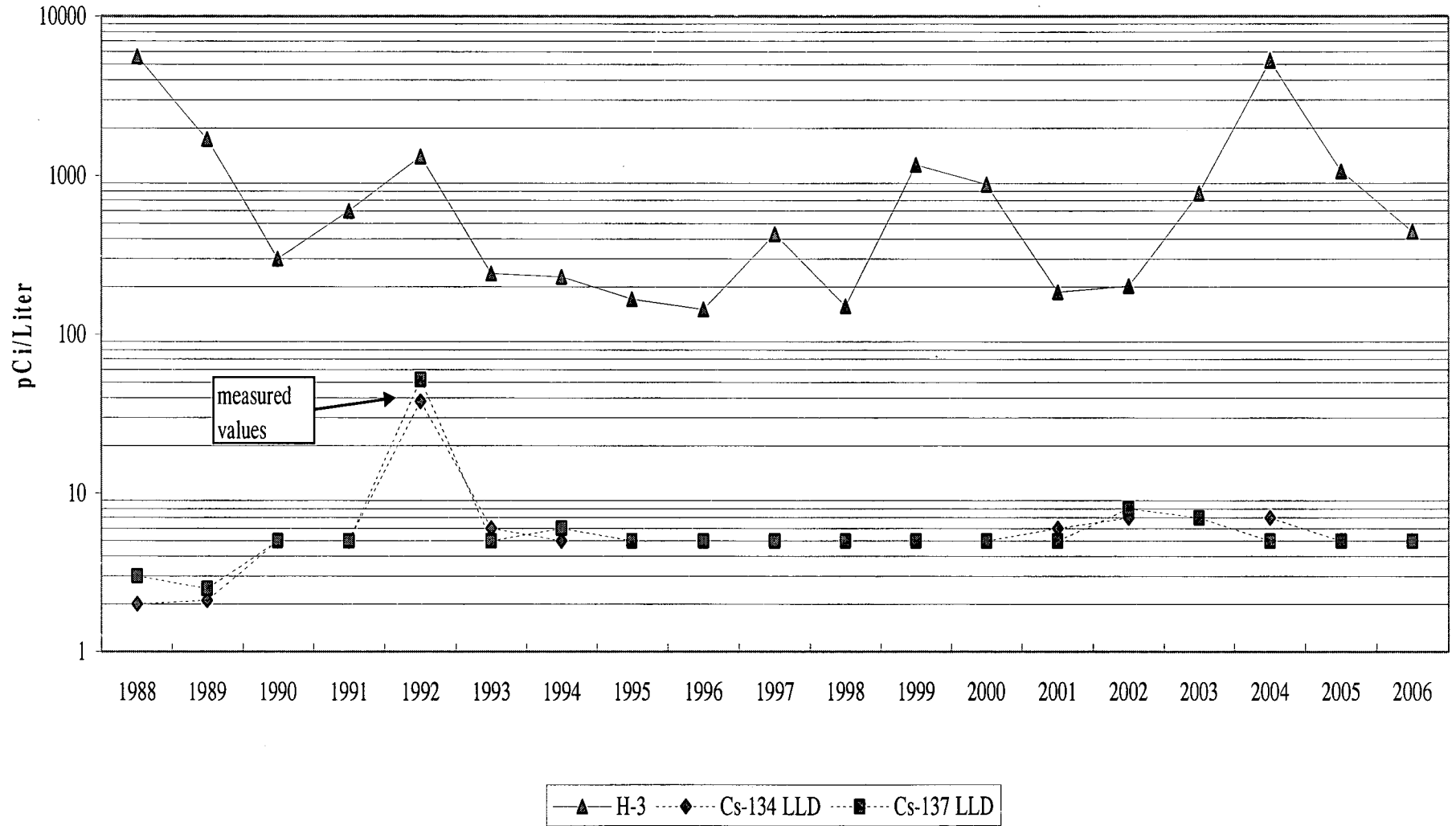


TABLE IV-C.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>1</sup>	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROUND WATER (pCi/L)	Tritium 2	155	None	-	-	<LLD	0
	γ Spec 2						
	Mn-54	4	None	-	-	<LLD	0
	Fe-59	9	None	-	-	<LLD	0
	Co-58	3	None	-	-	<LLD	0
	Co-60	6	None	-	-	<LLD	0
	Zn-65	8	None	-	-	<LLD	0
	Zr-Nb-95	8	None	-	-	<LLD	0
	I-131	5	None	-	-	<LLD	0
	Cs-134	5	None	-	-	<LLD	0
	Cs-137	4	None	-	-	<LLD	0
	Ba-La-140	14	None	-	-	<LLD	0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-C.2.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	NUCLIDE	FIRST HALF	SECOND HALF
C40	H-3	<155	<140
	Mn-54	<3	<4
	Fe-59	<6	<9
	Co-58	<3	<3
	Co-60	<3	<6
	Zn-65	<7	<8
	Zr-Nb-95	<6	<8
	I-131	<5	<4
	Cs-134	<3	<5
	Cs-137	<4	<4
	Ba-La-140	<8	<14
	K-40	<57	<75

