PROCEDURE COVER SHEET

PENNSYLVANIA POWER & LIGHT CO. SUSQUEHANNA STEAM ELECTRIC STATION	
EMERGENCY ENVIRONMENTAL SAMPLING	EP-IP-044 Revision 1 Page 1 of 65
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EMERGENCY ENVIRONMENTAL SAMPLING

1.0 PURPOSE

The purpose of this procedure is to describe the methods and responsibilities for conducting environmental monitoring during and after an EMERGENCY.

2.0 SCOPE

This procedure includes all sampling and analyses to support assessment of environmental impact in the event of an abnormal gaseous or liquid release leading to or during an emergency at SSES. Provisions are included for returning to the routine radiological environmental monitoring program as described in NSI-QA-4.1.

3.0 REFERENCES

3.1 SSES Emergency Plan

3.2 EPA Protective Action Guides

3.3 NSI-QA-4.1 Radiological Environmental Monitoring Program

3.4 Radiation Management Corporation, Procedure - T46

3.5 Radiation Monitoring Data Analysis Verification Program Manual - Appendix I, Part E

3.6 Ecological studies of the Susquehanna river in the vicinity of SSES, Ichthyological Associates, Annual Report for 1976

4.0 RESPONSIBILITIES

4.1 In the event of a liquid release, it is the responsibility of the RADIATION PROTECTION COORDINATOR to assess initial results of the liquid sample taken by the CHEMISTRY STAFF and to take appropriate actions.

4.2 In the event of a liquid release, it is the responsibility of the CHEMISTRY STAFF to collect liquid samples from the blowdown line composite sampler located in the sewage treatment plant and to analyze these samples in accordance with this procedure.

4.3 It is the responsibility of the RADIATION SUPPORT MANAGER to direct the ENVIRONMENTAL SAMPLING SUPERVISOR once the EOF has been manned.

4.4 It is the responsibility of the ENVIRONMENTAL SAMPLING SUPERVISOR to direct the ENVIRONMENTAL SAMPLE COLLECTORS and to arrange for the analyses of the samples which are collected during and after the EMERGENCY.

4.5 It is the responsibility of the ENVIRONMENTAL SAMPLE COLLECTORS to perform the sampling required by the ENVIRONMENTAL SAMPLING SUPERVISOR.

4.6 It is the responsibility of the ADMINISTRATIVE SUPPORT MANAGER to dispatch couriers to transport samples to the analyses laboratory upon request by the ENVIRONMENTAL SAMPLING SUPERVISOR.

5.0 DEFINITIONS

5.1 pCi - picocurie

5.2 cpm - counts per minute

5.3 NRC - U.S. Nuclear Regulatory Commission

5.4 EPA - U.S. Environmental Protection Agency

5.5 Pa. DER/BRP - Pennsylvania Department of Environmental Resources/Bureau of Radiation Protection

5.7 EOF - Emergency Operations Facility

5.8 REMP - Radiological Environmental Monitoring Program

6.0 INSTRUCTIONS

6.1 Upon notification of an emergency, the RADIATION PROTECTION COORDINATOR will follow the Instructions in Attachment A, Action Step, RADIATION PROTECTION COORDINATOR.

6.2 At the direction of the RADIATION PROTECTION COORDINATOR the CHEMISTRY STAFF will follow Instructions in Attachment B, Action Step, CHEMISTRY STAFF.

6.3 Upon arrival at the EOF the RADIATION SUPPORT MANAGER will follow Instructions in Attachment C, Action Step, RADIATION SUPPORT MANAGER.

6.4 Upon notification by the RADIATION SUPPORT MANAGER, the ENVIRONMENTAL SAMPLING SUPERVISOR will follow Instructions in Attachment D, Action Step, ENVIRONMENTAL SAMPLING SUPERVISOR.

6.5 At the direction of the ENVIRONMENTAL SAMPLING SUPERVISOR, the ENVIRONMENTAL SAMPLE COLLECTORS will follow Instructions in Attachment E, Action Step, ENVIRONMENTAL SAMPLE COLLECTORS.

6.6 Upon notification from the ENVIRONMENTAL SAMPLING SUPERVISOR, the ADMINISTRATIVE SUPPORT MANAGER will follow Instructions in Attachment F, Action Step, ADMINISTRATIVE SUPPORT MANAGER.

ACTION STEP
RADIATION PROTECTION COORDINATOR

A.1.0 In the event of a liquid release during an EMERGENCY the RADIATION PROTECTION COORDINATOR will:

A.1.1 Obtain results of the initial liquid sample analysis performed by the CHEMISTRY STAFF.

A.1.2 Notify the Danville Water Authority of the release. Notification of the release should be made to the Superintendent of Water, or supervisor on duty, Danville Borough at . Initial instructions for Danville should be to continue normal operation until river flow calculations can provide data needed to make decisions on protective actions to be taken.

A.1.3 Direct the CHEMISTRY STAFF to continue sampling as necessary.

A.1.4 Inform the RADIATION SUPPORT MANAGER of the liquid sample analysis and of the actions already taken. Include the amount of liquid released, time of release, termination time, and the initial concentration of radioactivity released in the discharge.

A.1.5 Inform the EMERGENCY DIRECTOR of the results of Steps A.1.1 through A.1.4.

A.1.6 When the EOF is <u>not</u> manned:

a. Perform liquid release calculations as per Attachment G of this procedure.

b. Provide DER/BRP with all results.

c. Advise DER/BRP, based on the results, of any protective actions which should be taken by Danville.

ACTION STEP
CHEMISTRY STAFF

B.1.0 In the event of a liquid release the CHEMISTRY STAFF will:

B.1.1 Upon notification from the EMERGENCY DIRECTOR, or designated COORDINATOR, report to the Control Room for sampling instructions.

B.1.2 When instructed, proceed to the sewage treatment plant and collect a grab sample from the blowdown line composite sampler.

B.1.3 Take the sample back to the radiochemistry laboratory for a GAMMA scan analysis.

B.1.4 Report the following to the RADIATION PROTECTION COORDINATOR:

B.1.4.1 GAMMA scan results

B.1.4.2 Volume of release (gal.)

B.1.4.3 Length of release (time)

B.1.5 Each sample should be labeled with the following information:

B.1.5.1 TIME SAMPLE WAS TAKEN

B.1.5.2 TIME SAMPLE WAS ANALYZED

B.1.5.3 LOCATION OF SAMPLE

B.1.5.4 AMOUNT OF SAMPLE

B.1.5.5 CONCENTRATION IN SAMPLE

ACTION STEP
RADIATION SUPPORT MANAGER

C.1.0 The RADIATION SUPPORT MANAGER will:

LIQUID RELEASE

C.1.1 Obtain, from the RADIATION PROTECTION COORDINATOR, discharge information such as amount of liquid released, time for release to be terminated, and the initial concentration of radioactivity in the discharge. Relay this information directly to the ENVIRONMENTAL SAMPLING SUPERVISOR.

C.1.2 Direct the ENVIRONMENTAL SAMPLING SUPERVISOR to implement off-site liquid monitoring activities as needed based on initital concentration results.

C.1.3 Provide the DER/BRP with the results of the liquid calculations.

C.1.4 Advise the Pa. DER/BRP, based on the results of the liquid calculations, of any protective action which should be taken by Danville.

GASEOUS RELEASE

C.2.0 Direct the ENVIRONMENTAL SAMPLING SUPERVISOR to implement the following off-site environmental monitoring activities as necessary:

C.2.1 Exchange of Emergency TLD's in the field and subsequent reading in the EOF.

C.2.2 Exchange of Quality Control TLD's once the EMERGENCY has been terminated. These will be changed out and analyzed by the REMP Quality Control Laboratory.

NOTE: Quality Control TLD's will be changed out and analyzed by Penn State University. The phone number for the analyses laboratory at Penn State is (normal working hours).

C.2.3 Food product and vegetation sampling

C.2.4 Air iodine cartridge and air particulate filter collection

C.2.5 Milk collection - Begins approximately 24 hours after possible release of Iodine.

NOTE: ASSURE THAT THE RADIATION LEVELS IN THE AREAS TO BE SAMPLED ARE SUCH THAT THE SAMPLE COLLECTORS WILL NOT EXCEED THEIR QUARTERLY EXPOSURE LIMIT.

C.2.6 Make a recommendation to DER/BRP to take appropriate protective action to affected farmers if the radioactivity in milk samples becomes 1.2×10^4 pCi/liter, if the radioactivity in pasture samples becomes 2.7×10^5 pCi/kg, or if the projected dose to the infant thyroid reaches 1.5 rem, whichever comes first.

ACTION STEP
ENVIRONMENTAL SAMPLING SUPERVISOR

D.1.0 The ENVIRONMENTAL SAMPLING SUPERVISOR will:

LIQUID RELEASE

D.1.1 Upon notification of an emergency at SSES, contact the PROJECT DIRECTOR or alternate at Ichthyological Associates to notify SAMPLE COLLECTORS to report to the Susquehanna Biological Laboratory.

D.1.2 Proceed to the EOF and receive initial instructions from the RADIATION SUPPORT MANAGER.

D.1.3 Obtain the river level from a river level gauge in the Susquehanna Biological Laboratory.

D.1.4 From the RADIATION SUPPORT MANAGER, obtain:

D.1.4.1 Amount of Liquid released

D.1.4.2 Time of release and termination time.

