

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

HISTORICAL

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## SUMMARY OF ODCM CHANGES

Changes other than those of a minor, editorial nature are summarized below.

1. Liquid dose calculation factors for P-32 fish ingestion and composite dose pathways have been revised for adult, teen and child age groups. These factors reflect revision to the basis calculations EC-ENVR-0501 and EC-ENVR-0502, in which credit is taken for a reduction of the P-32 bioaccumulation factor from 100,000 to 3,000. This change has been advised by the NRC in NUREG/CR-1336. Site-Specific Information used by LADTAP II Code, Appendix D, has been revised to show discharge per unit specific to the release period in addition to 11 cfs now stated.
2. Three environmental monitoring TLD stations have been eliminated. Location 3D1 was eliminated due to the removal of the air sampling station at this location, with eventual dismantling of this station. Location 3F1 was removed due to its relatively large distance from SSES, and the interference from overgrown vegetation at the monitoring location. Location 3G5 was eliminated due to concern for safety of sampling personnel when changing out the TLD near a high voltage source. The TLD at location 1D2 has been moved due to elimination of the air sampling station at this site. A replacement site is located approximately 50 yards from the original location. Although the difference in distance between the original and replacement sites from SSES is slight, the new site will be redesignated 1D5. The TLD at location 4E1 has been moved closer to a location where the NRC currently co-monitors direct radiation. The new location is approximately 100 yards from the original, and will be redesignated 4E2. The TLD at location 14E1 has been moved significantly closer to SSES. This new location was sought because of concerns for traffic hazards posed to sampling personnel who change out this badge. The new location is designated 14B3 and is located 1.3 miles WNW.
3. Three particulate/radioiodine air sampling stations have been moved and re-designated. Station 15S4 has been moved to a point 0.4 miles southeast of SSES, at the end of Kline's Road. This station is now 7S7. Station 1D2, in Mocanaqua, has been moved to a point 0.6 miles south-southwest of SSES (east of Confer's Lane, south of the Tower's Club), and is re-designated 10S3. Location 3D1 has been relocated to 0.4 miles west of the former laydown area (west of Confer's Lane); this station is now 13S6.

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5.0 INDIVIDUAL DOSE DUE TO WATERBORNE EFFLUENT

SPECIFICATION 3.11.1.2 - THE DOSE OR DOSE COMMITMENT TO A MEMBER OF THE PUBLIC FROM RADIOACTIVE MATERIALS IN LIQUID EFFLUENTS RELEASED FROM EACH REACTOR UNIT TO UNRESTRICTED AREAS (SEE FIGURE 5.1.3-1) SHALL BE LIMITED:

- a. DURING ANY CALENDAR QUARTER TO LESS THAN OR EQUAL TO 1.5 MREM TO THE TOTAL BODY AND TO LESS THAN OR EQUAL TO 5 MREM TO ANY ORGAN, AND
- b. DURING ANY CALENDAR YEAR TO LESS THAN OR EQUAL TO 3 MREM TO THE TOTAL BODY AND TO LESS THAN OR EQUAL TO 10 MREM TO ANY ORGAN.

The calculations of dose received by the hypothetical maximally exposed individual are based on ingestion of fish, drinking water and exposure on the shoreline. Drinking water is taken from the nearest public drinking water intake location (Danville Water Authority). Shoreline and fish ingestion are associated with the SSES river outfall (edge of initial mixing zone).

Methodology for calculating dose to the maximum hypothetical offsite individual has been developed (1)(2) for separate (fish, drinking water and shoreline exposure) and composite liquid effluent pathways. This methodology incorporates usage, dilution, and transit parameters specific to the SSES site.

(1) PP&L Calculation EC-ENVR-0501

(2) PP&L Calculation EC-ENVR-0502

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Table 5-1a: Dose Factors for Fish Pathway: Maximum Hypothetical Adult (Page 1 of 2)  
 Dose Factor Units: mrem-ft<sup>3</sup>/Ci-sec  
 Location: Outfall/FIXED DILUTION

		Usage (Uap) (kg/yr:FISH) =		21				
		Dilution (1/Mp:FISH) =		15.9				
		Transit time (tf) hrs =		25				
	Isotope	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00e+00	1.37e-04	1.37e-04	1.37e-04	1.37e-04	1.37e-04	1.37e-04
2	C-14	1.90e+01	3.80e+00	3.80e+00	3.80e+00	3.80e+00	3.80e+00	3.80e+00
3	Na-24	7.78e-02	7.78e-02	7.78e-02	7.78e-02	7.78e-02	7.78e-02	7.78e-02
4	P-32	8.00e+02	4.97e+01	3.09e+01	0.00e+00	0.00e+00	0.00e+00	8.99e+01
5	Cr-51	0.00e+00	0.00e+00	7.53e-04	4.50e-04	1.66e-04	9.99e-04	1.89e-01
6	Mn-54	0.00e+00	2.65e+00	5.06e-01	0.00e+00	7.89e-01	0.00e+00	8.12e+00
7	Mn-56	0.00e+00	8.06e-05	1.43e-05	0.00e+00	1.02e-04	0.00e+00	2.57e-03
8	Fe-55	3.99e-01	2.78e-01	6.43e-02	0.00e+00	0.00e+00	1.54e-01	1.58e-01
9	Fe-59	6.20e-01	1.46e+00	5.59e-01	0.00e+00	0.00e+00	4.07e-01	4.86e+00
10	Co-58	0.00e+00	5.36e-02	1.20e-01	0.00e+00	0.00e+00	0.00e+00	1.09e+00
11	Co-60	0.00e+00	1.55e-01	3.43e-01	0.00e+00	0.00e+00	0.00e+00	2.92e+00
12	Ni-63	1.89e+01	1.31e+00	6.33e-01	0.00e+00	0.00e+00	0.00e+00	2.73e-01
13	Ni-65	7.91e-05	1.03e-05	4.69e-06	0.00e+00	0.00e+00	0.00e+00	2.61e-04
14	Cu-64	0.00e+00	1.55e-03	7.26e-04	0.00e+00	3.90e-03	0.00e+00	1.32e-01
15	Zn-65	1.40e+01	4.46e+01	2.02e+01	0.00e+00	2.98e+01	0.00e+00	2.81e+01
16	Zn-69	2.35e-10	4.49e-10	3.13e-11	0.00e+00	2.92e-10	0.00e+00	6.75e-11
17	Br-83	0.00e+00	0.00e+00	1.74e-05	0.00e+00	0.00e+00	0.00e+00	2.51e-05
18	Br-84	0.00e+00	0.00e+00	2.14e-16	0.00e+00	0.00e+00	0.00e+00	1.88e-21
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-86	0.00e+00	5.90e+01	2.75e+01	0.00e+00	0.00e+00	0.00e+00	1.16e+01
21	Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
22	Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
23	Sr-89	1.32e+01	0.00e+00	3.80e-01	0.00e+00	0.00e+00	0.00e+00	2.12e+00
24	Sr-90	3.30e+02	0.00e+00	8.11e+01	0.00e+00	0.00e+00	0.00e+00	9.54e+00
25	Sr-91	3.99e-02	0.00e+00	1.61e-03	0.00e+00	0.00e+00	0.00e+00	1.90e-01
26	Sr-92	1.57e-04	0.00e+00	6.77e-06	0.00e+00	0.00e+00	0.00e+00	3.10e-03
27	Y-90	2.67e-04	0.00e+00	7.15e-06	0.00e+00	0.00e+00	0.00e+00	2.83e+00
28	Y-91m	2.84e-15	0.00e+00	1.10e-16	0.00e+00	0.00e+00	0.00e+00	8.34e-15
29	Y-91	5.06e-03	0.00e+00	1.35e-04	0.00e+00	0.00e+00	0.00e+00	2.78e+00
30	Y-92	2.30e-07	0.00e+00	6.71e-09	0.00e+00	0.00e+00	0.00e+00	4.02e-03
31	Y-93	1.75e-05	0.00e+00	4.83e-07	0.00e+00	0.00e+00	0.00e+00	5.55e-01
32	Zr-95	1.44e-04	4.82e-05	3.13e-05	0.00e+00	7.25e-05	0.00e+00	1.46e-01
33	Zr-97	2.89e-06	5.83e-07	2.87e-07	0.00e+00	8.80e-07	0.00e+00	1.81e-01
34	Nb-95	2.66e-01	1.48e-01	7.94e-02	0.00e+00	1.46e-01	0.00e+00	8.97e+02
35	Mo-99	0.00e+00	4.82e-02	9.16e-03	0.00e+00	1.09e-01	0.00e+00	1.12e-01

