1985

ANNUAL

RADIOLOGICAL ENVIRONMENTAL

OPERATING REPORT

ST. LUCIE PLANT

UNIT NOS. 1 AND 2

License Nos. DPR-67, NPF-16

Docket Nos. 50-335, 50-389

Data Submitted By: Florida DHRS
Report Prepared: Peter C. Brady Jan 86
Report Reviewed: [signature] 4/14/86
4/9/86

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I. INTRODUCTION

This report is submitted pursuant to Specification 6.9 of St. Lucie Unit No. 1 and St. Lucie Unit No. 2 Technical Specifications. The Annual Radiological Environmental Operating Report provides information, summaries and analytical results pertaining to the Radiological Environmental Monitoring Program for the calendar year indicated. This report covers surveillance activities meeting the requirements of Unit No. 1 and Unit No. 2. Technical Specifications.

II. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. Purpose: The purpose of the radiological environmental monitoring program is to provide representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of members of the public resulting from station operation. The radiological environmental monitoring program also supplements the radiological effluent monitoring program by verifying that the measureable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways.

B. Program Description: The Radiological Environmental Monitoring Program for the St. Lucie Plant is conducted pursuant to Technical Specifications 3/4.12 of St. Lucie Unit No. 1 and St. Lucie Unit No. 2 Technical Specifications.

1. Sample Locations, Types and Frequencies:

a. Direct radiation gamma exposure rate is monitored continuously at 27 locations by thermoluminescent dosimeters (TLD's). TLD's are collected and analyzed quarterly.

b. Airborne radioiodine and particulate samplers are operated continuously at five locations. Samples are collected and analyzed weekly. Analyses include Iodine-131, gross beta, and gamma isotopic measurements.

c. Surface water samples are collected from two locations. Samples are collected and analyzed weekly and monthly respectively. Analyses include gamma isotopic and tritium measurements.

d. Bottom sediment samples are collected from two locations coinciding with the locations for surface water samples. Samples are collected and analyzed semi-annually. Sediment samples are analyzed by gamma isotopic measurements.

e. Fish and invertebrate samples are collected from two locations. Samples are collected and analyzed semi-annually. Fish and invertebrate samples are analyzed by gamma isotopic measurements.

f. Broad leaf vegetation samples are collected from three locations. Samples are collected and analyzed monthly. Broad leaf vegetation samples are analyzed by gamma isotopic measurements.

Attachment A provides specific information pertaining to sample locations, types and frequencies.

2. Analytical Responsibility:

Radiological environmental monitoring for the St. Lucie Plant is conducted by the State of Florida, Department of Health and Rehabilitative Services (DHRS). Samples are collected and analyzed by DHRS personnel. Samples are analyzed at the DHRS Environmental Radiation Control Laboratory in Orlando, Florida.

C. Analytical Results: Table 1, Environmental Radiological Monitoring Program Annual Summary provides a summary for all specified samples collected during the referenced surveillance period. Deviations from the sample schedule, missing data and/or samples not meeting the specified "A PRIORI" LLD, if any, are noted and explained in Tables 1A and 1B respectively. Analysis data for all specified samples analyzed during the surveillance period is provided in Attachment B.

D. Land Use Census: A land use census out to a distance of 5 miles radius from the St. Lucie Plant is conducted annually to determine the location of the nearest milk animal, residence, and garden producing broad leaf vegetation in each of the sixteen meteorological sectors. A summary of the land use census for the surveillance year is provided in Table 2, Land Use Census Summary.

No locations yielding a calculated dose or dose commitment greater than the values currently being calculated were identified by the land use census.

No locations yielding a calculated dose or dose commitment (via the same exposure pathway) 20 % greater than locations currently being sampled in the radiological environmental monitoring program were identified by the land use census.

E. Interlaboratory Comparison Program: The State of Florida Environmental Radiation Control Laboratory participates in the Environmental Radioactivity Laboratory Intercomparison Studies Program conducted by the Environmental Protection Agency. Results from the Interlaboratory Comparison Program are provided in Attachment C.

