



MAR 23 2000

L-2000-074
10 CFR 50.36a(a)(2)

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Annual Radioactive Effluent Release Report

Attached is the Radioactive Effluent Release Report for the period of January 1, 1999, through December 31, 1999, for Turkey Point Units 3 and 4, as required by Technical Specification 6.9.1.4 and 10 CFR 50.36a (a) (2).

Should there be any questions or comments regarding this information, please contact us.

Very truly yours,

A handwritten signature in black ink, appearing to read 'R. J. Hovey', with a horizontal line extending to the right from the end of the signature.

R. J. Hovey
Vice President
Turkey Point Plant

GSS

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

IE48

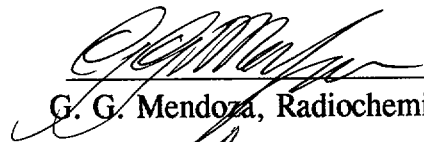
Turkey Point Plant
Units 3 and 4

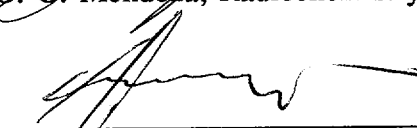
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

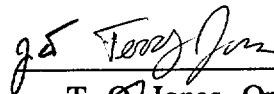
January 1999 through December 1999

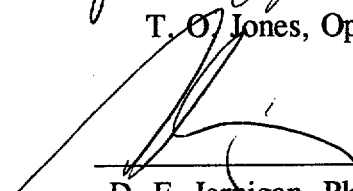
Submitted by:

NUCLEAR CHEMISTRY DEPARTMENT
FLORIDA POWER AND LIGHT COMPANY

 3-10-00
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TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1999 THROUGH DECEMBER 1999

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1.0 REGULATORY LIMITS

1.1 Liquid Effluent

- (a) The concentration of radioactive material released in liquid effluent to unrestricted areas shall not exceed ten times the concentration specified in 10CFR20 Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained gases. For dissolved or entrained noble gases, the concentration shall not exceed 2.0E-04 microcuries per milliliter.
- (b) The dose or dose commitment per reactor to a member of the public from any radioactive materials in liquid effluents released to unrestricted areas shall be limited as follows:
 - During any calendar quarter, to less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ.
 - During any calendar year, to less than or equal to 3.0 mrem to the total body and less than or equal to 10 mrem to any organ.

1.2 Gaseous Effluent

- (a) The dose rate due to radioactive materials released in gaseous effluent from the site to areas at and beyond the site boundary shall be limited to the following:
 - Less than or equal to 500 mrem per year to the total body and less than or equal to 3000 mrem per year to the skin due to noble gases.
 - Less than or equal to 1500 mrem per year to any organ due to I-131, I-133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days.
- (b) The air dose per reactor to areas at and beyond the site boundary due to noble gases released in gaseous effluents shall be limited to:
 - During any calendar quarter, to less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation.
 - During any calendar year, to less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.
- (c) The dose per reactor to a member of the public, due to I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluent released to areas at and beyond the site boundary shall not exceed 7.5 mrem to any organ during any calendar quarter and shall not exceed 15 mrem to any organ during any calendar year.

2.0 EFFLUENT CONCENTRATION

Water : In accordance with 10CFR20, Appendix B, Table 2, Column 2, and for entrained or dissolved noble gases as described in 1.1.a of this report.

Air : Release concentrations are limited to dose rate limits described in 1.2.a of this report.

3.0 AVERAGE ENERGY

The average energy of fission and activation gases in effluents is not applicable.

4.0 MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

All liquid and airborne discharges to the environment during this period were analyzed in accordance with Technical Specification requirements. The minimum frequency of analysis as required by Regulatory Guide 1.21 was met or exceeded.

When alpha, tritium and named nuclides are shown as "-" curies on the following tables, this should be interpreted as 'no activity' was detected on the samples using the Plant Technical Specification analysis techniques to achieve the required Lower Limit of Detection ("LLD") sensitivity for radioactive effluents.

4.1 Liquid Effluents

Aliquots of representative pre-release samples, from waste disposal system, were isotopically analyzed for gamma emitting isotopes on a multichannel analyzer.

Frequent periodic sampling and analysis were used to conservatively determine if any radioactivity was being released via the steam generator blowdown system and the storm drain system.

Monthly and quarterly composite samples for the waste disposal system were prepared to give proportional weight to each liquid release made during the designated period of accumulation. The monthly composite was analyzed for tritium and gross alpha radioactivity. Tritium was determined by use of liquid scintillation techniques, and gross alpha radioactivity was determined by use of a solid state scintillation system. The quarterly composite was analyzed for Sr-89, Sr-90, and Fe-55 by chemical separation.

