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APR 29 2002

U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555

**SUSQUEHANNA STEAM ELECTRIC STATION**
**RADIOACTIVE EFFLUENT RELEASE REPORT**
**AND OFFSITE DOSE CALCULATION MANUAL**
**PLA-5458**

**Docket No. 50-387**
**and 50-388**

In accordance with 10CFR50.36a(a)(2) and the Susquehanna SES Unit 1 and 2 Technical Specifications Section 5.6.3, attached is the annual Radioactive Effluent Release Report for SSES Units 1 and 2 covering the period January 1 through December 31, 2001. Additionally, pursuant to Technical Specification Section 5.5.1.C.3, attached is a copy of the Offsite Dose Calculation Manual as revised through December 31, 2001.

If you have any questions, please contact Mr. Robert D. Kichline at (610) 774-7705.

Sincerely,

R. G. Byram

Attachment

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# SUSQUEHANNA STEAM ELECTRIC STATION

# ANNUAL EFFLUENT
# &
# WASTE DISPOSAL REPORT

## FOR JANUARY – DECEMBER

## 2001

**PPL Susquehanna, LLC**
**Two North Ninth Street**
**Allentown, Pennsylvania 18101-1179**

**April 2002**

# SUSQUEHANNA STEAM ELECTRIC STATION

# ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT

# REPORT PERIOD: 01/01/01 - 12/31/01

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# *SECTION 1*

# *INTRODUCTION AND SUPPLEMENTAL INFORMATION*

## INTRODUCTION

The Susquehanna Steam Electric Station (SSES) is located in Salem Township, Luzerne County, Pennsylvania. It is on the west bank of the Susquehanna River, 8 km northeast of Berwick. The Station consists of two boiling water reactor generating units, each with about 1,100 MW net electrical capacity. The reactor and generating units were supplied by General Electric, while the Bechtel Corporation served as architect-engineer and constructor.

Construction of the Station began in the early 1970s. Fuel load began in Unit 1 in July of 1982. Initial criticality was achieved in the Unit 1 reactor on September 10, 1982. The reactor reached 100% power for the first time on February 4, 1983. Commercial operation of Unit 1 was declared on June 8, 1983. Initial criticality of Unit 2 occurred on May 8, 1984. Unit 2 was declared commercial on February 12, 1985.

Airborne effluents are released from the Susquehanna Station via five rooftop vents on the reactor building (see Figure 1-1). Each vent is continuously monitored, and a program of periodic sampling and analysis is conducted as specified in the plant Technical Requirements. All waterborne effluents are released in batch mode and are sampled and analyzed prior to release. Waterborne effluents from the site are released into the cooling tower blowdown line for dilution prior to release to the Susquehanna River (see Figure 1-2). Blowdown line flow rates are at least 5,000 gpm during periods of liquid radwaste release. The diluted effluent is introduced to the river by way of a perforated diffuser pipe placed on the river bed. The diffuser serves to rapidly and uniformly mix the station discharge with the main flow of the river.

This report presents a summary of the quantities of radioactive materials which were released from the Susquehanna Steam Electric Station during the period from January 1, 2001 to December 31, 2001. In addition, this report serves as a medium for notifying the US Nuclear Regulatory Commission staff of changes to the SSES Offsite Dose Calculation Manual (ODCM) and Solid Radioactive Waste Process Control Program (PCP) and documentation of any exceptions to the SSES effluent monitoring program which must be reported per Technical Requirements.

Airborne and waterborne radioactive effluent releases to the environment during the report period were sampled and analyzed in accordance with the Technical Requirements. All radioactive effluent releases were within the concentration and release limits specified in the Technical Requirements. Calculations and terms utilized in this report are those outlined in the SSES ODCM.

Section 1 contains supplemental information pertaining to effluents from the Susquehanna plant. Included are regulatory limits (Table 1-1), sampling and analysis methods, and characterization of the number and duration of batch and abnormal releases, if any.

Section 2 contains effluent and waste disposal data for the report period. Table 2-1 contains a summation of all airborne releases, grouped into the radionuclide categories of gases, particulates, iodines, and tritium. Average release rates are presented and compared to the applicable limits. Table 2-2 presents the activity totals of specific radionuclides in airborne effluents.

Waterborne effluents are summarized in Table 2-3. Average diluted concentrations are presented and compared to the applicable limits. Table 2-4 presents the release quantities of specific radionuclides in waterborne effluents over the report period. Figures present the Susquehanna River Monthly Average Flow Rates for 2001 and the SSES Monthly Liquid Radwaste Discharge Totals for 2001.

Table 2-5 contains estimates of the errors associated with the measurements involved in quantifying effluents. Sampling errors, counting errors, and errors associated with determining effluent flow rates and volumes all contribute to the total error of effluent measurements. Error estimates are presented for each category of radionuclide detected in airborne and waterborne effluents and solid wastes during the report period.

Tables 2-7 through 2-20 present a characterization of the solid radioactive waste shipped offsite during the report period. Included are the volumes and curie contents associated with each type of solid waste. An estimate of major nuclide composition is presented for each waste type, as well as the number of waste shipments from the site, how they were transported, and their final destination.

Section 3 presents meteorological data for 2001 including data recovery, joint frequency distribution of wind speed and direction, stability class distribution, and atmospheric dispersion estimates for selected locations.

Section 4 of this report contains an assessment of the calculated doses attributed to the reported radiological effluents for the calendar year. The LADTAP II code was used for calculation of doses from waterborne effluents. Site-specific parameters used in the calculations for the Danville receiver are shown in Table 4-1. The GASPAR code was used for calculation of doses from airborne effluents. The calculated doses and direct radiation estimates can be used to estimate the doses to maximally exposed members of the public. Table 4-2 summarizes maximum calculated doses and dose commitments to members of the public from airborne and waterborne effluents and direct radiation. Table 4-3 presents calculated collective doses to members of the public within the Riverlands/Information Center Complex. Table 4-4 summarizes the calculated doses for residences and other occupied areas within the SSES site boundary and nearest dairy.

Section 5 of this report documents changes to the Offsite Dose Calculation Manual and the Solid Radioactive Waste Process Control Program.

Section 6 presents a listing of cases (if any) in which airborne or waterborne effluent monitoring instrumentation was declared inoperable and was not restored to operability within the time period specified in Technical Requirements 3.11.1.4, 3.11.1.5 and 3.11.2.6 Action Statements. In addition, this section presents issues (if any) with the collection of milk or fresh leafy vegetables per Technical Requirement 3.11.4.1 and change due to the land use census per Technical Requirement 3.11.4.2.

Section 7 contains corrections (if any) to doses reported in previous Semiannual or Annual Effluent and Waste Disposal Reports.

Section 8 contains information on effluent and offsite dose from the systems classified as insignificant effluent pathways

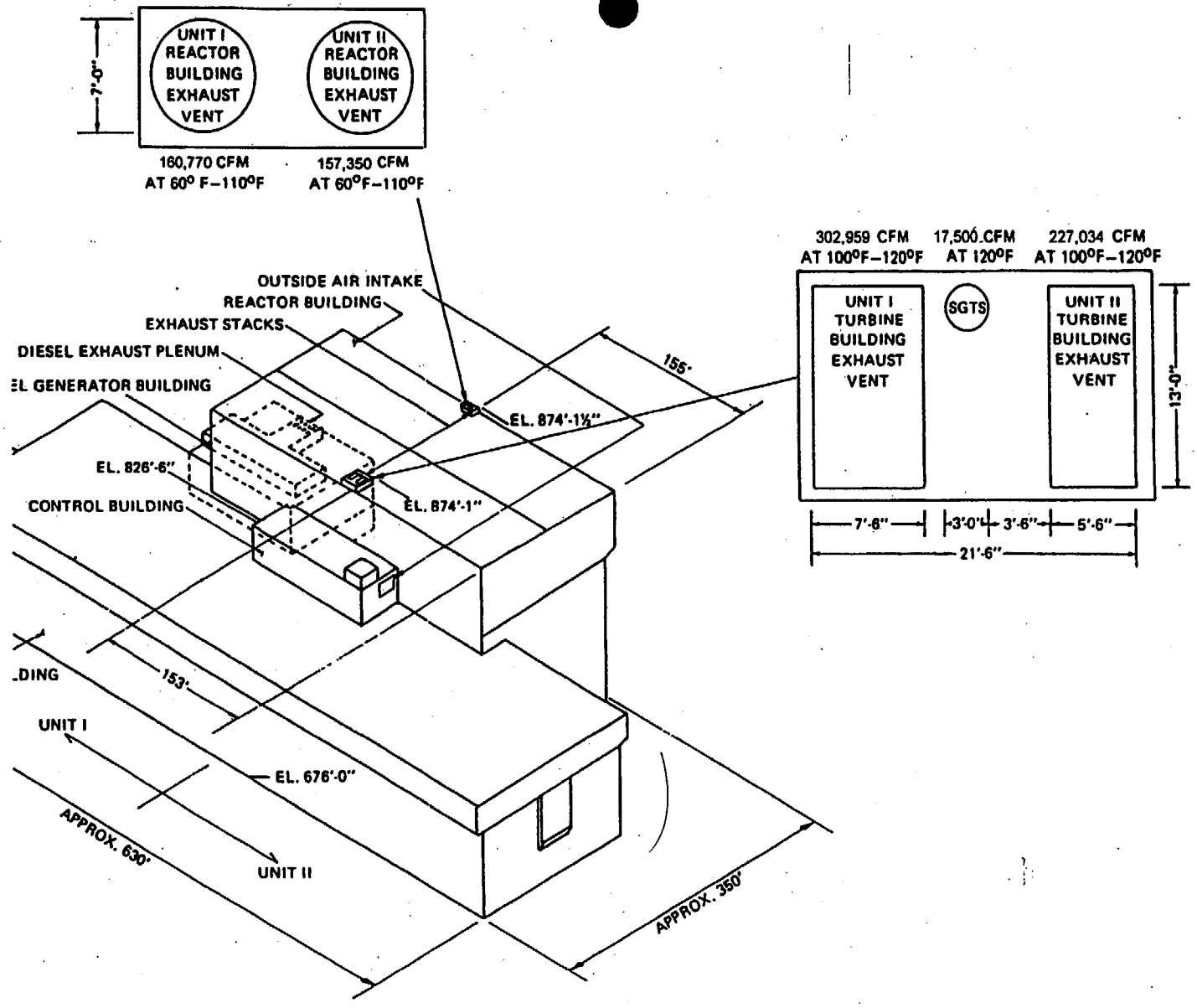
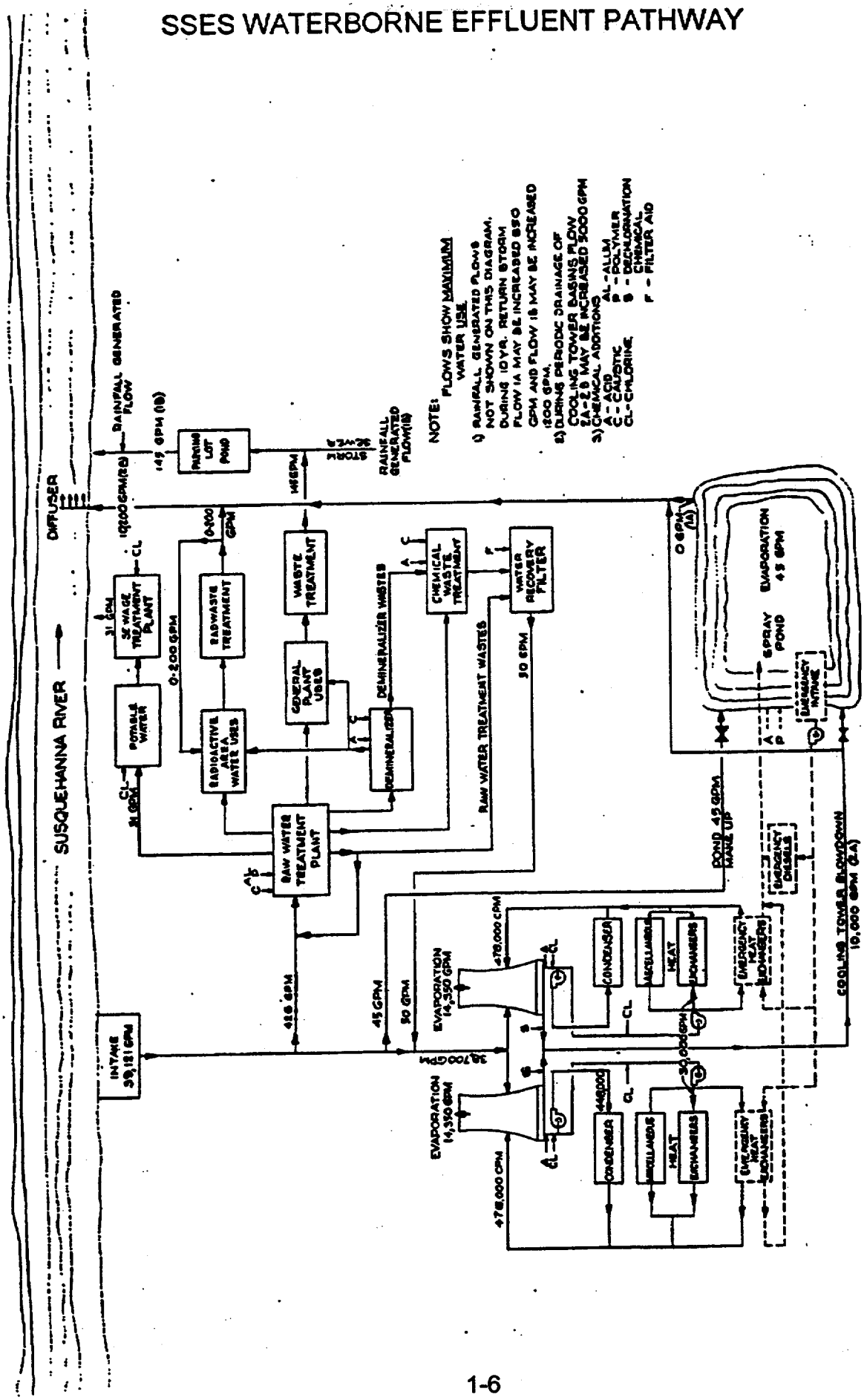



FIGURE 1-1

SSES AIRBORNE EFFLUENT RELEASE POINTS

# FIGURE 1-2
## SSES WATERBORNE EFFLUENT PATHWAY



## SUPPLEMENTAL INFORMATION

### 1. Regulatory Limits

Technical Requirements 3.11.1 and 3.11.2 outline requirements for release of radioactive liquid and gaseous effluents, respectively. Concentration of radioactive materials released in liquid effluents and dose or dose commitment resultant thereof are limited in unrestricted areas. Dose and dose rate due to radioactive materials released in gaseous effluents are limited in areas at or beyond the site boundary. Technical Requirement limits are listed in Table 1-1.

### 2. Maximum Permissible Concentrations in Waterborne Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas is limited to 10 times the concentrations specified in 10 CFR Part 20 Appendix B Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases.

For dissolved or entrained noble gases, the concentration is limited to 2.0E-04 μCi/ml total activity (TRO 3.11.1.1).

### 3. Average Energy of Fission and Activation Gas

The Calculation of Noble Gas Effluent Average Energies E-Bar Beta and Gamma for 2001 resulted in an Annual E-Bar Beta value of 3.17E-01 and an E-Bar Gamma activity of 2.45E-01.

### 4. Measurements and Approximations of Total Radioactivity

Analyses of specific radionuclides in effluent samples are used to evaluate the radioactive composition and concentration of effluents.

### 5. Methods of Quantifying Effluents

a. **Fission and Activation Gases**: Gas samples are routinely collected monthly and analyzed with a high resolution (Ge[Li] or HPGE) detector system which incorporates a data reduction program to determine radionuclide composition in terms of specific activity. Data tapes from the continuous vent monitors are used to determine the average concentration of noble gases. The high resolution (Ge[Li] or HPGE) isotopic scan is used to convert the continuous vent monitor activity to actual activity based on the determined nuclide mixture. The vent and sample flow rates are continuously monitored and the average flow rates for each vent are used to calculate the total activity released in a given time period. When the continuous monitors are out of

service, manual grab samples are taken from each vent once each eight hours (once each four hours for the standby gas treatment vent).

b. **Iodines**: Iodine is continuously collected on charcoal cartridges via an isokinetic sampling assembly in each vent. Filters are normally exchanged once per week and analyzed on a high resolution (Ge[Li] or HPGE) system. The daily average flow rates for the vents and sample pumps are averaged for the duration of the sampling period and a ratio of vent flow rate to sample flow rate is determined. The ratio is used to determine the total activity of each isotope released during the time period in question. When the continuous monitors are out of service, iodine is continuously collected on charcoal cartridges attached to air samplers which draw directly from the affected rooftop vent(s) or from alternate sampling ports available on the sample lines.

c. **Particulates**: Particulates are continuously collected via an isokinetic sampling assembly in each vent. Filters are normally exchanged once per week and analyzed on a high resolution (Ge[Li] or HPGE) system. Flow rate corrections are performed as for iodines. When the continuous vent monitors are out of service, particulates are continuously collected directly from the affected rooftop vent(s) or from alternate sampling ports available on the sample lines.

d. **Tritium**: Airborne tritium is collected monthly via bubbler sampler. The sample is collected for one hour at a flow rate of approximately 1000 cc/min. Tritium activity in the bubbler sample is determined by liquid scintillation counting. The liquid sample tritium concentration is converted to air concentration by volume proportion, then compared to the Technical Requirement Table (TRO) 3.11.2.1.-1 Lower Limit of Detection (1 E-6 µCi/cc).

e. **Waterborne Effluents**: Each tank of liquid radwaste is sampled and analyzed for principal gamma emitters prior to release. Each sample tank is recirculated for a sufficient amount of time prior to sampling to ensure that a representative sample is obtained. Samples are analyzed on a high resolution (Ge[Li] or HPGE) system and release permits are generated based on the values obtained from the isotopic analysis and the most recent values for tritium, gross alpha, iron-55, and strontium-89 and -90. An aliquot based on release volume is saved and added to monthly and quarterly composite containers. The monthly tritium analysis is done in-house. The monthly liquid radwaste composite sample is also analyzed offsite for P-32. The quarterly composite is sent to a vendor laboratory for iron-55, strontium-89 and -90, and gross alpha analyses.

The concentration of each radionuclide in each batch is decay-corrected from the time of counting to the midpoint of the release period, and is then multiplied by the volume of the batch to determine the total quantity of each

nuclide released in each batch. The isotopic totals for each are summed to determine the total source term for the report period.

## TABLE 1-1

## 1. TECHNICAL REQUIREMENT LIMITS

### A. NOBLE GASES:

1. ≤500 mrem/year - TOTAL BODY
   ≤3000 mrem/year - SKIN

   - dose rate limit at and beyond the site boundary
     (TRO 3.11.2.1)

2. ≤5 mrad - AIR GAMMA
   ≤10 mrad - AIR BETA

   - quarterly air dose limits per reactor unit at and beyond the site boundary
     (TRO 3.11.2.2a)

3. ≤10 mrad - AIR GAMMA
   ≤20 mrad - AIR BETA

   - annual air dose limits per reactor unit at and beyond the site boundary
     (TRO 3.11.2.2.b)

### B. AIRBORNE I-131, I-133, TRITIUM, PARTICULATES WITH HALF-LIVES > 8 DAYS:

1. ≤1500 mrem/year - ORGAN
   (inhalation pathways only)

   - dose rate limit at and beyond the site boundary
     (TRO 3.11.2.1.II.A)

2. ≤7.5 mrem - ORGAN

   - quarterly dose limit per reactor unit at and beyond the site boundary
     (TRO 3.11.2.3.a)

3. ≤15 mrem - ORGAN

   - annual dose limit per reactor unit at and beyond the site boundary
     (TRO 3.11.2.3.b)

## C. LIQUID EFFLUENTS:

1. ≤1.5 mrem - TOTAL BODY
   ≤5.0 mrem ORGAN
   - quarterly dose limits per SSES unit (TRO 3.11.1.2.a)

2. ≤3.0 mrem - TOTAL BODY
   ≤10.0 mrem - ORGAN
   - annual dose limits per SSES unit (TRO 3.11.1.2.b)

## D. AIRBORNE EFFLUENT: BASES FOR PERCENT OF APPLICABLE TECHNICAL REQUIREMENT LIMIT

### Fission and Activation Gases

A derived release rate limit based on the Technical Requirement (TRO 3.11.2.1.I.A) limit of 500 mrem/yr was calculated from the expected mix of noble gas radionuclides presented in Table 4.4 of the SSES Final Environmental Statement (NUREG-0564). The limit is 8.51E+05 µCi/min (1.42E+04 µCi/sec).

### Iodines

A derived release rate limit based on the Technical Requirement (TRO 3.11.2.1.II.A) limit of 1500 mrem/yr from I-131, I-133, tritium and particulates with half-lives greater than 8 days was calculated from the annual release quantity of I-131 provided in Table 4.4 of the SSES Final Environmental Statement (NUREG-0564). The limit is 1.04E+02 µCi/min (1.73E+00 µCi/sec).

### Particulates

A derived release rate limit based on the Technical Requirement (TRO 3.11.2.1.II.A) limit of 1500 mrem/yr from I-131, I-133, tritium and particulates with half-lives greater than 8 days was calculated based on the expected mix of particulate radionuclides presented in Table 4.4 of the SSES Final Environmental Statement (NUREG-0564). The limit is 7.72E+02 µCi/min (1.29E+01 µCi/sec).

### Tritium

A derived release rate was calculated based on the 10 CFR 20, Appendix B, Table 2, Column 1, Effluent Concentration Limit for tritium (1.0E-07 µCi/cc) to unrestricted areas. A relative concentration of 4.1E-05 sec/$m^3$ was assumed. The limit is 1.46E+05 µCi/min (2.44E+03 µCi/sec).

## E. WATERBORNE EFFLUENT: BASES FOR PERCENT OF APPLICABLE TECHNICAL REQUIREMENT LIMIT

### Fission and Activation Products

Concentrations of fission and activation products in liquid effluent from radwaste effluent are determined for each batch prior to release. Each isotope concentration is compared to ten times the 10CFR20 Appendix B, Table 2, Column 2 Effluent Concentration Values. No Technical Requirement limit for the total concentration of fission and activation products in liquid effluents is applicable for this category.

### Tritium

Liquid effluent quarterly tritium concentrations are compared to ten times the 10 CFR 20 Appendix B, Table 2, Column 2, Effluent Concentration value of 1.0E-03 µCi/ml to unrestricted areas.

### Dissolved and Entrained Gases

Liquid effluent quarterly concentration totals for dissolved and entrained gases are compared to the limiting value for a noble gas of 2.0E-04 µCi/ml.

## *SECTION 2*

## *EFFLUENT AND WASTE DISPOSAL DATA*

## Airborne Effluents

Summaries of the radionuclide total curie activities and average release rates are included in Tables 2-1 and 2-2.

| | |
|---|---|
| 1. Number of Batch Releases: | 0 |
| 2. Total Time Period for Batch Release: | NA |
| 3. Maximum Time Period for a Batch Release: | NA |
| 4. Average Time Period for a Batch Release: | NA |
| 5. Minimum Time Period for a Batch Release: | NA |

## Abnormal Releases

| | |
|---|---|
| 1. Number of Releases | 0 |
| 2. Total Activity Released | NA |

If a radionuclide was not detected, zero activity was used for that isotope in dose calculations. A zero activity indicates that no activity was positively detected in any sample when samples were analyzed with techniques which achieved the required Lower Limits of Detection (LLD) as specified in the SSES Technical Requirement (TRO) Table 3.11.2.1-1, Radioactive Gaseous Effluent Sampling and Analysis Program. In all cases, these LLDs were less than the levels required by Technical Requirements. The following are typical LLDs.

| Radionuclide | LLD (µCi/cc) |
|---|---|
| Kr-87 | 4.6 E-08 |
| Kr-88 | 5.3 E-08 |
| Xe-133 | 5.4 E-08 |
| Xe-133m | 1.3 E-07 |
| Xe-135 | 1.5 E-08 |
| Xe-135m | 5.0E-08 |
| Xe-138 | 1.2 E-07 |
| Mn-54 | 2.9 E-14 |
| Fe-59 | 2.8 E-14 |
| Co-58 | 1.8 E-14 |
| Co-60 | 3.8 E-14 |
| Zn-65 | 4.4 E-14 |
| Mo-99 | 3.3 E-13 |
| Cs-134 | 2.4 E-14 |

| Radionuclide | LLD (µCi/cc) |
|---|---|
| Cs-137 | 2.1 E-14 |
| Ce-141 | 1.5 E-14 |
| Ce-144 | 7.0 E-14 |
| I-131 | 4.4 E-14 |
| Sr-89 | 2.0 E-15 |
| Sr-90 | 3.0 E-16 |
| H-3 | 2.6 E-08 |
| Gross Alpha | 5.0 E-16 |

## TABLE 2-1

## ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT (2001)
## AIRBORNE EFFLUENT - SUMMATION OF ALL RELEASES

| A. Fission and Activation Gas | Unit | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
|---|---|---|---|---|---|
| | | | | | |
| Total Release | Ci | 6.78E+00 | 0 | 0 | 0 |
| Average Release Rate for Period | µCi/sec | 8.71E-01 | 0 | 0 | 0 |
| % of TRM Limit | % | 6.14E-03 | 0 | 0 | 0 |

**B. Iodines**

| | | | | | |
|---|---|---|---|---|---|
| Total I-131 | Ci | 0 | 0 | 0 | 0 |
| Total I-133 | Ci | 0 | 0 | 0 | 0 |
| Average Release Rate for Period | µCi/sec | 0 | 0 | 0 | 0 |
| Percent TRM Limit | % | 0 | 0 | 0 | 0 |

**C. Particulate**

| | | | | | |
|---|---|---|---|---|---|
| Particulate with Half-Life >8 Days | Ci | 3.27E-04 | 9.79E-04 | 8.62E-05 | 6.04E-03 |
| Average Release Rate for Period | µCi/sec | 4.20E-05 | 1.24E-04 | 1.08E-05 | 7.60E-04 |
| Percent TRM Limit | % | 3.26E-04 | 9.67E-04 | 8.42E-05 | 5.91E-03 |
| Gross Alpha Radioactivity | Ci | 0 | 0 | 0 | 0 |

**D. Tritium**

| | | | | | |
|---|---|---|---|---|---|
| Total Release | Ci | 2.08E+01 | 3.59E+01 | 4.72E+01 | 2.53E+01 |
| Average Release Rate for Period | µCi/sec | 2.67E+00 | 4.57E+00 | 5.94E+00 | 3.18E+00 |
| Percent TRM Limit | % | 1.10E-01 | 1.87E-01 | 2.43E-01 | 1.30E-01 |

## TABLE 2-2

## ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT (2001)
## AIRBORNE EFFLUENT

| Nuclides Released | Unit | Releases in Continuous Mode | | | |
|---|---|---|---|---|---|
| | | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
| **A. Fission and Activation Gases** | | | | | |
| Ar-41 | Ci | 0 | 0 | 0 | 0 |
| Kr-85 | Ci | 0 | 0 | 0 | 0 |
| Kr-85m | Ci | 0 | 0 | 0 | 0 |
| Kr-87 | Ci | 0 | 0 | 0 | 0 |
| Kr-88 | Ci | 0 | 0 | 0 | 0 |
| Xe-133 | Ci | 0 | 0 | 0 | 0 |
| Xe-133m | Ci | 1.27E-01 | 0 | 0 | 0 |
| Xe-135 | Ci | 6.65E+00 | 0 | 0 | 0 |
| Xe-135m | Ci | 0 | 0 | 0 | 0 |
| Xe-138 | Ci | 0 | 0 | 0 | 0 |
| Total for Period | Ci | 6.78E+00 | 0 | 0 | 0 |
| **B. Iodines** | | | | | |
| I-131 | Ci | 0 | 0 | 0 | 0 |
| I-133 | Ci | 0 | 0 | 0 | 0 |
| I-135 | Ci | 0 | 0 | 0 | 0 |
| Total for Period | Ci | 0 | 0 | 0 | 0 |
| **C. Particulate** | | | | | |
| Cr-51 | Ci | 2.81E-05 | 4.41E-04 | 6.66E-05 | 5.94E-03 |
| Mn-54 | Ci | 2.08E-04 | 3.32E-04 | 6.66E-06 | 4.96E-05 |
| Fe-59 | Ci | 0 | 6.40E-05 | 0 | 0 |
| Co-58 | Ci | 1.61E-05 | 7.51E-06 | 0 | 2.07E-05 |
| Co-60 | Ci | 7.25E-05 | 1.21E-04 | 1.29E-05 | 2.07E-05 |
| Zn-65 | Ci | 0 | 0 | 0 | 0 |
| Sr-89 | Ci | 0 | 0 | 0 | 0 |
| Sr-90 | Ci | 0 | 0 | 0 | 0 |
| Cs-134 | Ci | 0 | 0 | 0 | 0 |
| Cs-137 | Ci | 0 | 0 | 0 | 0 |
| Ce-141 | Ci | 1.76E-06 | 0 | 0 | 0 |
| Ce-144 | Ci | 0 | 6.97E-06 | 0 | 0 |
| AG-110M | Ci | 0 | 6.42E-07 | 0 | 1.12E-05 |
| NB-95 | Ci | 0 | 5.39E-06 | 0 | 0 |
| *AS-76 | Ci | 1.47E-03 | 1.12E-03 | 1.72E-04 | 3.50E-03 |
| *NA-24 | Ci | 9.06E-05 | 0 | 0 | 1.61E-04 |
| *TC-99M | Ci | 2.86E-04 | 0 | 0 | 7.63E-04 |
| Ba-La-140 | Ci | 0 | 0 | 0 | 0 |
| Total for Period | Ci | 3.27E-04 | 9.79E-04 | 8.62E-05 | 6.04E-03 |

Sr-89, Sr-90 and Gross Alpha values for the fourth quarter 2001 are estimated based on third quarter 2001 sample analyses and fourth quarter 2001 ventilation exhaust rates.

