CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

April 30, 1999

Docket No. 50-213
CY-99-058

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Haddam Neck Plant
Annual Radiological Environmental Operating Report

In accordance with the requirements of the Haddam Neck Technical Specifications, Section 6.9.1.6 and the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual, an implementing document of the Haddam Neck Technical Specifications, two (2) copies of the Annual Radiological Environmental Operating Report are herewith submitted.

If you should have any questions, please contact Mr. G. P. van Noordennen at (860) 267-3938.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

K J Heider for R A Mellor

Russell A. Mellor
Vice President - Operations and Decommissioning

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cc: H. J. Miller, NRC Region I Administrator
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Northeast Utilities

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

HADDAM NECK STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

JANUARY 1, 1998 - DECEMBER 31, 1998

DOCKET NO. 50-213
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Prepared for the

CONNECTICUT YANKEE ATOMIC POWER COMPANY
Haddam, Connecticut

By the

NORTHEAST NUCLEAR ENERGY COMPANY
Waterford, Connecticut

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1. SUMMARY

The radiological environmental monitoring program for the Haddam Neck Station was continued for the period January through December 1998, in compliance with the Technical Specifications and the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual (REMODCM). This annual report was prepared for the Connecticut Yankee Atomic Power Company (CYAPCO) by the Safety Analysis Branch of the Nuclear Engineering Department of Northeast Nuclear Energy Company (NNECO). Sample collection and preparation and gamma exposure rate measurements were performed by the Production Operations Services Laboratory (POSL). Laboratory analyses were performed by Duke Engineering and Services Environmental Laboratory (DESEL).

Thermoluminescent dosimeters (TLDs) were used to measure direct gamma exposure in the vicinity of the station and as far away as 12.5 miles. Radiochemical and radiological counting analyses of samples were performed to detect the presence of any station related radioactivity. Samples included air particulates collected on filters, milk, cow and goat feed (hay), broad leaf vegetation, well water, fruits, vegetables, river water, bottom sediment shellfish, and fish. In evaluating the results of these analyses it is necessary to consider the variability of natural and man-made sources of radioactivity, distribution in the environment and uptake in environmental media. This variability is dependent on many factors including station release rates, past spatial variability of radioactive fallout from nuclear weapons tests and on-going redistribution of the fallout, contribution from cosmically produced radioactivity, ground water dynamics, soil characteristics, farming practices, and feed type. Significant variations in measured levels of radioactivity could be caused by any one of these factors. Therefore, these factors need to be considered in order to properly explain any variations in radiation detected and to distinguish between natural and station related radioactivity.

Haddam Neck is permanently shutdown. Primary activities at the Haddam Neck station are now focused on decommissioning. Even though the station is no longer generating power, decommissioning activities included processing and discharging of liquids containing radioactivity and releasing of airborne radioactivity. However, the levels of radioactivity released are significantly lower than releases during plant operation. The radiological monitoring of the environment through this program will continue to assure the health and safety of the public and workers are maintained at all times.

The predominant radioactivity detected by the monitoring program was that from outside sources, such as fallout from nuclear weapons tests and naturally occurring radionuclides. As typical of previous years, station related radioactivity was observed at some of the on-site gamma monitoring locations. The only other observation of station effects was tritium in well water at the on-site location.

As usual, Cesium-137 and Strontium-90 were measured in both cow and goat milk. These levels are a result of nuclear weapons testing in the 1960s and not the result of station decommissioning operations. This can be concluded because insufficient quantities of these isotopes have been released by the station to account for the measured concentrations. Higher levels of Cesium-137 and Strontium-90 were detected prior to initial plant operation and have been declining since the ban on nuclear weapons testing in the 1960s.

The radiation dose (dose equivalent commitment) to the general public from the station's discharges has been evaluated by two methods. One method utilizes measurements of station's discharges and conservative transport models and the other utilizes the measured concentrations of radioactivity in the environmental media.

The maximum whole body dose (station boundary) that could occur to a member of the general public was calculated to be 0.2 millirem. The average dose to a member of the public residing within 50 miles of the station is 0.00065 millirem. These doses are 0.8 percent and 0.0026 percent of the standard as set by the Environmental Protection Agency on the maximum allowable dose to an individual of the general public. The standards of the Environmental Protection Agency are a small fraction (less than 10 percent) of the 284 mrem per year normal Connecticut resident background radiation (NCRP94) and are designed to be inconsequential in regard to public health and safety. Station related doses are a small fraction of these standards and of the variation in natural background in Connecticut. They pose insignificant public health consequences.

2. PROGRAM DESCRIPTION

2.1. *Sampling Schedule, Types, and Locations*

The sample locations and the sample types and frequency of analysis are given in Tables 2-1 and 2-2 and Figures 2.1 and 2.2. The program as described here includes both required samples as specified in the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual and any extra samples.

Table 2-1 Environmental Monitoring Program Sampling Types and Locations

Location Number*	Location Name	Direction & Distance From Release Point†	Sample Types
1-I	On-site - Mouth of Discharge Canal	1.1 Mi, ESE	TLD
2-I	Haddam-Park Rd.	0.8 Mi, S	TLD
3-I	Haddam-Jail Hill Rd.	0.8 Mi, WSW	TLD
4-I	Haddam-Ranger Rd.	1.8 Mi, SW	TLD, Air Particulate
5-I	On-site-Injun Hollow Rd.	0.4 Mi, NW	TLD, Air Particulate
6-I	On-site-Substation	0.5 Mi, NE	TLD, Air Particulate, Vegetation
7-I	Haddam	1.8 Mi, SE	TLD, Air Particulate
8-I	East Haddam	3.1 Mi, ESE	TLD, Air Particulate
9-I	Higganum	4.3 Mi, WNW	TLD, Air Particulate
10-I	Hurd Park Rd.	2.8 Mi, NNW	TLD
11-C	Middletown	9.0 Mi, NW	TLD
12-C	Deep River	7.1 Mi, SSE	TLD
13-C	North Madison	12.5 Mi, SW	TLD, Air Particulate
14-C	Colchester	10.5 Mi, NE	TLD
15-I	On-site Wells	0.5 Mi, ESE**	Well Water
16-C	Well-State Highway Dept. E. Haddam	2.8 Mi, SE	Well Water
17-C	Beyond 10 Miles	Beyond 10 Miles	Fruits & Vegetables
18-I	Site Boundary	0.4 Mi, NW	Vegetation
19-I	Cow Location #1	6.5 Mi, ENE	Milk
20-I	Cow Location #2	8.0 Mi, NE	Milk
21-I	Cow Location #3	11.0 Mi, SE	Milk
22-C	Cow Location #4	11.0 Mi, ENE	Milk
23-C	Goat Location #1	16.0 Mi, NNE	Milk
24-I	Goat Location #2	3.6 Mi, SSE	Milk
25-I	Within 10 Miles	Within 10 Miles	Fruits & Vegetables
26-I	CT River-Near Intake	1.0 Mi, WNW	Fish
27-C	CT River-Higganum Light	4.0 Mi, WNW	Shellfish
28-I	CT River-E. Haddam Bridge	1.8 Mi, SE	Bottom Sediment, River Water
28-X	CT River-E. Haddam Bridge	1.8 Mi, SE	Shellfish
29-I	Vicinity of Discharge	Within 0.3 Miles	Bottom Sediment, Fish
30-C	CT River - Middletown	9.0 Mi, NW	River Water, Bottom Sediment
		7.6 Mi, NW	Fish
31-I	Mouth of Salmon River	0.8 Mi, ESE	Shellfish
40-X	Near Intake Structure	0.1 Mi, SSW	TLD
41-X	Picnic Area	0.3 Mi, WNW	TLD
42-X	Environmental Trail	0.1 Mi, NW	TLD
43-X	Moodus - Rts 149 & 151	2.5 Mi, ENE	TLD
44-X	Shailerville, Horton Rd.	1.0 Mi, SE	TLD
45-X	Old Waste Gas Sphere Fence	0.1 Mi, E	TLD
46-X	Discharge Canal Fence	0.2 Mi, SE	TLD
47-X	Info Center	0.1 Mi, WNW	TLD

* Key: I - Indicator C - Control X - Extra - sample not required

† The release points are the stack for terrestrial locations and the end of the discharge canal for aquatic locations.

** New wells at 0.4 miles SE may be used as a replacement for this location.

Table 2-2 Technical Specification Sampling Frequency & Type of Analysis

Exposure Pathway and/or Sample	Number of Locations	Sampling & Collection Frequency	Type of Analysis
1a. Gamma Exposure - Environmental TLD	14	Monthly	Gamma Dose - Monthly
1b. Gamma Exposure - Accident TLD	25	Quarterly‡	N/A‡
2. Airborne Particulate	7	Continuous sampler - weekly filter change	Gross Beta - Weekly Gamma Spectrum - Quarterly on composite (by location), and on individual filter if gross beta is greater than 10 times the mean of the weekly control station's gross beta results
3. Vegetation	4	One sample near middle & one near end of growing season	Gamma Isotopic on each sample
4. Milk	6	Monthly	Gamma Isotopic on each sample - Monthly Sr-89 and Sr-90 - Quarterly
4a. Pasture Grass	6	Sample as necessary to substitute for unavailable milk	Gamma Isotopic
5. Well Water	2	Quarterly	Gamma Isotopic and Tritium on each composite
6. Bottom Sediment	3	Semiannually	Gamma Isotopic
7. River Water	2	Quarterly Sample - Indicator is continuous composite; Background is composite of six weekly grab samples	Quarterly - Gamma Isotopic and Tritium
8. Fish (edible portion) - bullheads and, when available, perch or other edible fish	3	Quarterly	Gamma Isotopic - Quarterly
9. Shellfish	2	Quarterly	Gamma Isotopic - Quarterly

‡ Accident monitoring TLDs to be dedosed at least quarterly

Figure 2.1 Haddam Neck Station Sample Stations

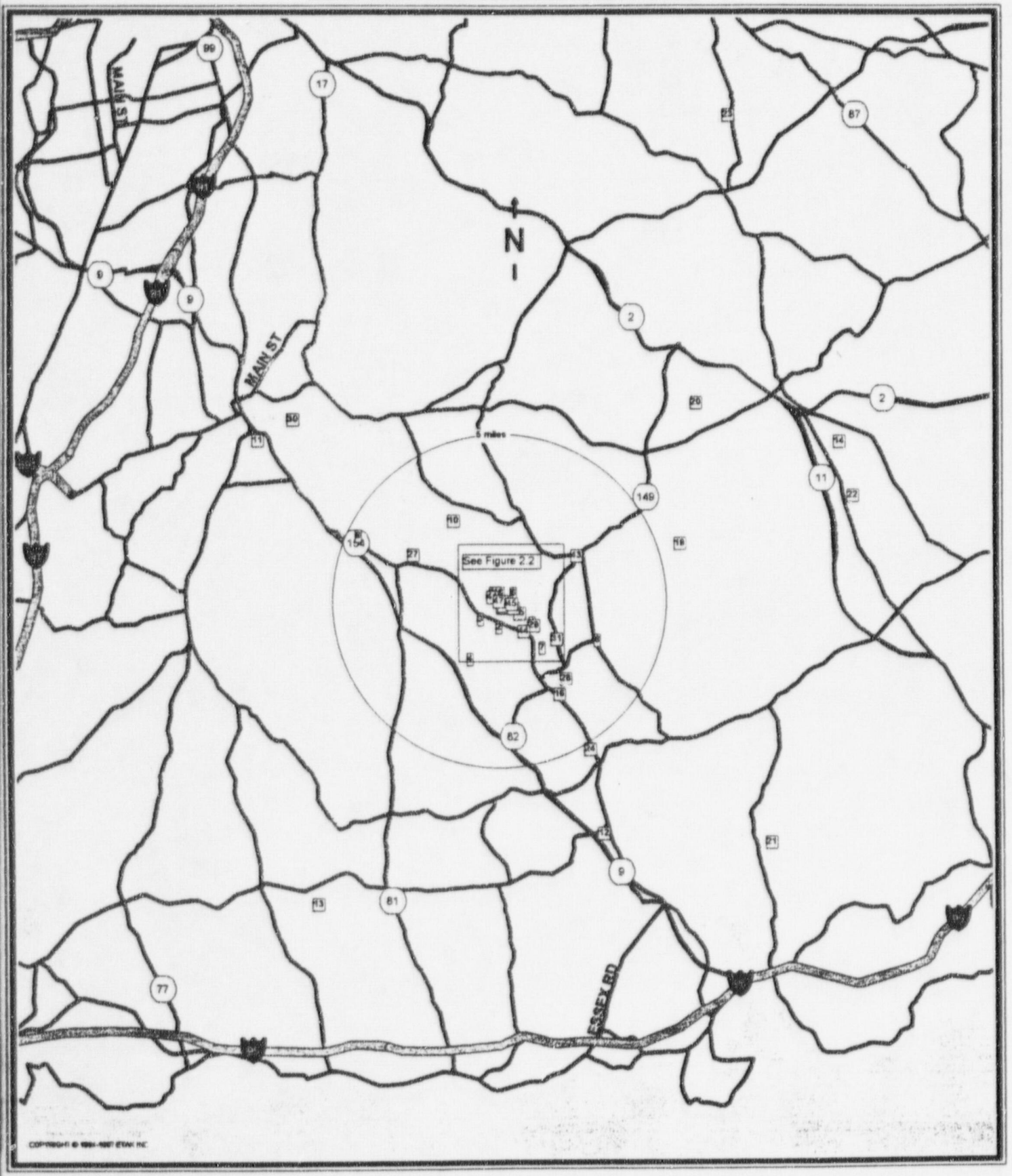
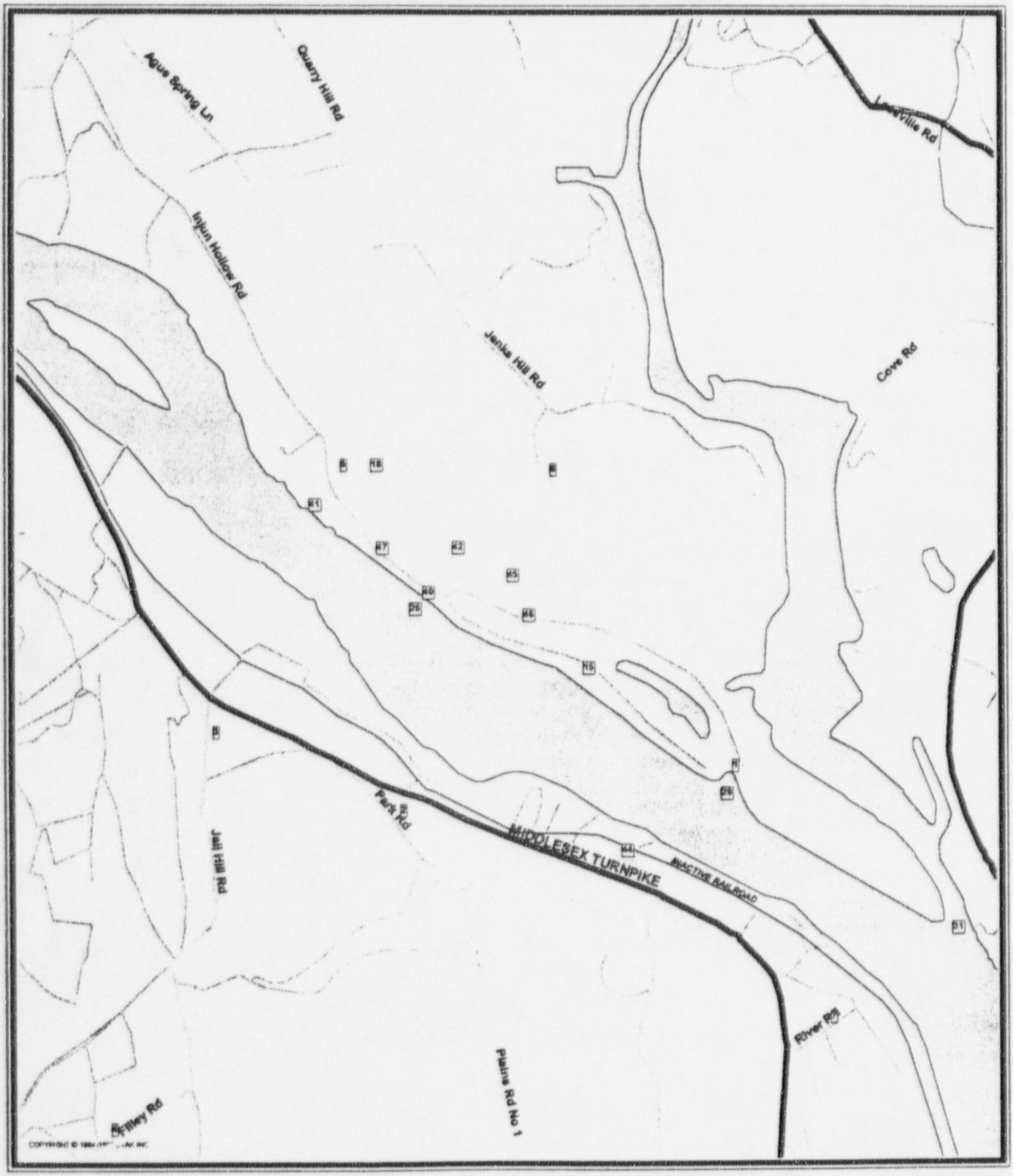


Figure 2.2 Haddam Neck Station Inner Sample Stations



2.2. *Samples Collected During Report Period*

The following table summarizes the number of samples of each type collected during the present reporting period:

Sample Type	Number of Technical Specification Required Samples	Number of Technical Specification Required Samples Analyzed	Number of Extra Samples Analyzed
Gamma Exposure - Environmental TLD	168	168	96
Air Particulates	364	364	0
Dairy Milk	48	44*	0
Goat Milk	24	18*	0
Pasture Grass	**	0*	3***
Well Water	8	8	8
Fruit & Vegetables	8	8	0
Broad Leaf Vegetation	4	4	9
River Water	8	8	0
Bottom Sediment	6	6	0
Fish	24	24	0
Shellfish	8	8	4
Total All Types	**670**	**660**	**120**

* Due to sample unavailability, less than required number of samples were obtained.

** Sample as necessary, during the months of April through December, to substitute for unavailable milk.

*** Three of ten unavailable milk samples occurred during the months when a pasture grass sample is required as a substitute. Hay was collected in lieu of pasture grass due to unavailability of grass.

3. RADIOCHEMICAL RESULTS

3.1. Summary Table

In accordance with the Radiological Effluent Monitoring Manual (REMM), Section F.1, a summary table of the radiochemical and radiological analyses results has been prepared and is presented in Table 3-1. All analysis results are summarized including analysis results of extra, non-required samples.

In the determination of the mean, the data was handled as recommended by the Health and Safety Laboratory, Idaho and NUREG/CR-4007 (Sept. 1984): all valid data, including negative values and zeros were used in the determination of the mean (see Part 3.2).

A more detailed analysis of the data is given in Section 4.0 where a discussion of the variations in the data explains many aspects that are not evident in the Summary Table because of the basic limitation of data summaries.

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
GAMMA DOSE (UR/HR)	216, 48 (D)	1.5	7.9 (6.6 - 10.5)	LOC # 45 0.1 MILES E	9.8 (9.3 - 10.3)	8.0 (6.5 - 9.5)	0
AIR PARTICULATE AND IODINE (PCI/M3)	312, 52 BETA	0.01 (E)	0.020 (0.006 - 0.044)	LOC # 9 4.3 MILES WNW	0.021 (0.007 - 0.044)	0.019 (0.006 - 0.040)	0
	GAMMA 24, 4 BE-7	--	0.092 (0.046 - 0.127)	LOC # 8 3.1 MILES ESE	0.104 (0.070 - 0.127)	0.096 (0.062 - 0.112)	0
	CO-60	--	0.000 (0.000 - 0.001)	LOC # 4 1.8 MILES SW	0.000 (0.000 - 0.001)	0.000 (0.000 - 0.001)	0
	ZR-95	--	0.000 (-0.001 - 0.004)	LOC # 5 0.4 MILES NW	0.001 (0.000 - 0.003)	-0.001 (-0.002 - 0.000)	0
	NB-95	--	-0.000 (-0.003 - 0.002)	LOC # 7 1.8 MILES SE	0.000 (-0.001 - 0.002)	0.000 (-0.001 - 0.002)	0
	RU-103	--	0.000 (-0.002 - 0.002)	LOC # 8 3.1 MILES ESE	0.001 (0.001 - 0.001)	0.000 (0.000 - 0.000)	0
	CS-134	0.05 (F)	0.000 (0.000 - 0.001)	LOC # 5 0.4 MILES NW	0.000 (0.000 - 0.001)	0.000 (0.000 - 0.001)	0
	CS-137	0.06	0.000 (0.000 - 0.000)	LOC # 7 1.8 MILES SE	0.000 (0.000 - 0.000)	0.000 (0.000 - 0.000)	0
MILK (DAIRY) (PCI/L)	SR 11, 4 SR-89	--	1.3 (-2.1 - 6.7)	LOC # 21 11.0 MILES SE	1.9 (-2.1 - 4.8)	1.3 (-0.6 - 3.5)	0
	SR-90	--	1.7 (-0.6 - 4.8)	LOC # 20 8 MILES NE	4.2 (3.5 - 4.8)	2.2 (1.0 - 3.4)	0
	IODINE 32,12 I-131	1	-0.76 (-6.00 - 3.09)	LOC # 21 11.0 MILES SE	-0.31 (-6.00 - 3.09)	-0.55 (-4.46 - 4.71)	0

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MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	GAMMA 32,12	15	-0.3	LOC # 20	-0.1	-0.6	0
	CS-134		(-2.2 - 2.9)	8 MILES NE	(-1.5 - 2.2)	(-5.4 - 1.6)	
	CS-137	18	1.9	LOC # 20	5.9	1.0	0
			(-1.5 - 9.3)	8 MILES NE	(2.7 - 9.3)	(-1.1 - 3.7)	
	BA-140	70	-0	LOC # 22C	1	1	0
			(-4 - 3)	11 MILES ENE	(-2 - 4)	(-2 - 4)	
	LA-140	25	-0.3	LOC # 22C	1.5	1.5	0
			(-5.1 - 4.0)	11 MILES ENE	(-1.8 - 4.1)	(-1.8 - 4.1)	
GOAT MILK (PCI/L)	SR 4, 4	--	2.6	LOC # 24	2.6	0.9	0
	SR-89		(0.8 - 4.7)	3.6 MILES SSE	(0.8 - 4.7)	(-2.4 - 8.6)	
	SR-90	--	7.1	LOC # 24	7.1	2.9	0
			(4.6 - 9.0)	3.6 MILES SSE	(4.6 - 9.0)	(0.6 - 5.1)	
	IODINE 10, 8	1	-0.92	LOC # 23C	0.50	0.50	0
	I-131		(-3.55 - 4.30)	16 MILES NNE	(-3.51 - 1.57)	(-3.51 - 1.57)	
	GAMMA 10, 8	15	0.1	LOC # 23C	0.2	0.2	0
	CS-134		(-2.3 - 2.1)	16 MILES NNE	(-2.5 - 2.4)	(-2.5 - 2.4)	
	CS-137	18	4.0	LOC # 23C	5.7	5.7	0
			(1.3 - 11.3)	16 MILES NNE	(2.5 - 11.4)	(2.5 - 11.4)	
	BA-140	70	-2	LOC # 23C	-0	-0	0
			(-6 - 1)	16 MILES NNE	(-6 - 3)	(-6 - 3)	
	LA-140	25	-2.0	LOC # 23C	-0.3	-0.3	0
			(-6.8 - 1.1)	16 MILES NNE	(-6.8 - 3.7)	(-6.8 - 3.7)	
PASTURE GRASS (PCI/G)	GAMMA 1, 2	0.06	0.036	LOC # 20	0.036	-0.019	0
	I-131		(0.036 - 0.036)	8 MILES NE	(0.036 - 0.036)	(-0.020 - -0.018)	

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	CS-134	0.06	-0.017 (-0.017 - -0.017)	LOC # 23C 16 MILES NNE	-0.011 (-0.024 - 0.001)	-0.011 (-0.024 - 0.001)	0
	CS-137	0.08	0.000 (0.000 - 0.000)	LOC # 23C 16 MILES NNE	0.036 (0.029 - 0.042)	0.036 (0.029 - 0.042)	0
	BA-140	--	0.012 (0.012 - 0.012)	LOC # 20 8 MILES NE	0.012 (0.012 - 0.012)	-0.046 (-0.058 - -0.034)	0
	LA-140	--	0.014 (0.014 - 0.014)	LOC # 20 8 MILES NE	0.014 (0.014 - 0.014)	-0.053 (-0.067 - -0.039)	0
GROUNDWATER (PCI/L)	GAMMA 12, 4 MN-54	15	-0.5 (-2.3 - 2.3)	LOC # 15 0.5 MILES ESE	-0.5 (-2.3 - 2.3)	-0.5 (-2.0 - 0.5)	0
	CO-58	15	0.1 (-2.0 - 1.7)	LOC # 15 0.5 MILES ESE	0.1 (-2.0 - 1.7)	-1.9 (-3.0 - -0.8)	0
	FE-59	30	-0.0 (-4.0 - 2.9)	LOC # 16C 2.8 MILES SE	1.5 (-0.6 - 5.9)	1.5 (-0.6 - 5.9)	0
	CO-60	15	-0.2 (-1.8 - 1.3)	LOC # 16C 2.8 MILES SE	0.5 (-0.7 - 1.6)	0.5 (-0.7 - 1.6)	0
	ZN-65	30	1.9 (-6.0 - 8.4)	LOC # 16C 2.8 MILES SE	3.9 (-7.7 - 18.8)	3.9 (-7.7 - 18.8)	0
	ZR-95	30	-0.4 (-4.6 - 3.4)	LOC # 16C 2.8 MILES SE	0.6 (-0.6 - 2.1)	0.6 (-0.6 - 2.1)	0
	NB-95	15	-1.2 (-3.8 - 0.7)	LOC # 16C 2.8 MILES SE	0.3 (-2.4 - 1.4)	0.3 (-2.4 - 1.4)	0
	I-131	--	-0 (-5 - 4)	LOC # 16C 2.8 MILES SE	3 (-1 - 9)	3 (-1 - 9)	0

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	CS-134	15	-0.1 (-3.0 - 1.1)	LOC # 15 0.5 MILES ESE	-0.1 (-3.0 - 1.1)	-0.3 (-1.2 - 0.9)	0
	CS-137	18	0.8 (-0.5 - 2.1)	LOC # 15 0.5 MILES ESE	0.8 (-0.5 - 2.1)	-1.4 (-2.4 - -0.2)	0
	BA-140	60	0 (-4 - 5)	LOC # 15 0.5 MILES ESE	0 (-4 - 5)	-2 (-5 - 3)	0
	LA-140	15	0 (-5 - 6)	LOC # 15 0.5 MILES ESE	0 (-5 - 6)	-2 (-6 - 3)	0
	TRITIUM 12, 4 H-3	2000	432 (215 - 633)	LOC # 15 0.5 MILES ESE	432 (215 - 633)	42 (0 - 93)	0
FRUITS AND VEGETABLES (PCI/G)	GAMMA 4, 4 BE-7	--	0.25 (0.05 - 0.51)	LOC # 25 <10 MILES	0.25 (0.05 - 0.51)	0.13 (0.00 - 0.35)	0
	K-40	--	2.54 (0.89 - 4.05)	LOC # 17C >10 MILES	2.72 (0.50 - 5.58)	2.72 (0.50 - 5.58)	0
	MN-54	--	-0.006 (-0.018 - 0.004)	LOC # 17C >10 MILES	-0.004 (-0.009 - 0.001)	-0.004 (-0.009 - 0.001)	0
	CO-58	--	0.001 (-0.006 - 0.006)	LOC # 17C >10 MILES	0.002 (-0.012 - 0.016)	0.002 (-0.012 - 0.016)	0
	CO-60	--	0.009 (0.000 - 0.024)	LOC # 25 <10 MILES	0.009 (0.000 - 0.024)	-0.005 (-0.018 - 0.003)	0
	ZR-95	--	0.012 (0.003 - 0.022)	LOC # 25 <10 MILES	0.012 (0.003 - 0.022)	-0.006 (-0.028 - 0.002)	0
	NB-95	--	0.010 (0.001 - 0.017)	LOC # 25 <10 MILES	0.010 (0.001 - 0.017)	0.006 (-0.011 - 0.017)	0

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	RU-103	--	0.006 (-0.002 - 0.013)	LOC # 25 <10 MILES	0.006 (-0.002 - 0.013)	-0.005 (-0.015 - 0.017)	0
	I-131	0.06 (G)	-0.005 (-0.017 - 0.008)	LOC # 17C >10 MILES	0.017 (-0.020 - 0.051)	0.017 (-0.020 - 0.051)	0
	CS-134	0.06	0.000 (-0.012 - 0.016)	LOC # 25 <10 MILES	0.000 (-0.012 - 0.016)	-0.008 (-0.019 - 0.006)	0
	CS-137	0.08	-0.003 (-0.021 - 0.008)	LOC # 17C >10 MILES	-0.002 (-0.012 - 0.011)	-0.002 (-0.012 - 0.011)	0
	RA-226	--	0.007 (-0.089 - 0.221)	LOC # 17C >10 MILES	0.377 (-0.106 - 0.767)	0.377 (-0.106 - 0.767)	0
	TH-228	--	0.029 (-0.012 - 0.133)	LOC # 25 <10 MILES	0.029 (-0.012 - 0.133)	0.003 (-0.024 - 0.034)	0
BROADLEAF VEGETATION (PCI/G)	GAMMA 13, . BE-7	--	1.20 (0.39 - 2.41)	LOC # 18 0.4 MILES NW	1.39 (0.39 - 2.41)	. (. - .)	0
	K-40	--	3.06 (0.72 - 6.50)	LOC # 6 0.5 MILES NE	3.57 (1.40 - 6.50)	. (. - .)	0
	MN-54	--	-0.000 (-0.031 - 0.020)	LOC # 18 0.4 MILES NW	0.002 (-0.004 - 0.010)	. (. - .)	0
	CO-58	--	-0.003 (-0.019 - 0.014)	LOC # 18 0.4 MILES NW	-0.003 (-0.019 - 0.014)	. (. - .)	0
	CO-60	--	0.001 (-0.012 - 0.009)	LOC # 18 0.4 MILES NW	0.001 (-0.012 - 0.009)	. (. - .)	0
	ZR-95	--	0.001 (-0.020 - 0.029)	LOC # 18 0.4 MILES NW	0.003 (-0.019 - 0.029)	. (. - .)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	NB-95	--	0.001 (-0.034 - 0.020)	LOC # 6 0.5 MILES NE	0.004 (-0.005 - 0.020)	. (. - .)	0
	RU-103	--	-0.001 (-0.018 - 0.009)	LOC # 6 0.5 MILES NE	0.001 (-0.004 - 0.006)	. (. - .)	0
	I-131	0.06	-0.004 (-0.079 - 0.056)	LOC # 18 0.4 MILES NW	-0.003 (-0.079 - 0.056)	. (. - .)	0
	CS-134	0.06	0.001 (-0.011 - 0.028)	LOC # 18 0.4 MILES NW	0.001 (-0.011 - 0.011)	. (. - .)	0
	CS-137	0.08	0.014 (-0.024 - 0.092)	LOC # 18 0.4 MILES NW	0.032 (-0.024 - 0.092)	. (. - .)	0
	RA-226	--	-0.025 (-0.929 - 0.457)	LOC # 18 0.4 MILES NW	0.035 (-0.208 - 0.222)	. (. - .)	0
	TH-228	--	0.040 (-0.105 - 0.257)	LOC # 6 0.5 MILES NE	0.055 (-0.105 - 0.257)	. (. - .)	0
RIVER WATER (PCI/L)	GAMMA 4, 4 K-40	--	-16 (-31 - -9)	LOC # 30C 9.0 MILES NW	18 (-16 - 72)	18 (-16 - 72)	0
	MN-54	15	0.4 (-0.3 - 1.6)	LOC # 28 1.8 MILES SE	0.4 (-0.3 - 1.6)	-0.0 (-0.2 - 0.4)	0
	CO-58	15	-0.3 (-1.0 - 0.9)	LOC # 28 1.8 MILES SE	-0.3 (-1.0 - 0.9)	-0.6 (-1.7 - -0.1)	0
	FE-59	30	-1.2 (-1.3 - -1.1)	LOC # 30C 9.0 MILES NW	-1.1 (-3.8 - 2.1)	-1.1 (-3.8 - 2.1)	0
	CO-60	15	-0.0 (-0.1 - 0.1)	LOC # 30C 9.0 MILES NW	0.1 (-0.2 - 0.3)	0.1 (-0.2 - 0.3)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	ZN-65	30	-0.3 (-1.3 - 1.4)	LOC # 30C 9.0 MILES NW	1.4 (-1.2 - 4.8)	1.4 (-1.2 - 4.8)	0
	ZR-95	30	0.1 (-4.0 - 5.3)	LOC # 28 1.8 MILES SE	0.1 (-4.0 - 5.3)	0.0 (-1.0 - 1.0)	0
	NB-95	15	0.5 (-1.6 - 1.8)	LOC # 30C 9.0 MILES NW	0.8 (0.2 - 1.7)	0.8 (0.2 - 1.7)	0
	I-131	--	31 (16 - 56)	LOC # 28 1.8 MILES SE	31 (16 - 56)	2 (-6 - 11)	0
	CS-134	15	-0.3 (-0.7 - 0.2)	LOC # 30C 9.0 MILES NW	0.1 (-0.7 - 0.8)	0.1 (-0.7 - 0.8)	0
	CS-137	18	-0.1 (-0.5 - 0.1)	LOC # 30C 9.0 MILES NW	-0.0 (-1.0 - 1.6)	-0.0 (-1.0 - 1.6)	0
	BA-140	60 (H)	-8 (-11 - -6)	LOC # 30C 9.0 MILES NW	1 (-3 - 6)	1 (-3 - 6)	0
	LA-140	15 (H)	-9 (-12 - -7)	LOC # 30C 9.0 MILES NW	1 (-4 - 6)	1 (-4 - 6)	0
	TRITIUM 4, 4 H-3	2000	274 (177 - 379)	LOC # 28 1.8 MILES SE	274 (177 - 379)	-136 (-342 - -49)	0
BOTTOM SEDIMENT (PCI/G)	GAMMA 4, 2 K-40	--	9.7 (8.9 - 11.5)	LOC # 30C 9.0 MILES NW	10.8 (8.1 - 13.6)	10.8 (8.1 - 13.6)	0
	MN-54	--	0.00 (-0.02 - 0.02)	LOC # 29 0 MILES N/A	0.02 (0.01 - 0.02)	0.00 (-0.02 - 0.02)	0
	CO-58	--	0.00 (-0.02 - 0.01)	LOC # 28 1.8 MILES SE	0.01 (0.00 - 0.01)	0.00 (-0.01 - 0.02)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CO-60	--	0.00 (-0.05 - 0.04)	LOC # 29 0 MILES N/A	0.03 (0.02 - 0.04)	0.01 (0.00 - 0.03)	0
	ZR-95	--	0.01 (-0.05 - 0.06)	LOC # 29 0 MILES N/A	0.05 (0.04 - 0.06)	-0.02 (-0.03 - -0.01)	0
	NB-95	--	-0.01 (-0.03 - 0.03)	LOC # 29 0 MILES N/A	0.01 (-0.02 - 0.03)	-0.04 (-0.06 - -0.03)	0
	I-131	--	-0.03 (-0.07 - 0.00)	LOC # 30C 9.0 MILES NW	-0.01 (-0.02 - -0.00)	-0.01 (-0.02 - -0.00)	0
	CS-134	0.15	0.00 (-0.01 - 0.01)	LOC # 30C 9.0 MILES NW	0.01 (0.01 - 0.01)	0.01 (0.01 - 0.01)	0
	CS-137	0.18	0.09 (0.06 - 0.16)	LOC # 29 0 MILES N/A	0.12 (0.08 - 0.16)	0.10 (0.04 - 0.16)	0
	RA-226	--	1.52 (0.97 - 2.24)	LOC # 29 0 MILES N/A	2.03 (1.82 - 2.24)	0.99 (0.76 - 1.22)	0
	TH-228	--	0.62 (0.57 - 0.69)	LOC # 28 1.8 MILES SE	0.66 (0.62 - 0.69)	0.65 (0.42 - 0.88)	0
SHELLFISH (PCI/G)	GAMMA 8, 4 BE-7	--	0.04 (-0.09 - 0.17)	LOC # 28 1.8 MILES SE	0.08 (-0.04 - 0.17)	-0.09 (-0.21 - 0.03)	0
	K-40	--	0.2 (-0.1 - 0.4)	LOC # 27C 4 MILES WNW	0.3 (0.1 - 0.4)	0.3 (0.1 - 0.4)	0
	CR-51	--	0.03 (-0.16 - 0.25)	LOC # 31 0.8 MILES ESE	0.11 (-0.03 - 0.25)	-0.02 (-0.06 - -0.00)	0
	MN-54	0.13	0.00 (-0.02 - 0.03)	LOC # 28 1.8 MILES SE	0.01 (-0.01 - 0.03)	0.00 (-0.01 - 0.01)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CO-58	0.13	-0.01 (-0.03 - 0.01)	LOC # 27C 4 MILES WNW	0.00 (-0.01 - 0.02)	0.00 (-0.01 - 0.02)	0
	FE-59	0.26	0.00 (-0.03 - 0.05)	LOC # 31 0.8 MILES ESE	0.01 (-0.03 - 0.05)	-0.01 (-0.04 - 0.01)	0
	CO-60	0.13	-0.00 (-0.02 - 0.02)	LOC # 28 1.8 MILES SE	0.00 (-0.02 - 0.02)	-0.00 (-0.01 - 0.01)	0
	ZN-65	0.26	-0.02 (-0.05 - 0.03)	LOC # 27C 4 MILES WNW	-0.00 (-0.05 - 0.04)	-0.00 (-0.05 - 0.04)	0
	ZR-95	--	0.00 (-0.01 - 0.03)	LOC # 27C 4 MILES WNW	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)	0
	NB-95	--	0.00 (-0.01 - 0.01)	LOC # 31 0.8 MILES ESE	0.00 (-0.01 - 0.01)	-0.01 (-0.01 - -0.00)	0
	RU-103	--	-0.00 (-0.02 - 0.01)	LOC # 27C 4 MILES WNW	0.00 (-0.02 - 0.03)	0.00 (-0.02 - 0.03)	0
	RU-106	--	0.06 (-0.21 - 0.17)	LOC # 28 1.8 MILES SE	0.10 (0.05 - 0.17)	0.07 (-0.09 - 0.29)	0
	AG-110M	--	-0.00 (-0.02 - 0.00)	LOC # 27C 4 MILES WNW	0.01 (0.00 - 0.01)	0.01 (0.00 - 0.01)	0
	I-131	--	-0.00 (-0.04 - 0.02)	LOC # 27C 4 MILES WNW	0.01 (-0.01 - 0.04)	0.01 (-0.01 - 0.04)	0
	CS-134	0.13	-0.01 (-0.02 - 0.01)	LOC # 31 0.8 MILES ESE	-0.00 (-0.02 - 0.01)	-0.01 (-0.04 - 0.01)	0
	CS-137	0.15	-0.00 (-0.02 - 0.02)	LOC # 28 1.8 MILES SE	0.00 (-0.01 - 0.02)	0.00 (-0.01 - 0.01)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	RA-226	--	0.21 (-0.26 - 0.80)	LOC # 28 1.8 MILES SE	0.27 (-0.26 - 0.80)	0.19 (0.00 - 0.31)	0
	TH-228	--	0.18 (0.09 - 0.32)	LOC # 31 0.8 MILES ESE	0.19 (0.09 - 0.32)	0.17 (0.09 - 0.23)	0
FISH (ALL TYPES) (PCI/G)	GAMMA 16, 8	--					
	BE-7		-0.01 (-0.13 - 0.17)	LOC # 29 0 MILES N/A	0.01 (-0.07 - 0.17)	-0.01 (-0.12 - 0.11)	0
	K-40	--	3.4 (2.6 - 4.0)	LOC # 26 1 MILES WNW	3.5 (3.0 - 4.0)	3.4 (2.6 - 4.2)	0
	CR-51	--	0.06 (-0.15 - 0.29)	LOC # 26 1 MILES WNW	0.11 (-0.04 - 0.29)	-0.05 (-0.14 - 0.03)	0
	MN-54	0.13	0.00 (-0.03 - 0.02)	LOC # 29 0 MILES N/A	0.01 (0.00 - 0.02)	0.00 (-0.01 - 0.01)	0
	CO-58	0.13	-0.00 (-0.02 - 0.01)	LOC # 29 0 MILES N/A	0.00 (-0.01 - 0.01)	0.00 (-0.01 - 0.02)	0
	FE-59	0.26	-0.01 (-0.07 - 0.03)	LOC # 29 0 MILES N/A	-0.01 (-0.05 - 0.03)	-0.02 (-0.10 - 0.02)	0
	CO-60	0.13	0.01 (-0.02 - 0.02)	LOC # 26 1 MILES WNW	0.01 (-0.01 - 0.02)	0.00 (-0.02 - 0.04)	0
	ZN-65	0.26	-0.01 (-0.05 - 0.04)	LOC # 26 1 MILES WNW	-0.00 (-0.04 - 0.04)	-0.02 (-0.05 - 0.00)	0
	ZR-95	--	-0.00 (-0.02 - 0.03)	LOC # 30C 7.6 MILES NW	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)	0
	NB-95	--	-0.00 (-0.02 - 0.01)	LOC # 26 1 MILES WNW	-0.00 (-0.02 - 0.01)	-0.01 (-0.03 - 0.02)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
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DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	RU-103	--	0.00 (-0.03 - 0.01)	LOC # 30C 7.6 MILES NW	0.01 (-0.00 - 0.02)	0.01 (-0.00 - 0.02)	0
	RU-106	--	0.04 (-0.07 - 0.24)	LOC # 26 1 MILES WNW	0.05 (-0.05 - 0.24)	0.04 (-0.10 - 0.19)	0
	AG-110M	--	-0.00 (-0.02 - 0.02)	LOC # 29 0 MILES N/A	0.01 (-0.02 - 0.02)	-0.01 (-0.03 - 0.01)	0
	I-131	--	-0.01 (-0.06 - 0.06)	LOC # 30C 7.6 MILES NW	0.02 (-0.03 - 0.15)	0.02 (-0.03 - 0.15)	0
	CS-134	0.13	-0.00 (-0.02 - 0.02)	LOC # 26 1 MILES WNW	-0.00 (-0.01 - 0.02)	-0.00 (-0.02 - 0.01)	0
	CS-137	0.15	0.01 (-0.01 - 0.04)	LOC # 29 0 MILES N/A	0.02 (-0.01 - 0.03)	0.02 (-0.01 - 0.03)	0
	RA-226	--	0.11 (-0.30 - 0.66)	LOC # 26 1 MILES WNW	0.20 (-0.07 - 0.52)	0.16 (-0.77 - 0.68)	0
	TH-228	--	0.02 (-0.03 - 0.07)	LOC # 29 0 MILES N/A	0.02 (-0.02 - 0.06)	-0.00 (-0.02 - 0.05)	0

NOTES FOR TABLE 3-1

A. For gamma measurements the (Minimum Detectabie Level) MDL's ≃ LLD + 2.33. For all others, MDL = 2 x (the standard deviation of the background). These MDL's are based on the absence of large amounts of interfering activity (excluding naturally occurring radionuclides). Deviations by about factors of 3 to 4 can occur.