D.1.4.3 Initial concentration of activity in the discharge

D.1.5 Calculate:

D.1.5.1 The dilution factor in the Susquehanna river

D.1.5.2 The time for the plume to reach Danville

D.1.5.3 Concentration of activity expected to reach Danville using the equations which are presented in Attachment G and Data Sheet contained in Attachment H.

D.1.6 Give the ENVIRONMENTAL SAMPLE COLLECTORS the following information:

D.1.6.1 Where to sample (i.e., Danville Water Authority, Control location above discharge, location below discharge.)

D.1.6.2 Type of sample (i.e., Composite or grab)

D.1.6.3 Amount and frequency of sample (normal sampling - 100 ml/1/2 hr. for 2 hrs.)

D.1.6.4 Special instructions including a reminder to pick up SRD's and TLD's at the EOF.

D.1.7 Arrange for transportation and analysis of samples to the Analyses Laboratories and collection of sample results.

D.1.8 Notify the RADIATION SUPPORT MANAGER of sample results.

NOTE: IN EMERGENCY SITUATIONS, RADIATION MANAGEMENT CORPORATION (RMC), PHILADELPHIA, PA., SHOULD BE USED FOR SAMPLE ANALYSES. THE TELEPHONE NUMBERS ARE:

WEEKDAYS, 9AM - 5PM

ALL OTHER TIMES

D.1.9 Keep track of the ENVIRONMENTAL SAMPLE COLLECTORS' exposures by filling out Attachment K, Personnel Exposure of Environmental Sample Collectors.

GASEOUS RELEASE

D.2.0 Receive inital direction from RADIATION SUPPORT MANAGER.

D.2.1 Obtain the following release information:

D.2.1.1 Type of release

D.2.1.2 Direction of plume

D.2.1.3 Approximate radiation levels, if available

D.2.2 Contact ENVIRONMENTAL SAMPLE COLLECTORS and provide initial instructions:

D.2.2.1 Type of samples to be collected (i.e., milk, TLD's, food product and vegetation, air iodine and air particulates)

D.2.2.2 Location of samples

D.2.2.3 Exchange of TLD's - replacement TLD's should be picked up at the EOF

D.2.2.4 Number of samples to be collected at each location

D.2.2.5 Special instructions (i.e., extra samples for Pa. DER, NRC, EPA, etc.)

D.2.3 Contact the ADMINISTRATIVE SUPPORT MANAGER and arrange for transport couriers to pick up samples and transport them to the analysis laboratory.

D.2.4 Once analysis results are known, determine from the RADIATION SUPPORT MANAGER if future sampling is necessary. If further sampling is necessary follow Action Steps D.2.2 through D.2.4

D.2.5 Keep track of ENVIRONMENTAL SAMPLE COLLECTORS' exposures by filling out Attachment K, Personnel Exposure of Environmental Sample Collectors.

ACTION STEP
ENVIRONMENTAL SAMPLE COLLECTORS

E.1.0 The ENVIRONMENTAL SAMPLE COLLECTORS will:

LIQUID RELEASE

E.1.1 Obtain the following information upon initial contact with the ENVIRONMENTAL SAMPLING SUPERVISOR:

E.1.1.1 Location of sample

E.1.1.2 Type of sample (i.e., composite or grab)

E.1.1.3 Amount and frequency of sample (normal sampling is 100 ml./1/2 hr. for 2 hrs.).

E.1.1.4 Phone number to reach ENVIRONMENTAL SAMPLING SUPERVISOR

E.1.1.5 Instructions for transporting samples to analysis laboratory.

E.1.2 Perform inventory of Sample Kits (located at Susquehanna Biological Laboratory:

E.1.2.1 Flashlight (with extra batteries)

E.1.2.2 Sample container

E.1.2.3 Sample collector (i.e., water bucket, flask, etc.)

E.1.2.4 Plastic bags

E.1.2.5 Gloves, rubber

E.1.2.6 EP-IP-044 - Emergency Environmental Sampling

E.1.2.7 Air cartridge and filter paper

E.1.2.8 Sample receipt sheets, notebook, and ID tags

E.1.2.9 Map of area

E.1.2.10 TLD shields

NOTE: Extra Sample Kits are located in the EOF.

E.1.3 Before proceeding to initial sample location, pick up SRD's and TLD's from the ENVIRONMENTAL SAMPLING SUPERVISOR at the EOF.

E.1.4 Collect samples at the following location as directed by the ENVIRONMENTAL SAMPLING SUPERVISOR:

E.1.4.1 Danville Water Authority

E.1.4.2 Control location above the discharge line

E.1.4.3 Location below the discharge line

E.1.5 When all samples have been collected, contact the ENVIRONMENTAL SAMPLING SUPERVISOR to arrange for transportation of the samples to the analysis laboratory. Samples should be labeled with the following information before being transported:

E.1.5.1 Location of sample

E.1.5.2 Type of sample

E.1.5.3 Amount and frequency of sample

E.1.5.4 Time sample was taken

E.1.6 Wait for further instructions from the ENVIRONMENTAL SAMPLING SUPERVISOR.

GASEOUS RELEASE

E.2.0 Upon notification of an EMERGENCY by the ENVIRONMENTAL SAMPLING SUPERVISOR obtain the following information:

E.2.1 Location of initial samples to be collected

E.2.2 Type of samples to be collected

E.2.3 Number of samples to be collected at each location

E.2.4 Perform inventory of sample kits located at Susquehanna Biological Laboratory.

Refer to E.1.2.1-10 of this procedure.

E.2.5 Before proceeding to initial sample location, pick up SRD's and TLD's from the ENVIRONMENTAL SAMPLING SUPERVISOR at the EOF.

E.2.6 Collect the environmental samples as directed by the ENVIRONMENTAL SAMPLING SUPERVISOR and in accordance with the sample collection procedures in Attachment I and the supplemental sample collection procedures in Attachment J.

E.2.7 When sample collection is complete, transport samples to the Susquehanna Biological Laboratory. The emergency TLD's should be placed in a TLD shield and transported to the EOF for analysis.

E.2.8 When all samples have been collected, contact the ENVIRONMENTAL SAMPLING SUPERVISOR to arrange for transportation of th samples to the analysis laboratory.

ACTION STEP
ADMINISTRATIVE SUPPORT MANAGER

F.1.0 The ADMINISTRATIVE SUPPORT MANAGER will:

F.1.1 Upon request from the ENVIRONMENTAL SAMPLING SUPERVISOR, dispatch transport couriers to pick up environmental samples and transport them to the analysis laboratory, Radiation Management Corporation, 3508 Market Street, Philadelphia, Pa., or, if requested, to the EOF.

CALCULATIONS OF RIVER TRANSIT TIME TO DANVILLE FROM SSES

G.1.0 Given a liquid discharge from the Susquehanna SES the following method will be used to determine the amount of time for the discharge to travel from SSES to the Danville Water Authority.

G.1.1 Obtain the river level, X, in meters above mean sea level, from the Susquehanna biological laboratory personnel. This is read from a river level gauge in the laboratory. (Phone # is)

Calculate the river flow velocity (Y), in meters/sec. by the use of the following equation:

$$Y\ (m/s) = 0.356\ (X) - 52.8$$

The transit time (t) to Danville can then be calculated by the following:

$$t = \frac{50{,}000\ m}{Y\ (m/s)} \div 3600\ sec./hr.$$

where 50,000 m is the river distance from SSES to the Danville Water Authority.

Example

river level (x) = 148.92 m

river flow velocity (y) = 0.356 (148.92m) - 52.8

(y) = 0.2205 m/s

transit time (t) = $\frac{50{,}000\ m}{.2205\ m/s} \div 3600\ sec/hr = 63\ hrs.$

G.2.0 Dilution Factor at Susquehanna SES

Given a liquid discharge exceeding technical specification limits from the Susquehanna SES the following method will be used to determine the dilution factor in the river at the time of the discharge.

Determine from the RADIATION SUPPORT MANAGER:

1. The total volume (gallons) of the release, A.

2. The total time (minutes) of release, B.

Obtain the river level, X, in meters above mean sea level from the Susquehanna biological laboratory personnel.

Calculate the total release rate, C, by the following equation:

$$C\ (\text{gal./sec.}) = \frac{A\ (\text{gal})}{B\ (\text{min})} \times \frac{1\ \text{min}}{60\ \text{sec.}}$$

where A = Total Release Volume (gal)

B = Total Release Time (min)

Calculate the river flow D (gal/sec), by converting the river level, X, to river flow E (M^3/sec) with the use of the attached river, depth, flow, level conversion table. Then multiply by the appropriate conversion factor:

(1 M^3 = 264.2 gal)

D (gal/sec) = E (M^3/sec) x 264.2 (gal/M^3)

where: E = river flow (M^3/s); from the conversion table.

Calculate the dilution factor, F, by use of the following equation:

$$F = \frac{C\ (\text{gal/sec})}{D\ (\text{gal/sec})}$$

Example:

Total Volume of Release A = 22,000 gal

Total Time of Release B = 30 min

River Level X = 148.92 M.

$$C = \frac{A}{B} = \frac{22{,}000\ \text{gal}}{30\ \text{min}} \times \frac{\text{min}}{60\ \text{sec}} = 12.22\ \text{gal/sec}$$

River Flow (E) (M^3/sec) = 205.6 M^3/sec (from conversion table.)