## Waterborne Effluents

Summaries of the radionuclide total curie activities, average diluted concentrations, and percent of applicable Technical Requirement limits are included in Tables 2-3 and 2-4.

| | Batch Releases* | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 | Annual |
|---|---|---|---|---|---|---|
| 1. | Number of Batch Releases | 22 | 23 | 10 | 10 | 65 |
| 2. | Total Time Period for a Batch Release | 2.70E+03 | 2.11E+03 | 8.26E+02 | 6.42E+02 | 6.28E+03 |
| 3. | Maximum Time Period for a Batch Release | 2.80E+02 | 2.88E+02 | 2.82E+02 | 8.60E+01 | |
| 4. | Average Time Period for a Batch Release | 1.23E+02 | 9.17E+01 | 8.26E+01 | 6.42E+01 | |
| 5. | Minimum Time Period for a Batch Release | 2.60E+01 | 2.90E+01 | 2.80E+01 | 3.00E+01 | |
| 6. | Average Cooling Tower Blowdown Flow Rate During Periods of Release | 6.85E+03 | 8.47E+03 | 1.06E+04 | 9.01E+03 | 8.33E+03 |
| 7. | Susquehanna River Flow Rate | 6.1E+06 | 9.3E+06 | 1.2E+06 | 1.9E+06 | 4.6E+06 |

*Units of time and flow are expressed in minutes and gallons per minute (gpm), respectively.

| | Abnormal Releases | | | | |
|---|---|---|---|---|---|
| 1. | Number of Releases | 0 | 0 | 0 | 0 |
| 2. | Volume Released | N/A | N/A | N/A | N/A |
| 3. | Total Activity Released | N/A | N/A | N/A | N/A |

If a radionuclide was not detected, zero activity was used for that isotope in dose calculations. A zero activity indicates that no activity was positively detected in any sample when samples were analyzed with techniques which achieved the required Lower Limits of Detection (LLD) as specified in the SSES Technical Requirement 4.11.1.1.1-1, Radioactive Liquid Waste Sampling and Analysis Program. In all cases, these LLDs were less than the levels required by Technical Requirements. The following are typical LLDs.

| Radionuclide | LLD (µCi/ml) |
|---|---|
| Mn-54 | 4.5 E-08 |
| Fe-59 | 5.0 E-08 |
| Co-58 | 2.4 E-08 |
| Co-60 | 5.4 E-08 |
| Zn-65 | 4.9 E-08 |
| Mo-99 | 1.7 E-07 |
| I-131 | 2.0 E-08 |
| Cs-134 | 2.2 E-08 |

| Radionuclide | LLD (µCi/ml) |
|---|---|
| Cs-137 | 2.6 E-08 |
| Ce-141 | 3.2 E-08 |
| Ce-144 | 1.3 E-07 |
| Sr-89 | 4.0 E-08 |
| Sr-90 | 4.0 E-09 |
| Fe-55 | 1.0 E-06 |
| H-3 | 4.6 E-06 |
| Gross Alpha | 3.0 E-08 |

## TABLE 2-3

## ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT (2001)
## WATERBORNE EFLUENT - SUMMATION OF ALL RELEASES

| | Unit | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
|---|---|---|---|---|---|
| **A. Fission and Activation Products** | | | | | |
| 1. Total Release (not including Tritium, Ent. Gases, Alpha) | Ci | 1.31E-02 | 9.14E-03 | 7.02E-04 | 1.32E-03 |
| 2. Average Diluted Concentration During Period | µCi/ml | 1.89E-07 | 1.42E-07 | 2.08E-08 | 5.95E-08 |
| **B. Tritium** | | | | | |
| 1. Total Release | Ci | 1.28E+01 | 7.35E+00 | 3.16E+00 | 1.13E+00 |
| 2. Average Diluted Concentration During Period | µCi/ml | 1.85E-04 | 1.14E-04 | 9.34E-05 | 5.10E-05 |
| 3. Percent of Applicable Limit (1.0E-2) | % | 1.85E+00 | 1.14E+00 | 9.34E-01 | 5.10E-01 |
| **C. Dissolved and Entrained Gases** | | | | | |
| 1. Total Release | Ci | 7.52E-07 | 0 | 0 | 0 |
| 2. Average Diluted Concentration During Period | µCi/ml | 1.09E-11 | 0 | 0 | 0 |
| 3. Percent of Applicable Limit (2.0E-4) | % | 5.45E-06 | 0 | 0 | 0 |
| **D. Gross Alpha Radioactivity** | | | | | |
| 1. Total Release | Ci | 0 | 0 | 0 | 4.71E-06 |
| **E. Volume of Water Released** (Prior to Dilution) | Gallons | 2.16E+05 | 1.58E+05 | 6.11E+04 | 4.27E+04 |
| | Liters | 8.16E+05 | 6.00E+05 | 2.31E+05 | 1.62E+05 |
| **F. Volume of Dilution Water** Used During Period of Release | Gallons | 1.81E+07 | 1.69E+07 | 8.87E+06 | 5.82E+06 |
| | Liters | 6.84E+07 | 6.39E+07 | 3.36E+07 | 2.20E+07 |
| **G. Volume of Dilution Water** Used Over Entire Period | Gallons | 7.37E+08 | 1.21E+09 | 1.49E+09 | 1.16E+09 |
| | Liters | 2.79E+09 | 4.58E+09 | 5.64E+09 | 4.39E+09 |

## TABLE 2-4

## ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT (2001)
## WATERBORNE EFFLUENT

| | | Releases in Batch Mode | | | |
|---|---|---|---|---|---|
| **Nuclides Released** | **Unit** | **First Quarter** | **Second Quarter** | **Third Quarter** | **Fourth Quarter** |
| **A. Fission and Activation Products** | | | | | |
| F-18 | Ci | 9.50E-08 | 8.48E-08 | 1.76E-09 | 0 |
| Na-24 | Ci | 2.48E-06 | 0 | 0 | 0 |
| P-32 | Ci | 0 | 0 | 6.94E-06 | 4.85E-06 |
| Cr-51 | Ci | 7.09E-03 | 5.36E-03 | 1.03E-05 | 0 |
| Mn-54 | Ci | 1.86E-03 | 1.07E-03 | 1.72E-04 | 3.37E-04 |
| Fe-55 | Ci | 2.64E-03 | 9.47E-04 | 1.81E-04 | 1.26E-04 |
| Fe-59 | Ci | 4.83E-06 | 2.55E-05 | 0 | 0 |
| Co-58 | Ci | 1.63E-04 | 2.36E-04 | 2.32E-05 | 5.49E-06 |
| Co-60 | Ci | 1.34E-03 | 1.42E-03 | 2.97E-04 | 8.47E-04 |
| Zn-65 | Ci | 2.59E-05 | 7.80E-05 | 1.56E-05 | 0 |
| As-76 | Ci | 0 | 0 | 0 | 0 |
| Rb-86 | Ci | 0 | 0 | 0 | 0 |
| Sr-89 | Ci | 0 | 0 | 0 | 0 |
| Sr-90 | Ci | 0 | 0 | 0 | 0 |
| Sr-92 | Ci | 0 | 0 | 0 | 0 |
| Nb-95 | Ci | 0 | 0 | 0 | 0 |
| Mo-99 | Ci | 0 | 0 | 0 | 0 |
| Ag-110m | Ci | 0 | 0 | 0 | 0 |
| Sb-124 | Ci | 0 | 0 | 9.07E-07 | 0 |
| **Total for Period** | **Ci** | **1.31E-02** | **9.14E-03** | **7.02E-04** | **1.32E-03** |
| | | | | | |
| **B Tritium** | | | | | |
| **Total for Period** | **Ci** | **12.8** | **7.35** | **3.16** | **1.13** |
| | | | | | |
| **C. Dissolved and Entrained Gases** | | | | | |
| Ar-41 | Ci | 0 | 0 | 0 | 0 |
| Kr-85 | Ci | 0 | 0 | 0 | 0 |
| Kr-86m | Ci | 0 | 0 | 0 | 0 |
| Kr-87 | Ci | 0 | 0 | 0 | 0 |
| Kr-88 | Ci | 0 | 0 | 0 | 0 |
| Xe-131m | Ci | 0 | 0 | 0 | 0 |
| Xe-133m | Ci | 0 | 0 | 0 | 0 |
| Xe-133 | Ci | 0 | 0 | 0 | 0 |
| Xe-135m | Ci | 0 | 0 | 0 | 0 |
| Xe-135 | Ci | 7.52E-07 | 0 | 0 | 0 |
| **Total for Period** | **Ci** | **7.52E-07** | **0** | **0** | **0** |

Activity values for composited samples (P-32, Strontium-89, Strontium-90, and Fe-55) reported for the fourth quarter were established based on third quarter sample analyses and fourth quarter discharge volumes.

**Figure 2-1**
**Susquehanna River Monthly Average Flow Rates**
**Data Period: 2001**

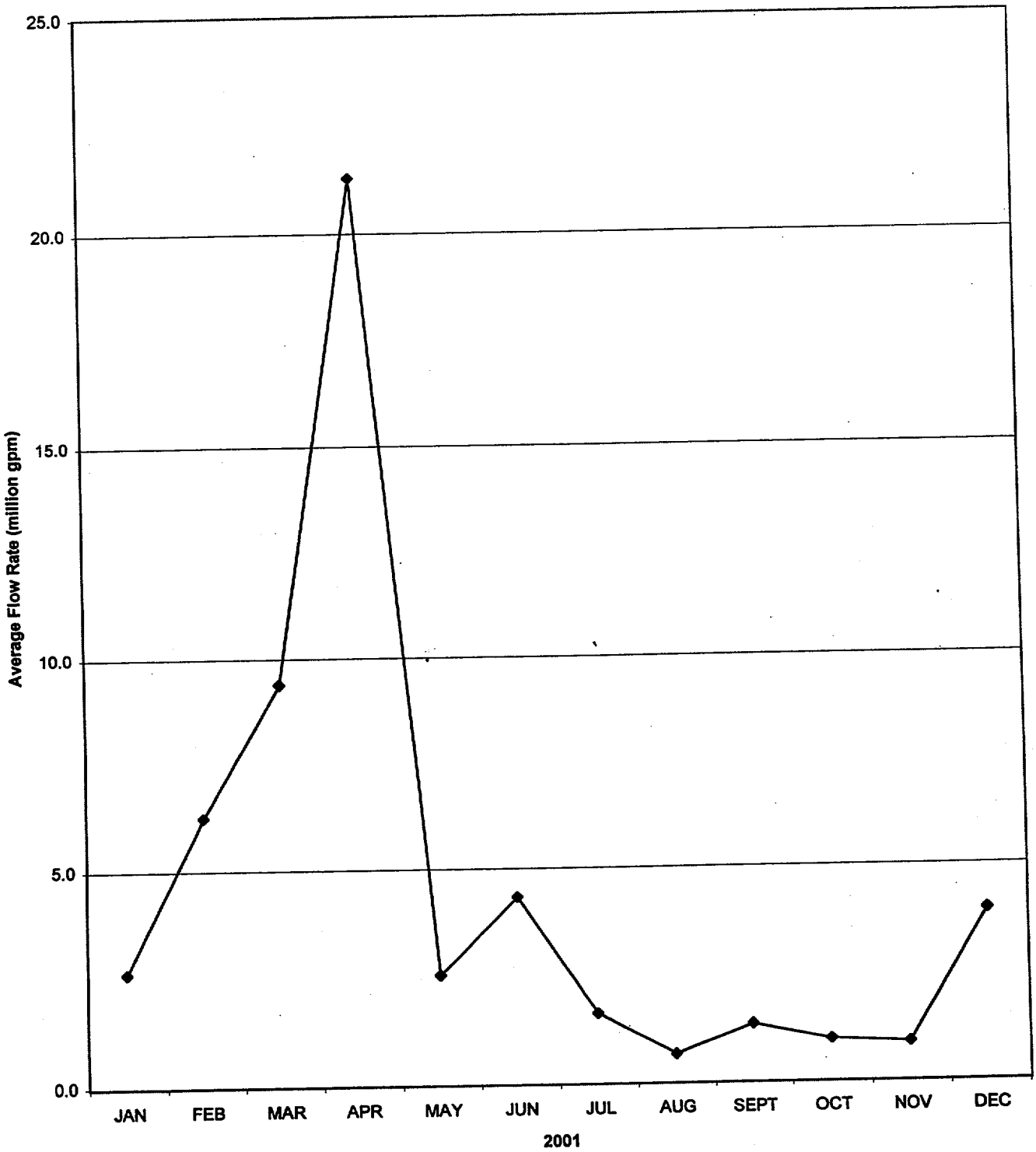
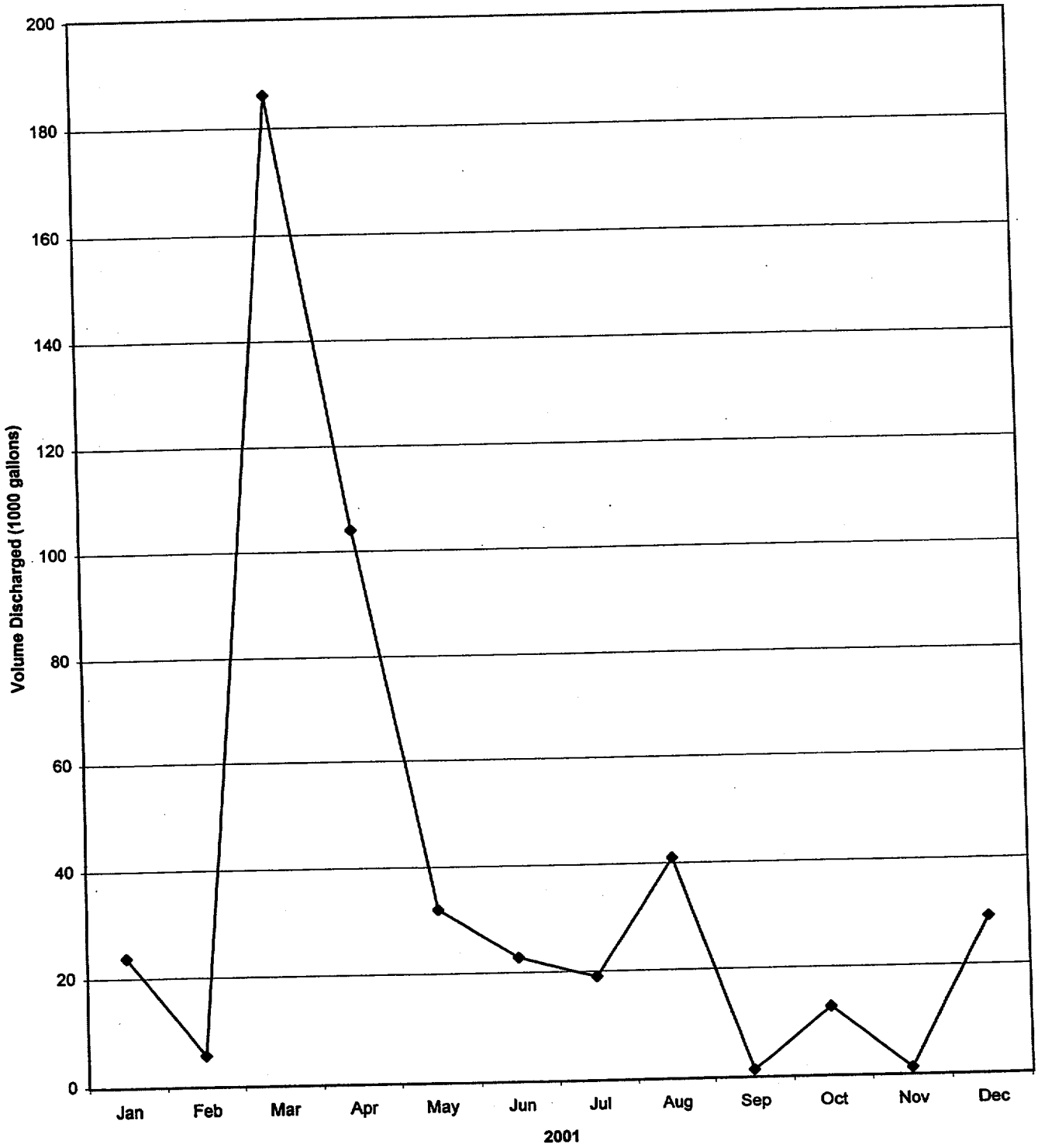


**Figure 2-2**
**SSES Monthly Liquid Radwaste Discharge Totals**
**Data Period: 2001**



## TABLE 2-5

## ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT ESTIMATED TOTAL ERRORS ASSOCIATED WITH EFFLUENTS MEASUREMENTS DATA PERIOD: JANUARY 1, 2001 - DECEMBER 31, 2001

| MEASUREMENT | ESTIMATED TOTAL ERROR |
|---|---|
| **1. Airborne Effluents** | |
| a. Fission and Activation Gases | 15.9% |
| b. I-131 | 13.3% |
| c. Particulates (incl. Gross Alpha) | 15.8% |
| d. Tritium | 13.6% |
| **2. Waterborne Effluents** | |
| a. Fission and Activation Products | 5.0% |
| b. Tritium | 3.3% |
| c. Dissolved and Entrained Gases | 8.4% |
| d. Gross Alpha Activity | 6.0% |
| e. Volume of Waste Released (Prior to Dilution) | 5.0% |
| f. Volume of Dilution Water Used During Period | 15.0% |
| | **ESTIMATED MAXIMUM MEASUREMENT ERROR** |
| **3. Solid Wastes** | |
| a. Dry Active Waste (DAW) - Class A Strong Tight Container (Compacted) | ±25% |
| b. Bead Resin/Charcoal – Class A HIC (Pyrolysis) | ±25% |
| c. Condensate Filtration System (CFS) Filters - Class A HIC (Dewatered) | ±25% |
| d. Liquid Oil – Class A (Fuel Blending for Co-Generation) | ±25% |
| e. Ultrasonic Resin Cleaning/Condensate Filtration System (URC/CFS) – Class A HIC (Dewatered) | ±25% |
| f. Dry Active Waste (DAW) – Class A Strong Tight Container (Incineration) | ±25% |
| g. Condensate Demineralizer/Radwaste Demineralizer - Class A HIC (Pyrolysis) | ±25% |

| MEASUREMENT | ESTIMATED MAXIMUM MEASUREMENT ERROR |
|---|---|
| **3. Solid Wastes (cont.)** | |
| h. LRW Filter Media – Class A HIC (Dewatered) | ±25% |
| i. Condensate Demineralizer/Radwaste Demineralizer - Class B HIC (Pyrolysis) | ±25% |
| j. Cartridge Filters – Class B HIC (Dewatered) | ±25% |
| k. Dry Active Waste (DAW) – Class B HIC (Non-Processed) | ±25% |
| l. Bead Resin/Charcoal – Class B HIC (Pyrolysis) | ±25% |
| m. RWCU Filter Media – Class B (Dewatered) | ±25% |
| n. Condensate Demineralizer/Radwaste Demineralizer - Class C HIC (Pyrolysis) | ±25% |

SUSQUEHANNA STEAM ELECTRIC STATION

RADIOACTIVE WASTE REPORT

ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT

SOLID RADIOACTIVE WASTE

DATA PERIOD: JANUARY 1, 2001 - DECEMBER 31, 2001

PREPARED BY: for Tom Kalinowski

T. M. KALINOWSKI - HEALTH PHYSICIST

APPROVED BY:

CURT SAXTON – SUPERVISOR SERVICES & PROGRAMS

## REPORT NOTES

1. All activities reported in millicuries (mCi) unless otherwise noted.

2. Reported activities, as indicated with the (<) sign, are comprised in whole or part of MDL values.

3. Estimated maximum measurement error is ±25%.

## TABLE 2-6

## WASTE DISPOSITIONS

**Data Period: January 1, 2001 - December 31, 2001**

### A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

| Number of Shipments | Mode of Transportation | Destination |
|---|---|---|
| 5 | Truck | Barnwell LLRW Disposal Facility |

### B. IRRADIATED FUEL SHIPMENTS

| Number of Shipments | Mode of Transportation | Destination |
|---|---|---|
| None | | |

## TABLE 2-7

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | DAW | |
| TYPE OF CONTAINER: | STRONG TIGHT CONTAINER | |
| METHOD OF PROCESS: | Compacted | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 14.74859049 | 0.52% |
| Am-241 | 1.211E-02 | 0.00% |
| Ba-133 | 2.043E-06 | 0.00% |
| C-14 | 1.819E+00 | 0.06% |
| Cd-109 | 7.221E-06 | 0.00% |
| Ce-139 | 1.940E-08 | 0.00% |
| Ce-141 | 6.341E-10 | 0.00% |
| Ce 144 | 7.591E+00 | 0.27% |
| Cm-242 | 2.052E-02 | 0.00% |
| Cm-244 | 1.017E-02 | 0.00% |
| Co-57 | 2.040E-07 | 0.00% |
| Co-58 | 2.646E+01 | 0.93% |
| Co-60 | 7.975E+02 | 27.90% |
| Cr-51 | 3.392E+01 | 1.19% |
| Cs-134 | 7.348E-04 | 0.00% |
| Cs-137 | 7.697E+00 | 0.27% |
| Fe-55 | 4.215E+02 | 14.74% |
| Fe-59 | 1.795E+02 | 6.28% |
| H-3 | 3.550E+00 | 0.12% |
| Hg-203 | 1.666E-11 | 0.00% |
| I-129 | 6.406E-03 | 0.00% |
| I-131 | 1.400E-02 | 0.00% |
| La-140 | 1.000E-04 | 0.00% |
| Mn-54 | 1.309E+03 | 45.80% |
| Nb-95 | 3.434E-01 | 0.01% |
| Ni-59 | 1.127E+00 | 0.04% |
| Ni-63 | 1.308E+01 | 0.46% |
| Pu-238 | 2.413E-02 | 0.00% |
| Pu-239 | 1.638E-02 | 0.00% |
| Pu-241 | 3.577E+00 | 0.13% |
| Ru-106 | 5.534E-03 | 0.00% |
| Sb-124 | 1.959E-01 | 0.01% |
| Sb-125 | 9.628E-02 | 0.00% |
| Sn-113 | 1.037E-08 | 0.00% |
| Sr-85 | 2.647E-13 | 0.00% |
| Sr-89 | 1.015E-01 | 0.00% |
| Sr-90 | 2.901E-02 | 0.00% |
| Tc-99 | 4.758E-01 | 0.02% |
| Y-88 | 1.847E-08 | 0.00% |
| Zn-65 | 3.600E+01 | 1.26% |
| Zr-95 | 1.689E-01 | 0.01% |
| TOTAL ACTIVITY (Ci) | 2.859 | 100.00% |
| CONTAINER VOLUME | 847.160 ft3 | 23.989 m3 |

## TABLE 2-8

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | BEAD RESIN / CHARCOAL | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Pyrolisis | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 0.000E+00 | 0.00% |
| Ba-140 | 0.000E+00 | 0.00% |
| C-14 | 3.410E-04 | 0.00% |
| Ce-141 | 0.000E+00 | 0.00% |
| Ce-144 | 1.340E-04 | 0.00% |
| Cm-242 | 0.000E+00 | 0.00% |
| Cm-243 | 0.000E+00 | 0.00% |
| Cm-244 | 0.000E+00 | 0.00% |
| Co-58 | 0.000E+00 | 0.00% |
| Co-60 | 2.820E+00 | 4.62% |
| Cr-51 | 0.000E+00 | 0.00% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 1.630E-04 | 0.00% |
| Fe-55 | 3.250E+00 | 5.33% |
| Fe-59 | 0.000E+00 | 0.00% |
| H-3 | 5.230E+01 | 85.75% |
| Hf-181 | 0.000E+00 | 0.00% |
| I-129 | 2.850E-05 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| I-133 | 0.000E+00 | 0.00% |
| La-140 | 0.000E+00 | 0.00% |
| Mn-54 | 2.560E+00 | 4.20% |
| Ni-59 | 2.000E-04 | 0.00% |
| Ni-63 | 5.550E-02 | 0.09% |
| Pu-238 | 0.000E+00 | 0.00% |
| Pu-239 | 2.640E-07 | 0.00% |
| Pu-241 | 7.490E-05 | 0.00% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-90 | 1.080E-05 | 0.00% |
| Sr-92 | 0.000E+00 | 0.00% |
| Tc-99 | 2.020E-03 | 0.00% |
| Xe-133 | 0.000E+00 | 0.00% |
| Zn-65 | 0.000E+00 | 0.00% |
| Zr-95 | 0.000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 0.061 | 100.00% |
| CONTAINER VOLUME | 31.210 ft3 | 0.884 m3 |

## TABLE 2-9

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | CFS FILTERS | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Dewatered | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 42.08 | 0.02% |
| Am-241 | 4.738E-01 | 0.00% |
| C-14 | 1.031E+02 | 0.05% |
| CE-141 | 1.817E+01 | 0.01% |
| Ce 144 | 2.672E+02 | 0.12% |
| Cm-242 | 2.362E-01 | 0.00% |
| Cm-244 | 2.833E-01 | 0.00% |
| Co-58 | 3.289E+02 | 0.15% |
| Co-60 | 1.297E+04 | 5.93% |
| Cr-51 | 3.453E+02 | 0.16% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 5.761E+01 | 0.03% |
| Fe-55 | 1.775E+05 | 81.13% |
| Fe-59 | 8.600E+01 | 0.04% |
| H-3 | 2.111E+01 | 0.01% |
| I-129 | 2.454E+01 | 0.01% |
| I-131 | 9.250E-02 | 0.00% |
| Mn-54 | 2.506E+04 | 11.46% |
| Ni-63 | 1.220E+02 | 0.06% |
| Pu-238 | 2.847E-01 | 0.00% |
| Pu-239 | 2.849E-01 | 0.00% |
| Pu-241 | 1.183E+02 | 0.05% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-89 | 2.290E+00 | 0.00% |
| Sr-90 | 2.920E+00 | 0.00% |
| Tc-99 | 1.109E-01 | 0.00% |
| Zn-65 | 1.718E+03 | 0.79% |
| TOTAL ACTIVITY (Ci) | 218.764 | 100.00% |
| CONTAINER VOLUME | 1140.860 ft3 | 32.306 m3 |

## TABLE 2-10

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | LIQUID OIL | |
| TYPE OF CONTAINER: | NONE | |
| METHOD OF PROCESS: | Fuel Blending for Co-Generation | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0 | |
| Am-241 | 8.440E-06 | 0.00% |
| C-14 | 2.320E-04 | 0.01% |
| Ce 144 | 8.700E-03 | 0.30% |
| Cm-242 | 9.560E-06 | 0.00% |
| Cm-244 | 6.580E-06 | 0.00% |
| Co-58 | 0.000E+00 | 0.00% |
| Co-60 | 5.980E-01 | 20.34% |
| Cr-51 | 0.000E+00 | 0.00% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 8.740E-03 | 0.30% |
| Fe-55 | 2.010E-01 | 6.84% |
| Fe-59 | 0.000E+00 | 0.00% |
| H-3 | 1.890E+00 | 64.29% |
| I-129 | 1.030E-08 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 2.180E-01 | 7.42% |
| Ni-59 | 8.920E-04 | 0.03% |
| Ni-63 | 1.170E-02 | 0.40% |
| Pu-238 | 2.120E-05 | 0.00% |
| Pu-239 | 1.240E-05 | 0.00% |
| Pu-241 | 2.570E-03 | 0.09% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-89 | 0.000E+00 | 0.00% |
| Sr-90 | 0.000E+00 | 0.00% |
| Tc-99 | 3.930E-08 | 0.00% |
| Zn-65 | 0.000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 0.003 | 100.00% |
| CONTAINER VOLUME | 0.000 ft3 | 0.000 m3 |

## TABLE 2-11

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | URC/CFS | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Dewatered | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 7.890E-03 | 0.00% |
| C-14 | 7.360E+01 | 0.04% |
| CE-141 | 0.000E+00 | 0.00% |
| Ce 144 | 1.647E+00 | 0.00% |
| Cm-242 | 8.040E-03 | 0.00% |
| Cm-244 | 6.950E-03 | 0.00% |
| Co-58 | 8.073E+02 | 0.41% |
| Co-60 | 1.476E+04 | 7.44% |
| Cr-51 | 1.187E+03 | 0.60% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 1.977E+01 | 0.01% |
| Fe-55 | 1.332E+05 | 67.12% |
| Fe-59 | 2.627E+03 | 1.32% |
| H-3 | 2.690E+01 | 0.01% |
| I-129 | 3.158E-04 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 4.506E+04 | 22.70% |
| Nb-95 | 7.190E+01 | 0.04% |
| Ni-59 | 2.450E+00 | 0.00% |
| Ni-63 | 2.172E+02 | 0.11% |
| Pu-238 | 1.216E-02 | 0.00% |
| Pu-239 | 5.040E-03 | 0.00% |
| Pu-241 | 3.270E+00 | 0.00% |
| Sb-124 | 1.330E+02 | 0.07% |
| Sr-89 | 0.000E+00 | 0.00% |
| Sr-90 | 4.990E-01 | 0.00% |
| Tc-99 | 1.170E+01 | 0.01% |
| Zn-65 | 2.600E+02 | 0.13% |
| TOTAL ACTIVITY (Ci) | 198.492 | 100.00% |
| CONTAINER VOLUME | 136.300 ft3 | 3.860 m3 |

## TABLE 2-12

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | DAW | |
| TYPE OF CONTAINER: | STRONG TIGHT CONTAINER | |
| METHOD OF PROCESS: | Incineration | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 0.000E+00 | 0.00% |
| C-14 | 9.600E-03 | 0.03% |
| Ce 144 | 7.200E-03 | 0.02% |
| Cm-242 | 0.000E+00 | 0.00% |
| Cm-244 | 0.000E+00 | 0.00% |
| Co-58 | 2.939E+00 | 8.11% |
| Co-60 | 2.497E+01 | 68.85% |
| Cr-51 | 8.492E-01 | 2.34% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 2.300E-03 | 0.01% |
| Fe-55 | 5.870E-01 | 1.62% |
| Fe-59 | 2.800E-03 | 0.01% |
| H-3 | 9.260E-02 | 0.26% |
| I-129 | 0.000E+00 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 2.211E+00 | 6.10% |
| Ni-59 | 1.080E-01 | 0.30% |
| Ni-63 | 2.351E-01 | 0.65% |
| Pu-238 | 0.000E+00 | 0.00% |
| Pu-239 | 0.000E+00 | 0.00% |
| Pu-241 | 1.980E-02 | 0.05% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-89 | 0.000E+00 | 0.00% |
| Sr-90 | 0.000E+00 | 0.00% |
| Tc-99 | 5.510E-02 | 0.15% |
| Zn-65 | 4.174E+00 | 11.51% |
| TOTAL ACTIVITY (Ci) | 0.036 | 100.00% |
| CONTAINER VOLUME | 2.594 ft3 | 0.073 m3 |

## TABLE 2-13

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | CONDENSATE DEMINERALIZER/ RADWASTE DEMINERALIZER | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Pyrolisis | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 2.359E-02 | 0.00% |
| C-14 | 3.170E+02 | 0.97% |
| Ce 144 | 7.560E+00 | 0.02% |
| Cm-242 | 1.301E-02 | 0.00% |
| Cm-244 | 2.021E-02 | 0.00% |
| Co-58 | 2.548E+02 | 0.78% |
| Co-60 | 7.128E+03 | 21.85% |
| Cr-51 | 2.547E+02 | 0.78% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 7.503E+00 | 0.02% |
| Fe-55 | 1.536E+04 | 47.09% |
| Fe-59 | 2.263E+02 | 0.69% |
| H-3 | 3.545E+02 | 1.09% |
| Hf-181 | 1.041E+00 | 0.00% |
| I-129 | 1.400E+00 | 0.00% |
| I-131 | 8.168E-01 | 0.00% |
| I-133 | 6.47E-09 | 0.00% |
| La-140 | 9.030E-10 | 0.00% |
| Mn-54 | 8.357E+03 | 25.62% |
| Nb-95 | 7.879E+00 | 0.02% |
| Ni-59 | 1.221E+00 | 0.00% |
| Ni-63 | 1.421E+02 | 0.44% |
| Pu-238 | 2.682E-02 | 0.00% |
| Pu-239 | 1.592E-02 | 0.00% |
| Pu-241 | 4.779E+00 | 0.01% |
| Sb-124 | 7.144E+00 | 0.02% |
| Sr-89 | 0.00E+00 | 0.00% |
| Sr-90 | 2.21E-01 | 0.00% |
| Sr-92 | 0.00E+00 | 0.00% |
| Tc-99 | 3.14E+01 | 0.10% |
| Zn-65 | 1.44E+02 | 0.44% |
| Zr-95 | 1.29E+01 | 0.04% |
| TOTAL ACTIVITY (Ci) | 32.624 | 100.00% |
| CONTAINER VOLUME | 338.00 ft3 | 9.571 m3 |

# TABLE 2-14

| | | |
|---|---|---|
| WASTE CLASS | A | |
| SOURCE OF WASTE: | LRW FILTER MEDIA | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Dewatered | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 2.230E+01 | 0.02% |
| Am-241 | 2.258E-02 | 0.00% |
| C-14 | 5.180E-04 | 0.00% |
| Ce 144 | 9.370E+00 | 0.01% |
| Cm-242 | 1.675E-02 | 0.00% |
| Cm-244 | 2.243E-02 | 0.00% |
| Co-58 | 1.298E+03 | 1.35% |
| Co-60 | 2.867E+04 | 29.81% |
| Cr-51 | 2.422E+03 | 2.52% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 2.470E+01 | 0.03% |
| Fe-55 | 1.391E+03 | 1.45% |
| Fe-59 | 2.074E+03 | 2.16% |
| H-3 | 6.200E+01 | 0.06% |
| I-129 | 3.450E-04 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 5.890E+04 | 61.24% |
| Nb-95 | 5.030E+01 | 0.05% |
| Ni-59 | 4.524E+01 | 0.05% |
| Ni-63 | 2.599E+02 | 0.27% |
| Ni-65 | 0.000E+00 | 0.00% |
| Pu-238 | 3.383E-02 | 0.00% |
| Pu-239 | 3.393E-02 | 0.00% |
| Pu-241 | 5.590E+00 | 0.01% |
| Sb-124 | 7.015E+01 | 0.07% |
| Sr-89 | 0.000E+00 | 0.00% |
| Sr-90 | 0.000E+00 | 0.00% |
| Sr-92 | 0.000E+00 | 0.00% |
| Tc-99 | 6.44E+01 | 0.07% |
| Zn-65 | 7.950E+02 | 0.83% |
| Zr-95 | 1.130E+01 | 0.01% |
| TOTAL ACTIVITY (Ci) | 96.175 | 100.00% |
| CONTAINER VOLUME | 397.200 ft3 | 11.248 m3 |