The LLD at a confidence level of 95% is the smallest concentration of radioactive material in a sample that will be detected with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ S_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

where

LLD	is the lower limit of detection as defined above (as pCi per unit mass or volume)
S_b	is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)
E	is the counting efficiency (as counts per transformation)
V	is the sample size (in units of mass or volume)
2.22	is the number of transformation per minute per picocurie
Y	is the fractional radiochemical yield (when applicable)
λ	is the radioactive decay constant for the particular radionuclide
Δt	is the elapsed time between sample collection (or end of the sample collection period) and time of counting

It should be recognized that LLD is a defined *a priori* (before the fact) limit representing the capability of a measurement system and not an *a posteriori* (after the fact) limit for a particular measurement.

Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these *a priori* LLDs unachievable. In such cases, the contributing factors will be identified and described in the *Annual Radiological Environmental Operating Report.*

B. Analytical results are handled as recommended by HASL *("Reporting of Analytical Results from HASL,"* letter by Leo B. Higginbotham) and NUREG/CR-4007 (Sept. 1984). Negative values were used in the determination of mean.

C. Nonroutine reported measurements (NRM's). These are results of samples that exceed the report levels of Table E-2 of the *Radiological Effluent Monitoring Manual.*

D. First number is the number of indicator measurements, the second is the number of control measurements.

E. Assuming 270 m^3

F. Assuming 1080 m^3

G. LLD for leafy vegetables.

H. LLD from the end of the sample period.

3.2. Data Tables

The data reported in this section are strictly counting statistics. The reported error is two times the standard deviation (2σ) of the net activity. Unless otherwise noted, the overall error (counting, sample size, chemistry, errors, etc.) is estimated to be 2 to 5 times that listed. Results are considered positive when the measured value exceeds 1.5 times the listed 2σ error (i.e., the measured value exceeds 3σ).

Because of counting statistics, negative values, zeros and numbers below the Minimum Detectable Level (MDL) are statistically valid pieces of data. For the purposes of this report, in order to indicate any background biases, all the valid data are presented. In instances where zeros are listed after significant digits, this is an artifact of the computer data handling program.

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Gross Beta Radioactivity
3. Air Particulates, Weekly I-131*
4. Air Particulates, Gamma Isotopic
5. Air Particulates, Quarterly Strontium*
6. Soil*
7. Milk - Dairy Farms
8. Milk - Goat Farms
9. Pasture Grass**
10. Well Water
11. Reservoir Water*
12. Fruits & Vegetables
13. Broad Leaf Vegetation
14. River Water
15. Bottom Sediment
16. Shellfish
17. Fish

* This type of sampling or analysis was not performed, therefore there is no table.

** Pasture grass was not available, therefore feed (hay) was collected as a substitute

TABLE 1
MONTHLY
GAMMA EXPOSURE RATE (UR/HR) *

LOCATIONS

PERIOD	1	2	3	4	5	6	7	8	9	10	11C
JAN 98	7.2 .2	7.0 .0	7.5 .0	6.6 .2	8.0 .1	7.1 .1	7.1 .0	8.6 .1	7.7 .0	9.2 .0	9.0 .1
FEB 98	7.2 .0	6.9 .3	7.5 .0	6.9 .1	7.8 .1	6.9 .1	6.6 .5	8.6 .2	7.4 .0	9.0 .1	8.6 .2
MAR 98	7.1 .1	6.9 .0	7.3 .1	6.6 .2	8.0 .0	6.8 .1	7.0 .1	8.4 .1	7.4 .0	8.7 .1	8.7 .1
APR 98	7.2 .0	7.0 .2	7.8 .0	6.9 .0	7.9 .1	7.2 .2	6.8 .2	8.9 .2	7.6 .0	8.9 .1	8.6 .0
MAY 98	7.4 .2	7.0 .0	7.7 .2	6.8 .2	8.3 .1	7.1 .3	7.3 .1	8.6 .1	7.7 .1	8.9 .1	9.0 .0
JUN 98	7.4 .0	7.0 .1	7.7 .1	7.1 .0	8.1 .0	7.1 .1	6.8 .1	9.0 .2	7.5 .0	8.9 .0	9.0 .1
JUL 98	7.7 .0	7.3 .1	7.7 .1	6.9 .2	8.5 .0	7.1 .1	7.4 .0	8.7 .1	7.7 .0	8.6 .3	9.3 .1
AUG 98	7.7 .1	7.6 .2	8.1 .1	7.3 .0	8.4 .1	7.4 .1	6.9 .1	9.2 .3	7.6 .1	8.8 .1	9.2 .1
SEP 98	7.9 .2	7.6 .0	8.1 .1	7.1 .1	8.9 .0	7.5 .1	7.7 .1	9.1 .1	8.0 .1	9.1 .0	9.5 .2
OCT 98	7.4 .1	7.1 .2	7.8 .1	7.1 .1	8.3 .1	7.3 .1	7.0 .0	8.9 .2	7.5 .1	8.8 .0	8.9 .0
NOV 98	7.5 .1	7.3 .1	7.8 .1	7.0 .0	8.5 .2	7.1 .0	7.4 .0	8.9 .0	7.8 .1	8.8 .1	9.1 .0
DEC 98	7.3 .0	7.0 .2	7.8 .0	7.0 .0	8.1 .1	7.2 .1	6.9 .1	9.0 .2	7.4 .0	8.6 .0	8.8 .0

PERIOD	12C	13C	14C	40X	41X	42X	43X	44X	45X	46X	47X
JAN 98	7.4 .0	6.8 .1	8.7 .0	7.2 .1	6.9 .1	9.6 .0	8.5 .0	7.3 .1	9.8 .1	7.2 .2	7.8 .1
FEB 98	7.5 .1	6.5 .1	8.6 .0	7.2 .1	7.2 .0	9.2 .0	8.3 .0	7.4 .0	9.7 .1	7.1 .0	7.9 .1
MAR 98	7.1 .2	6.6 .0	8.6 .1	6.7 .0	6.7 .2	9.4 .1	8.2 .1	7.1 .1	9.3 .2	6.9 .2	7.6 .2
APR 98	7.6 .1	6.7 .2	8.8 .1	7.2 .1	7.2 .2	9.4 .4	8.4 .1	7.6 .1	9.7 .1	7.2 .1	8.1 .2
MAY 98	7.4 .2	6.8 .1	9.2 .1	7.1 .1	7.1 .1	9.6 .1	8.7 .0	7.5 .1	9.8 .2	7.1 .3	8.2 .2
JUN 98	7.6 .1	6.8 .2	8.7 .2	7.3 .1	7.3 .1	9.4 .1	8.5 .0	7.7 .1	9.9 .0	7.3 .2	8.0 .2
JUL 98	7.4 .1	6.9 .0	9.2 .0	7.1 .0	7.3 .2	10.2 .2	8.8 .1	7.6 .1	9.9 .0	7.4 .1	8.4 .0
AUG 98	7.8 .0	7.0 .1	9.1 .3	7.5 .1	7.7 .0	10.5 .4	8.7 .0	8.0 .1	10.2 .1	7.7 .2	8.8 .2
SEP 98	7.9 .1	7.2 .1	9.4 .2	7.4 .0	7.5 .3	10.4 .3	9.0 .2	8.1 .2	10.3 .1	7.8 .2	8.7 .3
OCT 98	7.6 .1	6.7 .2	8.7 .0	7.4 .0	7.4 .0	10.0 .4	8.4 .0	7.7 .1	9.8 .1	7.4 .2	8.5 .1
NOV 98	7.5 .0	6.9 .1	9.1 .0	7.2 .2	7.3 .3	10.1 .1	8.6 .0	7.6 .1	10.1 .1	7.5 .1	8.3 .2
DEC 98	7.5 .1	6.8 .1	8.6 .2	7.4 .0	7.4 .3	9.8 .3	8.3 .0	7.6 .0	9.8 .2	7.4 .1	8.4 .1

* VALUES LISTED ARE THE AVERAGE OF TWO TLDS.
ERRORS LISTED ARE 1 SIGMA.

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVTY
(PCI/M3)

PERIOD ENDING	LOCATIONS													
	4		5		6		7		8		9		13C	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
JAN05	0.021	0.004	0.021	0.004	0.019	0.004	0.021	0.004	0.019	0.004	0.021	0.004	0.018	0.004
JAN12	0.012	0.003	0.010	0.003	0.010	0.003	0.011	0.003	0.010	0.004	0.013	0.003	0.010	0.003
JAN19	0.023	0.004	0.023	0.004	0.019	0.004	0.022	0.004	0.021	0.004	0.022	0.004	0.022	0.004
JAN26	0.013	0.003	0.012	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.014	0.003
FEB02	0.025	0.004	0.023	0.004	0.026	0.004	0.025	0.004	0.025	0.004	0.024	0.004	0.027	0.004
FEB09	0.025	0.003	0.026	0.004	0.024	0.003	0.023	0.003	0.024	0.004	0.027	0.003	0.026	0.003
FEB17	0.024	0.003	0.024	0.004	0.024	0.004	0.025	0.004	0.022	0.003	0.023	0.003	0.024	0.003
FEB23	0.012	0.004	0.008	0.004	0.007	0.004	0.010	0.004	0.010	0.004	0.009	0.004	0.007	0.004
MAR02	0.011	0.003	0.008	0.003	0.008	0.003	0.012	0.004	0.010	0.003	0.012	0.003	0.008	0.003
MAR09	0.017	0.004	0.014	0.004	0.015	0.004	0.013	0.004	0.015	0.004	0.016	0.003	0.014	0.003
MAR16	0.023	0.003	0.021	0.003	0.022	0.003	0.022	0.003	0.023	0.003	0.023	0.003	0.021	0.003
MAR23	0.014	0.003	0.013	0.003	0.013	0.004	0.015	0.004	0.013	0.003	0.011	0.003	0.009	0.003
MAR30	0.030	0.004	0.027	0.004	0.026	0.004	0.028	0.004	0.028	0.004	0.031	0.004	0.031	0.004
APR06	0.012	0.003	0.016	0.003	0.014	0.003	0.014	0.003	0.013	0.003	0.013	0.003	0.013	0.003
APR13	0.023	0.003	0.024	0.003	0.023	0.003	0.023	0.003	0.022	0.003	0.025	0.003	0.026	0.004
APR20	0.025	0.004	0.023	0.004	0.023	0.004	0.024	0.004	0.022	0.004	0.024	0.004	0.022	0.004
APR27	0.019	0.004	0.019	0.004	0.017	0.004	0.016	0.004	0.016	0.004	0.018	0.003	0.017	0.003
MAY04	0.016	0.004	0.014	0.004	0.013	0.003	0.013	0.003	0.014	0.004	0.014	0.003	0.016	0.003
MAY11	0.009	0.003	0.010	0.004	0.008	0.004	0.011	0.004	0.010	0.004	0.009	0.003	0.006	0.003
MAY18	0.022	0.004	0.016	0.004	0.017	0.004	0.022	0.004	0.019	0.004	0.019	0.004	0.018	0.004
MAY26	0.017	0.003	0.017	0.003	0.017	0.003	0.015	0.003	0.015	0.004	0.019	0.003	0.018	0.003
JUN01	0.026	0.004	0.025	0.004	0.025	0.004	0.024	0.004	0.017	0.003	0.025	0.004	0.020	0.004
JUN08	0.011	0.004	0.008	0.003	0.006	0.004	0.007	0.003	0.010	0.004	0.010	0.003	0.007	0.003
JUN15	0.011	0.004	0.008	0.004	0.007	0.004	0.010	0.004	0.011	0.004	0.008	0.003	0.008	0.003
JUN22	0.017	0.004	0.015	0.004	0.016	0.004	0.015	0.004	0.013	0.004	0.014	0.003	0.013	0.003
JUN29	0.019	0.004	0.017	0.004	0.017	0.004	0.018	0.004	0.018	0.004	0.021	0.004	0.019	0.004

SAMPLE DATES MAY VARY BY A COUPLE OF DAYS.

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVTY
(PCI/M3)

PERIOD ENDING	LOCATIONS 4	(+/-)	5	(+/-)	6	(+/-)	7	(+/-)	8	(+/-)	9	(+/-)	13C	(+/-)
JUL06	0.011	0.004	0.016	0.004	0.012	0.004	0.014	0.004	0.014	0.004	0.013	0.003	0.012	0.003
JUL13	0.016	0.003	0.015	0.003	0.013	0.003	0.015	0.003	0.014	0.003	0.016	0.003	0.013	0.003
JUL20	0.021	0.003	0.020	0.003	0.017	0.003	0.019	0.003	0.018	0.003	0.020	0.003	0.017	0.003
JUL27	0.023	0.004	0.024	0.004	0.022	0.004	0.021	0.004	0.021	0.004	0.020	0.004	0.022	0.004
AUG03	0.021	0.004	0.024	0.004	0.023	0.004	0.017	0.004	0.019	0.004	0.020	0.004	0.018	0.004
AUG10	0.026	0.004	0.023	0.004	0.026	0.004	0.025	0.004	0.024	0.004	0.023	0.004	0.012	0.003
AUG17	0.016	0.004	0.015	0.003	0.013	0.004	0.019	0.004	0.016	0.004	0.019	0.003	0.014	0.003
AUG24	0.024	0.004	0.019	0.003	0.022	0.003	0.019	0.003	0.020	0.003	0.025	0.003	0.024	0.003
SEP01	0.029	0.003	0.027	0.003	0.025	0.003	0.030	0.003	0.027	0.003	0.027	0.003	0.027	0.003
SEP08	0.025	0.004	0.026	0.004	0.031	0.004	0.029	0.004	0.024	0.004	0.030	0.004	0.024	0.004
SEP14	0.020	0.004	0.020	0.004	0.019	0.004	0.019	0.003	0.020	0.004	0.020	0.003	0.020	0.004
SEP21	0.026	0.004	0.028	0.004	0.026	0.004	0.028	0.004	0.026	0.004	0.027	0.004	0.027	0.004
SEP28	0.029	0.004	0.028	0.004	0.028	0.004	0.026	0.004	0.023	0.004	0.027	0.003	0.024	0.003
OCT05	0.018	0.003	0.017	0.003	0.015	0.003	0.016	0.003	0.016	0.003	0.018	0.003	0.017	0.003
OCT13	0.012	0.003	0.010	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.013	0.003	0.010	0.003
OCT19	0.021	0.004	0.018	0.004	0.023	0.004	0.020	0.004	0.021	0.004	0.024	0.004	0.017	0.004
OCT26	0.020	0.004	0.020	0.003	0.019	0.004	0.022	0.004	0.022	0.004	0.022	0.004	0.021	0.004
NOV02	0.016	0.004	0.016	0.004	0.018	0.004	0.017	0.004	0.015	0.004	0.018	0.003	0.015	0.004
NOV09	0.010	0.003	0.010	0.003	0.011	0.003	0.013	0.003	0.010	0.003	0.007	0.003	0.012	0.003
NOV16	0.036	0.004	0.032	0.004	0.033	0.004	0.036	0.004	0.031	0.004	0.035	0.004	0.031	0.004
NOV23	0.023	0.003	0.025	0.003	0.023	0.004	0.022	0.003	0.022	0.003	0.022	0.003	0.020	0.003
NOV30	0.027	0.004	0.029	0.004	0.025	0.004	0.026	0.004	0.026	0.004	0.030	0.004	0.024	0.004
DEC07	0.043	0.004	0.029	0.004	0.035	0.004	0.037	0.004	0.034	0.004	0.037	0.004	0.032	0.004
DEC14	0.027	0.004	0.026	0.004	0.028	0.004	0.030	0.004	0.028	0.004	0.029	0.004	0.028	0.004
DEC21	0.027	0.004	0.025	0.004	0.025	0.004	0.025	0.004	0.022	0.004	0.027	0.004	0.023	0.004
DEC28	0.039	0.004	0.038	0.004	0.036	0.004	0.039	0.004	0.036	0.005	0.044	0.005	0.040	0.005

SAMPLE DATES MAY VARY BY A COUPLE OF DAYS.

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TABLE 4A
AIR PARTICULATES
GAMMA SPECTRA - QTR 1
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.083	0.033	0.0000	0.0003	0.0007	0.0019	-0.0020	0.0019	-0.0010	0.0026
5	0.046	0.032	0.0000	0.0006	0.0009	0.0024	-0.0010	0.0027	-0.0010	0.0018
6	0.063	0.032	0.0001	0.0009	0.0002	0.0023	0.0016	0.0041	-0.0020	0.0025
7	0.085	0.033	0.0000	0.0006	0.0003	0.0023	0.0003	0.0026	0.0000	0.0020
8	0.127	0.037	0.0000	0.0004	0.0004	0.0018	-0.0010	0.0029	0.0009	0.0019
9	0.081	0.035	0.0003	0.0010	-0.0010	0.0025	0.0000	0.0022	-0.0010	0.0024
13C	0.110	0.034	0.0000	0.0007	-0.0020	0.0018	-0.0010	0.0027	0.0000	0.0018

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0020	0.0076	0.0000	0.0007	0.0000	0.0004	0.0038	0.0341	0.0006	0.0024
5	-0.0060	0.0076	0.0005	0.0007	0.0000	0.0006	0.0439	0.0529	0.0009	0.0029
6	0.0015	0.0077	0.0000	0.0007	0.0000	0.0006	0.0138	0.0415	0.0000	0.0028
7	-0.0020	0.0073	0.0001	0.0006	0.0000	0.0008	-0.0130	0.0239	-0.0030	0.0029
8	0.0011	0.0068	0.0001	0.0007	0.0000	0.0005	-0.0110	0.0208	0.0026	0.0027
9	-0.0040	0.0084	0.0005	0.0006	0.0000	0.0008	-0.0120	0.0220	0.0000	0.0024
13C	0.0000	0.0078	0.0000	0.0007	0.0000	0.0006	0.0020	0.0448	0.0000	0.0025

TABLE 4B
AIR PARTICULATES
GAMMA SPECTRA - QTR 2
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.092	0.032	0.0003	0.0007	0.0000	0.0022	0.0000	0.0018	0.0000	0.0018
5	0.103	0.028	0.0000	0.0006	0.0025	0.0026	0.0008	0.0018	0.0004	0.0014
6	0.102	0.031	0.0004	0.0007	-0.0010	0.0020	0.0016	0.0022	0.0008	0.0017
7	0.093	0.031	0.0000	0.0008	0.0000	0.0015	0.0016	0.0025	-0.0010	0.0020
8	0.093	0.036	0.0004	0.0008	-0.0010	0.0029	-0.0010	0.0032	0.0011	0.0018
9	0.117	0.032	0.0003	0.0011	0.0000	0.0007	-0.0030	0.0026	0.0003	0.0014
13C	0.098	0.031	0.0000	0.0007	-0.0010	0.0019	-0.0010	0.0018	0.0004	0.0014

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0020	0.0071	0.0002	0.0007	0.0000	0.0005	0.0034	0.0167	0.0000	0.0021
5	-0.0010	0.0075	0.0003	0.0008	0.0000	0.0005	0.0032	0.0191	-0.0010	0.0018
6	0.0025	0.0078	0.0000	0.0006	0.0000	0.0008	0.0000	0.0164	0.0004	0.0018
7	0.0011	0.0080	0.0000	0.0005	0.0001	0.0004	0.0048	0.0183	0.0000	0.0022
8	0.0001	0.0061	0.0000	0.0007	0.0000	0.0008	-0.0100	0.0142	0.0006	0.0023
9	0.0000	0.0075	0.0000	0.0007	0.0000	0.0007	-0.0050	0.0105	0.0000	0.0015
13C	0.0000	0.0052	0.0006	0.0007	0.0000	0.0005	-0.0030	0.0181	0.0001	0.0021

TABLE 4C
AIR PARTICULATES
GAMMA SPECTRA - QTR 3
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.107	0.036	0.0006	0.0009	0.0000	0.0022	0.0001	0.0022	0.0000	0.0017
5	0.093	0.032	0.0000	0.0005	0.0000	0.0020	0.0004	0.0018	0.0019	0.0020
6	0.118	0.037	0.0000	0.0005	0.0035	0.0033	-0.0020	0.0025	0.0013	0.0019
7	0.097	0.036	0.0000	0.0005	0.0006	0.0032	0.0000	0.0026	0.0013	0.0021
8	0.126	0.038	0.0002	0.0006	0.0002	0.0024	-0.0010	0.0022	0.0010	0.0022
9	0.088	0.031	0.0000	0.0005	-0.0010	0.0019	0.0013	0.0023	0.0000	0.0006
13C	0.112	0.034	0.0003	0.0009	0.0003	0.0013	0.0009	0.0026	0.0003	0.0020

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.0000	0.0097	0.0000	0.0010	0.0000	0.0007	0.0115	0.0199	0.0000	0.0023
5	0.0066	0.0079	0.0000	0.0005	0.0000	0.0006	0.0000	0.0152	0.0011	0.0020
6	0.0000	0.0068	0.0000	0.0009	0.0000	0.0009	-0.0050	0.0102	0.0003	0.0020
7	-0.0010	0.0067	0.0001	0.0006	0.0000	0.0008	-0.0060	0.0114	0.0000	0.0021
8	0.0021	0.0070	0.0005	0.0008	0.0000	0.0006	-0.0050	0.0099	0.0003	0.0025
9	0.0044	0.0067	0.0000	0.0007	0.0000	0.0008	0.0079	0.0177	0.0000	0.0021
13C	-0.0070	0.0077	0.0000	0.0007	0.0000	0.0007	0.0058	0.0194	0.0008	0.0019

TABLE 4D
AIR PARTICULATES
GAMMA SPECTRA - QTR 4
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.071	0.028	0.0000	0.0010	0.0000	0.0015	0.0002	0.0027	0.0000	0.0019
5	0.100	0.032	0.0002	0.0007	0.0000	0.0013	0.0000	0.0022	-0.0010	0.0018
6	0.076	0.033	0.0003	0.0010	0.0000	0.0028	-0.0010	0.0030	0.0006	0.0023
7	0.084	0.033	0.0000	0.0006	0.0022	0.0033	-0.0010	0.0030	0.0005	0.0019
8	0.070	0.025	0.0002	0.0007	0.0004	0.0016	0.0013	0.0022	0.0011	0.0017
9	0.100	0.031	0.0000	0.0004	0.0010	0.0024	0.0000	0.0021	-0.0010	0.0014
13C	0.062	0.035	0.0005	0.0012	0.0000	0.0032	0.0016	0.0050	0.0003	0.0029

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0030	0.0048	0.0002	0.0009	0.0000	0.0006	0.0088	0.0198	0.0008	0.0021
5	0.0000	0.0036	0.0001	0.0006	0.0000	0.0005	0.0062	0.0207	0.0002	0.0020
6	0.0000	0.0053	0.0003	0.0007	0.0001	0.0006	-0.0100	0.0253	0.0003	0.0025
7	0.0041	0.0077	0.0000	0.0006	0.0003	0.0008	0.0056	0.0187	-0.0010	0.0028
8	-0.0020	0.0063	0.0000	0.0007	0.0000	0.0006	-0.0020	0.0192	0.0000	0.0020
9	0.0000	0.0052	0.0000	0.0006	0.0000	0.0006	-0.0030	0.0184	-0.0010	0.0018
13C	-0.0030	0.0104	0.0000	0.0008	0.0003	0.0007	-0.0090	0.0238	0.0006	0.0031

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TABLE 7
DAIRY MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
19	01/07/98	.	.	.	.	-3.42	4.97	0.1	2.7	0.0	3.6	-1	4	-1.6	4.4
19	02/10/98	.	.	.	.	-0.70	4.21	-1.7	2.2	3.0	2.8	2	3	1.8	4.0
19	03/10/98	0.7	2.8	0.2	0.9	1.04	7.43	-0.1	3.2	-0.6	4.3	1	6	1.0	6.5
19	04/07/98	.	.	.	.	0.61	5.36	1.0	2.9	0.5	3.2	-1	4	-1.4	5.1
19	05/13/98	.	.	.	.	1.75	8.16	1.1	3.1	2.8	3.1	-1	5	-1.6	5.8
19	06/10/98	3.3	2.8	0.6	1.1	-1.62	4.85	0.6	2.5	0.2	3.0	1	4	1.1	4.8
19	07/08/98	.	.	.	.	-1.46	5.23	0.6	2.5	-0.8	3.4	-0	4	-0.1	4.7
19	08/18/98	.	.	.	.	2.57	5.40	-0.2	2.1	1.0	2.9	-2	3	-2.3	3.3
19	09/09/98	-0.3	3.6	0.0	1.0	-0.70	6.76	-1.0	3.1	1.6	3.9	-2	5	-2.0	5.9
19	10/07/98	.	.	.	.	-2.72	7.33	-2.1	3.7	0.4	4.0	-4	4	-5.1	5.2
19	11/10/98	.	.	.	.	1.02	4.58	-0.6	2.1	3.0	3.0	2	4	2.5	4.2
19	12/10/98	-0.5	5.2	1.7	1.0	-3.17	4.79	-1.1	2.2	0.8	2.6	-3	3	-3.3	4.0
20	04/07/98 A	.	.	.	.	0.60	5.74	-1.1	2.8	2.7	3.6	-1	4	-0.6	4.4
20	05/13/98	.	.	.	.	1.56	7.34	-0.2	3.4	4.3	4.7	-2	5	-2.6	5.8
20	06/10/98	6.7	4.7	4.2	1.1	-5.45	4.65	0.4	2.0	5.9	3.5	-1	3	-0.9	3.8
20	07/08/98	.	.	.	.	0.50	4.55	-0.4	2.2	5.3	3.8	2	3	1.8	3.8
20	08/18/98	.	.	.	.	-4.55	5.06	-1.5	2.3	9.1	4.8	1	3	1.5	3.9
20	09/09/98	-1.6	4.0	3.5	1.2	2.77	5.41	-0.1	2.7	8.0	4.0	-3	4	-3.6	4.8
20	10/07/98	.	.	.	.	-5.30	7.42	2.2	3.5	4.7	4.0	-2	6	-2.3	6.4
20	11/10/98 A	-1.4	5.7	4.8	1.1	-3.78	3.90	-0.2	1.7	2.9	3.2	2	3	2.6	4.0
21	01/07/98	.	.	.	.	-3.87	6.29	0.2	2.7	1.4	3.7	1	4	1.3	4.3
21	02/10/98	.	.	.	.	0.70	5.68	-0.9	3.0	-1.2	2.6	-0	3	-0.6	3.8
21	03/10/98	0.9	2.8	1.8	0.9	-6.00	7.90	-1.1	2.3	-1.2	2.8	-4	5	-4.5	5.5
21	04/07/98	.	.	.	.	-2.29	5.69	2.9	2.9	0.0	3.3	0	5	0.2	5.3
21	05/13/98	.	.	.	.	-0.65	7.27	-0.8	2.9	0.0	3.8	3	4	4.0	5.1
21	06/10/98	4.1	4.5	1.2	1.0	3.09	4.50	-2.2	2.2	1.8	2.5	1	3	0.7	3.1
21	07/08/98	.	.	.	.	-0.36	4.68	1.8	2.1	1.2	2.2	1	3	1.0	3.7
21	08/18/98	.	.	.	.	0.28	5.57	-1.5	2.1	1.7	3.2	2	4	2.2	4.8
21	09/09/98	-2.1	4.9	-0.6	1.1	-0.08	6.42	-0.6	3.6	1.1	3.8	1	4	1.5	4.3
21	10/07/98	.	.	.	.	2.15	5.58	-0.5	2.5	-0.2	2.6	-2	3	-2.4	3.9
21	11/10/98	.	.	.	.	1.52	4.12	-1.3	1.6	-0.4	2.0	1	3	0.8	3.1
21	12/10/98	4.8	5.0	1.0	1.0	1.83	4.48	-2.2	6.5	-1.5	2.2	-0	3	-0.2	3.3

A: MILK AND PASTURE GRASS WERE UNAVAILABLE AT LOC. 20 IN JAN, FEB, MAR AND DEC. FEED TAKEN IN DEC.

TABLE 7
DAIRY MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
22C	01/07/98	.	.	.	.	-4.46	9.19	-5.4	3.7	1.6	5.3	3	8	3.0	9.1
22C	02/10/98	.	.	.	.	4.71	5.94	-0.7	2.8	0.5	3.3	1	4	1.5	4.4
22C	03/10/98	2.1	3.0	1.0	0.9	1.85	9.78	-0.3	3.6	-1.1	3.9	4	8	4.1	8.7
22C	04/07/98	.	.	.	.	-1.03	4.31	-0.2	2.7	2.3	3.0	3	4	3.9	4.4
22C	05/13/98	.	.	.	.	2.17	7.41	-1.3	3.8	0.6	4.1	3	6	3.2	6.7
22C	06/10/98	3.5	2.9	2.5	1.2	0.04	5.13	-1.7	2.2	3.7	2.7	-1	4	-1.2	4.2
22C	07/07/98	.	.	.	.	0.26	5.70	0.7	3.3	0.3	3.3	3	4	3.9	5.1
22C	08/18/98	.	.	.	.	-1.17	5.47	0.3	2.1	0.6	3.0	0	3	0.5	3.4
22C	09/09/98	0.1	4.7	3.4	1.3	0.20	5.80	-1.9	2.6	-0.5	3.4	0	3	0.0	3.6
22C	10/07/98	.	.	.	.	-3.87	6.55	1.6	3.4	0.0	3.5	2	3	1.9	3.7
22C	11/10/98	.	.	.	.	-3.19	3.91	0.4	1.8	2.5	2.3	-2	3	-1.8	3.3
22C	12/10/98	-0.6	4.6	1.9	1.0	-2.13	4.55	1.1	1.9	1.0	2.2	-0	3	-0.5	3.2

A: MILK AND PASTURE GRASS WERE UNAVAILABLE AT LOC. 20 IN JAN, FEB, MAR AND DEC. FEED TAKEN IN DEC.

TABLE 8
GOAT'S MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
23C	03/10/98 A	-0.1	2.7	2.4	0.9	1.57	6.82	1.2	2.6	11.4	4.3	-6	5	-6.8	5.3
23C	04/07/98	.	.	.	.	-3.51	8.15	2.4	4.7	3.1	5.5	3	7	3.7	7.7
23C	05/13/98	.	.	.	.	1.44	6.76	0.2	4.2	9.6	6.6	-3	5	-3.2	5.9
23C	06/10/98	8.6	6.4	0.6	1.0	1.53	4.22	-0.3	2.2	3.0	3.2	-0	3	-0.3	3.8
23C	07/08/98	.	.	.	.	0.13	5.66	-2.5	3.0	3.8	3.4	2	4	2.2	4.7
23C	08/18/98	.	.	.	.	1.18	4.22	-1.8	2.2	2.5	2.6	0	4	0.1	4.1
23C	09/09/98	-2.4	5.6	5.1	1.2	0.70	7.13	1.7	3.6	4.9	6.1	3	6	3.0	6.5
23C	10/07/98 B	-2.3	6.2	3.5	1.1	0.95	5.54	0.7	1.6	7.1	3.0	-1	4	-1.2	4.3
24	03/10/98 D	1.8	3.0	6.4	1.0	-3.39	9.13	-1.8	2.4	5.7	4.4	-6	6	-6.5	6.8
24	04/07/98	.	.	.	.	-0.37	4.88	0.4	2.3	1.3	3.1	-0	4	-0.3	4.5
24	05/13/98	.	.	.	.	-3.55	6.93	1.7	2.7	2.5	4.2	-1	7	-1.3	7.6
24	06/10/98	2.9	4.5	4.6	1.2	4.30	7.56	-0.3	2.9	2.2	3.9	-6	5	-6.8	5.7
24	07/08/98	.	.	.	.	-1.28	4.26	-2.3	2.1	1.5	3.2	-1	3	-1.5	3.8
24	08/18/98	.	.	.	.	-3.37	5.37	0.6	2.3	11.3	5.0	0	3	0.4	3.9
24	09/09/98	4.7	5.8	9.0	1.3	-2.76	5.32	-1.3	3.1	5.5	3.9	1	4	1.1	5.1
24	10/07/98	.	.	.	.	1.00	9.65	1.8	2.2	1.7	3.2	-2	4	-2.1	4.6
24	11/10/98	.	.	.	.	-1.05	4.72	0.3	2.1	4.9	4.3	0	3	0.5	3.7
24	12/10/98	0.8	4.5	8.6	1.4	1.32	6.45	2.1	2.6	3.5	4.4	-3	4	-3.6	4.4

A: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE FROM CONTROL LOC. 23C IN JAN. AND FEB.
B: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE IN NOV AND DEC AT LOC. 23C. FEED SAMPLED INSTEAD.
D: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE IN JAN AND FEB AT LOC. 24.

TABLE 9
PASTURE GRASS *
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
20	12/10/98 A	0.95	0.33	8.20	0.64	0.12	0.22	-0.006	0.021	0.002	0.022	0.027	0.055
23C	11/10/98 A	1.47	0.43	10.88	1.11	-0.06	0.24	0.001	0.028	0.007	0.026	0.045	0.094
23C	12/10/98 A	0.99	0.33	11.75	0.67	0.15	0.22	-0.013	0.019	-0.002	0.020	0.014	0.066

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
20	12/10/98 A	0.007	0.022	0.054	0.046	0.019	0.038	-0.004	0.029	0.015	0.024	-0.023	0.211
23C	11/10/98 A	-0.009	0.032	0.017	0.081	0.009	0.047	-0.004	0.035	0.021	0.026	-0.077	0.263
23C	12/10/98 A	0.002	0.022	0.081	0.091	-0.024	0.036	-0.019	0.028	-0.001	0.022	-0.060	0.200

LOCATION	COLLECTION DATE	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	CE-141	(+/-)
20	12/10/98 A	0.036	0.069	-0.017	0.022	0.000	0.023	0.012	0.047	0.014	0.054	-0.050	0.050
23C	11/10/98 A	-0.020	0.058	0.001	0.029	0.042	0.031	-0.058	0.046	-0.067	0.053	0.037	0.030
23C	12/10/98 A	-0.018	0.075	-0.024	0.021	0.029	0.022	-0.034	0.049	-0.039	0.056	-0.046	0.049

* SAMPLES TAKEN AS A SUBSTITUTE FOR UNAVAILABLE MILK.
PASTURE GRASS IS REQUIRED AS A SUBSTITUTE DURING THE MONTHS OF APR THROUGH DEC. IF PASTURE GRASS IS UNAVAILABLE, DIRECTIONS SINCE MID-YEAR HAVE BEEN TO SAMPLE SOME OTHER ALTERNATIVE FEED SUPPLY.
A: PASTURE GRASS WAS UNAVAILABLE AS A GOAT MILK SUBSTITUTE,HAY WAS SAMPLED INSTEAD.

TABLE 9
PASTURE GRASS *
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	CE-144	(+/-)	RA-226	(+/-)	TH-228	(+/-)
20	12/10/98 A	0.006	0.097	-0.507	0.808	0.063	0.104
23C	11/10/98 A	0.046	0.107	-0.057	0.732	0.057	0.130
23C	12/10/98 A	0.018	0.093	-1.120	0.745	0.155	0.089

* SAMPLES TAKEN AS A SUBSTITUTE FOR UNAVAILABLE MILK.
PASTURE GRASS IS REQUIRED AS A SUBSTITUTE DURING THE MONTHS OF APR THROUGH DEC. IF PASTURE GRASS IS UNAVAILABLE, DIRECTIONS SINCE MID-YEAR HAVE BEEN TO SAMPLE SOME OTHER ALTERNATIVE FEED SUPPLY.
A: PASTURE GRASS WAS UNAVAILABLE AS A GOAT MILK SUBSTITUTE,HAY WAS SAMPLED INSTEAD.

