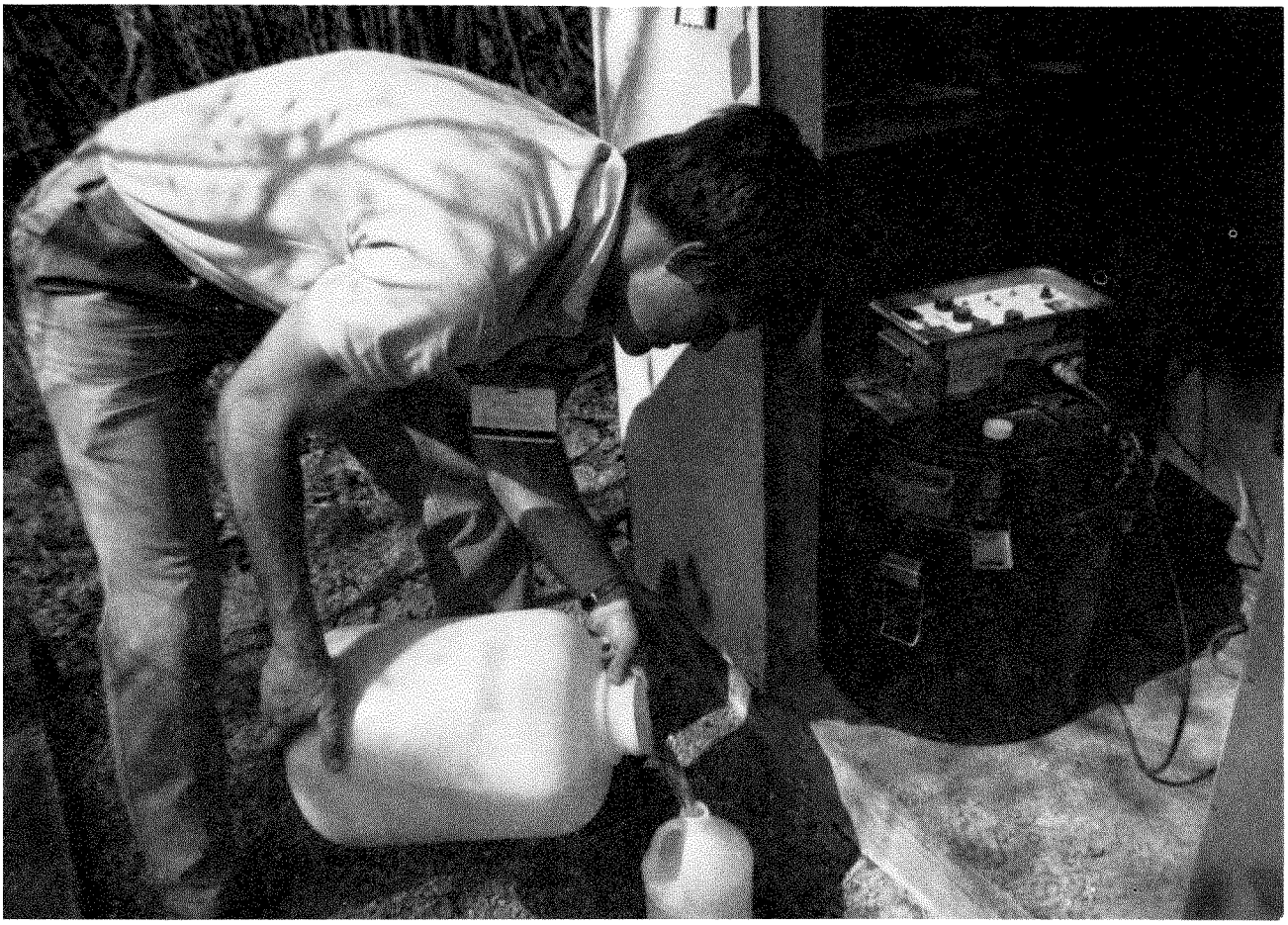

**COLLECTING A COMPOSITE WATER SAMPLE AT THE PROJECT BOUNDARY**

# APPENDIX C - 1

# SUMMARY OF WATER AND SEDIMENT MONITORING DATA

## Table C - 1 .1

### Total Radioactivity of Liquid Effluents Released from WVDP Lagoon 3 in 1989( curies)

| | Alpha | Beta | H-3 | C-14 | Sr-90 | I-129 | Cs-137 |
|---|---|---|---|---|---|---|---|
| 1st Qtr | 9.02 ± 6.3 E−04 | 2.03 ± 0.4 E-02 | 1.45 ± .04 E+00 | 1.75 ± 0.4 E-02 | 1.91 ± 0.2 E-03 | < 2.9 E-05 | 4.21 ± 2.1 E-03 |
| 2nd Qtr | 1.79 ± 1.8 E−04 | 1.46 ± 0.2 E-02 | 1.46 ± .04 E+00 | < 5.7E-04 | 1.02 ± 0.1 E-03 | 3.80 ± 0.9 E-05 | 7.18 ± 5.5 E-04 |
| 3rd Qtr | *** No release this period *** | | | | | | |
| 4th Qtr | 2.11 ± 2.1 E−04 | 4.34 ± 0.9 E-03 | 9.68 ± 0.3 E-01 | 5.72 ± 3.4 E-04 | 6.48 ± 0.5 E-04 | 4.42 ± 1.1 E-05 | 5.80 ± 4.8 E-04 |
| **1989 Totals** | 1.29 ± 0.7 E−03 | 3.92 ± 0.5 E-02 | 3.88 ± 0.1 E+00 | 1.86 ± 0.4 E-02 | 3.58 ± 0.2 E-03 | 1.11 ± 0.3 E-04 | 5.51 ± 2.2 E-03 |
| **1989 Average ($\mu$Ci/mL)** | 3.30 E-08 | 1.00 E -06 | 9.95E-05 | 4.76 E-07 | 9.17 E-08 | 2.84 E-09 | 1.41 E-07 |

| | U-234 | U-235 | U-238 | Pu-238 | Pu-239 | Am-241 |
|---|---|---|---|---|---|---|
| 1st Qtr | 2.31 ± 0.5 E−04 | 7.49 ± 3.1 E-06 | 9.01 ± 1.2 E-05 | 4.28 ± 2.1 E-06 | 3.23 ± 0.8 E-06 | 1.20 ± 0.2 E-05 |
| 2nd Qtr | 3.14 ± 0.5 E−05 | < 2.1 E-06 | 1.32 ± 0.3 E-05 | < 2.1 E-06 | < 2.1 E-06 | < 3.0 E-06 |