# Ground Water

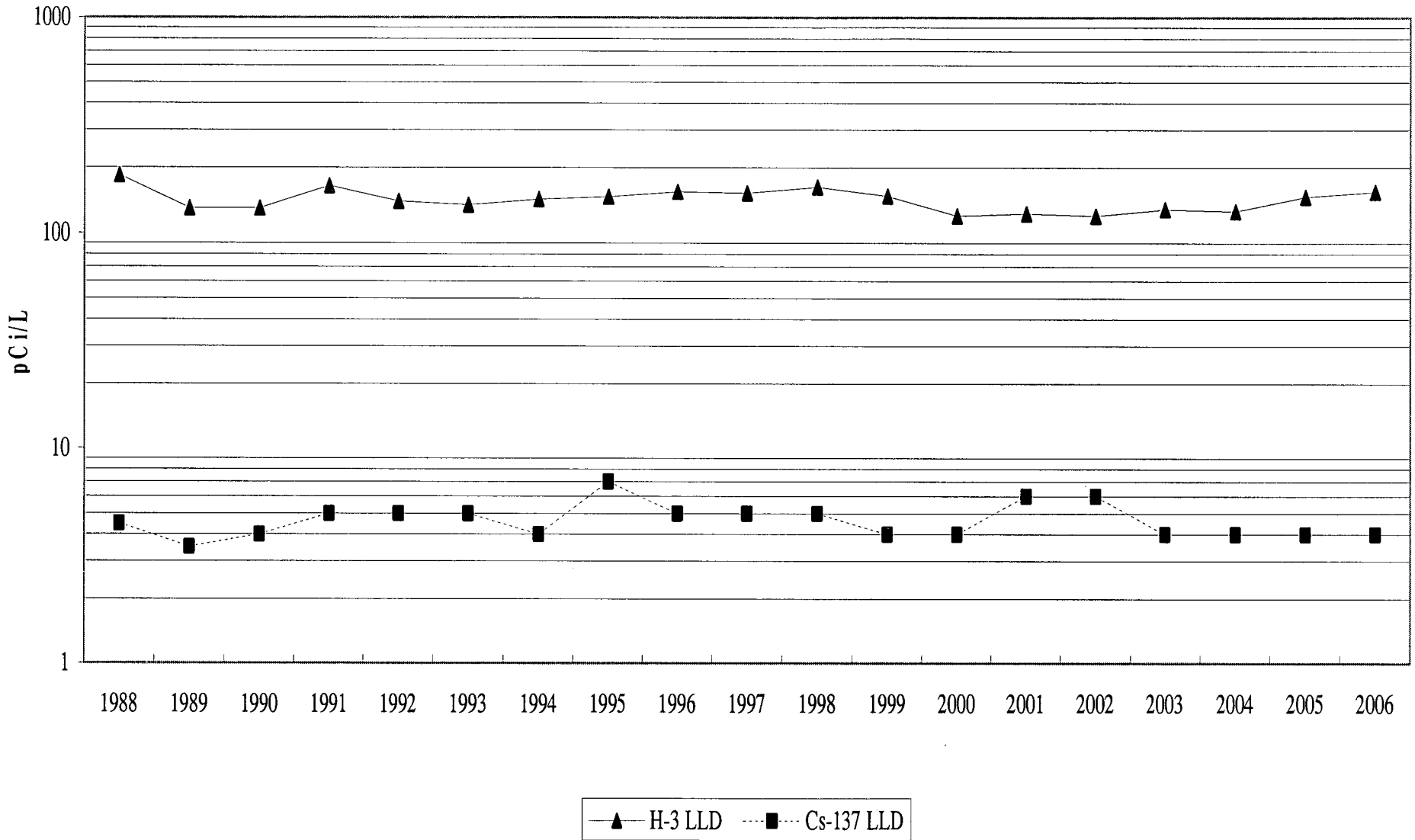




TABLE IV-C.3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) <sup>1</sup>	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
DRINKING WATER (pCi/L)	Tritium 12	148	None	-	-	<LLD	0
	γ Spec 12						
	Mn-54	5	None	-	-	<LLD	0
	Fe-59	10	None	-	-	<LLD	0
	Co-58	5	None	-	-	<LLD	0
	Co-60	5	None	-	-	<LLD	0
	Zn-65	10	None	-	-	<LLD	0
	Zr-Nb-95	10	None	-	-	<LLD	0
	I-131	7	None	-	-	<LLD	0
	Cs-134	6	None	-	-	<LLD	0
Cs-137	6	None	-	-	<LLD	0	
Ba-La-140	14	None	-	-	<LLD	0	