River Flow D, (gal/sec) = E (M^3/sec) x 264.2 (gal/M^3)

D = 205.6 (M^3/sec) x 264.2 (gal/M^3)

D = 54,320 gal/sec

The dilution factor (F) may now be determined:

$$F = \frac{C}{D} = \frac{12.22 \text{ (gal/sec)}}{54,320 \text{ (gal/sec)}}$$

$$F = 2.25 \times 10^{-4}$$

NOTE: FOR AN UNDETERMINED RELEASE TIME (B) OR QUANTITY OF DISCHARGE (Δ), A VALUE OF 1 MINUTE PER 10,000 GALLONS RELEASED SHOULD BE ASSUMED.

G.3.0 CONCENTRATION OF RADIOACTIVITY AT DANVILLE

Obtain the initial radioactivity concentration in the water at the blowdown line from the RADIATION SUPPORT MANAGER (G).

Multiply this number by the dilution factor calculated in I.2.0 to obtain the concentration of radioactivity released into the Susquehanna river (H).

To calculate the concentration which reaches Danville, obtain the dilution factor in the Susquehanna river to Danville from Table 5.2-19 which is attached at the end of this section. Divide the concentration released into the Susquehanna by the dilution factor to Danville to obtain the calculation of radioactivity expected to reach the Danville Water Authority.

Example:

- Initial concentration at blowdown time =

  4.2×10^{3} uCi/ml (G)

- Dilution factor at Susquehanna SES =

  3×10^{4} (F)

- Concentration released to Susquehanna

  = F x G

  = 1.26×10^{6} uCi/ml (H)

- Dilution between Susquehanna SES and Danville (for January) = 314 (I)

- Concentration at Danville Water Authority

  = (H) ÷ (I)

  = 3.82×10^{3} uCi/ml

RIVER DEPTH, LEVEL, FLOW CONVERSION TABLE AT THE SUSQUEHANNA SES BIOLOGICAL LABORATORY

Water Depth (ft.)	Level (m above msl)	Flow (m3/s)	Depth (ft.)	Level (m above msl)	Flow (m3/s)
2.0)	147.82	0.8	5.5)	148.89	196.5
2.1)	147.85	3.1	5.6)	148.92	205.6
2.2)	147.88	5.5	5.7)	148.95	215.0
2.3)	147.91	8.1	5.8)	148.98	224.5
2.4)	147.94	10.9	5.9)	149.01	234.3
2.5)	147.97	13.9	6.0)	149.04	244.2
2.6)	148.00	17.1	6.1)	149.07	254.4
2.7)	148.03	20.5	6.2)	149.10	264.7
2.8)	148.06	24.2	6.3)	149.13	275.3
2.9)	148.09	28.0	6.4)	149.16	286.0
3.0)	148.12	32.0	6.5)	149.19	297.0
3.1)	148.16	36.2	6.6)	149.22	308.1
3.2)	148.19	40.6	6.7)	149.25	319.4
3.3)	148.22	45.2	6.8)	149.28	331.0
3.4)	148.25	50.0	6.9)	149.31	324.7
3.5)	148.28	55.0	7.0)	149.34	354.6
3.6)	148.31	60.2	7.1)	149.37	366.7
3.7)	148.34	65.6	7.2)	149.40	379.1
3.8)	148.37	71.1	7.3)	149.44	391.6
3.9)	148.40	76.9	7.4)	149.47	404.3
4.0)	148.43	82.9	7.5)	149.50	417.2
4.1)	148.46	89.1	7.6)	149.53	430.4
4.2)	148.49	95.5	7.7)	149.56	443.7
4.3)	148.52	102.1	7.8)	149.59	457.2
4.4)	148.55	108.8	7.9)	149.62	470.9
4.5)	148.58	115.8	8.0)	149.65	484.8
4.6)	148.61	123.0	8.1)	149.68	498.9
4.7)	148.64	130.4	8.2)	149.71	513.2
4.8)	148.67	137.9	8.3)	149.74	527.7
4.9)	148.70	145.7	8.4)	149.77	542.4
5.0)	148.73	153.7	8.5)	149.80	557.3
5.1)	148.76	161.8	8.6)	149.83	572.4
5.2)	148.80	170.2	8.7)	149.86	587.7
5.3)	148.83	178.8	8.8)	149.89	603.2
5.4)	148.86	187.5	8.9)	149.92	618.9

Water Depth (ft.)	Level (m above msl)	Flow (m3/s)	Depth (ft.)	Level (m above msl)	Flow (m3/s)
9.0)	149.95	634.8	12.8)	151.11	1385.4
9.1)	149.98	650.9	12.9)	151.14	1409.0
9.2)	150.01	667.2	13.0)	151.17	1432.8
9.3)	150.05	683.7	13.1)	151.20	1456.9
9.4)	150.08	700.3	13.2)	151.23	1481.1
9.5)	150.11	717.2	13.3)	151.26	1505.5
9.6)	150.14	734.3	13.4)	151.29	1530.1
9.7)	150.17	751.6	13.5)	151.33	1554.9
9.8)	150.20	769.0	13.6)	151.36	1579.9
9.9)	150.23	786.7	13.7)	151.39	1605.1
10.0)	150.26	804.6	13.8)	151.42	1630.5
10.1)	150.29	822.7	13.9)	151.45	1656.1
10.2)	150.32	840.9	14.0)	151.48	1681.9
10.3)	150.35	859.4	14.1)	151.51	1707.9
10.4)	150.38	878.1	14.2)	151.54	1734.1
10.5)	150.41	896.9	14.3)	151.57	1760.5
10.6)	150.44	916.0	14.4)	151.60	1787.0
10.7)	150.47	935.2	14.5)	151.63	1813.8
10.8)	150.50	954.7	14.6)	151.66	1840.8
10.9)	150.53	974.4	14.7)	151.69	1868.0
11.0)	150.56	994.2	14.8)	151.72	1895.4
11.1)	150.59	1014.3	14.9)	151.75	1923.0
11.2)	150.62	1034.5	15.0)	151.78	1950.7
11.3)	150.65	1054.9	15.1)	151.81	1978.7
11.4)	150.69	1075.6	15.2)	151.84	2006.9
11.5)	150.72	1096.4	15.3)	151.87	2035.2
11.6)	150.75	1117.5	15.4)	151.90	2063.8
11.7)	150.78	1138.7	15.5)	151.93	2092.6
11.8)	150.81	1160.2	15.6)	151.97	2121.5
			15.7)	152.00	2150.7
11.9)	150.84	1181.8	15.8)	152.03	2180.1
12.0)	150.87	1203.6	15.9)	152.06	2209.6
12.1)	150.90	1225.7	16.0)	152.09	2239.4
12.2)	150.93	1247.9	16.1)	152.12	2269.3
12.3)	150.96	1270.3	16.2)	152.15	2299.5
12.4)	150.99	1292.9	16.3)	152.18	2329.8
12.5)	151.02	1315.8	16.4)	152.21	2360.4
12.6)	151.95	1338.8	16.5)	152.24	2391.1
12.7)	151.08	1362.0			

Water Depth (ft.)	Level (m above msl)	Flow (m3/s)	Depth (ft.)	Level (m above msl)	Flow (m3/s)
16.6)	152.27	2422.1	20.4)	153.43	3744.8
16.7)	152.30	2453.2	20.5)	153.46	3783.4
16.8)	152.33	2484.6	20.6)	153.49	3822.3
16.9)	152.36	2516.1	20.7)	153.52	3861.4
17.0)	152.39	2547.8	20.8)	153.55	3900.6
17.1)	152.42	2579.8	20.9)	153.58	3940.1
17.2)	152.45	2611.9	21.0)	153.61	3979.8
17.3)	152.48	2644.2	21.1)	153.64	4019.6
17.4)	152.51	2676.8	21.2)	153.67	4059.7
17.5)	152.54	2709.5	21.3)	153.70	4099.9
17.6)	152.57	2742.4	21.4)	153.73	4140.4
17.7)	152.61	2775.5	21.5)	153.76	4181.0
17.8)	152.64	2808.9	21.6)	153.79	4221.9
17.9)	152.67	2842.4	21.7)	153.82	4262.9
18.0)	152.70	2876.1	21.8)	153.86	4304.2
18.1)	152.73	2910.0	21.9)	153.89	4345.6
18.2)	152.76	2944.1	22.0)	153.92	4387.3
18.3)	152.79	2978.5	22.1)	153.95	4429.1
18.4)	152.82	3013.0	22.2)	153.98	4471.1
18.5)	152.85	3047.7	22.3)	154.01	4513.4
18.6)	152.88	3082.6	22.4)	154.04	4555.8
18.7)	152.91	3117.7	22.5)	154.07	4598.4
18.8)	152.94	3153.0	22.6)	154.10	4641.3
18.9)	152.97	3188.5			
19.0)	153.00	3224.2	22.7)	154.13	4684.3
19.1)	153.03	3260.1	22.8)	154.16	4727.5
19.2)	153.06	3296.2	22.9)	145.19	4771.0
19.3)	153.09	3332.5	23.0)	154.22	4814.6
19.4)	153.12	3369.0	23.1)	154.22	4814.6.
19.5)	153.15	3405.7	23.2)	154.28	4902.4
19.6)	153.18	3442.5	23.3)	154.31	4946.6
19.7)	153.21	3479.6	23.4)	154.34	4991.1
19.8)	153.25	3516.9	23.5)	154.37	5035.7
19.9)	153.28	3554.4	23.6)	154.40	5080.5
20.0)	153.31	3592.1	23.7)	154.43	5125.5
20.1)	153.34	3629.9	23.8)	154.46	5170.7
20.2)	153.37	3668.0	23.9)	154.50	5216.1
20.3)	153.40	3706.3	24.0)	154.53	5261.7

