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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

Applicable Regulation:
Washington Public Power
Supply System Technical
Specification 6.9.1.10

April 27, 1990
G02-90-086

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Dear Sir:

SUBJECT: 1989 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL REPORT

Enclosed are eighteen (18) copies of the 1989 Radiological Environmental Monitoring Program Annual Report. This report fulfills the reporting requirement stated in Washington Public Power Supply System Technical Specification 6.9.1.10.

If you have any questions or comments about this report, please contact Catherine J. Card at (509) 377-8066.

Sincerely,

G. C. Sorensen, Manager
Regulatory Programs

GSC/CJC/vlc

Enclosure

cc: R. B. Samworth - NRC (w/o attach)

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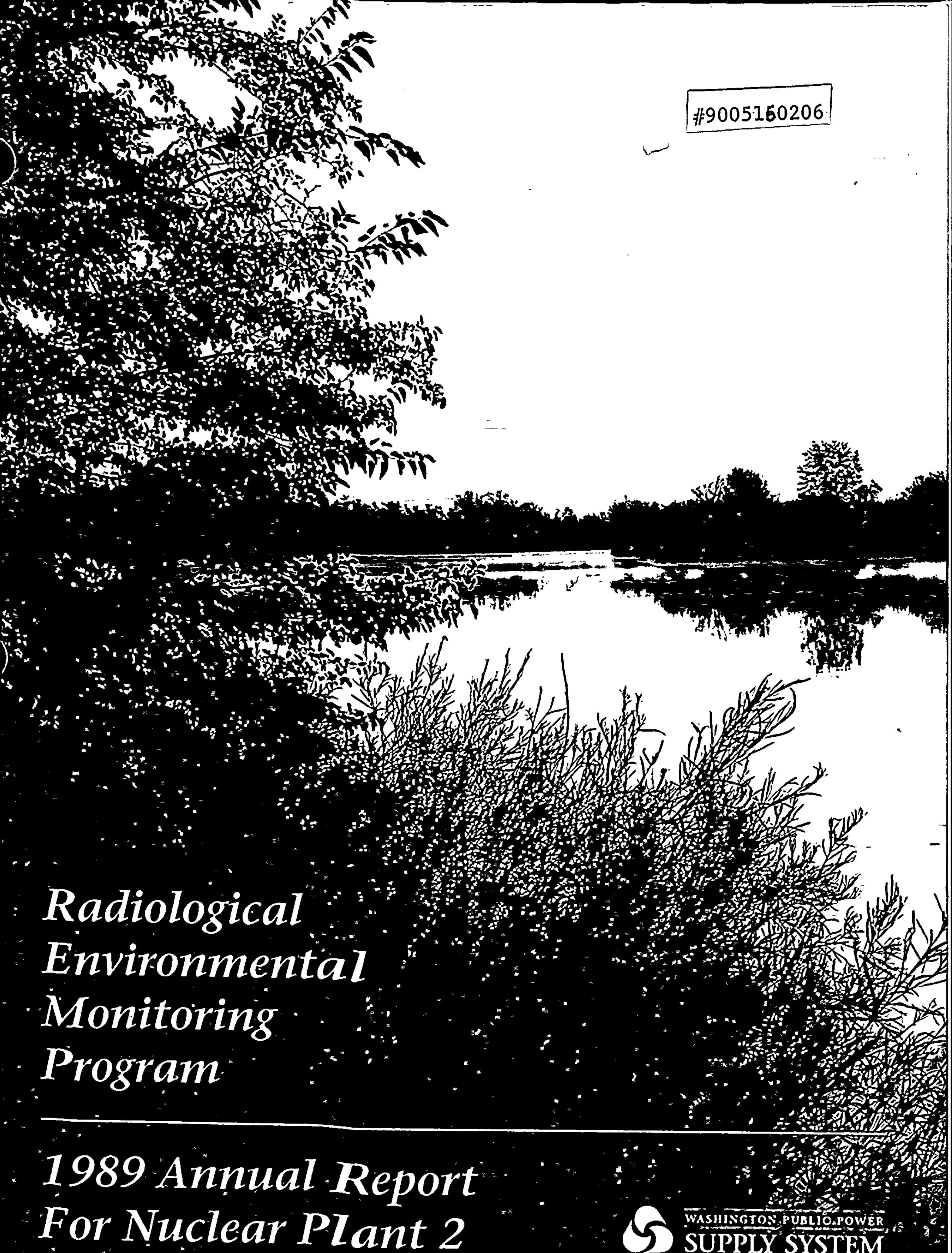

#9005160206

Radiological Environmental Monitoring Program

1989 Annual Report For Nuclear Plant 2

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

NUCLEAR PLANT NUMBER 2

RADIOLOGICAL ENVIRONMENTAL

MONITORING PROGRAM

1989 ANNUAL REPORT

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1989 Radiological Environmental Monitoring Program

Annual Report - Plant 2

April 1990

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ACKNOWLEDGEMENTS

The authors would like to gratefully acknowledge F. Anderson for her fine effort in the production of this report.

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1.0 EXECUTIVE SUMMARY

The Washington Public Power Supply System Radiological Environmental Monitoring Program (REMP) activities during 1989 are discussed in this report. The REMP was conducted in accordance with a program plan which involves the collection of air, water, milk, soil, sediment, fish and garden produce samples on a regular basis from the region surrounding the plant. In addition, direct radiation from the plant and plant effluents was measured using thermoluminescent dosimeters (TLDs). The objective of assessing these samples and the TLDs was to detect the radiological impact, if any, of Plant 2 operations on the environment.

Determining whether plant operation affected the environment significantly involved comparison of samples taken in areas near the plant and in other regions which could be potentially affected by Plant 2 effluents to samples taken in an area that is highly unlikely to be affected. In addition, a comparison of the samples taken during 1989 at locations of potential impact to samples taken at the same location prior to plant operation and during previous periods of operation provided another mechanism for detecting changes in the environmental radioactivity that could be attributed to Plant 2 operations. Other methods used to evaluate the REMP results and to bring the results into perspective included comparison of the 1989 results to the lower limits of detection (LLDs) determined for each radionuclide and to the reporting, or notification, levels established by the State of Washington and the U. S. Nuclear Regulatory Commission.

Most of the REMP sample results during 1989 were less than the respective LLDs. However, some analyses, such as the determination of gross (total) beta, generated results that were above the LLD, i.e., detectable results, for nearly all samples of air and water. This occurred because of the low detection limit for the gross beta analysis and the abundance of naturally-occurring beta-emitting radionuclides in the environment. Other results above detection levels, such as cesium-137 in soil and sediment, reflected the effect of past Hanford activities or fallout from past nuclear weapons testing.

In February 1989, iodine-131 was detected in a milk sample collected from a farm in Franklin County. An investigation into the result determined that it could not be attributed to Plant 2 operations because of the low amounts of iodine in plant effluents at the time. Because the concentration of iodine-131 measured was very low, i.e., just above the LLD of 0.5 pCi/liter, and because iodine-131 was not detected in milk from other dairies in that region, this result has little significance in terms of impact on the environment, regardless of its source.

The TLD results for 1989 reflected a 4-5% decrease from the levels observed since the end of 1986. This decrease is apparently the effect of a change made in 1989 to the method used to determine the calibration factors for individual TLDs. Instead of using a single ionization chamber measurement made during each TLD irradiation as the exposure value, a source strength value was determined for the encapsulated cesium source. This was used to determine each calibration exposure value. The difference in the exposure rates determined by the two methods is reflected in the slight decrease observed in the TLD results.

Aside from the one detectable iodine in milk result, the 1989 REMP data was very similar to the data for previous operational and pre-operational years. Based on the extensive comparisons and evaluations performed on the 1989 data, no significant impacts on the environment due to Plant 2 operation were detected by the REMP.

2.0 INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) for Washington Public Power Supply System Plant 2 provides for the collection and analysis of samples of various environmental media, in order to assess the radiological impact of plant operations. The environmental media routinely sampled by the REMP include air, water, milk, soil, river sediment, fish, vegetables, fruits, and root crops. Other sample media, such as vegetation and animal products (for example, eggs and meat) are also sampled under special circumstances, when additional information about particular radionuclides is needed. The direct radiation near the plant and at various distances from the plant is assessed through the use of thermoluminescent dosimeters.

The results of environmental measurements made during CY 1989 are presented in this report. The results are discussed and interpreted by comparing them to similar measurements made during the preoperational and previous operational periods and to the detection capabilities associated with the current methods of analysis. Special investigations performed into the cause of unusual sample results are also discussed in this report.

2.1 Site Description

The Washington Public Power Supply System Plant 2 is located in a sparsely populated shrub-steppe region within the Department of Energy-operated Hanford Site in southeastern Washington. The plant is approximately three miles west of the Columbia River and is surrounded on all sides by uninhabited desert land. The nearest population centers are Richland, Kennewick and Pasco, which are 12 miles south, 21 miles southeast, and 18 miles southeast, respectively. The nearest privately-owned lands are located approximately four miles ENE of the plant, across the Columbia River. Given the prevailing wind directions, as shown in the 1989 wind frequency distribution in Figure 2-1, the focus of REMP sampling is this farming region across the river.

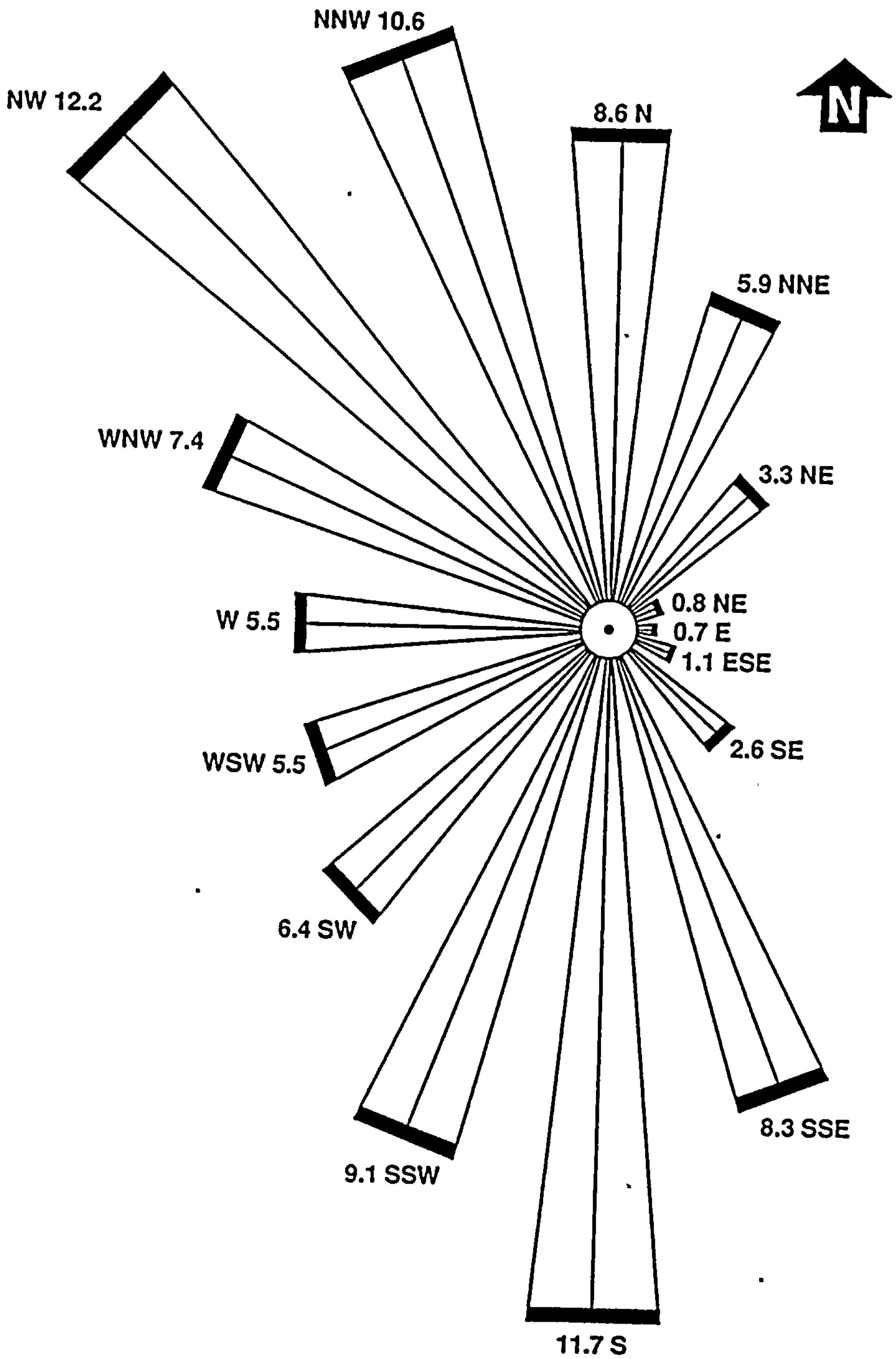

Figure 2-1
1989 WIND FREQUENCY DISTRIBUTION IN PERCENT FROM EACH DIRECTION
RELATIVE TO PLANT 2

Because Plant 2 is located on the Hanford Site, other sources of radioactive effluents are in relatively close proximity to Plant 2. For this reason, the near-plant sampling locations provide useful information for separating the potential environmental effects of Plant 2 from the effects of the other effluent sources on the Hanford Site.

2.2 Program Background

The REMP is designed to conform to the regulatory guidance provided by Regulatory Guides 4.1[1] and 4.8[2], including the Radiological Assessment Branch Technical Position (BTP)[3], while taking into account site specific characteristics. The quality assurance aspects of the program and the thermoluminescent dosimetry are conducted in accordance with Regulatory Guides 4.15[4] and 4.13[5]. The preoperational phase of the program, which extended from March 1978 to January 19, 1984, the date of initial criticality, provided a baseline of environmental data. Variability of the background levels of radioactivity due to differences in geologic composition, nuclear weapons test fallout, meteorological conditions and seasonal changes is reflected in that preoperational data.

Analysis of REMP environmental samples has always been performed by a contract analytical laboratory. Since June 1986, Teledyne Isotopes, Inc. in Westwood, New Jersey, has performed the analysis of REMP samples. The thermoluminescent dosimeters used in the REMP to assess the direct radiation are processed by the Supply System External Dosimetry Laboratory under the Radiological Programs and Instrument Calibration Department.

2.3 Program Objectives

The REMP provides a mechanism for determining whether the levels of radioactivity in the plant environs are within established limits and for ensuring that the accumulation of radionuclides in the environment will not become significant as a result of plant operations. While in-plant monitoring programs are used to ensure that 10CFR20[6] and 10CFR50[7] criteria for releases of radioactive effluents are met, the REMP provides supplemental verification that the concentrations of radionuclides in the environment are not greater than anticipated.

Any radiological effect of Plant 2 on the environment must be distinguished from the normal variation in background radiation levels and from the effects of other sources of radioactive effluents in the area. The monitoring results obtained during each year of the plant's operation are compared to the preoperational data and to data from previous operating years, in order to determine whether a significant accumulation of plant-produced radionuclides has occurred in the environment. Should a significant accumulation be observed and be attributed to plant operation, steps would be taken to locate the release pathway and prevent further releases.

3.0 PROGRAM DESCRIPTION

The REMP plan for Plant 2 is presented in Table 3-1. It summarizes the sample locations, collection frequency and types of analysis performed on the sample media. The methods of sampling and sampling frequencies utilized in the program have been determined by such factors as the half-lives and major exposure pathways for the radionuclides potentially released from the plant to the surrounding environment.

3.1 Sample Locations

Seventy-seven sample locations were included in the 1989 monitoring program. Seventy indicator and two control, i.e. background, locations were within 10 miles (16 kilometers) of the Plant 2 containment. Three additional control stations and two indicator stations were outside the 10-mile radius from the plant. Sample stations are listed in Table 3-2 by meteorological sector, sample media and approximate distance from the plant. The number and locations of sample stations is based not only on factors, such as population distribution and meteorological conditions, but also on station accessibility, security throughout the year and the requirements of applicable regulations.

Maps of the REMP sampling locations described in Tables 3-1 and 3-2 are presented in Figure 3-1 for sampling locations within the 10-mile radius and Figure 3-2 for sampling locations outside the 10-mile radius. A more detailed presentation of sampling locations in the Sunnyside/Grandview area is given in Figure 3-3. Maps indicating the sampling locations for each specific type of sample media are presented in Section 3.3 as Figures 3-4 through 3-12.

3.2 Land Use Census

In August the annual land use census was performed, as required by Plant Technical Specifications.[8] One purpose of the land use census is to identify, within a distance of 5 miles, the locations of the nearest milk

TABLE 3-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM PLAN

	SAMPLE TYPE[a]	SAMPLE STATION NO.[b]	SAMPLING AND COLLECTION FREQUENCY[c]	TYPE AND FREQUENCY OF ANALYSIS
1.	AIRBORNE			
	Particulates and radioiodine (6/12)	1, 4-9A, 21, 23, 40, 48, and 57	Continuous sampling Weekly collection	Particulate: Weekly gross beta[d]; gamma isotopic[e] of quarterly composite (by location) Iodine: Weekly gamma analysis.
	Soil[f] (0/5)	9A, 1, 7, 21 and 23	Annually	Gamma isotopic[e] Strontium-90[g]
2.	DIRECT RADIATION			
	TLD[h] (34/57)	1-9A, 10-25, 40-47, 49-51, 53-56, 61, 71-86 (1S-16S)[i]	Quarterly, annually	Thermoluminescent output; quarterly and annual processing.
	PIC[j] (0/3)	1, 21, and 23	Continuous recording	Data tape analysis, as appropriate (when used)
3.	WATERBORNE			
	Surface/ Drinking Water[k] (3/4)	26, 27, 28 and 29	Composite aliquots[l] monthly	Gamma isotopic,[e] gross beta, quarterly tritium composite, strontium-90[m], Iodine-131[n]

TABLE 3-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM PLAN

SAMPLE TYPE[a]	SAMPLE STATION NO.[b]	SAMPLING AND COLLECTION FREQUENCY[c]	TYPE AND FREQUENCY OF ANALYSIS
Ground Water (2/3)	31, 32, and 52	Quarterly	Gamma isotopic[e], quarterly tritium grab sample
Sediment from shoreline (1/2)	33 and 34	Semiannually	Gamma isotopic[e]
4. INGESTION			
Milk[o] (4/5)	9B, 36, 40, 59, and 96[p]	Semimonthly during grazing season, monthly at other times	Gamma isotopic[e] Iodine-131 Strontium-90[q]
Fish[r] (2/2)	30 and 38	Seasonal or Semiannually	Gamma isotopic[e]
Garden Produce[s] (1/3)	9C, 91[t] and 37	Monthly during growing season in the Riverview area of Pasco and a control near Grandview; annual collection at Station 91.	Gamma isotopic[e]

[a] The fraction in parentheses for each sample type indicates the ratio of Technical Specification-required sample locations to the total number of sample locations currently being monitored in the surveillance program.

[b] The underlined sample location designates a control station.

[c] Deviations are permitted if samples are unobtainable due to hazardous conditions, seasonal availability, malfunction of automatic sampling equipment, or other legitimate reasons. Such deviations are documented in Appendix D.

TABLE 3-1 (Cont.)

(d)Particulate sample filters will be analyzed for gross beta after at least 24 to 48 hours to allow for the decay of radon daughter products. If gross beta activity is greater than 10 times the mean of the result for the control, Station 9A, gamma isotopic analysis shall be performed on the individual sample.

(e)Gamma isotopic means identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents of Plant 2.

(f)Soil samples are collected to satisfy the requirements of the Site Certification Agreement (SCA)[9] for Plant 2.

(g)Strontium-90 analysis shall be performed on any indicator soil sample having cesium results greater than ten times the results for the control location.

(h)TLD refers to thermoluminescent dosimeter. For purposes of the REMP, a TLD is a phosphor card (31.75mm x 44.75mm x 0.4mm) with eight individual read-out areas (four main dosimeter areas and four back-up dosimeter areas) in each badge case. TLDs used in the REMP meet the requirements of Regulatory Guide 4.13 (ANSI N545-1975), except for specified energy-dependence response. Correction factors are available for energy ranges with response outside of the specified tolerances.

(i)TLD Stations 71-86 are special interest stations and are not included among the 34 routine TLD stations required by Plant Technical Specifications, Table 3.12-1. Their alternate designations are S1-S16. Station 61 is also a special interest location. It was added to the program during the third quarter of 1989.

(j)Pressurized ion chambers (PICs) are no longer required as part of the routine monitoring program. They are used only as a supplemental or backup system.

(k)The term "river/drinking water," instead of "surface/drinking water", is used throughout this report because the surface water is taken from the Columbia River. Station 26, Plant 2 makeup water intake from the Columbia River is both an upstream surface, or river, water sample and drinking water control sample location. Station 28 (300 Area) and Station 29 samples are drinking water samples. The Station 27 sample, which is drawn from the plant discharge line, is taken in place of a "downstream" water sample near but beyond the mixing zone. It reflects the radioactivity present in the plant discharge prior to any river dilution.

(l)Composite (integrated grab) samples are collected with equipment which collects an aliquot at time intervals that are short relative to the compositing period.

TABLE 3-1 (Cont.)

(m) When the gross beta activity in drinking water exceeds 8 pCi/liter, a strontium-90 analysis is performed.

(n) When the dose calculated via ODCM methodology for consumption of water exceeds 1 mrem per year, iodine-131 analyses are performed on the drinking water samples.

(o) Milk samples will be obtained from farms or individual milk animals which are located in the most prevalent wind directions from Plant 2. Routine milk samples are collected in areas of high dose potential instead of within 5 kilometers, due to location of milk animals.

(p) Station 96 is the control station for milk samples because it was determined that the cows at Station 9B were given feed grown in the Franklin County area across the Columbia River from Plant 2.

(q) If cesium-134 or cesium-137 is measured in an individual milk sample in excess of 30 pCi/l, then the strontium-90 analysis will be performed.

(r) There are no commercially important species in the Hanford Reach of the Columbia River. Most recreationally important species in the area are anadromous, primarily salmonids. Four fish specimen will normally be collected by electroshock technique in the vicinity of the plant discharge (Station 30) and from the Snake River (Station 38). If electroshocking produces insufficient anadromous fish samples from the Snake River, samples may be obtained from the fish trap at Ice Harbor Dam, Lyons Ferry Fish Hatchery, or other similar facility (Station 38A). If insufficient anadromous fish samples are produced through electroshocking on the Columbia River, samples may be obtained at the Ringold Fish Hatchery (Station 39).

(s) Garden produce will routinely be obtained from farms or gardens using Columbia River water for irrigation. One sample of a root crop, leafy vegetable, and a fruit is collected each sample period, if available. The variety of the produce obtained will be dependent on seasonal availability.

(t) Station 91 is an apple orchard irrigated by the Columbia River. The apple crop from Station 91 is sampled annually.

TABLE 3-2

REMP SAMPLE LOCATIONS BY SECTOR

SECTOR[a]		STATION[b] NUMBER	ESTIMATED MILES	DISTANCE[c] METERS	SAMPLE TYPE[d]
N	(1)	52	0.1	161	GW
		71(1S)	0.3	483	TLD
		47	0.5	805	TLD
		57	0.8	1201	AP/AI
		18	1.1	1770	TLD
		53	7.5	12068	TLD
NNE	(2)	72(2S)[e]	0.4	644	TLD
		2	1.8	2896	TLD
		54	6.5	10459	TLD
NE	(3)	73(3S)	0.5	805	TLD
		19	1.8	2896	TLD
		48	4.5	7241	AP/AI
		39	4.4	7084	FI
		46	5.0	8045	TLD
ENE	(4)	74(4S)	0.4	644	TLD
		21	1.5	2414	AP/AI/SO/TLD
		20	1.9	3057	TLD
		11	3.1	4988	TLD
		33	3.6	5792	SE
		45	4.3	6919	TLD
		44	5.8	9332	TLD
E	(5)	75(5S)	0.4	644	TLD
		22	2.1	3379	TLD
		10	3.1	4988	TLD
		26	3.2	5149	PW

TABLE 3-2 (Cont.)

REMP SAMPLE LOCATIONS BY SECTOR

SECTOR[a]		STATION[b] NUMBER	ESTIMATED MILES	DISTANCE[c] METERS	SAMPLE TYPE[d]
E	(5) Cont.	27[e]	3.2	5149	DW
		30	3.3	5311	FI
		43	5.8	9332	TLD
ESE	(6)	76(6S)	0.4	644	TLD
		31	1.1	1770	GW
		32	1.2	1931	GW
		51	2.1	3379	TLD
		23	3.0	4827	AP/AI/SO/TLD
		34	3.5	5632	SE
		8	4.5	7241	AP/AI/TLD
		42	5.6	9010	TLD
		36[e]	7.2	11585	MI
		5	7.7	12389	AP/AI/TLD
		38	26.5	42639	FI
		91	4.4	7079	FR
SE	(7)	77(7S)	0.5	805	TLD
		24	1.9	3057	TLD
		3	2.0	3218	TLD
		41	5.8	9332	TLD
		40	6.4	10298	AP/AI/MI/TLD
		59	9.6	15443	MI
		61	6.5	10456	TLD
SSE	(8)	78(8S)	0.7	1126	TLD
		25	1.6	2574	TLD
		55	7.0	11263	TLD
		28	7.4	11907	PW

TABLE 3-2 (Cont.)

REMP SAMPLE LOCATIONS BY SECTOR

SECTOR[a]		STATION[b] NUMBER	ESTIMATED MILES	DISTANCE[c] METERS	SAMPLE TYPE[d]
SSE	(8) Cont.	4	9.3	14964	AI/AP/TLD
		29	11.0	17699	PW
		37[e]	16.0	25744	GP
S	(9)	79(9S)	0.7	1126	TLD
		1	1.3	2092	AP/AI/SO/TLD
		6	7.7	12389	AP/AI/TLD
SSW	(10)	80(10S)	0.8	1287	TLD
		50	1.2	1931	TLD
		56	7.0	11263	TLD
SW	(11)	81(11S)	0.7	1126	TLD
		13	1.4	2253	TLD
		96	36.0	49250	MI
WSW	(12)	82(12S)	0.5	805	TLD
		14	1.4	2253	TLD
		9A,9B,9C[e]	30.0	48270	AP/AI/MI/GP/ TLD/SO
W	(13)	83(13S)	0.5	805	TLD
		15	1.4	2253	TLD
WNW	(14)	84(14S)	0.5	805	TLD
		16	1.4	2253	TLD
		7	2.7	4344.	AP/AI/SO/TLD

TABLE 3-2 (Cont.)

REMP SAMPLE LOCATIONS BY SECTOR

SECTOR[a]		STATION[b] NUMBER	ESTIMATED MILES	DISTANCE[c] METERS	SAMPLE TYPE[d]
NW	(15)	85(15S)	0.5	805	TLD
		49	1.2	1931	TLD
NNW	(16)	86(16S)	0.4	644	TLD
		17	1.2	1931	TLD
		12	6.1	9815	TLD

(a) The area in the vicinity of Plant 2 is separated into 16 separate sectors for reporting purposes. The 16 sectors cover 360 degrees in equal 22.5 degree sections, beginning with Sector 1 (N) at 348.75 to 11.25 degrees and continuing clockwise through Sector 16 (NNW).

(b) The alternate designations for TLD Stations 71-86 are given in parentheses, i.e. 1S-16S.

(c) Distances are estimated from map positions for each location as a radial distance from Plant 2 containment.

(d) Sample Type Key:

TLD	Thermoluminescent Dosimeter	MI	Milk
AP	Air Particulate	PW	Surface (River)/ Drinking Water
AI	Air Iodine	GW	Ground Water
SE	Sediment	DW	Discharge Water
FI	Fish	GP	Garden Produce
SO	Soil	FR	Fruit

Station 9 designates the Sunnyside-Grandview control area. It is actually three separate stations (Stations 9A for TLD, AI/AP and SO, 9B for milk, and 9C for GP) within a few miles of each other and all within 30-35 miles of Plant 2. Station 96, which is the control station for milk, is also located within the control area. It is 36 miles from Plant 2. Station 9B, which was the control location for milk until 1986, is now an indicator milk location.

(e) Duplicate samples, i.e., samples drawn at the same time as the routine samples and submitted for analysis as a quality assurance check, are collected at this location. The station designation for the duplicate of Station 27 is Station 72. The station designation for the duplicate of Station 36 is Station 37.

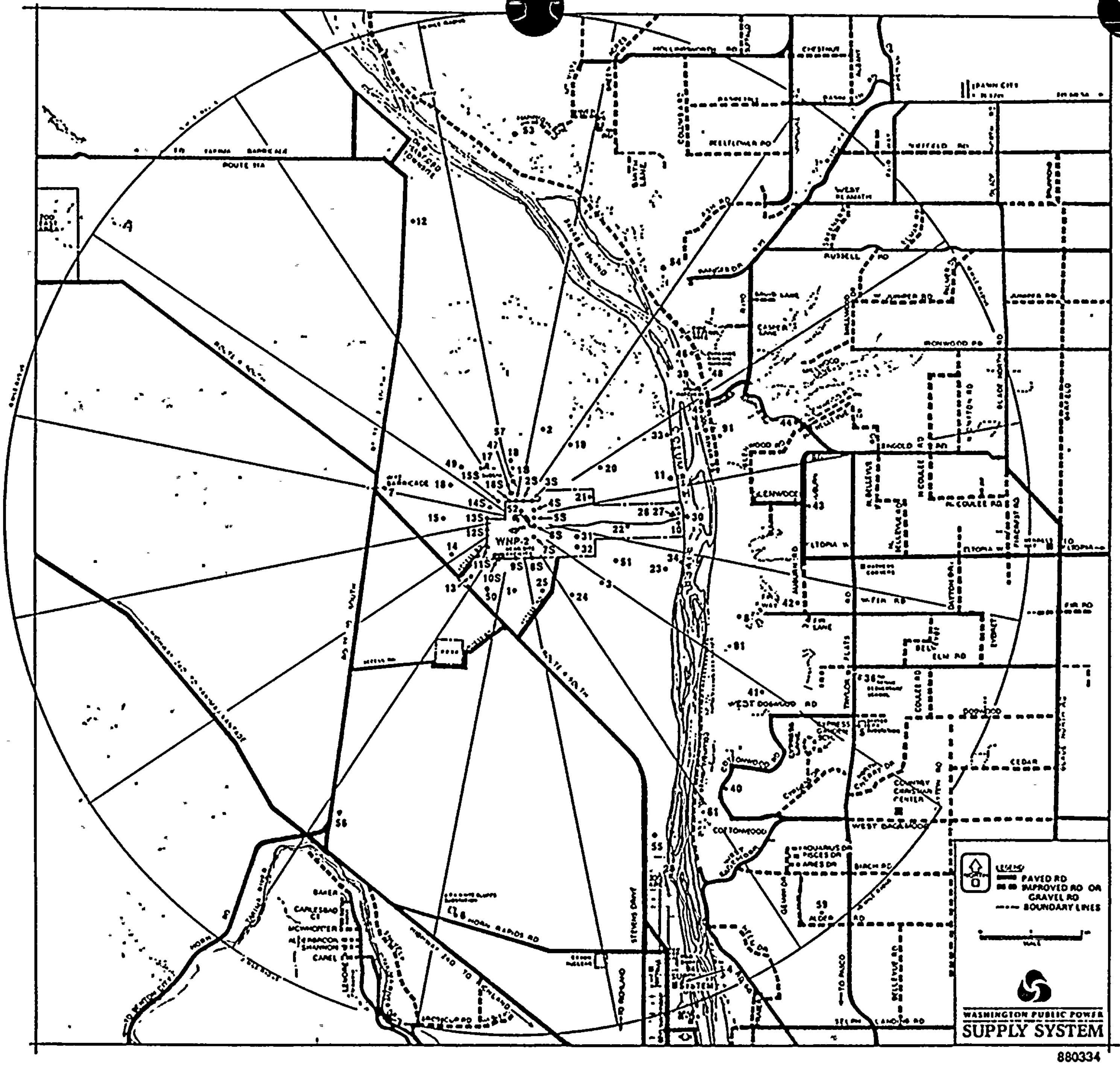

FIGURE 3-1
REMP SAMPLING LOCATIONS WITHIN THE 10-MILE RADIUS

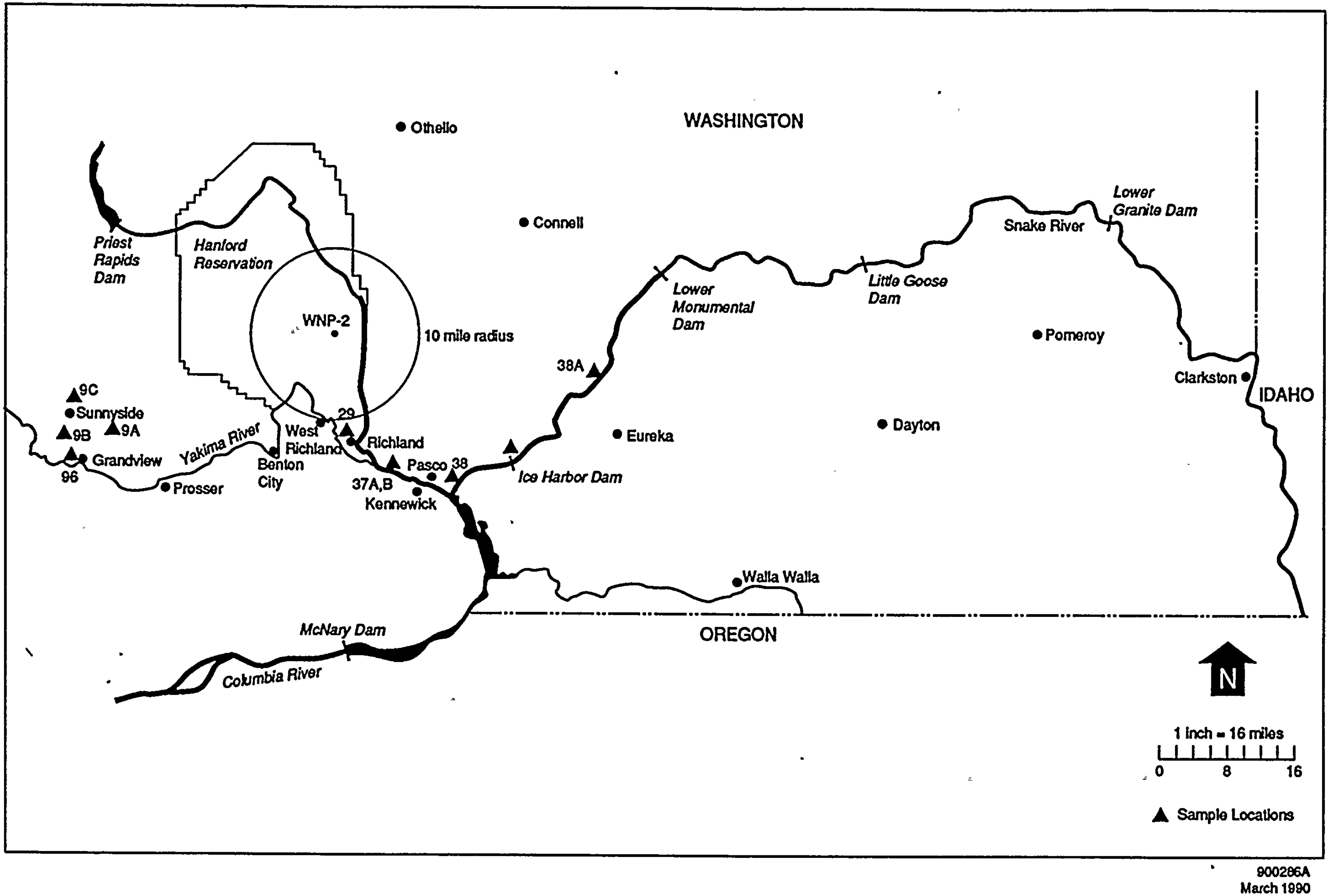

FIGURE 3-2
REMP SAMPLING LOCATIONS OUTSIDE THE 10-MILE RADIUS

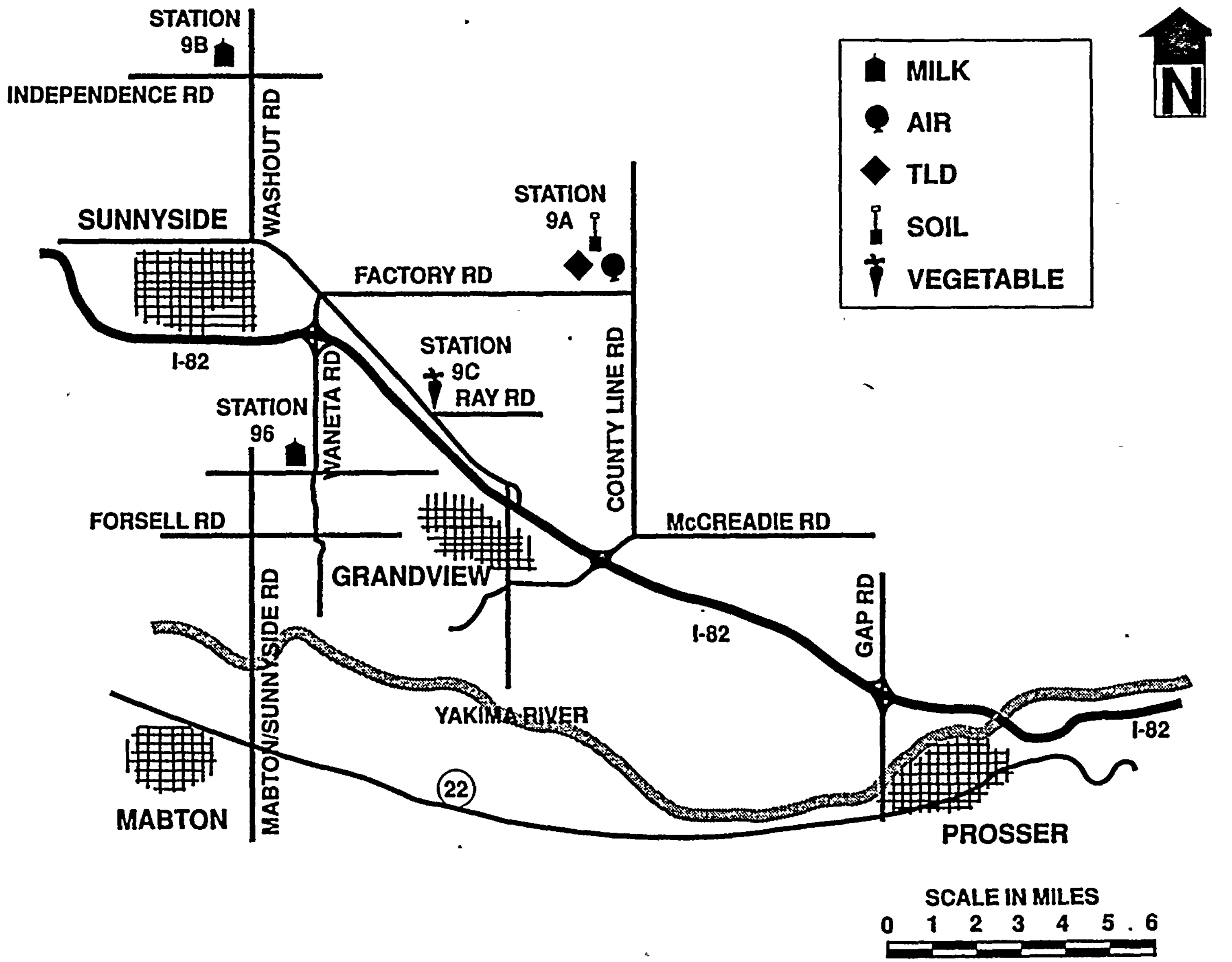

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FIGURE 3-3
REMP SAMPLING LOCATIONS IN THE SUNNYSIDE/GRANDVIEW AREA

animal, residence and garden greater than 50 m^2 (500 ft^2) producing broadleaf vegetation. Another objective of the census is to determine whether any site located during the census has a calculated dose or dose commitment greater than the sites currently monitored for the same exposure pathway. If so, routine sampling of that exposure pathway would be initiated at that new site.

The results of the 1989 land use census within 5 miles are given in Table 3-3. No milk animals are located within the 5-mile radius. The closest milk locations are at 6.4 miles SE and 7.2 miles ESE. One large garden containing broadleaf vegetation was located within 5 miles of the Plant during the 1989 use census. Samples were not obtained at this location due to the owner's reluctance to participate in the sampling program.

3.3 Sampling Methods

The collection of environmental samples for the REMP was performed according to the schedule in Table 3-1. All samples were collected by Supply System personnel. Documented procedures contained in the Environmental Program Instruction Manual were used for sample collection and preparation. The following sections describe the Supply System's sampling and preparation methods.

3.3.1 Direct Radiation

During 1989, thermoluminescent dosimeters (TLDs) were used to determine the direct radiation levels at the fifty-seven (57) monitoring locations shown in Figures 3-4, 3-5 and 3-6. Station 61 was added to the program during the third quarter. It is located in Franklin County near a large cherry orchard approximately 6.5 miles SE of Plant 2.

The environmental dosimeter consists of a card containing $CaSO_4$:Dy (25%) phosphor in a Teflon matrix. Following oven annealing at 250°C

TABLE 3-3

DISTANCES[(a)] IN MILES TO NEAREST POINTS OF INTEREST WITHIN FIVE MILES OF PLANT 2 CONTAINMENT

SECTOR[(b)] PARAMETER	NEAREST RESIDENT	GARDEN ($>50M^2$)	DAIRY[(c)] ANIMALS	LIVESTOCK
NE	4.3	0	0	5.0 (horse)
ENE	4.1	4.1[(d)]	0	4.9 (beef cattle)
E	4.5	0	0	0
ESE	4.2	4.4[(e)]	0	4.7 (horses)
SE	4.8	0	0	0

(a) These are estimated distances; slight variations occur when the map used for the land use census is changed.

(b) Eleven of the sixteen meterological sectors within the five-mile radius of Plant 2 are on the federally-owned Hanford Site; the remaining land is comprised of 4.48 sq. miles of privately-owned farm land. Only those sectors containing points of interest are presented here.

(c) The closest dairy animal locations are at 6.4 miles, 8.3 miles and 9.6 miles SE and 7.2 miles ESE. The dairy at 8.3 miles SE is not used for milk sample collection due to the owner's reluctance to participate.

(d) Large garden with broadleaf; samples were not available due to owner's reluctance to participate.

(e) Large garden, but no broadleaf vegetation.