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-C.3.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	DATE	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Zn-Nb-95	I-131	Cs-134	Cs-137	Ba-La-140
C07	01-10	<144	53	<3	<3	<6	<3	<7	<5	<4	<5	<3	<8
	04-04	<148	59	<3	<3	<8	<4	<6	<5	<4	<4	<3	<7
	07-05	<135	70	<5	<4	<9	<4	<10	<10	<6	<6	<6	<8
	10-17	<146	69	<4	<5	<8	<4	<9	<7	<5	<5	<4	<14
C10	01-10	<144	56	<3	<3	<7	<4	<7	<6	<4	<4	<3	<14
	04-04	<148	56	<3	<3	<5	<4	<8	<6	<4	<4	<4	<7
	07-05	<135	72	<4	<4	<10	<5	<8	<9	<6	<6	<4	<7
	10-17	<146	58	<3	<4	<7	<4	<8	<6	<4	<4	<4	<11
C18	01-10	<144	34	<2	<2	<4	<2	<4	<3	<2	<2	<2	<5
	04-04	<148	51	<4	<4	<6	<3	<8	<6	<4	<4	<3	<8
	07-05	<135	80	<4	<4	<9	<4	<9	<8	<7	<6	<5	<8
	10-17	<146	53	<3	<2	<5	<4	<6	<5	<4	<3	<3	<13

# Drinking Water

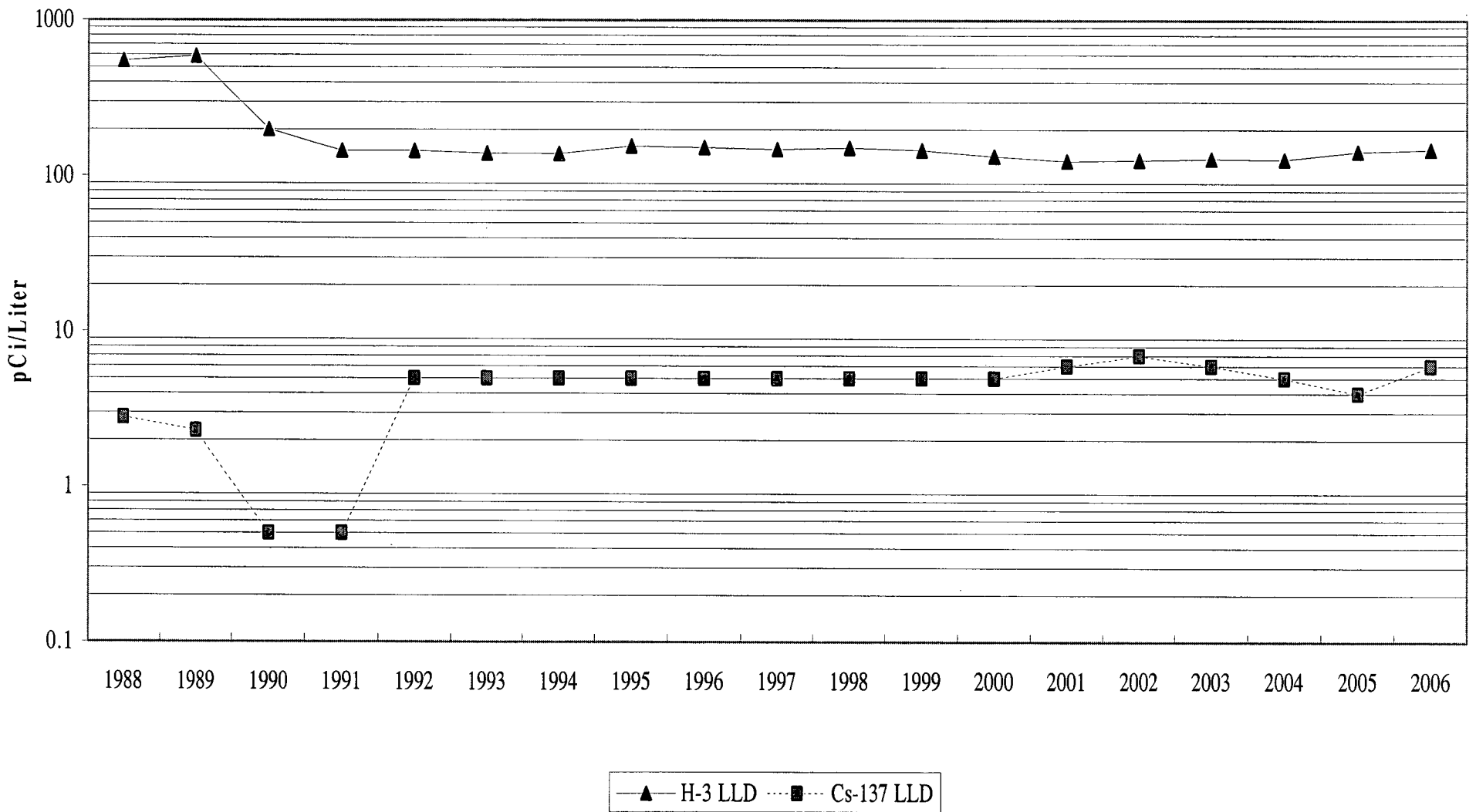


TABLE IV-C.4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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		
SHORELINE SEDIMENT (pCi/kg)	$\gamma$ Spec 8 Cs-134 Cs-137	29 19	<LLD 55 (3/6) (42-70)	— C14H 0.1 @ 325°	— 55 (3/3)	<LLD <LLD	0 0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-C.4.a