| 3rd Qtr | *** No release this period *** | | | | | |
| 4th Qtr | 9.63 ± 1.2 E−05 | 4.07 ± 1.4 E-06 | 2.97 ± 0.5 E-05 | < 1.6 E-06 | < 1.6 E-06 | < 3.8 E-07 |
| **1989 Totals** | 3.59 ± 0.5 E−04 | 1.37 ± 0.4 E-05 | 1.33 ± 0.1 E-04 | 7.98 ± 3.4 E-06 | 6.93 ± 2.8 E-06 | 1.54 ± 0.4 E-05 |
| **1989 Average ($\mu$Ci/mL)** | 9.19 E-09 | 3.51 E-10 | 3.41 E-09 | 2.04 E-10 | 1.77 E-10 | 3.94 E-10 |

**Table C - 1. 2**

**Comparison of 1989 Lagoon 3 Liquid Effluent Radioactivity Concentrations with Department of Energy (DOE) Guidelines**

| Isotope | Total $\mu$Ci Released[a] | Avg Concentration ($\mu$Ci/mL) | DCG ($\mu$Ci/L) | Percent of DCG |
|---|---|---|---|---|
| Alpha | 1.29 E+03 | 3.30 E-08 | N/A [b] | – |
| Beta | 3.92 E+04 | 1.00 E-06 | N/A [b] | – |
| H-3 | 3.88 E+06 | 9.95E-05 | 2.0 E-03 | 5.0 |
| C-14 | 1.86 E+04 | 4.76 E-07 | 7.0 E-05 | 0.7 |
| Sr-90 | 3.58 E+03 | 9.17 E-08 | 1.0 E-06 | 9.2 |
| I-129 | 1.11 E+02 | 2.84 E-09 | 5.0 E-07 | 0.6 |
| Cs-137 | 5.51 E+03 | 1.41 E-07 | 3.0 E-06 | .4.7 |
| U-234 [c] | 3.59 E+02 | 9.19 E-09 | 5.0 E-07 | 1.8 |
| U-235 [c] | 1.37 E+01 | 3.51 E-10 | 6.0 E-07 | 0.1 |
| U-238 [c] | 1.33 E+02 | 3.41 E-09 | 6.0 E-07 | 0.6 |
| Pu-238 | 7.98 E+00 | 2.04 E-10 | 4.0 E-08 | 0.5 |
| Pu-239 | 6.93 E+00 | 1.77 E-10 | 3.0 E-08 | 0.6 |
| Am-241 | 1.54 E+01 | 3.94 E-10 | 3.0 E-08 | 1.3 |
| Total% of DCG | | | | 25.1 [d] |