III. DISCUSSION AND INTERPRETATION OF RESULTS

A. Reporting of Results: The Annual Radiological Environmental Operating Report contains the summaries, interpretations and information required by the St. Lucie Plant, Unit Nos. 1 & 2 Technical Specifications. Table 1 provides a summary of the measurements made for the nuclides required by Technical Specifications, Table 4.12-1, for all samples specified by Table 3.12-1. In addition, summaries are provided for other nuclides identified in the specified samples, including those not related to station operation. These include nuclides such as ^{40}K, ^{232}Th, ^{226}Ra, ^{228}Ra, ^{7}Be, ^{238}U, and ^{210}Pb which are common in the Florida environment.

B. Interpretation of Results

1. Direct Radiation: The results for direct radiation monitoring are consistent with past measurements for the specified locations. The exposure rate data shows no indication of any trends attributed to effluents from the plant. The measured exposure rates are consistent with exposure rates that were observed during the preoperational surveillance program. Direct radiation monitoring results are summarized in Table 1.

2. Air Particulates/Radioiodine: The results for radioactive air particulate and radioiodine monitoring are consistent with past measurements and indicate no trends attributed to plant effluents. All samples for radioiodine yielded no detectable ^{131}I. Gamma isotopic measurements yielded no indication of any nuclides attributed to station operation. The results for air particulate/radioiodine samples are consistent with measurements which were made during the preoperational surveillance program. Air particulate and radioiodine monitoring results are summarized in Table 1.

3. Surface Water: The results for radioactivity measurements in surface water samples are consistent with past measurements. Tritium was reported as present in one of the weekly surface water samples collected from Site H-15. Subsequent samples indicate there has been no increase nor adverse trend for

tritium in surface water samples at H15. The measured tritium was less than 0.5% of the reporting level specified by plant technical specifications, Table 3.12-2. No other nuclides attributed to station operation were detected. Results for surface water samples are summarized in Table 1.

4. Waterborne Sediment and Food Products: The results for radioactivity measurements in waterborne sediment, fish and crustacea samples are consistent with past measurements and with measurements made during the preoperational surveillance program. There were no indications of any radionuclides attributed to plant effluents. Results for the waterborne sediment, fish and crustacea samples are summarized in Table 1.

5. Broad Leaf Vegetation: The results for radioactivity measurements in broad leaf vegetation are consistent with past measurements and with measurements made during the preoperational surveillance program. There were no indications of any nuclides attributed to plant effluents. Results for the broad leaf vegetation samples are summarized in Table 1.

C. Conclusions

The data obtained through the St. Lucie Plant Radiological Environmental Monitoring Program verifies that the levels of radiation and concentrations of radioactive materials in environmental samples, representing the highest potential exposure pathways to members of the public, are not being increased. The measurements verify that the dose or dose commitment to members of the public, due to operation of St. Lucie Unit Nos. 1 & 2, during the surveillance year, are well within "as low as reasonably achievable (ALARA)" criteria established by 10 CFR 50, Appendix I.

TABLE 1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Name of Facility St. Lucie Unit Nos. 1 and 2 Docket No.(s) 50-335 and 50-389

Location of Facility St. Lucie, Florida (County, State) Reporting Period January 1 - December 31, 1985

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection[a] (LLD)	All Indicator Locations Mean (f)[b] Range	Location with Highest Annual Mean Name[c] Distance & Direction	Mean (f)[b] Range	Control Locations Mean (f)[b] Range	Number of Nonroutine Reported Measurements
DIRECT RADIATION							
TLD (micro-R/hr)	Exposure rate 108[d]	-	5.2 (108/108) 4.5 - 6.3	NW-10 10 miles, NW	6.2 (4/4) 6.1 - 6.3	6.0 (4/4) 5.7 - 6.1	0
AIRBORNE							
Radioiodines (pCi/m^3)	^{131}I 212	0.024	< MDA	-	< MDA	< MDA	0
Air Particulates (pCi/m^3)	Gross Beta 212	0.0025	0.014 (212/212) 0.006-0.034	H-08 6 miles, WNW	0.016 (53/53) 0.006-0.024	0.014 (53/53) 0.007-0.030	0
	γ-Isotopic 20 (composite)						
	^{7}Be	0.0052	0.099 (20/20) 0.068-0.247	H-12 12 miles, S	0.106 (4/4) 0.078-0.234	0.106 (4/4) 0.078-0.234	0
	^{40}K	0.012	0.012 (4/20) 0.007-0.020	H-14 1 mile, SE	0.020 (1/4)	<MDA	0
	^{210}Pb	-	0.030 (2/20) 0.020-0.040	H-30 2 miles, W	0.040 (1/4)	<MDA	0
	^{134}Cs	0.00069	<MDA	-	< MDA	< MDA	0
	^{137}Cs	0.00066	<MDA	-	< MDA	< MDA	0