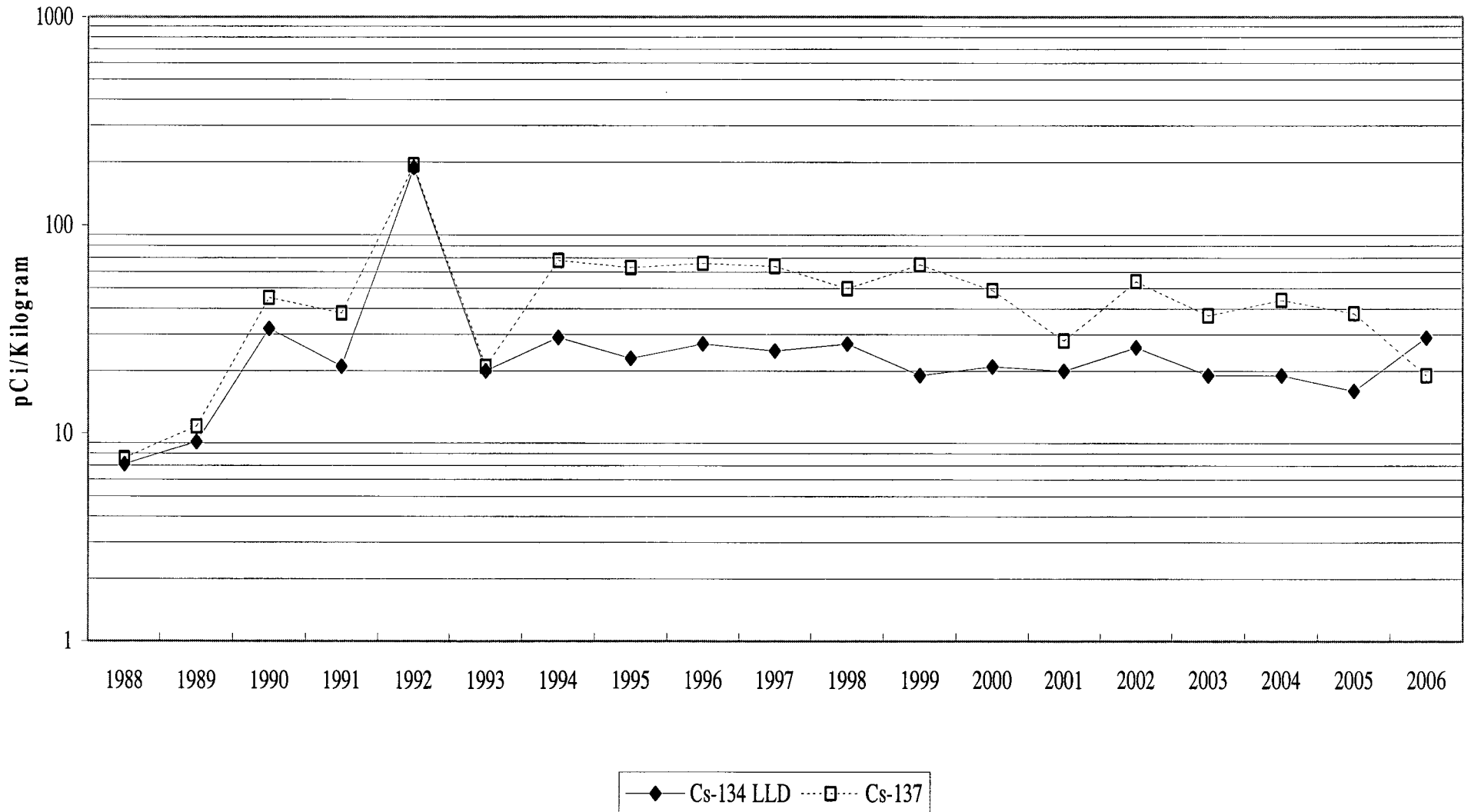
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/kg  $\gamma$  EMITTERS IN SHORELINE SEDIMENT

STATION	PERIOD	Co-58	Co-60	Cs-134	Cs-137	K-40	Ra-226
C09	First Half	<11	<13	<13	<13	<114	586 $\pm$ 174
	Second Half	<10	<10	<13	<11	386 $\pm$ 84	<351
C14H	First Half	<20	<32	<29	53 $\pm$ 9	1802 $\pm$ 187	786 $\pm$ 158
	Second Half	<14	<24	<19	70 $\pm$ 9	2171 $\pm$ 142	1117 $\pm$ 188
C14M	First Half	<14	283 $\pm$ 9	<18	<19	845 $\pm$ 95	822 $\pm$ 167
	Second Half	<17	178 $\pm$ 9	<20	42 $\pm$ 9	1096 $\pm$ 151	1748 $\pm$ 183
C14G	First Half	<12	<17	<15	<14	306 $\pm$ 49	786 $\pm$ 158
	Second Half	<10	<16	<13	<14	311 $\pm$ 61	918 $\pm$ 159

C09 is the control station at Ft. Island Beach. C14H, C14M, & C14G are discharge canal stations.

