

Trojan Nuclear Plant

OPERATIONAL ENVIRONMENTAL RADIOLOGICAL SURVEILLANCE PROGRAM 1984 ANNUAL REPORT

PORTLAND GENERAL ELECTRIC COMPANY

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8505290580 841231
PDR ADOCK 05000344
R PDR

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TROJAN NUCLEAR PLANT
OPERATIONAL ENVIRONMENTAL RADIOLOGICAL
SURVEILLANCE PROGRAM

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Prepared by

PORTLAND GENERAL ELECTRIC COMPANY

With Analyses by

EBERLINE SERVICES DIVISION

ALBUQUERQUE LABORATORY

TROJAN NUCLEAR PLANT
OPERATIONAL ENVIRONMENTAL RADIOLOGICAL
SURVEILLANCE PROGRAM

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ABSTRACT

This report presents the data obtained through the analyses of environmental samples collected through the Portland General Electric Trojan Nuclear Plant Environmental Radiological Surveillance Program for the period January 1, 1984 through December 31, 1984.

The levels of radioactivity and specific radionuclides observed during 1984 were comparable to the preoperational baseline and operational data accumulated since the Trojan Nuclear Plant achieved criticality in December 1975. In no case did radioactivity which may be attributed to the Trojan Nuclear Plant exceed the design objectives of the Trojan Radiological Environmental Technical Specifications.

1.0 INTRODUCTION

The Trojan Nuclear Plant, a 1130 MWe pressurized water reactor, first achieved criticality on December 15, 1975. This report presents the analytical data from the Environmental Radiological Surveillance Program with appropriate interpretation for 1984.

The analytical contractor during this period has been Eberline Services Division, a division of Thermo Electron Corporation. In comparing data obtained during this period with those from previous periods, care should be taken to ensure that differences in procedures between the several contractors are considered. This is particularly true for "gross beta" measurements for which the use of different reference nuclides may produce appropriately significant differences in gross beta concentrations.

Information concerning the Environmental Radiological Surveillance Program prior to this period may be found in earlier reports.

2.0 SAMPLING AND PROGRAM PROCEDURES

2.1 SAMPLING LOCATIONS

Eighty-two sampling locations are used in the Environmental Radiological Surveillance Program, 76 on land and 6 in the Columbia River, which is one less sampling location than used at the end of 1983. In April 1984, the air monitor at Sample Location 3 (Lindberg-Kelley residence) was discontinued because there was no need for a sample location between the existing air monitor locations at the site boundary (Location 1I) and at the City of Rainier (Location 2). The remainder of the sampling locations for 1984 were the same as those described in the report for 1983 (PGE-1006-83).

The sampling locations are shown in Figures 2-1 and 2-2. Table 2-1 includes a listing of the sites, their distance from Trojan, and the type and frequency of sample collection.

2.2 SAMPLING PROCEDURES

2.2.1 AIR PARTICULATE AND RADIOIODINE

Air particulate and radioiodine sampling was performed weekly. The samples were gathered with a portable, low-volume air sampling device which is designed to draw a constant flow rate regardless of filter loading. The sampling devices were set to maintain 1 cfm. The sample pump, metering devices, and timer were in a weatherproof housing. The filter and cartridge were located in an inlet parallel to and about 1 meter above the ground. Glass fiber filters were used to collect particulate matter. Activated charcoal cartridges were used to collect radioiodine.

The glass fiber filter was removed from the air sampler and placed in a 2-in. plastic petri dish. The activated charcoal cartridge was removed at the same time. Air flow readings and other data required to compute the levels of radioactivity were recorded and submitted to the analysis laboratory along with the samples.

2.2.2 AMBIENT RADIATION MEASUREMENTS USING TLDs

Thermoluminiscent dosimeters (TLDs) were placed for field exposure and collected on a quarterly frequency. The dosimeters were placed about 1 meter above ground level in plastic containers. The time of collection, the exposure period, and any abnormal conditions such as moisture in the holders, damage done by animals, etc, were recorded when the dosimeters were retrieved. Care was taken to minimize exposure to the TLDs between collection and delivery to the laboratory. The TLDs were transported to the field in lead boxes to ensure low background levels. Control TLDs were carried with the field TLDs during collection and delivery.

During the period of July-August 1984, the TLD field exposure quarter periods were redefined from January-April, April-July, July-October, and October-January to February-May, May-August, August-November and November-February. This change was made so that the TLD field exposure periods would more closely match those of the Oregon State Health Division.

2.2.3 PRECIPITATION

Rainwater samples were collected monthly from precipitation reservoirs. The reservoir was removed from its holder and agitated to ensure thorough mixing of the contents. The contents were measured with a graduated cylinder and the volume recorded on the sample label. One gallon, or the total volume if it was less than 1 gal, was placed in a polyethylene collection bottle. Sixty ml samples were taken for tritium analysis. Concentrated HCl was added to the large water sample only. The identification number of the sample site, the date collected, and the volume measured were recorded on the data collection forms.

2.2.4 TERRESTRIAL SOIL

Terrestrial soil samples of about 1 quart in volume were taken twice a year. The soil samples were taken from a 1 sq ft area with the vegetation and large rocks removed before sample collection. The soil

sampling depth varied between 1 to 4 in. and the soil was passed through a No. 6 sieve before placement in the plastic collection bottles. The collected terrestrial soil samples along with information such as the sample site identification number, the date collected, and the volume obtained were recorded on the collection forms.

2.2.5 TERRESTRIAL VEGETATION

Grass samples were collected semiannually. Representative samples of tuberous and foliar fruits and vegetables were collected during local harvesting. Grass samples were obtained from a sizable area because of the large (2-3 lb) sample size. Grass was removed at ground level. Samples were sealed in plastic bags immediately following collection, taking care not to include any soil or foreign material. The sample site identification number, the date collected, the sample type, and the volume obtained were recorded on the data collection forms.

2.2.6 TERRESTRIAL ANIMALS

Animal samples were taken semiannually from cattle and goats purchased from local farmers after determining that the animal had been raised on the local farm. Samples taken from each animal included muscle, heart, and liver. Muscle specimens were approximately 3 lb each, but the entire heart and liver were collected. The sample site identification number, the date collected, the sample type, and volume obtained were recorded on the collection data forms. Samples were packed in plastic containers and refrigerated until shipment.

2.2.7 MILK

Milk samples (cow or goat) were collected monthly. Milk was collected in polyethylene bottles (2 gal for cow dairy and 1 gal for goat dairy). Prior to shipment of samples to the analysis laboratory, an ion exchange resin was used to concentrate any iodine present to improve detection sensitivity. The whole milk (after iodine removal) and resins were labeled and collection data forms prepared specifying sample site, date collected, sample type, and volume obtained.

2.2.8 WELL WATER

Well water was collected quarterly either from the tap that leads off the pump or directly from the well itself. At sites with faucets the line was purged for 1 min prior to collection. Sixty ml were drawn from the 1-gal sample for tritium analysis. The remainder of the sample was put in a 1-gal polyethylene bottle and acidified with concentrated HCl. The bottles were securely sealed, labeled, and collection data forms prepared specifying site, collection date, volume, and sample type.

2.2.9 SURFACE WATER AND DRINKING WATER

Surface water was sampled monthly except at sampling locations #2 (Rainier) and #66 (St. Helens) where monthly composites were collected. For the monthly composites, a compositing sampler took a sample every 2 hr and aliquots of this monthly composite were sent for analysis. The grab samples were taken by submerging a bucket in the body of water. From these water samples, 60 ml are sent for tritium analysis and a 1-gal polyethylene bottle is acidified with concentrated HCl and sent for the other analyses. The bottles were securely sealed, labeled, and collection data forms prepared specifying site, collection date, volume, and sample type.

2.2.10 BOTTOM SEDIMENT

Sediment samples were collected semiannually. Sediment samples approximately 4 in. in thickness were collected with an Eckman dredge. Specimens were packed to within 1/4 in. of the top of 1-qt polyethylene containers. Excess water was decanted from the containers before being sealed with a tight-fitting lid. The sample site identification number, date collected, and volume obtained were recorded on collection data forms.

2.2.11 SHORELINE SOIL

Shoreline soil samples of about 1 qt in volume were taken twice a year. The soil samples were taken from a 1 sq ft area with the vegetation and

large rocks removed before sample collection. The soil sampling depth varied between 1 to 4 in. and the soil was passed through a No. 6 sieve before placement in the plastic collection bottles. The sample site identification number, date collected, and volume obtained were recorded on the collection data forms.

2.2.12 AQUATIC VEGETATION

Aquatic vegetation samples were taken semiannually. Rooted species were obtained in shallow, quiescent areas of the surface water during the growing season when they were emergent. Filamentous (slime) species and mosses were obtained from submerged rocks. Samples were collected with trowel or clippers where appropriate. Three to 5 lb of aquatic grass was collected. Samples were sealed in bags with care taken not to include soil or foreign material. The sample site identification number, date collected, sample type, and volume obtained were recorded on collection data forms.

2.2.13 AQUATIC ANIMAL

Aquatic animal (fish) sampling was performed semiannually. Both indigenous and anadromous species were acquired by seining, netting, or trapping.

If the fish fork length exceeded 8 in., the fish were filleted. At least 2 lb of fish muscle was obtained from each location with a mixing of panfish species if needed. The sample site identification number, the date collected, the fish species, and the volume obtained were recorded on collection data forms.

2.3 YEARLY AGRICULTURAL SURVEY WITHIN 5-MILE RADIUS OF TROJAN

2.3.1 INTRODUCTION

The annual survey of agricultural production within a 5-mile radius of Trojan Nuclear Plant was performed on August 22 and 23, 1984. Observations were made of the dairy animals (cows and goats), meat animals (cattle and sheep), and vegetable gardens within this area. This survey was completed by driving the roads within a 5-mile radius of Trojan and recording the location of any of the above-mentioned agricultural production activities.

2.3.2 DAIRY ANIMALS

Table 2-2 presents the locations where cattle dairy animals were observed within the 5-mile radius of Trojan. In Table 2-2 and the four other agricultural survey tables, the radial direction and radial mileage from Trojan are presented for each location. The radial direction is one of the 16 different compass points. The radial mileage was estimated from map positions for each location. Each of the location tables is organized into 16 compass directions, starting with the north direction and proceeding in a clockwise manner around the compass. Within each compass direction, the locations are presented in order of increasing radial distance. Table 2-3 presents the locations where goat dairy animals were observed within the 5-mile radius of Trojan.

2.3.3 MEAT ANIMALS

Table 2-4 presents the locations for cattle meat animals and Table 2-5 presents the locations for the sheep meat animals, both within the 5-mile radius of Trojan.

2.3.4 VEGETABLE GARDENS

Table 2-6 presents the locations for vegetable gardens within a 5-mile radius of Trojan.

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SAMPLING LOCATIONS AND FREQUENCY BY TYPE

[illegible]

TABLE 2-1

Sample Location	Radial		Air		Terrestrial							Aquatic			
	Mileage	Direction	Partic	I-131	TLD	Rain	Soil	Veg	Anim	Milk	Water	Surf	Sed	Shore	Veg Anim
<u>ONSITE</u>															
21 - SE of Plant on Columbia River shore	0.3	SE			Q										
22 - Between Recreation Lake and U.S. 30	0.4	SEW			Q										
23 - Recreation Lake near E-W road to Plant	0.5	SW			Q										
24 - U.S. 30 S of E-W road to Prescott	0.6	WNW			Q										
64 - NW corner of Reflection Lake	0.5	W			Q										
<u>OREGON</u>															
2 - Rainier	3.8	NW	W		Q	M						MC			
3 - Lindberg (Kelley Res.)	2.0	NNW	W		Q		S/A	S/A			Q				
4A - Prescott (Municipal Water Supply)	0.6	N										M			
4C - Prescott (Jack Falls residential area)	1.3	NNW			Q										
5 - Neer City (Ball Farm)	1.4	SW	W	W	Q		S/A	S/A							
6B - Goble (Neer Res.)	1.3	SSE	W	W	Q						Q				

Sheet 3 of 8

[illegible]

TABLE 2-1

[illegible]

Sheet 5 of 8

[illegible]

TABLE 2-1

[illegible]

TABLE 2-1

Sheet 7 of 8

Sample Location	Radial		Terrestrial									Aquatic				
	Mileage	Direction	Air Partic	Air I-131	TLD	Rain	Soil	Veg	Anim	Milk	Well Water	Surf Water	Sed	Shore Soil	Veg	Anim
<u>WASHINGTON</u>																
59 - Kalama (S of Sportsman Road)	0.5	E			Q											
60 - Kalama (N of Sportsman Road)	0.5	ENE			Q											
61 - Carrolls (W Kingsbury Road)	0.7	NE			Q											
62 - W of [redacted] ls Channel	1.0	NNE			Q											
65 - Totem Pole Dairy	13.6	NW								M						

TABLE 2-1

Sheet 8 of 8

Sample Location	River Mileage	Radial Direction	Terrestrial								Aquatic				
			Air Partic	Air I-131	TLD	Rain	Soil	Veg	Anim	Milk	Well Water	Surf Water	Sed	Shore Soil	Veg
<u>COLUMBIA RIVER</u>															
CR1 - Rainier	68.3	NW											S/A	S/A	S/A
CR1A - Rainier	66.6	NW													S/A
CR2 - Lindberg	69.6	NNW									M	S/A			
CR3 - Trojan	72.4	E									M	S/A	S/A	S/A	S/A
CR4 - Kalama	75.2	SSE									M	S/A			
CR5 - Woodland	81.5	SSE											S/A	S/A	S/A

LEGEND:

W - Weekly
 Q - Quarterly
 M - Monthly
 MC - Monthly composite
 S/A - Semiannually

TABLE 2-2

DAIRY ANIMALS - COWS
WITHIN 5 MILES OF TROJAN - AUGUST 1984

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Cows</u>
NNE	5.0	12
NE	3.6	1
S	5.0	1
SSW	4.5	1
SW	3.3	1
SW	3.4	2
SW	3.6	1
SW	5.0	175
WSW	3.3	1
W	2.0	1
NW	4.1	1

[a] Measured from Trojan Containment.

TABLE 2-3

DAIRY ANIMALS - GOATS
WITHIN 5 MILES OF TROJAN - AUGUST 1984

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Goats</u>
N	4.3	1
NNE	1.9	1
NNE	2.0	1
NNE	2.7	2
NNE	3.5	1
NNE	3.6	3
NNE	3.7	1
NNE	4.1	1
NNE	4.4	1
NE	3.6	1
E	2.6	7
E	3.0	1
ESE	2.3	1
SSE	1.6	2
SSW	2.7	17
SW	3.4	1
WSW	1.5	1
WSW	2.0	1
WSW	3.3	1
WSW	4.5	2
WSW	5.0	3
WNW	3.3	2
WNW	3.6	2
WNW	3.8	25
WNW	4.1	1
WNW	4.4	1
WNW	4.6	1

[a] Measured from Trojan Containment.

TABLE 2-4

Sheet 1 of 3

MEAT ANIMALS - CATTLE
WITHIN 5 MILES OF TROJAN - AUGUST 1984

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Cattle</u>
N	4.2	3
N	4.9	2
NNE	2.7	26
NNE	3.5	3
NNE	4.0	6
NNE	4.2	14
NNE	4.3	29
NE	1.6	6
NE	3.3	3
NE	4.3	13
NE	4.4	4
ENE	1.5	25
ENE	4.3	4
ENE	4.5	15
E	1.5	12
E	2.4	20
E	2.7	3
E	2.9	4
E	3.0	1
E	3.2	14
ESE	2.3	40
ESE	2.5	5
ESE	2.7	24
SE	4.3	15
SE	4.5	3
SE	4.6	26
SE	4.7	13
SE	5.0	6

[a] Measured from Trojan Containment.

TABLE 2-4

Sheet 2 of 3

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Cattle</u>
SSE	4.8	201
SSE	5.0	60
S	1.7	2
S	2.0	5
S	2.8	3
S	4.3	3
S	4.5	2
S	4.6	28
SSW	2.5	4
SSW	2.8	3
SSW	3.1	7
SSW	3.6	2
SSW	3.8	10
SSW	3.9	23
SSW	4.3	14
SSW	4.6	14
SW	2.0	3
SW	2.5	5
SW	2.6	16
SW	2.7	7
SW	3.3	23
SW	3.5	2
SW	3.6	2
SW	4.2	5
SW	4.3	28
WSW	1.5	6
WSW	2.0	7
WSW	3.1	2
WSW	3.3	10
WSW	4.3	78

[a] Measured from Trojan Containment.

TABLE 2-4

Sheet 3 of 3

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Cattle</u>
WSW	4.5	2
WSW	4.9	10
W	2.0	3
W	2.5	7
W	3.0	7
W	3.6	12
W	4.7	12
WNW	2.3	20
WNW	3.6	2
WNW	3.7	5
WNW	3.8	3
WNW	4.1	8
WNW	4.3	12
WNW	4.4	15
WNW	4.6	2
NW	2.3	28
NW	2.4	10
NW	2.7	3
NNW	2.1	35
NNW	2.7	2
NNW	3.2	3
NNW	3.3	3

[a] Measured from Trojan Containment.

TABLE 2-5

MEAT ANIMALS - SHEEP
WITHIN 5 MILES OF TROJAN - AUGUST 1984

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Sheep</u>
NNE	3.5	1
E	2.6	3
E	3.0	16
S	1.7	1
SW	2.6	1
SW	2.7	10
SW	4.3	75
WNW	4.6	2

[a] Measured from Trojan Containment.

TABLE 2-6

Sheet 1 of 5

VEGETABLE GARDENS
WITHIN 5 MILES OF TROJAN - AUGUST 1984

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Gardens</u>
N	4.2	1
N	4.9	1
NNE	1.9	1
NNE	2.0	4
NNE	2.2	1
NNE	2.5	1
NNE	2.7	1
NNE	2.8	1
NNE	3.5	2
NNE	3.6	2
NNE	3.7	2
NNE	3.8	3
NNE	3.9	2
NNE	4.0	2
NNE	4.1	3
NNE	4.2	4
NNE	4.3	3
NNE	4.4	2
NNE	4.5	1
NNE	4.6	2
NNE	4.8	1
NE	1.6	4
NE	1.7	6
NE	2.4	1
NE	2.5	1
NE	3.2	1
NE	3.3	1
NE	3.4	2

[a] Measured from Trojan Containment.

TABLE 2-6

Sheet 2 of 5

<u>Radial Direction</u> ^[a]	<u>Radial Mileage</u> ^[a]	<u>Number of Cardens</u>
NE	3.6	2
NE	3.7	2
NE	4.0	1
NE	4.2	1
NE	4.3	1
NE	4.8	1
ENE	4.3	1
ENE	4.4	3
ENE	4.5	2
E	1.5	1
E	2.0	2
E	2.4	5
E	2.6	5
E	2.7	2
E	2.9	1
E	3.0	4
E	3.2	2
E	3.3	1
E	4.2	1
E	4.5	1
ESE	2.1	1
ESE	2.2	2
ESE	2.4	1
ESE	2.5	1
ESE	2.6	1
SE	2.4	2
SE	2.7	2
SE	2.8	3
SE	2.9	2
SE	3.0	1

^[a] Measured from Trojan Containment.

TABLE 2-6

Sheet 3 of 5

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Gardens</u>
SE	3.1	2
SE	3.3	5
SE	3.4	2
SE	4.3	2
SE	4.4	3
SE	4.6	2
SE	4.7	3
SE	5.0	3
SSE	1.6	1
S	2.1	1
S	2.3	1
S	2.8	1
S	2.9	1
S	4.5	1
S	4.6	1
S	4.7	1
S	4.8	1
SSW	2.8	1
SSW	3.2	1
SSW	3.4	1
SSW	3.9	1
SSW	4.3	4
SSW	4.6	1
SW	2.5	1
SW	2.6	2
SW	2.7	2
SW	3.3	2
SW	3.4	1
SW	3.6	2
SW	4.2	1

[a] Measured from Trojan Containment.

TABLE 2-6

Sheet 4 of 5

<u>Radial Direction</u> ^[a]	<u>Radial Mileage</u> ^[a]	<u>Number of Gardens</u>
SW	4.9	1
WSW	3.1	1
WSW	3.2	1
WSW	3.3	1
WSW	4.3	2
WSW	5.0	1
W	3.5	1
W	3.6	2
W	3.7	1
W	4.6	4
W	4.7	1
W	4.8	1
WNW	2.3	1
WNW	3.6	2
WNW	3.7	1
WNW	3.8	1
WNW	4.0	1
WNW	4.1	1
WNW	4.3	1
WNW	4.4	2
WNW	4.6	2
NW	1.1	2
NW	2.4	1
NW	2.6	2
NW	3.8	2
NW	4.0	1
NW	4.1	2
NW	4.3	21
NW	4.4	1
NW	4.6	16

[a] Measured from Trojan Containment.

TABLE 2-6

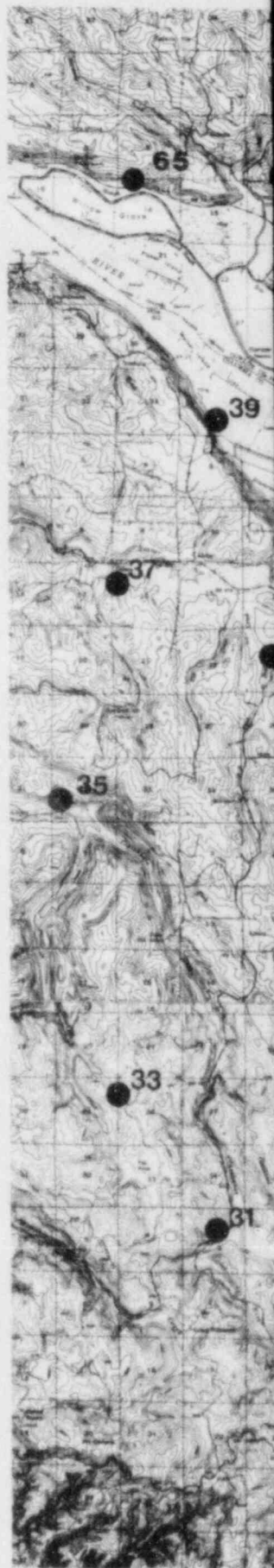
Sheet 5 of 5

<u>Radial Direction</u> [a]	<u>Radial Mileage</u> [a]	<u>Number of Gardens</u>
NW	4.7	2
NW	4.8	5
NW	5.0	1
NNW	.6	4
NNW	2.1	1
NNW	2.3	1
NNW	2.4	1
NNW	2.7	1
NNW	3.2	1
NNW	3.3	1
NNW	3.9	1
NNW	4.1	4

[a] Measured from Trojan Containment.