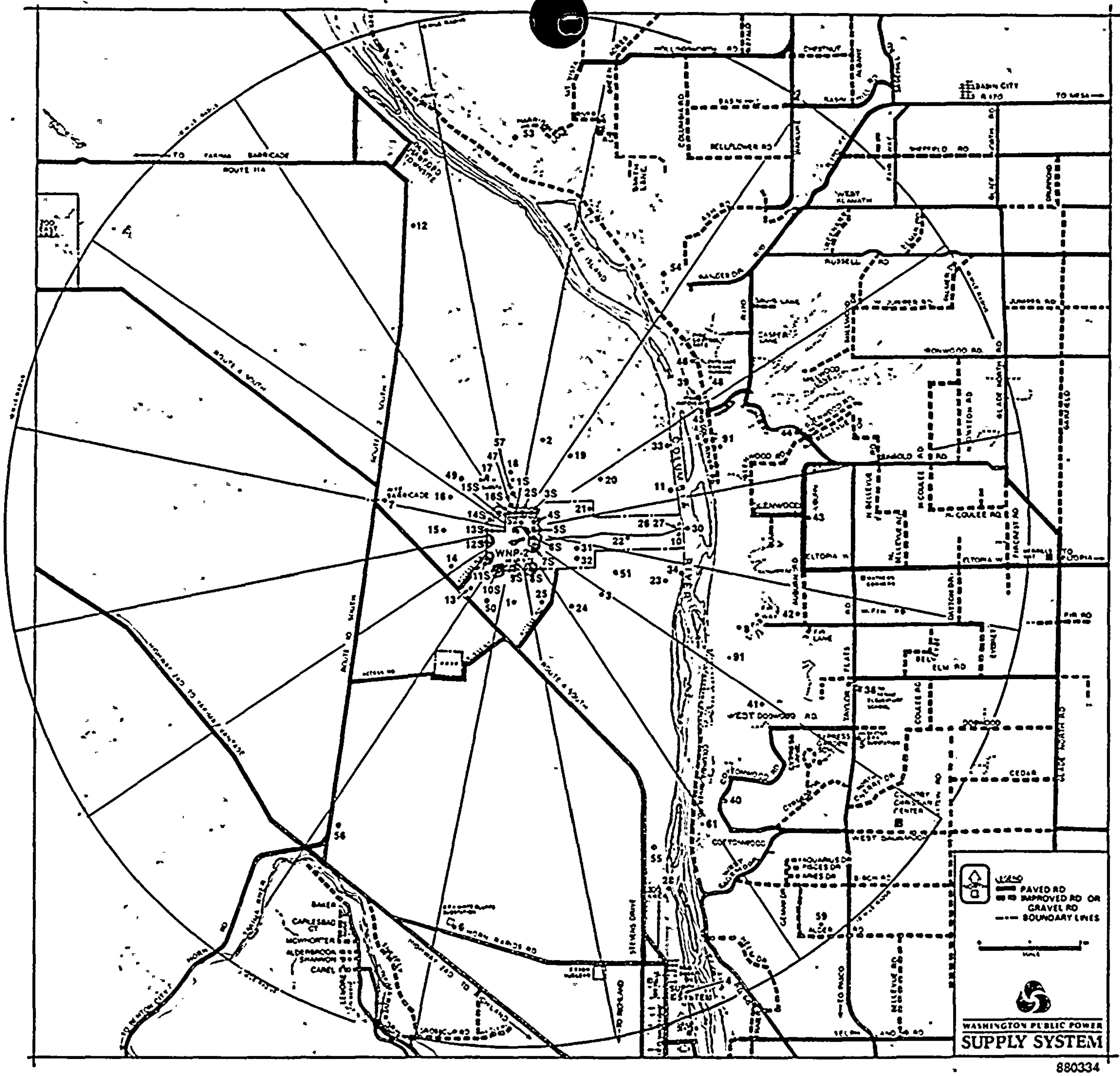

FIGURE 3-4
INNER CIRCLE TLD LOCATIONS

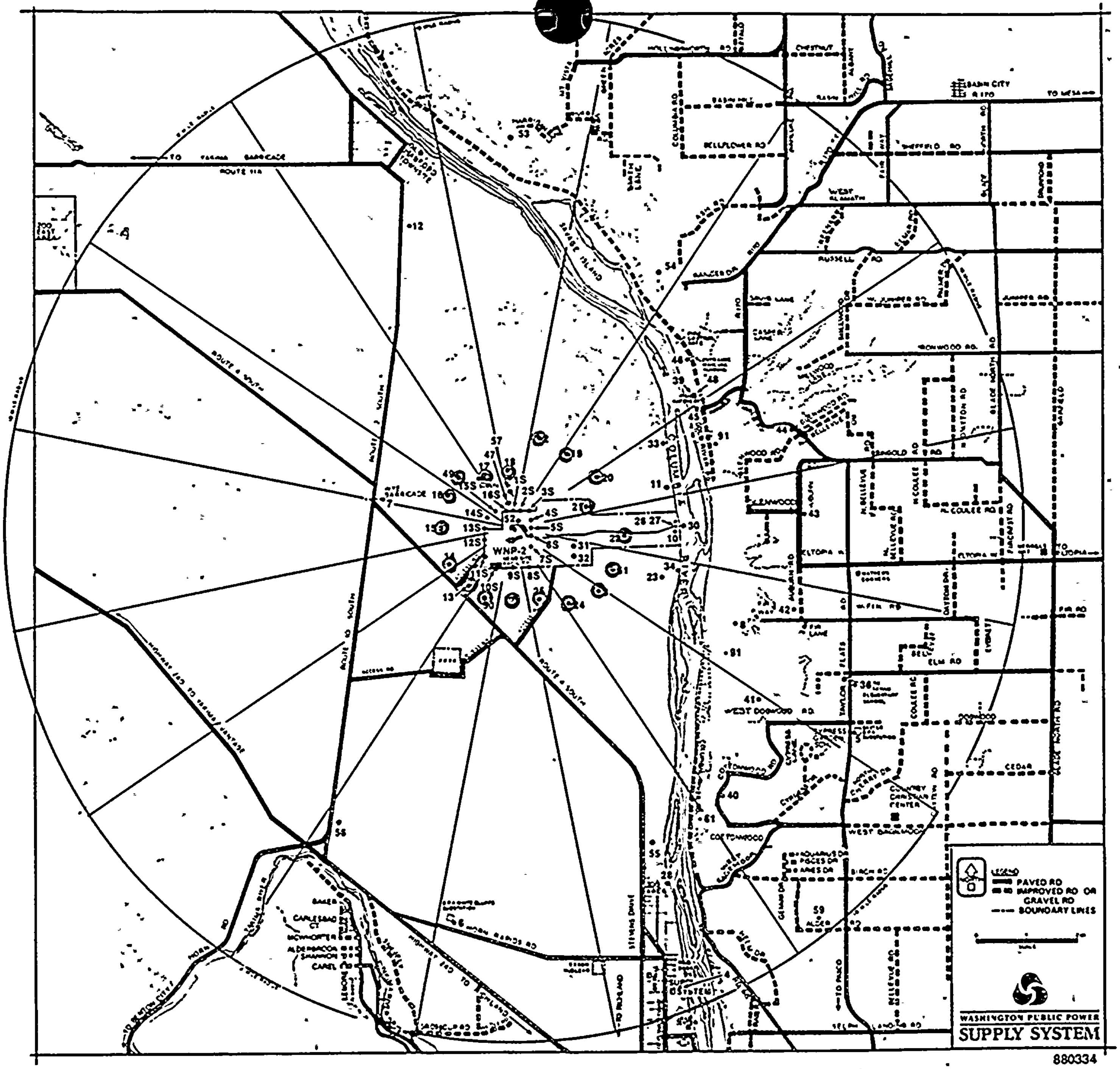

FIGURE 3-5
NEAR-PLANT TLD LOCATIONS

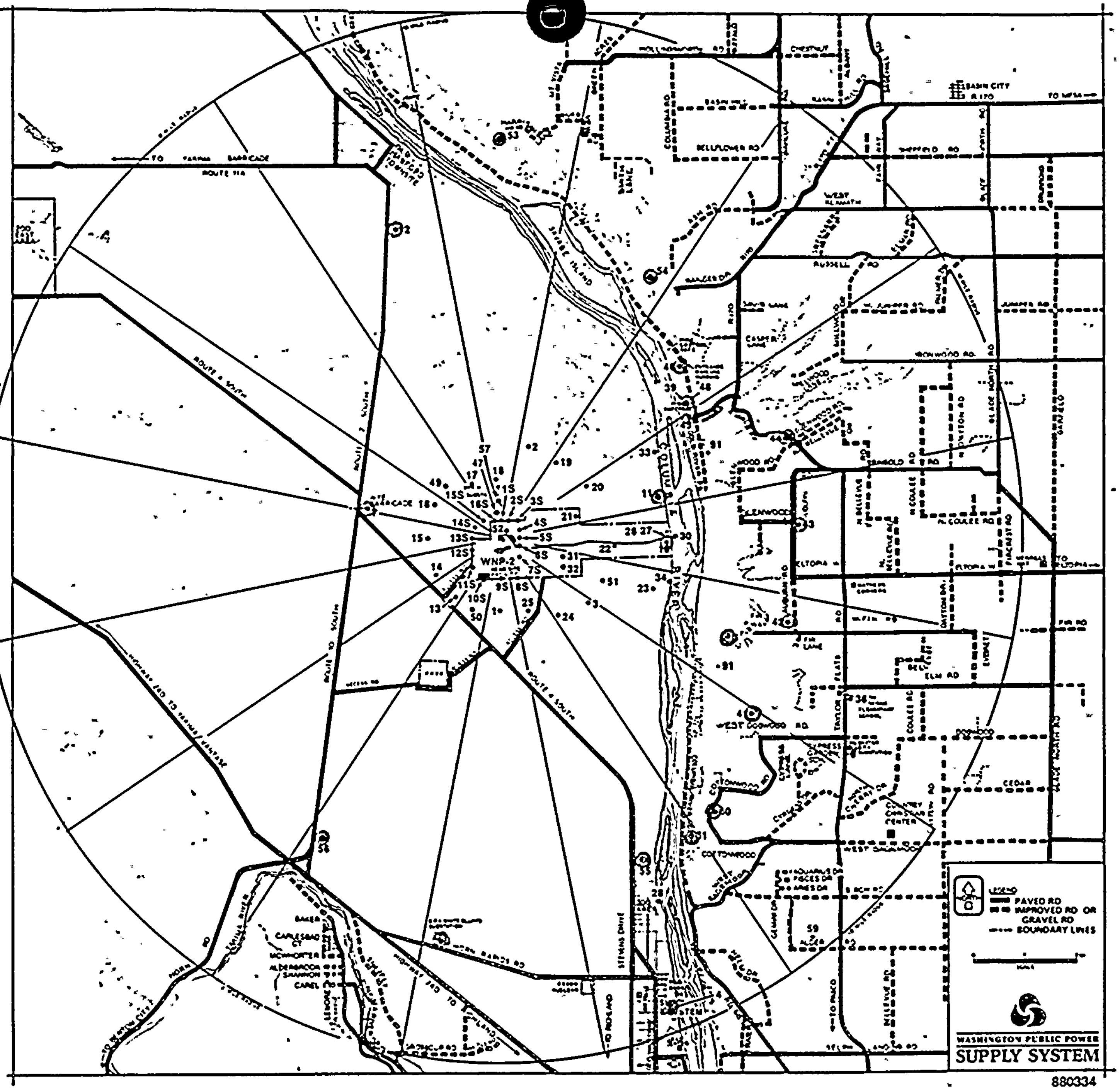

FIGURE 3-6
OUTLYING TLD LOCATIONS WITHIN THE 10-MILE RADIUS

for 2 hours, the 31.75 mm x 44.75 mm x 0.4 mm thick card was loaded into a plastic case (Teledyne Model EB-2) lined with 0.58 mm copper (520 mg/cm^2) to lessen the TLD's over-response to low energy photons.[10] The TLD was prepared for the field by first wrapping the case with aluminum foil, sealing it in two plastic bags and finally placing it in a cotton bag, which was hung from a metal post at each site. The TLDs were hung approximately three feet above the ground.

Two sets of TLDs were employed at each location. One set was exchanged on a quarterly basis and the other exchanged on an annual basis. Exposure of the field TLDs during transport to the TLD sites was monitored by a set of field control dosimeters that accompanied the field dosimeters to and from the field locations.

The environmental dosimeters were processed on a Teledyne Isotopes Model 9100 Automatic Reader. Following the initial processing, the field dosimeters were annealed and given a calibration exposure of approximately 100 mR of cesium-137 gamma, in order to determine response (i.e, calibration) factors for each dosimeter. The calibration factors were then used to determine the total exposure received by each TLD.

During 1989, the exposure values determined for calibration exposures, as well as the exposures of the QA dosimeters (i.e., processing control dosimeters) and audit dosimeters (spiked dosimeters), were based on the calculated field strength of the encapsulated cesium-137 source rather than on a single ionization chamber measurement made at the time of irradiation. The calculated field strength of the source was determined from National Institute of Standards and Technology (NIST)-traceable ionization chamber measurements made over a period of several years during the routine use and calibration of the source. The ionization chamber measurements were still made at the time of TLD irradiation, but they were used as quality control checks only and not as the official TLD exposures.

Three Reuter Stokes pressurized ionization chambers (PICs) provide an additional capability for measuring direct radiation exposure. These units are maintained for use in special monitoring situations or as back-up monitoring systems and are no longer part of the routine monitoring program. Solar panels have been constructed for the units to eliminate the occurrence of power surges and lightning damage.

3.3.2 Airborne Particulate/Iodine

Air particulate and air iodine (I-131) samples were obtained through the use of portable, low volume (1.5 cfm) constant flow rate sampling units at each of twelve locations. The samples drawn at Station 9A (Figure 3-3) are considered control, or background, samples; the ones drawn at the other locations (Figure 3-7) are indicator samples. Air particulates were collected by drawing air through a 47mm-diameter glass fiber filter. Air iodine was collected by drawing air through a 57mm-diameter TEDA-impregnated charcoal cartridge. The particulate air filter and charcoal cartridge were placed in tandem, particulate filter first, in a holder that attached to the air inlet of the sampler unit. The sampler units were placed in ventilated metal weather-proof housings mounted on elevated platforms at each air sample location.

The air sampler units were run continuously, with the filter and charcoal cartridge exchanged weekly for analysis. The total sample time for each filter and cartridge was recorded from the elapsed time indicator and the sample volume was calculated and recorded. The filters and cartridges were shipped or delivered to the analytical contractor within one or two days of collection.

3.3.3 Water

The water sampling network consists of seven sampling locations: three for evaluation of river/drinking water, one for evaluation of plant

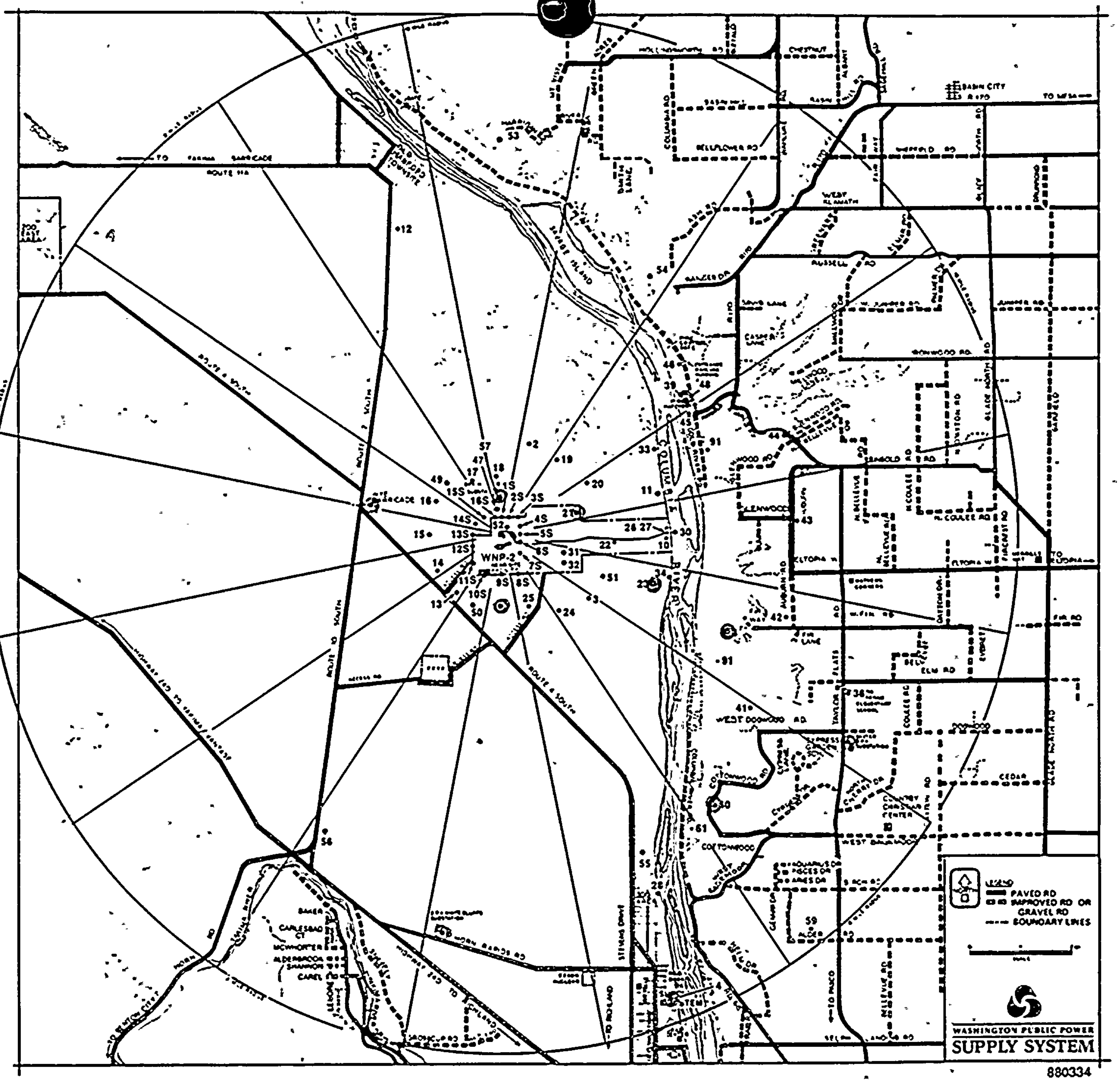

FIGURE 3-7
AIR SAMPLING LOCATIONS WITHIN THE 10-MILE RADIUS

discharge water and three for the evaluation of groundwater (Figures 3-8 and 3-9). The river/drinking water stations are located at the plant intake (Station 26), the DOE 300 Area river intake (Station 28) and the Richland Water Treatment Plant (Station 29 in Figure 3-2). The discharge water sample is taken in place of the downstream (i.e., near but beyond the mixing zone) sample required by Technical Specifications. It is drawn from the plant discharge line (Station 27) to the Columbia River and it reflects the radioactivity present in the plant discharge prior to any river dilution. The sample drawn from the plant intake line is considered the control sample, while the samples drawn from the other locations are indicator samples. Collins Model 42 composite samplers are installed at the two drinking water locations (Stations 28 and 29) and the control location (Station 26) to periodically collect 25-ml aliquots of water at a regular time interval. These aliquots are added to large collection bottles. At the prescribed intervals, the sampler collects, alternately, an aliquot for the sample designated for gross beta and gamma isotopic analyses and an aliquot for the sample designated for tritium analysis. The Collins Model 42-2P6 composite sampler drawing samples from the discharge line is capable of operating in a flow-proportional mode. Installation of a low-range flow meter and the associated electrical system to permit operation in the flow-proportional mode was completed in 1989. However, the complexity of this sampling system was a major factor in the frequent outages occurring during 1989. These outages and the corrective actions taken are discussed in Section 4.3 and in Appendix D.

Prior to the start of each monthly sampling period, concentrated nitric acid was added to the large collection bottles receiving the gross beta and gamma isotopic water samples, in order to inhibit biological growth and plateout of dissolved ions on the bottle wall. Acid was not added to the collection bottles receiving the water samples for tritium analysis. One gallon of each of the gross beta samples was poured into a clean plastic cubitainer each month. A 250-ml cubitainer

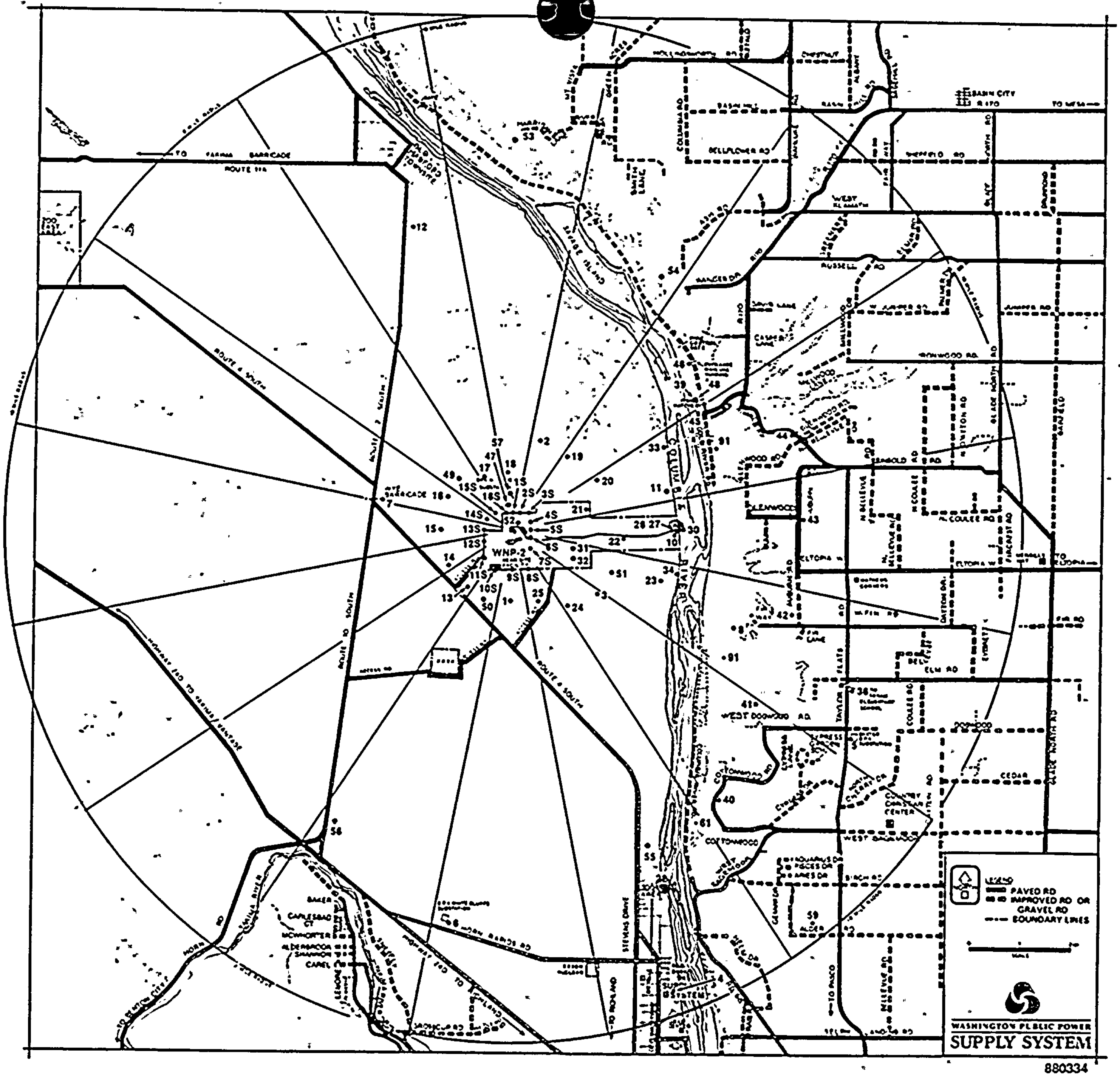

FIGURE 3-8
RIVER/DRINKING AND DISCHARGE WATER SAMPLING LOCATIONS WITHIN THE 10-MILE RADIUS

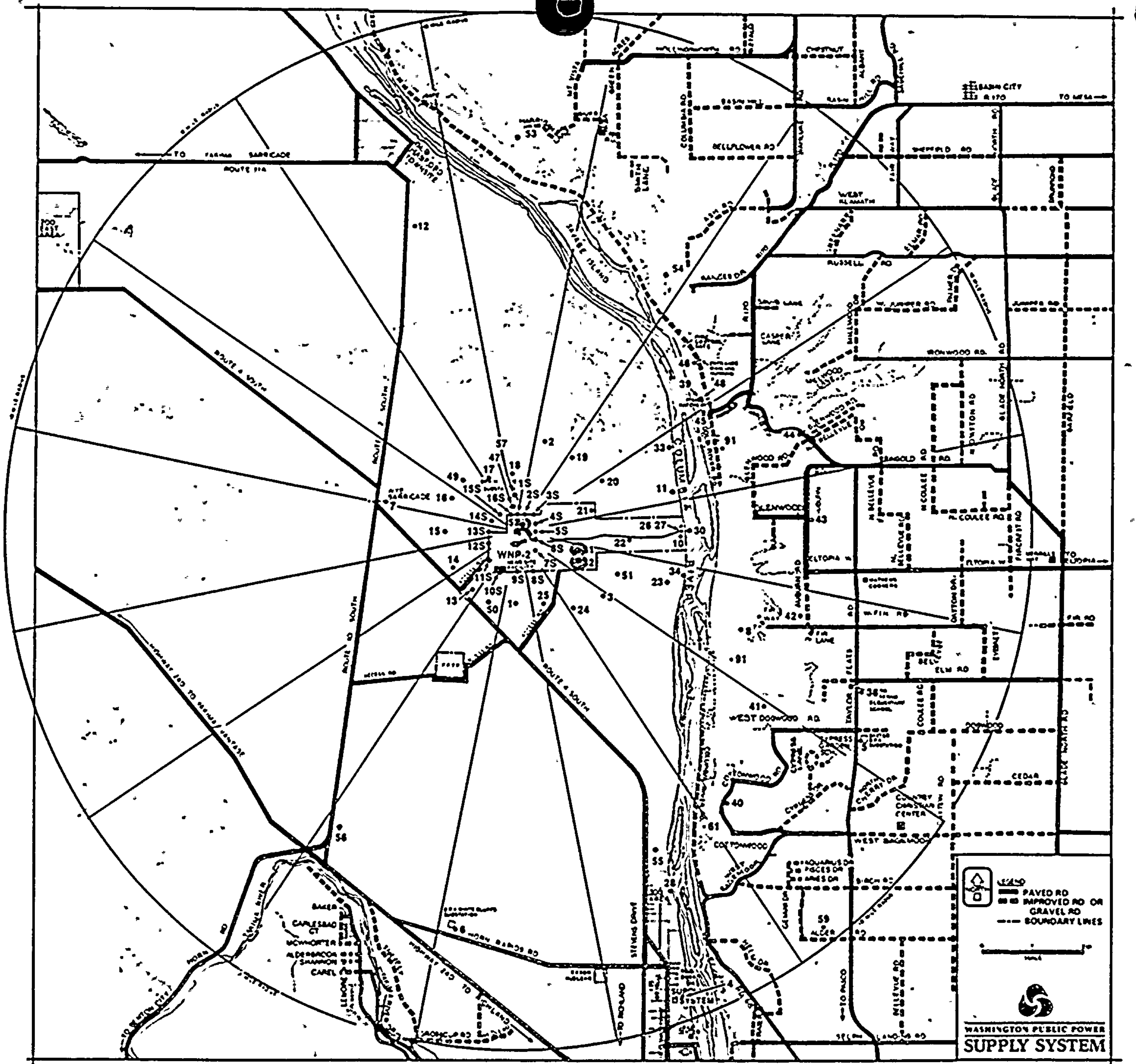

FIGURE 3-9
GROUNDWATER SAMPLING LOCATIONS

was used to hold the monthly sample submitted for the quarterly tritium composite.

Nonroutine analyses include strontium-90 analysis, when the gross beta activity in the drinking water exceeds 8 pCi/liter or ten times the mean of the previous three months' activity for a specific location, and iodine-131 analysis, when the dose calculated for the consumption of water exceeds one mrem per year. Neither of these analyses were required during 1989.

The three groundwater stations are located on Supply System property: one well on the Plant 2 site (0.1 mile north of the Reactor Building) and two wells on the WNP-1 site (1.2 miles downgradient from Plant 2). Water from the Plant 2 well can be used as a backup source for drinking and fire protection. Water from the WNP-1 wells supplies the drinking and fire protection water for the WNP-1 site. Quarterly grab samples were taken from each of these wells. One gallon was collected from each well for gamma analysis and 250 ml was drawn for tritium analysis. The gamma analysis samples were acidified with nitric acid. The tritium samples were left unacidified.

All the routine water samples were shipped to the analytical contractor within one to two days of collection.

3.3.4 Soil

Soil samples were collected once during 1989, as required by the Site Certification Agreement. Samples were taken from the four indicator locations (Stations 1, 7, 21 and 23) shown in Figure 3-10. One sample was taken at the control location, Station 9A (Figure 3-3). Each sample was taken from an area of approximately one square foot and a depth of approximately one inch. Approximately two kilograms of soil were used in each sample. Soil samples were shipped to the analytical contractor within ten working days after collection.

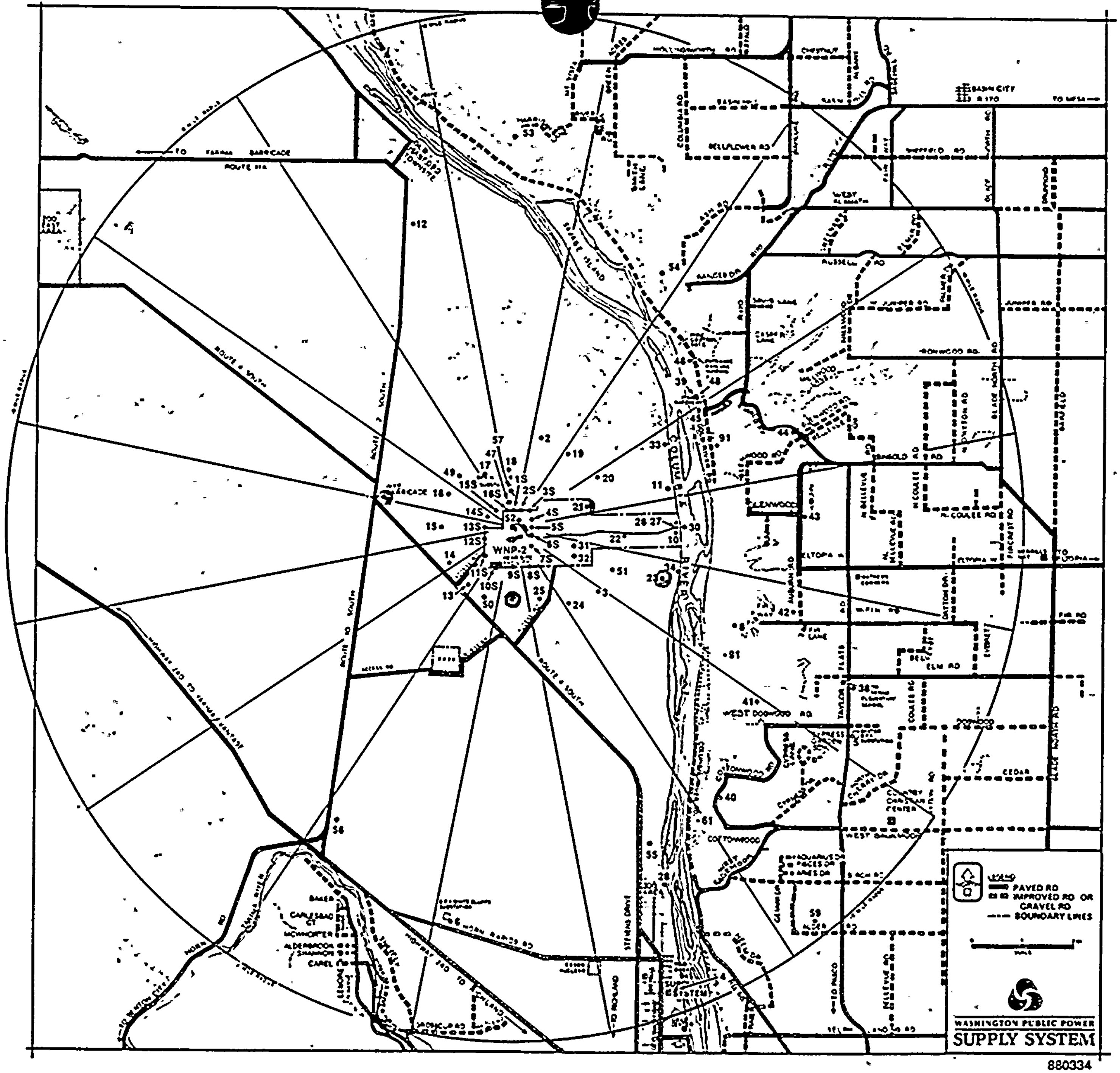

FIGURE 3-10
SOIL SAMPLING LOCATIONS WITHIN THE 10-MILE RADIUS

Each sample was submitted for gamma isotopic analysis. As required by the SCA, one soil sample (Station 23) was submitted for strontium analysis during 1989 because the cesium results for that indicator station exceeded ten (10) times the results for the control station.

3.3.5 Shoreline Sediment

Two shoreline sediment samples were collected twice during 1989 in accordance with the routine sampling schedule. In June, three additional sediment samples were collected above and below the plant discharge point in order to determine whether cobalt-57, which was indicated in the Station 34 sample collected in April, was present in concentrations above the detection limit.

The upstream sediment sampling location (Station 33) is approximately two miles up the Columbia River from the plant discharge point and the downstream sampling location (Station 34) is approximately one mile downstream of the discharge point (Figure 3-11). Samples were scooped from under water near the river shoreline. Each sample consisted of approximately two kilograms of the shallow surface sediment. The samples were placed in clean plastic bags and shipped to the analytical contractor within a day or two of collection.

3.3.6 Fish

Fish sampling was performed during May and October, when the likelihood of obtaining anadromous* species was high. Fish samples collected from the Columbia River (Station 30 in Figure 3-1) were indicator samples, while the fish collected on the Snake River (Stations 38 and 38A in Figure 3-2) were control samples.

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*Fish, such as salmonids, which ascend rivers from the sea for breeding.

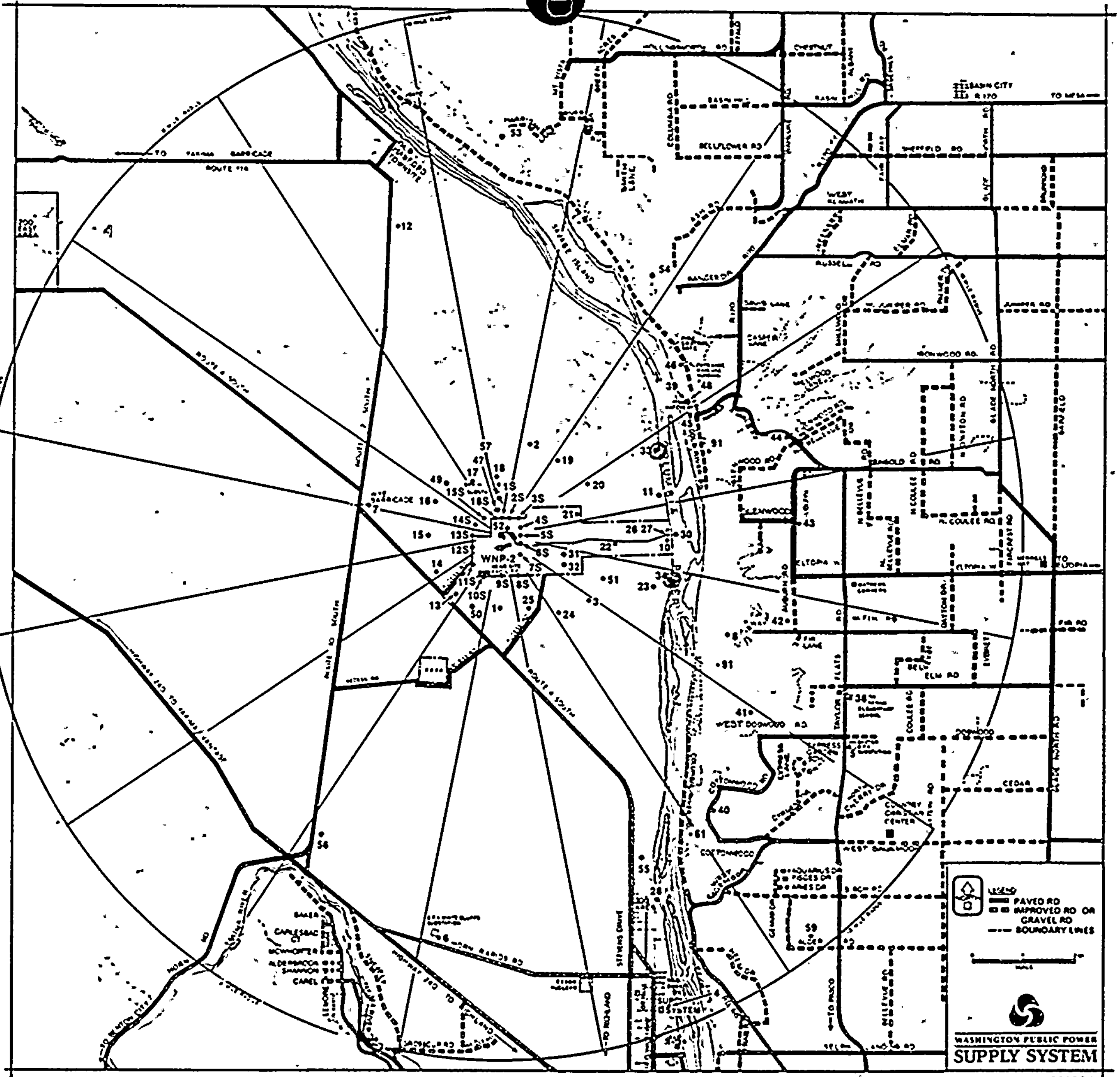

FIGURE 3-11
SEDIMENT SAMPLING LOCATIONS

Four separate fish samples, consisting of an anadromous species and three other species generally considered edible or potentially edible (such as carp, catfish and whitefish), were collected at each location. Most of the fish were collected through the use of electroshock, but samples of the anadromous species were also collected from the Lyons Ferry Fish Hatchery on the Snake River. The fish were filleted to obtain one kilogram of edible flesh per sample. The fillets were placed in clean plastic bags, frozen until shipment to the analytical contractor. Fish samples are normally shipped to the analytical contractor within ten working days of collection. However, as a result of problems encountered during the fall fish sampling, this 10-day period was exceeded for some samples. This problem is further explained in Appendix D.

3.3.7 Milk

Milk samples were collected monthly during January, February, March, October, November and December and semi-monthly during the remaining six months when the cows were likely to be grazing. One gallon of raw milk was collected from each sampling location. The milk samples were chilled thoroughly and shipped to the analytical contractor within a day of collection.

Routine samples were collected from three indicator locations (Stations 36, 40, and 59) across the Columbia River in Franklin County, as shown in Figure 3-12. Samples were also collected at one indicator station (Station 9B) and one control location (Station 96) in the Sunnyside/ Grandview area (in Figure 3-3). Station 9B in Grandview continued to serve as an indicator station in 1989 because a portion of the feed for the cows at that location is hay from the north Pasco area of Franklin County. That factor makes it unsuitable for use as a control location.

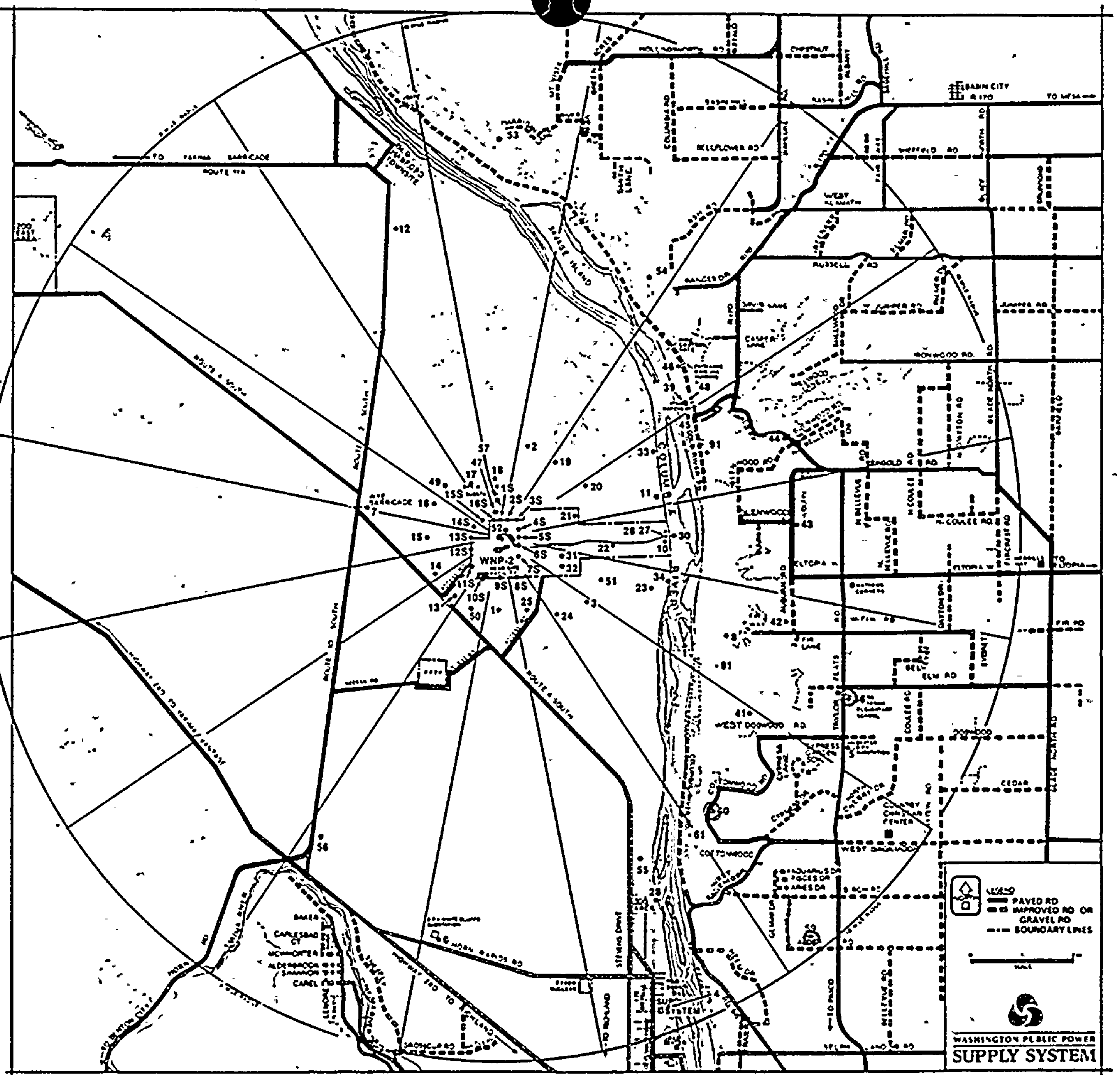

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FIGURE 3-12
MILK SAMPLING LOCATIONS WITHIN THE 10-MILE RADIUS

3.3.8 Garden Produce

Samples of local garden produce were collected monthly during the four months from April to September, when the produce was readily available. When possible, three types of produce samples--a root crop, fruit and a leafy vegetable--were collected at each location. The indicator samples were collected from a region in the predominant downwind direction (Station 37 in Figure 3-2) where crops are irrigated with Columbia River water. The control samples were obtained from produce stands in the Sunnyside area (Station 9C in Figure 3-3), the direction least likely to be affected by plant effluents. During 1989, apples were also collected in August from Station 91, the Rio Vista Farms orchard, which is irrigated with Columbia River water (Figure 3-1).

Produce samples were shipped to the analytical contractor within one to two days of collection.

3.4 Analytical Procedures

The analytical procedures used for the 1989 REMP samples are described below. Teledyne Isotopes performed all analyses of REMP samples during 1989.

3.4.1 Gross Beta Activity on Particulate Filters

The particulate filters were counted in a gas-flow proportional counter after a delay of five or more days to allow for the radon-222 and radon-220 (thoron) daughter products to decay. An unused air particulate filter, supplied by the Supply System, was counted as the blank with each weekly set of filters.

3.4.2 Measurement of Gamma Emitters

<u>Milk and Water</u>

A 1-liter Marinelli beaker was filled with a representative aliquot of the sample. The sample was then counted for at least 1000 minutes (16.7 hours) with a shielded Ge(Li) detector.

<u>Foodstuff</u>

As much of the edible portion of the sample as possible was loaded into a tared Marinelli and weighed. The sample was then counted for at least 1000 minutes (16.7 hours) with a shielded Ge(Li) detector.

<u>Soils and Sediments</u>

A large quantity of the sample was dried at a temperature below 100°C. As much sample as possible was loaded into a tared 1-liter Marinelli and weighed. The sample was then counted for at least 360 minutes (6 hours) with a shielded Ge(Li) detector.

<u>Charcoal Cartridges (Air Iodine)</u>

Charcoal filters were counted up to five at a time, with one positioned on the face of a Ge(Li) detector and up to four on the side of the Ge(Li) detector. Each Ge(Li) detector was calibrated for both positions. The detection limit for iodine-131 on each charcoal cartridge was determined (assuming no positive iodine-131) uniquely from the volume of air which passed through it. In the event that iodine-131 would have been observed in the initial counting of a set, each charcoal cartridge in the set was then positioned separately on the face of the detector and counted.

<u>Air Particulate Filters</u>

Four air particulate filters for a quarterly composite for each field station were aligned one in front of another and then counted for at least 360 minutes (6 hours) with a shielded Ge(Li) detector.

The shielded Ge(Li) detector was coupled to a mini-computer-based data acquisition system which performed pulse height analysis. A mini-computer software program defined peaks by certain changes in the slope of the spectrum. The program also compared the energy of each peak with a library of peaks for isotope identification and then performed the radioactivity calculation using the appropriate fractional gamma ray abundance, half-life, detector efficiency, and net counts in the peak region.

3.4.3 Gross Beta Activity in Water

One liter of each sample was evaporated to a small volume and transferred to a stainless steel planchet. The sample was dried under heat lamps, cooled, then counted on an automatic beta proportional counter. The results were calculated using empirical self-absorption curves which enabled the correction of effective counting efficiency, based on the sample residue mass.

3.4.4 Iodine-131 in Water

Two liters of sample were first equilibrated with stable iodide carrier. A batch treatment with anion exchange resin was used to remove iodine from the sample. The iodine was then stripped from the resin with sodium hypochlorite solution, reduced with hydroxylamine hydrochloride and extracted into carbon tetrachloride as free iodine. It was then back-extracted as iodide into sodium bisulfite solution and precipitated as palladium iodide. The precipitate was weighed for chemical yield and mounted on a nylon planchet for low level beta counting. The chemical yield was corrected by measuring the stable iodide content of the water with a specific ion electrode. During 1989, this procedure was used only on intercomparison samples, since the doses calculated via ODCM methodology for the consumption of drinking water did not exceed 1 mrem per year (Table 3-1, footnote n).

3.4.5 Tritium in Water

Approximately two milliliters of water were converted to hydrogen by passing the water, heated to its vapor state, over a granular zinc conversion column heated to 400°C. The hydrogen was loaded into a one liter proportional detector and the volume was determined by recording the pressure. The proportional detector was passively shielded by lead and steel and an electronic, anti-coincidence system provided additional shielding from cosmic rays.

3.4.6 Strontium-89 and 90 in Water, Milk and Soil

Water

Stable strontium carrier was added to one liter of sample and the volume was reduced by evaporation. Strontium was precipitated as $Sr(NO_3)_2$ using nitric acid.

Milk

Stable strontium carrier was added to one liter of sample and trichloroacetic acid (TCA) was added to produce a curd. The curd was separated by filtration and discarded. An oxalate precipitation was performed on the filtrate and the precipitate was ashed in a muffle furnace. The ash was dissolved and strontium was precipitated as $Sr(NO_3)_2$ using fuming (90%) nitric acid.

Soil and Sediment

The sample was first dried under heat lamps and a 10-gram aliquot was taken. Stable strontium carrier was added and the sample was leached in nitric acid. The mixture was filtered and the liquid portion was reduced in volume by evaporation. Strontium was precipitated as $Sr(NO_3)_2$ using fuming nitric acid.

A barium chromate scavenge and an iron (ferric hydroxide) scavenge were then performed. Stable yttrium carrier was added and the sample was allowed to stand for 7 to 10 days for yttrium ingrowth. Yttrium was then precipitated as hydroxide, dissolved and re-precipitated as oxalate. The yttrium oxalate was mounted on a nylon planchet and counted in a low-level beta counter to infer strontium-90 activity. Strontium-89 activity was determined by precipitating $SrCO_3$ from the sample after yttrium separation. This precipitate was mounted on a nylon planchet and covered with an 80 mg/cm^2 aluminum absorber for low-level beta counting.

The strontium in soil procedure was used during 1989 on the soil sample from Station 23 because its cesium results were greater than ten times those of the control location. The strontium procedures were also employed in the analyses of intercomparison samples.

3.4.7 Iodine-131 in Milk

Two liters of sample were first equilibrated with stable iodide carrier. A batch treatment with anion exchange resin was used to remove iodine from the sample. The iodine was then stripped from the resin with sodium hypochlorite solution, reduced with hydroxylamine hydrochloride and extracted into carbon tetrachloride as free iodine. It was then back-extracted as iodide into sodium bisulfite solution and precipitated as palladium iodide. The precipitate was weighed for chemical yield and mounted on a nylon planchet for low-level beta counting. The chemical yield was corrected by measuring the stable iodide content of the milk with a specific ion electrode.

3.5 Data Analysis Methods

Since mid-1984, the results of the REMP analyses have been given as net results calculated from the gross or total counts determined for each radionuclide minus the background counts of the counting or detection instrument. Consequently, for several sample types, the results range from negative to positive numbers. This manner of presenting environmental data prevents the bias and loss of individual results inherent in the use of "less than" (<) values, where the "less than" numbers can have a variety of meanings, such as "less than the lower limit of detection" or "less than the two sigma uncertainty."

The net results for REMP samples are presented with an asterisk (*) in front, if the results are less than the lower limit of detection. A listing of the current lower limits of detection determined for each analysis is provided in Section 4.0 as a reference when reviewing the sample results.

Plots of the sample results versus time are used to represent the results for analyses such as gross beta on air particulate filters, where the results are normally above the lower limits of detection. In such cases, the indicator station results are plotted with the control station results for easy comparison. Other data analysis techniques, such as log probability plotting, are also used to represent the data and to determine whether trends that could be attributed to the effect of Plant 2 operations are evident.

Thermoluminescent dosimeter (TLD) data is presented in terms of the net mR/day exposure rate. These results are determined from the total mR exposure calculated for each TLD from its total thermoluminescent (TLD) output minus the TLD background, minus any transit exposure received during distribution and retrieval, and divided by the number of days the TLD was in the field. Log probability plots and graphs of TLD data by meteorological sector and distance from the plant are used to interpret trends in the results.

TLD data summaries include the term "standard error," along with "standard deviation." The standard error, which is the estimate of the precision of the mean, is used for mean annual summaries of mean quarterly data. The standard deviation is used for the TLD data involving a single dosimeter result that has been determined from the four reader areas of the TLD. Both terms simply provide an indicator of the uncertainty associated with the results.

4.0 RESULTS AND DISCUSSION

During 1989 the analyses of REMP samples were performed by Teledyne Isotopes in Westwood, New Jersey. The thermoluminescent dosimeters were processed by the Supply System External Dosimetry Laboratory. Table 4-1 presents the means and ranges of the 1989 results for each type of sample collected. The means and ranges of the preoperational and the previous operational data from 1984 to 1988 are also included in the table for comparison.

The data for the preoperational period and the first six months of 1984 included "less than" (<) designations for results below the lower limits of detection (LLD), the contractual LLD or the two sigma error, depending upon the convention employed by the analytical contractor. Consequently, the data averages using "less than" values are biased high.

The use of the "less than" designation was discontinued in mid 1984. Since then, REMP data have been reported as net results, i.e., total (gross) results minus the detector counting background. Comparison of the mean results for 1989 to the mean preoperational results is difficult due to the high bias stemming from the "less than" data. However, comparison of the range of results observed for each period, in order to determine whether the 1989 results are significantly greater than the results for preoperational and previous operational periods, is a viable approach. Careful interpretation of the data ranges for the previous operational data is still required because of the effects of the Chernobyl accident in 1986. For this report only the data from the last six months of 1984 were included in the previous operational data in order to eliminate the "less than" values in that category of summary data.

