



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

Ref: ITS 5.7.1.1(b)

May 14, 2012
3F0512-03

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

Subject: Crystal River Unit 3 – 2011 Annual Radiological Environmental Operating Report

Dear Sir:

Florida Power Corporation, doing business as Progress Energy Florida, Inc., hereby submits the 2011 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, 2011 through December 31, 2011.

This letter establishes no new regulatory commitments.

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

Sincerely,

Terry Hobbs
Plant General Manager
Crystal River Nuclear Plant

TH/ff

Attachment

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

IE25
NRR

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

ATTACHMENT

**2011 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING
REPORT**

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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 (NEI 07-07).

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 2011 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, I-3, I-4, and I-5. Sample frequency and analysis type may be determined from Table I-2. Figure I-1 illustrates the relevant exposure pathways. Regarding waterborne pathways, the groundwater area of the Crystal River site is too saline to be used as a source of drinking water, hence there is no credible drinking water uptake pathway. Additionally, the Florida aquifer groundwater flows in a west-southwest direction across the site toward the Gulf of Mexico and since the locale of the site is along the coast, there is no downstream public impact regarding groundwater.

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.

There are, however, positively measured results of iodine and cesium airborne concentrations during the period of March 22 through April 12th for almost all sampling stations including the control station. These measurements are a direct result of the earthquake and tsunami event at the Dai-Ichi, Fukushima following the March 11, 2011 Tohoku event in Japan. These measurements are not related to Crystal River Unit 3 activities. The Japanese event also affected broad leaf vegetation sample media throughout the year as long-lived radionuclides (Cs-137) were released at Fukushima multiple times.

The results of the 2011 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, in the following entry;

15 (249/256)
(4 - 35)

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 - 2011

SAMPLE STATION LOCATIONS

SAMPLE MEDIA	STATION ID	DIRECTION	APPROX. DISTANCE (Miles)
TLD – on-site	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
	TLD – off-site	C18	N
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 - 2011

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
SITE GROUND WATER	CR3-2	E	0.1
	CR3-4	SSE	0.086
	CR3-5	SSW	0.051
	CR3-6S	W	0.038
	CR3-6D	W	0.038
	CR3-7	WNW	0.060
	CR3-8	WNW	0.073
	CR3-9	NW	0.1
	CR3-10	NNE	0.1
	DRINKING WATER	C07-Control	ESE
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	ENE	0.9
	C47-Control	ESE	78
WATERMELON	C04	NE	13
CITRUS	C19	ENE	9.6

TABLE I-2
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD ¹	
TLD	33*	Quarterly	γ Dose	---	
Air Iodine	6	Weekly	I-131	0.07 ^g pCi/m ³	
Air Particulate	6	Weekly	Gross β	0.01	
		Quarterly	γ Spec : Cs-134	0.05 ^e	
			Cs-137	0.06 ^e	
Seawater	3	Monthly	Tritium	2000 ^b pCi/L	
		Monthly	γ Spec :	Mn-54	15
				Fe-59	30
				Co-58	15
				Co-60	15
				Zn-65	30
				Zr-Nb-95	15 ^c
				I-131	1 ^f
				Cs-134	15
				Cs-137	18
				Ba-La-140	15 ^c
Ground Water	1	Semiannual	Tritium	2000 ^b pCi/L	
		Semiannual	γ Spec :	2 ²	
Site Ground Water ⁶	9	Quarterly	Tritium	2000 ^b pCi/L	
		Quarterly	γ Spec :	2 ²	
Drinking Water	3	Quarterly	Tritium	2000 ^b pCi/L	
		Quarterly	γ Spec :	2 ²	
Shoreline Sediment	4	Semiannual	γ Spec : Cs-134	150 pCi/kg	
			Cs-137	180	

*Includes 3 stations which are not required by the ODCM

¹The maximum "a priori" LLD

²Same as Seawater γ Spec

⁶Additional 2 stations reported that are not required by the ODCM

^bLLD for drinking water. If no drinking water pathway exists, a value of 3000 pCi/L may be used

^cThe specified LLD is for an equilibrium mixture of parent and daughter nuclides which contain 15 pCi/L of the parent nuclide

^eLLDs apply only to quarterly composite gamma spectral analysis, not to analyses of single particulate filters

^fLLD for drinking water. If no drinking water pathway exists, the LLD of the gamma isotopic analysis may be used

^gLLD for I-131 applies to a single weekly filter

TABLE I-2 (Cont'd)
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
SAMPLING AND ANALYSIS PROGRAM

SAMPLE MEDIA	# OF STATIONS	FREQUENCY	ANALYSIS	LLD ¹	
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
Broad Leaf Vegetation	3	Monthly ³	γ Spec :	I-131	60 pCi/kg
				Cs-134	60
				Cs-137	80
Watermelon	1	Annual ⁴	γ Spec :	5	5
Citrus	1	Annual ⁴	γ Spec :	5	5

¹The maximum "a priori" LLD

³When available

⁴During harvest

⁵Same as broad leaf vegetation

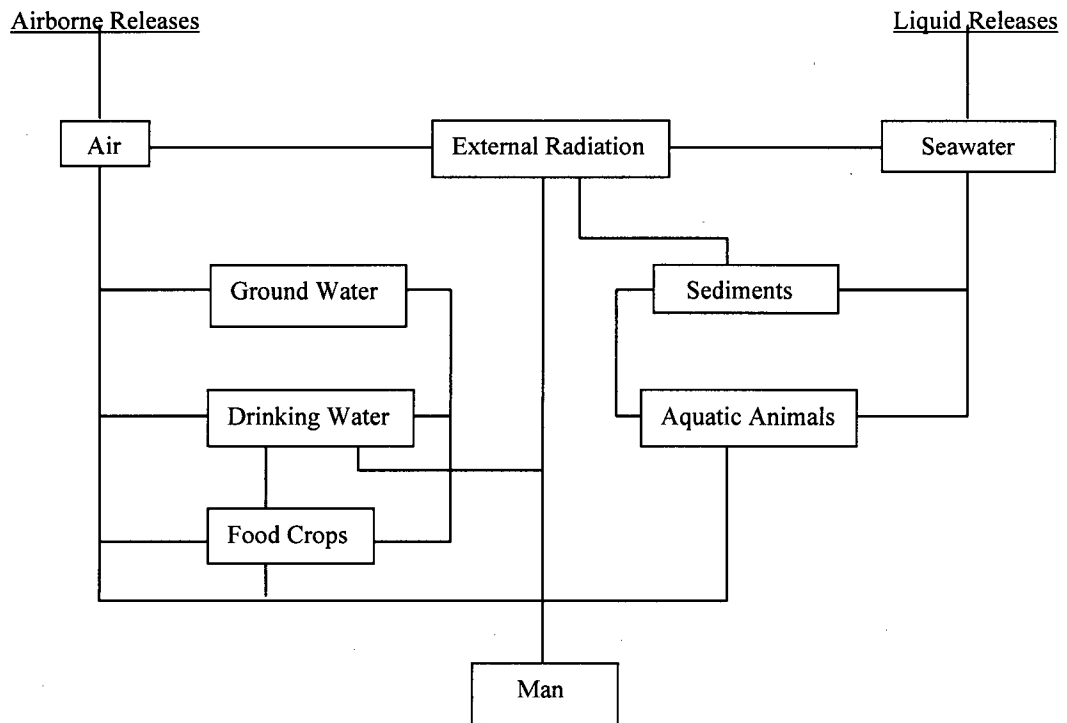


FIGURE I-1: Environmental Media and Exposure Pathways

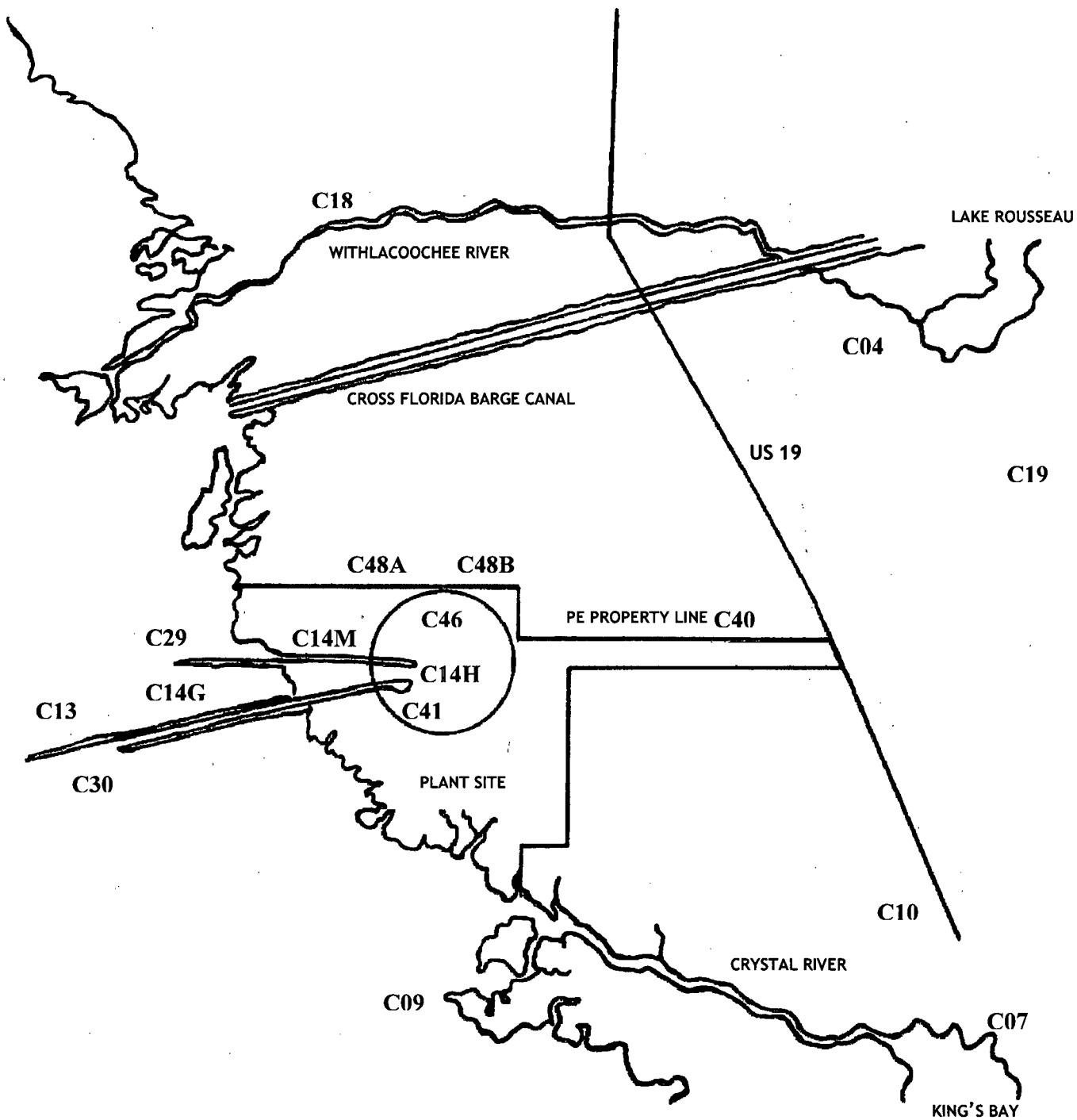
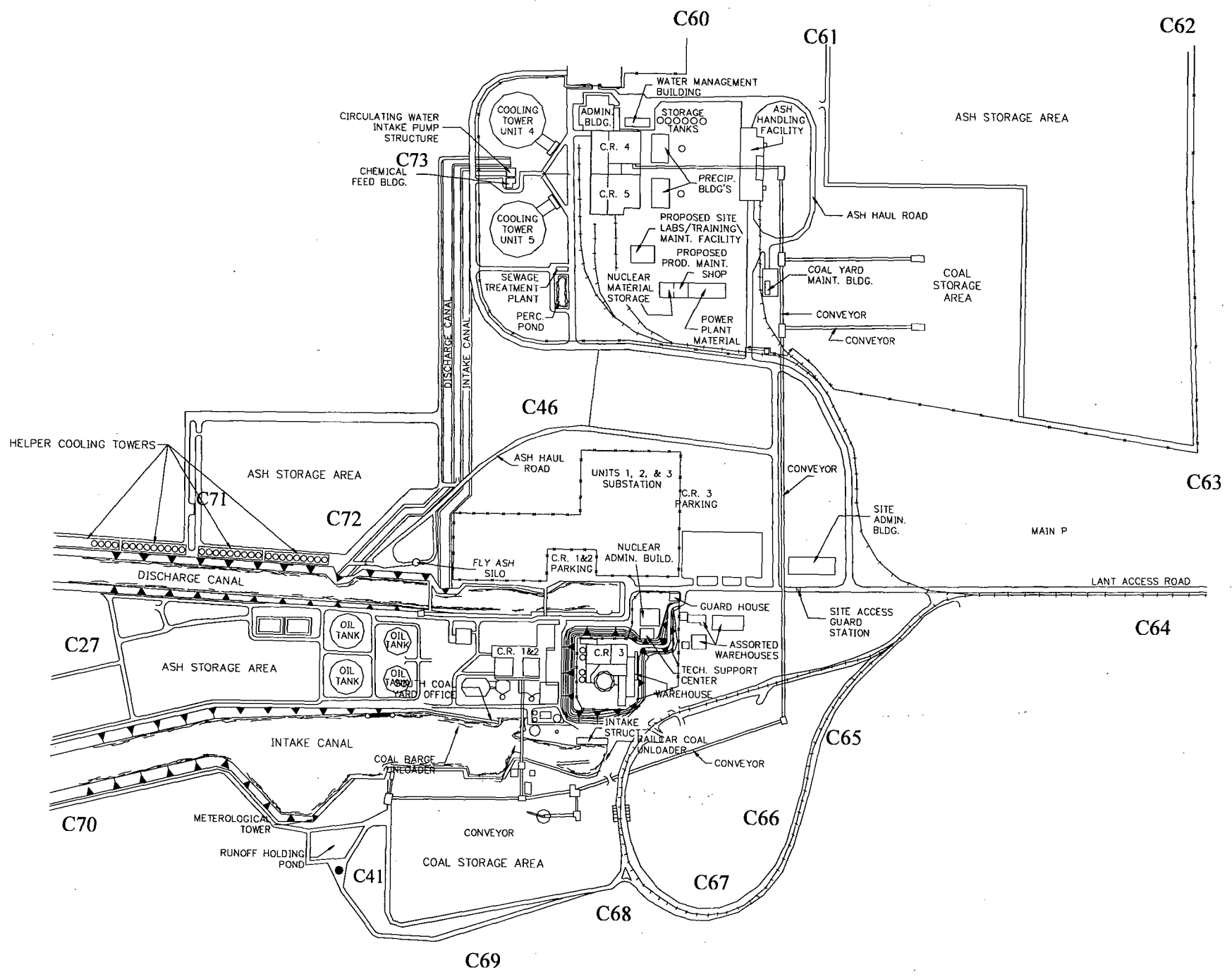


FIGURE I-2: Environmental Monitoring Sample Stations (non-TLDs)

FIGURE I-3: Environmental Monitoring TLD Locations (on site)

8



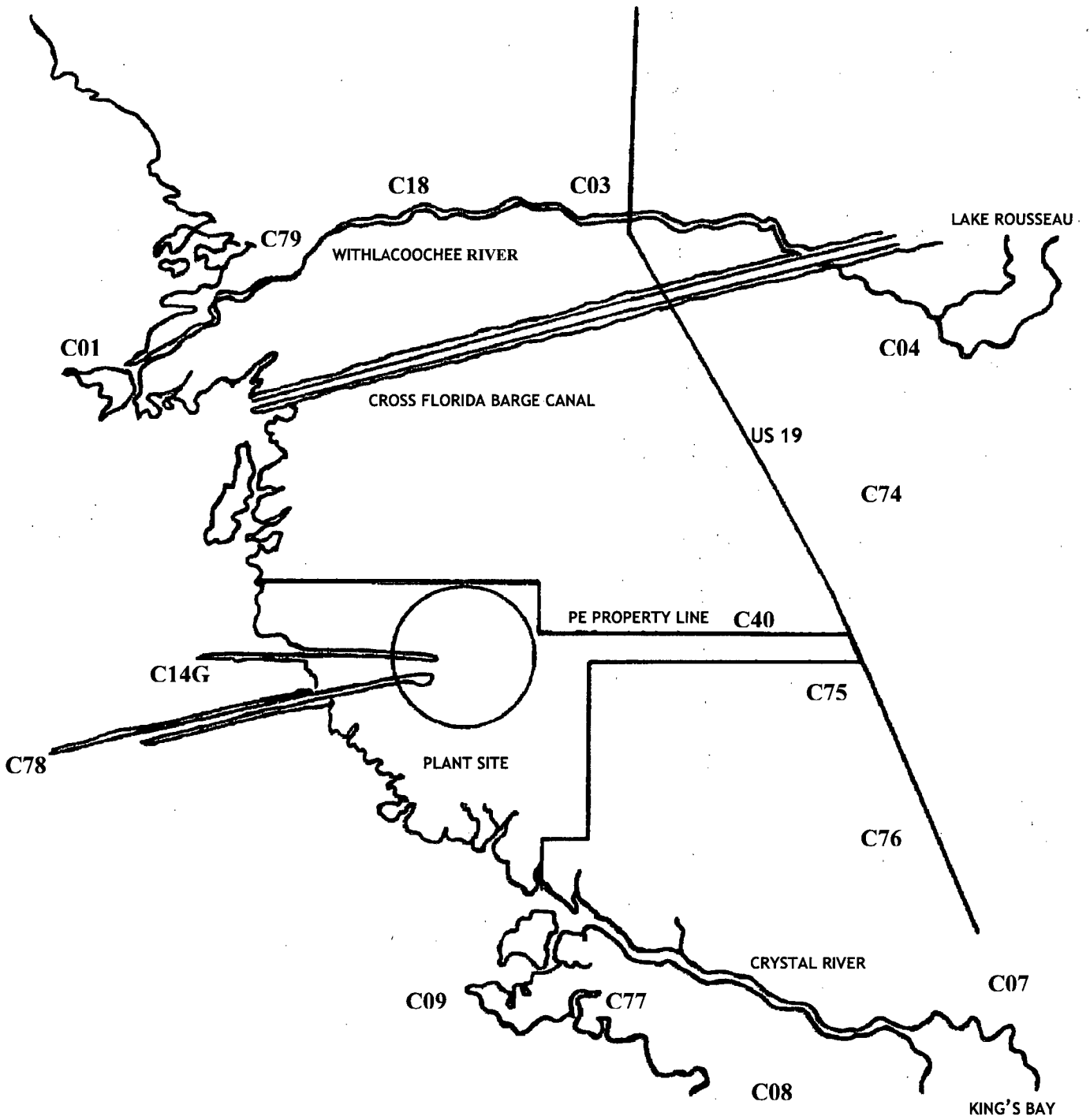
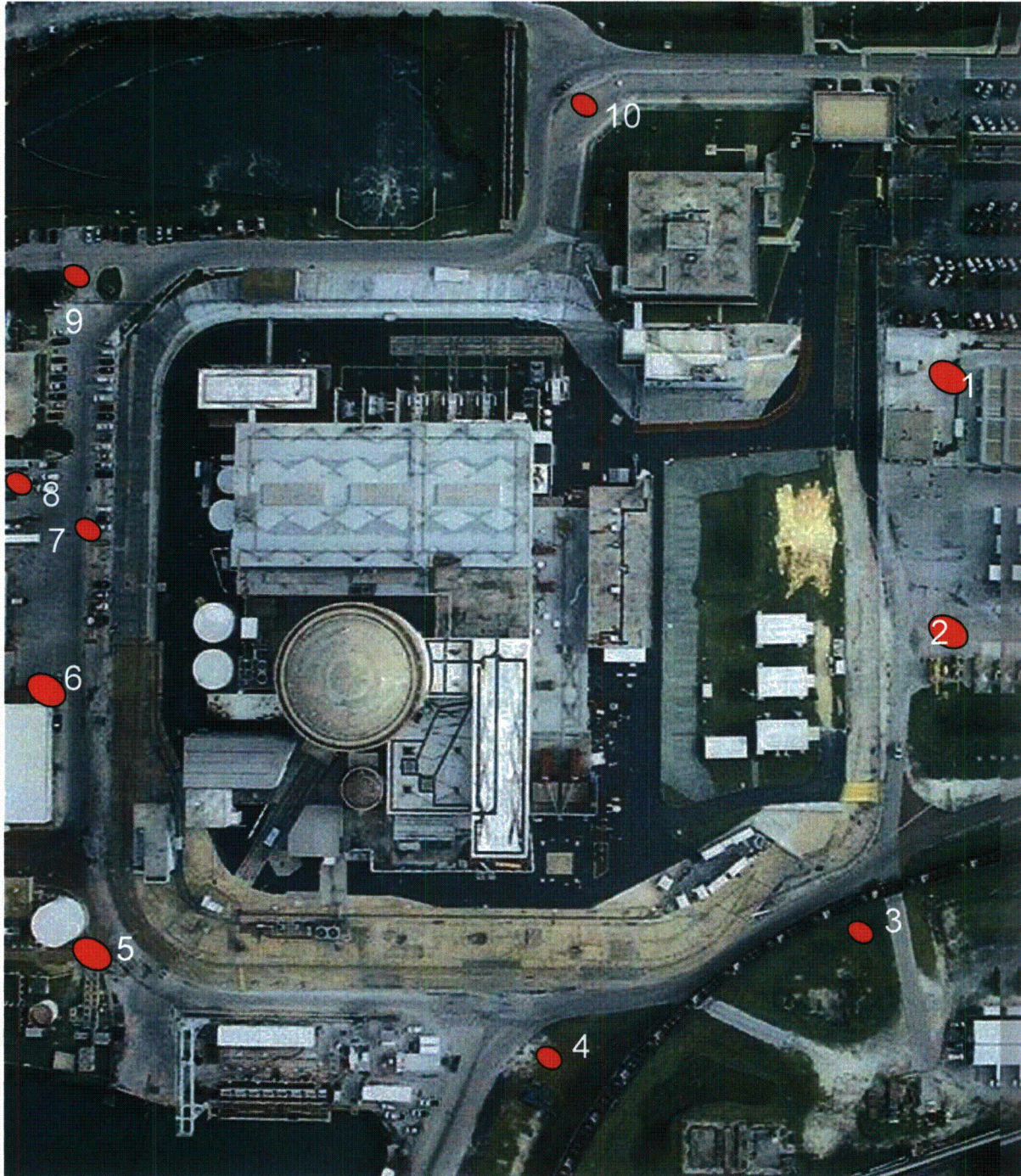


