SEMIANNUAL REPORT OF RADIOACTIVE EFFLUENT RELEASES, PTP UNITS 3 & 4, 7/78 - 12/78

Introduction

All liquid and airborne discharges to the environment during this reporting period were analyzed in accordance with Technical Specification requirements. The minimum frequency of analysis as required by Safety Guide 21 has been met or exceeded.

Liquid Releases

Aliquots of representative pre-release samples were either isotopically analyzed for gamma emitting isotopes on a multichannel analyzer, or evaporated and analyzed for gross beta-gamma activity in a 2π gas flow proportional counter. The efficiency of the gas flow proportional counter is adjusted so that the activity determined by gross beta-gamma analysis approximates the isotopic activities determined by gamma spectrum analysis and selected beta determinations, exclusive of tritium and dissolved gases.

The above procedure was followed for all releases from the waste disposal system and for secondary system batch releases. Frequent periodic sampling and anaysis were used to conservatively estimate the quantity of radioactivity released via the steam generator blowdown system.

The following comments will aid in the interpretation and evaluation of the liquid release data presented in Table I, pages 1 through 6:

1. The reported values in Table I, page 1, include in their computation the quantity of radioactivity released from both the waste disposal system and the secondary system. The secondary system releases occurred when contaminated water was blown down from the steam generators during primary to secondary leakage conditions, or when the generators were drained for repair or refueling, or during lancing of the generators.

2. The reported values in Table I, pages 2 and 3 are the total quantities of radioactivity for individual nuclides released from the waste disposal system and the secondary system together. The values in Table I, page 4 are for the waste disposal system only and page 5 is for the secondary system only.

3. During primary to secondary leakage, release of several short-lived nuclides occurred from the secondary system. These short-lived nuclides are not generally detected in batch releases from the waste disposal system due to the long holdup time of processed water. Only those isotopes that were detected in the secondary system releases were reported. All non-detectable isotopes are listed as (--).

4. Weekly and monthly 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 composites were analyzed for gamma emitting isotopes on a multichannel analyzer attached to a high resolution Ge(Li) detector, and for Sr-89 and Sr-90, using a chemical separation and subsequent beta determination with a 2π gas flow proportional counter. Tritium was determined by use of liquid scintillation techniques and gross alpha radioactivity was determined by use of a 2π gas flow proportional counter. All concentrations for radioactivity determined from analysis of a 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.

5. At least one representative batch of liquid effluent from the waste disposal system was analyzed monthly for dissolved fission and activation gases by use of gamma spectrum analysis. The resulting isotope concentrations were multiplied by the total volume released for the month in order to estimate the total dissolved gases released. If more than one batch of effluent was analyzed, the concentrations were weighted in an appropriate manner. The results are

totaled on a monthly basis in Table I, page 6. Dissolved gases from secondary system releases were determined from the samples of the individual releases. Isotopic concentrations were multiplied by the volume released to determine the quantity of radiogas nuclides released.

6. Representative samples of secondary system batch releases were analyzed individually for gamma emitting isotopes. Analysis of a representative composite for tritium, gross alpha and selected beta emitters was made for releases which occurred due to primary to secondary leakage.

7. The applicable limit for release of radioactive material in liquid waste is five curies per quarter excluding tritium and dissolved gases.

8. The following notes have been added to help explain some of the results in Table I:

On pages 3 and 5 an entry entitled "Unidentified" is made in the isotope listing. This activity is the result of an analysis of blowdown water yielding a low gross beta gamma activity value and being multiplied by a large volume of water. The low activity of the blowdown water often makes isotopic analysis of the water unreasonable and therefore a gross beta gamma counter efficiency is chosen so that the total activity determined by gross beta gamma analysis will approximate the total activity which would be determined using an isotopic analysis.

Airborne Releases

Airborne releases to the atmosphere occurred from release of gas decay tanks, via the instrument bleedline, containment purges, and from the secondary system during conditions of primary to secondary leakage. 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-89-90 determination, gross alpha analysis, and gross beta-gamma analysis.

c) Absorption of halogen radionuclides on a charcoal filter and subsequent gamma-spectrum analysis, and

d) Condensation of water vapor in a gas sample followed by analysis for tritium using liquid scintillation techniques.

All sporadic gas releases from the plant which were not accounted for by the above methods were conservatively estimated by curies of Xe-133 equivalent by use of the plant vent process monitor recorder chart.

The maximum rated capacity for the hogging jets and the maximum measured flow-rate for the condenser air ejectors, and an estimate of the rate of exhaust from the atmospheric dumps were used to conservatively estimate the airborne releases from the secondary system whenever applicable.

The following comments will aid in the interpretation and evaluation of the airborne release data presented in Table II.

1. Calculation of total radioactivity of noble gases, I-131, and particulates is based upon detectable radionuclides only.

2. The applicable limit for release of total radioactive materials in gaseous waste is 0.012 Ci/sec when averaged over the calendar quarter.

   The percent of the applicable limit for total gaseous release was computed as follows:

$$\% \text{ of Limit} = \frac{\text{Total curies released in gaseous waste during quarter} \times 100\%}{(.012 \text{ Ci/sec})\ (\text{seconds in quarter})}$$

3. The applicable limit for the release of I-131 and particulate radionuclides with half-lives greater than eight days in airborne waste is:

$$\Sigma \frac{Q_i}{MPC_i} \leq 10{,}000 \frac{m^3}{sec}, \text{ where } Q_i = \text{release rate of } i^{th} \text{ nuclide, Ci/sec}$$

and MPC_i = maximum permissible concentration of the i^{th} nuclide.

The release rate, Q_i, was determined by dividing the total activity released in Ci, for the i^{th} nuclide ($t_{\frac{1}{2}} > 8d$), during the calendar quarter by the seconds in the quarter.