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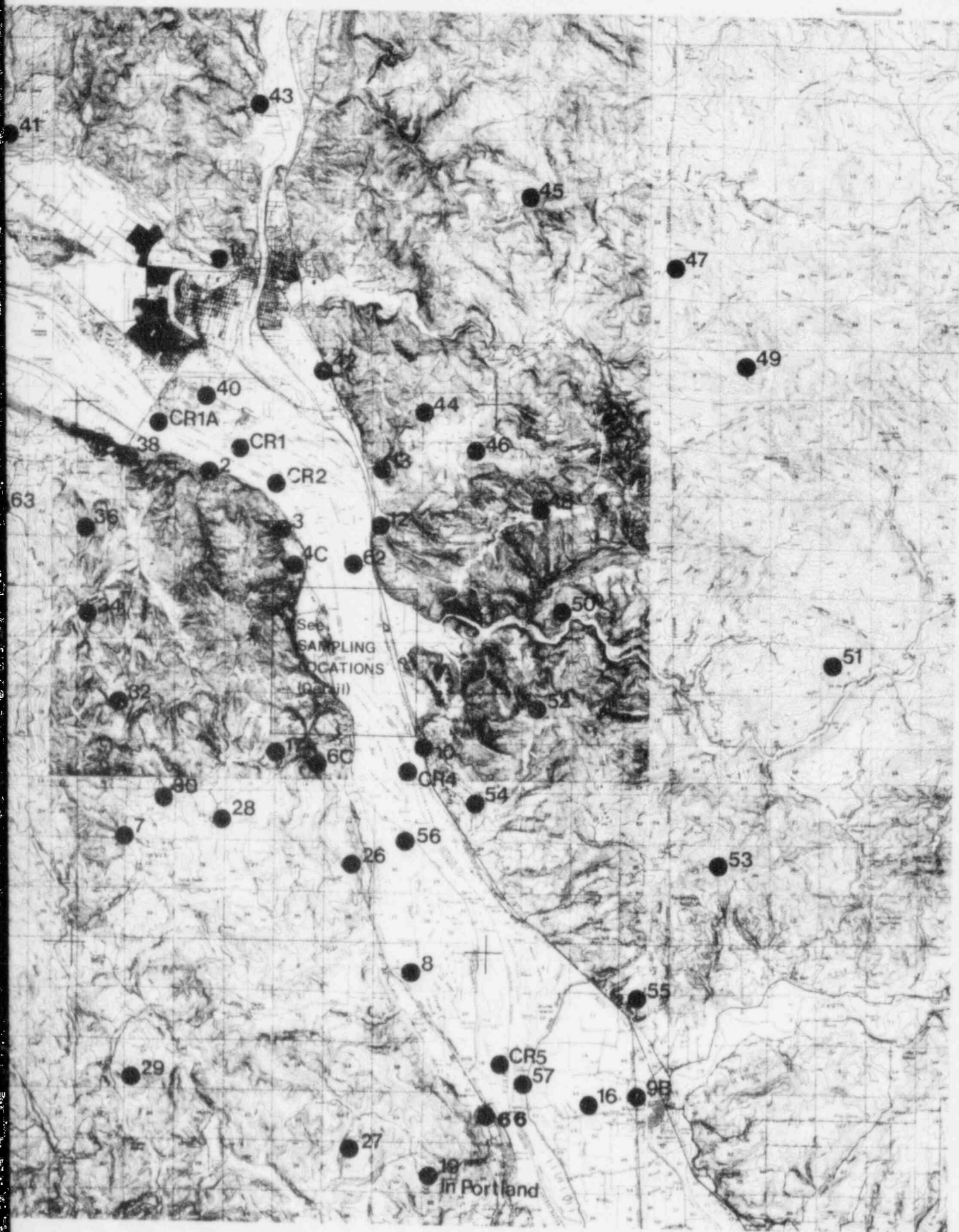
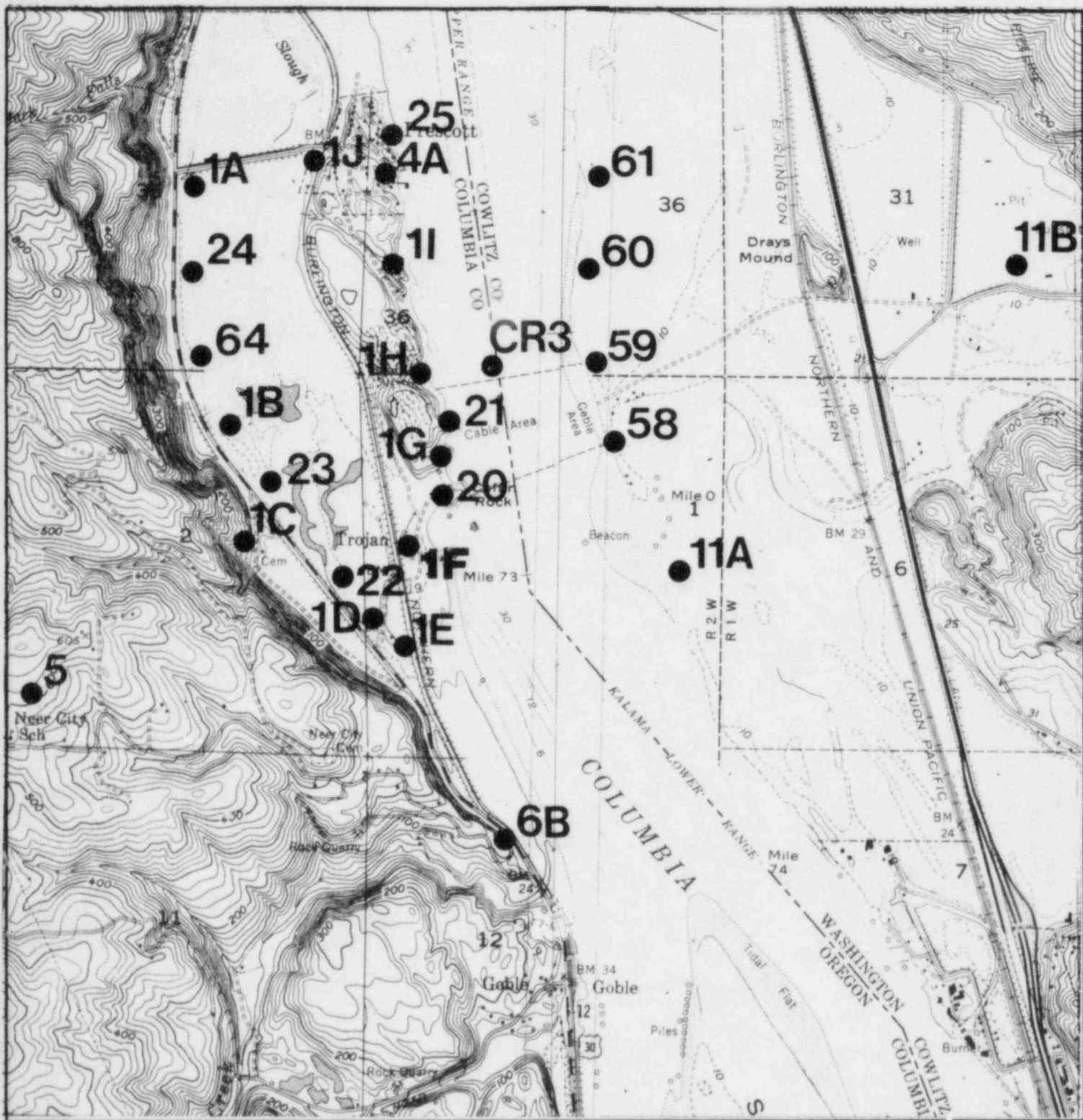


Figure 2-1. SAMPLING LOCATIONS
December 31, 1984

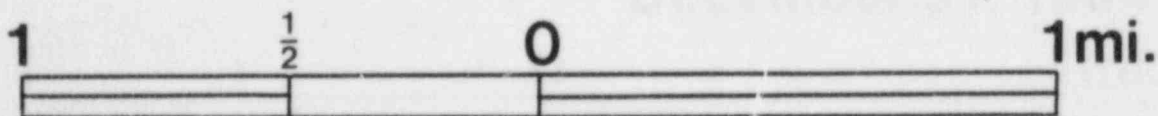
8505290580-01

1 1 0 1 2 miles



**Figure 2-2. SAMPLING LOCATIONS
(Detail)**

December 31, 1984



3.0 ANALYTICAL PROCEDURES AND COUNTING METHODS

Samples are analyzed for the various radioactive components by standard radiochemical methods. These methods are equal to, and in most cases, identical with, those of the USDOE (HASL Procedures Manual, HASL-300, Health and Safety Laboratory, U. S. Atomic Energy Commission, 376 Hudson Street, New York, NY 10014) or those of the U. S. Environmental Protection Agency (EPA).

Analyses of individual sample types, general methods, and routine analytical sensitivities are discussed below. The analytical program and sensitivity requirements are given in Table 3-1.

3.1 ANALYTICAL DETECTION LIMITS AND COUNT RATE ERRORS

In environmental radiological analyses the dominant known uncertainty is usually the sample count rate. Error terms given in this report are based on this factor since all other analytical uncertainties are relatively small. Uncertainties are calculated by standard methods (see Reference 4), and are reported at the 95-percent confidence level (2σ). The lower limit of detection (LLD) is defined as "that concentration which is 3 times the standard deviation error of the average concentration in a blank or background sample". Analytical data for samples for which concentrations are less than or equal to the LLD are preceded by the symbol "<".

3.2 AIR PARTICULATES

Gross beta concentrations are measured with low background gas flow (proportional and/or Geiger) counting systems with anti-coincidence background suppression. The routine detection limit (LLD) is 0.002 pCi/m^3 for gross beta or gross alpha based on $300 \text{ m}^3/\text{week}$.

Gamma isotopic analyses are performed with germanium detectors with a routine detection limit of about 0.05 pCi/m^3 for most gamma emitters for single filters and about 0.01 pCi/m^3 for monthly composite samples.

3.3 RADIOIODINE

The charcoal cartridges used are of the TEDA-impregnated type. The iodine is extracted from the charcoal, chemically separated, and counted as AgI using wide beta or low beta counters which yield an LLD of 0.1 pCi/m³.

3.4 RAINFALL, SURFACE WATER, AND WELL WATER

Gross beta analysis of water samples is performed by evaporation of a measured aliquot of the sample, digestion, planchetting of the processed sample and radiometric assay by low-level beta counting, with an LLD of 0.5 pCi/l. Tritium analysis is performed on all water samples to the required LLD of 1000 pCi/l by liquid scintillation counting. Gamma isotopic analysis is performed using germanium detectors with a routine LLD of 25 pCi/l per gamma emitting radionuclide.

3.5 SOIL OR SEDIMENT

Samples are oven-dried and results reported based on dry weight. Gamma emitters are measured with germanium detectors with an LLD as specified. The analysis for Sr-89 and Sr-90 is performed on ashed samples using a strontium chemical yield and two-separation technique.

3.6 VEGETATION, MEAT, POULTRY, FISH, AND FOOD CROPS

Measured amounts of these types of samples are analyzed for gamma emitters by gamma spectrometry with counting times adjusted to provide LLDs at least as sensitive as those required in Table 3-1 for the appropriate sample type. The analysis for Sr-89 and Sr-90 is performed on ashed samples using a strontium chemical yield and two-separation technique.

3.7 MILK

The determination of I-131 in fresh milk is based on anion exchange removal of the I-131 followed by radiochemical purification and low

background beta counting. The LLD is 0.2 pCi/l or better and the overall accuracy at 0.5 pCi/l is ± 25 percent or better at the 95-percent confidence level. Gamma emitters in milk are measured with germanium detectors. The analysis for Sr-89 and Sr-90 is performed on ashed samples using a strontium chemical yield and two-separation technique.

3.8 AMBIENT RADIATION MEASUREMENTS

The responsibility for ambient radiation dose measurements resides with Portland General Electric Company (PGE). A total of 66 field locations were monitored with the dosimeters analyzed quarterly. The field dosimeters used thermoluminescent radiation detection materials (CaF_2 : Dy or TLD-200 chips) with each dosimeter having more than two separate chips or measurement devices. For each field dosimeter, the chips were packed in a plastic foam and sealed in plastic containers. To minimize radiation energy dependence for the TLD-200 chips, the field dosimeters were shielded with a two-element filter of 10 mil tantalum and 2 mil lead as described in the report by Denham, et al.

Calibration of the field dosimeters was performed with Cs-137 sources traceable to the U. S. National Bureau of Standards. Calibration dosimeters were prepared for each readout of the field dosimeters.

3.9 QUALITY CONTROL

Approximately 15 percent of the analyses performed by Eberline are for quality control purposes. Eberline participates in Environmental Protection Agency, International Atomic Energy Agency, Nuclear Regulatory Commission, several states', and other intercalibration programs. Reports of all quality control analyses are presented monthly to PGE. Results of EPA intercalibrations (for which "known" data are available) are given in Table 3-2. In those cases where discrepant values are obtained, an investigation is undertaken to determine the cause, and corrective action as required. Table 3-3 summarizes the intralaboratory quality control results for the year 1984.

During 1981, 1982, and 1984, PGE participated in the Fifth, Sixth, and Seventh International Intercomparison of Environmental Dosimeters. The results of the Fifth and Sixth Intercomparisons were presented in the 1982 and 1983 reports. The Seventh Intercomparison results are shown below and the PGE values are comparable with the project values.

<u>Exposure Type</u>	<u>Project Value</u>	<u>PGE Value</u>
Field	75.8 \pm 6.0 mR	73.5 \pm 6.2 mR
Laboratory: Cs-137	75.0 \pm 3.8 mR	72.5 \pm 6.6 mR
Laboratory: Co-60	79.9 \pm 4.0 mR	72.2 \pm 7.2 mR

3.10 REFERENCES FOR ANALYTICAL PROCEDURES

1. American Public Health Association, American Water Works Association and Water Pollution Control Federation (1971): Standard Methods for the Examination of Water and Wastewater. Thirteenth edition, pp 583-632; 12th edition, pp 325-352. APHA, 1740 Broadway, New York, NY 10019.
2. Department of Health, Education and Welfare, Public Health Service: Radioassay Procedures for Environmental Samples. National Center for Radiological Health (1967), Sec. 1, pp 36-115.
3. Atomic Energy Commission: Regulatory Guide 4.3 (September 1973).
4. Health and Safety Laboratory, Atomic Energy Commission: HASL Procedures Manual (now known as EML of the Department of Energy). HASL, 376 Hudson Street, New York, NY 10014.
5. National Environmental Research Center, Environmental Protection Agency; Handbook of Radiochemical Analytical Methods. Program Element 1HA 325. Office of Research and Development, Las Vegas, NV 89114.
6. D. H. Denham, R. L. Kathren, and J. P. Corley, "A Ca₂:Dy Thermoluminescent Dosimeter for Environmental Monitoring", USAEC Report BNWL-SA-4191 (1972).

TABLE 3-1

TECHNICAL SPECIFICATION REQUIRED ANALYSES AND REPORTED DETECTION LEVELS^[a]

Required Analysis	Required and Reported Detection Limits
Air Particulate-gross beta	0.002 pCi/m ³
Air Particulate-gross alpha	0.002 pCi/m ³
Air Particulate-gamma scan	0.3 pCi/m ³ /nuclide
Air Radioiodine	0.1 pCi/m ³
Precipitation-gross beta	0.5 pCi/liter
Precipitation-tritium	1000 pCi/liter
Precipitation-gamma scan	25 pCi/liter/nuclide
Terrestrial Soil-Strontium 89/90	0.01 pCi/g (dry)
Terrestrial Soil-gamma scan	0.1 pCi/g/nuclide (dry)
Terrestrial Vegetation-Strontium 89/90	0.005 pCi/g (wet)
Terrestrial Vegetation-gamma scan	0.05 pCi/g/nuclide (wet)
Terrestrial Animal-Strontium 89/90	0.005 pCi/g (wet)
Terrestrial Animal-gamma scan	0.05 pCi/g/nuclide (wet)
Milk-Iodine-131	0.5 pCi/liter
Milk-Strontium 89/90	1.0 pCi/liter
Milk-gamma scan	50 pCi/liter/nuclide
Surface Water-gross beta	0.5 pCi/liter
Surface Water-tritium	1000 pCi/liter
Surface Water-gamma scan	25 pCi/liter/nuclide
Well Water-gross beta	0.5 pCi/liter
Well Water-tritium	1000 pCi/liter
Well Water-gamma scan	25 pCi/liter/nuclide
Bottom Sediment-gamma scan	0.1 pCi/g/nuclide (dry)
Shoreline Soil-gamma scan	0.1 pCi/g/nuclide (dry)
Aquatic Vegetation-Strontium 89/90	0.005 pCi/g (wet)
Aquatic Vegetation-gamma scan	0.1 pCi/g/nuclide (wet)
Aquatic Animal-Strontium 89/90	0.005 pCi/g (wet)
Aquatic Animal-gamma scan	0.1 pCi/g/nuclide (wet)
Direct Radiation	1.25 mR/quarter change

[a] Stated as three standard deviations above average concentration in a blank sample.

1984 USEPA - EBERLINE INTERCOMPARISON PROGRAM

<u>Sample Type</u>	<u>Analysis</u>	<u>Value (EPA)</u>	<u>Value (EIC)</u>	<u>Units</u>
Air Filter	Alpha	19±8.7	16±2	pCi/filter
Air Filter	Beta	50±8.7	58±4	pCi/filter
Air Filter	Sr-90	15±2.6	18±3	pCi/filter
Air Filter	Cs-137	20±8.7	26±2	pCi/filter
Air Filter	Alpha	15±8.7	12±1	pCi/filter
Air Filter	Beta	51±8.7	63±3	pCi/filter
Air Filter	Sr-90	21±2.6	16±3	pCi/filter
Air Filter	Cs-137	10±8.7	13±6	pCi/filter
Air Filter	Alpha	17±8.7	15±1	pCi/filter
Air Filter	Beta	51±8.7	53±3	pCi/filter
Air Filter	Sr-90	18±2.4	27±4	pCi/filter
Air Filter	Cs-137	15±8.7	7±1	pCi/filter
Food	Sr-89	34±8.7	28±6	pCi/kg
Food	Sr-90	20±8.7	19±4	pCi/kg
Food	I-131	20±10.4	<33	pCi/kg
Food	Cs-137	20±8.7	22±6	pCi/kg
Food	K-40	2720±235	2660±270	mg/kg
Food	Sr-89	25±8.7	14±6	pCi/kg
Food	Sr-90	20±2.6	10±1	pCi/kg
Food	I-131	39±10.4	<30	pCi/kg
Food	Cs-137	25±8.7	30±11	pCi/kg
Food	K	2605±226	2093±30	mg/kg
Milk	Sr-89	15±8.7	14±6	pCi/l
Milk	Sr-90	14±2.6	16±3	pCi/l
Milk	I-131	40±10.4	54±4	pCi/l
Milk	Cs-137	33±8.7	36±20	pCi/l
Milk	K	1550±135	1550±210	mg/l
Milk	I-131	6±1.6	6.3±1.9	pCi/l
Milk	Sr-89	25±8.7	20±4	pCi/l
Milk	Sr-90	17±2.6	5±1	pCi/l
Milk	I-131	43±10.4	49±1	pCi/l
Milk	Cs-137	35±8.7	42±13	pCi/l
Milk	K	1496±130	1610±200	mg/l
Milk	Sr-89	22±8.7	20±6	pCi/l
Milk	Sr-90	16±2.6	14±3	pCi/l
Milk	I-131	42±10.4	32±4	pCi/l
Milk	Cs-137	32±8.7	36±12	pCi/l
Milk	K	1517±131	1010±320	mg/l
Water	Alpha	22±5.5	26±2	pCi/l
Water	Beta	63±5	64±6	pCi/l
Water	Alpha	5±8.7	9±2	pCi/l
Water	Beta	20±8.7	22±2	pCi/l
Water	Alpha	3±8.7	5±1	pCi/l
Water	Beta	6±8.7	8±1	pCi/l
Water	Alpha	5.0±8.7	5±1	pCi/l
Water	Beta	16.0±8.7	17±2	pCi/l

Sample Type	Analysis	Value (EPA)	Value (EIC)	Units
Water	Alpha	7.0±8.7	7±2	pCi/l
Water	Beta	20.0±8.7	23±2	pCi/l
Water	I-131	20±10.4	24±2	pCi/l
Water	I-131	6±1.5	7.3±1.2	pCi/l
Water	I-131	34.0±10.4	31±1	pCi/l
Water	H-3	2389±608	2970±620	pCi/l
Water	H-3	2383±607	3120±560	pCi/l
Water	H-3	3508±630	3931±580	pCi/l
Water	H-3	3051±622	3800±600	pCi/l
Water	H-3	2817±617	2680±510	pCi/l
Water	H-3	2810±356	2940±540	pCi/l
Water	Ra-226	7.4±1.92	9.7±1.8	pCi/l
Water	Ra-228	3.9±1.01	5.7±0.8	pCi/l
Water	Ra-226	5.1±0.8	5.4±0.5	pCi/l
Water	Ra-228	2.8±0.4	7.9±1.8	pCi/l
Water	Ra-226	4.1±1.06	4.5±0.8	pCi/l
Water	Ra-228	2.0±0.52	1.8±0.5	pCi/l
Water	Ra-226	4.9±1.27	7.1±2.1	pCi/l
Water	Ra-228	2.3±0.6	1.9±0.8	pCi/l
Water	Uranium	11±6	11±1	pCi/l
Water	Uranium	15±10	14±1	pCi/l
Water	Uranium	20.0±10.4	19.7±1.7	pCi/l
Water	Sr-89	17±5	7±3	pCi/l
Water	Sr-90	8±1.5	9±1	pCi/l
Water	Sr-89	36±8.7	15±8	pCi/l
Water	Sr-90	24±2.6	11±2	pCi/l
Water	Sr-89	25±8.7	9±5	pCi/l
Water	Sr-90	5±2.6	3±1	pCi/l
Water	Sr-89	34±8.7	20±5	pCi/l
Water	Sr-90	19±2.6	11±2	pCi/l
Water	Pu-239	18.8±3.3	16.2±0.8	pCi/l
Water	Pu-239	12.5±2.1	11.7±0.4	pCi/l
Water	Co-60	11±5	12±2	pCi/l
Water	Cs-134	15±5	16±2	pCi/l
Water	Cs-137	15±5	18±1	pCi/l
Water	Cr-51	40±8.7	56±11	pCi/l
Water	Co-60	10±8.7	12±2	pCi/l
Water	Zn-65	50±8.7	68±7	pCi/l
Water	Ru-106	61±8.7	57±16	pCi/l
Water	Cs-134	31±8.7	35±3	pCi/l
Water	Cs-137	16±8.7	19±3	pCi/l
Water	Cr-51	66±8.7	56±11	pCi/l
Water	Co-60	31±8.7	30±3	pCi/l
Water	Zn-65	63±8.7	62±6	pCi/l
Water	Ru-106	29±8.7	22±11	pCi/l
Water	Cs-134	47±8.7	41±3	pCi/l
Water	Cs-137	37±8.7	35±3	pCi/l
Water	Cr-51	40±8.7	<420	pCi/l
Water	Co-60	20±8.7	21±3	pCi/l
Water	Zn-65	147±8.7	144±9	pCi/l
Water	Ru-106	47±8.7	47±14	pCi/l
Water	Cs-134	31±8.7	25±3	pCi/l
Water	Cs-137	24±8.7	25±3	pCi/l

1984 QUALITY CONTROL ANALYSES SUMMARY

The table below summarizes results of samples run for process quality control purposes during the subject year. These listings are in addition to such measurements as detector backgrounds, check source values, radiometric-gravimetric comparisons, system calibrations, etc. Detailed listings of each measurement are maintained at the laboratory and are available for inspection if required.