FIGURE I-4: Environmental Monitoring TLD Locations (off site)

Figure I-5: CR3 Groundwater Monitoring Well Locations
Deep Wells Are Also Installed at #'s 1, 3, 6



Wells # 1 & 3 are not routinely
sampled by the REMP

II. LAND-USE CENSUS

A land-use census was conducted during June through August. 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	4.5 @ 2°	*	*
NNE	4.6 @ 15°	*	*
NE	3.8 @ 54°	*	*
ENE	3.4 @ 60°	4.4 @ 63°	*
E	2.4 @ 92°	*	*
ESE	4.2 @ 102°	4.7 @ 103°	*
SE	4.9 @ 133°	*	*
SSE	3.5 @ 149°	*	*
S	*	*	*
SSW	*	*	*
SW	*	*	*
WSW	*	*	*
W	*	*	*
WNW	*	*	*
NW	4.8 @ 321°	*	*
NNW	4.6 @ 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.

III. 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 March 2011:

Media	Nuclide	Result	% Bias	Acceptance Range	Flag
Air	Co-57	3.19	-4.2	2.33 – 4.33	A
Air	Cs-134	3.22	-7.7	2.44 – 4.54	A
Air	Cs-137	2.46	7.9	1.60 – 2.96	A
Air	Mn-54	3.00	13.6	1.85 – 3.43	A
Air	Zn-65	3.71	16.7	2.23 – 4.13	A
Air	Gross Beta	1.44	8.8	0.662–1.985	A
Soil	K-40	544.81	0.9	378 – 702	A
Soil	Co-60	485.55	0.7	337 – 627	A
Soil	Cs-134	684.71	0.7	476 – 884	A
Soil	Cs-137	780.80	3.0	531 – 985	A
Soil	Co-57	942.79	1.7	649 – 1205	A
Vegetation	Co-57	8.64	-13.1	6.96 – 12.92	A
Vegetation	Co-60	4.26	-13.2	3.44 – 6.38	A
Vegetation	Zn-65	2.8	-6.4	2.09 – 3.89	A
Vegetation	Cs-134	5.12	-6.9	3.85 – 7.15	A
Vegetation	Mn-54	5.77	-9.8	4.48 – 8.32	A
Water	H-3	239.32	-1.5	170 – 316	A
Water	Mn-54	33.12	4.8	22.1 – 41.1	A
Water	Cs-134	21.84	1.6	15.1 – 28.0	A
Water	Cs-137	30.21	2.8	20.6 – 38.2	A
Water	Ni-63	15.18	-18.4	13.0 – 24.2	A
Water	Co-60	24.82	0.9	17.2 – 32.0	A

FLORIDA DEPARTMENT OF HEALTH - INTERLABORATORY COMPARISON PROGRAM DATA, cont'd

Results for September 2011:

Media	Nuclide	Result	% Bias	Acceptance Range	Flag
Air	Cs-137	2.74	5.4	1.82 – 3.38	A
Air	Co-57	4.689	-7.9	3.56 – 6.62	A
Air	Co-60	3.13	-2.2	2.24 – 4.16	A
Air	Zn-65	4.64	12.9	2.88 – 5.34	A
Soil	Mn-54	901.50	6.3	594 – 1102	A
Soil	Co-60	652.60	1.3	451 – 837	A
Soil	Co-57	1197.21	1.5	826 – 1534	A
Soil	Zn-65	1721.94	10.4	1092 – 2028	A
Soil	Cs-137	1013.69	3.5	685 – 1273	A
Vegetation	Mn-54	4.79	-16.1	4.00 – 7.42	A
Vegetation	Co-60	2.71	-19.8	2.37 – 4.39	A
Vegetation	Cs-137	3.91	-17.0	3.30 – 6.12	A
Vegetation	Zn-65	5.45	-14.7	4.47 – 8.31	A
Water	H-3	910.69	-10.2	710 – 1318	A
Water	Co-57	35.50	-3.0	25.6 – 47.6	A
Water	Co-60	29.31	0.0	20.5 – 38.1	A
Water	Cs-134	19.18	0.4	13.4 – 24.8	A
Water	Zn-65	31.10	9.1	20.0 – 37.1	A
Water	Mn-54	26.02	4.1	17.5 – 32.5	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 Department of Health, State Bureau of Radiation Control in Orlando.

Table IV-A.1 provides a statistical summary of the analytical results for 311 gross beta samples and 311 iodine samples.

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

Three hundred eleven particulate samples were analyzed for gross beta activity, all of which had measurable activity except 1 sample. The average indicator concentration was 19 pCi/1000 m³ with a range of 13 to 29 pCi/1000 m³. The average indicator concentration since 1996 was in the range of 14 to 20 pCi/1000 m³. The control location concentration for 2011 averaged 18 pCi/1000 m³, with a range of 14 to 23 pCi/1000 m³.

REMP samples obtained from locations labeled with a footnote connecting the media to the Fukushima *tsunami* event during 2011 identified detectable concentrations of isotopes that could be related to operation of *Crystal River Unit 3*. Given the following facts, the detectable concentrations are not a result of *Crystal River Unit 3* operation:

- (1) The quantities of radioactive airborne effluents from *Crystal River Unit 3* during 2011 did not increase significantly compared to year 2010.
- (2) REMP sample results have not detected the presence of these isotopes in airborne *particulate or iodine* samples from prior to 22-Mar-2011 or after 12-Apr-2011.
- (3) The concentrations being detected in the indicator samples were also identified in the control samples for from *Crystal River Unit 3*.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Dai-ichi, Fukushima following the March 11, 2011 Tohoku earthquake and is not related to the operations of *Crystal River Unit 3*.

Three hundred eleven samples were analyzed for iodine activity, with several having measurable activity due to the Fukushima tsunami event. The highest iodine LLD was 0.03 pCi/m³. The highest iodine value was measured at 0.64 pCi/m³ at station C46. All stations including the control station in Orlando reported measurable iodine values from the time period of 3/22/12 to 4/12/12. The control station actually had the highest measurable mean value.

Quarterly composite data are summarized in Table IV-A.4. Also due to the Fukushima event, measurable quantities of cesium were identified in two particulate filter samples. At station C40 the Cs-137 concentration was 1.9 pCi/1000 m³ and at station C46 the Cs-137 concentration was 0.8 pCi/1000 m³. The highest cesium LLD was 2.9 pCi/1000 m³ for cesium 134.

There was one instance of non-collected airborne samples for the year 2011, due to a fire at Crystal River Unit 1 that resulted in loss of power feed to the sample station C-41.

1. In January station C-41 was down for 217 hours due to a fire at CR-1.
2. In June station C-41 was down for 67.2 hours due to a failed vacuum pump.
3. In June station C-40 was down for 47 hours due to the power being disconnected by fossil maintenance to install remote controls to a nearby well pump that uses the same power feed as the air sample station.

The remaining 4 sample stations were in service 100% of the time, with exception of filter changes and air pump/gas meter replacements. The percentages of down times for the 2 stations are as follows:

C40	0.56%
C41	3.36%

The air sample station's down times are documented in the plant Corrective Action Program (CAP) under Condition Reports (CRs) 443108, 471322, and 473514.

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, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIRBORNE IODINE (pCi/m ³)	γ Spec 311 I-131	0.03	0.177 (17/259) (0.018–0.636)	C47 78 @ 135°	0.262(3-52) (0.043-0.471)	0.262(3-52) (0.043-0.471)	0
AIRBORNE PARTICULATES (pCi/1000m ³ for Gross β, pCi/1000m ³ for γ Spec)	Gross β 311 γ Spec 24 Cs-134 Cs-137	6.0 2.9 1.8	19 (258/259) (5–110) <LLD 1.35(2/24) (0.8-1.9)	C40 3.4 @ 60° -- C40 3.4 @ 60°	21 (52/52) (5–110) -- 1.9(1/24) (<LLD-1.9)	18 (52/52) (6–114) <LLD <LLD	0 0 0 0

¹The "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 - 2011

pCi/m³ IODINE - 131 IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Jan-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
11-Jan-11	<0.03(A)	<0.02	<0.02	<0.02	<0.02	<0.02
18-Jan-11	<0.03	<0.03	<0.03	<0.04(B)	<0.03	<0.03
25-Jan-11	<0.02	<0.02	<0.02	(C)	<0.02	<0.02
01-Feb-11	<0.02	<0.02	<0.02	<0.03	<0.02	<0.02
08-Feb-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
15-Feb-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
21-Feb-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
01-Mar-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
09-Mar-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02(D)
16-Mar-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22-Mar-11(E)	0.114 ± 0.012	0.036 ± 0.004	0.018 ± 0.005	0.074 ± 0.013	0.074 ± 0.017	0.272 ± 0.022
28-Mar-11(E)	0.617 ± 0.033	0.186 ± 0.013	0.584 ± 0.034	0.421 ± 0.021	0.636 ± 0.034	0.471 ± 0.022

- (A) Pump failed and was replaced. Estimated run time 60.1 out of 193.8 hours.
- (B) No power due to fire at CR-1. Estimated run time 120 out of 169 hours.
- (C) No power, no flow or run time due to fire event.
- (D) Power outage. Estimated run time 178.5 out of 191.3 hours.
- (E) Positive measured iodine values attributed to Japanese Fukushima power plant tsunami event.

TABLE IV-A.2 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/m³ IODINE - 131 IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Apr-11(A)	0.044 ± 0.008	0.053 ± 0.015	0.032 ± 0.014	0.022 ± 0.004	0.029 ± 0.004	0.043 ± 0.008
12-Apr-11(A)	0.036 ± 0.010	0.027 ± 0.005	<0.02	<0.02	<0.02	<0.02
19-Apr-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
26-Apr-11	<0.03	<0.03	<0.02	<0.03	<0.02	<0.03
03-May-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
10-May-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
17-May-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24-May-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
31-May-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
07-Jun-11	<0.02	<0.02	<0.03	<0.02	<0.02	<0.02
14-Jun-11	<0.03	<0.03	<0.03	<0.05	<0.03	<0.03
20-Jun-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
28-Jun-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

(A) Positively Measured Iodine values are a result of the Japanese Fukushima power plant tsunami event.

TABLE IV-A.2 (Cont'd)
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
pCi/m³ IODINE - 131 IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Jul-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
13-Jul-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
19-Jul-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27-Jul-11	<0.01	<0.01	<0.02(A)	<0.01	<0.01	<0.01
02-Aug-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
09-Aug-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
17-Aug-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
23-Aug-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
31-Aug-11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
06-Sep-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
14-Sep-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
20-Sep-11	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
28-Sep-11	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01

(A) Pump failed and was replaced. Estimated run time 179.7 out of 191.2 hours.

TABLE IV-A.2 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/m³ IODINE - 131 IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
04-Oct-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
11-Oct-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18-Oct-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
25-Oct-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
01-Nov-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
08-Nov-11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16-Nov-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22-Nov-11	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02
29-Nov-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
06-Dec-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
12-Dec-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
20-Dec-11	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27-Dec-11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE IV-A.3

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/1000m³ GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
03-Jan-11	20	24	17	17	23	21
11-Jan-11	36(A)	24	24	26	30	27
18-Jan-11	21	25	24	25(B)	27	21
25-Jan-11	20	23	24	(C)	27	20
01-Feb-11	17	21	22	21	23	19
08-Feb-11	16	16	17	21	16	17
15-Feb-11	19	24	21	23	23	18
21-Feb-11	22	29	26	27	24	16
01-Mar-11	17	17	16	14	19	16
09-Mar-11	11	15	14	11	17	15(D)
16-Mar-11	19	17	21	17	19	21
22-Mar-11(E)	44	37	40	37	40	114
28-Mar-11(E)	59	74	110	78	76	75
Average:	25	27	29	24	28	31

(A) Pump failed and was replaced. Estimated run time 60.1 out of 193.8 hours.

(B) No power due to fire at CR-1. Estimated run time 120 out of 169 hours.

(C) No power, no flow or run time due to fire event.

(D) Power outage. Estimated run time 178.5 out of 191.3 hours.

(E) Elevated Gross Beta values attributed to Japanese Fukushima power plant tsunami event.

TABLE IV-A.3 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/1000m³ GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Apr-11	19	20	17	19	16	22
12-Apr-11	15	19	21	18	21	21
19-Apr-11	23	23	24	21	21	22
26-Apr-11	15	15	17	16	14	17
03-May-11	15	15	19	15	13	9
10-May-11	10	22	20	21	18	25
17-May-11	26	25	20	24	25	17
24-May-11	24	23	19	26	13	12
31-May-11	20	21	20	20	21	19
07-Jun-11	10	13	14	13	8	14
14-Jun-11	22	24	26	17	23	16
20-Jun-11	24	22	25	17	23	14
28-Jun-11	12	12	13	14	11	13
Average:	18	20	20	18	17	17

TABLE IV-A.3 (Cont'd)
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
pCi/1000m³ GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
05-Jul-11	9	11	12	15	14	6
13-Jul-11	11	15	14	13	12	10
19-Jul-11	15	17	16	16	12	11
27-Jul-11	12	9	12(A)	11	9	11
02-Aug-11	9	13	13	13	7	11
09-Aug-11	12	15	13	9	11	12
17-Aug-11	18	24	18	21	15	12
23-Aug-11	14	11	15	12	22	6
31-Aug-11	20	21	20	24	24	18
06-Sep-11	13	13	14	9	17	7
14-Sep-11	15	20	23	17	26	13
20-Sep-11	21	30	32	28	31	23
28-Sep-11	5	8	5	4	7	<6
Average:	13	16	16	15	16	<11

(A) Pump failed and was replaced. Estimated run time 179.7 out of 191.2 hours.