The 1989 REMP data compares well to the ranges of data from previous periods. The quarterly TLD results for 1989 were slightly lower than the results from 1987 and 1988. This was apparently due to a change

TABLE 4-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM COMPARATIVE SUMMARY

MEDIA/ANALYSIS	PREOPERATIONAL[a]		PREVIOUS OPERATIONAL[b][c]		1989[d]	
	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
Air: pCi/m^3						
Gross Beta	<0.02	(<0.003 - 0.130)	0.03	(0.02 - 0.74)	0.02	(0.00 - 0.08)
I-131[e]	<0.05	(<0.01 - 0.11)	0.01	(-0.04 - 0.82)	0.00	(-0.01 - 0.02)
Gamma						
Cs-134	<0.01	(<0.001 - 0.040)	0.001	(-0.002 - 0.015)	0.0001	(-0.0001 - 0.0003)
Cs-137	<0.01	(<0.001 - 0.040)	0.002	(-0.001 - 0.036)	0.0001	(-0.0001 - 0.0003)
Ru-103	Not Reported		0.002	(0.000 - 0.019)	0.000	(-0.0003 - 0.0002)
Water: pCi/l						
Gross Beta[f]	<4.4	(<1.0 - <22.0)	6.2	(-0.2 - 36.0)	11.8	(1.0 - 48.0)
Gamma[g]						
Cs-134	<3.8	(<1.0 - <12.0)	0.5	(-5.4 - 5.4)	0.6	(-2.2 - 5.4)
Cs-137	<3.8	(<0.8 - <16.0)	1.0	(-4.0 - 7.9)	2.0	(-0.5 - 5.1)

(a) All stations, all years.
(b) Indicator stations only for the years 1984 to 1988. Some of the data means and ranges are biased high due to the effects of the Chernobyl accident in 1986.
(c) The data used for these averages does not include the "less than" values reported in 1984.
(d) Indicator stations only.
(e) Charcoal cartridge results.
(f) Includes river/drinking water and discharge water results only.
(g) Includes ground water, river/drinking water and discharge water results.

TABLE 4-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM COMPARATIVE SUMMARY

MEDIA/ANALYSIS	PREOPERATIONAL[a]		PREVIOUS OPERATIONAL[b][c]		1989[d]	
	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
Water: pCi/l (Cont.)						
Gamma[e]						
Co-58	<4.6	(<1.0 - <25.0)	0.1	(-3.3 - 4.6)	0.1	(-2.6 - 2.3)
Co-60	<4.6	(<0.1 - <13.0)	0.9	(-8.7 - 10.5)	3.6	(-0.8 - 28.2)
Fe-59	<12.1	(<2.0 - <93.0)	0.5	(-8.9 - 6.6)	1.2	(-3.1 - 5.5)
Ba-140	<50.5	(<4.0 - <300.0)	1.9	(-22.9 - 61.1)	0.6	(-9.8 - 15.6)
La-140	<25.5	(<3.0 - <160.0)	-0.9	(-64.8 - 15.7)	-1.0	(-7.0 - 5.9)
Nb-95	<5.1	(<1.0 - <29.0)	-13.6	(-974 - 6.5)	1.6	(-1.6 - 7.4)
Zn-65	<8.0	(<1.4 - 27.0)	-0.5	(-16.2 - 86.7)	-1.2	(-12.7 - 29.2)
Zr-95	<10.6	(<2.0 - 63.0)	0.7	(-11.0 - 10.1)	0.1	(-4.0 - 11.1)
H-3[e]	<463.1	(<10.0 - 2600.0)	392.0	(-516.0 - 4400.0)	586.3	(-130.0 - 3,500.0)
Sr-90[f]	Analysis Not Performed		0.6	(0.1 - 1.1)	Analysis Not Performed	

(a)All stations, all years.
(b)Indicator stations only for the years 1984 to 1988. Some of the data means and ranges are biased high due to the effects of the Chernobyl accident in 1986.
(c)The data used for these averages does not include the "less than" values reported in 1984.
(d)Indicator stations only.
(e)Includes ground water, river/drinking water and discharge water results.
(f)Performed on drinking water samples having gross beta levels greater than 8.0 pCi/liter.

TABLE 4-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM COMPARATIVE SUMMARY

MEDIA/ANALYSIS	PREOPERATIONAL[a] MEAN	PREOPERATIONAL[a] RANGE	PREVIOUS OPERATIONAL[b][c] MEAN	PREVIOUS OPERATIONAL[b][c] RANGE	1989[d] MEAN	1989[d] RANGE
Sediment: pCi/kg						
Gamma						
Co-60	<254.6	(130.0 - 610.0)	58.5	(27.1 - 129.0)	34.0	(32.0 - 35.0)
Cs-134	<112.5	(<50.0 - <150.0)	61.5	(7.0 - 172.0)	35.5	(28.0 - 43.0)
Cs-137	<287.0	(<50.0 - <560.0)	406.6	(153.0 - 1890.0)	197.0	(169.0 - 225.0)
Co-57	Not Reported		46.0	(34.0 - 54.0)	29.4	(29.0 - 29.7)
Eu-152	Not Reported		143.0	(140.0 - 146.0)	48.3	(18.2 - 78.3)
Soil: pCi/kg						
Gamma						
Cs-134	<65.3	(<20.0 - <150.0)	30.4	(7.1 - 53.2)	27.3	(22.7 - 32.2)
Cs-137	<364.3	(<20.0 - <1880.0)	317.1	(9.4 - 735.0)	240.7	(18.4 - 531.5)
Sr-90	Analysis Not Performed		357.5	(260.0 - 455.0)	96.0	
Milk: pCi/l						
Gamma						
Cs-134	<3.7	(<0.9 - <14.0)	1.6	(-7.4 - 22.6)	0.5	(-1.8 - 5.6)
Cs-137	<3.8	(<1.0 - <12.0)	4.0	(-7.4 - 47.3)	2.0	(-1.7 - 5.0)

[a] All stations, all years.
[b] Indicator stations only for the years 1984 to 1988. Some of the data means and ranges are biased high due to the effects of the Chernobyl accident in 1986.
[c] The data used for these averages does not include "less than" values reported in 1984.
[d] Indicator stations only.

TABLE 4-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM COMPARATIVE SUMMARY

MEDIA/ANALYSIS	PREOPERATIONAL[a] MEAN	PREOPERATIONAL[a] RANGE	PREVIOUS OPERATIONAL[b][c] MEAN	PREVIOUS OPERATIONAL[b][c] RANGE	1989[d] MEAN	1989[d] RANGE
Milk: pCi/l						
Gamma						
Ba-140	<72.1	(<6.0 - <2000.0)	0.7	(-44.3 - 55.0)	0.4	(-11.5 - 8.0)
La-140	<33.3	(<5.0 - <1000.0)	-1.2	(-24.2 - 9.7)	-0.2	(-5.3 - 5.7)
I-131[e]	<0.5	(<0.1 - <1.0)	2.2	(-0.8 - 144.0)	0.0	(-0.4 - 0.8)
Sr-90	Not Reported		2.2	(-1.3 - 3.9)	Not Reported	
Fish: pCi/kg						
Gamma						
Cs-134	<61.2	(<6.0 - <130.0)	1.7	(-20.4 - 14.4)	0.5	(-1.7 - 3.8)
Cs-137	<88.8	(<10.0 - <130.0)	12.7	(-35.1 - 54.9)	16.2	(9.3 - 25.5)
Co-58	<87.7	(<9.0 - <130.0)	1.7	(-16.8 - 25.8)	0.3	(-1.8 - 3.2)
Co-60	<80.6	(<9.0 - <130.0)	0.4	(-18.4 - 19.1)	0.9	(-2.1 - 2.3)
Fe-59	<130.0	(<30.0 - <260.0)	-2.8	(-34.6 - 21.1)	0.9	(-4.4 - 8.0)
Mn-54	<88.3	(<8.0 - <130.0)	2.3	(-10.3 - 30.9)	0.6	(-2.1 - 3.7)

[a] All stations, all years.
[b] Indicator stations only for the years 1984 to 1988. Some of the data means and ranges are biased high due to the effects of the Chernobyl accident in 1986.
[c] The data used for these averages does not include "less than" values reported in 1984.
[d] Indicator stations only.
[e] Resin method for iodine-131 determination.

TABLE 4-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM COMPARATIVE SUMMARY

MEDIA/ANALYSIS	PREOPERATIONAL(a)		PREVIOUS OPERATIONAL(b)(c)		1989(d)	
	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
Produce: pCi/kg						
Gamma						
Cs-134	<49.1	(<10.0 - <140.0)	1.0	(-24.8 - 19.8)	2.5	(-0.5 - 5.8)
Cs-137	<69.8	(<10.0 - <140.0)	4.7	(-9.8 - 20.9)	2.4	(-2.3 - 6.3)
I-131	<105.6	(<10.0 - <1000.0)	1.4	(-21.3 - 59.0)	-0.3	(-8.3 - 10.8)
TLD: mR/day						
Quarterly	0.24	(0.11 - 0.32)	0.24	(0.16 - 0.35)	0.25	(0.22 - 0.32)
Annual	0.23	(0.20 - 0.31)	0.22	(0.18 - 0.32)	0.24	(0.22 - 0.29)

(a) All stations, all years.
(b) Indicator stations only for the years 1984 to 1988. Some of the data means and ranges are biased high due to the effects of the Chernobyl accident in 1986.
(c) The data used for these averages does not include "less than" values reported in 1984.
(d) Indicator stations only.

in the method used to determine TLD exposures from the encapsulated cesium source. Further discussion of this change is included in Subsections 4.1 and 5.1.

The range and mean of the annual TLD results compared well with the quarterly results and also with the previous operational results. Although slightly lower than the quarterly results, the annual results did not show the under-response observed in the set of TLDs used as annual TLDs in 1988.

The LLDs generally determined by Teledyne Isotopes for each analysis performed and each radionuclide of interest are listed in Table 4-2. Presented alongside the Teledyne LLDs are the LLDs required by the NRC Branch Technical Position (BTP). The LLDs determined for analyses at Teledyne Isotopes have met the NRC requirements in all cases.

A summary of the REMP results relative to detection limits is presented in Table 4-3. If a particular radionuclide of interest was not detected in the 1989 samples, the term "LLD" is noted in the data mean and range columns. In this table the discharge water, river/drinking water, and groundwater results are listed separately to delineate the higher levels observed in the gross beta and tritium levels reported for the discharge water samples.

In general, the positive, or detected, 1989 results compare well with the results from previous years. Any significant differences or increases evident in the 1989 results are discussed in the following subsections.

4.1 <u>Direct Radiation</u>

Summaries of the environmental radiation exposure rates, determined by thermoluminescent dosimeters (TLDs) are presented in Tables 4-4 and 4-5. The individual quarterly and annual results for each TLD station are given in Tables A-1.1 and A-1.2 of Appendix A. Figures 4-1 and

TABLE 4-2

COMPARISON OF TELEDYNE NOMINAL LOWER LIMITS OF DETECTION WITH BRANCH TECHNICAL POSITION REQUIREMENTS

MEDIA (UNITS)	ANALYSIS	TELEDYNE LLDs	BTP REQUIRED LLDs
Air	Gross Beta	0.003	0.01
Particulates:	Gamma Spectrometry		
(pCi/m^3)	Cs-134	0.001	0.05
	Cs-137	0.001	0.06
Air Iodine:	I-131	0.01	0.07
(pCi/m^3)			
Water:	Gross Beta	4	4
(pCi/l)	Tritium	100-200	2000
	I-131	1	1
	Sr-90	1	--
	Gamma Spectrometry		
	Mn-54	10	15
	Fe-59	20	30
	Co-58	10	15
	Co-60	10	15
	Zn-65	20	30
	Zr-95	20	30
	Nb-95	10	15
	Cs-134	10	15
	Cs-137	10	18
	Ba-140	20	60
	La-140	10	15

TABLE 4-2 (Cont.)

COMPARISON OF TELEDYNE LOWER NOMINAL LIMITS OF DETECTION
WITH BRANCH TECHNICAL POSITION REQUIREMENTS

MEDIA (UNITS)	ANALYSIS	TELEDYNE LLDs	BTP REQUIRED LLDs
Soil/	Gamma Spectrometry		
Sediment:	Co-57	120	--
(pCi/kg)	Co-60	30	--
	Cs-134	30	150
	Cs-137	40	180
	Sr-90	10	--
Fish:	Gamma Spectrometry		
(pCi/kg)	Mn-54	20	130
	Fe-59	30	260
	Co-58	20	130
	Co-60	20	130
	Zn-65	30	260
	Cs-134	20	130
	Cs-137	20	150
Milk:	I-131	1	1
(pCi/l)	Gamma Spectrometry		
	Cs-134	10	15
	Cs-137	10	18
	Ba-140	20	60
	La-140	10	15
	Sr-90	1	--
Garden	Gamma Spectrometry		
Produce:	Cs-134	20	60
(pCi/kg)	Cs-137	20	80
	I-131	30	60

Table 4-3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATES (pCi/m^3)	Gross Beta 623	0.003	0.016(569/571) (0.001-0.082)	1 1.3 mi S	0.017(52/52) (0.005-0.082)	0.014(51/52) (0.004-0.07)	0
	Gamma (Quarterly) 48						
	Be-7	0.01	0.048(44/44) (0.0169-0.0711)	1 1.3 mi S	0.053(4/4) (0.035-0.068)	0.047(4/4) (0.027-0.067)	0
	K-40	0.01	0.006(6/44) (0.004-0.007)	48 4.5 mi NE	0.007(1/4)	LLD	0
	Cs-137	0.01	LLD			LLD	0
	Cs-134	0.001	LLD			LLD	0
AIR IODINE (pCi/m^3)	I-131 623	0.01	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
WATER (River/Drinking) (pCi/liter)	Gross Beta	36	4	2.11(23/24) (1.2-3.6)	26 3.2 mi E	2.59(11/12) (1.5-4.1)	2.59(11/12) (1.5-4.1)	0
	Tritium	12	200	206(5/8) (150-290)	28 7.4 mi SSE	210(4/4) (150-290)	140(1/4) -	0
	Gamma	12						
	Mn-54		10	LLD			LLD	0
	Fe-59		20	LLD			LLD	0
	Co-58		10	LLD			LLD	0
	Co-60		10	LLD			LLD	0
	Zn-65		20	LLD			LLD	0
	Zr-95		20	LLD			LLD	0
	Nb-95		10	LLD			LLD	0
	Cs-134		10	LLD			LLD	0
	Cs-137		10	LLD			LLD	0
	Ba-140		20	LLD			LLD	0
	La-140		10	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
WATER (Discharge) (pCi/liter)	Gross Beta	36	12	31.1(12/12) (18-48)	27 3.2 mi E	31.1(12/12) (18-48)	None	0
	Tritium	4	200	2950(2/4) (2400-3500)	27 3.2 mi E	2950(2/4) (2400-3500)	None	0
	Gamma	12						
	Mn-54		10	LLD			LLD	0
	Fe-59		20	LLD			LLD	0
	Co-58		10	LLD			LLD	0
	Co-60		10	19.45(4/12) (11.6-28.2)	27 3.2 mi E	19.45(4/12) (11.6-28.2)	LLD	0
	Zn-65		20	22.6(2/12) (16.0-29.2)	27 3.2 mi E	22.6(2/12) (16.0-29.2)	LLD	0
	Zr-95		20	LLD			LLD	0
	Nb-95		10	LLD			LLD	0
	Cs-134		10	LLD			LLD	0
	Cs-137		10	LLD			LLD	0
	Ba-140		20	LLD			LLD	0
	La-140		10	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
WATER (Ground) (pCi/liter)	Tritium	12	200	LLD			None	0
	Gamma	12						
	Mn-54		10	LLD			LLD	0
	Fe-59		20	LLD			LLD	0
	Co-58		10	LLD			LLD	0
	Co-60		10	LLD			LLD	0
	Zn-65		20	LLD			LLD	0
	Zr-95		20	LLD			LLD	0
	Nb-95		10	LLD			LLD	0
	Cs-134		10	LLD			LLD	0
	Cs-137		10	LLD			LLD	0
	Ba-140		20	LLD			LLD	0
	La-140		10	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SOIL (pCi/kg dry)	Gamma 5						
	Cs-134	30	LLD			LLD	0
	Cs-137	40	315(3/4) (21.4-532)	23 3.0 mi ESE	532(1/1)	36.9(1/1)	0
	Ra-226	400	734(4/4) (662-862)	23 3.0 mi ESE	862(1/1)	717(1/1)	0
	Th-228	50	564(4/4) (423-750)	1 1.3 mi S	750(1/1)	617(1/1)	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)(a) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)(a)	CONTROL LOCATION MEAN (b)(a) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (pCi/kg dry)	Gamma 4						
	K-40	700	14450(2/2) (13700-15200)	33 3.6 mi ENE	14850(2/2) (13700-16000)	14850(2/2) (13700-16000)	0
	Co-60	30	LLD			LLD	0
	Cs-134	30	LLD			LLD	0
	Cs-137	40	197(2/2) (169-225)	34 3.5 mi ENE	197(2/2) (169-225)	110(2/2) (90.6-130)	0
	Ra-226	400	728(1/2)	33 3.6 mi ENE	1320(2/2) (1300-1340)	1320(2/2) (1300-1340)	0
	Th-228	50	884(2/2) (698-1070)	33 3.6 mi ENE	1114(2/2) (838-1390)	1114(2/2) (838-1390)	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)(a) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)(a)	CONTROL LOCATION MEAN (b)(a) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (pCi/liter)	I-131	90	1	0.75(1/72)	40 6.4 mi SE	0.75(1/18)	LLD	0
	Gamma	90						
	K-40	90	-	1382(72/72) (1140-1690)	40 6.4 mi SE	1389(18/18) (1140-1690)	1379(18/18) (1150-1560)	0
	Cs-134	90	10	LLD			LLD	0
	Cs-137	90	10	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397

HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
FISH (pCi/kg wet)	Gamma 17						
	K-40	1000	3790(8/8) (2640-4600)	38 26.5 mi ESE	3800(9/9) (3400-4130)	3800(9/9) (3400-4130)	0
	Mn-54	20	LLD			LLD	0
	Fe-59	30	LLD			LLD	0
	Co-58	20	LLD			LLD	0
	Co-60	20	LLD			LLD	0
	Zn-65	30	LLD			LLD	0
	Cs-134	20	LLD			LLD	0
	Cs-137	20	18.3(6/8) (11.6-25.5)	30 3.3 mi E	18.3(6/8) (11.6-25.5)	18.3(6/9) (12.1-30.3)	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN (b)[a] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
ROOTS (pCi/kg wet)	Gamma 9						
	I-131	50	LLD			LLD	0
	Cs-134	50	LLD			LLD	0
	Cs-137	50	LLD			LLD	0
FRUITS (pCi/kg wet)	Gamma 8						
	I-131	50	LLD			LLD	0
	Cs-134	50	LLD			LLD	0
	Cs-137	50	LLD			LLD	0
VEGETABLES (pCi/kg wet)	Gamma 12						
	I-131	50	LLD			LLD	0
	Cs-134	50	LLD			LLD	0
	Cs-137	50	LLD			LLD	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

Table 4-3 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP-2 DOCKET NO. 50-397
HANFORD WASHINGTON JANUARY 1 to DECEMBER 31, 1989

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (b)[a] RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (b)[a]	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
DIRECT RADIATION Quarterly TLD's (mR/day)	TLD	224	-	0.25(221/221) (0.22-0.32)	46 4.7 mi NE	0.31(4/4) (0.30-0.31)	0.23(4/4) (0.22-0.24)	0
DIRECT RADIATION Annual TLD's (mR/day)	TLD	57	-	0.22(56/56) (0.19-0.29)	46 4.7 mi NE	0.29(1/1) -	0.22(1/1) -	0

(a) "(b)" is the ratio of positive results above the LLD to the number of samples analyzed for the parameter of interest.

TABLE 4-4

MEAN QUARTERLY TLD DATA SUMMARY FOR THE PREOPERATIONAL AND OPERATIONAL PERIODS

Results in mR/day

STATION	PREOPERATIONAL		1984 - 1988 OPERATIONAL		1989 OPERATIONAL	
	MEAN	STANDARD ERROR	MEAN	STANDARD ERROR	MEAN	STANDARD ERROR
1	0.24	0.02	0.25	0.01	0.25	0.01
2	0.23	0.02	0.24	0.01	0.25	0.01
3	0.22	0.01	0.23	0.01	0.24	0.01
4	0.22	0.02	0.22	0.01	0.23	0.02
5	0.23	0.01	0.23	0.01	0.24	0.01
6	0.22	0.01	0.23	0.01	0.24	0.02
7	0.23	0.01	0.24	0.01	0.25	0.01
8	0.26	0.01	0.26	0.01	0.28	0.01
9	0.22	0.01	0.22	0.01	0.23	0.01
10	0.23	0.01	0.23	0.01	0.24	0.01
11	0.24	0.01	0.24	0.01	0.25	0.01
12	0.25	0.01	0.26	0.01	0.27	0.01
13	0.24	0.01	0.24	0.01	0.25	0.01
14	0.24	0.02	0.24	0.01	0.25	0.01
15	0.25	0.01	0.26	0.01	0.27	0.01
16	0.24	0.01	0.25	0.01	0.25	0.01
17	0.25	0.01	0.25	0.01	0.26	0.01
18	0.24	0.01	0.25	0.01	0.26	0.01
19	0.24	0.01	0.25	0.01	0.25	0.02
20	0.24	0.01	0.24	0.01	0.25	0.01
21	0.23	0.01	0.22	0.01	0.23	0.01
22	0.24	0.01	0.24	0.01	0.25	0.01
23	0.24	0.01	0.24	0.01	0.25	0.01
24	0.24	0.01	0.24	0.01	0.25	0.01
25	0.25	0.01	0.26	0.01	0.27	0.01
40	0.22	0.01	0.23	0.01	0.24	0.00
41	0.26	0.02	0.26	0.01	0.27	0.01
42[a]	0.25	0.01	0.25	0.01	0.26	0.01

(a) TLD for the third quarter lost in field, so this is the mean of only three quarters.

TABLE 4-4 (Cont.)

MEAN QUARTERLY TLD DATA SUMMARY FOR THE PREOPERATIONAL AND OPERATIONAL PERIODS

Results in mR/day

STATION	PREOPERATIONAL		1984 - 1988 OPERATIONAL		1989 OPERATIONAL	
	MEAN	STANDARD ERROR	MEAN	STANDARD ERROR	MEAN	STANDARD ERROR
43	0.25	0.01	0.25	0.01	0.27	0.01
44	0.23	0.01	0.24	0.01	0.24	0.01
45	0.23	0.01	0.24	0.01	0.25	0.01
46	0.28	0.02	0.29	0.02	0.31	0.01
47	0.22	0.02	0.22	0.01	0.24	0.01
49	0.24	0.00	0.24	0.01	0.25	0.01
50	0.22	0.00	0.24	0.01	0.25	0.01
51	0.23	0.01	0.24	0.01	0.24	0.01
53	0.27	0.00	0.27	0.01	0.28	0.01
54	0.26	0.00	0.25	0.01	0.26	0.01
55	0.23	0.00	0.24	0.01	0.24	0.01
56	0.24	0.00	0.24	0.01	0.25	0.01
61	(a)				0.28	0.02
71(1S)	0.24	0.02	0.27	0.02	0.28	0.02
72(2S)	0.25	0.01	0.26	0.01	0.28	0.02
73(3S)	0.23	0.01	0.23	0.01	0.24	0.01
74(4S)	0.26	0.01	0.26	0.01	0.27	0.01
75(5S)	0.22	0.02	0.24	0.01	0.26	0.02
76(6S)	0.24	0.01	0.24	0.01	0.25	0.02
77(7S)	0.25	0.01	0.25	0.01	0.25	0.01
78(8S)	0.25	0.01	0.24	0.01	0.25	0.01
79(9S)	0.25	0.01	0.25	0.01	0.25	0.00
80(10S)	0.24	0.01	0.24	0.01	0.25	0.01
81(11S)	0.24	0.02	0.24	0.01	0.25	0.01
82(12S)	0.25	0.02	0.25	0.01	0.26	0.01
83(13S)	0.25	0.01	0.25	0.01	0.26	0.01
84(14S)	0.24	0.01	0.24	0.01	0.26	0.01
85(15S)	0.26	0.01	0.26	0.02	0.27	0.01
86(16S)	0.25	0.01	0.27	0.02	0.28	0.02
All	0.24	0.00	0.24	0.00	0.25	0.00

(a) Station 61 was added in 1989.

TABLE 4-5

ANNUAL TLD DATA SUMMARY FOR THE PREOPERATIONAL AND OPERATIONAL PERIODS

Results in mR/day

STATION	PREOPERATIONAL MEAN[a]	PREOPERATIONAL STANDARD ERROR	OPERATIONAL MEAN	OPERATIONAL STANDARD ERROR	1989 OPERATIONAL MEAN	1989 OPERATIONAL STANDARD DEVIATION(2σ)
1	0.23	0.04	0.23	0.02	0.24	0.01
2	0.22	0.04	0.22	0.02	0.24	0.01
3	0.21	0.04	0.21	0.02	0.23	0.01
4	0.22	0.06	0.20	0.02	0.22	0.01
5	0.22	0.04	0.21	0.02	0.22	0.01
6	0.21	0.04	0.21	0.02	0.22	0.00
7	0.22	0.02	0.23[b]	0.02	0.23	0.01
8	0.25	0.04	0.25[b]	0.03	0.26	0.01
9	0.20	0.02	0.21	0.02	0.22	0.01
10	0.22	0.04	0.22	0.02	0.23	0.01
11	0.22	0.04	0.22	0.02	0.24	0.01
12	0.24	0.04	0.24	0.02	0.25	0.01
13	0.22	0.04	0.23	0.02	0.23	0.01
14	0.22	0.04	0.22	0.02	0.23	0.01
15	0.23	0.06	0.24	0.03	0.26	0.01
16	0.23	0.04	0.23	0.02	0.25	0.01
17	0.23	0.02	0.23[b]	0.03	0.24	0.01
18	0.25	0.02	0.23	0.02	0.24	0.00
19	0.22	0.04	0.23	0.02	0.24	0.01
20	0.23	0.04	0.23	0.02	0.24	0.01
21	0.23	0.02	0.21	0.02	0.22	0.01
22	0.22	0.02	0.22	0.02	0.24	0.00
23	0.24	0.02	0.22	0.02	0.24	0.01
24	0.22	0.02	0.23	0.02	0.24	0.01
25	0.24	0.02	0.23	0.03	0.26	0.01
40	0.21[c]	0.02	0.22	0.02	0.23	0.00
41	0.26[c]	0.04	0.24	0.02	0.25	0.00
42	0.24(c)	0.02	0.23	0.02	0.24	0.00
43	0.24(c)	0.02	0.24	0.03	0.26	0.01
44	0.24	0.02	0.22	0.02	0.23	0.01

TABLE 4-5 (Cont.)

ANNUAL TLD DATA SUMMARY FOR THE PREOPERATIONAL AND OPERATIONAL PERIODS

Results in mR/day

STATION	PREOPERATIONAL		1984 - 1988 OPERATIONAL		1989 OPERATIONAL	
	MEAN[(a)]	STANDARD ERROR	MEAN	STANDARD ERROR	MEAN	STANDARD DEVIATION(2σ)
45	0.24	0.01	0.22	0.02	0.24	0.00
46	0.29	0.01	0.28	0.03	0.29	0.01
47	0.22(c)	0.03	0.21	0.02	0.23	0.01
49	(d)		0.22	0.02	0.22	0.01
50	(d)		0.23	0.03	0.24	0.01
51	(d)		0.22	0.02	0.23	0.01
53	(d)		0.25	0.02	0.27	0.01
54	(d)		0.24	0.02	0.25	0.00
55	(d)		0.22	0.02	0.23	0.00
56	(d)		0.22	0.02	0.24	0.00
61	(d)				0.27	0.01
71	0.24(c)	0.02	0.25	0.02	0.27	0.01
72	0.25(c)	0.02	0.25	0.02	0.27	0.01
73	0.23(c)	0.01	0.22	0.02	0.23	0.01
74	0.24(c)	0.01	0.24	0.02	0.26	0.02
75	0.24(c)	0.01	0.22	0.03	0.25	0.00
76	0.24(c)	0.02	0.23	0.02	0.24	0.01
77	0.25(c)	0.02	0.22	0.02	0.24	0.00
78	0.25(c)	0.04	0.24	0.03	0.24	0.01
79	0.25(c)	0.02	0.23	0.02	0.24	0.01
80	0.23(c)	0.05	0.22	0.02	0.24	0.01
81	0.23(c)	0.02	0.22	0.02	0.24	0.01
82	0.25(c)	0.03	0.24	0.02	0.25	0.01
83	0.25(c)	0.02	0.23	0.02	0.25	0.02
84	0.23(c)	0.02	0.23	0.03	0.25	0.01
85	0.26(c)	0.02	0.25	0.03	0.26	0.01
86	0.24	0.02	0.25	0.02	0.28	0.01
All	0.23	0.02	0.23	0.00	0.24	0.03

(a) This preoperational mean is for 1982 - 1983 data only.
(b) 1985 TLD missing
(c) Only one annual exchange during the preoperational period.
(d) Stations 49-56 were first monitored during Fourth Quarter 1983.
Station 61 was added in 1989.

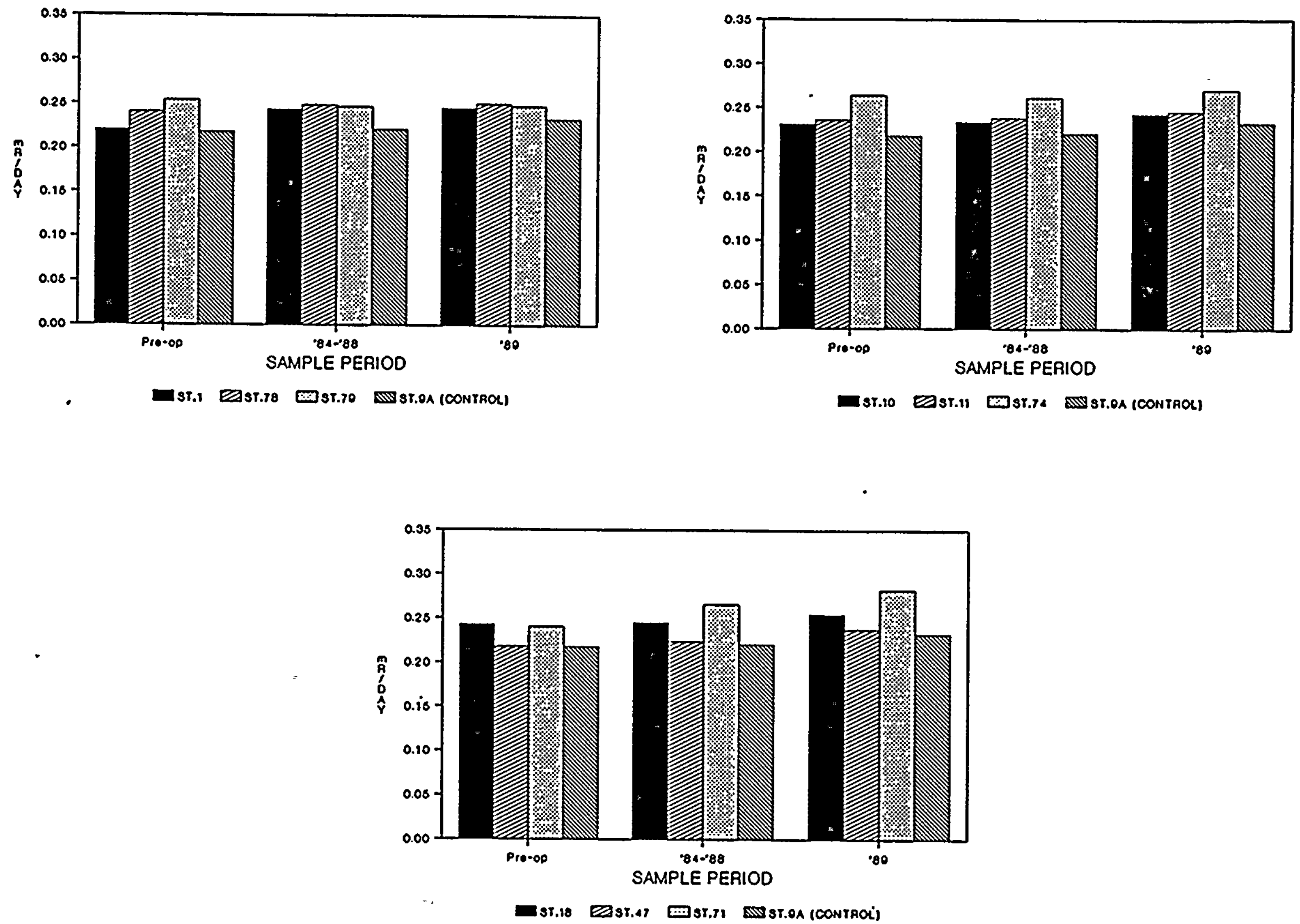


FIGURE 4-1

AVERAGE QUARTERLY TLD RESULTS FOR NEAR-PLANT LOCATIONS
AND THE CONTROL LOCATION (STATION 9A) FOR THE PREOPERATIONAL PERIOD, 1984-1988, AND 1989

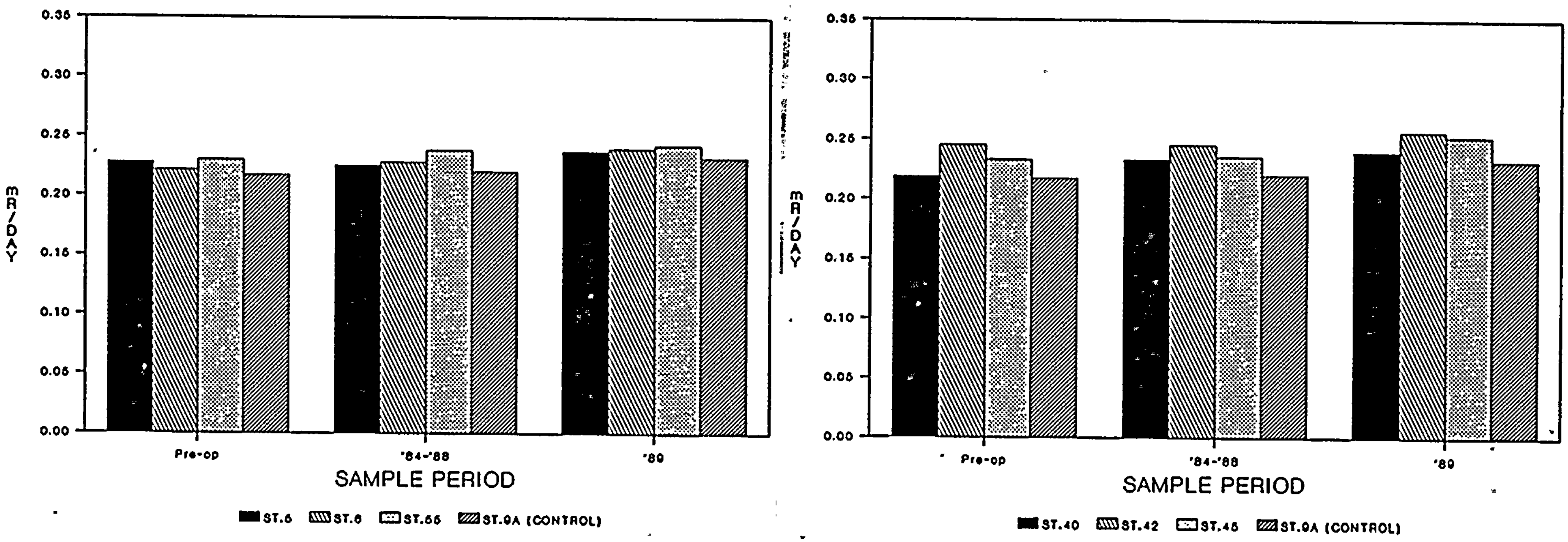


FIGURE 4-2

AVERAGE QUARTERLY TLD RESULTS FOR REMOTE LOCATIONS

AND THE CONTROL LOCATION (STATION 9A) FOR THE PREOPERATIONAL PERIOD, 1984-1988, AND 1989

4-2 show the mean quarterly results for near-plant and remote TLD locations for the preoperational period, 1984-1988 and 1989. Figures 4-3 and 4-4 show the annual TLD results for near-plant and remote locations for the same periods. In general, the quarterly and annual results for the control location (Station 9A) show the same fluctuations over time as the indicator locations and the relationships between the different locations remain very consistent over the three periods.

Figure 4-5 presents the mean 1989 results for each of the sixteen meteorological sectors. The relationship of the mean 1989 results to the results for the preoperational and previous operational periods is very similar for each sector. This indicates that there were no significant directional effects observed in the 1989 TLD results.

The higher TLD results observed in 1987 and in 1988 were not observed in 1989. A slight decrease (~4-5%) occurred in the 1989 results due to a change in the method used for determining the calibration exposure, i.e., calibration factor, for the individual TLDs. Instead of using a single ionization chamber measurement made during TLD irradiation as the exposure value, a source strength value was determined for the encapsulated cesium-137 source from numerous ionization chamber measurements made during several years of source calibration. The resulting calculated source exposure rate was slightly lower (4-5%) than the ionization chamber measurements made previously. Some of this difference may be due to the fluctuation in the calibration factors determined for the ionization chambers used in the TLD calibration exposures.

Station 46 in the Wahluke Reserve remained the location with the highest mean exposure rate, 0.31 mR/day. Since the preoperational measurement phase, the results for this location have exceeded the results for all other locations. Variations in the ambient background due to variations in the soil and underlying rock composition account for such local differences in the TLD results. Figure 4-6 compares the Station 46 results to the results of Station 9A, the control location, from

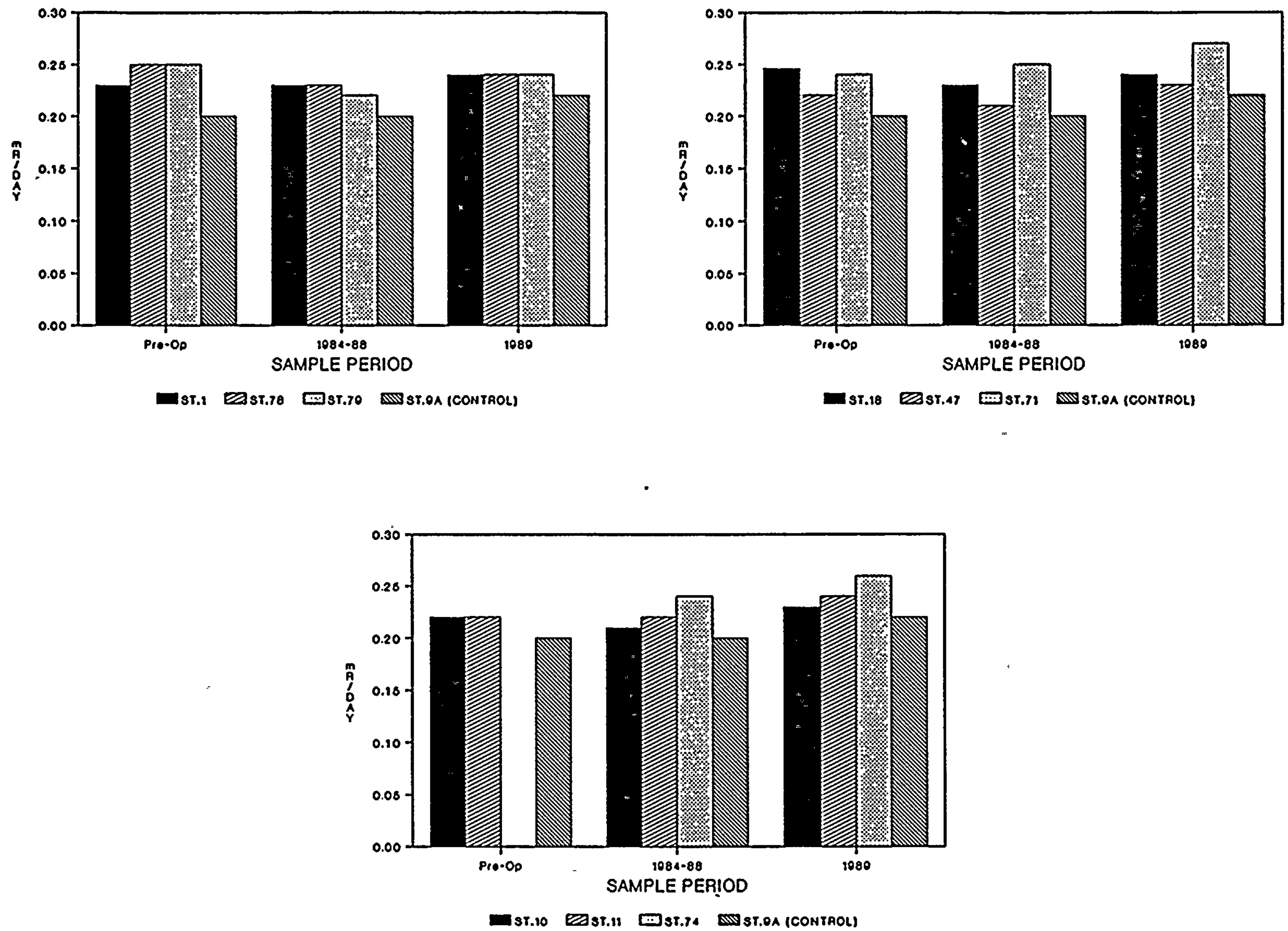
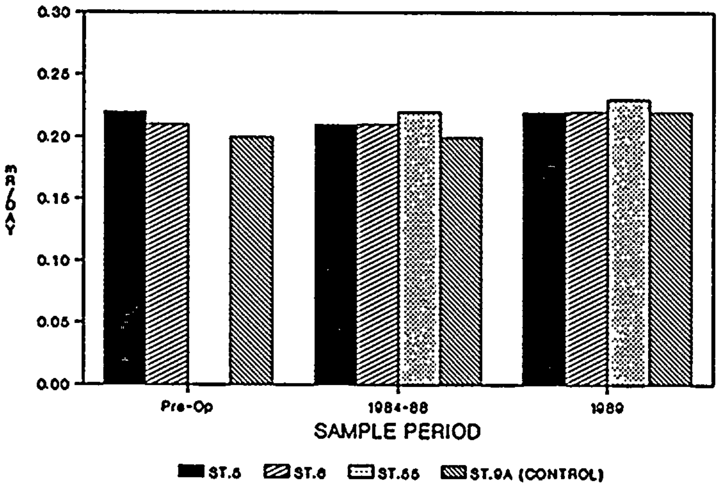


FIGURE 4-3

ANNUAL TLD RESULTS FOR NEAR-PLANT LOCATIONS

AND THE CONTROL LOCATION (STATION 9A) FOR THE PREOPERATIONAL PERIOD, 1984-1988, AND 1989



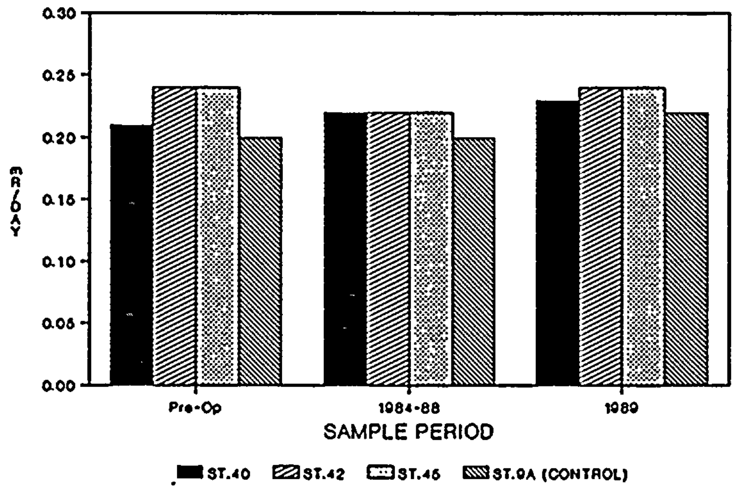


FIGURE 4-4

ANNUAL TLD RESULTS FOR REMOTE LOCATIONS AND THE CONTROL (STATION 9A)

FOR THE PREOPERATIONAL PERIOD, 1984-1988, AND 1989

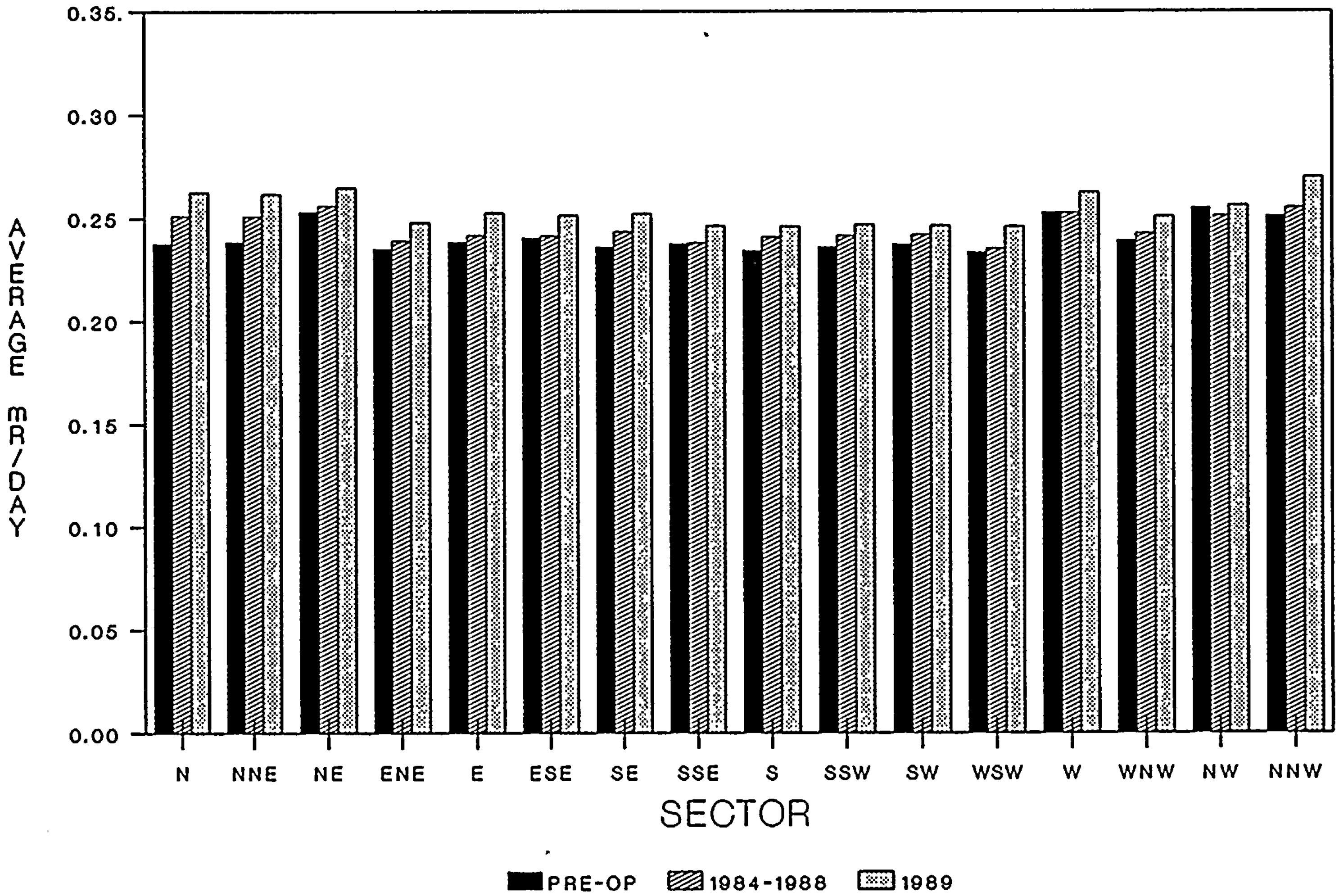


FIGURE 4-5

MEAN 1989 QUARTERLY TLD RESULTS FOR LOCATIONS IN EACH METEOROLOGICAL SECTOR COMPARED TO PREOPERATIONAL AND PREVIOUS OPERATIONAL RESULTS

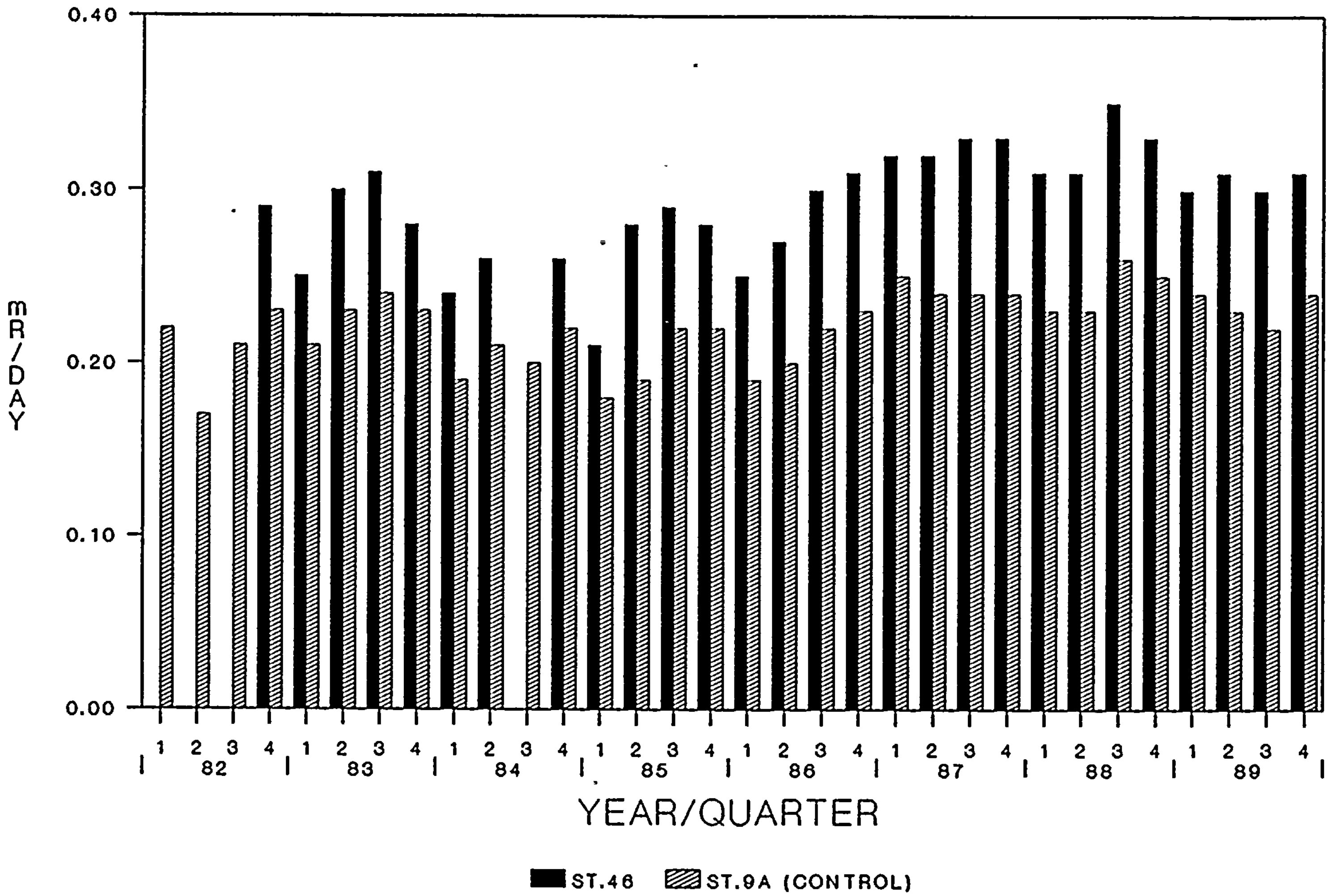


FIGURE 4-6

QUARTERLY TLD RESULTS FOR STATION 46 AND THE CONTROL LOCATION (STATION 9A) FOR THE PERIOD 1982-1989

1982 to 1989. The relationship between the results at these two locations has remained fairly consistent from the preoperational period (1982-1983) to the present.