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)	CO-60	(+/-)	ZN-65	(+/-)
15	01/30/98	-23	35	-9	21	0.6	1.8	0.9	2.0	0.8	5.1	-0.3	2.0	5.0	10.1
15	02/17/98	-3	25	9	15	-1.9	1.4	-0.6	1.6	1.0	4.6	0.5	1.6	8.4	7.9
15	03/12/98	49	34	-8	25	-0.1	2.0	-0.4	2.2	2.1	7.9	0.0	2.4	-3.4	5.2
15	04/13/98	-2	33	14	24	-2.3	2.1	0.9	2.3	2.9	6.0	0.2	2.8	3.7	11.6
15	05/06/98	-32	28	1	25	-0.7	1.7	1.7	2.5	-3.5	6.1	-1.8	2.0	-6.0	5.6
15	06/08/98	37	35	5	17	0.6	1.4	0.7	1.7	-1.0	4.6	-0.1	1.5	0.3	3.5
15	07/13/98	3	42	0	25	0.4	2.4	-2.0	3.0	-4.0	6.8	0.5	3.2	-1.3	5.4
15	08/18/98	-7	32	-12	27	-1.1	2.3	-0.2	2.3	2.6	7.1	-0.7	2.3	4.5	13.4
15	09/04/98	28	27	33	24	-0.9	2.0	-1.5	2.0	1.9	5.0	1.3	2.3	4.6	4.4
15	10/05/98	21	46	-5	31	2.3	3.1	-0.3	3.1	-1.3	9.3	-0.5	3.8	5.2	8.5
15	11/02/98	18	43	3	25	-1.8	2.4	0.7	2.8	-2.7	5.7	-1.3	2.7	-1.0	4.1
15	12/07/98	0	35	12	20	-0.9	1.8	0.9	1.7	0.7	5.0	-0.3	2.1	2.3	4.0
16C	03/12/98	-5	31	17	28	0.5	2.3	-2.2	4.8	-0.6	6.1	1.6	2.4	0.1	16.7
16C	06/08/98	29	29	-20	26	-2.0	2.4	-3.0	2.3	0.6	5.7	0.6	2.3	18.8	17.0
16C	09/04/98	-19	41	5	33	0.4	2.6	-0.8	2.8	5.9	6.5	0.6	3.4	-7.7	16.3
16C	12/07/98	6	23	-1	17	-0.9	1.4	-1.6	1.6	0.1	3.7	-0.7	1.7	4.6	8.8

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)
15	01/30/98	-0.2	3.5	-1.3	2.4	0.0	2.2	9	19	-3	5	-0.9	2.0	-0.5	2.3
15	02/17/98	-1.3	2.3	-2.2	1.8	-0.8	1.7	-6	16	1	3	-0.2	1.5	0.2	1.7
15	03/12/98	-4.6	4.0	0.7	2.7	-1.1	2.5	15	23	3	6	0.9	2.3	0.9	2.3
15	04/13/98	-0.8	4.0	0.4	4.6	-1.6	2.4	3	19	1	4	-3.0	7.2	-0.2	2.5
15	05/06/98	-2.9	4.2	-0.3	2.9	-2.9	2.5	-7	19	-5	7	1.1	2.5	0.7	2.3
15	06/08/98	-0.2	3.1	-0.9	2.1	-0.9	2.0	1	18	0	4	0.4	1.6	2.1	1.8
15	07/13/98	-1.5	5.6	-3.8	3.6	-1.3	2.8	-10	25	1	5	0.2	2.3	-0.3	3.2
15	08/18/98	0.8	3.7	-1.6	4.8	-0.6	2.7	15	22	-2	6	0.5	2.4	1.6	2.8
15	09/04/98	2.1	3.6	-0.6	2.3	0.5	2.3	3	18	4	6	0.3	2.1	1.2	2.5
15	10/05/98	3.4	6.1	-2.1	4.1	-4.0	2.8	3	25	3	6	-0.2	2.3	1.4	2.9
15	11/02/98	-2.7	4.5	-0.5	2.6	-2.0	2.7	-6	25	-1	4	0.4	2.3	1.9	2.8
15	12/07/98	2.6	3.8	-2.1	2.1	-0.5	1.9	9	16	-3	4	-1.3	2.0	0.7	2.2
16C	03/12/98	2.1	4.0	1.4	6.4	-2.6	2.8	-18	20	-1	7	0.9	2.3	-2.4	2.4
16C	06/08/98	-0.2	4.0	-2.4	5.9	-1.3	2.4	1	20	4	5	-1.2	2.1	-1.7	2.4
16C	09/04/98	-0.6	4.0	0.6	7.0	0.7	3.2	-21	23	9	7	-0.2	3.0	-0.2	3.1
16C	12/07/98	1.3	2.5	1.3	3.3	-1.3	1.7	9	13	-1	4	-0.7	1.4	-1.3	1.8

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	BA-140	(+/-)	LA-140	(+/-)	BI-214	(+/-)	TH-228	(+/-)	H-3	(+/-)
15	01/30/98	1	4	0.6	4.2	-18.2	62.6	9.6	7.6	417	222
15	02/17/98	-1	2	-0.9	2.8	-11.2	39.5	3.0	5.8	633	228
15	03/12/98	5	5	5.7	5.6	-60.4	71.7	-1.9	9.4	433	234
15	04/13/98	1	3	0.6	3.4	58.4	61.4	10.0	9.6	420	206
15	05/06/98	-1	5	-1.7	5.7	53.8	83.1	0.0	7.8	614	199
15	06/08/98	0	3	0.3	3.3	1.6	46.1	-4.1	6.2	541	218
15	07/13/98	1	5	0.7	6.0	18.1	71.7	3.2	11.0	358	212
15	08/18/98	3	4	3.0	4.7	40.5	60.2	-3.3	8.5	600	226
15	09/04/98	1	4	1.0	4.2	-53.8	60.0	1.7	8.7	456	182
15	10/05/98	-4	5	-4.9	6.0	73.9	71.7	4.2	14.3	215	184
15	11/02/98	0	4	0.3	4.2	30.1	93.3	5.6	9.9	271	211
15	12/07/98	-2	2	-2.0	2.3	-51.5	68.0	5.0	8.1	231	205
16C	03/12/98	-5	5	-6.0	5.4	-36.7	76.6	4.4	9.0	0	213
16C	06/08/98	3	4	2.9	4.7	-29.8	61.7	-1.2	8.5	50	200
16C	09/04/98	-5	5	-6.1	5.2	148.8	70.4	-11.0	10.8	24	161
16C	12/07/98	2	3	2.3	3.3	18.8	40.7	6.8	5.3	93	201

TABLE 12
FRUITS & VEGETABLES
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
17C	06/22/98	STRAWBERRIES	0.09	0.20	0.88	0.56	0.07	0.22	0.000	0.018	0.004	0.026	0.021	0.080
17C	06/30/98	LETTUCE	0.00	0.20	3.90	0.86	-0.04	0.27	0.001	0.022	-0.001	0.024	0.022	0.085
17C	09/04/98	APPLES	0.07	0.14	0.50	0.33	0.07	0.19	-0.009	0.013	-0.012	0.013	0.004	0.045
17C	09/09/98	SWISS CHARD	0.35	0.24	5.58	0.94	-0.03	0.22	-0.009	0.017	0.016	0.022	0.000	0.067
25	06/22/98	LETTUCE	0.40	0.36	3.43	0.81	-0.11	0.18	-0.002	0.019	-0.002	0.024	0.075	0.085
25	06/22/98	STRAWBERRIES	0.05	0.17	1.81	0.76	-0.06	0.21	0.004	0.024	0.006	0.017	-0.072	0.090
25	09/04/98	BROCCOLI	0.51	0.24	4.05	0.71	-0.06	0.09	-0.007	0.012	0.005	0.013	-0.042	0.045
25	09/04/98	APPLES	0.05	0.21	0.89	0.49	-0.02	0.24	-0.018	0.022	-0.006	0.024	-0.031	0.048

LOCATION	COLLECTION DATE	TYPE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
17C	06/22/98	STRAWBERRIES	0.003	0.024	-0.023	0.053	0.001	0.042	0.009	0.026	-0.014	0.017	-0.022	0.173
17C	06/30/98	LETTUCE	-0.018	0.029	-0.021	0.053	-0.028	0.048	-0.011	0.031	-0.015	0.023	0.061	0.176
17C	09/04/98	APPLES	-0.003	0.016	0.017	0.036	0.002	0.028	0.017	0.037	0.017	0.019	0.051	0.147
17C	09/09/98	SWISS CHARD	-0.003	0.028	0.008	0.050	-0.001	0.037	0.010	0.025	-0.009	0.023	0.034	0.182
25	06/22/98	LETTUCE	0.005	0.020	0.020	0.052	0.022	0.034	0.006	0.030	0.012	0.027	-0.115	0.221
25	06/22/98	STRAWBERRIES	0.024	0.030	-0.009	0.055	0.003	0.034	0.014	0.026	0.013	0.025	0.207	0.242
25	09/04/98	BROCCOLI	0.006	0.014	-0.003	0.040	0.016	0.022	0.001	0.012	0.001	0.011	-0.014	0.109
25	09/04/98	APPLES	0.000	0.016	-0.017	0.046	0.008	0.041	0.017	0.059	-0.002	0.024	-0.121	0.177

TABLE 12
FRUITS & VEGETABLES
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	I-131		CS-134		CS-137		BA-140		LA-140		CE-141	
				(+/-)		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
17C	06/22/98	STRAWBERRIES	0.051	0.040	-0.011	0.022	0.011	0.025	0.005	0.035	0.006	0.040	-0.003	0.028
17C	06/30/98	LETTUCE	0.002	0.084	-0.019	0.020	-0.009	0.023	-0.027	0.047	-0.031	0.054	-0.033	0.032
17C	09/04/98	APPLES	-0.020	0.076	0.006	0.016	0.002	0.018	0.024	0.047	0.027	0.054	-0.031	0.031
17C	09/09/98	SWISS CHARD	0.035	0.079	-0.008	0.019	-0.012	0.026	-0.055	0.049	-0.064	0.057	0.002	0.032
25	06/22/98	LETTUCE	0.008	0.043	0.016	0.028	0.008	0.023	0.030	0.031	0.034	0.036	0.001	0.037
25	06/22/98	STRAWBERRIES	-0.009	0.040	-0.012	0.025	-0.001	0.018	-0.008	0.043	-0.010	0.050	0.005	0.026
25	09/04/98	BROCCOLI	-0.001	0.024	-0.004	0.012	0.003	0.013	-0.006	0.011	-0.007	0.013	-0.004	0.013
25	09/04/98	APPLES	-0.017	0.111	0.002	0.025	-0.021	0.027	0.037	0.070	0.042	0.080	-0.032	0.042

LOCATION	COLLECTION DATE	TYPE	CE-144		RA-226		TH-228	
				(+/-)		(+/-)		(+/-)
17C	06/22/98	STRAWBERRIES	0.131	0.110	-0.106	0.760	-0.024	0.091
17C	06/30/98	LETTUCE	0.018	0.109	0.463	0.696	0.034	0.106
17C	09/04/98	APPLES	-0.046	0.077	0.384	0.642	0.007	0.062
17C	09/09/98	SWISS CHARD	0.046	0.094	0.767	0.673	-0.006	0.093
25	06/22/98	LETTUCE	-0.036	0.128	-0.089	0.940	-0.001	0.093
25	06/22/98	STRAWBERRIES	-0.026	0.094	0.221	0.564	-0.012	0.100
25	09/04/98	BROCCOLI	-0.022	0.039	-0.071	0.189	0.133	0.073
25	09/04/98	APPLES	0.015	0.118	-0.031	0.493	-0.006	0.086

TABLE 13
BROADLEAF VEGETATION
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
6	04/27/98	1.37	0.16	3.82	0.37	-0.01	0.06	-0.006	0.005	-0.003	0.006	-0.017	0.024
6	05/20/98	1.00	0.25	2.45	0.56	-0.11	0.15	0.005	0.015	-0.010	0.017	0.015	0.057
6	06/22/98	0.56	0.13	1.40	0.25	-0.08	0.08	0.000	0.007	-0.002	0.008	0.013	0.029
6	07/20/98	1.12	0.16	3.11	0.33	0.00	0.09	-0.010	0.009	-0.006	0.009	-0.010	0.031
6	08/24/98	1.29	0.47	2.93	0.77	0.02	0.26	-0.031	0.025	-0.014	0.024	0.017	0.068
6	09/14/98	0.61	0.26	4.79	0.70	-0.04	0.19	0.007	0.020	0.009	0.020	-0.068	0.061
6	10/07/98	1.28	0.31	6.50	0.71	0.19	0.21	0.020	0.021	0.003	0.022	-0.033	0.075
18	05/20/98	0.45	0.17	3.08	0.49	-0.04	0.14	-0.004	0.012	-0.006	0.013	-0.042	0.044
18	06/22/98	0.39	0.10	0.72	0.19	-0.01	0.05	0.000	0.006	0.001	0.006	0.000	0.021
18	07/20/98	1.46	0.18	2.12	0.29	0.03	0.09	0.002	0.008	-0.004	0.009	0.023	0.029
18	08/24/98	2.41	0.47	3.14	0.79	-0.02	0.22	0.006	0.022	0.014	0.027	-0.038	0.057
18	09/14/98	1.81	0.48	2.71	0.87	0.05	0.22	0.010	0.031	-0.019	0.023	-0.030	0.082
18	10/07/98	1.82	0.20	3.02	0.33	0.00	0.11	-0.003	0.011	-0.004	0.011	0.002	0.035

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
6	04/27/98	0.001	0.008	-0.017	0.018	-0.003	0.010	0.005	0.008	0.000	0.007	-0.057	0.058
6	05/20/98	0.000	0.014	-0.034	0.034	0.006	0.029	0.007	0.031	-0.001	0.015	0.113	0.139
6	06/22/98	0.005	0.007	0.007	0.023	0.005	0.014	-0.004	0.009	0.002	0.008	-0.004	0.068
6	07/20/98	0.000	0.011	-0.008	0.021	0.004	0.017	0.000	0.012	0.001	0.010	0.050	0.087
6	08/24/98	-0.012	0.026	0.042	0.132	0.017	0.049	-0.005	0.033	-0.004	0.027	0.184	0.239
6	09/14/98	0.001	0.022	-0.002	0.043	-0.015	0.030	0.020	0.027	0.006	0.020	-0.055	0.184
6	10/07/98	0.009	0.027	-0.041	0.056	-0.020	0.041	0.007	0.029	0.005	0.023	0.232	0.210
18	05/20/98	0.005	0.014	-0.014	0.032	-0.019	0.024	-0.001	0.020	0.009	0.014	-0.071	0.135
18	06/22/98	0.000	0.007	-0.009	0.014	0.005	0.011	-0.001	0.008	0.003	0.006	-0.027	0.057
18	07/20/98	0.000	0.010	-0.005	0.022	0.000	0.016	-0.006	0.011	-0.006	0.009	0.017	0.085
18	08/24/98	0.009	0.028	0.039	0.055	-0.012	0.044	0.007	0.030	-0.018	0.028	-0.065	0.239
18	09/14/98	-0.012	0.034	0.021	0.062	0.029	0.060	-0.034	0.030	0.000	0.029	0.020	0.227
18	10/07/98	0.002	0.011	0.019	0.024	0.012	0.019	0.013	0.020	-0.004	0.012	-0.058	0.108

TABLE 13
BROADLEAF VEGETATION
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	CE-141	(+/-)
6	04/27/98	-0.005	0.018	0.000	0.005	-0.007	0.007	0.002	0.013	0.003	0.014	0.000	0.007
6	05/20/98	0.005	0.073	0.003	0.013	0.005	0.013	0.008	0.043	0.009	0.050	-0.007	0.020
6	06/22/98	-0.009	0.031	-0.005	0.008	-0.002	0.009	0.011	0.021	0.012	0.024	0.005	0.013
6	07/20/98	-0.015	0.033	-0.002	0.010	0.015	0.011	-0.009	0.025	-0.011	0.029	0.005	0.012
6	08/24/98	0.002	0.051	0.028	0.029	-0.006	0.032	-0.009	0.042	-0.010	0.048	-0.040	0.036
6	09/14/98	-0.035	0.066	-0.009	0.020	0.001	0.020	0.031	0.033	0.035	0.038	0.031	0.028
6	10/07/98	0.021	0.063	-0.009	0.022	-0.018	0.024	0.007	0.051	0.008	0.059	0.006	0.027
18	05/20/98	0.056	0.076	-0.011	0.014	0.013	0.016	-0.010	0.039	-0.011	0.045	0.024	0.024
18	06/22/98	-0.004	0.021	0.002	0.006	0.004	0.007	0.000	0.015	-0.001	0.017	0.001	0.007
18	07/20/98	0.013	0.035	0.001	0.008	0.092	0.018	-0.009	0.025	-0.010	0.028	-0.001	0.011
18	08/24/98	-0.006	0.046	0.002	0.028	0.054	0.035	-0.019	0.052	-0.022	0.060	-0.022	0.035
18	09/14/98	-0.079	0.061	0.002	0.024	-0.024	0.031	-0.025	0.058	-0.029	0.067	-0.004	0.031
18	10/07/98	0.001	0.032	0.011	0.027	0.053	0.020	-0.006	0.023	-0.007	0.027	-0.036	0.018

LOCATION	COLLECTION DATE	CE-144	(+/-)	RA-226	(+/-)	TH-228	(+/-)
6	04/27/98	-0.003	0.023	0.125	0.177	-0.007	0.027
6	05/20/98	0.001	0.055	-0.022	0.371	0.033	0.073
6	06/22/98	-0.026	0.034	-0.019	0.263	0.056	0.038
6	07/20/98	-0.013	0.034	0.128	0.256	0.058	0.051
6	08/24/98	-0.075	0.129	-0.929	0.933	0.096	0.143
6	09/14/98	0.037	0.085	-0.275	0.654	0.257	0.083
6	10/07/98	-0.026	0.082	0.457	0.607	-0.105	0.096
18	05/20/98	0.012	0.059	-0.073	0.459	0.028	0.058
18	06/22/98	0.006	0.020	0.176	0.092	0.027	0.035
18	07/20/98	-0.015	0.034	-0.083	0.235	-0.004	0.033
18	08/24/98	0.048	0.120	0.176	0.895	0.042	0.100
18	09/14/98	0.037	0.106	0.222	0.746	0.005	0.103
18	10/07/98	0.000	0.050	-0.208	0.415	0.041	0.047

TABLE 14
RIVER WATER
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)	CO-60	(+/-)
28	02/02/98	-13	26	-20	44	0.3	1.5	-0.2	2.1	-1.2	7.1	0.0	1.5
28	05/04/98	-31	25	-26	44	0.2	1.5	0.9	2.3	-1.1	8.6	-0.1	1.3
28	08/03/98	-9	32	-23	57	1.6	1.9	-0.9	2.7	-1.3	9.9	-0.1	1.9
28	11/02/98	-12	10	19	16	-0.3	0.5	-1.0	0.8	-1.2	2.9	0.1	0.6
30C	01/26/98	12	20	-1	14	0.4	1.0	-0.3	1.3	2.1	3.2	-0.2	1.1
30C	04/27/98	72	44	-31	30	-0.2	2.3	-1.7	2.2	-3.8	7.9	0.3	2.2
30C	07/23/98	-16	21	-6	21	-0.0	1.2	-0.1	1.4	-0.5	4.7	0.0	1.2
30C	10/22/98	3	32	-6	22	-0.2	1.3	-0.4	1.4	-2.4	4.8	0.2	1.3

LOCATION	COLLECTION DATE	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)	I-131	(+/-)
28	02/02/98	-0.5	5.5	5.3	3.9	1.8	3.2	-4.8	3.4	13	15	16	113
28	05/04/98	1.4	3.7	-4.0	3.9	1.7	3.8	0.2	3.3	13	15	31	122
28	08/03/98	-1.3	4.1	0.5	3.9	-1.6	5.0	-3.4	4.2	-9	18	56	163
28	11/02/98	-0.6	1.3	-1.3	1.5	0.1	1.4	1.0	1.5	-1	5	20	56
30C	01/26/98	0.8	2.2	0.4	2.1	0.2	1.5	-1.9	1.4	[illegible]	11	-3	7
30C	04/27/98	1.3	6.0	-1.0	3.3	1.7	3.6	2.5	3.1	2	20	11	20
30C	07/23/98	-1.2	6.0	-0.3	2.7	0.2	2.1	-1.4	2.0	-1	13	7	12
30C	10/22/98	4.8	5.3	1.0	3.2	0.9	2.1	-0.7	2.1	-2	12	-6	14

TABLE 14
RIVER WATER
(PCI/L)

LOCATION	COLLECTION DATE	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	RA-226	(+/-)	TH-228	(+/-)
28	02/02/98	-0.6	1.5	-0.5	1.4	-7	25	-9	28	5.7	68.0	3.4	6.1
28	05/04/98	0.2	1.4	0.1	1.5	-8	24	-10	28	-57.1	50.5	1.5	5.8
28	08/03/98	-0.7	2.0	-0.2	2.0	-6	25	-7	29	-21.0	86.5	3.5	8.8
28	11/02/98	-0.2	0.5	-0.0	0.6	-11	11	-12	12	-7.2	19.9	1.4	2.6
30C	01/26/98	-0.7	1.0	-1.0	1.1	-2	4	-3	4	-2.3	37.1	-0.9	3.7
30C	04/27/98	0.2	2.2	1.6	2.3	6	10	6	11	70.3	46.6	7.3	8.7
30C	07/23/98	0.1	1.1	-0.8	1.2	3	6	3	6	-48.8	58.0	-2.3	5.0
30C	10/22/98	0.8	1.5	0.1	1.6	-3	6	-4	7	-38.4	50.0	3.9	5.4

LOCATION	COLLECTION DATE	H-3	(+/-)
28	02/02/98	184	471
28	05/04/98	177	427
28	08/03/98	357	480
28	11/02/98	379	470
30C	01/26/98	-58	477
30C	04/27/98	-342	462
30C	07/23/98	-97	404
30C	10/22/98	-49	442

TABLE 15
BOTTOM SEDIMENT
(PCI/G DRY WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
28	03/17/98	0.78	0.36	8.9	1.5	-0.06	0.22	-0.02	0.03	0.00	0.03	0.02	0.09
28	09/04/98	0.10	0.40	9.0	1.9	0.41	0.41	0.01	0.04	0.01	0.04	-0.04	0.11
29	03/17/98	0.36	0.30	9.4	1.4	-0.05	0.26	0.01	0.03	-0.02	0.03	0.04	0.10
29	09/04/98	0.11	0.50	11.5	2.3	0.20	0.57	0.02	0.06	0.01	0.04	-0.14	0.14
30C	03/17/98	-0.05	0.19	8.1	1.1	0.12	0.19	0.02	0.02	-0.01	0.02	0.03	0.05
30C	09/04/98	0.56	0.67	13.6	2.1	-0.02	0.48	-0.02	0.04	0.02	0.04	-0.00	0.14

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
28	03/17/98	0.01	0.03	0.02	0.17	-0.03	0.05	-0.01	0.04	0.01	0.03	0.06	0.21
28	09/04/98	-0.05	0.05	-0.05	0.07	-0.05	0.09	-0.03	0.06	-0.01	0.04	-0.14	0.29
29	03/17/98	0.02	0.03	-0.04	0.07	0.06	0.05	-0.02	0.04	-0.01	0.03	0.06	0.27
29	09/04/98	0.04	0.05	0.06	0.11	0.04	0.08	0.03	0.06	-0.03	0.05	0.12	0.48
30C	03/17/98	0.00	0.03	0.03	0.13	-0.01	0.04	-0.03	0.02	0.01	0.03	0.12	0.25
30C	09/04/98	0.03	0.05	0.06	0.27	-0.03	0.09	-0.06	0.06	0.01	0.04	0.04	0.43

TABLE 15
BOTTOM SEDIMENT
(PCI/G DRY WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
28	03/17/98	-0.00	0.03	0.00	0.04	-0.01	0.03	0.06	0.04	0.97	0.87	0.69	0.16
28	09/04/98	-0.04	0.05	-0.06	0.10	-0.00	0.04	0.07	0.06	1.04	0.83	0.62	0.20
29	03/17/98	-0.04	0.05	-0.01	0.04	0.00	0.03	0.08	0.04	2.24	1.29	0.61	0.18
29	09/04/98	0.02	0.06	-0.07	0.14	0.01	0.05	0.16	0.11	1.82	1.97	0.57	0.27
30C	03/17/98	-0.00	0.03	-0.00	0.03	0.01	0.02	0.04	0.04	0.76	0.99	0.42	0.11
30C	09/04/98	0.03	0.05	-0.02	0.11	0.01	0.04	0.16	0.08	1.22	1.87	0.88	0.24

TABLE 16
SHELLFISH
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
27C	02/04/98	-.042	0.166	0.3	0.4	-.019	0.198	0.007	0.015	-.004	0.016	0.008	0.060
27C	05/12/98	0.031	0.128	0.3	0.4	-.001	0.165	0.005	0.015	-.011	0.015	0.000	0.037
27C	08/10/98	-.142	0.184	0.4	0.5	-.056	0.231	-.008	0.022	0.009	0.026	-.016	0.051
27C	11/06/98	-.209	0.241	0.1	0.5	-.023	0.302	0.007	0.027	0.018	0.027	-.041	0.084
28X	02/04/98	0.174	0.205	0.1	0.4	0.167	0.280	0.033	0.030	0.004	0.025	-.005	0.076
28X	05/12/98	0.126	0.200	0.3	0.5	-.158	0.182	0.001	0.022	0.004	0.021	0.014	0.051
28X	08/10/98	0.062	0.150	0.4	0.4	-.107	0.163	0.011	0.017	-.007	0.017	-.024	0.044
28X	11/06/98	-.043	0.203	-0.1	0.3	-.071	0.259	-.007	0.019	0.006	0.026	-.008	0.054
31	02/04/98	0.072	0.243	0.1	0.4	0.023	0.250	-.021	0.021	0.001	0.019	0.035	0.074
31	05/12/98	-.086	0.142	0.3	0.3	0.181	0.170	0.000	0.019	-.020	0.015	0.048	0.051
31	08/10/98	-.022	0.166	0.3	0.4	-.027	0.199	0.006	0.017	-.006	0.019	0.000	0.059
31	11/06/98	0.028	0.282	-0.1	0.4	0.247	0.324	0.006	0.025	-.026	0.025	-.032	0.091

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
27C	02/04/98	0.005	0.012	0.000	0.035	-.010	0.029	-.004	0.023	-.023	0.022	0.097	0.159
27C	05/12/98	0.003	0.016	0.043	0.097	-.003	0.028	-.006	0.022	0.006	0.015	-.094	0.167
27C	08/10/98	-.006	0.019	-.052	0.062	0.027	0.053	-.013	0.021	-.003	0.027	-.023	0.246
27C	11/06/98	-.004	0.020	-.011	0.048	0.013	0.051	-.007	0.036	0.035	0.033	0.291	0.284
28X	02/04/98	-.016	0.021	-.034	0.052	0.026	0.039	-.008	0.030	-.019	0.027	0.055	0.278
28X	05/12/98	-.001	0.023	-.042	0.034	-.002	0.035	0.000	0.024	0.011	0.022	0.067	0.215
28X	08/10/98	0.003	0.015	-.015	0.043	-.004	0.032	0.012	0.038	0.005	0.019	0.113	0.163
28X	11/06/98	0.019	0.029	-.020	0.038	0.004	0.046	-.003	0.034	-.009	0.025	0.165	0.310
31	02/04/98	-.022	0.023	-.027	0.057	-.007	0.030	0.006	0.037	0.002	0.026	-.210	0.248
31	05/12/98	-.004	0.016	-.046	0.092	0.013	0.033	0.012	0.034	0.015	0.019	0.036	0.201
31	08/10/98	0.009	0.025	0.000	0.049	-.012	0.031	-.007	0.024	-.003	0.021	0.137	0.194
31	11/06/98	0.000	0.036	0.027	0.070	-.002	0.035	-.007	0.042	-.006	0.030	0.083	0.290

TABLE 16
SHELLFISH
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
27C	02/04/98	0.002	0.027	-.010	0.050	0.012	0.019	0.007	0.016	0.000	0.648	0.180	0.099
27C	05/12/98	0.006	0.021	-.008	0.029	-.007	0.016	-.005	0.022	0.307	0.522	0.088	0.086
27C	08/10/98	0.008	0.028	0.040	0.053	-.002	0.020	-.002	0.027	0.196	0.809	0.175	0.119
27C	11/06/98	0.013	0.046	0.006	0.085	-.044	0.035	0.004	0.025	0.273	0.849	0.234	0.202
28X	02/04/98	-.022	0.029	0.016	0.081	-.012	0.028	-.009	0.032	-.256	0.699	0.185	0.130
28X	05/12/98	0.003	0.032	0.022	0.041	-.007	0.024	-.013	0.018	0.803	0.493	0.149	0.123
28X	08/10/98	0.003	0.031	0.002	0.032	-.017	0.017	0.023	0.020	0.450	0.682	0.208	0.100
28X	11/06/98	-.004	0.031	-.016	0.075	0.000	0.025	0.005	0.029	0.071	0.557	0.121	0.114
31	02/04/98	-.014	0.026	0.020	0.063	-.016	0.024	-.007	0.020	0.098	0.581	0.087	0.163
31	05/12/98	0.001	0.016	-.008	0.028	-.010	0.018	-.006	0.018	0.015	0.448	0.093	0.098
31	08/10/98	0.003	0.023	0.005	0.046	0.010	0.019	-.018	0.019	0.331	0.762	0.251	0.130
31	11/06/98	-.001	0.028	-.041	0.073	0.004	0.031	0.005	0.038	0.170	0.696	0.319	0.214

TABLE 17A
FISH-BULLHEADS
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
26	01/07/98	0.030	0.155	3.3	1.0	0.290	0.242	-.027	0.025	0.011	0.021	0.006	0.068
26	04/10/98	-.003	0.122	3.4	0.6	0.059	0.147	0.006	0.013	0.000	0.016	-.022	0.052
26	07/02/98	-.128	0.172	3.0	0.7	0.073	0.212	-.008	0.017	-.007	0.016	-.034	0.049
26	10/09/98	0.041	0.150	3.6	0.7	0.124	0.230	-.011	0.015	0.002	0.017	0.023	0.054
29	01/07/98	-.012	0.114	3.5	0.6	0.116	0.127	0.003	0.013	-.013	0.011	-.012	0.041
29	04/10/98	-.056	0.142	3.5	0.7	-.147	0.196	0.001	0.018	0.005	0.022	-.036	0.061
29	07/02/98	0.166	0.184	2.7	0.9	0.017	0.212	0.019	0.023	0.009	0.023	-.050	0.065
29	10/09/98	0.114	0.147	3.4	0.7	-.025	0.202	0.012	0.021	-.003	0.023	0.010	0.070
30C	01/08/98	-.027	0.164	3.0	0.7	-.114	0.136	0.001	0.018	-.003	0.015	-.039	0.048
30C	04/13/98	-.121	0.168	3.3	0.9	0.032	0.187	0.008	0.018	-.006	0.023	-.029	0.061
30C	07/06/98	-.087	0.170	4.2	0.8	-.087	0.191	-.002	0.016	-.006	0.017	-.001	0.052
30C	10/09/98	0.102	0.180	3.2	0.9	0.029	0.312	-.014	0.021	0.000	0.025	-.003	0.095

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
26	01/07/98	0.014	0.031	0.020	0.077	-.006	0.041	0.008	0.026	0.007	0.024	0.241	0.209
26	04/10/98	0.002	0.017	-.022	0.035	0.018	0.028	0.004	0.020	0.011	0.014	-.050	0.155
26	07/02/98	-.001	0.020	0.013	0.048	-.005	0.028	0.013	0.021	0.013	0.022	0.071	0.173
26	10/09/98	-.008	0.021	-.033	0.044	-.008	0.035	-.005	0.023	-.003	0.019	0.116	0.174
29	01/07/98	0.006	0.010	0.014	0.029	0.030	0.024	0.001	0.015	0.013	0.013	0.024	0.123
29	04/10/98	0.000	0.018	-.052	0.119	-.020	0.034	-.005	0.048	-.009	0.020	0.015	0.166
29	07/02/98	0.016	0.024	-.020	0.051	-.021	0.040	-.010	0.033	0.011	0.023	0.134	0.210
29	10/09/98	0.012	0.024	-.040	0.046	0.004	0.040	-.020	0.031	0.008	0.022	-.015	0.192
30C	01/08/98	-.022	0.021	-.011	0.033	0.009	0.032	-.004	0.018	0.008	0.018	0.017	0.190
30C	04/13/98	-.009	0.014	-.019	0.053	0.026	0.043	-.009	0.025	0.006	0.019	0.110	0.210
30C	07/06/98	0.000	0.020	-.023	0.041	0.000	0.036	0.019	0.023	0.002	0.016	-.103	0.201
30C	10/09/98	0.005	0.029	-.043	0.075	-.011	0.052	-.027	0.036	0.021	0.028	-.051	0.242

TABLE 17A
FISH-BULLHEADS
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
26	01/07/98	0.018	0.035	0.014	0.043	0.000	0.025	0.004	0.030	0.523	0.443	0.043	0.105
26	04/10/98	-.010	0.019	-.023	0.033	-.010	0.016	0.027	0.020	0.295	0.465	-.012	0.060
26	07/02/98	0.007	0.026	0.024	0.054	0.018	0.018	0.023	0.024	0.272	0.800	-.031	0.094
26	10/09/98	-.014	0.027	-.061	0.087	0.000	0.015	0.015	0.020	0.324	0.313	0.033	0.075
29	01/07/98	0.006	0.017	0.022	0.025	0.010	0.016	0.020	0.019	0.145	0.482	-.024	0.049
29	04/10/98	0.011	0.030	-.016	0.054	0.002	0.021	-.007	0.024	-.289	0.729	0.033	0.098
29	07/02/98	0.019	0.030	0.002	0.062	-.007	0.016	0.015	0.026	-.168	0.468	0.030	0.097
29	10/09/98	-.021	0.024	-.037	0.082	-.008	0.017	0.025	0.024	0.663	0.331	0.001	0.086
30C	01/08/98	-.012	0.025	-.021	0.032	0.007	0.020	0.024	0.018	-.773	0.671	0.000	0.074
30C	04/13/98	-.026	0.019	-.018	0.032	-.018	0.019	0.029	0.027	0.524	0.701	0.046	0.086
30C	07/06/98	0.012	0.027	0.025	0.044	-.003	0.018	0.020	0.026	-.125	0.421	-.006	0.087
30C	10/09/98	0.000	0.031	-.025	0.146	-.005	0.024	0.018	0.028	0.563	0.457	-.009	0.101

TABLE 17B
FISH-OTHER
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
26	01/26/98 A	OTHER	-0.06	0.25	3.50	0.94	0.09	0.35	0.002	0.023	0.002	0.032	-0.072	0.099
26	04/10/98	BASS	-0.10	0.16	3.91	0.72	-0.04	0.14	0.018	0.021	0.001	0.022	-0.007	0.045
26	07/02/98	BASS	0.05	0.19	3.99	0.87	0.14	0.19	-0.021	0.020	-0.008	0.017	0.011	0.079
26	10/09/98	PERCH	-0.07	0.24	3.67	1.20	0.11	0.34	0.011	0.029	-0.015	0.029	0.000	0.107
29	01/06/98	PERCH	-0.04	0.18	3.59	0.84	0.13	0.15	0.004	0.018	-0.002	0.022	0.018	0.071
29	04/10/98	CARP	-0.07	0.14	2.60	0.64	0.01	0.17	0.006	0.020	0.000	0.018	0.034	0.036
29	07/02/98	BASS	-0.04	0.18	3.80	0.93	0.06	0.25	0.004	0.022	0.011	0.030	-0.035	0.084
29	10/09/98	CARP	-0.02	0.23	3.03	0.89	0.03	0.37	0.001	0.032	0.004	0.030	-0.004	0.071
30C	01/08/98	CARP	-0.06	0.09	2.62	0.56	-0.12	0.12	-0.010	0.017	-0.009	0.012	-0.010	0.040
30C	04/13/98	BASS	0.11	0.13	3.37	0.73	0.01	0.15	0.006	0.017	-0.006	0.017	0.021	0.056
30C	07/06/98	BASS	-0.06	0.18	3.69	0.89	0.02	0.20	0.010	0.023	0.016	0.025	-0.102	0.070
30C	10/09/98	BASS	0.04	0.22	3.98	1.06	-0.14	0.28	0.007	0.024	0.019	0.034	0.013	0.088

LOCATION	COLLECTION DATE	TYPE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
26	01/26/98 A	OTHER	0.018	0.034	0.024	0.061	0.021	0.057	-0.015	0.034	-0.001	0.031	-0.024	0.212
26	04/10/98	BASS	0.010	0.021	0.039	0.136	0.000	0.036	-0.016	0.043	-0.013	0.019	0.031	0.190
26	07/02/98	BASS	0.019	0.025	-0.043	0.065	0.010	0.040	0.002	0.027	-0.011	0.020	0.079	0.203
26	10/09/98	PERCH	0.019	0.043	-0.028	0.054	-0.008	0.084	-0.007	0.045	-0.025	0.045	-0.035	0.347
29	01/06/98	PERCH	-0.019	0.026	0.004	0.050	-0.007	0.043	0.003	0.026	0.014	0.019	0.043	0.209
29	04/10/98	CARP	0.003	0.021	-0.003	0.042	0.002	0.027	-0.015	0.022	-0.002	0.017	0.080	0.199
29	07/02/98	BASS	0.014	0.025	-0.020	0.073	0.006	0.047	-0.020	0.051	0.002	0.023	0.000	0.248
29	10/09/98	CARP	0.012	0.021	-0.030	0.051	-0.016	0.058	0.008	0.035	0.005	0.031	-0.066	0.281
30C	01/08/98	CARP	0.004	0.015	-0.017	0.032	-0.012	0.028	-0.009	0.016	0.005	0.012	-0.029	0.133
30C	04/13/98	BASS	0.011	0.018	0.001	0.040	0.011	0.031	-0.009	0.018	0.006	0.015	0.119	0.169
30C	07/06/98	BASS	0.000	0.027	-0.053	0.058	0.032	0.044	0.007	0.024	0.002	0.022	0.187	0.199
30C	10/09/98	BASS	0.037	0.038	-0.026	0.064	0.022	0.042	-0.020	0.035	-0.001	0.027	0.059	0.250

A: SAMPLE OF PIKE AND BASS.

TABLE 17B
FISH-OTHER
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
26	01/26/98 A	OTHER	-0.012	0.028	-0.065	0.148	-0.002	0.022	0.009	0.032	-0.052	0.684	-0.007	0.109
26	04/10/98	BASS	-0.008	0.026	-0.008	0.044	-0.009	0.021	-0.012	0.028	0.356	0.704	0.018	0.076
26	07/02/98	BASS	-0.017	0.026	0.030	0.057	0.000	0.022	0.040	0.033	-0.042	0.408	0.002	0.086
26	10/09/98	PERCH	-0.012	0.040	0.061	0.169	0.001	0.029	-0.003	0.038	-0.074	0.718	0.065	0.150
29	01/06/98	PERCH	0.016	0.024	0.000	0.032	0.007	0.016	0.026	0.036	-0.207	0.445	0.063	0.103
29	04/10/98	CARP	-0.007	0.020	-0.008	0.044	-0.020	0.016	0.014	0.022	-0.298	0.450	-0.013	0.075
29	07/02/98	BASS	0.004	0.030	0.031	0.082	-0.009	0.026	-0.002	0.028	0.143	0.708	0.020	0.112
29	10/09/98	CARP	0.019	0.034	-0.063	0.175	-0.016	0.028	0.034	0.030	0.143	0.546	0.052	0.095
30C	01/08/98	CARP	0.008	0.021	-0.014	0.023	0.002	0.017	0.025	0.025	-0.222	0.332	-0.018	0.047
30C	04/13/98	BASS	-0.002	0.019	0.022	0.032	0.014	0.017	-0.008	0.019	0.037	0.320	-0.001	0.061
30C	07/06/98	BASS	-0.026	0.024	0.022	0.050	-0.020	0.022	0.011	0.025	0.559	0.408	-0.021	0.083
30C	10/09/98	BASS	-0.017	0.035	0.146	0.176	0.003	0.022	0.003	0.027	0.679	0.467	-0.023	0.088

A: SAMPLE OF PIKE AND BASS.

4. DISCUSSION OF RESULTS

This section summarizes the results of the analyses of environmental media sampled. NNECO has carefully examined the data throughout the year and has presented in this section all cases where station related radioactivity could be detected and compared the results with previous environmental surveillance data. The only impact observed from the station was tritium detected in on-site wells during 1998. Subsections describe each particular media or potential exposure pathway. Any dose commitments from station-related exposures is insignificant as explained in Section 5.

Naturally occurring nuclides such as Be-7, K-40, Ra-226 and Th-228 were detected in numerous samples. Be-7, which is produced by cosmic processes, was observed predominantly in airborne and vegetation samples. Ra-226 and Th-228 results were variable and were observed in broadleaf vegetation, river water (one barely positive Ra-226), river bottom sediment, shellfish, and fish (one barely positive Ra-226).

Cs-137 and Sr-90, present because of atmospheric nuclear weapons testing of years past, were observed at levels similar to those of past years.

4.1. Gamma Exposure Rate (Table 1)

Gamma exposure from all sources of radioactivity is measured over periods of approximately one month using CaF_2 (Mn) thermoluminescent dosimeters (TLDs). These dosimeters are strategically placed at a number of on-site locations, as well as at inner and outer off-site locations. Glass bulb type TLDs such as these, are subject to inherent self-irradiation which has been experimentally measured for each dosimeter. The results, shown in Table 1 have been adjusted for this effect. The range of this correction for field dosimeters is 0.4 μR/hr to 2.8 μR/hr, with a mean of approximately 1 μR/hr.

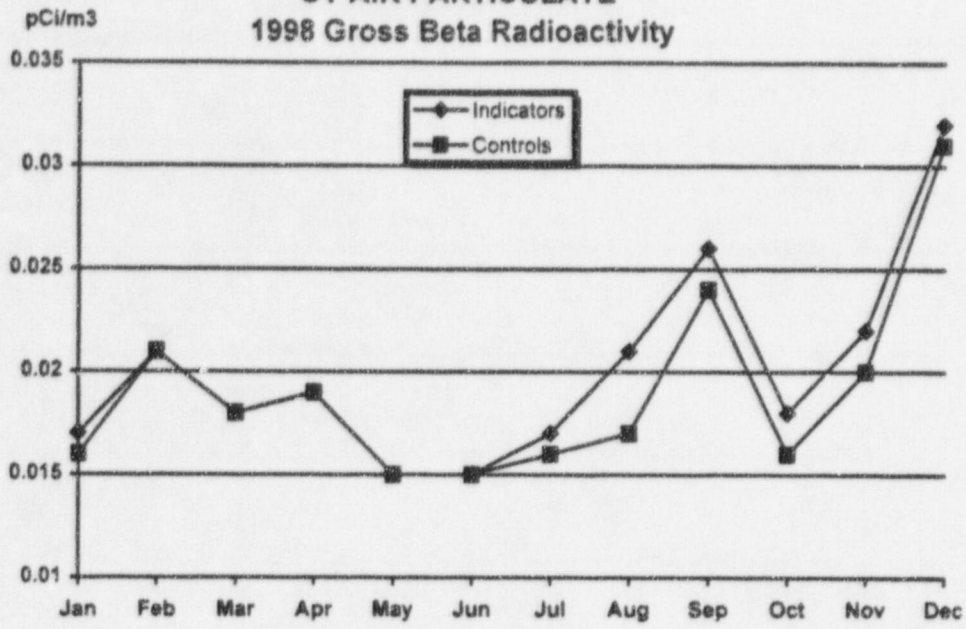
No indications of plant related exposure were observed. The exposure rate measurements exhibit the same trends as those of past years. These measurements demonstrate the general variations in background radiation between the various on-site and off-site locations and include gamma exposure from all sources of radioactivity.

4.2. Air Particulate Gross Beta Radioactivity (Table 2)

Air is continuously sampled at seven inner ring and two outer ring locations by passing it through glass fiber particulate filters. These are collected weekly and analyzed for gross beta radioactivity. Results are shown on Figure 4-1 and Table 2.

Gross beta activity remained at levels similar to that seen over the last decade. Inner and outer ring monitoring locations showed no significant variation in measured activities. This indicates that any station contribution is not measurable.

Figure 4-1
CY AIR PARTICULATE
1998 Gross Beta Radioactivity



4.3. Airborne Iodine (Table 3)

Because the station permanently shutdown in 1996 all radioactive iodines, which have short half-lives, have decayed away. Therefore the requirement to sample airborne iodine has been removed from the Radiological Effluent Monitoring Manual (REMM) and no samples were collected in 1998.