TABLE IV-A.3 (Cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/1000m³ GROSS β IN AIR

Collection Date	SAMPLE SITE					
	C07	C18	C40	C41	C46	C47
04-Oct-11	17	19	24	14	20	17
11-Oct-11	12	15	16	16	19	14
18-Oct-11	10	15	20	11	18	11
25-Oct-11	13	19	19	17	17	16
01-Nov-11	14	26	26	27	21	19
08-Nov-11	11	17	18	13	9	13
16-Nov-11	17	20	26	16	16	16
22-Nov-11	13	18	18	11	17	16
29-Nov-11	8	12	10	10	7	7
06-Dec-11	17	17	16	16	14	15
12-Dec-11	21	22	21	12	16	9
20-Dec-11	22	30	20	22	23	23
27-Dec-11	13	12	15	10	13	12
Average:	14	19	19	15	16	14

TABLE IV-A.4

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/1000m³ γ EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
C07	Be-7	147	172	109	189
	K-40	<21	<22	<6.9	<31
	Cs-134	<2.1	<1.2	<0.4	<1.7
	Cs-137	<1.7	<1.2	<0.3	<1.4
C18	Be-7	161	208	116	167
	K-40	<16	<25	<21	<26
	Cs-134	<1.4	<1.7	<1.2	<1.9
	Cs-137	<1.6	<1.2	<0.9	<1.6
C40	Be-7	159	185	107	149
	K-40	<21	<19	<17	<25
	Cs-134	<2.9	<1.6	<1.9	<1.8
	Cs-137	1.9(A)	<1.6	<1.5	<1.1
C41	Be-7	175	149	106	139
	K-40	<23	<22	<22	<17
	Cs-134	<2.3	<2.0	<0.9	<1.8
	CS-137	<1.8	<1.5	<0.8	<1.5
C46	Be-7	178	158	141	146
	K-40	<6.4	<26	<18	<22
	Cs-134	<0.6	<1.4	<1.5	<1.8
	Cs-137	0.8(A)	<1.5	<1.0	<1.1
C47	Be-7	165	172	94	147
	K-40	<20	<22	<27	<23
	Cs-134	<2.2	<1.7	<1.0	<1.4
	Cs-137	<1.4	<1.0	<1.0	<1.1

(A)Due to Fukushima event

TABLE IV-A.4.A (SUPPLEMENTAL DATA)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/1000m³ γ EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATES

STATION	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
C07	I-131	117(A)	N/A	N/A	N/A
	Cs-134	<2.1	N/A	N/A	N/A
	Cs-137	<1.7	N/A	N/A	N/A
C18	I-131	93(A)	N/A	N/A	N/A
	Cs-134	<1.4	N/A	N/A	N/A
	Cs-137	<1.6	N/A	N/A	N/A
C40	I-131	159(A)	N/A	N/A	N/A
	Cs-134	<2.9	N/A	N/A	N/A
	Cs-137	1.9(A)	N/A	N/A	N/A
C41	I-131	89(A)	N/A	N/A	N/A
	Cs-134	<2.3	N/A	N/A	N/A
	CS-137	<1.8	N/A	N/A	N/A
C46	I-131	109(A)	N/A	N/A	N/A
	Cs-134	<0.6	N/A	N/A	N/A
	Cs-137	0.8(A)	N/A	N/A	N/A
C47	I-131	239(A)	N/A	N/A	N/A
	Cs-134	<2.2	N/A	N/A	N/A
	Cs-137	<1.4	N/A	N/A	N/A

(A)Due to Fukushima tsunami event

This data not required by the ODCM

TABLE IV-A.4.A (SUPPLEMENTAL DATA) Cont'd

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

AIR PARTICULATES - *GAMMA ANALYSIS OF WEEKLY COMPOSITES - (pCi/1000m³)

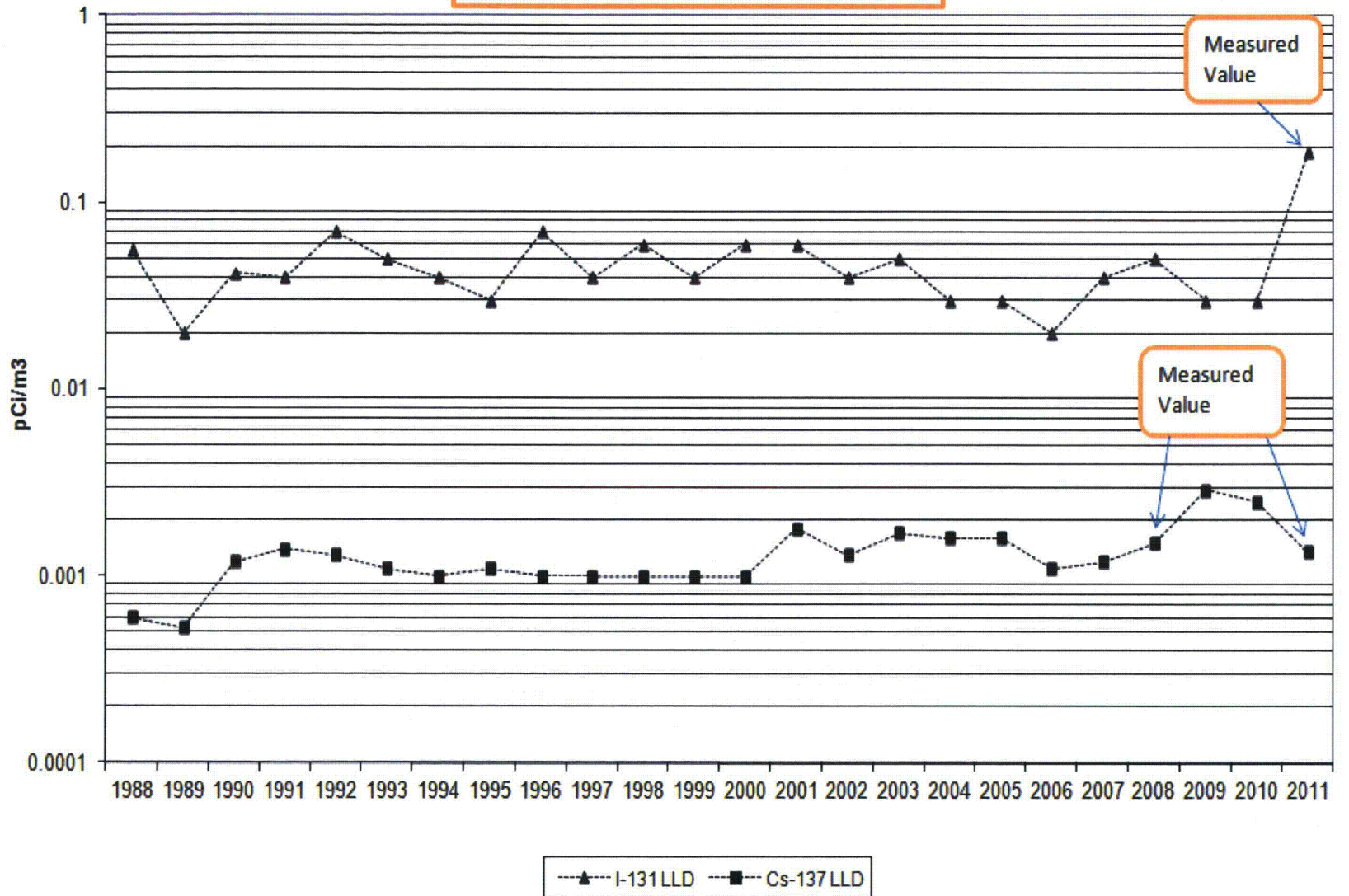
Collection Date	Be-7	K-40	Cr-51	I-131
22-Mar-11	95	<25	<14	32
28-Mar-11	6.2	<1.2	<0.8	1.2
	Cs-134	Cs-137	Pb-210	Te-132
22-Mar-11	<2.4	<1.6	<128	7.4
28-Mar-11	0.4	0.4	<1.6	0.3

Additional data in response to Fukushima tsunami event.

* Gamma analysis of weekly composites is supplemental; not required by the ODCM.

Airborne (highest values plotted)

2011 Measured Values due to Fukushima Event



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 2011.

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 84 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 62 mrem/yr at station C65 (ESE at 1584 feet).

The highest off-site dose was 55 mrem/yr at station C40 (east at 3.5 miles). The control station (C47) average dose was 61 mrem/yr. The average for all stations (except control) was 46 mrem/yr for 2011, 49 mrem/yr for 2010, and 51 mrem/yr for 2009. Direct radiation results are similar to previous years and show no change of significance.

There were no missing or unanalyzed TLDs during this evaluation period.

TABLE IV-B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	<u>ALL INDICATOR LOCATIONS</u> MEAN RANGE	<u>LOCATION WITH HIGHEST MEAN</u> NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
DIRECT RADIATION (mrem/yr)	γ DOSE, 132	15	46 (128/128) (31 - 84)	C71 0.6 @ 296°	75 (4/4) (60 - 84)	61 (4/4) (46 - 70)	0

TABLE IV-B.1

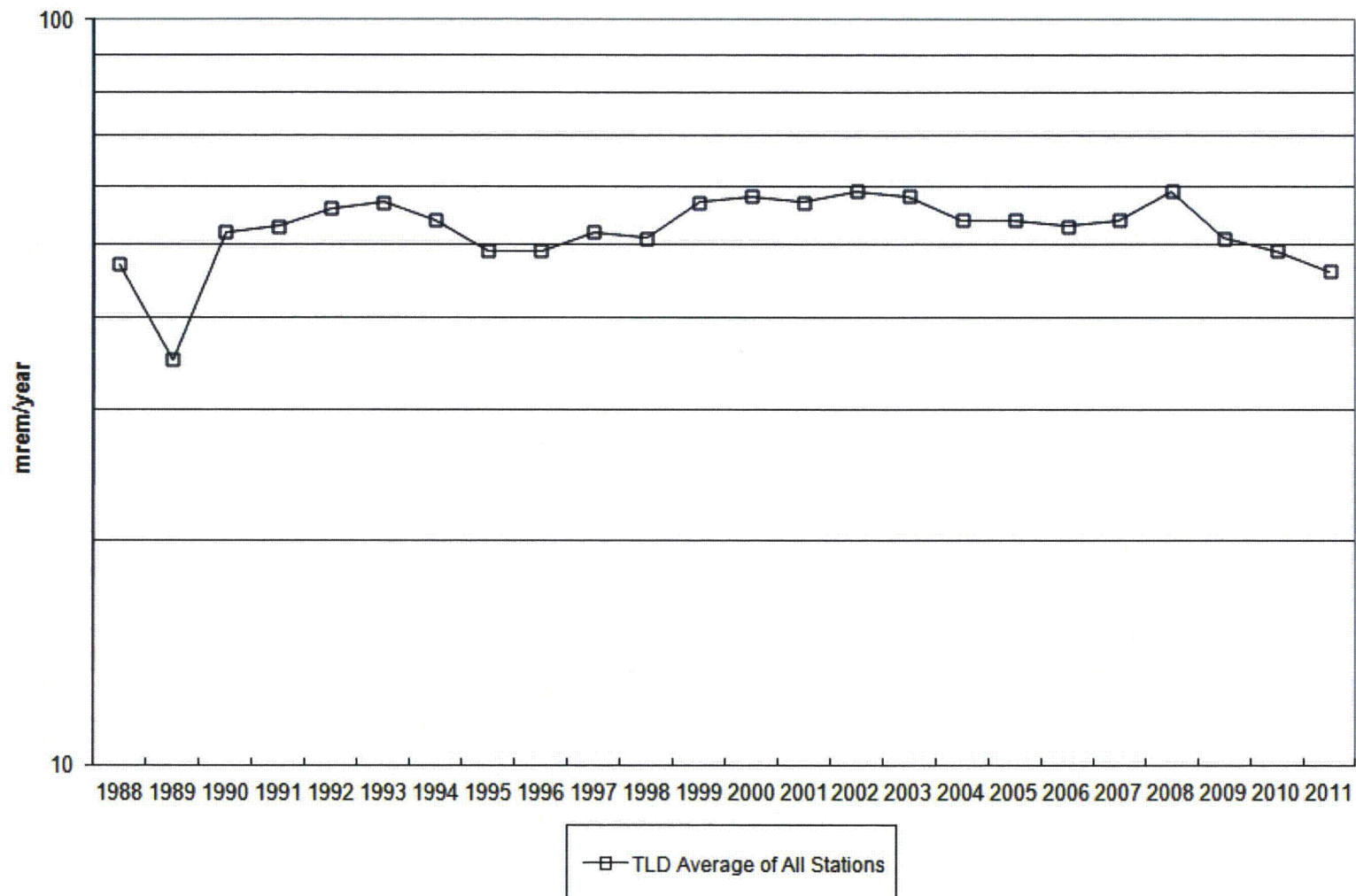
PROGRESS ENERGY FLORIDA, INC. - CR-3 - 2011

mrem/yr γ Dose

TLD STATION	Quarter	1	2	3	4
CO1		40	37	40	31
CO3		40	38	39	31
CO4		34	38	38	30
CO7*		34	37	36	30
CO8		35	38	36	30
C09		36	40	37	31
C14G		46	48	45	37
C18		41	45	16	34
C27		53	57	55	44
C40*		51	55	53	43
C41		54	52	51	41
C46*		50	54	48	41
C47 (CONTROL)		70	69	60	46
C60		48	55	48	37
C61		48	55	51	39
C62		54	61	58	45
C63		50	57	51	43
C64		47	52	47	40
C65		56	62	60	45
C66		52	54	53	40
C67		53	60	53	42
C68		51	56	52	40
C69		62	59	55	42
C70		56	57	55	44
C71		79	84	76	60
C72		49	53	51	41
C73		48	52	48	38
C74		38	42	37	31
C75		47	51	49	37
C76		44	47	44	35
C77		44	48	43	34
C78		37	42	38	30
C79		42	45	40	36

*TLDs not required by the ODCM.

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. In 2011, of twenty-four indicator samples, five had measurable tritium at an average concentration of 190 pCi/L, as compared to one measurable sample containing tritium with a concentration of 1774 pCi/L in 2010. The sample with the highest concentration of tritium, 281 pCi/L, was obtained in October at station C14G near the end 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. CR-3 was in Refuel 16 outage at the time of sampling with reduced dilution due to no circulating water pumps running. Plant raw water pumps were providing the dilution flow. This resulted in the concentration of tritium in the discharge canal being slightly elevated. In 2011 four control station samples had measurable tritium concentrations at an average of 168 pCi/L. The 2010 control station results were all < LLD.

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 150 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 site ground water samples are taken at nine locations surrounding the perimeter of the CR-3 protected area. Presently five of these ground water wells have shown indications of very low levels of tritium on the west-southwest side of the plant. It is believed that this tritium is the result of a leak in the Station Drain Tank (SDT-1) to the settling pond discharge line that occurred in 1998. This discharge line has recently been leak tested and it is leak free. There are no other known leaking plant components. In 2011 the five wells that have shown measurable amounts of tritium range from 76 to 854 pCi/L. These five wells have been sampled additionally on a monthly basis to develop trend data. This information is shown as supplemental data. Along with these wells, two other wells that are not presently part of the REMP have been sampled that are on either side of the plant settling ponds (percolation ponds). In 2011 these two wells are showing measurable amounts of tritium in the range of 92 to 211 pCi/L, which are a result of plant discharges from the SDT-1. These discharges are being minimized through operational focus. The positively measured tritium values are below the reporting criteria of the ODCM and the NEI 07-07 Ground Water Protection Initiative Guidelines. There have been no measurable amounts of gamma emitting radionuclides in any of these wells. There have been no measurable amounts of hard-to-detect (HTD) radionuclides in any of these wells with exception of trace levels of gross alpha, which is expected, given the naturally occurring limestone strata that surrounds the Florida aquifer. It should be noted that site ground water flows in a west-southwest direction toward the Gulf of Mexico. This flow was re-verified in 2006 with a new ground water flow study performed by a certified hydro-geologist as part of the NEI Ground Water Protection Initiative. Additionally, the ground water at the CR-3 site is too saline for use as a potable water source, hence there is no drinking water uptake pathway at the Crystal River site.

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

Table IV-C.2.b.1 provides the results of the quarterly samples.

Table IV-C.2.b.2 provides the results of the monthly supplemental samples.

IV-C. WATERBORNE PATHWAY Cont'd

4. Monthly non-REMP required well samples were collected as discussed in item #3 above. Two wells were sampled. These two wells are located on the north side and the south side of the site percolation ponds. The information is discussed above. Both of these wells showed no measurable amounts of any other radionuclides of interest. The tritium concentration in these wells have decreased significantly due to a focused reduction in the number of discharges from the station drain tank (SDT-1) to the site percolation ponds.

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

Table IV-C.2.c.1 provides the results of the monthly supplemental non-REMP required samples.

5. 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.

6. 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, two had measurable amounts of cesium-137 with a concentration range of 14 to 37 pCi/kg and three had measurable amounts of cobalt-60 with a concentration range of 11 to 65 pCi/kg. In 2010 there were two samples with measurable amounts of cobalt-60. The average cobalt-60 concentration at the indicator locations ranged from 30 to 389 pCi/L from 1998 through 2007. In 2009 the average cesium-137 concentration at the indicator locations was 24 pCi/L. The average cesium-137 concentration in 2008 was 25 pCi/L. The 2011 results are similar to previous years' results. None of the samples taken at Fort Island Gulf Beach, the control location station C09, 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.

7. There were no unmonitored spills or releases of radioactive material in 2011 that could have the potential to contaminate the ground water per the guidelines of the Nuclear Energy Institute Ground Water Protection Initiative – Final Guidance Document 07-07. As such, there were no communiqués issued to state, local, or regulatory agencies.
8. Additional samples taken in 2011 but not required by the ODCM:

Annual sediment samples were collected at four locations in the site settling ponds. Cs-137 was detected in three of the four samples in concentrations ranging from 76 to 97 pCi/kg. There were no measurable amounts of Co-60 or Cs-134 in any of the samples.

Annual surface water samples were collected at two locations in the site percolation ponds. The tritium concentration was < LLD of 152 pCi/L in both samples. Both of these samples showed no measurable amounts of any other radionuclides of interest. Note that these surface water samples were collected in January of 2012 due to the percolation ponds being drained for maintenance in December of 2011.

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, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEAWATER (pCi/L)	<u>Tritium, 36</u>	152	190(5/24) (116-281)	C14H 0.1 @ 0°	252 (1/12) (<LLD-252)	168(4/12) (97-252)	0
	<u>γ Spec, 36</u>						
	Mn-54	5	<LLD	--	--	<LLD	0
	Fe-59	10	<LLD	--	--	<LLD	0
	Co-58	5	<LLD	--	--	<LLD	0
	Co-60	6	<LLD	--	--	<LLD	0
	Zn-65	11	<LLD	--	--	<LLD	0
	Zr-Nb-95	9	<LLD	--	--	<LLD	0
	I-131	6	<LLD	--	--	<LLD	0
	Cs-134	6	<LLD	--	--	<LLD	0
	Cs-137	6	<LLD	--	--	<LLD	0
	Ba-La-140	15	<LLD	--	--	<LLD	0

¹The "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 - 2011
pCi/L γ 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	97±44	254±14	<2	<2	<5	<2	<5	<4	<3	<3	<2	<5
	FEB	<139	281±32	<4	<4	<9	<5	<8	<5	<5	<4	<4	<15
	MAR	<143	255±21	<3	<3	<7	<4	<8	<6	<4	<4	<4	<13
	APR	<145	263±32	<4	<4	<8	<5	<10	<7	<5	<5	<4	<6
	MAY	<141	270±33	<4	<3	<9	<4	<10	<7	<4	<5	<5	<14
	JUN	125±45	306±33	<3	<4	<8	<5	<8	<5	<5	<5	<5	<7
	JUL	197±27	385±34	<4	<3	<7	<5	<9	<6	<4	<4	<4	<11
	AUG	<143	304±40	<4	<4	<8	<4	<8	<6	<4	<5	<4	<11
	SEP	<140	188±19	<4	<4	<8	<4	<10	<7	<4	<5	<4	<9
	OCT	252±48	209±30	<3	<3	<7	<5	<10	<5	<4	<5	<3	<4
	NOV	<134	265±21	<3	<4	<7	<4	<9	<6	<4	<4	<4	<9
	DEC	<152	274±31	<4	<4	<8	<4	<8	<6	<5	<5	<4	<7
C14G	JAN	133±45	285±31	<3	<4	<7	<4	<8	<6	<3	<4	<4	<6
	FEB	<139	332±28	<4	<4	<8	<5	<9	<7	<4	<5	<4	<15
	MAR	<143	237±28	<3	<3	<8	<4	<8	<6	<4	<4	<4	<12
	APR	<145	234±19	<2	<2	<6	<3	<6	<4	<3	<3	<3	<5
	MAY	<152	292±29	<3	<3	<7	<4	<7	<7	<4	<4	<4	<12
	JUN	<138	308±51	<5	<5	<10	<6	<11	<9	<5	<6	<6	<11
	JUL	116±42	290±34	<4	<4	<9	<5	<7	<7	<4	<5	<5	<11
	AUG	167±48	230±20	<4	<4	<8	<4	<9	<6	<4	<5	<4	<11
	SEP	<140	241±28	<5	<5	<7	<5	<9	<7	<5	<5	<4	<8
	OCT	281±49	222±34	<4	<3	<8	<5	<8	<7	<5	<5	<4	<7
	NOV	<134	256±30	<3	<3	<7	<4	<7	<6	<5	<5	<4	<8
	DEC	<152	323±34	<3	<4	<7	<4	<7	<5	<4	<4	<4	<8