Notes:

[a] Total volume released = 3.90E+10 mL, measured at actual on-site release point

[b] Derived Concentration Guides (DCGs) are not applicable for gross alpha or beta activity

[c] Total U ($\mu$g) = 4.06E+08; average U (mg/L) = 1.04E-02

[d] Total percent DCG for specific measured radionuclides

## Table C - 1. 3

### 1989 Radioactivity Concentrations in Surface Water Upstream of the WVDP at Fox Valley (WFBCBKG) ($\mu$Ci/mL)

| MONTH | Alpha | Beta | H-3 | Sr-90 | Cs-137 |
|---|---|---|---|---|---|
| JAN | <7.3 E-10 | 2.24 ± 1.2 E−09 | <1.0 E-07 | | |
| FEB | <1.0 E-09 | 3.10 ± 1.2 E−09 | <1.0 E-07 | | |
| MAR | <7.6 E-10 | 5.37 ± 1.2 E−09 | <1.0 E-07 | | |
| 1ST QTR | | | | <9.9E-10 | <2.1E-08 |
| APR | <5.9 E-10 | 1.35 ± 0.8 E−09 | <1.0 E-07 | | |
| MAY | <4.0 E-10 | 1.95 ± 0.8 E−09 | <1.0 E-07 | | |
| JUN | 2.41 ± 1.4 E−09 | 4.73 ± 1.1 E-09 | <1.0 E-07 | | |
| 2ND QTR | | | | <1.1 E-09 | <2.1 E-08 |
| JUL | 1.83 ± 1.4 E−09 | 2.45 ± 0.9 E-09 | <1.0 E-07 | | |
| AUG | <1.1 E-09 | 2.96 ± 1.0 E−09 | <1.0 E-07 | | |
| SEP | <1.3 E-09 | 6.12 ± 1.3 E−09 | <1.0 E-07 | | |
| 3RD QTR | | | | 1.83 ± 1.3 E-09 | <2.1 E-08 |
| OCT | <9.1 E-10 | 4.25 ± 1.1 E−09 | <1.0 E-07 | | |
| NOV | <1.1 E-09 | 3.21 ± 1.0 E−09 | <1.0 E-07 | | |
| DEC | <7.1 E-10 | 1.95 ± 0.9 E−09 | <1.0 E-07 | | |
| 4TH QTR | | | | 5.82 ± 2.1 E−09 | <2.1 E-08 |

## Table C - 1. 4

### 1989 Radioactivity Concentrations in Surface Water Downstream of the WVDP at Thomas Corners (WFBCTCB) ($\mu$Ci/mL)

| MONTH | Alpha | Beta | H-3 | Sr-90 | Cs-137 |
|---|---|---|---|---|---|
| JAN | <5.4 E-10 | 5.06 ± 1.2 E−09 | 2.37 ± 1.2 E-07 | | |
| FEB | <5.4 E-10 | 6.07 ± 1.2 E−09 | <1.0 E-07 | | |
| MAR | 1.29 ± 1.2 E−09 | 4.30 ± 1.1 E-09 | <1.0 E-07 | | |
| 1ST QTR | | | | 1.83 ±1.3E−09 | <2.1 E-08 |
| APR | <8.7 E-10 | 4.35 ±1.1E−09 | <1.0 E-07 | | |
| MAY | <5.3 E-10 | 2.27 ± 0.9E−09 | <1.0 E-07 | | |
| JUN | 6.83 ± 2.9 E−09 | 1.62 ± 0.2E-08 | 5.00 ± 1.3 E-07 | | |
| 2ND QTR | | | | 1.46 ± 1.3 E−09 | <2.1 E-08 |
| JUL | <8.8 E-10 | 3.47 ± 1.0 E−09 | <1.0 E-07 | | |
| AUG | <8.2 E-10 | 5.55 ± 1.3 E−09 | <1.0 E-07 | | |
| SEP | <2.1 E-09 | 7.00 ± 1.4 E−09 | <1.0 E-07 | | |
| 3RD QTR | | | | 4.59 ± 1.9 E−09 | <2.1 E-08 |
| OCT | <8.2 E-10 | 1.30 ± 0.2 E−08 | 1.73 ± 0.1 E-06 | | |
| NOV | <1.3 E-09 | 4.28 ± 1.1 E−09 | <1.0 E-07 | | |
| DEC | <5.5 E-10 | 3.53 ± 1.0 E−09 | <1.0 E-07 | | |
| 4TH QTR | | | | 2.01 ± 1.5 E−09 | <2.1 E-08 |