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Table 5-1b: Dose Factors for Fish Pathway: Maximum Hypothetical Teen (Page 1 of 2)  
 Dose Factor Units: mrem-ft<sup>3</sup>/Ci-sec  
 Location: Outfall/FIXED DILUTION

	Usage (U <sub>ap</sub> ) (kg/yr:FISH) =		16					
	Dilution (1/M <sub>p</sub> :FISH) =		15.9					
	Transit time (t <sub>f</sub> ) hrs =		25					
	Isotope	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00e+00	1.06e-04	1.06e-04	1.06e-04	1.06e-04	1.06e-04	1.06e-04
2	C-14	2.07e+01	4.13e+00	4.13e+00	4.13e+00	4.13e+00	4.13e+00	4.13e+00
3	Na-24	8.02e-02	8.02e-02	8.02e-02	8.02e-02	8.02e-02	8.02e-02	8.02e-02
4	P-32	8.71e+02	5.40e+01	3.38e+01	0.00e+00	0.00e+00	0.00e+00	7.32e+01
5	Cr-51	0.00e+00	0.00e+00	7.78e-04	4.31e-04	1.70e-04	1.11e-03	1.30e-01
6	Mn-54	0.00e+00	2.61e+00	5.17e-01	0.00e+00	7.77e-01	0.00e+00	5.35e+00
7	Mn-56	0.00e+00	8.44e-05	1.50e-05	0.00e+00	1.07e-04	0.00e+00	5.55e-03
8	Fe-55	4.18e-01	2.98e-01	6.91e-02	0.00e+00	0.00e+00	1.88e-01	1.28e-01
9	Fe-59	6.39e-01	1.49e+00	5.78e-01	0.00e+00	0.00e+00	4.71e-01	3.53e+00
10	Co-58	0.00e+00	5.33e-02	1.23e-01	0.00e+00	0.00e+00	0.00e+00	7.34e-01
11	Co-60	0.00e+00	1.55e-01	3.50e-01	0.00e+00	0.00e+00	0.00e+00	2.02e+00
12	Ni-63	1.96e+01	1.38e+00	6.64e-01	0.00e+00	0.00e+00	0.00e+00	2.20e-01
13	Ni-65	8.55e-05	1.09e-05	4.98e-06	0.00e+00	0.00e+00	0.00e+00	5.93e-04
14	Cu-64	0.00e+00	1.63e-03	7.65e-04	0.00e+00	4.12e-03	0.00e+00	1.26e-01
15	Zn-65	1.27e+01	4.41e+01	2.06e+01	0.00e+00	2.83e+01	0.00e+00	1.87e+01
16	Zn-69	2.55e-10	4.87e-10	3.41e-11	0.00e+00	3.18e-10	0.00e+00	8.97e-10
17	Br-83	0.00e+00	0.00e+00	1.89e-05	0.00e+00	0.00e+00	0.00e+00	0.00e+00
18	Br-84	0.00e+00	0.00e+00	2.26e-16	0.00e+00	0.00e+00	0.00e+00	0.00e+00
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-86	0.00e+00	6.35e+01	2.98e+01	0.00e+00	0.00e+00	0.00e+00	9.39e+00
21	Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
22	Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
23	Sr-89	1.44e+01	0.00e+00	4.12e-01	0.00e+00	0.00e+00	0.00e+00	1.72e+00
24	Sr-90	2.76e+02	0.00e+00	6.81e+01	0.00e+00	0.00e+00	0.00e+00	7.74e+00
25	Sr-91	4.32e-02	0.00e+00	1.72e-03	0.00e+00	0.00e+00	0.00e+00	1.96e-01
26	Sr-92	1.69e-04	0.00e+00	7.21e-06	0.00e+00	0.00e+00	0.00e+00	4.31e-03
27	Y-90	2.89e-04	0.00e+00	7.79e-06	0.00e+00	0.00e+00	0.00e+00	2.39e+00
28	Y-91m	3.07e-15	0.00e+00	1.17e-16	0.00e+00	0.00e+00	0.00e+00	1.45e-13
29	Y-91	5.49e-03	0.00e+00	1.47e-04	0.00e+00	0.00e+00	0.00e+00	2.25e+00
30	Y-92	2.51e-07	0.00e+00	7.25e-09	0.00e+00	0.00e+00	0.00e+00	6.88e-03
31	Y-93	1.91e-05	0.00e+00	5.23e-07	0.00e+00	0.00e+00	0.00e+00	5.82e-01
32	Zr-95	1.49e-04	4.70e-05	3.23e-05	0.00e+00	6.90e-05	0.00e+00	1.08e-01
33	Zr-97	3.11e-06	6.14e-07	2.83e-07	0.00e+00	9.32e-07	0.00e+00	1.66e-01
34	Nb-95	2.67e-01	1.48e-01	8.17e-02	0.00e+00	1.44e-01	0.00e+00	6.34e+02
35	Mo-99	0.00e+00	5.13e-02	9.79e-03	0.00e+00	1.17e-01	0.00e+00	9.19e-02