Blank Samples

<u>Nuclide Analyzed</u>	<u>Number of Determinations</u>	<u>Number of Analyses Exceeding the LLD for that Analysis</u>
Gross Alpha	68	0
Gross Beta	65	0
H-3	61	0
U-234	35	0
Th-230	21	0
Ra-226	41	0
Pb-210	16	0
I-131	*	
Sr-89, 90	35	0
Pu-239	21	0
Am-241	3	0

* Blank I-131 analyses are performed with each batch of samples processed. All blank data were below the detection limit.

Spiked Samples

<u>Nuclide Analyzed</u>	<u>Number of Determs.</u>	<u>Within 2 Sigma of Known</u>	<u>Within 3 Sigma of Known</u>	<u>Differing From Known by >3 Sigma</u>
Gross Alpha	68	68	-	-
Gross Beta	65	65	-	-
H-3	61	61	-	-
U-234	35	35	-	-
Th-230	21	21	-	-
Ra-226	41	41	-	-
Pb-210	16	16	-	-
Sr-90	35	35	-	-
Pu-239	21	21	-	-
Am-241	3	3	-	-

TABLE 3-3

Sheet 2 of 2

Split Samples

<u>Nuclide Analyzed</u>	<u>Number of Determs.</u>	<u>No. Agreeing Within 2 Sigma</u>	<u>No. Agreeing Within 3 Sigma</u>	<u>No. Differing by >3 Sigma</u>
Gross Alpha	53	53	-	-
Gross Beta	69	69	-	-
H-3	62	62	-	-
U-234	24	24	-	-
Th-230	11	11	-	-
Ra-226	29	29	-	-
Pb-210	13	13	-	-
Sr-89	16	16	-	-
Sr-90	25	25	-	-
Pu-239	8	8	-	-
Am-241	1	1	-	-
Gamma	8	8	-	-

4.0 RESULTS AND DISCUSSION

4.1 SAMPLES FROM THE TERRESTRIAL ENVIRONMENT

4.1.1 AIR PARTICULATES AND AIRBORNE I-131

The gross beta air particulate data obtained during 1984 was comparable to the data obtained during the years of 1982, 1983, and the preoperational period. Gross beta concentrations for air particulates remained generally at low levels throughout the year. Average concentrations for the years 1984 and before are presented in Table 4-1 for both onsite and offsite locations. In October 1980, the Peoples' Republic of China tested a nuclear device in the atmosphere. For this reason, the increased average concentrations in 1981 were due to increased fallout levels from the October 1980 Chinese test and not from operation of the Trojan Nuclear Plant. In all cases, the gross beta concentration values in 1984 were below the design objective level of 0.1 pCi/m^3 .

For 1984, the gross alpha concentration values for the monthly composites of air particulate filters were either at the detection limit (0.002 pCi/m^3) or slightly above (0.003 to 0.010 pCi/m^3). In only one case did the gross alpha concentration values for 1984 reach the design objective level of 0.01 pCi/m^3 (Location 1F in January). The quarterly average value was $0.006 \pm 0.004 \text{ pCi/m}^3$ for Location 1F during the first quarter of 1984.

Airborne I-131 concentration values for 1984 were below the detection limit of 0.1 pCi/m^3 (at collection time) in all cases.

Data for these air monitoring samples are listed in Chapter 5. The air particulate gross beta concentration data are plotted vs time throughout 1984 for each air monitoring station and are listed in Chapter 5.

4.1.2 TERRESTRIAL ANIMALS

Samples of various organs from beef cattle and goats were collected and analyzed for radiostrontium and gamma emitters. Strontium-90 activity

was detected in two samples, but it was due to worldwide fallout and not the operation of the Trojan Nuclear Plant. Strontium-89 and gamma emitting radionuclides were not detected in animal tissue samples. The data are presented in Chapter 5.

4.1.3 FOOD CROPS

Samples of food crops were collected and analyzed for radiostrontium and gamma emitters. Strontium-90 activity was detected in one sample, but it was due to worldwide fallout and not the operation of the Trojan Nuclear Plant. Strontium-89 and gamma emitting radionuclides were not detected in the food crop samples. The data are presented in Chapter 5.

4.1.4 TERRESTRIAL VEGETATION

Samples of grass were taken at six locations and analyzed for radiostrontium and gamma emitters. Gamma emitting radionuclides and Sr-89 were not detected in these grass samples, though one of the samples had measurable concentrations of Sr-90. The activity detected in this grass sample originated from worldwide fallout and was not attributable to operation of the Trojan Nuclear Plant. Data are presented in Chapter 5.

4.1.5 WELL WATER

Well water samples were collected quarterly from five locations. Low levels of gross beta radioactivity were detected which are to be expected from natural sources. Tritium levels were below the sensitivity requirements of the program, which shows that the gross beta radioactivity detected in these samples is not due to Trojan Nuclear Plant operations. Data are presented in Chapter 5.

4.1.6 MILK

Milk samples were collected from seven locations, and were analyzed for I-131, and radiostrontium and gamma emitters. Most samples contained Sr-90, which is attributable to worldwide fallout. No samples contained

I-131, Sr-89, or gamma emitters at detectable levels, which confirms that the Sr-90 is attributable to worldwide fallout. Data are presented in Chapter 5.

4.1.7 SOIL

Soil samples were collected from seven locations and analyzed for gamma isotopic and radiostrontium concentrations. Data indicate the presence of no radioactivity attributable to the operation of the Trojan Nuclear Plant. Traces of Cs-137 and Sr-90 were found in most samples. The presence of these two nuclides is attributed to worldwide fallout from atmospheric nuclear tests (see Section 4.1.1). Data are presented in Chapter 5.

4.1.8 PRECIPITATION

Monthly samples of precipitation were collected from three locations and analyzed for gross beta and tritium content. Radionuclides (other than natural) were not detected in the samples. Although numerical differences in gross beta concentrations were observed in the samples, there were no significant differences between stations based on the tritium data which are much more useful for comparison than are the beta data. Data are presented in Chapter 5.

4.1.9 AMBIENT RADIATION LEVELS

Ambient dose rates in mR/day for the dosimeters for measurement locations that have been established since before the Trojan Nuclear Plant began operations are shown in Chapter 5. The mean and standard deviation for the quarterly dosimeters data from these 22 locations was calculated to be 0.12 ± 0.02 mR/day, which does not differ from the ambient dose rate of about 0.13 mR/day measured in previous years. The mean and standard deviations were also calculated for the three geographical groups in 1984: the mean daily dose rates were 0.12 ± 0.03 mR/day for the eight Trojan onsite locations; 0.13 ± 0.02 mR/day for the seven Oregon locations; and 0.12 ± 0.02 mR/day for the seven Washington locations, which also

agrees with the similar data from 1983 and before. Furthermore, the ambient gamma radiation data in Table 5-12 were analyzed for dose rate differences in the four major compass directions from the Trojan Nuclear Plant and no significant differences were found.

Tables 5-13 through 5-16 present plots of the environmental dosimeter data for 1984. Separate plots are presented for those dosimeters within the Trojan Nuclear Plant exclusion area boundary and for increasing radial distance groupings from the Plant.

4.2 SAMPLES FROM THE AQUATIC ENVIRONMENT

4.2.1 SURFACE WATER AND DRINKING WATER SAMPLES

Surface water samples were collected monthly and quarterly from locations near the Trojan site and included samples from the Columbia River, ponds, and municipal water supplies. Analyses were made for gross beta activity, tritium, and gamma emitters. The data are presented in Chapter 5.

No activity which is attributable to operation of the Trojan Nuclear Plant was detected in any of the water samples.

4.2.2 SEDIMENT AND SHORELINE SOIL

Sediment and shoreline soil were collected from lakes and streams in the Trojan area as well as from the Columbia River. Analyses were performed for gamma emitters. The data are presented in Chapter 5. None of the sediment or shoreline soil samples showed detectable levels of gamma emitters.

4.2.3 AQUATIC PLANTS

Aquatic plants were sampled semiannually from the Columbia River and ponds in the vicinity of the Trojan Nuclear Plant and analyzed for radio-strontium and gamma emitter concentrations. The data are presented in Chapter 5. Several of the aquatic plant samples showed detectable

concentrations of Sr-90 and Cs-137. Since none of the aquatic plant samples showed detectable levels of Sr-89, the measured Sr-90 levels were due to worldwide fallout and not Trojan operations. Likewise, since Cs-134 was not detected, the Cs-137 was probably due to worldwide fallout. In addition, the measured concentrations of Cs-137 were less than the design objective values for edible leafy vegetables such as lettuce.

4.2.4 FISH

Fish and crawfish were collected twice during the year and the fillets and/or tails were analyzed for radiostrontium and gamma emitters. No radioactivity attributable to the Trojan Nuclear Plant was detected in any of the samples analyzed. The only non-naturally occurring radionuclides detected were Sr-90 and Cs-137, which is due to long-term worldwide fallout (see Section 4.1.1). This conclusion is supported by the fact that the radionuclides Sr-89 and Cs-134 were not detected in crawfish samples, which would have been the case if the detected radionuclides were from operation of the Trojan Nuclear Plant. In both cases, the measured concentrations of Sr-90 and Cs-137 were less than the design objective values for fish. Data are presented in Chapter 5.

TABLE 4-1

AVERAGE GROSS BETA CONCENTRATIONS
FOR AIR PARTICULATES

(Units: 10^{-2} pCi/m ³)			
	<u>Trojan</u> <u>(onsite)</u>	<u>Oregon</u> <u>(offsite)</u>	<u>Washington</u> <u>(offsite)</u>
Preop	2±2	2±2	3±2
1976	2±6	3±8	2±4
1977	3±4	4±4	5±2
1978	2±2	2±1	2±1
1979	1±1	1±1	1±1
1980	3±4	3±4	2±4
1981	11±2	11±4	11±1
1982	2±5	2±7	2±6
1983	2±2	2±2	2±2
1984	2±2	2±2	2±2

5.0 COMMENTS ON AND TERMS USED IN DATA TABLES

Wet Weight	A reporting unit used with organic tissue samples such as vegetation and animal samples in which the amount of sample is taken to be the weight as received from the field with no moisture removed.
Dry Weight	A reporting unit used for soil and sediment in which the amount of sample is taken to be the weight of the sample after removal of moisture by drying in an oven at about 110°C for about 15 hr.
pCi/m ³	A reporting unit used with air particulate and radioiodine data which refers to the radioactivity content expressed in picocuries of the volume of air expressed in cubic meters passed through the filter and/or the charcoal trap. Note that the volumes are not corrected to standard conditions.
Gamma Emitters or Gamma Isotopic	Samples were analyzed by high resolution germanium gamma spectrometry. The resulting spectrum is analyzed by a computer program which scans about 50 to 2000 KeV and lists the energy peaks of any nuclides present in concentrations exceeding the sensitivity limits set for that particular experiment.
Error Terms	Figures following "±" are error terms based on counting uncertainties at the 2σ (95-percent confidence) level. Values preceded by the "<" symbol were below the stated concentration at the 3σ (99-percent confidence) level.
Sensitivity	In general, all analyses meet the sensitivity requirements of the program as given in Table 3-1. For the few samples that do not (because of inadequate sample quantities, analytical interference, etc), the sensitivity actually obtained in the analysis is given.

Comment

When all analyses of a particular type during the period resulted in concentrations below the sensitivity limits, a statement is made on the appropriate table rather than presenting a whole page of "<" data. If all but one or two data points are below the sensitivity limits, the previously mentioned convention is followed and the finite data are given as footnotes.

TABLE 5-1

Sheet 1 of 8

AIRBORNE IODINE-131* AND GROSS BETA IN AIR PARTICULATE FILTERS
(Weekly Collections)

Location 1F*			Location 1H*			Location 1I*		
Collection	Volume	Gross B	Collection	Volume	Gross B	Collection	Volume	Gross B
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
01/10/84	285	0.015±0.015	01/10/84	280	0.018±0.005	01/10/84	285	0.014±0.005
01/17/84	285	0.035±0.005	01/17/84	[a]	[a]	01/17/84	285	0.027±0.005
01/24/84	285	0.050±0.007	01/24/84	530	0.036±0.005	01/24/84	285	0.046±0.007
01/31/84	290	0.031±0.006	01/31/84	325	0.015±0.005	01/31/84	290	0.012±0.005
02/07/84	285	0.027±0.003	02/07/84	285	0.023±0.003	02/07/84	285	0.023±0.003
02/14/84	285	0.008±0.003	02/14/84	285	0.009±0.003	02/14/84	285	0.009±0.003
02/21/84	280	0.012±0.003	02/21/84	280	0.012±0.003	02/21/84	280	0.015±0.003
02/28/84	285	0.028±0.002	02/28/84	285	0.008±0.006	02/28/84	285	0.027±0.002
03/06/84	275	0.016±0.003	03/06/84	275	0.012±0.003	03/06/84	280	0.013±0.003
03/13/84	295	0.018±0.003	03/13/84	290	0.026±0.003	03/13/84	290	0.024±0.003
03/20/84	285	0.009±0.003	03/20/84	285	0.011±0.003	03/20/84	285	0.008±0.003
03/27/84	285	0.024±0.006	03/27/84	285	0.026±0.002	03/27/84	285	0.018±0.002
04/03/84	285	0.015±0.003	04/03/84	285	0.011±0.003	04/03/84	285	0.010±0.003
04/10/84	285	0.010±0.003	04/10/84	200	0.013±0.004	04/10/84	285	0.009±0.003
04/17/84	285	0.013±0.003	04/17/84	285	0.014±0.003	04/17/84	285	0.013±0.003
04/24/84	200	0.005±0.004	04/24/84	285	0.008±0.003	04/24/84	285	0.004±0.003
05/01/84	280	0.003±0.003	05/01/84	285	0.005±0.003	05/01/84	285	0.017±0.004
05/08/84	285	0.015±0.003	05/08/84	285	0.013±0.003	05/08/84	285	0.012±0.003
05/15/84	345	0.020±0.003	05/15/84	310	0.020±0.003	05/15/84	285	0.019±0.003
05/22/84	285	0.027±0.003	05/22/84	285	0.023±0.003	05/22/84	285	0.023±0.003
05/29/84	345	0.012±0.001	05/29/84	285	0.011±0.011	05/29/84	280	0.010±0.001
06/05/84	285	0.007±0.003	06/05/84	285	0.006±0.003	06/05/84	280	0.007±0.003
06/12/84	285	0.013±0.003	06/12/84	285	0.014±0.003	06/12/84	285	0.017±0.004
06/19/84	250	0.044±0.004	06/19/84	245	0.018±0.004	06/19/84	250	0.017±0.004
06/27/84	250	0.014±0.005	06/27/84	250	0.014±0.005	06/27/84	250	0.028±0.005

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.
[a] Sample collection was missed due to weather problems. Sample collected 01/23/84 was for two weeks.

TABLE 5-1

Sheet 2 of 8

Location 1F*			Location 1H*			Location 1I*		
Collection	Volume	Gross β	Collection	Volume	Gross β	Collection	Volume	Gross β
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
07/03/84	325	0.037 \pm 0.004	07/03/84	325	0.018 \pm 0.003	07/03/84	325	0.014 \pm 0.003
07/10/84	260	0.015 \pm 0.003	07/10/84	280	0.016 \pm 0.003	07/10/84	275	0.013 \pm 0.003
07/17/84	290	0.015 \pm 0.003	07/17/84	290	0.015 \pm 0.003	07/17/84	285	0.011 \pm 0.003
07/24/84	285	0.015 \pm 0.003	07/24/84	285	0.010 \pm 0.003	07/24/84	285	0.014 \pm 0.003
07/31/84	290	0.004 \pm 0.003	07/31/84	285	0.007 \pm 0.003	07/31/84	285	0.016 \pm 0.003
08/07/84	285	0.030 \pm 0.004	08/07/84	285	0.009 \pm 0.004	08/07/84	285	0.010 \pm 0.004
08/14/84	280	0.024 \pm 0.004	08/14/84	285	0.014 \pm 0.003	08/14/84	280	0.014 \pm 0.003
08/21/84	285	0.023 \pm 0.004	08/21/84	285	0.024 \pm 0.003	08/21/84	285	0.019 \pm 0.003
08/28/84	285	0.012 \pm 0.006	08/28/84	285	0.016 \pm 0.006	08/28/84	285	0.036 \pm 0.007
09/04/84	285	0.035 \pm 0.004	09/04/84	285	0.022 \pm 0.003	09/04/84	285	0.018 \pm 0.003
09/11/84	285	0.012 \pm 0.003	09/11/84	285	0.034 \pm 0.004	09/11/84	285	0.015 \pm 0.003
09/18/84	285	0.012 \pm 0.003	09/18/84	285	0.011 \pm 0.003	09/18/84	285	0.009 \pm 0.003
09/25/84	285	0.011 \pm 0.006	09/25/84	285	0.017 \pm 0.006	09/25/84	285	0.011 \pm 0.006
10/02/84	285	0.027 \pm 0.004	10/02/84	285	0.021 \pm 0.004	10/02/84	285	0.022 \pm 0.004
10/09/84	285	0.031 \pm 0.004	10/09/84	280	0.057 \pm 0.004	10/09/84	285	0.033 \pm 0.004
10/16/84	[a]		10/16/84	[a]		10/16/84	[a]	
10/23/84	285	0.024 \pm 0.004	10/23/84	285	0.044 \pm 0.004	10/23/84	285	0.025 \pm 0.004
10/30/84	290	0.015 \pm 0.005	10/30/84	290	0.019 \pm 0.006	10/30/84	290	0.020 \pm 0.006
11/06/84	280	0.024 \pm 0.004	11/06/84	280	0.044 \pm 0.004	11/06/84	290	0.016 \pm 0.003
11/13/84	280	0.006 \pm 0.003	11/13/84	285	0.005 \pm 0.003	11/13/84	285	0.004 \pm 0.003
11/20/84	285	0.014 \pm 0.003	11/20/84	285	0.021 \pm 0.003	11/20/84	285	0.018 \pm 0.003
11/27/84	55[b]	<0.014	11/27/84	285	0.004 \pm 0.003	11/27/84	285	0.003 \pm 0.003
12/04/84	285	0.008 \pm 0.003	12/04/84	285	0.011 \pm 0.003	12/04/84	285	0.007 \pm 0.003
12/11/84	285	0.021 \pm 0.002	12/11/84	285	0.022 \pm 0.002	12/11/84	285	0.022 \pm 0.002
12/18/84	285	0.016 \pm 0.004	12/18/84	285	0.018 \pm 0.004	12/18/84	285	0.015 \pm 0.004
12/26/84	325	0.038 \pm 0.004	12/26/84	325	0.028 \pm 0.004	12/26/84	325	0.027 \pm 0.004

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.

[a] Samples were lost in shipment.

[b] Lower sensitivity due to low sample volume because of sampler malfunction.

TABLE 5-1

Sheet 3 of 8

Location 3			Location 5*			Location 6B*		
Collection Date	Volume (m ³)	Gross β pCi/m ³	Collection Date	Volume (m ³)	Gross β pCi/m ³	Collection Date	Volume (m ³)	Gross β pCi/m ³
01/10/84	285	0.018 \pm 0.005	01/10/84	285	0.017 \pm 0.005	01/10/84	285	0.018 \pm 0.005
01/17/84	285	0.030 \pm 0.005	01/17/84	285	0.029 \pm 0.005	01/17/84	285	0.034 \pm 0.005
01/24/84	285	0.033 \pm 0.005	01/24/84	285	0.043 \pm 0.005	01/24/84	285	0.048 \pm 0.007
01/31/84	290	0.022 \pm 0.006	01/31/84	290	0.014 \pm 0.005	01/31/84	290	0.013 \pm 0.005
02/07/84	285	0.030 \pm 0.004	02/07/84	285	0.023 \pm 0.003	02/07/84	285	0.020 \pm 0.003
02/14/84	285	0.009 \pm 0.003	02/14/84	285	0.010 \pm 0.003	02/14/84	285	0.009 \pm 0.003
02/21/84	280	0.017 \pm 0.003	02/21/84	285	0.010 \pm 0.003	02/21/84	285	0.012 \pm 0.003
02/28/84	285	0.025 \pm 0.002	02/28/84	95 [a]	0.056 \pm 0.004	02/28/84	285	0.007 \pm 0.006
03/06/84	280	0.013 \pm 0.003	03/06/84	280	0.016 \pm 0.003	03/06/84	280	0.012 \pm 0.003
03/13/84	290	0.026 \pm 0.003	03/13/84	290	0.030 \pm 0.003	03/13/84	290	0.026 \pm 0.003
03/20/84	285	0.010 \pm 0.003	03/20/84	285	0.010 \pm 0.003	03/20/84	285	0.010 \pm 0.003
03/27/84	285	0.024 \pm 0.003	03/27/84	285	0.017 \pm 0.002	03/27/84	285	0.022 \pm 0.002
04/03/84	285	0.012 \pm 0.003	04/03/84	285	0.017 \pm 0.003	04/03/84	285	0.008 \pm 0.003
[b]	[b]	[b]	04/10/84	285	0.009 \pm 0.003	04/10/84	200	0.009 \pm 0.004
			04/17/84	285	0.015 \pm 0.003	04/17/84	285	0.017 \pm 0.003
			04/24/84	290	0.005 \pm 0.003	04/24/84	400	0.006 \pm 0.002
			05/01/84	200	0.005 \pm 0.002	05/01/84	285	0.003 \pm 0.003
			05/08/84	285	0.013 \pm 0.003	05/08/84	285	0.016 \pm 0.003
			05/15/84	285	0.025 \pm 0.003	05/15/84	285	0.022 \pm 0.003
			05/22/84	175	0.037 \pm 0.005	05/22/84	285	0.026 \pm 0.003
			05/29/84	280	0.011 \pm 0.001	05/29/84	280	0.015 \pm 0.001
			06/05/84	285	0.007 \pm 0.003	06/05/84	285	0.008 \pm 0.003
			06/12/84	285	0.016 \pm 0.003	06/12/84	345	0.009 \pm 0.003
			06/19/84	280	0.016 \pm 0.003	06/19/84	250	0.016 \pm 0.004
			06/25/84	200	0.014 \pm 0.006	06/27/84	250	0.024 \pm 0.005

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.