MPC_i values were obtained from Appendix B, Table II, Column 1; 10 CFR 20. The MPC chosen was the most conservative value of either the soluble or insoluble MPC for each isotope.

The percent of applicable limit was determined as follows:

$$\% \text{ of Limit} = \frac{\Sigma \frac{Q_i}{MPC_i} \times 100\%}{10{,}000 \text{ m}^3/\text{sec}}$$

4. The maximum gaseous release rate for each month is listed in Table II, page 1, under section A, line 3. The applicalbe limit for maximum allowable release rate is 6.7 E+04 µCi/sec.

5. All values reported in Table II, pages 2 and 3, include the particulate, gaseous, and/or halogen activity released from the containments during purging, auxiliary building (leakage from pumps, valves, etc), the gas waste disposal system and the secondary system during conditions of primary to secondary system leakage. If a minimum detectable activity value was not calculated for an isotope, it will be listed as (—).

1978 Table I Report of Radioactive Effluents: Liquid Page 1

Liquid Releases	July	August	September	October	November	December
A. Gross Radioactivity (β-γ)						
1. Total Release (mCi)	9.33 E+01	1.36 E+02	9.02 E+01	4.73 E+01	3.11 E+01	5.61 E+01
2. Avg Concentration During Releases (μCi/ml)	7.0 E-10	1.3 E-09	1.7 E-09	8.9 E-10	9.1 E-10	1.0 E-09
3. Avg Concentration for Month (μCi/ml)	3.1 E-10	7.2 E-10	4.2 E-10	1.7 E-10	1.2 E-10	2.0 E-10
4. Max Concentration Released (μCi/ml)	7.8 E-09	1.2 E-08	7.0 E-09	3.3 E-09	4.8 E-09	3.9 E-09
5. Percent of Technical Specification Limit for Total Activity Released (%)		6.4 E+00			2.7 E+00	
B. Tritium						
1. Total Release (Ci)	1.62 E+02	8.70 E+01	1.03 E+02	7.66 E+01	7.88 E+01	1.11 E+02
2. Avg Concentration During Releases (μCi/ml)	1.2 E-06	8.1 E-07	2.0 E-06	1.4 E-06	2.3 E-06	2.0 E-06
3. Avg Concentration for Month (μCi/ml)	5.3 E-07	4.4 E-07	4.8 E-07	2.8 E-07	2.9 E-07	3.9 E-07
C. Dissolved Noble Gas						
1. Total Release (mCi)	2.17 E+00	4.90 E+01	3.91 E+01	4.66 E+00	1.22 E+01	1.86 E+02
2. Avg Concentration During Releases (μCi/ml)	1.6 E-11	4.7 E-10	7.5 E-10	8.8 E-11	3.6 E-10	3.4 E-09
3. Avg Concentration for Month (μCi/ml)	7.1 E-12	2.5 E-10	1.8 E-10	1.7 E-11	4.5 E-11	6.5 E-10
D. Gross Alpha Radioactivity						
1. Total Release (mCi)	(<1.7 E-08)	(<1.7 E-08)	(<2.2 E-08)	(<2.4 E-08)	(<1.1 E-08)	(<1.0 E-08)
2. Avg Concentration During Releases (μCi/ml)	(<1.3 E-19)	(<1.6 E-19)	(<4.2 E-19)	(<4.5 E-19)	(<3.2 E-19)	(<1.8 E-19)
3. Avg Concentration for Month (μCi/ml)	(<5.6 E-20)	(<8.8 E-20)	(<1.0 E-19)	(<8.7 E-20)	(<4.1 E-20)	(<3.5 E-20)
E. Volumes						
1. Vol of Liquid Waste to Discharge (Liters)	4.50 E+06	8.08 E+06	3.45 E+06	2.10 E+06	1.35 E+06	3.43 E+06
2. Vol of Dilution Water During Rel (Liters)	1.33 E+11	1.05 E+11	5.22 E+10	5.30 E+10	3.43 E+10	5.53 E+10
3. Vol of Dilution Water for Month (Liters)	3.04 E+11	1.94 E+11	2.17 E+11	2.76 E+11	2.69 E+11	2.85 E+11