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All radioactivity concentrations determined from sample analysis of a pre-release composite were multiplied by the total represented volume of the liquid waste released to determine the total quantity of each isotope and of gross alpha activity released during the compositing period.

Aliquots of representative samples from the waste disposal system were analyzed on a pre-release basis by gamma spectrum analysis. The resulting isotope concentrations were multiplied by the total volume released in order to estimate the total dissolved gases released.

The liquid waste treatment system is shared by both units at the site and generally all liquid releases are allocated on a 50/50 basis to each unit respectively.

There were no continuous liquid effluent releases above the lower limit of detection for either Unit 3 or Unit 4 during this reporting period and therefore these have been omitted from Table 2 of this report.

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4.2 Gaseous Effluents

Airborne releases to the atmosphere occurred from the following sources:

- Gas Decay Tanks
- Containment Purges
- Releases incidental to operation of the plant.

The techniques employed in determining the radioactivity in airborne releases are:

- a) Gamma spectrum analysis for fission and activation gases,
- b) Removal of particulate material by filtration and subsequent gamma spectrum analysis, Sr-89, Sr-90 determination, and gross alpha determination,
- c) Absorption of halogen radionuclides on a charcoal filter and subsequent gamma spectral analysis, and
- d) Analysis of water vapor in a gas sample for tritium using liquid scintillation techniques.

All gas releases from the plant which were not accounted for by the above methods were conservatively estimated as curies of Xe-133 by use of the SPING-4 radiation monitors and the Plant Vent process monitor recorder chart and the current calibration curve for that process monitor.

Portions of the gas waste treatment system are shared by both units and generally all gas releases from the shared system are allocated on a 50/50 basis to each unit.

Meteorological data for the period January 1999 through December 1999, in the form of Joint Frequency Distribution Tables, are maintained on site.

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4.3 Estimation of Errors

a) Sampling Error

The error associated with volume measurement devices, flow measuring devices, etc., based on calibration data and design tolerances has been conservatively estimated to be collectively less than $\pm 10\%$.

b) Analytical Error

Our quarterly Q.C. Cross-Check Program involves counting unknown samples provided by an independent external lab. The errors associated with our analysis of these unknown samples, reported to us by the independent lab, were used as the basis for deriving the following analytical error terms:

<u>NUCLIDE TYPE</u>	<u>AVERAGE ERROR</u>	<u>MAXIMUM ERROR</u>
Liquid	$\pm 5.9\%$	$\pm 11.0\%$
Gaseous	$\pm 2.7\%$	$\pm 11.0\%$

5.0 BATCH RELEASES

5.1 LIQUID

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	1.60E+02	1.60E+02
b) Total time period of batch releases, minutes	1.32E+04	1.32E+04
c) Maximum time period for a batch release, minutes	1.45E+02	1.45E+02
d) Average time period for a batch release, minutes	7.82E+01	7.82E+01
e) Minimum time for a batch release, minutes	1.00E+00	1.00E+00
f) Average stream flow during period of release of effluent into a flowing stream, liters-per-minute	4.85E+06	4.85E+06

5.1 GASEOUS

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	1.05E+01	1.15E+01
b) Total time period of batch releases, minutes	4.04E+02	3.70E+04
c) Maximum time period for a batch release, minutes	4.50E+01	3.66E+04
d) Average time period for a batch release, minutes	3.84E+01	3.22E+03
e) Minimum time for a batch release, minutes	3.00E+01	3.00E+01

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6.0 UNPLANNED RELEASES

6.1 Liquid

There were no unplanned liquid releases this period for either Unit 3 or Unit 4.

6.2 Gaseous

There were no unplanned gas releases this period for either Unit 3 or Unit 4.

7.0 REACTOR COOLANT ACTIVITY

7.1 Unit 3

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

7.2 Unit 4

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

8.0 SITE RADIATION DOSE

The assessment of radiation dose from radioactive effluents to the general public due to their activities inside the site boundary assumes a visitor was at the child development center/fitness center for ten hours a day, five days each week for fifty weeks of the year, receiving exposure from both Unit 3 and Unit 4 at Turkey Point. The child development center/fitness center is located approximately 1.75 miles WNW of the plant. Specific activities used in these calculations are the sum of the activities listed in Unit 3 Table 3 and Unit 4 Table 3. The following dose calculations were made using historical, meteorological data :

	Adult Inhalation	Child Inhalation
Bone (mrem)	3.67E-08	6.62E-08
Liver (mrem)	1.08E-06	7.90E-07
Thyroid (mrem)	1.83E-05	2.31E-05
Kidney (mrem)	1.12E-06	5.18E-07
Lung (mrem)	1.03E-06	7.22E-07
GI-LLI (mrem)	1.04E-06	7.26E-07
Total Body (mrem)	1.06E-06	7.73E-07

Gamma Air Dose (mrad)	5.01E-05
Beta Air Dose (mrad)	6.87E-05

9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVISIONS

The ODCM was revised once during this reporting period. The following changes are included in Appendix A:

- a. Revised Control 5.3, Interlaboratory Comparison Program.