## Table C - 1. 5

**Radioactivity Concentrations in Surface Water Downstream of the WVDP at Frank's Creek (WNSPOO6) ($\mu$Ci/mL)**

| MONTH | Alpha | Beta | H-3 |
|---|---|---|---|
| JAN | < 1.3 E-09 | 4.54 ± 0.4 E−08 | 2.34 ± 0.2 E-06 |
| FEB | 1.02 ± 1.0 E−09 | 1.72 ± 0.2 E-08 | 1.92 ± 1.2 E-07 |
| MAR | 1.82 ± 1.5 E−09 | 4.19 ± 0.3 E-08 | 4.93 ± 0.2 E-07 |
| APR | < 9.8 E-10 | 2.45 ± 0.2 E−08 | 1.08 ± 0.1 E-06 |
| MAY | < 8.2 E-10 | 1.98 ± 0.2 E−08 | 1.53 ± 1.1 E-07 |
| JUN | < 1.0 E-09 | 1.14 ± 0.1 E−07 | 1.95 ± 0.1 E-05 |
| JUL | < 1.3 E-09 | 4.86 ± 0.3 E−08 | 1.62 ± 1.2 E-07 |
| AUG | < 1.6 E-09 | 5.02 ± 0.4 E−08 | 1.24 ± 1.1 E-07 |
| SEP | < 1.7 E-09 | 4.97 ± 0.3 E−08 | < 1.0 E-07 |
| OCT | 6.27 ± 3.9 E−09 | 9.44 ± 0.5 E-08 | 2.71 ± 0.1 E-05 |
| NOV | 1.80 ± 1.7 E−09 | 2.39 ± 0.2 E-08 | 1.31 ± 1.1 E-07 |
| DEC | < 9.6 E-10 | 1.93 ± 0.2 E−08 | 1.46 ± 1.1 E-07 |

## Table C - 1. 6

**Radioactivity Concentrations in Surface Water Downstream of the WVDP at Frank's Creek (WNSPOO6) ($\mu$Ci/mL)**

| 1989 | C-14 | Sr-90 | I-129 | Cs-137 | U-234 |
|---|---|---|---|---|---|
| 1st Qtr | < 4.0 E-07 | 1.17 ± 0.2 E−08 | < 2.0 E-09 | 3.11 ± 2.9 E-08 | 6.89 ± 2.8 E-10 |
| 2nd Qtr | < 5.4 E-08 | 1.28 ± 0.3 E−08 | < 2.0 E-09 | 9.38 ± 3.0 E-08 | 5.43 ± 1.9 E-10 |
| 3rd Qtr | 4.35 ± 4.2 E−08 | 2.18 ± 0.3 E-08 | < 2.0 E-09 | 4.21 ± 3.0 E-08 | 2.92 ± 1.4 E-10 |
| 4th Qtr | < 5.8 E-08 | 1.82 ± 0.3 E−08 | 8.23 ± 4.0 E-10 | 3.79 ± 2.8 E-08 | 1.33 ± 0.3 E-09 |

| | U-235 | U-238 | Pu-238 | Pu-239 | Am-241 |
|---|---|---|---|---|---|
| 1st Qtr | < 2.7 E-10 | < 2.7 E-10 | < 2.0 E-10 | < 2.0 E-10 | 2.97 ± 1.1 E−10 |
| 2nd Qtr | < 2.0 E-10 | 3.16 ± 1.5 E−10 | < 2.0 E-10 | < 2.0 E-10 | < 7.6 E-10 |
| 3rd Qtr | 1.80 ± 1.2 E−10 | 2.02 ± 1.2 E-10 | < 2.0 E-10 | < 2.0 E-10 | < 6.3 E-11 |
| 4th Qtr | < 1.1 E-10 | 4.37 ± 2.0 E−10 | 1.56 ± 0.8 E-10 | 1.25 ± 0.7 E-10 | 1.46 ± 0.9 E-10 |