Note: [illegible] maximum concentration in Ci/ml

1978	Table I Report of Radioactive Effluents: Liquid - Total					Page 2
Isotope Unit	July	August	September	October	November	December
Ag-110m mCi	6.42 E-01	5.20 E-01	1.08 E+00	(<4.7 E-08)	7.63 E-01	1.51 E+00
Ba-140 mCi	(<2.7 E-07)	(<3.5 E-07)	(<4.8 E-07)	(<4.1 E-07)	(<9.9 E-08)	(<1.1 E-07)
Co-58 mCi	6.25 E+00	4.15 E+01	2.33 E+01	8.49 E+00	3.48 E+00	5.04 E+00
Co-60 mCi	3.73 E+01	2.72 E+01	3.59 E+01	2.39 E+01	1.53 E+01	2.61 E+01
Cr-51 mCi	(<1.9 E-07)	6.54 E+00	2.09 E+00	(<2.8 E-07)	(<2.1 E-07)	8.06 E-01
Cs-134 mCi	4.61 E-01	5.36 E+00	6.61 E+00	1.79 E+00	1.76 E+00	1.97 E+00
Cs-136 mCi	(<1.5 E-07)	4.9 E-01	(<3.5 E-08)	(<2.8 E-08)	(<3.0 E-08)	(<3.0 E-08)
Cs-137 mCi	9.95 E-01	8.45 E+00	1.39 E+01	2.80 E+00	4.76 E+00	3.52 E+00
Cs-138 mCi	2.06 E+00	--	--	--	--	--
F-18 mCi	3.92 E-01	--	--	--	--	--
Fe-59 mCi	(<6.3 E-08)	6.01 E-01	(<7.5 E-08)	(<5.8 E-08)	(<4.9 E-08)	(<5.5 E-08)
I-131 mCi	1.09 E+00	3.09 E+01	1.50 E+00	4.67 E-01	1.75 E-02	5.66 E+00
I-132 mCi	7.92 E+00	--	--	--	--	--
I-133 mCi	9.05 E+00	7.64 E+00	(<4.3 E-08)	(<3.6 E-08)	(<2.8 E-08)	6.64 E+00
I-134 mCi	7.29 E+00	--	--	--	--	--
I-135 mCi	9.10 E+00	--	--	--	--	--
La-140 mCi	(<1.8 E-08)	(<2.5 E-08)	(<1.7 E-08)	(<8.3 E-09)	(<1.1 E-08)	8.51 E-01
Mn-54 mCi	3.95 E-01	1.29 E+00	1.40 E-01	5.75 E-02	3.49 E-02	2.35 E-01
Mo-99/Tc-99m mCi	1.07 E-01	8.27 E-01	(<2.4 E-07)	(<2.1 E-07)	(<1.7 E-07)	(<1.6 E-07)
Na-24 mCi	1.48 E+00	--	--	--	--	--
Nb-95 mCi	(<1.2 E-07)	6.0 E-01	3.92 E-01	(<3.3 E-08)	(<3.2 E-08)	(<3.2 E-08)
Ru-103 mCi	(<2.5 E-08)	3.06 E-01	(<4.5 E-08)	(<3.4 E-08)	(<2.6 E-08)	(<2.8 E-08)
Sb-124 mCi	(<3.1 E-08)	6.95 E-01	3.88 E+00	3.21 E-01	3.19 E-02	2.07 E-01
Sb-125 mCi	2.96 E-01	(<9.9 E-08)	1.43 E+00	2.54 E-01	2.12 E-01	1.81 E-01

NOTE: Numbers in parentheses represent maximum sensitivity in uCi/ml.

1978	Table I Report of Radioactive Effluents: Liquid - Total					Page 3
Isotope Unit	July	August	September	October	November	December
Sr-89 mCi	1.3 E+00	1.3 E-01	6.0 E-03	8.4 E-02	1.8 E-02	(<2.7 E-09)
Sr-90 mCi	(<6.7 E-09)	(<3.0 E-09)	(<2.9 E-09)	(<3.0 E-09)	7.3 E-03	(<2.7 E-09)
Unidentified mCi	7.16 E+00	2.71 E+00	--	9.11 E+00	4.71 E+00	3.37 E+00
Total mCi	9.33 E+01	1.36 E+02	9.02 E+01	4.73 E+01	3.11 E+01	5.61 E+01

NOTE: Numbers in parentheses represent maximum sensitivity in μCi/ml.

1978	Table I Report of Radioactive Effluents: Liquid - Waste Disposal System					Page 4
Isotope	Unit	July	August	September	October	November	December
Ag-110m	mCi	6.42 E-01	5.20 E-01	1.08 E+00	(<4.7 E-08)	7.63 E-01	1.51 E+00
Ba-140	mCi	(<2.7 E-07)	(<3.5 E-07)	(<4.8 E-07)	(<4.1 E-07)	(<9.9 E-08)	(<1.1 E-07)
Co-58	mCi	2.58 E+00	3.16 E+01	2.25 E+01	7.36 E+00	3.48 E+00	5.04 E+00
Co-60	mCi	6.61 E+00	4.77 E+00	6.2 E+00	3.55 E+00	3.23 E+00	4.08 E+00
Cr-51	mCi	(<1.9 E-07)	6.54 E+00	2.09 E+00	(<2.8 E-07)	(<2.1 E-07)	8.06 E-01
Cs-134	mCi	4.61 E-01	1.86 E+00	1.12 E+00	1.79 E+00	1.44 E+00	1.97 E+00
Cs-137	mCi	8.81 E-01	2.95 E+00	1.80 E+00	2.80 E+00	2.42 E+00	2.95 E+00
Fe-59	mCi	(<6.3 E-08)	6.01 E-01	(<7.5 E-08)	(<5.8 E-08)	(<4.9 E-08)	(<5.5 E-08)
I-131	mCi	7.94 E-02	1.93 E+01	1.50 E+00	4.67 E-01	1.75 E-02	3.41 E+00
I-133	mCi	7.84 E-02	5.74 E+00	(<4.3 E-08)	(<3.6 E-08)	(<2.8 E-08)	(<2.8 E-08)
La-140	mCi	(<1.8 E-08)	(<2.5 E-08)	(<1.7 E-08)	(<8.3 E-09)	(<1.1 E-08)	8.51 E-01
Mn-54	mCi	3.95 E-01	1.27 E+00	1.40 E-01	5.75 E-02	3.49 E-02	2.35 E-01
Mo-99/Tc-99m	mCi	1.07 E-01	8.27 E-01	(<2.4 E-07)	(<2.1 E-07)	(<1.7 E-07)	(<1.6 E-07)
Nb-95	mCi	(<1.2 E-07)	6.0 E-01	3.92 E-01	(<3.3 E-08)	(<3.2 E-08)	(<3.2 E-08)
Ru-103	mCi	(<2.5 E-08)	3.06 E-01	(<4.5 E-08)	(<3.4 E-08)	(<2.6 E-08)	(<2.8 E-08)
Sb-124	mCi	(<3.1 E-08)	6.95 E-01	3.88 E+00	3.21 E-01	3.19 E-02	2.07 E-01
Sb-125	mCi	2.96 E-01	(<9.9 E-08)	1.43 E+00	2.54 E-01	2.12 E-01	1.81 E-01
Sr-89	mCi	1.3 E+00	9.55 E-02	(<2.9 E-09)	8.4 E-02	1.8 E-02	(<2.7 E-09)
Sr-90	mCi	(<6.7 E-09)	(<3.0 E-09)	(<2.9 E-09)	(<3.0 E-09)	7.3 E-03	(<2.7 E-09)
Total	mCi	1.34 E+01	7.77 E+01	4.21 E+01	1.67 E+01	1.17 E+01	2.12 E+01