10.0 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

No irradiated fuel shipments were made from the site. Common solid waste from Turkey Point Units 3 and 4 was shipped jointly. A summation of these shipments is given in Table 6 of this report.

11.0 PROCESS CONTROL PROGRAM REVISIONS

Revisions were made to the process control program during this reporting period. The revisions included:

- a. Deleted references and sections covering solidification of various types of wastes because of equipment obsolescence.
- b. Added processing requirements for wet radioactive waste such as resins, filters, waste oil, and liquid waste.

12.0 INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

No inoperable effluent monitoring instrumentation requiring reportability during this period.

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LIQUID EFFLUENTS SUMMARY

**UNIT 3
TABLE 1**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium gases, alpha)	Ci	3.31E-02	4.90E-03	3.16E-03	1.15E-02	3.44
2. Average diluted concentration during the period	uCi/ml	9.52E-10	5.79E-10	3.78E-10	9.29E-10	
3. Percent of applicable limit	%	9.52E-03	5.79E-03	3.78E-03	9.29E-03	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.66E+02	5.39E+01	5.80E+01	1.48E+02	2.50
2. Average diluted concentration during the period	uCi/ml	4.77E-06	6.36E-06	6.94E-06	1.20E-05	
3. Percent of applicable limit	%	4.77E-01	6.36E-01	6.94E-01	1.20E+00	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.93E-03	3.40E-04	8.13E-05	3.26E-04	3.44
2. Average diluted concentration during the period	uCi/ml	5.56E-11	4.01E-11	9.73E-12	2.64E-11	
3. Percent of applicable limit	%	2.78E-05	2.01E-05	4.86E-06	1.32E-05	

D. GROSS ALPHA RADIOACTIVITY

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	

E. LIQUID VOLUMES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	1.82E+06	8.64E+05	3.34E+05	4.95E+05	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	3.47E+10	8.47E+09	8.36E+09	1.24E+10	

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LIQUID EFFLUENTS SUMMARY

UNIT 3
TABLE 2

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	4.97E-06	1.25E-06	2.56E-06	1.11E-03
Sr-89	Ci	2.60E-08	2.10E-08	1.40E-05	1.73E-05
Sr-90	Ci	1.60E-09	3.02E-05	2.01E-07	9.91E-06
Na-24	Ci	--	--	--	--
Cr-51	Ci	2.31E-04	4.45E-05	1.12E-04	--
Mn-54	Ci	1.29E-02	1.68E-04	3.81E-05	6.77E-05
Co-57	Ci	5.52E-05	8.20E-07	2.04E-06	7.13E-05
Co-58	Ci	8.58E-03	2.16E-03	1.37E-03	5.17E-03
Fe-59	Ci	1.96E-04	--	6.53E-06	--
Co-60	Ci	8.79E-03	6.47E-04	6.44E-04	1.80E-03
Zn-65	Ci	--	--	--	--
Nb-95	Ci	3.16E-04	8.20E-05	6.26E-05	5.57E-05
Zr-95	Ci	--	5.25E-05	4.11E-05	1.47E-05
Mo-99	Ci	--	--	--	--
Ru-103	Ci	--	--	--	--
Ag-110	Ci	7.87E-04	1.36E-05	6.06E-04	2.60E-03
Sn-113	Ci	3.49E-05	--	--	--
Sn-117	Ci	3.61E-06	--	--	--
Sb-124	Ci	7.05E-05	4.05E-04	--	--
Sb-125	Ci	6.54E-04	1.27E-03	1.70E-04	4.00E-04
I-131	Ci	2.90E-06	--	--	6.25E-07
I-133	Ci	--	--	--	--
I-134	Ci	--	1.30E-06	--	--
Cs-134	Ci	7.02E-06	--	--	--
I-135	Ci	--	--	--	--
Cs-137	Ci	4.09E-04	3.62E-05	6.94E-06	2.46E-05
La-140	Ci	1.55E-05	--	1.52E-06	1.15E-05
Ce-141	Ci	--	--	1.96E-06	--
Ce-144	Ci	--	--	--	--
W-187	Ci	2.48E-05	--	7.45E-05	1.38E-04
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	3.31E-02	4.90E-03	3.16E-03	1.15E-02