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WATERBORNE							
Surface Water (pCi/l)	Tritium 65	230	140 (1/65)	H15 <1 Mile, ENE/E/ESE	140 (1/65)	< MDA	0
	γ- Isotopic 65						
	^{40}K	60	336 (65/65) 220-410	H-15 <1 mile, ENE/E/ESE	338 (53/65) 260-410	329 (12/65) 220-400	0
	^{54}Mn	4	< MDA	-	-	< MDA	0
	^{59}Fe	8	< MDA	-	-	< MDA	0
	^{58}Co	4	< MDA	-	-	< MDA	0
	^{60}Co	4	< MDA	-	-	< MDA	0
	^{65}Zn	8	< MDA	-	-	< MDA	0
	^{95}Zr-Nb	7	< MDA	-	-	< MDA	0
	^{131}I	5	< MDA	-	-	< MDA	0
	^{134}Cs	5	< MDA	-	-	< MDA	0

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Surface Water (pCi/l)	^{137}Cs	4	<MDA	-	-	<MDA	0
	^{140}Ba-La	11	<MDA	-	-	<MDA	0
WATERBORNE							
Sediment (pCi/kg,dry)	γ- Isotopic 4						
	^{40}K	140	290 (4/4) 170-430	H-15 1 mile, ENE/E/ESE	400 (2/2) 360-430	180 (2/2) 170-200	0
	^{226}Ra	49	190 (4/4) 172-210	H-15 1 mile, ENE/E/ESE	198 (2/2) 185-210	182 (2/2) 172-191	0
	^{232}Th	52	51 (3/4) 40-62	H-59 10 - 20 miles S/SE	62 (1/2)	62 (1/2)	0

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Sediment (pCi/kg, dry)	^{238}U	-	288 (2/4) 270-306	H-59 10-20 miles S/SE	306 (1/2)	306 (1/2)	0
	^{58}Co	9	< MDA	-	-	< MDA	0
	^{60}Co	12	< MDA	-	-	< MDA	0
	^{134}Cs	14	< MDA	-	-	< MDA	0
	^{137}Cs	12	< MDA	-	-	< MDA	0
INGESTION							
Crustacea (pCi/kg,wet)	γ- Isotopic 4						
	^{40}K	130	2000(4/4) 1600-2300	H-59 10-20 miles S/SE	2150 (2/2) 2000-2300	2150 (2/2) 2000-2300	0
	^{226}Ra	20	105 (3/4) 86-120	H-15 <1 mile ENE/E/ESE	110 (1/2)	103 (2/2) 86-120	0

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Crustacea (pCi/kg,wet)	^{228}Ra	-	100(1/4)	H59 10-20 miles, S/SSE	100(1/2)	100(1/2)	0
	^{232}Th	30	86.(2/4)	H-59 10-20 miles S/SSE	101 (1/2)	101 (1/2)	0
	^{54}Mn	9	< MDA	-	-	< MDA	0
	^{59}Fe	16	< MDA	-	-	< MDA	0
	^{58}Co	9	< MDA	-	-	< MDA	0
	^{60}Co	10	< MDA	-	-	< MDA	0
	^{65}Zn	17	< MDA	-	-	< MDA	0
	^{134}Cs	9	< MDA	-	-	< MDA	0
	^{137}Cs	9	< MDA	-	-	< MDA	0

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INGESTION							
Fish (pCi/kg,wet)	γ - Isotopic 6						
	^{40}K	130	2750 (6/6) 2000-3000	H-59 10-20 miles S/SSE	3000 (2/2) 3000-3000	3000 (2/2) 3000-3000	0
	^{54}Mn	9	< MDA	-	< MDA	< MDA	0
	^{59}Fe	16	< MDA	-	< MDA	< MDA	0
	^{58}Co	9	< MDA	-	< MDA	< MDA	0
	^{60}Co	10	< MDA	-	< MDA	< MDA	0
	^{65}Zn	17	< MDA	-	< MDA	< MDA	0
	^{134}Cs	9	< MDA	-	< MDA	< MDA	0
	^{137}Cs	9	< MDA	-	< MDA	< MDA	0