[a] Volume may be an underestimate due to problem with power connection to the timer.

[b] Collection was discontinued.

TABLE 5-1

Sheet 4 of 8

Location 3			Location 5*			Location 6B*		
Collection	Volume	Gross B	Collection	Volume	Gross B	Collection	Volume	Gross B
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
[a]	[a]	[a]	07/03/84	23	0.058±0.036 ^[b]	07/03/84	325	0.010±0.003
			07/10/84	195	0.019±0.005	07/10/84	280	0.016±0.003
			07/17/84	290	0.012±0.003	07/17/84	290	0.020±0.003
			07/24/84	285	0.015±0.003	07/24/84	285	0.020±0.003
			07/31/84	285	0.006±0.003	07/31/84	285	0.010±0.003
			08/07/84	285	0.008±0.004	08/07/84	285	0.013±0.004
			08/14/84	280	0.012±0.003	08/14/84	280	0.006±0.003
			08/21/84	285	0.017±0.003	08/21/84	285	0.019±0.003
			08/28/84	285	0.011±0.006	08/28/84	285	0.021±0.007
			09/04/84	285	0.019±0.003	09/04/84	285	0.030±0.004
			09/11/84	285	0.010±0.003	09/11/84	285	0.017±0.003
			09/18/84	285	0.011±0.003	09/18/84	285	0.018±0.003
			09/25/84	285	0.013±0.006	09/25/84	285	0.013±0.006
			10/02/84	285	0.024±0.004	10/02/84	285	0.025±0.004
			10/09/84	285	0.032±0.004	10/09/84	285	0.035±0.004
			10/16/84	[c]		10/16/84	[c]	
			10/23/84	285	0.026±0.004	10/23/84	285	0.026±0.004
			10/30/84	290	0.017±0.005	10/30/84	290	0.016±0.005
			11/06/84	290	0.014±0.003	11/06/84	290	0.016±0.003
			11/13/84	285	0.006±0.003	11/13/84	285	0.006±0.003
			11/20/84	285	0.019±0.003	11/20/84	285	0.016±0.003
			11/27/84	285	0.003±0.003	11/27/84	285	0.008±0.003
			12/04/84	285	0.007±0.003	12/04/84	285	0.009±0.003
			12/11/84	285	0.016±0.002	12/11/84	285	0.022±0.002
			12/18/84	285	0.013±0.004	12/18/84	285	0.015±0.004
			12/26/84	325	0.013±0.003	12/26/84	325	0.024±0.004

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.

[a] Sample collection was discontinued.

[b] Lower sensitivity due to low sample volume because of sampler malfunction.

[c] Samples were lost in shipment.

TABLE 5-1

Sheet 5 of 8

Location 9B			Location 10			Location 11B*		
Collection	Volume	Gross B	Collection	Volume	Gross B	Collection	Volume	Gross B
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
01/10/84	285	0.016±0.005	01/10/84	285	0.016±0.005	01/10/84	285	0.019±0.005
01/17/84	285	0.028±0.005	01/17/84	285	0.030±0.005	01/17/84	285	0.028±0.005
01/24/84	285	0.055±0.007	01/24/84	285	0.050±0.007	01/24/84	285	0.048±0.007
01/31/84	290	0.020±0.006	01/31/84	290	0.026±0.006	01/31/84	290	0.021±0.006
02/07/84	285	0.026±0.003	02/07/84	285	0.026±0.003	02/07/84	285	0.022±0.003
02/14/84	280	0.008±0.003	02/14/84	280	0.009±0.003	02/14/84	280	0.010±0.003
02/21/84	285	0.018±0.003	02/21/84	285	0.018±0.003	02/21/84	290	0.012±0.003
02/28/84	285	0.028±0.002	02/28/84	285	0.028±0.002	02/28/84	285	0.011±0.006
03/06/84	285	0.014±0.003	03/06/84	280	0.014±0.003	03/06/84	280	0.011±0.003
03/13/84	285	0.024±0.003	03/13/84	290	0.026±0.003	03/13/84	290	0.024±0.003
03/20/84	285	0.013±0.003	03/20/84	285	0.009±0.003	03/20/84	285	0.011±0.003
03/27/84	285	0.019±0.002	03/27/84	285	0.017±0.002	03/27/84	285	0.017±0.002
04/03/84	285	0.009±0.003	04/03/84	285	0.010±0.003	04/03/84	285	0.010±0.003
04/10/84	285	0.011±0.003	04/10/84	285	0.008±0.003	04/10/84	270	0.009±0.003
04/17/84	285	0.013±0.003	04/17/84	280	0.012±0.003	04/17/84	280	0.011±0.003
04/24/84	200	0.008±0.004	04/24/84	200	0.012±0.004	04/24/84	205	0.008±0.004
05/01/84	285	0.006±0.003	05/01/84	285	0.003±0.003	05/01/84	285	0.003±0.003
05/08/84	285	0.013±0.003	05/08/84	285	0.015±0.003	05/08/84	285	0.016±0.003
05/15/84	285	0.024±0.003	05/15/84	285	0.023±0.003	05/15/84	345	0.021±0.002
05/22/84	285	0.030±0.003	05/22/84	285	0.026±0.003	05/22/84	285	0.025±0.003
05/29/84	285	0.016±0.001	05/29/84	285	0.014±0.001	05/29/84	285	0.014±0.001
06/05/84	285	0.018±0.003	06/05/84	285	0.008±0.003	06/05/84	280	0.005±0.003
06/12/84	285	0.012±0.003	06/12/84	285	0.013±0.003	06/12/84	285	0.009±0.003
06/19/84	250	0.015±0.004	06/19/84	250	0.014±0.004	06/19/84	250	0.016±0.004
06/27/84	250	0.017±0.005	06/27/84	250	0.011±0.005	06/27/84	250	0.009±0.005

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.

TABLE 5-1

Sheet 6 of 8

Location 9B			Location 10			Location 11B*		
Collection	Volume	Gross B	Collection	Volume	Gross B	Collection	Volume	Gross B
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
07/03/84	325	0.014±0.003	07/03/84	325	0.026±0.003	07/03/84	325	0.011±0.003
07/10/84	280	0.013±0.005	07/10/84	285	0.014±0.005	07/10/84	280	0.012±0.003
07/17/84	290	0.020±0.003	07/17/84	290	0.018±0.003	07/17/84	290	0.018±0.003
07/24/84	285	0.015±0.003	07/24/84	285	0.015±0.003	07/24/84	285	0.011±0.003
07/31/84	285	0.008±0.003	07/31/84	285	0.008±0.003	07/31/84	285	0.006±0.003
08/07/84	285	0.013±0.004	08/07/84	285	0.013±0.004	08/07/84	285	0.008±0.004
08/14/84	280	0.024±0.003	08/14/84	275	0.015±0.003	08/14/84	275	0.012±0.003
08/21/84	290	0.022±0.003	08/21/84	290	0.018±0.003	08/21/84	290	0.016±0.003
08/28/84	285	0.012±0.006	08/28/84	285	0.010±0.006	08/28/84	285	0.008±0.006
09/04/84	285	0.028±0.004	09/04/84	285	0.023±0.003	09/04/84	285	0.022±0.003
09/11/84	285	0.012±0.003	09/11/84	285	0.012±0.003	09/11/84	285	0.010±0.003
09/18/84	285	0.017±0.003	09/18/84	285	0.013±0.003	09/18/84	285	0.011±0.003
09/25/84	285	0.040±0.007	09/25/84	285	0.014±0.006	09/25/84	285	0.006±0.005
10/02/84	285	0.023±0.004	10/02/84	285	0.024±0.004	10/02/84	285	0.022±0.004
10/09/84	285	0.039±0.004	10/09/84	285	0.032±0.004	10/09/84	285	0.028±0.004
10/16/84	[a]	[a]	10/16/84	[a]	[a]	10/16/84	[a]	[a]
10/23/84	285	0.028±0.004	10/23/84	285	0.025±0.004	10/23/84	285	0.020±0.003
10/30/84	290	0.042±0.006	10/30/84	290	0.036±0.006	10/30/84	290	0.016±0.005
11/06/84	290	0.022±0.003	11/06/84	290	0.014±0.003	11/06/84	285	0.010±0.003
11/13/84	285	0.007±0.003	11/13/84	285	0.004±0.003	11/13/84	285	0.007±0.003
11/20/84	285	0.031±0.004	11/20/84	285	0.017±0.003	11/20/84	285	0.016±0.003
11/27/84	285	0.007±0.003	11/27/84	285	0.005±0.003	11/27/84	285	0.005±0.003
12/04/84	285	0.004±0.003	12/04/84	285	0.008±0.003	12/04/84	290	0.006±0.003
12/11/84	285	0.037±0.003	12/11/84	285	0.022±0.002	12/11/84	285	0.019±0.002
12/18/84	285	0.030±0.004	12/18/84	270	0.036±0.004	12/18/84	285	0.020±0.004
12/26/84	325	0.028±0.004	12/26/84	325	0.033±0.004	12/26/84	325	0.033±0.004

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.
[a] Samples were lost in shipment.

TABLE 5-1

Sheet 7 of 8

Location 14*			Location 2			Location 19*		
Collection	Volume	Gross β	Collection	Volume	Gross β	Collection	Volume	Gross β
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
01/10/84	285	0.016±0.005	01/10/84	285	0.014±0.005	01/10/84	285	0.015±0.005
01/17/84	285	0.026±0.005	01/17/84	285	0.028±0.005	01/17/84	285	0.032±0.005
01/24/84	285	0.049±0.007	01/24/84	285	0.045±0.007	01/24/84	285	0.046±0.007
01/31/84	290	0.018±0.006	01/31/84	290	0.032±0.007	01/31/84	290	0.025±0.006
02/07/84	285	0.021±0.003	02/07/84	285	0.025±0.003	02/07/84	285	0.036±0.004
02/14/84	280	0.009±0.003	02/14/84	285	0.011±0.003	02/14/84	285	0.014±0.003
02/21/84	290	0.013±0.003	02/21/84	280	0.012±0.003	02/21/84	285	0.016±0.003
02/28/84	285	0.023±0.002	02/28/84	285	0.007±0.006	02/28/84	285	0.008±0.006
03/06/84	280	0.013±0.003	03/06/84	280	0.017±0.003	03/06/84	285	0.013±0.003
03/13/84	290	0.029±0.003	03/13/84	290	0.022±0.003	03/13/84	285	0.025±0.003
03/20/84	285	0.010±0.003	03/20/84	285	0.010±0.003	03/20/84	285	0.015±0.003
03/27/84	285	0.019±0.002	03/27/84	285	0.017±0.003	03/27/84	285	0.017±0.002
04/03/84	285	0.015±0.003	04/03/84	285	0.015±0.003	04/03/84	285	0.012±0.003
04/10/84	285	0.010±0.003	04/10/84	370	0.009±0.002	04/10/84	285	0.008±0.003
04/17/84	280	0.015±0.003	04/17/84	285	0.012±0.003	04/17/84	285	0.013±0.003
04/24/84	290	0.007±0.003	04/24/84	230	0.011±0.004	04/24/84	310	0.006±0.003
05/01/84	285	0.005±0.003	05/01/84	285	0.008±0.003	05/01/84	200	0.011±0.002
05/08/84	285	0.013±0.003	05/08/84	285	0.012±0.003	05/08/84	285	0.015±0.003
05/15/84	345	0.023±0.003	05/15/84	285	0.025±0.003	05/15/84	370	0.023±0.003
05/22/84	285	0.023±0.003	05/22/84	285	0.026±0.003	05/22/84	285	0.027±0.003
05/29/84	315	0.011±0.001	05/29/84	285	0.013±0.001	05/29/84	285	0.014±0.001
06/05/84	285	0.005±0.003	06/05/84	70[a]	0.018±0.011	06/05/84	285	0.008±0.003
06/12/84	285	0.012±0.003	06/12/84	285	0.012±0.003	06/12/84	285	0.010±0.009
06/19/84	245	0.012±0.004	06/19/84	250	0.011±0.004	06/19/84	250	0.017±0.004
06/27/84	250	0.012±0.005	06/27/84	250	0.022±0.005	06/27/84	250	0.007±0.005

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.
[a] Low volume due to sampler problem.

TABLE 5-1

Sheet 8 of 8

Location 14*			Location 2			Location 19*		
Collection	Volume	Gross B	Collection	Volume	Gross B	Collection	Volume	Gross B
Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³	Date	(m ³)	pCi/m ³
07/03/84	325	0.009±0.002	07/03/84	325	0.014±0.003	07/03/84	325	0.016±0.003
07/10/84	280	0.012±0.003	07/10/84	275	0.014±0.005	07/10/84	285	0.017±0.003
07/17/84	285	<0.002	07/17/84	285	0.012±0.003	07/17/84	290	0.016±0.003
07/24/84	285	<0.002	07/24/84	285	0.013±0.003	07/24/84	285	0.019±0.003
07/31/84	285	<0.002	07/31/84	290	0.011±0.003	07/31/84	285	0.006±0.003
08/07/84	285	0.011±0.004	08/07/84	285	0.010±0.004	08/07/84	285	0.013±0.004
08/14/84	280	0.010±0.003	08/14/84	275	0.017±0.003	08/14/84	280	0.013±0.003
08/21/84	290	0.018±0.003	08/21/84	290	0.014±0.003	08/21/84	285	0.019±0.003
08/28/84	285	0.007±0.002	08/28/84	285	0.018±0.006	08/28/84	285	0.006±0.002
09/04/84	285	0.019±0.003	09/04/84	285	0.021±0.003	09/04/84	285	0.024±0.003
09/11/84	285	0.012±0.003	09/11/84	285	0.010±0.003	09/11/84	285	0.011±0.003
09/18/84	285	0.010±0.003	09/18/84	285	0.008±0.003	09/18/84	285	0.013±0.003
09/25/84	285	0.021±0.006	09/25/84	285	0.011±0.006	09/25/84	285	0.016±0.006
10/02/84	285	0.022±0.004	10/02/84	285	0.023±0.004	10/02/84	285	0.027±0.004
10/09/84	285	0.033±0.004	10/09/84	285	0.030±0.004	10/09/84	315	0.030±0.003
10/16/84	[a]	[a]	10/16/84	[a]	[a]	10/16/84	[a]	[a]
10/23/84	285	0.038±0.003	10/23/84	285	0.022±0.004	10/23/84	230	0.027±0.004
10/30/84	290	0.021±0.006	10/30/84	290	0.014±0.005	10/30/84	290	0.023±0.004
11/06/84	290	0.012±0.003	11/06/84	290	0.013±0.003	11/06/84	285	0.018±0.003
11/13/84	285	0.005±0.003	11/13/84	285	0.006±0.003	11/13/84	285	0.005±0.003
11/20/84	285	0.017±0.003	11/20/84	285	0.027±0.004	11/20/84	285	0.015±0.003
11/27/84	170 ^[b]	<0.005	11/27/84	285	0.017±0.003	11/27/84	285	0.015±0.003
12/04/84	290	0.012±0.003	12/04/84	290	0.008±0.003	12/04/84	285	0.011±0.003
12/11/84	285	0.025±0.002	12/11/84	285	0.019±0.002	12/11/84	285	0.035±0.003
12/18/84	285	0.011±0.004	12/18/84	285	0.015±0.004	12/18/84	285	0.013±0.004
12/26/84	325	0.024±0.004	12/26/84	315	0.026±0.004	12/26/84	325	0.013±0.003

* Iodine cartridges are weekly samples. Concentrations are <0.1 unless otherwise noted.

[a] Samples were lost in shipment.

[b] Lower sensitivity due to low sample volume because of sampler malfunction.