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Xe-133	Ci	1.92E-03	3.33E-04	8.13E-05	3.26E-04
Xe-133m	Ci	6.65E-06	6.65E-06	--	--
Xe-135	Ci	1.86E-06	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	1.93E-03	3.40E-04	8.13E-05	3.26E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager			
Location : Cooling Canal			
Shoreline Deposition	Dose (mrem)	% of Annual Limit	
TOTAL BODY	5.92E-04	1.97E-02	

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GASEOUS EFFLUENTS SUMMARY

UNIT 3
TABLE 3

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	2.69E-01	3.37E-02	1.11E+00	--	2.79
2. Average release rate for the period	uCi/sec	3.46E-02	4.28E-03	1.40E-01	--	
3. Percent of Technical Specification Limit	%	1.17E-12	1.31E-13	4.51E-12	--	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	6.62E-04	--	3.44
2. Average release rate for the period	uCi/sec	--	--	8.33E-05	--	
3. Percent of Technical Specification Limit	%	--	--	1.14E-01	--	

C. PARTICULATES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	Ci	--	--	--	--	

D. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

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GASEOUS EFFLUENTS SUMMARY

**UNIT 3
TABLE 4**

A. FISSION GASES

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	7.36E-08	--	--
Kr-85	Ci	3.23E-04	2.91E-03	7.77E-02	--
Kr-85m	Ci	2.68E-08	3.56E-06	--	--
Xe-131m	Ci	3.24E-03	1.30E-03	--	--
Xe-133	Ci	2.63E-01	2.93E-02	1.01E+00	--
Xe-133m	Ci	1.94E-03	1.66E-04	9.12E-03	--
Xe-135	Ci	7.61E-04	4.74E-05	3.41E-03	--
TOTAL FOR PERIOD	Ci	2.69E-01	3.37E-02	1.10E+00	--

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-87	Ci	--	--	--	--
Kr-88	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	--	--
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-135m	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

B. IODINES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	Ci	--	--	--	--
I-131	Ci	--	--	2.70E-04	--
I-133	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	2.70E-04	--

C. PARTICULATES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	Ci	--	--	--	--
Co-60	Ci	--	--	--	--
Mn-54	Ci	--	--	--	--
Cr-51	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

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DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 3
TABLE 6**

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	1.11E-05	1.33E-05	4.27E-03	3.32E-06	0.00E+00	4.98E-07	0.00E+00	7.77E-06
Fruit & Veg Fresh (mrem)	5.32E-07	5.45E-07	1.77E-04	3.33E-07	0.00E+00	4.68E-08	0.00E+00	4.11E-07
Ground Plane (mrem)	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	8.97E-08	7.38E-08
Inhalation - Adult (mrem)	2.16E-08	3.06E-08	1.02E-05	5.26E-08	0.00E+00	5.38E-09	0.00E+00	1.75E-08
TOTAL (mrem)	1.17E-05	1.39E-05	4.45E-03	3.78E-06	7.38E-08	6.24E-07	8.97E-08	8.27E-06
% of Annual Limit	7.83E-05	9.28E-05	2.97E-02	2.52E-05	4.92E-07	4.16E-06	5.98E-07	5.52E-05

DOSE DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	8.59E-06	8.59E-05
Beta Air Dose	2.87E-05	1.43E-04

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LIQUID EFFLUENTS SUMMARY

**UNIT 4
TABLE 1**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium, gases, alpha)	Ci	3.31E-02	4.90E-03	3.16E-03	1.15E-02	3.44
2. Average diluted concentration during the period	uCi/ml	9.52E-10	5.79E-10	3.78E-10	9.29E-10	
3. Percent of applicable limit	%	9.52E-03	5.79E-03	3.78E-03	9.29E-03	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.66E+02	5.39E+01	5.80E+01	1.48E+02	2.50
2. Average diluted concentration during the period	uCi/ml	4.77E-06	6.36E-06	6.94E-06	1.20E-05	
3. Percent of applicable limit	%	4.77E-01	6.36E-01	6.94E-01	1.20E+00	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.93E-03	3.40E-04	8.13E-05	3.26E-04	3.44
2. Average diluted concentration during the period	uCi/ml	5.56E-11	4.01E-11	9.73E-12	2.64E-11	
3. Percent of applicable limit	%	2.78E-05	2.01E-05	4.86E-06	1.32E-05	

D. GROSS ALPHA RADIOACTIVITY

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	

E. LIQUID VOLUMES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	1.82E+06	8.64E+05	3.34E+05	4.95E+05	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	3.47E+10	8.47E+09	8.36E+09	1.24E+10	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1999 THROUGH DECEMBER 1999