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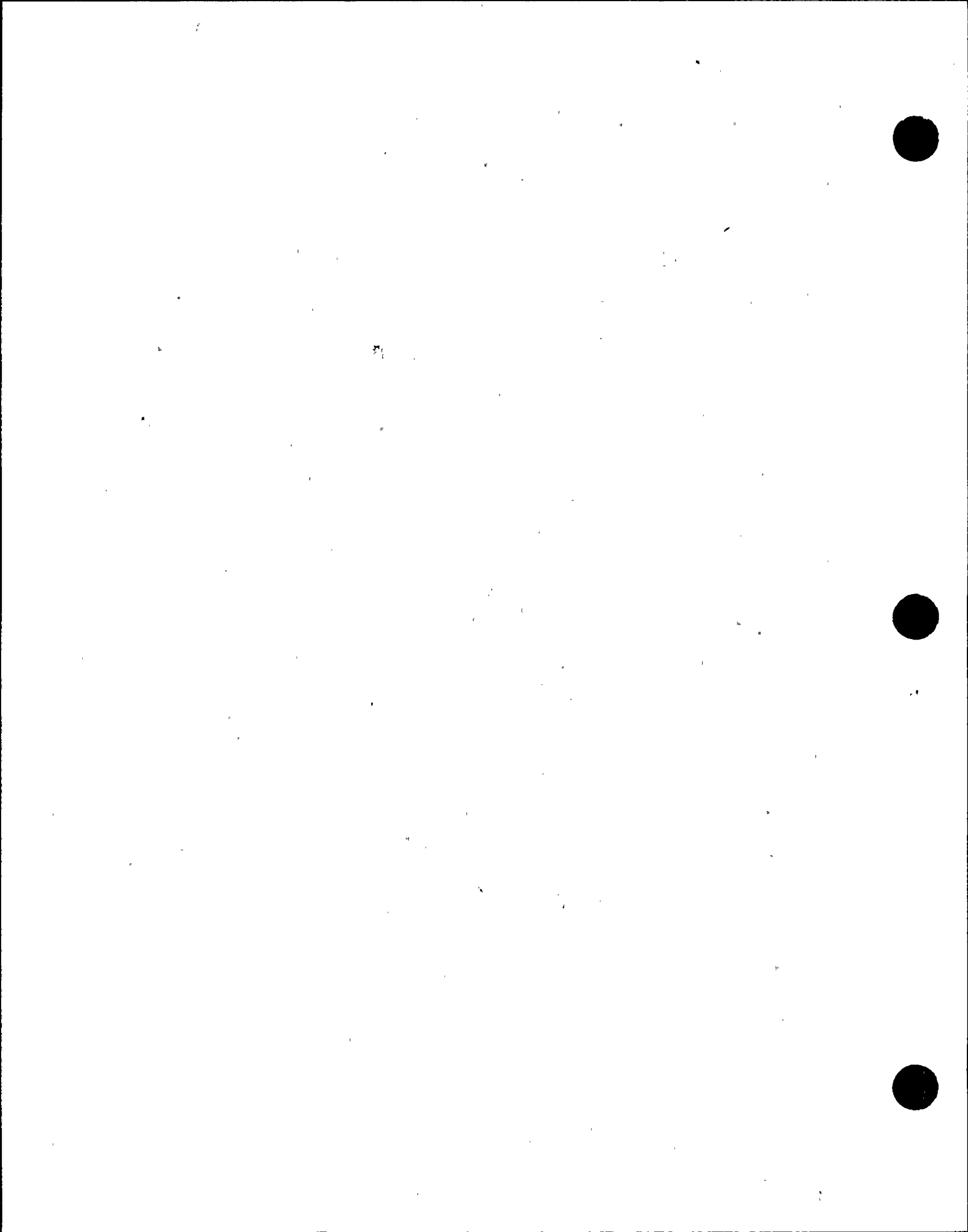


Table 5-1c: Dose Factors for Fish Pathway: Maximum Hypothetical Child (Page 1 of 2)  
 Dose Factor Units: mrem-ft<sup>3</sup>/Ci-sec  
 Location: Outfall/FIXED DILUTION

		Usage (Uap) (kg/yr:FISH) =		6.9				
		Dilution (1/Mp:FISH) =		15.9				
		Transit time (tf) hrs =		25				
	Isotope	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GILLI
1	H-3	0.00e+00	8.72e-05	8.72e-05	8.72e-05	8.72e-05	8.72e-05	8.72e-05
2	C-14	2.88e+01	5.31e+00	5.31e+00	5.31e+00	5.31e+00	5.31e+00	5.31e+00
3	Na-24	8.72e-02	8.72e-02	8.72e-02	8.72e-02	8.72e-02	8.72e-02	8.72e-02
4	P-32	1.12e+03	5.28e+01	4.33e+01	0.00e+00	0.00e+00	0.00e+00	3.10e+01
5	Cr-51	0.00e+00	0.00e+00	8.28e-04	4.59e-04	1.26e-04	8.39e-04	4.39e-02
6	Mn-54	0.00e+00	2.04e+00	5.43e-01	0.00e+00	5.72e-01	0.00e+00	1.71e+00
7	Mn-56	0.00e+00	7.89e-05	1.74e-05	0.00e+00	9.30e-05	0.00e+00	1.11e-02
8	Fe-55	5.49e-01	2.91e-01	9.02e-02	0.00e+00	0.00e+00	1.85e-01	5.39e-02
9	Fe-59	7.75e-01	1.25e+00	6.25e-01	0.00e+00	0.00e+00	3.84e-01	1.31e+00
10	Co-58	0.00e+00	4.25e-02	1.30e-01	0.00e+00	0.00e+00	0.00e+00	2.48e-01
11	Co-60	0.00e+00	1.28e-01	3.72e-01	0.00e+00	0.00e+00	0.00e+00	6.99e-01
12	Ni-63	2.57e+01	1.37e+00	8.74e-01	0.00e+00	0.00e+00	0.00e+00	9.28e-02
13	Ni-65	1.09e-04	1.03e-05	8.01e-08	0.00e+00	0.00e+00	0.00e+00	1.28e-03
14	Cu-64	0.00e+00	1.49e-03	9.03e-04	0.00e+00	3.81e-03	0.00e+00	7.01e-02
15	Zn-65	1.30e+01	3.47e+01	2.18e+01	0.00e+00	2.19e+01	0.00e+00	6.10e+00
16	Zn-69	3.28e-10	4.74e-10	4.38e-11	0.00e+00	2.88e-10	0.00e+00	2.99e-08
17	Br-83	0.00e+00	0.00e+00	2.43e-05	0.00e+00	0.00e+00	0.00e+00	0.00e+00
18	Br-84	0.00e+00	0.00e+00	2.88e-18	0.00e+00	0.00e+00	0.00e+00	0.00e+00
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-86	0.00e+00	6.15e+01	3.78e+01	0.00e+00	0.00e+00	0.00e+00	3.86e+00
21	Rb-88	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
22	Rb-89	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
23	Sr-89	1.88e+01	0.00e+00	5.32e-01	0.00e+00	0.00e+00	0.00e+00	7.21e-01
24	Sr-90	2.43e+02	0.00e+00	6.17e+01	0.00e+00	0.00e+00	0.00e+00	3.28e+00
25	Sr-91	5.55e-02	0.00e+00	2.09e-03	0.00e+00	0.00e+00	0.00e+00	1.22e-01
26	Sr-92	2.18e-04	0.00e+00	8.88e-08	0.00e+00	0.00e+00	0.00e+00	4.09e-03
27	Y-90	3.74e-04	0.00e+00	1.00e-05	0.00e+00	0.00e+00	0.00e+00	1.07e+00
28	Y-91m	3.92e-15	0.00e+00	1.43e-16	0.00e+00	0.00e+00	0.00e+00	7.88e-12
29	Y-91	7.10e-03	0.00e+00	1.90e-04	0.00e+00	0.00e+00	0.00e+00	9.45e-01
30	Y-92	3.21e-07	0.00e+00	9.20e-09	0.00e+00	0.00e+00	0.00e+00	9.29e-03
31	Y-93	2.45e-05	0.00e+00	6.72e-07	0.00e+00	0.00e+00	0.00e+00	3.85e-01
32	Zr-95	1.81e-04	3.97e-05	3.54e-05	0.00e+00	5.89e-05	0.00e+00	4.14e-02
33	Zr-97	3.95e-08	5.71e-07	3.37e-07	0.00e+00	8.19e-07	0.00e+00	8.84e-02
34	Nb-95	3.16e-01	1.23e-01	8.78e-02	0.00e+00	1.15e-01	0.00e+00	2.27e+02
35	Mo-99	0.00e+00	4.88e-02	1.21e-02	0.00e+00	1.04e-01	0.00e+00	4.04e-02