## TABLE 2-15

| | |
|---|---|
| WASTE CLASS | B |
| SOURCE OF WASTE: | CONDENSATE DEMINERALIZER/ RADWASTE DEMINERALIZER |
| TYPE OF CONTAINER: | HIC |
| METHOD OF PROCESS: | Pyrolisis |

| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
|---|---|---|
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 7.747E-03 | 0.00% |
| C-14 | 1.298E+02 | 0.12% |
| Ce 144 | 3.248E+00 | 0.00% |
| Cm-242 | 4.948E-03 | 0.00% |
| Cm-244 | 6.525E-03 | 0.00% |
| Co-58 | 5.299E+03 | 4.81% |
| Co-60 | 5.758E+04 | 52.22% |
| Cr-51 | 2.947E+02 | 0.27% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 3.227E+00 | 0.00% |
| Fe-55 | 3.061E+04 | 27.76% |
| Fe-59 | 4.091E+00 | 0.00% |
| H-3 | 1.650E+02 | 0.15% |
| Hf-181 | 0.000E+00 | 0.00% |
| I-129 | 6.242E-01 | 0.00% |
| I-131 | 1.196E-01 | 0.00% |
| I-133 | 1.431E-14 | 0.00% |
| La-140 | 0.000E+00 | 0.00% |
| Mn-54 | 7.637E+03 | 6.93% |
| Nb-95 | 3.280E-02 | 0.00% |
| Ni-59 | 2.347E+01 | 0.02% |
| Ni-63 | 3.732E+02 | 0.34% |
| Pu-238 | 7.871E-03 | 0.00% |
| Pu-239 | 4.791E-03 | 0.00% |
| Pu-241 | 5.945E+01 | 0.05% |
| Sb-124 | 2.620E-02 | 0.00% |
| Sr-89 | 1.370E-01 | 0.00% |
| Sr-90 | 1.103E-01 | 0.00% |
| Sr-92 | 0.000E+00 | 0.00% |
| Tc-99 | 2.725E+01 | 0.02% |
| Zn-65 | 8.052E+03 | 7.30% |
| Zr-95 | 0.000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 110.261 | 100.00% |
| CONTAINER VOLUME | 110.900 ft3 | 3.140 m3 |

## TABLE 2-16

| | | |
|---|---|---|
| WASTE CLASS | B | |
| SOURCE OF WASTE: | CARTRIDGE FILTERS | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Dewatered | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 1.620E+00 | 0.04% |
| Am-241 | 2.3320E-03 | 0.00% |
| C-14 | 6.6244E-01 | 0.02% |
| Ce 144 | 6.3870E-02 | 0.00% |
| Cm-242 | 1.1211E-04 | 0.00% |
| Cm-244 | 1.8440E-03 | 0.00% |
| Co-58 | 4.5200E-03 | 0.00% |
| Co-60 | 2.9511E+03 | 81.18% |
| Cr-51 | 0.0000E+00 | 0.00% |
| Cs-137 | 1.3540E-02 | 0.00% |
| Fe-55 | 3.6880E+02 | 10.15% |
| Fe-59 | 3.4600E-04 | 0.00% |
| H-3 | 3.5034E-01 | 0.01% |
| I-129 | 3.1105E-03 | 0.00% |
| Mn-54 | 2.2509E+02 | 6.19% |
| Ni-59 | 1.5015E+00 | 0.04% |
| Ni-63 | 5.5270E+01 | 1.52% |
| Pu-238 | 3.0060E-03 | 0.00% |
| Pu-239 | 3.0830E-03 | 0.00% |
| Pu-241 | 7.6540E-01 | 0.02% |
| Sr-90 | 6.6060E-02 | 0.00% |
| Tc-99 | 4.7595E-01 | 0.01% |
| Zn-65 | 2.9457E+01 | 0.81% |
| Zr-95 | 0.0000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 3.635 | 100.00% |
| CONTAINER VOLUME | 60.690 ft3 | 1.719 m3 |

## TABLE 2-17

| | | |
|---|---|---|
| WASTE CLASS | B | |
| SOURCE OF WASTE: | DAW | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Non-processed | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 11.8938 | 0.36% |
| Am-241 | 2.359E-03 | 0.00% |
| C-14 | 2.861E-03 | 0.00% |
| Ce 144 | 2.532E-02 | 0.00% |
| Cm-242 | 1.017E-04 | 0.00% |
| Cm-244 | 1.776E-03 | 0.00% |
| Co-58 | 8.996E-03 | 0.00% |
| Co-60 | 2.141E+03 | 65.33% |
| Cr-51 | 3.083E-06 | 0.00% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 6.492E-01 | 0.02% |
| Fe-55 | 6.430E+02 | 19.62% |
| Fe-59 | 9.089E-04 | 0.00% |
| H-3 | 3.179E-02 | 0.00% |
| I-129 | 2.894E-02 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 4.010E+02 | 12.24% |
| Ni-59 | 7.235E+00 | 0.22% |
| Ni-63 | 5.820E+01 | 1.78% |
| Pu-238 | 2.814E-03 | 0.00% |
| Pu-239 | 2.897E-03 | 0.00% |
| Pu-241 | 7.440E-01 | 0.02% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-89 | 0.000E+00 | 0.00% |
| Sr-90 | 5.480E-02 | 0.00% |
| Tc-99 | 1.137E+00 | 0.03% |
| Zn-65 | 1.198E+01 | 0.37% |
| TOTAL ACTIVITY (Ci) | 3.277 | 100.00% |
| CONTAINER VOLUME | 71.710 ft3 | 2.031 m3 |

## TABLE 2-18

| | | |
|---|---|---|
| WASTE CLASS | B | |
| SOURCE OF WASTE: | BEAD RESIN / CHARCOAL | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Pyrolisis | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 4.480E-04 | 0.00% |
| Ba-140 | 0.000E+00 | 0.00% |
| C-14 | 3.920E-02 | 0.06% |
| Ce-141 | 0.000E+00 | 0.00% |
| Ce-144 | 8.890E-02 | 0.13% |
| Cm-242 | 6.190E-04 | 0.00% |
| Cm-243 | 0.000E+00 | 0.00% |
| Cm-244 | 4.470E-04 | 0.00% |
| Co-58 | 0.000E+00 | 0.00% |
| Co-60 | 1.045E+01 | 15.06% |
| Cr-51 | 0.000E+00 | 0.00% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 2.494E-02 | 0.04% |
| Fe-55 | 0.000E+00 | 0.00% |
| Fe-59 | 0.000E+00 | 0.00% |
| H-3 | 3.493E+01 | 50.34% |
| Hf-181 | 0.000E+00 | 0.00% |
| I-129 | 1.168E+01 | 16.83% |
| I-131 | 0.000E+00 | 0.00% |
| I-133 | 0.000E+00 | 0.00% |
| La-140 | 0.000E+00 | 0.00% |
| Mn-54 | 1.182E+01 | 17.03% |
| Ni-59 | 0.000E+00 | 0.00% |
| Ni-63 | 2.056E-01 | 0.30% |
| Pu-238 | 4.920E-04 | 0.00% |
| Pu-239 | 4.920E-04 | 0.00% |
| Pu-241 | 1.168E-01 | 0.17% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sr-90 | 0.000E+00 | 0.00% |
| Sr-92 | 0.000E+00 | 0.00% |
| Tc-99 | 3.605E-02 | 0.05% |
| Xe-133 | 0.000E+00 | 0.00% |
| Zn-65 | 0.000E+00 | 0.00% |
| Zr-95 | 0.000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 0.069 | 100.00% |
| CONTAINER VOLUME | 17.810 ft3 | 0.504 m3 |

## TABLE 2-19

| | | |
|---|---|---|
| WASTE CLASS | B | |
| SOURCE OF WASTE: | RWCU FILTER MEDIA | |
| TYPE OF CONTAINER: | HIC | |
| METHOD OF PROCESS: | Dewatered | |
| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
| Ag-110m | 2.760E+02 | 0.02% |
| Am-241 | 0.000E+00 | 0.00% |
| C-14 | 6.770E+01 | 0.00% |
| Ce 144 | 4.710E+00 | 0.00% |
| Cm-242 | 0.000E+00 | 0.00% |
| Cm-244 | 0.000E+00 | 0.00% |
| Co-58 | 6.710E+02 | 0.04% |
| Co-60 | 1.400E+05 | 7.95% |
| Cr-51 | 8.970E+01 | 0.01% |
| Cs-134 | 1.460E+01 | 0.00% |
| Cs-137 | 8.360E-01 | 0.00% |
| Fe-55 | 1.430E+06 | 81.25% |
| Fe-59 | 1.830E+02 | 0.01% |
| H-3 | 5.110E+02 | 0.03% |
| I-129 | 1.000E-04 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| Mn-54 | 1.810E+05 | 10.28% |
| Nb-95 | 0.000E+00 | 0.00% |
| Ni-59 | 1.050E+02 | 0.01% |
| Ni-63 | 2.300E+03 | 0.13% |
| Pu-238 | 0.000E+00 | 0.00% |
| Pu-239 | 0.000E+00 | 0.00% |
| Pu-241 | 5.530E+01 | 0.00% |
| Sb-124 | 0.000E+00 | 0.00% |
| Sb-125 | 0.000E+00 | 0.00% |
| Sn-113 | 0.000E+00 | 0.00% |
| Sr-89 | 8.750E+00 | 0.00% |
| Sr-90 | 1.490E+00 | 0.00% |
| Tc-99 | 6.020E-05 | 0.00% |
| Zn-65 | 4.720E+03 | 0.27% |
| Zr-95 | 0.000E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 1760.009 | 100.00% |
| CONTAINER VOLUME | 132.400 ft3 | 3.749 m3 |

## TABLE 2-20

| | |
|---|---|
| WASTE CLASS | C |
| SOURCE OF WASTE: | CONDENSATE DEMINERALIZER/ RADWASTE DEMINERALIZER |
| TYPE OF CONTAINER: | HIC |
| METHOD OF PROCESS: | Pyrolisis |

| ISOTOPES | ACTIVITY (mCi) | % OF TOTAL |
|---|---|---|
| Ag-110m | 0.000E+00 | 0.00% |
| Am-241 | 5.490E-04 | 0.00% |
| C-14 | 2.347E+01 | 0.03% |
| Ce 144 | 1.596E-01 | 0.00% |
| Cm-242 | 0.000E+00 | 0.00% |
| Cm-244 | 2.910E-04 | 0.00% |
| Co-58 | 2.029E+03 | 2.84% |
| Co-60 | 4.424E+04 | 61.93% |
| Cr-51 | 4.096E+01 | 0.06% |
| Cs-134 | 0.000E+00 | 0.00% |
| Cs-137 | 9.120E-01 | 0.00% |
| Fe-55 | 1.561E+04 | 21.85% |
| Fe-59 | 1.879E+01 | 0.03% |
| H-3 | 5.492E+01 | 0.08% |
| Hf-181 | 0.000E+00 | 0.00% |
| I-129 | 1.787E-01 | 0.00% |
| I-131 | 0.000E+00 | 0.00% |
| I-133 | 0.000E+00 | 0.00% |
| La-140 | 0.000E+00 | 0.00% |
| Mn-54 | 4.132E+03 | 5.78% |
| Nb-95 | 1.500E-01 | 0.00% |
| Ni-59 | 4.540E+01 | 0.06% |
| Ni-63 | 3.122E+02 | 0.44% |
| Pu-238 | 0.000E+00 | 0.00% |
| Pu-239 | 0.000E+00 | 0.00% |
| Pu-241 | 3.384E+01 | 0.05% |
| Sb-124 | 1.87E-01 | 0.00% |
| Sr-89 | 0.00E+00 | 0.00% |
| Sr-90 | 2.97E-02 | 0.00% |
| Sr-92 | 0.00E+00 | 0.00% |
| Tc-99 | 1.14E+01 | 0.02% |
| Zn-65 | 4.88E+03 | 6.83% |
| Zr-95 | 0.00E+00 | 0.00% |
| TOTAL ACTIVITY (Ci) | 71.435 | 100.00% |
| CONTAINER VOLUME | 39.970 ft3 | 1.132 m3 |

# *SECTION 3*

# *METEOROLOGICAL DATA AND DISPERSION ESTIMATES*

## METEOROLOGY AND DISPERSION DATA

Meteorological data have been collected at the Susquehanna SES (SSES) site since the early 1970s. At the present time, the meteorological system is based on a 300-foot high tower located approximately 1,000 feet to the southeast of the plant. Wind sensors are mounted at the 10m and 60m elevations on this tower. Vertical temperature differential is measured with redundant sensor pairs between the 10m and 60m levels. Sigma theta (the standard deviation of horizontal wind direction) is calculated from wind direction at both levels. Dew point and ambient temperature sensors are present at the 10m level. Precipitation is measured at ground level.

A back-up meteorological tower was erected in 1982. It is a 10m tower providing alternate measurements of wind speed, wind direction, and sigma theta. A 10m supplemental downriver meteorological tower is also available. This tower measures wind speed, wind direction, sigma theta, temperature and dew point.

SSES meteorological data are transmitted to the plant Control Room, Technical Support Center, and Emergency Operations Facility for emergency response availability. The data are also transmitted via telephone data line to EQE/PLG's offices in Bethesda, Maryland.

Dispersion modeling for effluents from normal operation of SSES is done using the EQE/PLG MIDAS system XDCALC program, a straight-line Gaussian plume model designed to estimate average relative concentration. The model was developed in accordance with Regulatory Guide 1.111. For periods when the wind speed is calm, the actual wind direction that occurred is used.

XDCALC and the XQINTR program that interpolates X/Q values to exact locations both use terrain correction factors to account for the temporal and spatial variations in the airflow in the region. A straight-line trajectory model assumes that a constant mean wind transports and diffuses effluents in the direction of airflow at the release point within the entire region of interest. The SSES terrain correction factors were taken from SSES FSAR Table 2.3-128.

## TABLE 3-1

## SSES METEOROLOGICAL DATA RECOVERY FOR 2001

| PARAMETER | PERCENT VALID DATA RECOVERY |
|---|---|
| Wind Speed 10m – Primary [1] | 100.0 |
| Wind Speed 60m – Primary | 99.4 |
| Wind Speed 10m – Backup[2] | 99.4 |
| Wind Speed 10m – Downriver[3] | 98.6 |
| Wind Direction 10m – Primary | 100.0 |
| Wind Direction 60m – Primary | 99.3 |
| Wind Direction 10m – Backup | 99.5 |
| Wind Direction 10m – Downriver | 98.5 |
| Temperature 10m – Primary | 99.9 |
| Dew Point 10m – Primary | 98.8 |
| Delta Temperature 60m – Primary | 99.3 |
| Sigma Theta 10m – Primary | 100.0 |
| Sigma Theta 60m – Primary | 99.3 |
| Sigma Theta 10m- Backup | 99.5 |
| Sigma Theta 10m - Downriver | 98.5 |
| Precipitation – Primary | 100.0 |
| **Composite Parameters** | |
| Wind Speed and Direction 10m, Delta Temperature 60-10m | 99.3 |
| Wind Speed and Direction 60m, Delta Temperature 60-10m | 99.2 |

[1]SSES "Primary" meteorological tower
[2]SSES "Backup" meteorological tower
[3]SSES "Downriver" meteorological tower

**TABLE 3-2**

Table 2. SSES Joint Frequency Distribution of Wind Speed and Direction 10m Versus Delta Temperature 60-10m for the Period of January 1, 2001 through December 31, 2001

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: A DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 1 | 1 | 4 | 0 | 0 | 0 | 6 |
| NNE | 1 | 9 | 4 | 0 | 0 | 0 | 14 |
| NE | 3 | 10 | 4 | 0 | 0 | 0 | 17 |
| ENE | 3 | 8 | 0 | 0 | 0 | 0 | 11 |
| E | 7 | 3 | 0 | 0 | 0 | 0 | 10 |
| ESE | 8 | 5 | 0 | 0 | 0 | 0 | 13 |
| SE | 5 | 16 | 2 | 0 | 0 | 0 | 23 |
| SSE | 2 | 21 | 0 | 0 | 0 | 0 | 23 |
| S | 5 | 34 | 5 | 0 | 0 | 0 | 44 |
| SSW | 4 | 40 | 7 | 0 | 0 | 0 | 51 |
| SW | 2 | 80 | 49 | 1 | 0 | 0 | 132 |
| WSW | 0 | 14 | 26 | 1 | 0 | 0 | 41 |
| W | 0 | 2 | 2 | 0 | 0 | 0 | 4 |
| WNW | 1 | 3 | 0 | 0 | 0 | 0 | 4 |
| NW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NNW | 0 | 1 | 2 | 0 | 0 | 0 | 3 |
| TOTAL | 42 | 247 | 105 | 2 | 0 | 0 | 396 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: B DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 3 | 3 | 11 | 0 | 0 | 0 | 17 |
| NNE | 0 | 18 | 6 | 0 | 0 | 0 | 24 |
| NE | 5 | 16 | 1 | 0 | 0 | 0 | 22 |
| ENE | 10 | 6 | 0 | 0 | 0 | 0 | 16 |
| E | 10 | 4 | 0 | 0 | 0 | 0 | 14 |
| ESE | 4 | 5 | 0 | 0 | 0 | 0 | 9 |
| SE | 5 | 13 | 1 | 0 | 0 | 0 | 19 |
| SSE | 2 | 5 | 2 | 0 | 0 | 0 | 9 |
| S | 6 | 15 | 1 | 0 | 0 | 0 | 22 |
| SSW | 4 | 27 | 1 | 0 | 0 | 0 | 32 |
| SW | 6 | 42 | 33 | 0 | 0 | 0 | 81 |
| WSW | 1 | 12 | 29 | 6 | 0 | 0 | 48 |
| W | 0 | 6 | 4 | 1 | 0 | 0 | 11 |
| WNW | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| NW | 0 | 2 | 1 | 0 | 0 | 0 | 3 |
| NNW | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| TOTAL | 56 | 174 | 95 | 7 | 0 | 0 | 332 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: C DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 1 | 10 | 21 | 0 | 0 | 0 | 32 |
| NNE | 2 | 15 | 12 | 0 | 0 | 0 | 29 |
| NE | 4 | 8 | 1 | 0 | 0 | 0 | 13 |
| ENE | 14 | 8 | 0 | 0 | 0 | 0 | 22 |
| E | 9 | 5 | 0 | 0 | 0 | 0 | 14 |
| ESE | 4 | 6 | 0 | 0 | 0 | 0 | 10 |
| SE | 6 | 8 | 0 | 0 | 0 | 0 | 14 |
| SSE | 7 | 8 | 0 | 0 | 0 | 0 | 15 |
| S | 7 | 25 | 2 | 0 | 0 | 0 | 34 |
| SSW | 11 | 24 | 0 | 0 | 0 | 0 | 35 |
| SW | 11 | 51 | 27 | 3 | 0 | 0 | 92 |
| WSW | 1 | 22 | 31 | 17 | 0 | 0 | 71 |
| W | 4 | 7 | 12 | 3 | 0 | 0 | 26 |
| WNW | 0 | 9 | 5 | 0 | 0 | 0 | 14 |
| NW | 0 | 11 | 5 | 0 | 0 | 0 | 16 |
| NNW | 2 | 7 | 8 | 0 | 0 | 0 | 17 |
| TOTAL | 83 | 224 | 124 | 23 | 0 | 0 | 454 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: D DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 29 | 146 | 116 | 1 | 0 | 0 | 292 |
| NNE | 80 | 119 | 28 | 0 | 0 | 0 | 228 |
| NE | 99 | 68 | 13 | 3 | 0 | 0 | 183 |
| ENE | 103 | 44 | 8 | 0 | 0 | 0 | 155 |
| E | 90 | 42 | 1 | 0 | 0 | 0 | 133 |
| ESE | 69 | 46 | 1 | 0 | 0 | 0 | 116 |
| SE | 80 | 75 | 14 | 0 | 0 | 0 | 169 |
| SSE | 76 | 62 | 7 | 1 | 0 | 0 | 146 |
| S | 85 | 99 | 6 | 4 | 0 | 0 | 194 |
| SSW | 69 | 84 | 13 | 0 | 0 | 0 | 166 |
| SW | 59 | 178 | 121 | 15 | 0 | 0 | 373 |
| WSW | 34 | 79 | 106 | 61 | 2 | 0 | 282 |
| W | 8 | 56 | 63 | 24 | 0 | 0 | 151 |
| WNW | 8 | 53 | 42 | 4 | 0 | 0 | 107 |
| NW | 17 | 86 | 145 | 20 | 0 | 0 | 268 |
| NNW | 6 | 113 | 148 | 21 | 0 | 0 | 288 |
| TOTAL | 912 | 1350 | 832 | 154 | 2 | 0 | 3251 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: E DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 31 | 55 | 3 | 0 | 0 | 0 | 89 |
| NNE | 100 | 75 | 6 | 0 | 0 | 0 | 181 |
| NE | 190 | 35 | 3 | 0 | 0 | 0 | 228 |
| ENE | 285 | 17 | 0 | 0 | 0 | 0 | 302 |
| E | 223 | 12 | 0 | 0 | 0 | 0 | 235 |
| ESE | 151 | 11 | 1 | 0 | 0 | 0 | 163 |
| SE | 141 | 18 | 1 | 0 | 0 | 0 | 160 |
| SSE | 133 | 29 | 3 | 0 | 0 | 0 | 165 |
| S | 167 | 48 | 7 | 0 | 0 | 0 | 222 |
| SSW | 134 | 127 | 7 | 0 | 0 | 0 | 268 |
| SW | 61 | 130 | 18 | 0 | 0 | 0 | 209 |
| WSW | 15 | 23 | 4 | 3 | 1 | 0 | 46 |
| W | 9 | 12 | 5 | 0 | 0 | 0 | 26 |
| WNW | 8 | 7 | 2 | 0 | 0 | 0 | 17 |
| NW | 4 | 27 | 1 | 0 | 0 | 0 | 32 |
| NNW | 7 | 35 | 4 | 0 | 0 | 0 | 46 |
| TOTAL | 1659 | 661 | 65 | 3 | 1 | 0 | 2389 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: F DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 7 | 2 | 0 | 0 | 0 | 0 | 9 |
| NNE | 21 | 12 | 0 | 0 | 0 | 0 | 33 |
| NE | 115 | 6 | 1 | 0 | 0 | 0 | 122 |
| ENE | 502 | 20 | 0 | 0 | 0 | 0 | 522 |
| E | 219 | 1 | 0 | 0 | 0 | 0 | 220 |
| ESE | 72 | 0 | 0 | 0 | 0 | 0 | 72 |
| SE | 44 | 0 | 0 | 0 | 0 | 0 | 44 |
| SSE | 37 | 3 | 0 | 0 | 0 | 0 | 40 |
| S | 48 | 0 | 0 | 0 | 0 | 0 | 48 |
| SSW | 24 | 6 | 0 | 0 | 0 | 0 | 30 |
| SW | 16 | 5 | 0 | 0 | 0 | 0 | 21 |
| WSW | 2 | 3 | 0 | 0 | 0 | 0 | 5 |
| W | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| WNW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NW | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| NNW | 4 | 1 | 0 | 0 | 0 | 0 | 5 |
| TOTAL | 1113 | 59 | 1 | 0 | 0 | 0 | 1173 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: G DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| NNE | 5 | 1 | 0 | 0 | 0 | 0 | 6 |
| NE | 67 | 1 | 0 | 0 | 0 | 0 | 68 |
| ENE | 429 | 20 | 0 | 0 | 0 | 0 | 449 |
| E | 115 | 1 | 0 | 0 | 0 | 0 | 116 |
| ESE | 22 | 0 | 0 | 0 | 0 | 0 | 22 |
| SE | 12 | 0 | 0 | 0 | 0 | 0 | 12 |
| SSE | 6 | 0 | 0 | 0 | 0 | 0 | 6 |
| S | 9 | 0 | 0 | 0 | 0 | 0 | 9 |
| SSW | 4 | 0 | 0 | 0 | 0 | 0 | 4 |
| SW | 4 | 0 | 0 | 0 | 0 | 0 | 4 |
| WSW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| W | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WNW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NW | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| NNW | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| TOTAL | 678 | 23 | 0 | 0 | 0 | 0 | 701 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

**TABLE 3-2**
**(continued)**

Table 2 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: ALL DT/DZ
ELEVATION: SPEED:10M SP DIRECTION:10M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 75 | 217 | 155 | 1 | 0 | 0 | 448 |
| NNE | 209 | 249 | 56 | 0 | 0 | 0 | 515 |
| NE | 483 | 144 | 23 | 3 | 0 | 0 | 653 |
| ENE | 1346 | 123 | 8 | 0 | 0 | 0 | 1477 |
| E | 673 | 68 | 1 | 0 | 0 | 0 | 742 |
| ESE | 330 | 73 | 2 | 0 | 0 | 0 | 405 |
| SE | 293 | 130 | 18 | 0 | 0 | 0 | 441 |
| SSE | 263 | 128 | 12 | 1 | 0 | 0 | 404 |
| S | 327 | 221 | 21 | 4 | 0 | 0 | 573 |
| SSW | 250 | 308 | 28 | 0 | 0 | 0 | 586 |
| SW | 159 | 486 | 248 | 19 | 0 | 0 | 912 |
| WSW | 53 | 153 | 196 | 88 | 3 | 0 | 493 |
| W | 22 | 83 | 86 | 28 | 0 | 0 | 219 |
| WNW | 17 | 72 | 51 | 4 | 0 | 0 | 144 |
| NW | 23 | 126 | 152 | 20 | 0 | 0 | 321 |
| NNW | 20 | 157 | 165 | 21 | 0 | 0 | 363 |
| TOTAL | 4543 | 2738 | 1222 | 189 | 3 | 0 | 8696 |

PERIODS OF CALM(HOURS): 1
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 64

Table 3. SSES Joint Frequency Distribution of Wind Speed and Direction 60m Versus Delta Temperature 60-10m for the Period of January 1, 2001 through December 31, 2001

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: A DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 0 | 1 | 3 | 5 | 0 | 0 | 9 |
| NNE | 0 | 9 | 5 | 2 | 0 | 0 | 16 |
| NE | 0 | 12 | 3 | 2 | 0 | 0 | 17 |
| ENE | 6 | 5 | 0 | 0 | 0 | 0 | 11 |
| E | 3 | 3 | 0 | 0 | 0 | 0 | 6 |
| ESE | 4 | 5 | 2 | 1 | 0 | 0 | 12 |
| SE | 0 | 8 | 9 | 1 | 1 | 0 | 19 |
| SSE | 0 | 6 | 13 | 3 | 0 | 0 | 22 |
| S | 4 | 7 | 20 | 14 | 0 | 0 | 45 |
| SSW | 0 | 18 | 23 | 7 | 2 | 0 | 50 |
| SW | 0 | 21 | 81 | 28 | 1 | 0 | 131 |
| WSW | 0 | 5 | 26 | 14 | 0 | 0 | 45 |
| W | 0 | 1 | 5 | 3 | 0 | 0 | 9 |
| WNW | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| NW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NNW | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| TOTAL | 17 | 101 | 194 | 80 | 4 | 0 | 396 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: B DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 0 | 3 | 6 | 6 | 0 | 0 | 15 |
| NNE | 2 | 8 | 18 | 5 | 0 | 0 | 33 |
| NE | 4 | 14 | 3 | 0 | 0 | 0 | 21 |
| ENE | 5 | 8 | 1 | 0 | 0 | 0 | 14 |
| E | 2 | 1 | 3 | 0 | 0 | 0 | 6 |
| ESE | 2 | 5 | 2 | 0 | 0 | 0 | 9 |
| SE | 2 | 5 | 9 | 1 | 0 | 0 | 17 |
| SSE | 0 | 2 | 7 | 2 | 0 | 0 | 11 |
| S | 0 | 6 | 9 | 4 | 0 | 0 | 19 |
| SSW | 2 | 20 | 9 | 3 | 0 | 0 | 34 |
| SW | 0 | 29 | 34 | 18 | 0 | 0 | 81 |
| WSW | 0 | 3 | 20 | 23 | 4 | 0 | 50 |
| W | 0 | 1 | 9 | 2 | 0 | 0 | 12 |
| WNW | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| NW | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| NNW | 0 | 1 | 3 | 2 | 0 | 0 | 6 |
| TOTAL | 19 | 108 | 135 | 66 | 4 | 0 | 332 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

**TABLE 3-3**
**(continued)**

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: C DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 1 | 5 | 21 | 6 | 0 | 0 | 33 |
| NNE | 4 | 11 | 11 | 8 | 0 | 0 | 34 |
| NE | 3 | 9 | 1 | 0 | 0 | 0 | 13 |
| ENE | 8 | 8 | 2 | 0 | 0 | 0 | 18 |
| E | 7 | 3 | 2 | 0 | 0 | 0 | 12 |
| ESE | 0 | 4 | 2 | 1 | 0 | 0 | 7 |
| SE | 0 | 5 | 6 | 1 | 0 | 0 | 12 |
| SSE | 3 | 6 | 4 | 1 | 0 | 0 | 14 |
| S | 4 | 11 | 9 | 3 | 0 | 0 | 27 |
| SSW | 5 | 28 | 13 | 6 | 0 | 0 | 52 |
| SW | 1 | 30 | 39 | 14 | 0 | 0 | 84 |
| WSW | 1 | 6 | 21 | 36 | 13 | 1 | 78 |
| W | 0 | 2 | 13 | 7 | 2 | 0 | 24 |
| WNW | 0 | 3 | 11 | 4 | 0 | 0 | 18 |
| NW | 0 | 1 | 14 | 0 | 0 | 0 | 15 |
| NNW | 0 | 1 | 9 | 3 | 0 | 0 | 13 |
| TOTAL | 37 | 133 | 178 | 90 | 15 | 1 | 454 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: D DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 16 | 67 | 140 | 28 | 0 | 0 | 251 |
| NNE | 48 | 80 | 71 | 26 | 5 | 0 | 230 |
| NE | 78 | 77 | 37 | 9 | 1 | 0 | 202 |
| ENE | 41 | 50 | 12 | 5 | 0 | 0 | 108 |
| E | 31 | 28 | 28 | 1 | 0 | 0 | 89 |
| ESE | 25 | 25 | 27 | 5 | 0 | 0 | 82 |
| SE | 30 | 30 | 58 | 14 | 2 | 0 | 134 |
| SSE | 31 | 30 | 51 | 10 | 0 | 0 | 122 |
| S | 52 | 38 | 57 | 10 | 8 | 0 | 165 |
| SSW | 45 | 93 | 55 | 26 | 3 | 0 | 222 |
| SW | 39 | 128 | 99 | 52 | 3 | 0 | 321 |
| WSW | 7 | 57 | 120 | 171 | 61 | 12 | 428 |
| W | 3 | 30 | 87 | 48 | 22 | 0 | 190 |
| WNW | 3 | 38 | 82 | 40 | 3 | 0 | 166 |
| NW | 2 | 43 | 147 | 78 | 3 | 0 | 273 |
| NNW | 5 | 30 | 151 | 82 | 0 | 0 | 268 |
| TOTAL | 456 | 844 | 1222 | 605 | 111 | 12 | 3251 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: E DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 29 | 82 | 38 | 1 | 0 | 0 | 150 |
| NNE | 80 | 174 | 42 | 8 | 0 | 0 | 304 |
| NE | 143 | 73 | 17 | 5 | 0 | 0 | 238 |
| ENE | 71 | 27 | 10 | 0 | 0 | 0 | 109 |
| E | 53 | 20 | 9 | 0 | 0 | 0 | 82 |
| ESE | 57 | 20 | 14 | 3 | 0 | 0 | 94 |
| SE | 68 | 29 | 13 | 4 | 1 | 0 | 115 |
| SSE | 71 | 52 | 37 | 5 | 1 | 0 | 166 |
| S | 64 | 65 | 36 | 8 | 5 | 0 | 178 |
| SSW | 39 | 90 | 104 | 27 | 6 | 0 | 266 |
| SW | 41 | 97 | 112 | 20 | 0 | 0 | 270 |
| WSW | 13 | 57 | 92 | 61 | 5 | 1 | 229 |
| W | 16 | 19 | 9 | 5 | 0 | 0 | 49 |
| WNW | 2 | 19 | 9 | 0 | 0 | 0 | 30 |
| NW | 7 | 28 | 30 | 2 | 0 | 0 | 67 |
| NNW | 10 | 11 | 18 | 1 | 0 | 0 | 40 |
| TOTAL | 764 | 863 | 590 | 150 | 18 | 1 | 2387 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: F DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 18 | 70 | 9 | 1 | 0 | 0 | 98 |
| NNE | 111 | 280 | 3 | 0 | 0 | 0 | 394 |
| NE | 111 | 54 | 2 | 0 | 0 | 0 | 167 |
| ENE | 59 | 11 | 0 | 0 | 0 | 0 | 70 |
| E | 53 | 11 | 1 | 1 | 0 | 0 | 66 |
| ESE | 31 | 5 | 1 | 0 | 0 | 0 | 37 |
| SE | 24 | 3 | 0 | 0 | 0 | 0 | 27 |
| SSE | 26 | 11 | 4 | 1 | 0 | 0 | 42 |
| S | 24 | 20 | 9 | 0 | 0 | 0 | 53 |
| SSW | 15 | 39 | 15 | 0 | 1 | 0 | 70 |
| SW | 6 | 45 | 28 | 3 | 0 | 0 | 82 |
| WSW | 2 | 5 | 17 | 8 | 0 | 0 | 32 |
| W | 4 | 3 | 0 | 0 | 0 | 0 | 7 |
| WNW | 1 | 4 | 0 | 0 | 0 | 0 | 5 |
| NW | 5 | 4 | 2 | 0 | 0 | 0 | 11 |
| NNW | 3 | 4 | 0 | 0 | 0 | 0 | 7 |
| TOTAL | 493 | 569 | 91 | 14 | 1 | 0 | 1168 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