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INGESTION							
Broad leaf vegetation (pCi/kg,wet)	γ - Isotopic 36						
	^{7}Be	71	620 (36/36) 290-1270	H-52 1 mile S/SSE	630 (12/12) 310-1270	610 (12/12) 290-1070	0
	^{40}K	100	2580 (36/36) 1700-4500	H-51 1 mile N/NW	2730 (12/12) 1700-4500	2300 (12/12) 1700-3000	0
	^{210}Pb	-	500 (1/36)	H-51 1 mile N/NW	500 (1/12)	<MDA	0
	^{131}I	9	<MDA	-	-	<MDA	0
	^{134}Cs	8	<MDA	-	-	<MDA	0
	^{137}Cs	8	<MDA	-	-	<MDA	0

TABLE 1

NOTES

a. The LLD is an "a priori" lower limit of detection which establishes the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a real signal..

LLD's in this column are at time of measurement. The MDAs reported in attachment B for the individual samples have been corrected to the time of sample collection.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (f).

c. Specific identifying information for each sample location is provided in Attachment - A.

d. Results are based upon the average net response of two TLDs. (Thermoluminescent dosimeters).

MDA refers to minimum detectable activity

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TABLE 1A

DEVIATIONS/MISSING DATA

Date	Location	Description of Problem	Deviation(s)	Corrective Action
09/24/85	H-34	Air sampler motor circuit breaker tripped approximately 80 hours into the 168 hour sampling period; suspected result of severe weather	Sampling not continuous	Reset breaker upon detection of fault
10/01/85	H-08	Air sampler pump failure (& replacement) during sampling interval. Sample acquired was 80% of typical sample volume	Sampling not continuous	Replaced air pump upon detection of failure
07/12/85 - 07/19/85	S-5	TLD's fell from their holder	Site S-5 was without continuous monitoring from 07/16 - 07/19/85	TLD's were recovered from a local resident, returned to the lab for readout and redeployed to the field within 3 days

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TABLE 1B

ANALYSES WITH LLDs ABOVE TABLE 4.12-1 DETECTION CAPABILITIES
1/1/85 - 12/31/85

Date	Sample Type	Location	Radionuclide	MDA	Table 4.12-1 LLD	Reason for Deviation

The values specified in Table 4.12-3, Detection Capabilities, were achieved for all samples.

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TABLE 2

LAND USE CENSUS

DISTANCE TO NEAREST[a,b]

Sector	6/85 Milk Animal [c]	6/85 Residence	6/85 Garden [d]
N	0[e]	0	0
NNE	0	0	0
NE	0	0	0
ENE	0	0	0
E	0	0	0
ESE	0	0	0
SE	0	1.5/141	0
SSE	L[f]	3.7/152[g]	L
S	L	3.2/191	L
SSW	L	2.2/213	3.1/195
SW	L	1.9/236	1.9/234
WSW	3.8/255	1.9/245[h]	1.9/253
W	4.5/266	1.9/260	2.0/264
WNW	L	2.3/281	3.3/301
NW	L	3.5/304	3.7/306
NNW	L	L	L

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TABLE 2 NOTES

LAND USE CENSUS

(a) All categories surveyed out to 5 miles radius from the St. Lucie Plant

(b) The following format is used to denote the location:

distance (miles)/bearing (degrees)

For example, a residence located in the southeast sector at a distance of 1.5 miles bearing 141 degrees is recorded as 1.5/141.

(c) Potential milk animal locations. All locations specified have been verified to be not producing milk for human consumption. (No calculated dose).

(d) Gardens with an estimated growing area of 500 square feet or more.

(e) 0 denotes that the sector area is predominently an ocean area.

(f) L denotes that the sector area is predominently a land area unoccupied by the category type.

(g) Other occupied buildings in this sector include the following:

-Fire Station, 1.8/149
-Country Club, 3.4/153

(h) Several residences in this sector are located approximately 1.9 miles from the St. Lucie Plant.