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Table 5-6a: Composite Dose Factors: Maximum Hypothetical Adult (Page 1 of 2)  
 Dose Factor Units: mrem/Ci Released  
 Location: Danville (Water Ing.)/Outfall (Fish and Shoreline)/FIXED DILUTION

	Usage (Uap) (kg/yr:FISH) =			21	Usage (Uap) (kg/yr:WATER) =			730	
	Usage (Uap) (hr/yr:SHORE) =			12	Dilution (1/Mp:SHORE) =			15.9	
	Dilution (1/Mp:FISH) =			15.9	Dilution (1/Mp:WATER) =			321	
	Transit time (tf) hrs =			25	Transit time (tw) hrs =			25.8	
	Transit time (tp) hrs =			1	Transit time (tb) hrs =			131400	
	Isotopes	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Skin
1	H-3	0.00e+00	3.59e-05	3.59e-05	3.59e-05	3.59e-05	3.59e-05	3.59e-05	0.00e+00
2	C-14	1.70e+00	3.41e-01	3.41e-01	3.41e-01	3.41e-01	3.41e-01	3.41e-01	0.00e+00
3	Na-24	7.09e-03	7.09e-03	7.12e-03	7.09e-03	7.09e-03	7.09e-03	7.09e-03	2.58e-05
4	P-32	7.18e+01	4.46e+00	2.77e+00	0.00e+00	0.00e+00	0.00e+00	8.07e+00	0.00e+00
5	Cr-51	0.00e+00	0.00e+00	7.72e-05	4.07e-05	1.50e-05	9.04e-05	1.71e-02	1.07e-05
6	Mn-54	0.00e+00	2.39e-01	4.82e-02	0.00e+00	7.10e-02	0.00e+00	7.31e-01	3.17e-03
7	Mn-56	0.00e+00	7.25e-06	2.63e-06	0.00e+00	9.21e-06	0.00e+00	2.31e-04	1.59e-06
8	Fe-55	3.84e-02	2.52e-02	5.87e-03	0.00e+00	0.00e+00	1.40e-02	1.44e-02	0.00e+00
9	Fe-59	5.66e-02	1.33e-01	5.15e-02	0.00e+00	0.00e+00	3.72e-02	4.43e-01	8.24e-04
10	Co-58	0.00e+00	4.97e-03	1.19e-02	0.00e+00	0.00e+00	0.00e+00	1.01e-01	8.64e-04
11	Co-60	0.00e+00	1.44e-02	7.37e-02	0.00e+00	0.00e+00	0.00e+00	2.71e-01	4.93e-02
12	Ni-63	1.72e+00	1.19e-01	5.78e-02	0.00e+00	0.00e+00	0.00e+00	2.49e-02	0.00e+00
13	Ni-65	7.20e-06	9.35e-07	8.66e-07	0.00e+00	0.00e+00	0.00e+00	2.37e-05	5.11e-07
14	Cu-64	0.00e+00	1.43e-04	6.84e-05	0.00e+00	3.81e-04	0.00e+00	1.22e-02	1.27e-06
15	Zn-65	1.26e+00	4.00e+00	1.81e+00	0.00e+00	2.68e+00	0.00e+00	2.52e+00	1.87e-03
16	Zn-69	2.11e-11	4.03e-11	2.80e-12	0.00e+00	2.62e-11	0.00e+00	6.06e-12	0.00e+00
17	Br-83	0.00e+00	0.00e+00	1.57e-06	0.00e+00	0.00e+00	0.00e+00	2.28e-06	1.03e-08
18	Br-84	0.00e+00	0.00e+00	1.07e-07	0.00e+00	0.00e+00	0.00e+00	1.51e-22	1.25e-07
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-86	0.00e+00	5.29e+00	2.47e+00	0.00e+00	0.00e+00	0.00e+00	1.04e+00	2.00e-05
21	Rb-88	0.00e+00	0.00e+00	6.27e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.17e-09
22	Rb-89	0.00e+00	0.00e+00	1.63e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.96e-08
23	Sr-89	1.25e+00	0.00e+00	3.60e-02	0.00e+00	0.00e+00	0.00e+00	2.01e-01	4.89e-08
24	Sr-90	3.13e+01	0.00e+00	7.69e+00	0.00e+00	0.00e+00	0.00e+00	9.05e-01	0.00e+00
25	Sr-91	3.77e-03	0.00e+00	1.56e-04	0.00e+00	0.00e+00	0.00e+00	1.80e-02	4.55e-06
26	Sr-92	1.47e-05	0.00e+00	1.81e-06	0.00e+00	0.00e+00	0.00e+00	2.91e-04	1.30e-06
27	Y-90	2.55e-05	0.00e+00	6.94e-07	0.00e+00	0.00e+00	0.00e+00	2.71e-01	1.02e-08
28	Y-91m	2.64e-16	0.00e+00	8.49e-08	0.00e+00	0.00e+00	0.00e+00	7.74e-16	9.83e-08
29	Y-91	4.85e-04	0.00e+00	1.51e-05	0.00e+00	0.00e+00	0.00e+00	2.67e-01	2.35e-06
30	Y-92	2.18e-08	0.00e+00	2.90e-07	0.00e+00	0.00e+00	0.00e+00	3.82e-04	3.43e-07
31	Y-93	1.67e-06	0.00e+00	3.80e-07	0.00e+00	0.00e+00	0.00e+00	5.30e-02	4.56e-07
32	Zr-95	1.97e-05	6.31e-06	4.81e-04	0.00e+00	9.90e-06	0.00e+00	2.00e-02	5.53e-04
33	Zr-97	3.90e-07	7.87e-08	5.57e-06	0.00e+00	1.19e-07	0.00e+00	2.44e-02	6.44e-06
34	Nb-95	2.38e-02	1.33e-02	7.39e-03	0.00e+00	1.31e-02	0.00e+00	8.04e+01	3.13e-04