**TABLE 3-3**
**(continued)**

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: G DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 7 | 69 | 0 | 0 | 0 | 0 | 76 |
| NNE | 59 | 171 | 3 | 0 | 0 | 0 | 233 |
| NE | 84 | 58 | 1 | 0 | 0 | 0 | 143 |
| ENE | 42 | 4 | 0 | 0 | 0 | 0 | 46 |
| E | 30 | 2 | 1 | 0 | 0 | 0 | 33 |
| ESE | 31 | 1 | 1 | 0 | 0 | 0 | 33 |
| SE | 19 | 2 | 0 | 0 | 0 | 0 | 21 |
| SSE | 9 | 7 | 0 | 0 | 0 | 0 | 16 |
| S | 17 | 16 | 0 | 0 | 0 | 0 | 33 |
| SSW | 4 | 13 | 5 | 0 | 0 | 0 | 22 |
| SW | 0 | 13 | 6 | 0 | 0 | 0 | 19 |
| WSW | 2 | 7 | 4 | 0 | 0 | 0 | 13 |
| W | 2 | 1 | 0 | 0 | 0 | 0 | 3 |
| WNW | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| NW | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| NNW | 0 | 3 | 0 | 0 | 0 | 0 | 3 |
| TOTAL | 307 | 373 | 21 | 0 | 0 | 0 | 701 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

**TABLE 3-3**
**(continued)**

Table 3 (continued)

SITE: SSES

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD = 01010101-01123124
STABILITY CLASS: ALL DT/DZ
ELEVATION: SPEED:60M SP DIRECTION:60M WD LAPSE:DT A

| WIND DIRECTION | WIND SPEED(MPH) 1-3 | 4-7 | 8-12 | 13-18 | 19-24 | >24 | TOTAL |
|---|---|---|---|---|---|---|---|
| N | 71 | 297 | 217 | 47 | 0 | 0 | 632 |
| NNE | 304 | 733 | 153 | 49 | 5 | 0 | 1244 |
| NE | 423 | 297 | 64 | 16 | 1 | 0 | 801 |
| ENE | 232 | 113 | 25 | 5 | 0 | 0 | 376 |
| E | 179 | 68 | 44 | 2 | 0 | 0 | 294 |
| ESE | 150 | 65 | 49 | 10 | 0 | 0 | 274 |
| SE | 143 | 82 | 95 | 21 | 4 | 0 | 345 |
| SSE | 140 | 114 | 116 | 22 | 1 | 0 | 393 |
| S | 165 | 163 | 140 | 39 | 13 | 0 | 520 |
| SSW | 110 | 301 | 224 | 69 | 12 | 0 | 716 |
| SW | 87 | 363 | 399 | 135 | 4 | 0 | 988 |
| WSW | 25 | 140 | 300 | 313 | 83 | 14 | 875 |
| W | 25 | 57 | 123 | 65 | 24 | 0 | 294 |
| WNW | 7 | 66 | 104 | 44 | 3 | 0 | 224 |
| NW | 14 | 82 | 194 | 80 | 3 | 0 | 373 |
| NNW | 18 | 50 | 184 | 88 | 0 | 0 | 340 |
| TOTAL | 2093 | 2991 | 2431 | 1005 | 153 | 14 | 8689 |

PERIODS OF CALM(HOURS): 2
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 71

# TABLE 3-4

## 2001 SSES ANNUAL RELATIVE CONCENTRATIONS NO DECAY, UNDEPLETED X/Q (sec/m$^3$)

DATES OF LAST X/Q ACCUMULATION ARE FROM 1 1 1 1 0 TO 1123124 0
X/Q ACCUMULATION FOR GROUND AVERAGE SEC/M3
FOR RELEASE POINT 1

| 0.5-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|---|---|---|
| **DIRECTION FROM N | | | | | | | | | |
| 4.1689E-06 | 7.8897E-07 | 3.2723E-07 | 1.7255E-07 | 1.1081E-07 | 4.0997E-08 | 1.1202E-08 | 5.4129E-09 | 3.3976E-09 | 2.4007E-09 |
| **DIRECTION FROM NNE | | | | | | | | | |
| 6.8874E-06 | 1.4010E-06 | 6.2680E-07 | 3.3588E-07 | 2.1699E-07 | 8.0568E-08 | 2.2105E-08 | 1.0869E-08 | 6.9045E-09 | 4.9347E-09 |
| **DIRECTION FROM NE | | | | | | | | | |
| 1.4953E-05 | 2.8305E-06 | 1.2895E-06 | 7.3290E-07 | 4.8639E-07 | 1.9283E-07 | 5.8612E-08 | 2.9553E-08 | 1.9038E-08 | 1.3853E-08 |
| **DIRECTION FROM ENE | | | | | | | | | |
| 5.4059E-05 | 9.9092E-06 | 4.8060E-06 | 2.8586E-06 | 1.9148E-06 | 7.6120E-07 | 2.2249E-07 | 1.0838E-07 | 7.0327E-08 | 5.1721E-08 |
| **DIRECTION FROM E | | | | | | | | | |
| 2.6447E-05 | 4.7832E-06 | 2.1113E-06 | 1.2010E-06 | 8.0549E-07 | 3.2925E-07 | 1.0488E-07 | 5.3303E-08 | 3.4503E-08 | 2.5214E-08 |
| **DIRECTION FROM ESE | | | | | | | | | |
| 1.3836E-05 | 2.7164E-06 | 1.2335E-06 | 6.9096E-07 | 4.5943E-07 | 1.8599E-07 | 5.1785E-08 | 2.2818E-08 | 1.4684E-08 | 1.0638E-08 |
| **DIRECTION FROM SE | | | | | | | | | |
| 1.3152E-05 | 2.6148E-06 | 1.1969E-06 | 6.7619E-07 | 4.4911E-07 | 1.8352E-07 | 4.6016E-08 | 1.7026E-08 | 1.0894E-08 | 7.8492E-09 |
| **DIRECTION FROM SSE | | | | | | | | | |
| 1.0165E-05 | 2.0145E-06 | 8.9866E-07 | 5.0471E-07 | 3.3936E-07 | 1.4620E-07 | 3.8356E-08 | 1.3745E-08 | 8.7861E-09 | 6.3133E-09 |
| **DIRECTION FROM S | | | | | | | | | |
| 8.6064E-06 | 1.8233E-06 | 8.9296E-07 | 5.2072E-07 | 3.5782E-07 | 1.6657E-07 | 4.6411E-08 | 1.6042E-08 | 1.0253E-08 | 7.3684E-09 |
| **DIRECTION FROM SSW | | | | | | | | | |
| 8.2432E-06 | 1.6833E-06 | 7.7952E-07 | 4.4330E-07 | 2.9516E-07 | 1.2360E-07 | 3.2523E-08 | 1.2455E-08 | 7.9443E-09 | 5.6973E-09 |
| **DIRECTION FROM SW | | | | | | | | | |
| 6.8726E-06 | 1.3824E-06 | 6.6147E-07 | 3.8239E-07 | 2.5781E-07 | 1.1427E-07 | 2.9979E-08 | 1.0173E-08 | 6.4626E-09 | 4.6129E-09 |
| **DIRECTION FROM WSW | | | | | | | | | |
| 3.0628E-06 | 5.8210E-07 | 2.7045E-07 | 1.5902E-07 | 1.0859E-07 | 5.1035E-08 | 1.5899E-08 | 5.9653E-09 | 3.0587E-09 | 1.6740E-09 |
| **DIRECTION FROM W | | | | | | | | | |
| 1.2899E-06 | 2.4363E-07 | 1.0482E-07 | 5.7293E-08 | 3.7473E-08 | 1.5263E-08 | 4.0993E-09 | 1.6571E-09 | 1.0308E-09 | 7.1950E-10 |
| **DIRECTION FROM WNW | | | | | | | | | |
| 1.0586E-06 | 1.9617E-07 | 7.8500E-08 | 4.0973E-08 | 2.6119E-08 | 9.6281E-09 | 2.6080E-09 | 1.2325E-09 | 7.6295E-10 | 5.3032E-10 |
| **DIRECTION FROM NW | | | | | | | | | |
| 2.3721E-06 | 4.3830E-07 | 1.7470E-07 | 8.9319E-08 | 5.6657E-08 | 2.0399E-08 | 5.3609E-09 | 2.5259E-09 | 1.5571E-09 | 1.0792E-09 |
| **DIRECTION FROM NNW | | | | | | | | | |
| 2.8294E-06 | 5.3749E-07 | 2.2865E-07 | 1.2238E-07 | 7.7370E-08 | 2.7102E-08 | 6.8237E-09 | 3.2590E-09 | 2.0291E-09 | 1.4200E-09 |

# TABLE 3-5

## 2001 SSES ANNUAL RELATIVE CONCENTRATIONS 2.26-DAY DECAY, UNDEPLETED X/Q (sec/m$^3$)

DATES OF LAST X/Q ACCUMULATION ARE FROM 1 1 1 1 0 TO 1123124 0
X/Q ACCUMULATION FOR GROUND DECAYED S.AVG SEC/M3
FOR RELEASE POINT 1

| 0.5-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|---|---|---|
| **DIRECTION FROM N | | | | | | | | | |
| 4.1613E-06 | 7.8462E-07 | 3.2419E-07 | 1.7029E-07 | 1.0893E-07 | 3.9823E-08 | 1.0556E-08 | 4.8990E-09 | 2.9541E-09 | 2.0040E-09 |
| **DIRECTION FROM NNE | | | | | | | | | |
| 6.8707E-06 | 1.3908E-06 | 6.1914E-07 | 3.3010E-07 | 2.1218E-07 | 7.7597E-08 | 2.0492E-08 | 9.5796E-09 | 5.7878E-09 | 3.9345E-09 |
| **DIRECTION FROM NE | | | | | | | | | |
| 1.4906E-05 | 2.8040E-06 | 1.2695E-06 | 7.1695E-07 | 4.7280E-07 | 1.8392E-07 | 5.3305E-08 | 2.5234E-08 | 1.5267E-08 | 1.0435E-08 |
| **DIRECTION FROM ENE | | | | | | | | | |
| 5.3889E-05 | 9.8153E-06 | 4.7305E-06 | 2.7960E-06 | 1.8611E-06 | 7.2605E-07 | 2.0249E-07 | 9.2678E-08 | 5.6520E-08 | 3.9085E-08 |
| **DIRECTION FROM E | | | | | | | | | |
| 2.6346E-05 | 4.7283E-06 | 2.0710E-06 | 1.1690E-06 | 7.7806E-07 | 3.1078E-07 | 9.3464E-08 | 4.4003E-08 | 2.6393E-08 | 1.7880E-08 |
| **DIRECTION FROM ESE | | | | | | | | | |
| 1.3779E-05 | 2.6828E-06 | 1.2081E-06 | 6.7109E-07 | 4.4250E-07 | 1.7468E-07 | 4.5666E-08 | 1.8506E-08 | 1.0955E-08 | 7.3034E-09 |
| **DIRECTION FROM SE | | | | | | | | | |
| 1.3103E-05 | 2.5857E-06 | 1.1747E-06 | 6.5857E-07 | 4.3408E-07 | 1.7335E-07 | 4.1024E-08 | 1.4059E-08 | 8.3355E-09 | 5.5646E-09 |
| **DIRECTION FROM SSE | | | | | | | | | |
| 1.0131E-05 | 1.9942E-06 | 8.8352E-07 | 4.9279E-07 | 3.2907E-07 | 1.3887E-07 | 3.4590E-08 | 1.1571E-08 | 6.9079E-09 | 4.6373E-09 |
| **DIRECTION FROM S | | | | | | | | | |
| 8.5816E-06 | 1.8074E-06 | 8.7996E-07 | 5.1009E-07 | 3.4844E-07 | 1.5933E-07 | 4.2448E-08 | 1.3825E-08 | 8.3292E-09 | 5.6432E-09 |
| **DIRECTION FROM SSW | | | | | | | | | |
| 8.2233E-06 | 1.6711E-06 | 7.7004E-07 | 4.3574E-07 | 2.8869E-07 | 1.1911E-07 | 3.0201E-08 | 1.1011E-08 | 6.6899E-09 | 4.5712E-09 |
| **DIRECTION FROM SW | | | | | | | | | |
| 6.8598E-06 | 1.3746E-06 | 6.5521E-07 | 3.7729E-07 | 2.5336E-07 | 1.1098E-07 | 2.8259E-08 | 9.2181E-09 | 5.6315E-09 | 3.8655E-09 |
| **DIRECTION FROM WSW | | | | | | | | | |
| 3.0581E-06 | 5.7940E-07 | 2.6834E-07 | 1.5728E-07 | 1.0706E-07 | 4.9835E-08 | 1.5154E-08 | 5.5083E-09 | 2.7371E-09 | 1.4520E-09 |
| **DIRECTION FROM W | | | | | | | | | |
| 1.2880E-06 | 2.4254E-07 | 1.0403E-07 | 5.6684E-08 | 3.6959E-08 | 1.4911E-08 | 3.9096E-09 | 1.5306E-09 | 9.2212E-10 | 6.2325E-10 |
| **DIRECTION FROM WNW | | | | | | | | | |
| 1.0570E-06 | 1.9522E-07 | 7.7866E-08 | 4.0509E-08 | 2.5736E-08 | 9.3899E-09 | 2.4781E-09 | 1.1312E-09 | 6.7643E-10 | 4.5402E-10 |
| **DIRECTION FROM NW | | | | | | | | | |
| 2.3686E-06 | 4.3640E-07 | 1.7343E-07 | 8.8397E-08 | 5.5900E-08 | 1.9939E-08 | 5.1158E-09 | 2.3346E-09 | 1.3941E-09 | 9.3533E-10 |
| **DIRECTION FROM NNW | | | | | | | | | |
| 2.8250E-06 | 5.3496E-07 | 2.2681E-07 | 1.2097E-07 | 7.6218E-08 | 2.6416E-08 | 6.4709E-09 | 2.9793E-09 | 1.7882E-09 | 1.2055E-09 |

# TABLE 3-6

## 2001 SSES ANNUAL RELATIVE CONCENTRATIONS 8-DAY DECAY, DEPLETED X/Q (sec/m$^3$)

DATES OF LAST X/Q ACCUMULATION ARE FROM 1 1 1 1 0 TO 1123124 0
X/Q ACCUMULATION FOR DECAYED DEPLETION SEC/M3
FOR RELEASE POINT 1

| 0.5-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|---|---|---|
| **DIRECTION FROM N | | | | | | | | | |
| 3.8089E-06 | 6.6828E-07 | 2.6465E-07 | 1.3368E-07 | 8.3000E-08 | 2.8511E-08 | 6.8995E-09 | 2.9078E-09 | 1.6348E-09 | 1.0473E-09 |
| **DIRECTION FROM NNE | | | | | | | | | |
| 6.2916E-06 | 1.1861E-06 | 5.0650E-07 | 2.5991E-07 | 1.6228E-07 | 5.5896E-08 | 1.3551E-08 | 5.7952E-09 | 3.2878E-09 | 2.1249E-09 |
| **DIRECTION FROM NE | | | | | | | | | |
| 1.3656E-05 | 2.3949E-06 | 1.0410E-06 | 5.6638E-07 | 3.6316E-07 | 1.3342E-07 | 3.5741E-08 | 1.5618E-08 | 8.9546E-09 | 5.8720E-09 |
| **DIRECTION FROM ENE | | | | | | | | | |
| 4.9372E-05 | 8.3840E-06 | 3.8797E-06 | 2.2090E-06 | 1.4296E-06 | 5.2667E-07 | 1.3570E-07 | 5.7305E-08 | 3.3103E-08 | 2.1948E-08 |
| **DIRECTION FROM E | | | | | | | | | |
| 2.4149E-05 | 4.0447E-06 | 1.7028E-06 | 9.2682E-07 | 6.0035E-07 | 2.2713E-07 | 6.3590E-08 | 2.7905E-08 | 1.6016E-08 | 1.0509E-08 |
| **DIRECTION FROM ESE | | | | | | | | | |
| 1.2633E-05 | 2.2964E-06 | 9.9435E-07 | 5.3289E-07 | 3.4215E-07 | 1.2813E-07 | 3.1304E-08 | 1.1885E-08 | 6.7675E-09 | 4.3929E-09 |
| **DIRECTION FROM SE | | | | | | | | | |
| 1.2010E-05 | 2.2113E-06 | 9.6545E-07 | 5.2191E-07 | 3.3479E-07 | 1.2663E-07 | 2.7901E-08 | 8.9124E-09 | 5.0559E-09 | 3.2698E-09 |
| **DIRECTION FROM SSE | | | | | | | | | |
| 9.2828E-06 | 1.7041E-06 | 7.2522E-07 | 3.8983E-07 | 2.5321E-07 | 1.0104E-07 | 2.3332E-08 | 7.2341E-09 | 4.1086E-09 | 2.6561E-09 |
| **DIRECTION FROM S | | | | | | | | | |
| 7.8608E-06 | 1.5430E-06 | 7.2110E-07 | 4.0257E-07 | 2.6730E-07 | 1.1534E-07 | 2.8345E-08 | 8.5000E-09 | 4.8402E-09 | 3.1379E-09 |
| **DIRECTION FROM SSW | | | | | | | | | |
| 7.5301E-06 | 1.4251E-06 | 6.2992E-07 | 3.4305E-07 | 2.2076E-07 | 8.5766E-08 | 1.9948E-08 | 6.6467E-09 | 3.7883E-09 | 2.4581E-09 |
| **DIRECTION FROM SW | | | | | | | | | |
| 6.2790E-06 | 1.1709E-06 | 5.3494E-07 | 2.9623E-07 | 1.9309E-07 | 7.9468E-08 | 1.8466E-08 | 5.4669E-09 | 3.1117E-09 | 2.0148E-09 |
| **DIRECTION FROM WSW | | | | | | | | | |
| 2.7985E-06 | 4.9318E-07 | 2.1882E-07 | 1.2327E-07 | 8.1405E-08 | 3.5545E-08 | 9.8239E-09 | 3.2230E-09 | 1.4839E-09 | 7.3844E-10 |
| **DIRECTION FROM W | | | | | | | | | |
| 1.1786E-06 | 2.0642E-07 | 8.4813E-08 | 4.4417E-08 | 2.8094E-08 | 1.0632E-08 | 2.5334E-09 | 8.9540E-10 | 5.0004E-10 | 3.1726E-10 |
| **DIRECTION FROM WNW | | | | | | | | | |
| 9.6730E-07 | 1.6619E-07 | 6.3508E-08 | 3.1758E-08 | 1.9576E-08 | 6.7034E-09 | 1.6101E-09 | 6.6473E-10 | 3.6914E-10 | 2.3304E-10 |
| **DIRECTION FROM NW | | | | | | | | | |
| 2.1675E-06 | 3.7137E-07 | 1.4137E-07 | 6.9252E-08 | 4.2481E-08 | 1.4211E-08 | 3.3135E-09 | 1.3649E-09 | 7.5540E-10 | 4.7580E-10 |
| **DIRECTION FROM NNW | | | | | | | | | |
| 2.5853E-06 | 4.5538E-07 | 1.8499E-07 | 9.4851E-08 | 5.7985E-08 | 1.8866E-08 | 4.2100E-09 | 1.7554E-09 | 9.7971E-10 | 6.2208E-10 |

# TABLE 3-7

## 2001 SSES ANNUAL RELATIVE DEPOSITION - D/Q (meters$^{-2}$)

DATES OF LAST X/Q ACCUMULATION ARE FROM 1 1 1 1 0 TO 1123124 0
X/Q ACCUMULATION FOR DEPOSITION 1/M2
FOR RELEASE POINT 1

| 0.5-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|---|---|---|
| **DIRECTION FROM N | | | | | | | | | |
| 2.5767E-08 | 3.7966E-09 | 1.5571E-09 | 7.3802E-10 | 4.3616E-10 | 1.3823E-10 | 3.3068E-11 | 1.2175E-11 | 6.4983E-12 | 4.0825E-12 |
| **DIRECTION FROM NNE | | | | | | | | | |
| 2.7814E-08 | 4.3096E-09 | 1.8692E-09 | 8.8906E-10 | 5.2335E-10 | 1.6307E-10 | 3.8014E-11 | 1.3996E-11 | 7.4701E-12 | 4.6930E-12 |
| **DIRECTION FROM NE | | | | | | | | | |
| 3.2977E-08 | 4.9737E-09 | 2.1267E-09 | 1.0293E-09 | 6.1067E-10 | 1.9672E-10 | 4.8200E-11 | 1.7746E-11 | 9.4718E-12 | 5.9505E-12 |
| **DIRECTION FROM ENE | | | | | | | | | |
| 7.9425E-08 | 1.2333E-08 | 5.4921E-09 | 2.6870E-09 | 1.5874E-09 | 5.0236E-10 | 1.1448E-10 | 4.0140E-11 | 2.1424E-11 | 1.3460E-11 |
| **DIRECTION FROM E | | | | | | | | | |
| 3.8686E-08 | 5.6511E-09 | 2.3024E-09 | 1.0993E-09 | 6.5592E-10 | 2.1631E-10 | 5.4769E-11 | 2.0165E-11 | 1.0763E-11 | 6.7616E-12 |
| **DIRECTION FROM ESE | | | | | | | | | |
| 2.4335E-08 | 3.6786E-09 | 1.5684E-09 | 7.5719E-10 | 4.5239E-10 | 1.5001E-10 | 3.4082E-11 | 1.1006E-11 | 5.8746E-12 | 3.6906E-12 |
| **DIRECTION FROM SE | | | | | | | | | |
| 3.1654E-08 | 4.8099E-09 | 2.1007E-09 | 1.0374E-09 | 6.2271E-10 | 2.1041E-10 | 4.3789E-11 | 1.1985E-11 | 6.3967E-12 | 4.0187E-12 |
| **DIRECTION FROM SSE | | | | | | | | | |
| 2.7486E-08 | 4.1028E-09 | 1.7478E-09 | 8.6301E-10 | 5.2597E-10 | 1.8830E-10 | 4.1308E-11 | 1.0979E-11 | 5.8601E-12 | 3.6815E-12 |
| **DIRECTION FROM S | | | | | | | | | |
| 2.7865E-08 | 4.4675E-09 | 2.0981E-09 | 1.0782E-09 | 6.7200E-10 | 2.6009E-10 | 6.0704E-11 | 1.5572E-11 | 8.3114E-12 | 5.2215E-12 |
| **DIRECTION FROM SSW | | | | | | | | | |
| 3.4252E-08 | 5.2389E-09 | 2.3498E-09 | 1.1895E-09 | 7.1999E-10 | 2.5121E-10 | 5.5806E-11 | 1.5925E-11 | 8.5000E-12 | 5.3400E-12 |
| **DIRECTION FROM SW | | | | | | | | | |
| 4.7976E-08 | 7.6159E-09 | 3.5832E-09 | 1.8540E-09 | 1.1456E-09 | 4.3066E-10 | 9.7292E-11 | 2.4785E-11 | 1.3229E-11 | 8.3108E-12 |
| **DIRECTION FROM WSW | | | | | | | | | |
| 2.9623E-08 | 4.5662E-09 | 2.1326E-09 | 1.1417E-09 | 7.2590E-10 | 2.9937E-10 | 8.4249E-11 | 2.4342E-11 | 1.0657E-11 | 5.2277E-12 |
| **DIRECTION FROM W | | | | | | | | | |
| 1.1008E-08 | 1.6524E-09 | 7.1499E-10 | 3.5678E-10 | 2.1745E-10 | 7.7849E-11 | 1.8996E-11 | 5.9517E-12 | 3.1766E-12 | 1.9957E-12 |
| **DIRECTION FROM WNW | | | | | | | | | |
| 8.0465E-09 | 1.1610E-09 | 4.6782E-10 | 2.2358E-10 | 1.3282E-10 | 4.3030E-11 | 1.0629E-11 | 3.9134E-12 | 2.0887E-12 | 1.3122E-12 |
| **DIRECTION FROM NW | | | | | | | | | |
| 1.9288E-08 | 2.8235E-09 | 1.1313E-09 | 5.2627E-10 | 3.1115E-10 | 9.8781E-11 | 2.3694E-11 | 8.7237E-12 | 4.6561E-12 | 2.9252E-12 |
| **DIRECTION FROM NNW | | | | | | | | | |
| 2.1981E-08 | 3.2645E-09 | 1.3792E-09 | 6.6677E-10 | 3.9057E-10 | 1.1906E-10 | 2.6794E-11 | 9.8651E-12 | 5.2654E-12 | 3.3079E-12 |

## TABLE 3-8

## 2001 ATMOSPHERIC DISPERSION ESTIMATES FOR GASPAR INPUT AT SELECTED LOCATIONS

| AFFECTED SECTOR | LOCATION | MILES | X/Q | X/Q DEC | X/Q DEC+DEP | DEPOSITION |
|---|---|---|---|---|---|---|
| 14/WNW | Maximum (X/Q) Site Boundary | 0.6 | 1.524E-5 | 1.515E-5 | 1.372E-5 | 2.360E-8 |
| 9/S | Closest (X/Q) Site Boundary | 0.38 | 4.780E-6 | 4.776E-6 | 4.451E-6 | 3.518E-8 |
| 14/WNW | Maximum (X/Q) Residence | 0.8 | 1.046E-5 | 1.038E-5 | 9.243E-6 | 1.528E-8 |
| 16/NNW | Maximum (D/Q) Residence | 0.6 | 7.435E-6 | 7.400E-6 | 6.704E-6 | 1.820E-8 |
| 12/WSW | Maximum (D/Q) Garden | 1.1 | 9.491E-6 | 9.419E-6 | 8.206E-6 | 1.450E-8 |
| 12/WSW | Maximum (D/Q) Dairy | 1.7 | 5.032E-6 | 4.977E-6 | 4.209E-6 | 7.146E-9 |
| 2/NNE | Maximum (D/Q) Meat Producer | 2.3 | 1.008E-6 | 9.954E-7 | 8.204E-7 | 2.723E-9 |
| NE | Riverlands / EIC | 0.7 | 4.465E-6 | 4.449E-6 | 3.985E-6 | 2.233E-8 |
| WSW | Tower's Club | 0.5 | 2.506E-5 | 2.498E-5 | 2.289E-5 | 4.395E-8 |

## NEAREST RESIDENCE WITHIN A 5-MILE RADIUS OF SSES BY SECTOR

| SECTOR NUMBER | AFFECTED SECTOR | NAME | MILES | X/Q | X/Q DEC | X/Q DEC+DEP | DEPOSITION |
|---|---|---|---|---|---|---|---|
| 1 | N | H. Burd | 1.3 | 2.041E-6 | 2.024E-6 | 1.745E-6 | 4.744E-9 |
| 2 | NNE | E. Ashbridge III | 1.0 | 3.351E-6 | 3.331E-6 | 2.918E-6 | 1.037E-8 |
| 3 | NE | W. Tuggle | 0.9 | 3.111E-6 | 3.097E-6 | 2.729E-6 | 1.466E-8 |
| 4 | ENE | D. Barberi | 2.1 | 5.534E-7 | 5.493E-7 | 4.548E-7 | 3.669E-9 |
| 5 | E | L. Kozlowski | 1.4 | 3.720E-7 | 3.704E-7 | 3.167E-7 | 2.747E-9 |
| 6 | ESE | R. Panetta | 0.5 | 1.315E-6 | 1.313E-6 | 1.201E-6 | 1.055E-8 |
| 7 | SE | J. Futoma | 0.5 | 1.561E-6 | 1.559E-6 | 1.427E-6 | 1.228E-8 |
| 8 | SSE | J. Naunczek | 0.6 | 2.082E-6 | 2.078E-6 | 1.878E-6 | 1.587E-8 |
| 9 | S | S. Slusser | 1.0 | 1.201E-6 | 1.197E-6 | 1.046E-6 | 7.104E-9 |
| 10 | SSW | S. Molnar | 0.9 | 2.467E-6 | 2.456E-6 | 2.164E-6 | 1.003E-8 |
| 11 | SW | F. Michael | 1.5 | 2.009E-6 | 1.992E-6 | 1.700E-6 | 4.509E-9 |
| 12 | WSW | W. Kisner | 1.1 | 9.491E-6 | 9.419E-6 | 8.206E-6 | 1.450E-8 |
| 13 | W | E. Seely/F. Hummel | 1.2 | 9.286E-6 | 9.202E-6 | 7.978E-6 | 1.169E-8 |
| 14 | WNW | R. Orlando | 0.8 | 1.046E-5 | 1.038E-5 | 9.243E-6 | 1.528E-8 |
| 15 | NW | L. Hidlay | 0.8 | 7.907E-6 | 7.850E-6 | 6.987E-6 | 1.462E-8 |
| 16 | NNW | W. Metzler | 0.6 | 7.435E-6 | 7.400E-6 | 6.704E-6 | 1.820E-8 |

## NEAREST GARDEN WITHIN A 5-MILE RADIUS OF SSES BY SECTOR

| SECTOR NUMBER | AFFECTED SECTOR | NAME | MILES | X/Q | X/Q DEC | X/Q DEC+DEP | DEPOSITION |
|---|---|---|---|---|---|---|---|
| 1 | N | J. Wojcik | 3.2 | 5.467E-7 | 5.357E-7 | 4.274E-7 | 1.067E-9 |
| 2 | NNE | R. Chapin | 2.3 | 1.008E-6 | 9.954E-7 | 8.204E-7 | 2.723E-9 |
| 3 | NE | Yokum | 2.7 | 6.399E-7 | 6.324E-7 | 5.122E-7 | 2.538E-9 |
| 4 | ENE | S. Glova | 3.6 | 2.458E-7 | 2.427E-7 | 1.897E-7 | 1.456E-9 |
| 5 | E | L.Kozlowski/W.Witts | 1.4 | 3.720E-7 | 3.704E-7 | 3.167E-7 | 2.747E-9 |
| 6 | ESE | L. Travelpiece | 2.5 | 8.934E-8 | 8.864E-8 | 7.228E-8 | 5.671E-10 |
| 7 | SE | F. Scholl | 0.6 | 1.195E-6 | 1.193E-6 | 1.079E-6 | 9.033E-9 |
| 8 | SSE | H. Roinick | 2.6 | 1.998E-7 | 1.982E-7 | 1.609E-7 | 1.232E-9 |
| 9 | S | M. Cope | 1.1 | 1.032E-6 | 1.028E-6 | 8.933E-7 | 5.975E-9 |
| 10 | SSW | S. Bodnar | 1.2 | 1.591E-6 | 1.582E-6 | 1.368E-6 | 6.039E-9 |
| 11 | SW | H. Schultz | 1.9 | 1.402E-6 | 1.387E-6 | 1.162E-6 | 3.076E-9 |
| 12 | WSW | W. Kisner | 1.1 | 9.491E-6 | 9.419E-6 | 8.206E-6 | 1.450E-8 |
| 13 | W | E. Seely/F. Hummel | 1.2 | 9.286E-6 | 9.202E-6 | 7.978E-6 | 1.169E-8 |
| 14 | WNW | P. Moskaluk, Jr. | 1.3 | 4.797E-6 | 4.744E-6 | 4.096E-6 | 6.301E-9 |
| 15 | NW | D. Goff | 1.8 | 2.239E-6 | 2.206E-6 | 1.861E-6 | 3.487E-9 |
| 16 | NNW | P. Culver | 4.0 | 4.370E-7 | 4.246E-7 | 3.313E-7 | 6.742E-10 |

