RETS MASTER FILE

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS) EFF-84A

ACCESSION NBR:8411210070 DOC.DATE: 84/06/30 NOTARIZED: NO DOCKET #
FACIL:50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylva 05000387
50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388

AUTH.NAME AUTHOR AFFILIATION
WIDNER,T.E. Pennsylvania Power & Light Co.
SHANK,K.E. Pennsylvania Power & Light Co.
KENYON,B.D.

RECIP.NAME RECIPIENT AFFILIATION
MURLEY,T.E. Region 1, Office of Director

SUBJECT: "Semiannual Effluent & Waste Disposal Rept,Jan-June 1984."
W/840830 ltr.

DISTRIBUTION CODE: IE25L COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 100
TITLE: Periodic Environ Monitoring Rept (50 DKT)-Annual/Semiannual/Effluent/

NOTES:1cy NMSS/FCAF/PM. LPDR 2cys Transcripts. 05000387
OL:07/17/82
1cy NMSS/FCAF/PM. LPDR 2cys Transcripts. 05000388
OL:03/23/84

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	NRR LB2 BC	04	7	7				
INTERNAL:	ACRS	11	1	1	AEOD		1	1
	IE FILE	01	1	1	NRR/DE/EEB	08	1	1
	~~NRR/DL/ORAB~~	09	1	1	NRR/DSI/METB		2	2
	NRR/DSI/RAB	10	1	1	RGN2/DRSS/EPRPB		1	1
	~~RM/DDAMI/MIB~~		1	1				
EXTERNAL:	LPDR	03	2	2	NRC PDR	02	1	1
	NTIS	05	1	1				
NOTES:			3	3				

TOTAL NUMBER OF COPIES REQUIRED: LTTR 24 ENCL 24

SUSQUEHANNA STEAM ELECTRIC STATION
SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT
REPORT PERIOD: 1/1/84-6/30/84

Prepared by: T.E. Widner 8/30/84
T. E. Widner
Health Physicist

Reviewed: K.E. Shank 8/30/84
K. E. Shank
Environmental Group Supervisor-Nuclear

Approved: K.E. Shank/for 8/30/84
R. L. Doty
Radiological and Environmental Services Supervisor

Pennsylvania Power and Light Company
Two North Ninth Street
Allentown, Pennsylvania 18101

IE25
1/1

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION 1

INTRODUCTION AND SUPPLEMENTAL INFORMATION

INTRODUCTION

The Susquehanna Steam Electric Station 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 1,050 MW net electrical capacity. The reactor and generator 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. Commercial operation of Unit 2 is scheduled for late 1984.

Gaseous effluents are released from the Susquehanna Station via five rooftop vents on the reactor building (see Figure 1). Each vent is continuously monitored when operational, and a program of periodic sampling is conducted as specified in the plant Technical Specifications. All liquid effluents are released in batch mode and are sampled and analyzed prior to release. Liquid effluents from the site are released into the cooling tower blowdown line for dilution prior to release to the Susquehanna River (see Figure 2). Normal blowdown line flow rates are approximately 5,000 gpm per reactor unit. The diluted effluent is added to the river by way of a perforated diffuser pipe placed in 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 Unit 1 reactor during the period from January 1 through June 30, 1984. In addition, this report serves as a medium for notifying the Nuclear Regulatory Commission of changes to PP&L's Off-Site Dose Calculation Manual (ODCM) and solid waste Process Control Program (PCP).

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

Table 2 contains a summation of all gaseous releases, grouped into the radionuclide categories of gases, particulates, iodines, and tritium. Average release rates are presented and compared to the applicable limits. Table 3 presents the totals of specific radionuclides in gaseous effluents.

Liquid effluents are summarized in Table 4. Average diluted concentrations are presented and compared to applicable concentration limits. Table 5 contains an isotopic breakdown of radionuclides in liquids released during the report period. Figure 6 presents the monthly discharge totals of liquids from SSES during the report period.

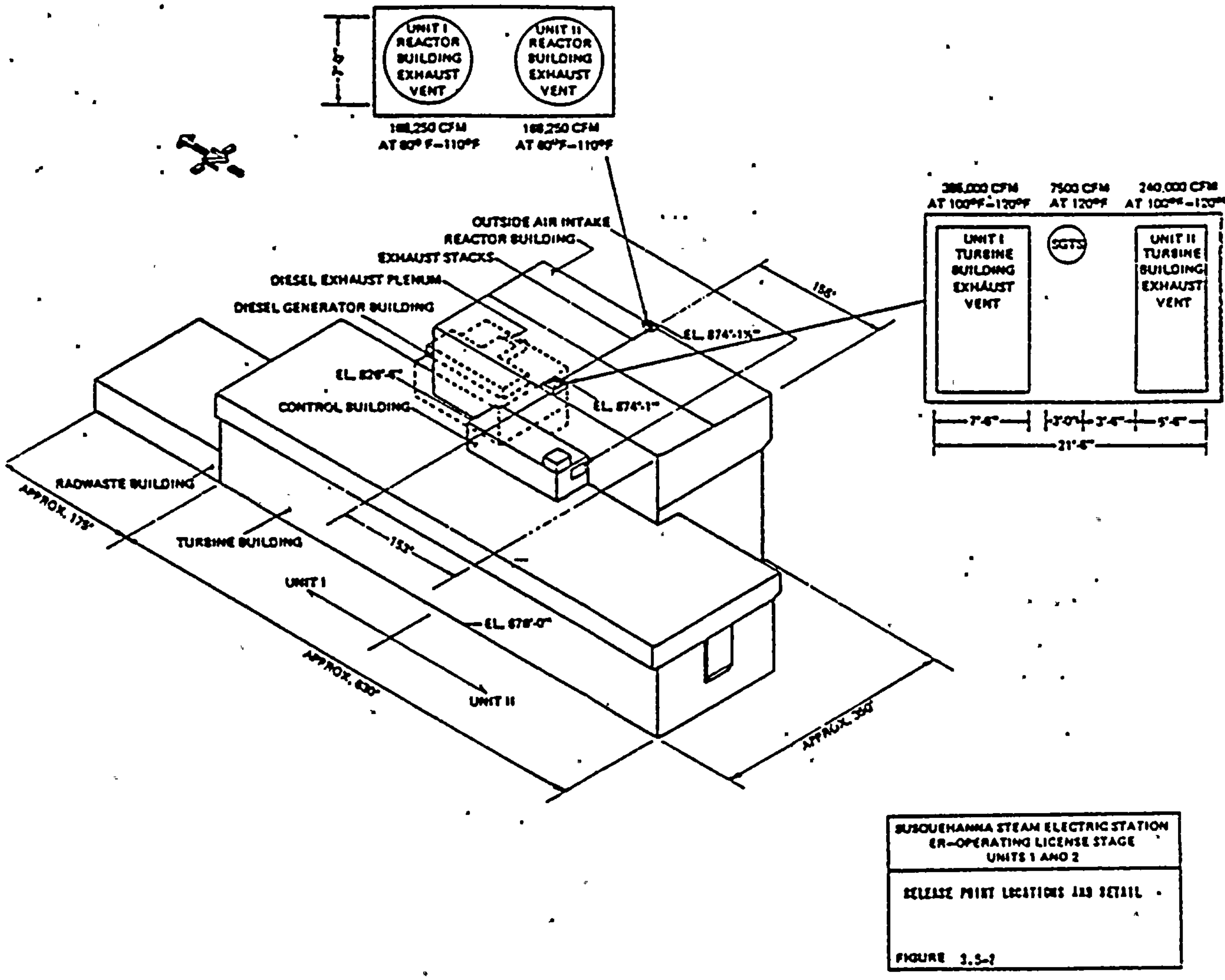
Tables 6-9 present a characterization of the solid waste shipped off-site during the report period. Included are the volumes and curie contents associated with each type of waste. An estimate of major nuclide composition is presented for each waste type, as well as the number of waste shipments from the site, how they were transported, and their final destination.

Table 10 contains estimates of the errors associated with the measurements involved in quantifying radioactive 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 gaseous and liquid effluents and solid wastes during the report period.

Section 3 of this report is reserved for documentation of changes to the Off-Site Dose Calculation Manual and the solid waste Process Control Program. The January 20, 1984 and May 14, 1984 revisions of the ODCM are described. Copies of the revised pages are provided, with revision bars marking the changes. A revised copy of the administrative procedure which described the Process Control Program is included along with a statement of the purpose and the nature of the changes.

Section 4 of this report presents documentation of events in which any effluent monitoring instrumentation channel remains inoperable for longer than the period specified in SSES Technical Specification, Table 3.3.7.10-1 or 3.3.7.11-1.

FIGURE 1



GASEOUS EFFLUENT RELEASE POINT LOCATIONS AND DETAIL

FIGURE 2
LIQUID EFFLUENT PATHWAY

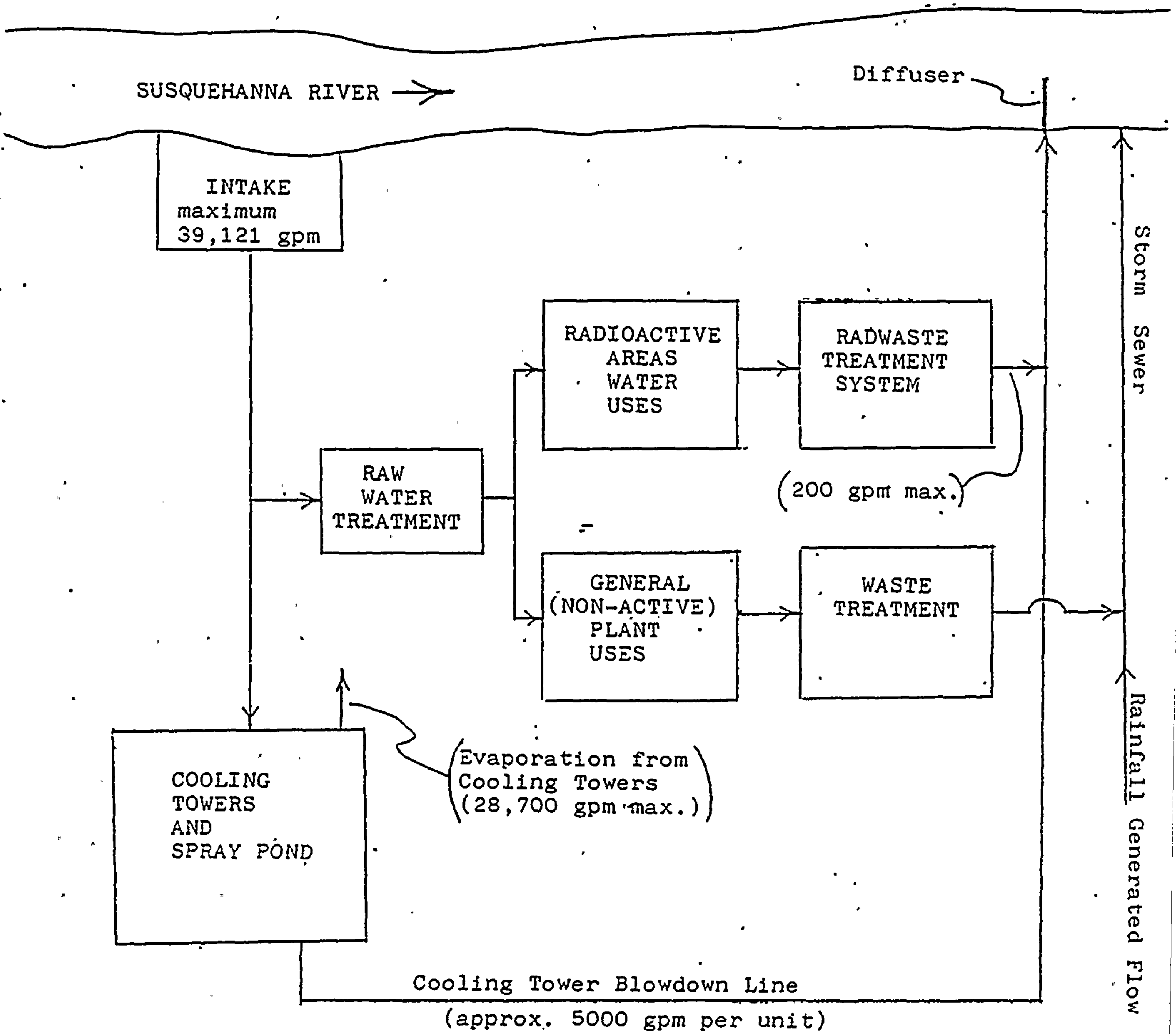


TABLE 1

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1983
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

   a. Fission and Activation Gases: 0.851 Ci/minute. (Release rate limit based on noble gas dose rate Technical Specification).

   b. Iodines: 141 uCi/minute. (Release rate limit based on Technical Specification limit of 1,500 mrem/yr for dose rate from iodine-131, tritium, and particulates with half-lives greater then eight days).

   c. Particulates: 772 uCi/minute. (Release rate limit based on Technical Specification limit of 1,500 mrem/yr for dose rate from iodine-131, tritium, and particulates with half-lives greater than eight days. This number is calculated based on the expected mix of particulates presented in Table 4.4 of the SSES Final Environmental Statement).