4.4. Air Particulate Gamma (Table 4A-D)

The weekly air particulate filters are composited quarterly for gamma spectral analyses. The results, as shown in Tables 4A-4D, indicate the presence of naturally occurring Be-7, which is produced by cosmic processes. No positive results were observed for all the other isotopes. These analyses indicate the lack of station effects.

4.5. Air Particulate Strontium (Table 5)

Table 5 in past years was used to report the measurement of Sr-89 and Sr-90 in quarterly composited air particulate filters. These measurements are not required by the REMM and have been discontinued. Previous data has shown the lack of detectable station activity in this media. This fact, and the fact that milk samples are a much more sensitive indicator of fission product existence in the environment, prompted the decision for discontinuation.

4.6. Soil (Table 6)

Soil samples are not required by the REMM.

4.7. Cow Milk (Table 7)

Analysis of milk samples is generally the most sensitive indicator of fission product existence in the terrestrial environment. This, in combination with the fact that consumption of milk is significant, results in this pathway usually being the most critical from the station release viewpoint. This pathway also shows measurable amounts of nuclear weapons testing fallout. Therefore, this media needs to be evaluated very carefully when trying to determine if there are any station effects.

Previous data over many years has shown the lack of station related strontium activity in this media. Therefore, the strontium analysis frequency is quarterly, rather than monthly. The monthly samples collected within each quarter from each sample location are composited and analyzed at the end of each quarter. Sr-90 was observed in nearly one half of all samples; the highest value observed was 4.8 pCi/l. Detailed analysis of previous data has concluded that these levels of Sr-90 are from weapons testing and are not station related (see Section 6.0 for details to this argument).

Cs-137 usually shows the same tendencies as Sr-90. Results for 1998 are similar to those seen for nearly the past two decades. Detailed analysis has concluded that these concentrations are most likely the result of fallout from previous nuclear weapons testing (see Section 6.0 for details).

Although not listed on Table 7, the only other nuclide detected by gamma spectrometry was naturally occurring K-40.

4.8. Goat Milk (Table 8)

Depending on the feeding habits, goat milk can be a more sensitive indicator than cow milk of fission products in the environment. This is due to the metabolism of these animals. Similar to the results of the cow milk samples, these show measurable amounts of nuclear weapons testing fallout.

Sr-90 and Cs-137 were observed in most samples. The levels observed are due to residual radioactivity in the environment from nuclear weapons testings in the 1960s. The variability in the results this year as well as in past years is caused by many factors, including feeding habits (amount of stored feed, etc.), soil characteristics, farming practices (tillage and quality of fertilization and land management), and feed type. For a complete discussion of the problem see Section 6.0.

4.9. Pasture Grass (Table 9)

When the routine milk samples are unavailable, samples of pasture grass are required as a replacement during the months of April through December. These samples may also be taken to further investigate the levels of radioactivity in milk. Directives since mid-year have been to sample feed (e.g., hay) if pasture grass is also unavailable. During the winter months and early spring, insufficient growth prohibits sampling of pasture grass as a replacement sample. Because of unavailability of pasture grass during November and December, feed (hay) was collected as a substitute for the pasture grass. No station effects were seen in the feed.

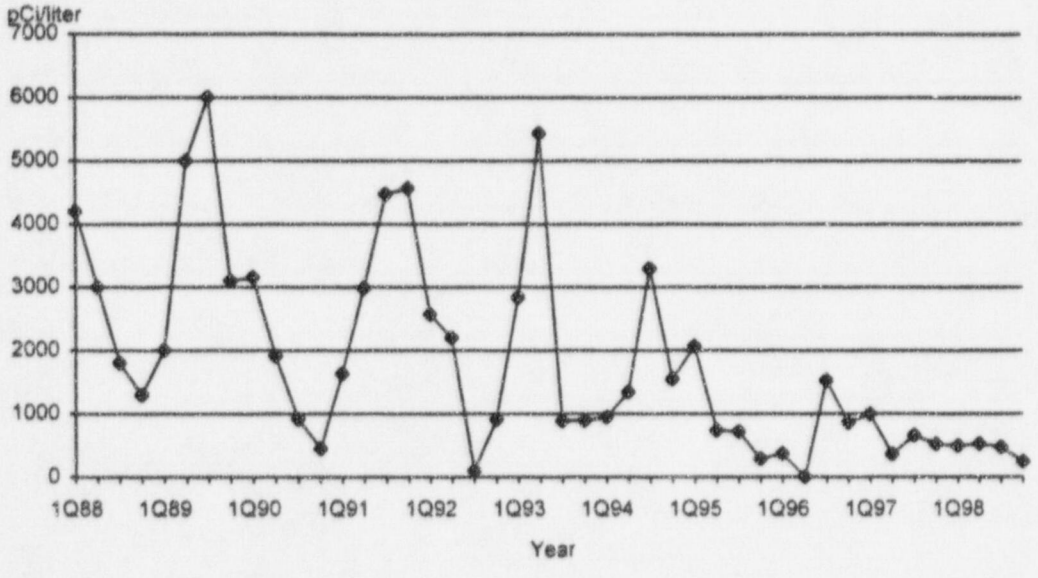
4.10. Well Water (Table 10)

Activity in this media results from either soluble station effluents permeating through the ground or the leaching of naturally occurring nuclides from the soil and rock. In 1998, samples of well water from the onsite stations (location 15) were taken monthly even though the requirements per the REMODCM are to sample quarterly. Because H-3 in station liquid effluents is the predominant radionuclide present, the higher sampling frequency was implemented to enhance program monitoring effectiveness. On-site wells (location 15) exhibited station related H-3 above background levels. This station effect results from the wells being located within an area influenced by the water in the discharge canal and H-3 having the ability to readily follow the flow of ground water. Off-site concentrations are much lower. This pathway does not result in any dose consequence since the water from these wells is used only in process streams at the station.

On-site H-3 levels detected in 1998 samples show a decrease compared to prior years. This is a trend that started back in cycle 17 (1992) due to replacing stainless steel clad fuel with zircaloy clad fuel. The levels of H-3 observed since permanent shutdown in July 1996 represent residual levels of tritium that remain in station process liquids and/or groundwater from beneath the site that are gradually dropping to natural background levels. Figure 4-2 shows the trend of H-3 measured in CY on-site wells since 1988. Of note in the figure is the highs and lows observed in measured levels of H-3. These swings are coincident with station operations. Higher H-3 levels are observed during periods when increased volumes of liquid processing occurred in preparation for station outages.

Figure 4-2

H-3 Levels in On-site Wells



4.11. *Reservoir Water (Table 11)*

Reservoir water samples are special samples not required by the REMM. Previous data has shown the lack of detectable station activity in this media. This fact and the extremely unlikely possibility of observing routine station effluents in this media has resulted in discontinuing these samples.

4.12. *Fruits and Vegetables (Table 12)*

This media did not show any station effects. Naturally occurring K-40 was detected in all samples and cosmically produced Be-7 was detected in one sample. Since there was no fresh fallout, no other nuclides were detected.

4.13. *Broad Leaf Vegetation (Table 13)*

Concentrations of Cs-137 seen in several of these samples are at levels comparable to past years and are due to fallout. To enhance program monitoring effectiveness, samples of broadleaf vegetation are collected monthly during the growing season, May - October, even though requirements are to collect twice a year. No station effects were observed in broadleaf samples.

4.14. River Water (Table 14)

These samples are collected on a quarterly basis; the sampling procedure is different at the control and indicator locations. Six weekly grab samples are taken within each quarter and composited for the control station (Middletown - location 30C). Continuous sampling, an automatic process of compositing a small volume of sample periodically over an entire quarter, is utilized at the indicator station (East Haddam Bridge - location 28).

Examination of the data shows there were no H-3 measurements that exceed 1.5 times the listed 2σ error. Even though H-3 measurements at the indicator location (Loc. 28) appear significantly higher than the control location (Loc. 30C), the values reported are the effect of counting statistics. Although measurable levels of tritium above background have been detected in the past; there have been no positive indications of tritium in this media since 1994.

4.15. Bottom Sediment (Table 15)

There were positive indications of Cs-137 in several samples, including the control location. Because the indicator and control samples show similar levels, the source of this Cs-137 is from weapons fallout deposited in woodlands and washed out into water bodies. No indications of station related activity were observed in this sample media.

4.16. Shellfish (Table 16)

As in previous years, no station related activity was observed. This media is not a source of consumption.

4.17. Fish (Tables 17A and 17B)

4.17.1. Bullheads (Table 17A)

No station related activity was observed.

4.17.2. Perch and Other Types (Table 17B)

As observed in the past, there was no positive indication of radioactivity in this media from the station, including Cs-137. Even though the measured values at the indicator locations do not exceed 1.5 times the listed 2σ error and are the effect of counting statistics, the results will be conservatively treated as a possible positive results in order to perform a dose consequence analysis in Section 5.0.

5. OFF-SITE DOSE EQUIVALENT COMMITMENTS

The off-site dose consequences (dose equivalent commitments) of the stations' radioactive liquid and airborne effluents have been evaluated using two methods. The first method utilizes the stations' measured radioactive discharges as input parameters into conservative models to simulate the transport mechanism through the environment to man. This results in the computation of the maximum doses to individuals and the 0 to 50 mile population dose. The results of these computations are submitted to the NRC in the Annual Radioactive Effluent Report written in accordance with the Radiological Effluent Monitoring Manual, Section F.2. The second method utilizes the actual measurements of the concentrations of radioactivity in various environmental media (e.g., milk, fish) and then computes the dose consequences resulting from the consumption of these foods.

The first method, which is usually conservative (i.e., computes higher doses than that which actually occur), has the advantage of approximating an upper limit to the dose consequences. This is important in those cases where the actual dose cannot be measured because they are so small as to be well below the capabilities of conventional monitoring techniques. For gaseous releases, extremely low concentrations of Cs-137 were released in 1998 for a short period of time. The only other station related activity observed in 1998 was H-3 in on-site well water. On-site well water is used for station processing and services, it is not a pathway for human consumption. Levels of Cs-137 observed in fish, although not plant related, were used to conservatively predict dose consequences as if the radioactivity were the result of station decommissioning operations.

Summarizing the data presented in Table 5.1:

MAXIMUM TOTAL INDIVIDUAL DOSES :

WHOLE BODY = 0.2 mrem (Adult)

LIVER = 0.27 mrem (Teen)

The average dose to an individual within 50 miles from the site using method 1 yields the following results for the period January - December 1998 for the average individual:

ANNUAL AVERAGE WHOLE BODY DOSE :

DUE TO AIRBORNE EFFLUENTS = 0.00002 mrem

DUE TO LIQUID EFFLUENTS = 0.00063 mrem

Thus, it can be seen that the average whole body dose to an individual is much less than the maximum whole body dose to an individual as shown in Table 5.1.

In order to provide perspective on the doses in Table 5.1, the standards for 1998 on the allowable maximum dose to an individual of the general public are given in 40CFR190 as 25 mrem whole body, 75 mrem thyroid, and 25 mrem any other organ. These standards are a fraction of the normal background radiation dose of 284 mrem per year and are designed to be inconsequential in regard to public health and safety. Station related doses are a small fraction of the standard as set by the Environmental Protection Agency and of the variation in natural background in Connecticut. Station related doses pose insignificant public health consequences.

TABLE 5.1 - COMPARISON OF DOSE CALCULATION METHODS
HADDAM NECK STATION
1998 Annual Dose (millirem)

Pathway	Individual	Organ	Method 1 [1]	Method 2 [1]
Airborne Effluents				
1. External Gamma Dose	Max. Ind. [2]	Whole Body	0.00015	ND [4]
2. Inhalation	Teen	Whole Body	0.051 [6]	NAD [3]
		Liver	0.051 [6]	
Liquid Effluents				
1. Fish Pathway only [7]	* Adult	Whole Body	0.15 [7]	<0.042 [8]
	Teen	"	0.082	<0.023
	Child	"	0.032	<0.009
	* Adult	GI(LLI) [5]	0.0078	<0.0012
	Teen	"	0.0058	<0.0009
	Child	"	0.0025	<0.0004
	Adult	Liver	0.22	<0.064
	* Teen	"	0.22	<0.066
	Child	"	0.20	<0.060

Notes:

(1) Method 1 uses measured station discharges and meteorological data as input parameters to conservative transport to man models. Method 2 uses actual measured concentrations in environmental media.

(2) Maximum individual - The maximum individual dose is the dose to the most critical age group at the location of maximum concentration of station related activity. The dose to the average individual is much less than the maximum individual dose. The doses for inhalation and vegetable consumption assume that the individual resides at the point of maximum quarterly dose. Therefore, his residence is subject to variation for conservatism.

(3) NAD - No activity detected above the minimum detectable level.

(4) ND - Not Detectable - The station effects at all off-site locations were so small that they could not be distinguished from fluctuations in natural background.

(5) GI(LLI) - Gastrointestinal Tract - Lower Large Intestine.

(6) Dose is primarily due to the release of tritium (H-3) in airborne effluents. Since tritium effects nearly all organs equally, the resulting dose to the whole body from inhaling tritium is the same.

(7) The dose values listed for the fish pathway represent the liquid dose pathway to man that is calculated using Method 1 conservative computer models.

(8) The dose values represent the dose consequences for eating fish with Cs-137 present from weapons fallout.

6. DISCUSSION

The evaluation of the effects of station operation on the environment requires the careful consideration of many factors. Those factors depend upon the media being affected. They include station release rates, effluent dispersion, fallout distribution from past nuclear weapons tests, redistribution of fallout dut to weathering and biotic activity, soil conditions (mineral content, pH, etc.), quality of fertilization, quality of land management (e.g., irrigation), pasturing habits of animals, and type of pasturage. Any of these factors could cause significant variations in the measured radioactivity. A failure to consider these factors could cause erroneous conclusions.

Consider, for example, the problem of deciphering the effect of station releases on the radioactivity measured in milk samples. This is an important problem because this product is widely consumed and fission products readily concentrate in this media. Some of these fission products, such as Sr-89 are relatively short-lived. Therefore they result from either station effluents, nuclear weapons tests or nuclear incidents (e.g. Chernobyl). The long-lived radionuclides of Sr-90 and Cs-137 are still remaining from the weapons testing era of the 1960's resulting in measurable amounts in milk samples. Distinguishing between this "background" of fallout activity and station effects is a difficult problem.

In reviewing the Sr-90 and Cs-137 measured in cow and goat milk in the areas around the Haddam Neck station, a casual observer could notice that in some cases the levels of these isotopes are higher at farms closer to the station than at those further away from the stations. The station's effluents might at first appear to be responsible. However, the following facts prove this conclusion wrong.

(1) The station accurately measures the long-lived fission products Sr-90 and Cs-137 in their releases. Based on these measurements and proven models developed by the Nuclear Regulatory Commission, concentrations in the environment can be calculated. These calculations, generally conservative, show that insufficient quantities of Sr-90 and Cs-137 have been released from the stations to yield the measured concentrations in milk.

(2) Although the shorter half-life isotopes of Sr-89 and Cs-134 have decayed away, their general absence in environmental samples in the past suggest that the isotopes of Sr-90 and Cs-137, presently seen in the environment, are not station related. Over the many years of station operation, Sr-89 has often been released in comparable quantity to Sr-90, as well as Cs-134 to Cs-137. Since the pairs of isotopes are chemically similar according to their elemental forms, comparable levels should have been detected in milk if Sr-90 and Cs-137 were station related. No station related Sr-89 or Cs-134 have ever been detected in milk samples, or in any other media. The only occurrences of detectable Cs-134 in milk resulted from the Chernobyl incident.

(3) Since dairy milk sampling began in the 1960's, several years prior to station operation, the immediate station areas have always shown higher levels of weapons fallout related Sr-90 and Cs-137 (see Figures 6-1 and 6-2). The ratio of activity between the locations has not changed with station operation. All areas show the same significant decrease in radioactivity since the 1964 Nuclear Test Ban Treaty.

(4) Local variability of Sr-90 and Cs-137 in milk is common throughout the United States. Due to the variability in soil conditions, pasturing methods, rainfall, etc., it is the rule rather than the exception. Therefore, it is not surprising that certain farms have higher levels of radioactivity than other farms. In fact, there are some cases where the farms further from the station have higher Sr-90 and Cs-137 values than the farms that are closer to the station (e.g., see pre-1984 Haddam Neck Goat Milk data.)

Based on these facts, it is concluded that station effluents are not responsible for variations of Sr-90 and Cs-137 in environmental samples. The cause must be one or more of the other variables.

Northeast Nuclear Energy Company has carefully examined the data throughout the year and has presented in this report all cases where station related radioactivity can be detected. An analysis of the potential exposure to the population from any station related activity has been performed and shows that in all cases the exposure is insignificant.

As in previous years, this data is being submitted to, and will be reviewed by the appropriate regulatory bodies such as the Nuclear Regulatory Commission, Environmental Protection Agency and Connecticut Department of Environmental Protection.

Figure 6-1 Strontium-90 in Milk

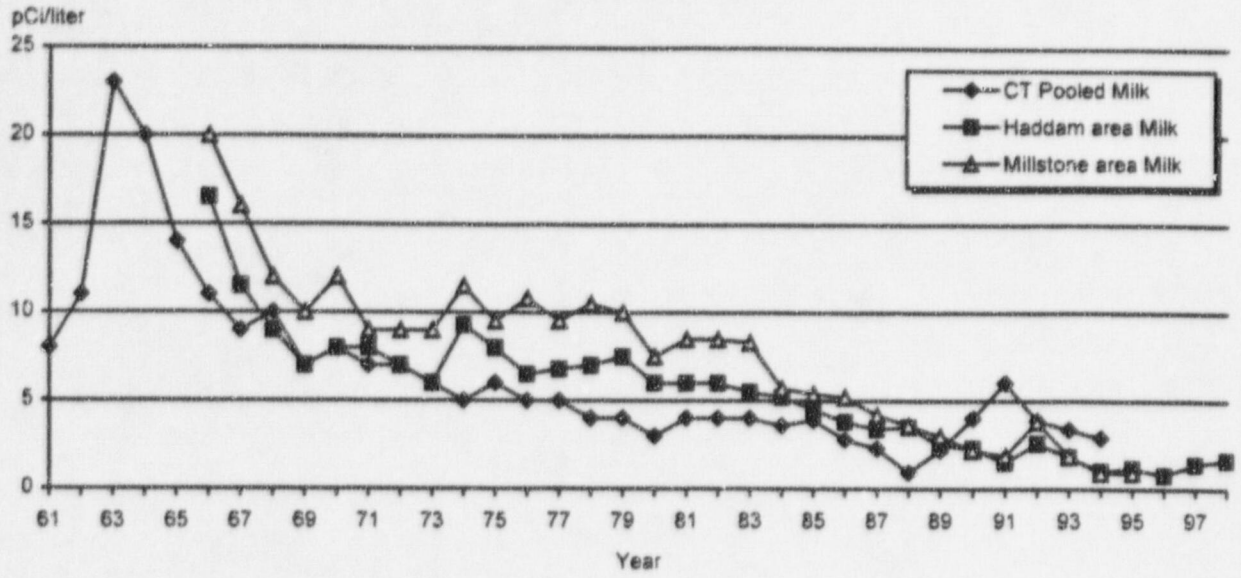
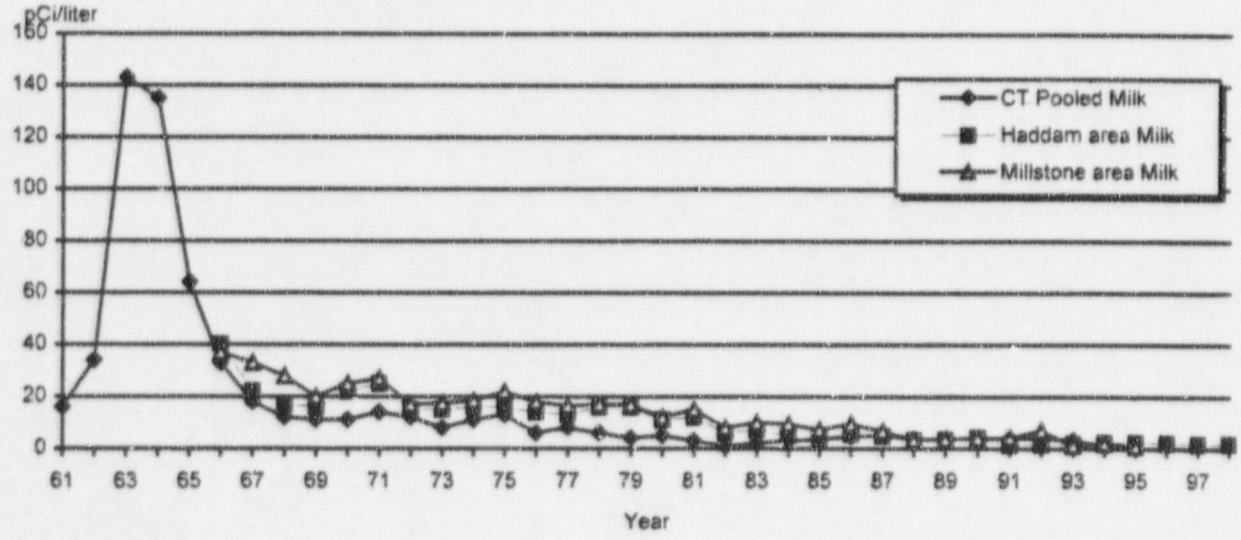


Figure 6-2 Cesium-137 in Milk



Dairy milk is no longer available in the Millstone area and CT Pooled milk has not been collected by the State of CT since 1994.

CY Start-up occurred: July 24, 1967
MP1 Start-up occurred: October 26, 1970
MP2 Start-up occurred: October 17, 1975
MP3 Start-up occurred: January 23, 1986

APPENDIX A

LAND USE CENSUS FOR 1998

TABLE A-1 (page 1 of 2)

Dairy Cows Within 15 Miles of Connecticut Yankee -December 1998

Direction	Distance	Name and Address	# of Cows
NNE	14 M	Allen Hills Hills Farm 527 Gilead Street Hebron, CT 06248	185
NNE	14 M	Edward Ellis Mapleleaf Farm, Inc. 768 Gilead Street Hebron, CT 06248	176
NNE	14 M	Gordon N. Rathburn Martin Road Hebron, CT 06248	36
NNE	14.5 M	Douglas Porter 14 Porter Rd. Hebron, CT 06248	140
NE	8 M	Elizabeth Gilman 178 Cato Corner Rd. Colchester, CT 06415	32
NE	14 M	Victor Botticello 302 Levita Road Lebanon, CT 06249	40
ENE	6.5 M	Robert Cone Grandpa Hill Farm Box 251 318 Old Colchester Tpke East Haddam, CT 06423	60
ENE	11 M	Richard Swider 475 New London Rd. Colchester, CT 06415	46
E	11.5 M	Eugene Wilczewski Salem Valley Farm Dairy 200 Darling Road Salem, CT 06415	45
E	14 M	Stuart Gadbois 40 Old Colchester Rd. Salem, CT 06415	225
SE	11 M	John Tiffany III Tiffany Farms 156 Sterling City Road Old Lyme, CT 06371	85

TABLE A-1 (page 2 of 2)

Dairy Cows Within 15 Miles of Connecticut Yankee - December 1998

Direction	Distance	Name and Address	# of Cows
WSW	8 M	Michael Dwyer 63 Grieb Rd. Wallingford, CT 06492	30
WSW	8 M	Robert Raudat 909 Durham Road Killingworth, CT 06417	44
WSW	11 M	Raymond Wimler 533 Guilford Road Durham, CT 06422	190
WSW	14 M	John & Edward Cella Cella Brothers Farm 2 No. Brandford Street Wallingford, CT 06492	150
WSW	15 M	David & Kirsten Footit D & K Farm 81 School St. Wallingford, CT 06492	140
W	11.5 M	Tony Caltabiano Friendly Acres Dairy Farm 145 Parmalee Hill Road Durham, CT 06422	45
W	14 M	Walter Werbiski North Farms 1069 Farms Road Wallingford, CT 06492	21
W	14.5 M	Charles Greenback & Sons, Inc. 182 Wallingford Rd. Durham, CT 06422	170
NW	13 M	Higgins Farm, Inc. 837 Ridgewood Road Middletown, CT 06457	79
NW	15 M	Joan Bryck or Jean Backiel Riverside Farm 1160 France St. Rocky Hill, CT 06067	51

TABLE A-2 (page 1 of 1)

Dairy Goats Within 20 Miles of Connecticut Yankee - December 1998

Direction	Distance	Name and Address	Total Goats
NNE	12 M	Louise Sage 155 Reidy Hill Road Hebron, CT 06248	4
NNE	16 M	Joan Bowers 350 Wall Street Hebron, CT 06248	2
NNE	16 M	Kathy Waters Burnt Hill Road Hebron, CT 06248	70
SSE	3.6 M	Virginia Marshall Old County Road Haddam, CT 06438	6
SE	19.5 M	Mrs. John Mingo 69 Spithead Road Waterford, CT 06385	7
SE	15.8 M	George Scacciaferro 338 Boston Post Road East Lyme, CT 06333	2
S	11.5 M	Victor Trudeau 174 Horse Hill Road Westbrook, CT 06498	5
W	15.3 M	Jim & Mary Hall Petlack 1000 North Farms Road Wallingford, CT 06492	12
WNW	19 M	Daniel Nitkowski 46 Firch Avenue Meriden, CT 06450	4
NNW	14 M	Dorothy Joba 171 Ferry Lane S. Glastonbury, CT 06073	10
NNW	15 M	Donald Reid 1654 Main Street Glastonbury, CT 06033	*

* ***UNABLE TO CONTACT AS OF THIS TIME.***

TABLE A-3 (page 1 of 1)

1998 Resident Survey

conducted August 1998

Sector	Downwind Direction	Distance (Meters)
A	N	1150
B	NNE	1780
C	NE	1265
D	ENE	1710
E	E	1955
F	ESE	2740
G	SE	1410
H	SSE	940
J	S	980
K	SSW	860
L	SW	940
M	WSW	1140
N	W	1360
P	WNW	660
Q	NW	750
R	NNW	1495

APPENDIX B

NNECO QA PROGRAM

INTRODUCTION

Northeast Nuclear Energy Company (NNECO) acting as the agent for the Connecticut Yankee Atomic Power Company (CYAPCO), maintains a quality assurance (QA) program as part of the radiological environmental monitoring program (REMP). The QA program consists of contractor appraisals, quality control samples, and quality control testing of environmental TLDs.

NNECO QA PROGRAM

Appraisals are conducted of the primary (Duke) radioanalysis contractor, of the Production Operations Support Laboratory (POSL), and of the NNECO Radiological Engineering Section (RES). A REMP evaluation form is completed for each appraisal and discrepancies are tracked on a separate form until corrective action is taken. The primary contractor, POSL, and RES are also audited by other organizations; the contractor by other customers, and POSL and RES by Northeast Utilities Nuclear Oversight Department.

There are two types of NNECO QA Program quality control samples - spikes and duplicates. Sample spikes are a check on the accuracy of results of the contractor's radioanalyses. Duplicate samples are a check of the contractor's precision or reproducibility of results. The number and type of NNECO QA Program quality control samples are given in Table 1. The results of the contractor's analyses of NNECO quality control samples must satisfy acceptance criteria in Procedure RAB B-3, "Quality Control of Radiological Environmental Monitoring Program Sample Analyses." An investigation is conducted of any result or trend which does not satisfy acceptance criteria.

There are two types QA Program tests of environmental TLDs - spikes and field comparisons. Spike testing involves the exposure of four TLDs each month. POSL readouts of the spiked TLDs are compared to the known radiation exposure. For field comparisons, QA TLDs of a different design from the REMP TLDs, are co-located with REMP TLDs at eight locations and processed at the Northeast Utilities Dosimetry Laboratory. Readings of the QA TLDs are compared to POSL's REMP TLD readings. The comparison results must satisfy acceptance criteria in NNECO Radiological Assessment Branch Procedure RAB B-2, "Quality Control of the Environmental TLD Monitoring Program." An investigation is conducted on any result or trend which does not satisfy acceptance criteria.

OTHER QA PROGRAMS

The NNECO QA Program is not the only QA Program which monitors REMP radioanalyses performance. Other programs include:

1. Duke's internal QA program. In addition to the NNECO quality control samples the radioanalysis contractor has it's own quality control samples. In total, at least five percent of the contractor's sample analyses include quality control samples.
2. Duke's interlaboratary comparison program with an independent third party, Analytics, Inc. Results of the Analytics intercomparison are contained in Appendix C. Primary contractor participation in an interlabortary comparison program is required by station Technical Specifications. The Analytics comparison satisfies this requirement and is supplemented by the EPA Intercomparison Studies Program.

3. Duke's participation in EPA's Environmental Radioactivity Laboratory Intercomparison Studies Program. Duke participates in EPA's program because of their analyses of drinking water, not because of nuclear power station environmental sample analyses. However, some of the EPA intercomparison samples are also applicable to nuclear power environmental samples. Results of the EPA Intercomparison Studies Program are contained in Appendix C.

RESULTS OF NNECO QA PROGRAM FOR CONTRACTOR RADIOANALYSES

The NNECO QA Program indicated that Duke's environmental radiological analysis program was adequate in 1998. Of 103 analysis results on QA samples, 99 passed criteria, a 96% success rate.

There were two air particulate gamma analyses which exceeded the criterion of being within 20% of the spiked value - both I-131 sample spikes, one at minus 23% and one at minus 30%. Although three other I-131 spikes on filter passed criteria in 1998, an negative bias for results of I-131 on filter analyses has been noted. This bias is currently under investigation.

There was one gross beta air particulate analysis which exceeded the criterion of being within 20% of the spiked value at minus 27%. The failure occurred because of a change in the method of preparing the QC sample. This was corrected by reverting back to the previous method and four subsequent QC samples in 1998 were within the criterion.

There was one strontium in milk QC sample which exceeded the criterion of being within 30% of the spiked value at plus 58%. The cause of the failure was that the source was expired. It was discarded and a new source was ordered.

RESULTS OF NUSCO QA PROGRAM FOR ENVIRONMENTAL TLDS

Eleven of the monthly TLD spike tests satisfied procedural criteria. One TLD spike test failed low because of a personnel error in spiking the test TLDs. A corrective action was identified for preventing a repeat of the spike test personnel error. The corrective action was implemented effective with the November test.

All twelve of the field comparisons satisfied procedural criteria.

TABLE B-1 (page 1 of 1)

NUMBER OF QUALITY CONTROL SAMPLES
1998

SAMPLE TYPE			NUMBER OF QC SAMPLES	NUMBER OF ROUTINE ANALYSES[1]
TLDs	-	Field Comparison	12 [2]	528
	-	Spike	12 [3]	528
Milk - Strontium			5[4]	32[4]
Milk - Gamma			60 [5]	800
Water - Gamma			60	576
Water - Tritium			3	32
Fish/Invertebrate - Gamma			3	2004
Fruits & Vegetation & Sediment - Gamma			0	2079
Air Particulate	-	Gross Beta	7	832
	-	Gamma	25	740

FOOTNOTES

(1) Includes both Millstone and Haddam Neck

(2) Each TLD field comparison sample is comprised of a set of 8 TLDs.

(3) Each TLD spike sample is comprised of a set of 4 TLDs.

(4) Sr-89 and Sr-90.

(5) Gamma in water QA spikes are treated as milk surrogates.

TABLE B-2 (page 1 of 1)

RESULTS OF QUALITY CONTROL SAMPLE ANALYSES
1998

SAMPLE TYPE			NUMBER PASS CRITERIA	NUMBER FAIL CRITERIA
TLDs	-	Field Comparison	12	0
	-	Spike	11	1
Milk - Strontium			4 [1]	1
Water - Gamma [2]			60	0
Water - Tritium			3	0
Oysters - Gamma [3]			3	0
Air Particulate	-	Gross Beta	6	1
	-	Gamma [4]	23	2
		TOTALS	TLDs: 23 Samples: 99	TLDs: 1 Samples: 4

FOOTNOTES

(1) Sr-89 or Sr-90.

APPENDIX C

SUMMARY OF INTERLABORATORY COMPARISONS

INTRODUCTION

This appendix covers the Intercomparison Program of the Duke Engineering and Services Environmental Laboratory (DESEL) as required by technical specifications for each Millstone unit. DESEL uses QA/QC samples provided by Analytics, Inc to monitor the quality of analytical processing associated with the Radiological Environmental Monitoring Program (REMP). The suite of Analytics QA/QC samples are designed to be comparable with the pre-1996 US EPA Interlaboratory Cross-Check Program. It was modified to more closely match the media mix presently being processed by DESEL. All intercomparison results received by DESEL on or before January 31, 1999 are included. Late results for 1998 will be reported in the annual report for 1999. DESEL also receives intercomparison samples from the US EPA because of their drinking water analysis program. Results from analyses of these samples are included where they are applicable to the REMP.

ACCEPTANCE CRITERIA

Intercomparison Program results are evaluated using two separate DESEL internal acceptance criteria. The first criterion concerns bias, which is defined as the deviation of any one result from the assumed known value. The second criterion concerns precision, which deals with the ability of the measurement to be faithfully replicated by comparison of an individual result with the mean of all results for a given sample set. A sample set is created by taking three aliquots from the same sample and submitting each as a blind replicate.

The bias criterion is defined as within 25% of the known value for Sr-89 or Sr-90 and within 15% of the known value for other radionuclides, or within two sigma of the known value. This bias criterion is applied to both the Analytics and the US EPA intercomparison sample results.

For Analytics intercomparison sample results, the precision criterion is defined as an overlap of the two sigma ranges for the three replicate analyses. US EPA samples have EPA supplied criteria of lower and upper control level within which the average of the three replicate samples must occur.

RESULTS (All results are extracted from References 1 and 2.)

For 1998, bias testing results for 72 individual environmental analyses of seven Analytics intercomparison samples are listed in the table on the following two pages. All of the analyses passed the bias criteria. Replicate sample results are not reported in References 1 and 2; however the references do report that, of the 72 environmental analyses for the seven samples there was only one result which failed the precision criterion. This was the low-level (LL) I-131 analysis for the third quarter water sample. DESEL issued CR 98-009 to investigate the failed precision test. The result of this investigation is not yet available.

Results of bias and precision testing on the US EPA intercomparison samples are contained in the table on Pages C-5 and C-6. Of 42 individual analyses of EPA samples, 40 passed the bias criteria, a 95% success rate. There were no failures of precision criteria for the EPA samples.

REFERENCES

1. DESEL Analytical Services Semi-Annual Quality Assurance Status Report, January-June 1998
2. DESEL Analytical Services Semi-Annual Quality Assurance Status Report, July-December 1998

TABLE C-1 (page 1 of 3)

ANALYTICS INTERCOMPARISON PROGRAM 1998

BIAS TESTING

QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
1st	Milk	Sr-89	53 pCi/L	55 pCi/L	1.04
		Sr-90	44	45	1.02
		Cr-51	201	204	1.01
		Mn-54	133	139	1.05
		Co-60	85	86	1.01
		Fe-59	95	100	1.05
		Zn-65	142	147	1.04
		I-131	82	84	1.02
		I-131 (LL)	82	83	1.01
		Cs-134	84	83	0.99
		Cs-137	161	171	1.06
		Ce-141	70	73	1.04
1st	Water	Beta	269 pCi/L	308 pCi/L	1.14
		Cr-51	167	171	1.02
		Mn-54	111	111	1.00
		Co-60	71	70	0.99
		Fe-59	79	82	1.04
		Zn-65	118	120	1.02
		I-131	90	90	1.00
		I-131 (LL)	90	92	1.02
		Cs-134	70	68	1.01
		Cs-137	134	136	1.02
		Ce-141	58	59	1.06
		Ra-226	53	56	1.02
		Ra-228	46	47	
2nd	Air Filter	Beta	212 pCi/filter	220 pCi/filter	1.04
		Sr-89	142	140	0.99
		Sr-90	51	49	0.96
		Cr-51	113	111	0.98
		Mn-54	91	96	1.05
		Co-60	124	116	0.94
		Fe-59	39	43	1.10
		Zn-65	105	114	1.09
		Cs-134	82	84	1.02
		Cs-137	61	62	1.02
		Ce-141	85	80	0.94
2nd	Water	H-3	6007 pCi/L	5697 pCi/L	0.95

TABLE C-1 (page 2 of 3)

ANALYTICS INTERCOMPARISON PROGRAM 1998

QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
2nd	Milk	Cr-51	132 pCi/L	128 pCi/L	0.97
		Mn-54	106	111	1.05
		Co-60	143	144	1.01
		Fe-59	45	46	1.02
		Zn-65	122	124	1.02
		I-131	67	71	1.06
		I-131 (LL)	67	67	1.00
		Cs-134	95	97	1.02
		Cs-137	70	74	1.06
		Ce-141	99	102	1.03
3rd	Milk	Sr-89	51 pCi/L	62 pCi/L	1.22
		Sr-90	81	72	0.89
		Cr-51	186	180	0.97
		Mn-54	74	77	1.04
		Co-60	148	146	0.99
		Fe-59	63	66	1.05
		Zn-65	195	201	1.03
		I-131	90	96	1.07
		I-131 (LL)	90	87	0.97
		Cs-134	82	80	0.98
		Cs-137	134	134	1.00
		Ce-141	146	145	0.99
3rd	Water	Sr-89	84 pCi/L	83 pCi/L	0.99
		Sr-90	51	47	0.92
		Beta	198	190	0.96
		Cr-51	165	172	1.04
		Mn-54	66	66	1.00
		Co-60	131	129	0.98
		Fe-59	55	59	1.07
		Zn-65	173	175	1.01
		I-131	79	82	1.04
		I-131 (LL)	79	78	0.99
		Cs-134	73	71	0.97
		Cs-137	119	117	0.98
		Ce-141	129	129	1.00

TABLE C-1 (page 3 of 3)

ANALYTICS INTERCOMPARISON PROGRAM 1998

QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
4th	Milk	Cr-51	195 pCi/L	205 pCi/L	1.05
		Mn-54	80	83	1.04
		Co-58	52	56	1.08
		Co-60	94	96	1.02
		Fe-59	57	62	1.09
		Zn-65	141	144	1.02
		I-131	39	42	1.08
		I-131 (LL)	39	38	0.97
		Cs-134	100	102	1.02
		Cs-137	103	109	1.06
		Ce-141	98	103	1.05

TABLE C-2 (page 1 of 2)

U.S. EPA INTERLABORATORY COMPARISON STUDIES PROGRAM 1998

(all values in pCi/L)

Date	Media	Nuclide	EPA Known	Lower Control	Upper Control	Duke (b)
1/16/98	Water	Sr-90	32.0	23.3	40.7	28.42
						29.26
						27.50
2/6/98	Water	I-131LL	104.9	86.7	123.1	109.7
						106.8
						110.2
3/13/98	Water	H-3	2155	1551	2759	2147
						2095
						2044
4/21/98	Water	Sr-89	9.3	5.3	13.3	7.8
						8.81
						10.3
4/21/98	Water	Co-60	50.0	41.3	58.7	47.7
						48.4
						48.5
4/21/98	Water	Cs-134	22.0	13.3	30.7	21.3
						21.7
						20.6
4/21/98	Water	Cs-137	10.0	1.3	18.7	8.6
						9.6
						9.1
6/5/98	Water	Co-60	12.0	3.3	20.7	11.5
						12.6
						11.4
6/5/98	Water	Zn-65	104.0	86.7	121.3	105.3
						106.6
						99.9
6/5/99	Water	Cs-134	31.0	22.3	39.7	28.9
						27.8
						26.9
6/5/98	Water	Cs-137	35.0	26.3	43.7	34.9
						36.3
						34.1

TABLE C-2 (page 2 of 2)

U.S. EPA INTERLABORATORY COMPARISON STUDIES PROGRAM 1998

(all values in pCi/L)

Date	Media	Nuclide	EPA Known	Lower Control	Upper Control	Duke*
7/17/98	Water	Sr-89	21.0	12.3	29.7	20.1
						20.3
						22.0
7/17/98	Water	Sr-90	7.00	0	15.7	9.80
						7.40
						7.11
8/7/98	Water	H-3	17996	14873	21119	17656
						17550
						17446
9/11/98	Water	I-131	6.10	2.60	9.60	6.04
						5.95
						4.85

* Same sample analyzed three times.

Northeast Utilities

Connecticut Yankee Atomic Power Company

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

HADDAM NECK STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

JANUARY 1, 1998 - DECEMBER 31, 1998

DOCKET NO. 50-213
LICENSE NO. DPR-61

Prepared for the

CONNECTICUT YANKEE ATOMIC POWER COMPANY
Haddam, Connecticut

By the

NORTHEAST NUCLEAR ENERGY COMPANY
Waterford, Connecticut

TABLE OF CONTENTS

1. SUMMARY

The radiological environmental monitoring program for the Haddam Neck Station was continued for the period January through December 1998, in compliance with the Technical Specifications and the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual (REMODCM). This annual report was prepared for the Connecticut Yankee Atomic Power Company (CYAPCO) by the Safety Analysis Branch of the Nuclear Engineering Department of Northeast Nuclear Energy Company (NNECO). Sample collection and preparation and gamma exposure rate measurements were performed by the Production Operations Services Laboratory (POSL). Laboratory analyses were performed by Duke Engineering and Services Environmental Laboratory (DESEL).