## NEAREST ANIMAL RAISED FOR MEAT CONSUMPTION WITHIN A 5-MILE RADIUS OF SSES BY SECTOR

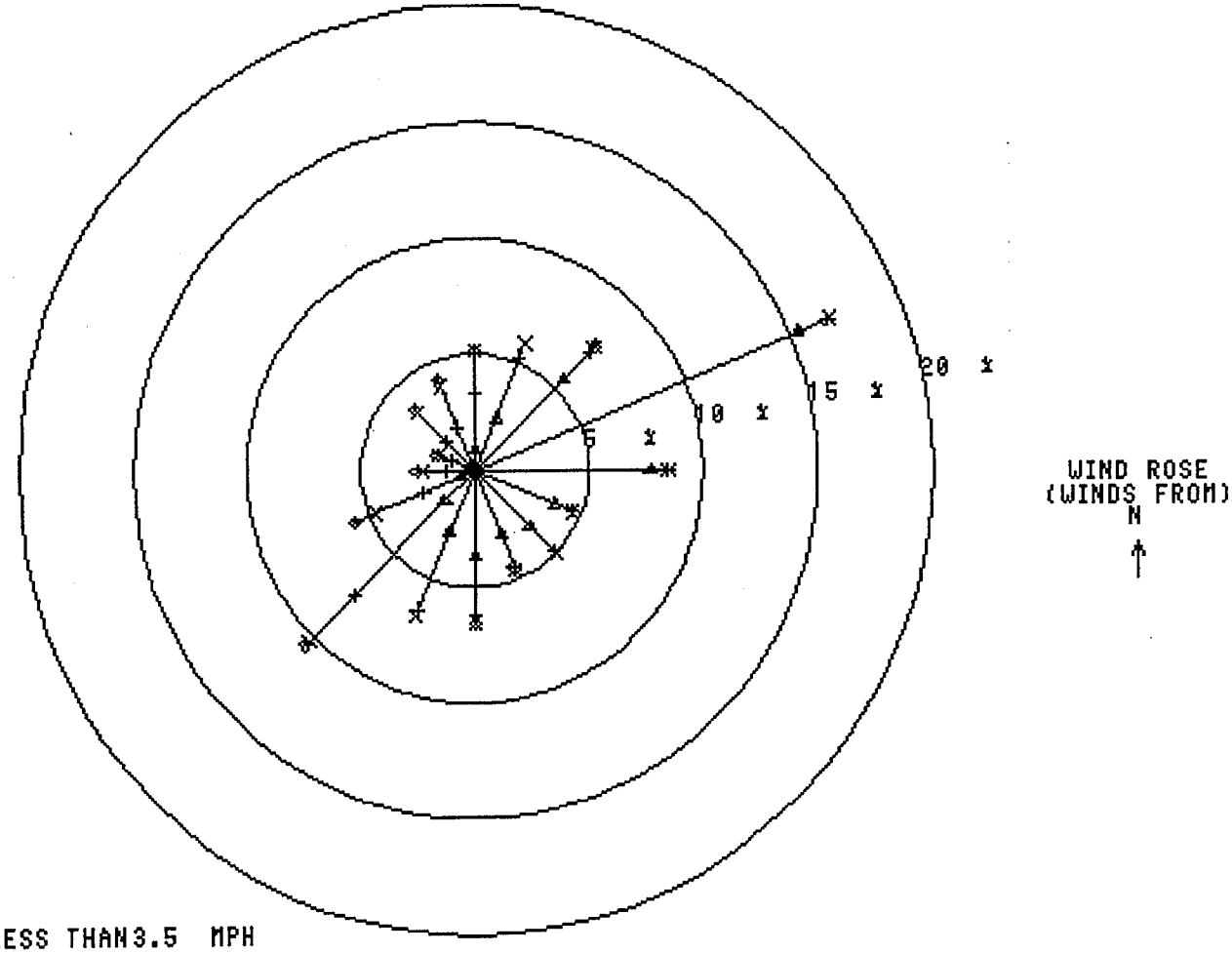
| SECTOR NUMBER | AFFECTED SECTOR | NAME | MILES | X/Q | X/Q DEC | X/Q DEC+DEP | DEPOSITION |
|---|---|---|---|---|---|---|---|
| 2 | NNE | R. Chapin | 2.3 | 1.008E-6 | 9.954E-7 | 8.204E-7 | 2.723E-9 |
| 10 | SSW | R. & C. Ryman | 3.0 | 3.572E-7 | 3.523E-7 | 2.820E-7 | 1.178E-9 |
| | | C. K. Drasher | 3.5 | 2.503E-7 | 2.464E-7 | 1.938E-7 | 7.833E-10 |

## ALL DAIRY LOCATIONS NEAR SSES

| SECTOR NUMBER | AFFECTED SECTOR | NAME | MILES | X/Q | X/Q DEC | X/Q DEC+DEP | DEPOSITION |
|---|---|---|---|---|---|---|---|
| 5 | E | W. Bloss | 4.5 | 5.114E-8 | 5.043E-8 | 3.834E-8 | 3.180E-10 |
| 6 | ESE | D. Moyer | 2.7 | 7.696E-8 | 7.630E-8 | 6.165E-8 | 4.786E-10 |
| | | F. Rinehimer | 4.2 | 3.086E-8 | 3.045E-8 | 2.335E-8 | 1.702E-10 |
| 10 | SSW | R. & C. Ryman | 3.0 | 3.572E-7 | 3.523E-7 | 2.820E-7 | 1.178E-9 |
| | | R. Ryman | 3.1 | 3.320E-7 | 3.273E-7 | 2.610E-7 | 1.083E-9 |
| | | C. K. Drasher | 3.5 | 2.503E-7 | 2.464E-7 | 1.938E-7 | 7.833E-10 |
| | | K. Davis | 14.0 | 1.983E-8 | 1.855E-8 | 1.232E-8 | 4.180E-11 |
| 13 | W | J. & N. Dent | 5.0 | 8.605E-7 | 8.300E-7 | 6.318E-7 | 6.750E-10 |
| 16 | NNW | H. Shoemaker | 4.2 | 4.094E-7 | 3.972E-7 | 3.082E-7 | 6.194E-10 |

| | |
|---|---|
| **X/Q** | **RELATIVE CONCENTRATION (SEC/M$^3$)** |
| **X/Q DEC** | **DECAYED AND UNDEPLETED, HALF-LIFE 2.26 DAYS (SEC/M$^3$)** |
| **X/Q DEC+DEP** | **DECAYED AND DEPLETED, HALF-LIFE 8 DAYS (SEC/M$^3$)** |
| **DEPOSITION** | **RELATIVE DEPOSITION RATE (1/M$^2$)** |

SSES 2001 ANNUAL WIND ROSE
10M LEVEL – PRIMARY TOWER




▲WIND SPEED LESS THAN3.5 MPH
+WIND SPEED LESS THAN7.5 MPH
×WIND SPEED LESS THAN12.5 MPH
✱WIND SPEED GREATER THAN 12.5 MPH

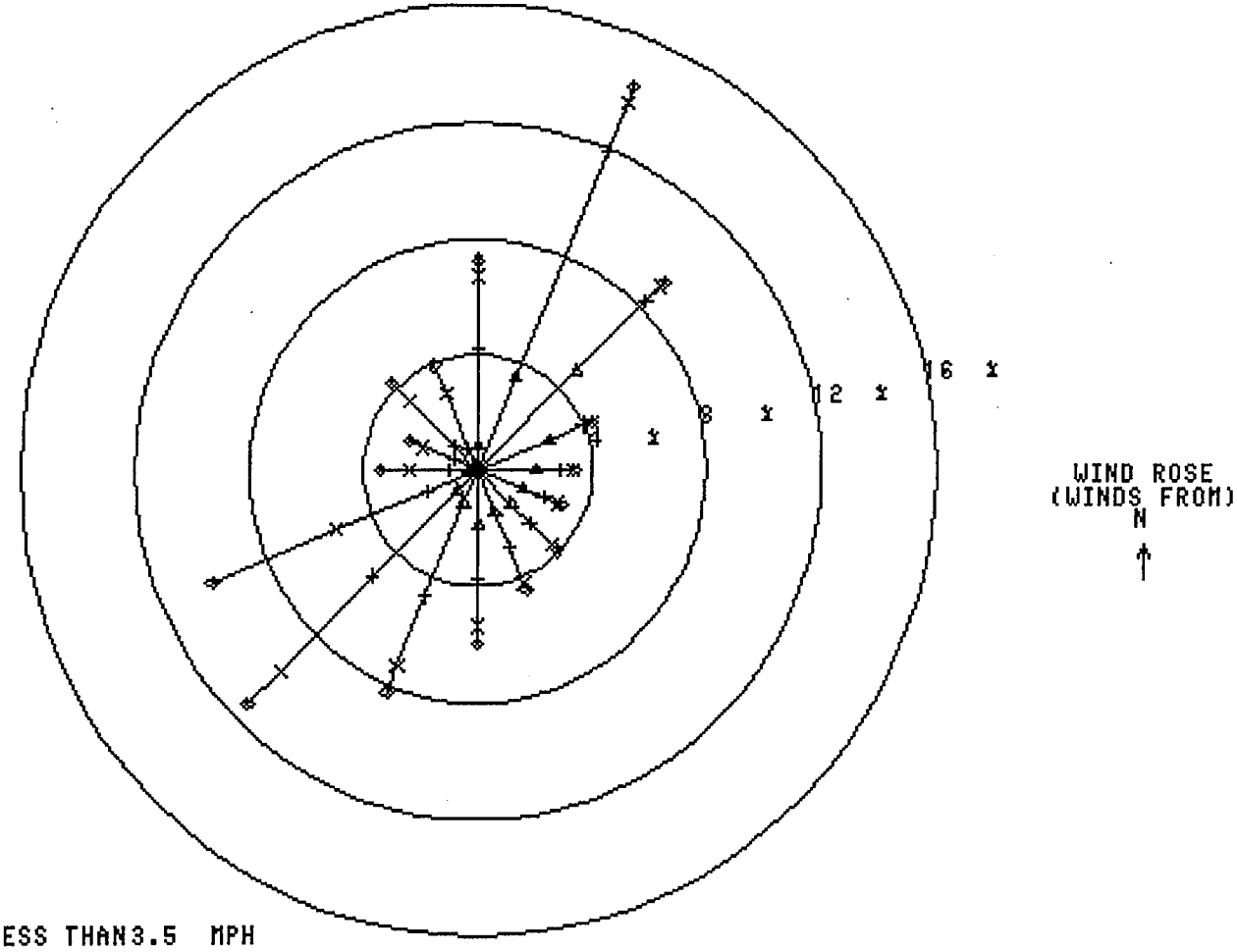
0.0 PERCENT CALMS
(NOT INCLUDED IN PLOT)

This wind rose displays the frequency of hourly average wind direction from a given sector. In 2001, the predominant wind direction occurred 17.0% of the time from the ENE sector. The average wind speed was 4.4 mph. The peak sector wind speed was 8.7 mph from the WSW.

FIGURE 3-1

| Calculation No. C-1030-201 | Rev. 0 |
|---|---|
| 02/14/2002 | |
| Page 25 of 28 | |
| Prepared by: | |
| Checked by: | |

SSES 2001 ANNUAL WIND ROSE
60M LEVEL – PRIMARY TOWER




▲WIND SPEED LESS THAN3.5 MPH
+WIND SPEED LESS THAN7.5 MPH
×WIND SPEED LESS THAN12.5 MPH
◆WIND SPEED GREATER THAN 12.5 MPH

0.0 PERCENT CALMS
(NOT INCLUDED IN PLOT)

This wind rose displays the frequency of hourly average wind direction from a given sector. In 2001, the predominant wind direction occurred 14.3% of the time from the NNE sector. The average wind speed was 7.3 mph. The peak sector wind speed was 12.3 mph from the WSW.

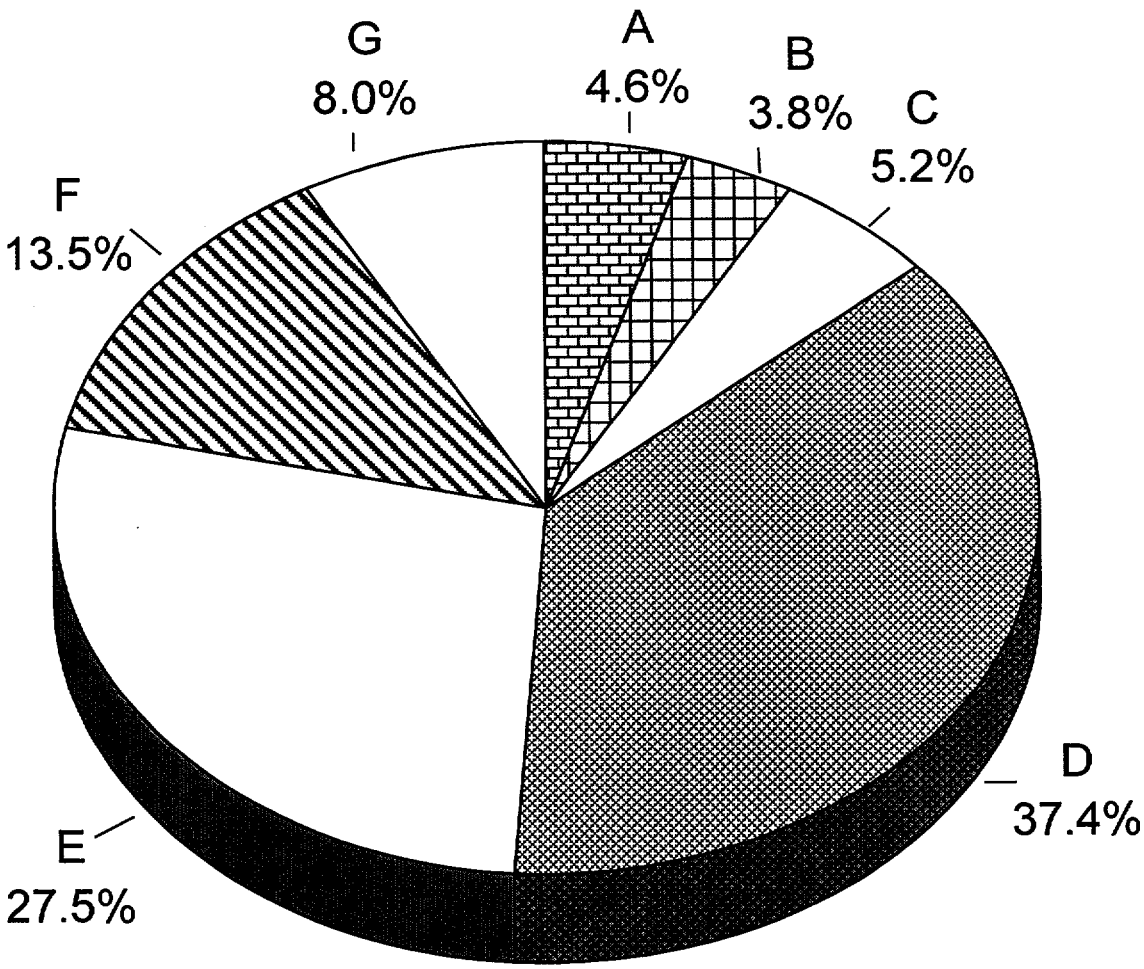
FIGURE 3-2

| Calculation No. | Rev. |
|---|---|
| C-03005G-201 | 0 |
| 02/14/2002 | |
| Page 26 of 28 | |
| Prepared by: | |
| Checked by: | |

Figure 3-3

SSES Pasquil Stability Class Prevalences Data
Period: 2001

**SSES Joint Frequency Distributions at 10 Meters**
**Wind Speed and Direction 10M vs. Delta Temperature 60-10M**
**(Based on 8720 Valid Hours)**



# *SECTION 4*

# *DOSE MEASUREMENTS AND ASSESSMENTS*

## Radiological Impact on Man

Sampling and analysis of airborne and waterborne effluents were performed in accordance with the frequencies, types of analysis, and Lower Limit of Detection (LLD) outlined in the SSES Technical Requirements.

Radioactive material was detected in some of the airborne and waterborne effluent samples analyzed. Dose calculations using measured effluent activity levels, meteorological data from the current reporting period and average river flow dilution factors resulted in estimated doses to individuals at levels below 10 CFR 20 and 10 CFR 50, Appendix I limits. Direct radiation resulting from plant operation, as measured by environmental thermoluminescent dosimeters located around the plant contributed a maximum of 2.71E-2 mrem (measured at TLD Location 9S2) at the Protected Area Boundary south of the plant. The maximum organ/total body dose including thyroid from all airborne effluent is 1.90E-1 mrem (child, skin, Table 4-4). The maximum organ/total body dose from liquid effluent is 3.16E-3 mrem (adult GI-LLI: two times the unit dose shown Table 4-2). Conservatively adding the maximum total body/organ dose from liquid and gaseous effluent (even though different age groups) and the maximum total body dose determined from direct radiation bounds the dose that any member of the public receives from operation of SSES. The result (2.20E-1 mrem) is 0.9% of the 40CFR190 limit of 25 mrem to total body/organ (except thyroid) and 0.3% of the 40CFR190 limit of 75 mrem to the thyroid.

Doses to a maximally exposed member of the public from waterborne effluents are calculated for fish ingestion and shoreline exposure at the plant outfall, and drinking water ingestion at Danville, PA. Site specific parameters used in the calculations for the Danville receiver, specific for actual average blowdown and river level for the entire year are shown in Table 4-1.

**TABLE 4-1**

**SITE-SPECIFIC PARAMETERS USED FOR LADTAP II CALCULATIONS (DANVILLE RECEIVER) FOR 2001**

| PARAMETER | ENTIRE YEAR |
|---|---|
| Cooling Tower Blowdown (CFS) | 18.6 |
| Average Net River Level (ft.) | 5.5 |
| Dilution Factor at Danville[1] | 297.2 |
| Transit time to Danville (hr.)[1] | 31.4 |

[1]From ODCM-QA-005, Att. D

Summaries of maximum individual doses resulting from airborne and waterborne radioactive effluent releases are given in Table 4-2. Meteorological data from Section 3 were used to calculate the dose from airborne effluents.

Technical Specifications 5.5.4 require assessment of radiation doses from radioactive airborne and waterborne effluent to members of the public within the site boundary. There are no significant exposure pathways from waterborne effluents in these areas. Onsite doses are assessed relative to offsite dose values and are adjusted for appropriate dispersion and occupancy factors. Summaries of the calculated maximum doses within the site boundary and selected locations resulting from airborne effluents are presented in Tables 4-3 through 4-4.

SSES Technical Specification 5.5.4 requires that the Annual Effluent Release Reports include an assessment of the radiation dose from radioactive effluents to members of the public within the site boundary. Within the SSES Site Boundary there are several areas frequented by members of the public. The SSES Riverlands Energy Information Center is a representative nearby location visited by members of the public. Doses from airborne effluent are calculated for members of the public for this location. The Riverlands, selected residences within the Site Boundary, and the maximum site boundary location for which dose calculations are performed are shown in Figure 4-1.

In the area comprising the Riverlands recreation area, which surrounds the Energy Information Center, three pathways of radiation exposure can be identified: plume, ground, and inhalation. There are no significant exposure pathways from waterborne effluents in this area. There are approximately 100,000 visitors to the Riverlands/Information Center complex each year. For dose calculations, it is assumed the visitor stays in the area for one hour.

Use of the GASPAR code yields calculated doses for the Riverlands area for the report period. These doses are the total doses at the location from gaseous effluents during the report period. In order to compute doses to members of the public who stay for only short periods of time, these doses are converted to dose rates which are averages for the entire year. Taking into account the estimated 100,000 person-hours of occupancy, the collective (person-rem) doses shown in Table 4-3 are calculated.

## TABLE 4-2

## SUMMARY OF MAXIMUM INDIVIDUAL DOSES TO MEMBERS OF THE PUBLIC

**DATA PERIOD: 1/1/01 TO 12/31/01**

| EFFLUENT | AGE GROUP | APPLICABLE ORGAN | ESTIMATED MAXIMUM DOSE (MREM) | LOCATION | | PERCENT OF LIMIT | LIMIT (MREM)[2] |
|---|---|---|---|---|---|---|---|
| | | | | DIST (MILES) | AFFECTED SECTOR | | |
| Liquid[1] | Teen | Total Body | 1.30E-3 | (3) | | 0.04 | 3 |
| Liquid[1] | Adult | GI-LLI | 3.16E-3 | (3) | | 0.03 | 10 |
| Noble Gas | N/A | Air Dose (Gamma-MRAD) | 9.98E-3 | N/A | N/A | 0.1 | 10 |
| Noble Gas | N/A | Air Dose (Beta-MRAD) | 1.29E-2 | N/A | N/A | 0.1 | 20 |
| Airborne Iodine, Tritium and Particulates [4] | Child | Lung | 1.84E-1 | 1.10 | WSW | 1.2 | 15 |

[1]Estimated dose is based on a site total activity release equally divided between Unit 1 and Unit 2.

[2]10 CFR 50, Appendix I limits are in terms of mrad or mrem/reactor-year for airborne effluent and mrem per year for waterborne effluent from each unit.

[3]Doses from liquid effluent are estimated from fish ingestion and shoreline exposure at the site outfall and from the drinking water pathway at Danville, PA.

[4]Estimated dose is based on the site total activity release.

## TABLE 4-3

## CALCULATED COLLECTIVE DOSES TO MEMBERS OF THE PUBLIC WITHIN THE RIVERLANDS/INFORMATION CENTER COMPLEX

**DATA PERIOD: 1/1/01 TO 12/31/01**

| EFFLUENT | AGE GROUP | APPLICABLE ORGAN | DOSE RATE[1] (MREM/HR) | COLLECTIVE DOSE[2] (PERSON-REM) |
|---|---|---|---|---|
| Noble Gas | N/A | Total Body | 1.66E-05 | 1.66E-03 |
| Noble Gas | N/A | Skin | 1.79E-05 | 1.79E-03 |
| Iodine, Tritium and Particulates | Teen | Skin | 1.58-05 | 1.58E-03 |

[1]Estimated dose rate is based on annual site total activity release (Table 4-4).

[2]Collective dose is based on occupancy of 100,000 person-hours.

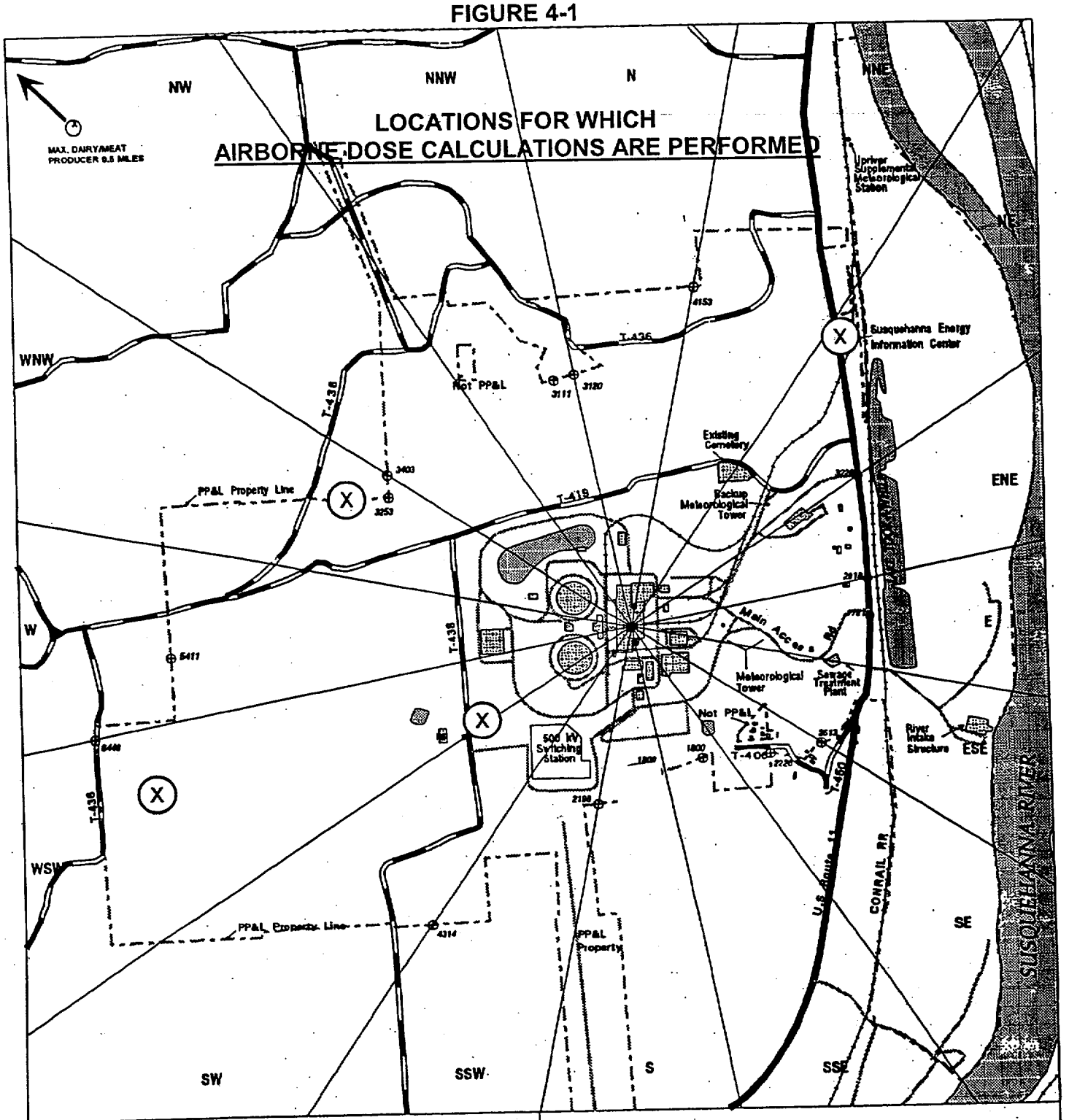
## TABLE 4-4

## SUMMARY OF MAXIMUM INDIVIDUAL DOSES FROM AIRBORNE EFFLUENT

| LOCATION | PATHWAY | MAXIMUM TOTAL BODY DOSE (MREM) | | MAXIMUM ORGAN DOSE (MREM) | | MAXIMUM THYROID DOSE (MREM) | |
|---|---|---|---|---|---|---|---|
| 1. Maximum site boundary X/Q | Plume | 3.94E-03 | | 1.05E-02 | | 3.94E-03 | |
| | Ground | 4.34E-03 | | 5.11E-03 | | 4.34E-04 | |
| | Inhalation | 7.93E-02 | | 8.08E-02 | | 7.93E-02 | |
| | **Total** | **8.76E-02** | **(TEEN)** | **9.64E-02** | **(TEEN, LUNG)** | **8.37E-02** | **(TEEN)** |
| 2. Closest site boundary | Plume | 1.27E-03 | | 3.38E-03 | | 1.27E-03 | |
| | Ground | 6.47E-03 | | 7.60E-03 | | 6.47E-03 | |
| | Inhalation | 2.49E-02 | | 2.54E-02 | | 2.49E-02 | |
| | **Total** | **3.26E-02** | **(TEEN)** | **3.64E-02** | **(TEEN, LUNG)** | **3.26E-02** | **(TEEN)** |
| 3. Maximum X/Q Residence | Plume | 2.68E-03 | | 7.11E-03 | | 2.68E-03 | |
| | Ground | 2.81E-03 | | 3.31E-03 | | 2.81E-03 | |
| | Inhalation | 5.44E-02 | | 5.44E-02 | | 5.44E-02 | |
| | **Total** | **5.99E-02** | **(TEEN)** | **6.48E-02** | **(TEEN, SKIN)** | **5.99E-02** | **(TEEN)** |
| 4. Maximum D/Q Residence | Plume | 1.94E-03 | | 5.14E-03 | | 1.94E-03 | |
| | Ground | 3.35E-03 | | 3.94E-03 | | 3.35E-03 | |
| | Inhalation | 3.87E-02 | | 3.87E-02 | | 3.87E-02 | |
| | **Total** | **4.40E-02** | **(TEEN)** | **4.78E-02** | **(TEEN, SKIN)** | 4.40E-02 | **(TEEN)** |
| 5. Maximum D/Q Garden | Plume | 2.54E-03 | | 6.75E-03 | | 2.54E-03 | |
| | Ground | 2.66E-03 | | 3.13E-03 | | 2.66E-03 | |
| | Vegetation | 1.36E-01 | | 1.36E-01 | | 1.36E-01 | |
| | Inhalation | 4.37E-02 | | 4.37E-02 | | 4.37E-02 | |
| | **Total** | **1.85E-01** | **(CHILD)** | **1.90E-01** | **(CHILD, SKIN)** | **1.85E-01** | **(CHILD)** |
| 6. Maximum D/Q Dairy | Plume | 1.26E-03 | | 3.35E-03 | | 1.26E-03 | |
| | Ground | 1.32E-03 | | 1.55E-03 | | 1.32E-03 | |
| | Vegetation | 7.23E-02 | | 7.22E-02 | | 7.22E-02 | |
| | Meat | 6.11E-03 | | 6.11E-03 | | 6.11E-03 | |
| | Cow Milk | 4.48E-02 | | 4.48E-02 | | 4.48E-02 | |
| | Inhalation | 2.62E-02 | | 2.62E-02 | | 2.62E-02 | |
| | **Total** | **1.52E-01** | **(CHILD)** | **1.54E-01** | **(CHILD, SKIN)** | 1.52E-01 | **(CHILD)** |
| 7. Maximum D/Q Meat | Plume | 2.50E-04 | | 6.66E-04 | | 2.50E-04 | |
| | Ground | 5.02E-04 | | 5.90E-04 | | 5.02E-04 | |
| | Vegetation | 1.45E-02 | | 1.45E-02 | | 1.45E-02 | |
| | Meat | 8.84E-04 | | 8.82E-04 | | 8.82E-04 | |
| | Inhalation | 4.64E-03 | | 4.64E-03 | | 4.64E-03 | |
| | **Total** | **2.08E-02** | **(CHILD)** | **2.13E-02** | **(CHILD, SKIN)** | **2.08E-02** | **(CHILD)** |
| 8. Tower's Club | Plume | 1.17E-03 | | 3.11E-03 | | 1.17E-03 | |
| | Ground | 4.11E-03 | | 4.83E-03 | | 4.11E-03 | |
| | Inhalation | 2.32E-02 | | 2.32E-02 | | 2.32E-02 | |
| | **Total** | **2.85E-02** | **(TEEN)** | **3.11E-02** | **(CHILD, SKIN)** | **2.85E-02** | **(TEEN)** |
| 9. Riverland/EIC | Plume | 6.58E-03 | | 1.75E-02 | | 6.58E-03 | |
| | Ground | 8.08E-03 | | 9.50E-03 | | 8.08E-03 | |
| | Inhalation | 1.30E-01 | | 1.30E-01 | | 1.30E-01 | |
| | **Total** | **1.45E-01** | **(TEEN)** | **1.57E-01** | **(CHILD, SKIN)** | **1.45E-01** | **(TEEN)** |

Note: The doses shown above are based on 100% occupancy at the indicated locations.