TABLE IV-C.1a (CONT'D)
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
pCi/L γ 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	<135	258±20	<3	<2	<5	<3	<5	<4	<3	<3	<3	<5
	FEB	<139	246±31	<3	<4	<8	<4	<8	<7	<5	<5	<4	<11
	MAR	<143	227±29	<4	<4	<8	<5	<9	<7	<4	<5	<4	<12
	APR	<145	233±33	<3	<4	<7	<4	<9	<7	<5	<4	<4	<4
	MAY	<141	317±39	<4	<4	<8	<5	<9	<7	<4	<5	<5	<15
	JUN	<138	320±30	<3	<3	<8	<5	<8	<7	<4	<4	<4	<8
	JUL	<128	261±21	<4	<4	<7	<4	<9	<6	<4	<4	<4	<14
	AUG	<138	273±34	<5	<3	<7	<5	<7	<6	<4	<5	<4	<11
	SEP	<140	245±31	<3	<3	<8	<4	<7	<7	<5	<4	<5	<8
	OCT	252±48	213±37	<4	<5	<7	<5	<10	<7	<5	<4	<4	<9
	NOV	<134	287±22	<3	<3	<8	<4	<9	<6	<4	<4	<4	<9
	DEC	<152	491±42	<5	<5	<10	<6	<9	<9	<6	<5	<5	<8

Seawater

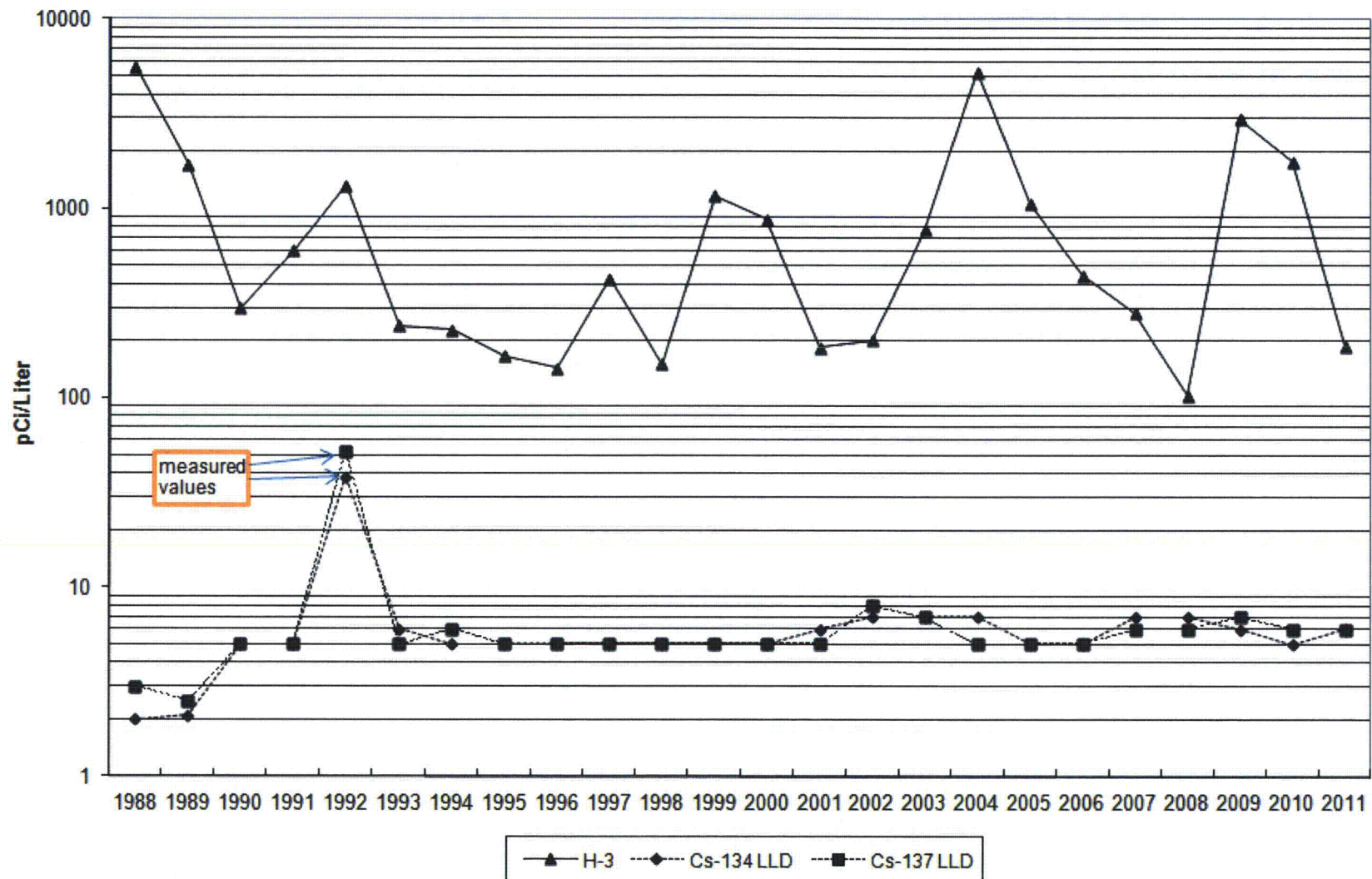


TABLE IV-C.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
GROUND WATER ² (pCi/L)	<u>Tritium, 2</u>	143	<LLD	--	--	<LLD	0
	<u>γ Spec, 2</u>						
	Mn-54	6	<LLD	--	--	<LLD	0
	Fe-59	6	<LLD	--	--	<LLD	0
	Co-58	12	<LLD	--	--	<LLD	0
	Co-60	7	<LLD	--	--	<LLD	0
	Zn-65	15	<LLD	--	--	<LLD	0
	Zr-Nb-95	11	<LLD	--	--	<LLD	0
	I-131	8	<LLD	--	--	<LLD	0
	Cs-134	6	<LLD	--	--	<LLD	0
	Cs-137	8	<LLD	--	--	<LLD	0
	Ba-La-140	9	<LLD	--	--	<LLD	0

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

²There is no drinking water uptake pathway at the Crystal River site.

TABLE IV-C.2.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN GROUND WATER

STATION	NUCLIDE	FIRST HALF	SECOND HALF
C40	H-3	<143	<143
	Mn-54	<4	<6
	Fe-59	<4	<6
	Co-58	<4	<12
	Co-60	<4	<7
	Zn-65	<8	<15
	Zr-Nb-95	<8	<11
	I-131	<6	<8
	Cs-134	<5	<6
	Cs-137	<4	<8
	Ba-La-140	<8	<9
	K-40	<55	<94

Ground Water

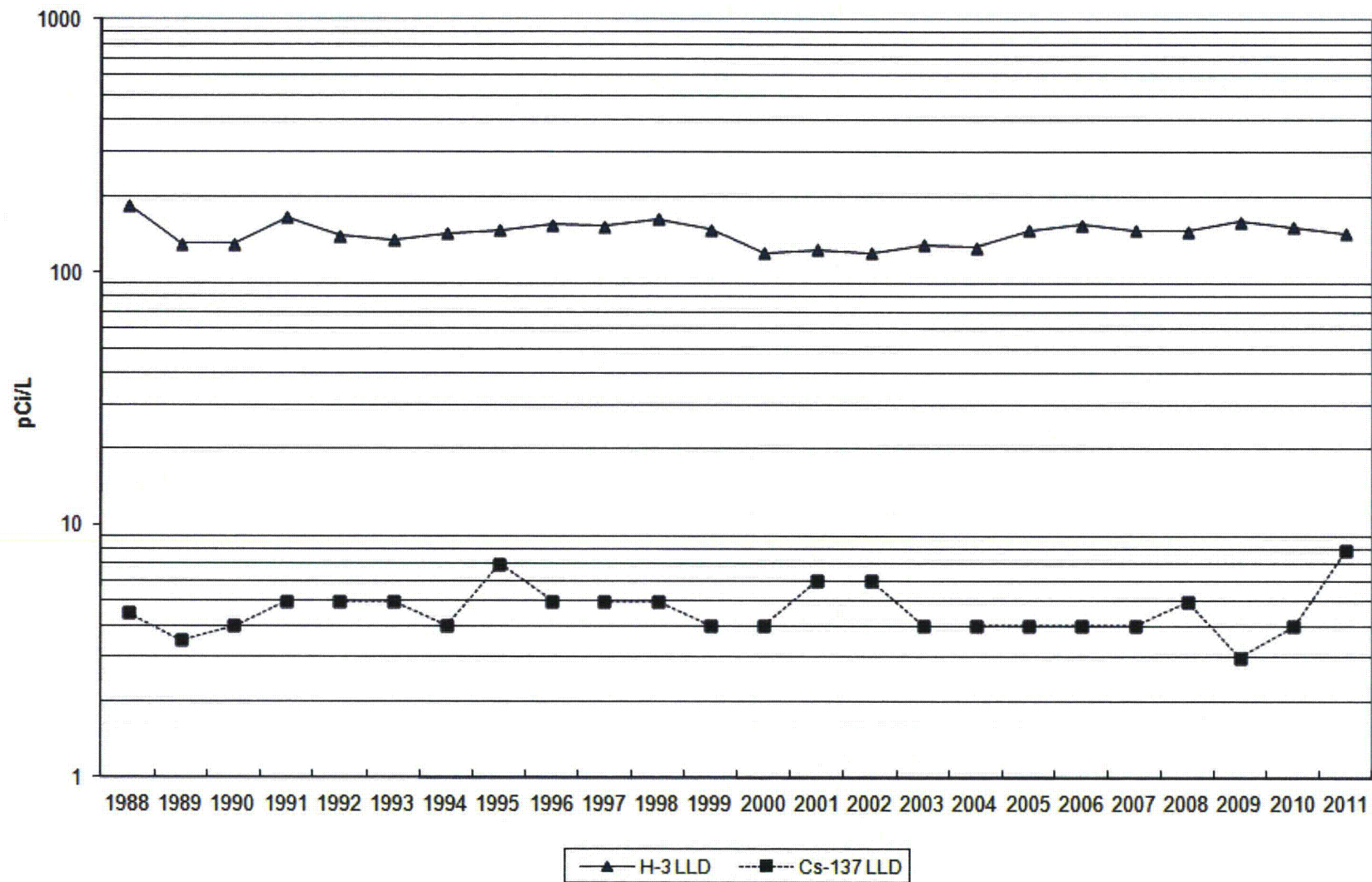


TABLE IV-C.2.b

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL (NUMBER) ² OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
CR3 SITE GROUND WATER (pCi/L)	Tritium 76	152	270 (43/72) (76-854)	C3-5 0.051 mi. @225°	610 (12/12) (335-854)	C3-2 <LLD	0
	<u>γ Spec 76</u>						
	Mn-54	6	<LLD	--	--	<LLD	0
	Fe-59	14	<LLD	--	--	<LLD	0
	Co-58	6	<LLD	--	--	<LLD	0
	Co-60	6	<LLD	--	--	<LLD	0
	Zn-65	25	<LLD	--	--	<LLD	0
	Zr-Nb-95	10	<LLD	--	--	<LLD	0
	I-131	13	<LLD	--	--	<LLD	0
	Cs-134	7	<LLD	--	--	<LLD	0
	Cs-137	7	<LLD	--	--	<LLD	0
	Ba-La-140	15	<LLD	--	--	<LLD	0

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

²Includes extra samples collected for data trending.

TABLE IV-C.2.b.1

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND 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
C3-2	01-06	<135	<43	<3	<4	<7	<4	<6	<7	<5	<4	<4	<6
	04-05	<135	<37	<3	<4	<7	<3	<15	<6	<4	<4	<4	<7
	07-05	<141	<73	<5	<4	<8	<5	<10	<8	<6	<6	<5	<10
	10-05	<138	<31	<2	<2	<3	<2	<4	<3	<2	<2	<2	<5
C3-4	01-06	<135	<31	<3	<3	<5	<3	<10	<5	<4	<3	<3	<5
	04-05	<145	<51	<4	<4	<8	<4	<17	<7	<6	<5	<5	<9
	07-05	<141	<61	<5	<5	<10	<5	<18	<9	<6	<5	<5	<11
	10-04	<144	<58	<5	<5	<9	<5	<18	<8	<6	<6	<6	<11
C3-5	01-06	854±60	45±20	<4	<4	<8	<4	<13	<7	<6	<5	<4	<6
	04-05	574±58	<96	<5	<4	<14	<6	<12	<9	<8	<7	<5	<10
	07-05	522±56	<61	<5	<4	<9	<4	<14	<8	<5	<5	<5	<9
	10-04	335±50	44±9	<4	<4	<8	<4	<15	<6	<4	<4	<4	<14

TABLE IV-C.2.b.1(cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND 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
C3-6S	01-06	131±44	32±5	<3	<3	<5	<3	<9	<4	<4	<3	<3	<4
	04-05	<145	<51	<4	<4	<9	<4	<15	<7	<6	<5	<5	<9
	07-05	123±45	<76	<4	<5	<7	<4	<7	<8	<5	<6	<4	<7
	10-05	119±33	32±4	<2	<2	<4	<2	<8	<3	<2	<2	<2	<6
C3-6D	01-06	<135	185±25	<4	<4	<8	<4	<8	<7	<5	<4	<4	<6
	04-05	<145	194±18	<4	<4	<8	<4	<14	<8	<5	<5	<5	<7
	07-05	128±27	167±18	<5	<4	<10	<5	<16	<8	<6	<5	<5	<11
	10-04	<145	152±20	<6	<5	<9	<5	<15	<9	<6	<5	<5	<12
C3-7	01-06	165±45	<67	<3	<3	<5	<3	<9	<5	<3	<3	<3	<6
	04-05	127±47	<72	<4	<3	<8	<4	<9	<8	<6	<5	<5	<7
	07-05	177±47	<75	<4	<5	<7	<4	<9	<6	<6	<5	<5	<6
	10-04	162±47	<50	<4	<4	<8	<4	<14	<7	<5	<4	<4	<9

TABLE IV-C.2.b.1(cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND 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
C3-8	01-06	110±44	<59	<4	<5	<8	<4	<16	<8	<7	<5	<5	<8
	04-05	141±48	70±20	<5	<6	<9	<5	<21	<8	<6	<6	<6	<11
	07-05	<141	<81	<5	<5	<10	<5	<9	<8	<7	<6	<5	<12
	10-05	89±43	53±8	<4	<4	<8	<4	<18	<7	<5	<4	<5	<15
C3-9	01-06	<135	66±17	<2	<2	<5	<2	<5	<4	<4	<3	<3	<4
	04-05	<145	<88	<5	<6	<11	<4	<13	<10	<8	<7	<6	<12
	07-05	87±26	53±5	<2	<2	<3	<2	<7	<3	<2	<2	<2	<4
	10-05	<139	26±9	<5	<5	<9	<5	<16	<8	<6	<5	<5	<11
C3-10	01-06	97±26	<53	<3	<4	<7	<4	<8	<6	<4	<4	<4	<6
	04-05	<145	<94	<5	<4	<12	<5	<11	<9	<8	<6	<5	<11
	07-05	<141	<56	<3	<4	<7	<4	<8	<6	<4	<4	<4	<11
	10-05	<139	<54	<6	<5	<10	<5	<22	<9	<7	<6	<6	<12

TABLE IV-C.2.b.2

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND WATER (SUPPLEMENTAL DATA)

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
C3-5	02-01	769±61	34±10	<5	<5	<10	<5	<19	<8	<6	<5	<6	<10
	03-02	741±60	<79	<3	<4	<8	<4	<7	<7	<5	<4	<4	<15
	05-03	519±56	40±8	<4	<4	<8	<4	<17	<7	<5	<5	<5	<15
	06-08	586±56	76±28	<5	<4	<7	<5	<8	<8	<6	<5	<5	<8
	08-03	604±57	56±12	<2	<2	<4	<2	<4	<3	<2	<2	<2	<5
	09-07	634±58	35±10	<5	<5	<9	<5	<20	<8	<6	<5	<6	<15
	11-02	485±54	<91	<5	<4	<7	<5	<9	<8	<7	<6	<6	<9
	12-07	696±62	<17	<1	<1	<2	<1	<2	<2	<2	<1	<1	<2
C3-6S	02-01	93±46	28±9	<5	<5	<9	<5	<17	<8	<6	<5	<5	<9
	03-02	<143	20±7	<4	<4	<7	<4	<16	<6	<4	<4	<5	<14
	05-04	<141	200±23	<5	<4	<9	<5	<9	<8	<5	<5	<5	<13
	06-08	<123±45	49±17	<4	<4	<7	<4	<9	<6	<5	<4	<4	<14
	08-03	<143	126±19	<3	<4	<11	<4	<9	<9	<13	<4	<4	<9
	09-07	<146	28±11	<2	<2	<4	<2	<4	<3	<2	<2	<2	<5
	11-02	119±33	<85	<4	<5	<9	<6	<11	<8	<6	<5	<5	<9
	12-07	<152	<50	<4	<4	<9	<4	<11	<7	<6	<4	<4	<7

TABLE IV-C.2.b.2(cont'd)

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND WATER (SUPPLEMENTAL DATA)

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
C3-7	02-01	261±49	<32	<3	<3	<5	<3	<9	<5	<3	<3	<3	<6
	03-02	154±47	37±22	<4	<4	<8	<4	<10	<7	<5	<5	<5	<15
	05-04	134±46	30±4	<2	<2	<4	<2	<7	<3	<2	<2	<2	<5
	06-08	272±49	44±11	<4	<5	<8	<4	<15	<7	<5	<5	<4	<10
	08-03	113±47	<73	<4	<3	<9	<4	<9	<7	<6	<5	<4	<9
	09-07	188±49	<74	<4	<4	<8	<5	<8	<7	<6	<5	<4	<9
	11-02	161±46	<70	<5	<5	<11	<6	<22	<8	<6	<6	<6	<13
	12-07	112±49	<39	<2	<3	<4	<2	<5	<4	<4	<3	<3	<4
C3-8	02-01	142±47	<95	<5	<6	<12	<6	<14	<10	<7	<7	<5	<13
	03-02	<143	21±6	<4	<4	<7	<4	<15	<6	<4	<4	<4	<12
	05-04	<141	70±20	<5	<4	<8	<4	<8	<8	<5	<5	<4	<12
	06-08	<138	107±27	<4	<5	<9	<5	<11	<8	<6	<5	<5	<12
	08-03	135±47	<44	<4	<4	<7	<4	<16	<6	<4	<4	<4	<13
	09-07	127±46	<62	<5	<6	<10	<6	<23	<9	<7	<6	<7	<12
	11-02	97±45	<71	<6	<6	<12	<6	<25	<10	<7	<7	<7	<14
	12-07	198±28	<35	<3	<2	<6	<3	<5	<5	<5	<3	<3	<4

TABLE IV-C.2.b.2(cont'd)