Thermoluminescent dosimeters (TLDs) were used to measure direct gamma exposure in the vicinity of the station and as far away as 12.5 miles. Radiochemical and radiological counting analyses of samples were performed to detect the presence of any station related radioactivity. Samples included air particulates collected on filters, milk, cow and goat feed (hay), broad leaf vegetation, well water, fruits, vegetables, river water, bottom sediment, shellfish, and fish. In evaluating the results of these analyses it is necessary to consider the variability of natural and man-made sources of radioactivity, distribution in the environment and uptake in environmental media. This variability is dependent on many factors including station release rates, past spatial variability of radioactive fallout from nuclear weapons tests and on-going redistribution of the fallout, contribution from cosmically produced radioactivity, ground water dynamics, soil characteristics, farming practices, and feed type. Significant variations in measured levels of radioactivity could be caused by any one of these factors. Therefore, these factors need to be considered in order to properly explain any variations in radiation detected and to distinguish between natural and station related radioactivity.

Haddam Neck is permanently shutdown. Primary activities at the Haddam Neck station are now focused on decommissioning. Even though the station is no longer generating power, decommissioning activities included processing and discharging of liquids containing radioactivity and releasing of airborne radioactivity. However, the levels of radioactivity released are significantly lower than releases during plant operation. The radiological monitoring of the environment through this program will continue to assure the health and safety of the public and workers are maintained at all times.

The predominant radioactivity detected by the monitoring program was that from outside sources, such as fallout from nuclear weapons tests and naturally occurring radionuclides. As typical of previous years, station related radioactivity was observed at some of the on-site gamma monitoring locations. The only other observation of station effects was tritium in well water at the on-site location.

As usual, Cesium-137 and Strontium-90 were measured in both cow and goat milk. These levels are a result of nuclear weapons testing in the 1960s and not the result of station decommissioning operations. This can be concluded because insufficient quantities of these isotopes have been released by the station to account for the measured concentrations. Higher levels of Cesium-137 and Strontium-90 were detected prior to initial plant operation and have been declining since the ban on nuclear weapons testing in the 1960s.

The radiation dose (dose equivalent commitment) to the general public from the station's discharges has been evaluated by two methods. One method utilizes measurements of station's discharges and conservative transport models and the other utilizes the measured concentrations of radioactivity in the environmental media.

The maximum whole body dose (station boundary) that could occur to a member of the general public was calculated to be 0.2 millirem. The average dose to a member of the public residing within 50 miles of the station is 0.00065 millirem. These doses are 0.8 percent and 0.0026 percent of the standard as set by the Environmental Protection Agency on the maximum allowable dose to an individual of the general public. The standards of the Environmental Protection Agency are a small fraction (less than 10 percent) of the 284 mrem per year normal Connecticut resident background radiation (NCRP94) and are designed to be inconsequential in regard to public health and safety. Station related doses are a small fraction of these standards and of the variation in natural background in Connecticut. They pose insignificant public health consequences.

2. PROGRAM DESCRIPTION

2.1. *Sampling Schedule, Types, and Locations*

The sample locations and the sample types and frequency of analysis are given in Tables 2-1 and 2-2 and Figures 2.1 and 2.2. The program as described here includes both required samples as specified in the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual and any extra samples.

Table 2-1 Environmental Monitoring Program Sampling Types and Locations

Location Number*	Location Name	Direction & Distance From Release Point†	Sample Types
1-I	On-site - Mouth of Discharge Canal	1.1 Mi, ESE	TLD
2-I	Haddam-Park Rd.	0.8 Mi, S	TLD
3-I	Haddam-Jail Hill Rd.	0.8 Mi, WSW	TLD
4-I	Haddam-Ranger Rd.	1.8 Mi, SW	TLD, Air Particulate
5-I	On-site-Injun Hollow Rd.	0.4 Mi, NW	TLD, Air Particulate
6-I	On-site-Substation	0.5 Mi, NE	TLD, Air Particulate, Vegetation
7-I	Haddam	1.8 Mi, SE	TLD, Air Particulate
8-I	East Haddam	3.1 Mi, ESE	TLD, Air Particulate
9-I	Higganum	4.3 Mi, WNW	TLD, Air Particulate
10-I	Hurd Park Rd.	2.8 Mi, NNW	TLD
11-C	Middletown	9.0 Mi, NW	TLD
12-C	Deep River	7.1 Mi, SSE	TLD
13-C	North Madison	12.5 Mi, SW	TLD, Air Particulate
14-C	Colchester	10.5 Mi, NE	TLD
15-I	On-site Wells	0.5 Mi, ESE**	Well Water
16-C	Well-State Highway Dept. E. Haddam	2.8 Mi, SE	Well Water
17-C	Beyond 10 Miles	Beyond 10 Miles	Fruits & Vegetables
18-I	Site Boundary	0.4 Mi, NW	Vegetation
19-I	Cow Location #1	6.5 Mi, ENE	Milk
20-I	Cow Location #2	8.0 Mi, NE	Milk
21-I	Cow Location #3	11.0 Mi, SE	Milk
22-C	Cow Location #4	11.0 Mi, ENE	Milk
23-C	Goat Location #1	16.0 Mi, NNE	Milk
24-I	Goat Location #2	3.6 Mi, SSE	Milk
25-I	Within 10 Miles	Within 10 Miles	Fruits & Vegetables
26-I	CT River-Near Intake	1.0 Mi, WNW	Fish
27-C	CT River-Higganum Light	4.0 Mi, WNW	Shellfish
28-I	CT River-E. Haddam Bridge	1.8 Mi, SE	Bottom Sediment, River Water
28-X	CT River-E. Haddam Bridge	1.8 Mi, SE	Shellfish
29-I	Vicinity of Discharge	Within 0.3 Miles	Bottom Sediment, Fish
30-C	CT River - Middletown	9.0 Mi, NW	River Water, Bottom Sediment
		7.6 Mi, NW	Fish
31-I	Mouth of Salmon River	0.8 Mi, ESE	Shellfish
40-X	Near Intake Structure	0.1 Mi, SSW	TLD
41-X	Picnic Area	0.3 Mi, WNW	TLD
42-X	Environmental Trail	0.1 Mi, NW	TLD
43-X	Moodus - Rts 149 & 151	2.5 Mi, ENE	TLD
44-X	Shailerville, Horton Rd.	1.0 Mi, SE	TLD
45-X	Old Waste Gas Sphere Fence	0.1 Mi, E	TLD
46-X	Discharge Canal Fence	0.2 Mi, SE	TLD
47-X	Info Center	0.1 Mi, WNW	TLD

* Key: **I** - Indicator **C** - Control **X** - Extra - sample not required

† The release points are the stack for terrestrial locations and the end of the discharge canal for aquatic locations.

** New wells at 0.4 miles SE may be used as a replacement for this location.

Table 2-2 Technical Specification Sampling Frequency & Type of Analysis

Exposure Pathway and/or Sample	Number of Locations	Sampling & Collection Frequency	Type of Analysis
1a. Gamma Exposure - Environmental TLD	14	Monthly	Gamma Dose - Monthly
1b. Gamma Exposure - Accident TLD	25	Quarterly‡	N/A‡
2. Airborne Particulate	7	Continuous sampler - weekly filter change	Gross Beta - Weekly Gamma Spectrum - Quarterly on composite (by location), and on individual filter if gross beta is greater than 10 times the mean of the weekly control station's gross beta results
3. Vegetation	4	One sample near middle & one near end of growing season	Gamma Isotopic on each sample
4. Milk	6	Monthly	Gamma Isotopic on each sample - Monthly Sr-89 and Sr-90 - Quarterly
4a. Pasture Grass	6	Sample as necessary to substitute for unavailable milk	Gamma Isotopic
5. Well Water	2	Quarterly	Gamma Isotopic and Tritium on each composite
6. Bottom Sediment	3	Semiannually	Gamma Isotopic
7. River Water	2	Quarterly Sample - Indicator is continuous composite; Background is composite of six weekly grab samples	Quarterly - Gamma Isotopic and Tritium
8. Fish (edible portion) - bullheads and, when available, perch or other edible fish	3	Quarterly	Gamma Isotopic - Quarterly
9. Shellfish	2	Quarterly	Gamma Isotopic - Quarterly

‡ Accident monitoring TLDs to be dedosed at least quarterly

Figure 2.1 Haddam Neck Station Sample Stations

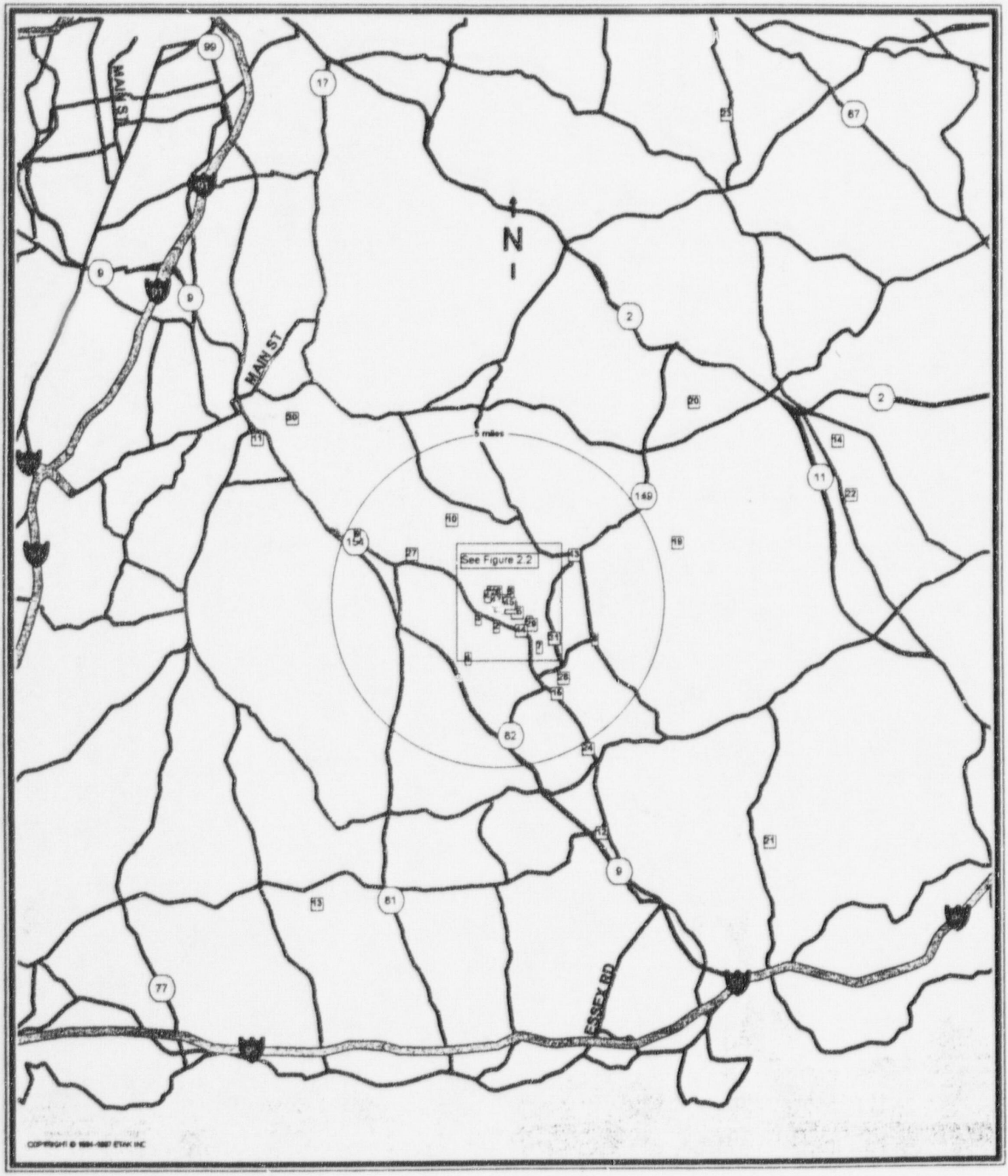
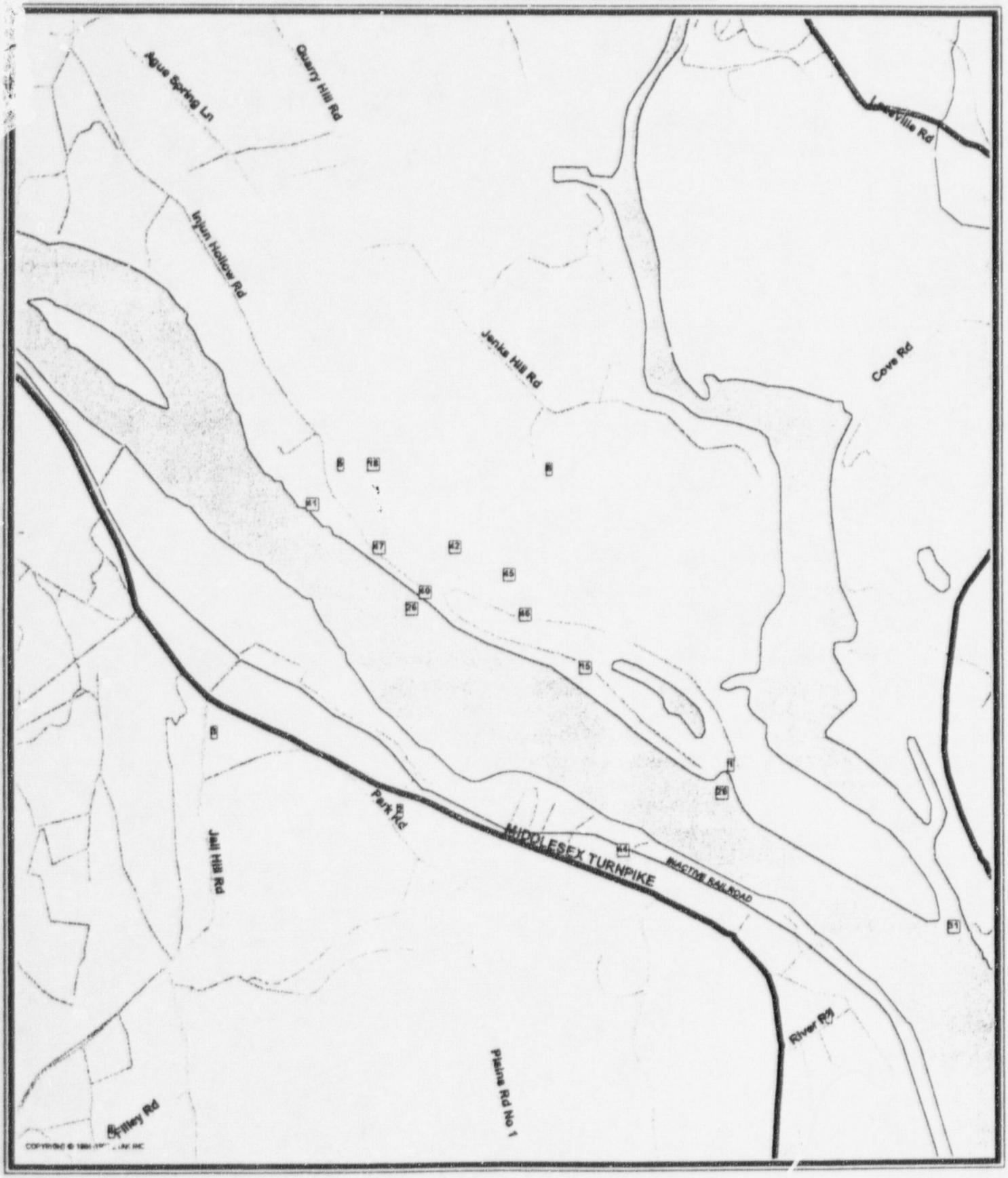


Figure 2.2 Haddam Neck Station Inner Sample Stations



2.2. *Samples Collected During Report Period*

The following table summarizes the number of samples of each type collected during the present reporting period:

Sample Type	Number of Technical Specification Required Samples	Number of Technical Specification Required Samples Analyzed	Number of Extra Samples Analyzed
Gamma Exposure - Environmental TLD	168	168	96
Air Particulates	364	364	0
Dairy Milk	48	44*	0
Goat Milk	24	18*	0
Pasture Grass	**	0*	3***
Well Water	8	8	8
Fruit & Vegetables	8	8	0
Broad Leaf Vegetation	4	4	9
River Water	8	8	0
Bottom Sediment	6	6	0
Fish	24	24	0
Shellfish	8	8	4
Total All Types	**670**	**660**	**120**

* Due to sample unavailability, less than required number of samples were obtained.

** Sample as necessary, during the months of April through December, to substitute for unavailable milk.

*** Three of ten unavailable milk samples occurred during the months when a pasture grass sample is required as a substitute. Hay was collected in lieu of pasture grass due to unavailability of grass.

3. RADIOCHEMICAL RESULTS

3.1. Summary Table

In accordance with the Radiological Effluent Monitoring Manual (REMM), Section F.1, a summary table of the radiochemical and radiological analyses results has been prepared and is presented in Table 3-1. All analysis results are summarized including analysis results of extra, non-required samples.

In the determination of the mean, the data was handled as recommended by the Health and Safety Laboratory, Idaho and NUREG/CR-4007 (Sept. 1984): all valid data, including negative values and zeros were used in the determination of the mean (see Part 3.2).

A more detailed analysis of the data is given in Section 4.0 where a discussion of the variations in the data explains many aspects that are not evident in the Summary Table because of the basic limitation of data summaries.

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
GAMMA DOSE (UR/HR)	216, 48 (D)	1.5	7.9 (6.6 - 10.5)	LOC # 45 0.1 MILES E	9.8 (9.3 - 10.3)	8.0 (6.5 - 9.5)	0
AIR PARTICULATE AND IODINE (PCI/M3)	312, 52 BETA	0.01 (E)	0.020 (0.006 - 0.044)	LOC # 9 4.3 MILES WNW	0.021 (0.007 - 0.044)	0.019 (0.006 - 0.040)	0
	GAMMA 24, 4 BE-7	--	0.092 (0.046 - 0.127)	LOC # 8 3.1 MILES ESE	0.104 (0.070 - 0.127)	0.096 (0.062 - 0.112)	0
	CO-60	--	0.000 (0.000 - 0.001)	LOC # 4 1.8 MILES SW	0.000 (0.000 - 0.001)	0.000 (0.000 - 0.001)	0
	ZR-95	--	0.000 (-0.001 - 0.004)	LOC # 5 0.4 MILES NW	0.001 (0.000 - 0.003)	-0.001 (-0.002 - 0.000)	0
	NB-95	--	-0.000 (-0.003 - 0.002)	LOC # 7 1.8 MILES SE	0.000 (-0.001 - 0.002)	0.000 (-0.001 - 0.002)	0
	RU-103	--	0.000 (-0.002 - 0.002)	LOC # 8 3.1 MILES ESE	0.001 (0.001 - 0.001)	0.000 (0.000 - 0.000)	0
	CS-134	0.05 (F)	0.000 (0.000 - 0.001)	LOC # 5 0.4 MILES NW	0.000 (0.000 - 0.001)	0.000 (0.000 - 0.001)	0
	CS-137	0.06	0.000 (0.000 - 0.000)	LOC # 7 1.8 MILES SE	0.000 (0.000 - 0.000)	0.000 (0.000 - 0.000)	0
MILK (DAIRY) (PCI/L)	SR 11, 4 SR-89	--	1.3 (-2.1 - 6.7)	LOC # 21 11.0 MILES SE	1.9 (-2.1 - 4.8)	1.3 (-0.6 - 3.5)	0
	SR-90	--	1.7 (-0.6 - 4.8)	LOC # 20 8 MILES NE	4.2 (3.5 - 4.8)	2.2 (1.0 - 3.4)	0
	IODINE 32,12 I-131	1	-0.76 (-6.00 - 3.09)	LOC # 21 11.0 MILES SE	-0.31 (-6.00 - 3.09)	-0.55 (-4.46 - 4.71)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	GAMMA 32, 12	15	-0.3	LOC # 20	-0.1	-0.6	0
	CS-134		(-2.2 - 2.9)	8 MILES NE	(-1.5 - 2.2)	(-5.4 - 1.6)	
	CS-137	18	1.9	LOC # 20	5.9	1.0	0
			(-1.5 - 9.3)	8 MILES NE	(2.7 - 9.3)	(-1.1 - 3.7)	
	BA-140	70	-0	LOC # 22C	1	1	0
			(-4 - 3)	11 MILES ENE	(-2 - 4)	(-2 - 4)	
	LA-140	25	-0.3	LOC # 22C	1.5	1.5	0
			(-5.1 - 4.0)	11 MILES ENE	(-1.8 - 4.1)	(-1.8 - 4.1)	
GOAT MILK (PCI/L)	SR 4, 4	--	2.6	LOC # 24	2.6	0.9	0
	SR-89		(0.8 - 4.7)	3.6 MILES SSE	(0.8 - 4.7)	(-2.4 - 8.6)	
	SR-90	--	7.1	LOC # 24	7.1	2.9	0
			(4.6 - 9.0)	3.6 MILES SSE	(4.6 - 9.0)	(0.6 - 5.1)	
	IODINE 10, 8	1	-0.92	LOC # 23C	0.50	0.50	0
	I-131		(-3.55 - 4.30)	16 MILES NNE	(-3.51 - 1.57)	(-3.51 - 1.57)	
	GAMMA 10, 8	15	0.1	LOC # 23C	0.2	0.2	0
	CS-134		(-2.3 - 2.1)	16 MILES NNE	(-2.5 - 2.4)	(-2.5 - 2.4)	
	CS-137	18	4.0	LOC # 23C	5.7	5.7	0
			(1.3 - 11.3)	16 MILES NNE	(2.5 - 11.4)	(2.5 - 11.4)	
	BA-140	70	-2	LOC # 23C	-0	-0	0
			(-6 - 1)	16 MILES NNE	(-6 - 3)	(-6 - 3)	
	LA-140	25	-2.0	LOC # 23C	-0.3	-0.3	0
			(-6.8 - 1.1)	16 MILES NNE	(-6.8 - 3.7)	(-6.8 - 3.7)	
PASTURE GRASS (PCI/G)	GAMMA 1, 2	0.06	0.036	LOC # 20	0.036	-0.019	0
	I-131		(0.036 - 0.036)	8 MILES NE	(0.036 - 0.036)	(-0.020 - -0.018)	

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CS-134	0.06	-0.017 (-0.017 - -0.017)	LOC # 23C 16 MILES NNE	-0.011 (-0.024 - 0.001)	-0.011 (-0.024 - 0.001)	0
	CS-137	0.08	0.000 (0.000 - 0.000)	LOC # 23C 16 MILES NNE	0.036 (0.029 - 0.042)	0.036 (0.029 - 0.042)	0
	BA-140	--	0.012 (0.012 - 0.012)	LOC # 20 8 MILES NE	0.012 (0.012 - 0.012)	-0.046 (-0.058 - -0.034)	0
	LA-140	--	0.014 (0.014 - 0.014)	LOC # 20 8 MILES NE	0.014 (0.014 - 0.014)	-0.053 (-0.067 - -0.039)	0
GROUNDWATER (PCI/L)	GAMMA 12, 4 MN-54	15	-0.5 (-2.3 - 2.3)	LOC # 15 0.5 MILES ESE	-0.5 (-2.3 - 2.3)	-0.5 (-2.0 - 0.5)	0
	CO-58	15	0.1 (-2.0 - 1.7)	LOC # 15 0.5 MILES ESE	0.1 (-2.0 - 1.7)	-1.9 (-3.0 - -0.8)	0
	FE-59	30	-0.0 (-4.0 - 2.9)	LOC # 16C 2.8 MILES SE	1.5 (-0.6 - 5.9)	1.5 (-0.6 - 5.9)	0
	CO-60	15	-0.2 (-1.8 - 1.3)	LOC # 16C 2.8 MILES SE	0.5 (-0.7 - 1.6)	0.5 (-0.7 - 1.6)	0
	ZN-65	30	1.9 (-6.0 - 8.4)	LOC # 16C 2.8 MILES SE	3.9 (-7.7 - 18.8)	3.9 (-7.7 - 18.8)	0
	ZR-95	30	-0.4 (-4.6 - 3.4)	LOC # 16C 2.8 MILES SE	0.6 (-0.6 - 2.1)	0.6 (-0.6 - 2.1)	0
	NB-95	15	-1.2 (-3.8 - 0.7)	LOC # 16C 2.8 MILES SE	0.3 (-2.4 - 1.4)	0.3 (-2.4 - 1.4)	0
	I-131	--	-0 (-5 - 4)	LOC # 16C 2.8 MILES SE	3 (-1 - 9)	3 (-1 - 9)	0

TABLE 3-1
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JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CS-134	15	-0.1 (-3.0 - 1.1)	LOC # 15 0.5 MILES ESE	-0.1 (-3.0 - 1.1)	-0.3 (-1.2 - 0.9)	0
	CS-137	18	0.8 (-0.5 - 2.1)	LOC # 15 0.5 MILES ESE	0.8 (-0.5 - 2.1)	-1.4 (-2.4 - -0.2)	0
	BA-140	60	0 (-4 - 5)	LOC # 15 0.5 MILES ESE	0 (-4 - 5)	-2 (-5 - 3)	0
	LA-140	15	0 (-5 - 6)	LOC # 15 0.5 MILES ESE	0 (-5 - 6)	-2 (-6 - 3)	0
	TRITIUM 12, 4 H-3	2000	432 (215 - 633)	LOC # 15 0.5 MILES ESE	432 (215 - 633)	42 (0 - 93)	0
FRUITS AND VEGETABLES (PCI/G)	GAMMA 4, 4 BE-7	--	0.25 (0.05 - 0.51)	LOC # 25 <10 MILES	0.25 (0.05 - 0.51)	0.13 (0.00 - 0.35)	0
	K-40	--	2.54 (0.89 - 4.05)	LOC # 17C >10 MILES	2.72 (0.50 - 5.58)	2.72 (0.50 - 5.58)	0
	MN-54	--	-0.006 (-0.018 - 0.004)	LOC # 17C >10 MILES	-0.004 (-0.009 - 0.001)	-0.004 (-0.009 - 0.001)	0
	CO-58	--	0.001 (-0.006 - 0.006)	LOC # 17C >10 MILES	0.002 (-0.012 - 0.016)	0.002 (-0.012 - 0.016)	0
	CO-60	--	0.009 (0.000 - 0.024)	LOC # 25 <10 MILES	0.009 (0.000 - 0.024)	-0.005 (-0.018 - 0.003)	0
	ZR-95	--	0.012 (0.003 - 0.022)	LOC # 25 <10 MILES	0.012 (0.003 - 0.022)	-0.006 (-0.028 - 0.002)	0
	NB-95	--	0.010 (0.001 - 0.017)	LOC # 25 <10 MILES	0.010 (0.001 - 0.017)	0.006 (-0.011 - 0.017)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
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	RU-103	--	0.006 (-0.002 - 0.013)	LOC # 25 <10 MILES	0.006 (-0.002 - 0.013)	-0.005 (-0.015 - 0.017)	0
	I-131	0.06 (G)	-0.005 (-0.017 - 0.008)	LOC # 17C >10 MILES	0.017 (-0.020 - 0.051)	0.017 (-0.020 - 0.051)	0
	CS-134	0.06	0.000 (-0.012 - 0.016)	LOC # 25 <10 MILES	0.000 (-0.012 - 0.016)	-0.008 (-0.019 - 0.006)	0
	CS-137	0.08	-0.003 (-0.021 - 0.008)	LOC # 17C >10 MILES	-0.002 (-0.012 - 0.011)	-0.002 (-0.012 - 0.011)	0
	RA-226	--	0.007 (-0.089 - 0.221)	LOC # 17C >10 MILES	0.377 (-0.106 - 0.767)	0.377 (-0.106 - 0.767)	0
	TH-228	--	0.029 (-0.012 - 0.133)	LOC # 25 <10 MILES	0.029 (-0.012 - 0.133)	0.003 (-0.024 - 0.034)	0
BROADLEAF VEGETATION (PCI/G)	GAMMA 13, . BE-7	--	1.20 (0.39 - 2.41)	LOC # 18 0.4 MILES NW	1.39 (0.39 - 2.41)	. (. - .)	0
	K-40	--	3.06 (0.72 - 6.50)	LOC # 6 0.5 MILES NE	3.57 (1.40 - 6.50)	. (. - .)	0
	MN-54	--	-0.000 (-0.031 - 0.020)	LOC # 18 0.4 MILES NW	0.002 (-0.004 - 0.010)	. (. - .)	0
	CO-58	--	-0.003 (-0.019 - 0.014)	LOC # 18 0.4 MILES NW	-0.003 (-0.019 - 0.014)	. (. - .)	0
	CO-60	--	0.001 (-0.012 - 0.009)	LOC # 18 0.4 MILES NW	0.001 (-0.012 - 0.009)	. (. - .)	0
	ZR-95	--	0.001 (-0.020 - 0.029)	LOC # 18 0.4 MILES NW	0.003 (-0.019 - 0.029)	. (. - .)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	NB-95	--	0.001 (-0.034 - 0.020)	LOC # 6 0.5 MILES NE	0.004 (-0.005 - 0.020)	. (. - .)	0
	RU-103	--	-0.001 (-0.018 - 0.009)	LOC # 6 0.5 MILES NE	0.001 (-0.004 - 0.006)	. (. - .)	0
	I-131	0.06	-0.004 (-0.079 - 0.056)	LOC # 18 0.4 MILES NW	-0.003 (-0.079 - 0.056)	. (. - .)	0
	CS-134	0.06	0.001 (-0.011 - 0.028)	LOC # 18 0.4 MILES NW	0.001 (-0.011 - 0.011)	. (. - .)	0
	CS-137	0.08	0.014 (-0.024 - 0.092)	LOC # 18 0.4 MILES NW	0.032 (-0.024 - 0.092)	. (. - .)	0
	RA-226	--	-0.025 (-0.929 - 0.457)	LOC # 18 0.4 MILES NW	0.035 (-0.208 - 0.222)	. (. - .)	0
	TH-228	--	0.040 (-0.105 - 0.257)	LOC # 6 0.5 MILES NE	0.055 (-0.105 - 0.257)	. (. - .)	0
RIVER WATER (PCI/L)	GAMMA 4, 4 K-40	--	-16 (-31 - -9)	LOC # 30C 9.0 MILES NW	18 (-16 - 72)	18 (-16 - 72)	0
	MN-54	15	0.4 (-0.3 - 1.6)	LOC # 28 1.8 MILES SE	0.4 (-0.3 - 1.6)	-0.0 (-0.2 - 0.4)	0
	CO-58	15	-0.3 (-1.0 - 0.9)	LOC # 28 1.8 MILES SE	-0.3 (-1.0 - 0.9)	-0.6 (-1.7 - -0.1)	0
	FE-59	30	-1.2 (-1.3 - -1.1)	LOC # 30C 9.0 MILES NW	-1.1 (-3.8 - 2.1)	-1.1 (-3.8 - 2.1)	0
	CO-60	15	-0.0 (-0.1 - 0.1)	LOC # 30C 9.0 MILES NW	0.1 (-0.2 - 0.3)	0.1 (-0.2 - 0.3)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
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DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	ZN-65	30	-0.3 (-1.3 - 1.4)	LOC # 30C 9.0 MILES NW	1.4 (-1.2 - 4.8)	1.4 (-1.2 - 4.8)	0
	ZR-95	30	0.1 (-4.0 - 5.3)	LOC # 28 1.8 MILES SE	0.1 (-4.0 - 5.3)	0.0 (-1.0 - 1.0)	0
	NB-95	15	0.5 (-1.6 - 1.8)	LOC # 30C 9.0 MILES NW	0.8 (0.2 - 1.7)	0.8 (0.2 - 1.7)	0
	I-131	--	31 (16 - 56)	LOC # 28 1.8 MILES SE	31 (16 - 56)	2 (-6 - 11)	0
	CS-134	15	-0.3 (-0.7 - 0.2)	LOC # 30C 9.0 MILES NW	0.1 (-0.7 - 0.8)	0.1 (-0.7 - 0.8)	0
	CS-137	18	-0.1 (-0.5 - 0.1)	LOC # 30C 9.0 MILES NW	-0.0 (-1.0 - 1.6)	-0.0 (-1.0 - 1.6)	0
	BA-140	60 (H)	-8 (-11 - -6)	LOC # 30C 9.0 MILES NW	1 (-3 - 6)	1 (-3 - 6)	0
	LA-140	15 (H)	-9 (-12 - -7)	LOC # 30C 9.0 MILES NW	1 (-4 - 6)	1 (-4 - 6)	0
	TRITIUM 4, 4 H-3	2000	274 (177 - 379)	LOC # 28 1.8 MILES SE	274 (177 - 379)	-136 (-342 - -49)	0
BOTTOM SEDIMENT (PCI/G)	GAMMA 4, 2 K-40	--	9.7 (8.9 - 11.5)	LOC # 30C 9.0 MILES NW	10.8 (8.1 - 13.6)	10.8 (8.1 - 13.6)	0
	MN-54	--	0.00 (-0.02 - 0.02)	LOC # 29 0 MILES N/A	0.02 (0.01 - 0.02)	0.00 (-0.02 - 0.02)	0
	CO-58	--	0.00 (-0.02 - 0.01)	LOC # 28 1.8 MILES SE	0.01 (0.00 - 0.01)	0.00 (-0.01 - 0.02)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CO-60	--	0.00 (-0.05 - 0.04)	LOC # 29 0 MILES N/A	0.03 (0.02 - 0.04)	0.01 (0.00 - 0.03)	0
	ZR-95	--	0.01 (-0.05 - 0.06)	LOC # 29 0 MILES N/A	0.05 (0.04 - 0.06)	-0.02 (-0.03 - -0.01)	0
	NB-95	--	-0.01 (-0.03 - 0.03)	LOC # 29 0 MILES N/A	0.01 (-0.02 - 0.03)	-0.04 (-0.06 - -0.03)	0
	I-131	--	-0.03 (-0.07 - 0.00)	LOC # 30C 9.0 MILES NW	-0.01 (-0.02 - -0.00)	-0.01 (-0.02 - -0.00)	0
	CS-134	0.15	0.00 (-0.01 - 0.01)	LOC # 30C 9.0 MILES NW	0.01 (0.01 - 0.01)	0.01 (0.01 - 0.01)	0
	CS-137	0.18	0.09 (0.06 - 0.16)	LOC # 29 0 MILES N/A	0.12 (0.08 - 0.16)	0.10 (0.04 - 0.16)	0
	RA-226	--	1.52 (0.97 - 2.24)	LOC # 29 0 MILES N/A	2.03 (1.82 - 2.24)	0.99 (0.76 - 1.22)	0
	TH-228	--	0.62 (0.57 - 0.69)	LOC # 28 1.8 MILES SE	0.66 (0.62 - 0.69)	0.65 (0.42 - 0.88)	0
SHELLFISH (PCI/G)	GAMMA 8, 4 BE-7	--	0.04 (-0.09 - 0.17)	LOC # 28 1.8 MILES SE	0.08 (-0.04 - 0.17)	-0.09 (-0.21 - 0.03)	0
	K-40	--	0.2 (-0.1 - 0.4)	LOC # 27C 4 MILES WNW	0.3 (0.1 - 0.4)	0.3 (0.1 - 0.4)	0
	CR-51	--	0.03 (-0.16 - 0.25)	LOC # 31 0.8 MILES ESE	0.11 (-0.03 - 0.25)	-0.02 (-0.06 - -0.00)	0
	MN-54	0.13	0.00 (-0.02 - 0.03)	LOC # 28 1.8 MILES SE	0.01 (-0.01 - 0.03)	0.00 (-0.01 - 0.01)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	CO-58	0.13	-0.01 (-0.03 - 0.01)	LOC # 27C 4 MILES WNW	0.00 (-0.01 - 0.02)	0.00 (-0.01 - 0.02)	0
	FE-59	0.26	0.00 (-0.03 - 0.05)	LOC # 31 0.8 MILES ESE	0.01 (-0.03 - 0.05)	-0.01 (-0.04 - 0.01)	0
	CO-60	0.13	-0.00 (-0.02 - 0.02)	LOC # 28 1.8 MILES SE	0.00 (-0.02 - 0.02)	-0.00 (-0.01 - 0.01)	0
	ZN-65	0.26	-0.02 (-0.05 - 0.03)	LOC # 27C 4 MILES WNW	-0.00 (-0.05 - 0.04)	-0.00 (-0.05 - 0.04)	0
	ZR-95	--	0.00 (-0.01 - 0.03)	LOC # 27C 4 MILES WNW	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)	0
	NB-95	--	0.00 (-0.01 - 0.01)	LOC # 31 0.8 MILES ESE	0.00 (-0.01 - 0.01)	-0.01 (-0.01 - -0.00)	0
	RU-103	--	-0.00 (-0.02 - 0.01)	LOC # 27C 4 MILES WNW	0.00 (-0.02 - 0.03)	0.00 (-0.02 - 0.03)	0
	RU-106	--	0.06 (-0.21 - 0.17)	LOC # 28 1.8 MILES SE	0.10 (0.05 - 0.17)	0.07 (-0.09 - 0.29)	0
	AG-110M	--	-0.00 (-0.02 - 0.00)	LOC # 27C 4 MILES WNW	0.01 (0.00 - 0.01)	0.01 (0.00 - 0.01)	0
	I-131	--	-0.00 (-0.04 - 0.02)	LOC # 27C 4 MILES WNW	0.01 (-0.01 - 0.04)	0.01 (-0.01 - 0.04)	0
	CS-134	0.13	-0.01 (-0.02 - 0.01)	LOC # 31 0.8 MILES ESE	-0.00 (-0.02 - 0.01)	-0.01 (-0.04 - 0.01)	0
	CS-137	0.15	-0.00 (-0.02 - 0.02)	LOC # 28 1.8 MILES SE	0.00 (-0.01 - 0.02)	0.00 (-0.01 - 0.01)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
CONNECTICUT YANKEE ATOMIC POWER COMPANY, HADDAM NECK PLANT
DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	RA-226	--	0.21 (-0.26 - 0.80)	LOC # 28 1.8 MILES SE	0.27 (-0.26 - 0.80)	0.19 (0.00 - 0.31)	0
	TH-228	--	0.18 (0.09 - 0.32)	LOC # 31 0.8 MILES ESE	0.19 (0.09 - 0.32)	0.17 (0.09 - 0.23)	0
FISH (ALL TYPES) (PCI/G)	GAMMA 16, 8	--					
	BE-7		-0.01 (-0.13 - 0.17)	LOC # 29 0 MILES N/A	0.01 (-0.07 - 0.17)	-0.01 (-0.12 - 0.11)	0
	K-40	--	3.4 (2.6 - 4.0)	LOC # 26 1 MILES WNW	3.5 (3.0 - 4.0)	3.4 (2.6 - 4.2)	0
	CR-51	--	0.06 (-0.15 - 0.29)	LOC # 26 1 MILES WNW	0.11 (-0.04 - 0.29)	-0.05 (-0.14 - 0.03)	0
	MN-54	0.13	0.00 (-0.03 - 0.02)	LOC # 29 0 MILES N/A	0.01 (0.00 - 0.02)	0.00 (-0.01 - 0.01)	0
	CO-58	0.13	-0.00 (-0.02 - 0.01)	LOC # 29 0 MILES N/A	0.00 (-0.01 - 0.01)	0.00 (-0.01 - 0.02)	0
	FE-59	0.26	-0.01 (-0.07 - 0.03)	LOC # 29 0 MILES N/A	-0.01 (-0.05 - 0.03)	-0.02 (-0.10 - 0.02)	0
	CO-60	0.13	0.01 (-0.02 - 0.02)	LOC # 26 1 MILES WNW	0.01 (-0.01 - 0.02)	0.00 (-0.02 - 0.04)	0
	ZN-65	0.26	-0.01 (-0.05 - 0.04)	LOC # 26 1 MILES WNW	-0.00 (-0.04 - 0.04)	-0.02 (-0.05 - 0.00)	0
	ZR-95	--	-0.00 (-0.02 - 0.03)	LOC # 30C 7.6 MILES NW	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)	0
	NB-95	--	-0.00 (-0.02 - 0.01)	LOC # 26 1 MILES WNW	-0.00 (-0.02 - 0.01)	-0.01 (-0.03 - 0.02)	0

TABLE 3-1
ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY
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DOCKET 50-213
JANUARY - DECEMBER 1998

MEDIUM OR PATHWAY SAMPLED	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (A)	ALL INDICATOR LOCATIONS MEAN (RANGE)(B)	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION #, DISTANCE AND DIRECTION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN (RANGE)(B)	CONTROL LOCATIONS MEAN (RANGE)(B)	# OF NRM (C)
	RU-103	--	0.00 (-0.03 - 0.01)	LOC # 30C 7.6 MILES NW	0.01 (-0.00 - 0.02)	0.01 (-0.00 - 0.02)	0
	RU-106	--	0.04 (-0.07 - 0.24)	LOC # 26 1 MILES WNW	0.05 (-0.05 - 0.24)	0.04 (-0.10 - 0.19)	0
	AG-110M	--	-0.00 (-0.02 - 0.02)	LOC # 29 0 MILES N/A	0.01 (-0.02 - 0.02)	-0.01 (-0.03 - 0.01)	0
	I-131	--	-0.01 (-0.06 - 0.06)	LOC # 30C 7.6 MILES NW	0.02 (-0.03 - 0.15)	0.02 (-0.03 - 0.15)	0
	CS-134	0.13	-0.00 (-0.02 - 0.02)	LOC # 26 1 MILES WNW	-0.00 (-0.01 - 0.02)	-0.00 (-0.02 - 0.01)	0
	CS-137	0.15	0.01 (-0.01 - 0.04)	LOC # 29 0 MILES N/A	0.02 (-0.01 - 0.03)	0.02 (-0.01 - 0.03)	0
	RA-226	--	0.11 (-0.30 - 0.66)	LOC # 26 1 MILES WNW	0.20 (-0.07 - 0.52)	0.16 (-0.77 - 0.68)	0
	TH-228	--	0.02 (-0.03 - 0.07)	LOC # 29 0 MILES N/A	0.02 (-0.02 - 0.06)	-0.00 (-0.02 - 0.05)	0

NOTES FOR TABLE 3-1

A. For gamma measurements the (Minimum Detectable Level) MDL's ≃ LLD ÷ 2.33. For all others, MDL = 2 x (the standard deviation of the background). These MDL's are based on the absence of large amounts of interfering activity (excluding naturally occurring radionuclides). Deviations by about factors of 3 to 4 can occur.