FIGURE 4-1




SUSQUEHANNA STEAM ELECTRIC STATION
EMERGENCY PLAN BOUNDARY DISTANCES
(DISTANCES IN FEET)

PENNSYLVANIA POWER & LIGHT

LEGEND

- PP&L Property Boundary
- Sector Wheel (22.5-degree)
- Roads
- Railroads
- (X) Locations for airborne dose calculations

Scale in Feet

0 500 1000 2000

## *SECTION 5*

## *CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL AND THE SOLID RADIOACTIVE WASTE PROCESS CONTROL PROGRAM*

## CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

The only revision to the ODCM that occurred during 2001 was Revision 3 to ODCM-QA-008, titled, "Radiological Environmental Monitoring Program." This revision became effective on May 22, 2001. This revision incorporated the following changes:

1. Milk sampling location 7C1 was replaced with location 10D3 on the map of Attachment B of ODCM-QA-008.

2. The description of milk sampling location 7C1 was replaced with that for location 10D3 in Attachment C.

3. Air sampling locations 5S4, 7S7, 9B1, and 10S3 were deleted from Attachments A, B, and C, as applicable.

4. Section 4.1.1 was revised to assign responsibilities formerly assigned to the Supervisor – Operations Technology to the Supervisor – Environmental Services – Nuclear.

5. Additional changes of a minor editorial nature were made to Attachments A and C.

Changes #1 and #2 regarding milk sampling locations were made based on the result of an Annual REMP Milk Sampling Location Evaluation performed in April 2000 as required by ST-099-004 and TRO 3.11.4.2 Action B.1. This evaluation determined that location 10D3 could be expected to have a sufficiently higher relative deposition rate than location 7C1, based on 1999 meteorological data, to require that location 10D3 be monitored.

Change #3 regarding air sampling locations did not involve monitoring locations that were required in accordance with TRO 3.11.4.1 and TR Table 3.11.4.1-1. This change was based on an evaluation performed in December 2000 to satisfy the requirements of Section 6.9.5 of NEPM-QA-1014, titled, "Radiological Environmental Monitoring Program." This evaluation made the following conclusions:

1. The highest projected annual doses to a Member of the Public at any of the deleted sampling locations were less than or equal to 10% of the total projected dose for the airborne pathway based on environmental monitoring.

2. The highest total reporting level fraction (RLF) from all radionuclides identified in air and attributable to SSES operation was less than or equal to 0.10 at each of these locations based on environmental monitoring.

It should be noted that for the period of at least three years considered in this evaluation, no radionuclide activity was identified in air samples obtained from any of these locations that was attributable to the operation of Susquehanna SES.

Safety Evaluation NR-01-001 was performed to support this ODCM revision. None of the changes listed above reduce the level of effluent control or the accuracy and/or reliability of dose calculations or setpoint determinations as required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I.

Besides the change to ODCM-QA-008, a PCAF (2001-1947) was issued against ODCM-QA-009, Revision 0. Other than clarifications of definitions, this change added the isolated bus duct cooling system as "not an effluent pathway." The PCAF is included in Appendix A.

## CHANGES TO THE
## SOLID WASTE PROCESS CONTROL PROGRAM

The only revision to the "Solid Waste Process Control Program," NDAP-QA-0646 that occurred during 2001 was Revision 6. This revision became effective on June 6, 2001. This revision incorporated the following changes:

1. Added reference to appropriate FSAR section.

2. Adjusted responsibilities to reflect changes in the distribution of work within the Effluents Management group.

3. Corrected document references in response to changes in the Effluents Management training program.

4. Changed names in Responsibilities section to reflect current titles.

5. Added definition for gross dewatering and description of how/when this process may be used.

6. Changeout waste type descriptions to reflect current processing method.

7. Deleted requirements for guaranteed volume calculations and tracking including Form NDAP-QA-0646-3. Information is no longer required by contracts.

8. Deleted LLRWHF procedures from PCP implementing matrix.

9. Various administrative changes to reflect current company name, etc.

10. Clarified references to DOT package specifications to eliminate confusion.

11. Removed restrictions on combining waste of different Waste Class to improve packaging efficiency and flexibility.

NDAP-QA-0646 continues to fully implement the requirements and intent of the following:

1. Sections 11.4 and 13.5 of the FSAR
2. Section 3.7.4 of the Technical Requirements Manual
3. 10 CFR 20, 10 CFR 61, 10 CFR 71, 49 CFR 100-177, and 40 CFR 261.

Compliance with all applicable regulatory requirements listed above continues to be met as the result of these changes to the program. These changes to the Process Control Program will not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes.

## PROCESS CONTROL PROGRAM CHANGES

The following changes were made to the Process Control Program and implementing procedures during 2001. None of the changes reduce the overall conformance of the solidified waste product to existing criteria for solid wastes. All changes were reviewed and approved by PORC as documented on the attached Procedure Change Process Forms. The following procedures were changed:

1. NDAP-QA-0646, Process Control Program

2. WM-RP-105, Cartridge Filter Processing and Packaging

3. WM-RP-107, Transfer and Drying Powdered Resin

4. WM-PS-155, 10 CFR 61 Sample Shipping and Correlation Factor Determination

5. WM-PS-210, Packaging and Loading of DAW and Radioactive Material

6. CH-TP-055, Solid Radwaste 10 CFR 61 Correlation Factor Determination – Sample Collection and Preparation. (Note: The change to this procedure was strictly a periodic review and change to the review due date and administrative titles. There were no changes to technical information. The change was not reviewed by PORC.)

## PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. N/A | 2. PAGE 1 OF ~~4~~ 3 | 3. PROC. NO. NDAP-QA-0646 REV. 6

4. FORMS REVISED - 1 R ~~84~~, - 2 R ~~85~~, - 3 R 3 (DELETED), - ___ R___, - ___ R___, - ___ R___

5. PROCEDURE TITLE
Solid Radioactive Waste Process Control Program

6. REQUESTED CHANGE
PERIODIC REVIEW ☐ NO ☒ YES
INCORPORATE PCAFS ☒ NO ☐ YES # _____ # _____ # _____ # _____
REVISION ☒ PCAF ☐ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
The following changes will not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes:
1. Added reference to appropriate FSAR sections.
2. Adjusted responsibilities to reflect changes in the distribution of work within the Effluents Management Group.
3. Corrected document references in response to changes in the Effluents Management Training Program.
4. Changed names in responsibilities section to reflect current titles.
5. Added definition for gross-dewatering and description of how/when this process may be used.

CONT'D ON PAGE 3 Continued ☒

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)
PORC REVIEW REQ'D? ☐ NO ☒ YES
ERC REVIEW REQ'D? ☒ NO ☐ YES

9. PORC MTG# 01-05-31
10. ERC MTG# N/A

**BLOCKS 11 THRU 14 ARE ON PAGE 2 OF FORM**

15. Thomas Kalinowski / 254-1940 / 5/23/01
PREPARER (Print or Type) / ETN / DATE

16. COMMUNICATION OF CHANGE REQUIRED?
☒ NO ☐ YES (TYPE) _____

17. [signature] / 5-23-01
RESPONSIBLE SUPERVISOR / DATE

SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 14 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 14 OR ATTACHED REVIEW FORMS.

18. [signature] / 5/23/01
FUM APPROVAL / DATE

19. RESPONSIBLE APPROVER [signature] / 5/31/01
INITIALS / DATE

ENTER N/A IF FUM HAS APPROVAL AUTHORITY

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FORM NDAP-QA-0002-8, Rev. 7, Page 1 of 2 (Electronic Form)

## PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. N/A | 2. PAGE 2 OF ~~61~~ 3 | 3. PROC. NO. NDAP-QA-0646 REV. 6 |
|---|---|---|

11. A 50.59 and 72.48 Evaluation per NDAP-QA-0726 is required to be attached or referenced for all procedure changes except Expedited Reviews and Administrative Corrections. Either 11a, b, or c must be checked "YES" and the appropriate form attached or referenced.

| | | |
|---|---|---|
| a. 50.59 and 72.48 Screening Determination (Form NDAP-QA-0726-5) | ☒ YES | ☐ N/A |
| b. 50.59 or 72.48 Safety Evaluation (Note: 50.59 Safety Evaluations prepared on Form NDAP-QA-0726-1 Rev. 5 or earlier also require a 50.59 & 72.48 Screening Determination)<br>Safety Evaluation No. _____ | ☐ YES | ☒ N/A |
| c. Expedited Review/Administrative Correction- 50.59 and 72.48 Evaluation not Required | ☐ YES | ☒ N/A |
| 12. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? | ☐ YES | ☒ NO |
| 13. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) | ☐ YES | ☒ NO |

14. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER _____ | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. ([58])

** Required for changes to Section XI Inservice Test Acceptance Criteria.

FORM NDAP-QA-0002-8, Rev. 7, Page 2 of 2 (Electronic Form)

Continued.

6. Change out waste type descriptions to reflect current processing methods.
7. Deleted requirements for guaranteed volume calculations and tracking including Form NDAP-QA-0646-3. Information is no longer required by contracts.
8. Deleted LLRWHF procedures from PCP implementing matrix.
9. Various administrative changes to reflect current Company name, etc.
10. Clarified references to DOT package specifications to eliminate confusion.
11. Removed restrictions on combining waste of different Waste Classes to improve packaging efficiency and flexibility.

## PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. N/A | 2. PAGE 1 OF 2 | 3. PROC. NO. WM-RP-105 REV. 4

4. FORMS REVISED - 1 R 5 - ___ R___, - ___ R___, - ___ R___, - ___ R___, - ___ R___

5. PROCEDURE TITLE
CARTRIDGEFILTERPROCESSING AND PACKAGING

6. REQUESTED CHANGE
PERIODIC REVIEW ☒ NO ☐ YES
INCORPORATE PCAFS ☐ NO ☒ YES # 2000-5442 # _____ # _____ # _____
REVISION ☒ PCAF ☐ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
Incorporated PCAF #2000-5442.
Incorporated various minor administrative changes.
Referenced applicable Effluents Management Procedures and Technical Bases.
Added use of Shop Dri as an absorbent and added new CFS filters.
Added note to allow packaging for shipment to a vendor processor. Liquid absorbant for shipment to vendors is no longer required.
Added combustible gas test IAW NDAP-QA-0646.
Revised FORM WM-RP-105-1
Continued ☐

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)
PORC REVIEW REQ'D? ☐ NO ☒ *YES*
ERC REVIEW REQ'D? ☒ NO ☐ *YES*

9. ***PORC MTG#*** 01-05-24

10. ***ERC MTG#*** N/A

***BLOCKS 11 THRU 14 ARE ON PAGE 2 OF FORM***

15. Michael C. Micca / 1790 / 5/2/01
PREPARER (Print or Type) / ETN / DATE

16. COMMUNICATION OF CHANGE REQUIRED?
☐ NO ☒ YES (TYPE) Non-Routine

17. RESPONSIBLE SUPERVISOR / 5/2/01 DATE
SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 14 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 14 OR ATTACHED REVIEW FORMS.

18. FUM APPROVAL / 5/2/01 DATE

19. RESPONSIBLE APPROVER
RAS / 5/24/01
INITIALS / DATE
ENTER N/A IF FUM HAS APPROVAL AUTHORITY

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FORM NDAP-QA-0002-8, Rev. 7, Page 1 of 2 (Electronic Form)

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## PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. N/A | 2. PAGE 2 OF ~~1~~ 2 | 3. PROC. NO. WM-RP-105 REV. 4 |
|---|---|---|

11. A 50.59 and 72.48 Evaluation per NDAP-QA-0726 is required to be attached or referenced for all procedure changes except Expedited Reviews and Administrative Corrections. Either 11a, b, or c must be checked "YES" and the appropriate form attached or referenced.

| | | |
|---|---|---|
| a. 50.59 and 72.48 Screening Determination (Form NDAP-QA-0726-5) | ☒ YES | ☐ N/A |
| b. 50.59 or 72.48 Safety Evaluation (Note: 50.59 Safety Evaluations prepared on Form NDAP-QA-0726-1 Rev. 5 or earlier also require a 50.59 & 72.48 Screening Determination)<br>Safety Evaluation No. _____ | ☐ YES | ☒ N/A |
| c. Expedited Review/Administrative Correction- 50.59 and 72.48 Evaluation not Required | ☐ YES | ☒ N/A |
| 12. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? | ☐ YES | ☒ NO |
| 13. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) | ☐ YES | ☒ NO |

14. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER _____ | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. ([58])

** Required for changes to Section XI Inservice Test Acceptance Criteria.

FORM NDAP-QA-0002-8, Rev. 7, Page 2 of 2 (Electronic Form)

## PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. NA | 2. PAGE 1 OF 37 | 3. PROC. NO. WM-RP-107 REV. 5

4. FORMS REVISED - 1 R 2 , - 2 R 0 , - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___

5. PROCEDURE TITLE
Transfer and Drying Powdered Resin

6. REQUESTED CHANGE
PERIODIC REVIEW ☒ NO ☐ YES
INCORPORATE PCAFS ☐ NO ☒ YES # 1999-6916 # _____ # _____ # _____
REVISION ☒ PCAF ☐ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
1. Changed "Radwaste Supervisor" references to "Wet Waste Program Owner" to be consistent with NDAP-QA-0640, 'Conduct of Effluents Management'.
2. Reorganized procedure steps to be consistent with actual order in which they are performed.
3. Changed Form WM-RP-107-1 sign-offs to be consistent with procedure order. Numbered sign-offs to reference procedure steps.
4. Created Form WM-RP-107-2 to separate temperature/humidity data collection from processing sign-offs.
5. Changed valve references to be consistent with actual valve names used on the vendor equipment.
6. Clarified Fill-head/Fill-plate installation instructions to ensure a spacer is included.

Continued ☒

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)
PORC REVIEW REQ'D? ☐ NO ☒ *YES*
ERC REVIEW REQ'D? ☒ NO ☐ *YES*

9. ***PORC MTG#*** 01-04-19

10. ***ERC MTG#*** _____

***BLOCKS 11 THRU 14 ARE ON PAGE 2 OF FORM***

15. Tom Kalinowski / 1940 / 4/2/01
PREPARER (Print or Type) / ETN / DATE

16. COMMUNICATION OF CHANGE REQUIRED?
☒ NO ☐ YES (TYPE) _____

17. [signature] 4/6/01
RESPONSIBLE SUPERVISOR / DATE

SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 14 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 14 OR ATTACHED REVIEW FORMS.

18. [signature] 4/6/01
FUM APPROVAL / DATE

19. RESPONSIBLE APPROVER [signature] 4/19/01
INITIALS / DATE

ENTER N/A IF FUM HAS APPROVAL AUTHORITY

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FORM NDAP-QA-0002-8, Rev. 7, Page 1 of 2 (Electronic Form)

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## PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. NA | 2. PAGE 2 OF 3 | 3. PROC. NO. WM-RP-107 REV. 5 |
|---|---|---|

11. A 50.59 and 72.48 Evaluation per NDAP-QA-0726 is required to be attached or referenced for all procedure changes except Expedited Reviews and Administrative Corrections. Either 11a, b, or c must be checked "YES" and the appropriate form attached or referenced.

| | | |
|---|---|---|
| a. 50.59 and 72.48 Screening Determination (Form NDAP-QA-0726-5) | ☒ YES | ☐ N/A |
| b. 50.59 or 72.48 Safety Evaluation (Note: 50.59 Safety Evaluations prepared on Form NDAP-QA-0726-1 Rev. 5 or earlier also require a 50.59 & 72.48 Screening Determination)<br>Safety Evaluation No. _____ | ☐ YES | ☒ N/A |
| c. Expedited Review/Administrative Correction- 50.59 and 72.48 Evaluation not Required | ☐ YES | ☒ N/A |
| 12. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? | ☐ YES | ☒ NO |
| 13. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) | ☐ YES | ☒ NO |

14. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER _____ | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. (58)

** Required for changes to Section XI Inservice Test Acceptance Criteria.

FORM NDAP-QA-0002-8, Rev. 7, Page 2 of 2 (Electronic Form)

SUMMARY OF /REASON FOR CHANGE (continued)

7. Clarified contamination control instructions to ensure appropriate measures are taken at all times.
8. Clarified container preparation requirements and verifications.
9. Added container inspection requirements for waste residue in response to CR # 188042, Bead Resin on Liner at Disposal Facility.

# PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. 2001-1488 | 2. PAGE 1 OF 3 | 3. PROC. NO. WM-PS-155 REV. 2

4. FORMS REVISED - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___

5. PROCEDURE TITLE
10CFR61 SAMPLE SHIPPING AND CORRELATION FACTOR DETERMINATION

6. REQUESTED CHANGE
PERIODIC REVIEW ☒ NO ☐ YES
INCORPORATE PCAFS ☒ NO ☐ YES # _____ # _____ # _____ # _____
REVISION ☐ PCAF ☒ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
Added step to inform Health Physics Management when 10CFR61 analyses include the presence of transuranics. This step was added in response to an action item identified from the 1999 Internal Dose Control Assessment.

Continued ☒

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)
PORC REVIEW REQ'D? ☐ NO ☒ *YES*
ERC REVIEW REQ'D? ☒ NO ☐ *YES*

9. *PORC MTG#* 01-06-28
10. *ERC MTG#* N/A

***BLOCKS 11 THRU 14 ARE ON PAGE 2 OF FORM***

15. Michael C. Micca / 1790 / 6/7/01
PREPARER (Print or Type) / ETN / DATE

16. COMMUNICATION OF CHANGE REQUIRED?
☒ NO ☐ YES (TYPE) _____

17. [signature] 6/7/01
RESPONSIBLE SUPERVISOR / DATE

SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 14 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 14 OR ATTACHED REVIEW FORMS.

18. [signature] 6/8/01
FUM APPROVAL / DATE

19. RESPONSIBLE APPROVER [signature] 6/29/01
INITIALS / DATE

ENTER N/A IF FUM HAS APPROVAL AUTHORITY

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# PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. 2001-1488 | 2. PAGE 2 OF 3 | 3. PROC. NO. WM-PS-155 REV. 2 |
|---|---|---|

11. A 50.59 and 72.48 Evaluation per NDAP-QA-0726 is required to be attached or referenced for all procedure changes except Expedited Reviews and Administrative Corrections. Either 11a, b, or c must be checked "YES" and the appropriate form attached or referenced.

    a. 50.59 and 72.48 Screening Determination (Form NDAP-QA-0726-5) ☒ YES ☐ N/A

    b. 50.59 or 72.48 Safety Evaluation (Note: 50.59 Safety Evaluations prepared on Form NDAP-QA-0726-1 Rev. 5 or earlier also require a 50.59 & 72.48 Screening Determination) ☐ YES ☒ N/A

    Safety Evaluation No. _____

    c. Expedited Review/Administrative Correction- 50.59 and 72.48 Evaluation not Required ☐ YES ☒ N/A

12. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? ☐ YES ☒ NO

13. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) ☐ YES ☒ NO

14. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER _____ | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. ([58])

** Required for changes to Section XI Inservice Test Acceptance Criteria.

## PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. NA | 2. PAGE 1 OF 2 | 3. PROC. NO. WM-PS-210 REV. 5

4. FORMS REVISED - 01 R 6 , - 02 R 5 , - 03 R 3 , - ___ R___ , - ___ R___ , - ___ R___

5. PROCEDURE TITLE
Packaging and Loading of DAW and Radioactive Material

6. REQUESTED CHANGE
PERIODIC REVIEW ☒ NO ☐ YES
INCORPORATE PCAFS ☐ NO ☒ YES # 2000-4835 # _____ # _____ # _____
REVISION ☐ PCAF ☐ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
Reorganized some steps to be consistent with practice. Added "*"s to body of procedure to indicate where signatures on forms are required. Added instructions on what needs to be documented on the "Material Description" column on Form WM-PS-210-1. Provided guidance for packages with dose rates approaching shipping limits. Clarified labeling requirements due to Condition Report #220636. Updated absorbent requirements used for packaging liquids due to the intended use of a new brand of absorbent. Updated drum closure requirements. Revised all WM-PS-210 forms. Various administrative corrections. Incorporated PCAF #2000-4835.

Continued ☐

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)
PORC REVIEW REQ'D? ☐ NO ☒ YES

9. PORC MTG# 01-09-27

**BLOCKS 11 THRU 16 ARE ON PAGE 2 OF FORM**

17. Mike Micca / 1790 / 09/13/2001
PREPARER (Print or Type) / ETN / DATE

18. COMMUNICATION OF CHANGE REQUIRED?
☐ NO ☒ YES (TYPE) Non-Routine Training

19. [signature] 9/13/01
RESPONSIBLE SUPERVISOR / DATE

SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 16 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 16 OR ATTACHED REVIEW FORMS.

20. [signature] 9/13/01
FUM APPROVAL / DATE

21. RESPONSIBLE APPROVER [signature] 10/3/01
INITIALS / DATE

ENTER N/A IF FUM HAS APPROVAL AUTHORITY

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FORM NDAP-QA-0002-8, Rev. 8, Page 1 of 2 (Electronic Form)

## PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. NA | 2. PAGE 2 OF 2 | 3. PROC. NO. WM-PS-210 REV. 5 |
|---|---|---|

11. This question documents the outcome of the 50.59 and 72.48 Review required by NDAP-QA-0726. Either 11a, b, c or d must be checked "YES" and the appropriate form attached or referenced.

| | | |
|---|---|---|
| a. This change is an Administrative Correction for which 50.59 and 72.48 are not applicable. | ☐ YES | ☒ N/A |
| b. This change is a change to any surveillance, maintenance or administrative procedure for which 50.59 and 72.48 are not applicable. A-01-363 | ☒ YES | ☐ N/A |
| c. This change is bounded by a 50.59/72.48 Screen/Evaluation, therefore, no new 50.59/72.48 Evaluation is required. Screen/Evaluation No. _____ | ☐ YES | ☒ N/A |
| d. 50.59 and/or 72.48 are applicable to this change and a 50.59/72.48 Screen/Evaluation is attached. | ☐ YES | ☒ N/A |
| 12. This change is consistent with the FSAR or an FSAR change is required. Change Request No. _____ | ☒ YES | |
| 13. Should this change be reviewed for potential effects on Training Needs or Material? If YES, enter an Action Item @ NIMS/Action/Gen Work Mech/PICN | ☐ YES | ☒ NO |
| 14. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? | ☐ YES | ☒ NO |
| 15. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) | ☐ YES | ☒ NO |

16. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER _____ | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. (50)

** Required for changes to Section XI Inservice Test Acceptance Criteria.

FORM NDAP-QA-0002-8, Rev. 8, Page 2 of 2 (Electronic Form)

# PROCEDURE CHANGE PROCESS FORM

1. PCAF NO. 2001-1327 | 2. PAGE 1 OF 4 | 3. PROC. NO. CH-TP-055 REV. 5

4. FORMS REVISED - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___ , - ___ R___

5. PROCEDURE TITLE
SOLID RADWASTE 10CFR61 CORRELATION FACTOR DETERMINATION - SAMPLE COLLECTION AND PREPARATION

6. REQUESTED CHANGE

PERIODIC REVIEW ☐ NO ☒ YES

INCORPORATE PCAFS ☒ NO ☐ YES # _____ # _____ # _____ # _____

REVISION ☐ PCAF ☒ DELETION ☐ (CHECK ONE ONLY)

7. SUMMARY OF / REASON FOR CHANGE
Procedure was reviewed and is suitable for use.
Periodic review due date and titles were updated.
This is an administrative correction.

Continued ☐

8. DETERMINE COMMITTEE REVIEW REQUIREMENTS
(Refer to Section 6.1.4)

PORC REVIEW REQ'D? ☒ NO ☐ *YES*

ERC REVIEW REQ'D? ☒ NO ☐ *YES*

9. *PORC MTG#* NA

10. *ERC MTG#* NA

***BLOCKS 11 THRU 14 ARE ON PAGE 2 OF FORM***

15. Karen Ziolkowski / 1825 / 3-29-01
PREPARER (Print or Type) | ETN | DATE

16. COMMUNICATION OF CHANGE REQUIRED?
☒ NO ☐ YES (TYPE) NA

17. Raymond E. Doeller 3/29/01
RESPONSIBLE SUPERVISOR | DATE

SIGNATURE ATTESTS THAT RESPONSIBLE SUPERVISOR HAS CONDUCTED QADR AND TECHNICAL REVIEW UNLESS OTHERWISE DOCUMENTED IN BLOCK 14 OR ATTACHED REVIEW FORMS. CROSS DISCIPLINE REVIEW (IF REQUIRED) HAS BEEN COMPLETED BY SIGNATURE IN BLOCK 14 OR ATTACHED REVIEW FORMS.

18. NA
FUM APPROVAL | DATE

19. RESPONSIBLE APPROVER
NA
INITIALS | DATE

ENTER N/A IF FUM HAS APPROVAL AUTHORITY

CONTROLLED

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## PROCEDURE CHANGE PROCESS FORM

| 1. PCAF NO. 2001-1327 | 2. PAGE 2 OF 4 | 3. PROC. NO. CH-TP-055 REV. 5 |
|---|---|---|

11. A 50.59 and 72.48 Evaluation per NDAP-QA-0726 is required to be attached or referenced for all procedure changes except Expedited Reviews and Administrative Corrections. Either 11a, b, or c must be checked "YES" and the appropriate form attached or referenced.

    a. 50.59 and 72.48 Screening Determination (Form NDAP-QA-0726-5) ☐ YES ☒ N/A

    b. 50.59 or 72.48 Safety Evaluation (Note: 50.59 Safety Evaluations prepared on Form NDAP-QA-0726-1 Rev. 5 or earlier also require a 50.59 & 72.48 Screening Determination) ☐ YES ☒ N/A

    Safety Evaluation No. NA

    c. Expedited Review/Administrative Correction- 50.59 and 72.48 Evaluation not Required ☒ YES ☐ N/A

12. Is a Surveillance Procedure Review Checklist required per NDAP-QA-0722? ☐ YES ☒ NO

13. Is a Special, Infrequent or Complex Test/Evolution Analysis Form required per NDAP-QA-0320? (SICT/E form does not need to be attached.) ☐ YES ☒ NO

14. Reviews may be documented below or by attaching Document Review Forms NDAP-QA-0101-1.

| REVIEW | REVIEWED BY WITH NO COMMENTS | DATE |
|---|---|---|
| QADR | | |
| TECHNICAL REVIEW | | |
| REACTOR ENGINEERING/NUCLEAR FUELS * | | |
| IST ** | | |
| OPERATIONS | | |
| NUCLEAR SYSTEMS ENGINEERING | | |
| NUCLEAR MODIFICATIONS | | |
| MAINTENANCE | | |
| HEALTH PHYSICS | | |
| NUCLEAR TECHNOLOGY | | |
| CHEMISTRY | | |
| OTHER NA | | |

* Required for changes that affect, or have potential for affecting core reactivity, nuclear fuel, core power level indication or impact the thermal power heat balance. (58)

** Required for changes to Section XI Inservice Test Acceptance Criteria.

# *SECTION 6*

## *MISCELLANEOUS TECHNICAL REQUIREMENTS MANUAL (TRM) FSAR AND 40CFR190 REPORTING*

1. TRM Action 3.11.1.4.F.2 requires the reporting of Liquid Radwaste Effluent Monitoring Instrumentation inoperability not corrected in a timely.

   None to report for 2001.

2. TRM Action 3.11.1.5.C.1 requires the reporting of Radioactive Liquid Process Effluent Monitoring Instrumentation inoperability not corrected in a timely.

   None to report for 2001.

3. TRM Action 3.11.2.6.K requires an explanation for Radioactive Gaseous Effluent Monitoring Instrumentation required actions and completion times not met.

   None to report for 2001.

4. TRM Action 3.11.4.1.F.2 requires reporting the cause of the unavailability of milk or fresh leafy vegetables samples and identify the new locations for obtaining replacements.

   None to report for 2001. [Note: Milk samples were acquired at three locations per the requirements of Table 3.11.4.1-1. Milk sampling at a fourth location was discontinued because dairy farming was discontinued. There was no need to identify a new location because samples were already being gathered from three locations per the requirements]

5. TRM Action 3.11.4.2.A requires reporting when land use census identifies a new location which yields a calculated dose or dose commitment greater than the values currently being calculated.

   None to report for 2001.

6. TRM Action 3.11.4.2.B requires reporting when land use census identifies locations that yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained.

   None to report for 2001. [Note: The 2000 Land Use Census determined that the relative disposition rate at a dairy farm exceeded those for each of the current milk monitoring locations by more than 20 percent. This would normally mean that the location with the lowest disposition rate be replaced. However, it was determined that samples of milk from the four cows at the new location are not available and no changes were made in milk monitoring locations during 2001.

7. The 40CFR190.10 standard for normal operation for the uranium fuel cycle including annual dose equivalent and total quantities of radioactive material limits were not exceeded by SSES operation. Refer to Page 4-2 for specific values.

8. FSAR Section 11.6.11 requires the reporting of airborne radioactivity detected in the Low Level Radwaste Holding Facility. None detected in 2001.

## *SECTION 7*

## *CORRECTIONS TO DOSES REPORTED IN PREVIOUS SEMIANNUAL OR ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT*

## CORRECTIONS TO DOSES REPORTED IN PREVIOUS SEMIANNUAL OR ANNUAL EFFLUENT AND WASTE DISPOSAL REPORTS

Sampling of milk at location 10D3, the Drasher Farm, located 3.5 miles SSW of the SSES, was initiated in April 2000. Sampling at this location was begun based on the results of an annual evaluation of 1999 meteorological data for potential milk sampling locations identified by the 1999 Annual Land Use Census. This evaluation looks at the relative sensitivities expected for the detection of any radionuclides that might be released to the air from SSES operation at potential monitoring locations. The purpose of this evaluation is to determine if any of the current REMP milk monitoring locations should be replaced by locations that might be more sensitive for detecting airborne radioactivity attributable to SSES operation. The results of the evaluation, performed in April 2000, indicated that location 10D3 should replace location 7C1 as a milk monitoring location. Since April 24, 2000, milk sampling has been taking place at both locations, 10D3 and 7C1. Milk monitoring at the radiological environmental monitoring program (REMP) location 7C1 was discontinued at the beginning of 2001. The reason for this change was that the Zajac farm (7C1) went out of the dairy farming business and sold all of its cows. Therefore, milk could no longer be obtained from this location.

# *SECTION 8*

# *EFFLUENT FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS*

## EFFLUENT FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS

Systems classified as Insignificant Effluent Pathways are evaporation from the Unit 1 and Unit 2 Condensate Storage Tanks (CSTs) and the common Refueling Water Storage Tank (RWST) and from the Hydrogen Seal Oil and the Main Turbine and RFPT lubrication oil mist eliminators which vent to the turbine building roofs. There are no waterborne effluent pathways classified as insignificant.

These pathways are not continuously monitored. The CSTs and RWST are sampled quarterly to determine the concentration of radionuclides present in these tanks. Airborne release to the environment from the tanks is estimated based on conservative estimates of the evaporation rates from each of the tanks using a modified method established within Chapter 7 of EPA AP-42. A conservative carry-over fraction of radionuclides from the water to the evaporated liquid is then assumed. Airborne release to the environment from the demisters conservatively assumes the maximum contamination of the oil by condensate (1000 ppm) as it passes through the turbines followed by immediate removal of 100% of the water by the oil mist eliminators. The annual release of tritium and, iodines, and particulates with half-lives greater than 8 days was calculated based on these conservative assumptions; the calculated releases are shown in Table 8-1. All nuclides are negligible compared to the airborne release shown in Tables 2-1 and 2-2 except for tritium. The maximum dose to the public from a release of 29.6 Ci of tritium is calculated to be 4.1E-2 mrem (child). This is a fraction of the maximum dose from airborne effluent reported in Section 4.

The CST analyses showed concentrations ranging from 3.9E-6 to 1.2E-05 μCi/ml of Xe-133 and Xe-135. This range of concentration of dissolved and entrained noble gas in water stored in tanks on site was approximately 9% of the Technical Requirement limit of 2E-4 μCi/ml allowed in water that may be discharged to the environment.