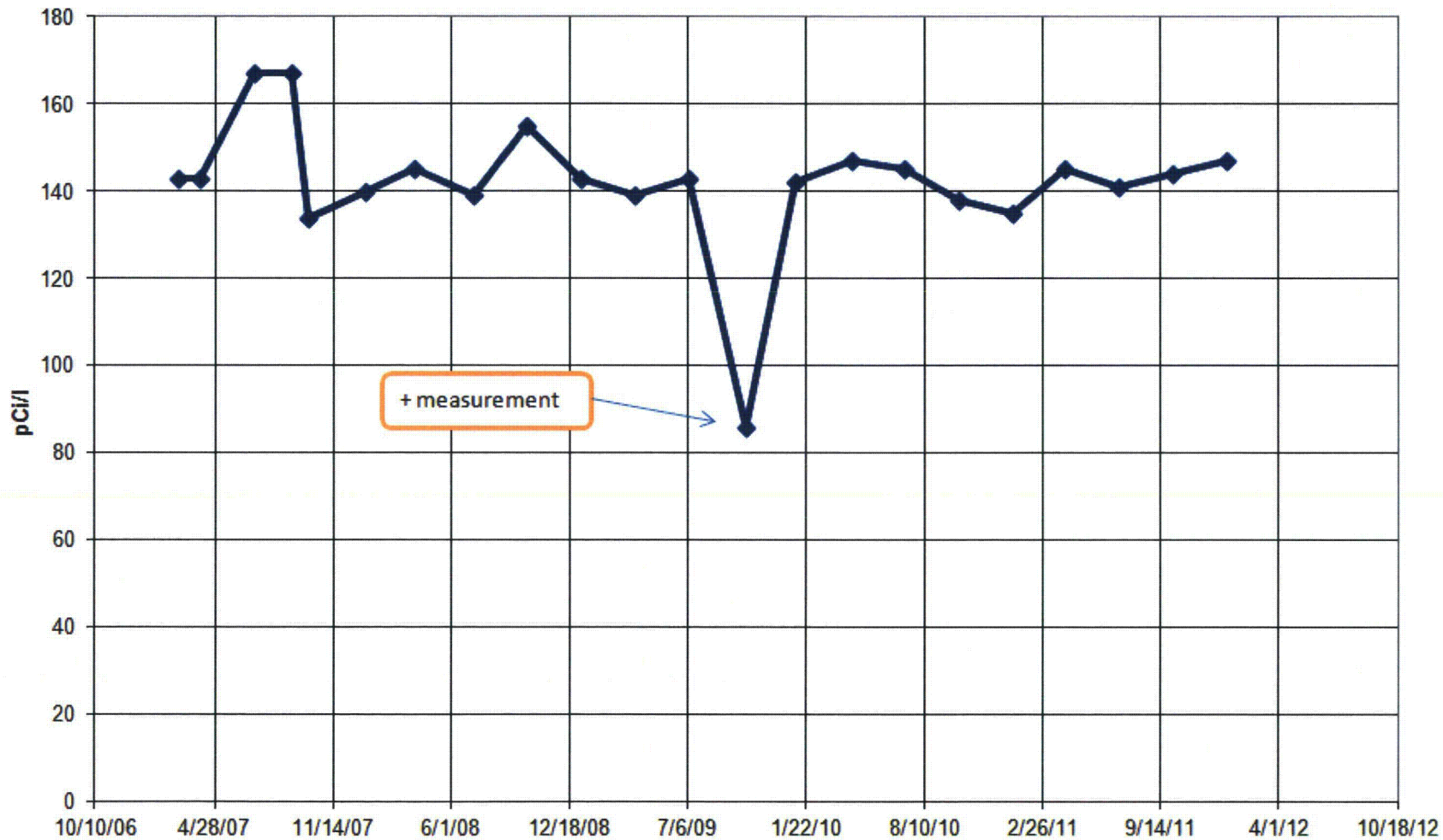
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND WATER (SUPPLEMENTAL DATA)

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
C3-9	02-01	<139	<55	<5	<5	<9	<5	<18	<7	<6	<4	<5	<12
	03-02	<143	<43	<2	<2	<5	<3	<5	<4	<3	<3	<3	<7
	05-04	<141	<53	<4	<4	<9	<5	<8	<7	<4	<5	<4	<15
	06-08	133±46	<73	<3	<3	<5	<3	<11	<5	<3	<3	<3	<8
	08-03	76±26	41±4	<2	<2	<4	<2	<8	<3	<2	<2	<2	<5
	09-07	<146	42±10	<5	<5	<8	<5	<17	<7	<6	<4	<5	<10
	11-02	<139	38±11	<5	<5	<10	<5	<19	<9	<6	<5	<6	<12
	12-07	117±49	<47	<2	<2	<4	<3	<5	<4	<5	<2	<4	<7