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Table 5-6b: Composite Dose Factors: Maximum Hypothetical Teen (Page 1 of 2)  
 Dose Factor Units: mrem/Ci Released  
 Location: Danville (Water Ing.)/Outfall (Fish and Shoreline)/FIXED DILUTION

Usage (Uap) (kg/yr:FISH) =		16			Usage (Uap) (kg/yr:WATER) =		510		
Usage (Uap) (hr/yr:SHORE) =		67			Dilution (1/Mp:SHORE) =		15.9		
Dilution (1/Mp:FISH) =		15.9			Dilution (1/Mp:WATER) =		321		
Transit time (tf) hrs =		25			Transit time (tw) hrs =		25.8		
Transit time (tp) hrs =		1			Transit time (tb) hrs =		131400		
Isotope	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Skin	
1	H-3	0.00e+00	2.61e-05	2.61e-05	2.61e-05	2.61e-05	2.61e-05	2.61e-05	0.00e+00
2	C-14	1.85e+00	3.71e-01	3.71e-01	3.71e-01	3.71e-01	3.71e-01	3.71e-01	0.00e+00
3	Na-24	7.30e-03	7.30e-03	7.43e-03	7.30e-03	7.30e-03	7.30e-03	7.30e-03	1.44e-04
4	P-32	7.82e+01	4.84e+00	3.03e+00	0.00e+00	0.00e+00	0.00e+00	6.57e+00	0.00e+00
5	Cr-51	0.00e+00	0.00e+00	1.21e-04	3.90e-05	1.54e-05	1.00e-04	1.18e-02	5.98e-05
6	Mn-54	0.00e+00	2.35e-01	6.16e-02	0.00e+00	7.00e-02	0.00e+00	4.81e-01	1.77e-02
7	Mn-56	0.00e+00	7.59e-08	8.86e-08	0.00e+00	9.81e-08	0.00e+00	5.00e-04	8.88e-08
8	Fe-55	3.81e-02	2.70e-02	6.30e-03	0.00e+00	0.00e+00	1.71e-02	1.17e-02	0.00e+00
9	Fe-59	5.82e-02	1.36e-01	5.55e-02	0.00e+00	0.00e+00	4.29e-02	3.21e-01	3.49e-03
10	Co-58	0.00e+00	4.93e-03	1.55e-02	0.00e+00	0.00e+00	0.00e+00	6.79e-02	4.82e-03
11	Co-60	0.00e+00	1.44e-02	2.67e-01	0.00e+00	0.00e+00	0.00e+00	1.87e-01	2.75e-01
12	Ni-63	1.78e+00	1.26e-01	6.05e-02	0.00e+00	0.00e+00	0.00e+00	2.01e-02	0.00e+00
13	Ni-65	7.77e-08	9.93e-07	2.91e-08	0.00e+00	0.00e+00	0.00e+00	5.38e-05	2.85e-08
14	Cu-64	0.00e+00	1.50e-04	7.69e-05	0.00e+00	3.80e-04	0.00e+00	1.17e-02	7.08e-06
15	Zn-65	1.14e+00	3.96e+00	1.86e+00	0.00e+00	2.54e+00	0.00e+00	1.68e+00	9.35e-03
16	Zn-69	2.29e-11	4.37e-11	3.06e-12	0.00e+00	2.85e-11	0.00e+00	8.05e-11	0.00e+00
17	Br-83	0.00e+00	0.00e+00	1.74e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	5.76e-08
18	Br-84	0.00e+00	0.00e+00	5.99e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.98e-07
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-88	0.00e+00	5.70e+00	2.68e+00	0.00e+00	0.00e+00	0.00e+00	8.43e-01	1.12e-04
21	Rb-88	0.00e+00	0.00e+00	3.50e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.00e-08
22	Rb-89	0.00e+00	0.00e+00	9.11e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.09e-07
23	Sr-89	1.36e+00	0.00e+00	3.89e-02	0.00e+00	0.00e+00	0.00e+00	1.62e-01	2.73e-07
24	Sr-90	2.60e+01	0.00e+00	6.43e+00	0.00e+00	0.00e+00	0.00e+00	7.30e-01	0.00e+00
25	Sr-91	4.07e-03	0.00e+00	1.84e-04	0.00e+00	0.00e+00	0.00e+00	1.85e-02	2.54e-05
26	Sr-92	1.58e-05	0.00e+00	7.22e-08	0.00e+00	0.00e+00	0.00e+00	4.03e-04	7.27e-08
27	Y-90	2.76e-05	0.00e+00	7.91e-07	0.00e+00	0.00e+00	0.00e+00	2.27e-01	5.71e-08
28	Y-91m	2.84e-16	0.00e+00	4.74e-07	0.00e+00	0.00e+00	0.00e+00	1.34e-14	5.49e-07
29	Y-91	5.24e-04	0.00e+00	2.57e-05	0.00e+00	0.00e+00	0.00e+00	2.15e-01	1.31e-05
30	Y-92	2.37e-08	0.00e+00	1.61e-06	0.00e+00	0.00e+00	0.00e+00	6.50e-04	1.92e-06
31	Y-93	1.81e-06	0.00e+00	1.91e-06	0.00e+00	0.00e+00	0.00e+00	5.53e-02	2.55e-06
32	Zr-95	1.97e-05	6.23e-06	2.66e-03	0.00e+00	9.15e-06	0.00e+00	1.44e-02	3.09e-03
33	Zr-97	4.07e-07	8.06e-08	3.09e-05	0.00e+00	1.22e-07	0.00e+00	2.18e-02	3.60e-05
34	Nb-95	2.40e-02	1.33e-02	8.81e-03	0.00e+00	1.29e-02	0.00e+00	5.69e+01	1.75e-03

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Table 5-6c: Composite Dose Factors: Maximum Hypothetical Child (Page 1 of 2)