NOTE: Numbers in parentheses represent maximum sensitivity in uCi/ml

1978	Table I Report of Radioactive Effluents: Liquid - Secondary System					Page 5
Isotope	Unit	July	August	September	October	November	December
Co-58	mCi	3.67 E+00	9.86 E+00	8.3 E-01	1.13 E+00	--	--
Co-60	mCi	3.07 E+01	2.24 E+01	2.97 E+01	2.03 E+01	1.21 E+01	2.20 E+01
Cs-134	mCi	--	3.5 E+00	5.49 E+00	--	3.2 E-01	--
Cs-136	mCi	--	4.9 E-01	--	--	--	--
Cs-137	mCi	1.14 E-01	5.5 E+00	1.21 E+01	--	2.34 E+00	5.73 E-01
Cs-138	mCi	2.06 E+00	--	--	--	--	--
F-18	mCi	3.92 E-01	--	--	--	--	--
I-131	mCi	1.01 E+00	1.16 E+01	--	--	--	2.25 E+00
I-132	mCi	7.92 E+00	--	--	--	--	--
I-133	mCi	8.97 E+00	1.9 E+00	--	--	--	6.64 E+00
I-134	mCi	7.29 E+00	--	--	--	--	--
I-135	mCi	9.10 E+00	--	--	--	--	--
Mn-54	mCi	--	2.48 E-02	--	--	--	--
Na-24	mCi	1.48 E+00	--	--	--	--	--
Sr-89	mCi	(<2.9 E-09)	3.34 E-02	6.0 E-03	--	--	--
Sr-90	mCi	(<2.9 E-09)	(<2.9 E-09)	(<2.9 E-09)	--	--	--
Unidentified	mCi	7.16 E+00	2.71 E+00	--	9.11 E+00	4.71 E+00	3.37 E+00
Total	mCi	7.99 E+01	5.80 E+01	4.81 E+01	3.05 E+01	1.95 E+01	3.48 E+01

NOTE: Numbers in parentheses represent maximum sensitivity in uCi/ml.

1978 Table 1 Report of Radioactive Effluents: Liquid - Dissolved Gas Page 6

Total		July	August	September	October	November	December
Kr-85	mCi	(<4.7 E-06)	3.47 E+01	3.91 E+01	(<6.3 E-06)	(<4.6 E-06)	(<5.9 E-06)
Xe-131m	mCi	(<6.9 E-07)	(<2.1 E-06)	(<9.9 E-07)	(<7.1 E-07)	(<6.3 E-07)	(<9.5 E-07)
Xe-133	mCi	2.17 E+00	1.35 E+01	(<5.9 E-08)	3.99 E+00	1.13 E+01	1.81 E+02
Xe-133m	mCi	(<1.3 E-07)	(<3.7 E-07)	(<2.1 E-07)	(<1.6 E-07)	(<1.5 E-07)	2.48 E+00
Xe-135	mCi	(<1.7 E-08)	8.03 E-01	(<2.5 E-08)	6.72 E-01	8.5 E-01	3.00 E+00

Waste Disposal System							
Kr-85	mCi	(<4.7 E-06)	3.47 E+01	3.91 E+01	(<6.3 E-06)	(<4.6 E-06)	(<5.9 E-06)
Xe-131m	mCi	(<6.9 E-07)	(<2.1 E-06)	(<9.9 E-07)	(<7.1 E-07)	(<6.3 E-07)	(<9.5 E-07)
Xe-133	mCi	2.17 E+00	1.35 E+01	(<5.9 E-08)	3.99 E+00	1.13 E+01	1.80 E+02
Xe-133m	mCi	(<1.3 E-07)	(<3.7 E-07)	(<2.1 E-07)	(<1.6 E-07)	(<1.5 E-07)	2.48 E+00
Xe-135	mCi	(<1.7 E-08)	8.03 E-01	(<2.5 E-08)	6.72 E-01	8.5 E-01	2.53 E+00

Secondary System							
Kr-85	mCi	--	--	--	--	--	--
Xe-131m	mCi	--	--	--	--	--	--
Xe-133	mCi	--	--	--	--	--	1.35 E+00
Xe-133m	mCi	--	--	--	--	--	--
Xe-135	mCi	--	--	--	--	--	4.7 E-01

NOTE: Numbers in parentheses represent maximum sensitivity in μCi/ml.