A comparison of the 1989 annual and mean quarterly TLD results is presented in Table 4-6. The 1989 annual TLD results are generally 4-5% lower than the mean quarterly results. This difference is much less than that observed in the 1988 annual results. It is not significant, in light of the variability commonly observed in TLD results. In most cases, the annual result is within the uncertainty associated with the quarterly TLD results.

The log probability plots of the 1989 and previous operational (1984-1988) quarterly TLD results are presented in Figure 4-7. The "slopes" of the lines in both plots are nearly the same (1.04 - 1.06), indicating that both sets of data are part of the same distribution.

The log probability plots of the 1989 annual results and the results from previous years of operation are presented in Figure 4-8. The 1989 results are consistent with results observed for the past monitoring periods. The slopes of the lines determined for this data are typical for ambient radiation measurements.

The log probability plots of the quarterly data for a near-plant locations, Stations 71-76, and the control location, Station 9A, from 1982 to 1989 are presented in Figure 4-9. The linearity of the plots indicates that the results are all within the same log normal distribution and that no significant increases or decreases indicating a change in the environmental radiation levels were evident.

The above comparisons of 1989 TLD results to preoperational and previous operational data and the analysis of results by meteorological sector and distance from the plant provide no indication that Plant 2 operations have impacted the direct radiation levels in the environment around the plant.

TABLE 4-6

1989 MEAN QUARTERLY VERSUS ANNUAL TLD DATA
Results in mR/day

STATION	QUARTERLY TLDS MEAN*	QUARTERLY TLDS STANDARD ERROR	ANNUAL TLDS MEAN**	ANNUAL TLDS STANDARD DEVIATION(2σ)
1	0.25	0.01	0.24	0.01
2	0.25	0.01	0.24	0.01
3	0.24	0.01	0.23	0.01
4	0.23	0.01	0.22	0.01
5	0.24	0.01	0.22	0.01
6	0.24	0.02	0.22	0.00
7	0.25	0.01	0.23	0.01
8	0.28	0.01	0.26	0.01
9	0.23	0.01	0.22	0.01
10	0.24	0.01	0.23	0.01
11	0.25	0.01	0.24	0.01
12	0.27	0.01	0.25	0.01
13	0.25	0.01	0.23	0.01
14	0.25	0.01	0.23	0.01
15	0.27	0.01	0.26	0.01
16	0.26	0.01	0.25	0.01
17	0.26	0.01	0.24	0.01
18	0.26	0.01	0.24	0.00
19	0.25	0.01	0.24	0.01
20	0.25	0.01	0.24	0.01
21	0.23	0.01	0.22	0.01
22	0.25	0.01	0.24	0.00
23	0.25	0.01	0.24	0.01
24	0.25	0.01	0.24	0.01
25	0.27	0.01	0.26	0.01
40	0.24	0.00	0.23	0.00
41	0.27	0.01	0.25	0.00
42	0.26	0.01	0.24	0.00

*Mean of the quarterly results.

**Mean of four readout areas on each TLD.

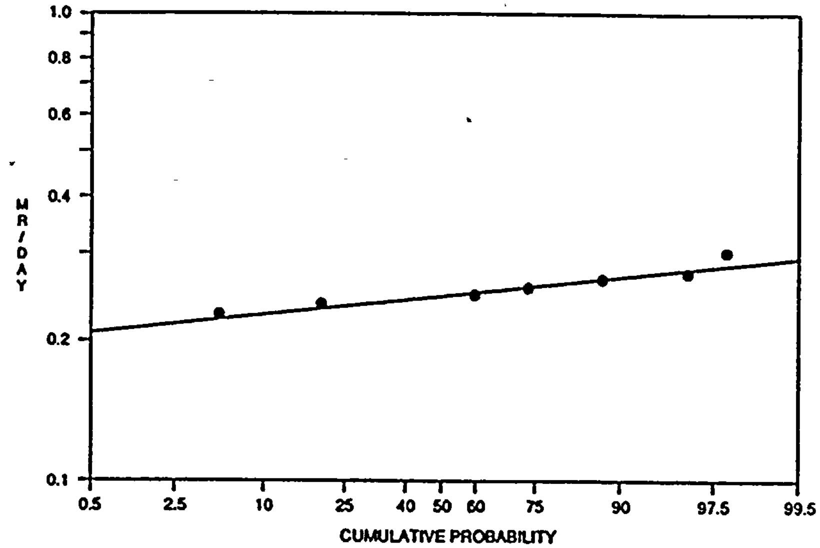
TABLE 4-6 (Cont.)

1989 MEAN QUARTERLY VERSUS ANNUAL TLD DATA
Results in mR/day

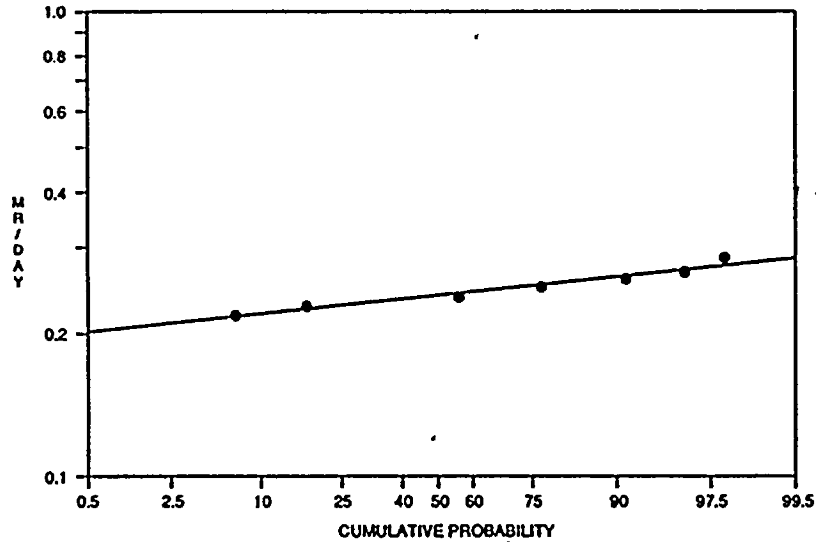
STATION	QUARTERLY TLDS MEAN*	QUARTERLY TLDS STANDARD ERROR	ANNUAL TLDS MEAN**	ANNUAL TLDS STANDARD DEVIATION (2σ)
43	0.27	0.01	0.26	0.01
44	0.24	0.01	0.23	0.01
45	0.25	0.01	0.24	0.00
46	0.31	0.02	0.29	0.01
47	0.24	0.01	0.23	0.01
49	0.25	0.01	0.22	0.01
50	0.25	0.01	0.24	0.01
51	0.24	0.01	0.23	0.01
53	0.28	0.01	0.27	0.01
54	0.26	0.01	0.25	0.00
55	0.24	0.01	0.23	0.00
56	0.25	0.01	0.24	0.00
61	0.28		0.27	0.01
71 (1S)	0.28	0.02	0.27	0.01
72 (2S)	0.28	0.02	0.27	0.01
73 (3S)	0.24	0.01	0.23	0.01
74 (4S)	0.27	0.01	0.26	0.02
75 (5S)	0.26	0.01	0.25	0.00
76 (6S)	0.25	0.01	0.24	0.01
77 (7S)	0.25	0.01	0.24	0.00
78 (8S)	0.25	0.01	0.24	0.01
79 (9S)	0.25	0.01	0.24	0.01
80 (10S)	0.25	0.01	0.24	0.01
81 (11S)	0.25	0.01	0.24	0.01
82 (12S)	0.26	0.01	0.25	0.01
83 (13S)	0.26	0.01	0.25	0.02
84 (14S)	0.26	0.01	0.25	0.01
85 (15S)	0.27	0.01	0.26	0.01
86 (16S)	0.28	0.02	0.28	0.01

*Mean of the quarterly mean results.

**Mean of four readout areas on each TLD.



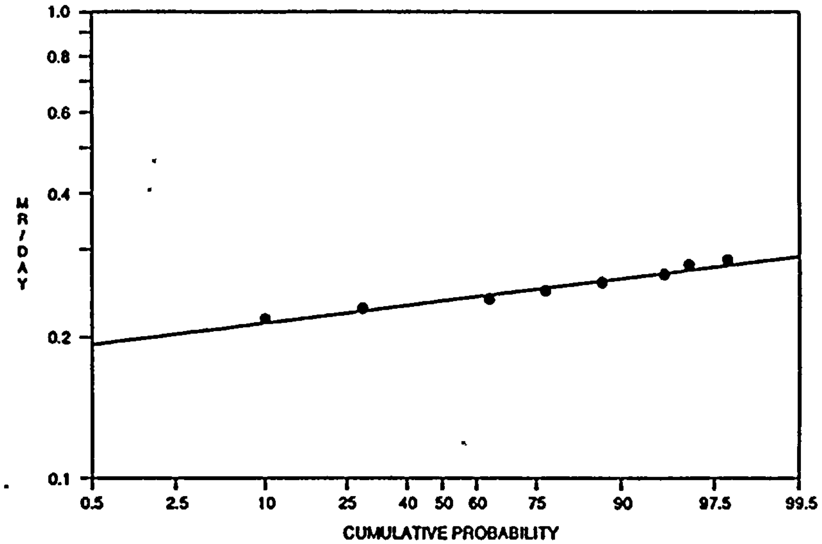
Quarterly 1989



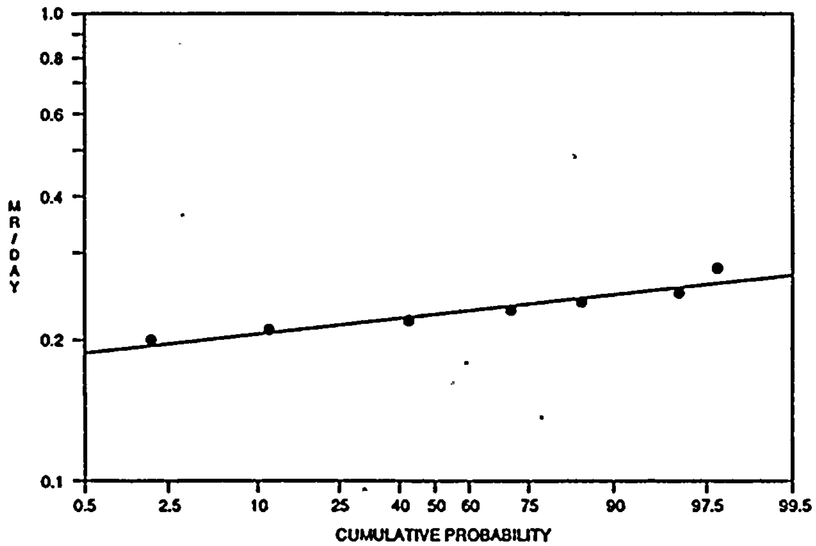
Quarterly 1984-1988

FIGURE 4-7

LOG PROBABILITY PLOTS OF THE 1989 AND 1984-1988 QUARTERLY TLD RESULTS



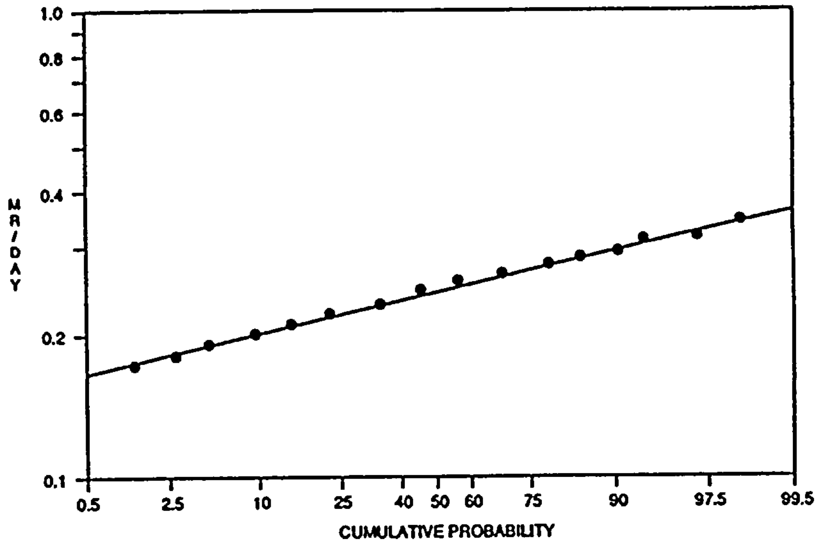
Annual 1989



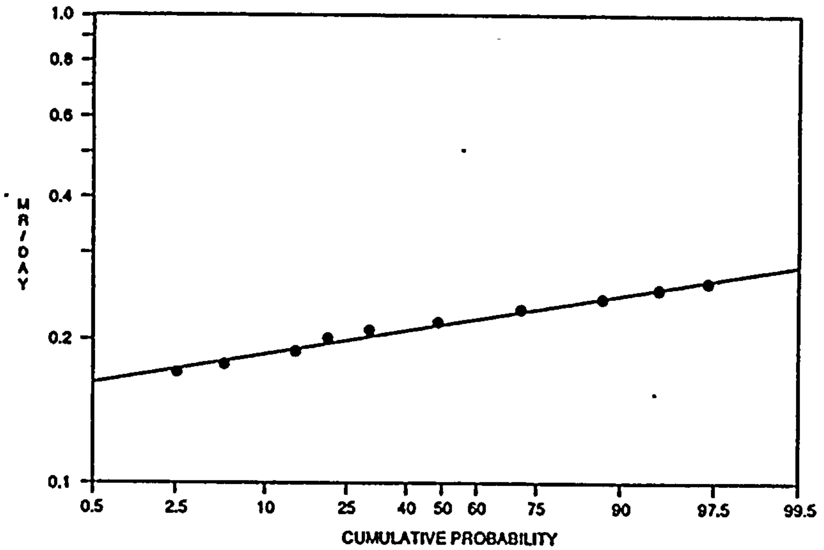
Annual 1984-1988

FIGURE 4-8

LOG PROBABILITY PLOTS OF THE 1989 AND 1984-1988 ANNUAL TLD RESULTS



Stations 71-76



Station 9A

FIGURE 4-9

LOG PROBABILITY PLOTS OF THE QUARTERLY TLD DATA FOR NEAR-PLANT LOCATIONS (STATION 71-76) AND THE CONTROL LOCATION (STATION 9A) FOR THE PERIOD 1982-1989

4.2 Airborne Particulate/Iodine

The results of the 1989 gross beta in air analyses are presented in Tables A-2.1 and A-2.2 of Appendix A. The 1989 mean weekly results of all indicator stations are plotted in Figure 4-10. The gross beta in air results for 1989 were within the ranges observed during the pre-operational period and during previous operational periods, as shown in Table 4-1 and in Figure 4-11. As observed previously, gross beta levels increased during periods of inversion occurring in the fall and winter months. The increase, which was evident in the results of all the air sampling locations, including the control location at Station 9A, was likely due to an increase in radon and radon daughter concentrations during the inversions. In Figure 4-12, plots of the weekly gross beta results for near-plant and remote locations and for the control location at Station 9A illustrate the similarity of the results from all locations.

The quarterly gamma analyses of the particulate filter composites, in general, indicated only the presence of beryllium-7 and potassium-40, two naturally-occurring radionuclides, at levels above detection limits at indicator locations and the control location. The results of the gamma analysis of particulate filter composites are presented in Table A-3.1 and A-3.2 of Appendix A.

The results of the gamma analyses of charcoal cartridges for iodine-131 are presented in Table A-4.1. All iodine-131 in air results for 1989 were less than the 0.01 pCi/cubic meter LLD.

No evidence of any impact of plant operations on the environment was apparent in the particulate filter and charcoal cartridge results for 1989.

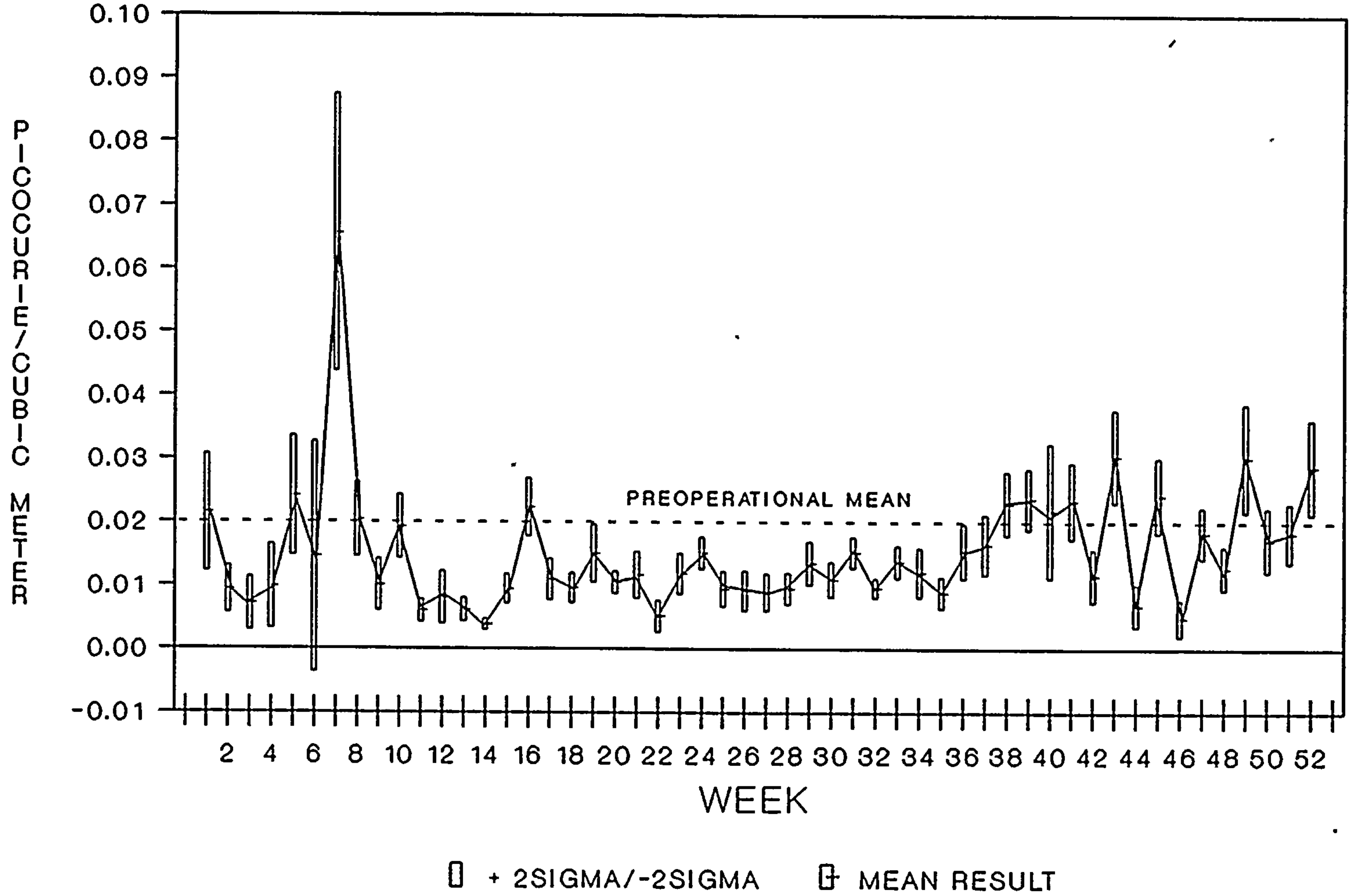


FIGURE 4-10
MEAN WEEKLY 1989 GROSS BETA IN AIR RESULTS

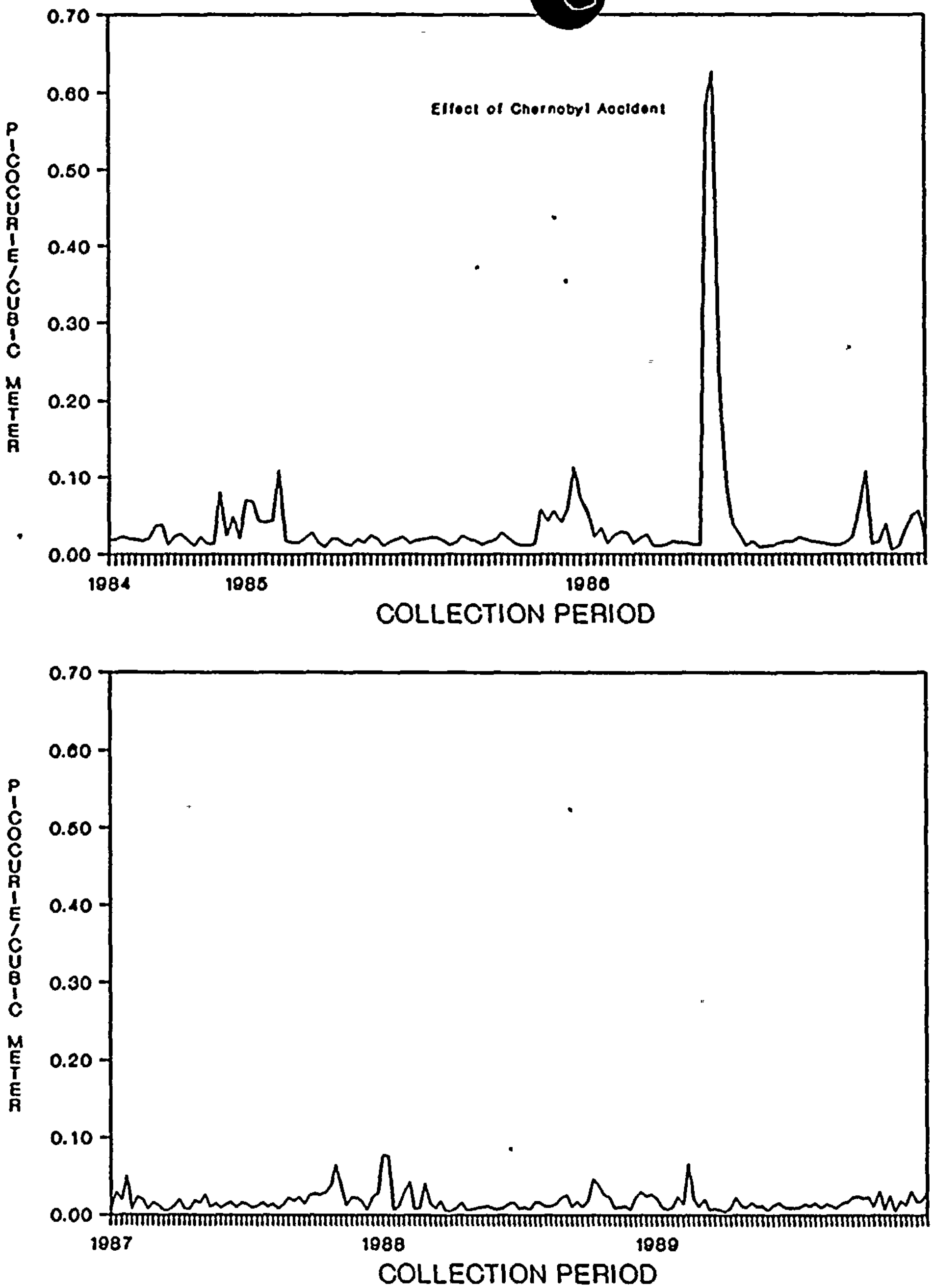


FIGURE 4-11

MEAN WEEKLY GROSS BETA IN AIR RESULTS FROM 1984 TO 1989

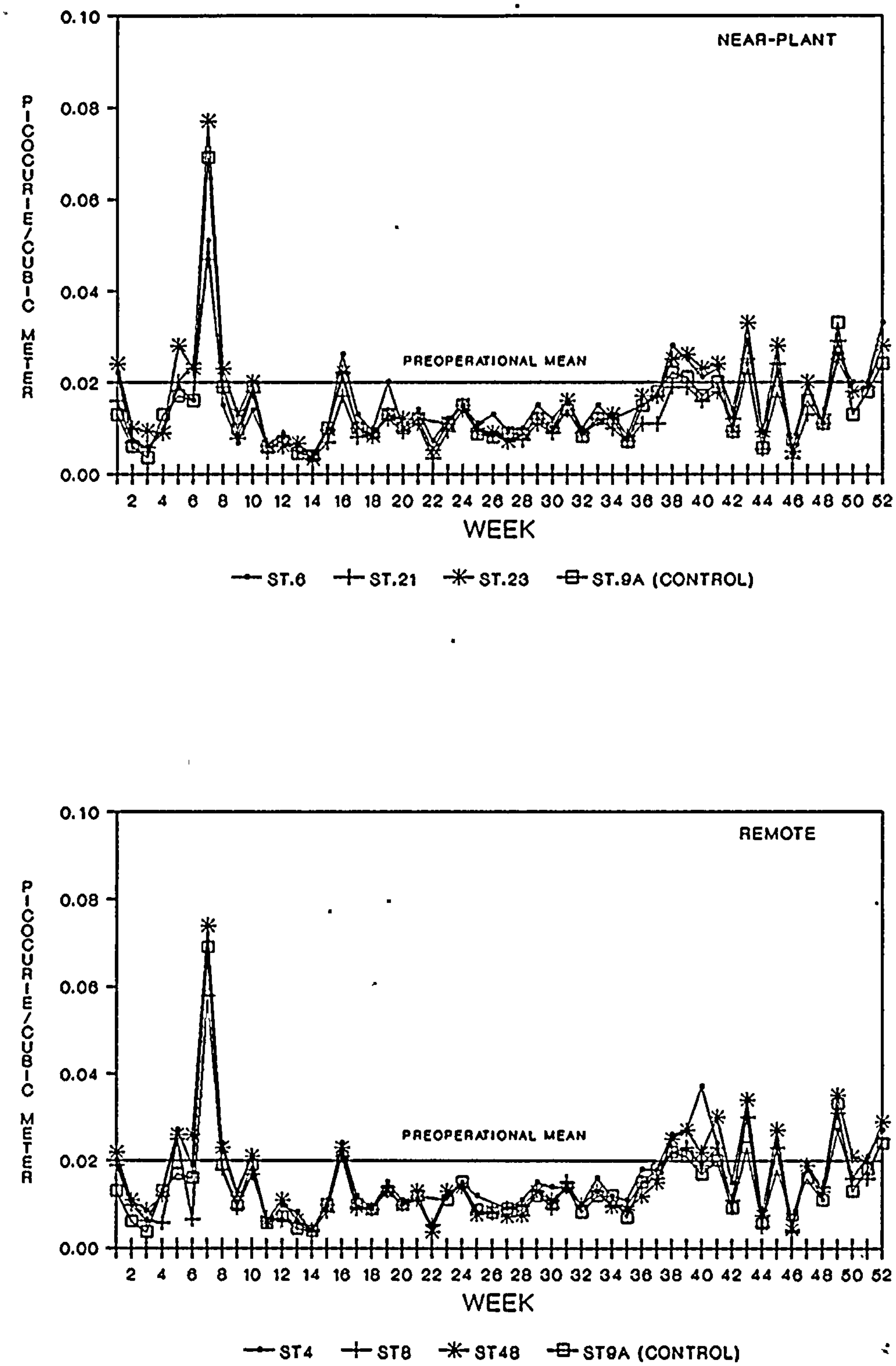


FIGURE 4-12

WEEKLY GROSS BETA IN AIR RESULTS FOR NEAR-PLANT AND REMOTE SAMPLING LOCATIONS VERSUS THE RESULTS FOR THE CONTROL LOCATION (STATION 9A)

4.3 Water

During 1989 there were frequent periods when sampler inoperability prevented the collection of composite water samples from the intake and/or discharge lines. During these periods, grab samples were taken as a matter of "good practice" to estimate the radionuclide concentrations in the intake or discharge water when flow proportional composite sampling was not possible. The focus of efforts to continue meeting Technical Specification requirements during these periods was to put the composite samplers back in operation, at least by the end of the next sampling period. The outage periods and corrective actions taken to remedy the equipment failures are presented in the sample deviations listing in Appendix D. The results of the grab samples taken during these periods are presented in Table C-1 of Appendix C.

The gross beta in river/drinking and discharge water results are given in Tables A-5.1 and A-5.2 of Appendix A. All river/drinking water results were within the ranges normally observed and less than 8 pCi/liter, the level at which a strontium analysis is performed to verify compliance with the Washington State drinking water standard. A graph of the gross beta in river/drinking water results during 1989 is presented in Figure 4-13. The gross beta in river/drinking water results from 1984 to 1988 are presented in Figure 4-14. The higher levels observed in the Richland water results in early 1986 and 1987 are due to the use of well water, instead of river water, during the annual maintenance outage of the Richland Water Treatment Plant.

The 1989 gross beta levels in the discharge water remained consistent with previous levels observed since the last half of 1986, as shown in Figure 4-15. The average gross beta result for the period was 30.9 pCi/liter. This gross beta level resulted from the current mode of plant operations using higher cycles of circulating water concentration. Under these conditions, the gross beta levels in the discharge

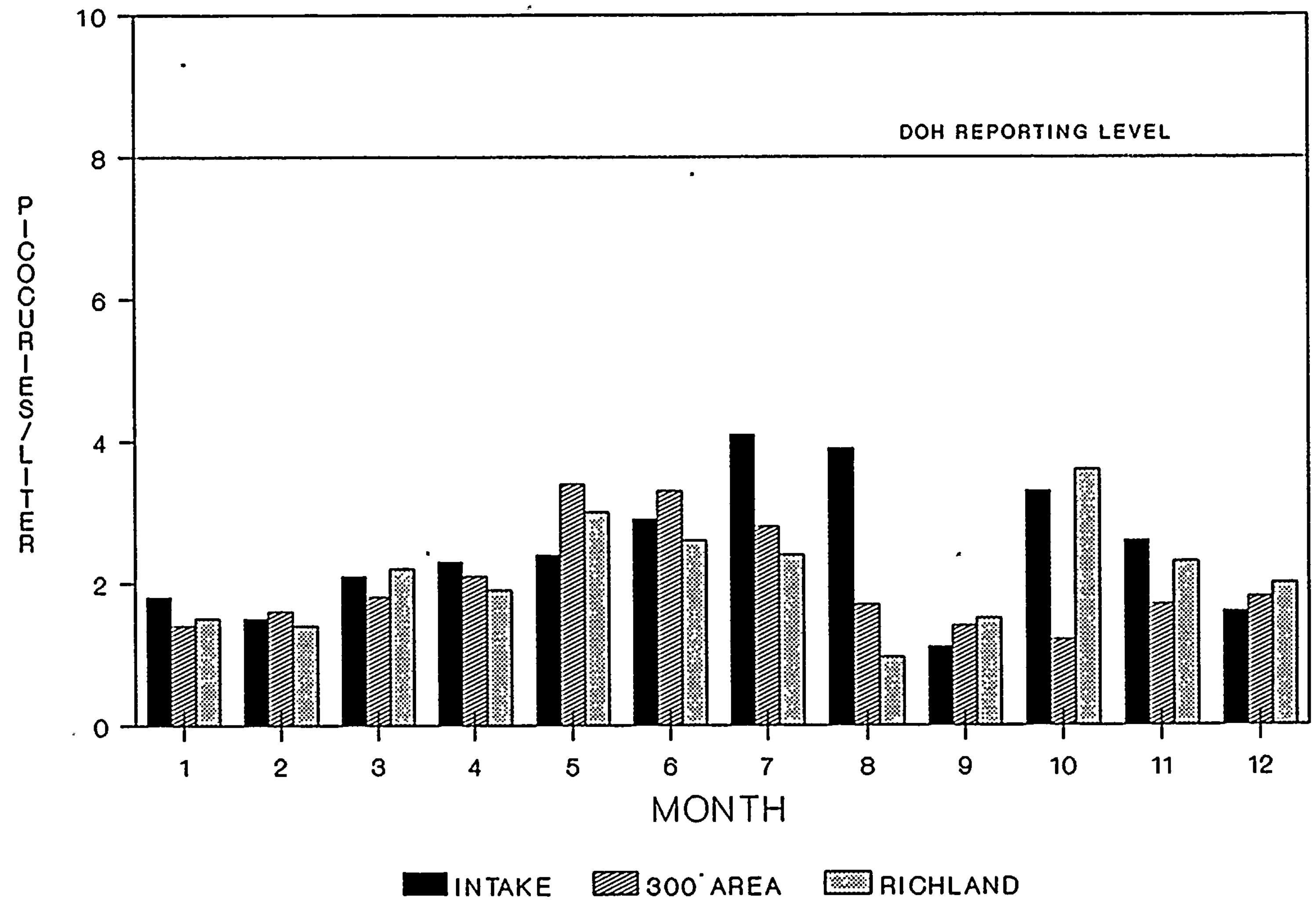
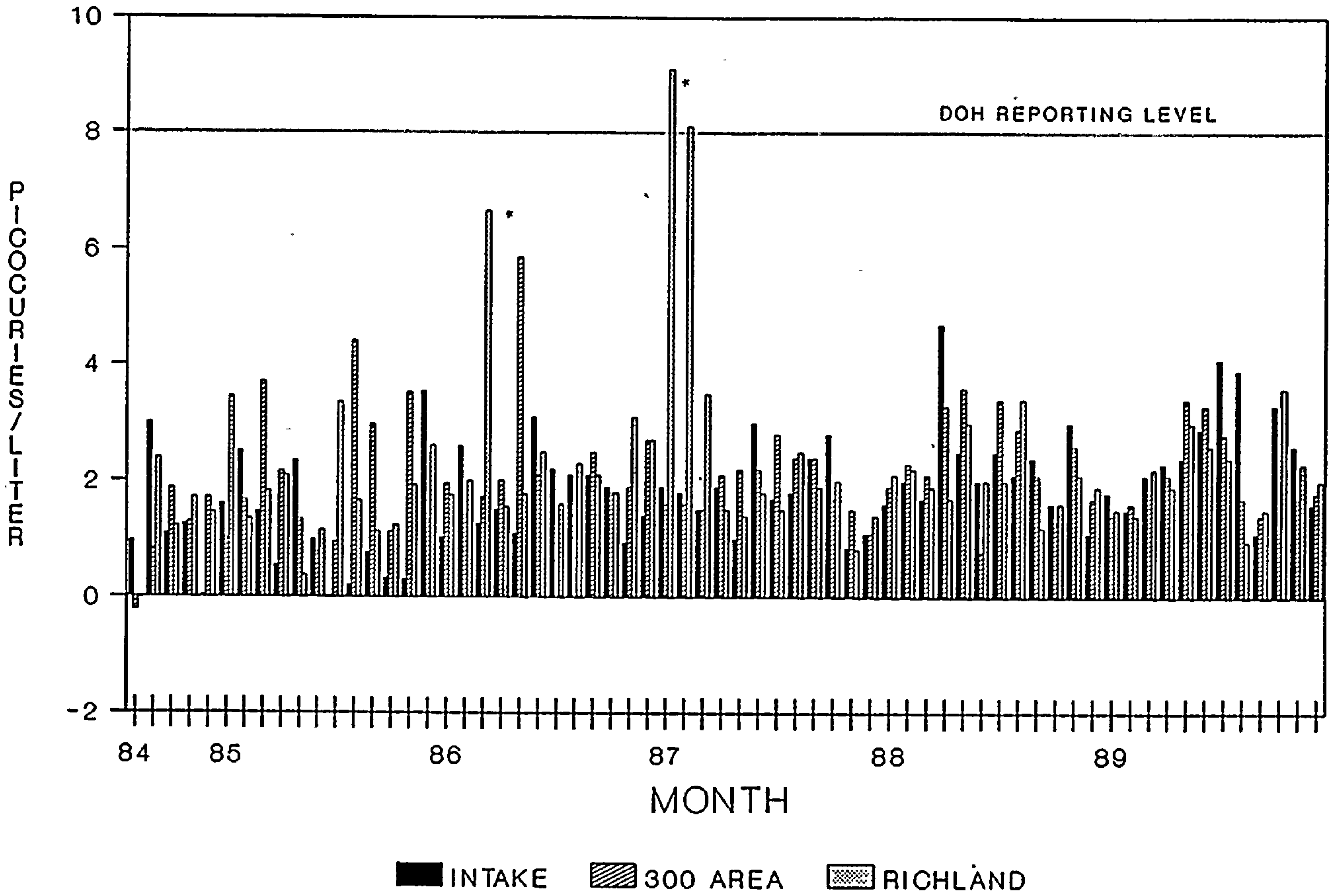


FIGURE 4-13

1989 GROSS BETA IN RIVER/DRINKING WATER RESULTS



*Well water used, instead of river water, during water treatment plant maintenance outages.

FIGURE 4-14

GROSS BETA IN RIVER/DRINKING WATER FROM 1984 TO 1989

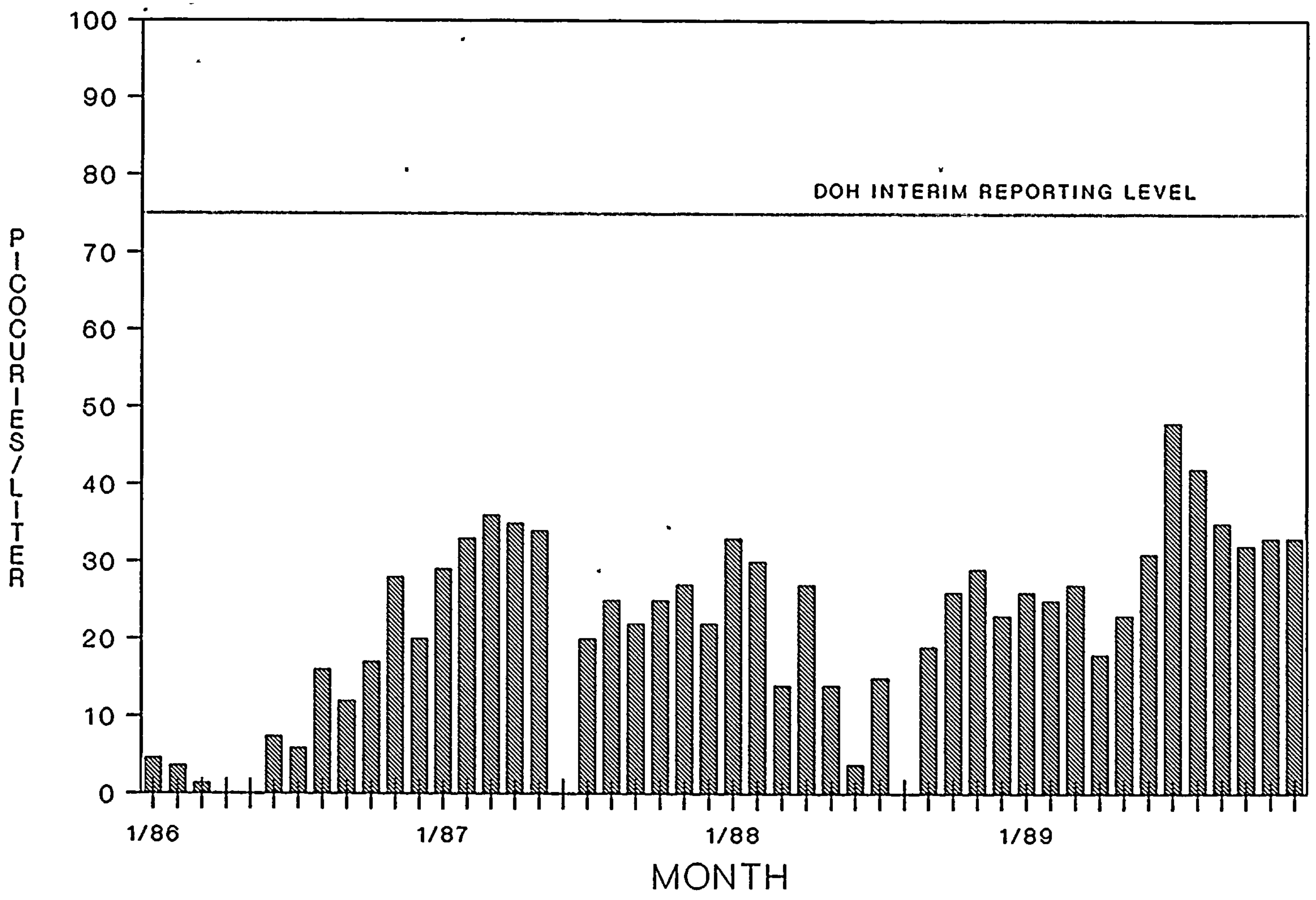


FIGURE 4-15

GROSS BETA IN DISCHARGE WATER RESULTS FOR 1986-1989 sample would reflect the concentration of naturally-occurring radionuclides, principally potassium-40, and any radionuclides from upstream sources or past Hanford activities present in the makeup water, in addition to radionuclides from Plant 2 discharges. The discharge sample results are representative of the radioactivity present in plant discharges before any mixing with river water occurs. Therefore, the sample is not indicative of the actual radionuclide concentrations in the river water downstream from Plant 2. This conservative approach of flow-proportional composite sampling from the discharge line in lieu of sampling from the river near the downstream edge of the mixing zone (as required by Technical Specifications) was considered to be the most feasible option. However, careful interpretation of the results from this sampling point is necessary, since they do not represent a true environmental sample.

The 1989 gross beta results for the discharge sample are presented in Figure 4-16. The temporary, or interim level for reporting to the Washington State Department of Health (DOH) (75 pCi/liter) is shown for comparison. The establishment of a final reporting level for gross beta in the discharge sample is still in progress.

The tritium results for river/drinking water, discharge water and groundwater are presented in Tables A-6.1 and A-6.2 of Appendix A. The tritium levels in the river/drinking water were all at or slightly above the LLD for that analysis, as shown in Figure 4-17. All the results were within the range normally observed in such water and within the range of the preoperational and previous operational results for the same stations.

The tritium results for the quarterly groundwater samples were all below the LLD. They are presented in Table A-6.1 of Appendix A.