## TABLE 8-1

## ANNUAL RELEASE FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS

| Nuclide | RWST (Ci) | U1-CST and Main Turbine/RFPT Lube Oil Systems (Ci) | U2-CST and Main Turbine/RFPT Lube Oil Systems (Ci) | Total (Ci) |
|---|---|---|---|---|
| H-3 | 5.95E-02 | 1.45E+01 | 1.51E+01 | 2.96E+01 |
| Mn-54 | 9.43E-08 | 1.06E-07 | 1.07E-06 | 1.27E-06 |
| Cr-51 | 4.02E-09 | 0 | 0 | 4.02E-09 |
| Co-58 | 2.21E-10 | 0 | 1.54E-08 | 1.57E-08 |
| Co-60 | 6.56E-08 | 1.37E-07 | 8.67E-07 | 1.07E-06 |
| Fe-59 | 1.01E-09 | 0 | 0 | 1.01E-09 |
| Cs-137 | 6.44E-10 | 3.46E-09 | 0 | 4.10E-09 |
| Xe-133 | 0 | 3.89E-06 | 0 | 3.89E-06 |
| Xe-135 | 0 | 1.19E-05 | 5.53E-06 | 1.75E-05 |

# SUSQUEHANNA STEAM ELECTRIC STATION

# APPENDIX A

# SSES ODCM

# AE&WD REPORT

# 2001

**PPL Susquehanna, LLC**
**Two North Ninth Street**
**Allentown, Pennsylvania 18101-1179**

**April 2002**

PROCEDURE COVER SHEET

| | | |
|---|---|---|
| | NUCLEAR DEPARTMENT PROCEDURE | |
| | ODCM INTRODUCTION | ODCM-QA-001<br>Revision 0<br>Page 1 of 11 |

| | |
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| QUALITY CLASSIFICATION:<br>☒ QA Program ☐ Non-QA Program | APPROVAL CLASSIFICATION:<br>☒ Plant ☐ Non-Plant<br>☐ Instruction |

EFFECTIVE DATE: 8-14-98

PERIODIC REVIEW FREQUENCY: N/A

PERIODIC REVIEW DUE DATE: N/A

RECOMMENDED REVIEWS:

Procedure Owner: R. K. Barclay

Responsible Supervisor: Supervisor - Operations Technology

Responsible FUM: Manager - Nuclear Technology

Responsible Approver: General Manager - SSES

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## PROCEDURE REVISION SUMMARY

**TITLE: ODCM INTRODUCTION**

EVALUATION OF THE IMPACT OF REV. 0 TO ODCM-QA-001 ON THE LEVEL OF EFFLUENT CONTROL AND THE OVERALL ACCURACY AND RELIABILITY OF CALCULATIONS

Revision 0 to the ODCM in procedure format is being made as part of the conversion from Current Technical Specifications (CTS) to Improved Technical Specifications (ITS). In addition, 10CFR20.1001 to .2402 are being incorporated as applicable.

The revision moves elements of the Radioactive Effluent Control Program (RECP) (formerly called the Radioactive Effluent Technical Specifications) and the Radiological Environmental Monitoring Program (REMP) from Technical Specifications to the Technical Requirements Manual. In addition, administrative and reporting requirements formerly contained in Technical Specifications were moved to the appropriate sections of the ODCM procedures which implement them. Requirements formerly contained in the ODCM (e.g., dose calculation formulae, dose conversion factors and setpoint calculation formulae) were maintained in this revision of the ODCM.

The revisions described below are editorial in nature, changing only the format of the ODCM and/or location of the required elements of the RECP and the REMP without any change in the actual limits. Thus, Revision 0 of ODCM-QA-001 maintains the level of radioactive effluent control required pursuant to 10CFR20.1302, 40CFR190, 10CFR50.36a and Appendix I to 10CFR50 and does not impact the accuracy or reliability of effluent, dose, or setpoint calculations.

1. Initial Issue in procedural format.

2. Section 1 of ODCM Revision 7 is reorganized in the format established by NDAP-QA-0002. No revision bars are used since the change was to the entire section.

3. Cover sheet, Revision Summary, and Table of Contents are added.

4. Description of all ODCM sections is provided.

5. Table 1 of ODCM Revision 7 is deleted because there are no requirements to present this information in the ODCM.

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| Approval | MWS |
| Date | see page 1 |

6. Section 3 of ODCM Revision 7 is deleted. It essentially duplicates Technical Specification 3.11.1.1 and there are no requirements to present this information in the ODCM.

7. Incorporated Radiological Effluent and Environmental responsibilities appropriate to the ODCM from NEPM-QA-1010 in Section 4. Changed responsibilities formerly assigned to Manager - Nuclear Engineering to Manager - Nuclear Modifications.

Information required by ITS/TRM has been added in Section 2.

8. Document titles (TS, LCOs, 10CFR20 App B) were changed to agree with ITS/TRM terminology.

9. Expanded the purpose (Section 1) of the ODCM to include requirements added to the ODCM under ITS/TRM.

10. MPCs were changed to ECLs to agree with the new 10CFR20 nomenclature.

11. Added sections 2.3, 2.4, 2.5 on required reporting.

12. Attachment A was added to specify the contents of the Annual Effluent and Waste Disposal Report.

13. Referenced ST-099-002 as the procedure for preparing the Annual Effluent and Waste Disposal Report.

14. Added NDAP-QA-0646, Solid Waste PCP as one of the documents for which changes must be reported in the Annual Effluent and Waste Disposal Report.

15. Expanded the description of ODCM-QA-007 to include system changes and reporting requirements.

16. Added reference 3.6 for ITS/TRM.

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## 1.0 PURPOSE

The purpose of this procedure is to describe the overall purpose and organization of the SSES Offsite Dose Calculation Manual (ODCM).

## 2.0 POLICY/DISCUSSION

The SSES Offsite Dose Calculation Manual (ODCM) is a licensing basis document required by Technical Specifications. It provides the methodology and parameters to be used in calculating offsite doses and effluent monitor setpoints for the Susquehanna Steam Electric Station, Units 1 and 2. Methods are included for determining maximum individual, whole body, and organ doses due to waterborne and airborne effluents to ensure compliance with the dose limitations in the Technical Specifications. Methods are included for performing dose calculations to ensure compliance with the waterborne and airborne treatment system operability sections of the Technical Specifications. This manual includes the methods used for determining quarterly individual doses for inclusion in Annual Effluent and Waste Disposal Reports.

The purpose of the ODCM is to provide the parameters and methodology to be used in calculating offsite doses and effluent monitoring setpoints for the Susquehanna Steam Electric Station, Units 1 and 2. The ODCM contains the requirements of the Radiological Effluent Control Program (RECP) as described in Section 2.2 and the Radiological Environmental Monitoring Program (REMP) as defined in TR 3.11.4. Remedial actions to be taken when program limits (TROs) are exceeded are specified in the Technical Requirements Manual (TRM). The ODCM includes methods for determining maximum individual, whole body, and organ doses due to waterborne and airborne effluents to ensure compliance with the dose limitations in the Technical Requirements (TR). Methods are also included for performing dose calculations to ensure compliance with the waterborne and airborne treatment system operability sections of the Technical Requirements. This manual includes the required inputs for inclusion in the Annual Effluent and Waste Disposal Report and the Annual Radiological Environmental Operating Report.

### 2.1 Derived Release Concentrations and Dose Rates

The ODCM uses 10 times the limits of Appendix B, Table 2, Column 2 of 10CFR20.1001-20.2402 as concentration limits for liquid releases and the instantaneous release rates which are no longer referenced in 10CFR20 but come directly from TR 3.11.2 for gaseous releases as confirmed in the 6/93 NRC response to NUMARC.

### 2.2 Radioactive Effluent Control Program (RECP)

The Radioactive Effluent Control Program (RECP) is a comprehensive program as detailed in TS 5.5.4 which provides control of radioactive effluent for maintaining the dose to members of the public from radioactive effluent as low as reasonably achievable. The RECP is defined in TR's 3.6.1, 3.11.1, 3.11.2, and 3.11.3.

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2.3 Annual Effluent and Waste Disposal Report

The radioactive effluent release report is titled, "Annual Effluent and Waste Disposal Report."

It covers the operation of the station during the previous year and must be submitted prior to May 1 of each year in accordance with TS 5.6.3. The report is prepared in accordance with Procedure ST-099-002 and the required topics for the report are provided in Attachment A.

2.4 Annual Radiological Environmental Operating Report

This report, submitted prior to May 15 of each year, contains the summaries, interpretations and analyses of the results of the Radiological Environmental Monitoring Program as spelled out in ODCM-QA-008 (TR's 3.11.4.1, 3.11.4.2, 3.11.4.3).

2.5 Special Reports

These reports are required to be submitted to the NRC when the limits of TR's 3.11.1.2, 3.11.1.3, 3.11.2.2, 3.11.2.3, 3.11.2.4, 3.11.2.5, 3.11.3, and 3.11.4.1 (Condition B, C, or D) are exceeded. Special reports shall be submitted within 30 days and shall address the actions required in the TRM.

## 3.0 REFERENCES

3.1 TS 6.14, Offsite Dose Calculation Manual (ODCM)

3.1 TS 5.5.1, Offsite Dose Calculation Manual (ODCM)

3.2 TR 3.6.1, Containment Venting or Purging

3.3 TR 3.11, Radioactive Effluents

3.4 NDAP-QA-0152, Quality Assurance for Radiological Environmental Monitoring, Radioactive Effluents, Meteorology, The Environmental Protection Plan, and The Offsite Dose Calculation Manual

3.5 ST-099-002, Radioactive Effluent Release Report

3.6 10CFR20 Appendix B, Annual Limits on Intake and Derived Air Concentrations of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage

3.7 NDAP-QA-0646, Solid Radwaste Process Control Program

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3.8 Letter from T. Murley, Director, Office of Nuclear Reactor Regulations, to T. Tipton, Vice President and Director of Operations, NUMARC, 6/93

3.9 ODCM-QA-008, Radiological Environmental Monitoring Program

3.10 NDAP-00-1203, Modification Identification and Scoping Process

## 4.0 RESPONSIBILITIES

### 4.1 General Manager - SSES

4.1.1 Ensures that the ODCM is used in performance of the surveillance requirements and for compliance with the limiting conditions of operation stated in the Technical Specifications relative to radioactive effluent.

4.1.1 Ensures that the ODCM is used in performance of the surveillance requirements and for compliance with the TROs stated in the TRM relative to radioactive effluent.

4.1.2 Approves revisions to the ODCM.

### 4.2 Manager - Nuclear Modifications

4.2.1 Provides modification engineering and support in accordance with NDAP-00-1203 for equipment and systems involved with the conduct of the effluent and environmental monitoring programs at SSES.

### 4.3 Manager - Nuclear Technology

4.3.1 Manages the programs for the assessment of the radiological environmental impact of SSES.

### 4.4 Manager - Nuclear Assessment Services

4.4.1 Periodically assesses the SSES effluent and environmental programs (including meteorological data) for compliance with the requirements of the Technical Specifications and the ODCM.

4.4.1 Periodically assesses the SSES effluent, environmental and meteorological programs for compliance with the requirements of the TRM and the ODCM.

### 4.5 Supervisor - Operations Technology

4.5.1 Ensures the adequacy and correctness of methodologies described in the ODCM.

4.5.2 Is responsible for reviewing revisions to the ODCM.

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4.5.3 Approves both the Annual Effluent and Waste Disposal and the Annual Radiological Environmental Operating Reports submitted to the NRC.

4.6 Supervisor - Nuclear Licensing

4.6.1 Submits the required radiological effluent and environmental reports to the NRC.

4.6.2 Notifies the appropriate groups of NRC licensing requirements.

4.7 Environmental Services - Health Physicist (Effluent)

4.7.1 Develops methodologies used in performance of effluent dose calculations and establishment of setpoints.

4.7.2 Performs dose calculations necessary for fulfillment of SSES Technical Specification Surveillance Requirements.

4.7.2 Performs dose calculations necessary for fulfillment of SSES Technical Requirements Surveillance.

4.7.3 Prepares and submits the Annual Effluent and Waste Disposal Report to Nuclear Licensing for submittal to the NRC.

4.8 Environmental Services - Health Physicist (REMP)

4.8.1 Prepares and submits the Annual Radiological Environmental Operating Report to Nuclear Licensing for submittal to the NRC.

## 5.0 DEFINITIONS

5.1 ECL - Effluent Concentration Limit as defined in 10CFR20, Appendix B.

5.2. Site Boundary - Is that line beyond which the land is not owned, leased or otherwise controlled by the licensee. (PPL Drawing C243786, SH1, Rev. 1, "U-1&2 Site Facilities and Boundary Map."

5.3 Unrestricted Area - The area at or beyond the site boundary access to which is neither limited nor controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the site boundary used for residential quarters or for industrial, commercial, institutional and/or recreational purposes.

# 6.0 PROCEDURE

## 6.1 Organization

Environmental Services shall develop and maintain a set of procedures as described in the following sub-sections.

### 6.1.1 ODCM-QA-001 - ODCM Introduction

This procedure describes the overall purpose and organization of the ODCM.

### 6.1.2 ODCM-QA-002 - ODCM Review And Revision Control

This procedure describes the initiation, review and processing of revisions to the ODCM and establishes responsibility for the ODCM.

### 6.1.3 ODCM-QA-003 - Effluent Monitor Setpoints

This procedure describes the policies pertaining to and the methodology used in establishing effluent monitor setpoints.

### 6.1.4 ODCM-QA-004 - Airborne Effluent Dose Calculations

This procedure provides the methodology and parameters used in calculating air dose resulting from noble gas effluent and maximum individual, whole body, and organ doses due to airborne effluents to ensure compliance with the dose limitations in the Technical Specifications.

This procedure provides the methodology and parameters used in calculating air dose resulting from noble gas effluent and maximum individual, whole body, and organ doses due to airborne effluents to ensure compliance with the dose limitations in the Technical Requirements Manual.

### 6.1.5 ODCM-QA-005 - Waterborne Effluent Dose Calculations

This procedure provides the methodology and parameters to be used in calculating maximum individual, whole body, and organ doses due to waterborne effluents to ensure compliance with the dose limitations in the Technical Specifications.

This procedure provides the methodology and parameters to be used in calculating maximum individual, whole body, and organ doses due to waterborne effluents to ensure compliance with the dose limitations in the Technical Requirements Manual.

6.1.6 ODCM-QA-006 - Total Dose Calculations

This procedure provides the methodology and parameters to determine the total dose to a member of the public from the fuel cycle in the vicinity of the SSES site.

6.1.7 ODCM-QA-007 - Radioactive Waste Treatment Systems

This procedure defines the operability requirements of the radioactive waste treatment systems.

This procedure defines the operability requirements of the radioactive waste treatment systems and monitoring instruments. It also includes reporting requirements where changes are made to systems or when operability is not maintained in accordance with the TRM.

6.1.8 ODCM-QA-008 - Radiological Environmental Monitoring Program

This procedure provides the methodology and parameters used to determine doses to the public resulting from inhalation, ingestion, and direct shine from radiologically contaminated environmental sampling media based on measured activity concentrations in those media. This procedure also describes the Radiological Environmental Monitoring Program (REMP), which includes the annual land use census survey and interlaboratory comparison program.

6.1.9 ODCM-QA-009- Dose Assessment Policy Statements

The purpose of this procedure is to state dose and effluent policy statements that are not directly associated with any other section of the ODCM.

## 7.0 RECORDS

Except for ODCM-QA-002, no records are specified by the ODCM. Records are generated in performance of other procedures that use the information contained in the ODCM. Control of these records is specified in the controlling procedures.



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## CONTENTS OF ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT

- A summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from each unit and/or the station.
- An annual summary of meteorological data collected over the previous year.
- An assessment of the radiation doses from radioactive liquid and gaseous effluents to members of the public due to their activities inside the site boundary as well as at or beyond the site boundary.
- An assessment of radiation doses to the most exposed member of the public from reactor releases and other nearby uranium fuel cycle sources to show conformance with 40CFR190.
- A list and description of unplanned releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluents during the reporting period.
- Any changes made during the reporting period to the ODCM, Section 3.11 of the TRM, and the Process Control Program (NDAP-QA-0646), as well as any major changes to liquid, gaseous or solid radwaste treatment systems.
- A listing of new locations for dose calculations and/or environmental monitoring identified by the land use census.
- An explanation as to why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in the TRO (3.11.1.4, 3.11.1.5 or 3.11.2.6), if any.
- A report of the cause of the unavailability of REMP samples and the identity of new locations for taking replacement samples.

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PROCEDURE COVER SHEET

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| QUALITY CLASSIFICATION:<br>☒ QA Program ☐ Non-QA Program | APPROVAL CLASSIFICATION:<br>☒ Plant ☐ Non-Plant<br>☐ Instruction |

EFFECTIVE DATE: 03/16/00

PERIODIC REVIEW FREQUENCY: N/A

PERIODIC REVIEW DUE DATE: N/A

RECOMMENDED REVIEWS:

Procedure Owner: M. B. Detamore

Responsible Supervisor: Supervisor-Environmental Services

Responsible FUM: Manager-Nuclear Technology

Responsible Approver: General Manager-SSES

## PROCEDURE REVISION SUMMARY

**TITLE: ODCM REVIEW AND REVISION CONTROL**

1. Incorporate ITS related changes.
2. Change responsibilities to recognize Supervisor – Environmental Services position.
3. Revise Section 6.1 to state that changes tracked by other mechanisms (Condition Reports, Modifications) do not require use of Form ODCM-QA-002-1.
4. Add a Section 6.3.4 to include the revision control requirements of Technical Specifications 5.5.1.C.3.
5. Revise Section 6.6 to allow other members of Operations Technology to present ODCM revisions to PORC.

**The above changes to ODCM-QA-002 have been evaluated as to not decrease the level of effluent control or the accuracy and/or reliability of dose calculations or setpoint determinations as required by 10CFR20.1302, 40CFR190, 10CFR50.36a and 10CFR50, App. I.**

**In addition, these changes(1) do not alter the conduct of the radiological environmental monitoring program, (2) do not change the radioactive effluent controls and radiological environmental monitoring activities, and(3) do not change the information to be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports.**

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## 1.0 PURPOSE

The purpose of this procedure is to describe the initiation, review, and processing of revisions to the ODCM and to establish responsibility for the ODCM.

This procedure constitutes part of the SSES Offsite Dose Calculation Manual (ODCM), which is a licensing basis document.

## 2.0 POLICY/DISCUSSION

2.1 The ODCM is part of the Licensing Basis of SSES and is controlled by ITS 5.5.1, Offsite Dose Calculation Manual (ODCM).

2.2 The ODCM procedures are controlled as Plant Functional Unit Procedures in accordance with the requirements of NDAP-QA-0002, with the following additional guidance and controls:

2.2.1 ODCM procedures shall be numbered as follows: ODCM-QA-nnn, where nnn is a sequential number starting with 001.

2.2.2 ODCM procedures shall be reviewed and accepted by the Manager - Nuclear Technology prior to PORC review.

2.2.3 ODCM procedures shall be approved by the General Manager - SSES.

2.2.4 Changes to the procedures comprising the ODCM require PORC review prior to approval. Changes which are solely administrative corrections or an expedited review revision are excepted. PORC review will be indicated by recording the PORC meeting number on the Procedure Change Process Form (NDAP-QA-0002-8).

2.2.5 ODCM procedures shall be issued and controlled by Nuclear Records Document Control Services (NR-DCS) in accordance with NR procedures. The distribution list shall be maintained by DCS.

2.3 Changes to the Radioactive Effluent Control Program (RECP) are controlled in accordance with NDAP-QA-0728, but are reported as changes to the ODCM in the Annual Effluent and Waste Disposal Report.

## 3.0 REFERENCES

3.1 TS 5.5.1, Offsite Dose Calculation Manual (ODCM)

3.2 NDAP-QA-0002, Nuclear Department Procedure Program

3.3 NDAP-QA-0101, Document Review

3.4 NDAP-QA-0152, Quality Assurance for Radiological Environmental Monitoring, Radioactive Effluents, Meteorology, The Environmental Protection Plan, and The Offsite Dose Calculation Manual

3.5 NDAP-QA-0728, SSES Technical Requirements Program

3.6 10CFR20.1302, Compliance with Dose Limits for Individual Members of the Public

3.7 40CFR190, Environmental Radiation Protection Standards for Nuclear Power Operation

3.8 10CFR50.36a, Technical Specifications on Effluents from Power Reactors

3.9 10CFR50, Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet "As Low As Is Reasonably Achievable" for Radioactive Material in Light-Water Cooled Nuclear Power Reactors

## 4.0 RESPONSIBILITIES

4.1 General Manager - SSES

4.1.1 Approves revisions to the ODCM.

4.2 Manager - Nuclear Technology

4.2.1 Is the Responsible Functional Unit Manager (FUM)

4.3 Supervisor – Environmental Services

4.3.1 Ensures the adequacy and correctness of methodologies described in the ODCM.

4.3.2 Is responsible for reviewing revisions to the ODCM.

4.4 Environmental Services - Health Physicist (Effluent)

4.4.1 Maintains the ODCM.

4.4.2 Processes revisions to the ODCM.

4.5 All Personnel

4.5.1 Submit comments on ODCM contents and proposed revisions to the Environmental Services- Health Physicist (Effluent).

## 5.0 DEFINITIONS

None.

## 6.0 PROCEDURE

6.1 Personnel shall submit proposed ODCM revisions on the SSES Offsite Dose Calculation Manual Change Request Form ODCM-QA-002-1. The submitter shall complete Sections 1 through 5 according to the directions on the form, including sufficient detail of the revision and technical basis of the change to support the rationale for the change and to enable the Environmental Services-Health Physicist (Effluent) to proceed. The submitter should provide at least one month lead time between the submittal date and the requested implementation date to permit preparation, review by interested parties, and approval of the ODCM revision. Changes tracked by other mechanisms (eg., Condition Reports and Modifications) do not require use of Form ODCM-QA-002-1.

6.2 The Environmental Services Health Physicist (Effluent) shall sign and date Form(s) ODCM-QA-002-1 on receipt, and retain the form(s) in a work file created for this ODCM revision. The Environmental Services - Health Physicist (Effluent) may contact the form submitter to discuss the details of the revision.

6.3 The Environmental Services Health Physicist (Effluent) or designee prepares a draft of the ODCM revision based on information in Form(s) ODCM-QA-002-1.

6.3.1 The preparer shall ensure that the change does not reduce the level of effluent control or the accuracy and/or reliability of dose calculations or setpoint determinations as required by 10CFR20.1302, 40CFR190, 10CFR50.36a and 10CFR50, Appendix I.

6.3.2 The preparer shall include a statement to this effect in the Procedure Revision Summary.

6.3.3 If compliance to the criterion in §6.3.1 cannot be demonstrated, the preparer shall make appropriate changes to ensure compliance, else the proposed revision shall be dismissed.

6.3.4 Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed. The date the change is implemented is indicated on the Procedure Cover sheet.

6.4 The Environmental Services Health Physicist (Effluent) follows the process described in NDAP-QA-0002, Section 7.0, for plant procedures.

6.4.1 All review comments and resolutions shall be documented according to NDAP-QA-0101.

6.4.2 The review shall sustain that the change does not reduce the accuracy or reliability of dose calculations and/or setpoint determinations.

6.5 The Environmental Services Health Physicist (Effluent) schedules the proposed ODCM revision for PORC review in accordance with PORC procedures.

6.6 The Supervisor – Environmental Services or Environmental Services Health Physicist (Effluent) presents the ODCM revision to PORC, along with originating information (Form(s) ODCM-QA-002-1), review documentation (Form NDAP-QA-0101-1), 50.59/72.48 Determination (Form NDAP-QA-0726-5), Safety Evaluation (if required, Forms NDAP-QA-0726-1, -2, -4) any technical material (calculations, studies, etc.) necessary to support the ODCM revision, the evaluation required in Section 6.3.1 and appropriate signature approvals.

6.7 The Environmental Services Health Physicist (Effluent) shall submit to the NRC a complete, legible copy of the revised ODCM in the Annual Effluent and Waste Disposal Report for the period of the report in which any change in the ODCM was made.

## 7.0 RECORDS

The following shall be submitted to Nuclear Records in accordance with NR procedures:

7.1 Form(s) ODCM-QA-002-1, with attachments, if any.

7.2 Review package, assembled in accordance with the requirements of NDAP-QA-0002 and NDAP-QA-0101.

**SSES OFFSITE DOSE CALCULATION MANUAL**
**CHANGE REQUEST**

1. ODCM-QA-___ Submit a separate form for each ODCM procedure to be revised.

2. Describe proposed revisions to the SSES ODCM below. Include references to sections, figures, tables, parameters, and equations with sufficient detail to convey complete and correct information. If necessary, use additional pages. If proposed revision can be more clearly indicated on marked up copy(s) of the current ODCM, then attach these marked up pages to this form.

3. Reason for revision: include references to Condition Reports, Audit Services observations or findings, Licensing Issues, DCPs, etc., as applicable. If necessary, use additional pages.

4. Additional pages attached? No ☐ Yes ☐
   Number of additional pages _____

5. Requested date for implementation of revision: _____

   Requested by: _____ Cost Area: _____ Date _____

To be completed by Environmental Services

Received by: _____ Date: _____

PROCEDURE COVER SHEET

| | | |
|---|---|---|
| | NUCLEAR DEPARTMENT PROCEDURE | |
| | EFFLUENT MONITOR SETPOINTS | ODCM-QA-003<br>Revision 0<br>Page 1 of 25 |

| | |
|---|---|
| QUALITY CLASSIFICATION:<br>☒ QA Program ☐ Non-QA Program | APPROVAL CLASSIFICATION:<br>☒ Plant ☐ Non-Plant<br>☐ Instruction |

EFFECTIVE DATE: 8-14-98

PERIODIC REVIEW FREQUENCY: N/A

PERIODIC REVIEW DUE DATE: N/A

RECOMMENDED REVIEWS:

Procedure Owner: R. K. Barclay

Responsible Supervisor: Supervisor - Operations Technology

Responsible FUM: Manager - Nuclear Technology

Responsible Approver: General Manager - SSES

## PROCEDURE REVISION SUMMARY

**TITLE: EFFLUENT MONITOR SETPOINTS**

EVALUATION OF THE IMPACT OF REV. 0 TO ODCM-QA-003 ON THE LEVEL OF EFFLUENT CONTROL AND THE OVERALL ACCURACY AND RELIABILITY OF CALCULATIONS

Revision 0 to the ODCM in procedure format is being made as part of the conversion from Current Technical Specifications (CTS) to Improved Technical Specifications (ITS). In addition, 10CFR20.1001 to .2402 are being incorporated as applicable.

The revision moves elements of the Radioactive Effluent Control Program (RECP) (formerly called the Radioactive Effluent Technical Specifications) and the Radiological Environmental Monitoring Program (REMP) from Technical Specifications to the Technical Requirements Manual. In addition, administrative and reporting requirements formerly contained in Technical Specifications were moved to the appropriate sections of the ODCM procedures which implement them. Requirements formerly contained in the ODCM (e.g., dose calculation formulae, dose conversion factors and setpoint calculation formulae) were maintained in this revision of the ODCM.

Most of the revisions described below are editorial in nature, changing only the format of the ODCM and/or location of the required elements of the RECP associated with radioactive effluent setpoints. Editorial changes were made to clarify the methodology for liquid monitors; the methodology presented is mathematically the same as before except for replacement of MPCs by ECLs under ITS. Editorial changes were made to clarify the methodology for airborne monitors. For CTS, the methodology presented is mathematically the same as before and the parameters presented in Attachment A are those used to determine the existing setpoints. For ITS, apportionment of the site limiting release rate is changed from an equal release rate basis to an equal concentration basis. Attachment A.ITS presents parameters based on current design basis calculations that are to be used to determine setpoints implementing ITS. Incorporation of NRC imposed changes, use of an equal concentration basis for airborne effluent, and use of current design basis input do not impact the accuracy or reliability of the setpoints. Thus, Revision 0 of ODCM-QA-003 maintains the level of radioactive effluent control required pursuant to 10CFR20.1302, 40CFR190, 10CFR50.36a and Appendix I to 10CFR50 and does not impact the accuracy or reliability of effluent, dose, or setpoint calculations.

1. Section 2 of ODCM Revision 7 is reorganized in the format established by NDAP-QA-0002. No revision bars are used since the change was to the entire section.

2. Cover sheet, Revision Summary, and Table of Contents are added.

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3. Policy statement regarding noble gas activity monitor setpoints in Section 4.1 of ODCM Revision 7 is relocated to §2 of this procedure.

4. Policy statements provided in Section 10 of ODCM Revision 7 pertaining to setpoints are relocated to §2 (§10.5, and §10.8) and §6.4 (§10.7) of this procedure.

5. Sample calculations from Appendix A of ODCM Revision 7 for determining setpoints for waterborne and airborne effluent monitors are deleted. The description of the methodology has been clarified, eliminating the need for sample calculations.

6. Added parameters used for determination of airborne effluent monitor setpoints as Attachment A.

7. Procedural step addressing post-release evaluations for liquid releases has been added.

8. SDHR Service Water radiation monitor added to §6.1.4.

9. Terminology and references were revised to agree with ITS/TRM.

10. MPC values were changed to ECL values from the new 10CFR20.

11. Setpoint calculations were revised to reflect the new ECL values.

12. Iodine-133 was added to the airborne effluents section as required by ITS/TRM.

13. Changed the method of apportioning the site airborne limiting release rates from an equal release rate per vent to an equal concentration basis.

14. Added current design basis parameters used for determination of airborne effluent monitor setpoints as Attachment A.ITS.

15. Added policy stating liquid effluent monitor setpoints are "field set."

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## 1.0 PURPOSE

This procedure discusses the methodology to be used in determining effluent monitor alarm/trip setpoints to be used to ensure compliance with the instantaneous release rate limits in Technical Specifications 3.11.1.1 and 3.11.2.1 and provides operational flexibility while giving reasonable assurance of meeting the design objectives of 10CFR50, Appendix I.

This procedure discusses the methodology to be used in determining effluent monitor alarm/trip setpoints to be used to ensure compliance with the concentration and instantaneous release rate limits in the Technical Requirements Manual (sections 3.11.1.1 and 3.11.2.1) and provides operational flexibility while giving reasonable assurance of meeting the design objectives of 10CFR50, Appendix I.

This procedure constitutes part of the SSES Offsite Dose Calculation Manual which is a licensing basis document.

## 2.0 POLICY/DISCUSSION

### 2.1 ODCM Setpoints are Upper Limit Values

2.1.1 Effluent monitor alarm/trip setpoints calculated in accordance with the ODCM shall be considered upper limit values. Higher (less conservative) setpoints shall not be used, however lower (more conservative) setpoints may be used as required to maximize the utility of the monitor.

### 2.2 Waterborne Effluent Monitors

2.2.1 A gross radioactivity monitor providing automatic termination of liquid effluent releases is present on the liquid radwaste effluent line. Flow rate measurement devices are also present on the liquid radwaste effluent line and the discharge line (cooling tower blowdown).

2.2.2 Precautions, limitations, and setpoints applicable to the operation of the SSES liquid effluent monitors are provided in the applicable plant procedures.

2.2.3 The liquid effluent monitor setpoints are determined in accordance with the methodology and parameters described in Section 6.1 and controlled as "field set" in accordance with applicable plant procedures.

2.2.4 Setpoint values are to be calculated to ensure that alarm and trip actions occur upon approaching the MPC limits of 10 CFR 20, Appendix B, Table II, Column 2 at the release point to the unrestricted area.

2.2.4 Setpoint values are to be calculated to ensure that alarm and trip actions occur upon approaching 10 times the EC limits of 10 CFR 20, Appendix

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B, Table II, Column 2 or 2E-4 μCi/ml for total dissolved gases at the release point to the Unrestricted Area.

2.2.5 Setpoint values for monitors used for leak detection (if set more conservatively than the EC limits) should be based on X times background values provided such values do not result in concentrations greater than the EC limits at the Unrestricted Area. Chemistry establishes the setpoint based on operating experience.

2.3 Airborne Effluent Monitors

2.3.1 Noble gas activity monitors, iodine samplers and monitors, and particulate samplers and monitors are present on the reactor building ventilation system (Units 1 and 2), the turbine building ventilation system (Units 1 and 2), and the standby gas treatment system exhaust vents. Effluent system flow rate and sampler flow rate are measured on all of the systems allowing the vent monitor microprocessor to calculate release rates based on measured flow rates.