1978	Table II Report of Radioactive Effluents: Airborne					Page 1
	July	August	September	October	November	December
A. Fission & Activation Gases.						
1. Total Release (Ci)	2.25 E+03	2.48 E+03	1.87 E+03	2.38 E+03	2.13 E+03	2.23 E+03
2. Avg Rel Rate for Period(μCi/Sec)	8.3 E+02	9.2 E+02	7.2 E+02	8.8 E+02	8.2 E+02	8.3 E+02
*3. Max Rel Rate for Period(μCi/Sec)	4.1 E+04	1.1 E+04	8.9 E+02	2.5 E+04	5.3 E+04	2.8 E+04
B. Iodine-131						
1. Total Iodine-131 (Ci)	4.1 E-03	1.0 E-02	1.6 E-03	3.4 E-03	3.7 E-04	1.8 E-02
2. Avg Rel Rate for Period(μCi/Sec)	1.5 E-03	3.7 E-03	6.2 E-04	1.3 E-03	1.4 E-04	6.7 E-03
C. Particulates						
1. Particulates with $t_{\frac{1}{2}}$>8d (Ci)	4.07 E-04	1.75 E-02	9.26 E-03	2.78 E-04	2.71 E-05	2.01 E-04
2. Avg Rel Rate for Period(μCi/Sec)	1.5 E-04	6.5 E-03	3.6 E-03	1.0 E-04	1.0 E-05	7.4 E-05
3. Gross Alpha Radioactivity (Ci)	3.1 E-09	3.7 E-08	7.3 E-08	(<2.8 E-12)	(<2.8 E-12)	(<3.1 E-12)
D. Tritium						
1. Total Release (Ci)	1.67 E-01	7.9 E-02	1.52 E-01	5.27 E-02	1.27 E-01	1.63 E-01
2. Avg Rel Rate for Period(μCi/Sec)	6.2 E-02	2.9 E-02	5.8 E-02	2.0 E-02	4.9 E-02	6.0 E-02

E. Percent of Applicable Limit	Quarter III	Quarter IV
1. Fission & Activation Gases (%)	6.9 E+00	7.0 E+00
2. I-131 and Part. ($t_{\frac{1}{2}}$>8d) (%)	2.2 E-01	2.7 E-01

*Maximum airborne release rate averaged over one hour for each month. Technical Specification limit is 6.7 E+04 μCi/Sec averaged over one hour.

NOTE: Numbers in parentheses represent maximum sensitivity in μCi/cc.

1978	Table II. Airborne Releases - Particulate					Page 2
Isotope	Unit	July	August	September	October	November	December
Ag-110m	Ci	(<4.7 E-14)	4.8 E-05	(<4.8 E-13)	(<3.3 E-14)	(<1.9 E-14)	(<5.0 E-14)
Ba-140	Ci	7.5 E-06	(<7.3 E-12)	(<5.2 E-12)	2.0 E-05	(<7.0 E-14)	(<1.3 E-13)
Ce-141	Ci	(<3.7 E-14)	2.6 E-05	(<2.5 E-13)	(<2.1 E-14)	(<1.6 E-14)	(<2.3 E-14)
Co-57	Ci	(<1.7 E-14)	3.2 E-05	2.1 E-05	(<1.3 E-14)	(<9.4 E-15)	(<1.4 E-14)
Co-58	Ci	2.5 E-04	1.3 E-02	6.9 E-03	9.2 E-05	1.4 E-05	5.5 E-05
Co-60	Ci	9.2 E-05	1.8 E-03	1.1 E-03	3.5 E-05	1.3 E-05	2.1 E-05
Cr-51	Ci	(<2.4 E-13)	1.5 E-03	6.0 E-04	(<2.1 E-13)	(<8.0 E-14)	1.5 E-05
Cs-134	Ci	1.5 E-05	1.1 E-05	4.3 E-05	3.8 E-05	(<2.1 E-14)	3.6 E-05
Cs-136	Ci	(<3.8 E-14)	(<4.2 E-13)	(<3.0 E-13)	6.9 E-06	(<1.1 E-14)	(<4.2 E-14)
Cs-137	Ci	2.4 E-05	2.1 E-05	6.7 E-05	5.0 E-05	(<2.0 E-14)	5.9 E-05
Fe-59	Ci	(<4.6 E-14)	1.2 E-04	6.2 E-05	(<4.6 E-14)	(<3.0 E-14)	(<5.9 E-14)
I-131	Ci	5.6 E-06	6.3 E-06	1.3 E-05	1.5 E-05	(<1.1 E-14)	1.2 E-05
La-140	Ci	7.5 E-06	(<1.9 E-13)	(<1.3 E-13)	1.2 E-05	(<1.2 E-14)	(<4.4 E-14)
Mn-54	Ci	(<3.4 E-14)	3.4 E-04	2.0 E-04	5.0 E-06	(<2.2 E-14)	2.1 E-06
Nb-95	Ci	(<3.0 E-14)	2.6 E-04	1.3 E-04	(<2.5 E-14)	(<1.3 E-14)	(<2.9 E-14)
Ru-103	Ci	(<3.7 E-14)	8.3 E-05	(<4.6 E-13)	(<2.9 E-14)	(<1.1 E-14)	(<2.9 E-14)
Sb-124	Ci	(<3.7 E-14)	1.7 E-04	6.2 E-05	(<2.8 E-14)	(<2.1 E-14)	(<5.5 E-14)
Sr-89	Ci	5.2 E-06	5.9 E-06	2.7 E-06	4.4 E-06	6.5 E-08	1.0 E-06
Sr-90	Ci	1.0 E-07	4.3 E-07	6.6 E-07	(<1.5 E-15)	(<6.5 E-16)	(<1.2 E-15)
Zr-95	Ci	(<4.9 E-14)	1.1 E-04	6.2 E-05	(<4.0 E-14)	(<2.4 E-14)	(<4.2 E-14)
Total	Ci	4.07 E-04	1.75 E-02	9.26 E-03	2.78 E-04	2.71 E-05	2.01 E-04

NOTE: Numbers in parentheses represent maximum sensitivity in μCi/cc.