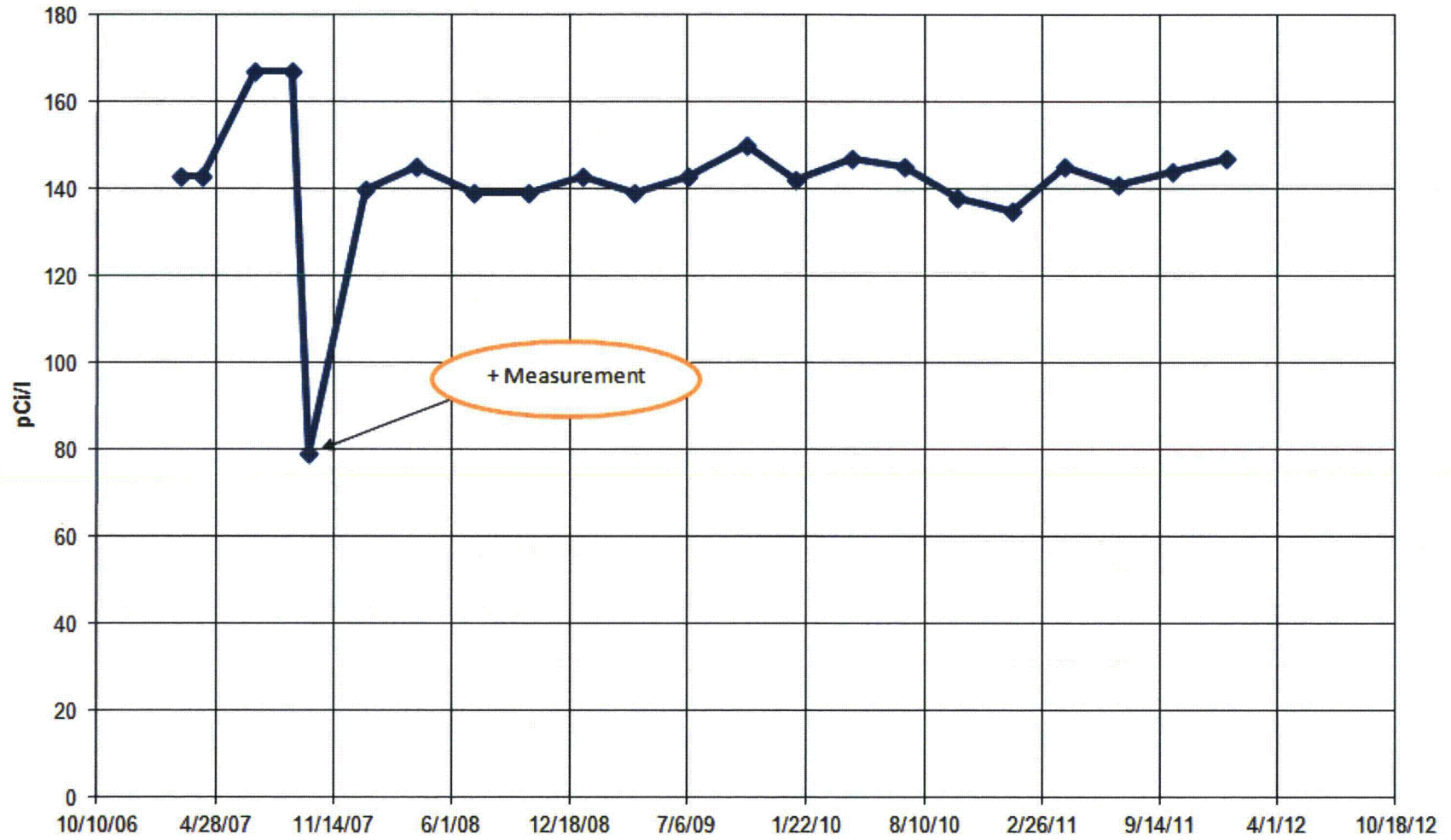
Tritium Measurement GW Well # CR3-2

All results are < LLD unless noted

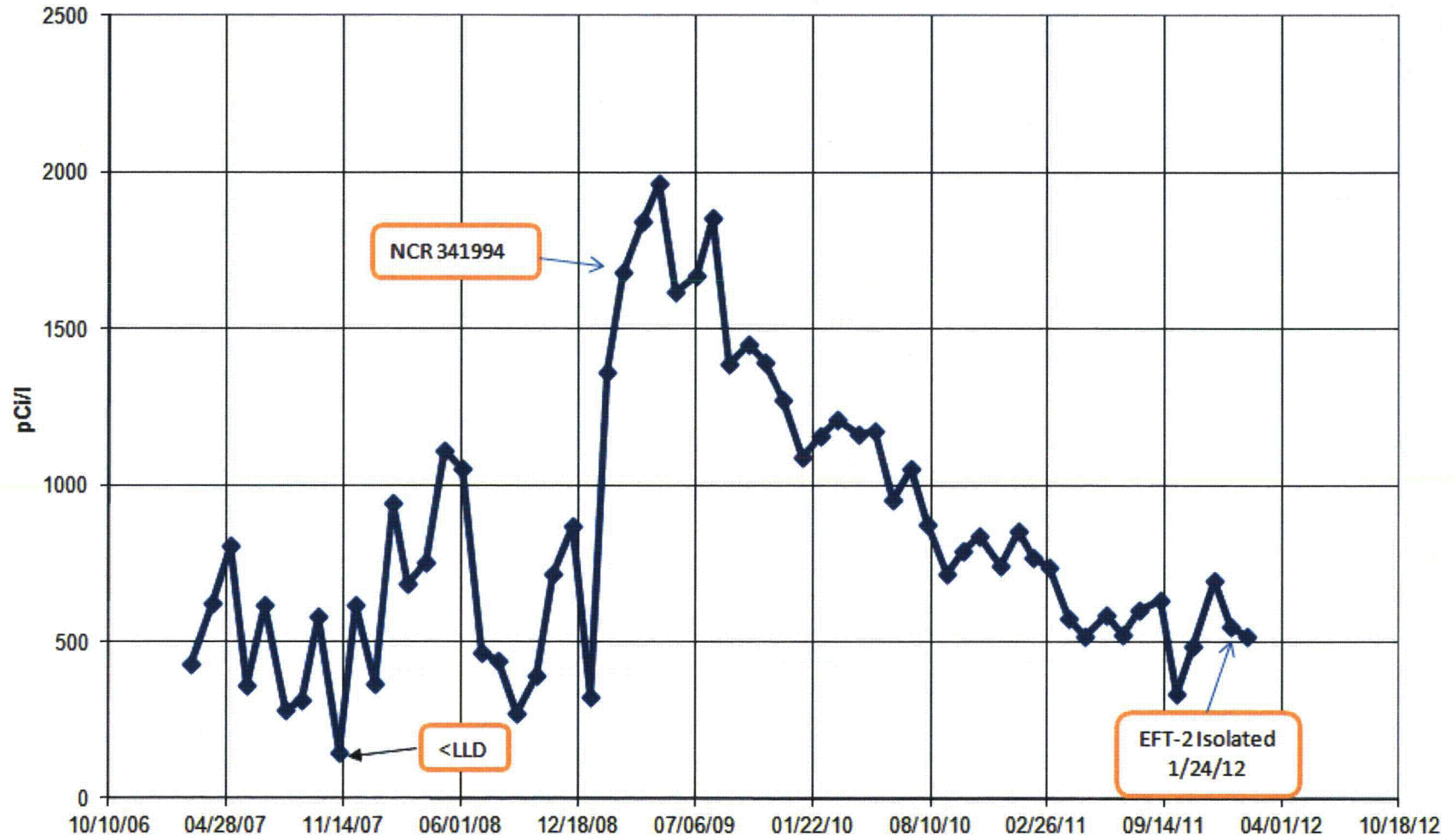


Tritium Measurement GW Well # CR3-4

All results are < LLD unless noted

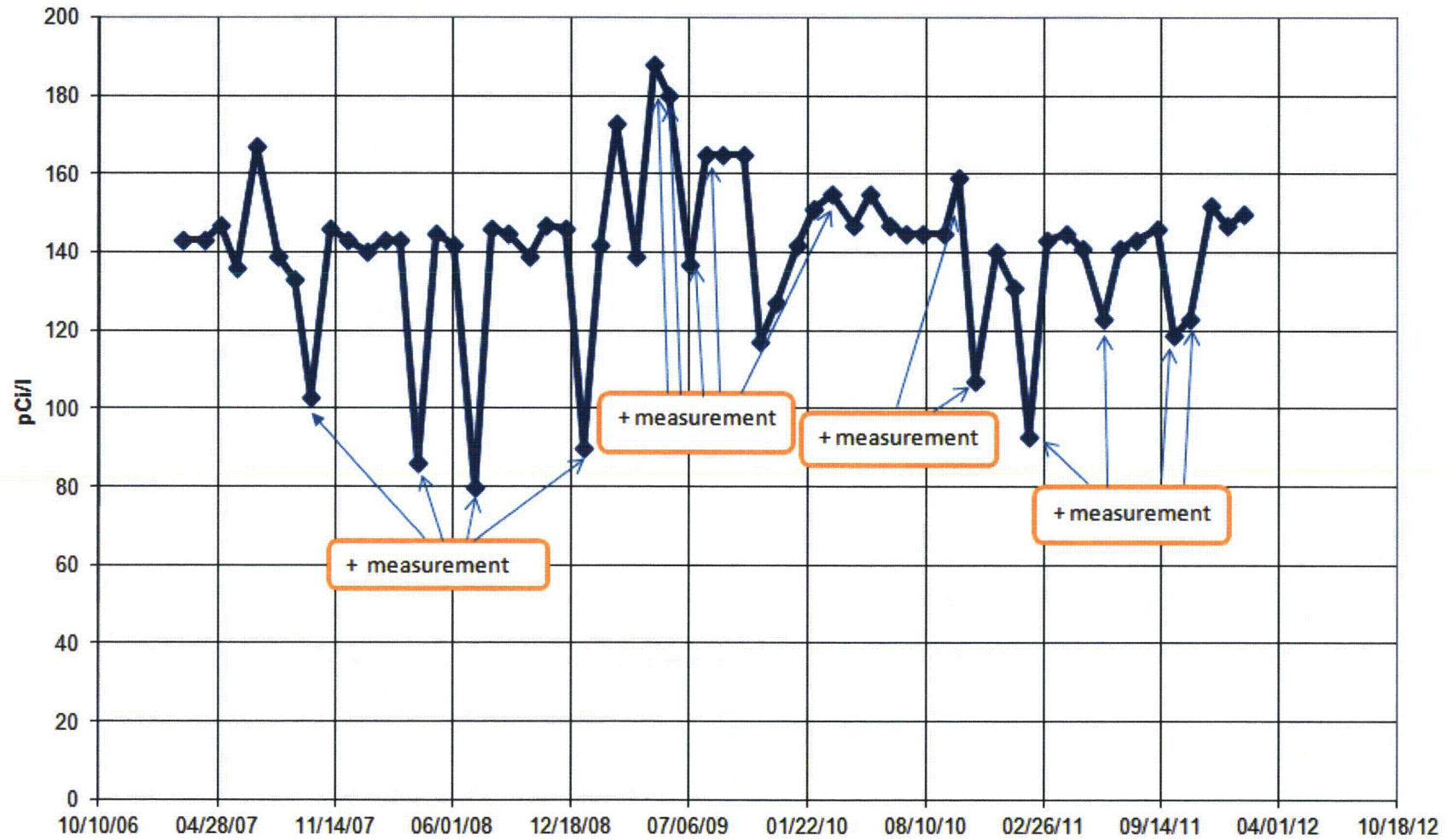


Tritium Measurement GW Well # CR3-5



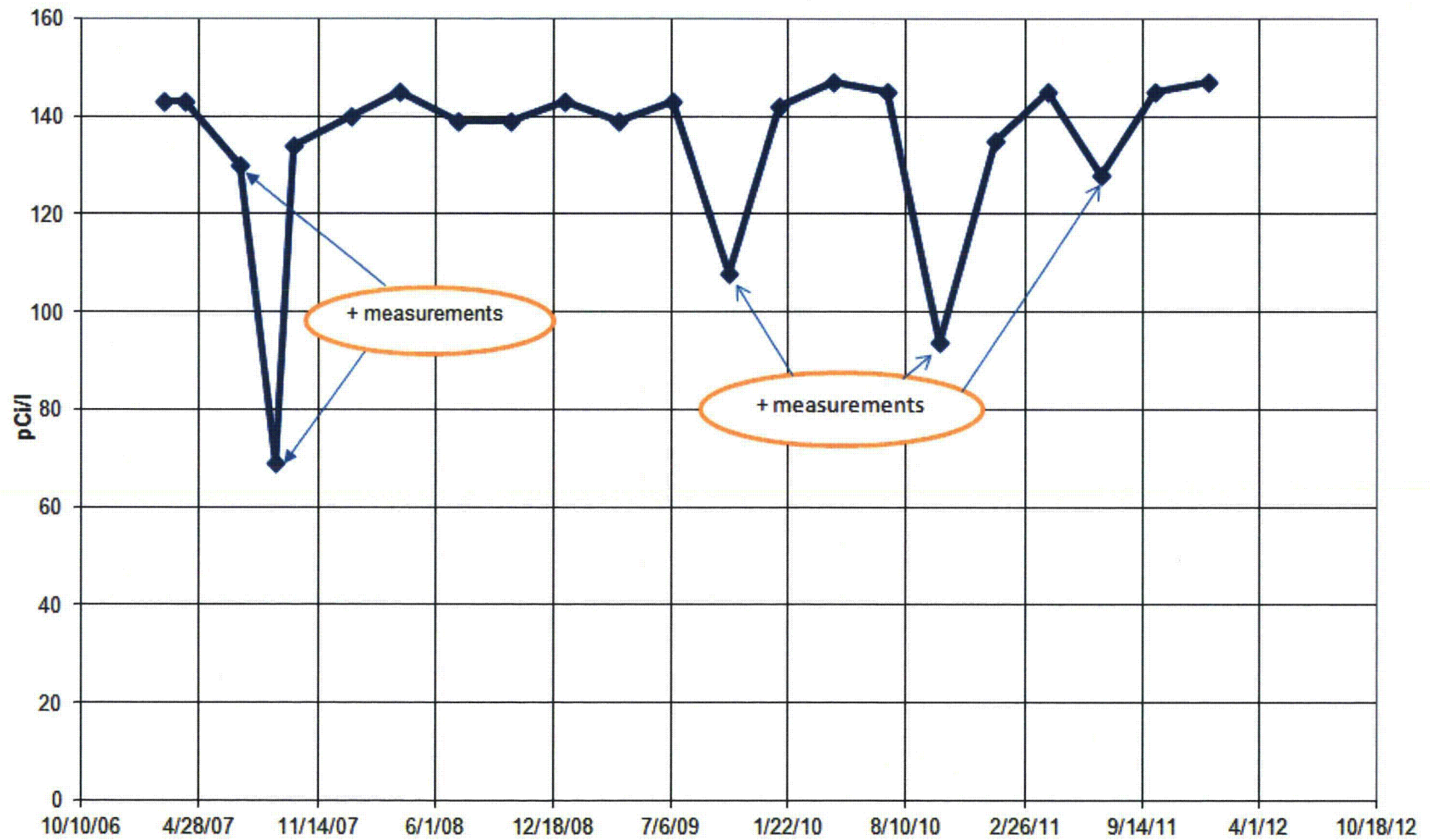
Tritium Measurement GW Well # CR3-6S

All results are < LLD unless noted

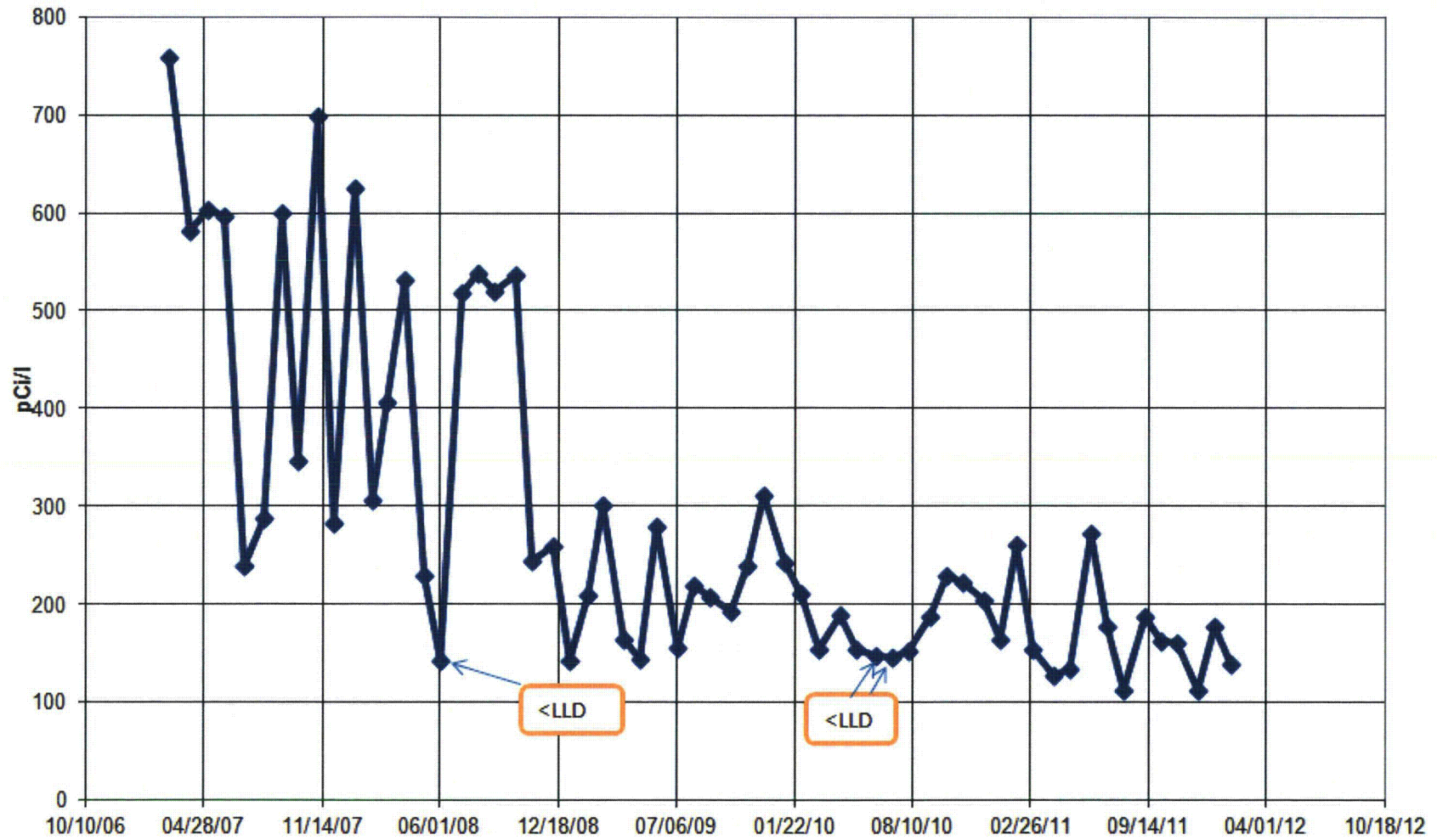


Tritium Measurements GW Well # CR3-6D

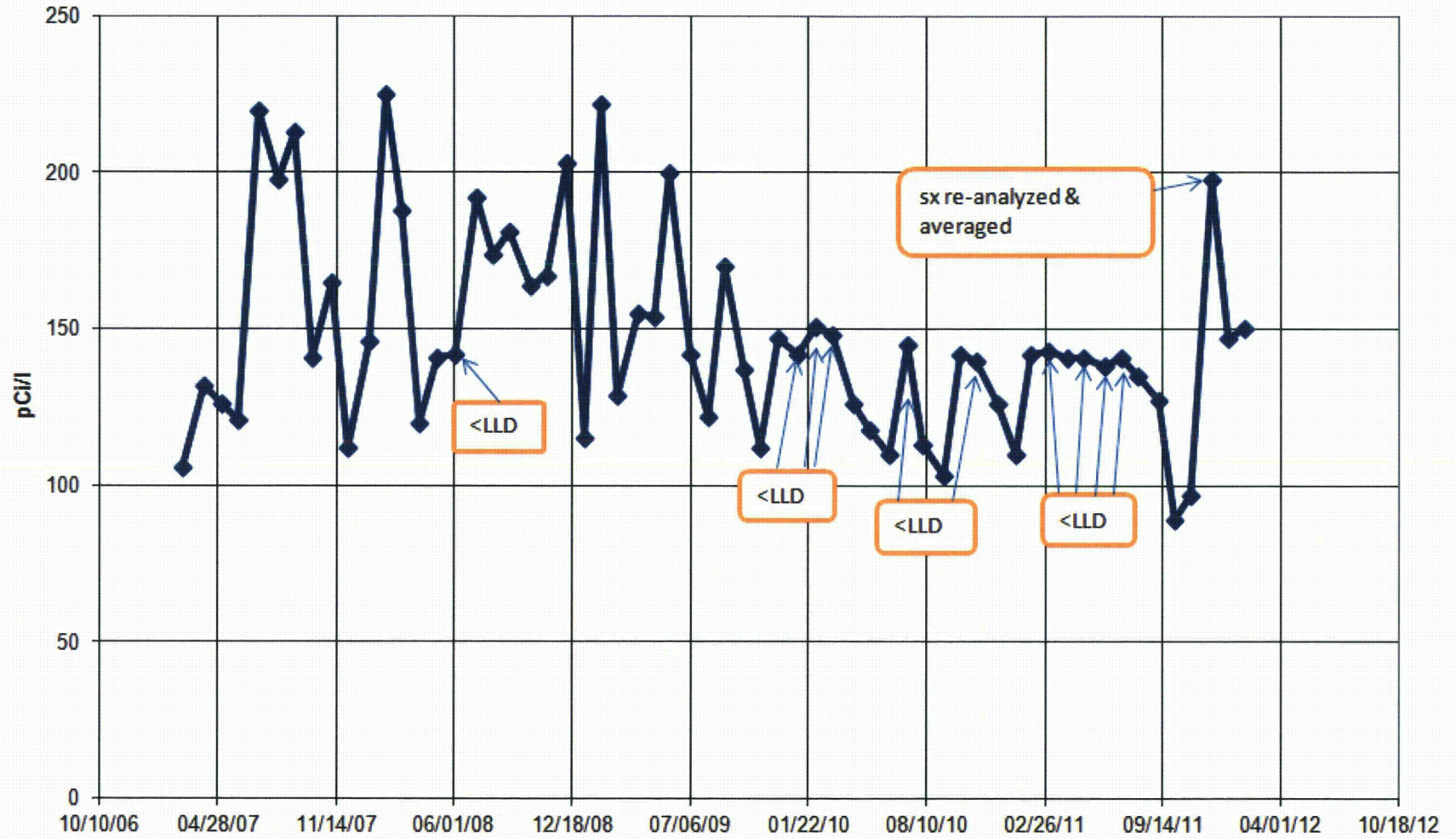
All results are < LLD unless noted



Tritium Measurements GW Well # CR3-7

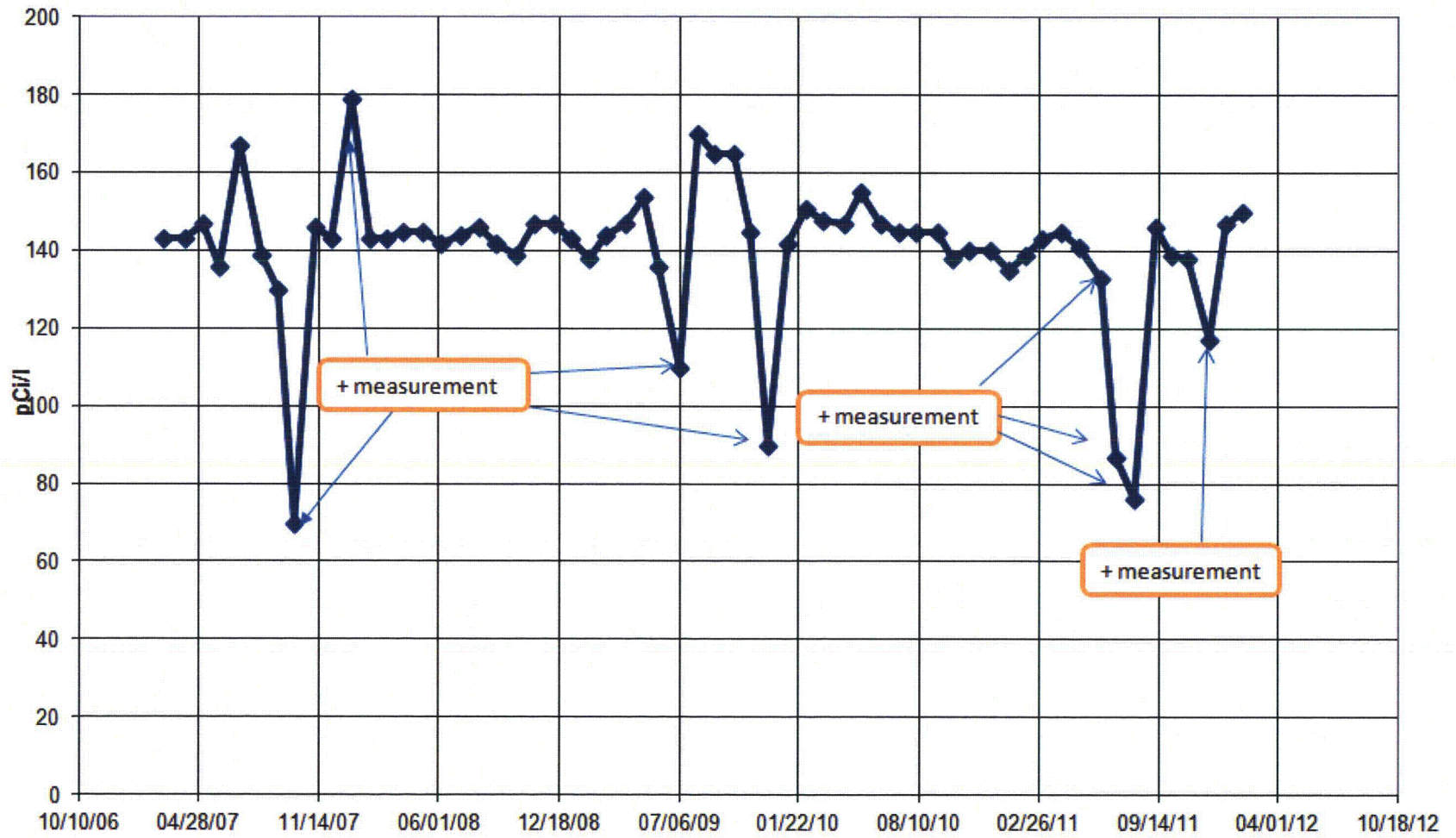


Tritium Measurements GW Well # CR3-8



Tritium Measurements GW Well # CR3-9

All results are < LLD unless noted



Tritium Measurements GW Well # CR3-10

All results are < LLD unless noted

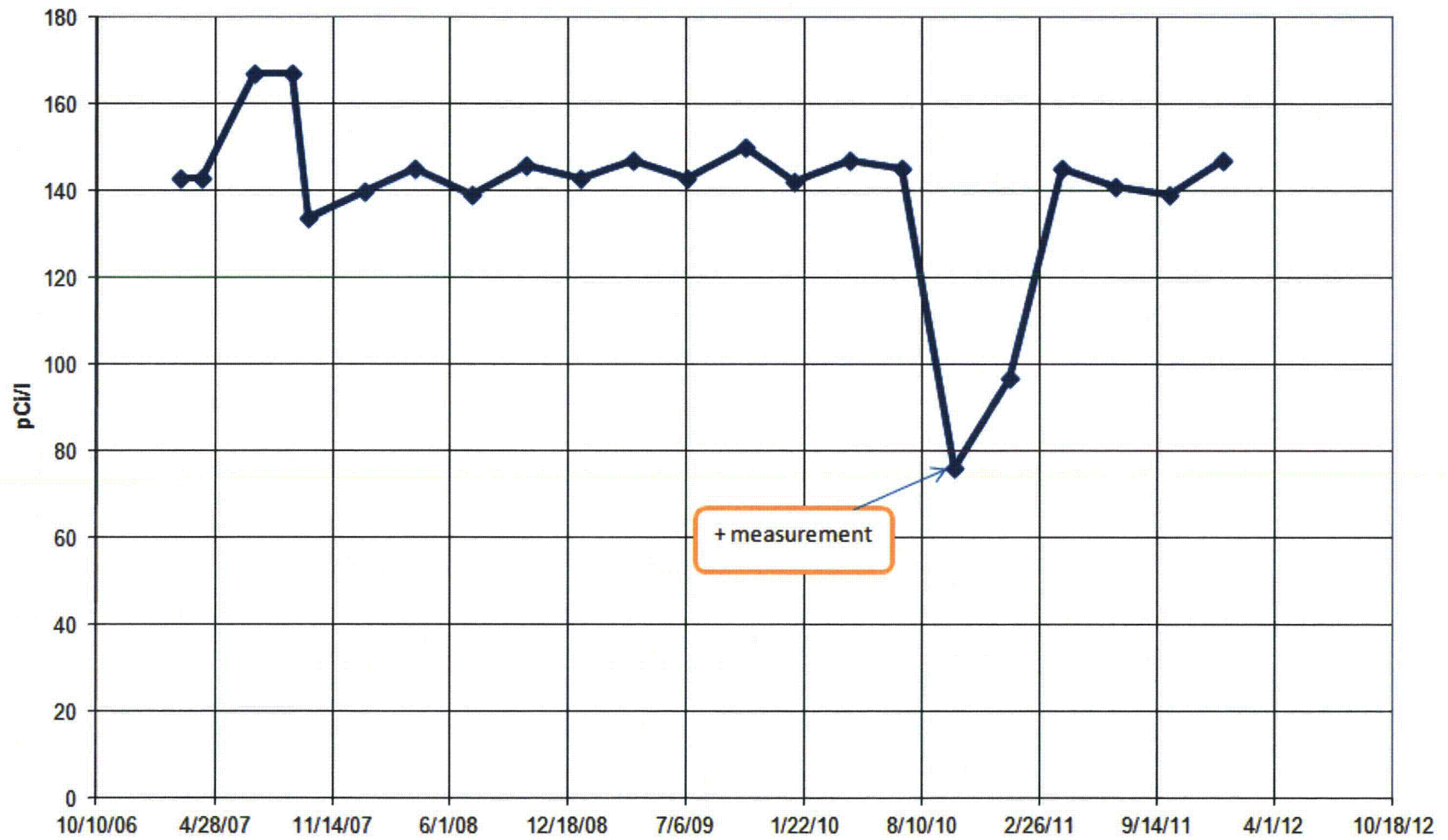


TABLE IV-C.2.c

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
*CR3 SITE GROUND WATER (pCi/L) *	Tritium 24	152	149 (8/24) (92-211)	MWC-27 0.42 mi.@285°	211 (1/12) (<LLD-211)	CR3-2 <LLD	0
	<u>γ Spec 24</u>						
	Mn-54	6	<LLD	-	-	<LLD	0
	Fe-59	11	<LLD	-	-	<LLD	0
	Co-58	5	<LLD	-	-	<LLD	0
	Co-60	6	<LLD	-	-	<LLD	0
	Zn-65	20	<LLD	-	-	<LLD	0
	Zr-Nb-95	8	<LLD	-	-	<LLD	0
	I-131	8	<LLD	-	-	<LLD	0
	Cs-134	5	<LLD	-	-	<LLD	0
	Cs-137	6	<LLD	-	-	<LLD	0
Ba-La-140	14	<LLD	-	-	<LLD	0	

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

*Non-REMP required samples

TABLE IV-C.2.c.1

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND WATER (SUPPLEMENTAL DATA)

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
MWC-27*	01-06	<137	<75	<4	<4	<8	<4	<9	<7	<6	<5	<4	<7
	02-01	<139	<58	<5	<5	<9	<5	<16	<8	<6	<5	<5	<9
	03-02	<143	<31	<3	<3	<5	<3	<11	<5	<3	<3	<3	<8
	04-06	<145	<49	<4	<4	<9	<4	<14	<7	<7	<4	<4	<6
	05-03	<141	<40	<4	<4	<7	<4	<14	<6	<5	<4	<4	<12
	06-08	<138	<60	<4	<5	<9	<4	<18	<8	<6	<5	<5	<10
	07-06	<141	<58	<5	<5	<9	<5	<19	<8	<6	<5	<5	<11
	08-03	<143	<60	<5	<5	<9	<4	<20	<8	<6	<5	<5	<10
	09-07	<146	<57	<5	<5	<9	<5	<18	<8	<6	<5	<5	<9
	10-05	<139	<11	<2	<2	<4	<2	<8	<3	<2	<2	<2	<6
	11-02	<138	<59	<5	<5	<8	<5	<17	<7	<6	<5	<5	<10
	12-07	211±51	34±8	<4	<5	<10	<5	<15	<8	<6	<5	<5	<11

*= These wells are not officially included in the REMP and are located on either side of the site percolation ponds.