LIQUID EFFLUENTS SUMMARY

**UNIT 4
TABLE 2**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	4.97E-06	1.25E-06	2.56E-06	1.11E-03
Sr-89	Ci	2.60E-08	2.10E-08	1.40E-05	1.73E-05
Sr-90	Ci	1.60E-09	3.02E-05	2.01E-07	9.91E-06
Na-24	Ci	--	--	--	--
Cr-51	Ci	2.31E-04	4.45E-05	1.12E-04	--
Mn-54	Ci	1.29E-02	1.68E-04	3.81E-05	6.77E-05
Co-57	Ci	5.52E-05	8.20E-07	2.04E-06	7.13E-05
Co-58	Ci	8.58E-03	2.16E-03	1.37E-03	5.17E-03
Fe-59	Ci	1.96E-04	--	6.53E-06	--
Co-60	Ci	8.79E-03	6.47E-04	6.44E-04	1.80E-03
Zn-65	Ci	--	--	--	--
Nb-95	Ci	3.16E-04	8.20E-05	6.26E-05	5.57E-05
Zr-95	Ci	--	5.25E-05	4.11E-05	1.47E-05
Mo-99	Ci	--	--	--	--
Ru-103	Ci	--	--	--	--
Ag-110	Ci	7.87E-04	1.36E-05	6.06E-04	2.60E-03
Sn-113	Ci	3.49E-05	--	--	--
Sn-117	Ci	3.61E-06	--	--	--
Sb-124	Ci	7.05E-05	4.05E-04	--	--
Sb-125	Ci	6.54E-04	1.27E-03	1.70E-04	4.00E-04
I-131	Ci	2.90E-06	--	--	6.25E-07
I-133	Ci	--	--	--	--
I-134	Ci	--	1.30E-06	--	--
Cs-134	Ci	7.02E-06	--	--	--
I-135	Ci	--	--	--	--
Cs-137	Ci	4.09E-04	3.62E-05	6.94E-06	2.46E-05
La-140	Ci	1.55E-05	--	1.52E-06	1.15E-05
Ce-141	Ci	--	--	1.96E-06	--
Ce-144	Ci	--	--	--	--
W-187	Ci	2.48E-05	--	7.45E-05	1.38E-04
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	3.31E-02	4.90E-03	3.16E-03	1.15E-02

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	1.92E-03	3.33E-04	8.13E-05	3.26E-04
Xe-133m	Ci	6.65E-06	6.65E-06	--	--
Xe-135	Ci	1.86E-06	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	1.93E-03	3.40E-04	8.13E-05	3.26E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager			
Location : Cooling Canal			
Shoreline Deposition		Dose (mrem)	% of Annual Limit
TOTAL BODY		5.92E-04	1.97E-02

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
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GASEOUS EFFLUENTS SUMMARY

**UNIT 4
TABLE 3**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	4.65E-01	3.37E-02	1.11E+00	--	2.79
2. Average release rate for the period	uCi/sec	5.98E-02	4.28E-03	1.40E-01	--	
3. Percent of Technical Specification Limit	%	2.66E-11	1.31E-13	4.51E-12	--	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	6.62E-04	--	3.44
2. Average release rate for the period	uCi/sec	--	--	8.33E-05	--	
3. Percent of Technical Specification Limit	%	--	--	1.14E-01	--	

C. PARTICULATES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	Ci	--	--	--	--	

D. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	3.57E-01	--	--	--	2.50
2. Average release rate for the period	uCi/sec	4.59E-02	--	--	--	
3. Percent of Technical Specification Limit	%	2.68E-06	--	--	--	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE RELEASE REPORT
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GASEOUS EFFLUENTS SUMMARY

**UNIT 4
TABLE 4**

A. FISSION GASES

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	1.96E-01	7.36E-08	--	--
Kr-85	Ci	3.23E-04	2.91E-03	7.77E-02	--
Kr-85m	Ci	2.68E-08	3.56E-06	--	--
Xe-131m	Ci	3.24E-03	1.30E-03	1.38E-02	--
Xe-133	Ci	2.63E-01	2.93E-02	1.01E+00	--
Xe-133m	Ci	1.94E-03	1.66E-04	9.12E-03	--
Xe-135	Ci	7.61E-04	4.74E-05	3.41E-03	--
Xe-135m	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	4.65E-01	3.37E-02	1.11E+00	0.00E+00

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-87	Ci	--	--	--	--
Kr-88	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	--	--
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-135m	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