TABLE 5-2

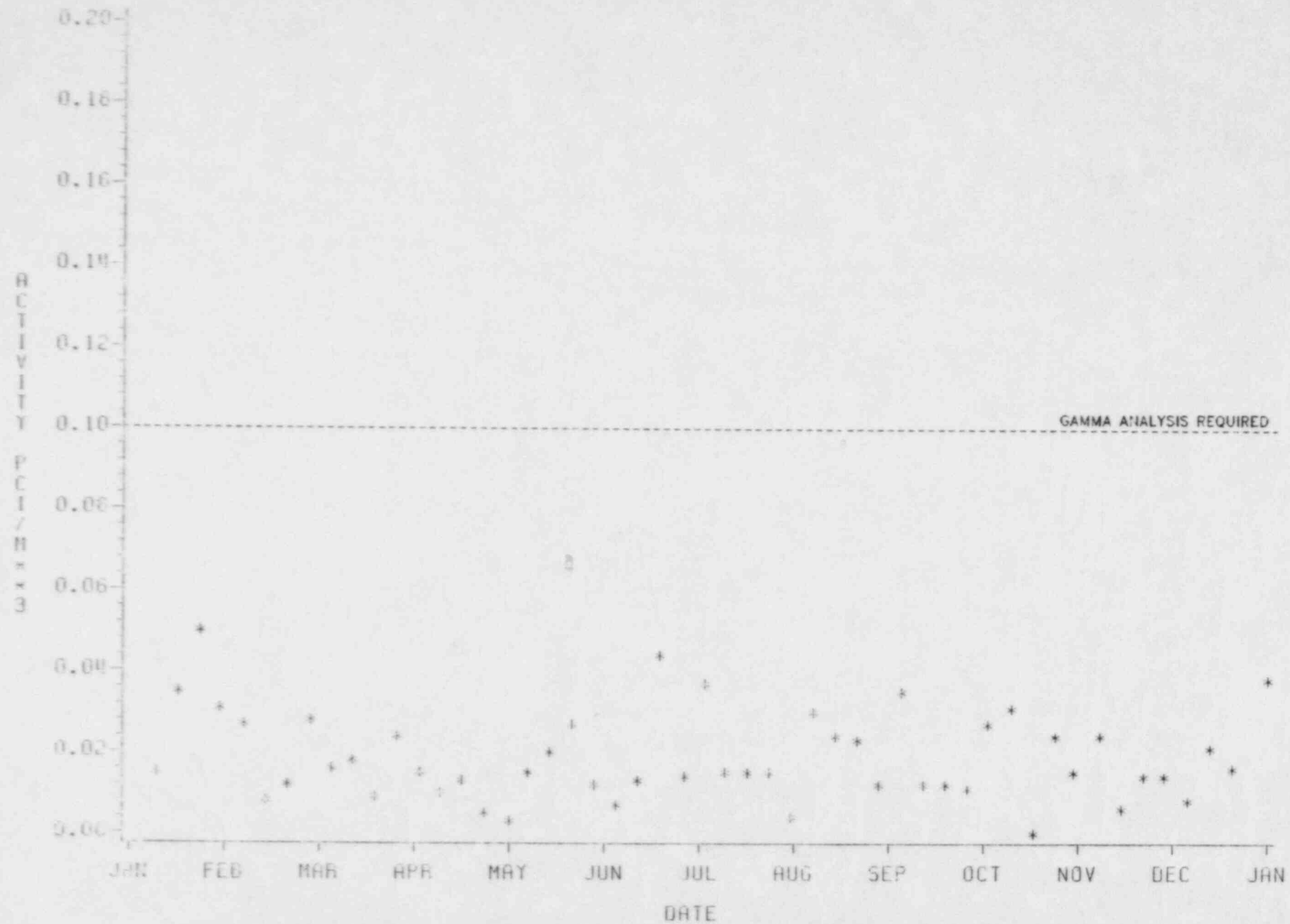
GROSS BETA ACTIVITY IN AIR
FROM SITE 1F

TABLE 5-2
GROSS BETA ACTIVITY IN AIR
FROM SITE 1H

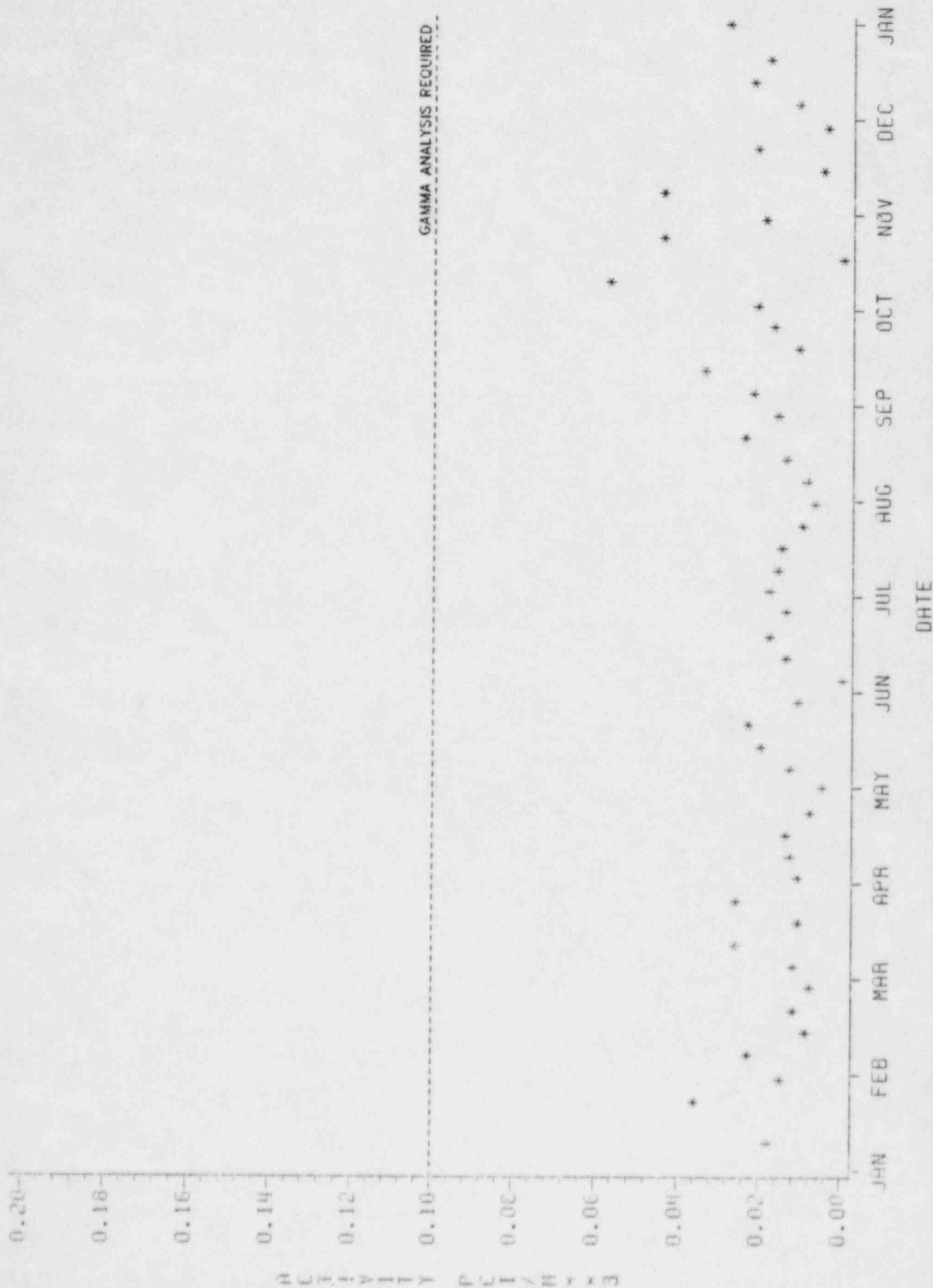


TABLE 5-2
GROSS BETA ACTIVITY IN AIR
FROM SITE 11

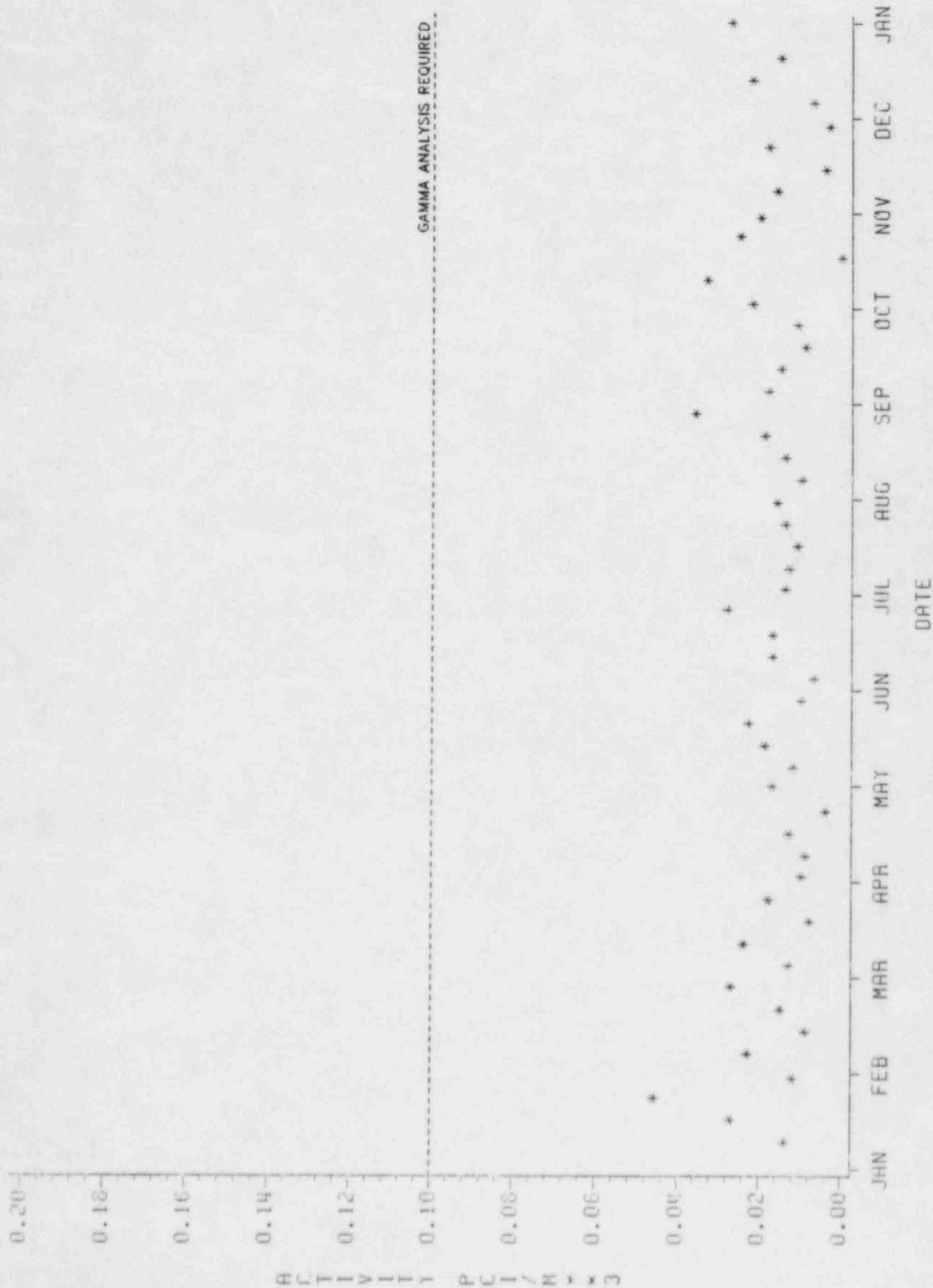
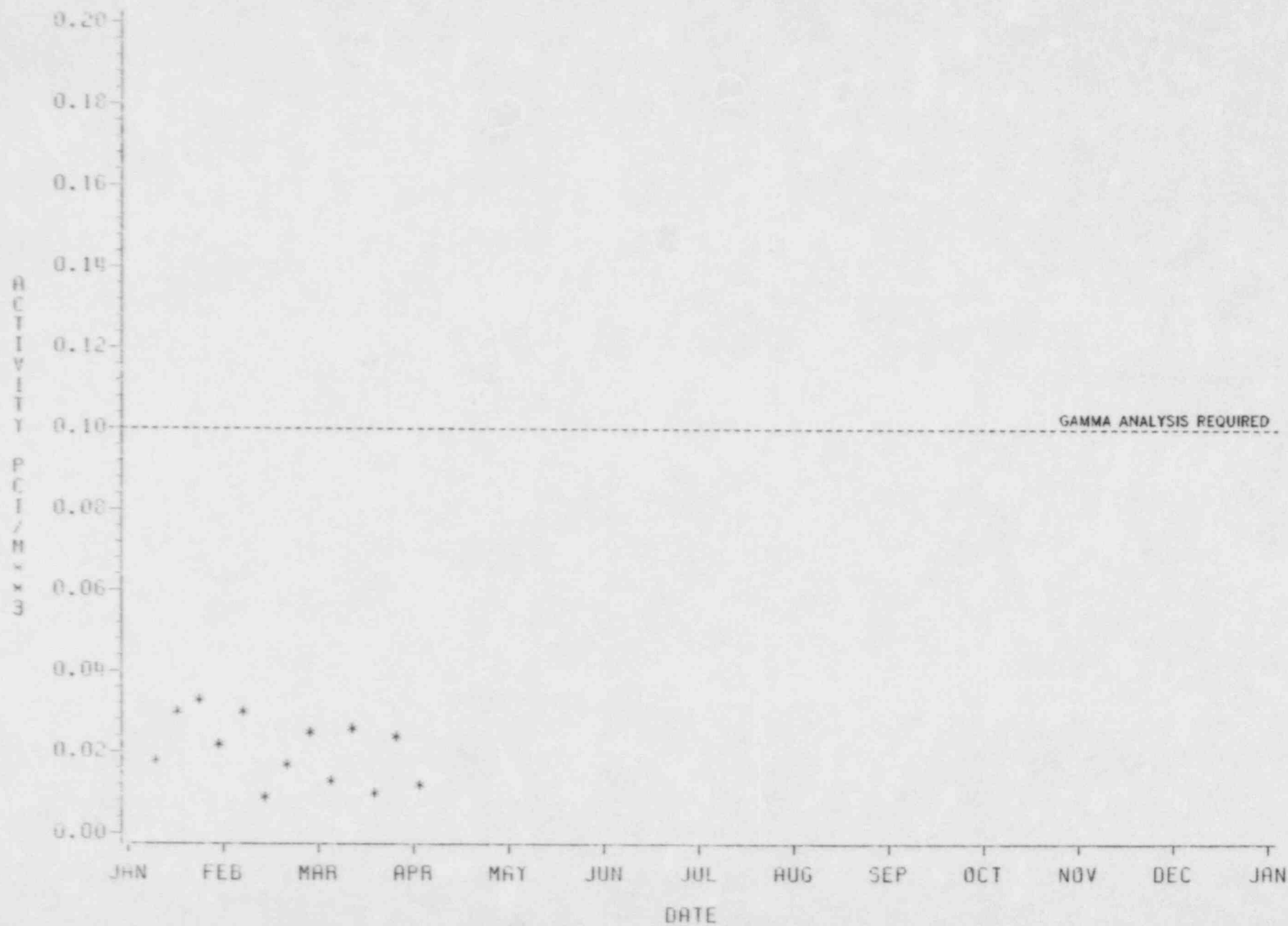


TABLE 5-2

GROSS BETA ACTIVITY IN AIR
FROM SITE 3

Sheet 4 of 12



GROSS BETA ACTIVITY IN AIR
FROM SITE 5

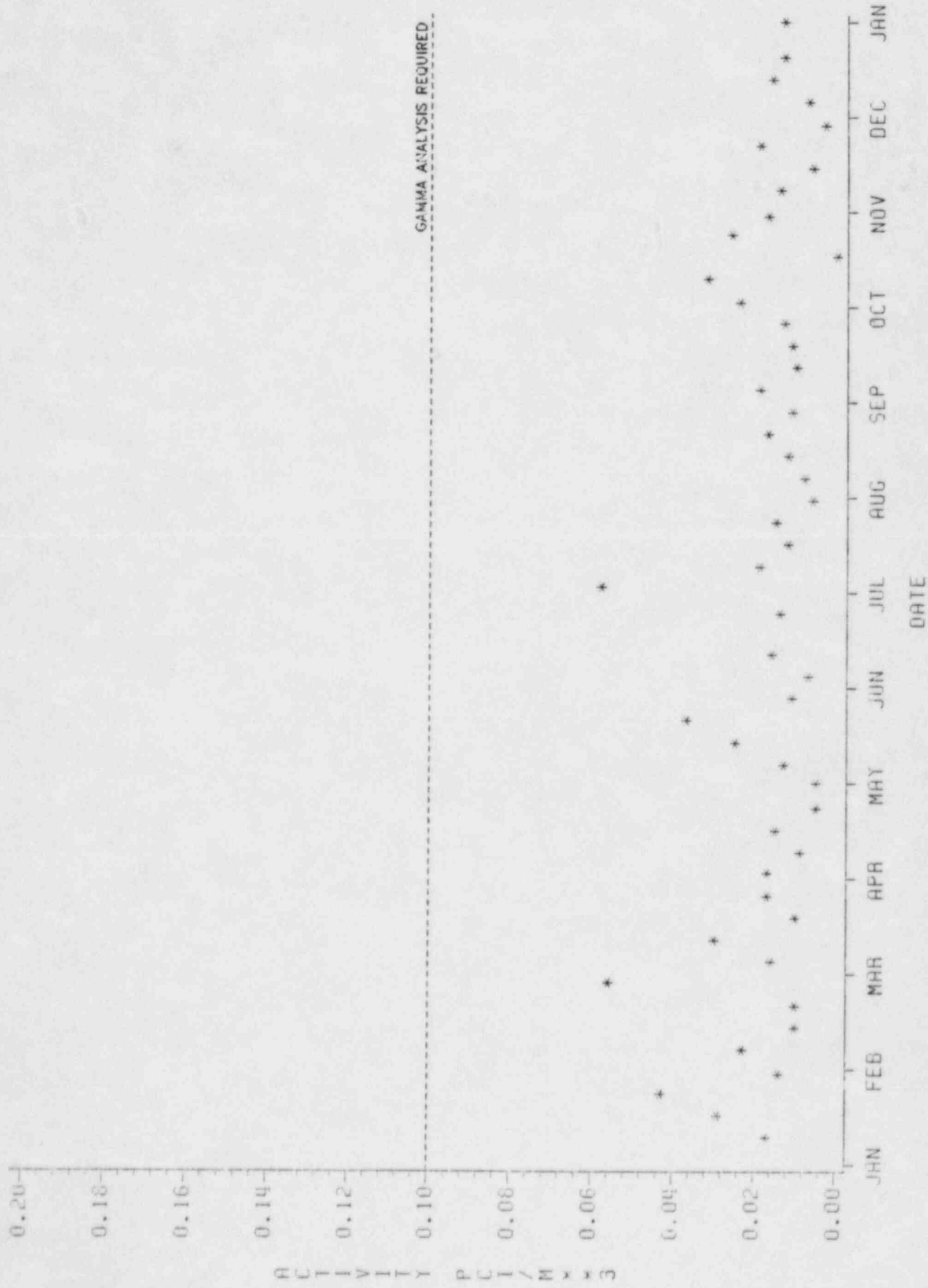
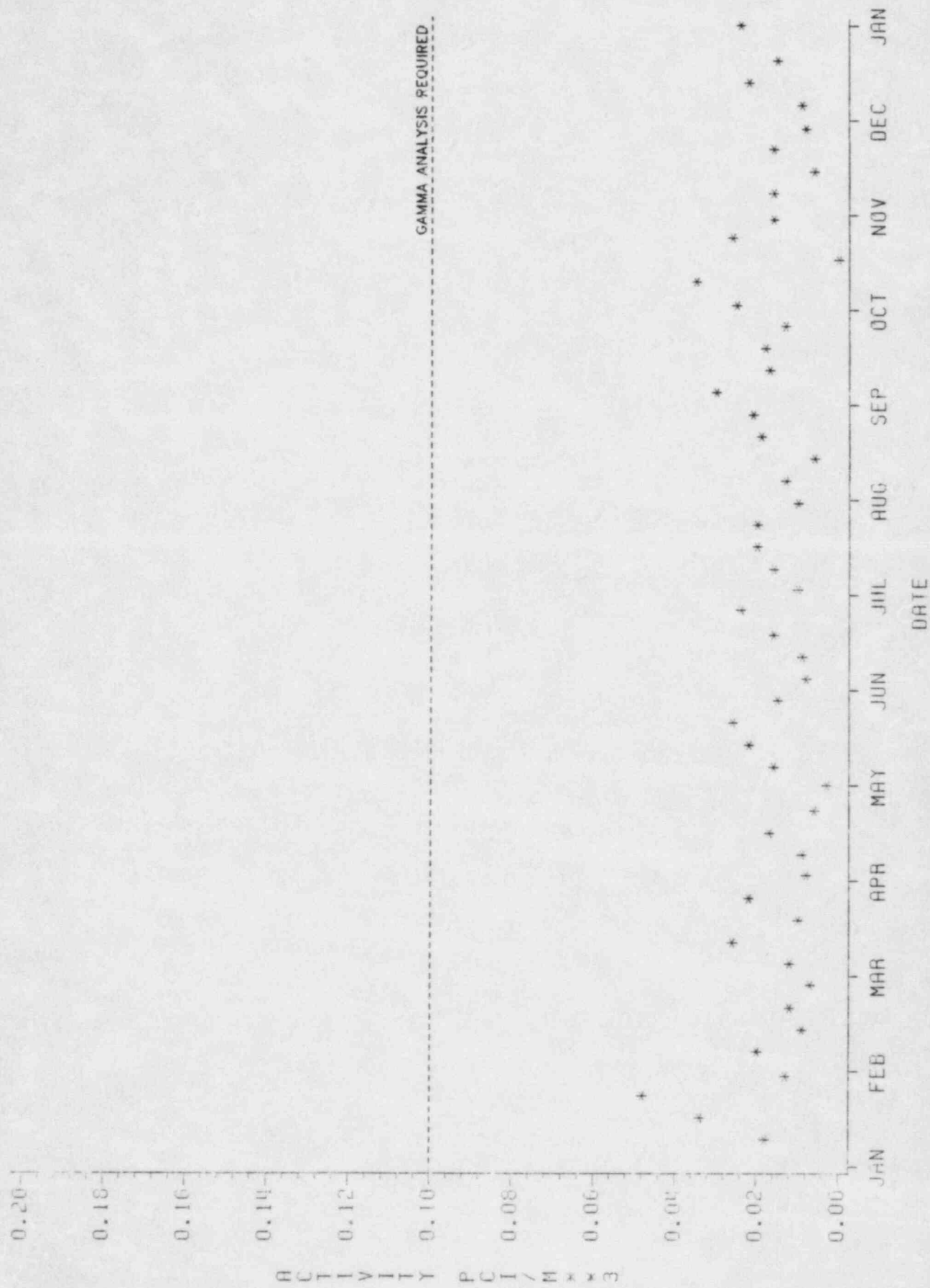


TABLE 5-2
GROSS BETA ACTIVITY IN AIR
FROM SITE 6B



GROSS BETA ACTIVITY IN AIR
FROM SITE 9B

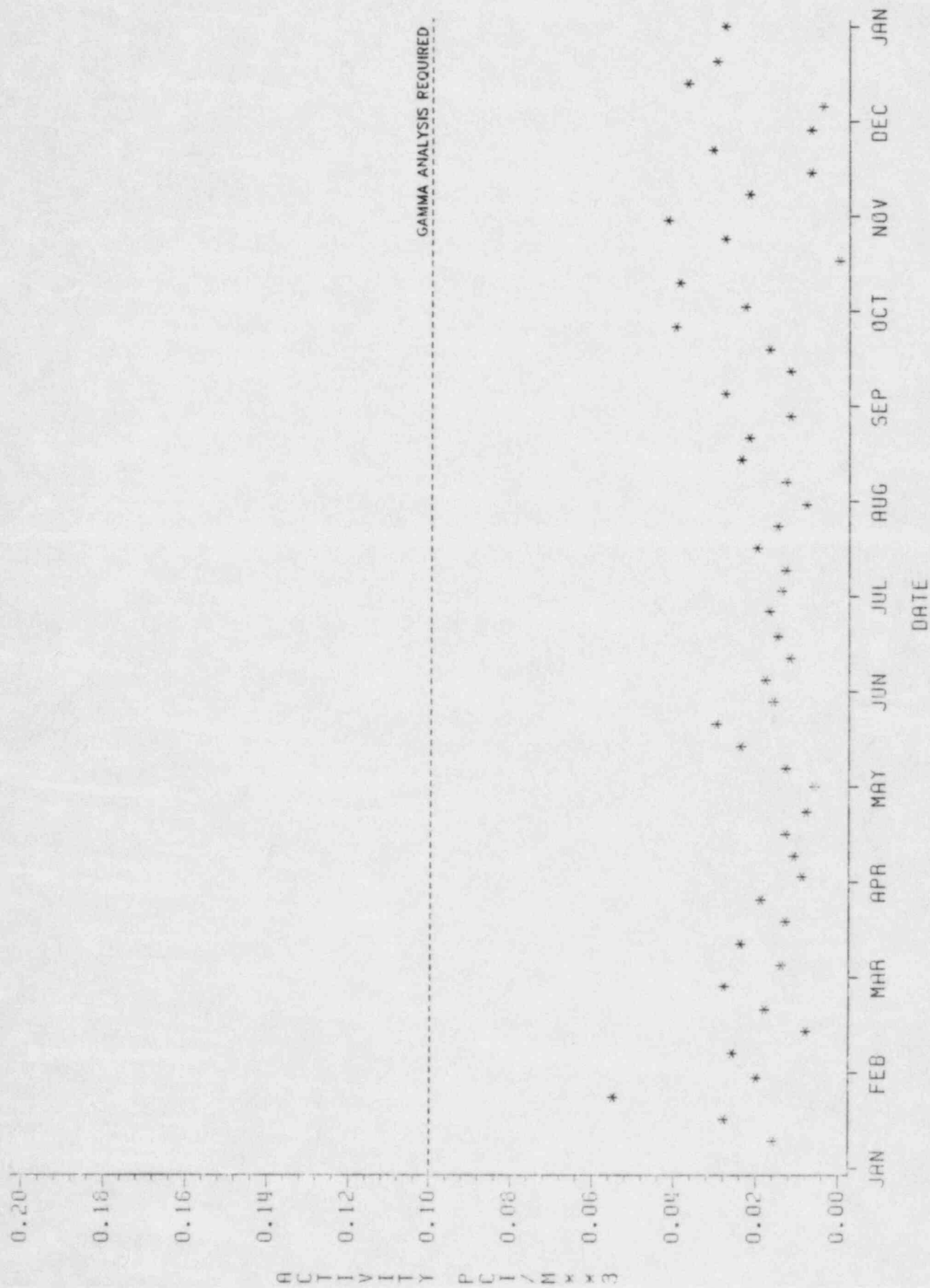
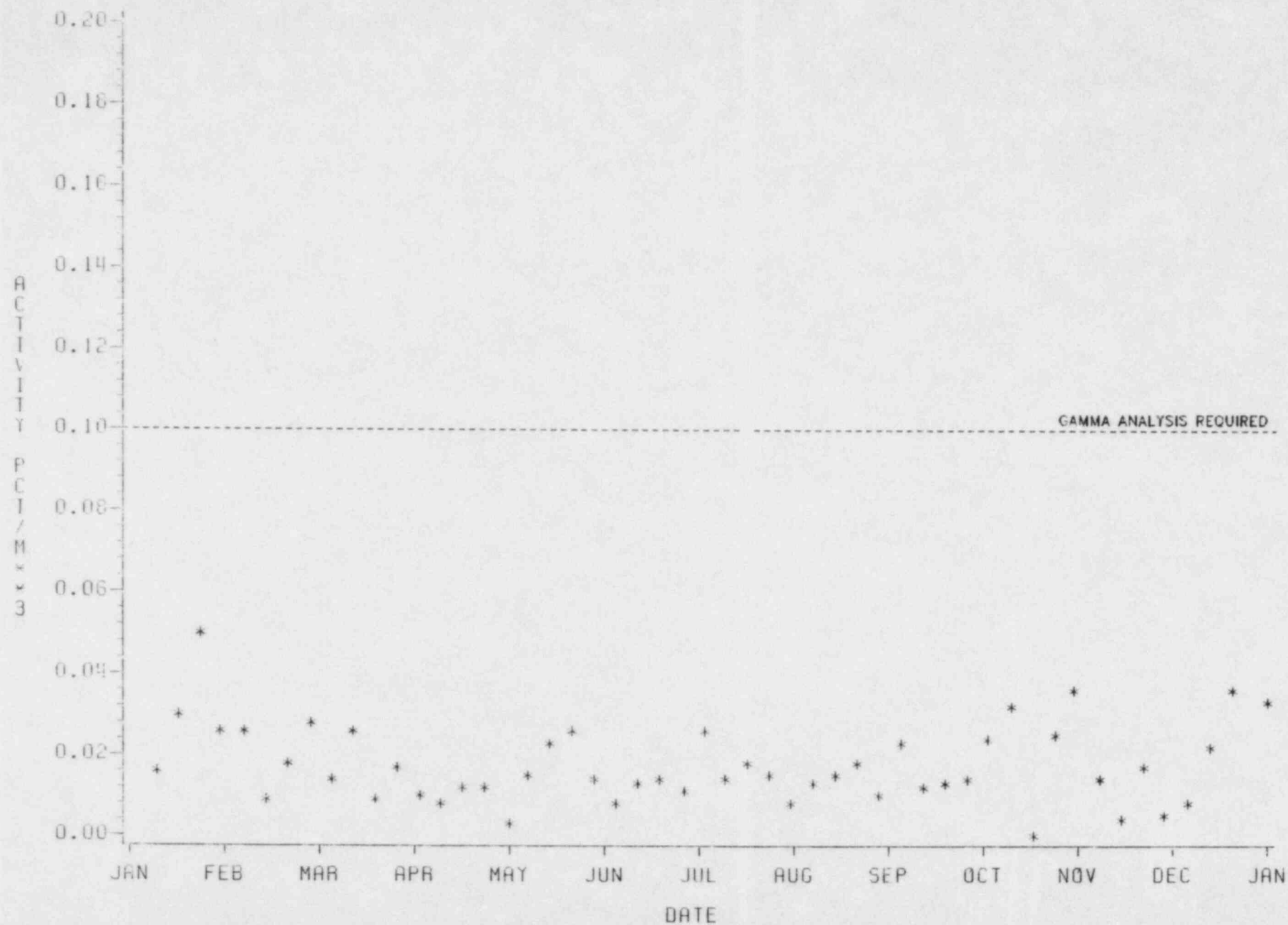