2. Maximum Permissible Concentrations

   The concentrations of radioactive materials in liquid effluents are limited to the concentrations specified in 10CFR, Part 20, Appendix B, Table II, Column 2, for radionuclides other than dissolved or entrained noble gases.

   For dissolved or entrained noble gases, the concentrations are limited to the following values, as stated in the applicable Technical Specification:

NUCLIDE	MPC (uCi/ml)
Kr 85m	2E-4
Kr 85	5E-4
Kr 87	4E-5
Kr 88	9E-5
Ar 41	7E-5
Xe 133m	5E-4
Xe 133	6E-4
Xe 135m	2E-4
Xe 135	2E-4

   These values are calculated using Equation 20 of ICRP Publication 2 (1959), adjusted for infinite cloud submersion in water.

3. Methods of Quantifying Effluents

   a. Fission and Activation Gases: Gas samples are routinely collected monthly and analyzed with a Ge(Li) 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 Ge(Li) isotopic scan data is used to convert the continuous vent monitor activity to actual activity based on the determined mixture. The vent and sample flow rates are continuously monitored, and the average flow rates for each vent and sample pump are used to calculate the total activity released in a given time period. When the continuous vent monitors are out of service, manual grab samples are taken from each vent once each eight hours.

b. Iodines: Iodine is continuously collected via an isokinetic sampling device from each vent. Charcoal cartridges are normally exchanged once per week and analyzed on a Ge(Li) 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 obtained. The ratio is used to determine the total activity of each isotope released during the time period in question. When the continuous vent monitors are out of service, iodine is continuously collected on charcoal cartridges attached to air samplers which draw directly from the rooftop vents.

c. Particulates: Particulates are continuously collected via an isokinetic sampling device from each vent. Filters are normally exthanged once per week and analyzed on a Ge(Li) system. Flow rate corrections are performed in the same manner as for iodines. When the continuous vent monitors are out of service, particulates are continuously sampled directly from the affected rooftop vent(s).

d. Liquid 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 Ge(Li) 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, 90. An aliquot based on release volume is saved and added to monthly and quarterly composite containers. The monthly composite is sent to an outside vendor for gross alpha analysis. The monthly tritium analysis is done in-house. The quarterly composite is sent to an outside vendor laboratory for iron-55, strontium-89, and strontium-90 analyses.

The concentration of each radionuclide in each batch is 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 time period in question.

4. Batch Release

a. Liquid

1.	Number of batch releases:	235
2.	Total time period for batch releases:	5.36E4 minutes
3.	Max. time period for a batch release:	713 minutes
4.	Avg. time period for batch releases:	230 minutes
5.	Min. time period for a batch release:	2 minutes
6.	Avg. stream flow during period of release of effluent into a flowing stream:	>5000 gpm (cooling tower blowdown)

b. Gaseous

1.	Number of batch releases:	0
2.	Total time period for batch releases:	NA
3.	Max. time period for a batch release:	NA
4.	Avg. time period for batch releases:	NA
5.	Min. time period for a batch release:	NA

5. Abnormal Releases

a. Liquid

1)	Number of releases:	0
2)	Volume released:	NA
3)	Total activity released:	NA

b. Gaseous

1)	Number of releases:	0
2)	Total activity released:	NA

SECTION 2

EFFLUENT AND WASTE DISPOSAL DATA

TABLE 2
SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT- 1984
AIRBORNE EFFLUENTS- SUMMATION OF ALL RELEASES

Nuclide Category	Unit	First Quarter		Second Quarter	
A. Fission and Activation Gases					
1. Total Release[1]	Ci	≥3.18E+00	<7.92E+02	≥5.82E+01	<9.12E+02
2. Average Release Rate for Period	uCi/sec	≥4.04E-01	<1.01E+02	≥7.40E+00	<1.16E+02
3. Percent of Applicable Limit[2]	%	≥2.85E-3	<7.11E-01	≥5.21E-02	<8.17E-01
B. Iodines					
1. Total Release	Ci		<2.87E-04	≥3.20E-03	<3.55E-03
2. Average Release Rate for Period	uCi/sec		<3.65E-05	≥4.07E-04	<4.52E-04
3. Percent of Applicable limit[2]	%		<1.55E-03	≥1.73E-02	<1.92E-02
C. Particulates					
1. Particulates with Half-lives >8 Days Released	Ci	≥3.54E-04	<2.07E-03	≥6.81E-05*	<2.04E-03*
2. Average Release Rate for Period	uCi/sec	≥4.50E-05	<2.63E-04	≥8.66E-06	<2.59E-04
3. Percent of Applicable Limit[2]	%	≥3.49E-04	<2.04E-03	≥6.71E-05	<2.01E-03
4. Gross Alpha Activity Released	Ci	≥1.79E-07	<7.07E-07	≥5.60E-07*	<1.38E-06*
D. Tritium					
1. Total Release	Ci	≥3.29E+00	<8.84E+00	≥9.75E+00	<1.76E+01
2. Average Release Rate for Period	uCi/sec	≥4.18E-01	<1.12E+00	≥1.24E+00	<2.24E+00
3. Percent of Applicable Limit[3]	%	≥8.57E-03	<2.30E-02	≥2.54E-02	<4.59E-02

[1]Notation: The first value presented (≥) includes only activity positively detected at the 95% confidence level. The second value (<) includes detected activity plus the Lower Limit of Detection values of any samples in which activity was not detected at the 95% CL.
[2]Based on release rate limit derived from dose rate Technical Specification.
[3]Based on release rate corresponding to ^{3}H Maximum Permissible Concentration in unrestricted areas.
*Strontium and gross alpha values are estimated based on first quarter 1984 sample analyses and second quarter ventilation exhaust rates.

TABLE 3
SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT- 1984
AIRBORNE EFFLUENTS (Curies)[1]

Nuclide	First Quarter		Second Quarter	
A. Gases				
^{41}Ar			4.90E+00	
^{85}Kr m			≥5.13E+00	<4.23E+01
^{87}Kr		< 5.54E+01	≥1.39E-01	<6.26E+01
^{88}Kr		< 5.05E+01	≥2.28E+00	<7.51E+01
^{133}Xe m		< 1.84E+02	≥2.86E-01	<2.39E+02
^{133}Xe	≥2.92E+00	< 6.37E+01	≥4.55E+01	<1.17E+02
^{135}Xe m		< 1.97E+02		<9.76E+01
^{135}Xe	≥2.60E-01	< 3.37E+01		<2.44E+01
^{138}Xe		< 2.07E+02		<2.49E+02
Total	≥3.18E+00	< 7.92E+02	≥5.82E+01	<9.12E+02
B. Iodines				
^{131}I		< 2.87E-04	≥3.20E-03	<3.55E-03
^{133}I	2.28E-05		2.92E-03	
C. Particulates with Half-lives > 8 d				
^{18}F		< 2.36E-05	1.91E-05	
^{51}Cr	2.23E-05		3.96E-05	
^{54}Mn	≥1.36E-04	< 2.99E-04	≥9.35E-06	<2.25E-04
^{59}Fe	≥3.01E-05	< 3.01E-04		<2.95E-04
^{58}Co	≥8.07E-05	< 2.15E-04		<1.68E-04
^{60}Co	≥8.36E-05	< 2.55E-04		<2.20E-04
^{65}Zn		< 2.62E-04		<2.97E-04
^{89}Sr		< 2.79E-06		<4.80E-06*
^{90}Sr		< 9.07E-07		<1.67E-06*
^{134}Cs		< 1.10E-04		<1.18E-04
^{137}Cs		< 1.19E-04		<1.31E-04
^{141}Ce		< 8.52E-05		<1.06E-04
^{144}Ce		< 3.77E-04		<4.17E-04
Total	≥3.54E-04	< 2.07E-03	≥6.81E-05	<2.04E-03

[1]Notation: The first value presented (≥) includes only activity positively detected at the 95% confidence level. The second value (<) includes detected activity plus the Lower Limit of Detection values of any samples in which activity was not detected at the 95% CL.
*Estimated based on first quarter 1984 sample analyses and second quarter 1984 ventilation exhaust rates.

TABLE 4

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT- 1984

LIQUID EFFLUENTS- SUMMATION OF ALL RELEASES

Nuclide Category	Unit	First Quarter		Second Quarter	
A. Fission & Activation Products					
1. Total Release[1]	Ci	≥4.55E-02	<6.88E-02	≥5.58E-03	<3.64E-02
2. Average Diluted Concentration	uCi/ml	≥7.58E-08	<1.15E-07	≥1.30E-08	<8.48E-08
3. Percent of Applicable Limit[2]	%	≥1.77E-02	<1.03E-01	≥4.04E-03	<4.84E-02
B. Tritium					
1. Total Release	Ci	2.95E+00		2.98E+00	
2. Average Diluted Concentration	uCi/ml	4.92E-06		6.95E-06	
3. Percent of Applicable limit[3]	%	1.64E-01		2.32E-01	
C. Dissolved and Entrained Gases					
1. Total Release	Ci	≥8.99E-05	<2.06E-01	≥2.43E-03	<1.97E-01
2. Average Diluted Concentration	uCi/ml	≥1.50E-10	<3.43E-07	≥5.66E-09	<4.59E-07
3. Percent of Applicable Limit[4]	%	≥3.75E-04	<8.58E-01	≥1.42E-02	<1.15E+00
D. Gross Alpha Radioactivity Released	Ci		<5.78E-04		<3.20E-04*
E. Volume of Waste Released	gal.	2.68E+06		1.88E+06	
	liters	1.01E+07		7.12E+06	
F. Volume of Dilution Water Used	gal.	1.56E+08		1.11E+08	
	liters	5.90E+08		4.20E+08	

[1]Notation: The first value presented (≥) includes only activity positively detected at the 95% confidence level. The second value (<) includes detected activity plus the Lower Limit of Detection values of any samples in which activity was not detected at the 95% CL.

[2]Based on quarterly dose limits from liquid effluents.

[3]Based on the Maximum Permissible Concentration for ^{3}H in effluents to unrestricted areas.

[4]Based on the most restrictive Maximum Permissible Concentration for a noble gas (^{87}Kr) from SSES Tech Spec Table 3.11.1.1-1.

*Based on sample analyses from April and May 1984.

TABLE 5

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT- 1984

LIQUID EFFLUENTS (Curies)[1]

Nuclide	First Quarter		Second Quarter	
A. Tritium	2.95E+00		2.98E+00	
B. Fission and Activation Products				
^{24}Na	5.53E-03			<1.53E-03
^{51}Cr	1.57E-03			<1.49E-02
^{54}Mn	≥3.87E-03	< 4.43E-03	≥2.44E-03	<2.92E-03
^{55}Fe		< 9.18E-03		<6.41E-03*
^{59}Fe	≥1.66E-04	< 1.96E-03	≥1.69E-04	<1.00E-03
^{58}Co	≥1.49E-03	< 1.94E-03	≥1.37E-03	<1.80E-03
^{60}Co	≥3.17E-02	< 3.88E-02	≥1.59E-03	<2.15E-03
^{65}Zn	≥7.76E-05	< 1.83E-03	≥1.16E-05	<1.01E-03
^{89}Sr		< 4.08E-04		<2.85E-04*
^{90}Sr		< 1.02E-04		<7.12E-05*
^{99}Mo	≥2.06E-06	< 4.34E-04		<2.58E-04
^{99}Tc m	6.66E-05			
^{110}Ag m	≥4.67E-04	< 4.74E-04		
^{110}Ag	7.53E-05			
^{131}I		< 7.80E-04		<3.93E-04
^{134}Cs		< 9.66E-04		<4.56E-04
^{137}Cs		< 1.03E-03		<4.93E-04
^{141}Ce		< 8.31E-04		<4.91E-04
^{144}Ce		< 3.43E-03		<2.21E-03
Total	≥4.55E-02	< 6.88E-02	≥5.58E-03	<3.64E-02
C. Dissolved and Entrained Gases				
^{41}Ar		< 9.00E-04		<4.86E-04
^{85}Kr m		< 5.56E-04		<3.27E-03
^{85}Kr		< 1.93E-01		<1.84E-01
^{87}Kr		< 1.19E-03		<1.32E-03
^{88}Kr		< 1.39E-03		<7.06E-04
^{133}Xe m		< 4.34E-03		<2.65E-03
^{133}Xe	≥2.46E-05	< 1.55E-03	≥1.74E-03	<2.88E-03
^{135}Xe m		< 2.16E-03	≥2.33E-05	<8.56E-04
^{135}Xe	≥6.53E-05	< 7.22E-04	≥6.65E-04	<1.11E-03
Total	≥8.99E-05	< 2.06E-01	≥2.43E-03	<1.97E-01
D. Unidentified	≥3.38E-05	< 1.07E-04		

[1]Notation: The first value presented (≥) includes only activity positively detected at the 95% confidence level. The second value (<) includes detected activity plus the Lower Limit of Detection values of any samples in which activity was not detected at the 95% CL.