B. IODINES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	Ci	--	--	--	--
I-131	Ci	--	--	2.70E-04	--
I-133	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	2.70E-04	--

C. PARTICULATES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	Ci	--	--	--	--
Co-60	Ci	--	--	--	--
Mn-54	Ci	--	--	--	--
Cr-51	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1999 THROUGH DECEMBER 1999

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 4
TABLE 5**

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	G-HLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	1.11E-05	1.59E-05	4.27E-03	4.50E-06	2.68E-06	3.18E-06	0.00E+00	1.05E-05
Fruit & Veg Fresh (mrem)	5.32E-07	8.25E-07	1.78E-04	5.17E-07	2.80E-07	3.26E-07	0.00E+00	6.91E-07
Ground Plane (mrem)	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	8.97E-08	7.38E-08
Inhalation - Adult (mrem)	2.16E-08	1.24E-06	1.14E-05	1.26E-06	1.21E-06	1.22E-06	0.00E+00	1.23E-06
TOTAL (mrem)	1.17E-05	1.81E-05	4.46E-03	6.35E-06	4.25E-06	4.80E-06	8.97E-08	1.24E-05
% of Annual Limit	7.83E-05	1.21E-04	2.97E-02	4.24E-05	2.83E-05	3.20E-05	5.98E-07	8.30E-05

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	4.16E-05	4.16E-04
Beta Air Dose	4.00E-05	2.00E-04

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1999 THROUGH DECEMBER 1999

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

Summation
Table 6

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant	2.22E-05	2.92E-05	8.54E-03	7.82E-06	2.68E-06	3.68E-06	0.00E+00	1.82E-05
Fruit & Veg Fresh	1.06E-06	1.37E-06	3.55E-04	8.50E-07	2.80E-07	3.73E-07	0.00E+00	1.10E-06
Ground Plane	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.79E-07	1.48E-07
Inhalation - Adult	4.31E-08	1.27E-06	2.16E-05	1.32E-06	1.21E-06	1.22E-06	0.00E+00	1.25E-06
TOTAL (mrem)	2.35E-05	3.20E-05	8.91E-03	1.01E-05	4.32E-06	5.42E-06	1.79E-07	2.07E-05
% of Annual Limit	1.57E-04	2.13E-04	5.94E-02	6.76E-05	2.88E-05	3.61E-05	1.20E-06	1.38E-04

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	5.01E-05	5.01E-04
Beta Air Dose	6.87E-05	3.43E-04

TURKEY POINT UNITS 3 AND 4
1999 ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFF SITE FOR BURIAL OR DISPOSAL

1.	<u>TYPE OF WASTE</u>	<u>UNITS</u>	<u>12 MONTH PERIOD</u>	<u>% ERROR</u>
a.	Spent resin, filters sludge, evaporator bottoms	m ³ Ci	17. 830.	20
b.	Dry Compressible waste (Note 1)	m ³ Ci	33. 1.6	20
c.	Irradiated components Control rods, etc.	m ³ Ci	0.00 0.00	
d.	Other non-compressible Waste	m ³ Ci	5. 2.7	20

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION OF TYPE OF WASTE

	<u>UNITS</u>	<u>VALUE</u>
a. C-14	%	1
MN-54	%	5
FE-55	%	25
Co-57	%	5
Co-60	%	28
NI-63	%	15
NI-59	%	5
AG-110M	%	1
CS-134	%	5
CS-137	%	5
CE-144	%	2
SR-89	%	1
SR-90	%	2

TURKEY POINT UNITS 3 AND 4
1999 ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6

b.	<u>UNITS</u>	<u>VALUE</u>
CR-51	%	1
MN-54	%	2
Co-58	%	5
FE-55	%	36
Co-60	%	35
Ni-63	%	17
Nb-95	%	1
SB-125	%	1
C-14	%	1
ZR-95	%	1

c. N/A

d.	<u>UNITS</u>	<u>VALUE</u>
Co-57	%	5
MN-54	%	5
Co-58	%	45
FE-55	%	10
Co-60	%	20
Ni-63	%	10
CS-137	%	5

3. SOLID WASTE DISPOSITION

A.	<u>Number of shipments</u>	<u>Mode of transport</u>	<u>Destination</u>
	10 (Note 2)	Sole use truck	Oak Ridge, TN
	5 (Note 2)	Sole use truck	Barnwell, SC
	1 (Note 2)	Sole use truck	Richland, WA.