# Shoreline Sediment



#### IV-D. INGESTION PATHWAY

To evaluate the ingestion pathway, samples are taken of fish, oysters, broad leaf vegetation, citrus, and watermelon.

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 cesium-137 LLD for station C29 was 28 pCi/kg. Naturally occurring potassium-40 was quantified in all eight samples at concentrations near 3000 pCi/kg.

Table IV-D.1 provides a statistical summary of the carnivorous fish gamma spectroscopy results.

Table IV-D.1.a provides the results of the quarterly samples.

2. Quarterly oyster samples were taken at the same locations as fish samples, C29 and C30. Of the isotopes required to be evaluated, none indicated measurable amounts of radioactivity. However, silver-110m was quantified in four samples at C29, and one sample at C30, with an average concentration of 350 pCi/kg and a range of 38 to 845 pCi/kg.

Table IV-D.2 provides a statistical summary of the oyster gamma spectroscopy results.

Table IV-D.2.a provides the results of the quarterly samples.

3. Monthly broad leaf vegetation samples were taken at two indicator locations, C48A and C48B, and one control location, C47. Four of twenty-four indicator samples had measurable amounts of cesium-137 with an average concentration of 30 pCi/kg and a range of 25 to 36 pCi/kg. This is similar to recent years results. Three of twelve control station samples had measurable amounts of cesium-137 with an average concentration of 49 pCi/kg and a range of 43 to 59 pCi/kg.

Table IV-D.3 provides a statistical summary of the broad leaf vegetation gamma spectroscopy results.

Table IV-D.3.a provides the results of the monthly samples.

4. Citrus samples are taken at station C19 and watermelon samples were obtained at station C04. None of the required radionuclides were found in measurable quantities in watermelon, but Cs-137 was quantified at 113 pCi/kg in the citrus sample.

Table IV-D.4 provides a statistical summary of the watermelon and citrus gamma spectroscopy results.

Table IV-D.4.a provides the results of the semi-annual samples.

TABLE IV-D.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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)	γ Spec 8  Mn-54 Fe-59 Co-58 Co-60 Zn-65 Cs-134 Cs-137	28 49 23 26 64 43 28	<LLD <LLD <LLD <LLD <LLD <LLD <LLD	- - - - - - -	- - - - - - -	<LLD <LLD <LLD <LLD <LLD <LLD <LLD	0 0 0 0 0 0 0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.



TABLE IV-D.1.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/kg  $\gamma$  EMITTERS IN CARNIVOROUS FISH

STATION	QUARTER	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	K-40
C29	1	<28	<23	<49	<20	<64	<43	<28	2362±253
	2	<23	<18	<44	<25	<44	<25	<26	2657±199
	3	<11	<12	<38	<13	<29	<13	<12	2965±140
	4	<17	<14	<29	<23	<37	<25	<21	2327±181
C30	1	<16	<13	<34	<18	<31	<19	<16	2910±172
	2	<19	<20	<23	<26	<47	<20	<17	2595±209
	3	<22	<23	<40	<26	<43	<27	<18	2488±217
	4	<22	<19	<45	<25	<51	<30	<25	3218±227