TABLE 5-2

GROSS BETA ACTIVITY IN AIR
FROM SITE 10

Sheet 8 of 12



GROSS BETA ACTIVITY IN AIR
FROM SITE 11B

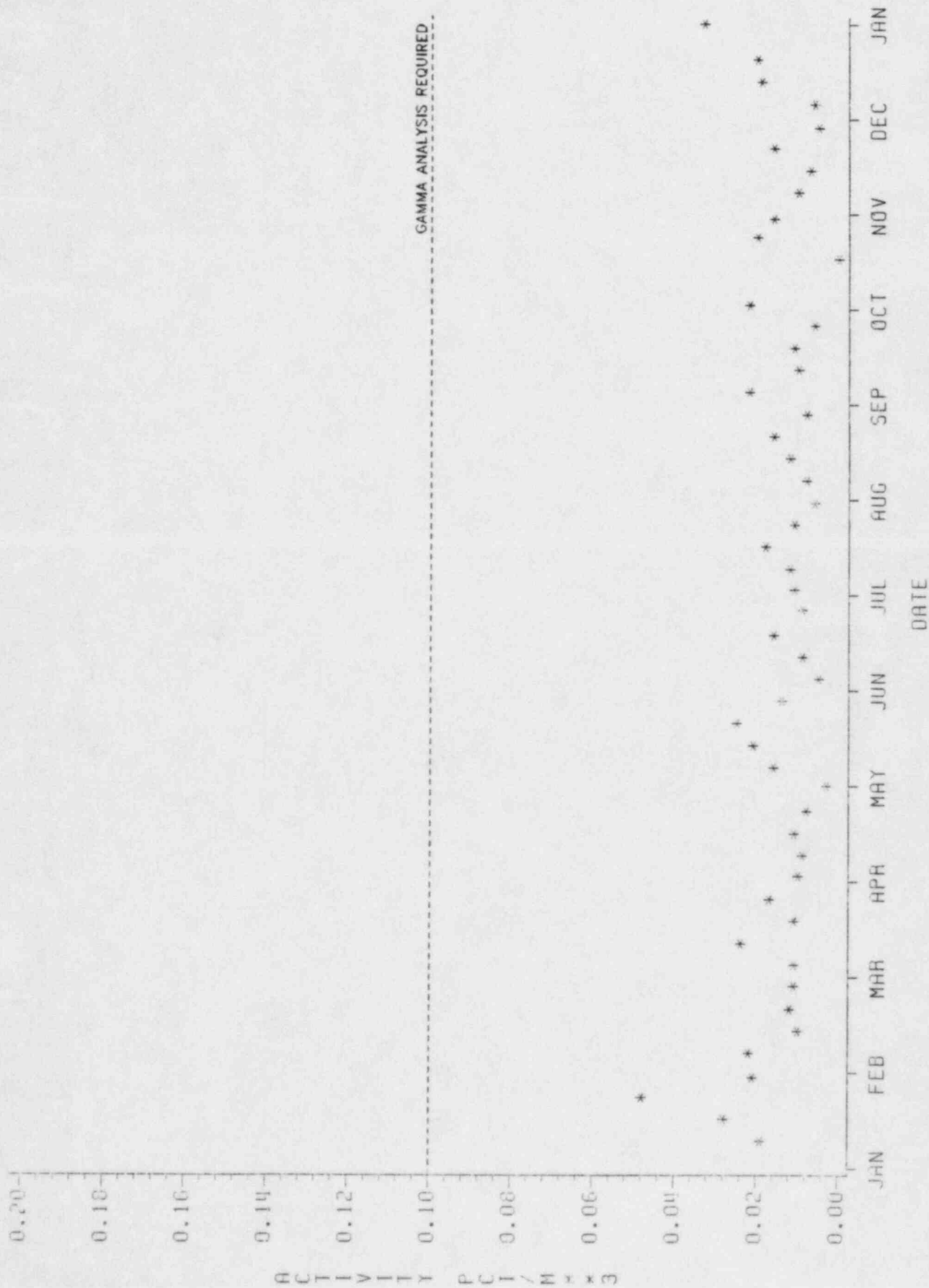


TABLE 5-2

GROSS BETA ACTIVITY IN AIR
FROM SITE 14

Sheet 10 of 12

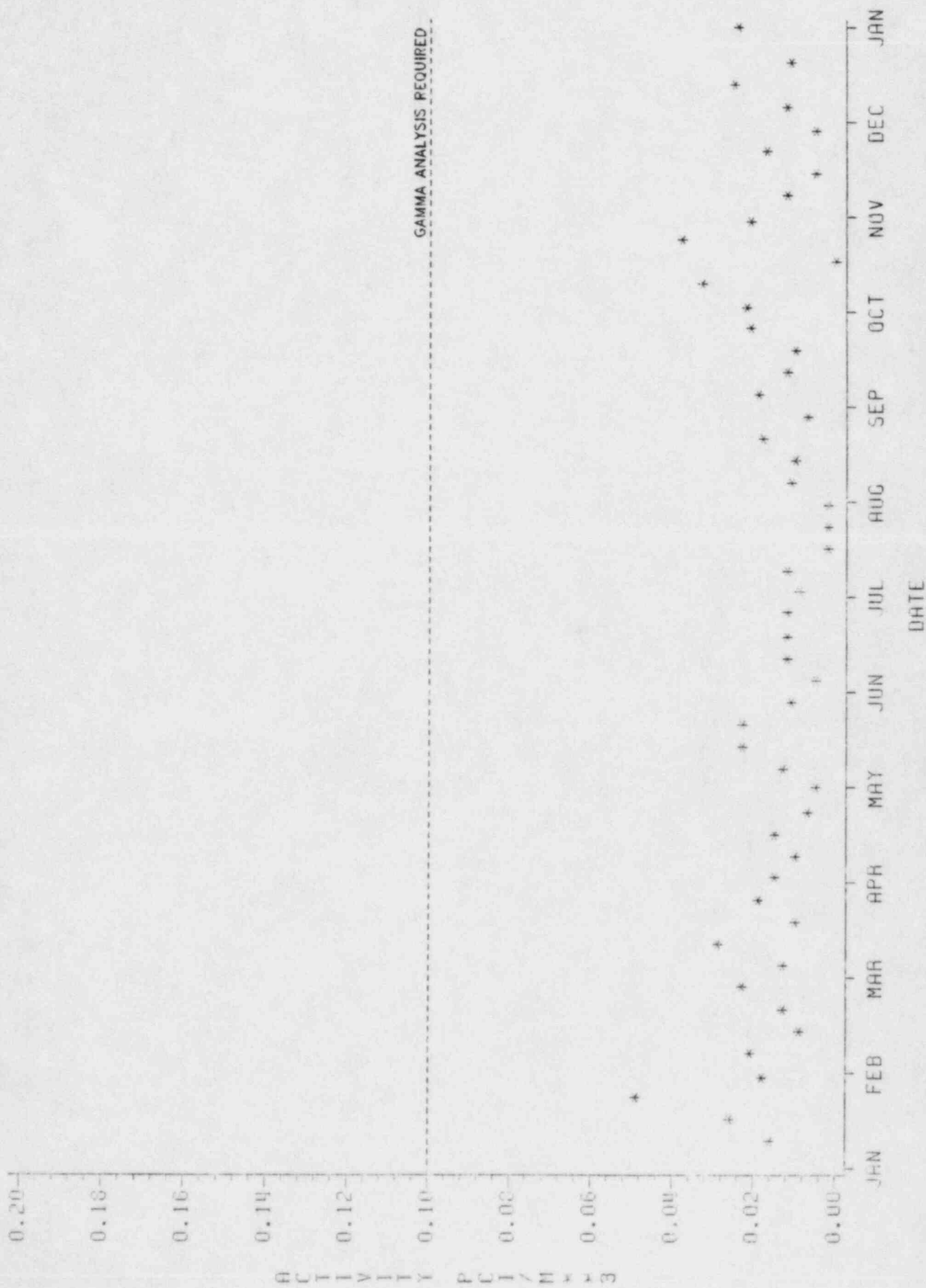


TABLE 5-2

GROSS BETA ACTIVITY IN AIR
FROM SITE 2

Sheet 11 of 12

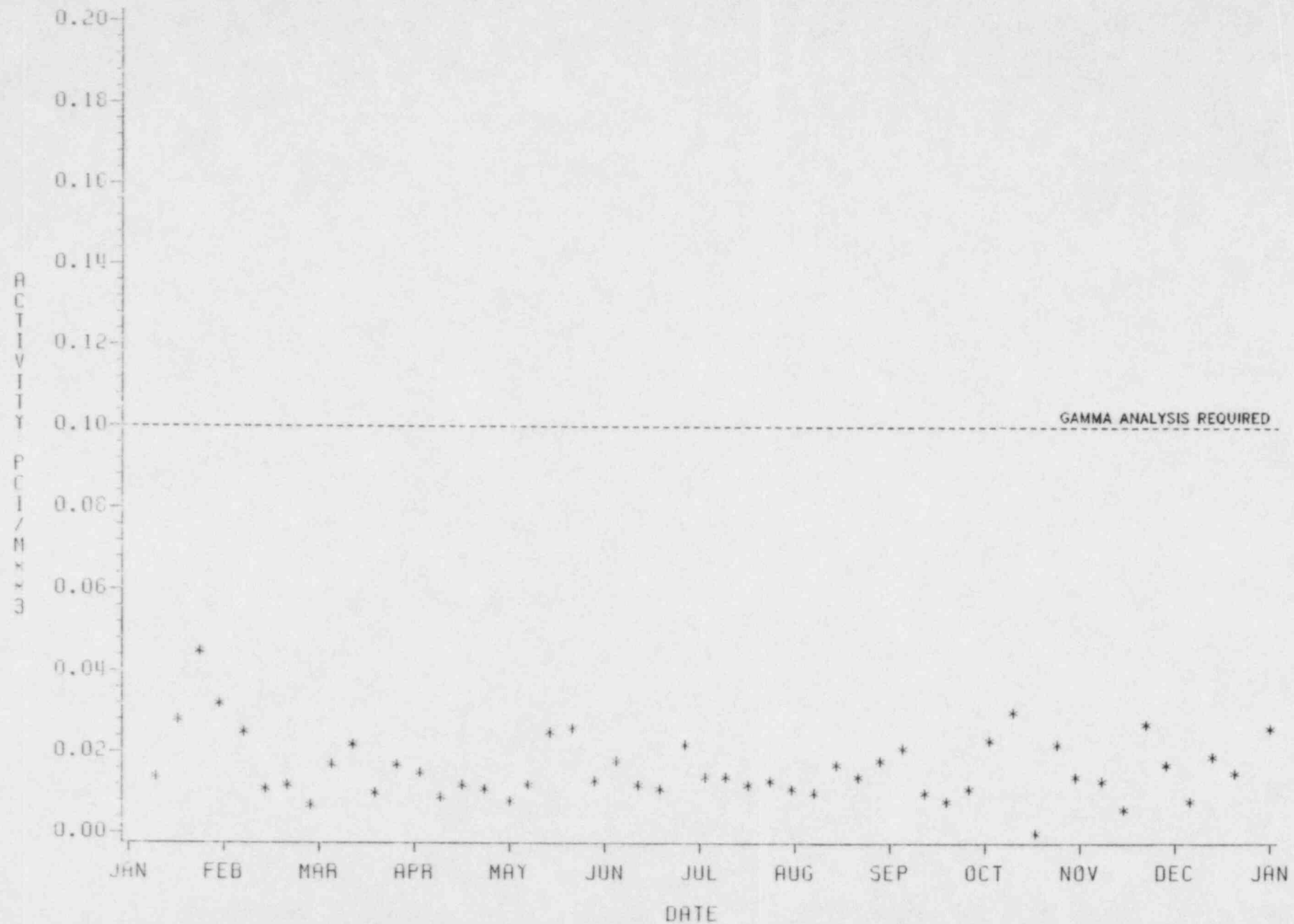


TABLE 5-2
GROSS BETA ACTIVITY IN AIR
FROM SITE 19

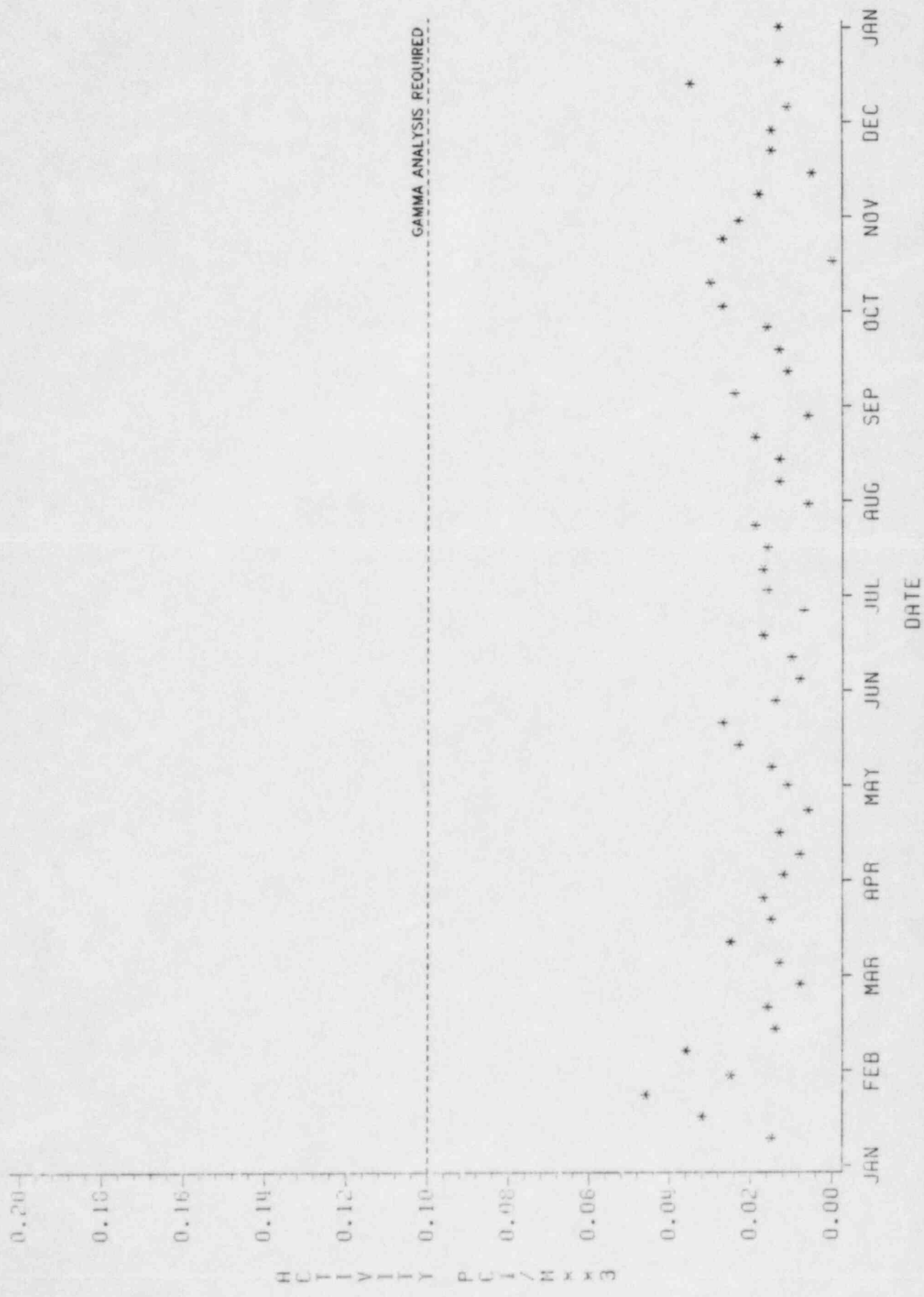


TABLE 5-3

Sheet 1 of 2

GROSS ALPHA CONCENTRATIONS IN AIR PARTICULATE FILTERS (Monthly Composites)

Coll. Date	pCi/m ³					
	Location 1F	Location 1H	Location 1I	Location 3	Location 5	Location 6B
Jan	0.010±0.001	<0.002	<0.002	<0.002	<0.002	<0.002
Feb	0.005±0.003	0.004±0.002	0.003±0.003	0.002±0.002	0.005±0.002	0.003±0.003
March	0.003±0.001	0.002±0.001	0.004±0.001	0.004±0.001	<0.002	0.002±0.001
April	0.002±0.001	<0.002	<0.002	0.003±0.003 ^[a]	0.003±0.001	0.003±0.001
May	<0.002	<0.002	<0.002	[b]	<0.002	<0.002
June	<0.002	<0.002	<0.002	[b]	<0.002	<0.002
July	0.002±0.001	0.002±0.001	<0.002	[b]	<0.002	<0.002
Aug	<0.002	<0.002	<0.002	[b]	<0.002	<0.002
Sept	<0.002	0.004±0.001	<0.002	[b]	<0.002	<0.002
Oct	<0.002	<0.002	<0.002	[b]	<0.002	<0.002
Nov	<0.002	<0.002	<0.002	[b]	<0.002	<0.002
Dec	0.003±0.001	0.002±0.001	0.002±0.001	[b]	0.002±0.001	0.003±0.001

[a] Lower sensitivity due to low sample volume as the sample collection was discontinued from 04/03/84.

[b] Sample collection was discontinued.

TABLE 5-3

Sheet 2 of 2

Coll. Date	pCi/m ³					
	Location 9B	Location 10	Location 11B	Location 14	Location 2	Location 19
Jan	<0.002	<0.002	<0.002	0.002±0.001	<0.002	<0.002
Feb	<0.002	0.003±0.003	0.003±0.002	0.002±0.002	<0.002	<0.002
March	<0.002	0.005±0.001	0.002±0.001	0.004±0.001	0.001±0.001	0.006±0.001
April	<0.002	0.003±0.001	<0.002	0.003±0.001	0.002±0.001	<0.002
May	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
June	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
July	<0.002	<0.002	<0.002	0.002±0.001	<0.002	0.002±0.001
Aug	<0.002	0.002±0.001	<0.002	<0.002	<0.002	<0.002
Sept	0.003±0.001	0.003±0.001	<0.002	0.002±0.001	0.003±0.001	<0.002
Oct	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nov	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dec	0.004±0.001	0.003±0.001	0.002±0.001	0.004±0.001	0.002±0.001	0.003±0.001

TABLE 5-4

SUMMARY - GROSS BETA IN AIR SAMPLES

	pCi/m ³		
	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Trojan Onsite Stations			
1F	0.019	0.050	0.003
1H	0.018	0.057	0.004
1I	0.017	0.046	0.003
Oregon Stations			
2	0.017	0.045	0.006
3	0.020	0.033	0.009
5	0.017	0.058	0.003
6B	0.017	0.048	0.003
19	0.017	0.046	0.006
Washington Stations			
9B	0.020	0.055	0.006
10	0.018	0.050	0.003
11B	0.015	0.048	0.003
14	0.016	0.049	0.005

TABLE 5-5

RADIOACTIVITY IN ANIMAL TISSUE

Location	Tissue Analyzed	Collection Date	pCi/g Wet Weight		
			Gamma Emitters	Sr-89	Sr-90
16	Beef Liver	03/15/84	<0.05	<0.010[a]	<0.012[a]
16	Beef Muscle	03/15/84	<0.05	<0.028[a]	<0.035[a]
16	Beef Heart	03/15/84	<0.05	<0.005	<0.007[a]
17A	Goat Liver	03/14/84	<0.05	<0.005	<0.005
17A	Goat Muscle	03/14/84	<0.05	<0.018[a]	<0.023[a]
17A	Goat Heart	03/14/84	<0.05	<0.005	<0.006[b]
16	Beef Liver	09/19/84	<0.05	<0.005	<0.005
16	Beef Muscle	09/19/84	<0.05	<0.005	0.009±0.002
16	Beef Heart	09/19/84	<0.05	<0.005	0.024±0.004
17A	Goat Liver	09/19/84	<0.05	<0.005	<0.005
17A	Goat Muscle	09/19/84	<0.05	<0.005	<0.005
17A	Goat Heart	09/19/84	<0.05	<0.018[b]	<0.022[b]

[a] Lower sensitivity due to low chemical recovery.

[b] Lower sensitivity due to insufficient sample size.