The tritium levels in the discharge water were higher than the levels observed for the river/drinking water samples because of plant releases. The levels observed are reasonable for samples taken

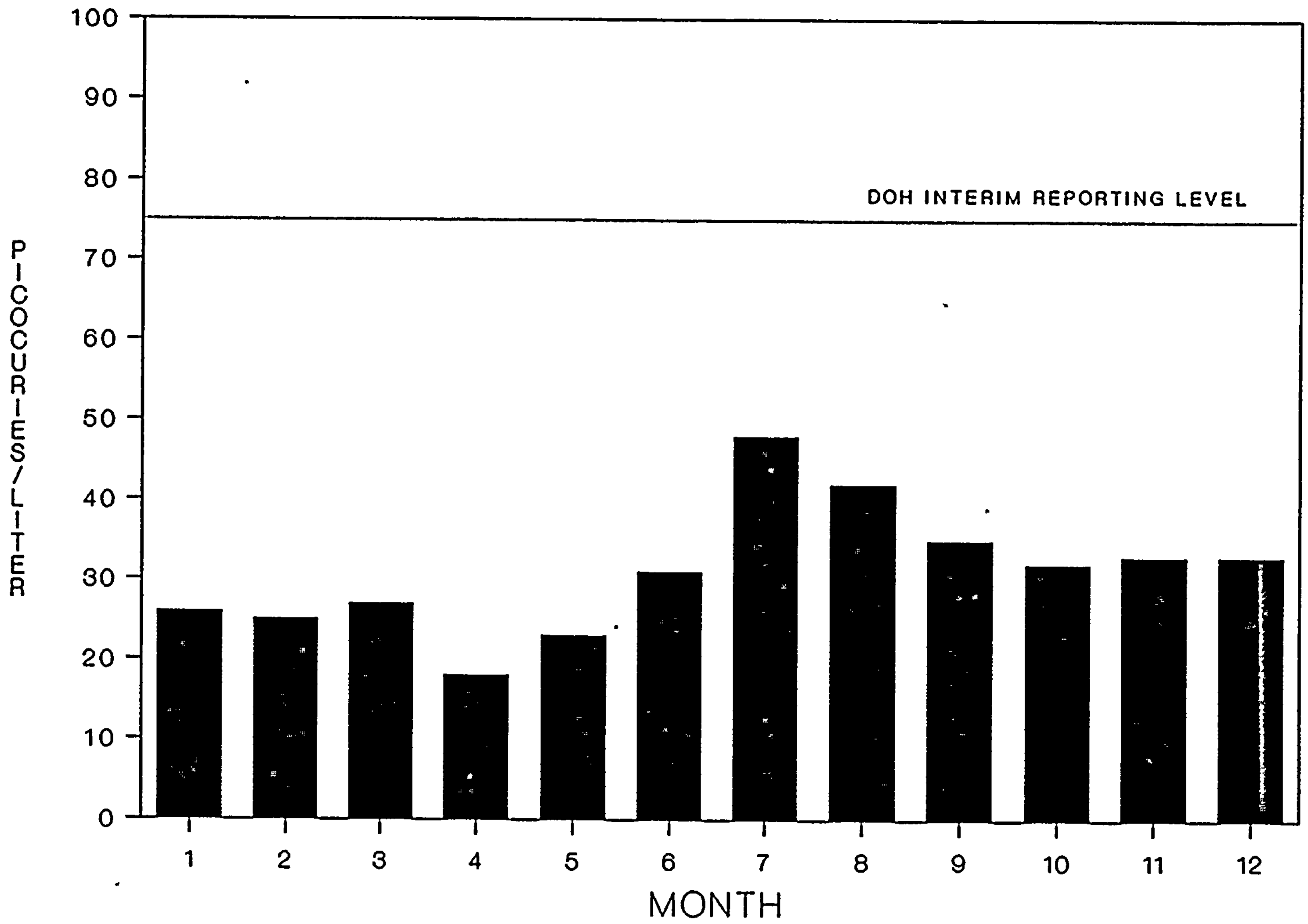


FIGURE 4-16

1989 GROSS BETA IN DISCHARGE WATER RESULTS

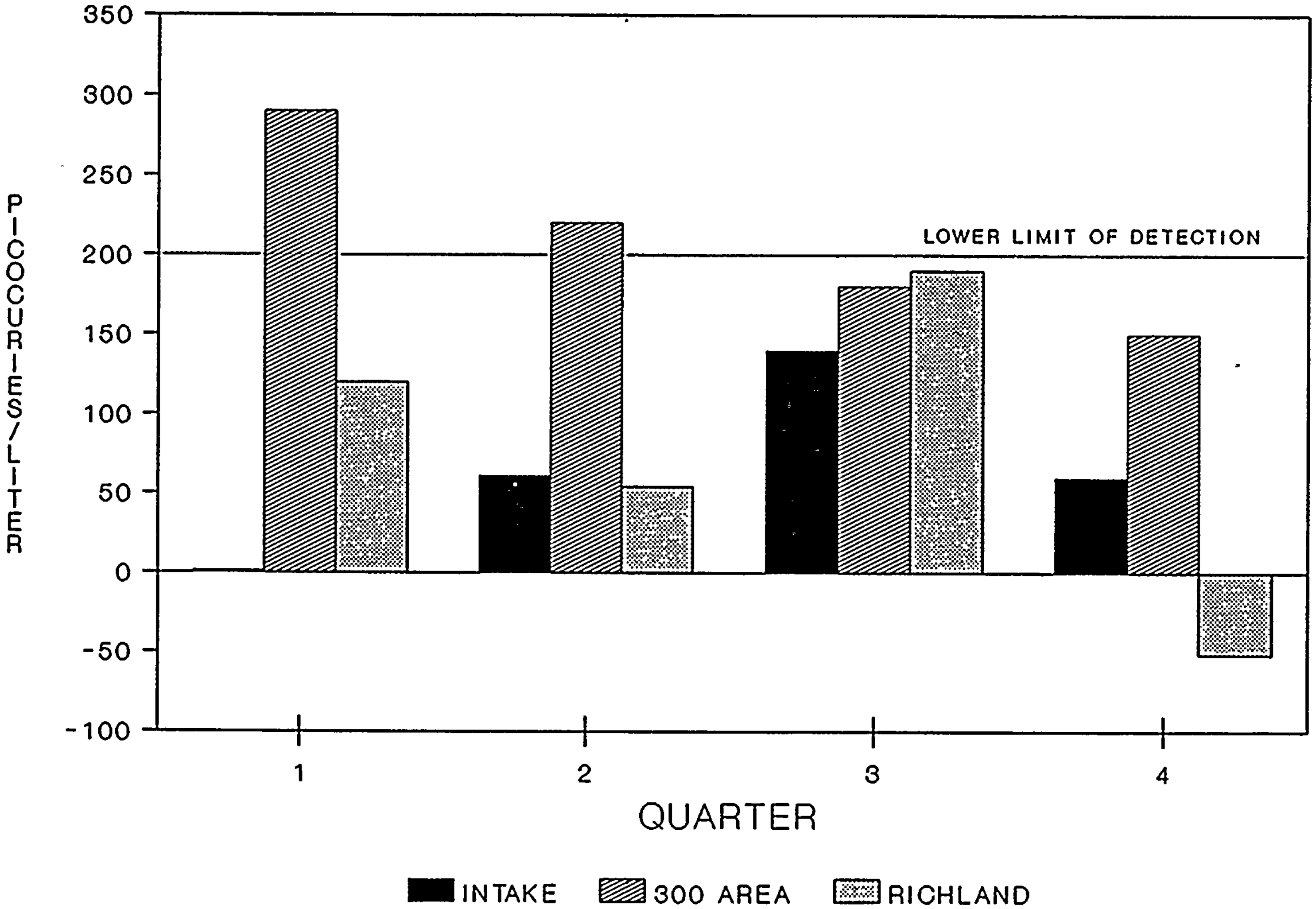


FIGURE 4-17

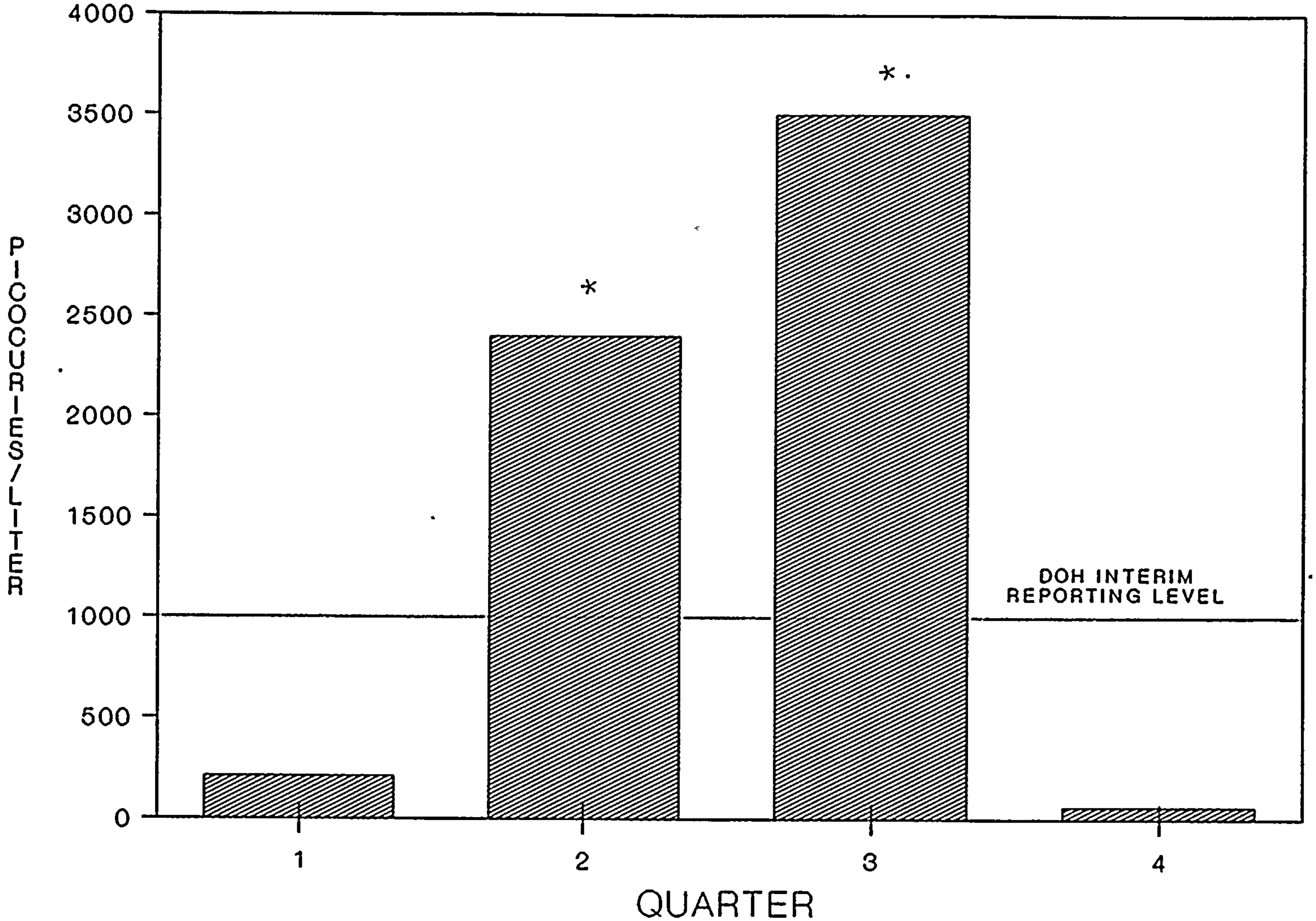
1989 TRITIUM IN RIVER/DRINKING WATER RESULTS

directly from the discharge line prior to any river dilution. Compared to the maximum allowable level for tritium in drinking water, 20,000 pCi/liter, the results were low.(14) A graph of the discharge water tritium levels for 1989 is presented in Figure 4-18. Second and third quarter results exceeded the DOH interim reporting level, 1000 pCi/liter. The interim tritium reporting level was also exceeded by the tritium result (5,300 ± 200 pCi/liter) determined for a composite of grab samples taken from May 17 to June 6, when the discharge sampler was inoperable (Appendix C). Since this level of tritium activity can be expected in the discharge line, given the current method of discharging, a request was made to DOH to raise the reporting level so that its function, i.e., to serve as a warning of significant changes in the tritium levels could be better fulfilled. This request is still pending.

The results of gamma isotopic analyses on river/drinking water, discharge water and groundwater are listed in Tables A-7.1 and A-7.2 of Appendix A. All results for the river/drinking water and ground water samples were less than detection limits. All results for discharge water samples were also below the detection levels, except the results for cobalt-60 and zinc-65 in the 5/10-5/14 and the 5/17-6/06 composites of grab samples and in four routine composite samples. In those samples, zinc-65 and cobalt-60 were present at detectable levels (16.0 - 29.2 pCi/liter for zinc-65 and 5.6 - 28.2 pCi/liter for cobalt-60). None of the results exceeded the DOH reporting level (100 pCi/liter) or the NRC reporting level (300 pCi/liter) for zinc-65 or cobalt-60.

4.4 Soil

Gamma spectrometry was performed on five soil samples collected in May. The cesium-137 levels in the samples ranged from 18.4 pCi/kilogram at Station 7, to 532 pCi/kilogram at Station 23. Aside from cesium-137, the only radionuclides detected in the samples were potassium-40, radium-226 and thorium-228, which are part of the natural radioactivity typically found in soils.



*NOTE: These results are low when considering that the maximum allowable level for tritium in drinking water is 20,000 pCi/liter.

FIGURE 4-18

1989 TRITIUM IN DISCHARGE WATER RESULTS

The cesium-137 levels in the soil samples were well within the range observed during preoperational and previous operational sampling. However, since the cesium-137 measured in the Station 23 sample was greater than ten times the result for Station 9A (control), a strontium analysis was performed on the sample, as required by the SCA. The strontium-90 result was 96.0 ± 20.0 pCi/kilogram, which was within the range that has been previously observed in the area.

The gamma spectrometry results for the soil samples are given in Tables A-8.1 and A-8.2 in Appendix A. No indication of impact of Plant 2 operations on the environment was evident in these results.

4.5 Shoreline Sediment

The results of gamma spectrometry of shoreline sediment are presented in Tables A-9.1 and A-9.2 in Appendix A. Aside from the naturally-occurring radionuclides (potassium-40, radium-226 and thorium-228), only cesium-137 was detected downstream of the plant (Station 34). Cesium-137 was also detected in the control location (Station 33) sample. Cesium-137 has been detected in preoperational samples and in samples taken since plant operation began. It has also been previously identified as a component of the Columbia River sediment originating from the operation of the old Hanford Reservation reactors.[15] Cobalt-57 was also observed in the downstream sediment sample at a concentration below the lower limit of detection. Cobalt-57 was previously observed in the downstream sediment in 1986. At that time, the detection of cobalt-57 was based on the presence of its most abundant peak (122 kev) and the uncertainty associated with that peak. However, during 1989, this protocol was changed to require the presence of the 136 kev peak, as well, in the gamma analysis. This change ensures positive identification of cobalt-57, even in the presence of other radionuclides, such as europium-152, which emit gammas with the same energy.

Special sediment samples were taken above and below the Plant 2 discharge point in June to determine if cobalt-57 was present in detectable levels. Cobalt-57 was not detected in the upstream or downstream samples. The results of these special samples are presented in Table C-2 of Appendix C.

4.6 Fish

The gamma spectrometry results of fish samples collected in the vicinity of the Plant 2 discharge and at the control location on the Snake River are presented in Tables A-10.1 and A-10.2 of Appendix A. All results were below detection limits, except for potassium-40, a naturally-occurring radionuclide, and cesium-137. The detectable cesium-137 levels for the fish taken from the Columbia River ranged from 11.6 to 25.5 pCi/kilogram and the detectable levels for fish taken from the Snake River ranged from 12.1 to 30.0 pCi/kilogram. These results were within the range observed during the preoperational and previous operational periods.

4.7 Milk

All the results of iodine-131 analyses of milk samples collected during 1989 were less than detection limits except the February 7 sample taken at Station 40, 6.4 miles SE of Plant 2. The iodine-131 concentration measured for this sample using the resin method of chemical separation, followed by beta counting, was 0.75 ± 0.12 pCi/liter. The LLD for this analysis is normally 0.5 pCi/liter or less. None of the milk samples taken the same day from other dairy locations in Franklin County and in the Sunnyside area had detectable iodine-131 concentrations.

A second aliquot of this milk sample was analyzed eleven days after the analysis of the original sample. The iodine-131 result for the second aliquot was 1.0 ± 0.5 pCi/liter, which confirmed the original result. However, the validity of this result is somewhat limited by the fact that there was a low sample yield and, therefore, a high degree of uncertainty in this analysis. Recount of the original sample indicated a decay rate similar to that expected for iodine-131, although the sample activity during the recounts was so low that there was significant uncertainty associated with the results.

The investigation of this milk result included taking another milk sample at Station 40, as well as taking samples of the corn and hay used to feed the cows at that location, analyzing plant effluent data and back-calculating the curies of iodine-131 that would have had to have been released for this result to be attributable to Plant 2 effluents.

Inquiries were made of other local environmental monitoring programs about their iodine-131 in milk results for the same period. No other instances of detectable iodine were observed by the other programs. Inquiries were also made of Teledyne Isotopes about the processing of the milk sample. There was no indication of a laboratory problem or cross-contamination.

No detectable iodine-131 was found in any of the special samples. However, this was not surprising since the lower limit of detection for iodine-131 in the feed samples is so much higher than that for iodine-131 in milk and since the period between the collection of the original milk sample and the collection of the special milk sample was large (nearly a month) compared to the half-life of iodine-131.

The conclusions drawn from the investigation were that the iodine-131 result was likely real and not simply a fluctuation in the detector used in the analysis and that the concentrations of iodine-131 in the Plant 2 effluents were not large enough to result in detectable iodine-131 in the milk of cows 6.4 miles away. The results of the special samples taken at Station 40 are presented in Table C-3 of Appendix C.

The routine iodine-131 in milk results are listed in Tables A-11.1 and A-11.2 of Appendix A. A graph of the 1989 iodine in milk results is presented in Figure 4-19. The gamma spectrometry results for the same milk samples are listed in Tables A-12.1 and A-12.2. All results for the indicator and control locations were less then the detection limits.

4.8 Garden Produce

The gamma isotopic analysis results for all root, fruit and leafy vegetables were below detection limits. The results of all produce samples, including the apples collected from Station 91, are listed in Tables A-13.1 through A-15.2 of Appendix A.

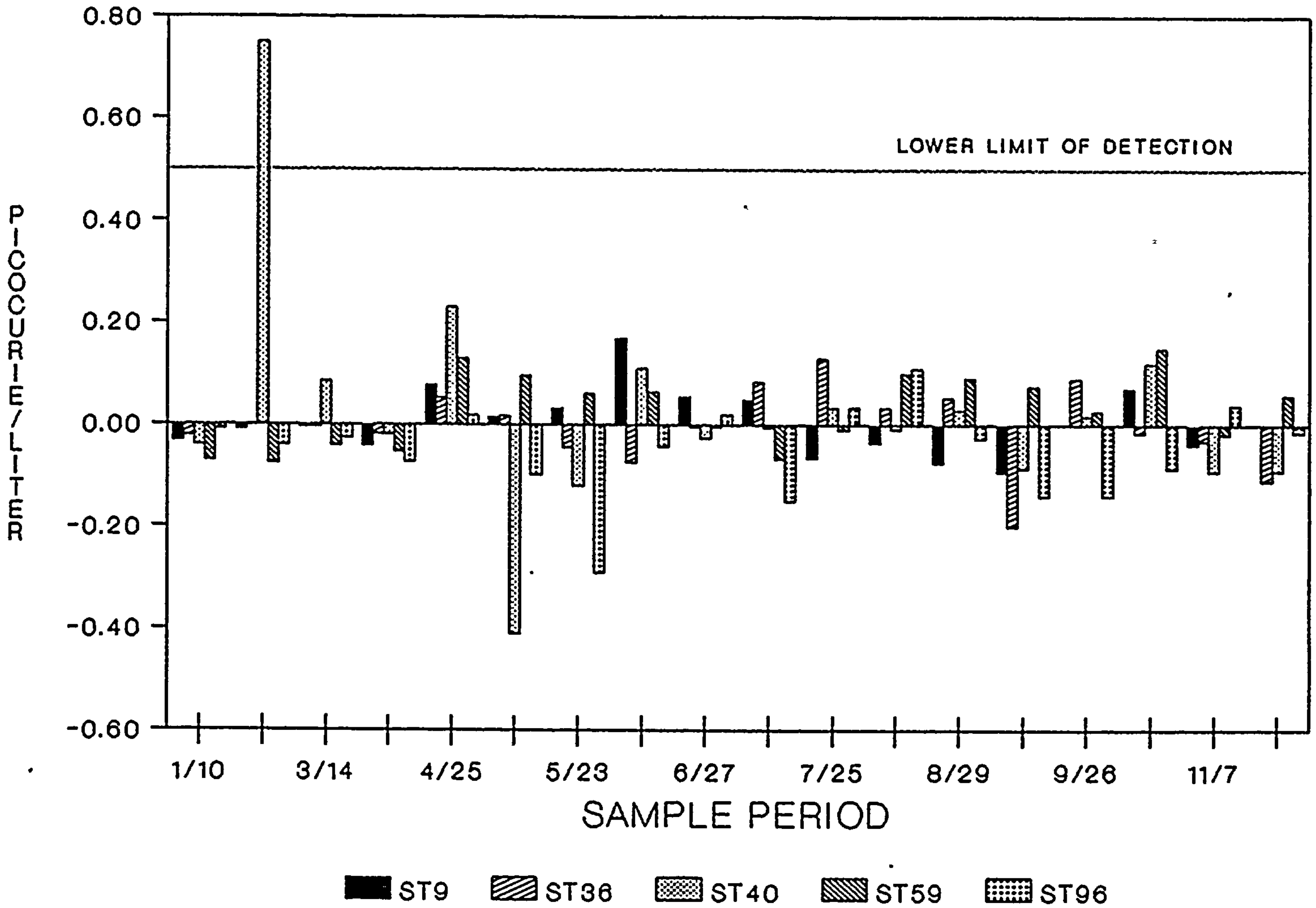


FIGURE 4-19

1989 IODINE-131 IN MILK RESULTS

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

The REMP is designed to meet the quality assurance and quality control criteria of Regulatory Guide 4.15. To accomplish this, the REMP requires that its analytical contractors meet these criteria also. In-depth audits are performed of the REMP records and activities and the records and activities of its support organizations at least annually by the Supply System Corporate Licensing and Assurance group.

Quality assurance and technical audits of the analytical contractor, Teledyne Isotopes, are also conducted annually to verify their compliance to regulatory and contractual requirements. The adequacy of their quality assurance program is also assessed during the audits.

The following sections summarize the quality assurance and quality control aspects of the TLD and analytical components of the REMP.

5.1 Quality Control For the Supply System Environmental TLD Program

The Quality Control Program for the environmental TLD preparation, processing and evaluation is described in Figures 5-1 and 5-2. QA dosimeters, which are annealed just prior to being given a known exposure to 100 mR of cesium-137 gamma radiation and processed among the field dosimeters, serve as indicators that the readout, calibration and evaluation of the field dosimeters were properly performed. The number of QA dosimeters used during each processing is generally 10% of the number of field dosimeters. Since 1987 the same QA dosimeters have been used repeatedly throughout the year in order to track their sensitivity and to provide consistency from run to run.

If the mean QA dosimeter results are greater than ± 5% (or 5 mR) of the given exposure, an investigation into the source of the discrepancy is initiated. Evaluation of the 1989 QA dosimeter results indicated only small biases of 3-5% for the four quarters. However, higher than normal variation was observed among the QA dosimeter results for the

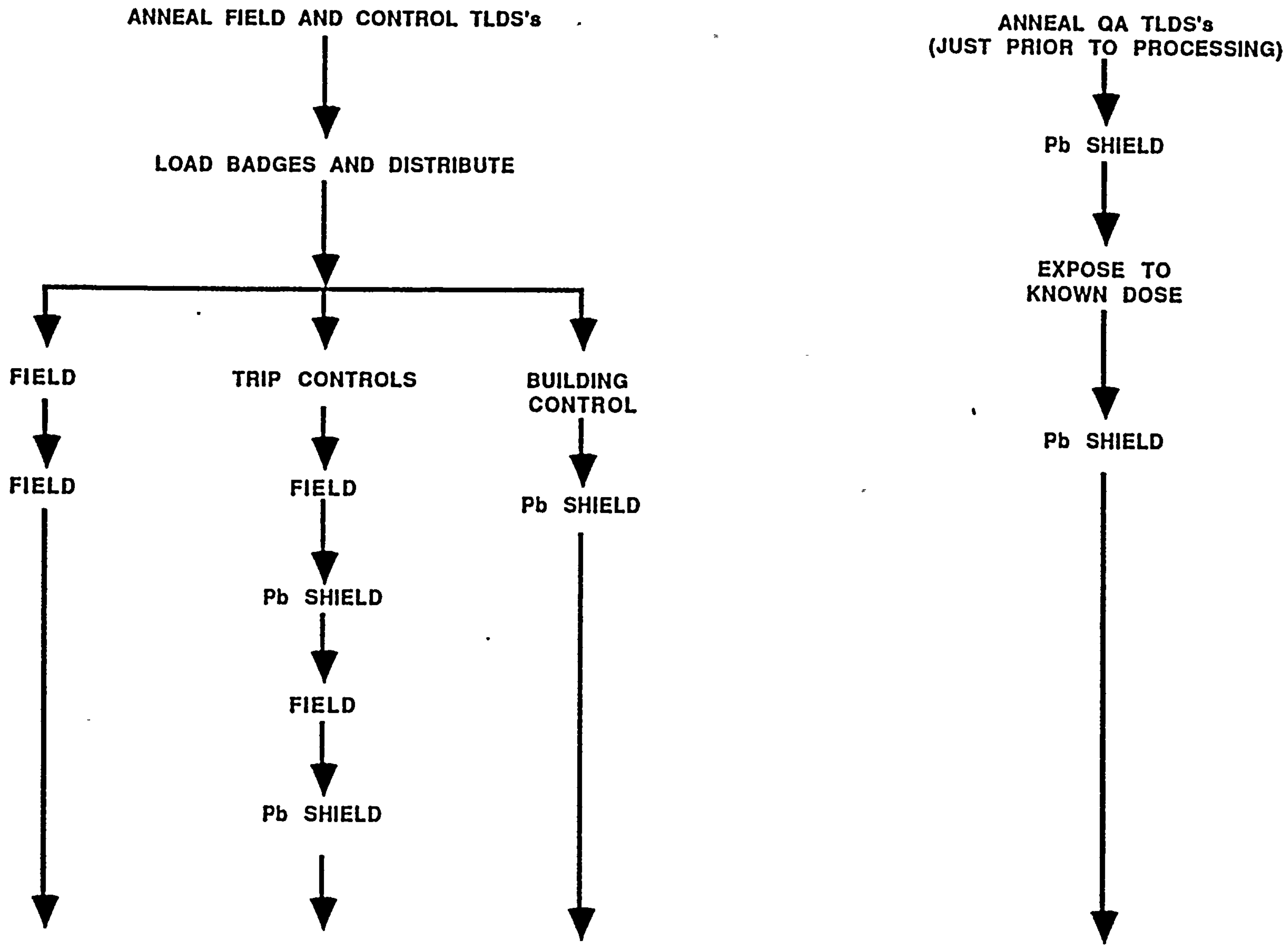


FIGURE 5-1
SUPPLY SYSTEM ENVIRONMENTAL TLD PREPARATION - USE CYCLE

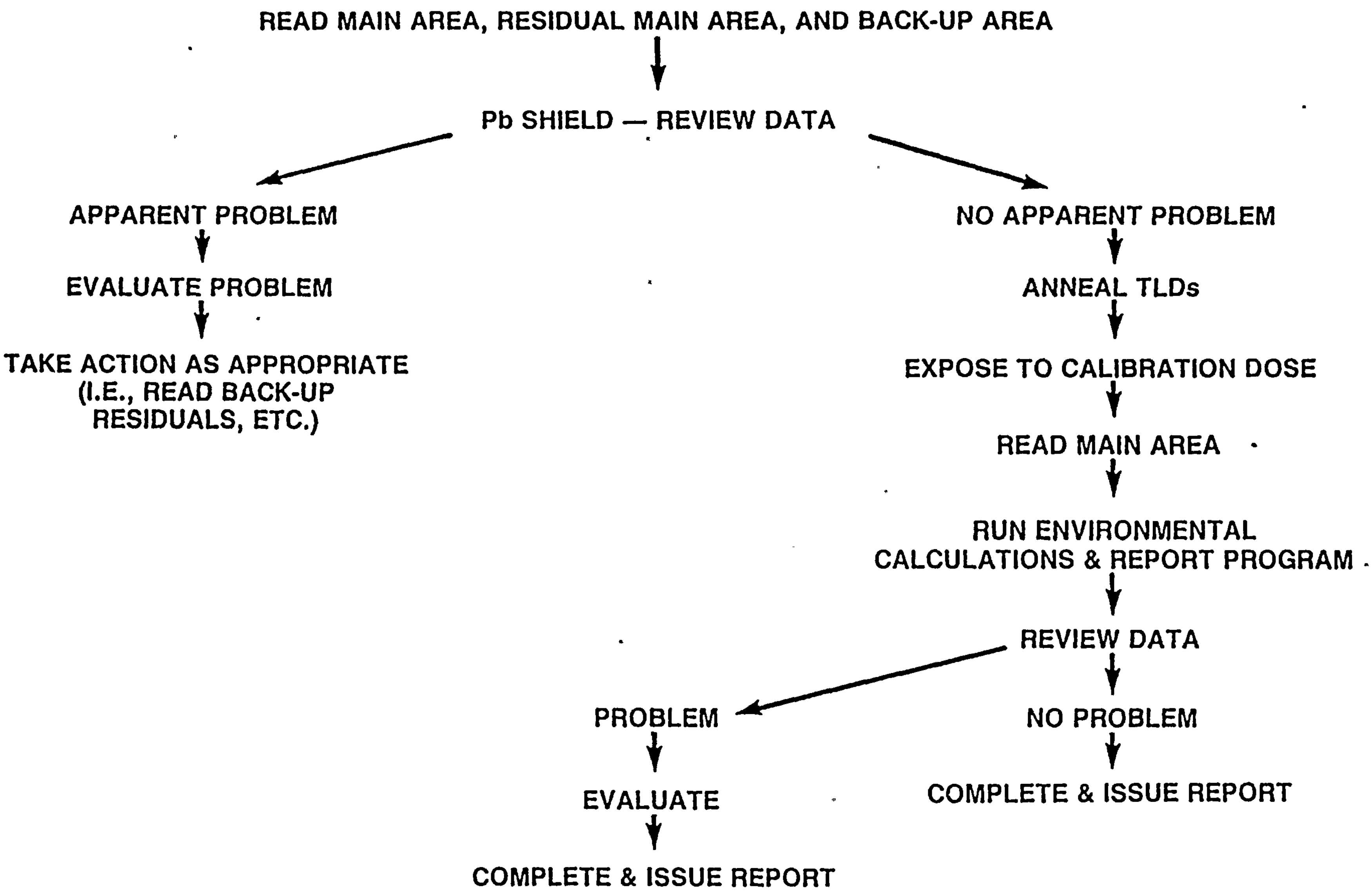


FIGURE 5-2
SUPPLY SYSTEM TLD EVALUATION

fourth quarter. This was apparently due to erratic reader performance during the initial processing run. The effect of the reader fluctuations on the field TLD results was estimated to be a 2.6% high bias.

Control dosimeters (trip controls) are used for each set of field dosimeters to monitor the contribution of the exposure received by the field TLDs while in transit. The radiation background in the storage area is also monitored by a separate set of control dosimeters (building controls). If the trip control results are significantly greater than the building control results, the difference between the two is subtracted from the field dosimeters.

Audit dosimeters, which are exposed to known levels of radiation below the 100 mR given to the QA dosimeters, were processed with the field dosimeters during each run to verify the accuracy of the environmental TLD evaluations. The results of these audit dosimeters processed during 1989 are presented in Table 5-1. The close agreement between the given audit exposures and the reported results provided another indication that the dosimeter evaluations were performed without significant problems.

During each environmental TLD processing, individual calibration factors are determined for each TLD by exposing the TLDs to 100 mR from an encapsulated cesium-137 source. The calibration exposure is determined from the exposure duration and the assessed source strength at 55 centimeters. As a quality control check for each calibration exposure, an NIST-traceable ionization chamber is also used to determine the calibration exposure. If the ionization chamber measurement does not agree with the calculated exposure to within $\pm$ 10% of the calculated value, an investigation is performed into the discrepancy and the TLD calibration is repeated, if necessary.

An additional aspect of the Quality Control Program for the TLDs is participation in intercomparison studies. The Supply System participated in the last International Intercomparison of Environmental

TABLE 5-1

1989 ENVIRONMENTAL AUDIT DOSIMETER RESULTS

TLD DISTRIBUTION	GIVEN EXPOSURE (mR)	REPORTED EXPOSURE (mR)	BIAS (%)
First Quarter	55.0	53.9	-2.0
		55.1	0.2
		54.9	-0.2
Second Quarter	60.0	60.0	0.0
		60.7	1.1
		60.5	0.8
Third Quarter	22.0	21.4	-2.7
		21.4	-2.7
		21.7	-1.4
Fourth Quarter	22.0	22.5	2.3
		23.6	7.3
		22.9	4.1
Annual	22.0	22.2	1.0
		22.0	0.0
		21.0	-4.5

Dosimeters, which was held in 1986 and in a local TLD intercomparison involving other environmental monitoring programs in the region. The Supply System results were reported in a previous annual report.(11)(13) In each comparison, the Supply System environmental TLD performed well. The TLD appears to be quite sensitive to fluctuations in environmental radiation, as evidenced by its over-response to lower energy gamma emitters, such as Ra-226.(13)

5.2 Quality Control For the Analytical Program

Quality control for the analytical program involves two components: the quality control activities performed by the Supply System and the quality control program of the analytical contractor, Teledyne Isotopes. Both of these components are described in the following sections.

5.2.1 Supply System Quality Control Activities

During 1989, several environmental samples were submitted to Teledyne Isotopes for intercomparison with other analytical laboratories. One set of intercomparison samples consisted of ground water, seeps, surface water, and vegetation collected on the Department of Energy Hanford Reservation for the 1989 Hanford/Columbia River Sampling Intercomparison. The samples were split among the States of Washington and Oregon, US DOE, the Hanford Education Action League (HEAL), and the Supply System. The results of this intercomparison, however, were not available by the publication of this report, so they will be reported in the 1990 annual report.

The Supply System has participated in the U.S. Department of Energy Environmental Measurements Laboratory (EML) Quality Assessment Program since 1987. In March 1989, soil, vegetation, water and air particulate filter samples were submitted to Teledyne Isotopes for analysis as a part of this intercomparison program. Another set of intercomparison samples was submitted to Teledyne in September, as well. The reported results, along with the EML expected values, are presented in Table 5-2. The footnotes to this table give additional information on the Supply System results that vary significantly from the EML values. The consistent low bias observed in the air particulate filter results is due to the differences in size between the filter used by EML (7 cm) and the filters routinely analyzed at Teledyne (4.7 cm). Steps are being taken at Teledyne to determine a better method of evaluating the larger filters.

In addition to the intercomparison samples, duplicate milk amd discharge water samples were submitted to Teledyne Isotopes during the year to check the consistency of the analyses. The results of these duplicate samples taken at the same times and in the same locations as the routine samples are presented in Table 5-3. Most of the gamma isotopic results and the iodine-131 results for milk were below detection limits, so comparison is somewhat difficult. Comparison of the potassium-40 results, however, gives an indication of the consistency of the milk data. In the water samples, the gross beta results are easily compared. Considering the uncertainty associated with the results below detection levels, the milk and water duplicate results compare well.

TABLE 5-2
1989 ENVIRONMENTAL MEASUREMENTS LABORATORY (EML)
QUALITY ASSESSMENT PROGRAM RESULTS

Date	Sample Type	Nuclide	Teledyne Reported Result	Percent Error (2σ)	EML Value	Ratio Reported/EML	+/-
8903	Particulate Filter[1] (total pCi)	Be-7	0.156E+04	10	0.195E+04	0.80	0.09
		Mn-54	0.315E+01	46	0.371E+01	0.84	0.41
		Co-60	0.105E+03	10	0.126E+03	0.83	0.10
		Sb-125	0.308E+02	13	0.968E+02	0.32	0.05
		Cs-134	0.110E+03	10	0.158E+03	0.70	0.08
		Cs-137	0.170E+03	10	0.189E+03	0.90	0.10
		Ce-144	0.284E+03	9	0.327E+03	0.87	0.10
8903	Soil (pCi/gr)	K-40	0.225E+02	10	0.241E+02	0.93	0.10
		Cs-137	0.205E+02	10	0.208E+02	0.99	0.11
		Sr-90	0.120E+01	8	0.109E+01	1.10	0.11
8903	Vegetation (pCi/gr)	K-40	0.301E+02	9	0.261E+02	1.15	0.12
		Cs-137	0.188E+01	10	0.160E+01	1.17	0.12
8903	Water (pCi/ml)	H-3	0.560E+01	1	0.631E+01	0.89	0.07
		Mn-54	0.334E+00	9	0.300E+00	1.11	0.13
		Co-57	0.912E+00	9	0.880E+00	1.04	0.12
		Co-60	0.950E+00	10	0.940E+00	1.01	0.11
		Sr-90	0.510E+00	3	0.550E+00	0.93	0.05
		Cs-134	0.242E+01	9	0.273E+01	0.89	0.10
		Cs-137	0.258E+01	10	0.255E+01	1.01	0.12
		Ce-144	0.204E+01	9	0.189E+01	1.08	0.12
8909	Particulate Filter[1] (total pCi)	Be-7	0.215E+04	10	0.332E+04	0.65	0.07
		Mn-54	0.836E+02	10	0.113E+03	0.74	0.08
		Co-60	0.168E+03	10	0.221E+03	0.76	0.08
		Cs-134	0.167E+03	10	0.252E+03	0.66	0.07
		Cs-137	0.799E+02	10	0.963E+02	0.83	0.09
		Ce-144	0.119E+03	14	0.191E+03	0.63	0.10
8909	Soil (pCi/gr)[2]	K-40	0.130E+02	9	0.152E+02	0.86	0.10
		Sr-90	0.870E-01	4	0.154E+00	0.56	0.26
		Cs-137	0.187E+02	9	0.173E+02	1.08	0.11
8909	Vegetation (pCi/gr)	K-40	0.413E+02	9	0.349E+02	1.19	0.13
		Co-60	0.247E+01	10	0.221E+01	1.13	0.11
		Cs-137	0.142E+01	9	0.129E+01	1.19	0.13
8909	Water (pCi/ml)[3]	H-3	0.940E+01	1	0.107E+02	0.88	0.02
		Mn-54	0.181E+01	9	0.181E+01	1.03	0.13
		Co-57	0.402E+01	10	0.365E+01	1.09	0.14
		Co-60	0.447E+01	10	0.419E+01	1.06	0.14
		Sr-90	0.960E+00	5	0.857E+00	1.12	0.06
		Cs-134	0.176E+01	10	0.185E+01	0.95	0.12
		Cs-137	0.195E+01	10	0.185E+01	1.06	0.13
		Ce-144	0.540E+01	1	0.357E+01	1.52	0.13

[1] The EML filter is larger than the standard filter geometry used at Teledyne. This difference is believed to account for the bias observed in the results.

[2] Only a 10 gram aliquot of the sample was analyzed. Strontium analysis of a larger aliquot would have improved the results. Due to the low spike level of the sample, the error associated with the result was 41%.

[3] The wrong result from the gamma analysis printout was reported for Ce-144; the result that should have been reported was 3.69 pCi/ml, which agreed well with the EML value.

TABLE 5-3

COMPARISON OF ANALYTICAL RESULTS

FOR 1989 DUPLICATE MILK AND WATER SAMPLES

Results in pCi/liter

MEDIA	COLLECTION DATE	RADIONUCLIDE	RESULTS	
			STATION 36	STATION 37
Milk	890314	Cs-134	* 2.1 ± 2.3E-00	* 2.4 ± 2.2E+00
		Cs-137	* 0.9 ± 2.5E+00	* 2.6 ± 2.1E+00
		I-131(a)	* -0.4 ± 10.4E-02	* 3.2 ± 11.3E-02
		Ba-140	* -1.5 ± 6.3E+00	* -3.9 ± 5.6E+00
		La-140	* 3.1 ± 26.9E+01	* -4.4 ± 24.5E+01
		K-40	1.3 ± 0.1E+03	1.5 ± 0.2E+03
	890926	Cs-134	* -6.1 ± 24.9E-01	* 1.6 ± 2.6E+00
		Cs-137	* 2.1 ± 2.5E-02	* 1.1 ± 2.5E+00
		I-131(a)	* 9.0 ± 11.7E-02	* 3.6 ± 11.2E-02
		Ba-140	* -5.5 ± 8.0E+00	* 0.0 ± 9.4E+00
		La-140	* 1.0 ± 3.6E+00	* 3.6 ± 4.2E+00
		K-40	1.3 ± 0.1E+03	1.5 ± 0.2E+03
			STATION 27	STATION 72
Water	891108 to 891206	Gr-B	3.3 ± 0.3E+01	3.1 ± 0.3E+01
		Mn-54	* 3.5 ± 3.0E+00	* 1.6 ± 2.1E+00
		Fe-59	* 1.4 ± 6.5E+00	* -0.5 ± 4.6E+00
		Co-60	* 3.5 ± 3.3E+00	* 0.5 ± 2.2E+00
		Co-58	* -1.1 ± 3.0E+00	* -1.1 ± 2.2E+00
		Zn-65	* 4.7 ± 7.1E+00	* -7.3 ± 5.1E+00
		Cs-134	* -0.6 ± 3.1E+00	* 1.8 ± 2.4E+00
		Cs-137	* 3.0 ± 3.1E+00	* 1.4 ± 2.2E+00
		Ba-140	* 3.0 ± 11.4E+00	* 1.9 ± 8.9E+00
		La-140	* -7.0 ± 5.0E+00	* 2.1 ± 4.5E+00
		K-40	* 10.0 ± 0.7E+02	* 1.5 ± 0.3E+02

(a) Resin Method

* Denotes a result less than the detection limit.

5.2.2 Teledyne Isotopes Quality Control Program

The goal of the quality control program at Teledyne Isotopes is to produce analytical results which are accurate, precise and supported by adequate documentation. The program is based on the requirements of 10CFR50, Appendix B, Regulatory Guide 4.15 and the program, as described in Quality Assurance Manual IWL-0032-395 and Quality Control Manual IWL-0032-365.

All measuring equipment is calibrated for efficiency yearly using standard reference material traceable to the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS). For beta counting, check sources are prepared and counted every week day except holidays. Control charts are maintained with three sigma limits specified. Control of the alpha-beta counting equipment is described in procedure PRO-032-27, "Calibration and Control of Alpha and Beta Counters". Backgrounds are usually measured at least once per week.

The efficiency of the gamma spectrometers is calibrated yearly with an NIST traceable standard reference material selected to cover the energy range of the nuclides to be monitored and to include all of the geometries measured. Backgrounds are determined every other week and check sources are counted weekly. The energy resolution and efficiency are plotted at two energy levels (125.1 and 1274.4 Kev) on charts and held within three sigma control limits. This procedure is described in PRO-042-44, "Calibration of Ge(Li) Gamma Ray Spectrometers".

Efficiency calibration factors of the tritium gas counters are determined monthly by counting an NIST standard. This data is plotted on control charts with three sigma limits. A background measurement is performed daily. This control system is described in PRO-052-2 "Determination of Tritium in Water by Gas Counting".

The flow-chart of sample control from the time of receipt to reporting of results is presented in Figure 5-3. Several of the quality control check

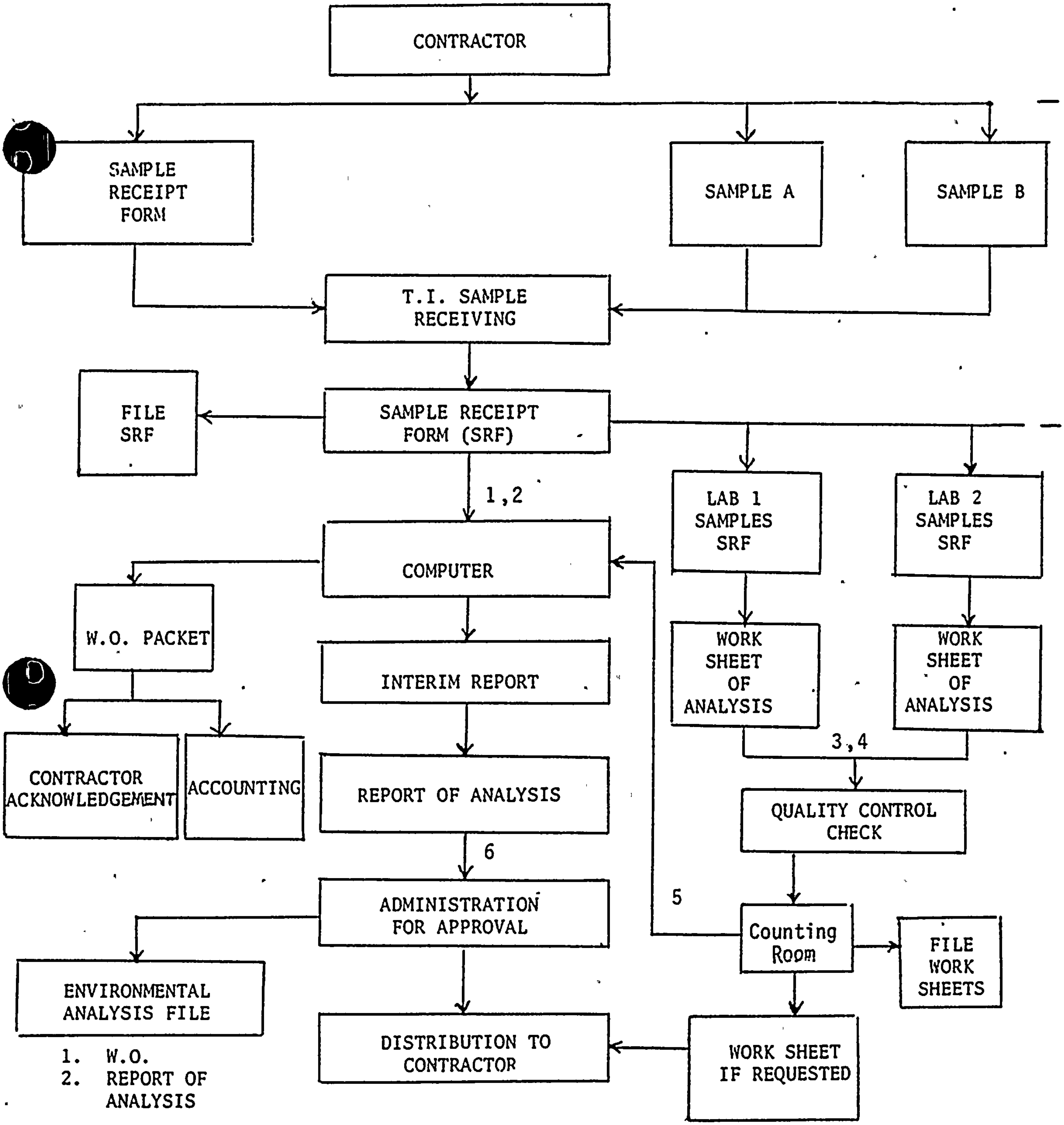


FIGURE 5-3

FLOW CHART FOR TELEDYNE ISOTOPES SAMPLES points are listed below and the corresponding numbers are shown on the flow chart, indicating the hold-points at which results are checked.

1. Check of Sample Receipt Form for completeness and conformance with the program of the customer by supervisor or qualified designate.

2. Preparation of all composites required by customer and designation of analyses by supervisor or qualified designate.

3. Monthly inspection of notebooks of technicians for completeness and any errors in computing yields, etc. by supervisor or qualified designate.

4. Review of all work sheets by the quality assurance manager or a qualified designate.

5. Editing of discs to remove all unapproved data before entry into computer.

6. Inspection of all final reports by quality assurance manager and technical vice president or qualified designates before being signed and mailed to the customer.

Control of sample identity is maintained by the assignment of a unique five-digit number which is maintained throughout the sample's history. The control of sample receipt, log-in number assignment, designation of analysis, assignment of blank sample to a group, etc., is described in procedure PRO-032-48. "Procedure for Receipt of Samples". Also included in this procedure are instructions for storage and prevention of contamination of samples.

Preparation of carrier solutions and acceptability criteria are contained in procedure PRO-032-49, "Standardization of Radiochemical Carrier Solutions". Preparation of efficiency calibration standards and check sources is described in procedure PRO-032-27, "Calibration and Control of Alpha and Beta Counters".

Results and associated parameters, such as decay, background, efficiency, etc. are reviewed by the quality control manager and/or the technical vice president before being entered into the data system. Any results which are suspect, ie which are higher or lower than results in the past, are returned to the laboratory for recount. If a longer count, decay check, recount on another system or recalculation does not give acceptable results based on experience, a new aliquot is analyzed. The complete information about the sample is contained on the work sheets(s).

No deviations from written procedures occurred during 1989. A summary of the quality control blank and spiked sample results of analyses follows. Summaries of the results of blanks and spike samples are presented in Tables 5-4 and 5-5.

I-131 - Milk

A blank milk was analyzed with each group of samples assayed. The results show that there was no contamination in the laboratory or counting area. The measurements of the blank samples (Table 5-4)(a)) indicated that there was no bias on the low background counters. The average activity for eighteen samples was -4.9 ± 1.1E-03 pCi/liter. This was calculated from quality control samples without considering detection limits. A total of fifty-six in-house blank milk samples were processed throughout 1989, averaging <1.E+00 pCi/liter, using the highest detection level.