1978	Table II Airborne Releases - Gaseous					Page 3
Fission & Activation Gases						
Isotope	Unit	July	August	September	October	November	December
Ar-41	Ci	1.27 E+01	4.41 E+00	1.94 E+01	8.19 E+00	1.05 E+01	2.12 E+01
Kr-85	Ci	(<3.8 E-05)	3.34 E-02	(<3.5 E-05)	(<3.7 E-05)	(<3.4 E-05)	6.64 E-02
Kr-85m	Ci	3.58 E-01	7.3 E-06	(<1.1 E-07)	2.17 E-01	2.77 E-01	6.85 E-01
Kr-87	Ci	(<2.6 E-07)	(<2.5 E-06)	(<2.4 E-07)	(<2.9 E-07)	(<3.1 E-07)	6.17 E-01
Kr-88	Ci	1.38 E-01	(<5.2 E-06)	(<2.5 E-07)	1.44 E-01	2.34 E-01	5.81 E-01
Xe-131m	Ci	3.61 E+00	1.32 E-02	(<4.8 E-06)	(<6.2 E-06)	(<7.2 E-06)	1.1 E-02
Xe-133	Ci	2.22 E+03	2.47 E+03	1.85 E+03	2.36 E+03	2.11 E+03	2.19 E+03
Xe-133m	Ci	3.70 E+00	5.49 E-01	7.01 E-02	2.22 E+00	1.58 E+00	2.30 E+00
Xe-135	Ci	7.38 E+00	1.08 E+00	2.37 E-01	5.09 E+00	4.78 E+00	1.26 E+01
Xe-135m	Ci	9.81 E-02	(<1.3 E-06)	(<1.6 E-07)	(<1.8 E-07)	(<1.7 E-07)	(<2.9 E-06)
Xe-138	Ci	(<3.0 E-07)	(<5.5 E-06)	(<3.0 E-07)	(<3.5 E-07)	(<2.7 E-07)	(<5.1 E-06)
Total	Ci	2.25 E+03	2.48 E+03	1.87 E+03	2.38 E+03	2.13 E+03	2.23 E+03

Halogens (Gaseous)							
Isotope	Unit	July	August	September	October	November	December
I-131	Ci	4.1 E-03	1.0 E-02	1.6 E-03	3.4 E-03	3.7 E-04	1.8 E-02
I-133	Ci	5.3 E-03	1.3 E-03	7.8 E-03	6.1 E-03	6.8 E-04	1.0 E-02
I-135	Ci	1.2 E-03	(<2.0 E-13)	6.7 E-03	8.8 E-04	(<7.7 E-14)	7.2 E-03
Br-82	Ci	3.5 E-04	--	--	1.6 E-04	1.4 E-04	4.6 E-04
Total	Ci	1.1 E-02	1.13 E-02	1.61 E-02	1.05 E-02	1.19 E-03	3.6 E-02

NOTE: Numbers in parentheses represent maximum sensitivity in μCi/cc.

ATTACHMENT 2
RADIOACTIVE WASTE REPORT
July 1, 1978 to December 31, 1978

Date of Shipment	Curies	Cu. Ft.	Disposition
7-12-78	3.000	60	Buried in Barnwell, SC
7-18-78	0.007	1,750	"
7-20-78	0.792	100	"
7-22-78	108.000	100	"
7-28-78	53.919	100	"
7-28-78	0.001	1,700	"
8-08-78	0.002	1,700	"
8-25-78	425.000	100	"
8-31-78	547.000	100	"
9-01-78	0.820	1,095	"
9-07-78	2.260	110	"
9-12-78	3.000	100	"
9-13-78	3.646	195	"
9-13-78	5.352	100	"
9-18-78	0.420	610	"
9-22-78	0.325	850	"
9-26-78	1.076	1,132	"
9-28-78	3.200	90	"
9-28-78	0.027	1,300	"
9-29-78	1.892	1,700	"
10-03-78	0.801	1,262	"
10-03-78	4.285	195	"
10-09-78	1.965	100	"
10-10-78	2.983	1,700	"
10-12-78	2.075	110	"
10-16-78	0.550	100	"
10-16-78	0.540	150	"
10-18-78	1.080	150	"
10-19-78	0.504	300	"
10-20-78	0.432	150	"
10-23-78	0.658	195	"
10-25-78	6.466	110	"
10-25-78	1.260	150	"
10-27-78	1.277	240	"
10-27-78	0.360	150	"
11-01-78	0.540	150	"
11-03-78	0.504	300	"
11-03-78	1.462	195	"
11-09-78	0.511	195	"
11-13-78	0.038	195	"
11-28-78	0.459	1,113	"
11-29-78	0.694	1,000	"
12-02-78	110.000	100	"
12-04-78	1.152	100	"
12-07-78	0.612	300	"
12-11-78	0.318	100	"
12-13-78	0.058	195	"
47 Shipments	1,301.323 Ci	21,997 Cu. Ft.	

On site as of January 1, 1979:

1.599 Ci 868 Cu. Ft.

TURKEY POINT: Units 3 & 4

Environmental Radiological Monitoring

(7-01-78 to 12-31-78)

1. Introduction

This report is submitted in accordance with Turkey Point Plant Technical Specifications.

All environmental samples were collected and analyzed in conformance with the requirements of the Technical Specifications. The minimum frequency of collection and analyses for specific radionuclides and sample types as required by these specifications has been met or exceeded.

2. The Monitoring Program

Period Covered: This current report covers the period from July 1, 1978 to December 31, 1978.

Analytical Responsibility: Environmental radiological monitoring at Turkey Point Plant is carried out by the Orlando Radiological Laboratory of the Department of Health and Rehabilitation Services of Florida (DHRS). All samples are collected and analyzed by DHRS personnel.

Number of Samples Analyzed: A total of 702 analyses on samples collected from 35 different sampling locations were performed during the period of this report. TABLE 1 summarizes the mean and range values of these analyses.

Split-Sample Analyses: At least 10 samples were collected to be analyzed by the DHRS/DOE Split-Sampling Program.