*Based on first quarter 1984 sample analyses and second quarter discharge volumes.

TABLE 6

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
Data Period: January 1, 1984-June 30, 1984

A. SOLID WASTE SHIPPED OFF-SITE FOR BURIAL OR DISPOSAL

Number of Shipments	Mode of Transportation	Destination
55	Truck	Barnwell, SC
10	Truck	Richland, WA

B. IRRADIATED FUEL SHIPMENTS

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

Table 7

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1984
SOLID RADIOACTIVE WASTE-CLASS A*
Data Period: January 1-June 30, 1984

Source of Waste and Processing Employed (Waste stream)	Condensate Demineralizer (Bead Resin)	Liquid Radwaste Filters (Sludge/Filter Media/DE)	Reactor Water Clean-Up Fuel Pool Clean-Up (Powdex)	Condensate Demineralizer Regeneration (Evaporator Concentrates)
Container Volume (cu. ft.)	3570 ft^3	8075 ft^3	850 ft^3	3995 ft^3
Total Curie Content	4.75 Ci	102.49 Ci	47.37 Ci	0.32 Ci
Above Determined by: a) measurement b) estimation c) measurement and correlation factors	C	C	C	C
Principle Radionuclides (Identity and Percent Composition)	CO-58 20% CO-60 15% CR-51 10% MN-54 30% C-14 2% Ni-63 3% FE-55 20%	CO-58 10% CO-60 13% CR-51 30% FE-59 5% MN-54 15% ZN-65 2% Ni-63 3% FE-55 22%	CO-58 18% CO-60 15% CR-51 9% FE-59 3% MN-54 29% ZN-65 2% Ni-63 3% FE-55 21%	CO-58 9% CO-60 10% MN-54 14% H-3 40% C-14 13% Ni-63 1.5% Fe-55 11% I-129 1.5%
Above Determined by: a) measurement b) estimation c) measurement and correlation factors	C	C	C	C
Type of Container	Carbon Steel Liners	Carbon Steel Liners	Carbon Steel Liners	Carbon Steel Liners
Solidification Agent or Absorbent	Portlant Cement	Portlant Cement	Portland Cement	Portland Cement

* As defined in 10CFR, Part 61

Table 7

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1984
SOLID RADIOACTIVE WASTE-CLASS A*
Data Period: January 1-June 30, 1984

Source of Waste and Processing Employed (Waste stream)	Non-Compactable Waste	Oily Waste	Compacted Trash
Container Volume (cu. ft.)	3200 ft^3	450 ft^3	5790 ft^3
Total Curie Content	0.36 Ci	0.023 Ci	4.79 Ci
Above Determined by: a) measurement b) estimation c) measurement and correlation factors	B	B	B
Principle Radionuclides (Identity and Percent Composition)	CO-58 17% CO-60 15% CR-51 1% FE-59 2% MN-54 25% ZN-65 2% Ni-63 3% FE-55 34% Ni-59 1%	CO-58 20% CO-60 18% CR-51 1% FE-59 3% MN-54 24% ZN-65 3% Ni-63 4% FE-55 27%	MN-54 17% CO-58 12% FE-59 2% CO-60 12% ZN-65 2% FE-55 53% Ni-63 2%
Above Determined by: a) measurement b) estimation c) measurement and correlation factors	B	B	B
Type of Container	128 ft^3 Metal Boxes	55 Gallon 17H Drums	55 Gallon 17H Drums
Solidification Agent or Absorbent	N/A	Oil-Dri	N/A

* As defined in 10CFR, Part 61

Table 8

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1984
SOLID RADIOACTIVE WASTE-CLASS B*
Data Period: January 1-June 30, 1984

Source of Waste and Processing Employed (Waste stream)	NO CLASS B WASTE GENERATED
Container Volume (cu. ft.)	
Total Curie Content	
Above Determined by:	
a) measurement	
b) estimation	
c) measurement and correlation factors	
Principle Radionuclides (Identity and Percent Composition)	
Above Determined by:	
a) measurement	
b) estimation	
c) measurement and correlation factors	
Type of Container	
Solidification Agent or Absorbent	

* As defined in 10CFR, Part 61

Table 9

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1984
SOLID RADIOACTIVE WASTE-CLASS C*
Data Period: January 1-June 30, 1984

Source of Waste and Processing Employed (Waste stream)	NO CLASS C WASTE GENERATED
Container Volume (cu. ft.)	
Total Curie Content	
Above Determined by:	
a) measurement	
b) estimation	
c) measurement and correlation factors	
Principle Radionuclides (Identity and Percent Composition)	
Above Determined by:	
a) measurement	
b) estimation	
c) measurement and correlation factors	
Type of Container	
Solidification Agent or Absorbent	

* As defined in 10CFR, Part 61

TABLE 10

SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT-1984
ESTIMATED TOTAL ERRORS ASSOCIATED WITH EFFLUENT MEASUREMENTS

Measurement	January-June Estimated Total Error
1. GASEOUS EFFLUENTS	
a. Fission and Activation Gases	9.5%
b. Iodines	13%
c. Particulates	13%
d. Tritium	11.4%
2. LIQUID EFFLUENTS	
a. Fission and Activation Products	7.5%
b. Tritium	9.3%
c. Dissolved and Entrained Gases	8.0%
d. Gross Alpha Radioactivity	None Detected
3. SOLID WASTES	
a. Condensate Demineralizers	26%
b. Liquid Radwaste Filters	26%
c. Reactor Water Clean-Up and Fuel Pool Clean-Up	26%
d. Condensate Demineralizer Regeneration	26%
e. Non-Compactable Trash	30%
f. Oily Waste	30%
g. Compacted Trash	30%

TABLE 11
SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT- 1984
EFFLUENT DATA NOT AVAILABLE FOR PREVIOUS SEMIANNUAL REPORT

Nuclide Category	Unit	Fourth Quarter 1983	
A. Airborne Effluents			
1. ^{89}Sr	Ci		<1.12E-06
2. ^{90}Sr	Ci		<2.69E-07
3. Gross Alpha Radioactivity	Ci	≥7.90E-08	<2.77E-07
B. Liquid Effluents			
1. ^{89}Sr	Ci		<1.36E-04
2. ^{90}Sr	Ci		<2.73E-05
3. ^{55}Fe	Ci		<4.09E-03
4. Gross Alpha Radioactivity	Ci		<2.30E-04

SECTION 3

CHANGES TO THE OFF-SITE DOSE CALCULATION MANUAL AND THE SOLID WASTE PROCESS CONTROL PROGRAM

CHANGES TO THE OFF-SITE DOSE CALCULATION MANUAL

The SSES Off-Site Dose Calculation Manual (ODCM) was revised on January 20, 1984 and May 14, 1984.

Revised pages with revision bars are provided. The changes were made to:

1. Include setpoints for the service water and RHR service water radiation monitors, exhaust vent flow rates, and vent monitor sample flow rates.

2. Indicate that high limit vent flow rates are assumed when calculating vent monitor setpoints.

3. Include offgas hydrogen monitor setpoint.

4. Indicate that vendor solidification services may be used.

5. Include discussion of Radiological Environmental Monitoring Program (REMP) charcoal air sampling cartridge certification.

6. Update REMP food product sampling locations.

PENNSYLVANIA POWER & LIGHT COMPANY
SUSQUEHANNA STEAM ELECTRIC STATION
OFFSITE DOSE CALCULATION MANUAL

Prepared By	T.E. Widner	Date	1/20/84
Reviewed By	K.E. Shank	Date	1/20/84
PORC Review Required Yes ( ) No (✓)		Date	
Approved By	[signature] Manager-Nuclear Support	Date	1/20/84

TABLE OF CONTENTS

JAN 20 1984

$$\frac{F + f}{f} = \frac{Y \cdot (A)}{MPC}$$

where $\frac{F + f}{f}$ = the setpoint dilution factor

The requirements of Equation (2) are then met as follows:

$$Y \cdot (A) = MPC\left(\frac{F + f}{f}\right)$$

Since, by definition, Y > X and Y(A) > X(A), then

$$(c) = X(A) < MPC\left(\frac{F + f}{f}\right)$$

The setpoint concentration (c) can then be converted to a setpoint count rate value by use of the monitor calibration factor.

$$\text{Setpoint (cpm)} = \frac{c\ (\mu Ci/ml)}{\text{Cal. Factor } (\mu Ci/ml \text{ per cpm})} \qquad (3)$$

The setpoint for the dilution water flow (cooling tower blowdown) is 5000 gpm from either cooling tower basin. The setpoint for the LRW discharge flow can then be determined from:

$$\frac{F + f}{f} = \frac{(A)}{MPC} \cdot Y$$

Sample calculations for determining the release concentration limits and setpoints are given in Section A.1.1 of Appendix A.

The Service Water System provides screened water from the cooling tower basin for cooling plant systems and equipment. 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 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

JAN 20 1984

radiation setpoints for these monitors are set at 2E-5 μCi/cc cesium-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 MPC is conservative based on the following parameters:

1) photon abundance (85%)
2) magnitude of applicable MPC (2E-5 μCi/cc)

Because Service Water & RHR Service Water 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/cc Cs-137 equivalent.

2.2 GASEOUS EFFLUENT MONITORS

SPECIFICATION 3.3.7.11 - THE RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION CHANNELS SHOWN IN TABLE 3.3.7.11-1 SHALL BE OPERABLE WITH THEIR ALARM/TRIP SETPOINTS SET TO ENSURE THAT THE LIMITS OF SPECIFICATION 3.11.2.1 ARE NOT EXCEEDED. THE ALARM/TRIP SETPOINTS OF THESE CHANNELS SHALL BE DETERMINED IN ACCORDANCE WITH THE METHODOLOGY AND PARAMETERS IN THE ODCM.

Noble gas activity monitors, iodine samplers, and practiculate samplers 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. 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. Precautions, limitations, and setpoints applicable to the operation of the SSES gaseous effluent monitors are provided in the applicable plant Procedures. Setpoints are conservatively established for each ventilation effluent monitor so that the instantaneous dose rates corresponding to 10 CFR 20 annual dose limits in unrestricted areas will not be exceeded. Conservatism is to be incorporated into the determination of each setpoint to account for:

JAN 20 1984

1. All exposure pathways of significance at the critical receptor locations;

2. Dose contributions to critical receptors from multiple release points; and

3. Dose contributions from major radioisotopes expected to be present in gaseous effluents.

The general methodology for establishing plant ventilation gaseous effluent monitor setpoints is based upon vent release rates (µCi/sec) derived from site-specific meteorological dispersion conditions, vent flow rates, and expected radioisotopic mixtures in the gaseous effluents. The vent release rate can then be converted to cpm depending upon the particular monitor's method of operation, sampling rate, and detection efficiency. It is not practical to apply alarm/trip setpoints to integrating radiation monitors sensitive to radioiodines, radioactive materials in particulate form, or radionuclides other than noble gases. Therefore, only the noble gas activity monitors in the five ventilation systems at the SSES will have established setpoints.

The calculated alarm and trip action setpoints for each noble gas ventilation effluent monitor and flow measurement device must satisfy the following equation for whole body dose:

$$Q'_{iv} \leq \frac{500}{(K_i)(\chi/Q)_v} \tag{4}$$

and by the following equation for skin dose:

$$Q'_{iv} \leq \frac{3000}{(L_i + 1.1\ M_i)(\chi/Q)_v} \tag{5}$$

JAN 20 1984

where:

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide (i) (mrem/yr per $\mu Ci/m^3$) from Table 2.

Q'_{iv} = the release rate of radionuclide (i) from vent (v) which results in an annual dose rate of 500 mrem to the whole body or 3000 mrem to the skin of the critical receptor ($\mu Ci/sec$).

$(\chi/Q)_v$ = the highest calculated annual average relative concentration for estimating the dose to the critical offsite receptor in an unrestricted area from vent release point (v) (sec/m^3).

500 = the 10 CFR 20 annual whole body dose limit (mrem/yr) to an individual in an unrestricted area.

L_i = the skin dose factor due to beta emissions for each identified noble gas radionuclide (i) (mrem/yr per $\mu Ci/m^3$) from Table 2.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide (i) (mrad/yr per $\mu Ci/m^3$) from Table 2 (conversion constant of 1.1 converts air dose-mrad to skin dose-mrem).

3000 = the 10 CFR 20 annual skin dose limit (mrem/yr) to an individual in an unrestricted area.

Xenon-135 should be the principal noble gas radionuclide released from the reactor building vents and the standby gas treatment system vent while Xenon-133 should be the principal noble gas radionuclide released from the turbine building vent due to the offgas holdup system. It is appropriate that these noble gas radionuclides be used as the reference isotopes for establishing the particular monitor setpoints. The whole body dose will be the most limiting and the release rate limit is calculated by substituting the appropriate values in Equation 4. After the release rate limit is determined for each vent, the corresponding vent concentration limits can be calculated based on normal vent flow rates:

$$\text{Setpoint } \frac{\mu Ci}{cc} = \frac{Q'_{iv}\ (\mu Ci/sec)}{\text{Flow rate } (cc/sec)} \qquad (6)$$

JAN 20 1984

Sample calculations for determining release limits for the whole body dose and the skin dose are given in Section A.1.2 of Appendix A. Also, typical values for flow rates and calibration factor are given for determining the setpoint of the Unit 1 turbine building vent gaseous effluent monitor.