NOTE: 1 m^3/s = 264.18 gal/s

SUSQUEHANNA SES-ER-OL

TABLE 5.2-19

ESTIMATED MONTHLY DISPERSION FACTORS FOR THE SUSQUEHANNA RIVER DOWNSTREAM OF SUSQUEHANNA SES

SITE	MILES FROM DISCHARGE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY AVE.
WAPWALLOPEN	1.6	82	99	181	161	105	76	46	31	33	44	70	99	86
BEACH HAVEN	3.1	170	206	348	404	218	121	64	43	47	62	145	206	170
NESCOPECK	5.5	201	244	445	516	258	143	80	51	53	77	172	244	207
BERWICK	6.4	214	259	473	549	274	152	82	53	56	79	183	259	219
MIFFLINVILLE	11.1	239	290	528	613	307	175	92	60	62	88	204	290	246
ALMEDIA	15.1	257	312	556	646	331	184	101	66	68	97	221	312	263
BLOOMSBURG	18.9	270	328	598	678	347	197	108	70	73	103	237	328	278
CATAWISSA	21.8	283	343	626	710	363	206	112	73	75	108	247	343	291
DANVILLE	30.8	314	381	681	791	404	228	124	82	86	112	269	281	321
WOLVERTON STATION	37.0	333	404	723	823	428	242	133	87	92	128	285	404	340
NORTHUMBERLAND	43.0	345	419	751	872	444	251	137	90	93	134	301	419	355
SUNBURY	43.5	352	427	765	888	452	255	140	92	95	136	307	427	361

DATA SHEET

I. TRAINSIT TIME FOR LIQUID DISCHARGE FROM SUSQ. SES TO DANVILLE

River Level = _____ meters above mean sea level (X)
(m above msl)

River Flow Velocity (meters/sec.) = 0.356(X)-52.795

= _____ meters/sec.
(Y)

Distance from Susquehanna SES to Danville = 50 km (River Distance)

Transit Time = $\frac{50{,}000 \text{ meters}}{Y \text{ meters/sec.}} \times \frac{1 \text{ hr.}}{3600 \text{ sec.}}$

= _____ hrs. (t)

II. CONCENTRATION OF RADIOACTIVITY

Initial Concentration in Blowdown = _____ uCi/ml(A)

Volume of Release = _____ gal (B)

Time of Release _____ to _____

Length of Release = _____ min. (C)

Time Release will Arrive at Danville = _____

III. DETERMINATION OF DILUTION FACTOR

Total Release Rate = $\frac{B \text{ (gal.)}}{C \text{ (min.)}} \times \frac{1 \text{ min.}}{60 \text{ sec.}}$

= _____ gal./sec. (D)

River Flow _____ m^3/sec. (E) (from Conversion Table)

River Flow (gal./sec.) = E (m^3/sec.) x 264.3 (gal./m^3)

= _____ gal./sec. (F)

Dilution Factor = $\frac{\text{D (gal./sec.)}}{\text{F (gal./sec.)}}$

= _____ (G)

IV. CONCENTRATION OF ACTIVITY AT DANVILLE

Concentration at Diffuser (SSES) = A (uCi/ml) x G

= _____ uCi/ml (H)

Concentration at Danville = H (uCi/ml) ÷ I (Danville Dilution Factor, Environmental Report Table 5.2-19)

= _____ uCi/ml (J)

RECOMMENDATION: _____

_____

_____

_____

_____

SAMPLE COLLECTION PROCEDURE

I.1.0 Milk

Collection of milk samples will begin approximately 24 hours (1 day) after the possible release of iodine. Milk sampling frequency will initially be every day for eight days. If milk iodine concentration has returned to less than 10 pCi/liter, sample frequency will be reduced to once per three days. When the iodine concentration is less than 1 pCi/liter, sampling will return to the routine environmental monitoring program sampling frequency. In tabular form this is as follows:

Milk Iodine Concentration	Milk Sampling Frequency
First 24 hours	No Sample
Nex eight days	Daily
>10 pCi/liter	Every day
<10 pCi/liter	Every third day
<1 pCi/liter	Routine REMP (monthly)

This schedule may be applied on an individual farm basis or to all the farms listed as a group, as determined by the ENVIRONMENTAL SAMPLING SUPERVISOR.

I.1.1 Locations which may be sampled:

Sample Code	Farm Name	Location
SS-MLK-12B2	Schultz Farm	1.69 mi WSW
SS-MLK-12B3	Young Farm	1.96 mi WSW
SS-MLK-6C1	Moyer Farm	2.7 mi ESE
SS-MLK-10D1	Ross Ryman Farm	3.02 mi SSW
SS-MLK-12D2	Dagostin Jug Milk	3.72 mi WSW
SS-MLK-5E1	Bloss Farm	4.4 mi E

SS-MLK-13E3	Dent Farm	4.9 mi W
SS-MLK-10G1	Davis Farm	14 mi SSW
SS-GMK-8D1	Poltrock	3.19 mi SSE

* Goat Milk

I.1.2 It is very important to note the following information for each milk sample taken.

I.1.2.1 Date

I.1.2.2 Time

I.1.2.3 Location

I.1.2.4 Number of milkings represented in this sample (e.g., morning only, morning plus previous evening, plus previous morning, etc.).

I.1.2.5 Are the cows 1) on pasture, 2) confined to indoors, 3) outdoors not on pasture, 4) other.

I.1.3 Collect two gallons of milk (if possible) at each location -- carefully label each container with the above information.

I.1.4 When all samples have been collected, arrange for transportation of the analysis laboratory(s) as soon as possible.

I.1.5 If requested by the ENVIRONMENTAL SAMPLING SUPERVISOR, obtain a separate sample for Pa. DER, NRC, EPA, or other agencies. The ENVIRONMENTAL SAMPLING SUPERVISOR will provide instruction on what to do with these samples.

I.1.6 Give the farmer all information you are sure of (e.g., results of previous analyses, sampling schedule, etc.).

NOTE: IF NOT SURE OF REQUESTED INFORMATION OBTAIN CORRECT INFORMATION FROM THE ENVIRONMENTAL SAMPLING SUPERVISOR.

I.1.7 Contact the ENVIRONMENTAL SAMPLING SUPERVISOR on each scheduled sampling day after the eight days to determine future sampling schedule.

I.1.8 Keep running log of all samples.

I.1.9 For further instruction on the collection and shipment of milk samples, refer to Appendix f of Attachment J.

I.2.0 Food Products and Vegetation

Discussion: One of the earliest indications of the presence of iodine will be on the air iodine cartridges if available, and food products and vegetation samples. For this reason, these media, if available, will be collected on the first day. Suitable vegetation samples includes grass, broccoli, cabbage, turnips, collards, skunk cabbage, corn apples, strawberries, etc.

I.2.1 If vegetation is available, collect in accordance with the normal procedure RMC-T46.

I.2.2 Pasture grass, green leafy vegetables or vegetation may be collected at the following locations, or as directed by the ENVIRONMENTAL SAMPLING SUPERVISOR.

Sample Code	Location Name	Location
SS-FPV-5S6	Biological Lab	.76 mi E
SS-FPV-12B1	Kisner Farm	1.15 mi WSW
SS-FPV-11D1	Zehner Bros. Farm	3.3 mi SW
SS-FPV-11D2	Lanning Farm	3.8 mi SW
SS-FPV-12F4	Lupini Farm	8.3 mi WSW
SS-FPV-12F5	Seesholtz Farm	8.6 mi WSW
SS-FPV-2H1	Yalicks Produce*	21 mi NNE
SS-PAS-15A1	Serafin Farm	.87 mi NW
SS-PAS-8D1	Poltrock Farm	3.19 mi SSE

*Control near Dallas, Pa.

I.2.3 Arrange for transportation to the analysis laboratory(s) as soon as possible.

I.2.4 Check with the ENVIRONMENTAL SAMPLING SUPERVISOR for resample frequency.

I.2.5 For further instruction on the collection of food product and vegetation samples, refer to Appendix 9 of Attachment J.

I.3.0 Air Iodine and Air Particulate

Discussion: In the event of an accident, selected REMP air iodine catridges and air particulate filters may be sampled as indicated in accordance with Procedure RMC-T46 and as directed by the ENVIRONMENTAL SAMPLING SUPERVISOR.

I.3.1 For each location, note the following information on each sample and on the sample logs.

- o Date Charcoal cartridge and/or air filter installed.
- o Date of this collection.
- o Time of collection
- o Volume of air sampled
- o Location

I.3.2 Contact ENVIRONMENTAL SAMPLING SUPERVISOR to determine collection frequency.