## Table C - 1. 7

### Radioactivity Concentrations in Surface Water Downstream of Buttermilk Creek at Felton Bridge (WFFELBR)

($\mu$Ci/mL)

| 1989 | Alpha | Beta | H-3 | Sr-90 | Cs-137 |
|---|---|---|---|---|---|
| Jan | <9.6 E-10 | 3.87 ± 1.1 E−09 | <1.2 E-07 | 3.53 ± 1.7 E-09 | <2.1 E-08 |
| Feb | <6.4 E-10 | 4.54 ± 1.1 E−09 | <1.2 E-07 | 2.31 ± 1.3 E-09 | <2.1 E-08 |
| Mar | <9.6 E-10 | 5.29 ± 1.2 E−09 | <1.0 E-07 | 2.29 ± 1.6 E-09 | <2.1 E-08 |
| Apr | 1.43 ± 1.3 E−09 | 5.32 ± 1.2 E-09 | <1.0 E-07 | 1.94 ± 1.3 E-09 | <2.1 E-08 |
| May | 1.26 ± 1.2 E−09 | 4.52 ± 1.1 E-09 | <1.0 E-07 | 2.65 ± 1.4 E-09 | <2.1 E-08 |
| Jun | 2.42 ± 1.7 E−09 | 7.44 ± 1.4 E-09 | 1.22 ± 1.2 E-07 | 4.78 ± 1.8 E-09 | <2.1 E-08 |
| Jul | <1.2 E-09 | 2.57 ± 1.0 E−09 | <1.0 E-07 | 3.49 ± 1.6 E-09 | <2.1 E-08 |
| Aug | <1.5 E-09 | 3.14 ± 1.1 E−09 | <1.0 E-07 | 4.32 ± 1.8 E-09 | <2.1 E-08 |
| Sep | <8.7 E-10 | 3.58 ± 1.1 E−09 | <1.0 E-07 | 2.96 ± 1.4 E-09 | <2.1 E-08 |
| Oct | <1.3 E-09 | 5.13 ± 1.2 E−09 | 1.63 ± 1.1 E-07 | 1.78 ± 1.2 E-09 | <2.1 E-08 |
| Nov | 1.60 ± 1.5 E−09 | 4.47 ± 1.2 E-09 | <1.0 E-07 | 3.25 ± 1.6 E-09 | <2.1 E-08 |
| Dec | <7.8 E-10 | 3.52 ± 1.1 E−09 | <1.0 E-07 | 8.26 ± 2.3 E-09 | <2.1 E-08 |

## Table C - 1. 8

### 1989 Results for Potable Well Water Sampled Around the WVDP Site ($\mu$Ci/mL)

| Sample ID | pH | Conductivity* | Alpha | Beta | H-3 | Cs-137 |
|---|---|---|---|---|---|---|
| WFWEL01 | 7.68 | 382 | <1.39E-09 | 3.41±1.57E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL02 | 6.85 | 327 | <7.33E-10 | 1.64±1.42E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL03 | 6.86 | 934 | <3.48E-09 | 4.43±2.16E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL04 | 8.00 | 1639 | <1.64E-08 | 2.22±1.83E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL05 | 6.43 | 272 | <1.01E-09 | 3.51±1.70E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL06 | 7.48 | 256 | <5.55E-10 | 1.63±1.17E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL07 | 7.59 | 392 | <1.11E-09 | 1.89 ±1.53E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL08 | 7.10 | 462 | <1.96E-09 | 2.21 ±1.95E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL09 | 7.57 | 568 | <2.09E-09 | 2.88±1.58E-09 | <1.00E-07 | <3.7E-08 |
| WFWEL10 | 7.20 | 542 | <1.14E-09 | 2.09±1.50E-09 | <1.00E-07 | <3.7E-08 |

* measured in $\mu$mhos/cm (@25°C)