Vent flow rates and sample flow rates are monitored and recorded for each of the five SSES release points. The measured flow rates are used to calculate vent concentrations and release rates. Flow channel setpoints are set at 10% and 90% of the calibrated sensor ranges to provide indication of possibly abnormal flow rates.

JAN 20 1984

PENNSYLVANIA POWER & LIGHT COMPANY
SUSQUEHANNA STEAM ELECTRIC STATION
OFFSITE DOSE CALCULATION MANUAL

Prepared By Thomas E Widner Date 5/9/84

Reviewed By Kenneth E. Shank Date 5/10/84

PORC Review Required Yes ( ) No (✓) Date ______

Approved By ______ Date 5/14/84
Manager-Nuclear Support

TABLE OF CONTENTS

MAY 14 1984

MAY 14 1984

LIST OF TABLES

MAY 14 1984

LIST OF FIGURES

MAY 14 1984

where:

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide (i) (mrem/yr per $\mu Ci/m^3$) from Table 2.

Q'_{iv} = the release rate of radionuclide (i) from vent (v) which results in an annual dose rate of 500 mrem to the whole body or 3000 mrem to the skin of the critical receptor (μCi/sec).

$(\chi/Q)_v$ = the highest calculated annual average relative concentration for estimating the dose to the critical offsite receptor in an unrestricted area from vent release point (v) (sec/m^3).

500 = the 10 CFR 20 annual whole body dose limit (mrem/yr) to an individual in an unrestricted area.

L_i = the skin dose factor due to beta emissions for each identified noble gas radionuclide (i) (mrem/yr per $\mu Ci/m^3$) from Table 2.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide (i) (mrad/yr per $\mu Ci/m^3$) from Table 2 (conversion constant of 1.1 converts air dose-mrad to skin dose-mrem).

3000 = the 10 CFR 20 annual skin dose limit (mrem/yr) to an individual in an unrestricted area.

Xenon-135 should be the principal noble gas radionuclide released from the reactor building vents and the standby gas treatment system vent while Xenon-133 should be the principal noble gas radionuclide released from the turbine building vent due to the offgas holdup system. It is appropriate that these noble gas radionuclides be used as the reference isotopes for establishing the particular monitor setpoints. The whole body dose will be the most limiting and the release rate limit is calculated by substituting the appropriate values in Equation 4. After the release rate limit is determined for each vent, the corresponding vent concentration limits can be calculated based on high limit vent flow rates:

$$\text{Setpoint } \frac{\mu Ci}{cc} = \frac{Q'_{iv}\ (\mu Ci/sec)}{\text{Flow rate (cc/sec)}} \tag{6}$$

MAY 14 1984

Sample calculations for determining release limits for the whole body dose and the skin dose are given in Section A.1.2 of Appendix A. Also, typical values for flow rates and calibration factor are given for determining the setpoint of the Unit 1 turbine building vent gaseous effluent monitor.

Vent flow rates and sample flow rates are monitored and recorded for each of the five SSES release points. The measured flow rates are used to calculate vent concentrations and release rates. Flow channel setpoints are set at 10% and 90% of the calibrated sensor ranges to provide indication of possibly abnormal flow rates.

SPECIFICATION 3.11.2.6 - THE CONCENTRATION OF HYDROGEN OR OXYGEN IN THE MAIN CONDENSER OFFGAS TREATMENT SYSTEM SHALL BE LIMITED TO LESS THAN OR EQUAL TO 4% BY VOLUME.

Hydrogen recombiners are used at SSES to maintain the relative concentration of components of potentially explosive gas mixtures outside the explosive envelope. The main condenser offgas treatment system explosive gas monitoring system (offgas hydrogen analyzers) have setpoints of 1% hydrogen to alarm and 2% hydrogen to isolate.

MAY 14 1984

The SSES solid radwaste system was designed to solidify all wet wastes for ultimate offsite disposal. There are two Backwash Receiving Tanks, one per unit, which collect two filter-demineralizer backwashes per tank (2450 gal capacity). Air spargers for resin mixing are driven by instrument air. Regeneration Waste Surge Tanks (4) and Phase Separators (3) have internal mixing eductors for sludge mixing driven by recirculation flow. The Spent Resin Tank has a reversible progressing cavity pump and internal mixing eductors. Two solidification trains have waste mixing tank progressing cavity feed and mixing pumps, and screw conveyors for feeding of dry Portland cement. Mixing is facilitated by the addition of sodium silicate.

Common solidification equipment includes waste container fill-port, transfer cart, capper washdown station, and swipe tool; cement silo with rotary feed valve, aeration blower, baghouse, and exhaust fan; sodium silicate tank and pump. Dry contaminated solids are compacted into 55 gallon drums. The trash compactor was hydraulic pump and hydraulic press piston with exhaust fan and HEPA filter.

A flow diagram of the SSES solid radwaste treatment system is shown in Figure 5.

NOTE: Vendor solidification services may be used in accordance with the SSES Process Control Program to supplement the plant solidification system or to take the place of the plant system when the plant system is out of service.

MAY 14 1984

9.2 MONITORING PROGRAM

SPECIFICATION 3.12.1 - THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SHALL BE CONDUCTED AS SPECIFIED IN TABLE 3.12.1-1.

Environmental samples shall be collected and analyzed according to Table 7 at locations shown in Figures 6 and 7. Analytical techniques used shall ensure that the detection capabilities in Table 8 are achieved.

A dust loading study (RMC-TR-81-01) was conducted to assure that the proper transmission factor was used in calculating gross beta activity of air particulate samples. This study concluded that the sample collection frequency of once per week was sufficient and that the use of 1 for the transmission connection factor for gross beta analysis of air particulate samples is valid.

The charcoal sampler cartridges used in the airborne radioiodine sampling program (Science Applications, Inc., Model CP-100) are designed and tested by the manufacturer to assure a high quality of radioiodine capture. A certificate from the manufacturer is supplied and retained with each batch of cartridges certifying the percent retention of radioiodine versus air flow rate through the cartridge.

The results of the radiological environmental monitoring program are intended to supplement the results of the radiological effluent monitoring by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Thus, the specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from station operation. The initial radiological environmental monitoring program will be conducted for the first three years of commercial operation of Unit 1. Following this period, program changes may be proposed based on operational experience. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment, and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, an effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the annual report. Reporting requirements for the radiological environmental surveillance program are given in Appendix B.

9.3 CENSUS PROGRAM

SPECIFICATION 3.12.2 - A LAND-USE CENSUS SHALL BE CONDUCTED AND SHALL IDENTIFY WITHIN A DISTANCE OF 8 KM (5 MILES) THE LOCATION IN EACH OF THE 16 METEOROLOGICAL SECTORS OF THE NEAREST MILK ANIMAL, THE NEAREST RESIDENCE AND THE NEAREST GARDEN* OF GREATER THAN 50 M^2 (500 FT^2) PRODUCING BROAD LEAF VEGETATION.

A land use census will be conducted to identify the location of the nearest milk animal and the nearest residence in each of the 16 meteorological sectors within a distance of five miles. When a land use census identifies a location(s) which yields a calculated dose or dose commitment greater than the values calculated from current sample locations, appropriate changes in the sample locations will be made. If a land use census identifies a location(s) with a higher average annual deposition rate (D/Q) than a current indicator location, the following shall apply:

*Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the site boundary in each of two directional sectors with the highest predicted D/Q's in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 3.12.1-1, item 4C shall be followed, including analysis of control samples.

MAY 14 1984

Exposure Pathways and/or Sample	Number of Samples and Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Sediment from Shoreline	7B Bell Bend - 1.2 mi SE	Semiannually	Gamma isotopic analysis semiannually.
Milk***	12B2 Shultz Farm - 1.69 mi. WSW 13E3 Dent Farm - 4.9 mi. W 5E1 Bloss Farm - 4.4 mi. E 10G1 Davis Farm - 14 mi. SSW[a]	Semi-monthly when animals are on pasture, monthly otherwise.	Gamma isotopic and I-131 analysis of each sample.
Fish and Invertebrates	Outfall area 2H Falls, Pa. (Approximately 30 mi NNE)	Sample in season. One sample of each of the following species[c]: 1. Walleye 2. Catfish.	Gamma isotopic on edible portions.
Food Products	11D1 Zehner Farm - 4.3 mi SW vegetable	At time of harvest	Gamma isotopic on edible portions.

*The location of samples and equipment were designed using the guidance in the Branch Technical Position to NRC Reg. Guide 4.8, Rev. 1 Nov. 1979, Reg. Guide 4.8 1975 and ORP/SID 72-2 Environmental Radioactivity Surveillance Guide. Therefore, the airborne sampler locations were based upon X/Q and/or D/Q.

**A dust loading study (RMS-TR-81-01) concluded that the assumption of 1 for the transmission correction factor for gross beta analysis of air particulate samples is valid. Air particulate samples need not be weighed to determine a transmission correction factor.

***If a milk sample is unavailable for more than two sampling periods from one or more of the locations, a vegetation sample shall be substituted until a suitable milk location is evaluated. Such an occurrence will be documented in the REMP annual report.

[a] Control sample location.

[b] Temporary locations until compositor is installed in intake and discharge lines; then frequency changes to composite sample collected over one-month period and location changes to 6S6 intake line, 6S7 discharge line. The upstream sample will be taken in the intake line and which is beyond significant influence of the discharges. The downstream sample will be taken in the discharge line.

[c] Other species in the same family could be sampled instead of the stated species if deemed desirable by the biological consultants.

[d] There is no river water intake at Berwick for drinking water. See Susquehanna SES-ER-OL Appendix G, page RAD-3.1. The calculated dose for Danville to the infant thyroid was 0.13 mrem per year. Therefore, there is no need to take a composite sample over two-week period and perform an I-131 analysis.

MAY 14 1984

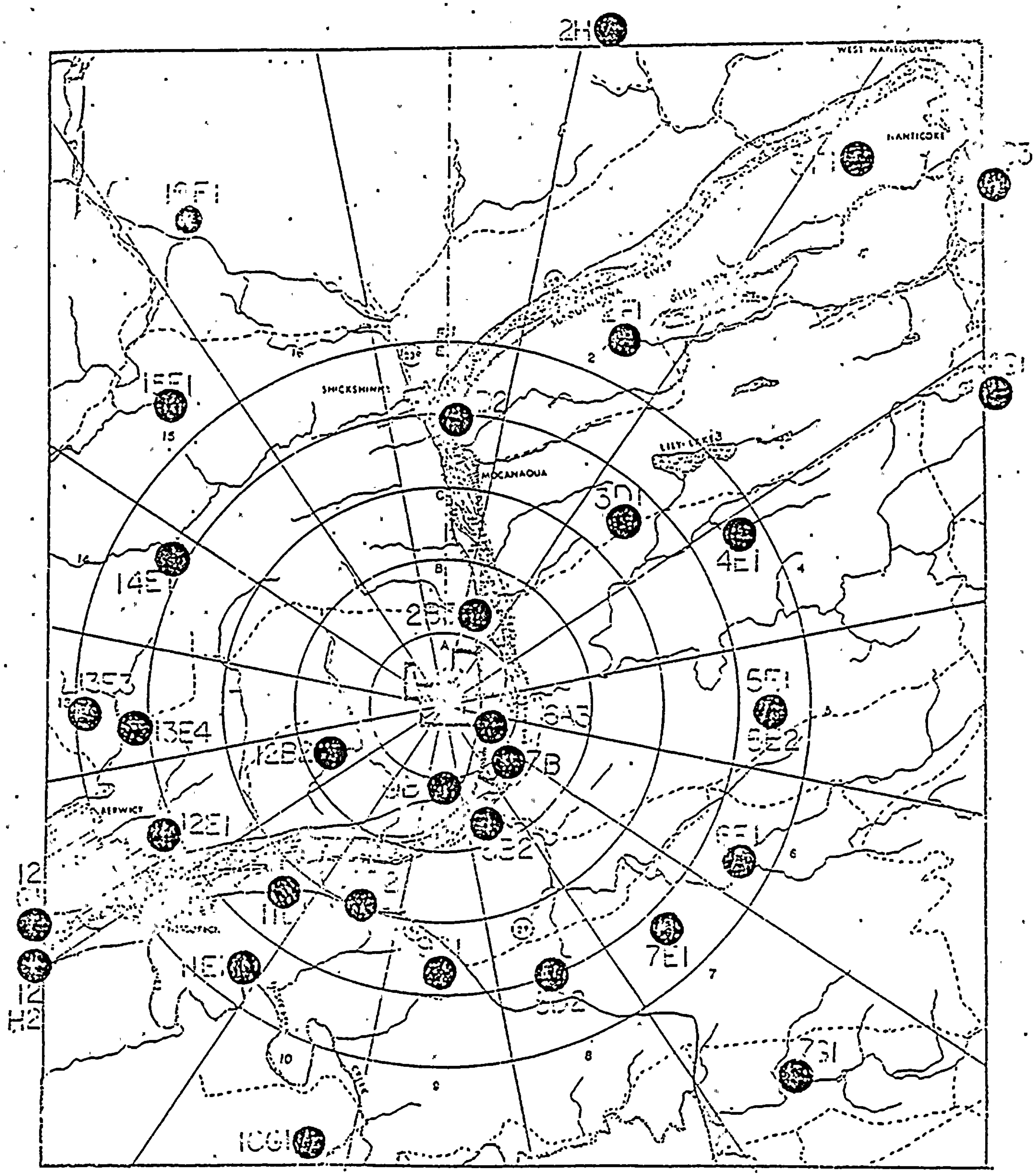


Figure 7. Offsite Environmental Sampling Locations - Susquehanna SES.