Sr-90 - Milk and Water

Bi-monthly blank and spike milk and weekly water samples were analyzed for strontium-90. The average activity of the blank water samples, based on the highest detection level, was less than 0.9 pCi/liter. Forty-six spiked water samples were analyzed with an average level of 4.4 ± 0.2E+01 pCi/liter, as compared with a spike level of 4.3 ± 0.7E+01 the limits allowed by the EPA Environmental Laboratory Intercomparison Studies Program. A total of 25 spiked milk samples were spiked to a level of 4.3 ± 0.7E+01 pCi/liter. The average activity was 3.9 ± 0.2 E+01 pCi/liter, which was within the limits as specified by the EPA Intercomparison Studies Program. A total of 25 blank milk samples were analyzed with an average activity of 1.5 ± 0.6E+00 pCi/liter of strontium-90.

Gross Beta - Water

Fifty-four blanks were prepared from distilled water. The resultant average based on the highest detection level measured was less than 1.0 pCi/liter. No contamination was indicated and the background level was low and stable. During 1989 fifty gross beta spike samples were analyzed. The average result was 2.0 ± 0.2E+01 pCi/liter with a spike level of 2.4 ± 0.5E+01 pCi/liter. This was well within the guidelines outlined in Table 2 of the EPA-600/4-81-004, "Environmental Radioactivity Laboratory Intercomparison Studies Program".

Tritium in Water

Fifty blank samples were analyzed by gas counting. The average result was less than 200 pCi/liter. The resultant average is based on the highest detection level measured. A total of 52 spike tritium samples were analyzed. The average result was 2.7 ± 0.2 E+03 pCi/liter, compared with a spike level of 2.6 ± 0.4 E+03 pCi/liter.

Gamma Spectroscopy

A blank water sample was analyzed on a weekly basis in the gamma spectroscopy laboratory. All nuclides were less than the normal level of detection, indicating no contamination. Spike samples were measured weekly using the Eu-154 peak at 1274.5 KeV. The average activity of 52 measurements was 1.5 ± 0.2E+05 pCi/liter, compared with a spike level of 1.5 ± 0.2E+05 pCi/liter.

Tables summarizing the results of internal blanks and spike samples are presented in Tables 5-4 and 5-5. A summary of the EPA cross-check samples is presented in Table B-1 of Appendix B. Any result above the ± three sigma normalized deviation from the known is explained, giving the reason for the deviation and the corrective action to be taken.

Iodine-131 Cartridges

One blank charcoal cartridge was analyzed with each set of cartridges, for a total of fifty-two blanks. The average result was -2.3 ± 43.1E-01 pCi per cartridge. This was calculated from the results of quality control samples without considering detection limits.

Gross Beta - Filters

One blank filter was measured with each set of filters. Fifty-one blanks were counted. The resultant average activity in total pCi was 1.08 ± 0.56, which indicated a relatively stable background for the filter, including the background of the gross beta proportional counters.

TABLE 5-4

SUMMARY OF 1989 QUALITY CONTROL DATA: BLANKS

NUCLIDE	MEDIUM	BLANKS NUMBER	AVERAGE BLANK	UNITS
I-131	Milk	18	(a) -4.9 ± 1.1E-03	pCi/l
		56	(d) < 1. E+00	pCi/l
Sr-90	Milk	25	(d) 1.5 ± 0.6 E+00	pCi/l
Sr-90	Water	46	(d) < 9. E-01	pCi/l
H-3 (Gas Counting)	Water	50	(d) < 2. E+02	pCi/l
Gross Beta	Water	54	(d) < 1. E+00	pCi/l
Gamma	Water	52	*	pCi/l
Gross Beta	AP Filter	51	(c)(d)1.08 ±0.56 E+00	Total pCi
I-131	Charcoal	52	(a) -2.3 ± 43.1E-01	Total pCi

* All nuclides less than minimum detection level.

(a) This average is calculated from the Supply System quality control samples without considering detection limits.

(b) The in-house weekly quality control blanks for AP filters and charcoals are calculated in total pCi.

(c) This average includes only the blank AP filters analyzed for the Supply System. A blank planchet (counter background) and a blank filter are counted with each set of filters analyzed (approximately 10 sets per week.

(d) The highest detection level was used as the average of these samples.

TABLE 5-5

SUMMARY OF 1989 QUALITY CONTROL DATA: SPIKES

NUCLIDE	MEDIUM	SPIKED SAMPLES NUMBER	AVERAGE RESULT	SPIKE LEVEL UNITS-pCi/l
Gross Beta	Water	50	2.0 ± 0.2E+01	2.2 ± 0.5E+01
H-3 (Gas Counting)	Water	52	2.7 ± 0.2E+03	2.6 ± 0.4E+03
Sr-90	Water	46	4.4 ± 0.2E+01	4.3 ± 0.7E+01
Sr-90	Milk	25	3.9 ± 0.2E+01	4.3 ± 0.7E+01
Eu-154	Water	52	1.5 ± 0.2E+05	1.5 ± 0.2E+05

6.0 REFERENCES

1. U.S. Nuclear Regulatory Commission, "Programs For Monitoring Radioactivity in the Environs of Nuclear Power Plants", Regulatory Guide 4.1, Revision 1, April 1975.

2. U.S. Nuclear Regulatory Commission, "Environmental Technical Specifications For Nuclear Power Plants", Regulatory Guide 4.8, December 1975.

3. U.S. Nuclear Regulatory Commission, "An Acceptable Radiological Environmental Monitoring Program", Assessment Branch Technical Position; Revision 1, November 1979.

4. U.S. Nuclear Regulatory Commission, "Quality Assurance For Radiological Environmental Monitoring Program (Normal Operations), Effluent Streams and the Environment", Regulatory Guide 4.15, Revision 1, February 1979.

5. U.S. Nuclear Regulatory Commission, "Performance, Testing and Procedure Specifications For Thermoluminescence Dosimetry-Environmental Applications", Regulatory Guide 4.13, Revision 1, July 1977.

6. Code of Federal Regulations, Title 10 Part 20, Standards For Protection Against Radiation.

7. Code of Federal Regulations, Title 10 Part 50, Domestic Licensing of Production and Utilization Facilities.

8. Washington Public Power Supply System Nuclear Plant No. 2, Operating License NSF-21, Technical Specifications 3/4.12.1, Table 3.13.1.

9. Site Certification Agreement Between the State of Washington and the Washington Public Power Supply System May 17, 1972 (with revision dated January, 1978).

10. "Teledyne Isotopes TLD System For Personnel and Environmental Monitoring," Teledyne Isotopes, Westwood, New Jersey; February 2, 1981.

11. Washington Public Power Supply System, Radiological Environmental Monitoring Program Annual Report Plant 2, 1986, April 1987.

12. Washington Public Power Supply System, Radiological Environmental Monitoring Program Annual Report Plant 2, 1987, April 1988.

13. Washington Public Power Supply System, Radiological Environmental Monitoring Program Annual Report Plant 2, 1988, April 1989.

14. Washington State Department of Social and Health Services, Rules and Regulations of the State Board of Health Regarding Public Drinking Water Systems, Chapter 248-54, August 1983.

15. Robertson, D. E., and J. J. Fix, Association of Hanford Origin Radionuclides With Columbia River Sediment, BNWL-2305, August 1977.

APPENDIX A: ROUTINE RESULTS

TABLE A-1.1

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
1	881229 to 890330	0.26	0.01
	890330 to 890629	0.24	0.02
	890629 to 890928	0.25	0.01
	890928 to 891228	0.26	0.00
2	881229 to 890330	0.25	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.26	0.01
3	881229 to 890330	0.24	0.00
	890330 to 890629	0.24	0.00
	890629 to 890928	0.23	0.01
	890928 to 891228	0.26	0.01
4	881229 to 890330	0.24	0.01
	890330 to 890629	0.23	0.01
	890629 to 890928	0.22	0.01
	890928 to 891228	0.25	0.01
5	881230 to 890331	0.25	0.01
	890331 to 890630	0.23	0.00
	890630 to 890928	0.23	0.00
	890928 to 891228	0.24	0.00
6	881229 to 890330	0.25	0.01
	890330 to 890629	0.23	0.01
	890629 to 890928	0.22	0.01
	890928 to 891228	0.26	0.02
7	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
8	881230 to 890331	0.28	0.01
	890331 to 890630	0.27	0.01
	890630 to 890929	0.27	0.01
	890929 to 891228	0.28	0.01

TABLE A-1.1 (Cont.)

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
9A	881230 to 890331	0.24	0.01
	890331 to 890630	0.23	0.01
	890630 to 890929	0.22	0.02
	890929 to 891228	0.24	0.01
10	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.00
	890629 to 890928	0.23	0.01
	890928 to 891228	0.25	0.00
11	881229 to 890330	0.25	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
12	881229 to 890330	0.27	0.01
	890330 to 890629	0.30	0.09
	890629 to 890928	0.26	0.00
	890929 to 891228	0.27	0.01
13	881229 to 890330	0.25	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.00
	890928 to 891228	0.25	0.00
14	881229 to 890330	0.26	0.01
	890330 to 890629	0.24	0.02
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
15	881229 to 890330	0.27	0.01
	890330 to 890629	0.26	0.01
	890629 to 890928	0.26	0.01
	890928 to 891228	0.27	0.01
16	881229 to 890330	0.26	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.27	0.01

TABLE A-1.1 (Cont.)

<u>1989 QUARTERLY TLD RESULTS</u>

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
17	881229 to 890330	0.26	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.25	0.01
	890928 to 891228	0.26	0.01
18	881228 to 890330	0.26	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.25	0.01
	890928 to 891228	0.26	0.01
19	881229 to 890330	0.23	0.01
	890330 to 890629	0.26	0.02
	890629 to 890928	0.24	0.01
	890928 to 891228	0.26	0.01
20	881229 to 890330	0.26	0.00
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.26	0.01
21	881229 to 890330	0.24	0.01
	890330 to 890629	0.22	0.00
	890629 to 890928	0.22	0.01
	890928 to 891228	0.23	0.01
22	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.00
	890928 to 891228	0.25	0.01
23	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.00
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
24	881229 to 890330	0.25	0.00
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.26	0.00

TABLE A-1.1 (Cont.)

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
25	881229 to 890330	0.27	0.00
	890330 to 890629	0.26	0.01
	890629 to 890928	0.26	0.01
	890928 to 891228	0.27	0.01
40	881230 to 890331	0.24	0.01
	890331 to 890630	0.24	0.01
	890630 to 890929	0.24	0.01
	890929 to 891228	0.24	0.01
41	881230 to 890331	0.27	0.01
	890331 to 890630	0.27	0.01
	890630 to 890929	0.26	0.01
	890929 to 891228	0.27	0.01
42	881230 to 890331	0.26	0.00
	890331 to 890630	0.25	0.01
	890630 to 890929	(a)	
	890929 to 891228	0.26	0.01
43	881230 to 890331	0.27	0.01
	890331 to 890630	0.26	0.01
	890630 to 890929	0.26	0.01
	890929 to 891228	0.27	0.01
44	881230 to 890331	0.25	0.01
	890331 to 890630	0.24	0.01
	890630 to 890929	0.23	0.01
	890929 to 891228	0.25	0.01
45	881230 to 890331	0.26	0.01
	890331 to 890630	0.25	0.00
	890630 to 890929	0.25	0.01
	890929 to 891228	0.25	0.02
46	881230 to 890331	0.30	0.00
	890331 to 890630	0.31	0.03
	890630 to 890929	0.30	0.00
	890929 to 891228	0.31	0.01

(a) TLD missing in field.

TABLE A-1.1 (Cont.)

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
47	881229 to 890330	0.25	0.01
	890330 to 890629	0.23	0.01
	890629 to 890928	0.23	0.01
	890928 to 891228	0.24	0.01
49	881229 to 890330	0.26	0.00
	890330 to 890629	0.24	0.00
	890629 to 890928	0.24	0.00
	890928 to 891228	0.25	0.01
50	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.00
	890928 to 891228	0.25	0.01
51	881229 to 890330	0.25	0.01
	890330 to 890629	0.23	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
53	881230 to 890331	0.28	0.01
	890331 to 890630	0.27	0.02
	890630 to 890929	0.28	0.01
	890929 to 891228	0.28	0.01
54	881230 to 890331	0.27	0.01
	890331 to 890630	0.26	0.02
	890630 to 890929	0.25	0.01
	890929 to 891228	0.27	0.01
55	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.00
	890629 to 890928	0.23	0.01
	890928 to 891228	0.25	0.01
56	881229 to 890330	0.26	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.00
	890928 to 891228	0.26	0.01

TABLE A-1.1 (Cont.)

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
61	890629 to 890928 (a)	0.27	0.01
	890928 to 891228	0.28	0.01
71	881229 to 890330	0.28	0.03
	890330 to 890629	0.25	0.00
	890629 to 890928	0.28	0.01
	890928 to 891228	0.32	0.05
72	881229 to 890330	0.28	0.01
	890330 to 890629	0.26	0.01
	890629 to 890928	0.27	0.01
	890928 to 891228	0.30	0.02
73	881229 to 890330	0.25	0.01
	890330 to 890629	0.23	0.01
	890629 to 890928	0.24	0.00
	890928 to 891228	0.25	0.01
74	881229 to 890330	0.27	0.01
	890330 to 890629	0.26	0.01
	890629 to 890928	0.27	0.02
	890928 to 891228	0.28	0.00
75	881229 to 890330	0.27	0.01
	890330 to 890629	0.24	0.01
	890629 to 890928	0.25	0.01
	890928 to 891228	0.27	0.00
76	881229 to 890330	0.26	0.00
	890330 to 890629	0.23	0.04
	890629 to 890928	0.25	0.01
	890928 to 891228	0.27	0.01
77	881229 to 890330	0.26	0.00
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.26	0.01
78	881229 to 890330	0.25	0.00
	890330 to 890629	0.24	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.00

(a) New station added to program during third quarter.

TABLE A-1.1 (Cont.)

1989 QUARTERLY TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
79	881229 to 890330	0.25	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
80	881229 to 890330	0.25	0.01
	890330 to 890629	0.25	0.02
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
81	881229 to 890330	0.25	0.01
	890330 to 890629	0.24	0.00
	890629 to 890928	0.24	0.01
	890928 to 891228	0.25	0.01
82	881229 to 890330	0.27	0.00
	890330 to 890629	0.26	0.01
	890629 to 890928	0.25	0.01
	890928 to 891228	0.26	0.00
83	881229 to 890330	0.27	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.25	0.01
	890928 to 891228	0.27	0.01
84	881229 to 890330	0.26	0.00
	890330 to 890629	0.25	0.01
	890629 to 890928	0.25	0.00
	890928 to 891228	0.27	0.03
85	881229 to 890330	0.27	0.01
	890330 to 890629	0.25	0.01
	890629 to 890928	0.26	0.01
	890928 to 891228	0.28	0.01
86	881229 to 890330	0.29	0.01
	890330 to 890629	0.26	0.01
	890629 to 890928	0.28	0.01
	890928 to 891228	0.31	0.02

TABLE A-1.2

1989 ANNUAL TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
1	881229 to 891228	0.24	0.01
2	881229 TO 891228	0.24	0.01
3	881229 TO 891228	0.23	0.01
4	881229 to 891228	0.22	0.01
5	881229 to 891228	0.22	0.01
6	881229 to 891228	0.22	0.00
7	881229 to 891228	0.23	0.01
8	881229 to 891228	0.26	0.01
9A	881229 to 891228	0.22	0.01
10	881229 to 891228	0.23	0.01
11	881229 to 891228	0.24	0.01
12	881229 to 891228	0.25	0.01
13	881229 to 891228	0.23	0.01
14	881229 to 891228	0.23	0.01
15	881229 to 891228	0.26	0.01
16	881229 to 891228	0.25	0.01
17	881229 to 891228	0.24	0.01
18	881229 to 891228	0.24	0.00
19	881229 to 891228	0.24	0.01
20	881229 to 891228	0.24	0.01
21	881229 to 891228	0.22	0.01
22	881229 to 891228	0.24	0.00
23	881229 to 891228	0.24	0.01
24	881229 to 891228	0.24	0.01
25	881229 to 891228	0.26	0.01
40	881229 to 891228	0.23	0.00
41	881229 to 891228	0.25	0.00
42	881229 to 891228	0.24	0.00
43	881229 to 891228	0.26	0.01

TABLE A-1.2 (Cont.)

1989 ANNUAL TLD RESULTS

Results in mR/day

LOCATION	COLLECTION PERIOD	RESULT	UNCERTAINTY 2σ
44	881229 to 891228	0.23	0.01
45	881229 to 891228	0.24	0.00
46	881229 to 891228	0.29	0.01
47	881229 to 891228	0.23	0.01
49	881229 to 891228	0.22	0.01
50	881229 to 891228	0.24	0.01
51	881229 to 891228	0.23	0.01
53	881229 to 891228	0.27	0.01
54	881229 to 891228	0.25	0.00
55	881229 to 891228	0.23	0.00
56	881229 to 891228	0.24	0.00
61	881229 to 891228 (a)	0.27	0.01
71	881229 to 891228	0.27	0.01
72	881229 to 891228	0.27	0.01
73	881229 to 891228	0.23	0.01
74	881229 to 891228	0.26	0.02
75	881229 to 891228	0.25	0.00
76	881229 to 891228	0.24	0.01
77	881229 to 891228	0.24	0.00
78	881229 to 891228	0.24	0.01
79	881229 to 891228	0.24	0.01
80	881229 to 891228	0.24	0.01
81	881229 to 891228	0.24	0.01
82	881229 to 891228	0.25	0.01
83	881229 to 891228	0.25	0.02
84	881229 to 891228	0.25	0.01
85	881229 to 891228	0.26	0.01
86	881229 to 891228	0.28	0.01

(a) New station added to the program during third quarter.

TABLE A-1.3

1989 TLD RESULTS - SUMMARY

Results in mR/day

MEDIA		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
			QUARTERLY TLD RESULTS			
TLD	(I)	0.25	0.22	0.32	221	221
TLD	(C)	0.23	0.22	0.24	4	4
			ANNUAL TLD RESULTS			
TLD	(I)	0.24	0.22	0.29	56	56
TLD	(C)	0.22	0.22	0.22	1	1

(I) Indicator Stations
(C) Control Station

TABLE A-2.1

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
1	881227 to 890103	3.1 E-02	3.0 E-03
	890103 to 890109	9.8 E-03	2.5 E-03
	890109 to 890116	9.4 E-03	1.9 E-03
	890116 to 890123	8.9 E-03	2.0 E-03
	890123 to 890130	2.7 E-02	3.0 E-03
	890130 to 890206	1.9 E-02	3.0 E-03
	890206 to 890213	8.2 E-02	4.0 E-03
	890213 to 890221	2.5 E-02	3.0 E-03
	890221 to 890227	1.1 E-02	2.0 E-03
	890227 to 890306	1.8 E-02	2.0 E-03
	890306 to 890313	6.8 E-03	1.9 E-03
	890313 to 890320	1.2 E-02	2.0 E-03
	890320 to 890327	5.7 E-03	1.9 E-03
	890327 to 890403	4.7 E-03	2.0 E-03
	890403 to 890410	9.2 E-03	2.1 E-03
	890410 to 890417	2.5 E-02	3.0 E-03
	890417 to 890424	1.2 E-02	2.0 E-03
	890424 to 890501	1.0 E-02	2.0 E-03
	890501 to 890508	1.7 E-02	3.0 E-03
	890508 to 890515	1.1 E-02	2.0 E-03
	890515 to 890522	1.4 E-02	2.0 E-03
	890522 to 890530	7.1 E-03	1.7 E-03
	890530 to 890605	1.3 E-02	3.0 E-03
	890605 to 890612	1.7 E-02	2.0 E-03
	890612 to 890619	8.2 E-03	2.2 E-03
	890619 to 890626	1.1 E-02	2.0 E-03
	890626 to 890703	1.2 E-02	2.0 E-03
	890703 to 890710	1.1 E-02	2.0 E-03
	890710 to 890717	1.5 E-02	2.0 E-03
	890717 to 890724	1.1 E-02	2.0 E-03
	890724 to 890731	1.8 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.4 E-02	2.0 E-03
	890814 to 890821	1.5 E-02	2.0 E-03
	890821 to 890828	8.7 E-03	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
1	890828 to 890905	1.5 E-02	2.0 E-03
	890905 to 890911	2.2 E-02	3.0 E-03
	890911 to 890918	2.1 E-02	3.0 E-03
	890918 to 890925	2.3 E-02	3.0 E-03
	890925 to 891002	2.2 E-02	3.0 E-03
	891002 to 891009	2.6 E-02	3.0 E-03
	891009 to 891016	1.2 E-02	2.0 E-03
	891016 to 891023	3.3 E-02	3.0 E-03
	891023 to 891030	6.0 E-03	2.1 E-03
	891030 to 891106	2.8 E-02	3.0 E-03
	891106 to 891113	4.5 E-03	2.1 E-03
	891113 to 891120	1.8 E-02	3.0 E-03
	891120 to 891127	1.6 E-02	2.0 E-03
	891127 to 891204	3.6 E-02	3.0 E-03
	891204 to 891211	2.0 E-02	3.0 E-03
	891211 to 891218	2.1 E-02	3.0 E-03
	891218 to 891227	3.5 E-02	3.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
4	881227 to 890103	2.0 E-02	3.0 E-03
	890103 to 890109	1.1 E-02	3.0 E-03
	890109 to 890116	6.2 E-03	1.7 E-03
	890116 to 890123	1.3 E-02	2.0 E-03
	890123 to 890130	2.7 E-02	3.0 E-03
	890130 to 890206	1.9 E-02	2.0 E-03
	890206 to 890213	6.7 E-02	4.0 E-03
	890213 to 890221	2.4 E-02	2.0 E-03
	890221 to 890227	1.3 E-02	2.0 E-03
	890227 to 890306	2.1 E-02	3.0 E-03
	890306 to 890313	5.2 E-03	1.8 E-03
	890313 to 890320	9.7 E-03	2.1 E-03
	890320 to 890327	8.2 E-03	2.0 E-03
	890327 to 890403	3.9 E-03	1.9 E-03
	890403 to 890410	1.0 E-02	2.0 E-03
	890410 to 890417	2.4 E-02	3.0 E-03
	890417 to 890424	1.2 E-02	2.0 E-03
	890424 to 890501	9.3 E-03	2.2 E-03
	890501 to 890508	1.5 E-02	2.0 E-03
	890508 to 890515	1.1 E-02	2.0 E-03
	890515 to 890522	1.1 E-02	2.0 E-03
	890522 to 890530	4.4 E-03	1.6 E-03
	890530 to 890605	1.2 E-02	3.0 E-03
	890605 to 890612	1.5 E-02	2.0 E-03
	890612 to 890619	1.2 E-02 (a)	6.0 E-03
	890619 to 890626	* 9.5 E-04 (a)	7.4 E-03
	890626 to 890703	9.1 E-03	2.0 E-03
	890703 to 890710	1.1 E-02	2.0 E-03
	890710 to 890717	1.5 E-02	2.0 E-03
	890717 to 890724	1.4 E-02 (b)	2.0 E-03
	890724 to 890731	1.4 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.6 E-02	3.0 E-03
	890814 to 890821	1.2 E-02	2.0 E-03
	890821 to 890828	1.1 E-02	2.0 E-03

(a) Blown fuse, shortened sampling time.
(b) Pumphead indicated out of calibration; actual measurements found in tolerance; no effect on results.
* Denotes a result less than the detection limit.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
4	890828 to 890905	1.8 E-02	2.0 E-03
	890905 to 890911	1.8 E-02	3.0 E-03
	890911 to 890918	2.6 E-02	3.0 E-03
	890918 to 890925	2.7 E-02	3.0 E-03
	890925 to 891002	3.7 E-02	3.0 E-03
	891002 to 891009	2.4 E-02	3.0 E-03
	891009 to 891016	8.2 E-03	2.2 E-03
	891016 to 891023	3.4 E-02	3.0 E-03
	891023 to 891030	8.6 E-03	2.5 E-03
	891030 to 891106	2.3 E-02	3.0 E-03
	891106 to 891113	5.9 E-03	2.2 E-03
	891113 to 891120	1.9 E-02	3.0 E-03
	891120 to 891127	1.1 E-02	2.0 E-03
	891127 to 891204	2.7 E-02	3.0 E-03
	891204 to 891211	1.6 E-02	2.0 E-03
	891211 to 891218	2.1 E-02	3.0 E-03
	891218 to 891227	2.7 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
5	881227 to 890103	2.1 E-02	3.0 E-03
	890103 to 890109	9.1 E-03	2.5 E-03
	890109 to 890116	5.7 E-03	1.7 E-03
	890116 to 890123	9.8 E-03	2.1 E-03
	890123 to 890130	2.3 E-02	3.0 E-03
	890130 to 890206	6.0 E-03	1.7 E-03
	890206 to 890213	6.0 E-02	4.0 E-03
	890213 to 890221	1.8 E-02	2.0 E-03
	890221 to 890227	7.6 E-03	2.1 E-03
	890227 to 890306	1.9 E-02	2.0 E-03
	890306 to 890313	5.9 E-03	1.8 E-03
	890313 to 890320	5.6 E-03	1.9 E-03
	890320 to 890327	6.6 E-03	1.9 E-03
	890327 to 890403	3.9 E-03	1.9 E-03
	890403 to 890410	1.1 E-02	2.0 E-03
	890410 to 890417	2.3 E-02	3.0 E-03
	890417 to 890424	1.2 E-02	2.0 E-03
	890424 to 890501	1.2 E-02	2.0 E-03
	890501 to 890508	1.5 E-02	2.0 E-03
	890508 to 890515	1.1 E-02	2.0 E-03
	890515 to 890522	6.9 E-03	1.8 E-03
	890522 to 890530	5.1 E-03	1.6 E-03
	890530 to 890605	1.1 E-02	3.0 E-03
	890605 to 890612	1.4 E-02	2.0 E-03
	890612 to 890619	1.1 E-02	2.0 E-03
	890619 to 890626	7.7 E-03	2.1 E-03
	890626 to 890703	1.1 E-02	2.0 E-03
	890703 to 890710	9.5 E-03 (a)	6.3 E-03
	890710 to 890717	* 1.5 E-02 (a)	1.0 E-02
	890718 to 890724	1.2 E-02	2.0 E-03
	890724 to 890731	1.5 E-02	2.0 E-03
	890731 to 890807	1.1 E-02	2.0 E-03
	890807 to 890814	1.5 E-02	3.0 E-03
	890814 to 890821	1.5 E-02	2.0 E-03
	890821 to 890828	8.5 E-03	2.0 E-03

(a) Blown fuse; result not included in average.
 * Denotes a result less than the detection limit.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
5	890828 to 890905	1.6 E-02	2.0 E-03
	890905 to 890911	1.8 E-02	3.0 E-03
	890911 to 890918	2.1 E-02	3.0 E-03
	890918 to 890925	2.3 E-02	3.0 E-03
	890925 to 891002	2.0 E-02	3.0 E-03
	891002 to 891009	2.2 E-02	3.0 E-03
	891009 to 891016	1.3 E-02	2.0 E-03
	891016 to 891023	3.4 E-02	3.0 E-03
	891023 to 891030	6.9 E-03	2.1 E-03
	891030 to 891106	2.5 E-02	3.0 E-03
	891106 to 891113	6.7 E-03	2.2 E-03
	891112 to 891120	2.0 E-02	3.0 E-03
	891120 to 891127	1.4 E-02	2.0 E-03
	891127 to 891204	3.1 E-02	3.0 E-03
	891204 to 891211	1.4 E-02	3.0 E-03
	891211 to 891218	1.7 E-02	2.0 E-03
	891218 to 891227	2.4 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
6	881227 to 890103	2.2 E-02	3.0 E-03
	890103 to 890109	7.3 E-03	2.4 E-03
	890109 to 890116	5.8 E-03	1.7 E-03
	890116 to 890123	9.7 E-03	2.1 E-03
	890123 to 890130	1.9 E-02	3.0 E-03
	890130 to 890206	1.6 E-02	2.0 E-03
	890206 to 890213	5.1 E-02	4.0 E-03
	890213 to 890221	1.5 E-02	2.0 E-03
	890221 to 890227	6.8 E-03	2.0 E-03
	890227 to 890306	1.4 E-02	2.0 E-03
	890306 to 890313	6.0 E-03	1.8 E-03
	890313 to 890320	8.7 E-03	2.1 E-03
	890320 to 890327	6.4 E-03	1.9 E-03
	890327 to 890403	4.4 E-03	1.9 E-03
	890403 to 890410	9.7 E-03	2.1 E-03
	890410 to 890417	2.6 E-02	3.0 E-03
	890417 to 890424	1.3 E-02	2.0 E-03
	890424 to 890501	9.4 E-03	2.2 E-03
	890501 to 890508	2.0 E-02	3.0 E-03
	890508 to 890515	1.0 E-02	2.0 E-03
	890515 to 890522	1.4 E-02	2.0 E-03
	890522 to 890530	7.2 E-03	1.7 E-03
	890530 to 890605	1.2 E-02	3.0 E-03
	890605 to 890612	1.5 E-02	2.0 E-03
	890612 to 890619	1.1 E-02	2.0 E-03
	890619 to 890626	1.3 E-02	2.0 E-03
	890626 to 890703	9.6 E-03	2.0 E-03
	890703 to 890710	1.0 E-02	2.0 E-03
	890710 to 890717	1.5 E-02	2.0 E-03
	890717 to 890724	1.2 E-02	2.0 E-03
	890724 to 890731	1.6 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.5 E-02	2.0 E-03
	890814 to 890821	1.2 E-02	2.0 E-03
	890821 to 890828	(a)	

(a) Sampler out of service; no sample submitted.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
6	890828 to 890905	1.5 E-02	2.0 E-03
	890905 to 890911	1.7 E-02	3.0 E-03
	890911 to 890918	2.8 E-02	3.0 E-03
	890918 to 890925	2.5 E-02	3.0 E-03
	890925 to 891002	2.1 E-02	3.0 E-03
	891002 to 891009	2.3 E-02	3.0 E-03
	891009 to 891016	1.4 E-02	2.0 E-03
	891016 to 891023	2.9 E-02	3.0 E-03
	891023 to 891030	9.0 E-03	2.2 E-03
	891030 to 891106	2.2 E-02	3.0 E-03
	891106 to 891113	4.2 E-03	2.1 E-03
	891113 to 891120	1.9 E-02	3.0 E-03
	891120 to 891127	1.1 E-02	2.0 E-03
	891127 to 891204	2.6 E-02	3.0 E-03
	891204 to 891211	2.0 E-02	3.0 E-03
	891211 to 891218	2.0 E-02	3.0 E-03
	891218 to 891227	3.3 E-02	3.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
7	881227 to 890103	2.5 E-02	3.0 E-03
	890103 to 890109	1.2 E-02	3.0 E-03
	890109 to 890116	1.1 E-02	2.0 E-03
	890116 to 890123	1.3 E-03	2.0 E-04
	890123 to 890130	3.3 E-02	3.0 E-03
	890130 to 890206	4.9 E-03	1.6 E-03
	890206 to 890213	7.6 E-02	4.0 E-03
	890213 to 890221	2.1 E-02	2.0 E-03
	890221 to 890227	1.1 E-02	2.0 E-03
	890227 to 890306	2.4 E-02	3.0 E-03
	890306 to 890313	7.9 E-03	1.9 E-03
	890313 to 890320	8.6 E-03	2.1 E-03
	890320 to 890327	6.4 E-03	1.9 E-03
	890327 to 890403	3.6 E-03	1.9 E-03
	890403 to 890410	8.8 E-03	2.1 E-03
	890410 to 890417	2.1 E-02	3.0 E-03
	890417 to 890424	1.2 E-02	2.0 E-03
	890424 to 890501	1.1 E-02	2.0 E-03
	890501 to 890508	1.6 E-02	3.0 E-03
	890508 to 890515	9.9 E-03	2.1 E-03
	890515 to 890522	1.2 E-02	2.0 E-03
	890522 to 890530	5.3 E-03	1.6 E-03
	890530 to 890605	1.4 E-02	3.0 E-03
	890605 to 890612	1.5 E-02	2.0 E-03
	890612 to 890619	7.9 E-03	2.2 E-03
	890619 to 890626	1.0 E-02	2.0 E-03
	890626 to 890703	8.5 E-03	2.0 E-03
	890703 to 890710	1.0 E-02	2.0 E-03
	890710 to 890717	1.6 E-02 (a)	3.0 E-03
	890717 to 890724	1.2 E-02	2.0 E-03
	890724 to 890731	1.6 E-02	2.0 E-03
	890731 to 890807	8.8 E-03	2.0 E-03
	890807 to 890814	1.4 E-02	2.0 E-03
	890814 to 890821	1.0 E-02	2.0 E-03
	890821 to 890828	8.4 E-03	2.0 E-03

(a) Blown fuse; shortened sampling time.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
7	890828 to 890905	1.6 E-02	2.0 E-03
	890905 to 890911	1.4 E-02	3.0 E-03
	890911 to 890918	2.2 E-02	3.0 E-03
	890918 to 890925	2.2 E-02	3.0 E-03
	890925 to 891002	2.1 E-02	3.0 E-03
	891002 to 891009	2.2 E-02	3.0 E-03
	891009 to 891016	1.2 E-02	2.0 E-03
	891016 to 891023	2.8 E-02	3.0 E-03
	891023 to 891030	5.3 E-03	2.1 E-03
	891030 to 891106	2.2 E-02	3.0 E-03
	891106 to 891113	3.6 E-03	2.1 E-03
	891113 to 891120	1.8 E-02	3.0 E-03
	891120 to 891127	1.3 E-02	2.0 E-03
	891127 to 891204	2.3 E-02	3.0 E-03
	891204 to 891211	1.7 E-02 (a)	3.0 E-03
	891211 to 891218	2.0 E-02	3.0 E-03
	891218 to 891227	3.1 E-02	3.0 E-03

(a) Sampler malfunction; shortened sampling time.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
8	881227 to 890103	1.9 E-02	3.0 E-03
	890103 to 890109	9.8 E-03	2.5 E-03
	890109 to 890116	6.3 E-03	1.7 E-03
	890116 to 890123	5.8 E-03	2.9 E-03
	890123 to 890130	2.5 E-02	3.0 E-03
	890130 to 890206	6.2 E-03	1.8 E-03
	890206 to 890213	5.8 E-02	4.0 E-03
	890213 to 890221	1.8 E-02	2.0 E-03
	890221 to 890227	9.2 E-03	2.2 E-03
	890227 to 890306	1.7 E-02	2.0 E-03
	890306 to 890313	7.0 E-03	1.9 E-03
	890313 to 890320	6.5 E-03	1.9 E-03
	890320 to 890327	5.7 E-03	1.9 E-03
	890327 to 890403	3.9 E-03	1.9 E-03
	890403 to 890410	8.3 E-03	2.0 E-03
	890410 to 890417	2.1 E-02	3.0 E-03
	890417 to 890424	9.0 E-03	2.1 E-03
	890424 to 890501	8.8 E-03	2.2 E-03
	890501 to 890508	1.4 E-02	2.0 E-03
	890508 to 890515	1.0 E-02	2.0 E-03
	890515 to 890522	1.1 E-02	2.0 E-03
	890522 to 890530	5.4 E-03	1.6 E-03
	890530 to 890605	1.3 E-02	3.0 E-03
	890605 to 890612	1.4 E-02	2.0 E-03
	890612 to 890619	8.3 E-03	2.2 E-03
	890619 to 890626	7.9 E-03	2.1 E-03
	890626 to 890703	9.2 E-03	2.0 E-03
	890703 to 890710	9.7 E-03	2.2 E-03
	890710 to 890717	1.3 E-02	2.0 E-03
	890717 to 890724	9.3 E-03	2.1 E-03
	890724 to 890731	1.5 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.3 E-02 (a)	3.0 E-03
	890814 to 890821	1.0 E-02	2.0 E-03
	890821 to 890828	9.7 E-03	2.1 E-03

(a) Sampler malfunction; shortened sampling time.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
8	890828 to 890905	1.5 E-02	2.0 E-03
	890905 to 890911	1.6 E-02	3.0 E-03
	890911 to 890918	2.2 E-02	3.0 E-03
	890918 to 890925	2.3 E-02	3.0 E-03
	890925 to 891002	1.9 E-02	3.0 E-03
	891002 to 891009	2.3 E-02	3.0 E-03
	891009 to 891016	1.1 E-02	2.0 E-03
	891016 to 891023	3.0 E-02	3.0 E-03
	891023 to 891030	4.9 E-03	2.0 E-03
	891030 to 891106	2.3 E-02	3.0 E-03
	891106 to 891113	3.8 E-03	2.1 E-03
	891113 to 891120	1.9 E-02	3.0 E-03
	891120 to 891127	1.4 E-02	2.0 E-03
	891127 to 891204	3.1 E-02	3.0 E-03
	891204 to 891211	1.6 E-02	2.0 E-03
	891211 to 891218	1.6 E-02	2.0 E-03
	891218 to 891227	2.5 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY
9A	881227 to 890103	1.3 E-02		2.0 E-03
	890103 to 890109	6.0 E-03		2.4 E-03
	890109 to 890116	3.6 E-03		1.5 E-03
	890116 to 890123	1.3 E-02		2.0 E-03
	890123 to 890130	1.7 E-02		2.0 E-03
	890130 to 890206	1.6 E-02	(a)	4.0 E-03
	890206 to 890213	6.9 E-02		5.0 E-03
	890213 to 890221	1.9 E-02		2.0 E-03
	890221 to 890227	9.7 E-03		2.5 E-03
	890227 to 890306	1.9 E-02		2.0 E-03
	890306 to 890313	5.7 E-03		1.8 E-03
	890313 to 890320	7.1 E-03		2.0 E-03
	890320 to 890327	4.4 E-03		1.8 E-03
	890327 to 890403	3.9 E-03		2.0 E-03
	890403 to 890410	1.0 E-02		2.0 E-03
	890410 to 890417	2.1 E-02		3.0 E-03
	890417 to 890424	1.0 E-02		2.0 E-03
	890424 to 890501	8.8 E-03		2.2 E-03
	890501 to 890508	1.3 E-02		2.0 E-03
	890508 to 890515	1.0 E-02		2.0 E-03
	890515 to 890522	1.2 E-02		2.0 E-03
	890522 to 890530	*-7.8 E-02	(b)	3.0 E-03
	890530 to 890605	1.1 E-02		2.0 E-03
	890605 to 890612	1.5 E-02		2.0 E-03
	890612 to 890619	8.7 E-03		2.2 E-03
	890619 to 890626	8.1 E-03		2.1 E-03
	890626 to 890703	9.0 E-03		2.0 E-03
	890703 to 890710	8.7 E-03		2.2 E-03
	890710 to 890717	1.2 E-02		2.0 E-03
	890717 to 890724	1.0 E-02		2.0 E-03
	890724 to 890731	1.4 E-02		2.0 E-03
	890731 to 890807	8.2 E-03		2.0 E-03
	890807 to 890814	1.2 E-02		2.0 E-03
	890814 to 890821	1.2 E-02		2.0 E-03
	890821 to 890828	7.0 E-03		1.9 E-03

(a) Power outage; low air volume.
(b) Sampler malfunction; result not included in average.
 * Denotes a result less than the detection limit.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
9A	890828 to 890905	1.5 E-02	2.0 E-03
	890905 to 890911	1.8 E-02	3.0 E-03
	890911 to 890918	2.2 E-02	3.0 E-03
	890918 to 890925	2.1 E-02	3.0 E-03
	890925 to 891002	1.7 E-02	3.0 E-03
	891002 to 891009	2.0 E-02	3.0 E-03
	891009 to 891016	9.2 E-03	2.3 E-03
	891016 to 891023	2.3 E-02	3.0 E-03
	891023 to 891030	5.6 E-03	2.1 E-03
	891030 to 891106	1.8 E-02	3.0 E-03
	891106 to 891113	7.5 E-03	2.3 E-03
	891113 to 891120	1.6 E-02	2.0 E-03
	891120 to 891127	1.1 E-02	2.0 E-03
	891127 to 891204	3.3 E-02	3.0 E-03
	891204 to 891211	1.3 E-02	2.0 E-03
	891211 to 891218	1.8 E-02	2.0 E-03
	891218 to 891227	2.4 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
21	881227 to 890103	1.6 E-02	2.0 E-03
	890103 to 890109	6.9 E-03	2.4 E-03
	890109 to 890116	5.8 E-03	1.7 E-03
	890116 to 890123	8.8 E-03	2.0 E-03
	890123 to 890130	2.0 E-02	3.0 E-03
	890130 to 890206	2.4 E-02 (a)	3.0 E-03
	890206 to 890213	4.7 E-02	4.0 E-03
	890213 to 890221	1.9 E-02	2.0 E-03
	890221 to 890227	7.8 E-03	2.1 E-03
	890227 to 890306	1.8 E-02	2.0 E-03
	890306 to 890313	4.8 E-03	1.7 E-03
	890313 to 890320	7.9 E-03	2.0 E-03
	890320 to 890327	5.1 E-03	1.8 E-03
	890327 to 890403	3.5 E-03	1.9 E-03
	890403 to 890410	6.9 E-03	2.0 E-03
	890410 to 890417	1.7 E-02	2.0 E-03
	890417 to 890424	8.1 E-03	2.0 E-03
	890424 to 890501	8.9 E-03	2.2 E-03
	890501 to 890508	1.2 E-02	2.0 E-03
	890508 to 890515	9.3 E-03	2.0 E-03
	890515 to 890522	1.1 E-02	2.0 E-03
	890522 to 890530	3.5 E-03	1.5 E-03
	890530 to 890605	9.3 E-03	2.4 E-03
	890605 to 890612	1.4 E-02	2.0 E-03
	890612 to 890619	9.4 E-03	2.2 E-03
	890619 to 890626	8.6 E-03	2.1 E-03
	890626 to 890703	7.6 E-03	1.9 E-03
	890703 to 890710	7.4 E-03	2.1 E-03
	890710 to 890717	1.1 E-02	2.0 E-03
	890717 to 890724	9.1 E-03 (b)	2.1 E-03
	890724 to 890731	1.4 E-02	2.0 E-03
	890731 to 890807	9.0 E-03	2.0 E-03
	890807 to 890814	1.2 E-02	2.0 E-03
	890814 to 890821	1.0 E-02	2.0 E-03
	890821 to 890828	7.2 E-03	1.9 E-03

(a) Sampler malfunction; shortened sampling time.
(b) Low cfm on unit; result corrected.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
21	890828 to 890905	1.1 E-02	3.0 E-03
	890905 to 890911	1.1 E-02	3.0 E-03
	890911 to 890918	1.9 E-02	3.0 E-03
	890918 to 890925	1.9 E-02	3.0 E-03
	890925 to 891002	1.6 E-02	3.0 E-03
	891002 to 891009	1.8 E-02	3.0 E-03
	891009 to 891016	1.2 E-02	2.0 E-03
	891016 to 891023	2.5 E-02	3.0 E-03
	891023 to 891030	5.3 E-03	2.1 E-03
	891030 to 891106	2.4 E-02	3.0 E-03
	891106 to 891113	3.5 E-03	2.1 E-03
	891113 to 891120	1.3 E-02	2.0 E-03
	891120 to 891127	1.3 E-02	2.0 E-03
	891127 to 891204	2.9 E-02	3.0 E-03
	891204 to 891211	1.8 E-02	2.0 E-03
	891211 to 891218	1.9 E-02	2.0 E-03
	891218 to 891227	2.8 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
23	881227 to 890103	2.4 E-02	3.0 E-03
	890103 to 890109	1.0 E-02	3.0 E-03
	890109 to 890116	9.4 E-03	1.9 E-03
	890116 to 890123	9.0 E-03	2.0 E-03
	890123 to 890130	2.8 E-02	3.0 E-03
	890130 to 890206	2.3 E-02	3.0 E-03
	890206 to 890213	7.7 E-02	4.0 E-03
	890213 to 890221	2.3 E-02	2.0 E-03
	890221 to 890227	1.3 E-02	2.0 E-03
	890227 to 890306	2.0 E-02	2.0 E-03
	890306 to 890313	6.1 E-03	1.8 E-03
	890313 to 890320	6.0 E-03	1.9 E-03
	890320 to 890327	6.6 E-03	1.9 E-03
	890327 to 890403	3.2 E-03	1.9 E-03
	890403 to 890410	9.6 E-03	2.1 E-03
	890410 to 890417	2.2 E-02	3.0 E-03
	890417 to 890424	1.0 E-02	2.0 E-03
	890424 to 890501	8.2 E-03	2.1 E-03
	890501 to 890508	1.3 E-02	2.0 E-03
	890508 to 890515	1.2 E-02	2.0 E-03
	890515 to 890522	1.2 E-02	2.0 E-03
	890522 to 890530	5.2 E-03	1.6 E-03
	890530 to 890605	1.1 E-02	3.0 E-03
	890605 to 890612	1.5 E-02 (a)	2.0 E-03
	890612 to 890619	1.0 E-02	2.0 E-03
	890619 to 890626	8.9 E-03	2.1 E-03
	890626 to 890703	7.0 E-03	1.9 E-03
	890703 to 890710	8.7 E-03	2.2 E-03
	890710 to 890717	1.2 E-02	2.0 E-03
	890717 to 890724	1.0 E-02	2.0 E-03
	890724 to 890731	1.6 E-02	2.0 E-03
	890731 to 890807	8.9 E-03	2.0 E-03
	890807 to 890814	2.5 E-02 (b)	8.0 E-03
	890814 to 890821	1.3 E-02	2.0 E-03
	890821 to 890828	8.3 E-03	2.0 E-03

(a) Slightly shortened sampling time due to power outage.
(b) Low sample volume due to blown fuse; result not included in average.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
23	890828 to 890905	1.7 E-02	2.0 E-03
	890905 to 890911	1.7 E-02	3.0 E-03
	890911 to 890918	2.5 E-02	3.0 E-03
	890918 to 890925	2.6 E-02	3.0 E-03
	890925 to 891002	2.3 E-02	3.0 E-03
	891002 to 891009	2.4 E-02	3.0 E-03
	891009 to 891016	9.3 E-03	2.4 E-03
	891016 to 891023	3.3 E-02	3.0 E-03
	891023 to 891030	9.2 E-03	2.3 E-03
	891030 to 891106	2.8 E-02	3.0 E-03
	891106 to 891113	4.8 E-03	2.1 E-03
	891113 to 891120	2.0 E-02	3.0 E-03
	891120 to 891127	1.1 E-02	2.0 E-03
	891127 to 891204	2.5 E-02	3.0 E-03
	891204 to 891211	1.8 E-02	2.0 E-03
	891211 to 891218	1.9 E-02	2.0 E-03
	891218 to 891227	2.8 E-02	3.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
40	881227 to 890103	2.0 E-02	3.0 E-03
	890103 to 890109	1.1 E-02	3.0 E-03
	890109 to 890116	6.3 E-03	1.7 E-03
	890116 to 890123	9.5 E-03	2.0 E-03
	890123 to 890130	2.1 E-02	3.0 E-03
	890130 to 890206	9.8 E-03	2.0 E-03
	890206 to 890213	5.8 E-02	4.0 E-03
	890213 to 890221	2.1 E-02	2.0 E-03
	890221 to 890227	9.3 E-03	2.2 E-03
	890227 to 890306	2.0 E-02	2.0 E-03
	890307 to 890313	5.8 E-03	2.0 E-03
	890313 to 890320	5.6 E-03	1.9 E-03
	890320 to 890327	5.9 E-03	1.9 E-03
	890327 to 890403	4.2 E-03	1.9 E-03
	890403 to 890410	9.1 E-03	2.1 E-03
	890410 to 890417	2.3 E-02	3.0 E-03
	890417 to 890424	1.3 E-02	2.0 E-03
	890424 to 890501	9.0 E-03	2.2 E-03
	890501 to 890508	1.7 E-02	3.0 E-03
	890508 to 890515	1.0 E-02	2.0 E-03
	890515 to 890522	1.2 E-02 (a)	2.0 E-03
	890522 to 890530	3.8 E-03	1.5 E-03
	890530 to 890605	9.3 E-03	2.4 E-03
	890605 to 890612	1.6 E-02	2.0 E-03
	890612 to 890619	9.1 E-03	2.2 E-03
	890619 to 890626	8.4 E-03	2.1 E-03
	890626 to 890703	8.8 E-03	2.0 E-03
	890703 to 890710	9.7 E-03	2.2 E-03
	890710 to 890717	1.2 E-02	2.0 E-03
	890717 to 890724	1.0 E-02	2.0 E-03
	890724 to 890731	1.6 E-02	2.0 E-03
	890731 to 890807	9.7 E-03	2.0 E-03
	890807 to 890814	1.3 E-02	2.0 E-03
	890814 to 890821	1.5 E-02	2.0 E-03
	890821 to 890828	1.0 E-02	2.0 E-03

(a) Power outage; shortened sampling time.