# Carnivorous Fish

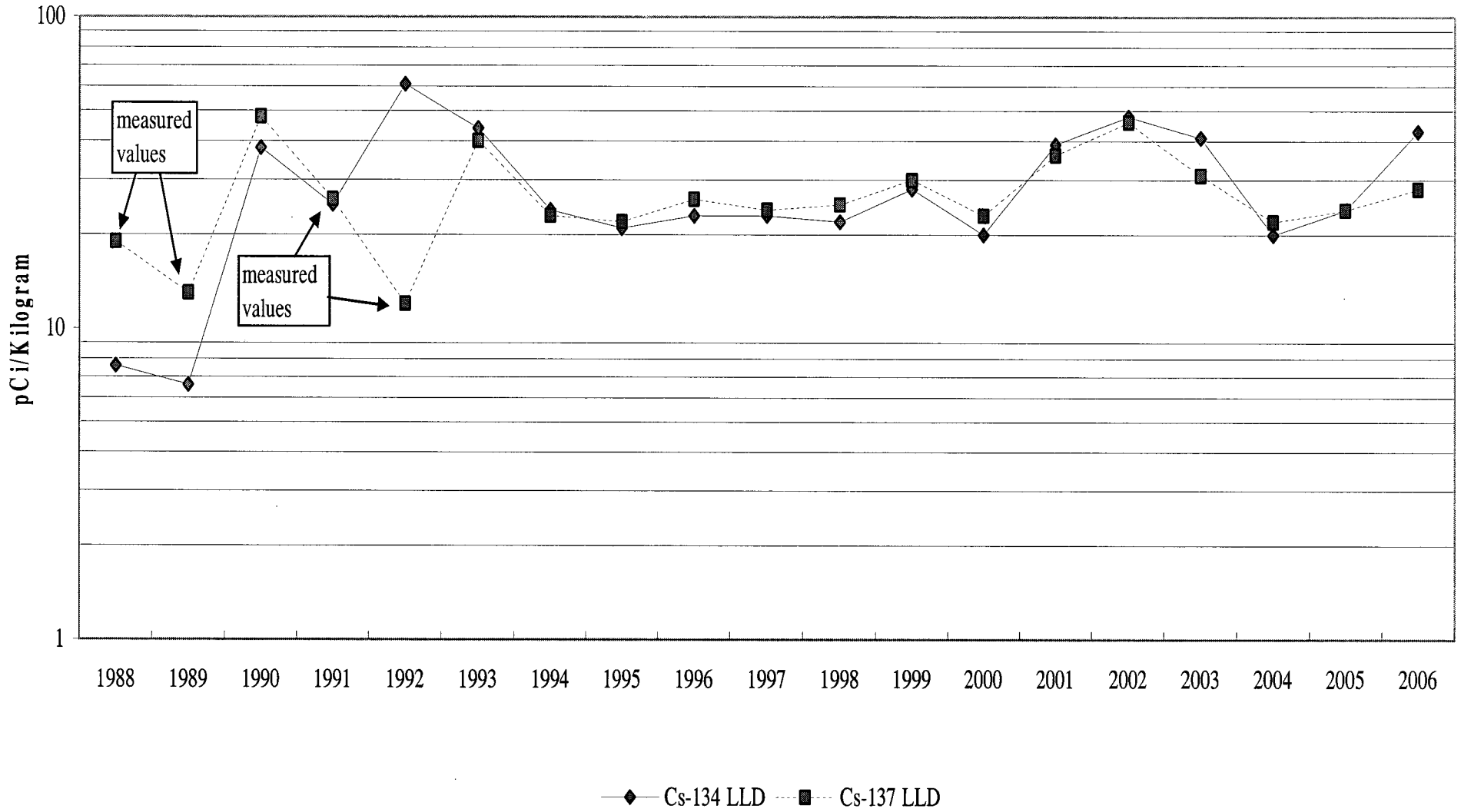


TABLE IV-D.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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		
OYSTERS (pCi/kg)	γ Spec 8							
	Mn-54	42	<LLD	-	-	<LLD		0
	Fe-59	89	<LLD	-	-	<LLD		0
	Co-58	42	<LLD	-	-	<LLD		0
	Co-60	45	<LLD	-	-	<LLD		0
	Zn-65	86	<LLD	-	-	<LLD		0
	Cs-134	46	<LLD	-	-	<LLD		0
	Cs-137	53	<LLD	-	-	<LLD		0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-D.2.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

pCi/kg  $\gamma$  EMITTERS IN OYSTERS

STATION	QUARTER	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	K-40
C29	1	<15	<16	<34	<18	<36	<20	<20	1005±124
	2	<42	<42	<89	<45	<86	<44	<53	1250±222
	3	<8	<8	<15	<9	<18	<10	<8	558±77
	4	<20	<21	<41	<19	<36	<27	<22	954±137
C30	1	<15	<18	<37	<18	<47	<17	<16	863±123
	2	<37	<24	<86	<32	<66	<46	<40	1404±269
	3	<8	<8	<18	<9	<20	<10	<9	667±73
	4	<24	<23	<52	<21	<57	<26	<26	1739±191

Ag-110m was quantified in four samples taken at station C29, near the end of the discharge canal and one sample at station C30. The concentration ranges from 38 to 845 pCi/Kg