TABLE 5-6

RADIOACTIVITY IN PRODUCE

Location	Sample Type	Collection Date	pCi/g (Wet Weight)		
			Gamma Emitters	Sr-89	Sr-90
1I	Onions	07/10/84	<0.05	<0.005	<0.005
1I	Cabbage	07/10/84	<0.05	<0.005	<0.005
1I	Swiss Chard	07/10/84	<0.05	<0.005	<0.005
1I	Lettuce	07/10/84	<0.05	<0.005	<0.005
1I	Squash	08/09/84	<0.05	<0.005	<0.005
1I	Potatoes	08/09/84	<0.05	<0.005	0.005±0.001
1I	Carrots	08/09/84	<0.05	<0.005	<0.005
1I	Blackberries	08/16/84	<0.05	<0.005	<0.005
1I	Apples	09/12/84	<0.05	<0.005	<0.005

TABLE 5-7

RADIOACTIVITY IN GRASS

Collection Site	Date	pCi/g (Wet Weight)		
		Gamma Emitters	Sr-89	Sr-90
17A Kandle Dairy	02/06/84	<0.05	<0.005	0.014±0.003
17A Kandle Dairy	03/14/84	<0.05	<0.005	<0.005
1F	03/19/84	<0.05	<0.005	<0.005
1I	03/19/84	<0.05	<0.005	<0.005
3	03/19/84	<0.05	<0.005	<0.005
5	03/19/84	<0.05	<0.005	<0.005
8	03/19/84	<0.05	<0.005	<0.005
1F	09/17/84	<0.05	<0.005	<0.005
1I	09/17/84	<0.05	<0.005	<0.005
3	09/17/84	<0.05	<0.005	<0.005
5	09/17/84	<0.05	<0.005	<0.005
8	09/17/84	<0.05	<0.005	<0.005

TABLE 5-8

RADIOACTIVITY IN WELL WATER

Collection Date	pCi/l					
	Location 1G		Location 3		Location 6B	
	Gross β	Tritium	Gross β	Tritium	Gross β	Tritium
03/19/84	2.5 \pm 0.5	<1000	0.9 \pm 0.4	<1000	<1.0	<1000
06/14/84	2.8 \pm 1.0	<1000	1.3 \pm 0.9	<1000	2.3 \pm 1.0	<1000
09/18/84	2.5 \pm 0.9	<1000	1.7 \pm 0.8	<1000	1.7 \pm 0.8	<1000
12/12/84	2.4 \pm 1.3	<1000	1.7 \pm 0.2	<1000	3.5 \pm 1.4	<1000

Collection Date	pCi/l			
	Location 11B		Location 16	
	Gross β	Tritium	Gross β	Tritium
03/19/84	1.8 \pm 0.4	<1000	1.0 \pm 0.4	<1000
06/14/84	5.4 \pm 0.4	<1000	<1.0	<1000
09/18/84	6.9 \pm 1.1	<1000	2.9 \pm 0.8	<1000
12/12/84	3.0 \pm 1.3	<1000	3.7 \pm 1.3	<1000

TABLE 5-9

Sheet 1 of 3

RADIOACTIVITY IN MILK

Collection Date	pCi/l Location 68				Collection Date	pCi/l Location 16			
	I-131	Sr-89	Sr-90	Y Emitters		I-131	Sr-89	Sr-90	Y Emitters
01/09/84	<0.5	<1	7.8±1.0	<50	01/09/84	<0.5	<1	2.2±0.8	<50
02/06/84	<0.5	<1	2.4±0.8	<50	02/06/84	<0.5	<1	2.1±0.8	<50
03/05/84	<0.5	<1	0.8±0.7	<50	03/05/84	<0.5	<1	1.6±0.7	<50
04/09/84	<0.5	<1	2.6±0.8	<50	04/09/84	<0.5	<1	1.5±0.7	<50
05/07/84	<0.5	<1	<1	<50	05/07/84	<0.5	<1	<1	<50
06/04/84	<0.5	<1	<1	<50	06/04/84	<0.5	<1	<1	<50
07/16/84	<0.5	<1	6.8±0.5	<50	07/16/84	<0.5	<1	4.6±0.4	<50
08/06/84	<0.5	<1.6 ^[a]	5.0±0.9	<50	08/06/84	<0.5	<1.7 ^[a]	1.6±0.7	<50
09/10/84	<0.5	<1	3.7±0.8	<50	09/10/84	<0.5	<1	2.4±0.7	<50
10/08/84	<0.5	<1	1.7±0.8	<50	10/08/84	<0.5	<1	1.2±0.8	<50
11/05/84	<0.5	<1	3.1±0.8	<50	11/05/84	<0.5	<1	3.7±0.7	<50
12/10/84	<0.5	<1	1.9±1.0	<50	12/10/84	<0.5	<1	1.5±0.6	<50

[a] Lower sensitivity due to low chemical recovery.

TABLE 5-9

Sheet 2 of 3

Collection Date	pCi/l Location 17A				Collection Date	pCi/l Location 19			
	I-131	Sr-89	Sr-90	Y Emitters		I-131	Sr-89	Sr-90	Y Emitters
01/09/84	<0.5	<1	3.0±0.8	<50	01/09/84	<0.5	<1	3.0±0.8	<50
02/06/84	[a]	[a]	[a]	[a]	02/06/84	<0.5	<1	2.3±0.7	<50
03/26/84	<0.5	<1	1.8±0.7	<50	03/05/84	<0.5	<1	0.6±0.3	<50
04/09/84	<0.5	<1	1.2±0.7	<50	04/09/84	<0.5	<1	1.6±0.7	<50
05/07/84	<0.5	<1	<1	<50	05/07/84	<0.5	<1	<1	<50
06/04/84	<0.5	<1	<1	<50	06/04/84	<0.5	<1	<1	<50
07/16/84	<0.5	<1	5.1±0.8	<50	07/16/84	<0.5	<1	2.2±0.4	<50
08/07/84	<0.5	<1	5.5±0.8	<50	08/06/84	<0.5	<1.6 ^[b]	3.1±0.7	<50
09/10/84	<0.5	<1	3.3±0.9	<50	09/10/84	<0.5	<1	2.6±0.7	<50
10/10/84	<0.5	<1.7 ^[b]	4.1±0.7	<50	10/08/84	<0.5	<1	1.8±0.7	<50
11/05/84	<0.5	<1	3.0±0.9	<50	11/05/84	<0.5	<1	2.6±0.6	<50
12/10/84	<0.5	<1	2.4±0.8	<50	12/10/84	<0.5	<1	1.0±0.7	<50

[a] Dairy goats were dry in February 1984. Grass sample was taken.

[b] Lower sensitivity due to low chemical recovery.

TABLE 5-9

Sheet 3 of 3

Collection Date	pCi/l			
	Location 65[c]			γ Emitters
	I-131	Sr-89	Sr-90	
01/09/84	<0.5	<1	3.4±0.8	<50
02/06/84	<0.5	<1	10.6±1.3	<50
03/05/84	<0.5	<1	0.7±0.5	<50
04/09/84	<0.5	<1	0.9±0.6	<50
05/07/84	<0.5	<1	<1	<50
06/04/84	<0.5	<1	<1	<50
07/16/84	<0.5	<1	1.5±0.3	<50
08/06/84	<0.5	<1.4[a]	2.2±0.7	<50
09/10/84	<0.5	<1	2.4±0.7	<50
10/08/84	<0.5	<1	1.7±0.7	<50
11/05/84	<0.5	<1	2.1±0.7	<50
12/10/84	<0.5	<1	1.2±0.7	<50

[a] Lower sensitivity due to low chemical recovery.

TABLE 5-10
RADIOACTIVITY IN SOIL

Collection Date	pCi/g Dry Weight			
	Sr-89	Sr-90	Cs-137	Other Gamma
Location 1A				
03/19/84	<0.01	0.017±0.009	<0.1	<0.1
09/17/84	<0.01	0.019±0.007	0.8±0.1	<0.1
Location 1F				
03/19/84	<0.01	0.021±0.010	<0.1	<0.1
09/17/84	<0.01	0.021±0.010	0.2±0.1	<0.1
Location 1I				
03/19/84	<0.01	0.077±0.015	0.2±0.1	<0.1
09/17/84	<0.01	0.046±0.009	0.4±0.1	<0.1
Location 3				
03/19/84	<0.01	0.094±0.017	<0.1	<0.1
09/17/84	<0.01	0.056±0.010	1.1±0.1	<0.1
Location 5				
03/19/84	<0.01	0.17±0.02	<0.1	<0.1
09/17/84	<0.01	0.56±0.010	0.5±0.1	<0.1
Location 8				
03/19/84	<0.01	0.10±0.02	0.5±0.1	<0.1
09/17/84	<0.01	0.083±0.017	0.5±0.1	<0.1
Location 11B				
03/19/84	<0.01	0.035±0.011	<0.1	<0.1
09/17/84	<0.01	0.021±0.007	<0.1	<0.1

TABLE 5-11

RADIOACTIVITY IN PRECIPITATION

Month	pCi/l					
	Met Tower (1F)		Woodland (9B)		Rainier (2)	
	Gross β	Tritium	Gross β	Tritium	Gross β	Tritium
January	5.0 \pm 1.0	<1000	2.1 \pm 1.7	<1000	5.5 \pm 1.8	<1000
February	<1.0	<1000	2.0 \pm 1.5	<1000	<1.0	<1000
March	4.3 \pm 0.7	<1000	3.7 \pm 0.7	<1000	4.6 \pm 0.7	<1000
April	3.4 \pm 1.5	<1000	4.4 \pm 1.5	<1000	3.8 \pm 1.5	<1000
May	4.2 \pm 1.3	<1000	4.3 \pm 1.3	<1000	1.4 \pm 1.2	<1000
June	<1.0	<1000	1.8 \pm 1.0	<1000	<1.0	<1000
July-September ^[a]	1.6 \pm 0.7	<1000	7.7 \pm 1.0	<1000	4.5 \pm 0.9	<1000
October	1.9 \pm 1.1	<1000	2.5 \pm 0.9	<1000	2.5 \pm 0.9	<1000
November	3.5 \pm 0.8	<1000	2.8 \pm 0.7	<1000	8.2 \pm 1.1	<1000
December	3.7 \pm 0.8	<1000	2.4 \pm 0.7	<1000	1.1 \pm 0.6	<1000

[a] Sample collected for three months due to lack of rainfall.

TABLE 5-12

Sheet 1 of 3

AMBIENT GAMMA RADIATION LEVELS FOR 1984

mR/Day (Mean Daily Exposure $\pm 2\sigma$ Error)

Site	First Quarter 01/11/84-04/11/84	Second Quarter 04/11/84-08/08/84	Third Quarter 08/08/84-11/14/84	Fourth Quarter 11/14/84-02/13/85
1A	0.10 \pm 0.02	0.10 \pm 0.04	0.11 \pm 0.02	0.09 \pm 0.03
1B	0.11 \pm 0.02	0.10 \pm 0.03	0.11 \pm 0.02	0.10 \pm 0.03
1C	*	0.12 \pm 0.04	0.12 \pm 0.03	0.11 \pm 0.03
1E	0.15 \pm 0.03	0.09 \pm 0.03	0.10 \pm 0.02	0.08 \pm 0.02
1F	0.10 \pm 0.02	0.12 \pm 0.04	0.13 \pm 0.03	0.11 \pm 0.03
1H	0.12 \pm 0.02	0.20 \pm 0.08	0.22 \pm 0.05	*
1I	0.16 \pm 0.03	0.11 \pm 0.04	0.12 \pm 0.03	0.11 \pm 0.04
1J	0.11 \pm 0.02	0.10 \pm 0.03	0.11 \pm 0.02	0.09 \pm 0.03
2	0.11 \pm 0.02	0.14 \pm 0.05	0.15 \pm 0.03	0.15 \pm 0.05
3	0.15 \pm 0.03	0.14 \pm 0.05	0.17 \pm 0.04	0.12 \pm 0.04
4C	0.12 \pm 0.02	0.12 \pm 0.04	0.13 \pm 0.03	0.11 \pm 0.03
5	*	0.15 \pm 0.05	0.18 \pm 0.04	*
6B	0.12 \pm 0.02	0.12 \pm 0.04	0.13 \pm 0.03	0.11 \pm 0.03
7	0.12 \pm 0.02	0.14 \pm 0.05	0.14 \pm 0.03	0.12 \pm 0.04
8	0.13 \pm 0.03	0.14 \pm 0.05	0.14 \pm 0.03	0.12 \pm 0.04
9B	0.12 \pm 0.02	0.12 \pm 0.04	0.14 \pm 0.03	0.12 \pm 0.04
10	0.15 \pm 0.03	0.14 \pm 0.05	0.17 \pm 0.04	0.12 \pm 0.04
11A	0.11 \pm 0.02	0.10 \pm 0.04	*	0.10 \pm 0.03
11B	0.11 \pm 0.02	*	0.13 \pm 0.03	0.10 \pm 0.03
12	0.11 \pm 0.02	0.11 \pm 0.04	0.12 \pm 0.03	0.10 \pm 0.03
13	0.14 \pm 0.03	0.14 \pm 0.05	0.15 \pm 0.03	0.13 \pm 0.04
14	0.13 \pm 0.02	0.12 \pm 0.04	0.13 \pm 0.03	0.12 \pm 0.04
20	*	0.10 \pm 0.03	0.10 \pm 0.02	0.09 \pm 0.03
21	0.08 \pm 0.01	0.08 \pm 0.03	0.09 \pm 0.02	0.07 \pm 0.02
22	0.10 \pm 0.02	0.09 \pm 0.03	0.10 \pm 0.02	0.09 \pm 0.03
23	0.11 \pm 0.02	0.10 \pm 0.04	0.10 \pm 0.02	0.10 \pm 0.03

* Dosimeter vandalized during field exposure.

TABLE 5-12

Sheet 2 of 3

Site	First Quarter 01/11/84-04/11/84	Second Quarter 04/11/84-08/08/84	Third Quarter 08/08/84-11/14/84	Fourth Quarter 11/14/84-02/13/85
24	0.15±0.03	0.15±0.05	0.15±0.03	0.13±0.04
25	0.12±0.02	0.11±0.04	0.12±0.03	0.11±0.03
26	0.15±0.03	0.15±0.06	0.16±0.04	0.15±0.05
27	0.17±0.03	0.16±0.06	0.18±0.04	0.16±0.05
28	0.14±0.03	0.15±0.06	0.16±0.04	0.15±0.05
29	0.15±0.03	0.16±0.06	0.18±0.04	0.15±0.05
30	0.15±0.03	0.15±0.06	0.17±0.03	0.14±0.05
31	0.12±0.02	0.14±0.05	0.15±0.03	0.14±0.04
32	0.12±0.02	0.12±0.04	0.13±0.02	0.12±0.04
33	0.13±0.02	0.13±0.05	0.14±0.02	0.12±0.04
34	*	0.13±0.05	0.14±0.03	0.13±0.04
35	0.12±0.02	0.12±0.04	0.13±0.02	0.11±0.03
36	0.14±0.03	0.12±0.04	0.13±0.02	0.12±0.04
37	0.13±0.03	0.13±0.05	0.14±0.03	0.13±0.04
38	0.13±0.02	0.11±0.04	0.12±0.02	0.12±0.04
39	0.16±0.03	0.16±0.06	0.17±0.03	0.15±0.05
40	0.12±0.02	0.12±0.04	0.13±0.02	0.12±0.04
41	0.12±0.02	0.12±0.05	0.13±0.02	0.12±0.04
42	0.11±0.02	0.11±0.04	0.11±0.02	0.11±0.03
43	0.12±0.02	0.12±0.04	0.13±0.02	0.12±0.04
44	0.14±0.03	0.14±0.05	0.15±0.03	0.13±0.04
45	*	0.13±0.05	*	0.11±0.03
46	0.12±0.02	0.11±0.04	0.12±0.02	0.11±0.03
47	0.11±0.02	0.12±0.04	0.12±0.02	0.11±0.03
48	0.12±0.02	*	0.11±0.02	0.11±0.03
49	0.13±0.02	*	0.10±0.02	*
50	0.10±0.02	0.10±0.04	0.10±0.02	0.10±0.03
51	0.11±0.02	0.12±0.04	0.12±0.02	0.11±0.03
52	0.10±0.02	0.10±0.04	0.10±0.02	0.10±0.03

* Dosimeter vandalized during field exposure.

TABLE 5-12

Sheet 3 of 3

<u>Site</u>	<u>First Quarter</u> <u>01/11/84-04/11/84</u>	<u>Second Quarter</u> <u>04/11/84-08/08/84</u>	<u>Third Quarter</u> <u>08/08/84-11/14/84</u>	<u>Fourth Quarter</u> <u>11/14/84-02/13/85</u>
53	0.10 \pm 0.02	0.11 \pm 0.04	0.10 \pm 0.02	0.11 \pm 0.03
54	0.15 \pm 0.03	0.16 \pm 0.06	0.15 \pm 0.03	0.17 \pm 0.05
55	0.10 \pm 0.02	0.10 \pm 0.04	0.11 \pm 0.02	0.11 \pm 0.03
56	0.06 \pm 0.01	0.06 \pm 0.03	0.06 \pm 0.01	0.07 \pm 0.02
57	0.12 \pm 0.02	0.13 \pm 0.05	0.12 \pm 0.02	0.14 \pm 0.04
58	0.13 \pm 0.03	0.13 \pm 0.05	0.13 \pm 0.02	0.14 \pm 0.04
59	0.10 \pm 0.02	0.10 \pm 0.03	0.09 \pm 0.02	0.10 \pm 0.03
60	0.11 \pm 0.02	0.10 \pm 0.03	0.10 \pm 0.02	0.11 \pm 0.03
61	0.14 \pm 0.03	0.13 \pm 0.05	0.14 \pm 0.02	0.15 \pm 0.05
62	0.07 \pm 0.01	0.06 \pm 0.02	0.06 \pm 0.01	0.06 \pm 0.02
64	0.11 \pm 0.02	0.10 \pm 0.03	0.11 \pm 0.02	0.11 \pm 0.03

* Dosimeter vandalized during field exposure.