I.3.3 Sampling Frequency Air Particulate/Air Iodine

Air Particulate Concentration	Sampling Frequency
<0.07 pCi/m³	Routing REMP (weekly)
<0.7 pCi/m³	2X Routine REMP (twice per week)
<7.0 pCi/m³	3X Routine REMP (every other day)
>7.0 pCi/m³	Daily

Air Iodine Concentration	Sampling Frequency
<0.02 pCi/m³	Routine REMP
<0.2 pCi/m³	Twice weekly
<2.0 pCi/m³	Every other day
>2.0 pCi/m³	Daily

I.3.4 Air Particulate and Air Iodine Locations

Sample Code	Location Name	Location
SS-APT-2S2	Energy Information Center	0.9 mi NNE
SS-APT-5S4	West of Biological Consultants	0.8 mi E
SS-APT-11S2	Golomb House	0.4 mi SW
SS-APT-9B1	Transmission Line South of Route 11	1.3 mi S
SS-APT-1D2	Near Mocanaqua Substation	4.0 mi N
SS-APT-3D1	Pond Hill	3.4 mi NE
SS-APT-12G1	Bloomsburg, PA	15 mi WSW
SS-APT-7H1	PP&L Roof, Allentown	47 mi SE

I.3.5 For further instruction on the collection of air particulate filters and air iodine cartridges, refer to Appendix 10 of Attachment J.

I.4.0 Thermoluminescent Dosimeters

TLD's will be collected by ENVIRONMENTAL SAMPLE COLLECTORS under the direction of the ENVIRONMENTAL SAMPLING SUPERVISOR. Replacement TLD's will be picked up at the EOF and installed at each collection location.

I.4.1 The ENVIRONMENTAL SAMPLING SUPERVISOR, upon request from the RADIATION SUPPORT MANAGER, will direct the ENVIRONMENTAL SAMPLE COLLECTORS to exchange the emergency TLD's. The location of the TLD's to be exchanged will also be relayed through the ENVIRONMENTAL SAMPLING SUPERVISOR.

I.4.1.1 West Side River

TLD Location Code	Distance/Direction	Location Description
SS-IDM-1S2E	0.24 mi N	Security Fence
SS-IDM-2S3E	0.20 mi NNE	Security Fence
SS-IDM-3S4E	0.30 mi NE	Security Fence
SS-IDM-4S3E	0.20 mi NNE	Security Fence
SS-IDM-5S7E	0.22 mi E	Security Fence
SS-IDM-6S4E	0.20 mi ESE	Security Fence
SS-IDM-7S3E	0.20 mi SE	Security Fence
SS-IDM-8S2E	0.20 mi SE	Security Fence
SS-IDM-9S1E	0 26 mi S	Security Fence
SS-IDM-10S1E	0.40 mi WSW	Security Fence
SS-IDM-11S3E	0.34 mi SW	Security Fence
SS-IDM-12S3E	0.40 mi WSW	Security Fence
SS-IDM-12E1E	4.68 mi WSW	Berwick Hospital
SS-IDM-13S2E	0.38 mi W	Security Fence
SS-IDM-14S2E	0.40 mi WNW	Security Fence
SS-IDM-14E1E	4.11 mi WNW	Knouse Farm

SS-IDM-15S3E	0.34 mi NW	Security Fence
SS-IDM-16S1E	0.30 mi NNW	Security Fence
SS-IDM-16F1E	7.81 mi NNW	Hidlay Residence/ Huntington Mills

I.4.1.2 East Side River

TLD Location Code	Distance/Direction	Location Description
SS-IDM-2F1E	5.88 mi NNE	St. Adalberts Cemetery
SS-IDM-4E1E	4.8 mi ENE	Pole #46422 N35-197
SS-IDM-6E1E	4.74 mi ESE	St. James Church
SS-IDM-8D2E	3.95 mi SSE	Mowry Residence
SS-IDM-10D2E	3.00 mi SSW	Ross Ryman Residence

I.4.2 The secondary (QC) TLD's will be picked up after the emergency has terminated as directed by the ENVIRONMENTAL SAMPLING SUPERVISOR. The location to be changed are as follows:

I.4.2.1 West Side River

TLD Location Code	Distance/Direction	Location Description
SS-IDM-1S2Q	0.24 mi N	Security Fence
SS-IDM-3S4Q	0.30 mi NE	Security Fence
SS-IDM-5S7Q	0.22 mi E	Security Fence
SS-IDM-7S3Q	0.20 mi SE	Security Fence
SS-IDM-9S1Q	0.26 mi S	Security Fence
SS-IDM-11S3Q	0.34 mi SW	Security Fence
SS-IDM-12E1Q	4.68 mi WSW	Berwick Hospital
SS-IDM-13S2Q	0.38 mi W	Security Fence

SS-IDM-14E1Q	4.11 mi WNW	Knouse Farm
SS-IDM-15S3Q	0.34 mi NW	Security Fence
SS-IDM-16F1Q	7.81 mi NNW	Hidlay Residence/ Huntington Mills

I.4.2.2 East Side River

TLD Location Code	Distance/Direction	Location Description
SS-IDM-2F1Q	5.88 mi NNE	St. Adalberts Cemetery
SS-IDM-4E1Q	4.8 mi ENE	Pole #46422 N35-197
SS-IDM-6E1Q	4.74 mi ESE	St. James Church
SS-IDM-8D2Q	3.95 mi SSE	Mowry Residence
SS-IDM-10D2Q	3.00 mi SSW	Ross Ryman Residence

I.4.3 For further instruction on TLD exchange, refer to Appendix 11 of Attachment J to this procedure.

SUPPLEMENTAL SAMPLE COLLECTION PROCEDURES FOR SUSQUEHANNA SES

1.0 PURPOSE

The purpose of this procedure is to provide instructions for the collection of samples for analysis by RMC.

2.0 SCOPE

This procedure shall apply to all samples collected for Susquehanna SES Preoperational REMP which are to be analyzed by the Phila. Division of RMC.

3.0 DEFINITIONS

N/A

4.0 REFERENCES

4.1 USNRC Regulatory Guide 4.1, Measuring and Reporting of Radioactivity in the Environs of Nuclear Power Plants.

4.2 USNRC Regulatory Guide 4.3, Measurements of Radionuclides in the Environment. Analysis of I-131 in Milk.

4.3 USNRC Regulatory Guide 4.8, Environmental Technical Specifications for Nuclear Power Plants (for comment).

4.4 H.A.S.L. Procedure Manual "HASL-300", ed. John Harley, Health and Safety Laboratory, New York, NY (1972).

4.5 ANSI-N13.1-1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities.

4.6 ORP/SID-72-2, Environmental Radioactivity Surveillance Guide, issued by the U.S. EPA.

5.0 PRECAUTIONS

See Appendices

6.0 APPARATUS

See Appendices

7.0 INSTRUCTIONS

7.1 The RMC sample identification system shall be used for all samples. It consists of a three-part code.

7.1.1 The first part is the power station identification code consisting of two letters.

7.1.2 The second part is three letters long, identifying the media being sampled. The media codes are listed in Table 1.

7.1.2.1 Codes labeled with an * require a comment that further describes the sample.

7.1.2.2 A complete description is required for any sample not covered by one of the codes. A code will be assigned at RMC.

7.1.3 The third part is a location code based on direction and distance from the site and consists of four symbols.

7.1.3.1 The first one to two symbols represent the sixteen angular sectors of 22 1/2 degrees centered about the reactor site. Sector one is divided evenly by the North axis and the other sectors are numbered in a clockwise direction (i.e., 2 = NNE, 3 = NE, 4 = ENE, etc.)

7.1.3.2 The next symbol is a letter which represents the radial distance from the site (See Table 2).

7.1.3.3 The last symbol is the station numerical designation within each sector and zone (i.e., 1, 2, 3...).

7.2 Sample designation, along with the remainder of the sampling information shall be recorded on the sample receipt sheet (provided by RMC).

7.2.1 Sample type and collection frequency shall be entered at the top of the sample receipt sheet.

7.2.2 One line of the sample receipt area shall be completed for each sample collected.

7.2.3 Sample codes shall be entered first, followed by the sampling dates.

7.2.4 For continuous samples (TLD, APT, AIO) both start and stop dates shall be given.

7.2.5 A single date in the "DATE STOPPED" column shall be used for grab samples.

7.2.6 The time spaces shall be completed if the sample is for air iodine.

7.2.7 The name of the collector and deliverer shall be listed along with the date collected and delivered.

7.3 Sample Containers

7.3.1 Two gallon, new, polyethylene bottles shall be used for liquid samples.

7.3.1.1 These bottles shall be rinsed with the media to be sampled prior to sampling, whenever possible.

7.3.1.2 Bottles shall be sealed with a screw top.

7.3.2 Solid samples shall be collected in new plastic jars or heavy duty plastic bags. Containers shall be sealed after collection.

7.4 Samples shall be delivered to the sample receiving area at RMC as soon as possible after collection.

7.4.1 If the possibility of spoilage exists, then samples shall be frozen (except milk).

7.4.2 No preservatives or additives shall be used with these samples unless authorized by RMC.

7.4.3 The U.S. Mail, other parcel services, or messenger may be used for sample delivery.

7.4.4 Any effluent sample or any sample that is suspected of containing levels of any radionuclide exceeding four times the level expected in background environmental samples shall be specifically labeled "ATTENTION HOT LAB".

7.5 Sample collection procedures. See Appendix I-15.

8.0 RECORDS

All records shall be maintained in accordance to RMC Procedure No. T-44, "Sample and Data Coordination Procedures".