Dose Factor Units: mrem/Ci Released

Location: Danville (Water Ing.)/Outfall (Fish and Shoreline)/FIXED DILUTION

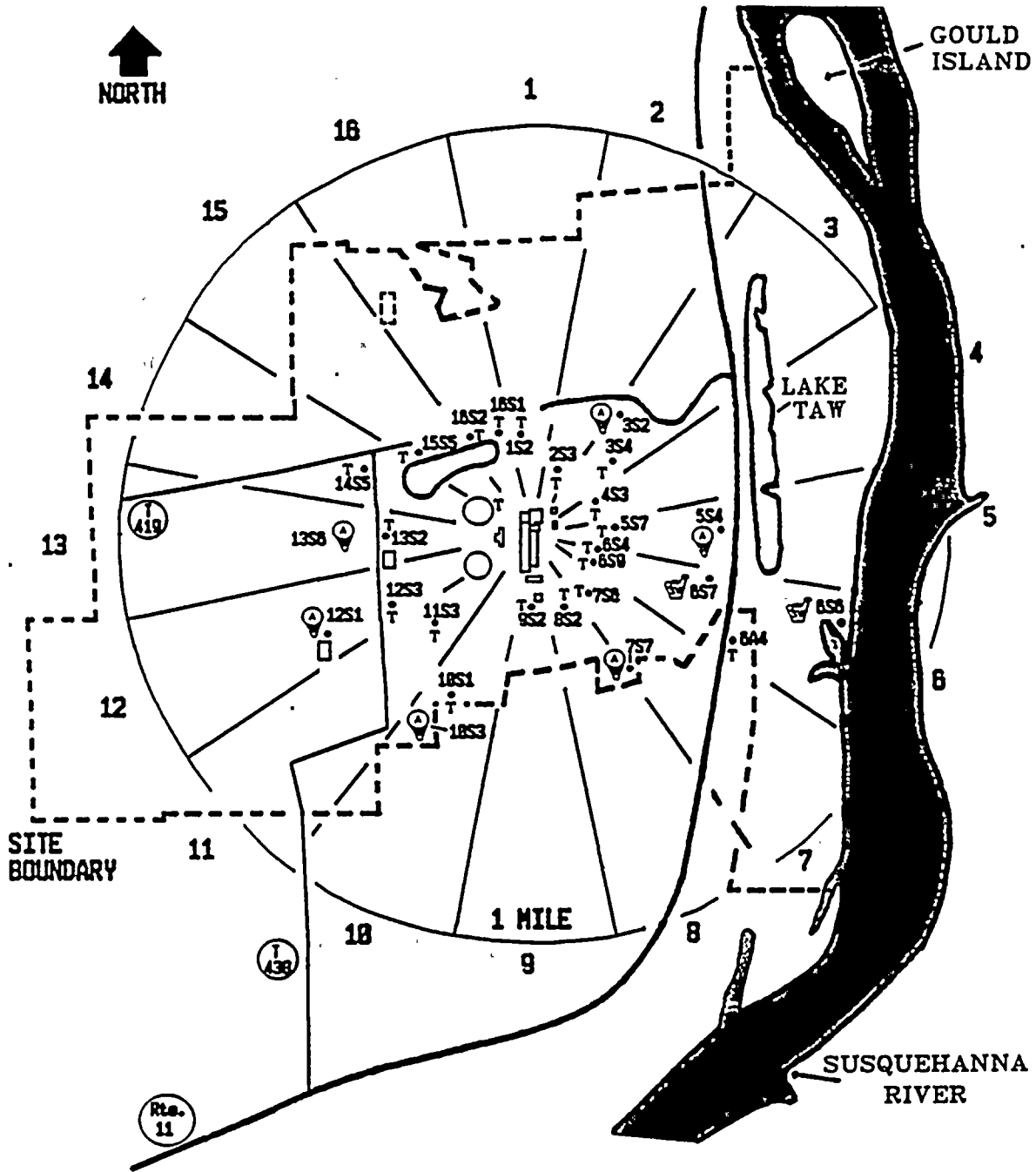
Usage (Uap) (kg/yr:FISH) =		6.9			Usage (Uap) (kg/yr:WATER) =			510	
Usage (Uap) (hr/yr:SHORE) =		14			Dilution (1/Mp:SHORE) =			15.9	
Dilution (1/Mp:FISH) =		15.9			Dilution (1/Mp:WATER) =			321	
Transit time (tf) hrs =		25			Transit time (tw) hrs =			25.8	
Transit time (tp) hrs =		1			Transit time (tb) hrs =			131400	
	Isotope	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Skin
1	H-3	0.00e+00	3.98e-05	3.98e-05	3.98e-05	3.98e-05	3.98e-05	3.98e-05	0.00e+00
2	C-14	2.38e+00	4.77e-01	4.77e-01	4.77e-01	4.77e-01	4.77e-01	4.77e-01	0.00e+00
3	Na-24	8.10e-03	8.10e-03	8.12e-03	8.10e-03	8.10e-03	8.10e-03	8.10e-03	3.01e-05
4	P-32	1.01e+02	4.72e+00	3.89e+00	0.00e+00	0.00e+00	0.00e+00	2.79e+00	0.00e+00
5	Cr-51	0.00e+00	0.00e+00	8.62e-05	4.20e-05	1.15e-05	7.66e-05	4.01e-03	1.25e-05
6	Mn-54	0.00e+00	1.84e-01	5.23e-02	0.00e+00	5.17e-02	0.00e+00	1.55e-01	3.69e-03
7	Mn-56	0.00e+00	6.95e-08	3.14e-08	0.00e+00	8.41e-08	0.00e+00	1.01e-03	1.85e-08
8	Fe-55	5.10e-02	2.71e-02	8.38e-03	0.00e+00	0.00e+00	1.53e-02	5.01e-03	0.00e+00
9	Fe-59	7.21e-02	1.17e-01	5.87e-02	0.00e+00	0.00e+00	3.38e-02	1.21e-01	7.28e-04
10	Co-58	0.00e+00	4.09e-03	1.34e-02	0.00e+00	0.00e+00	0.00e+00	2.39e-02	1.01e-03
11	Co-60	0.00e+00	1.21e-02	8.47e-02	0.00e+00	0.00e+00	0.00e+00	6.73e-02	5.75e-02
12	Ni-63	2.39e+00	1.28e-01	8.12e-02	0.00e+00	0.00e+00	0.00e+00	8.61e-03	0.00e+00
13	Ni-65	1.01e-05	9.50e-07	1.07e-06	0.00e+00	0.00e+00	0.00e+00	1.18e-04	5.98e-07
14	Cu-64	0.00e+00	1.43e-04	8.79e-05	0.00e+00	3.47e-04	0.00e+00	6.73e-03	1.48e-08
15	Zn-65	1.17e+00	3.12e+00	1.94e+00	0.00e+00	1.97e+00	0.00e+00	5.48e-01	1.95e-03
16	Zn-69	2.95e-11	4.28e-11	3.94e-12	0.00e+00	2.58e-11	0.00e+00	2.68e-09	0.00e+00
17	Br-83	0.00e+00	0.00e+00	2.21e-06	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.20e-08
18	Br-84	0.00e+00	0.00e+00	1.25e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.46e-07
19	Br-85	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
20	Rb-86	0.00e+00	5.53e+00	3.40e+00	0.00e+00	0.00e+00	0.00e+00	3.56e-01	2.33e-05
21	Rb-88	0.00e+00	0.00e+00	7.31e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00	8.36e-09
22	Rb-89	0.00e+00	0.00e+00	1.90e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	2.28e-08
23	Sr-89	1.88e+00	0.00e+00	5.38e-02	0.00e+00	0.00e+00	0.00e+00	7.26e-02	5.71e-08
24	Sr-90	2.45e+01	0.00e+00	6.21e+00	0.00e+00	0.00e+00	0.00e+00	3.30e-01	0.00e+00
25	Sr-91	5.55e-03	0.00e+00	2.14e-04	0.00e+00	0.00e+00	0.00e+00	1.22e-02	5.31e-08
26	Sr-92	2.13e-05	0.00e+00	2.22e-06	0.00e+00	0.00e+00	0.00e+00	4.03e-04	1.52e-06
27	Y-90	3.84e-05	0.00e+00	1.04e-06	0.00e+00	0.00e+00	0.00e+00	1.09e-01	1.19e-08
28	Y-91m	3.78e-16	0.00e+00	9.91e-08	0.00e+00	0.00e+00	0.00e+00	7.40e-13	1.15e-07
29	Y-91	7.30e-04	0.00e+00	2.20e-05	0.00e+00	0.00e+00	0.00e+00	9.72e-02	2.74e-06
30	Y-92	3.24e-08	0.00e+00	3.38e-07	0.00e+00	0.00e+00	0.00e+00	9.37e-04	4.00e-07
31	Y-93	2.50e-08	0.00e+00	4.58e-07	0.00e+00	0.00e+00	0.00e+00	3.73e-02	5.32e-07
32	Zr-95	3.42e-05	7.51e-08	5.83e-04	0.00e+00	1.08e-05	0.00e+00	7.84e-03	6.45e-04
33	Zr-97	7.34e-07	1.06e-07	6.52e-06	0.00e+00	1.52e-07	0.00e+00	1.61e-02	7.51e-06
34	Nb-95	2.83e-02	1.10e-02	8.19e-03	0.00e+00	1.04e-02	0.00e+00	2.04e+01	3.65e-04