The LLD at a confidence level of 95% is the smallest concentration of radioactive material in a sample that will be detected with a 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ S_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

where

LLD	is the lower limit of detection as defined above (as pCi per unit mass or volume)
S_b	is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)
E	is the counting efficiency (as counts per transformation)
V	is the sample size (in units of mass or volume)
2.22	is the number of transformation per minute per picocurie
Y	is the fractional radiochemical yield (when applicable)
λ	is the radioactive decay constant for the particular radionuclide
Δt	is the elapsed time between sample collection (or end of the sample collection period) and time of counting

It should be recognized that LLD is a defined *a priori* (before the fact) limit representing the capability of a measurement system and not an *a posteriori* (after the fact) limit for a particular measurement.

Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these *a priori* LLDs unachievable. In such cases, the contributing factors will be identified and described in the *Annual Radiological Environmental Operating Report.*

B. Analytical results are handled as recommended by HASL *("Reporting of Analytical Results from HASL,"* letter by Leo B. Higginbotham) and NUREG/CR-4007 (Sept. 1984). Negative values were used in the determination of mean.

C. Nonroutine reported measurements (NRM's). These are results of samples that exceed the report levels of Table E-2 of the *Radiological Effluent Monitoring Manual.*

D. First number is the number of indicator measurements, the second is the number of control measurements.

E. Assuming 270 m^3

F. Assuming 1080 m^3

G. LLD for leafy vegetables.

H. LLD from the end of the sample period.

3.2. Data Tables

The data reported in this section are strictly counting statistics. The reported error is two times the standard deviation (2σ) of the net activity. Unless otherwise noted, the overall error (counting, sample size, chemistry, errors, etc.) is estimated to be 2 to 5 times that listed. Results are considered positive when the measured value exceeds 1.5 times the listed 2σ error (i.e., the measured value exceeds 3σ).

Because of counting statistics, negative values, zeros and numbers below the Minimum Detectable Level (MDL) are statistically valid pieces of data. For the purposes of this report, in order to indicate any background biases, all the valid data are presented. In instances where zeros are listed after significant digits, this is an artifact of the computer data handling program.

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Gross Beta Radioactivity
3. Air Particulates, Weekly I-131*
4. Air Particulates, Gamma Isotopic
5. Air Particulates, Quarterly Strontium*
6. Soil*
7. Milk - Dairy Farms
8. Milk - Goat Farms
9. Pasture Grass**
10. Well Water
11. Reservoir Water*
12. Fruits & Vegetables
13. Broad Leaf Vegetation
14. River Water
15. Bottom Sediment
16. Shellfish
17. Fish

* This type of sampling or analysis was not performed, therefore there is no table.

** Pasture grass was not available, therefore feed (hay) was collected as a substitute

TABLE 1
MONTHLY
GAMMA EXPOSURE RATE (UR/HR) *

LOCATIONS

PERIOD	1	2	3	4	5	6	7	8	9	10	11C
JAN 98	7.2 .2	7.0 .0	7.5 .0	6.6 .2	8.0 .1	7.1 .1	7.1 .0	8.6 .1	7.7 .0	9.2 .0	9.0 .1
FEB 98	7.2 .0	6.9 .3	7.5 .0	6.9 .1	7.8 .1	6.9 .1	6.6 .5	8.6 .2	7.4 .0	9.0 .1	8.6 .2
MAR 98	7.1 .1	6.9 .0	7.3 .1	6.6 .2	8.0 .0	6.8 .1	7.0 .1	8.4 .1	7.4 .0	8.7 .1	8.7 .1
APR 98	7.2 .0	7.0 .2	7.8 .0	6.9 .0	7.9 .1	7.2 .2	6.8 .2	8.9 .2	7.6 .0	8.9 .1	8.6 .0
MAY 98	7.4 .2	7.0 .0	7.7 .2	6.8 .2	8.3 .1	7.1 .3	7.3 .1	8.6 .1	7.7 .1	8.9 .1	9.0 .0
JUN 98	7.4 .0	7.0 .1	7.7 .1	7.1 .0	8.1 .0	7.1 .1	6.8 .1	9.0 .2	7.5 .0	8.9 .0	9.0 .1
JUL 98	7.7 .0	7.3 .1	7.7 .1	6.9 .2	8.5 .0	7.1 .1	7.4 .0	8.7 .1	7.7 .0	8.6 .3	9.3 .1
AUG 98	7.7 .1	7.6 .2	8.1 .1	7.3 .0	8.4 .1	7.4 .1	6.9 .1	9.2 .3	7.6 .1	8.8 .1	9.2 .1
SEP 98	7.9 .2	7.6 .0	8.1 .1	7.1 .1	8.9 .0	7.5 .1	7.7 .1	9.1 .1	8.0 .1	9.1 .0	9.5 .2
OCT 98	7.4 .1	7.1 .2	7.8 .1	7.1 .1	8.3 .1	7.3 .1	7.0 .0	8.9 .2	7.5 .1	8.8 .0	8.9 .0
NOV 98	7.5 .1	7.3 .1	7.8 .1	7.0 .0	8.5 .2	7.1 .0	7.4 .0	8.9 .0	7.8 .1	8.8 .1	9.1 .0
DEC 98	7.3 .0	7.0 .2	7.8 .0	7.0 .0	8.1 .1	7.2 .1	6.9 .1	9.0 .2	7.4 .0	8.6 .0	8.8 .0

PERIOD	12C	13C	14C	40X	41X	42X	43X	44X	45X	46X	47X
JAN 98	7.4 .0	6.8 .1	8.7 .0	7.2 .1	6.9 .1	9.6 .0	8.5 .0	7.3 .1	9.8 .1	7.2 .2	7.8 .1
FEB 98	7.5 .1	6.5 .1	8.6 .0	7.2 .1	7.2 .0	9.2 .0	8.3 .0	7.4 .0	9.7 .1	7.1 .0	7.9 .1
MAR 98	7.1 .2	6.6 .0	8.6 .1	6.7 .0	6.7 .2	9.4 .1	8.2 .1	7.1 .1	9.3 .2	6.9 .2	7.6 .2
APR 98	7.6 .1	6.7 .2	8.8 .1	7.2 .1	7.2 .2	9.4 .4	8.4 .1	7.6 .1	9.7 .1	7.2 .1	8.1 .2
MAY 98	7.4 .2	6.8 .1	9.2 .1	7.1 .1	7.1 .1	9.6 .1	8.7 .0	7.5 .1	9.8 .2	7.1 .3	8.2 .2
JUN 98	7.6 .1	6.8 .2	8.7 .2	7.3 .1	7.3 .1	9.4 .1	8.5 .0	7.7 .1	9.9 .0	7.3 .2	8.0 .2
JUL 98	7.4 .1	6.9 .0	9.2 .0	7.1 .0	7.3 .2	10.2 .2	8.8 .1	7.6 .1	9.9 .0	7.4 .1	8.4 .0
AUG 98	7.8 .0	7.0 .1	9.1 .3	7.5 .1	7.7 .0	10.5 .4	8.7 .0	8.0 .1	10.2 .1	7.7 .2	8.8 .2
SEP 98	7.9 .1	7.2 .1	9.4 .2	7.4 .0	7.5 .3	10.4 .3	9.0 .2	8.1 .2	10.3 .1	7.8 .2	8.7 .3
OCT 98	7.6 .1	6.7 .2	8.7 .0	7.4 .0	7.4 .0	10.0 .4	8.4 .0	7.7 .1	9.8 .1	7.4 .2	8.5 .1
NOV 98	7.5 .0	6.9 .1	9.1 .0	7.2 .2	7.3 .3	10.1 .1	8.6 .0	7.6 .1	10.1 .1	7.5 .1	8.3 .2
DEC 98	7.5 .1	6.8 .1	8.6 .2	7.4 .0	7.4 .3	9.8 .3	8.3 .0	7.6 .0	9.8 .2	7.4 .1	8.4 .1

* VALUES LISTED ARE THE AVERAGE OF TWO TLDS.
ERRORS LISTED ARE 1 SIGMA.

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVTY
(PCI/M3)

PERIOD ENDING	LOCATIONS 4	(+/-)	5	(+/-)	6	(+/-)	7	(+/-)	8	(+/-)	9	(+/-)	13C	(+/-)
JAN05	0.021	0.004	0.021	0.004	0.019	0.004	0.021	0.004	0.019	0.004	0.021	0.004	0.018	0.004
JAN12	0.012	0.003	0.010	0.003	0.010	0.003	0.011	0.003	0.010	0.004	0.013	0.003	0.010	0.003
JAN19	0.023	0.004	0.023	0.004	0.019	0.004	0.022	0.004	0.021	0.004	0.022	0.004	0.022	0.004
JAN26	0.013	0.003	0.012	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.014	0.003
FEB02	0.025	0.004	0.023	0.004	0.026	0.004	0.025	0.004	0.025	0.004	0.024	0.004	0.027	0.004
FEB09	0.025	0.003	0.026	0.004	0.024	0.003	0.023	0.003	0.024	0.004	0.027	0.003	0.026	0.003
FEB17	0.024	0.003	0.024	0.004	0.024	0.004	0.025	0.004	0.022	0.003	0.023	0.003	0.024	0.003
FEB23	0.012	0.004	0.008	0.004	0.007	0.004	0.010	0.004	0.010	0.004	0.009	0.004	0.007	0.004
MAR02	0.011	0.003	0.008	0.003	0.008	0.003	0.012	0.004	0.010	0.003	0.012	0.003	0.008	0.003
MAR09	0.017	0.004	0.014	0.004	0.015	0.004	0.013	0.004	0.015	0.004	0.016	0.003	0.014	0.003
MAR16	0.023	0.003	0.021	0.003	0.022	0.003	0.022	0.003	0.023	0.003	0.023	0.003	0.021	0.003
MAR23	0.014	0.003	0.013	0.003	0.013	0.004	0.015	0.004	0.013	0.003	0.011	0.003	0.009	0.003
MAR30	0.030	0.004	0.027	0.004	0.026	0.004	0.028	0.004	0.028	0.004	0.031	0.004	0.031	0.004
APR06	0.012	0.003	0.016	0.003	0.014	0.003	0.[illegible]	0.003	0.013	0.003	0.013	0.003	0.013	0.003
APR13	0.023	0.003	0.024	0.003	0.023	0.003	0.023	0.003	0.022	0.003	0.025	0.003	0.026	0.004
APR20	0.025	0.004	0.023	0.004	0.023	0.004	0.024	0.004	0.022	0.004	0.024	0.004	0.022	0.004
APR27	0.019	0.004	0.019	0.004	0.017	0.004	0.016	0.004	0.016	0.004	0.018	0.003	0.017	0.003
MAY04	0.016	0.004	0.014	0.004	0.013	0.003	0.013	0.003	0.014	0.004	0.014	0.003	0.016	0.003
MAY11	0.009	0.003	0.010	0.004	0.008	0.004	0.011	0.004	0.010	0.004	0.009	0.003	0.006	0.003
MAY18	0.022	0.004	0.016	0.004	0.017	0.004	0.022	0.004	0.019	0.004	0.019	0.004	0.018	0.004
MAY26	0.017	0.003	0.017	0.003	0.017	0.003	0.015	0.003	0.015	0.004	0.019	0.003	0.018	0.003
JUN01	0.026	0.004	0.025	0.004	0.025	0.004	0.024	0.004	0.017	0.003	0.025	0.004	0.020	0.004
JUN08	0.011	0.004	0.008	0.003	0.006	0.004	0.007	0.003	0.010	0.004	0.010	0.003	0.007	0.003
JUN15	0.011	0.004	0.008	0.004	0.007	0.004	0.010	0.004	0.011	0.004	0.008	0.003	0.008	0.003
JUN22	0.017	0.004	0.015	0.004	0.016	0.004	0.015	0.004	0.013	0.004	0.014	0.003	0.013	0.003
JUN29	0.019	0.004	0.017	0.004	0.017	0.004	0.018	0.004	0.018	0.004	0.021	0.004	0.019	0.004

SAMPLE DATES MAY VARY BY A COUPLE OF DAYS.

TABLE 2
AIR PARTICULATES
GROSS BETA RADIOACTIVTY
(PCI/M3)

LOCATIONS

PERIOD ENDING	4	(+/-)	5	(+/-)	6	(+/-)	7	(+/-)	8	(+/-)	9	(+/-)	13C	(+/-)
JUL06	0.011	0.004	0.016	0.004	0.012	0.004	0.014	0.004	0.014	0.004	0.013	0.003	0.012	0.003
JUL13	0.016	0.003	0.015	0.003	0.013	0.003	0.015	0.003	0.014	0.003	0.016	0.003	0.013	0.003
JUL20	0.021	0.003	0.020	0.003	0.017	0.003	0.019	0.003	0.018	0.003	0.020	0.003	0.017	0.003
JUL27	0.023	0.004	0.024	0.004	0.022	0.004	0.021	0.004	0.021	0.004	0.020	0.004	0.022	0.004
AUG03	0.021	0.004	0.024	0.004	0.023	0.004	0.017	0.004	0.019	0.004	0.020	0.004	0.018	0.004
AUG10	0.026	0.004	0.023	0.004	0.026	0.004	0.025	0.004	0.024	0.004	0.023	0.004	0.012	0.003
AUG17	0.016	0.004	0.015	0.003	0.013	0.004	0.019	0.004	0.016	0.004	0.019	0.003	0.014	0.003
AUG24	0.024	0.004	0.019	0.003	0.022	0.003	0.019	0.003	0.020	0.003	0.025	0.003	0.024	0.003
SEP01	0.029	0.003	0.027	0.003	0.025	0.003	0.030	0.003	0.027	0.003	0.027	0.003	0.027	0.003
SEP08	0.025	0.004	0.026	0.004	0.031	0.004	0.029	0.004	0.024	0.004	0.030	0.004	0.024	0.004
SEP14	0.020	0.004	0.020	0.004	0.019	0.004	0.019	0.003	0.020	0.004	0.020	0.003	0.020	0.004
SEP21	0.026	0.004	0.028	0.004	0.026	0.004	0.028	0.004	0.026	0.004	0.027	0.004	0.027	0.004
SEP28	0.029	0.004	0.028	0.004	0.028	0.004	0.026	0.004	0.023	0.004	0.027	0.003	0.024	0.003
OCT05	0.018	0.003	0.017	0.003	0.015	0.003	0.016	0.003	0.016	0.003	0.018	0.003	0.017	0.003
OCT13	0.012	0.003	0.010	0.003	0.014	0.003	0.014	0.003	0.014	0.003	0.013	0.003	0.010	0.003
OCT19	0.021	0.004	0.018	0.004	0.023	0.004	0.020	0.004	0.021	0.004	0.024	0.004	0.017	0.004
OCT26	0.020	0.004	0.020	0.003	0.019	0.004	0.022	0.004	0.022	0.004	0.022	0.004	0.021	0.004
NOV02	0.016	0.004	0.016	0.004	0.018	0.004	0.017	0.004	0.015	0.004	0.018	0.003	0.015	0.004
NOV09	0.010	0.003	0.010	0.003	0.011	0.003	0.013	0.003	0.010	0.003	0.007	0.003	0.012	0.003
NOV16	0.036	0.004	0.032	0.004	0.033	0.004	0.036	0.004	0.031	0.004	0.035	0.004	0.031	0.004
NOV23	0.023	0.003	0.025	0.003	0.023	0.004	0.022	0.003	0.022	0.003	0.022	0.003	0.020	0.003
NOV30	0.027	0.004	0.029	0.004	0.025	0.004	0.026	0.004	0.026	0.004	0.030	0.004	0.024	0.004
DEC07	0.043	0.004	0.029	0.004	0.035	0.004	0.037	0.004	0.034	0.004	0.037	0.004	0.032	0.004
DEC14	0.027	0.004	0.026	0.004	0.028	0.004	0.030	0.004	0.028	0.004	0.029	0.004	0.028	0.004
DEC21	0.027	0.004	0.025	0.004	0.025	0.004	0.025	0.004	0.022	0.004	0.027	0.004	0.023	0.004
DEC28	0.039	0.004	0.038	0.004	0.036	0.004	0.039	0.004	0.036	0.005	0.044	0.005	0.040	0.005

SAMPLE DATES MAY VARY BY A COUPLE OF DAYS.

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TABLE 4A
AIR PARTICULATES
GAMMA SPECTRA - GTR 1
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.083	0.033	0.0000	0.0003	0.0007	0.0019	-0.0020	0.0019	-0.0010	0.0026
5	0.046	0.032	0.0000	0.0006	0.0009	0.0024	-0.0010	0.0027	-0.0010	0.0018
6	0.063	0.032	0.0001	0.0009	0.0002	0.0023	0.0016	0.0041	-0.0020	0.0025
7	0.085	0.033	0.0000	0.0006	0.0003	0.0023	0.0003	0.0026	0.0000	0.0020
8	0.127	0.037	0.0000	0.0004	0.0004	0.0018	-0.0010	0.0029	0.0009	0.0019
9	0.081	0.035	0.0003	0.0010	-0.0010	0.0025	0.0000	0.0022	-0.0010	0.0024
13C	0.110	0.034	0.0000	0.0007	-0.0020	0.0018	-0.0010	0.0027	0.0000	0.0018

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0020	0.0076	0.0000	0.0007	0.0000	0.0004	0.0038	0.0341	0.0006	0.0024
5	-0.0060	0.0076	0.0005	0.0007	0.0000	0.0006	0.0439	0.0529	0.0009	0.0029
6	0.0015	0.0077	0.0000	0.0007	0.0000	0.0006	0.0138	0.0415	0.0000	0.0028
7	-0.0020	0.0073	0.0001	0.0006	0.0000	0.0008	-0.0130	0.0239	-0.0030	0.0029
8	0.0011	0.0068	0.0001	0.0007	0.0000	0.0005	-0.0110	0.0208	0.0026	0.0027
9	-0.0040	0.0084	0.0005	0.0006	0.0000	0.0008	-0.0120	0.0220	0.0000	0.0024
13C	0.0000	0.0078	0.0000	0.0007	0.0000	0.0006	0.0020	0.0448	0.0000	0.0025

TABLE 4B
AIR PARTICULATES
GAMMA SPECTRA - QTR 2
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.092	0.032	0.0003	0.0007	0.0000	0.0022	0.0000	0.0018	0.0000	0.0018
5	0.103	0.028	0.0000	0.0006	0.0025	0.0026	0.0008	0.0018	0.0004	0.0014
6	0.102	0.031	0.0004	0.0007	-0.0010	0.0020	0.0016	0.0022	0.0008	0.0017
7	0.093	0.031	0.0000	0.0008	0.0000	0.0015	0.0016	0.0025	-0.0010	0.0020
8	0.093	0.036	0.0004	0.0008	-0.0010	0.0029	-0.0010	0.0032	0.0011	0.0018
9	0.117	0.032	0.0003	0.0011	0.0000	0.0007	-0.0030	0.0026	0.0003	0.0014
13C	0.098	0.031	0.0000	0.0007	-0.0010	0.0019	-0.0010	0.0018	0.0004	0.0014

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0020	0.0071	0.0002	0.0007	0.0000	0.0005	0.0034	0.0167	0.0000	0.0021
5	-0.0010	0.0075	0.0003	0.0008	0.0000	0.0005	0.0032	0.0191	-0.0010	0.0018
6	0.0025	0.0078	0.0000	0.0006	0.0000	0.0008	0.0000	0.0164	0.0004	0.0018
7	0.0011	0.0080	0.0000	0.0005	0.0001	0.0004	0.0048	0.0183	0.0000	0.0022
8	0.0001	0.0061	0.0000	0.0007	0.0000	0.0008	-0.0100	0.0142	0.0006	0.0023
9	0.0000	0.0075	0.0000	0.0007	0.0000	0.0007	-0.0050	0.0105	0.0000	0.0015
13C	0.0000	0.0052	0.0006	0.0007	0.0000	0.0005	-0.0030	0.0181	0.0001	0.0021

TABLE 4C
AIR PARTICULATES
GAMMA SPECTRA - QTR 3
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.107	0.036	0.0006	0.0009	0.0000	0.0022	0.0001	0.0022	0.0000	0.0017
5	0.093	0.032	0.0000	0.0005	0.0000	0.0020	0.0004	0.0018	0.0019	0.0020
6	0.118	0.037	0.0000	0.0005	0.0035	0.0033	-0.0020	0.0025	0.0013	0.0019
7	0.097	0.036	0.0000	0.0005	0.0006	0.0032	0.0000	0.0026	0.0013	0.0021
8	0.126	0.038	0.0002	0.0006	0.0002	0.0024	-0.0010	0.0022	0.0010	0.0022
9	0.088	0.031	0.0000	0.0005	-0.0010	0.0019	0.0013	0.0023	0.0000	0.0006
13C	0.112	0.034	0.0003	0.0009	0.0003	0.0013	0.0009	0.0026	0.0003	0.0020

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.0000	0.0097	0.0000	0.0010	0.0000	0.0007	0.0115	0.0199	0.0000	0.0023
5	0.0066	0.0079	0.0000	0.0005	0.0000	0.0006	0.0000	0.0152	0.0011	0.0020
6	0.0000	0.0068	0.0000	0.0009	0.0000	0.0009	-0.0050	0.0102	0.0003	0.0020
7	-0.0010	0.0067	0.0001	0.0006	0.0000	0.0008	-0.0060	0.0114	0.0000	0.0021
8	0.0021	0.0070	0.0005	0.0008	0.0000	0.0006	-0.0050	0.0099	0.0003	0.0025
9	0.0044	0.0067	0.0000	0.0007	0.0000	0.0008	0.0079	0.0177	0.0000	0.0021
13C	-0.0070	0.0077	0.0000	0.0007	0.0000	0.0007	0.0058	0.0194	0.0008	0.0019

TABLE 4D
AIR PARTICULATES
GAMMA SPECTRA - QTR 4
(PCI/M3)

A N A L Y S E S

LOCATION	BE-7		CO-60		ZR-95		NB-95		RU-103	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	0.071	0.028	0.0000	0.0010	0.0000	0.0015	0.0002	0.0027	0.0000	0.0019
5	0.100	0.032	0.0002	0.0007	0.0000	0.0013	0.0000	0.0022	-0.0010	0.0018
6	0.076	0.033	0.0003	0.0010	0.0000	0.0028	-0.0010	0.0030	0.0006	0.0023
7	0.084	0.033	0.0000	0.0006	0.0022	0.0033	-0.0010	0.0030	0.0005	0.0019
8	0.070	0.025	0.0002	0.0007	0.0004	0.0016	0.0013	0.0022	0.0011	0.0017
9	0.100	0.031	0.0000	0.0004	0.0010	0.0024	0.0000	0.0021	-0.0010	0.0014
13C	0.062	0.035	0.0005	0.0012	0.0000	0.0032	0.0016	0.0050	0.0003	0.0029

LOCATION	RU-106		CS-134		CS-137		BA-140		CE-141	
		(+/-)		(+/-)		(+/-)		(+/-)		(+/-)
4	-0.0030	0.0048	0.0002	0.0009	0.0000	0.0006	0.0088	0.0198	0.0008	0.0021
5	0.0000	0.0036	0.0001	0.0006	0.0000	0.0005	0.0062	0.0207	0.0002	0.0020
6	0.0000	0.0053	0.0003	0.0007	0.0001	0.0006	-0.0100	0.0253	0.0003	0.0025
7	0.0041	0.0077	0.0000	0.0006	0.0003	0.0008	0.0056	0.0187	-0.0010	0.0028
8	-0.0020	0.0063	0.0000	0.0007	0.0000	0.0006	-0.0020	0.0192	0.0000	0.0020
9	0.0000	0.0052	0.0000	0.0006	0.0000	0.0006	-0.0030	0.0184	-0.0010	0.0018
13C	-0.0030	0.0104	0.0000	0.0008	0.0003	0.0007	-0.0090	0.0238	0.0006	0.0031

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TABLE 7
DAIRY MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
19	01/07/98	.	.	.	.	-3.42	4.97	0.1	2.7	0.0	3.6	-1	4	-1.6	4.4
19	02/10/98	.	.	.	.	-0.70	4.21	-1.7	2.2	3.0	2.8	2	3	1.8	4.0
19	03/10/98	0.7	2.8	0.2	0.9	1.04	7.43	-0.1	3.2	-0.6	4.3	1	6	1.0	6.5
19	04/07/98	.	.	.	.	0.61	5.36	1.0	2.9	0.5	3.2	-1	4	-1.4	5.1
19	05/13/98	.	.	.	.	1.75	8.16	1.1	3.1	2.8	3.1	-1	5	-1.6	5.8
19	06/10/98	3.3	2.8	0.6	1.1	-1.62	4.85	0.6	2.5	0.2	3.0	1	4	1.1	4.8
19	07/08/98	.	.	.	.	-1.46	5.23	0.6	2.5	-0.8	3.4	-0	4	-0.1	4.7
19	08/18/98	.	.	.	.	2.57	5.40	-0.2	2.1	1.0	2.9	-2	3	-2.3	3.3
19	09/09/98	-0.3	3.6	0.0	1.0	-0.70	6.76	-1.0	3.1	1.6	3.9	-2	5	-2.0	5.9
19	10/07/98	.	.	.	.	-2.72	7.33	-2.1	3.7	0.4	4.0	-4	4	-5.1	5.2
19	11/10/98	.	.	.	.	1.02	4.58	-0.6	2.1	3.0	3.0	2	4	2.5	4.2
19	12/10/98	-0.5	5.2	1.7	1.0	-3.47	4.79	-1.1	2.2	0.8	2.6	-3	3	-3.3	4.0
20	04/07/98 A	.	.	.	.	0.60	5.74	-1.1	2.8	2.7	3.6	-1	4	-0.6	4.4
20	05/13/98	.	.	.	.	1.56	7.34	-0.2	3.4	4.3	4.7	-2	5	-2.6	5.8
20	06/10/98	6.7	4.7	4.2	1.1	-5.45	4.65	0.4	2.0	5.9	3.5	-1	3	-0.9	3.8
20	07/08/98	.	.	.	.	0.50	4.55	-0.4	2.2	9.3	3.8	2	3	1.8	3.8
20	08/18/98	.	.	.	.	-4.55	5.06	-1.5	2.3	9.1	4.8	1	3	1.5	3.9
20	09/09/98	-1.6	4.0	3.5	1.2	2.77	5.41	-0.1	2.7	8.0	4.0	-3	4	-3.6	4.8
20	10/07/98	.	.	.	.	-5.30	7.42	2.2	3.5	4.7	4.0	-2	6	-2.3	6.4
20	11/10/98 A	-1.4	5.7	4.8	1.1	-3.78	3.90	-0.2	1.7	2.9	3.2	2	3	2.6	4.0
21	01/07/98	.	.	.	.	-3.87	6.29	0.2	2.7	1.4	3.7	1	4	1.3	4.3
21	02/10/98	.	.	.	.	0.70	5.68	-0.9	3.0	-1.2	2.6	-0	3	-0.6	3.8
21	03/10/98	0.9	2.8	1.8	0.9	-6.00	7.90	-1.1	2.3	-1.2	2.8	-4	5	-4.5	5.5
21	04/07/98	.	.	.	.	-2.29	5.69	2.9	2.9	0.0	3.3	0	5	0.2	5.3
21	05/13/98	.	.	.	.	-0.65	7.27	-0.8	2.9	0.0	3.8	3	4	4.0	5.1
21	06/10/98	4.1	4.5	1.2	1.0	3.09	4.50	-2.2	2.2	1.8	2.5	1	3	0.7	3.1
21	07/08/98	.	.	.	.	-0.36	4.68	1.8	2.1	1.2	2.2	1	3	1.0	3.7
21	08/18/98	.	.	.	.	0.28	5.57	-1.5	2.1	1.7	3.2	2	4	2.2	4.8
21	09/09/98	-2.1	4.9	-0.6	1.1	-0.08	6.42	-0.6	3.6	1.1	3.8	1	4	1.5	4.3
21	10/07/98	.	.	.	.	2.15	5.58	-0.5	2.5	-0.2	2.6	-2	3	-2.4	3.9
21	11/10/98	.	.	.	.	1.52	4.12	-1.3	1.6	-0.4	2.0	1	3	0.8	3.1
21	12/10/98	4.8	5.0	1.0	1.0	1.83	4.48	-2.2	6.5	-1.5	2.2	-0	3	-0.2	3.3

A: MILK AND PASTURE GRASS WERE UNAVAILABLE AT LOC. 20 IN JAN, FEB, MAR AND DEC. FEED TAKEN IN DEC.

TABLE 7
DAIRY MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
22C	01/07/98	.	.	.	.	-4.46	9.19	-5.4	3.7	1.6	5.3	3	8	3.0	9.1
22C	02/10/98	.	.	.	.	4.71	5.94	-0.7	2.8	0.5	3.3	1	4	1.5	4.4
22C	03/10/98	2.1	3.0	1.8	0.9	1.85	9.78	-0.3	3.6	-1.1	3.9	4	8	4.1	8.7
22C	04/07/98	.		.	.	-1.03	4.31	-0.2	2.7	2.3	3.0	3	4	3.9	4.4
22C	05/13/98	.		.	.	2.17	7.41	-1.3	3.8	0.6	4.1	3	6	3.2	6.7
22C	06/10/98	3.5	[illegible]	2.5	1.2	0.04	5.13	-1.7	2.2	3.7	2.7	-1	4	-1.2	4.2
22C	07/07/98	.	.	.	.	0.26	5.70	0.7	3.3	0.3	3.3	3	4	3.9	5.1
22C	08/18/98	.	.	.	.	-1.17	5.47	0.3	2.1	0.6	3.0	0	3	0.5	3.4
22C	09/09/98	0.1	4.7	3.4	1.3	0.20	5.80	-1.9	2.6	-0.5	3.4	0	3	0.0	3.6
22C	10/07/98	.	.	.	.	-3.87	6.55	1.6	3.4	0.0	3.5	2	3	1.9	3.7
22C	11/10/98	.	.	.	.	-3.19	3.91	0.4	1.8	2.5	2.1	-2	3	-1.8	3.3
22C	12/10/98	-0.6	4.6	1.9	1.0	-2.13	4.55	1.1	1.9	1.0	2.2	-0	3	-0.5	3.2

A: MILK AND PASTURE GRASS WERE UNAVAILABLE AT LOC. 20 IN JAN, FEB, MAR AND DEC. FEED TAKEN IN DEC.

TABLE 8
GOAT'S MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
23C	03/10/98 A	-0.1	2.7	2.4	0.9	1.57	6.82	1.2	2.6	11.4	4.3	-6	5	-6.8	5.3
23C	04/07/98	.	.	.	.	-3.51	8.15	2.4	4.7	3.1	5.5	3	7	3.7	7.7
23C	05/13/98	.	.	.	.	1.44	6.76	0.2	4.2	9.6	6.6	-3	5	-3.2	5.9
23C	06/10/98	8.6	6.4	0.6	1.0	1.53	4.22	-0.3	2.2	3.0	3.2	-0	3	-0.3	3.8
23C	07/08/98	.	.	.	.	0.13	5.66	-2.5	3.0	3.8	3.4	2	4	2.2	4.7
23C	08/18/98	.	.	.	.	1.18	4.22	-1.8	2.2	2.5	2.6	0	4	0.1	4.1
23C	09/09/98	-2.4	5.6	5.1	1.2	0.70	7.13	1.7	3.6	4.9	6.1	3	6	3.0	6.5
23C	10/07/98 B	-2.3	6.2	3.5	1.1	0.95	5.54	0.7	1.6	7.1	3.0	-1	4	-1.2	4.3
24	03/10/98 D	1.8	3.0	6.4	1.0	-3.39	9.13	-1.8	2.4	5.7	4.4	-6	6	-6.5	6.8
24	04/07/98	.	.	.	.	-0.37	4.88	0.4	2.3	1.3	3.1	-0	4	-0.3	4.5
24	05/13/98	.	.	.	.	-3.55	6.93	1.7	2.7	2.5	4.2	-1	7	-1.3	7.6
24	06/10/98	2.9	4.5	4.6	1.2	4.30	7.56	-0.3	2.9	2.2	3.9	-6	5	-6.8	5.7
24	07/08/98	.	.	.	.	-1.28	4.26	-2.3	2.1	1.5	3.2	-1	3	-1.5	3.8
24	08/18/98	.	.	.	.	-3.37	5.37	0.6	2.3	11.3	5.0	0	3	0.4	3.9
24	09/09/98	4.7	5.8	9.0	1.3	-2.76	5.32	-1.3	3.1	5.5	3.9	1	4	1.1	5.1
24	10/07/98	.	.	.	.	1.00	9.65	1.8	2.2	1.7	3.2	-2	4	-2.1	4.6
24	11/10/98	.	.	.	.	-1.05	4.72	0.3	2.1	4.9	4.3	0	3	0.5	3.7
24	12/10/98	0.8	4.5	8.6	1.4	1.32	6.45	2.1	2.6	3.5	4.4	-3	4	-3.6	4.4

A: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE FROM CONTROL LOC. 23C IN JAN. AND FEB.
B: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE IN NOV AND DEC AT LOC. 23C. FEED SAMPLED INSTEAD.
D: GOAT MILK AND PASTURE GRASS WERE UNAVAILABLE IN JAN AND FEB AT LOC. 24.

TABLE 9
PASTURE GRASS *
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
20	12/10/98 A	0.95	0.33	8.20	0.64	0.12	0.22	-0.006	0.021	0.002	0.022	0.027	0.065
23C	11/10/98 A	1.47	0.43	10.88	1.11	-0.06	0.24	0.001	0.028	0.007	0.026	0.045	0.094
23C	12/10/98 A	0.99	0.33	11.75	0.67	0.15	0.22	-0.013	0.019	-0.002	0.020	0.014	0.066

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
20	12/10/98 A	0.007	0.022	0.054	0.046	0.019	0.038	-0.004	0.029	0.015	0.024	-0.023	0.211
23C	11/10/98 A	-0.009	0.032	0.017	0.081	0.009	0.047	-0.004	0.035	0.021	0.026	-0.077	0.263
23C	12/10/98 A	0.002	0.022	0.081	0.091	-0.024	0.036	-0.019	0.028	-0.001	0.022	-0.060	0.200

LOCATION	COLLECTION DATE	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	CE-141	(+/-)
20	12/10/98 A	0.036	0.069	-0.017	0.022	0.000	0.023	0.012	0.047	0.014	0.054	-0.050	0.050
23C	11/10/98 A	-0.020	0.058	0.001	0.029	0.042	0.031	-0.058	0.046	-0.067	0.053	0.037	0.030
23C	12/10/98 A	-0.018	0.075	-0.024	0.021	0.029	0.022	-0.034	0.049	-0.039	0.056	-0.046	0.049

* SAMPLES TAKEN AS A SUBSTITUTE FOR UNAVAILABLE MILK.
PASTURE GRASS IS REQUIRED AS A SUBSTITUTE DURING THE MONTHS OF APR THROUGH DEC. IF PASTURE GRASS IS UNAVAILABLE, DIRECTIONS SINCE MID-YEAR HAVE BEEN TO SAMPLE SOME OTHER ALTERNATIVE FEED SUPPLY.
A: PASTURE GRASS WAS UNAVAILABLE AS A GOAT MILK SUBSTITUTE,HAY WAS SAMPLED INSTEAD.

TABLE 9
PASTURE GRASS *
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	CE-144	(+/-)	RA-226	(+/-)	TH-228	(+/-)
20	12/10/98 A	0.006	0.097	-0.507	0.808	0.063	0.104
23C	11/10/98 A	0.046	0.107	-0.057	0.732	0.057	0.130
23C	12/10/98 A	0.018	0.093	-1.120	0.745	0.155	0.089

* SAMPLES TAKEN AS A SUBSTITUTE FOR UNAVAILABLE MILK.
PASTURE GRASS IS REQUIRED AS A SUBSTITUTE DURING THE MONTHS OF APR THROUGH DEC. IF PASTURE GRASS IS UNAVAILABLE, DIRECTIONS SINCE MID-YEAR HAVE BEEN TO SAMPLE SOME OTHER ALTERNATIVE FEED SUPPLY.
A: PASTURE GRASS WAS UNAVAILABLE AS A GOAT MILK SUBSTITUTE,HAY WAS SAMPLED INSTEAD.