9.0 REPORTING

N/A

TABLE 1

AIO - Air Iodine
APT - Air Particulate
CRB - Crab
*AQF - Fish
AQ1 - Aquatic Invertegrates
CLM - Clams
OYS - Oysters
AQS - Sediment
AQP - Aquatic Plants
SOL - Soil
*FPL - Green Leafy Vegetables
FPE - Eggs
*FPB - Food Products
*GAX - Game
IDM - TLD-CaSO
MLK - Milk
PWR - Potable Water-Raw
PWT - Potable Water-Treated
RWA - Rain Water-Precipitation
SWA - Surface Water
FPB - Beef
GAD - Deer
WWA - Well Water
PAS - Pasture

*Requires a comment that further describes the sample.

TABLE 2

S = On-site location
A = 0-1 miles off-site
B = 1-2 miles off-site
C = 2-3 miles off-site
D = 3-4 miles off-site
E = 4-5 miles off-site
F = 5-10 miles off-site
G = 01-20 miles off-site
H = >20 miles off-site

APPENDIX 1

SURFACE WATER, GRAB

Rev 3 Nov 80 - Three (3) gallons to be collected

Materials Needed

Rev 3 Nov 80
1. Two two-gallon, new polyethylene bottles with screw caps
2. Plastic sampling container and line (if required at the location)
3. Labels
4. Marking pencil
5. Sample receipt sheets

Sampling Procedure

1. Samples may be taken from a boat, jetty or bridge, or by wading into the water if care is taken not to disturb the sediment.

2. Rinse sample bottles three times with water to be sampled.

3. Collect three gallons of the water sample in the sample bottles.

Rev 3 Nov 80
4. Seal the containers.

5. Put labels on the bottles and give the following information:

   a. Station number and sample code number
   b. Type of sample
   c. Date of sampling
   d. Your name
   e. Size of sample

6. Log this information onto the sample receipt sheet provided.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

2. Do not disturb the sediment in the sampling area. If the sediment is disturbed, do not sample until the water is quiescent again.

APPENDIX 2

SS-SWA-12H1

SURFACE WATER, MONTHLY COMPOSITE

- Five hundred milliliters to be collected daily

Materials Needed

Rev 3
Nov 80

1. Two two-gallon new polyethylene bottles with screw caps
2. Labels
3. Marking pencils
4. Sample receipt sheet
5. 500 ml sampling bottle

Sampling Procedure

1. Turn on the continuous sampler tap - allow to run for three minutes.

2. Rinse the 500 ml sample bottle three times with water to be sampled.

3. Fill the bottle with the sample and pour into a five gallon container provided for the sample.

4. Collect a monthly three-gallon sample from the daily composites.

5. Rinse sample bottles three times with water to be sampled.

Rev 3
Nov 80

6. Collect three gallons of the water sample in the sample bottles.

7. Seal the containers.

8. Put labels on the bottles and give the following information.

   a. Station number and sample code number
   b. Type of sample
   c. Date of sampling
   d. Your name
   e. Size of sample

9. Log this information onto the sample receipt sheet provided.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

NOTES: 1) Procedures 1 to 3 may be performed by treatment plant personnel.

APPENDIX 3

SS-SWA-5S8, 6S5

SURFACE WATER, COMPOSITE

Rev 3 - Three (3) gallons to be collected
Nov 80

Materials Needed

Rev 3 1. Two two-gallon, new polyethylene bottles with screw caps
Nov 80 2. Sampling container with one-quart capacity line
3. Sample labels
4. Marking pencils
5. Sample receipt sheets

Sampling Procedure

1. Samples are usually collected from a boat.

Rev 3 2. Rinse sample bottles three times with water to be sampled at
Nov 80 time of collection of first quart.

3. Rinse sampling container (one-quart capacity) three times with water to be sampled before sampling each quart.

4. A three-quart collection is taken once per week four times per month for a total volume of three gallons.

Rev 3
Nov 80 5. Log the following information on the sample receipt sheet and on the sample labels:

a. Station and sample
b. Type of sample
c. Size of sample
d. Date started and date stopped
e. Your name

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

2. Do not disturb the sediment in the sampling area. If sediment is disturbed, do not sample until the water is quiescent again.

APPENDIX 4

Rev 3 SS-WWA
Nov 80 SS-SWA-13E1

Rev 3 - Three (3) gallons to be collected
Nov 80

Materials Needed

Rev 3 1. Two two-gallon new polyethylene bottles with screw caps
Nov 80 2. Labels
3. Marking pencil
4. Sample receipt sheet

Sampling Procedures

1. Turn on the well pump - allow to run for three minutes.

2. Rinse the sample bottles three times with the water to be sampled.

Rev 3 3. Collect three gallons of the water sample in the sample bottles
Nov 80 and seal them with screw caps.

4. Put labels on the bottles that includes the following information:

a. Station number and sample code number
b. Type of sample
c. Date of sampling
d. Your name
e. Size of sample

5. Log this information onto the sample receipt sheet provided.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

APPENDIX 5

Rev 3
Nov 80

FISH

- At least one (1) kg of fillets from each species to be analyzed should be collected

Materials Needed

1. Plastic bags.
2. Collection equipment (A-C, D-C electrofisher, trapnets, trotlines, etc.).
3. Fillet knife, measuring board, scale, scaler.
4. Manila tags with strings.
5. Marking pencil.
6. Sample receipt sheets.
7. Labels.

Sampling Procedure

1. Samples are collected by the ecological consultant semi-annually in the spring and fall.

2. Samples are collected and separated into species (agreed upon beforehand).

3. Individual fish are weighed and measured (this information is recorded and forwarded in tabular form).

4. Fish are scaled.

5. Fillets are obtained, placed into bags, sealed and labeled.

6. Log the following information on the sample receipt sheet and on the manila tag:

   a. Station and sample code number.
   b. Type of sample (including species).
   c. Size of sample.
   d. Dates of sampling.
   e. Your name.

7. Freeze the sample and ship it.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

2. No more than one pound of the sample should be taken from any individual fish. If a fish weighs more than one pound, a piece of its midsection should be used.

APPENDIX 6

Rev 3
Nov 80

AQUATIC SEDIMENT, GRAB

- Two (2), 1-gallon replicates to be collected

Materials Needed

1. One-gallon jars with station designation labels.
2. Collection equipment (these samples are usually collected by a scuba diver). In periods of low river levels, some stations can be sampled by wading into the appropriate area.
3. Manila tags with strings.
4. Marking pencil.
5. Plastic bags.
6. Sample receipt sheets.
7. Labels (inside and outside)

Sampling Procedure

1. Samples are collected by the ecological consultant semi-annually in the spring and fall on same day.

2. Sampling sites are usually reached via motor boat.

3. 1-gallon is collected by scraping sediment from the substrate into 1-gallon jars. Area covered by water.

4. Jars are sealed with lids and transported back to the laboratory.

5. All contents are emptied into separate plastic bags, sealed and labeled.

6. Log the following information on the sample receipt sheet and on the manila tag:

   a. Station and sample code number.
   b. Type of sample.
   c. Size of sample.
   d. Date and time of sampling.
   e. Your name.

7. Freeze the sample and ship it.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

APPENDIX 7

MILK

Rev 1 Aug 79 - Three gallons (twelve liters) to be collected.

Materials Needed

Rev 1 Aug 79

1. Two two-gallon new polyethylene bottle with a screw top.
2. Labels
3. Marking pencil.
4. Sample receipt sheet.
5. Ice or disposable freezer packs.

Sampling Procedures

1. If the sample is taken at a farm, ask the proprietor to turn on the mixing tank before taking the sample.

2. Fill the bottle with milk and seal with screw top.

3. Put a label on the bottle and give the following information:

   a. Station number and sample code number.
   b. Type of sample.
   c. Date of sampling.
   d. Your name.
   e. Size of sample.

4. Log this information onto the sample receipt sheet provided.

5. Ship in a cooler packed with ice or freezer packs.

Precautions

1. Ship the sample to RMC immediately as analysis must be completed within 8 days.

APPENDIX 8

Soil - 12 topsoil plugs to be collected (6" diameter, 0" - 2" depth)
Rev 2 12 subsoil cores to be collected (6" diameter, 2" - 6" depth)
Aug 80

Materials Needed

1. Soil auger (able to cut 6" deep)
2. Widemouth plastic jars or plastic bags
3. Sample locating line (rope or string) and stakes
4. Maps showing locations of soil collection points

Rev 2 Aug 80
5. Labels
6. Marking pens
7. Sample receipt sheets

Rev 4 Jan 81
8. Flat blade knife
9. Rubber mallet (if necessary)

Rev 2 Aug 80 Twelve topsoil plug samples, 6" diameter and 2" deep and twelve subsoil core samples, 6" diameter and 4" further down in the topsoil plug hole (2" - 6" deep) are to be taken at each of the sampling locations.

Sampling Procedures

Rev 4 Jan 81
1. Locate three reference points at the soil sampling locations. These should be fixed land marks which are not likely to change within several years.

2. Using the locating line equipped with large stakes at each end, establish a location for a fifteen to twenty foot straight line. Measure the line exactly. Include in the sketch, the distance from each end of the line to each reference point, six reference measurements (see Figure 2).

*3. Using the soil auger, force it into the ground to a depth of 2" without twisting or disturbing the grass cover or surface soil in any way. This may best be accomplished by stepping on the rim of the cutter with both shoe heels. If excessive vegetation is present, this should be clipped off above the soil surface. The litter at the surface and the root mat are considered part of the soil sample.