MAY 12 1984

CHANGES TO THE SOLID WASTE PROCESS CONTROL PROGRAM

Following is documentation of changes made to the solid waste Process Control Program during the report period. The attached letter indicates the nature of the changes and the reasons for incorporating the changes.

PP&L FORM 35

PP&L

cc: DCC File
OPS File

July 29, 1984

T. Widner

SUSQUEHANNA STEAM ELECTRIC STATION
PROCESS CONTROL PROGRAM REVISION
ER 100450 FILE 926
PLIS - 17,233

Attached for your use is a copy of AD-QA-311, Rev. 3, SOLID RADWASTE PROCESS CONTROL PROGRAM. In the past six months, the following changes were made:

1. Revised procedure to incorporate use of Type I cement in mobile solidification processes. This was to comply with 10CFR61 criteria.

2. Added Attachment C, SUSQUEHANNA GUARANTEED WASTE VOLUME RECORD sheet to formally track vendor guaranteed solid waste packaging efficiency.

These changes in no way jeoprodize the integrity of the program.

JPFelock

J. P. Felock
SR. Project Engineer - Radwaste

/shd

PROCEDURE COVER SHEET

PENNSYLVANIA POWER & LIGHT CO. SUSQUEHANNA STEAM ELECTRIC STATION	
SOLID WASTE PROCESS CONTROL PROGRAM	AD-QA-311 Revision 3 Page 1 of 49

Effective Date 6-8-84 Expiration Date 6-8-86

Revised Expiration Date ______

PROCEDURE TYPE: PORC X, NON-PORC ____, Alternate Review ____

PORC MTG. NO. 84-109 (If applicable)

CONTROLLED

Prepared by	[signature]	Date	5-2-84
Reviewed by	[signature]	Date	5-2-84
Recommended:	[signature] Section Head/Manager	Date	5/2/4
	[signature] Superintendent of Plant	Date	5-18-84

PROCEDURE REVISION INDEX

Procedure No. AD-QA-311	Title Solid Waste Process Control Program	
Rev. No.	**Description of Revision**	**Effective Date**
3	1. Revised procedure to incorporate use of Type I cement in mobile solidification to comply with 10CFR 61 criteria. 2. Added Attachment C, SUSQUEHANNA GUARANTEED WASTE VOLUME RECORD sheet to formally track vendor guaranteed solid waste packaging efficiency.	

TABLE OF CONTENTS

ATTACHMENTS

1.0 PURPOSE

Provide Administrative control and guidance for the solidification and dewatering of applicable forms of Radwaste for ultimate disposal.

2.0 SCOPE

This procedure is applicable to SSES installed systems and temporary systems and equipment provided by vendors for solidification and dewatering of applicable waste forms.

3.0 REFERENCES

3.1 49 CFR 173

3.2 10 CFR 20,61,71

3.3 SSES Technical Specifications Section 3.11.3, 4.11.3.1 and 4.11.3.2.

3.4 Standard review plan 11.4

3.5 HNDC "Liner Dewatering Test Report" Report No. I-843-3.

3.6 HNDC report on Dewatering of Bead Ion Exchange Resin and Activated Carbon, report No. Std-R-03-001.

3.7 HNDC Process Control Program for Dewatering Ion-Exchange Resin and Activated Charcoal filter media to 1/2% drainable liquid, Report No. Std.-P-04-002.

3.8 HNDC Report on Dewatering of Bead Ion Exchange Resin and activated Carbon in Hittman Radlok 100 High Integrity containers, Report No. Std.-R-03-002

3.9 HNDC Report on Dewaterig Hittman Radlok 100 containers with Rigid Underdrains to less than 1% Drainable Liquid, Report No. Std.-P-03-005.

3.10 HNDC Report on Dewatering Hittman Radlok 100 containers with Flexible Underdrains to less than 1% Drainable Liquid, Report No. Std.-P-03-005.

3.11 HNDC Radioactive Waste Container General Specification, HNDC-S-1001.

3.12 South Carolina Department of Health and Environmental Control Bureau of Radiological Health Certificate of Compliance No. DHEC-HIC-PL-005 HNDC Radlok 100 container.

3.13 Burial Site Criteria for Barnwell S.C..

3.14 Burial Site Criteria for Richland, Washington as indicated in the site license Amendments 13 and 14.

3.15 AD-QA-765 "Solid Radwaste Program"

3.16 AD-QA-605 Calibration of Installed Plant Instrumentation

3.17 CNSI Topical Report "Mobile Cement Solidification System" 4313-01354-01P-A

3.18 CNSI Topical Report "Polyethylene High Integrity Containers" CNSI-HIC-14571-01-P

3.19 CNSI Topical Report "CNSI Dewatering Control Process Containers Topical Report" CNSI-DW-11118-01-P

3.20 DHEC-HIC-PL-001 South Carolina Certificate of Compliance for CNSI High Integrity Containers

3.21 DHEC-HIC-PO-006 South Carolina Certificate of Compliance for CNSI Overpak High Integrity Containers

3.22 DHEC-HIC-FRP-003 South Carolina Certificate of Compliance for CNSI Fiberglass Reinforced Polyester 24 Inch Pressure Vessel as a High Integrity Container

3.23 CNSI FO-AD-002 Operating Guidelines for use of Polyethylene High Integrity Containers

3.24 CNSI FO-AS-004 Operating Guidelines for use of Fiberglass Reinforced Plastic High Integrity Containers

3.25 CNSI FO-OP-019 Polyethylene High Integrity Container Overpak Handling Procedure

4.0 <u>RESPONSIBILITIES</u>

4.1 Shift Supervision shall assume the responsibility of the Radwaste Supervisor in his/her absense.

4.2 Radwaste Supervisor responsibilities:

4.2.1 Ensure procedures are adequate to provide for proper solidification and dewatering. Test data shall be available to justify applicable functions and dewatering.

4.2.2 Ensure Solidification Equipment is operated in accordance with approved operating procedures including vendor supplied equipment.

4.2.3 Ensure the appropriate waste solidification and dewatering records are generated.

4.2.4 Interface with station support groups to ensure proper implementation of process controls programs.

4.2.5 Interface with contractor personnel involved in solid waste processing activities of Solidification and Dewatering.

a. Ensure that test data is available to justify specific functions.

b. Applicable vendor procedures may be used if approved by PORC.

4.2.6 Ensures Solidification and Dewatering operations are carried out in an ALARA manner.

4.2.7 Interface with H. P. Radwaste Specialist on liner and cask selection for solid waste shipping activities.

4.2.8 Ensures proper marking of containers prior to filling.

4.2.9 Maintains a log of Batch processes for test Solidification requirements.

4.2.10 Ensure Radwaste solidification personnel are adequately trained per NTI-QA-302O.

4.3 Chemistry Group responsibilities:

4.3.1 Sampling as required.

4.3.2 Performing required analysis in accordance with approved chemistry procedures.

4.3.3 Performing test solidification if required.

4.3.4 Providing the Isotopic mix and concentration of isotopes detected in the material sampled for solidification.

4.3.5 Providing mix ratios to the Radwaste Supervisor if analysis results indicate the waste type is out of the normal envelope for Solidification or an abnormal waste type is encountered.

4.3.6 Completing Chemistry portion of the Solidification Record Sheet. (Attachment A) and Dewatering Record Sheet. (Attachment B).

4.3.7 Ensures personnel are adequately trained per NTI-QA-3081A.

4.4 Health Physics Radwaste Specialist responsibilities:

4.4.1 Provide the Radwaste Supervisor with the type and specification of the liner to be used for solidification or dewatering.

4.4.2 Determining the type and specification of Casks which may be required.

4.4.3 Completing applicable portions of the Solidification or Dewatering Record Sheet.

4.4.4 Retention of the Solidification and Dewatering Record Sheet.

4.4.5 Storage of packaged solidified and dewatered material.

4.4.6 For determining curie content of solidified and dewatered material.

4.4.7 Final disposition of solidified and dewatered material.

4.4.8 Ensures SSES is a registered user of applicable High Integrity containers.

4.4.9 Ensures Radwaste Worker training has been conducted per AD-QA-765.

4.5 Quality Control is responsible for:

4.5.1 Ensuring process controls are adhered to

4.5.2 Review of Solidification and Dewatering record sheet.

4.5.3 Check of container marking.

4.5.4 Inspection of Liners and High Integrity Containers as required by applicable procedures.

4.5.5 Checking containers for free standing water through applicable procedural methods.

4.5.6 Verification of product acceptability when containers are checked through applicable procedural methods.

4.5.7 Receipt inspection of cement and additives including vendor supplied material.

4.6 I&C Supervisor

4.6.1 Ensure that periodic calibrations and inspections are performed as required.

4.7 Auxiliary Systems Operator is responsible for:

4.7.1 Operating the solidification and dewatering equipment in accordance with approved operating procedures as directed by the Radwaste Supervisor.

4.7.2 Completing applicable portions of the Solidification and Dewatering Record Sheet.

4.8 Vendors providing Solidification and/or Dewatering services.

4.8.1 Vendors providing solidification and/or dewatering service shall have in place a valid contract for said services and provide test data or make same available for PP&L review during vendor audits to demonstrate that their services and equipment meet the applicable regulatory and burial site limitations for the function they are providing.

4.8.2 Vendors shall provide training documentation to demonstrate that the personnel being provided, to conduct the applicable service, are infact trained and knowledgable in the applicable functions.

4.8.3 Vendors shall provide procedure that are or can be placed into the SSES procedure format for the functions being provided.

4.8.4 Vendors shall have an acceptable Quality Assurance Program that covers the services being provided. The vendor shall work within the SSES Quality Assurance Program when applicable.

4.8.5 Vendors shall complete applicable sections of Attachments A,B and C as required for each linerprocessed.

5.0 <u>DEFINITIONS</u>

5.1 Batch - The total volume of waste contained in a waste mixing tank, spent resin tank concentrates tank or phase separator that has been sampled for solidification.

5.2 Solidification - A conversion of radioactive materials from liquid and solid systems to a monolithic immobilized solid with definite volume and shape, bounded by a stable surface of distinct outline on all sides (free standing), with a free water content of less than .5% by volume.

5.3 Waste Type - The specific content of the waste to be solidified and may be Evaporator Concentrates, Filter Demineralizer Media, Dewatered Filter Sludges, Dewatered Bead resins or a combination of each.

5.4 Waste Pre-Conditioning - The physical or chemical adjustment of the waste to bring it within an established envelope to assure solidification.

5.5 Curing Time - The time allowed for the solidified product to set prior to transporting or capping the liner.

5.6 Mixing Ratio - The amounts of waste, cement and additive required for satisfactory solidification.

5.7 Test Solidification - The mixing of waste and solidification agents in the labratory to support selection of mixing ratios.

5.8 Dewatered - The removal of water from solid material to a point where less than 1% or 0.5% by volume remains as applicable to containers used and burial site limits.

5.9 Liner - The physical container in which the solidification product is deposited.

5.10 High Integrity Container - An approved container for burial that has an expected life of 300 years.

6.0 PROCEDURES

6.1 Waste Types - The following waste types may be solidified individually or in combinations as defined by specific chemistry procedures.

6.1.1 Evaporator Concentrates

a. Normally Evaporator Concentrates will be in the range of 5-25 weight % sodium sulfate waste.

b. Concentrates are the product of Condensate Demineralizer Regeneration OR

c. From processing of Chemical Waste Tank which may have low concentrations of the following:

(1) Tri Sodium Phophate

(2) Sodium sulfate

(3) Minute amounts of other chemicals used for chemistry analysis

(4) Decontamination Solutions (not including Phosphoric Acid)

(5) Phosphoric Acid

6.1.2 Filter/Demineralizer Media

a. Filter/Demineralizer media will consist of one or more of the following:

(1) Diatomaceous Earth

(2) Powdered Resin

(3) Carbon Materials

(4) Various solids, dirt and corrosion products in small concentrations

b. Filter/Demineralizer media may be dried to approximately 50 weight % moisture by air drying after removal of gross water volumes by draining.

c. Filter/Demineralizer media is discharged to the waste mixing tanks at the end of the filter run on a batch basis resulting in a minimum addition of 150 gal to the Waste Mixing Tank.

d. Filter/Demineralizer media may also be pumped from the Waste Mixing Tank to the appropriate container and dewatered/solidified. 6.1.3 Dewatered Filter Sludges for Solidification and Dewatering

a. RWCU Filter sludges are dewatered in the LRW Filter/Demineralizer from the RWCU Phase Separator where they are collected and allowed to decay.