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)	CO-60	(+/-)	ZN-65	(+/-)
15	01/30/98	-23	35	-9	21	0.6	1.8	0.9	2.0	0.8	5.1	-0.3	2.0	5.0	10.1
15	02/17/98	-3	25	9	15	-1.9	1.4	-0.6	1.6	1.0	4.6	0.5	1.6	8.4	7.9
15	03/12/98	49	34	-8	25	-0.1	2.0	-0.4	2.2	2.1	7.9	0.0	2.4	-3.4	5.2
15	04/13/98	-2	33	14	24	-2.3	2.1	0.9	2.3	2.9	6.0	0.2	2.8	3.7	11.6
15	05/06/98	-32	28	1	25	-0.7	1.7	1.7	2.5	-3.5	6.1	-1.8	2.0	-6.0	5.6
15	06/08/98	37	35	5	17	0.6	1.4	0.7	1.7	-1.0	4.6	-0.1	1.5	0.3	3.5
15	07/13/98	3	42	0	25	0.4	2.4	-2.0	3.0	-4.0	6.8	0.5	3.2	-1.3	5.4
15	08/18/98	-7	32	-12	27	-1.1	2.3	-0.2	2.3	2.6	7.1	-0.7	2.3	4.5	13.4
15	09/04/98	28	27	33	24	-0.9	2.0	-1.5	2.0	1.9	5.0	1.3	2.3	4.6	4.4
15	10/05/98	21	46	-5	31	2.3	3.1	-0.3	3.1	-1.3	9.3	-0.5	3.8	5.2	8.5
15	11/02/98	18	43	3	25	-1.8	2.4	0.7	2.8	-2.7	5.7	-1.3	2.7	-1.0	4.1
15	12/07/98	0	35	12	20	-0.9	1.8	0.9	1.7	0.7	5.0	-0.3	2.1	2.3	4.0
16C	03/12/98	-5	31	17	28	0.5	2.3	-2.2	4.8	-0.6	6.1	1.6	2.4	0.1	16.7
16C	06/08/98	29	29	-20	26	-2.0	2.4	-3.0	2.3	0.6	5.7	0.6	2.3	18.8	17.0
16C	09/04/98	-19	41	5	33	0.4	2.6	-0.8	2.8	5.9	6.5	0.6	3.4	-7.7	16.3
16C	12/07/98	6	23	-1	17	-0.9	1.4	-1.6	1.6	0.1	3.7	-0.7	1.7	4.6	8.8

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)
15	01/30/98	-0.2	3.5	-1.3	2.4	0.0	2.2	9	19	-3	5	-0.9	2.0	-0.5	2.3
15	02/17/98	-1.3	2.3	-2.2	1.8	-0.8	1.7	-6	16	1	3	-0.2	1.5	0.2	1.7
15	03/12/98	-4.6	4.0	0.7	2.7	-1.1	2.5	15	23	3	6	0.9	2.3	0.9	2.3
15	04/13/98	-0.8	4.0	0.4	4.6	-1.6	2.4	3	19	1	4	-3.0	7.2	-0.2	2.5
15	05/06/98	-2.9	4.2	-0.3	2.9	-2.9	2.5	-7	19	-5	7	1.1	2.5	0.7	2.3
15	06/08/98	-0.2	3.1	-0.9	2.1	-0.9	2.0	1	18	0	4	0.4	1.6	2.1	1.8
15	07/13/98	-1.5	5.6	-3.8	3.6	-1.3	2.8	-10	25	1	5	0.2	2.3	-0.3	3.2
15	08/18/98	0.8	3.7	-1.6	4.8	-0.6	2.7	15	22	-2	6	0.5	2.4	1.6	2.8
15	09/04/98	2.1	3.6	-0.6	2.3	0.5	2.3	3	18	4	6	0.3	2.1	1.2	2.5
15	10/05/98	3.4	6.1	-2.1	4.1	-4.0	2.8	3	25	3	6	-0.2	2.3	1.4	2.9
15	11/02/98	-2.7	4.5	-0.5	2.6	-2.0	2.7	-6	25	-1	4	0.4	2.3	1.9	2.8
15	12/07/98	2.6	3.8	-2.1	2.1	-0.5	1.9	9	16	-3	4	-1.3	2.0	0.7	2.2
16C	03/12/98	2.1	4.0	1.4	6.4	-2.6	2.8	-18	20	-1	7	0.9	2.3	-2.4	2.4
16C	06/08/98	-0.2	4.0	-2.4	5.9	-1.3	2.4	1	20	4	5	-1.2	2.1	-1.7	2.4
16C	09/04/98	-0.6	4.0	0.6	7.0	0.7	3.2	-21	23	9	7	-0.2	3.0	-0.2	3.1
16C	12/07/98	1.3	2.5	1.3	3.3	-1.3	1.7	9	13	-1	4	-0.7	1.4	-1.3	1.8

TABLE 10
WELL WATER
(PCI/L)

LOCATION	COLLECTION DATE	BA-140	(+/-)	LA-140	(+/-)	BI-214	(+/-)	TH-228	(+/-)	H-3	(+/-)
15	01/30/98	1	4	0.6	4.2	-18.2	62.6	9.6	7.6	417	222
15	02/17/98	-1	2	-0.9	2.8	-11.2	39.5	3.0	5.8	633	228
15	03/12/98	5	5	5.7	5.6	-60.4	71.7	-1.9	9.4	433	234
15	04/13/98	1	3	0.6	3.4	58.4	61.4	10.0	9.6	420	206
15	05/06/98	-1	5	-1.7	5.7	53.8	83.1	0.0	7.8	614	199
15	06/08/98	0	3	0.3	3.3	1.6	46.1	-4.1	6.2	541	218
15	07/13/98	1	5	0.7	6.0	18.1	71.7	3.2	11.0	358	212
15	08/18/98	3	4	3.0	4.7	40.5	60.2	-3.3	8.5	600	226
15	09/04/98	1	4	1.0	4.2	-53.8	60.0	1.7	8.7	456	182
15	10/05/98	-4	5	-4.9	6.0	73.9	71.7	4.2	14.3	215	184
15	11/02/98	0	4	0.3	4.2	30.1	93.3	5.6	9.9	271	211
15	12/07/98	-2	2	-2.0	2.3	-51.5	68.0	5.0	8.1	231	205
16C	03/12/98	-5	5	-6.0	5.4	-36.7	76.6	4.4	9.0	0	213
16C	06/08/98	3	4	2.9	4.7	-29.8	61.7	-1.2	8.5	50	200
16C	09/04/98	-5	5	-6.1	5.2	148.8	70.4	-11.0	10.8	24	161
16C	12/07/98	2	3	2.3	3.3	18.8	40.7	6.8	5.3	93	201

TABLE 12
FRUITS & VEGETABLES
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
17C	06/22/98	STRAWBERRIES	0.09	0.20	0.88	0.56	0.07	0.22	0.000	0.018	0.004	0.026	0.021	0.080
17C	06/30/98	LETTUCE	0.00	0.20	3.90	0.86	-0.04	0.27	0.001	0.022	-0.001	0.024	0.022	0.085
17C	09/04/98	APPLES	0.07	0.14	0.50	0.33	0.07	0.19	-0.009	0.013	-0.012	0.013	0.004	0.045
17C	09/09/98	SWISS CHARD	0.35	0.24	5.58	0.94	-0.03	0.22	-0.009	0.017	0.016	0.022	0.000	0.067
25	06/22/98	LETTUCE	0.40	0.36	3.43	0.81	-0.11	0.18	-0.002	0.019	-0.002	0.024	0.075	0.085
25	06/22/98	STRAWBERRIES	0.05	0.17	1.81	0.76	-0.06	0.21	0.004	0.024	0.006	0.017	-0.072	0.090
25	09/04/98	BROCCOLI	0.51	0.24	4.05	0.71	-0.06	0.09	-0.007	0.012	0.005	0.013	-0.042	0.045
25	09/04/98	APPLES	0.05	0.21	0.89	0.49	-0.02	0.24	-0.018	0.022	-0.006	0.024	-0.031	0.048

LOCATION	COLLECTION DATE	TYPE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
17C	06/22/98	STRAWBERRIES	0.003	0.024	-0.023	0.053	0.001	0.042	0.009	0.026	-0.014	0.017	-0.022	0.173
17C	06/30/98	LETTUCE	-0.018	0.029	-0.021	0.053	-0.028	0.048	-0.011	0.031	-0.015	0.023	0.061	0.176
17C	09/04/98	APPLES	-0.003	0.016	0.017	0.036	0.002	0.028	0.017	0.037	0.017	0.019	0.051	0.147
17C	09/09/98	SWISS CHARD	-0.003	0.028	0.008	0.050	-0.001	0.037	0.010	0.025	-0.009	0.023	0.034	0.182
25	06/22/98	LETTUCE	0.005	0.020	0.020	0.052	0.022	0.034	0.006	0.030	0.012	0.027	-0.115	0.221
25	06/22/98	STRAWBERRIES	0.024	0.030	-0.009	0.055	0.003	0.034	0.014	0.026	0.013	0.025	0.207	0.242
25	09/04/98	BROCCOLI	0.006	0.014	-0.003	0.040	0.016	0.022	0.001	0.012	0.001	0.011	-0.014	0.109
25	09/04/98	APPLES	0.000	0.016	-0.017	0.046	0.008	0.041	0.017	0.059	-0.002	0.024	-0.121	0.177

TABLE 12
FRUITS & VEGETABLES
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	CE-141	(+/-)
17C	06/22/98	STRAWBERRIES	0.051	0.040	-0.011	0.022	0.011	0.025	0.005	0.035	0.006	0.040	-0.003	0.028
17C	06/30/98	LETTUCE	0.002	0.084	-0.019	0.020	-0.009	0.023	-0.027	0.047	-0.031	0.054	-0.033	0.032
17C	09/04/98	APPLES	-0.020	0.076	0.006	0.016	0.002	0.018	0.024	0.047	0.027	0.054	-0.031	0.031
17C	09/09/98	SWISS CHARD	0.035	0.079	-0.008	0.019	-0.012	0.026	-0.055	0.049	-0.064	0.057	0.002	0.032
25	06/22/98	LETTUCE	0.008	0.043	0.016	0.028	0.008	0.023	0.030	0.031	0.034	0.036	0.001	0.037
25	06/22/98	STRAWBERRIES	-0.009	0.040	-0.012	0.025	-0.001	0.018	-0.008	0.043	-0.010	0.050	0.005	0.026
25	09/04/98	BROCCOLI	-0.001	0.024	-0.004	0.012	0.003	0.013	-0.006	0.011	-0.007	0.013	-0.004	0.013
25	09/04/98	APPLES	-0.017	0.111	0.002	0.025	-0.021	0.027	0.037	0.070	0.042	0.080	-0.032	0.042

LOCATION	COLLECTION DATE	TYPE	CE-144	(+/-)	RA-226	(+/-)	TH-228	(+/-)
17C	06/22/98	STRAWBERRIES	0.131	0.110	-0.106	0.760	-0.024	0.091
17C	06/30/98	LETTUCE	0.018	0.109	0.463	0.696	0.034	0.106
17C	09/04/98	APPLES	-0.046	0.077	0.384	0.642	0.007	0.062
17C	09/09/98	SWISS CHARD	0.046	0.094	0.767	0.673	-0.006	0.093
25	06/22/98	LETTUCE	-0.036	0.128	-0.089	0.940	-0.001	0.093
25	06/22/98	STRAWBERRIES	-0.026	0.094	0.221	0.564	-0.012	0.100
25	09/04/98	BROCCOLI	-0.022	0.039	-0.071	0.189	0.133	0.073
25	09/04/98	APPLES	0.015	0.118	-0.031	0.493	-0.006	0.086

TABLE 13
BROADLEAF VEGETATION
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
6	04/27/98	1.37	0.16	3.82	0.37	-0.01	0.06	-0.006	0.005	-0.003	0.006	-0.017	0.024
6	05/20/98	1.00	0.25	2.45	0.56	-0.11	0.15	0.005	0.015	-0.010	0.017	0.015	0.057
6	06/22/98	0.56	0.13	1.40	0.25	-0.08	0.08	0.000	0.007	-0.002	0.008	0.013	0.029
6	07/20/98	1.12	0.16	3.11	0.33	0.00	0.09	-0.010	0.009	-0.006	0.009	-0.010	0.031
6	08/24/98	1.29	0.47	2.93	0.77	0.02	0.26	-0.031	0.025	-0.014	0.024	0.017	0.068
6	09/14/98	0.61	0.26	4.79	0.70	-0.04	0.19	0.007	0.020	0.009	0.020	-0.068	0.061
6	10/07/98	1.28	0.31	6.50	0.71	0.19	0.21	0.020	0.021	0.003	0.022	-0.033	0.075
18	05/20/98	0.45	0.17	3.08	0.49	-0.04	0.14	-0.004	0.012	-0.006	0.013	-0.042	0.044
18	06/22/98	0.39	0.10	0.72	0.19	-0.01	0.05	0.000	0.006	0.001	0.006	0.000	0.021
18	07/20/98	1.46	0.18	2.12	0.29	0.03	0.09	0.002	0.008	-0.004	0.009	0.023	0.029
18	08/24/98	2.41	0.47	3.14	0.79	-0.02	0.22	0.006	0.022	0.014	0.027	-0.038	0.057
18	09/14/98	1.81	0.48	2.71	0.87	0.05	0.22	0.010	0.031	-0.019	0.023	-0.030	0.082
18	10/07/98	1.82	0.20	3.02	0.33	0.00	0.11	-0.003	0.011	-0.004	0.011	0.002	0.035

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
6	04/27/98	0.001	0.008	-0.017	0.018	-0.003	0.010	0.005	0.008	0.000	0.007	-0.057	0.058
6	05/20/98	0.000	0.014	-0.034	0.034	0.006	0.029	0.007	0.031	-0.001	0.015	0.113	0.139
6	06/22/98	0.005	0.007	0.007	0.023	0.005	0.014	-0.004	0.009	0.002	0.008	-0.004	0.068
6	07/20/98	0.000	0.011	-0.008	0.021	0.004	0.017	0.000	0.012	0.001	0.010	0.050	0.087
6	08/24/98	-0.012	0.026	0.042	0.132	0.017	0.049	-0.005	0.033	-0.004	0.027	0.184	0.239
6	09/14/98	0.001	0.022	-0.002	0.043	-0.015	0.030	0.020	0.027	0.006	0.020	-0.055	0.184
6	10/07/98	0.009	0.027	-0.041	0.056	-0.020	0.041	0.007	0.029	0.005	0.023	0.232	0.210
18	05/20/98	0.005	0.014	-0.014	0.032	-0.019	0.024	-0.001	0.020	0.009	0.014	-0.071	0.135
18	06/22/98	0.000	0.007	-0.009	0.014	0.005	0.011	-0.001	0.008	0.003	0.006	-0.027	0.057
18	07/20/98	0.000	0.010	-0.005	0.022	0.000	0.016	-0.006	0.011	-0.006	0.009	0.017	0.085
18	08/24/98	0.009	0.028	0.039	0.055	-0.012	0.044	0.007	0.030	-0.018	0.028	-0.065	0.239
18	09/14/98	-0.012	0.034	0.021	0.062	0.029	0.060	-0.034	0.030	0.000	0.029	0.020	0.227
18	10/07/98	0.002	0.011	0.019	0.024	0.012	0.019	0.013	0.020	-0.004	0.012	-0.058	0.108

TABLE 13
BROADLEAF VEGETATION
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	CE-141	(+/-)
6	04/27/98	-0.005	0.018	0.000	0.005	-0.007	0.007	0.002	0.013	0.003	0.014	0.000	0.007
6	05/20/98	0.005	0.073	0.003	0.013	0.005	0.013	0.008	0.043	0.009	0.050	-0.007	0.020
6	06/22/98	-0.009	0.031	-0.005	0.008	-0.002	0.009	0.011	0.021	0.012	0.024	0.005	0.013
6	07/20/98	-0.015	0.033	-0.002	0.010	0.015	0.011	-0.009	0.025	-0.011	0.029	0.005	0.012
6	08/24/98	0.002	0.051	0.028	0.029	-0.006	0.032	-0.009	0.042	-0.010	0.048	-0.040	0.036
6	09/14/98	-0.035	0.066	-0.009	0.020	0.001	0.020	0.031	0.033	0.035	0.038	0.031	0.028
6	10/07/98	0.021	0.063	-0.009	0.022	-0.018	0.024	0.007	0.051	0.008	0.059	0.006	0.027
18	05/20/98	0.056	0.076	-0.011	0.014	0.013	0.016	-0.010	0.039	-0.011	0.045	0.024	0.024
18	06/22/98	-0.004	0.021	0.002	0.006	0.004	0.007	0.000	0.015	-0.001	0.017	0.001	0.007
18	07/20/98	0.013	0.035	0.001	0.008	0.092	0.018	-0.009	0.025	-0.010	0.028	-0.001	0.011
18	08/24/98	-0.006	0.046	0.002	0.028	0.054	0.035	-0.019	0.052	-0.022	0.060	-0.022	0.035
18	09/14/98	-0.079	0.061	0.002	0.024	-0.024	0.031	-0.025	0.058	-0.029	0.067	-0.004	0.031
18	10/07/98	0.001	0.032	0.011	0.027	0.053	0.020	-0.006	0.023	-0.007	0.027	-0.036	0.018

LOCATION	COLLECTION DATE	CE-144	(+/-)	RA-226	(+/-)	TH-228	(+/-)
6	04/27/98	-0.003	0.023	0.125	0.177	-0.007	0.027
6	05/20/98	0.001	0.055	-0.022	0.371	0.033	0.073
6	06/22/98	-0.026	0.034	-0.019	0.263	0.056	0.038
6	07/20/98	-0.013	0.034	0.128	0.256	0.058	0.051
6	08/24/98	-0.075	0.129	-0.929	0.933	0.096	0.143
6	09/14/98	0.037	0.085	-0.275	0.654	0.257	0.083
6	10/07/98	-0.026	0.082	0.457	0.607	-0.105	0.096
18	05/20/98	0.012	0.059	-0.073	0.459	0.028	0.058
18	06/22/98	0.006	0.020	0.176	0.092	0.027	0.035
18	07/20/98	-0.015	0.034	-0.083	0.235	-0.004	0.033
18	08/24/98	0.048	0.120	0.176	0.895	0.042	0.100
18	09/14/98	0.037	0.106	0.222	0.746	0.005	0.103
18	10/07/98	0.000	0.050	-0.208	0.415	0.041	0.047

TABLE 14
RIVER WATER
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)	CO-60	(+/-)
28	02/02/98	-13	26	-20	44	0.3	1.5	-0.2	2.1	-1.2	7.1	0.0	1.5
28	05/04/98	-31	25	-26	44	0.2	1.5	0.9	2.3	-1.1	8.6	-0.1	1.3
28	08/03/98	-9	32	-23	57	1.6	1.9	-0.9	2.7	-1.3	9.9	-0.1	1.9
28	11/02/98	-12	10	19	16	-0.3	0.5	-1.0	0.8	-1.2	2.9	0.1	0.6
30C	01/26/98	12	20	-1	14	0.4	1.0	-0.3	1.3	2.1	3.2	-0.2	1.1
30C	04/27/98	72	44	-31	30	-0.2	2.3	-1.7	2.2	-3.8	7.9	0.3	2.2
30C	07/23/98	-16	21	-6	21	-0.0	1.2	-0.1	1.4	-0.5	4.7	0.0	1.2
30C	10/22/98	3	32	-6	22	-0.2	1.3	-0.4	1.4	-2.4	4.8	0.2	1.3

LOCATION	COLLECTION DATE	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)	I-131	(+/-)
28	02/02/98	-0.5	5.5	5.3	3.9	1.8	3.2	-4.8	3.4	13	15	16	113
28	05/04/98	1.4	3.7	-4.0	3.9	1.7	3.8	0.2	3.3	13	15	31	122
28	08/03/98	-1.3	4.1	0.5	3.9	-1.6	5.0	-3.4	4.2	-9	18	56	163
28	11/02/98	-0.6	1.3	-1.3	1.5	0.1	1.4	1.0	1.5	-1	5	20	56
30C	01/26/98	0.8	2.2	0.4	2.1	0.2	1.5	-1.9	1.4	9	11	-3	7
30C	04/27/98	1.3	6.0	-1.0	3.3	1.7	3.6	2.5	3.1	2	20	11	20
30C	07/23/98	-1.2	6.0	-0.3	2.7	0.2	2.1	-1.4	2.0	-1	13	7	12
30C	10/22/98	4.8	5.3	1.0	3.2	0.9	2.1	-0.7	2.1	-2	12	-6	14

TABLE 14
RIVER WATER
(PCI/L)

LOCATION	COLLECTION DATE	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)	RA-226	(+/-)	TH-228	(+/-)
28	02/02/98	-0.6	1.5	-0.5	1.4	-7	25	-9	28	5.7	68.0	3.4	6.1
28	05/04/98	0.2	1.4	0.1	1.5	-8	24	-10	28	-57.1	50.5	1.5	5.8
28	08/03/98	-0.7	2.0	-0.2	2.0	-6	25	-7	29	-21.0	86.5	3.5	8.8
28	11/02/98	-0.2	0.5	-0.0	0.6	-11	11	-12	12	-7.2	19.9	1.4	2.6
30C	01/26/98	-0.7	1.0	-1.0	1.1	-2	4	-3	4	-2.3	37.1	-0.9	3.7
30C	04/27/98	0.2	2	1.6	2.3	6	10	6	11	70.3	46.6	7.3	8.7
30C	07/23/98	0.1	1	-0.8	1.2	3	6	3	6	-48.8	58.0	-2.3	5.0
30C	10/22/98	0.8	1.5	0.1	1.6	-3	6	-4	7	-38.4	50.0	3.9	5.4

LOCATION	COLLECTION DATE	H-3	(+/-)
28	02/02/98	184	471
28	05/04/98	177	427
28	08/03/98	357	480
28	11/02/98	379	470
30C	01/26/98	-58	477
30C	04/27/98	-342	462
30C	07/23/98	-97	404
30C	10/22/98	-49	442

TABLE 15
BOTTOM SEDIMENT
(PCI/G DRY WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
28	03/17/98	0.78	0.36	8.9	1.5	-0.06	0.22	-0.02	0.03	0.00	0.03	0.02	0.09
28	09/04/98	0.10	0.40	9.0	1.9	0.41	0.41	0.01	0.04	0.01	0.04	-0.04	0.11
29	03/17/98	0.36	0.30	9.4	1.4	-0.05	0.26	0.01	0.03	-0.02	0.03	0.04	0.10
29	09/04/98	0.11	0.50	11.5	2.3	0.20	0.57	0.02	0.06	0.01	0.04	-0.14	0.14
30C	03/17/98	-0.05	0.19	8.1	1.1	0.12	0.19	0.02	0.02	-0.01	0.02	0.03	0.05
30C	09/04/98	0.56	0.67	13.6	2.1	-0.02	0.48	-0.02	0.04	0.02	0.04	-0.00	0.14

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
28	03/17/98	0.01	0.03	0.02	0.17	-0.03	0.05	-0.01	0.04	0.01	0.03	0.06	0.21
28	09/04/98	-0.05	0.05	-0.05	0.07	-0.05	0.09	-0.03	0.06	-0.01	0.04	-0.14	0.29
29	03/17/98	0.02	0.03	-0.04	0.07	0.06	0.05	-0.02	0.04	-0.01	0.03	0.06	0.27
29	09/04/98	0.04	0.05	0.06	0.11	0.04	0.08	0.03	0.06	-0.03	0.05	0.12	0.48
30C	03/17/98	0.00	0.03	0.03	0.13	-0.01	0.04	-0.03	0.02	0.01	0.03	0.12	0.25
30C	09/04/98	0.03	0.05	0.06	0.27	-0.03	0.09	-0.06	0.06	0.01	0.04	0.04	0.43

TABLE 15
BOTTOM SEDIMENT
(PCI/G DRY WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
28	03/17/98	0.78	0.36	8.9	1.5	-0.06	0.22	-0.02	0.03	0.00	0.03	0.02	0.09
28	09/04/98	0.10	0.40	9.0	1.9	0.41	0.41	0.01	0.04	0.01	0.04	-0.04	0.11
29	03/17/98	0.36	0.30	9.4	1.4	-0.05	0.26	0.01	0.03	-0.02	0.03	0.04	0.10
29	09/04/98	0.11	0.50	11.5	2.3	0.20	0.57	0.02	0.06	0.01	0.04	-0.14	0.14
30C	03/17/98	-0.05	0.19	8.1	1.1	0.12	0.19	0.02	0.02	-0.01	0.02	0.03	0.05
30C	09/04/98	0.36	0.67	13.6	2.1	-0.02	0.48	-0.02	0.04	0.02	0.04	-0.00	0.14

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
28	03/17/98	0.01	0.03	0.02	0.17	-0.03	0.05	-0.01	0.04	0.01	0.03	0.06	0.21
28	09/04/98	-0.05	0.05	-0.05	0.07	-0.05	0.09	-0.03	0.06	-0.01	0.04	-0.14	0.29
29	03/17/98	0.02	0.03	-0.04	0.07	0.06	0.05	-0.02	0.04	-0.01	0.03	0.06	0.27
29	09/04/98	0.04	0.05	0.06	0.11	0.04	0.08	0.03	0.06	-0.03	0.05	0.12	0.48
30C	03/17/98	0.00	0.03	0.03	0.13	-0.01	0.04	-0.03	0.02	0.01	0.03	0.12	0.25
30C	09/04/98	0.03	0.05	0.06	0.27	-0.03	0.09	-0.06	0.06	0.01	0.04	0.04	0.43

TABLE 15
BOTTOM SEDIMENT
(PCI/G DRY WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
28	03/17/98	-0.00	0.03	0.00	0.04	-0.01	0.03	0.06	0.04	0.97	0.87	0.69	0.16
28	09/04/98	-0.04	0.05	-0.06	0.10	-0.00	0.04	0.07	0.06	1.04	0.83	0.62	0.20
29	03/17/98	-0.04	0.05	-0.01	0.04	0.00	0 03	0.08	0.04	2.24	1.29	0.61	0.18
29	09/04/98	0.02	0.06	-0.07	0.14	0.01	0.05	0.16	0.11	1.82	1.97	0.57	0.27
30C	03/17/98	-0.00	0.03	-0.00	0.03	0.01	0.02	0.04	0.04	0.76	0.99	0.42	0.11
30C	09/04/98	0.03	0.05	-0.02	0.11	0.01	0.04	0.16	0.08	1.22	1.37	0.88	0.24

TABLE 16
SHELLFISH
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
27C	02/04/98	-.042	0.166	0.3	0.4	-.019	0.198	0.007	0.015	-.004	0.016	0.008	0.060
27C	05/12/98	0.031	0.128	0.3	0.4	-.001	0.165	0.005	0.015	-.011	0.015	0.000	0.037
27C	08/10/98	-.142	0.184	0.4	0.5	-.056	0.231	-.008	0.022	0.009	0.026	-.016	0.051
27C	11/06/98	-.209	0.241	0.1	0.5	-.023	0.302	0.007	0.027	0.018	0.027	-.041	0.084
28X	02/04/98	0.174	0.205	0.1	0.4	0.167	0.280	0.033	0.030	0.004	0.025	-.005	0.076
28X	05/12/98	0.126	0.200	0.3	0.5	-.158	0.182	0.001	0.022	0.004	0.021	0.014	0.051
28X	08/10/98	0.062	0.150	0.4	0.4	-.107	0.163	0.011	0.017	-.007	0.017	-.024	0.044
28X	11/06/98	-.043	0.203	-0.1	0.3	-.071	0.259	-.007	0.019	0.006	0.026	-.008	0.054
31	02/04/98	0.072	0.243	0.1	0.4	0.023	0.250	-.021	0.021	0.001	0.019	0.035	0.074
31	05/12/98	-.086	0.142	0.3	0.3	0.181	0.170	0.000	0.019	-.020	0.015	0.048	0.051
31	08/10/98	-.022	0.166	0.3	0.4	-.027	0.199	0.006	0.017	-.006	0.019	0.000	0.059
31	11/06/98	0.028	0.282	-0.1	0.4	0.247	0.324	0.006	0.025	-.026	0.025	-.032	0.091

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
27C	02/04/98	0.005	0.012	0.000	0.035	-.010	0.029	-.004	0.023	-.023	0.022	0.097	0.159
27C	05/12/98	0.003	0.016	0.043	0.097	-.003	0.028	-.006	0.022	0.006	0.015	-.094	0.167
27C	08/10/98	-.006	0.019	-.052	0.062	0.027	0.053	-.013	0.021	-.003	0.027	-.023	0.246
27C	11/06/98	-.004	0.020	-.011	0.048	0.013	0.051	-.007	0.036	0.035	0.033	0.291	0.284
28X	02/04/98	-.016	0.021	-.034	0.052	0.026	0.039	-.008	0.030	-.019	0.027	0.055	0.278
28X	05/12/98	-.001	0.023	-.042	0.034	-.002	0.035	0.000	0.024	0.011	0.022	0.067	0.215
28X	08/10/98	0.003	0.015	-.015	0.043	-.004	0.032	0.012	0.038	0.005	0.019	0.113	0.163
28X	11/06/98	0.019	0.029	-.020	0.038	0.004	0.046	-.003	0.034	-.009	0.025	0.165	0.310
31	02/04/98	-.022	0.023	-.022	0.057	-.007	0.030	0.006	0.037	0.002	0.026	-.210	0.248
31	05/12/98	-.004	0.016	-.046	0.092	0.013	0.033	0.012	0.034	0.015	0.019	0.036	0.201
31	08/10/98	0.009	0.025	0.000	0.049	-.012	0.031	-.007	0.024	-.003	0.021	0.137	0.194
31	11/06/98	0.000	0.036	0.027	0.070	-.002	0.035	-.007	0.042	-.006	0.030	0.083	0.290

TABLE 16
SHELLFISH
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
27C	02/04/98	0.002	0.027	-.010	0.050	0.012	0.019	0.007	0.016	0.000	0.648	0.180	0.099
27C	05/12/98	0.006	0.021	-.008	0.029	-.007	0.016	-.005	0.022	0.307	0.522	0.088	0.086
27C	08/10/98	0.008	0.028	0.040	0.053	-.002	0.020	-.002	0.027	0.196	0.808	0.175	0.119
27C	11/06/98	0.013	0.046	0.006	0.085	-.044	0.035	0.004	0.025	0.273	0.849	0.234	0.202
28X	02/04/98	-.022	0.029	0.016	0.081	-.012	0.028	-.009	0.032	-.256	0.699	0.185	0.130
28X	05/12/98	0.003	0.032	0.022	0.041	-.007	0.024	-.013	0.018	0.803	0.493	0.149	0.123
28X	08/10/98	0.003	0.031	0.002	0.032	-.017	0.017	0.023	0.020	0.450	0.682	0.208	0.100
28X	11/06/98	-.004	0.031	-.016	0.075	0.000	0.025	0.005	0.029	0.071	0.557	0.121	0.114
31	02/04/98	-.014	0.026	0.020	0.063	-.016	0.024	-.007	0.020	0.098	0.581	0.087	0.163
31	05/12/98	0.001	0.016	-.008	0.028	-.010	0.018	-.006	0.018	0.015	0.448	0.093	0.098
31	08/10/98	0.003	0.023	0.005	0.046	0.010	0.019	-.018	0.019	0.331	0.762	0.251	0.130
31	11/06/98	-.001	0.028	-.041	0.073	0.004	0.031	0.005	0.038	0.170	0.696	0.319	0.214

TABLE 17A
FISH-BULLHEADS
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
26	01/07/98	0.030	0.155	3.3	1.0	0.290	0.242	-.027	0.025	0.011	0.021	0.006	0.068
26	04/10/98	-.003	0.122	3.4	0.6	0.059	0.147	0.006	0.013	0.000	0.016	-.022	0.052
26	07/02/98	-.128	0.172	3.0	0.7	0.073	0.212	-.008	0.017	-.007	0.016	-.034	0.049
26	10/09/98	0.041	0.150	3.6	0.7	0.124	0.230	-.011	0.015	0.002	0.017	0.023	0.054
29	01/07/98	-.012	0.114	3.5	0.6	0.116	0.127	0.003	0.013	-.013	0.011	-.012	0.041
29	04/10/98	-.056	0.142	3.5	0.7	-.147	0.196	0.001	0.018	0.005	0.022	-.036	0.061
29	07/02/98	0.166	0.184	2.7	0.9	0.017	0.212	0.019	0.023	0.009	0.023	-.050	0.065
29	10/09/98	0.114	0.147	3.4	0.7	-.025	0.202	0.012	0.021	-.003	0.023	0.010	0.070
30C	01/08/98	-.027	0.164	3.0	0.7	-.114	0.136	0.001	0.018	-.003	0.015	-.039	0.048
30C	04/13/98	-.121	0.168	3.3	0.9	0.032	0.187	0.008	0.018	-.006	0.023	-.029	0.061
30C	07/06/98	-.087	0.170	4.2	0.8	-.087	0.191	-.002	0.016	-.006	0.017	-.001	0.052
30C	10/09/98	0.102	0.180	3.2	0.9	0.029	0.312	-.014	0.021	0.000	0.025	-.003	0.095

LOCATION	COLLECTION DATE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
26	01/07/98	0.014	0.031	0.020	0.077	-.006	0.041	0.008	0.026	0.007	0.024	0.241	0.209
26	04/10/98	0.002	0.017	-.022	0.035	0.018	0.028	0.004	0.020	0.011	0.014	-.050	0.155
26	07/02/98	-.001	0.020	0.013	0.048	-.005	0.028	0.013	0.021	0.013	0.022	0.071	0.173
26	10/09/98	-.008	0.021	-.033	0.044	-.008	0.035	-.005	0.023	-.003	0.019	0.116	0.174
29	01/07/98	0.006	0.010	0.014	0.029	0.030	0.024	0.001	0.015	0.013	0.013	0.024	0.123
29	04/10/98	0.000	0.018	-.052	0.119	-.020	0.034	-.005	0.048	-.009	0.020	0.015	0.166
29	07/02/98	0.016	0.024	-.020	0.051	-.021	0.040	-.010	0.033	0.011	0.023	0.134	0.210
29	10/09/98	0.012	0.024	-.040	0.046	0.004	0.040	-.020	0.031	0.008	0.022	-.015	0.192
30C	01/08/98	-.022	0.021	-.011	0.033	0.009	0.032	-.004	0.018	0.008	0.018	0.017	0.190
30C	04/13/98	-.009	0.014	-.019	0.053	0.026	0.043	-.009	0.025	0.006	0.019	0.110	0.210
30C	07/06/98	0.000	0.020	-.023	0.041	0.000	0.036	0.019	0.023	0.002	0.016	-.103	0.201
30C	10/09/98	0.005	0.029	-.043	0.075	-.011	0.052	-.027	0.036	0.021	0.028	-.051	0.242

TABLE 17A
FISH-BULLHEADS
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
26	01/07/98	0.018	0.035	0.014	0.043	0.000	0.025	0.004	0.030	0.523	0.443	0.043	0.105
26	04/10/98	-.010	0.019	-.023	0.033	-.010	0.016	0.027	0.020	0.295	0.465	-.012	0.060
26	07/02/98	0.007	0.026	0.024	0.054	0.018	0.018	0.023	0.024	0.272	0.800	-.031	0.094
26	10/09/98	-.014	0.027	-.061	0.087	0.000	0.015	0.015	0.020	0.324	0.313	0.033	0.075
29	01/07/98	0.006	0.017	0.022	0.025	0.010	0.016	0.020	0.019	0.145	0.482	-.024	0.049
29	04/10/98	0.011	0.030	-.016	0.054	0.002	0.021	-.007	0.024	-.289	0.729	0.033	0.098
29	07/02/98	0.019	0.030	0.002	0.062	-.007	0.016	0.015	0.026	-.168	0.468	0.030	0.097
29	10/09/98	-.021	0.024	-.037	0.082	-.008	0.017	0.025	0.024	0.663	0.331	0.001	0.086
30C	01/08/98	-.012	0.025	-.021	0.032	0.007	0.020	0.024	0.018	-.773	0.671	0.000	0.074
30C	04/13/98	-.026	0.019	-.018	0.032	-.018	0.019	0.029	0.027	0.524	0.701	0.046	0.086
30C	07/06/98	0.012	0.027	0.025	0.044	-.003	0.018	0.020	0.026	-.125	0.421	-.006	0.087
30C	10/09/98	0.000	0.031	-.025	0.146	-.005	0.024	0.018	0.028	0.563	0.457	-.009	0.101

TABLE 17B
FISH-OTHER
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	BE-7	(+/-)	K-40	(+/-)	CR-51	(+/-)	MN-54	(+/-)	CO-58	(+/-)	FE-59	(+/-)
26	01/26/98 A	OTHER	-0.06	0.25	3.50	0.94	0.09	0.35	0.002	0.023	0.002	0.032	-0.072	0.099
26	04/10/98	BASS	-0.10	0.16	3.91	0.72	-0.04	0.14	0.018	0.021	0.001	0.022	-0.007	0.045
26	07/02/98	BASS	0.05	0.19	3.99	0.87	0.14	0.19	-0.021	0.020	-0.008	0.017	0.011	0.079
26	10/09/98	PERCH	-0.07	0.24	3.67	1.20	0.11	0.34	0.011	0.029	-0.015	0.029	0.000	0.107
29	01/06/98	PERCH	-0.04	0.18	3.59	0.84	0.13	0.15	0.004	0.018	-0.002	0.022	0.018	0.071
29	04/10/98	CARP	-0.07	0.14	2.60	0.64	0.01	0.17	0.006	0.020	0.000	0.018	0.034	0.036
29	07/02/98	BASS	-0.04	0.18	3.80	0.93	0.06	0.25	0.004	0.022	0.011	0.030	-0.035	0.084
29	10/09/98	CARP	-0.02	0.23	3.03	0.89	0.03	0.37	0.001	0.032	0.004	0.030	-0.004	0.071
30C	01/08/98	CARP	-0.06	0.09	2.62	0.56	-0.12	0.12	-0.010	0.017	-0.009	0.012	-0.010	0.040
30C	04/13/98	BASS	0.11	0.13	3.37	0.73	0.01	0.15	0.006	0.017	-0.006	0.017	0.021	0.056
30C	07/06/98	BASS	-0.06	0.18	3.69	0.89	0.02	0.20	0.010	0.023	0.016	0.025	-0.102	0.070
30C	10/09/98	BASS	0.04	0.22	3.98	1.06	-0.14	0.28	0.007	0.024	0.019	0.034	0.013	0.088

LOCATION	COLLECTION DATE	TYPE	CO-60	(+/-)	ZN-65	(+/-)	ZR-95	(+/-)	NB-95	(+/-)	RU-103	(+/-)	RU-106	(+/-)
26	01/26/98 A	OTHER	0.018	0.034	0.024	0.061	0.021	0.057	-0.015	0.034	-0.001	0.031	-0.024	0.212
26	04/10/98	BASS	0.010	0.021	0.039	0.136	0.000	0.036	-0.016	0.043	-0.013	0.019	0.031	0.190
26	07/02/98	BASS	0.019	0.025	-0.043	0.065	0.010	0.040	0.002	0.027	-0.011	0.020	0.079	0.203
26	10/09/98	PERCH	0.019	0.043	-0.028	0.054	-0.008	0.084	-0.007	0.045	-0.025	0.045	-0.035	0.347
29	01/06/98	PERCH	-0.019	0.026	0.004	0.050	-0.007	0.043	0.003	0.026	0.014	0.019	0.043	0.209
29	04/10/98	CARP	0.003	0.021	-0.003	0.042	0.002	0.027	-0.015	0.022	-0.002	0.017	0.080	0.199
29	07/02/98	BASS	0.014	0.025	-0.020	0.073	0.006	0.047	-0.020	0.051	0.002	0.023	0.000	0.248
29	10/09/98	CARP	0.012	0.021	-0.030	0.051	-0.016	0.058	0.008	0.035	0.005	0.031	-0.066	0.281
30C	01/08/98	CARP	0.004	0.015	-0.017	0.032	-0.012	0.028	-0.009	0.016	0.005	0.012	-0.029	0.133
30C	04/13/98	BASS	0.011	0.018	0.001	0.040	0.011	0.031	-0.009	0.018	0.006	0.015	0.119	0.169
30C	07/06/98	BASS	0.000	0.027	-0.053	0.058	0.032	0.044	0.007	0.024	0.002	0.022	0.187	0.199
30C	10/09/98	BASS	0.037	0.038	-0.026	0.064	0.022	0.042	-0.020	0.035	-0.001	0.027	0.059	0.250

A: SAMPLE OF PIKE AND BASS.

TABLE 17B
FISH-OTHER
(PCI/G WET WT.)

LOCATION	COLLECTION DATE	TYPE	AG-110M	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	RA-226	(+/-)	TH-228	(+/-)
26	01/26/98 A	OTHER	-0.012	0.028	-0.065	0.148	-0.002	0.022	0.009	0.032	-0.052	0.684	-0.007	0.109
26	04/10/98	BASS	-0.008	0.026	-0.008	0.044	-0.009	0.021	-0.012	0.028	0.356	0.704	0.018	0.076
26	07/02/98	BASS	-0.017	0.026	0.030	0.057	0.000	0.022	0.040	0.033	-0.042	0.408	0.002	0.086
26	10/09/98	PERCH	-0.012	0.040	0.061	0.169	0.001	0.029	-0.003	0.038	-0.074	0.718	0.065	0.150
29	01/06/98	PERCH	0.016	0.024	0.000	0.032	0.007	0.016	0.026	0.036	-0.207	0.445	0.063	0.103
29	04/10/98	CARP	-0.007	0.020	-0.008	0.044	-0.020	0.016	0.014	0.022	-0.298	0.450	-0.013	0.075
29	07/02/98	BASS	0.004	0.030	0.031	0.082	-0.009	0.026	-0.002	0.028	0.143	0.708	0.020	0.112
29	10/09/98	CARP	0.019	0.034	-0.063	0.175	-0.016	0.028	0.034	0.030	0.143	0.545	0.052	0.095
30C	01/08/98	CARP	0.008	0.021	-0.014	0.023	0.002	0.017	0.025	0.025	-0.222	0.332	-0.018	0.047
30C	04/13/98	BASS	-0.002	0.019	0.022	0.032	0.014	0.017	-0.008	0.019	0.037	0.320	-0.001	0.061
30C	07/06/98	BASS	-0.026	0.024	0.022	0.050	-0.020	0.022	0.011	0.025	0.559	0.408	-0.021	0.083
30C	10/09/98	BASS	-0.017	0.035	0.146	0.176	0.003	0.022	0.003	0.027	0.679	0.467	-0.023	0.088

A: SAMPLE OF PIKE AND BASS.

4. DISCUSSION OF RESULTS

This section summarizes the results of the analyses of environmental media sampled. NNECO has carefully examined the data throughout the year and has presented in this section all cases where station related radioactivity could be detected and compared the results with previous environmental surveillance data. The only impact observed from the station was tritium detected in on-site wells during 1998. Subsections describe each particular media or potential exposure pathway. Any dose commitments from station-related exposures is insignificant as explained in Section 5.

Naturally occurring nuclides such as Be-7, K-40, Ra-226 and Th-228 were detected in numerous samples. Be-7, which is produced by cosmic processes, was observed predominantly in airborne and vegetation samples. Ra-226 and Th-228 results were variable and were observed in broadleaf vegetation, river water (one barely positive Ra-226), river bottom sediment, shellfish, and fish (one barely positive Ra-226).

Cs-137 and Sr-90, present because of atmospheric nuclear weapons testing of years past, were observed at levels similar to those of past years.

4.1. Gamma Exposure Rate (Table 1)

Gamma exposure from all sources of radioactivity is measured over periods of approximately one month using CaF_2 (Mn) thermoluminescent dosimeters (TLDs). These dosimeters are strategically placed at a number of on-site locations, as well as at inner and outer off-site locations. Glass bulb type TLDs such as these, are subject to inherent self-irradiation which has been experimentally measured for each dosimeter. The results, shown in Table 1 have been adjusted for this effect. The range of this correction for field dosimeters is 0.4 μR/hr to 2.8 μR/hr, with a mean of approximately 1 μR/hr.

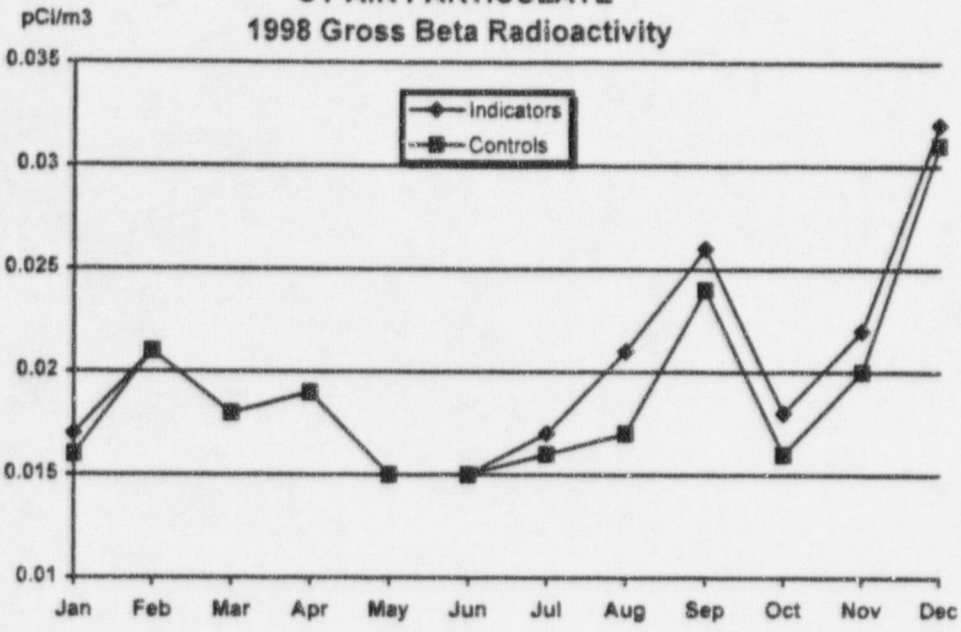
No indications of plant related exposure were observed. The exposure rate measurements exhibit the same trends as those of past years. These measurements demonstrate the general variations in background radiation between the various on-site and off-site locations and include gamma exposure from all sources of radioactivity.