Rev 2 Aug 80
4. Gently twist the handle of the cutter to cleanly remove the topsoil plug.

5. Take all the topsoil plugs and place them in a plastic jar. Sometimes it may not be possible to remove a 2" deep plug cleanly because of a deep root mat. A 4 or 6 inch deep cutter may be used to remove the topsoil by pounding it part way into the ground with the rubber mallet, until it is possible to remove the core intact. It is not possible to measure top soil depth accurately by this method.

Rev 4 Jan 81

6. Next, using the auger, take the subsoil samples down another 4" (2" - 6"). Tap or scrape out the soil with a long flat blade knife. It may not be possible to take out the entire subsoil plug in one step. If this is the case, press and turn the auger as far down as possible. Remove the auger, scrape out the sample and repeat until a depth of 6" is sampled.

*7. Using the locating line, continue to obtain soil samples 1 to 2 feet apart on the straight line.

8. Place the soil in a plastic jar and label with the following information:

   a. Station number and sample code
   b. Type of sample
   c. Date of sampling
   d. Your name
   e. Size of sample
   f. Depth

Rev 2 Aug 80

9. Log this information onto the sample receipt sheet provided.

Rev 2 Aug 80

10. Document the exact location of all core samples in your log books, as shown in Figure 1. The location of each end of the sampling line must be identified by its distance from the same three reference points. Complete the form (sketch) by identifying the sample station and number, the date and the sample number.

Rev 4 Jan 81

11. Prepare the sample for shipment to the laboratory for analysis.

12. Issue a copy of the core sample drilling locations to Radiation Management Corporation.

13. If the sampling location is pasture or attended grass, fill all holes with topsoil and re-seed with grass.

Rev 4
Jan 81

* Where a fifteen foot straight line is impractical, any reasonable scattered set of samples can be taken, provided an accurate record of each core sample location is made, including reference to several fixed (permanent) objects.

FIGURE 1

SKETCH FOR LOCATING SOIL SAMPLES

_____ _____

STATION DATE OF SAMPLE

_____

SAMPLE NO.

Reference Hole to Two Landmarks

REMARKS:

_____

_____

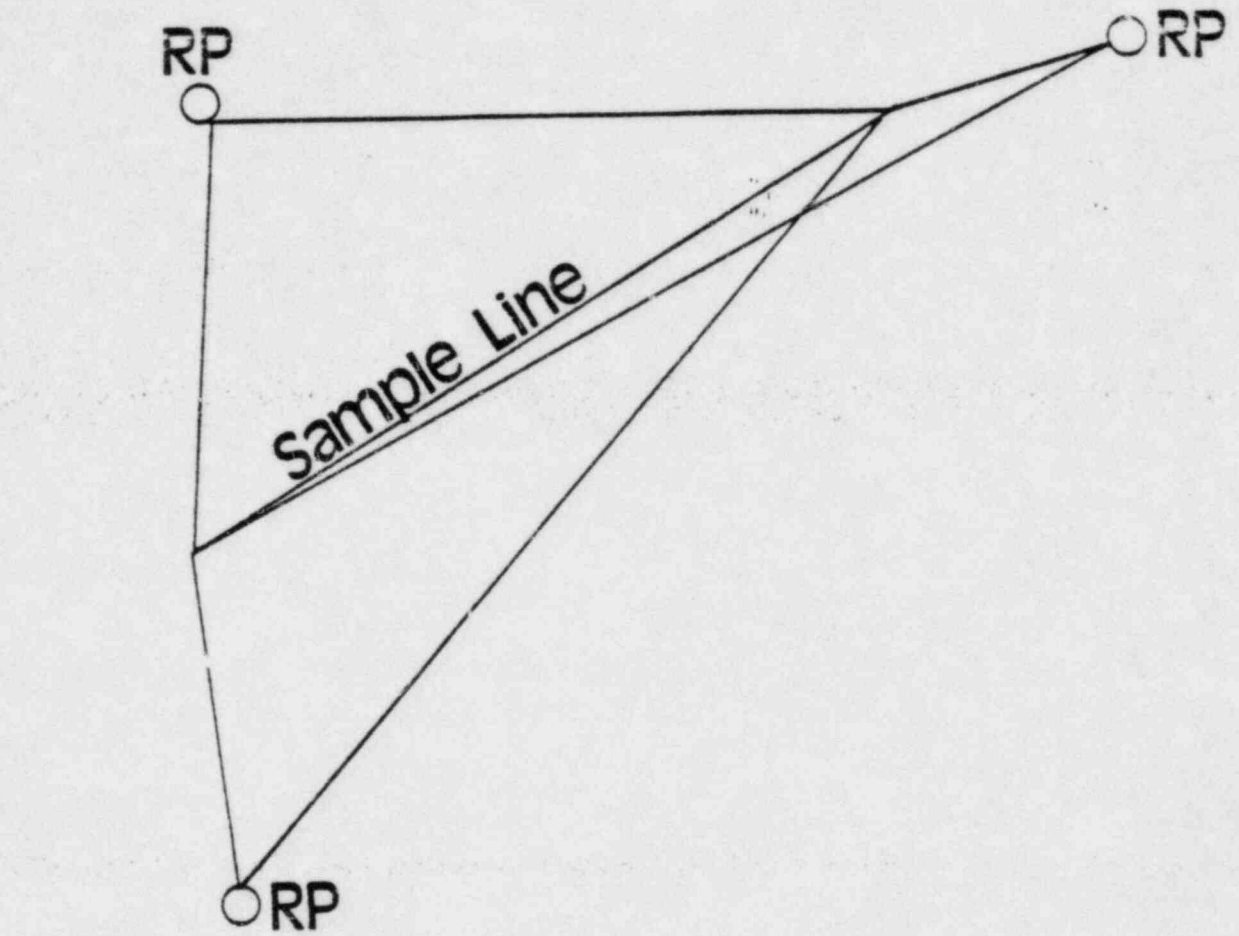
_____

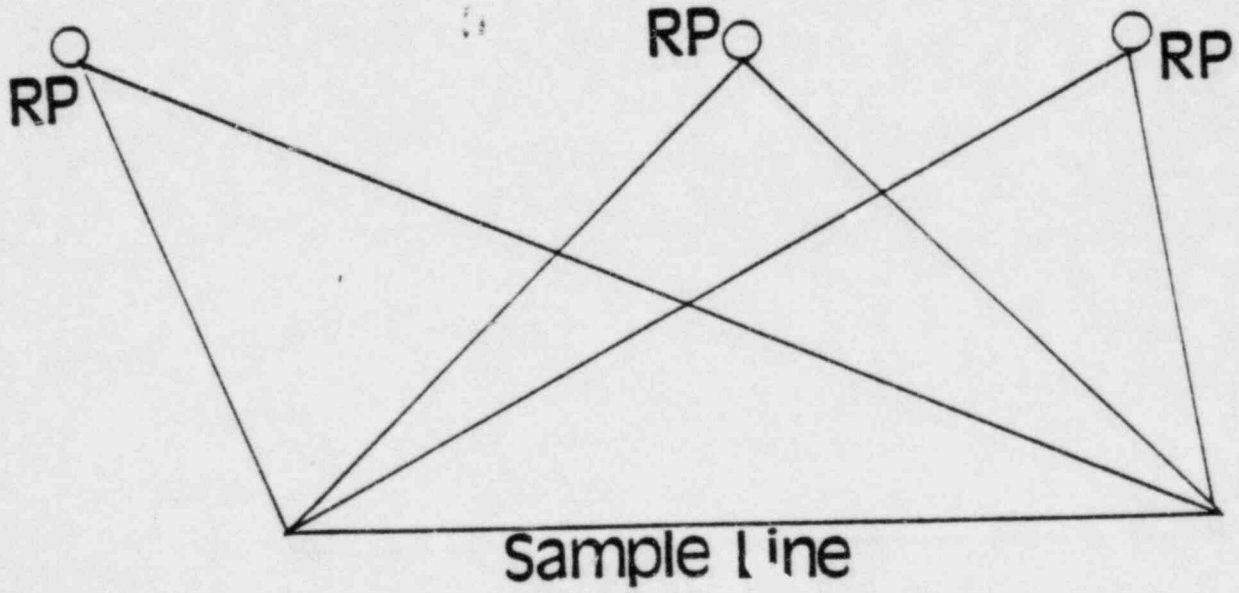
_____

(signature) _____

SAMPLES TAKEN BY

FIGURE 2





APPENDIX 9

VEGETATION

- Five pounds of edible portion to be collected

Materials Needed

1. Large plastic jar or bag and tape to seal.
2. Labels.
3. Marking pencil.
4. Sample receipt sheet.

Sampling Procedures

1. Collect enough edible portion of sample to equal five pounds and place in a plastic bag. Seal it with tape.

2. Label the bag with the following information:

   a. Station number and sample code number.
   b. Type of sample.
   c. Date of sampling.
   d. Your name.
   e. Size of sample.

3. Log this information onto the sample receipt sheet provided.

Precautions

1. Take extreme caution not to contaminate the sample with soil.

NOTE: 1) This class of sample includes edible vegetables and fruits, feedstuffs, and forage for livestock. Non-edible vegetation may be substituted for unavailable leafy vegetables if leafy characteristics are similar.

APPENDIX 10

AIR PARTICULATES & AIR IODINE

Rev 4 Jan 81 - Filter or filter and cartridge to be collected.