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
40	890828 to 890905	1.8 E-02	2.0 E-03
	890905 to 890911	1.8 E-02	3.0 E-03
	890911 to 890918	2.3 E-02	3.0 E-03
	890918 to 890925	2.5 E-02	3.0 E-03
	890925 to 891002	2.0 E-02	3.0 E-03
	891002 to 891009	2.5 E-02	3.0 E-03
	891009 to 891016	1.0 E-02	2.0 E-03
	891016 to 891023	3.1 E-02	3.0 E-03
	891023 to 891030	5.5 E-03	2.1 E-03
	891030 to 891106	2.4 E-02	3.0 E-03
	891106 to 891113	7.1 E-03	2.2 E-03
	891113 to 891120	1.9 E-02	3.0 E-03
	891120 to 891127	1.2 E-02	2.0 E-03
	891127 to 891204	3.5 E-02	3.0 E-03
	891204 to 891211	1.5 E-02	2.0 E-03
	891211 to 891218	1.5 E-02	2.0 E-03
	891218 to 891227	2.8 E-02	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
48	881227 to 890103	2.2 E-02	3.0 E-03
	890103 to 890109	1.1 E-02	3.0 E-03
	890109 to 890116	8.6 E-03	1.9 E-03
	890116 to 890123	1.2 E-02	2.0 E-03
	890123 to 890130	2.6 E-02	3.0 E-03
	890130 to 890206	2.5 E-02	3.0 E-03
	890206 to 890213	7.4 E-02	4.0 E-03
	890213 to 890221	2.3 E-02	2.0 E-03
	890221 to 890227	1.2 E-02	2.0 E-03
	890227 to 890306	2.1 E-02	3.0 E-03
	890306 to 890313	6.2 E-03	1.8 E-03
	890313 to 890320	1.1 E-03	2.0 E-03
	890320 to 890327	6.4 E-03	1.9 E-03
	890327 to 890403	4.1 E-03	1.9 E-03
	890403 to 890410	1.0 E-02	2.0 E-03
	890410 to 890417	2.3 E-02	3.0 E-03
	890417 to 890424	9.4 E-03	2.1 E-03
	890424 to 890501	8.8 E-03	2.2 E-03
	890501 to 890508	1.3 E-02	2.0 E-03
	890508 to 890515	1.0 E-02	2.0 E-03
	890515 to 890522	1.3 E-02	2.0 E-03
	890522 to 890530	3.8 E-03	1.5 E-03
	890530 to 890605	1.3 E-02	3.0 E-03
	890605 to 890612	1.4 E-02	2.0 E-03
	890612 to 890619	7.6 E-03	2.1 E-03
	890619 to 890626	8.5 E-03	2.1 E-03
	890626 to 890703	7.2 E-03	1.9 E-03
	890703 to 890710	7.5 E-03	2.1 E-03
	890710 to 890717	1.3 E-02	2.0 E-03
	890717 to 890724	1.1 E-02	2.0 E-03
	890724 to 890731	1.4 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.3 E-02	2.0 E-03
	890814 to 890821	9.6 E-03	2.2 E-03
	890821 to 890828	8.9 E-03	2.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
48	890828 to 890905	1.2 E-02	2.0 E-03
	890905 to 890911	1.5 E-02	3.0 E-03
	890911 to 890918	2.5 E-02	3.0 E-03
	890918 to 890925	2.7 E-02	3.0 E-03
	890925 to 891002	2.2 E-02	3.0 E-03
	891002 to 891009	3.0 E-02	3.0 E-03
	891009 to 891016	1.5 E-02	3.0 E-03
	891016 to 891023	3.4 E-02	3.0 E-03
	891023 to 891030	7.5 E-03	2.2 E-03
	891030 to 891106	2.7 E-02	3.0 E-03
	891106 to 891113	4.3 E-03	2.1 E-03
	891113 to 891120	1.9 E-02	3.0 E-03
	891120 to 891127	1.3 E-02	2.0 E-03
	891127 to 891204	3.5 E-02	3.0 E-03
	891204 to 891211	2.1 E-02	3.0 E-03
	891211 to 891218	2.0 E-02	3.0 E-03
	891218 to 891227	2.9 E-02	3.0 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
57	881227 to 890103	2.5 E-02	3.0 E-03
	890103 to 890109	8.4 E-03	2.5 E-03
	890109 to 890116	7.3 E-03	1.8 E-03
	890116 to 890123	1.3 E-02	2.0 E-03
	890123 to 890130	2.5 E-02	3.0 E-03
	890130 to 890206	2.5 E-02	4.0 E-03
	890206 to 890213	6.9 E-02	4.0 E-03
	890213 to 890221	1.9 E-02	2.0 E-03
	890221 to 890227	1.1 E-02	2.0 E-03
	890227 to 890306	2.1 E-02	2.0 E-03
	890306 to 890313	4.9 E-03	1.7 E-03
	890313 to 890320	8.2 E-03	2.0 E-03
	890320 to 890327	6.6 E-03	1.9 E-03
	890327 to 890403	3.5 E-03	1.9 E-03
	890403 to 890410	1.1 E-02	2.0 E-03
	890410 to 890417	2.3 E-02	3.0 E-03
	890417 to 890424	1.1 E-02	2.0 E-03
	890424 to 890501	1.1 E-02	2.0 E-03
	890501 to 890508	1.6 E-02	3.0 E-03
	890508 to 890515	1.2 E-02	2.0 E-03
	890515 to 890522	1.1 E-02	2.0 E-03
	890522 to 890530	5.9 E-03	1.7 E-03
	890530 to 890605	1.4 E-02	3.0 E-03
	890605 to 890612	1.8 E-02	2.0 E-03
	890612 to 890619	1.0 E-02	2.0 E-03
	890619 to 890626	9.2 E-03	2.2 E-03
	890626 to 890703	8.2 E-03	2.0 E-03
	890703 to 890710	1.1 E-02	2.0 E-03
	890710 to 890717	1.5 E-02	2.0 E-03
	890717 to 890724	1.1 E-02	2.0 E-03
	890724 to 890731	1.5 E-02	2.0 E-03
	890731 to 890807	1.0 E-02	2.0 E-03
	890807 to 890814	1.4 E-02	2.0 E-03
	890814 to 890821	1.1 E-02	2.0 E-03
	890821 to 890828	9.5 E-03	2.1 E-03

TABLE A-2.1 (Cont.)

GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
57	890828 to 890905	1.7 E-02	2.0 E-03
	890905 to 890911	1.6 E-02	3.0 E-03
	890911 to 890918	2.2 E-02	3.0 E-03
	890918 to 890925	2.3 E-02	3.0 E-03
	890925 to 891002	2.4 E-02	3.0 E-03
	891002 to 891009	2.4 E-02	3.0 E-03
	891009 to 891016	1.3 E-02	2.0 E-03
	891016 to 891023	3.2 E-02	3.0 E-03
	891023 to 891030	8.7 E-03	2.2 E-03
	891030 to 891106	2.7 E-02	3.0 E-03
	891106 to 891113	3.7 E-03	2.1 E-03
	891113 to 891120	2.0 E-02	3.0 E-03
	891120 to 891127	1.5 E-02	2.0 E-03
	891127 to 891204	3.2 E-02	3.0 E-03
	891204 to 891211	1.9 E-02	2.0 E-03
	891211 to 891218	1.4 E-02	2.0 E-03
	891218 to 891227	3.4 E-02	3.0 E-03

TABLE A-2.2

GROSS BETA ON AIR PARTICULATE FILTERS - SUMMARY

Results in pCi/cubic meter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Gr-Beta (I)	1.6E-02	1.1E-03	8.2E-02	571	569
Gr-Beta (C)	1.4E-02	3.6E-03	6.9E-02	52	51

(I) Indicator Stations
(C) Control Station

TABLE A-3.1

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
1	890103 to 890403	Be-7	4.23 E-02	3.92 E-03
		K-40	* 3.12 E-02	4.09 E-03
		Ru-103	*-1.89 E-05	2.69 E-04
		Ru-106	*-9.80 E-04	1.76 E-03
		Cs-134	* 8.04 E-05	2.16 E-04
		Cs-137	* 2.51 E-04	2.10 E-04
		Ra-226	* 5.45 E-03	3.54 E-03
		Th-228	* 5.75 E-04	3.02 E-04
	890403 to 890703	Be-7	6.67 E-02	4.91 E-03
		K-40	* 4.96 E-03	2.76 E-03
		Ru-103	*-3.32 E-05	2.36 E-04
		Ru-106	*-5.08 E-04	1.66 E-03
		Cs-134	*-1.03 E-05	1.87 E-04
		Cs-137	* 1.91 E-04	2.04 E-04
		Ra-226	* 5.27 E-03	3.64 E-03
		Th-228	* 5.60 E-04	2.93 E-04
	890703 to 891002	Be-7	6.77 E-02	4.97 E-03
		K-40	4.13 E-03	2.09 E-03
		Ru-103	* 2.00 E-05	2.06 E-04
		Ru-106	* 0.00 E+00	1.33 E-03
		Cs-134	*-2.36 E-05	1.42 E-04
		Cs-137	* 1.36 E-04	1.66 E-04
		Ra-226	* 2.56 E-03	2.53 E-03
		Th-228	* 6.32 E-04	2.43 E-04
	891002 to 900102	Be-7	3.46 E-02	4.12 E-03
		K-40	* 9.36 E-03	3.04 E-03
		Ru-103	* 1.65 E-04	2.47 E-04
		Ru-106	*-7.84 E-04	1.57 E-03
		Cs-134	*-1.01 E-04	1.86 E-04
		Cs-137	* 2.12 E-04	2.03 E-04
		Ra-226	* 2.36 E-03	3.57 E-03
		Th-228	* 8.73 E-04	2.92 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
4	890103 to 890403	Be-7	4.57 E-02	4.28 E-03
		K-40	* 7.44 E-03	3.02 E-03
		Ru-103	* 5.25 E-05	1.91 E-04
		Ru-106	* 1.30 E-03	1.48 E-03
		Cs-134	* 1.39 E-04	1.70 E-04
		Cs-137	* 1.32 E-04	1.60 E-04
		Ra-226	* 2.55 E-03	3.00 E-03
		Th-228	* 5.70 E-04	2.58 E-04
	890403 to 890703	Be-7	6.09 E-02	4.75 E-03
		K-40	* 9.93 E-03	2.87 E-03
		Ru-103	*-2.53 E-05	2.35 E-04
		Ru-106	*-7.34 E-05	1.46 E-03
		Cs-134	*-4.17 E-05	1.80 E-04
		Cs-137	* 1.23 E-04	1.85 E-04
		Ra-226	* 1.68 E-03	3.31 E-03
		Th-228	* 4.46 E-04	2.85 E-04
	890703 to 891002	Be-7	6.86 E-02	5.18 E-03
		K-40	* 5.54 E-03	2.40 E-03
		Ru-103	*-8.60 E-05	2.15 E-04
		Ru-106	* 3.07 E-04	1.32 E-03
		Cs-134	* 1.10 E-05	1.71 E-04
		Cs-137	* 5.46 E-05	1.58 E-04
		Ra-226	* 5.75 E-03	3.25 E-03
		Th-228	* 6.90 E-04	2.71 E-04
	891002 to 900102	Be-7	3.28 E-02	3.75 E-03
		K-40	* 1.04 E-02	2.90 E-03
		Ru-103	*-9.63 E-05	1.98 E-04
		Ru-106	* 6.57 E-05	1.31 E-03
		Cs-134	* 0.00 E+00	1.57 E-04
		Cs-137	* 2.34 E-05	1.69 E-04
		Ra-226	* 2.57 E-03	2.97 E-03
		Th-228	* 8.42 E-04	2.55 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
5	890103 to 890403	Be-7	3.93 E-02	3.71 E-03
		K-40	* 9.10 E-03	2.74 E-03
		Ru-103	* 1.63 E-05	2.07 E-04
		Ru-106	*-1.02 E-03	1.52 E-03
		Cs-134	*-1.03 E-04	1.68 E-04
		Cs-137	*-2.62 E-05	1.65 E-04
		Ra-226	* 5.97 E-03	2.87 E-03
		Th-228	* 5.25 E-04	2.77 E-04
	890403 to 890703	Be-7	4.63 E-02	3.99 E-03
		K-40	* 1.59 E-02	3.88 E-03
		Ru-103	* 4.74 E-05	2.30 E-04
		Ru-106	*-7.97 E-04	1.74 E-03
		Cs-134	* 1.64 E-04	2.14 E-04
		Cs-137	* 1.15 E-04	2.13 E-04
		Ra-226	* 3.30 E-03	3.44 E-03
		Th-228	* 1.84 E-03	3.05 E-04
	890703 to 891002	Be-7	6.87 E-02	7.46 E-03
		K-40	* 1.16 E-02	3.63 E-03
		Ru-103	* 1.82 E-04	3.12 E-04
		Ru-106	* 1.97 E-03	2.10 E-03
		Cs-134	* 1.32 E-04	2.36 E-04
		Cs-137	* 1.72 E-04	2.49 E-04
		Ra-226	* 2.43 E-03	3.90 E-03
		Th-228	* 1.79 E-03	3.87 E-04
	891002 to 900102	Be-7	2.83 E-02	3.67 E-03
		K-40	* 1.68 E-02	3.46 E-03
		Ru-103	* 3.77 E-05	2.60 E-04
		Ru-106	* 1.59 E-04	1.74 E-03
		Cs-134	* 1.01 E-04	1.97 E-04
		Cs-137	* 2.60 E-04	2.12 E-04
		Ra-226	* 6.70 E-03	3.39 E-03
		Th-228	* 2.52 E-03	3.22 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
6	890103 to 890403	Be-7	3.38 E-02	3.28 E-03
		K-40	* 7.55 E-03	2.47 E-03
		Ru-103	* 4.05 E-05	1.76 E-04
		Ru-106	* 0.00 E+00	1.22 E-03
		Cs-134	* 0.00 E+00	1.40 E-04
		Cs-137	* 1.71 E-04	1.70 E-04
		Ra-226	* 5.17 E-03	2.70 E-03
		Th-228	* 8.38 E-04	2.38 E-04
	890403 to 890703	Be-7	6.46 E-02	4.55 E-03
		K-40	* 2.45 E-02	3.75 E-03
		Ru-103	*-4.52 E-05	2.36 E-04
		Ru-106	* 1.23 E-03	1.66 E-03
		Cs-134	* 2.10 E-05	2.05 E-04
		Cs-137	* 7.67 E-05	1.91 E-04
		Ra-226	* 6.44 E-03	3.46 E-03
		Th-228	* 5.10 E-04	2.85 E-04
	890703 to 891002	Be-7	6.13 E-02	5.66 E-03
		K-40	* 5.23 E-02	6.33 E-03
		Ru-103	*-7.30 E-05	3.22 E-04
		Ru-106	* 1.61 E-03	2.19 E-03
		Cs-134	* 1.26 E-04	2.68 E-04
		Cs-137	* 1.91 E-04	2.44 E-04
		Ra-226	* 2.93 E-03	4.02 E-03
		Th-228	* 9.10 E-04	3.44 E-04
	891002 to 900102	Be-7	2.83 E-02	3.26 E-03
		K-40	* 2.57 E-02	3.67 E-03
		Ru-103	*-3.00 E-05	2.43 E-04
		Ru-106	*-4.92 E-05	1.59 E-03
		Cs-134	*-3.48 E-05	2.00 E-04
		Cs-137	*-5.26 E-05	1.87 E-04
		Ra-226	* 5.05 E-03	3.48 E-03
		Th-228	* 6.20 E-04	2.92 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
7	890103 to 890403	Be-7	4.29 E-02	3.43 E-03
		K-40	* 5.87 E-03	2.24 E-03
		Ru-103	* 9.42 E-05	1.50 E-04
		Ru-106	* 4.77 E-04	1.15 E-03
		Cs-134	* 2.29 E-05	1.44 E-04
		Cs-137	* 1.27 E-05	1.39 E-04
		Ra-226	* 3.57 E-03	2.00 E-03
		Th-228	* 4.61 E-04	1.68 E-04
	890403 to 890703	Be-7	7.11 E-02	4.48 E-03
		K-40	* 4.94 E-03	2.41 E_03
		Ru-103	*-1.50 E-05	1.66 E-04
		Ru-106	*-6.68 E-04	1.06 E-03
		Cs-134	* 3.89 E-05	1.45 E-04
		Cs-137	*-3.22 E-05	1.37 E-04
		Ra-226	* 2.63 E-03	2.36 E-03
		Th-228	* 4.61 E-04	2.21 E-04
	890703 to 891002	Be-7	5.68 E-02	5.76 E-03
		K-40	* 5.77 E-02	6.40 E-03
		Ru-103	*-3.00 E-04	3.11 E-04
		Ru-106	*-9.20 E-04	2.19 E-03
		Cs-134	* 3.23 E-05	2.52 E-04
		Cs-137	* 4.53 E-05	2.35 E-04
		Ra-226	* 1.82 E-03	3.61 E-03
		Th-228	* 6.14 E-04	3.21 E-04
	891002 to 900102	Be-7	3.27 E-02	3.84 E-03
		K-40	* 7.47 E-03	2.71 E-03
		Ru-103	* 8.20 E-05	2.18 E-04
		Ru-106	*-6.14 E-04	1.46 E-03
		Cs-134	*-2.95 E-05	1.69 E-04
		Cs-137	* 1.55 E-04	1.72 E-04
		Ra-226	* 1.76 E-03	2.90 E-03
		Th-228	* 1.14 E-03	2.68 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
8	890103 to 890403	Be-7	4.05 E-02	3.16 E-03
		K-40	* 4.99 E-02	4.38 E-03
		Ru-103	* 7.87 E-05	2.14 E-04
		Ru-106	*-1.71 E-04	1.54 E-03
		Cs-134	* 8.93 E-05	1.95 E-04
		Cs-137	* 1.07 E-04	1.89 E-04
		Ra-226	* 5.45 E-03	2.48 E-03
		Th-228	* 8.96 E-04	2.36 E-04
	890403 to 890703	Be-7	6.35 E-02	4.31 E-03
		K-40	* 8.28 E-03	2.90 E-03
		Ru-103	* 1.61 E-04	1.95 E-04
		Ru-106	* 5.45 E-04	1.39 E-03
		Cs-134	* 1.97 E-05	1.71 E-04
		Cs-137	* 1.96 E-04	1.83 E-04
		Ra-226	* 3.12 E-03	2.94 E-03
		Th-228	* 5.35 E-04	2.40 E-04
	890703 to 891002	Be-7	6.18 E-02	5.14 E-03
		K-40	4.25 E-03	2.24 E-03
		Ru-103	* 5.63 E-05	2.21 E-04
		Ru-106	*-7.22 E-04	1.55 E-03
		Cs-134	*-1.29 E-05	1.95 E-04
		Cs-137	* 1.07 E-04	1.81 E-04
		Ra-226	* 3.57 E-03	3.25 E-03
		Th-228	* 5.45 E-04	2.94 E-04
	891002 to 900102	Be-7	3.05 E-02	3.81 E-03
		K-40	* 8.80 E-03	2.83 E-03
		Ru-103	*-1.02 E-04	2.13 E-04
		Ru-106	* 7.57 E-05	1.42 E-03
		Cs-134	*-4.34 E-05	1.77 E-04
		Cs-137	*-1.26 E-04	1.53 E-04
		Ra-226	* 4.52 E-03	3.17 E-03
		Th-228	* 9.07 E-04	2.65 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9A	890103 to 890403	Be-7	4.07 E-02	4.10 E-03
		K-40	* 1.27 E-02	3.75 E-03
		Ru-103	* 6.75 E-05	2.46 E-04
		Ru-106	* 1.37 E-03	1.80 E-03
		Cs-134	* 1.72 E-05	2.12 E-04
		Cs-137	* 7.73 E-05	2.05 E-04
		Ra-226	* 4.19 E-03	3.52 E-03
		Th-228	* 1.24 E-03	3.06 E-04
	890403 to 890703	Be-7	6.73 E-02	5.53 E-03
		K-40	* 1.23 E-02	3.13 E-03
		Ru-103	*-9.14 E-06	2.35 E-04
		Ru-106	*-6.34 E-04	1.54 E-03
		Cs-134	* 2.24 E-05	2.00 E-04
		Cs-137	* 8.52 E-05	1.92 E-04
		Ra-226	* 7.48 E-03	3.28 E-03
		Th-228	* 7.76 E-04	3.02 E-04
	890703 to 891002	Be-7	5.44 E-02	4.90 E-03
		K-40	* 6.31 E-03	2.65 E-03
		Ru-103	*-5.53 E-05	2.01 E-04
		Ru-106	* 5.20 E-04	1.46 E-03
		Cs-134	* 1.07 E-04	1.78 E-04
		Cs-137	* 7.95 E-05	1.66 E-04
		Ra-226	* 4.94 E-03	2.91 E-03
		Th-228	* 8.64 E-04	2.65 E-04
	891002 to 900102	Be-7	2.73 E-02	4.41 E-03
		K-40	* 5.92 E-03	3.64 E-03
		Ru-103	* 6.70 E-05	2.52 E-04
		Ru-106	*-1.19 E-03	1.64 E-03
		Cs-134	* 6.12 E-05	2.10 E-04
		Cs-137	* 1.03 E-04	2.17 E-04
		Ra-226	* 9.52 E-03	4.21 E-03
		Th-228	* 1.29 E-03	3.61 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
21	890103 to 890403	Be-7	3.00 E-02	3.31 E-03
		K-40	* 6.69 E-03	2.82 E-03
		Ru-103	*-5.57 E-05	2.05 E-04
		Ru-106	*-3.73 E-04	1.48 E-03
		Cs-134	* 0.00 E+00	1.77 E-04
		Cs-137	* 3.05 E-04	1.87 E-04
		Ra-226	* 3.86 E-03	2.64 E-03
		Th-228	* 2.46 E-04	2.14 E-04
	890403 to 890703	Be-7	5.61 E-02	4.32 E-03
		K-40	6.06 E-03	3.14 E-03
		Ru-103	* 8.40 E-05	1.84 E-04
		Ru-106	* 1.77 E-03	1.45 E-03
		Cs-134	*-4.24 E-05	1.48 E-04
		Cs-137	*-7.98 E-05	1.60 E-04
		Ra-226	* 3.18 E-03	2.92 E-03
		Th-228	* 5.95 E-04	2.49 E-04
	890703 to 891002	Be-7	4.74 E-02	6.60 E-03
		K-40	* 6.10 E-02	7.51 E-03
		Ru-103	*-1.07 E-05	3.98 E-04
		Ru-106	* 7.69 E-04	2.77 E-03
		Cs-134	* 1.58 E-04	3.33 E-04
		Cs-137	* 2.33 E-04	3.09 E-04
		Ra-226	* 1.88 E-03	4.34 E-03
		Th-228	* 1.38 E-03	4.03 E-04
	891002 to 900102	Be-7	2.51 E-02	4.33 E-03
		K-40	* 7.97 E-03	3.35 E-03
		Ru-103	* 8.85 E-05	2.76 E-04
		Ru-106	*-2.68 E-04	1.86 E-03
		Cs-134	* 1.90 E-04	2.43 E-04
		Cs-137	* 2.86 E-04	2.55 E-04
		Ra-226	*-1.35 E-03	3.42 E-03
		Th-228	* 1.00 E-03	3.20 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
23	890103 to 890403	Be-7	4.26 E-02	2.58 E-03
		K-40	* 5.67 E-02	3.77 E-03
		Ru-103	* 8.28 E-05	1.72 E-04
		Ru-106	* 3.37 E-04	1.27 E-03
		Cs-134	* 9.71 E-05	1.63 E-04
		Cs-137	* 1.36 E-04	1.54 E-04
		Ra-226	* 4.12 E-03	2.41 E-03
		Th-228	* 1.02 E-03	2.01 E-04
	890403 to 890703	Be-7	6.03 E-02	4.23 E-03
		K-40	* 6.80 E-03	2.37 E-03
		Ru-103	*-9.01 E-05	1.81 E-04
		Ru-106	*-9.83 E-04	1.25 E-03
		Cs-134	* 8.89 E-05	1.59 E-04
		Cs-137	*-2.21 E-05	1.52 E-04
		Ra-226	* 3.56 E-03	2.68 E-03
		Th-228	* 9.44 E-04	2.36 E-04
	890703 to 891002	Be-7	6.99 E-02	6.20 E-03
		K-40	* 1.09 E-02	3.44 E-03
		Ru-103	*-2.40 E-05	2.67 E-04
		Ru-106	*-2.80 E-04	1.64 E-03
		Cs-134	*-9.15 E-05	1.71 E-04
		Cs-137	* 6.59 E-05	1.91 E-04
		Ra-226	* 7.51 E-03	3.51 E-03
		Th-228	* 9.69 E-04	3.22 E-04
	891002 to 900102	Be-7	1.69 E-02	3.75 E-03
		K-40	* 2.45 E-02	5.94 E-03
		Ru-103	* 2.35 E-04	3.36 E-04
		Ru-106	* 0.00 E+00	2.28 E-03
		Cs-134	* 2.74 E-04	2.83 E-04
		Cs-137	*-9.11 E-06	2.61 E-04
		Ra-226	* 1.57 E-03	4.26 E-03
		Th-228	* 6.80 E-04	3.74 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
40	890103 to 890403	Be-7	4.55 E-02	2.75 E-03
		K-40	* 4.28 E-02	3.94 E-03
		Ru-103	*-7.43 E-05	2.14 E-04
		Ru-106	* 2.00 E-04	1.55 E-03
		Cs-134	* 0.00 E+00	1.88 E-04
		Cs-137	* 5.20 E-05	1.82 E-04
		Ra-226	* 5.83 E-03	2.61 E-03
		Th-228	* 1.06 E-03	2.43 E-04
	890403 to 890703	Be-7	5.89 E-02	4.40 E-03
		K-40	* 7.74 E-03	2.77 E-03
		Ru-103	* 2.20 E-05	1.75 E-04
		Ru-106	*-6.37 E-04	1.20 E-03
		Cs-134	* 0.00 E+00	1.47 E-04
		Cs-137	* 1.52 E-05	1.65 E-04
		Ra-226	* 3.78 E-03	2.87 E-03
		Th-228	* 4.96 E-04	2.34 E-04
	890703 to 891002	Be-7	5.82 E-02	5.64 E-03
		K-40	6.70 E-03	2.98 E-03
		Ru-103	* 4.56 E-05	2.49 E-04
		Ru-106	*-7.19 E-04	1.51 E-03
		Cs-134	* 2.56 E-05	1.90 E-04
		Cs-137	* 6.39 E-05	1.78 E-04
		Ra-226	* 2.24 E-03	3.28 E-03
		Th-228	* 8.24 E-04	3.02 E-04
	891002 to 900102	Be-7	3.25 E-02	5.07 E-03
		K-40	* 4.98 E-02	5.91 E-03
		Ru-103	* 6.50 E-05	3.05 E-04
		Ru-106	*-4.47 E-04	1.96 E-03
		Cs-134	*-8.40 E-05	2.54 E-04
		Cs-137	* 7.06 E-05	2.47 E-04
		Ra-226	*-9.15 E-04	3.54 E-03
		Th-228	* 4.44 E-04	3.08 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
48	890103 to 890403	Be-7	3.94 E-02	4.46 E-03
		K-40	* 6.45 E-03	2.71 E-03
		Ru-103	*-6.08 E-05	1.85 E-04
		Ru-106	* 7.67 E-05	1.43 E-03
		Cs-134	* 5.51 E-05	1.75 E-04
		Cs-137	* 2.21 E-04	1.72 E-04
		Ra-226	* 2.46 E-03	3.15 E-03
		Th-228	* 4.87 E-04	2.59 E-04
	890403 to 890703	Be-7	5.37 E-02	4.36 E-03
		K-40	7.34 E-03	2.45 E-03
		Ru-103	*-7.95 E-05	1.76 E-04
		Ru-106	*-6.79 E-04	1.22 E-03
		Cs-134	*-9.59 E-06	1.47 E-04
		Cs-137	* 8.10 E-05	1.48 E-04
		Ra-226	* 3.84 E-03	2.44 E-03
		Th-228	* 7.59 E-04	2.40 E-04
	890703 to 891002	Be-7	5.59 E-02	4.58 E-03
		K-40	* 5.65 E-03	2.64 E-03
		Ru-103	*-4.69 E-05	2.34 E-04
		Ru-106	* 2.24 E-04	1.37 E-03
		Cs-134	* 0.00 E+00	1.80 E-04
		Cs-137	* 1.77 E-04	1.76 E-04
		Ra-226	* 4.78 E-03	2.97 E-03
		Th-228	* 9.36 E-04	2.60 E-04
	891002 to 900102	Be-7	3.42 E-02	4.06 E-03
		K-40	* 8.45 E-03	2.98 E-03
		Ru-103	* 7.20 E-05	2.44 E-04
		Ru-106	*-1.43 E-04	1.63 E-03
		Cs-134	*-9.11 E-05	1.98 E-04
		Cs-137	* 1.27 E-04	1.92 E-04
		Ra-226	* 2.47 E-03	3.44 E-03
		Th-228	* 8.69 E-04	2.91 E-04

* Denotes a result less than the detection limit.

TABLE A-3.1 (Cont.)

GAMMA SPECTROMETRY OF PARTICULATE FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
57	890103 to 890403	Be-7	4.04 E-02	5.02 E-03
		K-40	* 5.06 E-02	6.26 E-03
		Ru-103	* 9.88 E-05	3.01 E-04
		Ru-106	* 1.41 E-03	2.25 E-03
		Cs-134	* 3.31 E-05	2.52 E-04
		Cs-137	*-2.80 E-05	2.57 E-04
		Ra-226	* 3.93 E-03	3.81 E-03
		Th-228	* 8.38 E-04	3.37 E-04
	890403 to 890703	Be-7	6.18 E-02	5.16 E-03
		K-40	* 5.61 E-02	5.74 E-03
		Ru-103	*-6.56 E-05	2.66 E-04
		Ru-106	*-5.61 E-04	1.89 E-03
		Cs-134	* 7.93 E-05	2.33 E-04
		Cs-137	* 1.71 E-04	2.24 E-04
		Ra-226	* 5.78 E-04	3.16 E-03
		Th-228	* 4.01 E-04	2.84 E-04
	890703 to 891002	Be-7	5.72 E-02	4.46 E-03
		K-40	5.57 E-03	2.18 E-03
		Ru-103	*-1.64 E-05	1.84 E-04
		Ru-106	* 7.05 E-04	1.34 E-03
		Cs-134	* 1.37 E-04	1.56 E-04
		Cs-137	*-7.57 E-06	1.40 E-04
		Ra-226	* 1.50 E-03	2.16 E-03
		Th-228	* 4.29 E-04	1.90 E-04
	891002 to 900102	Be-7	3.23 E-02	3.55 E-03
		K-40	* 9.15 E-03	2.60 E-03
		Ru-103	* 1.65 E-05	2.16 E-04
		Ru-106	*-3.92 E-04	1.37 E-03
		Cs-134	* 2.76 E-05	1.52 E-04
		Cs-137	* 0.00 E+00	1.53 E-04
		Ra-226	* 2.14 E-03	3.01 E-03
		Th-228	* 6.42 E-04	2.55 E-04

* Denotes a result less than the detection limit.

TABLE A-3.2

GAMMA SPECTROMETRY OF PARTICULATE FILTERS - SUMMARY

Results in pCi/cubic meter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Ru-103	(I)	1.12E-05	-3.00E-04	2.35E-04	44	0
Ru-103	(C)	1.75E-05	-5.53E-05	6.75E-05	4	0
Ru-106	(I)	-4.34E-05	-9.80E-04	2.35E-04	44	0
Ru-106	(C)	1.65E-05	-1.19E-03	1.37E-03	4	0
Cs-134	(I)	3.24E-05	-1.03E-04	2.74E-04	44	0
Cs-134	(C)	5.20E-05	1.72E-05	1.07E-04	4	0
Cs-137	(I)	9.89E-05	-1.26E-04	3.05E-04	44	0
Cs-137	(C)	8.63E-05	7.73E-05	1.03E-04	4	0
Be-7	(I)	4.79E-02	1.69E-02	7.11E-02	44	44
Be-7	(C)	4.74E-02	2.73E-02	6.73E-02	4	4
K-40	(I)	1.89E-02	4.13E-03	6.10E-02	44	6
K-40	(C)	9.31E-03	5.92E-03	1.27E-02	4	0

(I) Indicator Stations
(C) Control Station

TABLE A-4.1

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
1	881227 to 890103	* 8.01 E-03	1.16 E-02
	890103 to 890109	* 2.56 E-03	1.13 E-02
	890109 to 890116	* 7.31 E-03	8.55 E-03
	890116 to 890123	* 2.69 E-03	9.18 E-03
	890123 to 890130	*-1.28 E-03	9.57 E-03
	890130 to 890206	*-3.76 E-03	1.38 E-02
	890206 to 890213	* 2.56 E-04	9.58 E-03
	890213 to 890221	* 2.28 E-03	1.14 E-02
	890221 to 890227	*-3.66 E-03	1.08 E-02
	890227 to 890306	*-3.58 E-03	9.14 E-03
	890306 to 890313	* 8.30 E-04	1.01 E-02
	890313 to 890320	* 3.90 E-03	8.97 E-03
	890320 to 890327	*-4.24 E-03	9.50 E-03
	890327 to 890403	* 1.03 E-03	1.33 E-02
	890403 to 890410	*-2.30 E-03	9.84 E-03
	890410 to 890417	*-3.78 E-03	9.31 E-03
	890417 to 890424	*-4.91 E-03	8.45 E-03
	890424 to 890501	*-1.05 E-03	1.27 E-02
	890501 to 890508	* 2.66 E-03	8.76 E-03
	890508 to 890515	* 2.39 E-03	1.07 E-02
	890515 to 890522	* 2.18 E-03	8.16 E-03
	890522 to 890530	* 3.42 E-04	7.09 E-03
	890530 to 890605	*-5.60 E-03	1.03 E-02
	890605 to 890612	* 1.11 E-03	9.99 E-03
	890612 to 890619	* 3.65 E-03	1.00 E-02
	890619 to 890626	*-2.91 E-04	1.12 E-02
	890626 to 890703	* 4.68 E-03	1.02 E-02
	890703 to 890710	*-3.25 E-03	9.11 E-03
	890710 to 890717	*-2.74 E-03	1.40 E-02
	890717 to 890724	*-7.49 E-04	1.06 E-02
	890724 to 890731	* 5.43 E-04	9.52 E-03
	890731 to 890807	*-2.45 E-03	8.75 E-03
	890807 to 890814	* 3.04 E-04	1.03 E-02
	890814 to 890821	* 1.43 E-03	1.05 E-02
	890821 to 890828	* 6.80 E-03	1.04 E-02

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
1	890828 to 890905	*-3.66 E-03	9.14 E-03
	890905 to 890911	*-9.11 E-04	1.11 E-02
	890911 to 890918	*-5.19 E-04	1.34 E-02
	890918 to 890925	*-1.16 E-02	1.30 E-02
	890925 to 901002	* 2.97 E-03	1.15 E-02
	891002 to 891009	* 3.47 E-04	9.75 E-03
	891009 to 891016	* 0.00 E+00	1.39 E-02
	891016 to 891023	* 1.37 E-03	1.02 E-02
	891023 to 891030	* 2.40 E-03	1.01 E-02
	891030 To 891106	* 5.94 E-03	9.91 E-03
	891106 To 891113	* 3.24 E-03	9.75 E-03
	891113 to 891120	* 9.39 E-04	9.33 E-03
	891120 to 891127	* 1.00 E-03	1.02 E-02
	891127 to 891204	* 1.03 E-03	9.41 E-03
	891204 to 891211	* 6.69 E-03	9.81 E-03
	891211 to 891218	* 2.76 E-03	9.47 E-03
	891218 to 891227	* 9.75 E-05	9.04 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY
4	881227 to 890103	* 7.86 E-03		1.14 E-02
	890103 to 890109	* 2.52 E-03		1.11 E-02
	890109 to 890116	* 7.19 E-03		8.41 E-03
	890116 to 890123	* 2.64 E-03		9.01 E-03
	890123 to 890130	*-1.25 E-03		9.33 E-03
	890130 to 890206	*-2.53 E-03		9.30 E-03
	890206 to 890213	* 2.51 E-04		9.39 E-03
	890213 to 890221	* 2.22 E-03		1.11 E-02
	890221 to 890227	*-3.62 E-03		1.07 E-02
	890227 to 890306	*-3.51 E-03		8.95 E-03
	890306 to 890313	* 8.16 E-04		9.94 E-03
	890313 to 890320	* 3.82 E-03		8.80 E-03
	890320 to 890327	*-4.16 E-03		9.33 E-03
	890327 to 890403	* 1.01 E-03		1.31 E-02
	890403 to 890410	*-2.25 E-03		9.63 E-03
	890410 to 890417	*-3.72 E-03		9.16 E-03
	890417 to 890424	*-4.82 E-03		8.31 E-03
	890424 to 890501	*-1.03 E-03		1.24 E-02
	890501 to 890508	* 2.60 E-03		8.54 E-03
	890508 to 890515	* 2.02 E-03		9.02 E-03
	890515 to 890522	* 2.15 E-03		8.07 E-03
	890522 to 890530	* 3.34 E-04		6.92 E-03
	890530 to 890605	*-5.50 E-03		1.01 E-02
	890605 to 890612	* 1.09 E-03		9.80 E-03
	890612 to 890619	* 1.11 E-02	(a)	3.03 E-02
	890619 to 890626	*-1.27 E-03	(a)	4.88 E-02
	890626 to 890703	* 4.60 E-03		1.00 E-02
	890703 to 890710	*-3.20 E-03		8.97 E-03
	890710 to 890717	*-2.67 E-03		1.37 E-02
	890717 to 890724	*-7.34 E-04	(b)	1.04 E-02
	890724 to 890731	* 5.33 E-04		9.36 E-03
	890731 to 890807	*-2.39 E-03		8.54 E-03
	890807 to 890814	* 3.02 E-04		1.02 E-02
	890814 to 890821	* 1.40 E-03		1.02 E-02
	890821 to 890828	* 6.68 E-03		1.03 E-02

(a) Blown fuse; very short sampling time.
(b) Pumphead indicated out of calibration; actual measurements found in tolerance; no effect on result.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
4	890828 to 890905	*-3.59 E-03	8.98 E-02
	890905 to 890911	*-8.92 E-04	1.09 E-02
	890911 to 890918	*-5.11 E-04	1.32 E-02
	890918 to 890925	*-1.14 E-02	1.28 E-02
	890925 to 891002	* 2.63 E-03	1.02 E-02
	891002 to 891009	* 3.43 E-04	9.63 E-03
	891009 to 891016	* 0.00 E+00	1.36 E-02
	891016 to 891023	* 1.36 E-03 (a)	1.01 E-02
	891023 to 891030	* 2.76 E-03 (a)	1.16 E-02
	891030 to 891106	* 5.86 E-03	9.77 E-03
	891106 to 891113	* 3.19 E-03	9.61 E-03
	891113 to 891120	* 9.19 E-04	9.13 E-03
	891120 to 891127	* 9.87 E-04	1.01 E-02
	891127 to 891204	* 1.02 E-03	9.24 E-03
	891204 to 891211	* 6.57 E-03	9.63 E-03
	891211 to 891218	* 2.71 E-03	9.30 E-03
	891218 to 891227	* 9.58 E-05	8.88 E-03

(a) Shortened sampling time due to sampler outage/malfunction.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
5	881227 to 890103	* 7.90 E-03	1.15 E-02
	890103 to 890109	* 2.54 E-03	1.12 E-02
	890109 to 890116	* 7.22 E-03	8.44 E-03
	890116 to 890123	* 2.66 E-03	9.06 E-03
	890123 to 890130	*-1.26 E-03	9.37 E-03
	890130 to 890206	*-2.54 E-03	9.35 E-03
	890206 to 890213	* 2.53 E-04	9.47 E-03
	890213 to 890221	* 2.24 E-03	1.12 E-02
	890221 to 890227	*-3.63 E-03	1.07 E-02
	890227 to 890306	*-3.54 E-03	9.05 E-03
	890306 to 890313	* 8.19 E-04	9.97 E-03
	890313 to 890320	* 3.85 E-03	8.87 E-03
	890320 to 890327	*-4.19 E-03	9.39 E-03
	890327 to 890403	* 1.02 E-03	1.32 E-02
	890403 to 890410	*-2.26 E-03	9.66 E-03
	890410 to 890417	*-3.75 E-03	9.25 E-03
	890417 to 890424	*-4.84 E-03	8.34 E-03
	890424 to 890501	*-1.04 E-03	1.26 E-02
	890501 to 890508	* 2.61 E-03	8.57 E-03
	890508 to 890515	* 2.02 E-03	9.05 E-03
	890515 to 890522	* 2.17 E-03	8.11 E-03
	890522 to 890530	* 3.37 E-04	7.09 E-03
	890530 to 890605	*-5.60 E-03	1.03 E-02
	890605 to 890612	* 1.11 E-03	9.99 E-03
	890612 to 890619	* 3.59 E-03	9.84 E-03
	890619 to 890626	*-2.87 E-04	1.10 E-02
	890626 to 890703	* 4.68 E-03	1.02 E-02
	890703 to 890710	*-1.09 E-02 (a)	3.05 E-02
	890710 to 890717	*-1.50 E-02 (a)	7.68 E-02
	890718 to 890724	*-8.29 E-04	1.18 E-02
	890724 to 890731	* 5.36 E-04	9.41 E-03
	890731 to 890807	*-2.40 E-03	8.58 E-03
	890807 to 890814	* 3.03 E-04	1.03 E-02
	890814 to 890821	* 1.41 E-03	1.03 E-02
	890821 to 890828	* 6.71 E-03	1.03 E-02

(a) Blown fuse; low sample volume; result not included in average.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
5	890828 to 890905	*-3.63 E-03	9.07 E-03
	890905 to 890911	*-8.97 E-04	1.09 E-02
	890911 to 890918	*-5.14 E-04	1.32 E-02
	890918 to 890925	*-1.15 E-02	1.29 E-02
	890925 to 891002	* 2.64 E-03	1.02 E-02
	891002 to 891009	* 3.45 E-04	9.69 E-03
	891009 to 891016	* 0.00 E+00	1.37 E-02
	891016 to 891023	* 1.36 E-03	1.01 E-02
	891023 to 891030	* 2.37 E-03	9.95 E-03
	891030 to 891106	* 5.89 E-03	9.82 E-03
	891106 to 891113	* 3.21 E-03	9.67 E-03
	891113 to 891120	* 9.23 E-04	9.17 E-03
	891120 to 891127	* 9.96 E-04	1.01 E-02
	891127 to 891204	* 1.02 E-03	9.27 E-03
	891204 to 891211	* 6.60 E-03	9.68 E-03
	891211 to 891218	* 2.72 E-03	9.34 E-03
	891218 to 891227	* 9.62 E-05	8.93 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
6	881227 to 890103	* 7.96 E-03	1.16 E-02
	890103 to 890109	* 2.56 E-03	1.13 E-02
	890109 to 890116	* 7.29 E-03	8.52 E-03
	890116 to 890123	* 2.68 E-03	9.14 E-03
	890123 to 890130	*-1.27 E-03	9.46 E-03
	890130 to 890206	*-2.56 E-03	9.43 E-03
	890206 to 890213	* 2.55 E-04	9.53 E-03
	890213 to 890221	* 2.26 E-03	1.14 E-02
	890221 to 890227	*-3.67 E-03	1.08 E-02
	890227 to 890306	*-3.58 E-03	9.14 E-03
	890306 to 890313	* 8.26 E-04	1.01 E-02
	890313 to 890320	* 3.89 E-03	8.95 E-03
	890320 to 890327	*-4.24 E-03	9.47 E-03
	890327 to 890403	* 1.03 E-03	1.33 E-02
	890403 to 890410	*-2.27 E-03	9.72 E-03
	890410 to 890417	*-3.79 E-03	9.33 E-03
	890417 to 890424	*-4.88 E-03	8.41 E-03
	890424 to 890501	*-1.05 E-03	1.27 E-02
	890501 to 890508	* 2.64 E-03	8.68 E-03
	890508 to 890515	* 2.05 E-03	9.17 E-03
	890515 to 890522	* 2.18 E-03	8.15 E-03
	890522 to 890530	* 3.41 E-04	7.06 E-03
	890530 to 890605	*-5.55 E-03	1.02 E-02
	890605 to 890612	* 1.11 E-03	9.95 E-03
	890612 to 890619	* 3.64 E-03	9.97 E-03
	890619 to 890626	*-2.90 E-04	1.12 E-02
	890626 to 890703	* 4.69 E-03	1.02 E-02
	890703 to 890710	*-3.24 E-03	9.06 E-03
	890710 to 890717	*-2.72 E-03	1.39 E-02
	890717 to 890724	*-7.48 E-04	1.06 E-02
	890724 to 890731	* 5.42 E-04	9.51 E-03
	890731 to 890807	*-2.44 E-03	8.71 E-03
	890807 to 890814	* 3.04 E-04	1.03 E-02
	890814 to 890821	* 1.42 E-03	1.04 E-02
	890821 to 890828	(a)	

(a) Sampler malfunction; out of service, no sample submitted.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
6	890828 to 890905	*-3.66 E-03	9.15 E-03
	890905 to 890911	*-9.09 E-04	1.11 E-02
	890911 to 890918	*-5.17 E-04	1.33 E-02
	890918 to 890925	*-1.16 E-02	1.30 E-02
	890925 to 891002	* 2.66 E-03	1.03 E-02
	891002 to 891009	* 3.49 E-04	9.80 E-03
	891009 to 891016	* 0.00 E+00	1.38 E-02
	891016 to 891023	* 1.37 E-03	1.02 E-02
	891023 to 891030	* 2.39 E-03	1.00 E-02
	891030 to 891106	* 5.94 E-03	9.92 E-03
	891106 to 891113	* 3.23 E-03	9.73 E-03
	891113 to 891120	* 9.36 E-04	9.30 E-03
	891120 to 891127	*-2.77 E-03	1.28 E-02
	891127 to 891204	* 1.03 E-03	9.38 E-03
	891204 to 891211	* 6.67 E-03	9.79 E-03
	891211 to 891218	* 2.75 E-03	9.44 E-03
	891218 to 891227	* 9.75 E-05	9.04 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY	
7	881227 to 890103	* 5.52	E-03	8.02	E-03
	890103 to 890109	* 1.72	E-03	7.59	E-03
	890109 to 890116	* 6.20	E-03	7.25	E-03
	890116 to 890123	* 2.28	E-03	7.78	E-03
	890123 to 890130	*-1.03	E-03	7.65	E-03
	890130 to 890206	*-1.57	E-03	5.77	E-03
	890206 to 890213	* 2.06	E-04	7.71	E-03
	890213 to 890221	* 1.57	E-03	7.88	E-03
	890221 to 890227	*-2.97	E-03	8.75	E-03
	890227 to 890306	*-2.90	E-03	7.40	E-03
	890306 to 890313	* 6.68	E-04	8.14	E-03
	890313 to 890320	* 3.14	E-03	7.24	E-03
	890320 to 890327	*-3.42	E-03	7.66	E-03
	890327 to 890403	* 7.15	E-04	9.25	E-03
	890403 to 890410	*-1.84	E-03	7.86	E-03
	890410 to 890417	*-3.22	E-03	7.94	E-03
	890417 to 890424	*-3.95	E-03	6.80	E-03
	890424 to 890501	*-6.17	E-04	7.44	E-03
	890501 to 890508	* 2.29	E-03	7.54	E-03
	890508 to 890515	* 1.75	E-03	7.81	E-02
	890515 to 890522	* 1.85	E-03	6.93	E-03
	890522 to 890530	* 2.90	E-04	6.01	E-03
	890530 to 890605	*-4.72	E-03	8.67	E-02
	890605 to 890612	* 8.96	E-04	8.05	E-03
	890612 to 890619	* 2.95	E-03	8.09	E-03
	890619 to 890626	*-2.34	E-04	9.01	E-03
	890626 to 890703	* 3.81	E-03	8.28	E-03
	890703 to 890710	*-2.76	E-03	7.73	E-03
	890710 to 890717	*-2.30	E-03 (a)	1.17	E-02
	890717 to 890724	*-6.06	E-04	8.60	E-03
	890724 to 890731	* 4.38	E-04	7.69	E-03
	890731 to 890807	*-2.07	E-03	7.41	E-03
	890807 to 890814	* 2.46	E-04	8.33	E-03
	890814 to 890821	* 1.15	E-03	8.40	E-03
	890821 to 890828	* 6.78	E-03	1.04	E-02