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FIGURE 5  
 ENVIRONMENTAL MONITORING LOCATIONS  
 WITHIN ONE MILE OF THE SSES

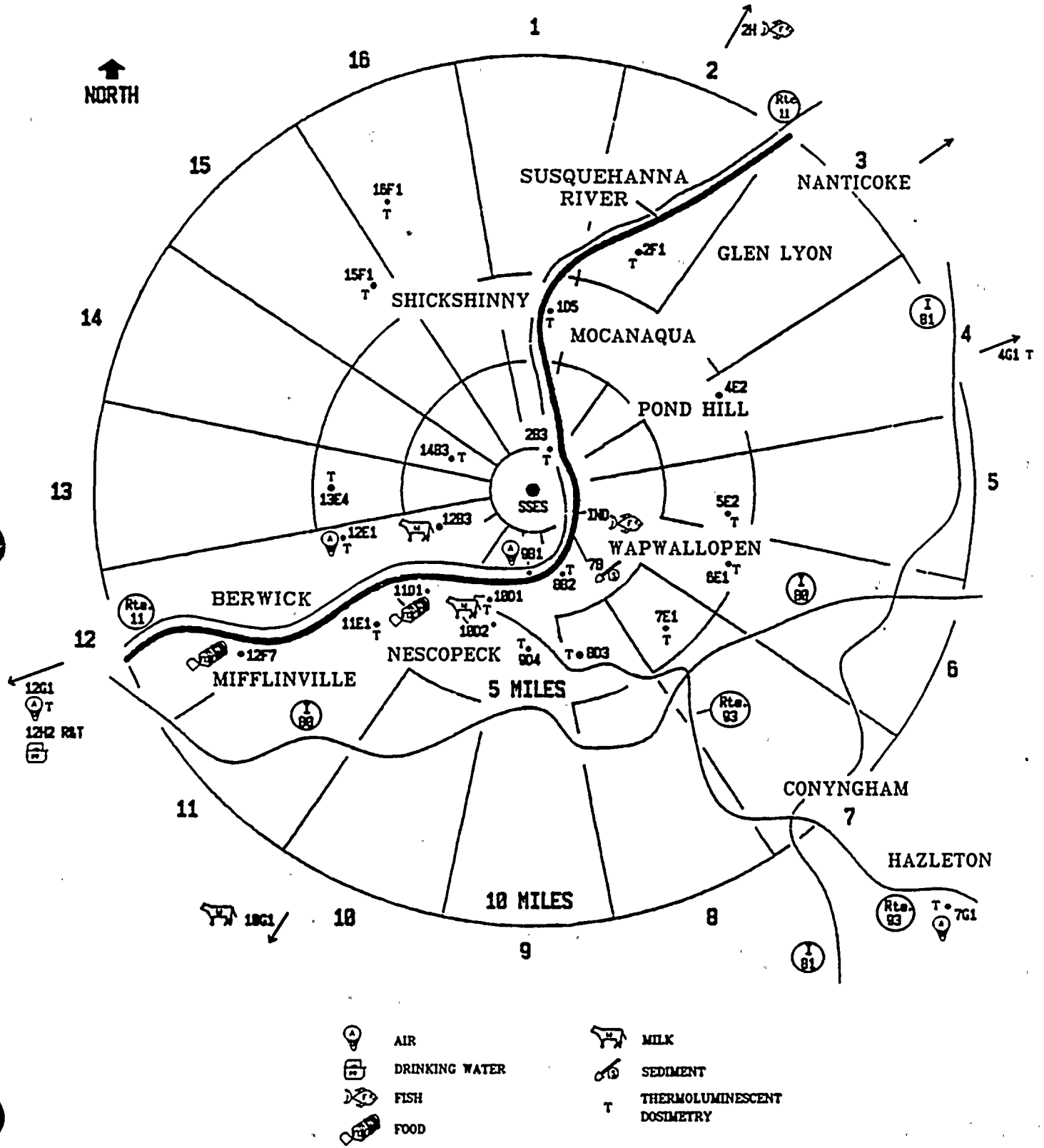


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 DATE 10/10/94

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FIGURE 6  
 ENVIRONMENTAL MONITORING LOCATIONS  
 GREATER THAN ONE MILE FROM THE SSES



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TABLE 6

## OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathways and/or Sample	Number of Samples and Locations*	Sampling and Collection Frequency	Type and Frequency of Analysis
<u>Airborne</u>			
Radioiodine and Particulates	12S1 0.4 mi WSW - E.O.F. Building 9B1 1.3 mi S - Transmission Line 5S4 0.8 mi E - Environmental Laboratory 12E1 4.7 mi WSW - Berwick Hospital 7G1 14 mi SE - PP&L Hazleton Complex* 3S2 0.5 mi NE - SSES Backup Met. Tower 7S7 0.4 mi SE - End of Kline's Road 10S3 0.6 mi SSW - East of Confer's Lane, South of Tower's Club 13S6 0.4 mi W - Former Laydown Area, West of Confer's Lane 12G1 15 mi WSW - PP&L Bloomsburg Service Center*	Continual sampler operation with sample collection weekly.**	Radioiodine Canister: analyze weekly for I-131
<u>Direct Radiation</u>			
46	1S2 Perimeter Fence - 0.2 mi N 1D5 Mocaqua Sewage Treatment Plant - 4.0 mi N 2S3 Perimeter Fence - 0.2 mi NNE 2B3 Durabond Corporation - 1.3 mi NNE 2F1 St. Adalberts Cemetery - 5.9 mi NNE 3S4 Perimeter Fence - 0.3 mi NE 4S3 West of Susquehanna APF - 0.2 mi ENE 4E2 Ruckles Hill & Pond Hill Roads Intersection 4.7 mi ENE 4G1 Crestwood Industrial Park - 14 mi ENE* 5S7 Perimeter Fence - 0.3 mi E 5E2 Bloss Farm - 4.5 mi E 6S4 Perimeter Fence - 0.2 mi ESE 6A4 Riverside Restaurant - 0.6 mi ESE	Quarterly	Particulate Sample: Analyze for gross beta radioactivity less than 24 hours following filter change. Perform isotopic analysis on composite sample (by location) quarterly.  Gamma Dose: Quarterly.