(1) RWCU Phase Separator sludges are dewatered in volumes of approximately 20 cubic feet resulting in approximately 150 gallons of dewatered waste to the Waste Mixing Tanks.

(2) It is estimated that 7 to 10 Filter/Demineralizer batches will be required to process the RWCU Phase Separator sludge.

b. Fuel Pool Filter sludges and condensate demineralizer sludges are dewatered in the LRW Filter/Demineralizer from the Waste Sludge Phase Separator where they are collected.

(1) Waste Sludge Phase Separator sludges are dewatered in batches of approximately 20 cubic feet per batch resulting in approximately 150 gallons per batch of dewatered waste to the Waste Mixing Tank.

(2) It is estimated that 10-14 Filter/Demineralizer batches will be required to process the Waste Sludge Phase Separator.

c. Filter sludges may also be pumped directly from the appropriate phase separator to appropriate containers and dewatered/solidified.

6.1.4 Dewatered Bead Resin for Solidification

a. Bead Resins from the Condensate Demineralizers and the Liquid Radwaste Demineralizer are collected in the Spent Resin Tank.

b. Spent Resin Tank contents are Dewatered in the LRW Filter/Demineralizer.

c. Spent Resin Tank is dewatered in batches of approximately 20 cubic feet per batch. Resulting in approximatley 150 gallons per batch of resin addition to the Waste Mixing Tank.

d. It is estimated that approximately 21 batches will be required to process the Spent Resin Tank assuming that it contains resin from 1 Condensate Demineralizer and 1 LRW Demineralizer.

e. Spent Resin may also be transfered directly to appropriate liners and dewatered for solidification.

6.1.5 Bead Resin For Dewatering

a. Bead resins from Condensate Demineralizers and the Liquid Radwaste Demineralizer are collected in the Spent Resin Tank.

b. Spent Resin Tank contents may also be pumped directly to appropriate containers and dewatered.

6.1.6 Cartrige Filters

a. Cartrige Filters may be disposed of by emplacement in a cement matrix in steel drums/liners.

b. Cartrige Filters may be disposed of by placement in a high integrity container (HIC).

6.1.7 Oily Waste

a. Oily Waste may be solidified on a routine basis to a maximum of 12% oil as a contaminate. To other waste forms provided the following are adhered to:

(1) An emulsification agent is added at the required concentrations.

(2) The Liner affected is NOT SHIPPED TO the Barnwell, S.C. Disposal Facility.

b. Oily Waste may be solidified without the use of emulsifier at concentrations less than 3% oil by volume.

c. Oily Waste less than 1% by volume of unintentional oil may be shipped to the Barnwell Disposal Facility.

d. Oily Waste at concentrations 12% to 40% may be solidified in cement provided the following are adhered to:

(1) An emulsification agent is added at the required concentrations.

(2) The Liner used for oil solidification is not shipped to the Barnwell disposal facility.

e. For d above the non-oil portion of the waste must be water or other approved aqueous wastes.

6.1.8 Various other materials not specifically identified as waste types will be evaluated for solidification or dewatering on a case by case basis.

6.2 Solidification and Dewatering Product Control

6.2.1 Sampling

a. Samples shall be obtained, and analyzed, for each batch of waste if possible.

b. Deviations from the sampling requirement shall be approved by the Chemistry Supervisor.

c. The tank to be sampled shall be recirculated for a minimum of 1/2 hour prior to sampling.

d. The Chemistry Group shall obtain the required samples after the specified recirculation time is complete.

e. Material to be solidified may also be processed by mobile solidification equipment.

f. For the purpose of liner selection, if a sample point of the Batch tank is not available, a dose rate may be taken on the bottom of the tank with recirculation shut down to estimate the curie concentration.

6.2.2 Waste Preconditioning

a. Waste preconditioning will be determined by chemistry analysis during batch sampling.

b. Preconditioning of waste will be performed if required prior to determining mix ratios.

c. Waste preconditioning is required when any of the following is not met.

(1) A high or low pH condition, out of the acceptable band of 4 to 11, exists in the Batch.

(2) Liquid content of the batch is too low or too high, out of the acceptable envelope for solidification.

(3) Solids content of the batch is too low or too high, out of the acceptable evevelope for solidification.

d. Waste preconditioning will be performed in accordance with approved procedures as recommended by Chemistry Group.

e. Upon completion of Waste Preconditioning Chemistry Group will obtain additional samples as required to determine mixing ratios.

6.2.3 Determination of Mixing Ratios

a. Determination of mixing ratios shall be performed for each waste batch to be processed.

b. Deviation from the recommended mixing ratios shall be approved by the Chemistry Supervisor.

c. Chemistry Group determines the waste type as determined by checking:

(1) Density of the liquid

(2) Specific density of Sodium Sulfate

(3) Volumetric content of settled solids

(4) Type of solids contained in the waste.

d. Chemistry Group shall perform test solidification of waste as required in section 6.2.4.

e. Chemistry Group determines mixing ratios to ensure proper solidification.

f. Chemistry Group shall provide an isotopic analysis which will be attached to the Solidification Record Sheet. (Form AD-QA-311-1)

g. Chemistry Group shall provide the projected total curie concentration to the Health Physics Specialist Radwaste.

h. Chemistry Group shall provide variation of the mixing ratios if the projected liner dose rates will exceed the required maximum levels.

6.2.4 Test Solidification

a. Test solidification shall be performed to support waste mixing ratios as follows:

(1) At least every tenth (10th) Batch of the same waste type.

(2) When sample analysis fall outside the normal envelope established indicating a change in the waste type.

(3) It is believed that some unexpected or abnormal contaminant may be present.

(4) When requested by the Chemistry Supervisor or Radwaste Supervisor.

b. Upon failure of a test solidification additional samples will be obtained and testing will continue until a successful test solidification has been completed with revised mixing ratios as determined by Chemistry.

c. Test solidifications shall be performed on each subsequent batch of the same waste type until at least three (3) consecutive initial test solidifications demonstrate acceptability.

d. Quality Control shall verify test solidification acceptability.

6.2.5 Curing Time

a. A minimum of 30 hours shall be allowed for curing prior to capping or transporting the container.

b. The liner may be moved during the first hour after solidification but must remain undisturbed for the remaining 29 hours.

c. Deviations from the minimum required curing time shall be approved by the Radwaste Supervisor and justifications documented in the remarks section of Solidification Data Sheet. (Form AD-QA-311-1)

6.2.6 Solidification Product Quality

a. Solidification product quality is assured by use of the predetermined mixing ratios of waste, cement and additive.

b. Mixing ratios are based on labratory testing non-radioactive waste materials.

c. Mixing ratios are re-enforced by the following:

(1) Test solidifications performed periodically as stated in 6.2.4.

(2) Visually and physically checking at least every fifth (5th) container of the same waste type.

d. Container checks shall consist of:

(1) A visual check of the solidified product for water on the surface of the product.

(2) Physically poking the surface of the solidified product with a ridgid unyielding device prior to capping (Nominal penetration is acceptable).

e. Quality Control shall verify acceptability of the solidified product when containers are checked.

f. Deviation from the container checking requirement shall be approved by the Radwaste Supervisor.

6.2.7 Handling of Unacceptable Solidified Waste Containers.

a. If the reason for unacceptability is free standing water:

(1) The free standing water will be removed or

(2) Extra cement/additive will be added to solidify the free water.

b. If portions or all of the product did not solidify:

(1) The waste container will be capped and placed in a storage location in the Radwaste facility and periodically checked until such a time that the product is acceptable: or

(2) Additional solidification agents may be added to achieve satisfactory solidification, as determined by the Radwaste Supervisor.

c. Specific instructions shall be established for handling unacceptable solidified waste container on a case by case basis.

d. Quality Control shall verify acceptability of the solidified product.

(1) Less than 0.5% free standing water.

(2) The solidified product appears to be able to hold its shape if it were removed from the liner.

e. If the product solidifies prematurely prior to complete addition of the required amount of cement and additive as calculated on the solidification calculation sheet for the specific procedure used. At a minimum the following are required.

(1) Chemistry Group shall perform a test solidificationat the actual ratio of cement and waste in the liner, provided ChemistryGroup has sufficient sample volume remaining to complete this item.

(2) Quality Control shall check the product for acceptability in accordance with 6.2.6.d of this procedure.

(3) The liner may be shipped provided the subsequent test solidification and/or product quality checks are acceptable to Quality Control and concurrence of the Radwaste Supervisor obtained.

6.2.8 Waste Container Space Utilization

a. Waste volume shall be maximized within the guidelines of the specific operating procedures to minimize potential void space at the top of the waste container after solidifcation or dewatering is complete.

b. Specific waste volumes committed too by the vendor shall bemet or otherwise justified as to why the waste volumes were not achieved.

c. Attachment C shall be used to track the waste volumes achieved in each individual liner; this form shall be completed by vendor personnel for each liner processed.

6.3 Solidification Agent Control

6.3.1 Portland Type I/Type II Cement

a. Portland Cement - ASTM C-150 Type I shall be used for the solidification process.

b. Portland Cement - ASTM C-150 Type II shall be used for the designed in house solidification of Class A waste only.

c. Certification of the type of cement received shall be provided by the vendor and signed by a responsible representative of that vendor.

d. Quality Control shall verify receipt of the proper cement upon delivery.

6.3.2 Sodium Silicate

a. Solidum Silicate from the PQ Corporation Type N, or equivalent shall meet the following specifications:

(1)	Weight Ratio SiO2/Na2O	3.20
(2)	Percent Na2O	8.90
(3)	Percent SiO2	28.70
(4)	Degrees Baume	41.00
(5)	Density, lb/gal	11.60
(6)	Viscosity	180.00

b. Certification of the sodium silicate received shall be provided by the vendor and signed by a responsible representative of that vendor.

c. Quality Control shall verify receipt of the proper sodium silicate upon delivery.

6.3.3 Other solidification agents may be used only after acceptable testing of the agent has been completed that demonstrates acceptable solidification.

6.3.4 VENDOR SUPPLIED SOLIDIFICATION AGENT. Documented Certification is not required for materials received in bags provided material verification can be obtained as follows:

a. Cement is acceptable provided the bag containing the cement indicates that the cement is Portland Type I.

b. Sodium Silicate is acceptable provided the bag containing the additive indicates Anhydrous Sodium Metasilicate and is a product of PQ Corporation.

c. Other additives are acceptable provided the bag containing the additive is clearly marked indicating the type of additive.

6.3.5 Other additives may be used for enhancement of the solidification process as specified in the operating procedure and documented on the solidification record sheet.

6.4 Equipment Calibrations shall be in accordance with AD-QA-605 Calibration of Installed Plant Instrumentation.

6.5 Solidification Record Sheet

6.5.1 A Solidification Record Sheet (Form AD-QA-311-1) shall be completed for each liner filled with solidification products.

6.5.2 Guidelines for completing the Solidification Record Sheet are attached to each part of the form. Parts of the form shall be completed by the following responsible individuals or groups.

a. The Radwaste Supervisor is responsible for initiating this form.

b. Part I, solidification record sheet cover page, shall be completed by the Radwaste Supervisor.

Part II, Sampling and Pre-Solidification Analysis shall be completed by Chemistry Group.

Part III, Container selection shall be completed by the HP Radwaste Specialist or his designee.

Part IV, System Preparation and Processing shall be completed by the Auxiliary System Operator. Part IIIa shall be used with vendor supplied equipment and is completed by vendor personnel and the Radwaste Supervisor.

Part V, Solidified Liner Data shall be completed by the HP Technician, HP Radwaste Specialist and the Radwaste Supervisor.

6.5.3 Quality Control shall provide verification as required in the Solidification Record Sheet.

6.6 Solidification Processing

6.6.1 Solidification processing shall be conducted by qualified SSES or vendor personnel in accordance with AD-QA-304.

6.6.2 The solidification process shall be operated in accordance with approved operating procedures.

6.6.3 Quality Control personnel shall verify proper system variable settings and material additions to the solidification container.

6.7 Radioactive Waste Dewatering

6.7.1 Dewatering of Radioactive Waste shall be performed by qualified SSES or vendor personnel.

6.7.2 Dewatering of Radioactive Waste shall be performed in accordance with approved operating procedures.

6.7.3 Dewatering procedures shall be based on documented test data that has demonstrated the ability to achieve drainable water limits as specified by applicable regulatory agencies.