TABLE 5-13

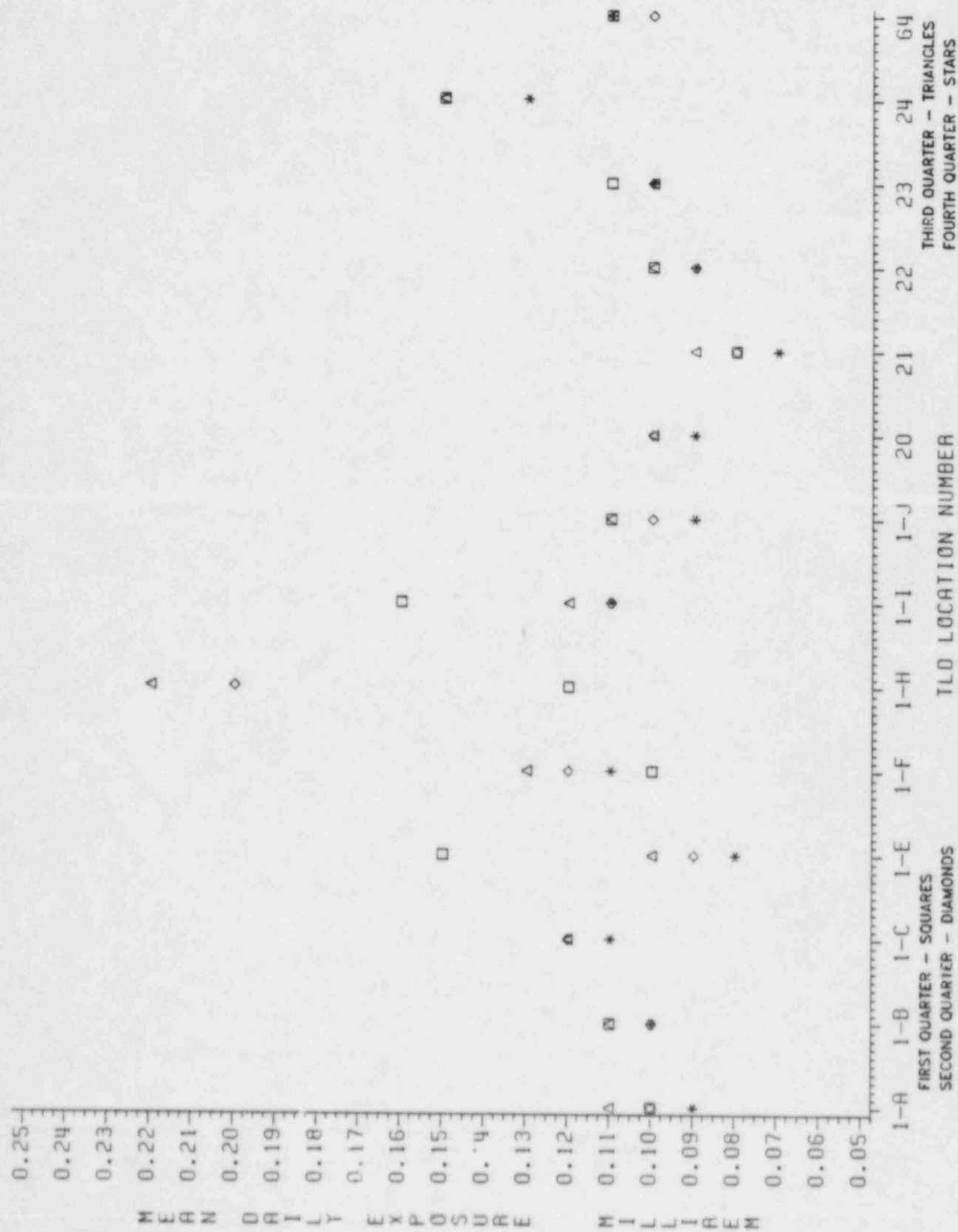
1984 AMBIENT ENVIRONMENTAL EXPOSURES
TLD LOCATIONS WITHIN PLANT EAB

TABLE 5-14

1984 AMBIENT ENVIRONMENTAL EXPOSURES
TLD LOCATIONS BETWEEN PLANT EAB AND 2.5 MILE RADIUS

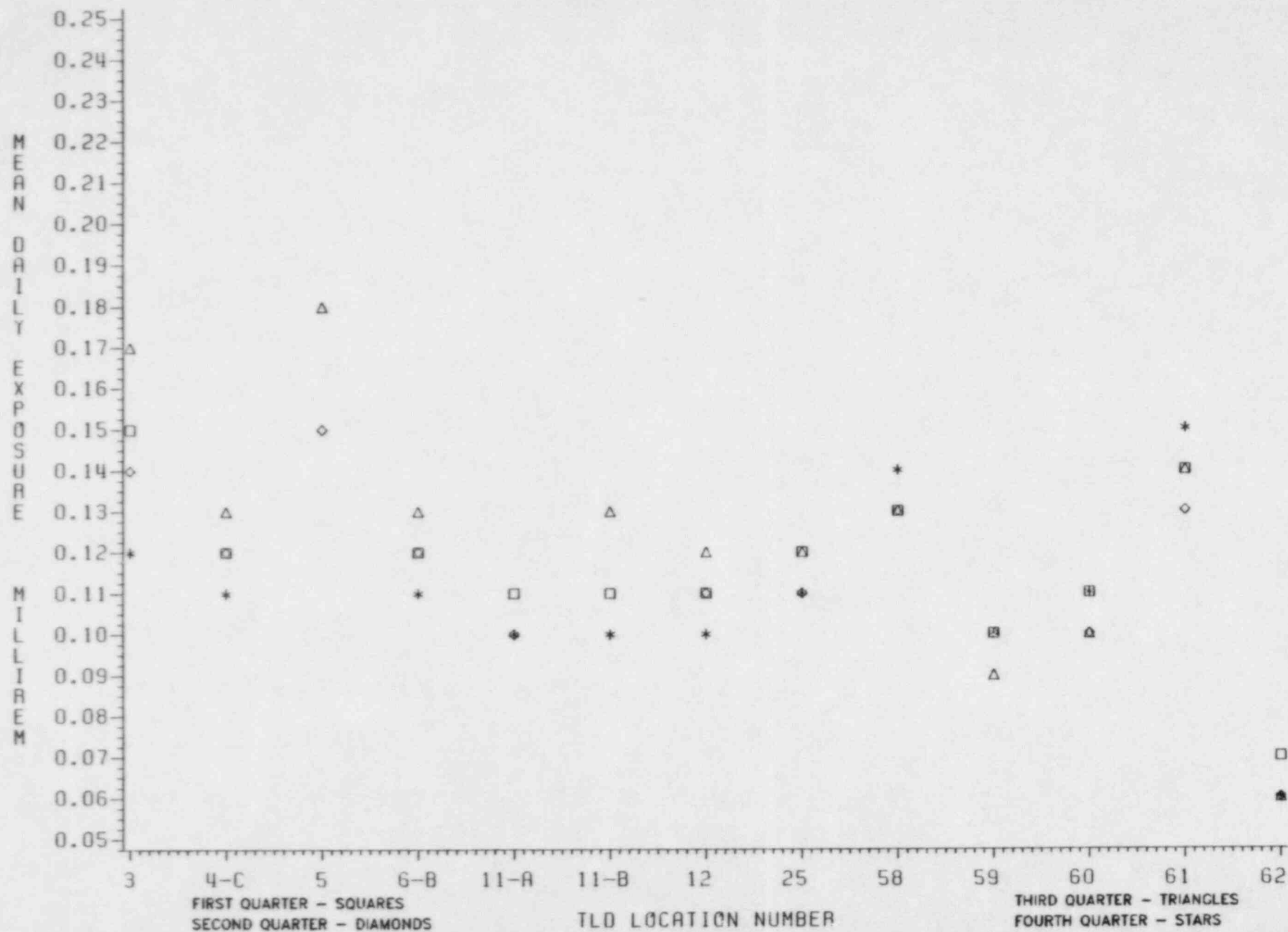


TABLE 5-15

1984 AMBIENT ENVIRONMENTAL EXPOSURES
TLD LOCATIONS BETWEEN PLANT 2.5 AND 5.0 MILE RADII

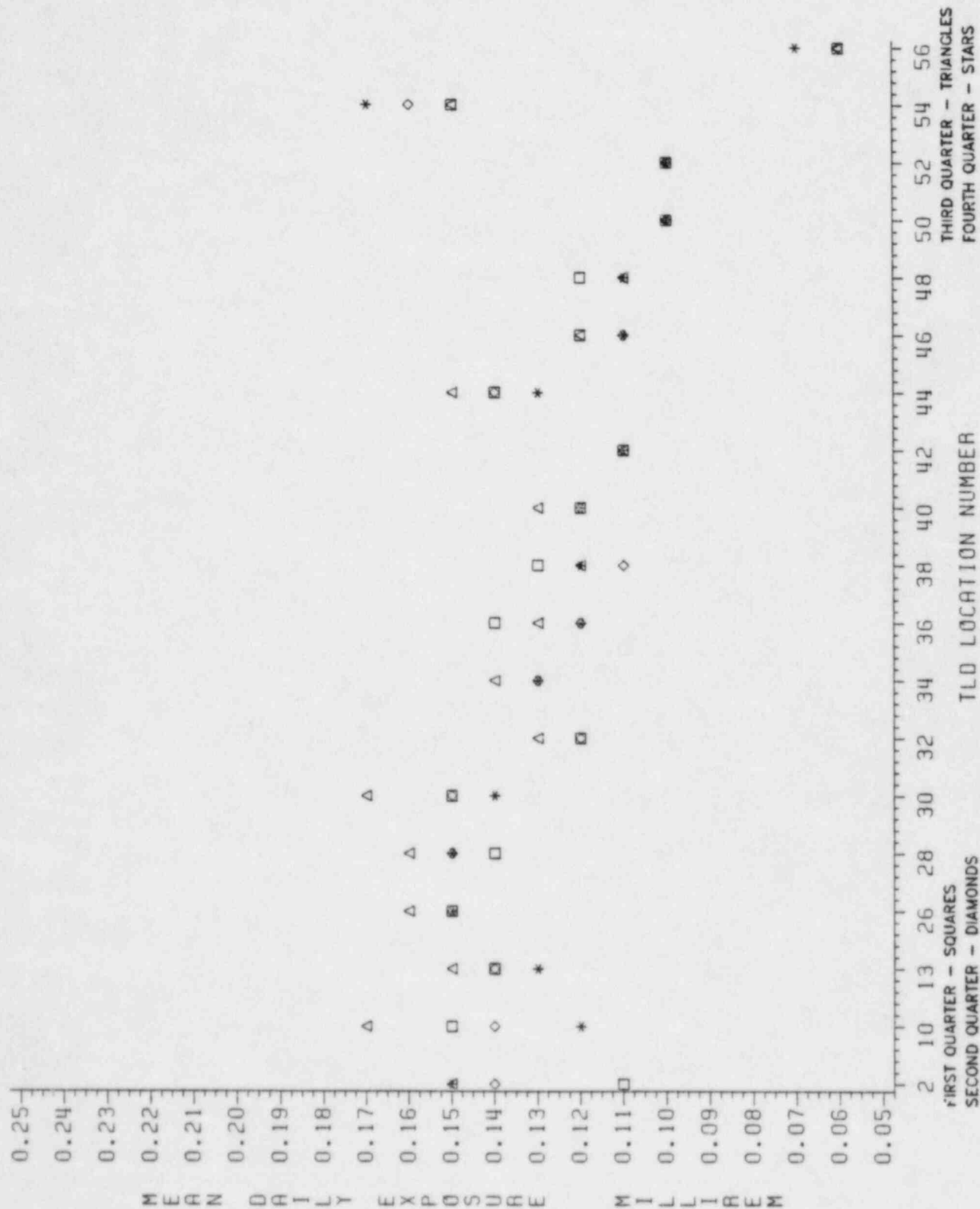
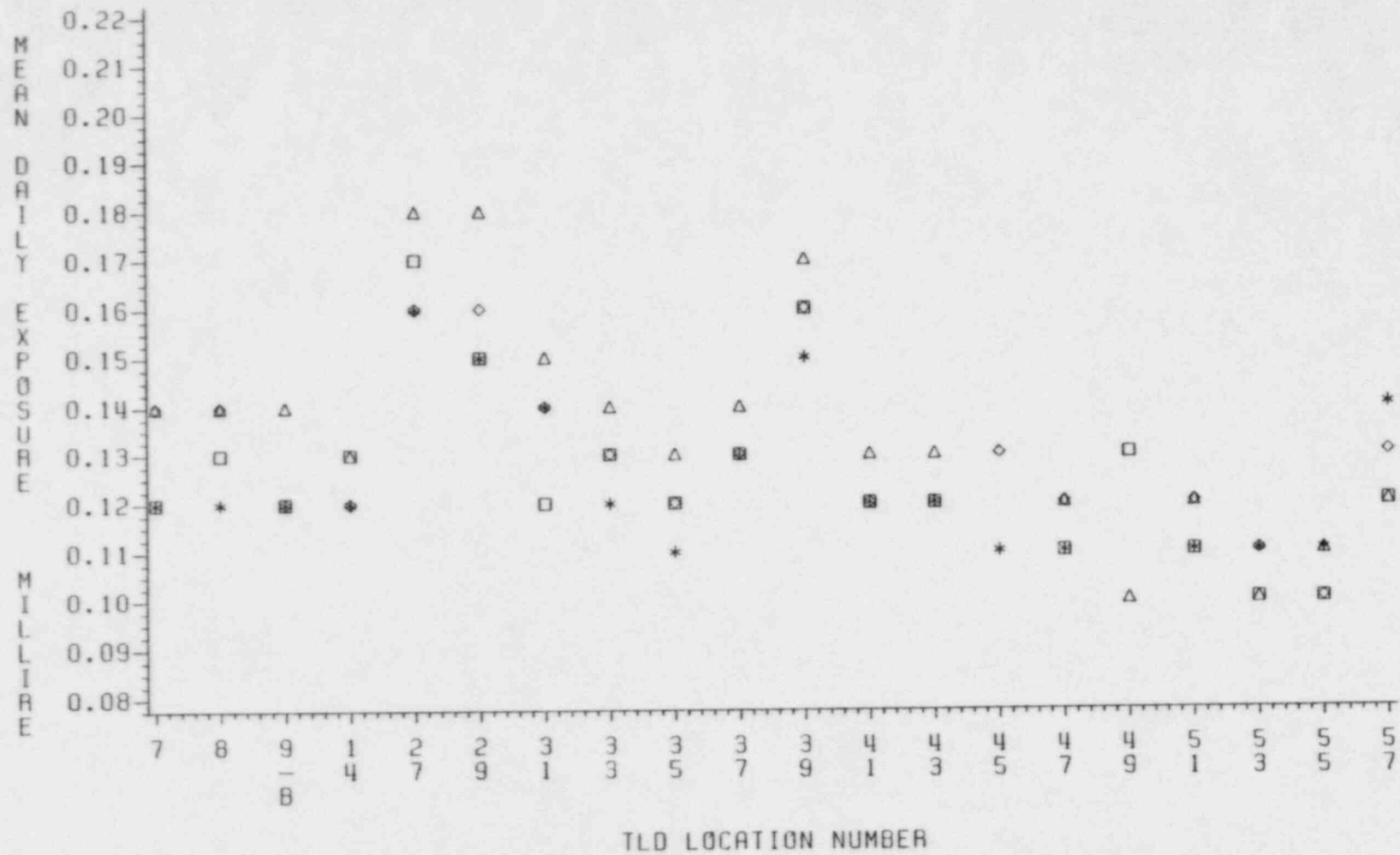


TABLE 5-16

1984 AMBIENT ENVIRONMENTAL MONITORING
TLD LOCATIONS BETWEEN PLANT 5.0 AND 10.0 MILE RADII



FIRST QUARTER - SQUARES
SECOND QUARTER - DIAMONDS

THIRD QUARTER - TRIANGLES
FOURTH QUARTER - STARS

TABLE 5-17

RADIOACTIVITY IN DRINKING WATER

Location 2 - Rainier Municipal Water Supply				Location 66 - St. Helen's Municipal Water Supply			
Collection Dates	pCi/l			Collection Dates	pCi/l		
	Gross Beta	Tritium	Gamma Emitters		Gross Beta	Tritium	Gamma Emitters
01/09/84-02/06/84	3.9±1.8	<1000	<25	01/09/84-02/06/84	5.7±1.2	<1000	<25
02/06/84-03/05/84	1.1±1.0	<1000	<25	02/06/84-03/05/84	2.7±1.1	<1000	<25
03/05/84-04/09/84	3.0±0.9	<1000	<25	03/05/84-04/09/84	4.2±1.0	<1000	<25
04/09/84-05/07/84	1.7±0.3	<1000	<25	04/09/84-05/07/84	1.7±0.3	<1000	<25
05/07/84-06/04/84	3.0±1.5	<1000	<25	05/07/84-06/04/84	6.9±1.1	<1000	<25
06/04/84-07/16/84	5.4±1.3	<1000	<25	06/04/84-07/16/84	5.3±1.3	<1000	<25
07/16/84-08/09/84	2.3±2.1	<1000	<25	07/16/84-08/09/84	5.5±2.3	<1000	<25
08/09/84-09/10/84	1.5±0.4	<1000	<25	08/09/84-09/10/84	3.8±1.2	<1000	<25
09/10/84-10/08/84	2.8±0.9	<1000	<25	09/10/84-10/08/84	2.5±0.8	<1000	<25
10/08/84-11/05/84	3.2±1.0	<1000	<25	10/08/84-11/05/84	5.7±1.6	<1000	<25
11/05/84-12/10/84	7.3±1.8	<1000	<25	11/05/84-12/10/84	6.8±1.8	<1000	<25
12/10/84-01/07/85	2.0±1.7	<1000	<25	12/10/84-01/07/85	1.2±0.7	<1000	<25

TABLE 5-18

Sheet 1 of 3

RADIOACTIVITY IN SURFACE WATER

Collection Date	pCi/l					
	Location 1A		Location 1B		Location 1D	
	Gross Beta	Tritium	Gross Beta	Tritium	Gross Beta	Tritium
01/12/84	3.9 \pm 1.7	<1000	3.8 \pm 1.7	1000 \pm 580	2.4 \pm 1.6	<1000
02/13/84	2.0 \pm 1.2	<1000	1.3 \pm 1.0	<1000	2.8 \pm 1.0	720 \pm 530
03/12/84	3.4 \pm 0.5	<1000	1.9 \pm 0.5	<1000	2.1 \pm 0.5	<1000
04/16/84	1.5 \pm 0.6	<1000	2.5 \pm 0.6	<1000	1.3 \pm 0.6	<1000
05/17/84	3.4 \pm 1.3	<1000	2.1 \pm 1.3	<1000	1.5 \pm 1.2	<1000
06/14/84	1.1 \pm 1.1	<1000	1.8 \pm 1.1	<1000	<1.0	<1000
07/19/84	5.1 \pm 1.1	<1000	3.3 \pm 1.0	<1000	4.2 \pm 1.0	<1000
08/09/84	4.5 \pm 2.2	<1000	1.2 \pm 1.2	<1000	2.5 \pm 2.1	<1000
09/10/84	2.8 \pm 1.1	<1000	1.8 \pm 1.1	<1000	1.3 \pm 1.1	<1000
10/15/84	7.8 \pm 2.1	<1000	6.1 \pm 2.1	<1000	5.9 \pm 0.4	<1000
11/15/84	4.2 \pm 1.1	<1000	2.1 \pm 0.9	<1000	4.0 \pm 1.0	<1000
12/12/84	4.3 \pm 1.4	<1000	3.3 \pm 1.2	<1000	4.3 \pm 1.2	<1000

TABLE 5-18

Sheet 2 of 3

Collection Date	pCi/l					
	Location 1C		Location 4A		Location 6C	
	Gross Beta	Tritium	Gross Beta	Tritium	Gross Beta	Tritium
01/12/84	2.0±1.6	<1000	1.7±1.5	<1000	4.3±1.8	<1000
02/13/84	<1.0	<1000	5.0±1.2	<1000	3.1±1.1	<1000
03/12/84	1.5±0.4	<1000	1.3±0.4	<1000	2.1±0.5	<1000
04/16/84	1.4±0.6	<1000	0.9±0.5	<1000	<1.0	<1000
05/17/84	1.5±1.2	<1000	2.1±1.2	<1000	1.9±1.3	<1000
06/14/84	1.7±1.1	<1000	2.8±1.2	<1000	2.1±1.2	<1000
07/19/84	4.2±1.0	<1000	3.5±1.1	<1000	3.4±1.0	<1000
08/09/84	2.7±2.1	<1000	3.3±2.1	<1000	3.7±2.1	<1000
09/10/84	2.5±1.1	<1000	1.8±1.0	<1000	1.6±1.1	<1000
10/15/84	4.2±2.0	<1000	4.1±2.0	<1000	5.3±0.4	<1000
11/15/84	2.2±1.0	<1000	0.9±0.9	<1000	2.8±0.9	<1000
12/12/84	2.3±1.2	<1000	4.3±1.3	<1000	6.1±1.5	<1000

TABLE 5-18

Sheet 3 of 3

Collection Date	pCi/l					
	Location CR2		Location CR3		Location CR4	
	Gross Beta	Tritium	Gross Beta	Tritium	Gross Beta	Tritium
01/12/84	4.3±1.7	1200±580	8.1±1.9	<1000	3.9±1.7	<1000
02/22/84	2.3±2.2	<1000	1.9±0.5	<1000	2.6±0.5	<1000
03/12/84	3.3±0.5	<1000	3.5±0.5	<1000	3.0±0.5	<1000
04/18/84	4.1±0.4	<1000	7.5±0.5	<1000	2.4±0.4	<1000
05/17/84	3.2±1.3	<1000	3.5±1.3	<1000	4.4±1.3	<1000
06/11/84	1.9±1.4	<1000	2.2±1.2	<1000	1.2±1.1	<1000
07/23/84	4.7±2.2	<1000	3.0±2.1	<1000	2.2±1.1	<1000
08/09/84	3.2±1.2	<1000	4.0±2.1	1000±500	2.9±2.1	<1000
09/11/84	2.1±1.1	<1000	1.1±1.0	<1000	1.6±1.0	<1000
10/16/84	3.5±1.7	<1000	2.1±1.6	<1000	2.9±1.0	<1000
11/15/84	3.7±0.9	<1000	2.1±1.0	<1000	5.4±1.1	<1000
12/27/84	5.1±1.1	<1000	2.8±1.0	<1000	4.2±1.1	<1000

TABLE 5-19

RADIOACTIVITY IN SHORELINE SOIL

<u>Collection Date</u>	<u>pCi/g (Dry Weight)</u>		
	<u>Location CR1</u>	<u>Location CR3</u>	<u>Location CR5</u>
	<u>Gamma Emitters</u>	<u>Gamma Emitters</u>	<u>Gamma Emitters</u>
03/06-08/84	<0.1	<0.1	<0.1
09/12-14/84	<0.1	<0.1	<0.1

TABLE 5-20

RADIOACTIVITY IN SEDIMENT

<u>Location</u>	<u>Collection Date</u>	<u>pCi/g (Dry Weight)</u>
		<u>Gamma Emitters</u>
1A	03/12/84	<0.1
1B	03/12/84	<0.1
1D	03/12/84	<0.1
CR2	03/08/84	<0.1
CR3	03/08/84	<0.1
CR4	03/08/84	<0.1
1A	09/20/84	<0.1
1B	09/20/84	<0.1
1D	09/20/84	<0.1
CR2	09/14/84	<0.1
CR3	09/13/84	<0.1
CR4	09/12/84	<0.1

TABLE 5-21

RADIOACTIVITY IN AQUATIC PLANTS

Location	Collection Date	pCi/g (Wet Weight)		
		Gamma Emitters	Sr-89	Sr-90
1A	03/12/84	<0.1	<0.005	0.005±0.003
1D	03/12/84	<0.1	<0.005	0.004±0.003
CR1	03/08/84	<0.1	<0.005	0.015±0.003
CR3	03/07/84	<0.1	<0.005	0.008±0.003
CR5	03/06/84	<0.1	<0.005	0.006±0.004
CR1	09/14/84	<0.1 ^[a]	<0.005	<0.005
CR3	09/13/84	<0.1	<0.005	<0.005
CR5	09/12/84	<0.1 ^[b]	<0.005	<0.005
1A	09/20/84	<0.1	<0.005	<0.005
1D	09/20/84	<0.1	<0.005	<0.005

[a] Cs-137 = 0.07±0.01 pCi/g wet

[b] Cs-137 = 0.05±0.01 pCi/g wet

TABLE 5-22

RADIOACTIVITY IN FISH MUSCLE

Location	Collection Date	Species	pCi/g (Wet Weight)		
			Gamma Emitters	Sr-89	Sr-90
CR1A	03/08/84	Male Steelhead	<0.1	<0.005	<0.005
CR3	03/07/84	Male Steelhead	<0.1	<0.005	<0.005
CR5	03/06/84	Female Steelhead	<0.1	<0.005	<0.005
1A	03/15/84	Trout and Northern Squawfish	<0.1	<0.005	<0.005
1D	03/14/84	Carp	<0.1	<0.005	<0.005
CR3	03/20/84	Crawfish	<0.1	<0.005	0.014±0.004
CR3	08/29/84	Crawfish	<0.2 ^[b]	<0.030	<0.039
CR1A	09/14/84	Male Steelhead	<0.1	<0.005	<0.005
CR3	09/13/84	Male Chinook Salmon	<0.1	<0.005	<0.005
CR5	09/12/84	Female Chinook Salmon	<0.1	<0.005	<0.005
1A	09/21/84	[a]	<0.1	<0.005	<0.005
1D	09/25/84	Smallmouth Bass	<0.1	<0.005	<0.005

[a] One Smallmouth Bass, one Sucker, and nine Northern Squawfish.

[b] Cs-137 = 0.5±0.2 pCi/g wet. Lower sensitivity due to small sample size.



Portland General Electric Company

Bart D. Withers Vice President

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RECEIVED

April 30, 1985

Trojan Nuclear Plant
Docket 50-344
License NPF-1

Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission
Creekside Oaks Office Park
1450 Maria Lane, Suite 210
Walnut Creek CA 94596-5368

Dear Mr. Martin:

Radiological Environmental Monitoring Report

Enclosed are two copies of the Portland General Electric Company's 1984 Operational Environmental Radiological Surveillance Program Annual Report, PGE-1006-84, for the Trojan Nuclear Plant.

Sincerely,

Bart D. Withers
Vice President
Nuclear

Attachments

c: Mr. Lynn Frank, Director
Department of Energy
State of Oregon

Mr. James R. Miller, Chief (2 enclosures)
Operating Reactors Branch No. 3
Director of Licensing
U.S. Nuclear Regulatory Commission

Mr. Ray. D. Paris, Manager (2 enclosures)
Radiation Control Section
Oregon State Health Division

Mr. Edward Cowen
Radiation Representative
U.S. Environmental
Protection Agency

Mr. Robert R. Mooney, Supervisor
Environmental Radiation and
Emergency Response Unit
Washington State Department of
Social and Health Services