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ATTACHMENT A

KEY TO SAMPLE LOCATIONS

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Direct Radiation	N-1	North of Blind Creek	TLD	Quarterly	1	N
Direct Radiation	NNW-5	South of Pete Stone Creek	TLD	Quarterly	5	NNW
Direct Radiation	NNW-10	C. G. Station	TLD	Quarterly	9	NNW
Direct Radiation	NW-5	Indian River Drive at Rio Vista Drive	TLD	Quarterly	6	NW
Direct Radiation	NW-10	Intersection of SR 68 and SR 607	TLD	Quarterly	10	NW
Direct Radiation	WNW-2	Cemetary South of 7107 Indian River Drive	TLD	Quarterly	3	WNW
Direct Radiation	WNW-5	US-1 at SR 712	TLD	Quarterly	5	WNW
Direct Radiation	WNW-10	SR 70, West of Turnpike	TLD	Quarterly	10	WNW
Direct Radiation	W-2	7609 Indian River Drive	TLD	Quarterly	2	W
Direct Radiation	W-5	Oleander and Sager Streets	TLD	Quarterly	5	W
Direct Radiation	W-10	I-95 and SR 709	TLD	Quarterly	9	W
Direct Radiation	WSW-2	8503 Indian River Drive	TLD	Quarterly	2	WSW
Direct Radiation	WSW-5	Prima Vista Blvd. at Yacht Club	TLD	Quarterly	5	WSW
Direct Radiation	WSW-10	Del Rio and Davis Streets	TLD	Quarterly	10	WSW
Direct Radiation	SW-2	9207 Indian River Drive	TLD	Quarterly	2	SW
Direct Radiation	SW-5	US 1 and Village Green Drive	TLD	Quarterly	5	SW
Direct Radiation	SW-10	Port St. Lucie Blvd. and Cairo Road	TLD	Quarterly	10	SW
Direct Radiation	SSW-2	10307 Indian River Drive	TLD	Quarterly	3	SSW
Direct Radiation	SSW-5	Port St. Lucie Blvd. and US 1	TLD	Quarterly	6	SSW
Direct Radiation	SSW-10	Pine Valley and Westmoreland Roads	TLD	Quarterly	8	SSW
Direct Radiation	S-5	13179 Indian River Drive	TLD	Quarterly	5	S

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
ST. LUCIE PLANT
Key to Sample Locations