B. IRRADIATED FUEL SHIPMENTS

None

TURKEY POINT UNITS 3 AND 4
 1999 ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
 TABLE 6
 SOLID WASTE SHIPMENT

Waste Classification	Total Volume Ft ³	(NOTE 3) Total Curie Quantity	(NOTE 4) Principal Radionuclides	(NOTE 5) Type of Waste	R.G. 121 Category	(NOTE 6) Type of Container	Solidification or Absorbers Agent
Class A	1165.	1.6	None	Compactible Waste	lb.	Strong Tight	N/A
Class A	189.	2.7	None	Non-Compressible Waste	ld.	Cask	N/A
Class B	120.3	2.7	None	Dewatered Filters	1a.	Cask	N/A
Class B	481.	418	None	Dewatered Resin	1a.	Cask	N/A
Class C	120.3	409	None	Dewatered Resin	1a.	Cask	N/A

TURKEY POINT UNITS 3 AND 4
1999 ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6

NOTE 1: Dry compressible waste volume indicates volume shipped to a burial site following reduction by a waste processing facility was 33 Cubic Meters.

NOTE 2: Material transported to Oak Ridge, Tennessee, was consigned to licensed processing facilities for volume reduction and decontamination activities. The material remaining after processing was transported by the processor to Barnwell, South Carolina or Clive, Utah in accordance with the appropriate burial license activity limits. The material shipped directly to Barnwell was processed by CNSI and buried. Material transported to Richland, Washington was consigned to a licensed processing facility.

NOTE 3: The total curie quantity and radionuclide composition of solid waste shipped from the Turkey Point Plant Units 3 and 4 are determined using a combination of qualitative and quantitative techniques. The Turkey Point Plant follows the guidelines in the Low Level Waste Licensing Branch Technical Position on Radioactive Waste Classification (5/11/83) for these determinations.

The most frequently used techniques for determining the total activity in a package are the dose to curie method and inference from specific activity and mass or activity concentration and volume. Activation analysis may be applied when it is appropriate. The total activity determination by any of these methods is considered to be an estimate.

The composition of radionuclides in the waste is determined by periodic off-site analyses for difficult to measure isotopes. Off-site analyses are used to establish scaling factors or other estimates for difficult to measure isotopes and principle Gamma emitters.

NOTE 4: Principle radionuclide refers to those radionuclides contained in the waste in concentrations greater than 0.01 times the concentration of the nuclide listed in Table 1 or 0.01 times the smallest concentration of the nuclide listed in Table 2 of 10§CFR 61.55.

NOTE 5: Type of waste is specified as described in NUREG 0782, Draft Environment Impact Statement on 10 CFR §61 "Licensing Requirements for Land Disposal of Radioactive Waste".

NOTE 6: Type of container refers to the transport package.

APPENDIX A
ODCM CHANGES 1999

OFFSITE DOSE CALCULATION MANUAL
FOR
GASEOUS AND LIQUID EFFLUENTS
FROM THE
TURKEY POINT PLANT UNITS 3 AND 4

REVISION 8

CHANGE DATED 03/02/99

Florida Power and Light Company

PNSC No. 99-019

PNSC APPROVAL	<i>Theresa Ottavillo</i>	DATE	<i>3/2/99</i>
PLT. MGR. APPROVAL	<i>[Signature]</i>	DATE	<i>3/3/99</i>

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

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TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

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TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

INTRODUCTION

PURPOSE

This manual describes methods which are acceptable for calculating radioactivity concentrations in the environment and potential offsite doses associated with liquid and gaseous effluents from the Turkey Point Nuclear Units. These calculations are performed to satisfy Technical Specifications and to ensure that the radioactive dose or dose commitment to any member of the public is not exceeded.

The radioactivity concentration calculations and dose estimates in this manual are used to demonstrate compliance with the Technical Specifications required by 10 CFR 50.36. The methods used are acceptable for demonstrating operational compliance with 10 CFR 20.1302, 10CFR50 Appendix I, and 40CFR190. Only the doses attributable to Turkey Point Units 3 and 4 are determined in demonstrating compliance with 40CFR190 since there are no other nuclear facilities within 50 miles of the plant. Monthly calculations are performed to verify that potential offsite releases do not exceed Technical Specifications and to provide guidance for the management of radioactive effluents. The dose receptor is described such that the exposure of any member of the public is not likely to be substantially underestimated.

Quarterly and annual calculations of committed dose are also performed to verify compliance with regulatory limits of offsite dose. For these calculations, the dose receptor is chosen on the basis of applicable exposure pathways identified in a land use survey and the maximum ground level atmospheric dispersion factor (χ/Q) at a residence, or on the basis of more conservative conditions such that the dose to any resident near the plant is not likely to be underestimated.