Materials Needed

1. Glassine evelope
2. Plastic bag or paper envelope
3. Tweezers (Rev 1 Aug 79)
4. Filter paper
5. Charcoal cartridge (for air iodine stations) (Rev 4 Jan 81)
6. Marking pencils
7. Sample receipt sheet
8. Assorted tools
9. Log book

Sampling Procedures

1. Unlock the air sampler and look for any unusual conditions in the sampling equipment, e.g., loose hoses, pump not running, etc. If problems are noted, refer to Procedure T-26. It is very important that air samples not be missed. When problems are corrective, action should start immediately. Every effort should be made to correct the problems prior to the next scheduled sampling period. Any unusual conditions should be noted in the log book and on the sample receipt sheet. (Rev 2 Aug 80)

   a. The dry gas meter has a six digit indicating mechanism, when read gives the volume of air samples in cubic feet, during a specified sampling period.

   b. The timers have a five or six digit indicating mechanism. The first four digits record the number of hours the sampler was on. The fifth digit represents tenths of hours the sampler was on. Those samplers with six digit timers record time to the hundredths of hours. (Rev 2 Aug 80)

2. Turn off the pump switch and record the dry gas meter reading. Record the reading and runtime in the following places:

   a. Log book and/or sampler log (in air sampler)

   b. Sample receipt sheet

Rev 2 Aug 80

3. On the sample receipt sheet also record:

   a. Customer
   b. Station number
   c. Sample type

Rev 3 Aug 80

   d. Date and time of sampling period
   e. Your initials or your name

Rev 2 Aug 80

4. Unscrew the sample head to expose the filters. Using tweezers remove the particulate filter carefully, so as not to tear the paper, and place the filter in a glassine envelope. If pieces of the particulate filter are stuck to the filter head, remove the pieces with the tweezers and put them in the glassine envelope, along with the the remainder of the filter. For those stations which have them, remove the charcoal cartridge, place it in a sample bag, and tie the bag shut.

Rev 2 Aug 80 Rev 4 Jan 81

Rev 4 Jan 81

5. Replace filter paper and charcoal cartridge, if the station is so supplied, with new sampling media and insert into sampling head. Return sampling head to sampler.

Rev 2 Aug 80

6. Turn on the sampling pump and lock up the sampling station.

7. Place all air particulate and air iodine samples in shipping bag along with the sample receipt sheets.

Rev 2 Aug 80

8. Mail to: Radiation Management Corporation
P.O. Box 7940
Philadelphia, PA 19101

APPENDIX 11

DIRECT RADIATION

- Two TLDs to be collected.

Materials Needed

1. Polyethylene bottle or "bird house".
2. Marking pencil.
3. Sample receipt sheet.

Sampling Procedure

1. TLDs should be placed in the field as close as possible to the first day of the quarter. Install all the TLDs on the same day or at least not on more than two days. When the TLD installation begins, place the two control TLD packets in the lead shield.

2. The sample station will be a brown polyethylene bottle or a formica "bird house". Unscrew the cap or unlock the "bird house".

3. Remove the TLD packet from the sampling station. Confirm the sample location identification on the TLD packet.

4. The accompanying sample receipt sheet lists the RMC sample ID number and the corresponding sample location identification. Record on the sample receipt sheet for each TLD location:

Rev 5
Mar 81

   a. Date of sample removal.
   b. Time of sample removal.
   c. Unusual conditions or changes concerning the TLDs or the station.
   d. Your name.

5. Replace TLD removed with the appropriate new packet, placing the packet in the polyethylene bottle or "bird house". Seal with a screw cap or lock the "bird house".

6. Record on the new sample receipt sheet:

   a. Date of sample installation.
   b. Time of sample installation.

7. After all TLDs have been removed from the field, remove the two control TLDs from the lead shield.

8. If new TLDs have been installed, determine the sample location identification and record on the receipt sheet.

9. Ship the receipt sheet and the TLDs, including the control TLDs, to RMC immediately (same day) by surface carrier e.g., Greyhound, Conrail, Package Express or UPS.

Precautions

1. Be sure the package is not damaged during or prior to removal.

2. Do not enter the fenced in area of the site with the TLDs.

3. Be certain that both the removed TLD packet and the installed TLD packet have the correct location identification.

4. The control TLD, labeled site zero, is used to determine the intransit dose. The same intransit dose is used in the calculation of the dose to each TLD. For this reason, it is important that the site zero TLD is in the lead shield during the same period that the sample TLDs are in the field. This is accomplished by installing all the TLDs as close as possible to the time that the site zero TLD is placed in the shield and removing the TLDs as close as possible to the time when the site zero TLD is removed from the shield. Handle all TLDs in the same manner. This again assures the validity of using a single intransit dose for all TLDs.

Rev 5
Mar 81

5. Do not expose the TLDs to heat radioactive materials or x-rays. Do not open the sealed polyethylene packets.

APPENDIX 12

DRINKING WATER, GRAB

Rev 3 - Three (3) gallons to be collected
Nov 80

Materials Needed

Rev 3 1. Two two-gallon new polyethylene bottles with screw caps.
Nov 80 2. Labels
3. Marking pencil
4. Sample receipt sheet

Sampling Procedures

1. Turn on the finished water tap - allow to run for three minutes.

2. Rinse the sample bottles three times with the water to be sampled.

3. Collect three gallons of the water sample in the sample bottles
Rev 3 seal them with screw caps.
Nov 80

4. Put labels on the bottles that include the following information:

   a. Station number and sample code number
   b. Type of sample
   c. Date of sampling
   d. Your name
   e. Size of sample

5. Log this information onto the sample receipt sheet provided.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

APPENDIX 13

SS-PWT-12H2

DRINKING WATER, MONTHLY COMPOSITE

Rev 3 Nov 80 - Three hundred milliliters to be collected daily

Materials Needed

Rev 3 Nov 80
1. Two two-gallon new polyethylene bottles with screw caps
2. Labels
3. Marking pencils
4. Sample receipt sheet
5. 100 ml sampling bottle

Sampling Procedures

1. Turn on the finish water tap - allow to run for three minutes.

2. Rinse the 100 ml sample bottle three times with water to be sampled.

3. Fill the bottle with the sample and pour into a two-gallon composite bottle. Repeat twice.

Rev 3 Nov 80
4. Reseal the two-gallon composite bottle. When the first two-gallon bottle is filled, fill the second bottle.

5. When 30 daily samples have been collected, replace the current sample container with a new empty container.

6. Put labels on the composite bottles that includes the following information:

   a. Station number and sample code number
   b. Type of sample
   c. Dates of sampling
   d. Your name
   e. Size of sample

7. Log this information onto the sample receipt sheet provided.

Precautions

1. Do not wear a tritium luminous dial watch, as it may contaminate the sample.

NOTES: 1) Procedures 1 to 5 may be performed by treatment plant personnel.

APPENDIX 14

MEAT, POULTRY AND GAME

- Five pounds of edible portion to be collected.

Materials Needed

1. Large plastic jar or bag and tape to seal.
2. Labels.
3. Marking pencil.
4. Sample receipt sheet.
5. Appropriate collecting license (for game).

Sampling Procedures

1. Meat and poultry may be purchased from local suppliers. Poultry should be cleaned and dressed. Edible portions only of large animals should be sent.
2. Game may be trapped or shot if the appropriate collecting permit or license has been obtained.
3. Small game should be cleaned and dressed. Edible portions only of large game should be sent. In the case of large animals (e.g. deer) a portion of a road-kill secured from local game wardens is satisfactory.
4. Collect enough edible portion of sample to equal five pounds and place in a plastic bag. Seal it with tape.
5. Label the bag with the following information:

    a. Station number and sample code number.
    b. Type of sample.
    c. Date of sampling.
    d. Your name.
    e. Size of sample.

6. Log this information onto the sample receipt sheet provided.
7. Freeze the sample and ship packed in ice or freezer packs.

Precautions

1. Take extreme caution not to contaminate the sample with soil.

APPENDIX 15

Precipitation - 2 gallons per station to be collected. If 2 gallons are not available, then collect the entire sample.

Materials Needed

1. New two-gallon polyethylene bottle with screw top
2. Labels
3. Marking pencil
4. Sample receipt sheet
5. Squeeze bottle

Sampling Procedure

1. Thoroughly shake the sample collection jug to assure mixing of sample. Rinse the sample bottle if sufficient sample is available.

2. Empty contents of sample into the sample bottle and seal with a screw top. Discard any extra sample not required to fill the 2-gallon sample bottle.

Rev 2
Aug 80

3. After emptying contents, rinse collection pan and sample collection tub with distilled water. Discard rinse.

4. Put a label on the bottle and give the following information:

   a. Station number and station code number
   b. Type of sample
   c. Date and time of sample
   d. Your name
   e. Sample volume

5. Log this information onto the sample receipt sheet.

Precautions

1. Do not wear a tritium luminous dial watch as this may contaminate the sample.

2. Be careful, do not spill any sample.

PERSONNEL EXPOSURE OF ENVIRONMENTAL SAMPLE COLLECTORS

NAME
Time Dosimetry Issued
Time Dosimetry Collected
TLD #
TLD Reading (mR)
Initial SRD Reading (mR) Time
SRD Reading 2 (mR) Time
SRD Reading 3 (mR) Time
Final SRD Reading (mR) Time