TABLE IV-C.2.c.1(cont'd)

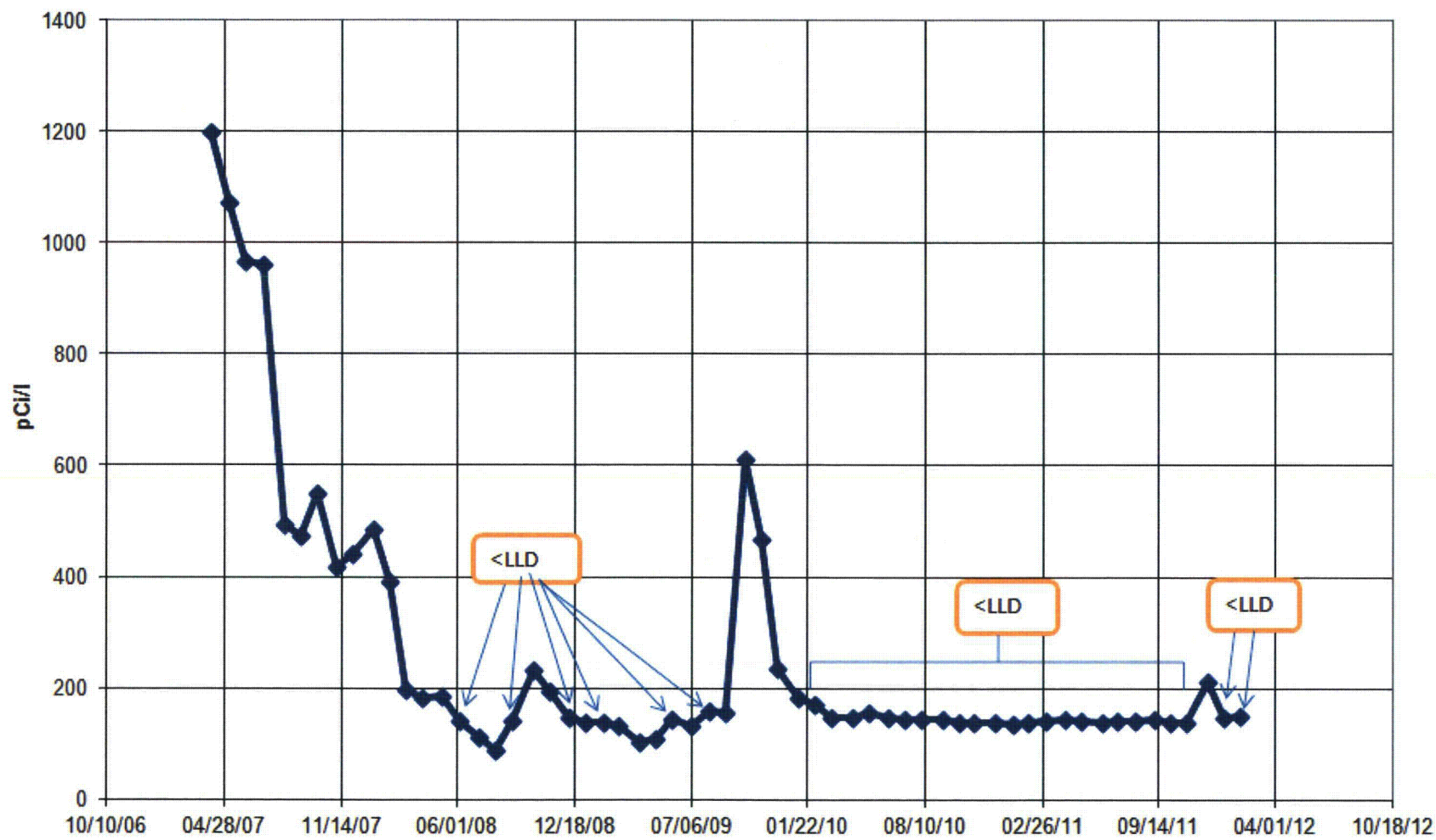
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ EMITTERS AND TRITIUM IN CR3 SITE GROUND WATER (SUPPLEMENTAL DATA)

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
MWC-IF2*	01-06	181±46	34±8	<4	<4	<8	<4	<8	<7	<6	<4	<4	<7
	02-01	124±47	60±27	<3	<3	<7	<4	<7	<6	<4	<4	<4	<8
	03-02	<143	<54	<4	<4	<8	<4	<17	<7	<5	<5	<5	<14
	04-06	<145	<50	<4	<5	<8	<4	<14	<7	<8	<5	<5	<7
	05-03	132±46	<49	<4	<4	<7	<4	<14	<6	<4	<4	<4	<13
	06-08	135±46	<49	<4	<5	<8	<5	<16	<7	<5	<5	<5	<10
	07-06	<141	<75	<4	<4	<8	<5	<9	<7	<5	<5	<4	<7
	08-03	<143	<53	<5	<5	<8	<5	<17	<8	<5	<5	<5	<10
	09-07	135±48	<57	<5	<5	<9	<5	<16	<7	<6	<5	<5	<9
	10-05	<139	<63	<6	<5	<11	<5	<18	<8	<6	<5	<5	<11
	11-02	92±45	<72	<5	<5	<9	<6	<17	<8	<6	<5	<6	<11
	12-07	180±51	<35	<2	<3	<5	<3	<7	<5	<4	<3	<3	<6

*= These wells are not officially included in the REMP and are located on either side of the site percolation ponds.

Tritium Measurements GW Well # MWC-27



Tritium Measurements GW Well # MWC-IF2

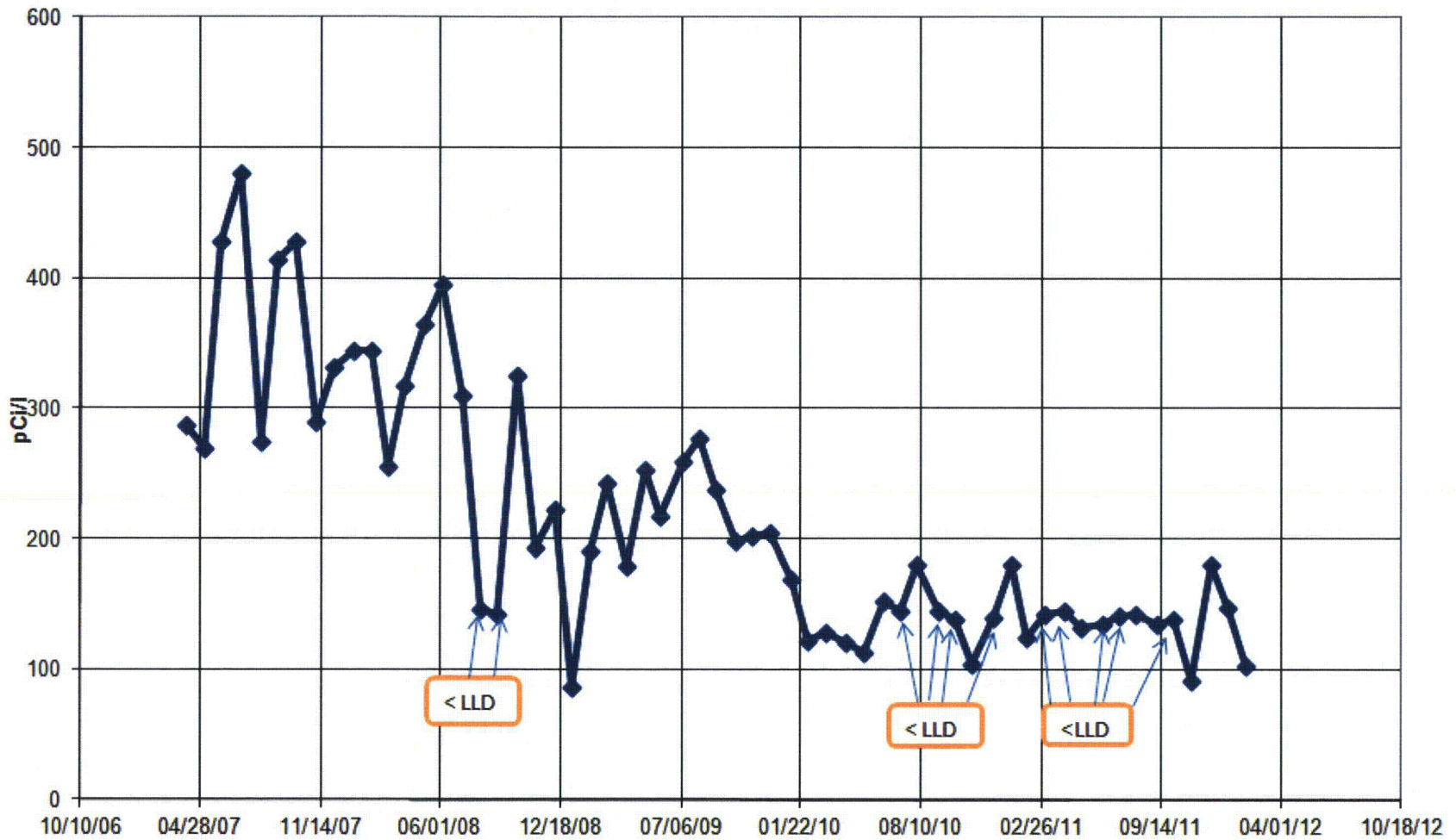


TABLE IV-C.3.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/L γ 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	01-18	<130	<52	<3	<4	<8	<4	<8	<7	<4	<4	<4	<14
	04-05	<145	<54	<4	<4	<8	<4	<6	<6	<4	<5	<3	<7
	07-06	<128	<42	<2	<2	<4	<2	<5	<4	<3	<3	<2	<4
	10-04	<150	<44	<4	<4	<8	<4	<13	<7	<5	<4	<5	<9
C10	01-18	<130	35±13	<4	<2	<6	<4	<8	<7	<4	<4	<4	<13
	04-05	<145	<75	<5	<5	<11	<6	<8	<6	<5	<6	<6	<12
	07-06	<128	<74	<5	<4	<10	<5	<10	<10	<5	<6	<5	<14
	10-04	<148	<50	<4	<4	<8	<4	<11	<6	<5	<4	<4	<10
C18	01-18	<142	<41	<4	<4	<8	<4	<10	<6	<4	<4	<4	<14
	04-05	<147	<47	<3	<4	<7	<4	<10	<6	<5	<4	<4	<8
	07-06	<145	<71	<3	<4	<8	<3	<6	<5	<4	<4	<4	<9
	10-04	<138	<71	<4	<4	<9	<3	<8	<6	<4	<4	<5	<10

Drinking Water

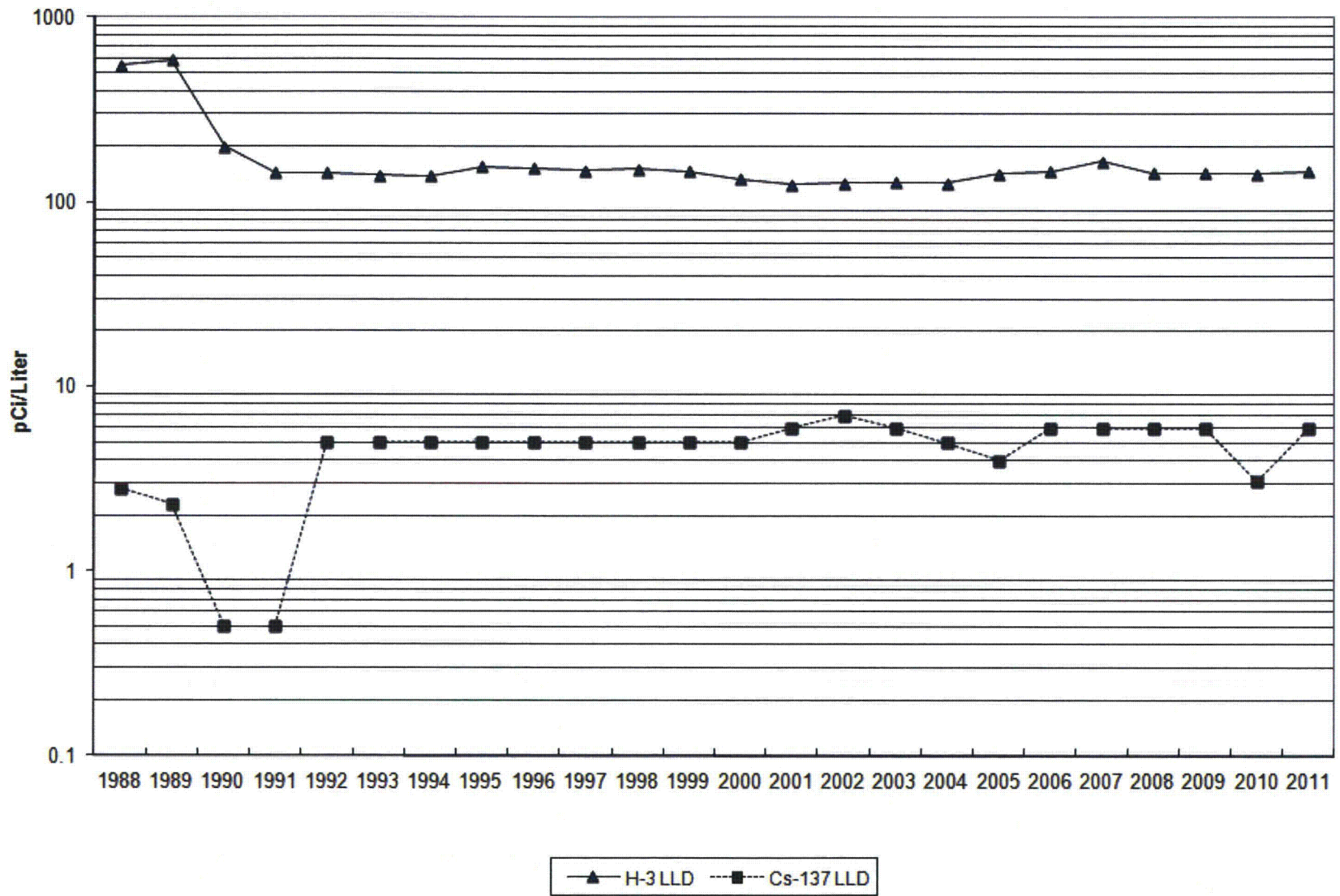


TABLE IV-C.4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SHORELINE SEDIMENT (pCi/kg)	γ Spec 8 Cs-134 Cs-137	21 22	<LLD 26 (2/6) (14-37)	— C14M 1.2 @ 270°	— 37 (1/2) (<LLD-37)	<LLD <LLD	0 0

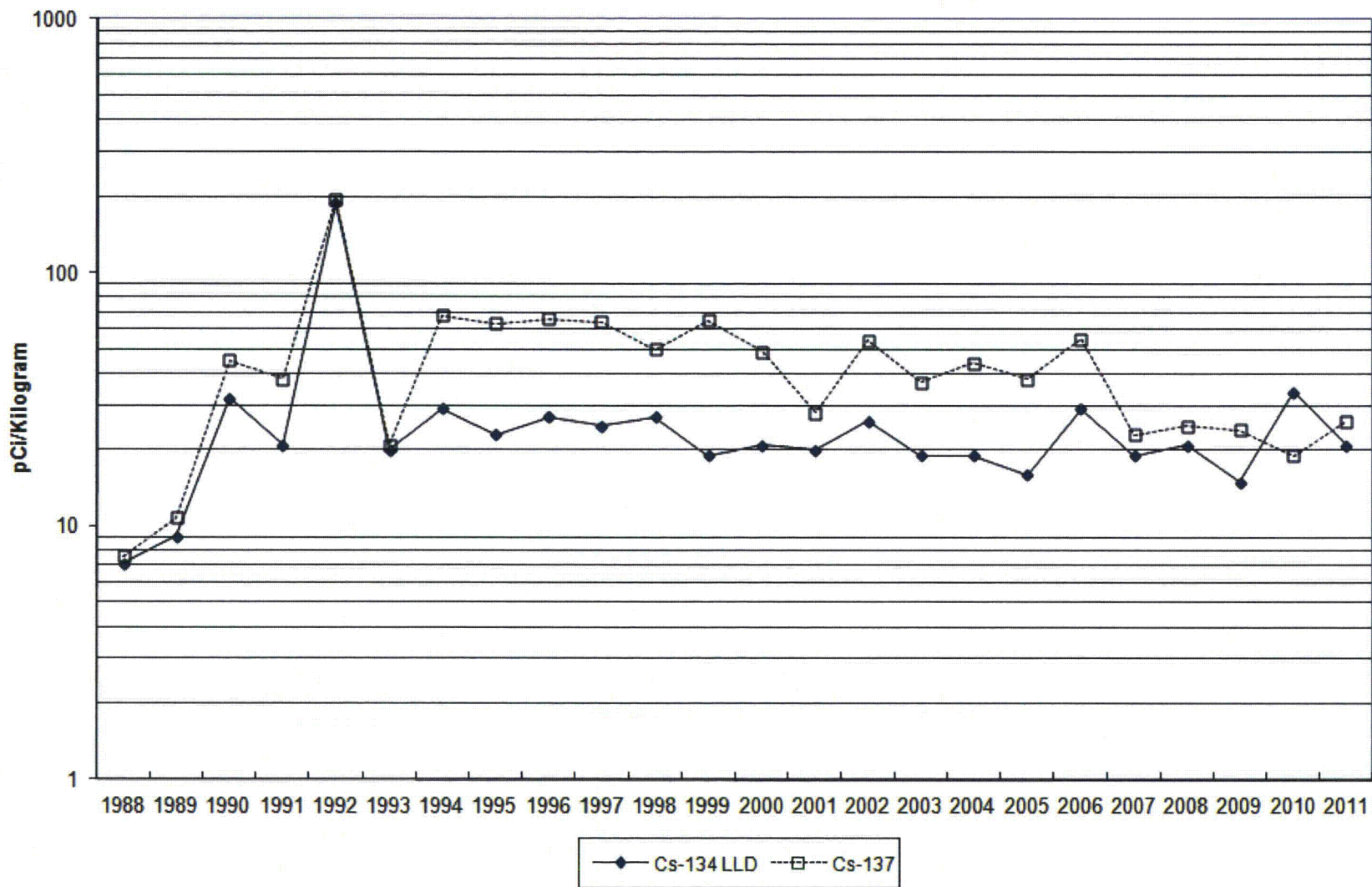
¹The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.

TABLE IV-C.4.a
PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011
pCi/kg γ EMITTERS IN SHORELINE SEDIMENT

STATION	PERIOD	Co-58	Co-60	Cs-134	Cs-137	K-40	Ra-226
C09	First Half	<10	<13	<13	<12	297±59	406±114
	Second Half	<8	<6	<12	<9	280±61	625±113
C14H	First Half	<18	<16	<20	<19	833±56	1893±186
	Second Half	<21	<18	<21	<22	623±48	3810±172
C14M	First Half	<12	46±4	<16	37±6	820±88	1846±192
	Second Half	<17	65±8	<19	<19	656±102	1653±164
C14G	First Half	<17	13	<19	<18	484±75	1493±192
	Second Half	<9	11±1	<9	14±1	485±28	1134±116

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 30 pCi/kg. Naturally occurring potassium-40 was quantified in all eight samples at an average concentration of 2609 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. In 2009, silver-110m was quantified in one sample at location C29 near the end of the discharge canal, at a concentration of 20 pCi/kg. Silver-110m was not quantified in any oyster samples collected in 2010 or 2008. In 2011, silver-110m was quantified in two samples at C29 with an average concentration of 19 pCi/kg and a range of 14 to 23 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. In 2011, eighteen of twenty four indicator samples had measurable amounts of cesium-137 with an average concentration of 76 pCi/kg and a range of 6 to 233 pCi/kg. Two of twenty four indicator samples also had measurable amounts of iodine-131 with an average of 232 pCi/kg and a range of 195-269 pCi/kg. The control station located in Orlando, Fl. also had measurable amounts of iodine-131 and cesium-137. In seven of twenty one samples, there was measurable I-131 at an average concentration of 324 pCi/kg and a range of 13-1397 pCi/kg. In seventeen of twenty one samples there was measurable cesium-137 at an average concentration of 61 pCi/kg and a range of 7 to 182 pCi/kg. Nine extra control samples were collected at the Orlando station location.

These positive-measured radionuclides were a result of the Fukushima earthquake and tsunami event and were not from the operation of CR3.

In 2010, five of twenty-four indicator samples had measurable amounts of cesium-137 with an average concentration of 66 pCi/kg and a range of 9 to 153 pCi/kg. This is higher than the levels found in 2009, but lower than in 2007 and 2008. It is believed the 2007 and 2008 spike was due to possible collection of wire grass mixed into the sample, which has a greater uptake rate of cesium as compared to other broad-leafed media. Additionally in 2010, eight of twelve control station samples had measurable amounts of cesium-137 with an average concentration of 21 pCi/kg and a range of 9 to 31 pCi/kg. During 2009 due to construction activities at the Crystal River Unit 4 & 5 site, the area where broad leaf vegetation was being collected at station C48A was removed. A new location in the same north sector was located near the air sample station C46. During 2010, also due to construction activities at the Crystal River Units 4 & 5 site, the area where broadleaf vegetation was being collected at station C48B became inaccessible. A new location in the ENE sector was located near the transmission power line corridor right of way, just NE of the mariculture center. This sector has the same D/Q value as the N and NNE sectors and is allowed by the ODCM.