4.2. Air Particulate Gross Beta Radioactivity (Table 2)

Air is continuously sampled at seven inner ring and two outer ring locations by passing it through glass fiber particulate filters. These are collected weekly and analyzed for gross beta radioactivity. Results are shown on Figure 4-1 and Table 2.

Gross beta activity remained at levels similar to that seen over the last decade. Inner and outer ring monitoring locations showed no significant variation in measured activities. This indicates that any station contribution is not measurable.

Figure 4-1
CY AIR PARTICULATE
1998 Gross Beta Radioactivity



4.3. Airborne Iodine (Table 3)

Because the station permanently shutdown in 1996 all radioactive iodines, which have short half-lives, have decayed away. Therefore the requirement to sample airborne iodine has been removed from the Radiological Effluent Monitoring Manual (REMM) and no samples were collected in 1998.

4.4. Air Particulate Gamma (Table 4A-D)

The weekly air particulate filters are composited quarterly for gamma spectral analyses. The results, as shown in Tables 4A-4D, indicate the presence of naturally occurring Be-7, which is produced by cosmic processes. No positive results were observed for all the other isotopes. These analyses indicate the lack of station effects.

4.5. Air Particulate Strontium (Table 5)

Table 5 in past years was used to report the measurement of Sr-89 and Sr-90 in quarterly composited air particulate filters. These measurements are not required by the REMM and have been discontinued. Previous data has shown the lack of detectable station activity in this media. This fact, and the fact that milk samples are a much more sensitive indicator of fission product existence in the environment, prompted the decision for discontinuation.

4.6. Soil (Table 6)

Soil samples are not required by the REMM.

4.7. Cow Milk (Table 7)

Analysis of milk samples is generally the most sensitive indicator of fission product existence in the terrestrial environment. This, in combination with the fact that consumption of milk is significant, results in this pathway usually being the most critical from the station release viewpoint. This pathway also shows measurable amounts of nuclear weapons testing fallout. Therefore, this media needs to be evaluated very carefully when trying to determine if there are any station effects.

Previous data over many years has shown the lack of station related strontium activity in this media. Therefore, the strontium analysis frequency is quarterly, rather than monthly. The monthly samples collected within each quarter from each sample location are composited and analyzed at the end of each quarter. Sr-90 was observed in nearly one half of all samples; the highest value observed was 4.8 pCi/l. Detailed analysis of previous data has concluded that these levels of Sr-90 are from weapons testing and are not station related (see Section 6.0 for details to this argument).

Cs-137 usually shows the same tendencies as Sr-90. Results for 1998 are similar to those seen for nearly the past two decades. Detailed analysis has concluded that these concentrations are most likely the result of fallout from previous nuclear weapons testing (see Section 6.0 for details).

Although not listed on Table 7, the only other nuclide detected by gamma spectrometry was naturally occurring K-40.

4.8. Goat Milk (Table 8)

Depending on the feeding habits, goat milk can be a more sensitive indicator than cow milk of fission products in the environment. This is due to the metabolism of these animals. Similar to the results of the cow milk samples, these show measurable amounts of nuclear weapons testing fallout.

Sr-90 and Cs-137 were observed in most samples. The levels observed are due to residual radioactivity in the environment from nuclear weapons testings in the 1960s. The variability in the results this year as well as in past years is caused by many factors, including feeding habits (amount of stored feed, etc.), soil characteristics, farming practices (tillage and quality of fertilization and land management), and feed type. For a complete discussion of the problem see Section 6.0.

4.9. Pasture Grass (Table 9)

When the routine milk samples are unavailable, samples of pasture grass are required as a replacement during the months of April through December. These samples may also be taken to further investigate the levels of radioactivity in milk. Directives since mid-year have been to sample feed (e.g., hay) if pasture grass is also unavailable. During the winter months and early spring, insufficient growth prohibits sampling of pasture grass as a replacement sample. Because of unavailability of pasture grass during November and December, feed (hay) was collected as a substitute for the pasture grass. No station effects were seen in the feed.

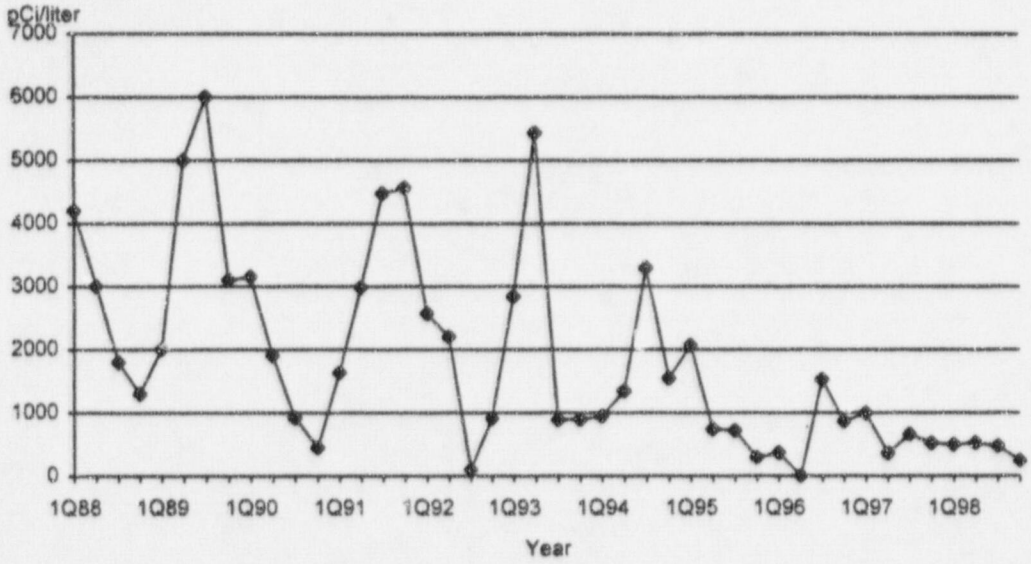
4.10. Well Water (Table 10)

Activity in this media results from either soluble station effluents permeating through the ground or the leaching of naturally occurring nuclides from the soil and rock. In 1998, samples of well water from the onsite stations (location 15) were taken monthly even though the requirements per the REMODCM are to sample quarterly. Because H-3 in station liquid effluents is the predominant radionuclide present, the higher sampling frequency was implemented to enhance program monitoring effectiveness. On-site wells (location 15) exhibited station related H-3 above background levels. This station effect results from the wells being located within an area influenced by the water in the discharge canal and H-3 having the ability to readily follow the flow of ground water. Off-site concentrations are much lower. This pathway does not result in any dose consequence since the water from these wells is used only in process streams at the station.

On-site H-3 levels detected in 1998 samples show a decrease compared to prior years. This is a trend that started back in cycle 17 (1992) due to replacing stainless steel clad fuel with zircaloy clad fuel. The levels of H-3 observed since permanent shutdown in July 1996 represent residual levels of tritium that remain in station process liquids and/or groundwater from beneath the site that are gradually dropping to natural background levels. Figure 4-2 shows the trend of H-3 measured in CY on-site wells since 1988. Of note in the figure is the highs and lows observed in measured levels of H-3. These swings are coincident with station operations. Higher H-3 levels are observed during periods when increased volumes of liquid processing occurred in preparation for station outages.

Figure 4-2

H-3 Levels in On-site Wells



4.11. *Reservoir Water (Table 11)*

Reservoir water samples are special samples not required by the REMM. Previous data has shown the lack of detectable station activity in this media. This fact and the extremely unlikely possibility of observing routine station effluents in this media has resulted in discontinuing these samples.

4.12. *Fruits and Vegetables (Table 12)*

This media did not show any station effects. Naturally occurring K-40 was detected in all samples and cosmically produced Be-7 was detected in one sample. Since there was no fresh fallout, no other nuclides were detected.

4.13. *Broad Leaf Vegetation (Table 13)*

Concentrations of Cs-137 seen in several of these samples are at levels comparable to past years and are due to fallout. To enhance program monitoring effectiveness, samples of broadleaf vegetation are collected monthly during the growing season, May - October, even though requirements are to collect twice a year. No station effects were observed in broadleaf samples.

4.14. River Water (Table 14)

These samples are collected on a quarterly basis; the sampling procedure is different at the control and indicator locations. Six weekly grab samples are taken within each quarter and composited for the control station (Middletown - location 30C). Continuous sampling, an automatic process of compositing a small volume of sample periodically over an entire quarter, is utilized at the indicator station (East Haddam Bridge - location 28).

Examination of the data shows there were no H-3 measurements that exceed 1.5 times the listed 2σ error. Even though H-3 measurements at the indicator location (Loc. 28) appear significantly higher than the control location (Loc. 30C), the values reported are the effect of counting statistics. Although measurable levels of tritium above background have been detected in the past; there have been no positive indications of tritium in this media since 1994.

4.15. Bottom Sediment (Table 15)

There were positive indications of Cs-137 in several samples, including the control location. Because the indicator and control samples show similar levels, the source of this Cs-137 is from weapons fallout deposited in woodlands and washed out into water bodies. No indications of station related activity were observed in this sample media.

4.16. Shellfish (Table 16)

As in previous years, no station related activity was observed. This media is not a source of consumption.

4.17. Fish (Tables 17A and 17B)

4.17.1. Bullheads (Table 17A)

No station related activity was observed.

4.17.2. Perch and Other Types (Table 17B)

As observed in the past, there was no positive indication of radioactivity in this media from the station, including Cs-137. Even though the measured values at the indicator locations do not exceed 1.5 times the listed 2σ error and are the effect of counting statistics, the results will be conservatively treated as a possible positive results in order to perform a dose consequence analysis in Section 5.0.

5. OFF-SITE DOSE EQUIVALENT COMMITMENTS

The off-site dose consequences (dose equivalent commitments) of the stations' radioactive liquid and airborne effluents have been evaluated using two methods. The first method utilizes the stations' measured radioactive discharges as input parameters into conservative models to simulate the transport mechanism through the environment to man. This results in the computation of the maximum doses to individuals and the 0 to 50 mile population dose. The results of these computations are submitted to the NRC in the Annual Radioactive Effluent Report written in accordance with the Radiological Effluent Monitoring Manual, Section F.2. The second method utilizes the actual measurements of the concentrations of radioactivity in various environmental media (e.g., milk, fish) and then computes the dose consequences resulting from the consumption of these foods.

The first method, which is usually conservative (i.e., computes higher doses than that which actually occur), has the advantage of approximating an upper limit to the dose consequences. This is important in those cases where the actual dose cannot be measured because they are so small as to be well below the capabilities of conventional monitoring techniques. For gaseous releases, extremely low concentrations of Cs-137 were released in 1998 for a short period of time. The only other station related activity observed in 1998 was H-3 in on-site well water. On-site well water is used for station processing and services, it is not a pathway for human consumption. Levels of Cs-137 observed in fish, although not plant related, were used to conservatively predict dose consequences as if the radioactivity were the result of station decommissioning operations.

Summarizing the data presented in Table 5.1:

MAXIMUM TOTAL INDIVIDUAL DOSES :

WHOLE BODY = 0.2 mrem (Adult)

LIVER = 0.27 mrem (Teen)

The average dose to an individual within 50 miles from the site using method 1 yields the following results for the period January - December 1998 for the average individual:

ANNUAL AVERAGE WHOLE BODY DOSE :

DUE TO AIRBORNE EFFLUENTS = 0.00002 mrem

DUE TO LIQUID EFFLUENTS = 0.00063 mrem

Thus, it can be seen that the average whole body dose to an individual is much less than the maximum whole body dose to an individual as shown in Table 5.1.

In order to provide perspective on the doses in Table 5.1, the standards for 1998 on the allowable maximum dose to an individual of the general public are given in 40CFR190 as 25 mrem whole body, 75 mrem thyroid, and 25 mrem any other organ. These standards are a fraction of the normal background radiation dose of 284 mrem per year and are designed to be inconsequential in regard to public health and safety. Station related doses are a small fraction of the standard as set by the Environmental Protection Agency and of the variation in natural background in Connecticut. Station related doses pose insignificant public health consequences.

TABLE 5.1 - COMPARISON OF DOSE CALCULATION METHODS
HADDAM NECK STATION
1998 Annual Dose (millirem)

Pathway	Individual	Organ	Method 1 [1]	Method 2 [1]
Airborne Effluents				
1. External Gamma Dose	Max. Ind. [2]	Whole Body	0.00015	ND [4]
2. Inhalation	Teen	Whole Body	0.051 [6]	NAD [3]
		Liver	0.051 [6]	
Liquid Effluents				
1. Fish Pathway only [7]	* Adult	Whole Body	0.15 [7]	<0.042 [8]
	Teen	"	0.082	<0.023
	Child	"	0.032	<0.009
	* Adult	GI(LLI) [5]	0.0078	<0.0012
	Teen	"	0.0058	<0.0009
	Child	"	0.0025	<0.0004
	Adult	Liver	0.22	<0.064
	* Teen	"	0.22	<0.066
	Child	"	0.20	<0.060

Notes:

(1) Method 1 uses measured station discharges and meteorological data as input parameters to conservative transport to man models. Method 2 uses actual measured concentrations in environmental media.

(2) Maximum individual - The maximum individual dose is the dose to the most critical age group at the location of maximum concentration of station related activity. The dose to the average individual is much less than the maximum individual dose. The doses for inhalation and vegetable consumption assume that the individual resides at the point of maximum quarterly dose. Therefore, his residence is subject to variation for conservatism.

(3) NAD - No activity detected above the minimum detectable level.

(4) ND - Not Detectable - The station effects at all off-site locations were so small that they could not be distinguished from fluctuations in natural background.

(5) GI(LLI) - Gastrointestinal Tract - Lower Large Intestine.

(6) Dose is primarily due to the release of tritium (H-3) in airborne effluents. Since tritium effects nearly all organs equally, the resulting dose to the whole body from inhaling tritium is the same.

(7) The dose values listed for the fish pathway represent the liquid dose pathway to man that is calculated using Method 1 conservative computer models.

(8) The dose values represent the dose consequences for eating fish with Cs-137 present from weapons fallout.

6. DISCUSSION

The evaluation of the effects of station operation on the environment requires the careful consideration of many factors. Those factors depend upon the media being affected. They include station release rates, effluent dispersion, fallout distribution from past nuclear weapons tests, redistribution of fallout dut to weathering and biotic activity, soil conditions (mineral content, pH, etc.), quality of fertilization, quality of land management (e.g., irrigation), pasturing habits of animals, and type of pasturage. Any of these factors could cause significant variations in the measured radioactivity. A failure to consider these factors could cause erroneous conclusions.

Consider, for example, the problem of deciphering the effect of station releases on the radioactivity measured in milk samples. This is an important problem because this product is widely consumed and fission products readily concentrate in this media. Some of these fission products, such as Sr-89 are relatively short-lived. Therefore they result from either station effluents, nuclear weapons tests or nuclear incidents (e.g. Chernobyl). The long-lived radionuclides of Sr-90 and Cs-137 are still remaining from the weapons testing era of the 1960's resulting in measurable amounts in milk samples. Distinguishing between this "background" of fallout activity and station effects is a difficult problem.

In reviewing the Sr-90 and Cs-137 measured in cow and goat milk in the areas around the Haddam Neck station, a casual observer could notice that in some cases the levels of these isotopes are higher at farms closer to the station than at those further away from the stations. The station's effluents might at first appear to be responsible. However, the following facts prove this conclusion wrong.

(1) The station accurately measures the long-lived fission products Sr-90 and Cs-137 in their releases. Based on these measurements and proven models developed by the Nuclear Regulatory Commission, concentrations in the environment can be calculated. These calculations, generally conservative, show that insufficient quantities of Sr-90 and Cs-137 have been released from the stations to yield the measured concentrations in milk.

(2) Although the shorter half-life isotopes of Sr-89 and Cs-134 have decayed away, their general absence in environmental samples in the past suggest that the isotopes of Sr-90 and Cs-137, presently seen in the environment, are not station related. Over the many years of station operation, Sr-89 has often been released in comparable quantity to Sr-90, as well as Cs-134 to Cs-137. Since the pairs of isotopes are chemically similar according to their elemental forms, comparable levels should have been detected in milk if Sr-90 and Cs-137 were station related. No station related Sr-89 or Cs-134 have ever been detected in milk samples, or in any other media. The only occurrences of detectable Cs-134 in milk resulted from the Chernobyl incident.

(3) Since dairy milk sampling began in the 1960's, several years prior to station operation, the immediate station areas have always shown higher levels of weapons fallout related Sr-90 and Cs-137 (see Figures 6-1 and 6-2). The ratio of activity between the locations has not changed with station operation. All areas show the same significant decrease in radioactivity since the 1964 Nuclear Test Ban Treaty.

(4) Local variability of Sr-90 and Cs-137 in milk is common throughout the United States. Due to the variability in soil conditions, pasturing methods, rainfall, etc., it is the rule rather than the exception. Therefore, it is not surprising that certain farms have higher levels of radioactivity than other farms. In fact, there are some cases where the farms further from the station have higher Sr-90 and Cs-137 values than the farms that are closer to the station (e.g., see pre-1984 Haddam Neck Goat Milk data.)

Based on these facts, it is concluded that station effluents are not responsible for variations of Sr-90 and Cs-137 in environmental samples. The cause must be one or more of the other variables.

Northeast Nuclear Energy Company has carefully examined the data throughout the year and has presented in this report all cases where station related radioactivity can be detected. An analysis of the potential exposure to the population from any station related activity has been performed and shows that in all cases the exposure is insignificant.

As in previous years, this data is being submitted to, and will be reviewed by the appropriate regulatory bodies such as the Nuclear Regulatory Commission, Environmental Protection Agency and Connecticut Department of Environmental Protection.

Figure 6-1 Strontium-90 in Milk

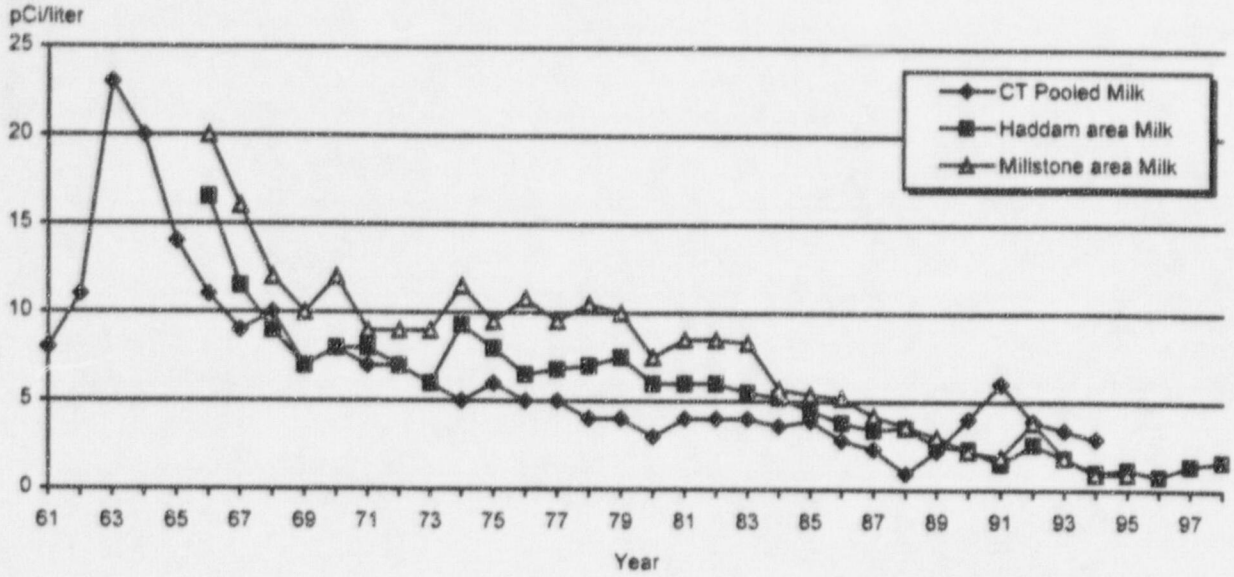
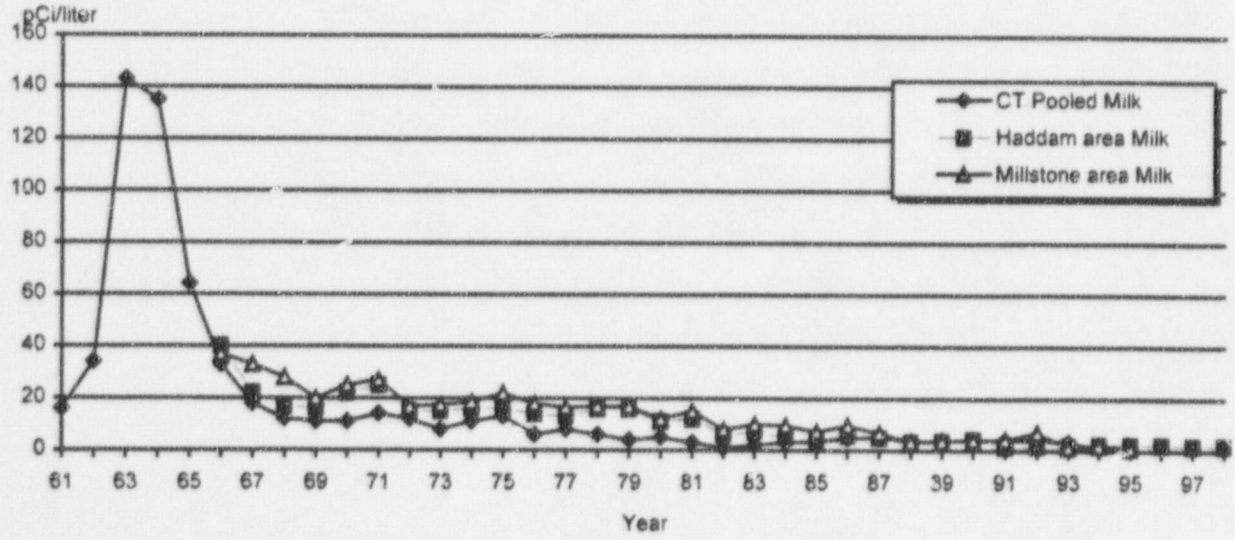


Figure 6-2 Cesium-137 in Milk



Dairy milk is no longer available in the Millstone area and CT Pooled milk has not been collected by the State of CT since 1994.

CY Start-up occurred: July 24, 1967
MP1 Start-up occurred: October 26, 1970
MP2 Start-up occurred: October 17, 1975
MP3 Start-up occurred: January 23, 1986

APPENDIX A

LAND USE CENSUS FOR 1998

TABLE A-1 (page 1 of 2)

Dairy Cows Within 15 Miles of Connecticut Yankee -December 1998

Direction	Distance	Name and Address	# of Cows
NNE	14 M	Allen Hills Hills Farm 527 Gilead Street Hebron, CT 06248	185
NNE	14 M	Edward Ellis Mapleleaf Farm, Inc. 768 Gilead Street Hebron, CT 06248	176
NNE	14 M	Gordon N. Rathburn Martin Road Hebron, CT 06248	36
NNE	14.5 M	Douglas Porter 14 Porter Rd. Hebron, CT 06248	140
NE	8 M	Elizabeth Gilman 178 Cato Corner Rd. Colchester, CT 06415	32
NE	14 M	Victor Botticello 302 Levita Road Lebanon, CT 06249	40
ENE	6.5 M	Robert Cone Grandpa Hill Farm Box 251 318 Old Colchester Tpke East Haddam, CT 06423	60
ENE	11 M	Richard Swider 475 New London Rd. Colchester, CT 06415	46
E	11.5 M	Eugene Wilczewski Salem Valley Farm Dairy 200 Darling Road Salem, CT 06415	45
E	14 M	Stuart Gadbois 40 Old Colchester Rd. Salem, CT 06415	225
SE	11 M	John Tiffany III Tiffany Farms 156 Sterling City Road Old Lyme, CT 06371	85

TABLE A-1 (page 2 of 2)

Dairy Cows Within 15 Miles of Connecticut Yankee - December 1998

Direction	Distance	Name and Address	# of Cows
WSW	8 M	Michael Dwyer 63 Grieb Rd. Wallingford, CT 06492	30
WSW	8 M	Robert Raudat 909 Durham Road Killingworth, CT 06417	44
WSW	11 M	Raymond Wimler 533 Guilford Road Durham, CT 06422	190
WSW	14 M	John & Edward Cella Cella Brothers Farm 2 No. Brandford Street Wallingford, CT 06492	150
WSW	15 M	David & Kirsten Footit D & K Farm 81 School St. Wallingford, CT 06492	140
W	11.5 M	Tony Caltabiano Friendly Acres Dairy Farm 145 Parmalee Hill Road Durham, CT 06422	45
W	14 M	Walter Werbiski North Farms 1069 Farms Road Wallingford, CT 06492	21
W	14.5 M	Charles Greenback & Sons, Inc. 182 Wallingford Rd. Durham, CT 06422	170
NW	13 M	Higgins Farm, Inc. 837 Ridgewood Road Middletown, CT 06457	79
NW	15 M	Joan Bryck or Jean Backiel Riverside Farm 1160 France St. Rocky Hill, CT 06067	51

TABLE A-2 (page 1 of 1)

Dairy Goats Within 20 Miles of Connecticut Yankee - December 1998

Direction	Distance	Name and Address	Total Goats
NNE	12 M	Louise Sage 155 Reidy Hill Road Hebron, CT 06248	4
NNE	16 M	Joan Bowers 350 Wall Street Hebron, CT 06248	2
NNE	16 M	Kathy Waters Burnt Hill Road Hebron, CT 06248	70
SSE	3.6 M	Virginia Marshall Old County Road Haddam, CT 06438	6
SE	19.5 M	Mrs. John Mingo 69 Spithead Road Waterford, CT 06385	7
SE	15.8 M	George Scacciaferro 338 Boston Post Road East Lyme, CT 06333	2
S	11.5 M	Victor Trudeau 174 Horse Hill Road Westbrook, CT 06498	5
W	15.3 M	Jim & Mary Hall Petlack 1000 North Farms Road Wallingford, CT 06492	12
WNW	19 M	Daniel Nitkowski 46 Firch Avenue Meriden, CT 06450	4
NNW	14 M	Dorothy Joba 171 Ferry Lane S. Glastonbury, CT 06073	10
NNW	15 M	Donald Reid 1654 Main Street Glastonbury, CT 06033	*

* ***UNABLE TO CONTACT AS OF THIS TIME.***

TABLE A-3 (page 1 of 1)

1998 Resident Survey

conducted August 1998

Sector	Downwind Direction	Distance (Meters)
A	N	1150
B	NNE	1780
C	NE	1265
D	ENE	1710
E	E	1955
F	ESE	2740
G	SE	1410
H	SSE	940
J	S	980
K	SSW	860
L	SW	940
M	WSW	1140
N	W	1360
P	WNW	660
Q	NW	750
R	NNW	1495

APPENDIX B

NNECO QA PROGRAM

INTRODUCTION

Northeast Nuclear Energy Company (NNECO) acting as the agent for the Connecticut Yankee Atomic Power Company (CYAPCO), maintains a quality assurance (QA) program as part of the radiological environmental monitoring program (REMP). The QA program consists of contractor appraisals, quality control samples, and quality control testing of environmental TLDs.

NNECO QA PROGRAM

Appraisals are conducted of the primary (Duke) radioanalysis contractor, of the Production Operations Support Laboratory (POSL), and of the NNECO Radiological Engineering Section (RES). A REMP evaluation form is completed for each appraisal and discrepancies are tracked on a separate form until corrective action is taken. The primary contractor, POSL, and RES are also audited by other organizations; the contractor by other customers, and POSL and RES by Northeast Utilities Nuclear Oversight Department.

There are two types of NNECO QA Program quality control samples - spikes and duplicates. Sample spikes are a check on the accuracy of results of the contractor's radioanalyses. Duplicate samples are a check of the contractor's precision or reproducibility of results. The number and type of NNECO QA Program quality control samples are given in Table 1. The results of the contractor's analyses of NNECO quality control samples must satisfy acceptance criteria in Procedure RAB B-3, "Quality Control of Radiological Environmental Monitoring Program Sample Analyses." An investigation is conducted of any result or trend which does not satisfy acceptance criteria.

There are two types QA Program tests of environmental TLDs - spikes and field comparisons. Spike testing involves the exposure of four TLDs each month. POSL readouts of the spiked TLDs are compared to the known radiation exposure. For field comparisons, QA TLDs of a different design from the REMP TLDs, are co-located with REMP TLDs at eight locations and processed at the Northeast Utilities Dosimetry Laboratory. Readings of the QA TLDs are compared to POSL's REMP TLD readings. The comparison results must satisfy acceptance criteria in NNECO Radiological Assessment Branch Procedure RAB B-2, "Quality Control of the Environmental TLD Monitoring Program." An investigation is conducted on any result or trend which does not satisfy acceptance criteria.

OTHER QA PROGRAMS

The NNECO QA Program is not the only QA Program which monitors REMP radioanalyses performance. Other programs include:

1. Duke's internal QA program. In addition to the NNECO quality control samples the radioanalysis contractor has it's own quality control samples. In total, at least five percent of the contractor's sample analyses include quality control samples.
2. Duke's interlaboratary comparison program with an independent third party, Analytics, Inc. Results of the Analytics intercomparison are contained in Appendix C. Primary contractor participation in an interlabortary comparison program is required by station Technical Specifications. The Analytics comparison satisfies this requirement and is supplemented by the EPA Intercomparison Studies Program.

3. Duke's participation in EPA's Environmental Radioactivity Laboratory Intercomparison Studies Program. Duke participates in EPA's program because of their analyses of drinking water, not because of nuclear power station environmental sample analyses. However, some of the EPA intercomparison samples are also applicable to nuclear power environmental samples. Results of the EPA Intercomparison Studies Program are contained in Appendix C.

RESULTS OF NNECO QA PROGRAM FOR CONTRACTOR RADIOANALYSES

The NNECO QA Program indicated that Duke's environmental radiological analysis program was adequate in 1998. Of 103 analysis results on QA samples, 99 passed criteria, a 96% success rate.

There were two air particulate gamma analyses which exceeded the criterion of being within 20% of the spiked value - both I-131 sample spikes, one at minus 23% and one at minus 30%. Although three other I-131 spikes on filter passed criteria in 1998, an negative bias for results of I-131 on filter analyses has been noted. This bias is currently under investigation.

There was one gross beta air particulate analysis which exceeded the criterion of being within 20% of the spiked value at minus 27%. The failure occurred because of a change in the method of preparing the QC sample. This was corrected by reverting back to the previous method and four subsequent QC samples in 1998 were within the criterion.

There was one strontium in milk QC sample which exceeded the criterion of being within 30% of the spiked value at plus 58%. The cause of the failure was that the source was expired. It was discarded and a new source was ordered.

RESULTS OF NUSCO QA PROGRAM FOR ENVIRONMENTAL TLDS

Eleven of the monthly TLD spike tests satisfied procedural criteria. One TLD spike test failed low because of a personnel error in spiking the test TLDs. A corrective action was identified for preventing a repeat of the spike test personnel error. The corrective action was implemented effective with the November test.

All twelve of the field comparisons satisfied procedural criteria.

TABLE B-1 (page 1 of 1)

NUMBER OF QUALITY CONTROL SAMPLES
1998

SAMPLE TYPE			NUMBER OF QC SAMPLES	NUMBER OF ROUTINE ANALYSES[1]
TLDs	-	Field Comparison	12 [2]	528
	-	Spike	12 [3]	528
Milk - Strontium			5[4]	32[4]
Milk - Gamma			60 [5]	800
Water - Gamma			60	576
Water - Tritium			3	32
Fish/Invertebrate - Gamma			3	2004
Fruits & Vegetation & Sediment - Gamma			0	2079
Air Particulate	-	Gross Beta	7	832
	-	Gamma	25	740

FOOTNOTES

(1) Includes both Millstone and Haddam Neck

(2) Each TLD field comparison sample is comprised of a set of 8 TLDs.

(3) Each TLD spike sample is comprised of a set of 4 TLDs.

(4) Sr-89 and Sr-90.

(5) Gamma in water QA spikes are treated as milk surrogates.

TABLE B-2 (page 1 of 1)

RESULTS OF QUALITY CONTROL SAMPLE ANALYSES
1998

SAMPLE TYPE			NUMBER PASS CRITERIA	NUMBER FAIL CRITERIA
TLDs	-	Field Comparison	12	0
	-	Spike	11	1
Milk - Strontium			4 [1]	1
Water - Gamma [2]			60	0
Water - Tritium			3	0
Oysters - Gamma [3]			3	0
Air Particulate	-	Gross Beta	6	1
	-	Gamma [4]	23	2
		TOTALS	TLDs: 23 Samples: 99	TLDs: 1 Samples: 4

FOOTNOTES

(1) Sr-89 or Sr-90.

APPENDIX C

SUMMARY OF INTERLABORATORY COMPARISONS

INTRODUCTION

This appendix covers the Intercomparison Program of the Duke Engineering and Services Environmental Laboratory (DESEL) as required by technical specifications for each Millstone unit. DESEL uses QA/QC samples provided by Analytics, Inc to monitor the quality of analytical processing associated with the Radiological Environmental Monitoring Program (REMP). The suite of Analytics QA/QC samples are designed to be comparable with the pre-1996 US EPA Interlaboratory Cross-Check Program. It was modified to more closely match the media mix presently being processed by DESEL. All intercomparison results received by DESEL on or before January 31, 1999 are included. Late results for 1998 will be reported in the annual report for 1999. DESEL also receives intercomparison samples from the US EPA because of their drinking water analysis program. Results from analyses of these samples are included where they are applicable to the REMP.

ACCEPTANCE CRITERIA

Intercomparison Program results are evaluated using two separate DESEL internal acceptance criteria. The first criterion concerns bias, which is defined as the deviation of any one result from the assumed known value. The second criterion concerns precision, which deals with the ability of the measurement to be faithfully replicated by comparison of an individual result with the mean of all results for a given sample set. A sample set is created by taking three aliquots from the same sample and submitting each as a blind replicate.

The bias criterion is defined as within 25% of the known value for Sr-89 or Sr-90 and within 15% of the known value for other radionuclides, or within two sigma of the known value. This bias criterion is applied to both the Analytics and the US EPA intercomparison sample results.

For Analytics intercomparison sample results, the precision criterion is defined as an overlap of the two sigma ranges for the three replicate analyses. US EPA samples have EPA supplied criteria of lower and upper control level within which the average of the three replicate samples must occur.

RESULTS (All results are extracted from References 1 and 2.)

For 1998, bias testing results for 72 individual environmental analyses of seven Analytics intercomparison samples are listed in the table on the following two pages. All of the analyses passed the bias criteria. Replicate sample results are not reported in References 1 and 2; however the references do report that, of the 72 environmental analyses for the seven samples there was only one result which failed the precision criterion. This was the low-level (LL) I-131 analysis for the third quarter water sample. DESEL issued CR 98-009 to investigate the failed precision test. The result of this investigation is not yet available.

Results of bias and precision testing on the US EPA intercomparison samples are contained in the table on Pages C-5 and C-6. Of 42 individual analyses of EPA samples, 40 passed the bias criteria, a 95% success rate. There were no failures of precision criteria for the EPA samples.

REFERENCES

1. DESEL Analytical Services Semi-Annual Quality Assurance Status Report, January-June 1998
2. DESEL Analytical Services Semi-Annual Quality Assurance Status Report, July-December 1998

TABLE C-1 (page 1 of 3)

ANALYTICS INTERCOMPARISON PROGRAM 1998

BIAS TESTING

QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
1st	Milk	Sr-89	53 pCi/L	55 pCi/L	1.04
		Sr-90	44	45	1.02
		Cr-51	201	204	1.01
		Mn-54	133	139	1.05
		Co-60	85	86	1.01
		Fe-59	95	100	1.05
		Zn-65	142	147	1.04
		I-131	82	84	1.02
		I-131 (LL)	82	83	1.01
		Cs-134	84	83	0.99
		Cs-137	161	171	1.06
		Ce-141	70	73	1.04
1st	Water	Beta	269 pCi/L	308 pCi/L	1.14
		Cr-51	167	171	1.02
		Mn-54	111	111	1.00
		Co-60	71	70	0.99
		Fe-59	79	82	1.04
		Zn-65	118	120	1.02
		I-131	90	90	1.00
		I-131 (LL)	90	92	1.02
		Cs-134	70	68	1.01
		Cs-137	134	136	1.02
		Ce-141	58	59	1.06
		Ra-226	53	56	1.02
		Ra-228	46	47	
2nd	Air Filter	Beta	212 pCi/filter	220 pCi/filter	1.04
		Sr-89	142	140	0.99
		Sr-90	51	49	0.96
		Cr-51	113	111	0.98
		Mn-54	91	96	1.05
		Co-60	124	116	0.94
		Fe-59	39	43	1.10
		Zn-65	105	114	1.09
		Cs-134	82	84	1.02
		Cs-137	61	62	1.02
		Ce-141	85	80	0.94
2nd	Water	H-3	6007 pCi/L	5697 pCi/L	0.95

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QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
2nd	Milk	Cr-51	132 pCi/L	128 pCi/L	0.97
		Mn-54	106	111	1.05
		Co-60	143	144	1.01
		Fe-59	45	46	1.02
		Zn-65	122	124	1.02
		I-131	67	71	1.06
		I-131 (LL)	67	67	1.00
		Cs-134	95	97	1.02
		Cs-137	70	74	1.06
		Ce-141	99	102	1.03
3rd	Milk	Sr-89	51 pCi/L	62 pCi/L	1.22
		Sr-90	81	72	0.89
		Cr-51	186	180	0.97
		Mn-54	74	77	1.04
		Co-60	148	146	0.99
		Fe-59	63	66	1.05
		Zn-65	195	201	1.03
		I-131	90	96	1.07
		I-131 (LL)	90	87	0.97
		Cs-134	82	80	0.98
		Cs-137	134	134	1.00
		Ce-141	146	145	0.99
3rd	Water	Sr-89	84 pCi/L	83 pCi/L	0.99
		Sr-90	51	47	0.92
		Beta	198	190	0.96
		Cr-51	165	172	1.04
		Mn-54	66	66	1.00
		Co-60	131	129	0.98
		Fe-59	55	59	1.07
		Zn-65	173	175	1.01
		I-131	79	82	1.04
		I-131 (LL)	79	78	0.99
		Cs-134	73	71	0.97
		Cs-137	119	117	0.98
		Ce-141	129	129	1.00

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ANALYTICS INTERCOMPARISON PROGRAM 1998

QUARTER	MEDIA	NUCLIDE	KNOWN	ANALYSIS	RATIO
4th	Milk	Cr-51	195 pCi/L	205 pCi/L	1.05
		Mn-54	80	83	1.04
		Co-58	52	56	1.08
		Co-60	94	96	1.02
		Fe-59	57	62	1.09
		Zn-65	141	144	1.02
		I-131	39	42	1.08
		I-131 (LL)	39	38	0.97
		Cs-134	100	102	1.02
		Cs-137	103	109	1.06
		Ce-141	98	103	1.05

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U.S. EPA INTERLABORATORY COMPARISON STUDIES PROGRAM 1998

(all values in pCi/L)

Date	Media	Nuclide	EPA Known	Lower Control	Upper Control	Duke (b)
1/16/98	Water	Sr-90	32.0	23.3	40.7	28.42 29.26 27.50
2/6/98	Water	I-131LL	104.9	86.7	123.1	109.7 106.8 110.2
3/13/98	Water	H-3	2155	1551	2759	2147 2095 2044
4/21/98	Water	Sr-89	9.3	5.3	13.3	7.8 8.81 10.3
4/21/98	Water	Co-60	50.0	41.3	58.7	47.7 48.4 48.5
4/21/98	Water	Cs-134	22.0	13.3	30.7	21.3 21.7 20.6
4/21/98	Water	Cs-137	10.0	1.3	18.7	8.6 9.6 9.1
6/5/98	Water	Co-60	12.0	3.3	20.7	11.5 12.6 11.4
6/5/98	Water	Zn-65	104.0	86.7	121.3	105.3 106.6 99.9
6/5/99	Water	Cs-134	31.0	22.3	39.7	28.9 27.8 26.9
6/5/98	Water	Cs-137	35.0	26.3	43.7	34.9 36.3 34.1

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U.S. EPA INTERLABORATORY COMPARISON STUDIES PROGRAM 1998

(all values in pCi/L)

Date	Media	Nuclide	EPA Known	Lower Control	Upper Control	Duke*
7/17/98	Water	Sr-89	21.0	12.3	29.7	20.1
						20.3
						22.0
7/17/98	Water	Sr-90	7.00	0	15.7	9.80
						7.40
						7.11
8/7/98	Water	H-3	17996	14873	21119	17656
						17550
						17446
9/11/98	Water	I-131	6.10	2.60	9.60	6.04
						5.95
						4.85

* Same sample analyzed three times.