3. Evaluation of Data

a) As applicable, TABLE 1 reports data for sampling locations that have concentrations of a particular radionuclide higher than the observed mean for all sampling locations where the same type of sample material was collected and analyzed for that particular radionuclide.

b) The ^{95}Zr, ^{106}Ru, and ^{144}Ce found in sponges collected at locations T-59, T-69, T-86, T-93, T-94, and T-95 could be attributable to fallout. Similary, these radionuclides were noted also in the assay of samples from soil samples at locations T-52, T-57, T-58, T-55, T-56, T-57 and could also be attributable to weapons testing fallout.

c) Recognition must be given that data reported herein could be influenced by the residual fallout from the Chinese weapons tests of March, 1978.

d) The ^{3}H concentration at sampling location T-84 is consistent with ^{3}H levels previously observed in the Cooling Canal System. The other canal location, T-97, had a slightly lower concentration of ^{3}H.

e) No increases above previously reported data have been observed in GB-DS and ^{3}H concentrations at location T-75 in the Fresh Water Canals.

f) The ^{3}H concentrations in the Ground Water Wells at sampling locations T-88, T-91 and T-92 continue to be of the same magnitude as previously reported.

g) No significant increases above previously reported concentration levels of ^{58}Co, ^{60}Co, ^{137}Cs, and ^{144}Ce have been observed in the bottom sediments in the Cooling Canal at sampling location T-84.

h) Trend plotting of air particulate and direct radiation data, reveal no plant-related variations.

i) All data have been compared with pre-operational data and have been found to be within the $\pm 2\sigma$ limits observed.

j) Where applicable, comparisons of test sample location data with that of the control sample show no differences in concentration levels except as noted in TABLE 1.

4. Conclusions

The concentration level of any radionuclide reported in TABLE 1 will contribute much less than the maximum permissible limits of individual or population group intake that could result if there had been a continuous exposure to radionuclides having concentration values equal to those permitted by APPENDIX B, TABLE II, 10CFR20. Therefore, the operations of Turkey Point Plant Units 3 & 4 are not contributing harmful effects or irreversible damage to either the environment or to the health and safety to individuals or population groups in the regions surrounding Turkey Point Plant.

TABLE 1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

NAME OF FACILITY TURKEY POINT PLANT UNIT 3 & 4 DOCKET NO. 50-250, -251

LOCATION OF FACILITY Dade County, Florida REPORTING PERIOD 7-01-78 to 12-31-78

Medium or Pathway Sampled	Unit	Analysis for	Number of			All Indicator Locations		Location with Highest Mean			Control Location(a)		Number of Nonroutine Reported Measurements
			Sites	Samples	Analyses	Mean	Range	Sample Location Distance and Direction	Mean	Range	Mean	Range	
1. Air Filters													
1.1 Air Particulates	pCi/m³	Gβ	8	215	215	.02	0.004-0.047	T-72: Boy Scout Camp	.022	.004-.047	.020	.007-.041	None
1.1.a Air Iodines	pCi/m³	^{131}I	8	208	208	ND		None		ND(b)			None
1.2 Direct Radiation	µRem/hr	γ	11	132	132	5	4-7	T-64: Natoma Substation, Miami, ENE, 30 miles	5.8	5-7	5.8	5-7	None
1.3 Precipitation	pCi/L	Gamma scan	4	23	23	ND		None			ND		None
		Gβ-DS	4	24	24	2.7	ND-22	T-52: Florida City Substation, West, 8 miles	4.8	ND-22	1.3	ND-4	
		Gβ-UDS	4	24	24	< 1	ND-8	T-52: Florida City Substation, West, 8 miles	2.7	ND-8	ND		
		^{3}H	4	24	24	< 200		None			< 200		

Medium or Pathway Sampled	Unit	Analysis for	Number of			All Indicator Locations		Location with Highest Mean			Control Location(a)		Number of Nonroutine Reported Measurements
			Sites	Samples	Analyses	Mean	Range	Sample Location Distance and Direction	Mean	Range	Mean	Range	
2. Water													
2.1 Estuarine	pCi/L	^{3}H	10	20	20	216	< 200-500	T-51: Homestead Bayfront Park, NNW, 2 miles	350	< 200-500			None
		Sr-89	10	20	19	ND		None					
		Sr-90	10	20	19	ND		None					
2.1.2 Cooling Canal	pCi/L	^{3}H	2	14	14	5298	2700-8800	T-84: Discharge Canal Southside of Bridge	5412	2870-8800			None
		Sr-89	2	14	14	ND		None					
		Sr-90	2	14	14	< 1	ND-2	T-97: Loch Rosetta, on-site	< 1	ND-2			
2.1.3 Fresh Water Canal	pCi/L	Gβ-DS	2	12	12	135	ND-460	T-75: Florida City Canal NNW, 1.5 miles	268	160-460			None
		Gβ-UDS	2	12	12	ND		None					
		^{3}H	2	12	12	287	< 200-1100	T-75: Florida City Canal NNW, 1.5 miles	573	250-1100			

Medium or Pathway Sampled	Unit	Analysis for	Number of			All Indicator Locations		Location with Highest Mean			Control Location(a)		Number of Nonroutine Reported Measurements
			Sites	Samples	Analyses	Mean	Range	Sample Location Distance and Direction	Mean	Range	Mean	Range	
2.2 Potable Water Wells	pCi/L	Gβ-DS	3	4	4	10.8	6-15	T-57: Dolan's Farms, WNW, 4.5 miles	14	13-15			None
		Gβ-UDS	3	4	4	ND		None					
		^{3}H	3	6	6	< 200		None					
2.3 Ground Water Wells	pCi/L	^{3}H	6	12	12	979	< 200-2200	T-92: Well G24A, SSW, 4.5 miles	2020	1840-2200			None
		^{89}Sr	6	12	12	ND		None					
		^{90}Sr	6	12	12	ND		None					