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. In 2011 two watermelon samples were collected at station C04. One sample had a measurable amount of cesium-137 at a concentration of 14 pCi/kg. All other radionuclides of interest were < LLD. Citrus samples were taken at station C19. There were no measurable quantities of radionuclides of interest in the citrus samples.
In 2010 watermelon samples were collected at station C04. None of the required radionuclides were found in measurable quantities. Citrus samples were taken at station C19. None of the required radionuclides were found in measurable quantities in the citrus samples with exception of Cs-137 at a concentration of 71 pCi/kg.
In 2008 and again in 2009, there were no watermelon samples available at station C04. In these 2 years, due to crop rotation, there were no locally grown watermelons found in any areas nearby the facility and no local commercial harvest performed.

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, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
CARNIVOROUS	γ Spec 8						
FISH							
(pCi/kg)	Mn-54	30	<LLD	-	-	<LLD	0
	Fe-59	57	<LLD	-	-	<LLD	0
	Co-58	27	<LLD	-	-	<LLD	0
	Co-60	31	<LLD	-	-	<LLD	0
	Zn-65	70	<LLD	-	-	<LLD	0
	Cs-134	37	<LLD	-	-	<LLD	0
	Cs-137	32	<LLD	-	-	<LLD	0

¹The "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 - 2011

pCi/kg γ EMITTERS IN CARNIVOROUS FISH

STATION	QUARTER	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	K-40
C29	1	<30	<27	<51	<31	<62	<37	<32	2966±256
	2	<18	<21	<43	<28	<47	<25	<20	2484±235
	3	<24	<26	<57	<30	<64	<31	<30	1974±157
	4	<17	<20	<46	<22	<43	<22	<22	2232±219
C30	1	<28	<26	<57	<31	<70	<33	<28	2648±185
	2	<15	<16	<34	<23	<39	<19	<15	2947±187
	3	<20	<23	<35	<24	<58	<25	<26	2824±214
	4	<20	<14	<36	<26	<39	<24	<21	2796±218

Carnivorous Fish

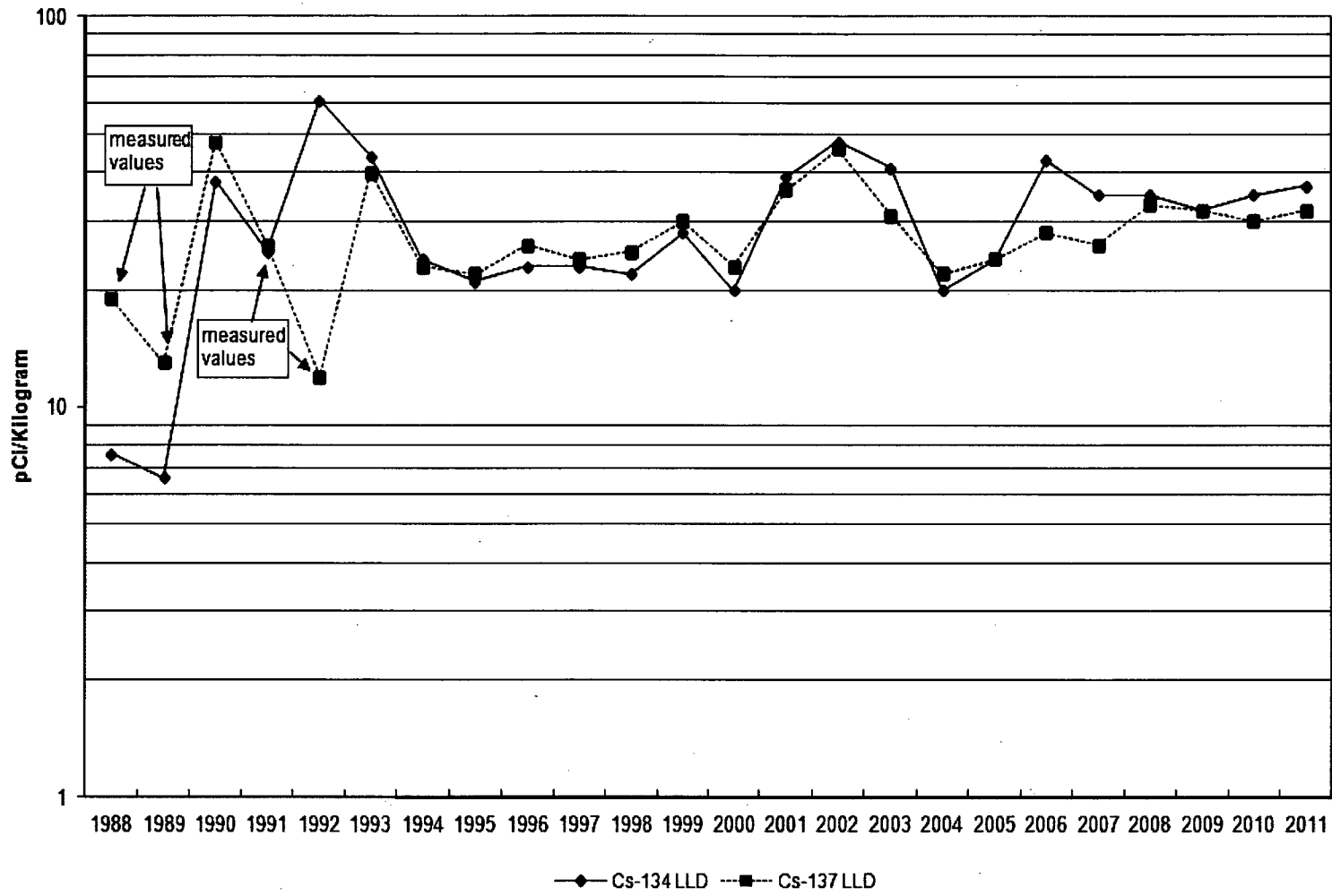


TABLE IV-D.2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN RANGE	NAME	MEAN RANGE		
OYSTERS (pCi/kg)	γ Spec 8						
	Mn-54	27	<LLD	-	-	<LLD	0
	Fe-59	68	<LLD	-	-	<LLD	0
	Co-58	23	<LLD	-	-	<LLD	0
	Co-60	28	<LLD	-	-	<LLD	0
	Zn-65	70	<LLD	-	-	<LLD	0
	Cs-134	31	<LLD	-	-	<LLD	0
	Cs-137	28	<LLD	-	-	<LLD	0

¹The "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 - 2011

pCi/kg γ EMITTERS IN OYSTERS

STATION	QUARTER	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	K-40
C29	1	<17	<15	<31	<18	<35	<20	<19	1434±88
	2	<20	<20	<42	<23	<47	<25	<28	1090±98
	3	<25	<22	<49	<28	<57	<29	<28	541±87
	4	<11	<10	<20	<12	<24	<12	<11	1041±56
C30	1	<27	<23	<68	<21	<70	<31	<25	1296±192
	2	<15	<19	<37	<19	<40	<23	<19	1503±137
	3	<15	<15	<31	<16	<32	<18	<15	636±58
	4	<9	<7	<17	<10	<17	<11	<10	1105±87

Oysters

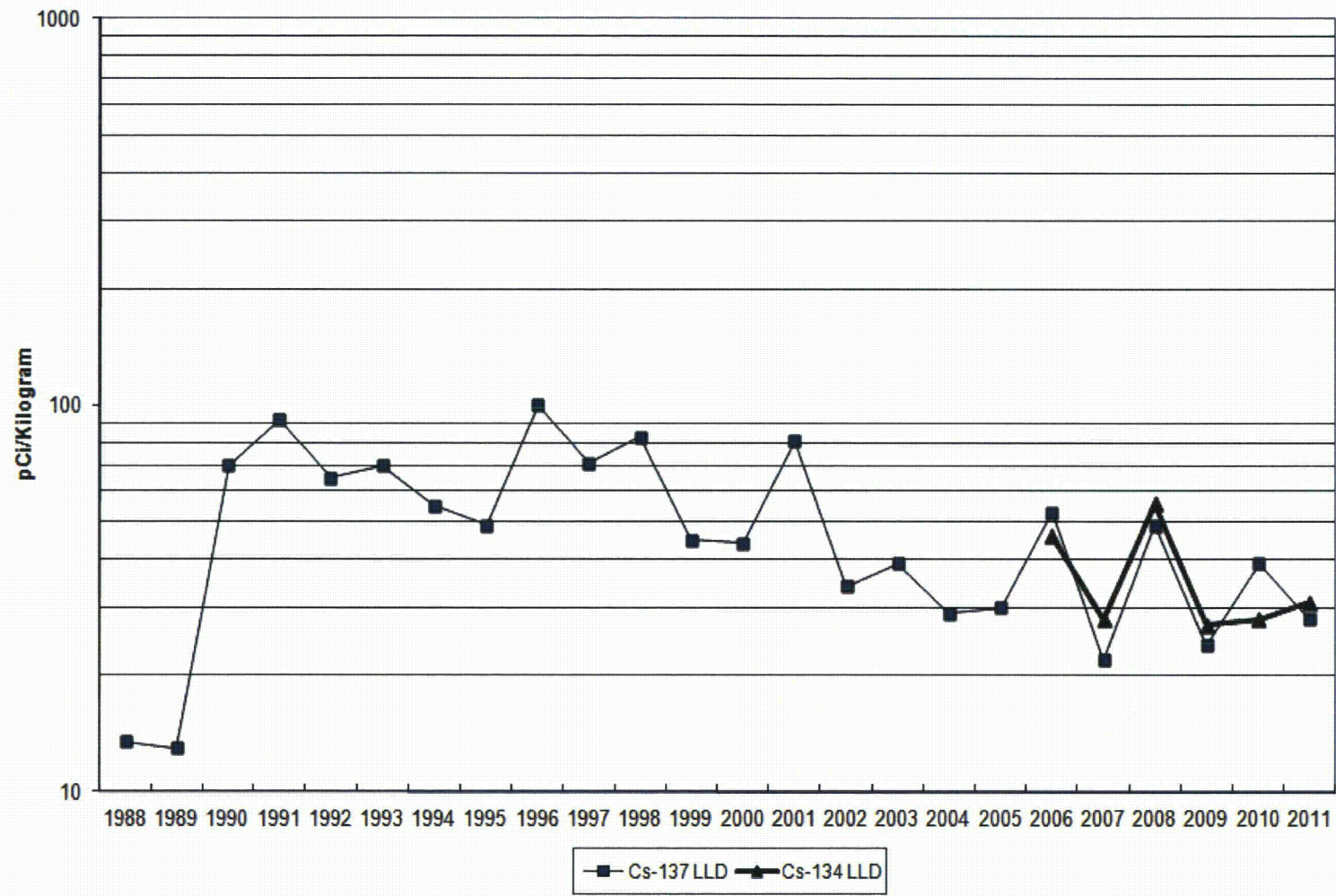


TABLE IV-D.3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS MEAN RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE & BEARING	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
BROAD LEAF VEGETATION (pCi/kg)	γ Spec 45 ²						
	I-131	30	232(2/24) (195-269)	C48B 0.9 @ 73°	269(1/12) (<LLD-269)	324(7/21) (13-1397)	9
	Cs-134	23	<LLD	-	-	<LLD	9
	Cs-137	23	76 (18/24) (6-233)	C48B 0.9 @ 73°	102(12/12) (15-233)	61 (17/21) (7-182)	9

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

²Includes extra samples collected due to the Fukushima earthquake and tsunami event. The elevated I-131 and Cs-137 values are not associated with the operation of CR3 and are a direct result of the aforementioned event.

TABLE IV-D.3.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/kg OF γ EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C47	JAN	<30	<22	<21	3536±211
	FEB	<16	<17	27±8	3417±201
	MAR	<19	<14	7±2	3487±137
	APR	294±15	<18	<21	4562±223
	MAY	23±3	<9	10±2	5221±102
	JUN	<17	<16	40±6	3845±166
	JUL	<20	<23	36±10	4271±261
	AUG	<15	<19	159±11	2616±190
	SEP	<14	<15	28±5	3594±156
	OCT	<14	<14	<15	3525±240
	NOV	<18	<14	28±3	2275±100
	DEC	<6	<5	143±5	1725±50
C48A	JAN	<13	<11	16±4	2181±107
	FEB	<9	<7	<8	1752±70
	MAR	<28	<16	<12	2685±170
	APR	195±7	<12	10±2	2574±111
	MAY	<19	<15	39±9	3092±184
	JUN	<17	<17	37±9	3386±194
	JUL	<18	<17	<22	2243±217
	AUG	<13	<13	28±6	2986±141
	SEP	<13	<10	<12	2169±124
	OCT	<12	<13	<14	3648±154
	NOV	<6	<5	6±2	2067±55
	DEC	<22	<16	<12	2682±154

The elevated I-131 and Cs-137 values are a direct result of the Fukushima earthquake and tsunami event and are not associated with CR-3 operation.

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

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/kg OF γ EMITTERS IN BROAD LEAF VEGETATION

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C48B	JAN	<17	<13	43±8	1431±104
	FEB	<17	<15	47±7	1898±160
	MAR	<25	<15	15±6	1257±133
	APR	269±15	<16	84±9	2086±148
	MAY	<14	<14	47±6	2663±125
	JUN	<19	<16	156±11	3478±187
	JUL	<16	<16	78±6	2004±116
	AUG	<17	<23	90±13	3375±190
	SEP	<13	<12	137±9	2319±121
	OCT	<15	<13	233±12	2336±125
	NOV	<7	<6	198±5	3876±118
	DEC	<5	<5	97±3	1625±51

The elevated I-131 and Cs-137 values are a direct result of the Fukushima earthquake and tsunami event and are not associated with CR-3 operation.

TABLE IV-D.3.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/kg OF γ EMITTERS IN BROAD LEAF VEGETATION (Supplemental Information)

STATION	DATE	I-131	Cs-134	Cs-137	K-40
C47J	21-Mar-11	322±14	<13	144±9	3207±147
	28-Mar-11	1397±23	<16	37±6	4397±187
	12-Apr-11	136±13	<19	<21	4487±224
	19-Apr-11	84±9	<11	27±4	3111±142
	26-Apr-11	13±2	<13	182±7	3099±128
	09-May-11	<19	<10	17±2	3103±119
	17-May-11	<21	<13	42±3	3290±130
	24-May-11	<10	<10	10±2	3446±122
	31-May-11	<13	<11	108±5	2444±105

Additional Sampling as a result of the Fukushima earthquake and tsunami event in Japan performed at the control station located in Orlando, FL. The elevated I-131 and Cs-137 values are a direct result of this event and are not associated with CR-3 operation.

Broad Leaf Vegetation

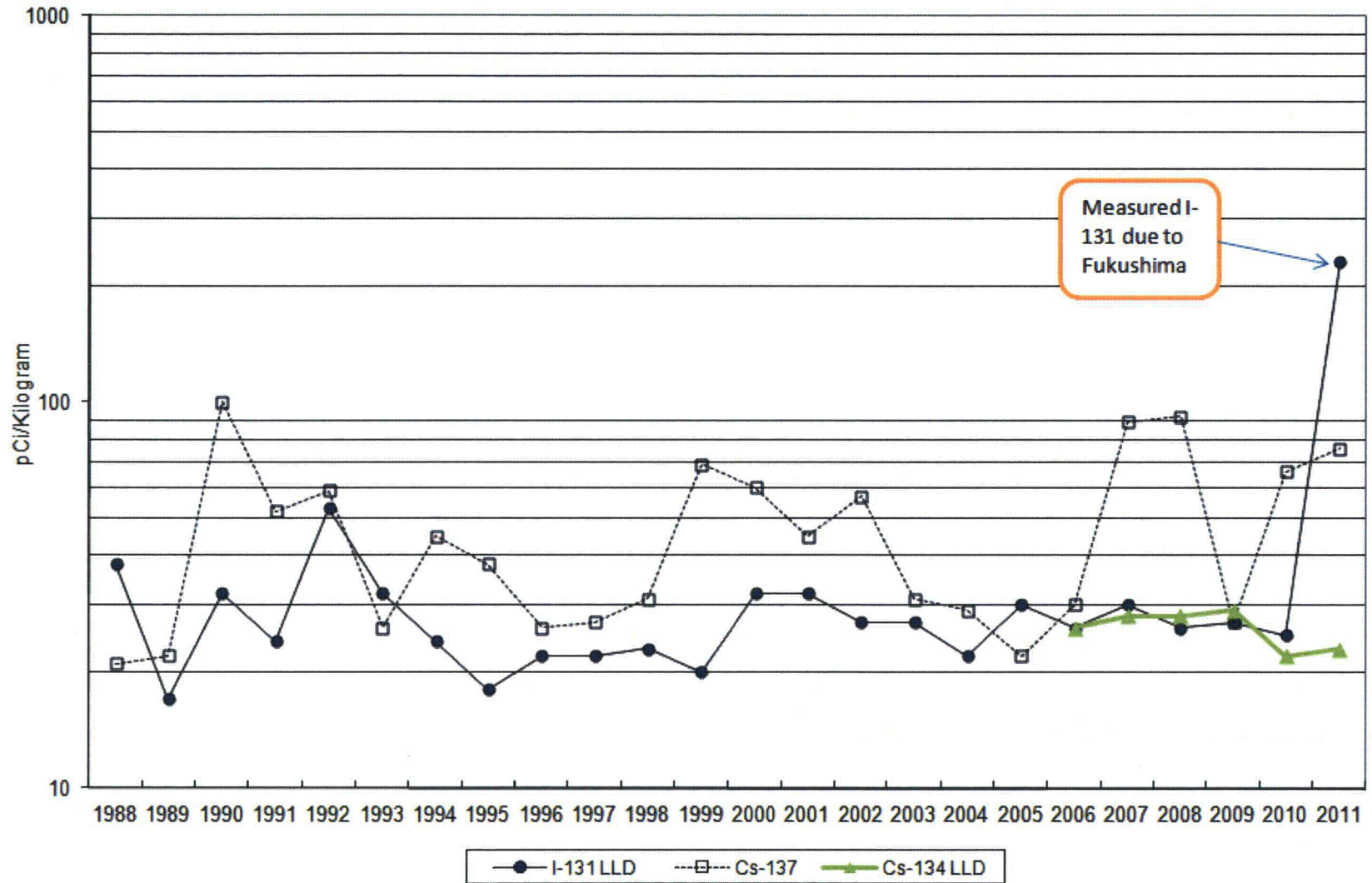


TABLE IV-D.4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

CITRUS COUNTY, FLORIDA

JANUARY 1 TO DECEMBER 31, 2011

MEDIUM OR PATHWAY SAMPLED (UNITS)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) ¹	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS	
			MEAN RANGE	NAME	MEAN RANGE			
WATERMELON (pCi/kg)	γ Spec 2							
		I-131	9	< LLD	-	-	None	1
		Cs-134	9	< LLD	-	-	None	1
		Cs-137	9	14(1/2) (<LLD-14)	C04 10.6@45°	14(1/2) (<LLD-14)	None	1
CITRUS (pCi/kg)	γ Spec 1							
		I-131	8	<LLD	-	-	None	0
		Cs-134	9	<LLD	-	-	None	0
		Cs-137	9	61(1/1)	C19 9.6@45°	61(1/1)	None	0

¹The "a priori" LLD which meets or exceeds the requirements of Table 2-9 of the CR-3 ODCM.
An extra watermelon sample collected. Positive measurement of Cs-137 potentially is a result of the Fukushima earthquake and tsunami event.

TABLE IV-D.4.a

PROGRESS ENERGY FLORIDA, INC. - CR3 - 2011

pCi/kg OF γ EMITTERS IN WATERMELON AND CITRUS

STATION	MONTH	I-131	Cs-134	Cs-137	K-40
C04 – Watermelon	June	<5	<5	14±2	1323±68
	June	<9	<9	<9	1733±105
C19 – Citrus	January	<8	<9	61±5	1586±82