2.3.2 Precautions, limitations, and setpoints applicable to the operation of the SSES airborne effluent monitors are provided in the applicable plant procedures.

2.3.3 Setpoints are conservatively established for each effluent monitor so that the instantaneous dose rates from all sources corresponding to annual dose limits in 10 CFR 20.105 for unrestricted areas will not be exceeded.

2.3.3 Setpoints are conservatively established for each effluent monitor so that the instantaneous dose rates of TRO 3.11.2.1 will not be exceeded.

2.3.4 The general methodology for establishing plant ventilation airborne effluent monitor setpoints is based upon vent release rates derived from site-specific meteorological dispersion conditions, vent flow rates, and measured or expected radionuclide mixtures in the gaseous effluents. The vent release rate can then be converted to vent concentrations for input as setpoints for the applicable detectors. Since the vent monitors are programmed to calculate concentrations of iodine and particulate being released based on the rate of accumulation of activity on the filters, setpoints can be established for the iodine and particulate channels.

2.3.5 The main condenser offgas pre-treatment monitor provides indication of offgas activity prior to input to the holdup system. Alarm setpoints are based on the Technical Specification 3.11.2.7 noble gas release rate limit of 330 millicuries/second or less at the motive steam jet condenser discharge.

2.3.5 The main condenser offgas pre-treatment monitor provides indication of offgas activity prior to input to the holdup system. Alarm setpoints are based on the Technical Specification 3.7.6 noble gas release rate limit of 330 millicuries/second or less at the motive steam jet condenser discharge.

2.3.6 Noble gas activity monitor setpoints are established at release rates which permit some margin for corrective action to be taken before exceeding offsite dose rates corresponding to the 10 CFR 20 annual dose limits as described herein.

2.3.6 Noble gas activity monitor setpoints are established at release rates which permit some margin for corrective action to be taken before exceeding the offsite instantaneous dose rates of TRO 3.11.2.1.

2.4 Selection of Data for Determination of Dose Rate Compliance

2.4.1 Airborne effluent monitor setpoints are maintained in accordance with Section 2.3, to alarm before the dose rate limits of Technical Specification 3.11.2.1 are exceeded. Station alarm response procedures contain instructions for investigation and verification of monitor alarms. Because setpoint calculations must include assumptions about the composition of the monitored effluent, a monitor high alarm does not necessarily indicate that a dose rate limit has been exceeded.

2.4.1 Airborne effluent monitor setpoints are maintained in accordance with Section 2.3, to alarm before the dose rate limits of the Technical Requirements Manual 3.11.2.1 are exceeded. Station alarm response procedures contain instructions for investigation and verification of monitor alarms. Because setpoint calculations must include assumptions about the composition of the monitored effluent, a monitor high alarm does not necessarily indicate that a dose rate limit has been exceeded.

2.4.2 Valid 10-minute averaged data should be the primary information used to determine the compliance status of an incident. One-minute averaged data should also be reviewed if available, but they may or may not provide additional information depending on the magnitude of the release due to the manner in which the monitors update values to be stored and associated statistical considerations. Averages over a longer period should be used only when data with higher resolution is not available. Grab sample analyses should be performed whenever possible to confirm or disprove monitor data, and to provide indication of the nuclide specific composition of the effluent. When grab sample data are available which, based on vent monitor data, are indicative of the period of elevated release, dose rate calculations should be performed

using the actual effluent mix. The determination of compliance status should not be based on monitor data alone when it is possible to collect and analyze a vent sample which will be representative of the period of elevated release.

2.5 Offgas Hydrogen Analyzers

The main condenser offgas treatment system explosive monitoring system (offgas hydrogen analyzers) have setpoints to alarm at 1% and 2% hydrogen with automatic isolation occurring at 2%.

2.5 Deleted

## 3.0 REFERENCES

3.1 TS 3.11.2.7, [Radioactive Effluents] Main Condenser

3.1 TS 3.7.5, [Radioactive Effluents] Main Condenser

3.2 TS 3.11.1.1, [Radioactive Effluents] Liquid Effluents Concentration

3.2 TR 3.11.1.1, [Radioactive Effluents] [Liquid Effluents] Concentration

3.3 TS 3.3.7.10, Radioactive Liquid Effluent Monitoring Instrumentation

3.3 TR 3.11.1.4, Liquid Radwaste Effluent Monitoring Instrumentation

3.4 TR 3.11.1.5, Radioactive Liquid Effluent Monitoring Instrumentation

3.5 TS 3.11.2.1, [Radioactive Effluents] Gaseous Effluents Dose Rate

3.5 TR 3.11.2.1, [Radioactive Effluents] [Gaseous Effluents] Dose Rate

3.6 TS 3.3.7.11, Radioactive Gaseous Effluent Monitoring Instrumentation

3.6 TR 3.11.2.6, Radioactive Gaseous Effluent Monitoring Instrumentation

3.7 10 CFR 20.105, Permissible Levels of Radiation in Unrestricted Areas

3.7 10 CFR 20.1301, Dose limits for individual members of the public

3.8 10 CFR 20 Appendix B, Concentrations in Air and Water Above Natural Background

3.8 10 CFR 20 Appendix B, Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage

3.9 40CFR190, Environmental radiation protection standards for nuclear power operations

3.10 10CFR50 Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents

3.11 NUREG-0564, Final Environmental Statement related to the operation of SSES, Units 1 and 2

3.11 EC-RADN-1041, SSES "Expected" Liquid and Gaseous Effluent Releases, Aquatic Doses, and Atmospheric Doses - Incorporates Condensate Filtration System and Hydrogen Water Chemistry

3.12 EC-ENVR-1040, Evaluation of Setpoint Methodology for Airborne Iodine and Particulate Monitors

3.13 TS 3.11.2.6, [Radioactive Effluents] Explosive Mixture

3.13 Deleted

3.14 1982 SSES Meteorology Report

3.14 Deleted

## 4.0 RESPONSIBILITIES

4.1 Supervisor - Chemistry

4.1.1 Is responsible for calibrating, functionally testing, and providing alarm responses for radiological effluent monitoring equipment.

4.2 Supervisor - Operations Technology

4.2.1 Ensures adequacy and correctness of methodology used to establish setpoints.

4.3 Environmental Services - Health Physicist

4.3.1 Is responsible for development of methodology and calculations used to establish setpoints.

## 5.0 DEFINITIONS

5.1 Actual Tank Activity - The sum of the products of tank concentrations and volume for each isotope.

5.2 Cs-137 Equivalent - Concentration equivalent of 2.00E-05 μCi/ml MPC for Cs-137.

5.2 Cs-137 Equivalent- Concentration equivalent of 1.00E-06 μCi/ml ECL for Cs-137.

5.3 MPC - Maximum Permissible Concentration as defined in 10CFR20, Appendix B.

5.3 ECL - Effluent Concentration Limits as defined in 10CFR20, Appendix B.

## 6.0 PROCEDURE

### 6.1 Liquid Effluent Monitoring

Chemistry shall develop procedures implementing the following requirements for Liquid Effluent Monitoring.

#### 6.1.1 Discharge Termination

Chemistry shall determine the setpoint concentration for the discharge termination, which limits the maximum concentration being released, as follows:

$$C_\gamma = X * \sum_n C_{\gamma n} \qquad \text{(Eq. 6.1-1)}$$

where:

$C_\gamma$ = The setpoint concentration at which the discharge would be terminated (μCi/ml).

$X$ = A unitless number greater than one that is chosen to prevent spurious alarms that might result from non-uniformity in the activity concentrations of the liquid discharges.

$C_{\gamma n}$ = The concentration of isotope n in the contents of the tank to be discharged as determined by pre-release sampling and analyses. The summation shall include gamma emitting isotopes only (including noble gases).

The setpoint concentration is based on the activity of the isotopes to which the monitor responds, i.e., gamma-emitting isotopes only. It is used to establish the radiation monitor setpoint (count rate) in units of cpm or cps.

6.1.2 Radiation Monitor Setpoint

The radiation monitor setpoint is the sum of the background count rate and the count rate equivalent of the setpoint concentration. The count rate equivalent of the setpoint concentration in units of μCi/ml is determined by dividing the setpoint concentration by the calibration factor (μCi/ml/cpm).

Chemistry shall determine the radiation monitor setpoint as follows:

$$S = \frac{C_\gamma}{K} + B \qquad \text{(Eq. 6.1-2)}$$

where:

$S$ = the radiation monitor setpoint (cpm)

$C_\gamma$ = the setpoint concentration at which the discharge would be terminated from Eq. 6.1-1 (μCi/ml)

$K$ = the radiation monitor calibration factor (μCi/ml/cpm)

$B$ = the background radiation level for the radiation monitor (cpm)

The alarm setpoint may be established at a suitable fraction of the setpoint for discharge termination.

6.1.3 Discharge Flow Rate Limit Determination

The flow rate below which tank discharges must be maintained depends on the magnitude of the dilution required to ensure compliance with the limits of TS 3.11.1.1.

Chemistry shall establish the maximum Discharge Flow Rate using the following equation:

$$f = \frac{F}{(Y * \sum_n C_n / MPC_n) - 1} \qquad \text{(Eq. 6.1-3)}$$

where:

f = the maximum discharge rate from the tank (gpm).

F = the minimum dilution flow rate of 5000 gpm provided by the blowdown flow from the Cooling Towers and any overflow from the spray pond.

Y = a unitless number greater than X used in §6.1.1 that is chosen to ensure that the dilution flow is conservatively determined.

$C_n$ = The concentration of isotope n in the contents of the tank to be discharged as determined by pre-release sampling and analyses. The summation shall include previous composite sample results for non-gamma emitting radionuclides such as H-3, P-32, Fe-55, Sr-89, and Sr-90 (μCi/ml).

$MPC_n$ = the maximum permissible concentration for isotope n per 10CFR20, Appendix B, Table II, column 2 for radionuclides other than noble gases and the values in TS Table 3.11.1.1-1 for dissolved and entrained noble gases.

The flow rate below which tank discharges must be maintained depends on the magnitude of the dilution required to ensure the dilution required to ensure compliance with the limits of TR 3.11.1.1.

Chemistry shall establish the maximum Discharge Flow Rate using the following equation:

$$f = \frac{F}{Y * \left( \sum_{n} C_n / L_n + \sum_{NGi} C_{NGi} / 2E-4 \right) - 1} \qquad \text{(Eq. 6.1-3)}$$

where:

f = the maximum discharge rate from the tank (gpm).

F = the minimum dilution flow rate of 5000 gpm provided by the blowdown flow from the Cooling Towers and any overflow from the spray pond (gpm).

Y = a unitless number that is chosen to ensure that the dilution flow is conservatively determined.

$C_n$ = The concentration of isotope n in the contents of the tank to be discharged as determined by pre-release sampling and analyses. The summation shall include previous composite sample results for non-gamma emitting radionuclides such as H-3, P-32, Fe-55, Sr-89, and Sr-90 (μCi/ml).

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| $L_n$ | = | Ten (10) times the effluent concentration (EC) for isotope n per 10CFR20, Appendix B, Table 2, Column 2 for radionuclides other than noble gases. To maintain compatibility with other federal regulations, the maximum permissible concentration (MPC) value from 10CFR20, Appendix B, Table II, Column 2 (pre-1994 10CFR20) may be used for those isotopes for which the MPC is more restrictive than 10EC. |
| $C_{NGi}$ | = | The concentration of noble gas isotope i in the contents of the tank to be discharged. The summation shall include all dissolved and entrained noble gases. |

Selecting values of X and Y is a matter of experience and the expected margin needed between the activity concentration and the maximum permissible concentration.

Selecting values of X and Y is a matter of experience and the expected margin needed between the activity concentration and the maximum concentration limit (10 x ECL).

6.1.4 Post-Release Evaluation

Chemistry shall perform post-release evaluations when the actual composite sample results for non-gamma-emitting radionuclides exceed pre-selected criteria.

6.1.5 Service Water, SDHR Service Water, and RHR Service Water

The Service Water System provides screened water from the cooling tower basin for cooling plant systems and equipment. The supplemental Decay Heat Removal Service Water System (SDHR) provides decay heat removal during refueling outages when the Service Water System is shutdown. The Residual Heat Removal (RHR) Service Water System provides water from the Engineered Safeguard Service Water (ESSW) spray pond to the RHR heat exchangers. In post-accident conditions, RHR Service Water can supply water for vessel and containment flooding. The Service Water, SDHR Service Water, and RHR Service Water Systems are not normal pathways for liquid effluents. Radiation monitors are in place on these systems to provide indication of leaks across heat exchangers into the service water. The high radiation setpoints for these monitors are set at 2E-5 μCi/ml Cs-137 equivalent. Considering the gamma emitting radionuclides predominant in SSES liquid effluents. e.g., Zn-65, Co-58, Co-60, Fe-59, Mn-54 and Cr-51, use

of a setpoint based on the Cs-137 MPC is conservative based on the following parameters:

1) photon abundance (85%), (0.662 MeV)

2) magnitude of applicable MPC (2E-5 μCi/ml)

The high radiation setpoints for these monitors are set at 1E-5 μCi/ml (10 times the Cs-137 equivalent). Considering the radionuclides predominant in SSES liquid effluents e.g., Co-58, Co-60, Fe-59, Mn-54 and Cr-51, use of a setpoint based on the Cs-137 ECL is reasonable based on the following parameters:

1) photon abundance (85%), photon energy (0.662 MeV)

2) magnitude of applicable ECL (1E-6 μCi/ml)

Because Service Water, SDHR Service Water, and RHR Service Water systems are not normal release pathways for liquid effluents, no credit should be taken for possible dilution scenarios. All service water should be maintained below 2E-5 μCi/ml Cs-137 equivalent.

Because Service Water, SDHR Service Water, and RHR Service Water systems are not normal release pathways for liquid effluents, no credit should be taken for possible dilution scenarios. All service water should be maintained below 1E-5 μCi/ml (10 times the Cs-137 equivalent ECL) or as established by Chemistry based on operating experience (Section 2.2.6).

In order to minimize the chance of a change in the background of a monitor masking a significant trend in monitored activity, the alarm setpoints for the Service Water, SDHR Service Water, and RHR Service Water monitors are determined as follows:

a. When monitor background ≤ (2E-5)/Cal. Factor:

HI RAD Setpoint = 0.5 Background + (2E-5)/Cal. Factor

DOWNSCALE or LOW RAD Setpoint = 0.5 Background

a. When monitor background ≤(1E-5)/Cal. Factor:

HI RAD Setpoint = 0.5 Background + (1E-5)/Cal. Factor

DOWNSCALE or LOW RAD Setpoint = 0.5 Background

b. When monitor background>(2E-5)/Cal. Factor:

HI RAD Setpoint = Background + 0.5 (2E-5)/Cal. Factor

DOWNSCALE or LOW RAD Setpoint = Background - 0.5 (2E-5)/Cal. Factor

Where:

| | | |
|---|---|---|
| Setpoint | = | alarm threshold value to be entered into monitor (cps for Service Water and SDHR Service Water, cpm for RHR Service Water) |
| Background | = | monitor background at most recent background determination (cps for Service Water and SDHR Service Water, cpm for RHR Service Water) |
| (2E-5) | = | Cs-137 Maximum Permissible Concentration (μCi/ml) |
| Cal. Factor | = | monitor response factor per unit Cs-137 concentration determined during most recent calibration (μCi/ml per cps for Service Water and SDHR Service Water, μCi/ml per cpm for RHR Service Water) |

The ALERT RAD setpoints for the RHR Service Water monitors are maintained at 80% of the applicable HI RAD setpoint (cpm).

b. When monitor background >(1E-5)/Cal. Factor:

HI RAD Setpoint = Background + 0.5 (1E-5)/Cal. Factor

DOWNSCALE or LOW RAD Setpoint = Background - 0.5 (1E-5)/Cal. Factor

Where:

| | | |
|---|---|---|
| Setpoint | = | alarm threshold value to be entered into monitor (cps for Service Water and SDHR Service Water, cpm for RHR Service Water) |
| Background | = | monitor background at most recent background determination (cps for Service Water, and SDHR Service Water, cpm for RHR Service Water) |
| (1E-5) | = | 10 times the Cs-137 ECL (μCi/ml) |

Cal. Factor = monitor response factor per unit Cs-137 concentration determined during most recent calibration (µCi/ml per cps for Service Water and SDHR Service Water, µCi/ml per cpm for RHR Service Water)

The ALERT RAD setpoints for the RHR Service Water monitors are maintained at 80% of the applicable HI RAD setpoint (cpm).

## 6.2 Airborne Effluent Monitoring - Noble Gas

Environmental Services shall prepare calculations implementing the following requirements for Airborne Effluent Monitoring of Noble Gas.

### 6.2.1 Site Limiting Release Rate - Noble Gas

a. Environmental Services shall determine the limiting total body and skin release rates calculated as follows:

$$L_{TB} = \frac{Q_{NG} * DR_{TB} * k}{D_{TB}} \qquad \text{(Eq. 6.2-1a)}$$

$$L_S = \frac{Q_{NG} * DR_S * k}{D_S} \qquad \text{(Eq. 6.2-1b)}$$

where:

$L_{TB}$ = limiting release rate- noble gas total body (µCi/min)

$L_S$ = limiting release rate- noble gas skin (µCi/min)

$Q_{NG}$ = total noble gas source term (Ci)

$DR_{TB}$ = total body dose rate limit for the noble gas effluent (500 mrem/year) (ref. TS 3.11.2.1.a)

$DR_{TB}$ = total body dose rate limit for the noble gas effluent (500 mrem/year) (ref. TRO 3.11.2.1.I.A)

$DR_S$ = total skin dose rate limit for the noble gas effluent (3000 mrem/year) (ref. TS 3.11.2.1.a)

$DR_S$ = total skin dose rate limit for the noble gas effluent (3000 mrem/year) (ref. TRO 3.11.2.1.I.B)

$D_{TB}$ = limiting total body offsite dose resulting from the noble gas source term $Q_{NG}$ (mrem)

$D_S$ = limiting skin offsite dose resulting from the noble gas source term $Q_{NG}$ (mrem)

$k$ = units conversion factor (1E6 μCi/Ci) * (1 yr/365 days) * (1 day/ 24 hours) * (1 hour/ 60 minutes)

Environmental Services shall determine $D_{TB}$ and $D_S$ in accordance with ODCM-QA-004 using the noble gas source term and dispersion parameters provided in Attachment A.

Note, $Q_{NG}$ is the sum of the noble gas activities provided in Attachment A. The ratio of the annual source term to the corresponding total body and skin dose is used in the above equations. Thus, either the total annual release per unit or the total annual release for the site may be used.

b. Environmental Services shall set the site limiting release rate for noble gas, $L_{NG}$, as the lesser of $L_{TB}$ and $L_S$ and the site limiting release rate for noble gas implemented in the Emergency Plan. The Emergency Plan may be revised to implement the lesser of $L_{TB}$ and $L_S$ to provide additional flexibility in plant operations.

6.2.2 Monitor Limiting Concentration - Noble Gas

Environmental Services shall determine the limiting noble gas release rate for each vent as follows.

$$L_V = 0.2\, L_{NG} \qquad \text{(Eq. 6.2-2)}$$

Where:

$L_V$ = limiting noble gas release rate per vent (μCi/min)

$L_{NG}$ = lesser of $L_{TB}$ and $L_S$ from §6.2.1 (μCi/min)

Environmental Services shall determine the Noble Gas Monitor Limiting Concentration for each monitor as follows:

$$C_{NG-max-V} = \frac{L_V}{F_V} \qquad \text{(Eq. 6.2-3)}$$

where:

$C_{NG-max-V}$ = limiting noble gas concentration for vent V (μCi/cc)

$L_V$ = limiting noble gas release rate per vent from Equation 6.2-2 (µCi/min)

$F_V$ = vent flow high limit for vent V (cc/min)

6.2.2 Monitor Limiting Concentration - Noble Gas

Environmental Services shall determine the limiting noble gas concentration as follows:

$$C_{NG} = \frac{L_{NG}}{\sum F_V} \qquad \text{(Eq. 6.2-2)}$$

Where:

$C_{NG}$ = limiting noble gas concentration (µCi/cc)

$L_{NG}$ = site limiting release rate - noble gas from §6.2.1 (µCi/min)

$F_V$ = vent flow high limit for vent V (cc/min)

6.3 Airborne Effluent Monitoring - Iodine and Particulate

Environmental Services shall prepare calculations implementing the following requirements for Airborne Effluent Monitoring of iodine and particulates. Note, the methodology for determining the limiting release rate and concentration for airborne iodine and particulates is evaluated in EC-ENVR-1040.

6.3.1 Site Limiting Release Rate - Iodine

a. Environmental Services shall determine the limiting I-131 release rate as follows:

$$L'_I = \frac{Q_I * DR_{IP} * k}{D_{IP}} \qquad \text{(Eq. 6.3-1)}$$

where:

$L'_I$ = provisional limiting release rate- I-131 (µCi/min)

$Q_I$ = total I-131 source term (Ci)

$DR_{IP}$ = dose rate limit for I-131, tritium, and particulate effluent (1500 mrem/year maximum organ, inhalation) (ref. TS 3.11.2.1.b)

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$DR_{IP}$ = dose rate limit for I-131, I-133, tritium, and particulate effluent (1500 mrem/year maximum organ, inhalation) (ref. TRO 3.11.2.1, II.A)

$D_{IP}$ = limiting (maximum) organ dose for all age groups resulting from the I-131 source term (mrem)

$D_{IP}$ = limiting (maximum) organ dose for all age groups resulting from the total I-131 and I-133 source term (mrem)

$k$ = units conversion factor
(1E6 µCi/Ci) * (1 yr/365 days) * (1 day/ 24 hours) * (1 hour/ 60 minutes)

Environmental Services shall determine $D_{IP}$ in accordance with ODCM-QA-004 using the iodine source term and dispersion parameters provided in Attachment A.

Note, $Q_I$ is the I-131 activity provided in Attachment A. The ratio of the annual source term to the corresponding organ dose is used in the above equations. Thus, either the total annual release per unit or the total annual release for the site may be used.

b. Environmental Services shall set the site limiting release rate for I-131, $L_I$, as the lesser of $L'_I$ and the site limiting release rate for I-131 implemented in the Emergency Plan. The Emergency Plan may be revised to implement $L'_I$ to provide additional flexibility in plant operations.

6.3.2 Monitor Limiting Concentration - Iodine

Environmental Services shall determine the limiting I-131 release rate for each vent as follows:

$$L_{I-V} = 0.2 L'_I \qquad \text{(Eq. 6.3-2)}$$

where:

$L_{I-V}$ = limiting I-131 release rate per vent (µCi/min)

$L'_I$ = limiting I-131 release rate from §6.3.1 (µCi/min)

Environmental Services shall determine the I-131 Limiting Concentration for each monitor as follows:

$$C_{I-max-V} = \frac{L_{I-V}}{F_V} \qquad \text{(Eq. 6.3-3)}$$

where:

$C_{I-max-V}$ = limiting I-131 concentration for vent V (µCi/cc)

$L_{I-V}$ = limiting I-131 release rate per vent from Equation 6.3-2 (µCi/min)

$F_V$ = vent flow high limit for vent V (cc/min)

6.3.2 Monitor Limiting Concentration Iodine

Environmental Services shall determine the limiting I-131 concentration as follows:

$$C_I = \frac{L_I}{\sum F_V} \qquad \text{(Eq. 6.3-2)}$$

Where:

$C_I$ = limiting I-131 concentration (µCi/cc)

$L_I$ = limiting I-131 release rate from §6.3.1 (µCi/min)

$F_V$ = vent flow high limit for vent V (cc/min)

6.3.3 Site Limiting Release Rate - Particulates

a. Environmental Service shall determine the limiting release rate for particulates as follows:

$$L'_P = \frac{Q_P * DR_{IP} * k}{D_P} \qquad \text{(Eq. 6.3-4)}$$

where:

$L'_P$ = provisional limiting release rate- particulates (µCi/min)

$Q_P$ = total particulate source term (Ci)

$DR_{IP}$ = dose rate limit for I-131, tritium, and particulate effluent (1500 mrem/year maximum organ, inhalation) (ref. TS 3.11.2.1.b)

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$DR_{IP}$ = dose rate limit for I-131, I-133, tritium, and particulate effluent (1500 mrem/year maximum organ, inhalation) (ref. TRO 3.11.2.1, II.A)

$D_P$ = limiting (maximum) organ dose for all age groups resulting from the source term $Q_P$ (mrem)

$k$ = units conversion factor (1E6 μCi/Ci) * (1 yr/365 days) * (1 day/ 24 hours) * (1 hour/ 60 minutes)

Environmental Services shall determine $D_P$ in accordance with ODCM-QA-004 using the particulate source term and dispersion parameters provided in Attachment A.

Note, $Q_P$ is the sum of the particulate activities provided in Attachment A. The ratio of the annual source term to the corresponding organ dose is used in the above equations. Thus, either the total annual release per unit or the total annual release for the site may be used.

b. Environmental Services shall set the site limiting release rate for particulates, $L_P$, as the lesser of $L'_P$ and the site limiting release rate for particulates implemented in the Emergency Plan. The Emergency Plan may be revised to implement $L'_P$ to provide additional flexibility in plant operations.

6.3.4 Monitor Limiting Concentration - Particulates

Environmental Services shall determine the limiting particulate release rate for each vent as follows:

$$L_{P-V} = 0.2\,L'_P \qquad \text{(Eq. 6.3-5)}$$

where:

$L_{P-V}$ = limiting particulate release rate per vent (μCi/min)

$L'_P$ = limiting release rate - particulate from §6.3.3 (μCi/min)

Environmental Services shall determine the Particulates Limiting Concentration for each monitor as follows:

$$C_{P-max-V} = \frac{L_{P-V}}{F_V} \qquad \text{(Eq. 6.3-6)}$$

where:

where:

$C_{P\text{-}max\text{-}V}$= limiting particulate concentration for vent V (μCi/cc)

$L_{P\text{-}V}$ = limiting particulate release rate per vent from Equation 6.3-5 (μCi/min)

$F_V$ = vent flow high limit for vent V (cc/min)

6.3.4 Monitoring Limiting Concentration - Particulates

Environmental Services shall determine the limiting particulate concentration as follows:

$$C_P = \frac{L_P}{\sum F_V} \qquad \text{(Eq. 6.3-5)}$$

where:

$C_p$ = limiting particulate concentration (μCi/cc)

$L_p$ = limiting particulate release rate from §6.3.3 (μCi/min)

$F_v$ = vent flow high limit for vent v (cc/min)

6.4 Airborne Monitor Line Loss Corrections

6.4.1 Chemistry shall apply the following correction factors to monitor data and sample analysis results in order to correct for airborne effluent monitor sample line loss in accordance with station procedures:

CORRECTION FACTORS

| Routine Effluent Monitors | Iodine | Particulates |
|---|---|---|
| Reactor Building Unit 1 | 1.5 | 3.2 |
| Reactor Building Unit 2 | 1.5 | 3.2 |
| Turbine Building Unit 1 | 1.6 | 3.6 |
| Turbine Building Unit 2 | 1.6 | 3.6 |
| Standby Gas Treatment | 1.5 | 3.9 |

| Post-Accident Vent Monitors | Iodine | Particulates |
|---|---|---|
| Turbine Building Unit 1 | 1.7 | 4.2 |
| Turbine Building Unit 2 | 1.7 | 4.3 |
| Standby Gas Treatment | 1.6 | 4.4 |

## 7.0 RECORDS

None.

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## PARAMETERS USED TO DETERMINE AIRBORNE EFFLUENT MONITOR SETPOINTS

| NUCLIDE | TOTAL RELEASE (1) (Ci/year per reactor) |
|---|---|
| | |
| Ar-41 | 2.5E+01 |
| Kr-83m | 4.0E+00 |
| Kr-85m | 1.7E+03 |
| Kr-85 | 2.7E+02 |
| Kr-87 | 3.2E+01 |
| Kr-88 | 6.6E+02 |
| Xe-131m | 7.1E+01 |
| Xe-133m | 1.4E+01 |
| Xe-133 | 1.25E+04 |
| Xe-135m | 2.2E+02 |
| Xe-135 | 5.9E+02 |
| Xe-138 | 2.9E+02 |
| | |
| | |
| | |
| | |

| NUCLIDE | TOTAL RELEASE (1) (Ci/year per reactor) |
|---|---|
| | |
| I-131 | 1.2E-01 |
| Cr-51 | 1.2E-04 |
| Mn-54 | 3.6E-04 |
| Fe-59 | 1.6E-04 |
| Co-58 | 5.8E-05 |
| Co-60 | 1.1E-03 |
| Zn-65 | 5.5E-05 |
| Sr-89 | 1.8E-05 |
| Sr-90 | 3.1E-06 |
| Zr-95 | 8.7E-06 |
| Sb-124 | 5.1E-06 |
| Cs-134 | 1.3E-04 |
| Cs-136 | 1.3E-03 |
| Cs-137 | 2.1E-04 |
| Ba-140 | 4.2E-05 |
| Ce-141 | 2.9E-05 |

Annual Average Dispersion Parameters (2)

| | |
|---|---|
| Relative Concentration | 4.1E-5 sec/m$^3$ |
| Decayed Relative Concentration | 4.1E-5 sec/m$^3$ |
| Decayed, depleted Relative Concentration | 3.8E-5 sec/m$^3$ |
| Deposition Rate | 4.2E-8 m$^{-2}$ |

Notes:
1. Final Environmental Statement Table 4.4.
2. SSES 1982 Meteorology Report.



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## PARAMETERS USED TO DETERMINE AIRBORNE EFFLUENT MONITOR SETPOINTS

| NUCLIDE | TOTAL RELEASE (1) (Ci/year per reactor) |
|---|---|
| | |
| Ar-41 | 2.60E+01 |
| Kr-83m | 0.00E+00 |
| Kr-85m | 1.10E+01 |
| Kr-85 | 2.30E+02 |
| Kr-87 | 1.42E+01 |
| Kr-88 | 2.22E+01 |
| Kr-89 | 1.47E+02 |
| Xe-131m | 1.80E+01 |
| Xe-133m | 0.00E+00 |
| Xe-133 | 2.23E+03 |
| Xe-135m | 6.70E+02 |
| Xe-135 | 9.73E+02 |
| Xe-137 | 4.68E+02 |
| Xe-138 | 2.10E+02 |
| | |
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| NUCLIDE | TOTAL RELEASE (1) (Ci/year per reactor) |
|---|---|
| | |
| I-131 (2) | 1.02E-01/1.23E-01 |
| I-133(2) | 1.14E+00/1.45E+00 |
| Cr-51 | 2.08E-05 |
| Mn-54 | 5.52E-05 |
| Fe-59 | 7.10E-06 |
| Co-58 | 7.00E-06 |
| Co-60 | 1.23E-04 |
| Zn-65 | 6.53E-05 |
| Sr-89 | 1.25E-05 |
| Sr-90 | 1.40E-07 |
| Nb-95 | 1.00E-04 |
| Zr-95 | 1.81E-05 |
| Ru-103 | 4.21E-05 |
| Ag-110m | 2.40E-08 |
| Sb-124 | 1.40E-06 |
| Cs-134 | 7.46E-05 |
| Cs-136 | 7.10E-06 |
| Cs-137 | 1.11E-04 |
| Ba-140 | 2.51E-04 |
| Ce-141 | 2.91E-05 |

Annual Average Dispersion Parameters - Limiting Site Boundary (3)

| | |
|---|---|
| Relative Concentration | 1.46E-5 sec/m$^3$ |
| Decayed Relative Concentration | 1.46E-5 sec/m$^3$ |
| Decayed, Depleted Relative Concentration | 1.35E-5 sec/m$^3$ |
| Deposition Rate | 3.35E-8 m$^{-2}$ |

Notes:

1. Design basis "expected" gaseous effluent releases per EC-RADN-1041 (particulates with half-lives greater than 8 days)
2. Use limiting case Normal Water Chemistry/Hydrogen Water Chemistry
3. 1973-76 Meteorological Data Updated to 1996 Land Use Survey per EC-RADN-1041



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