# Oysters

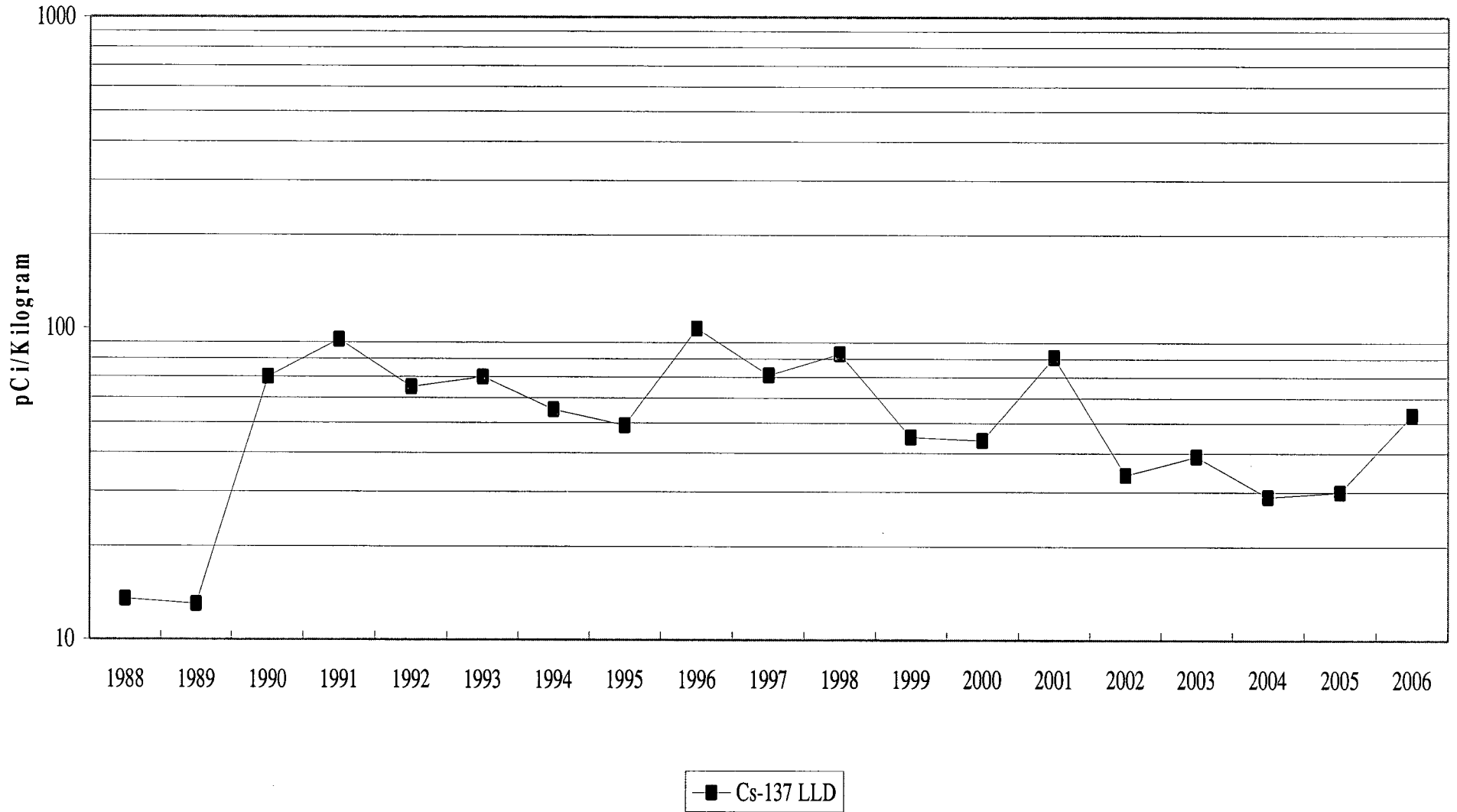


TABLE IV-D.3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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		
BROAD LEAF								
VEGETATION (pCi/kg)	γ Spec 36							
	I-131	26	<LLD		-	-	<LLD	0
	Cs-134	26	<LLD		-	-	<LLD	0
	Cs-137	25	30 (4/24) (25-36)		C48A 0.4 @ 0°	29 (3/12)	49 (3/12) (43-59)	0

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-D.3.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C47	JAN	<14	<18	<16	3427±186
	FEB	<10	<13	<18	2929±136
	MAR	<12	<15	43±8	4539±181
	APR	<17	<13	<15	4642±149
	MAY	<17	<23	<24	3918±214
	JUN	<17	<20	<22	4727±234
	JUL	<20	<19	<21	4897±234
	AUG	<14	<13	<16	3980±167
	SEP	<16	<13	59±7	3253±142
	OCT	<17	<13	<12	3184±136
	NOV	<19	<14	<15	3788±163
	DEC	<13	<15	45±7	2958±152
C48A	JAN	<17	<19	<16	7277±214
	FEB	<26	<24	27±8	5587±277
	MAR	<19	<17	<23	3825±242
	APR	<18	<24	36±9	5707±297
	MAY	<9	<12	25±4	7818±153
	JUN	<18	<22	<23	6550±276
	JUL	<24	<26	<21	6284±283
	AUG	<20	<24	<25	7792±311
	SEP	<18	<20	<21	6557±284
	OCT	<12	<14	<15	7845±201
	NOV	<17	<24	<23	5854±257
	DEC	<16	<19	<18	6693±269

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

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C48B	JAN	<8	<9	<9	2419±91
	FEB	<16	<17	<17	2829±190
	MAR	<17	<21	<21	5350±267
	APR	<19	<22	33±8	5275±258
	MAY	<16	<17	<18	4183±217
	JUN	<16	<21	<17	3993±222
	JUL	<24	<21	<18	5532±270
	AUG	<12	<13	<11	2254±131
	SEP	<15	<19	<20	4328±239
	OCT	<13	<15	<15	4689±194
	NOV	<9	<10	<9	3086±123
	DEC	<13	<20	<15	2061±158