6.7.4 A Dewatering Record Sheet (Attachment B, Form AD-QA-311-2) shall be completed for each container filled with dewatered resins. Guides for completing the Dewatering Record Sheet are attached to each part of the form. Parts of the form shall be completed by the following responsible individuals or goups.

a. The Radwaste Supervisor is responsible for initiating this form and completing Part I.

b. Part II Sampling and pre dewatering analysis shall be completed by the Chemistry Group

c. Part III container selection shall be completed by the HP Radwaste Specialist and Radwaste Supervisor.

d. Part IV Dewatering operation documentation shall be completed by the qualified person completing the various operations.

e. Part V Dewatered container data shall be completed by the HP technicians, and HP Radwaste Specialist as applicable.

f. Quality Control personnel shall provide verification as required by the Dewatering Record Sheet.

6.7.5 The Health Physics Specialist Radwaste shall assure that SSES is a registered user of High Integrity Containers (HIC) used at SSES for the purpose of Radwaste disposal prior to the use of a specific type HIC.

6.8 Changes to the Solid Waste Process Control Program.

6.8.1 Any changes to the Solid Waste Process Control Program shall be provided in the semiannual Radioactive Effluent Release Report filed with the NRC.

6.8.2 Any changes to the Solid Waste Process Control Program shall be approved by the Plant Operations Review Committee (PORC).

6.9 Container Inspections

6.9.1 Quality Control shall inspect the containers to be used for solidification and dewatering.

a. This inspection shall assure and document that the conditions of the Certificate of Compliance for High Integrity Containers have been met.

b. This inspection shall assure that prior to use, the containers to be used for solidification or dewatering are intact and their internals are free of any visual damage that would prevent them from performing their intended function.

7.0 RECORDS

7.1 The Solidification Record Sheet or Dewatering Record Sheet and the attached Isotopic Analysis shall be forwarded to the HP Radwaste Specialist for retention until such time as the Liner identified on the Record Sheet is shipped for final disposition.

7.2 When the identified liner is shipped the Solidification Record Sheet or Dewatering Record Sheet and other documents concerning the Shipment shall be forwarded to the DCC for retention.

SOLIDIFICATION RECORD SHEET

Part I Cover Sheet

a. Step 1 - Enter PP&L Liner identification number.

b. Step 2 - Enter waste type to be processed.

c. Step 3 - Enter process number for this waste type from the Radwaste Supervisor's log book; this is the next sequential number for this waste type.

d. Step 4 - Enter the batch number associated with this process; this is obtained from the Radwaste Supervisor's log book for this waste type.

e. Step 5 - Identify if a test solidification is required based on the information contained in the Radwaste Supervisor's log book for this waste type.

f. Step 6 - Shift Supervision/Radwaste Supervisor signature indicates approval for sampling and test solidification if required.

Solidification Record Sheet

Part II Sampling and Pre-Solidification Analysis Instructions

a. Step 1 - Identify which mixing tank A or B or other tank that is to be processed by a check mark, or identify.

b. Step 2 - Check that the pH of the sample taken from the tank to be processed is within a range acceptable for solidification.

c. Step 3 - Enter the wet weight percent settled solids and the weight percent sodium sulfate, and the percent water by volume of the sample.

d. Step 4 - Enter the density of the sample taken from the tank. Be sure to use the density of the whole sample not just of the liquid phase.

e. Step 5 - Check off the quantity of oil in the sample by noting either "none" or less than one percent, "< 1%" or indicating the percentage of oil.

f. Step 6 - Check that a copy of the radionuclide analysis is attached.

g. Step 7 - Based on the isotopic analysis attached enter the total curie concentration.

h. Step 8 - Determine final product density.

i. Step 9 Identify here the type of cement used (i.e., Type I)

j. Step 10a - For the process feed pump (OP-304) provide the pump flow rate to be used for the solidification process. If a Vendor Supplied system is provided enter waste volume.

Part II cont'd
Instructions

k. Step 10b For the cement feed system (OS-305) provide the cement feed rate to be used for the solidification process. If vendor supplied System is provided, enter Cement Volume in lb/ft^3.

l. Step 10c - For the liquid sodium silicate feed pump (OP-309) provide the pump feed rate to be used in the solidification process. If Sodium Silicate or other agent is used with vendor provided systems, enter volume in lb/ft^3 or liters/gallon.

m. Step 11 Enter the curing time required based on the most recent test solidification of that waste type. At a minimum 30 hrs. cure time will be required.

n. Step 12 - Chemistry Supervision shall sign with the date and time signed that the waste in the identified tank has been sampled and analyzed in accordance with approved procedures and is acceptable for solidification at the indicated mixing ratios.

Solidification Record Sheet

Part III Container Selection Instructions

a. Step 1 - Based on the isotopic analysis of the waste to be solidified provide the estimated dose rates for the bare liner on contact and at a distance from the surface of 2 meters.

b. Step 2 - Enter the projected curie concentration of the solidified waste.

c. Step 3 Enter the waste classification based on the Isotopic analysis per 10CFR part 61.

d. Step 4 - Identify the type of liner to be used.

e. Step 5 - Enter the appropriate cask designation to be used for shipment. More than one designation may be entered.

f. Step 6 - Enter the PP&L liner identification number.

g. Step 7 - The Radwaste Supervisor or his designee shall sign, with date and time, that the cask(s) and cask liner identified above are appropriate for the waste to be solidified.

Solidification Record Sheet

Part IV System Preparation and Processing Instructions

a. Step 1 - Enter the serial number of the liner to be used.

b. Step 2 - Enter the PP&L identification number on the liner. (This must be the same as the number in Part II step 5)

c. Step 3 - Verify that the liner is properly loaded on the correct transfer cart.

d. Step 4 - After the cart is moved to the fill position verify that the liner is properly positioned under the fill port.

e. Step 5 - Check that the mating surface between the fill flange and the liner is proper and will not leak.

f. Step 6a - Enter the process speed control setting for the appropriate waste feed pump (OP-304 A or B). (As determined by the Radwaste Supervisor)

g. Step 6b - Enter the process speed control setting for the cement feed system, (OS-305). (As determined by the Radwaste Supervisor)

h. Step 6c - Enter the process speed control setting for the sodium silicate pump, (OP-309). (As determined by the Radwaste Supervisor)

i. Step 6d - Verify that the Process Mix Pump (OP-307) process speed control setting is on 10.

j. Step 7 - Shift Supervisor/RW Supervisor shall sign, with date and time, that the process control speed settings are proper and consistent with Section 6.5.2.

k. Step 8 - Verify that sufficient cement is available for solidification of the tank contents.

l. Step 9 - Verify that sufficient liquid sodium silicate is available for solidification of the tank contents.

Part IV cont'd
Instructions

m. Step 10 - Enter the quanitity of waste in the Waste Mixing Tank to be processed.

n. Step 11 - Shift Supervision shall verify and sign, with date and time, that all requirements of the Process Control Program have been met and that the authorization to proceed with the solidification process is granted.

o. Step 12 - Enter the time and solidification process is initiated.

p. Step 13 - Enter the time the solidification process is stopped.

q. Step 14 - Enter cement level in silo at completion of solidification process.

r. Step 15 - Enter liquid solium silicate tank level at completion of solidification process.

s. Step 16 - Enter final Waste Mixing Tank level.

t. Step 17 - Enter estimated weight of the liner with the solidified material.

u. Step 18 - The Radwaste Operator shall sign, with date and time, that the process has been completed.

v. Step 19 - QC verification of fifth (5th) filled liner check.

w. Step 20 - Verify, with time and date, that the liner is properly capped and sealed.

x. Step 21 - Enter the curing time between Steps 13 and 19.

y. Step 22 - Verify that the liner has been moved to the washdown area.

z. Step 23 - Shift Supervision shall sign, with date and time, that the solidification process has been accomplished according to the requirements of this procedure and that Health Physics has been notified.

Solidification Record Sheet
Part IVa System Preparation and Processing
Instruction (Vendor or alternate system)

a. Step 1 - Enter the serial number of liner to be used.

b. Step 2 - Check that PP&L identification number is stenciled on the liner. (This must be the same as the number in Part II step 5).

c. Step 3 - Verify that the liner is properly positioned and ALARA consideration has been made for spills and expected dose rates.

d. Step 4 - Shift Supervision authorize start of processing.

e. Step 5 - Enter process parameters in appropriate units.

f. Step 6 - Enter processing start time.

g. Step 7 - Enter processing stop time

h. Step 8 - QC verification for hardness/solidification by manual penetration tests visual observations for water in the liner.

i. Step 9 - The actual curing time prior to capping shall be entered here.

j. Step 10 - Enter the Final solidified waste volume in cubic feet.

k. Step 11 - Enter date and time liner capped.

l. Step 12 - Supervisor review and release liner to Health Physics.

Solidification Record Sheet

Part V Filled Liner Data Instructions

a. Step 1a - The contact radiation levels on the top and bottom of the liner and at four points, 90° apart, around the centerline of the liner shall be recorded.

b. Step 1b - Enter the level of external contamination on the liner as determined by an analysis of a swipe smear.

c. Step 1c - Based on the data entered in 6.5.5.b of this procedure determine whether or not a liner washdown is to be performed. If a washdown is required signify by entering "yes", if a washdown is not required signify by entering "NR".

d. Step 1d - Enter the level of external contamination on the liner as determined by an analysis of a swipe smear. If a second, or subsequent, swipe smear is not required enter "NR".

e. Step 1e - Health Physics shall verify and sign, with date and time, that the liner is ready for transfer to storage or for transfer directly to a shipping cask for transportation to a licensed burial site.

f. Step 2 - Enter the storage location liner is transfered to. Enter "NA" if the liner is not stored prior to shipment.

g. Step 3 - Enter the transportation shipment number.

h. Step 4 - Enter the name of the burial site the liner is being shipped to Health Physics and QC shall sign, with date and time, that his procedure has been properly followed.

SOLIDIFICATION RECORD SHEET

Part I Cover Page

1. LINER Identification No. ________________

2. WASTE TYPE ________________

3. Sequential Liner No. of Waste Type ________________

4. BATCH No. ________________

5. Test Solidification required ________________
   Yes/No

6. Approval for use ________________
   Shift Supervision/Radwaste Supervisor

SOLIDIFICATION RECORD SHEET

Part II Sampling and Pre Solidification Analysis ________ tank placed on recic.
Date/Time

1. Waste Mixing Tank Sampled ______A ______B ______ ______
Other Date/Time

2. Waste Stream pH 4-11 ______
Check

3. Type of Waste[1] ____________________

   a. Wet WT. % settled solids __________

   b. WT. % Sodium Sulfate __________

   c. % Water by volume __________

4. Waste sample density __________gm/ml

5. Oil Content (check a or b, or enter % by volume in c)

   a. ______ None

   b. ______ Less 1%

   c. ______ % oil

6. Isotopic Analysis Attached __________
Check

7. Estimated Total Curie Concentration ______ uCi/cc

8. Final product density ______ gm/cc

9. Type of cement to be used __________

[1] Include nomenclature of type of waste, i.e. bead resin, powdered resin, carbon, oil, diatomaceous earth sodium sulfate or combination, etc,

10. Mixing Ratios

SSES INPLANT SYSTEM		Initial		VENDOR SYSTEM	Initial
a.	Waste (OP-304)	________	gpm	Waste ______ ft^3	
b.	Cement (OS-305)	________	lb/min	Cement ______ lbs/ft^3 of waste	
c.	Sodium Silicate (OP-309)	________	gpm	Sodium Silicate ______ lb/ft^3 of waste	
				Other additive ______ liters/gallons	

11. Cure time required ________ hours.

12. The above tank has been analyzed and is acceptable for solidification at the indicated mixing ratios.

______________________________	____________	____________
Chemistry Supervision	Date	Time

PART III CONTAINER SELECTION

1. Estimated Liner Dose rates ________ mr/hr on contact

________ mr/hr at 2 meters

2. Projected Curie Loading ________ uci/gm

3. Waste Classification ______________

4. Liner type used ______________
TYPE

5. Type cask to be used ______________
TYPE

6. PP&L Liner Identificiation Number ______________

7. The above specified Liner and cask have been determined appropriate for the solidified waste based on projected curie loading and dose rates

______________________	____________	____________
Radwaste Supervisor or His Designee	Date	Time

PART IV SYSTEM PREPARATION AND PROCESSING
(Use Part IVa if vendor supplied system is used)

1. Liner Serial Number ______________

2. PP&L Liner Identification Number on liner __________ Check

3. Liner Properly Loaded on Transfer Cart __________ Check

4. Liner Properly Positioned Under Fill Port. __________ Check

5. Fill Flange Properly Mated To Liner __________ Check

6. Process Speed Control Setting. (obtained form Radwaste Supervisor)

   a. Water Feed (OP-304) ______A ______B

   b. Cement Feed (OS-305) ______A ______B

   c. Sodium Silicate (OP-309) ______A ______B

   d. Process Mix Pump (OP-307) __10__A __10__B

7. Process speed control settings verified

______________________________	__________	__________
Shift Supervision/RW Supervisor	Date	Time
______________________________	__________	__________
QC Verification	Date	Time

8. Sufficient Cement Available __________ Check

9. Sufficient Sodium Silicate __________ Check

10. Waste Mixing Tank Level ________ %

11. Authorization to Commence Process

Shift Supervision	Date	Time

12. Time process started ______ Time

13. Time Process Stopped ______ Time

14. Cement Silo Level ______ %

15. Sodium Silicate Tank Level ______ %

16. Waste Mixing Tank Level ______ %

17. Liner Weight ______

18. Process completed

Operator	Date	Time

19. Liner Check (5th liner) complete ______ QC Verification (6.2.6.d)

20. Liner Capped ______ Date ______ Time

21. Curing time allowed prior to capping

______ hours ______

22. Liner Transfered to wash down station ______ Check

23. Supervisory review and Health Physics notification

Shift Supervision	Date	Time

Part IVa System Preparation and Processing
(Vendor or alternate system)

1. Liner Serial Number ________

2. PP&L Liner Identification Number on liner ________.
Check

3. Liner properly positioned and ALARA consideration made ________.
Check

4. Authorization to commence processing

Shift Supervision	Date	Time

5. Process parameters

Waste in liner		actual ________	ft^3
Cement to be added to liner ________lbs		actual ________	lbs
Sodium Silicate to be added to liner ______lbs		actual ________	lbs
Other additive added to liner		actual ________	lbs/ft^3/gallons

Tank from which waste is to be transferred ____________________.