## Table C - 1. 9

### 1989 Radioactivity Concentrations in Stream Sediment Around the WVDP Site ($\mu$Ci/g dry weight from upper 15 cm)

| Location | Date | Alpha | Beta | K-40 | Cs-137 | Sr-90 | Co-60 |
|---|---|---|---|---|---|---|---|
| SFBCSED | June 1989 | 1.82 ±0.96 E−05 | 1.57 ±0.71 E-05 | 1.21 ±0.13 E-05 | < 1.0 E-07 | 1.15 ±0.47 E-07 | < 7.0 E-08 |
| SFSDSED | June 1989 | 2.33 ±0.94 E−05 | 1.95 ±0.80 E-05 | 1.10 ±0.13 E-05 | 4.74 ±1.04 E-07 | 9.01 ±1.05 E-07 | < 7.0 E-08 |
| SFTCSED | June 1989 | 4.47 ±3.76 E−06 | 2.37 ±0.85 E-05 | 9.64 ±1.22 E-06 | 3.31 ±0.19 E-06 | 7.71 ±1.01 E-07 | < 7.0 E-08 |
| SFCCSED | June 1989 | 1.09 ±0.67 E−05 | 9.73 ±6.33 E-06 | 1.14 ±0.15 E-05 | 4.14 ±0.68 E-07 | < 7.2 E-08 | < 7.0 E-08 |
| SFBISED | June 1989 | 8.37 ±6.15 E−06 | 1.14 ±0.64 E-05 | 1.07 ±0.13 E-05 | < 1.0 E-07 | < 8.1 E-08 | < 7.0 E-08 |
| SFBCSED | Dec. 1989 | 1.74 ± 0.81E-05 | 6.65 ±5.82 E-06 | 1.17 ±0.14 E-05 | < 1.0 E-07 | < 7.6 E−08 | < 7.0 E-08 |
| SFSDSED | Dec. 1989 | 1.64±0.81E−05 | 1.63 ±0.72 E-05 | 1.23 ±0.13 E-05 | 2.97 ±1.20 E-07 | < 8.2 E-08 | < 7.0 E-08 |
| SFTCSED | Dec. 1989 | 1.83 ±0.96 E−05 | 1.27 ±0.67 E-05 | 1.07 ±0.12 E-05 | 2.47 ±0.17 E-06 | 1.41±0.48 E-07 | < 7.0 E-08 |
| SFCCSED | Dec. 1989 | < 8.15E-06 | 7.27±5.74E-06 | 8.64 ±1.05 E-06 | 2.88 ±1.04 E-07 | < 6.8 E-08 | < 7.0 E-08 |
| SFBISED | Dec. 1989 | 1.12 ±0.80 E−05 | 1.57 ±0.71 E-05 | 1.02 ±0.11 E-05 | 1.14 ±0.94 E-07 | 1.73 ± 0.46 E-07 | < 7.0 E-08 |
| | | **U-234** | **U-235/236** | **U-238** | **Pu-238** | **Pu-239/240** | **Am-241** |
| SFBCSED | June 1989 | 7.97 ±2.12 E−07 | < 1.3 E-07 | 7.77 ±2.09 E-07 | < 3.0 E-08 | < 3.0 E-08 | < 6.6 E-08 |
| SFTCSED | June 1989 | 6.06 ±1.70 E−07 | < 1.2 E-07 | 5.10 ±1.55 E-07 | < 2.6 E-08 | < 2.6 E-08 | < 8.6 E-08 |

## Table C - 1. 10

### 1989 Contribution by New York State Low-Level Waste Disposal Area to Radioactivity in WVDP Liquid Effluents (curies)

| | TOTALS |
|---|---|
| Gross Alpha | < 8.4 E-07 |
| Gross Beta | 1.51 ± .04E −03 |
| H-3 | 6.74 ± 0.2 E−02 |
| C-14 | 8.53 ± 1.7 E−05 |
| Sr-90 | 7.08 ± 0.1 E−04 |
| I-129 | 1.15 ± 0.3 E−06 |
| Cs-137 | < 9.0 E-06 |
| U-234 | 1.96 ± 0.8 E−07 |
| U-235 | < 8.5 E-08 |
| U-238 | 1.23 ± 0.6 E−07 |
| Pu-238 | < 8.5 E-08 |
| Pu-239 | < 8.5 E-08 |
| Am-241 | < 2.3 E-07 |