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Exposure Pathways  
and/or Sample

Number of Samples  
and Locations\*

Sampling and  
Collection Frequency

Type and  
Frequency of Analysis

6E1 St. James Church - 4.7 mi ESE  
 6S9 Perimeter Fence - 0.2 mi ESE  
 7S6 Perimeter Fence - 0.2 mi SE  
 7E1 Harwood Transmission Line Pole #2 -  
 4.2 mi SE  
 7G1 PP&L Hazleton Complex - 14 mi SE<sup>a</sup>  
 8S2 Perimeter Fence - 0.2 mi SSE  
 8B2 LaWall Residence - 1.4 mi SSE  
 8D3 Mowry Residence - 4.0 mi SSE  
 9S2 Security Fence - 0.2 mi S  
 9D4 Country Folk Store - 3.6 mi S  
 10S1 Post South of Switching Station - 0.4 mi SSW  
 10D1 Ross Ryman Farm - 3.0 mi SSW  
 11S3 Security Fence - 0.3 mi SW  
 11E1 Thomas Residence - 4.7 mi SW  
 12S3 Perimeter Fence - 0.4 mi WSW  
 12E1 Berwick Hospital - 4.7 mi WSW  
 12G1 PP&L Bloomsburg Service Center - 15 mi WSW<sup>a</sup>  
 13S2 Perimeter Fence - 0.4 mi W  
 13E4 Kessler Farm - 4.1 mi W  
 14S5 Beach Grove Rd. & Confer's Lane Intersection  
 0.5 mi WNW  
 14B3 Moskaluk Residence - 1.3 mi. WNW  
 15F1 Zawatski Farm - 5.4 mi NW  
 15S5 Perimeter Fence - 0.4 mi NW  
 16S1 Perimeter Fence - 0.3 mi NNW  
 16S2 Perimeter Fence - 0.3 mi NNW  
 16F1 Hidlay Residence - 7.8 NNW

Waterborne

Surface	6S6 river water intake line <sup>a</sup> 6S7 cooling tower blowdown discharge line	Monthly composite Monthly composite	Gamma isotopic analysis. Composite tritium analysis at least quarterly.
Drinking	12H2 Danville Water Co. (Approximately 30 miles downstream)	Monthly composite <sup>b</sup>	Gross beta and gamma isotopic analyses monthly. Composite for tritium analysis at least quarterly.
Sediment from Shoreline	7B Bell Bend - 1.2 mi SE	Semi-annually	Gamma isotopic analysis semi-annually.

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APPENDIX D

SITE SPECIFIC INFORMATION USED BY LADTAP II CODE

- 1) Total discharge per unit: 11 cubic feet per second, or specific to release period.
- 2) Total Annual Blowdown Volume: 6.94E8 cubic feet
- 3) Dose to Maximum Hypothetical Individual

Shorewidth Factor: 0.2  
Sediment exposure time: 131,400 hr.

USAGE FACTORS

PATHWAY	INFANT	CHILD	TEEN	ADULT
Fish (kg/yr)	0	6.9	16	21
Potable Water (liter/yr)	330	510	510	730
Shoreline (hr/yr)	0	14	67	12

DILUTION FACTORS (DF)

PATHWAY	LOCATION	DF
Fish	Outfall	15.9
Potable Water	Danville	321*
Shoreline	Outfall	15.9

\*For estimating purposes. Actual dilution factors at Danville, Pa., for various river levels located in Table 5-4.

TRANSIT TIMES (Tp)

PATHWAY	LOCATION	Tp (hr)
Fish	Outfall	25**
Potable Water	Danville	25.8*
Shoreline	Outfall	1

\*For estimating purposes. Actual river transit times at Danville, Pa., for various river levels located in Table 5-4.

\*\*Includes one hour transit from outfall plus 24 hours to consumption.

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**APPENDIX B**

**REVISIONS TO SSES SOLID WASTE PROCESS CONTROL PROGRAM  
(NDAP-QA-0646)**

3. PROCEDURE NO. NDAP-QA-0646 REV. 3 4. FORM NO. N/A REV. \_\_\_\_\_

5. PROCEDURE TITLE Solid Radioactive Waste Process Control Program 6. PROCEDURE TYPE:  
 QA PROGRAM  YES  NO  
 PLANT PROC  YES  NO

7. REQUESTED CHANGE  
 DELETE PCAFs  NO  YES # \_\_\_\_\_ # \_\_\_\_\_ # \_\_\_\_\_ # \_\_\_\_\_  
Attached pages 11, 31, 57, 59  
Continued

8. REASON FOR CHANGE Due to the unavailability of offsite disposal facilities, excess radioactive waste samples will require storage. Review of existing regulatory guidance and implementing procedures do not require radioactive waste samples to be stored after their packaged radioactive waste is placed into its designated storage area. Existing records provide reasonable assurance the waste was properly analyzed. Revised Procedure Matrix to reflect changes in procedures.  
Continued

9. RECOMMENDED FOR PERMANENT STATUS?  YES  NO, EXPIRATION DATE N/A  
 (60 DAY MAXIMUM FOR TEMPORARY STATUS)

10. IF PLANT PROCEDURE COMPLETE ITEMS 11 THRU 15 ON PAGE 2 OF THIS FORM.

16. INITIATOR: Mark [Signature] DATE: 10-24-94

18. AUTHORIZATION (FOR PLANT PROCEDURES)  
 SHIFT SUPERVISOR: \_\_\_\_\_ DATE: \_\_\_\_\_

17. MANAGEMENT REVIEW  
 a.  QADR NOT REQUIRED  
 b.  QADR PERFORMED, NO COMMENTS  
 c.  NQA QADR REQUIRED PRIOR TO APPROVAL PER BLOCK 21  
J. DeLoe 10/25/94  
 MANAGEMENT MEMBER DATE

19. NQA QADR  
 a.  NQA QADR NOT REQUIRED  
 b.  NQA QADR PERFORMED, NO COMMENTS  
 c.  NQA QADR PERFORMED, COMMENTS ATTACHED  
 REVIEWER: Jess Schmidt DATE: 10/26/94

20. COMMITTEE MEETING  
 TYPE: Proc.  
 MTG #: 94-158  
 RECOMMENDED:  YES  NO  
 REVISED:  YES  NO

21. APPROVAL  
[Signature] NOV 03 1994  
 (INITIALS) DATE