QC Verification	Date	Time

6. Time processing started __________

7. Time processing stopped __________

8. Liner check for complete solidification and visible water or drainable water.

   a. Penetration check (6.2.6.d) ____________________ QC Verification/Date/Time

   b. Visible water (6.2.6.d) ____________________ QC Verification/Date/Time

9. Curing time actual ________(A minimum of 30 hrs is required.)

10. Final container solidified waste volume ________ft^3

DEWATERING RECORD SHEET

Part I Cover Page

a. Step 1 - Enter the liner identification number from Radwaste Supervisor Log Book.

b. Step 2 - Enter the waste identification (i.e., Bead resin, Powdex, carbon, etc..)

Part II Sampling and Pre-Dewatering Analysis

a. Step 1 - Sample the appropriate tank after a recirc period of 1/2 hour or 1 tank volume as a minimum.

b. Step 2 - Same as Step 1.

c. Step 3 - Collect a liquid sample from the material to be dewatered to assure the liquid will not be corrosive to a carbon steel liner.

d. Step 4 - Determine the oil content of the material to be dewatered.

e. Step 5 - Conduct an isotopic analysis of the material to be dewatered.

f. Step 6 - Enter the specific activity.

11. Liner capped ________ ________ ________
Date Time Initials

12. Supervisory review and Health Physics notification.

________ ________ ________
Shift Supervision Date Time

PART V Filled Liner Data

1. Filled Liner Radiation Levels

a. Top ________ mr/hr
Bottom ________ mr/hr
4 Quadrants 1 ______ mr/hr
2 ______ mr/hr
3 ______ mr/hr
4 ______ mr/hr

b. Smearable Activity ________ dpm/100cm

c. Container washdown / decon performed ________
Yes/NR

d. Smearable activity after washdown/decon ______ dpm/100cm

e. Liner ready for transfer to storage

________ ________ ________
HP Tech. Date Time

2. Storage Location: RW ________ / ________ / ________
Date Time Initials

LLWHF ________________
Date Time Initials

3. Shipment # ________

4. Destination ________

________ ________ ________
HP Radwaste Spec. Date Time

________ ________ ________
Quality Control Review Date Time

Part III Container Selection

a. Step 1 - Based on the isotopic analysis of the material to be dewatered provide the estimated dose rates for the bare container on contact and at a distance of 2 meters from the surface.

b. Step 2 - Enter the projected curie concentration on the dewatered waste.

c. Step 3 - Enter waste classification per 10CFR part 61 (i.e., A, B or C).

d. Step 4 - Identify the type of container to be used.

e. Step 5 - Enter the appropriate cask designation to be used for the container if required.

f. Step 6 - Enter the PP&L liner identification number.

g. Step 7 - The Radwaste Supervisor or his designee shall sign, with date and time, that the cask(s) and container identified above are appropriate for the waste to be dewatered.

Part IV Dewatering Operations Documentation

a. Step I - A specific operating procedure for the container will be used to document the applicable dewatering functions.

b. Step 2 - Enter Final Dewatered Waste volume.

c. Step 3 - Enter date and time the liner is capped.

d. Step 4 - Supervision review of dewatering documentation.

Part V Dewatered Container Data

a. Step 1 - Document the container radiological data on a blank survey form ______ and attach the form to the Dewatering Record Sheet.

Use HP-TP-800 to assist in determining the transport groups and curie content of material being dewatered.

b. Step 2 - The storage location shall be assigned by the HP Specialist Radwaste.

c. Step 3 - The shipment # and destination shall be designated by the HP Specialist Radwaste.

DEWATERING RECORD SHEET

Part I Cover Page

1. Liner Identification Number ____________
2. Waste Identification ____________

____
Shift Supervision/
Radwaste Supervisor

Part II Sampling and Pre-Dewatering Analysis

1. Waste Mixing Tank Sampled: ________ A ________ B
   Check/NA Check/NA

2. Other tank sampled ________________
   Name

3. pH of liquid contained within solids if a Carbon Steel liner is used ____________ pH

4. Oil Content (check one)

   ________ None

   ________ less than 1%

5. Isotopic Analysis attached ____________
   Check

6. Specific activity of Dewatered Sample ____________ µCi/gm

   The above tank containing solids has been sampled and found to contain the isotopes and specific activities as indicated on the attached data sheets.

______________________ Chemistry Supervisor ____________ Date ____________ Time

Part III Container Selection

1. Estimated Liner Dose Rates ____________ mr/hr on contact

____________ mr/hr at 2 meters

2. Projected Curie Loading ____________ UCi/gm

3. Waste Classification ____________

4. Liner type used ____________
Type

5. Type cask to be used ____________
Type

6. PP&L Liner Identification Number ____________

7. The above specified container and cask have been determined appropriate for the dewatered waste based on projected curie loading and dose rates:

____________	____________	____________
Radwaste Supervisor /or His Designee	Date	Time

Part IV Dewatering Operations Documentation

1. Attach the complete specific operating procedure check off sheet for the specific dewatering container being used ______________
Check

2. Final Dewatered Waste Volume ____________ Ft^3

3. Liner Capped ________/________
Date Time

4. Dewatering check off sheet review and (Use specific check sheet for liner being used) transferred to HP Specialist Rad Waste

Shift Supervision	Date	Time

Part V Dewatered Container Data

1. Container Radiation Levels

a. Top ______________________ mr/hr

Bottom ______________________ mr/hr

4 Quadrants 1 __________ mr/hr
2 __________ mr/hr
3 __________ mr/hr
4 __________ mr/hr

b. Smearable Activity ______________ $dpm/100cm^2$

c. Container washdown/decon performed ______________
Yes/No

d. Smearable activity after washdown/decon
______________ $dpm/100cm^2$
(attach radiological survey form)

e. Liner ready for transfer to storage

HP Tech	Date	Time

Part V (Cont'd.)

2. Storage location: RW ________/________/________
Date Time Initials

LLWHF ________/________/________
Date Time Initials

3. Shipment # ________________

Destination ________________

________________ ________ ________
HP Specialist Radwaste Date Time

________________ ________ ________
Quality Control Review Date Time

SUSQUEHANNA GUARENTEED WASTE VOLUME RECORD

a. Step 1 - Enter the date and PP&L Liner Identification number.

b. Step 2 - Enter the type of waste processed and its source (i.e., Waste Mix tank, Phase Seperator, etc..)

c. Step 3 - Describe the physical appearance of the waste (i.e., color clarity, etc..)

d. Step 4 - Enter liner type used.

e. Step 5 - Enter burial volume associated with this liner.

f. Step 6 - Enter the Q.C. verified waste volume from FORM AD-QA-311-1 or 2.

g. Step 7 - Enter usable liner volume for liner specified in Step 4.

h. Step 8 - Enter Guaranteed minimum waste volume in inches (measured from top of liner) and cubic feet.

i. Step 9 - Enter waste volume attained in inches (measured from top of liner) and cubic feet.

j. Step 10 - Enter the waste volume difference (±) from the guaranteed volumes as per Steps 8 and 9.

k. Step 11 - Remarks - this section is used to explain all waste shortages.

l. Step 12 - The solidification vendor representative signs indicating all the information contained on this document is correct.

m. Step 13 - The Radwaste Supervisor signs indicating agreement with the information contained on this documents.

SUSQUEHANNA GUARANTEED WASTE VOLUME RECORD

1. Date ______________ Liner number ______________

2. Type of waste ______________ Source ______________

3. Physical appearance ______________

4. Liner Type ______________

5. Burial Volume ______________

6. Waste Volume ______________

7. Useable Liner Volume ______________

8. Guaranteed Minimum Waste Volume ______________

9. Waste Volume Attained
   __________inches ______________ft^3

10. Waste Volume Difference
   __________inches ______________ft^3

11. Remarks:

12. Signature ______________________________
   Solidification Vendor Representative

13. Signature ______________________________
   Radwaste Supervisor SSES

SECTION 4

REPORT OF EXCEPTIONS TO THE SSES EFFLUENT MONITORING PROGRAM
(Per Technical Specifications 3.3.7.10 and 3.3.7.11)

EXCEPTIONS TO THE SSES EFFLUENT MONITORING PROGRAM

A. PURPOSE

This section serves as documentation of any cases in which effluent monitoring instrumentation channels remain inoperable for longer than the time periods specified in Technical Specification Tables 3.3.7.10-1 and 3.3.7.11-1. Reporting of such events is required per Technical Specifications 3.3.7.10 (liquid effluent monitors) and 3.3.7.11 (airborne effluent monitors).

B. EVENTS

1. Monitor: Service Water System Effluent Line Monitor
Date of Report: January 21, 1984
Description:

The background radiation levels around the Unit 1 Service Water Monitor increased to the point that the Service Water Monitor high alarm setpoint could not ensure that the service water discharge from the fuel pool heat exchangers was less than the Cs-137 MPC ODCM setpoint.

Action Taken:

The monitor was declared inoperable, and 8-hour grab sampling and analysis was initiated. The Cs-137 MPC of 2.0 E-5 uCi/ml corresponds to 1300 cps if an efficiency of 1.54E-8 uCi/ml per cps is assumed. Because of the high background, the 1300 cps above background limit was split to determine the monitor's high setpoint (background + 650 cps) and low setpoint (background-650 cps). The addition of shielding to decrease the background radiation in the detector was requested.

2. Monitor: Unit 1 Service Water System Effluent Sine
Date of Report: March 14, 1984
Description:

The Service Water Monitor was removed from service due to flunctuating background radiation levels. The fluctuating background could mask a heat exchanger leak.

Actions Taken:

Grab sampling and analysis was initiated at 8-hour intervals. A plant modification was implemented which added two inches of lead shielding to the detector.

3. Monitor: Unit 2 RHR Service Water System Effluent Line
Date of Report: April 2, 1984
Description:

The Unit 2 RHR Service Water Radiation Monitor A and B failed the quarterly functional test because a low flow condition or sample pump trip did not cause control room indication of instrument inoperability.

Actions Taken:

A plant modification was implemented which included low flow status input to the applicable control room alarm.

PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101 • 215 / 770-5151

Bruce D. Kenyon
Vice President-Nuclear Operations
215/770-7502

AUG 30 1984

Dr. Thomas E. Murley
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
SEMI-ANNUAL RADIOACTIVE EFFLUENT
RELEASE REPORT
ER 100450/100508 FILES 890-13/841
PLA-2278

Docket Nos. 50-387/NPF-14
and 50-388/NPF-22

Dear Dr. Murley:

In accordance with 10CFR50.36a(a)(2) and the Susquehanna SES Unit 1 and 2 Technical Specifications, attached is the Semi-Annual Radioactive Effluent Release Report for SSES Units 1 and 2 covering the period January 1 through June 30, 1984.

Very truly yours,

B Kenyon

B. D. Kenyon
Vice President-Nuclear Operations

cc: Director
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. R. L. Perch - USNRC
Mr. R. H. Jacobs - USNRC

Mr. Robert J. Benich
General Electric Company
Nuclear Services
Marketing Department
1000 First Avenue
King of Prussia, PA 19406

E25
11

SUSQUEHANNA STEAM ELECTRIC STATION
SEMIANNUAL EFFLUENT AND WASTE DISPOSAL REPORT
REPORT PERIOD: 07/01/84 - 12/31/84

Prepared by: T.E. Widner 2/25/85
T.E. Widner
Health Physicist

Reviewed: K.E. Shank 2/25/85
K.E. Shank
Environmental Group Supervisor- Nuclear

Approved: Richard L. Doty 2/26/85
R.L. Doty
Radiological & Environmental Services Supervisor

Pennsylvania Power & Light Company
Two North Ninth Street
Allentown, Pennsylvania 18101

TABLE OF CONTENTS