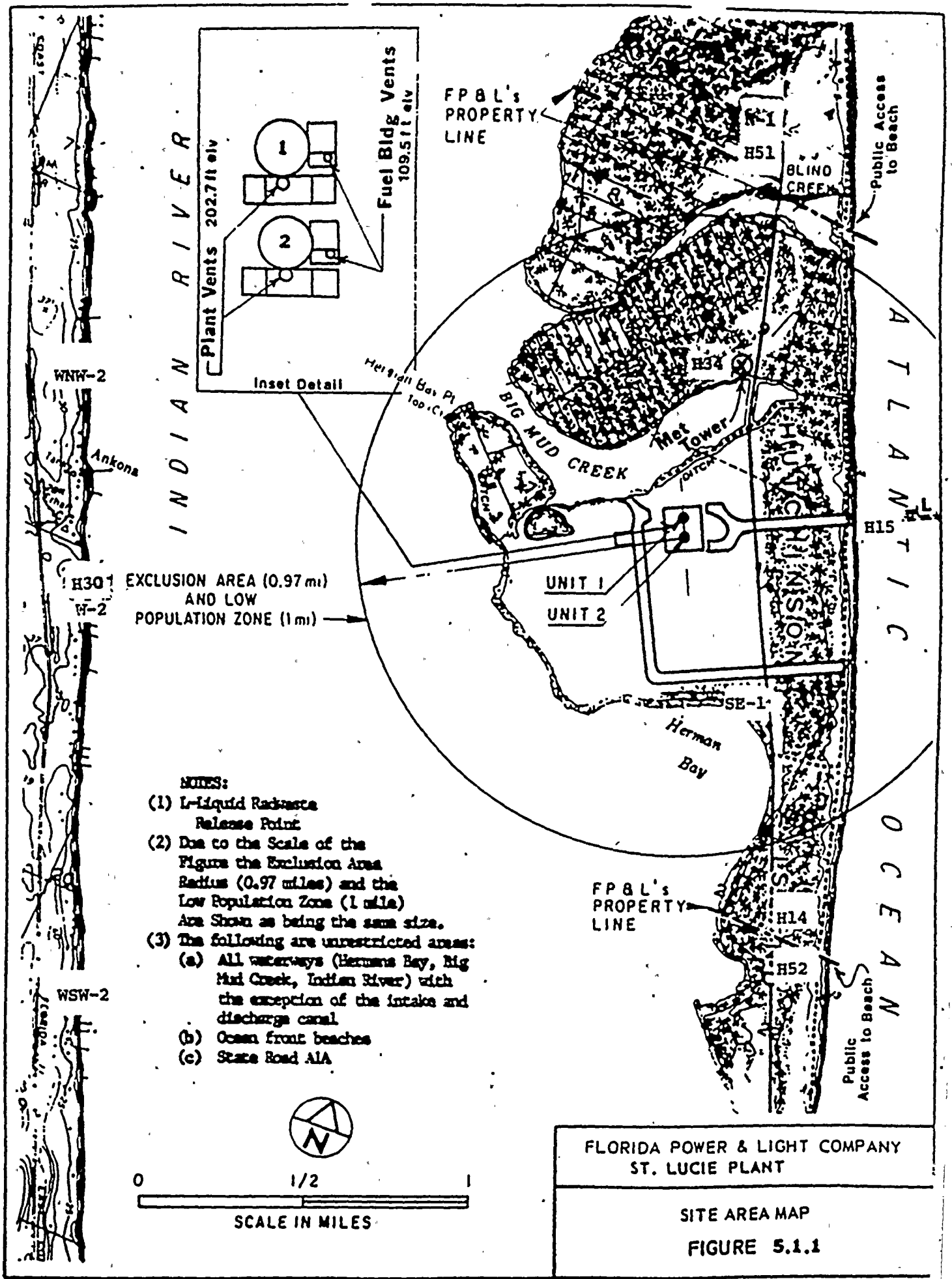
PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Direct Radiation	S-10	US 1 and SR 714	TLD	Quarterly	10	S
Direct Radiation	S/SSE-10	Indian River Drive and Quail Run Lane	TLD	Quarterly	10	SSE
Direct Radiation	SSE-5	Entrance of Nettles Island	TLD	Quarterly	5	SSE
Direct Radiation	SSE-10	Elliot Museum	TLD	Quarterly	10	SSE
Direct Radiation	SE-1	South of Cooling Canal	TLD	Quarterly	1	SE
Direct Radiation	*1-32	U. of Florida-IFAS Entomology Lab Vero Beach	TLD	Quarterly	19	NNW
Airborne	H08	FPL Substation - Weatherby Road	Radioiodine & Particulates	Weekly	6	WNW
Airborne	*H12	FPL Substation - SR 76, Stuart	Radioiodine & Particulates	Weekly	12	S
Airborne	H14	Onsite - near south property line	Radioiodine & Particulates	Weekly	1	SE
Airborne	H30	Power Line - 7609 Indian River Drive	Radioiodine & Particulates	Weekly	2	W
Airborne	H34	Onsite - At Meteorological Tower	Radioiodine & Particulates	Weekly	0.5	N
Waterborne	H15	Atlantic Ocean vicinity of public beaches east side of Route AlA	Surface Water (ocean) Sediment From shoreline	Weekly Semi-Annually	< 1	ENE/E/ESE
Waterborne	*H59	Near south end of Hutchinson Island	Surface Water (ocean) Sediment From shoreline	Monthly Semi-Annually	10-20	S/SSE

* Denotes Control Sample

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE
ST. LUCIE PLANT
Key to Sample Locations

PATHWAY	LOCATION	DESCRIPTION	SAMPLES COLLECTED	SAMPLE COLLECTION FREQUENCY	APPROXIMATE DISTANCE (miles)	DIRECTION SECTOR
Food Products	H15	Ocean side vicinity of St. Lucie Plant	Crustacea Fish	Semi-Annually Semi-Annually	< 1	ENE/E/ESE
Food Products	H51	Offsite near north property line	Broad leaf vegetation (mangrove)	Monthly (when available)	1	N/NNW
Food Products	H52	Offsite near south property line	Broad leaf vegetation (mangrove)	Monthly (when available)	1	S/SSE
Food Products	*H59	Near south end of Hutchinson Island	Crustacea Fish Broad leaf vegetation (mangrove)	Semi-Annually Semi-Annually Monthly	10-20	S/SSE

* Denotes control sample



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT

SITE AREA MAP

FIGURE 5.1.1

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ATTACHMENT B

RADIOLOGICAL SURVEILLANCE OF
FLORIDA POWER AND LIGHT COMPANY'S

ST. LUCIE SITE

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First Quarter, 1985
Second Quarter, 1985
Third Quarter, 1985
Fourth Quarter, 1985