Medium or Pathway Sampled	Unit	Analysis for	Number of Sites	Number of Samples	Number of Analyses	All Indicator Locations Mean	All Indicator Locations Range	Location with Highest Mean: Sample Location Distance and Direction	Location with Highest Mean: Mean	Location with Highest Mean: Range	Control Location(a) Mean	Control Location(a) Range	Number of Nonroutine Reported Measurements
3.0 Bottom Sediments													
3.1 Cooling Canal	pCi/kg	^{144}Ce	2	4	4	333	ND-600	T-84; Discharge Canal, Southside of Bridge	500	400-600			None
		^{137}Cs	2	2	2	220	ND-440	T-84: Discharge Canal, Southside of Bridge	440				
		^{58}Co	2	4	4	93	ND-230	T-84: Discharge Canal, Southside of Bridge	93	ND-230			
		^{60}Co	2	4	4	925	ND-3400	T-84: Discharge Canal, Southside of Bridge	925	ND-3400			
		^{89}Sr	2	4	4	ND		None					
		^{90}Sr	2	4	4	ND		None					
		^{134}Cs	2	2	2	70	ND-140	T-84: Discharge Canal, Southside of Bridge	70	ND-140			
3.2 Estuarine	pCi/kg	^{89}Sr	7	7	7	ND		None					None
		^{90}Sr	7	7	7	ND		None					

Medium or Pathway Sampled	Unit	Analysis for	Number of Sites	Number of Samples	Number of Analyses	All Indicator Locations Mean	All Indicator Locations Range	Location with Highest Mean: Sample Location Distance and Direction	Location with Highest Mean: Mean	Location with Highest Mean: Range	Control Location(a) Mean	Control Location(a) Range	Number of Nonroutine Reported Measurements
4.0 Biota													
4.1 Crustacea	pCi/kg	^{144}Ce	6	6	6	ND		None					None
		^{89}Sr	6	5	5	ND		None					
		^{90}Sr	6	5	5	ND		None					
		^{106}Ru	6	6	6	180	ND-900	T-94: Pumpkin Key, SSE, 8 miles	900 (c)				
4.2.a Fish Carnivore	pCi/kg	^{106}Ru	6	6	6	230	ND-800	T-69: Elliott Key, South end, ESE, 7 miles	800 (d)				None
		^{89}Sr	6	4	4	ND		None					
		^{90}Sr	6	4	4	ND		None					
		^{144}Ce	6	6	6	400	300-500	T-81: Card Sound, New Discharge Canal	400 (d)				

Medium or Pathway Sampled	Unit	Analysis for	Number of			All Indicator Locations		Location with Highest Mean			Control Location(a)		Number of Nonroutine Reported Measurements
			Sites	Samples	Analyses	Mean	Range	Sample Location Distance and Direction	Mean	Range	Mean	Range	
4.2.b Fish Herbivore	pCi/kg	^{89}Sr	6	5	5	ND		None					None
		^{90}Sr	6	5	5	3.2	ND-16	T-59: Elliott Key, E, 8 miles	16 (a)				
		^{134}Ce	6	6	6	ND		None					
4.3.a Manatee Grass	pCi/kg	^{144}Ce	6	6	6	ND		None					None
		^{89}Sr	6	4	4	ND		None					
		^{90}Sr	6	4	4	ND		None					
4.3.b Sponges	pCi/kg	^{144}Ce	6	6	6	1783	ND-4500	T-59: Elliott Key, E, 8 miles	4500				None
		^{106}Ru	6	6	6	183.	ND-600	T-86: West Arsenicker Key, Card Sound, SSE, 3 miles	600				
		^{95}Zr	6	6	6	.20	ND-120	T-93: Pelican Bank, East, 1.8 miles	120				

Medium or Pathway Sampled	Unit	Analysis for	Number of Sites	Number of Samples	Number of Analyses	All Indicator Locations Mean	All Indicator Locations Range	Location with Highest Mean: Sample Location Distance and Direction	Location with Highest Mean: Mean	Location with Highest Mean: Range	Control Location(a) Mean	Control Location(a) Range	Number of Nonroutine Reported Measurements
5.0 Terrestrial Biota													
5.2.1 Small Animals	pCi/kg	^{137}Cs	1	1	1	210	190-230	T-58: On Site Entrance Road	210 (f)				None
		^{90}Sr	1	1	1	25	18-32	T-58: On Site Entrance Road	25				
		^{89}Sr	1	1	1	ND		None					
5.2.3 Mangrove Leaves	pCi/kg	^{89}Sr	7	7	7	ND		None					None
		^{90}Sr	7	7	7	6.7	ND-21	T-51: Homestead Bayfront Park NNW, 2 miles	21				
5.3 Soil	pCi/kg	^{137}Cs	7	7	7	394	90-950	T-56: Princeton Sub-station, NNW, 8 miles	950				None
		^{144}Ce	7	7	7	243	ND-700	T-57: Dolan's Farms, NNW, 4.5 miles	700				
		^{89}Sr	7	7	7	ND		None					
		^{90}Sr	7	7	7	ND		None					

Medium or Pathway Sampled	Unit	Analysis for	All Indicator Locations					Location with Highest Mean			Control Location(a)		Number of Nonroutine Reported Measurements
			Number of Sites	Number of Samples	Number of Analyses	Mean	Range	Sample Location Distance and Direction	Mean	Range	Mean	Range	

Notes

(a) T-64: Natoma Substation, Miami, ENE, 30 miles

(b) ND = Non detectable

(c) Shrimp

(d) Fish

(e) Mullet

(f) Raccoon.