The radioactive effluent controls set forth in this ODCM are designed to allow operational flexibility but still maintain releases and doses "as low as is reasonably achievable"; that is, within the objectives of Appendix I, 10 CFR Part 50 and comply with the limits in 10 CFR 20.1302.

The methods specified in the OFFSITE DOSE CALCULATION MANUAL (ODCM) for calculating doses due to planned or actual releases are consistent with the guidance and methods provided in:

Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1. October 1977.

Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977.

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INTRODUCTION, (continued)

Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

The required detection capabilities for radioactive materials in liquid and gaseous waste samples are tabulated in terms of the lower limits of detection (LDD's). Detailed discussion of the LLD and other detection limits, can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4077 (September 1984), in HASL Procedures Manual, HASL300 and in Hartwell, J. K. "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

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5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.3: INTERLABORATORY COMPARISON PROGRAM

Analyses shall be performed on all samples, supplied as part of an Interlaboratory Comparison Program, that correspond to the matrices shown on Table 5.3-1

This control may be satisfied by participation in a government sponsored radiological measurements Intercomparison program that involves at least three of the matrices shown in Table 5.3-1

APPLICABILITY: At all times.

ACTION:

- a. With analysis not being performed as required above, report the corrective actions taken to prevent recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Control 1.4.
- b. The provisions of Control 1.6.3 are not applicable.

SURVEILLANCE REQUIREMENTS:

- 5.3.1 A summary of the results obtained, as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Control 1.4.

METHOD 5.3:

- 5.3.1 The Program shall be conducted such that on an annual basis:
At least three of the matrices will be involved, and at least two of the analytical methods will be evaluated, and for Gamma Spectroscopy, a majority of the nuclides shown in Table 5.3-1 will be included.
- 5.3.2 Any laboratory approved by FP&L may provide samples for the Intercomparison Program provided that the radioisotopes used for sample preparation are traceable to the National Institute of Standards and Technology (NIST).

TURKEY POINT UNIT 3 & 4 OFFSITE DOCSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

METHOD 5.3: (continued)

- 5.3.3 Analysis of Matrix samples shall be capable of achieving ODCM Table 5.1-3 prescribed Lower Limit of Detection (LLD) on a blank sample.
- 5.3.4 Results within 20% of expected should be considered acceptable. Results exceeding 20% but within 35% require a description of probable cause and actions performed to bring the analysis into conformance. Results exceeding 35% are considered Not Acceptable; the Matrix shall be replaced and reanalyzed.

BASIS 5.3: INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR 50.

The Interlaboratory Comparison Program described herein provides an independent check on the precision and accuracy of the radiological monitoring measurements conducted as part of the Radiological Environmental Monitoring Program. The purpose of the Interlaboratory Comparison Program described in this appendix is to provide adequate confidence in the results of Turkey Point's radiological monitoring measurements, by providing an independent test of the ability to measure radionuclides in the sample medium.

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5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE 5.3-1

INTERLABORATORY COMPARISON PROGRAM SAMPLE ANALYSIS ⁽¹⁾

Analytical Method ⁽²⁾	ANALYSIS	WATER ⁽³⁾	AIRBORNE PARTICULATE OR GASES	SOIL	VEGETATION
GB	Gross Beta		X		
H3	H-3	X			
GS	Co-57		X		
	Co-60	X	X		X
	Cs-134	X	X		
	Cs-137	X	X	X	X
	Ce-144		X		
	Mn-54		X		
	K-40			X	X
	Ru-106		X		
	Sb-125		X		

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE NOTATIONS

1. The sample matrices shown on table 5.3-1 correspond to the matrices shown in Tables 5.1-1 & 5.1-2, with the following exceptions:
 - a. Milk is not currently in the REMP sampling program; there are no milk animals in the area encompassed by the Land Use Census. Therefore, inclusion of milk samples in the Interlaboratory Comparison Program is not required. Continued exclusion of milk in the Interlaboratory Comparison Program is acceptable until the Land Use Census indicates the existence of milk producing animals within the geographic area covered by REMP; see note 3, below.
 - b. The INGESTION exposure pathway is represented by inclusion of Broad Leaf Vegetation in the Interlaboratory Comparison Program cross checks. Fish and Invertebrate samples are not included in the cross check program due to the instability of maintaining radioactivity in a fixed matrix due to decaying tissue and refrigeration limitations.
2. The analytical methods to be evaluated are those applied in the current REMP:
 - a. GB – Gross Beta analysis of an Air Filter matrix
 - b. H3 – Tritium in water, using method employed in REMP
 - c. GS – Gamma Spectroscopy, Quantitative.
3. The Gamma Spectroscopy method for water will suffice for Gamma Spectroscopy of Milk, should milk samples become available. Milk is over 98 % water.