# Broad Leaf Vegetation

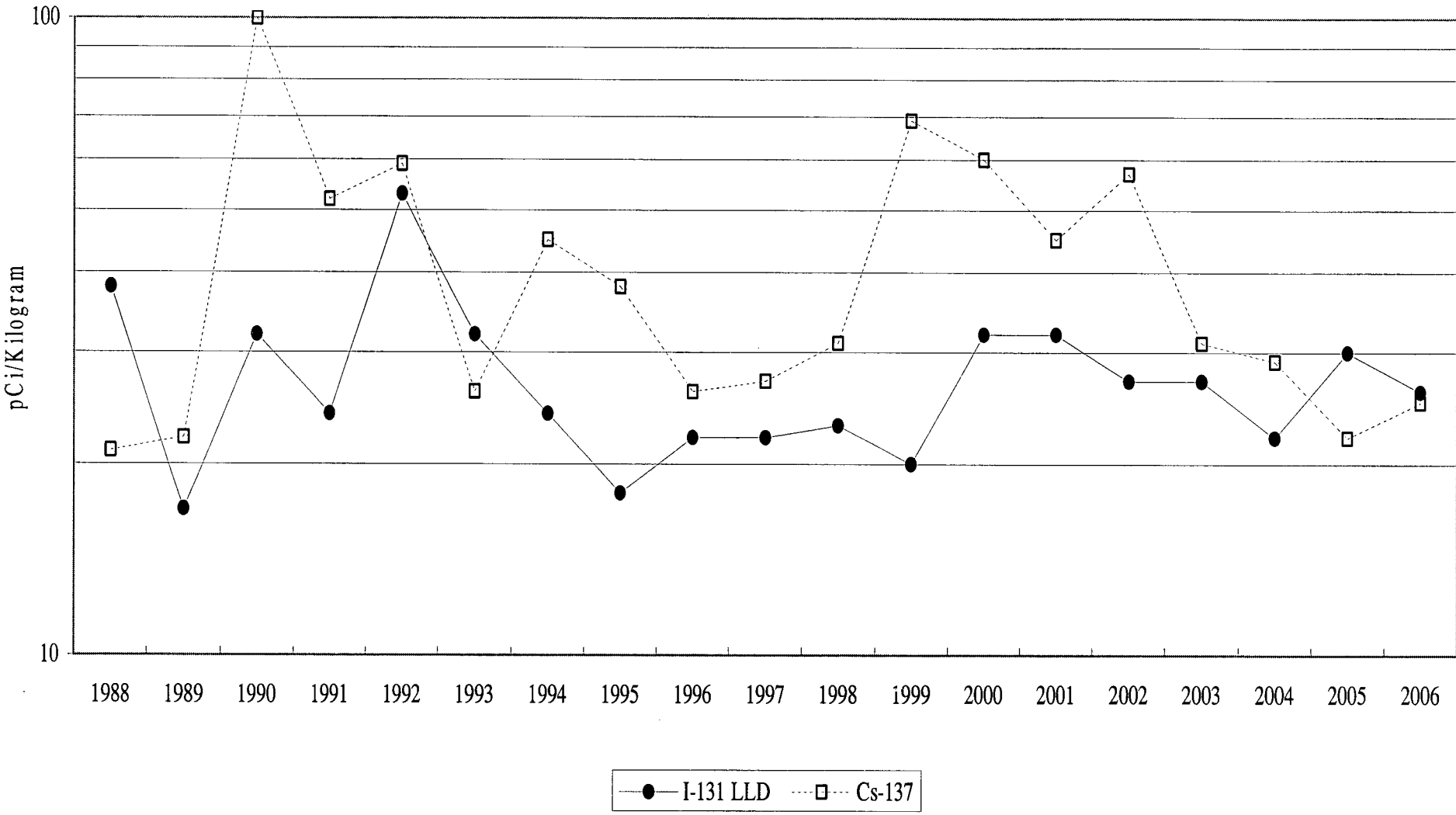


TABLE IV-D.4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2006

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	MEAN RANGE	DISTANCE & BEARING		
WATERMELON (pCi/kg)	γ Spec 1							
	I-131	3	<LLD	-	-	None	0	
	Cs-134	3	<LLD	-	-	None	0	
	Cs-137	4	<LLD	-	-	None	0	
CITRUS (pCi/kg)	γ Spec 1							
	I-131	6	<LLD	-	-	None	0	
	Cs-134	8	<LLD	-	-	None	0	
	Cs-137	8	113 (1/1)	C19 9.6 @ 57°	113 (1/1)	None	0	

<sup>1</sup>The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-D.4.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2006

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

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C04 - Watermelon	June	<3	<3	<4	1381 $\pm$ 38
C19 - Citrus	January	<6	<8	113 $\pm$ 5	2152 $\pm$ 89