(a) Blown fuse; shortened sampling time.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
7	890828 to 890905	*-2.96 E-03	7.39 E-03
	890905 to 890911	*-7.35 E-04	8.95 E-03
	890911 to 890918	*-3.59 E-04	9.25 E-03
	890918 to 890925	*-8.09 E-03	9.04 E-03
	890925 to 891002	* 2.16 E-03	8.32 E-03
	891002 to 891009	* 2.82 E-04	7.93 E-03
	891009 to 891016	* 0.00 E+00	9.67 E-03
	891016 to 891023	* 1.11 E-03	8.24 E-03
	891023 to 891030	* 1.93 E-03	8.12 E-03
	891030 to 891106	* 4.81 E-03	8.02 E-03
	891106 to 891113	* 2.62 E-03	7.87 E-03
	891113 to 891120	* 7.59 E-04	7.54 E-03
	891120 to 891127	*-2.77 E-03	1.28 E-02
	891127 to 891204	* 8.76 E-04	7.98 E-03
	891204 to 891211	* 5.82 E-03 (a)	8.54 E-03
	891211 to 891218	* 2.22 E-03	7.64 E-03
	891218 to 891227	* 6.77 E-05	6.28 E-03

(a) Sampler malfunction; shortened sampling time.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
8	881227 to 890103	*-8.87 E-04	8.97 E-03
	890103 to 890109	*-2.31 E-03	9.76 E-03
	890109 to 890116	*-5.10 E-03	7.15 E-03
	890116 to 890123	* 1.67 E-03	1.42 E-02
	890123 to 890130	* 7.23 E-03	1.25 E-02
	890130 to 890206	* 8.70 E-04	1.32 E-02
	890206 to 890213	*-6.19 E-04	8.88 E-03
	890213 to 890221	* 1.45 E-03	7.76 E-03
	890221 to 890227	*-8.72 E-03	9.48 E-03
	890227 to 890306	*-4.62 E-04	7.95 E-03
	890306 to 890313	*-3.34 E-04	9.03 E-03
	890313 to 890320	* 5.46 E-03	8.35 E-03
	890320 to 890327	* 2.10 E-03	8.58 E-03
	890327 to 890403	* 6.96 E-03	1.24 E-02
	890403 to 890410	* 8.11 E-04	8.94 E-03
	890410 to 890417	*-1.68 E-03	8.02 E-03
	890417 to 890424	* 1.99 E-03	7.75 E-03
	890424 to 890501	*-1.04 E-02	1.01 E-02
	890501 to 890508	*-6.57 E-03	7.86 E-03
	890508 to 890515	* 9.74 E-04	7.96 E-03
	890515 to 890522	*-5.88 E-03	7.08 E-03
	890522 to 890530	* 2.12 E-03	6.09 E-03
	890530 to 890605	* 8.10 E-03	9.20 E-03
	890605 to 890612	* 3.18 E-03	8.60 E-03
	890612 to 890619	* 9.30 E-03	8.82 E-03
	890619 to 890626	*-3.34 E-03	9.56 E-03
	890626 to 890703	* 3.19 E-03	9.48 E-03
	890703 to 890710	* 7.44 E-03	9.50 E-03
	890710 to 890717	*-2.15 E-03	9.28 E-03
	890717 to 890724	* 0.00 E+00	9.32 E-03
	890724 to 890731	* 2.63 E-03	8.35 E-03
	890731 to 890807	*-3.81 E-03	1.31 E-02
	890807 to 890814	* 5.90 E-04 (a)	9.82 E-03
	890814 to 890821	*-2.76 E-03	9.06 E-03
	890821 to 890828	* 5.40 E-03	8.32 E-03

(a) Sampler malfunction; shortened sampling time.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
8	890828 to 890905	* 2.45 E-03	8.10 E-03
	890905 to 890911	* 1.53 E-02	1.48 E-02
	890911 to 890918	* 3.74 E-03	8.20 E-03
	890918 to 890925	*-4.99 E-03	1.37 E-02
	890925 to 891002	* 7.47 E-03	9.47 E-03
	891002 to 891009	* 2.81 E-03	8.85 E-03
	891009 to 891016	*-6.86 E-04	8.96 E-03
	891016 to 891023	* 3.48 E-03	8.94 E-03
	891023 to 891030	* 5.78 E-03	9.38 E-03
	891030 to 891106	*-2.12 E-03	8.79 E-03
	891106 to 891113	* 5.88 E-03	8.79 E-03
	891113 to 891120	* 3.13 E-03	8.32 E-03
	891120 to 891127	*-2.74 E-03	1.27 E-02
	891127 to 891204	* 1.96 E-03	9.96 E-03
	891204 to 891211	* 5.37 E-03	8.88 E-03
	891211 to 891218	*-7.28 E-03	8.76 E-03
	891218 to 891227	* 0.00 E+00	8.32 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY
9A	881227 to 890103	*-8.90 E-04		9.00 E-03
	890103 to 890109	*-2.33 E-03		9.85 E-03
	890109 to 890116	*-5.14 E-03		7.20 E-03
	890116 to 890123	* 9.63 E-04		8.19 E-03
	890123 to 890130	* 4.94 E-03		8.53 E-03
	890130 to 890206	* 1.74 E-03	(a)	2.65 E-02
	890206 to 890213	*-9.39 E-04		1.35 E-02
	890213 to 890220	* 1.40 E-03		7.50 E-03
	890220 to 890227	*-1.05 E-02		1.14 E-02
	890227 to 890306	*-4.66 E-04		8.01 E-03
	890306 to 890313	*-3.35 E-04		9.06 E-03
	890313 to 890320	* 5.49 E-03		8.40 E-03
	890320 to 890327	* 2.11 E-03		8.64 E-03
	890327 to 890403	* 7.29 E-03		1.30 E-02
	890403 to 890410	* 8.16 E-04		8.99 E-03
	890410 to 890417	*-1.69 E-03		8.10 E-03
	890417 to 890424	* 1.98 E-03		7.72 E-03
	890424 to 890501	* 1.05 E-02		1.02 E-02
	890501 to 890508	*-6.61 E-03		7.90 E-03
	890508 to 890515	* 9.81 E-04		8.02 E-03
	890515 to 890522	*-5.88 E-03		7.06 E-03
	890522 to 890530	* 5.15 E-01	(b)	1.48 E+00
	890530 to 890605	* 8.15 E-03		9.26 E-03
	890605 to 890612	* 3.20 E-03		8.66 E-03
	890612 to 890619	* 9.33 E-03		8.86 E-03
	890619 to 890626	*-3.36 E-03		9.62 E-03
	890626 to 890703	* 3.22 E-03		9.58 E-03
	890703 to 890710	* 7.41 E-03		9.46 E-03
	890710 to 890717	*-2.16 E-03		9.33 E-03
	890717 to 890724	* 0.00 E+00		9.37 E-03
	890724 to 890731	* 2.66 E-03		8.43 E-03
	890731 to 890807	*-3.82 E-03		1.31 E-02
	890807 to 890814	* 5.59 E-04		9.29 E-03
	890814 to 890821	*-2.77 E-03		9.11 E-03
	890821 to 890828	* 5.67 E-03		9.44 E-03

(a) Power outage; low sample volume.
(b) Sampler malfunction; result not included in average.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
9A	890828 to 890905	* 2.45 E-03	8.11 E-03
	890905 to 890911	* 1.55 E-02	1.49 E-02
	890911 to 890918	* 3.76 E-03	8.26 E-03
	890918 to 890925	*-5.00 E-03	1.38 E-02
	890925 to 891002	* 7.51 E-03	9.53 E-03
	891002 to 891009	* 2.82 E-03	8.90 E-03
	891009 to 891016	*-6.90 E-04	9.01 E-03
	891016 to 891023	* 3.50 E-03	8.99 E-03
	891023 to 891030	* 5.81 E-03	9.44 E-03
	891030 to 891106	*-2.14 E-03	8.84 E-03
	891106 to 891113	* 5.92 E-03	8.84 E-03
	891113 to 891120	* 3.14 E-03	8.34 E-03
	891120 to 891127	*-2.77 E-03	1.28 E-02
	891127 to 891204	* 1.97 E-03	1.00 E-02
	891204 to 891211	* 5.41 E-03	8.94 E-03
	891211 to 891218	*-7.32 E-03	8.81 E-03
	891218 to 891227	* 0.00 E+00	8.37 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY
21	881227 to 890103	*-9.01 E-04		9.12 E-03
	890103 to 890109	*-2.36 E-03		9.95 E-03
	890109 to 890116	*-5.19 E-03		7.27 E-03
	890116 to 890123	* 9.73 E-04		8.28 E-03
	890123 to 890130	* 5.04 E-03		8.69 E-03
	890130 to 890206	* 8.94 E-04	(a)	1.36 E-02
	890206 to 890213	*-6.23 E-04		8.94 E-03
	890213 to 890221	* 1.43 E-03		7.64 E-03
	890221 to 890227	*-8.79 E-03		9.55 E-03
	890227 to 890306	*-4.69 E-04		8.07 E-03
	890306 to 890313	*-3.39 E-04		9.17 E-03
	890313 to 890320	* 5.54 E-03		8.47 E-03
	890320 to 890327	* 2.13 E-03		8.72 E-03
	890327 to 890403	* 7.06 E-03		1.26 E-02
	890403 to 890410	* 8.29 E-04		9.14 E-03
	890410 to 890417	*-1.70 E-03		8.10 E-03
	890417 to 890424	* 2.02 E-03		7.81 E-03
	890424 to 890501	* 1.06 E-02		1.03 E-02
	890501 to 890508	*-6.72 E-03		8.04 E-03
	890508 to 890515	* 9.85 E-04		8.05 E-03
	890515 to 890522	*-5.95 E-03		7.15 E-03
	890522 to 890530	* 2.16 E-03		6.19 E-03
	890530 to 890605	* 8.26 E-03		9.39 E-03
	890605 to 890612	* 3.25 E-03		8.77 E-03
	890612 to 890619	* 9.47 E-03		8.98 E-03
	890619 to 890626	*-3.38 E-03		9.70 E-03
	890626 to 890703	* 3.24 E-03		9.64 E-03
	890703 to 890710	* 7.57 E-03		9.66 E-03
	890710 to 890717	*-2.20 E-03		9.49 E-03
	890717 to 890724	* 0.00 E+00	(b)	9.49 E-03
	890724 to 890731	* 2.66 E-03		8.44 E-03
	890731 to 890807	*-3.90 E-03		1.34 E-02
	890807 to 890814	* 5.59 E-04		9.30 E-03
	890814 to 890821	*-2.81 E-03		9.23 E-03
	890821 to 890828	* 5.71 E-03		9.51 E-03

(a) Sampler malfunction; lower sample volume.
(b) Low cfm on unit, result corrected.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY	
21	890828 to 890905	* 2.48	E-03	8.19	E-03
	890905 to 890911	* 1.56	E-02	1.50	E-02
	890911 to 890918	* 3.79	E-03	8.31	E-03
	890918 to 890925	*-5.05	E-03	1.39	E-02
	890925 to 891002	* 7.63	E-03	9.68	E-03
	891002 to 891009	* 2.83	E-03	8.94	E-03
	891009 to 891016	*-6.94	E-04	9.06	E-03
	891016 to 891023	* 3.53	E-03	9.07	E-03
	891023 to 891030	* 5.88	E-03	9.55	E-03
	891030 to 891106	*-2.15	E-03	8.89	E-03
	891106 to 891113	* 5.96	E-03	8.91	E-03
	891113 to 891120	* 3.19	E-03	8.47	E-03
	891120 to 891127	*-1.93	E-03	8.93	E-03
	891127 to 891204	* 2.01	E-03	1.02	E-02
	891204 to 891211	* 5.46	E-03	9.03	E-03
	891211 to 891218	*-7.39	E-03	8.90	E-03
	891218 to 891227	* 0.00	E+00	8.45	E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
23	881227 to 890103	*-9.01 E-04	9.11 E-03
	890103 to 890109	*-2.35 E-03	9.94 E-03
	890109 to 890116	*-5.18 E-03	7.26 E-03
	890116 to 890123	* 9.71 E-04	8.27 E-03
	890123 to 890130	* 5.02 E-03	8.66 E-03
	890130 to 890206	* 8.82 E-04	1.34 E-02
	890206 to 890213	*-6.24 E-04	8.95 E-03
	890213 to 890221	* 1.43 E-03	7.63 E-03
	890221 to 890227	*-9.08 E-03	9.87 E-03
	890227 to 890306	*-4.69 E-04	8.07 E-03
	890306 to 890313	*-3.39 E-04	9.16 E-03
	890313 to 890320	* 5.54 E-03	8.47 E-03
	890320 to 890327	* 2.13 E-03	8.71 E-03
	890327 to 890403	* 7.05 E-03	1.26 E-02
	890403 to 890410	* 8.29 E-04	9.13 E-03
	890410 to 890417	*-1.70 E-03	8.12 E-03
	890417 to 890424	* 2.00 E-03	7.80 E-03
	890424 to 890501	* 1.06 E-02	1.03 E-02
	890501 to 890508	*-6.71 E-03	8.03 E-03
	890508 to 890515	* 9.84 E-04	8.05 E-02
	890515 to 890522	*-5.94 E-03	7.15 E-03
	890522 to 890530	* 2.15 E-03	6.19 E-03
	890530 to 890605	* 8.25 E-03	9.38 E-03
	890605 to 890612	* 3.38 E-03 (a)	9.13 E-03
	890612 to 890619	* 9.46 E-03	8.97 E-03
	890619 to 890626	*-3.38 E-03	9.69 E-03
	890626 to 890703	* 3.23 E-03	9.60 E-03
	890703 to 890710	* 7.49 E-03	9.56 E-03
	890710 to 890717	*-2.20 E-03	9.48 E-03
	890717 to 890724	* 0.00 E+00	9.48 E-03
	890724 to 890731	* 2.66 E-03	8.43 E-03
	890731 to 890807	*-3.90 E-03	1.34 E-02
	890807 to 890814	* 2.04 E-03 (b)	3.40 E-02
	890814 to 890821	*-2.81 E-03	9.22 E-03
	890821 to 890828	* 5.72 E-03	9.54 E-03

(a) Slightly shortened sampling time due to power outage.
(b) Blown fuse; low sample volume. Result not included in average.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY	
23	890828 to 890905	* 2.47	E-03	8.17	E-03
	890905 to 890911	* 1.56	E-02	1.50	E-02
	890911 to 890918	* 3.78	E-03	8.30	E-03
	890918 to 890925	*-5.06	E-03	1.39	E-02
	890925 to 891002	* 7.63	E-03	9.67	E-03
	891002 to 891009	* 2.83	E-03	8.93	E-03
	891009 to 891016	*-7.33	E-04	9.58	E-03
	891016 to 891023	* 3.54	E-03	9.09	E-03
	891023 to 891030	* 5.88	E-03	9.54	E-03
	891030 to 891106	*-2.15	E-03	8.89	E-03
	891106 to 891113	* 5.96	E-03	8.90	E-03
	891113 to 891120	* 3.19	E-03	8.46	E-03
	891120 to 891127	* 8.54	E-03	9.27	E-03
	891127 to 891204	* 1.99	E-03	1.01	E-02
	891204 to 891211	* 5.46	E-03	9.02	E-03
	891211 to 891218	*-7.39	E-03	8.89	E-03
	891218 to 891227	* 0.00	E+00	8.68	E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT		OVERALL UNCERTAINTY
40	881227 to 890103	*-5.99 E-04		6.06 E-03
	890103 to 890109	*-1.20 E-03		5.08 E-03
	890109 to 890116	*-3.48 E-03		4.88 E-03
	890116 to 890123	* 6.51 E-04		5.54 E-03
	890123 to 890130	* 4.18 E-03		7.21 E-03
	890130 to 890206	* 5.01 E-04		7.63 E-03
	890206 to 890213	*-5.27 E-04		7.55 E-03
	890213 to 890221	* 1.19 E-03		6.36 E-03
	890221 to 890227	*-7.42 E-03		8.07 E-03
	890227 to 890306	*-3.95 E-04		6.79 E-03
	890306 to 890313	*-3.27 E-04		8.84 E-03
	890313 to 890320	* 4.65 E-03		7.10 E-03
	890320 to 890327	* 1.79 E-03		7.31 E-03
	890327 to 890403	* 4.01 E-03		7.16 E-03
	890403 to 890410	* 6.91 E-04		7.61 E-03
	890410 to 890417	*-1.15 E-03		5.47 E-03
	890417 to 890424	* 1.68 E-03		6.53 E-03
	890424 to 890501	* 8.43 E-03		8.19 E-03
	890501 to 890508	*-4.47 E-03		5.35 E-03
	890508 to 890515	* 6.61 E-04		5.40 E-03
	890515 to 890522	*-4.26 E-03	(a)	5.13 E-03
	890522 to 890530	* 1.45 E-03		4.16 E-03
	890530 to 890605	* 5.51 E-03		6.26 E-02
	890605 to 890612	* 2.71 E-03		7.33 E-03
	890612 to 890619	* 7.90 E-03		7.49 E-03
	890619 to 890626	*-2.84 E-03		8.14 E-03
	890626 to 890703	* 2.72 E-03		8.09 E-03
	890703 to 890710	* 5.98 E-03		7.63 E-03
	890710 to 890717	*-1.12 E-03		4.82 E-03
	890717 to 890724	* 0.00 E+00		7.93 E-03
	890724 to 890731	* 2.24 E-03		7.11 E-03
	890731 to 890807	*-2.19 E-03		7.54 E-03
	890807 to 890814	* 4.73 E-04		7.86 E-03
	890814 to 890821	*-2.35 E-03		7.71 E-03
	890821 to 890828	* 5.64 E-03		9.40 E-03

(a) Power outage; shortened sampling time.
* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
40	890828 to 890905	* 2.08 E-03	6.86 E-03
	890905 to 890911	* 8.82 E-03	8.50 E-03
	890911 to 890918	* 2.16 E-03	4.73 E-03
	890918 to 890925	*-3.46 E-03	9.53 E-03
	890925 to 891002	* 6.36 E-03	8.06 E-03
	891002 to 891009	* 2.39 E-03	7.53 E-03
	891009 to 891016	*-5.84 E-04	7.63 E-03
	891016 to 891023	* 2.96 E-03	7.61 E-03
	891023 to 891030	* 4.92 E-03	7.98 E-03
	891030 to 891106	*-1.81 E-03	7.48 E-03
	891106 to 891113	* 5.01 E-03	7.48 E-03
	891113 to 891120	* 2.66 E-03	7.08 E-03
	891120 to 891127	* 8.45 E-03	9.18 E-03
	891127 to 891204	* 1.33 E-03	6.76 E-03
	891204 to 891211	* 4.57 E-03	7.56 E-03
	891211 to 891218	*-6.19 E-03	7.45 E-03
	891218 to 891227	* 0.00 E+00	5.66 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1-(Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
48	881227 to 890103	* 3.33 E-04	7.41 E-03
	890103 to 890109	* 5.40 E-03	9.33 E-03
	890109 to 890116	* 2.29 E-03	1.27 E-02
	890116 to 890123	*-4.42 E-03	1.37 E-02
	890123 to 890130	*-5.18 E-03	7.19 E-03
	890130 to 890206	* 0.00 E+00	8.42 E-03
	890206 to 890213	*-2.06 E-03	1.25 E-02
	890213 to 890221	* 3.43 E-04	6.01 E-03
	890221 to 890227	* 7.07 E-03	8.40 E-03
	890227 to 890306	* 4.82 E-03	7.31 E-03
	890306 to 890313	*-2.54 E-03	1.35 E-02
	890313 to 890320	*-2.60 E-03	1.23 E-02
	890320 to 890327	* 7.55 E-04	7.33 E-03
	890327 to 890403	* 4.37 E-03	9.77 E-03
	890403 to 890410	*-2.68 E-04	7.48 E-03
	890410 to 890417	*-5.01 E-03	1.33 E-02
	890417 to 890424	*-2.87 E-04	6.59 E-03
	890424 to 890501	*-7.03 E-04	8.69 E-03
	890501 to 890508	* 3.10 E-04	1.29 E-02
	890508 to 890515	*-1.93 E-03	1.30 E-02
	890515 to 890522	* 1.03 E-03	1.20 E-02
	890522 to 890530	*-1.06 E-04	1.07 E-02
	890530 to 890605	* 7.51 E-03	1.61 E-02
	890605 to 890612	* 6.75 E-03	7.77 E-03
	890612 to 890619	*-1.39 E-03	7.72 E-03
	890619 to 890626	*-3.75 E-03	8.61 E-03
	890626 to 890703	* 2.52 E-04	7.98 E-03
	890703 to 890710	*-2.58 E-03	8.20 E-03
	890710 to 890717	*-5.99 E-03	9.16 E-03
	890717 to 890724	* 1.33 E-03	8.48 E-03
	890724 to 890731	*-1.88 E-03	1.27 E-02
	890731 to 890807	*-3.37 E-03	8.98 E-03
	890807 to 890814	* 1.26 E-04	1.00 E-02
	890814 to 890821	*-3.28 E-03	1.37 E-02
	890821 to 890828	* 4.79 E-03	7.99 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
48	890828 to 890905	*-3.27 E-03	6.80 E-03
	890905 to 890911	*-2.92 E-03	1.18 E-02
	890911 to 890918	*-9.08 E-03	1.27 E-02
	890918 to 890925	*-1.29 E-03	8.37 E-03
	890925 to 891002	* 5.04 E-03	7.98 E-03
	891002 to 891009	* 2.08 E-03	7.76 E-03
	891009 to 891016	*-6.00 E-03	1.20 E-02
	891016 to 891023	* 0.00 E+00	7.86 E-03
	891023 to 891030	* 9.09 E-03	8.10 E-03
	891030 to 891106	*-2.68 E-04	7.63 E-03
	891106 to 891113	*-5.91 E-03	1.30 E-02
	891113 to 891120	*-1.33 E-03	1.01 E-02
	891120 to 891127	* 8.40 E-03	9.12 E-03
	891127 to 891204	* 1.97 E-03	2.71 E-02
	891204 to 891211	*-2.56 E-03	1.01 E-02
	891211 to 891218	*-2.60 E-03	7.48 E-03
	891218 to 891227	*-7.51 E-03	1.27 E-02

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
57	881227 to 890103	* 3.39 E-04	7.53 E-03
	890103 to 890109	* 5.52 E-03	9.54 E-03
	890109 to 890116	* 2.33 E-03	1.29 E-02
	890116 to 890123	*-4.52 E-03	1.39 E-02
	890123 to 890130	*-5.31 E-03	7.37 E-03
	890130 to 890206	* 0.00 E+00	1.45 E-02
	890206 to 890213	*-2.08 E-03	1.26 E-02
	890213 to 890221	* 3.55 E-04	6.21 E-03
	890221 to 890227	* 7.12 E-03	8.45 E-03
	890227 to 890306	* 4.90 E-03	7.43 E-03
	890306 to 890313	*-2.59 E-03	1.38 E-02
	890313 to 890320	*-2.64 E-03	1.25 E-02
	890320 to 890327	* 7.68 E-04	7.46 E-03
	890327 to 890403	* 4.45 E-03	9.93 E-03
	890403 to 890410	*-2.73 E-04	7.64 E-03
	890410 to 890417	*-5.07 E-03	1.35 E-02
	890417 to 890424	*-2.92 E-04	6.70 E-03
	890424 to 890501	*-7.11 E-04	8.79 E-03
	890501 to 890508	* 3.17 E-04	1.32 E-02
	890508 to 890515	*-1.96 E-03	1.32 E-02
	890515 to 890522	* 1.05 E-03	1.22 E-02
	890522 to 890530	*-1.09 E-04	1.09 E-02
	890530 to 890605	* 7.65 E-03	1.64 E-02
	890605 to 890612	* 6.88 E-03	7.92 E-03
	890612 to 890619	*-1.42 E-03	7.88 E-03
	890619 to 890626	*-3.82 E-03	8.75 E-03
	890626 to 890703	* 2.56 E-04	8.10 E-03
	890703 to 890710	*-2.62 E-03	8.33 E-03
	890710 to 890717	*-6.14 E-03	9.39 E-03
	890717 to 890724	* 1.36 E-03	8.65 E-03
	890724 to 890731	*-1.90 E-03	1.29 E-02
	890731 to 890807	*-3.46 E-03	9.20 E-03
	890807 to 890814	* 1.28 E-04	1.02 E-02
	890814 to 890821	*-3.39 E-03	1.42 E-02
	890821 to 890828	*-6.30 E-03	8.15 E-03

* Denotes a result less than the detection limit.

TABLE A-4.1 (Cont.)

I-131 IN CHARCOAL FILTERS

Results in pCi/cubic meter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
57	890828 to 890905	*-3.31 E-03	6.88 E-03
	890905 to 890911	*-2.99 E-03	1.20 E-02
	890911 to 890918	*-9.24 E-03	1.29 E-02
	890918 to 890925	*-1.31 E-03	8.53 E-03
	890925 to 891002	* 5.15 E-03	8.15 E-03
	891002 to 891009	* 2.10 E-03	7.85 E-03
	891009 to 891016	*-6.11 E-03	1.22 E-02
	891016 to 891023	* 0.00 E+00	7.97 E-03
	891023 to 891030	* 9.27 E-03	8.26 E-03
	891030 to 891106	*-2.73 E-04	7.77 E-03
	891106 to 891113	*-5.99 E-03	1.32 E-02
	891113 to 891120	*-1.36 E-03	1.03 E-02
	891120 to 891127	* 8.55 E-03	9.28 E-02
	891127 to 891204	* 2.01 E-03	2.76 E-02
	891204 to 891211	*-2.61 E-03	1.03 E-02
	891211 to 891219	*-2.66 E-03	7.64 E-03
	891219 to 891227	*-7.51 E-03	1.29 E-02

* Denotes a result less than the detection limit.

TABLE A-4.2

I-131 IN CHARCOAL FILTERS - SUMMARY

Results in pCi/cubic meter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
I-131 (I)	6.22E-04	-1.16E-02	1.56E-02	571	0
I-131 (C)	1.40E-03	-1.05E-02	1.55E-02	52	0

(I) Indicator Stations
(C) Control Station

TABLE A-5.1

GROSS BETA IN WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
	River/Drinking		
26	881214 to 890118	1.8 E+00	8.0 E-01
	890118 to 890215	1.5 E+00 (a)	8.0 E-01
	890215 to 890315	2.1 E+00 (a)	8.0 E-01
	890315 to 890412	2.3 E+00 (a)	8.0 E-01
	890412 to 890516	2.4 E+00	4.0 E-01
	890516 to 890613	2.9 E+00	8.0 E-01
	890613 to 890712	4.1 E+00	9.0 E-01
	890712 to 890815	3.9 E+00	1.0 E+00
	890815 to 890913	* 1.1 E+00 (a)	7.6 E-01
	890913 to 891011	3.3 E+00 (a)	9.0 E-01
	891011 to 881107	2.6 E+00	1.1 E+00
	891108 to 891206	1.6 E+00	7.0 E-01
28	881214 to 890118	1.4 E+00	7.0 E-01
	890118 to 890215	1.6 E+00	8.0 E-01
	890215 to 890315	1.8 E+00	8.0 E-01
	890315 to 890412	2.1 E+00	8.0 E-01
	890412 to 890516	3.4 E+00	4.0 E-01
	890516 to 890613	3.3 E+00	9.0 E-01
	890613 to 890712	2.8 E+00 (a)	8.0 E-01
	890712 to 890815	1.7 E+00	8.0 E-01
	890815 to 890913	1.4 E+00	8.0 E-01
	890913 to 891011	1.2 E+00	7.0 E-01
	891011 to 891107	1.7 E+00	8.0 E-01
	891108 to 891206	1.8 E+00	7.0 E-01
29	881214 to 890118	1.5 E+00	7.0 E-01
	890118 to 890215	1.4 E+00	8.0 E-01
	890215 to 890315	2.2 E+00	8.0 E-01
	890315 to 890412	1.9 E+00	8.0 E-01
	890412 to 890516	3.0 E+00	8.0 E-01
	890516 to 890613	2.6 E+00	8.0 E-01
	890613 to 890712	2.4 E+00	8.0 E-01
	890712 to 890815	* 9.6 E-01	6.9 E-01
	890815 to 890913	1.5 E+00	8.0 E-01
	890913 to 891011	3.6 E+00	9.0 E-01
	891011 to 891107	2.3 E+00	9.0 E-01
	891108 to 891206	2.0 E+00	7.0 E-01

(a) Sampler out of operation during part of the period.
 * Denotes a result less than the detection limit.

TABLE A-5.1 (Cont.)

GROSS BETA IN WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
	Discharge		
27	881214 to 890118	2.6 E+01	3.0 E+00
	890118 to 890215	2.5 E+01 (a)	3.0 E+00
	890215 to 890315	2.7 E+01	3.0 E+00
	890315 to 890412	1.8 E+01	2.0 E+00
	890412 to 890509	2.3 E+01	1.0 E+00
	890606 to 890613	3.1 E+01 (a)	2.0 E+00
	890613 to 890712	4.8 E+01 (a)	3.0 E+00
	890712 to 890815	4.2 E+01 (a)	4.0 E+00
	890815 to 890913	3.5 E+01 (a)	4.0 E+00
	890926 to 891011	3.2 E+01 (b)	3.0 E+00
	891011 to 891107	3.3 E+01	3.0 E+00
	891108 to 891206	3.3 E+01	3.0 E+00

(a) Sampler malfunction during part of period.
(b) Sampler out of operation from 9/13 to 9/25.

TABLE A-5.2

GROSS BETA IN WATER - SUMMARY

Results in pCi/liter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
		River/Drinking			
Gr-Beta (I)	2.07E+00	9.60E-01	3.60E+00	24	23
Gr-Beta (C)	2.47E+00	1.10E+00	4.10E+00	12	11
		Discharge (a)			
Gr-Beta (I)	3.09E+01	1.80E+01	4.80E+01	12	12

(a) Duplicate station 72 not included in averages.
(I) Indicator Stations
(C) Control Station

TABLE A-6.1

TRITIUM IN WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
		River/Drinking	
26	881214 to 890315	* 1.2 E+00 (a)	9.7 E+01
	890315 to 890613	* 6.1 E+01	6.5 E+01
	890613 to 890913	1.4 E+02 (a)	8.0 E+01
	890913 to 891206	* 6.0 E+01	1.1 E+02
28	881214 to 890315	2.9 E+02	1.2 E+02
	890315 to 890613	2.2 E+02	7.0 E+01
	890613 to 890913	1.8 E+02 (a)	9.0 E+01
	890912 to 891206	1.5 E+02	9.0 E+01
29	881214 to 890315	* 1.2 E+02	9.0 E+01
	890315 to 890613	* 5.4 E+01	7.2 E+01
	890613 to 890913	1.9 E+02	6.0 E+01
	890913 to 891206	*-6.2 E+01	7.4 E+01
		Discharge	
27	881214 to 890315	* 2.1 E+02 (a)	1.3 E+02
	890315 to 890613	2.4 E+03 (a)	1.0 E+02
	890613 to 890913	3.5 E+03 (a)	1.0 E+02
	890913 to 891206	* 6.0 E+01 (a)	1.1 E+02
		Ground	
31 (Well 1)	890315	* 5.0 E+01	9.9 E+01
	880613	*-4.3 E+01	9.7 E+01
	890913	*-1.3 E+02	9.0 E+01
	891206	* 1.1 E+02	8.0 E+01
32 (Well 2)	890315	* 6.2 E+01	8.2 E+01
	890728	*-5.0 E+01 (b)	8.9 E+01
	890913	* 3.1 E+01	9.2 E+01
	891206	* 5.2 E+01	8.6 E+01

(a) Sampler out of operation during part of this period.
(b) Sample delayed due to pump outage.
* Denotes a result less than the detection limit.

TABLE A-6.1 (Cont.)

TRITIUM IN WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	RESULT	OVERALL UNCERTAINTY
		Ground	
52 (Well 3)	890315	* 9.0 E+01	7.7 E+01
	890613	* 5.0 E+01	9.2 E+01
	890913	* 3.9 E+01	9.8 E+01
	891206	*-4.0 E+01	9.4 E+01

* Denotes a result less than the detection limit.

TABLE A-6.2

TRITIUM IN WATER - SUMMARY

Results in pCi/liter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
			River/Drinking			
H-3	(I)	1.43E+02	-6.20E+01	2.90E+02	8	5
H-3	(C)	6.56E+01	1.20E+00	1.40E+02	4	1
			Discharge (a)			
H-3	(I)	1.54E+03	6.00E+01	3.50E+03	4	2
			Ground			
H-3	(I)	1.84E+01	-1.30E+02	1.10E+02	12	0

(a) Duplicate station 72 not included in average.
(I) Indicator Stations
(C) Control Station

TABLE A-7.1

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	881214 to 890118	Be-7	* 1.71 E+00	1.87 E+01
		K-40	* 1.43 E+02	3.20 E+01
		Mn-54	*-3.55 E-01	1.93 E+00
		Co-58	*-6.54 E-01	2.02 E+00
		Fe-59	*-2.84 E+00	4.20 E+00
		Co-60	*-7.71 E-01	2.18 E+00
		Zn-65	* 6.70 E+00	4.98 E+00
		Zr-95	* 1.32 E+00	4.20 E+00
		Nb-95	* 2.46 E+00	2.16 E+00
		Cs-134	*-4.59 E-01	2.32 E+00
		Cs-137	* 1.12 E+00	2.21 E+00
		Ba-140	*-6.18 E+00	6.82 E+00
		La-140	*-7.34 E-01	3.08 E+00
		Ra-226	* 6.88 E+01	5.37 E+01
		Th-228	* 8.15 E+00	3.83 E+00
	890118 to 890215 (a)	Be-7	* 4.84 E+00	2.28 E+01
		K-40	* 4.10 E+02	4.24 E+01
		Mn-54	* 6.17 E-01	2.36 E+00
		Co-58	*-1.29 E+00	2.57 E+00
		Fe-59	* 4.11 E+00	5.43 E+00
		Co-60	* 4.01 E+00	2.66 E+00
		Zn-65	*-2.96 E+00	5.62 E+00
		Zr-95	* 3.21 E-01	5.06 E+00
		Nb-95	* 1.66 E-01	2.52 E+00
		Cs-134	* 1.80 E-01	2.53 E+00
		Cs-137	* 6.71 E-01	2.67 E+00
		Ba-140	*-1.51 E+00	9.94 E+00
		La-140	* 1.72 E-01	3.89 E+00
		Ra-226	* 9.07 E+01	5.86 E+01
		Th-228	* 5.74 E+00	4.25 E+00

(a) Sampler out of operation during part of this period.
 * Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	890215 to 890315 (a)	Be-7	* 0.00 E+00	1.75 E+01
		K-40	* 1.60 E+02	3.16 E+01
		Mn-54	* 1.47 E-01	1.89 E+00
		Co-58	*-5.27 E-01	1.80 E+00
		Fe-59	* 4.05 E+00	4.03 E+00
		Co-60	* 1.60 E+00	2.16 E+00
		Zn-65	*-3.86 E+00	4.29 E+00
		Zr-95	* 2.74 E-01	3.93 E+00
		Nb-95	* 3.05 E+00	1.96 E+00
		Cs-134	* 1.50 E+00	2.06 E+00
		Cs-137	* 5.48 E-01	1.93 E+00
		Ba-140	*-2.45 E+00	6.30 E+00
		La-140	*-2.48 E+00	3.41 E+00
		Ra-226	* 1.62 E+02	4.89 E+01
		Th-228	* 1.55 E+01	3.69 E+00
	890315 to 890412 (a)	Be-7	*-4.00 E-01	2.54 E+01
		K-40	* 9.71 E+02	6.54 E+01
		Mn-54	*-5.69 E-01	2.73 E+00
		Co-58	*-7.23 E-01	2.87 E+00
		Fe-59	*-8.00 E-01	6.33 E+00
		Co-60	*-1.05 E+00	2.84 E+00
		Zn-65	*-4.90 E-01	6.57 E+00
		Zr-95	* 1.33 E+00	5.63 E+00
		Nb-95	* 4.35 E-01	2.88 E+00
		Cs-134	*-4.08 E-01	2.92 E+00
		Cs-137	* 3.32 E+00	3.02 E+00
		Ba-140	* 2.76 E+00	1.05 E+01
		La-140	* 0.00 E+00	4.44 E+00
		Ra-226	* 7.78 E+01	5.17 E+01
		Th-228	* 9.96 E+00	4.36 E+00

(a) Sampler out of operation during part of this period.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	890412 to 890516	Be-7	* 1.32 E+01	2.61 E+01
		K-40	* 1.00 E+03	6.64 E+01
		Mn-54	* 3.87 E-01	2.73 E+00
		Co-58	*-6.76 E-01	2.87 E+00
		Fe-59	* 5.63 E+00	6.11 E+00
		Co-60	* 1.17 E+00	2.97 E+00
		Zn-65	*-6.00 E+00	6.44 E+00
		Zr-95	* 3.60 E+00	5.69 E+00
		Nb-95	* 8.33 E-01	2.91 E+00
		Cs-134	*-6.93 E-02	2.91 E+00
		Cs-137	* 2.17 E+00	3.04 E+00
		Ba-140	*-3.38 E+00	1.10 E+01
		La-140	* 1.71 E+00	5.15 E+00
		Ra-226	* 8.88 E+01	5.18 E+01
		Th-228	* 1.54 E+01	4.44 E+00
	890516 to 890613	Be-7	*-1.82 E+01	1.94 E+01
		K-40	* 1.10 E+02	2.78 E+01
		Mn-54	* 2.89 E+00	2.04 E+00
		Co-58	* 6.92 E-01	2.06 E+00
		Fe-59	* 2.14 E+00	4.62 E+00
		Co-60	* 1.51 E+00	2.29 E+00
		Zn-65	*-6.86 E-01	4.68 E+00
		Zr-95	* 1.13 E+00	4.27 E+00
		Nb-95	* 8.50 E-01	2.05 E+00
		Cs-134	* 8.20 E-01	2.12 E+00
		Cs-137	* 1.80 E+00	2.14 E+00
		Ba-140	* 2.78 E+00	9.69 E+00
		La-140	*-9.90 E-01	5.01 E+00
		Ra-226	* 1.11 E+02	4.17 E+01
		Th-228	* 1.02 E+01	3.43 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	890613 to 890712	Be-7	* 5.74 E+00	1.83 E+01
		K-40	* 1.09 E+02	2.93 E+01
		Mn-54	* 2.03 E-01	1.98 E+00
		Co-58	*-4.96 E-01	2.13 E+00
		Fe-59	* 1.97 E+00	4.59 E+00
		Co-60	*-6.43 E-01	2.40 E+00
		Zn-65	* 7.22 E-01	4.73 E+00
		Zr-95	* 1.93 E+00	4.29 E+00
		Nb-95	* 6.01 E-01	2.14 E+00
		Cs-134	* 4.35 E-01	2.25 E+00
		Cs-137	* 1.18 E+00	2.26 E+00
		Ba-140	*-3.37 E+00	7.91 E+00
		La-140	*-2.96 E+00	4.16 E+00
		Ra-226	* 8.14 E+01	4.30 E+01
		Th-228	* 1.09 E+01	3.52 E+00
	890712 to 890815	Be-7	*-2.12 E+01	2.65 E+01
		K-40	* 2.83 E+02	4.12 E+01
		Mn-54	* 2.32 E+00	2.74 E+00
		Co-58	*-2.70 E-01	2.84 E+00
		Fe-59	*-1.83 E+00	5.70 E+00
		Co-60	* 1.57 E+00	2.94 E+00
		Zn-65	*-2.35 E+00	5.85 E+00
		Zr-95	* 2.85 E+00	6.01 E+00
		Nb-95	* 1.47 E-01	3.03 E+00
		Cs-134	* 4.22 E+00	3.14 E+00
		Cs-137	* 1.62 E+00	3.01 E+00
		Ba-140	*-5.11 E+00	1.14 E+01
		La-140	* 1.54 E+00	5.18 E+00
		Ra-226	* 1.31 E+02	6.22 E+01
		Th-228	* 7.47 E+01	5.92 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	890815 to 890913 (a)	Be-7	* 3.56 E+00	1.48 E+01
		K-40	* 9.09 E+01	2.26 E+01
		Mn-54	* 1.39 E+00	1.51 E+00
		Co-58	* 4.88 E-01	1.54 E+00
		Fe-59	* 5.43 E-01	3.58 E+00
		Co-60	* 4.75 E-01	1.73 E+00
		Zn-65	*-2.70 E-01	3.48 E+00
		Zr-95	* 1.78 E+00	3.22 E+00
		Nb-95	* 1.03 E-01	1.62 E+00
		Cs-134	* 1.65 E+00	1.65 E+00
		Cs-137	* 7.59 E-01	1.63 E+00
		Ba-140	*-1.63 E+00	6.37 E+00
		La-140	* 4.94 E-01	3.06 E+00
		Ra-226	* 9.53 E+01	3.82 E+01
		Th-228	* 9.96 E+00	2.90 E+00
	890913 to 891011 (a)	Be-7	* 7.11 E+00	2.10 E+01
		K-40	* 1.07 E+02	2.89 E+01
		Mn-54	* 8.93 E-01	1.95 E+00
		Co-58	* 1.39 E+00	2.17 E+00
		Fe-59	* 8.28 E-01	4.56 E+00
		Co-60	*-4.44 E-01	2.14 E+00
		Zn-65	*-3.28 E+00	4.32 E+00
		Zr-95	* 1.21 E+00	4.22 E+00
		Nb-95	* 2.80 E+00	2.36 E+00
		Cs-134	* 1.27 E+00	2.19 E+00
		Cs-137	*-4.12 E-01	2.16 E+00
		Ba-140	*-2.51 E+00	1.15 E+01
		La-140	*-1.50 E+00	5.37 E+00
		Ra-226	* 1.34 E+02	5.20 E+01
		Th-228	* 1.50 E+01	4.03 E+00

(a) Sampler out of operation during part of this period.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
26	891011 to 891107	Be-7	*-3.92 E+00	1.66 E+01
		K-40	* 1.10 E+02	2.46 E+01
		Mn-54	* 8.68 E-01	1.66 E+00
		Co-58	* 1.08 E+00	1.75 E+00
		Fe-59	* 1.99 E+00	4.08 E+00
		Co-60	* 1.06 E+00	1.92 E+00
		Zn-65	* 1.41 E+00	4.04 E+00
		Zr-95	* 2.35 E+00	3.56 E+00
		Nb-95	* 1.95 E+00	1.86 E+00
		Cs-134	* 8.73 E-01	1.79 E+00
		Cs-137	* 3.41 E+00	1.87 E+00
		Ba-140	*-3.17 E+00	8.11 E+00
		La-140	* 1.78 E-01	3.98 E+00
		Ra-226	* 9.98 E+01	3.60 E+01
		Th-228	* 1.31 E+01	2.94 E+00
	891108 to 891206	Be-7	* 1.08 E+01	2.13 E+01
		K-40	* 8.24 E+01	2.98 E+01
		Mn-54	*-3.12 E-01	1.97 E+00
		Co-58	*-2.43 E-01	2.10 E+00
		Fe-59	* 0.00 E+00	4.43 E+00
		Co-60	* 0.00 E+00	2.35 E+00
		Zn-65	*-6.25 E+00	4.33 E+00
		Zr-95	*-2.08 E+00	4.59 E+00
		Nb-95	* 9.98 E+00	2.75 E+00
		Cs-134	*-1.68 E-01	2.25 E+00
		Cs-137	* 2.41 E+00	2.39 E+00
		Ba-140	* 2.96 E+00	8.14 E+00
		La-140	*-2.62 E+00	3.66 E+00
		Ra-226	* 1.32 E+02	5.41 E+01
		Th-228	* 1.53 E+01	4.25 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	881214 to 890118	Be-7	* 3.13 E+01	2.79 E+01
		K-40	* 3.24 E+02	4.39 E+01
		Mn-54	* 8.75 E-01	2.86 E+00
		Co-58	* 1.38 E-01	2.93 E+00
		Fe-59	*-1.50 E+00	5.56 E+00
		Co-60	* 7.00 E+00	3.33 E+00
		Zn-65	*-5.24 E-01	6.44 E+00
		Zr-95	*-1.64 E+00	5.85 E+00
		Nb-95	*-1.56 E+00	2.89 E+00
		Cs-134	* 3.27 E+00	3.38 E+00
		Cs-137	* 4.23 E+00	3.31 E+00
		Ba-140	* 8.20 E+00	1.04 E+01
		La-140	*-2.90 E+00	4.23 E+00
		Ra-226	* 1.46 E+02	6.64 E+01
		Th-228	* 7.25 E+01	6.10 E+00
	890118 to 890215 (a)	Be-7	* 5.17 E+00	2.01 E+01
		K-40	* 9.78 E+01	3.01 E+01
		Mn-54	* 1.05 E+00	2.13 E+00
		Co-58	*-1.57 E-01	2.16 E+00
		Fe-59	* 9.61 E-01	4.50 E+00
		Co-60	* 2.30 E-01	2.51 E+00
		Zn-65	* 9.80 E-01	4.79 E+00
		Zr-95	* 1.43 E-00	4.67 E+00
		Nb-95	* 1.18 E+00	2.18 E+00
		Cs-134	*-6.47 E-01	2.22 E+00
		Cs-137	* 4.91 E-01	2.25 E+00
		Ba-140	* 4.78 E+00	8.65 E+00
		La-140	*-6.41 E-01	3.70 E+00
		Ra-226	* 1.16 E+02	5.20 E+01
		Th-228	* 1.34 E+01	4.04 E+00

(a) Sampler out of operation during part of this period.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	890215 to 890315	Be-7	* 2.80 E+00	2.55 E+01
		K-40	* 1.09 E+03	7.07 E+01
		Mn-54	* 1.23 E+00	2.81 E+00
		Co-58	*-1.72 E+00	2.76 E+00
		Fe-59	* 2.55 E+00	6.18 E+00
		Co-60	* 2.35 E+00	3.22 E+00
		Zn-65	*-2.00 E+00	6.65 E+00
		Zr-95	* 4.49 E+00	6.03 E+00
		Nb-95	* 3.63 E+00	2.95 E+00
		Cs-134	*-9.08 E-01	2.99 E+00
		Cs-137	* 2.38 E+00	3.06 E+00
		Ba-140	*-2.38 E+00	9.59 E+00
		La-140	* 1.95 E+00	4.25 E+00
		Ra-226	* 1.43 E+02	5.61 E+01
		Th-228	* 1.00 E+01	4.64 E+00
	890315 to 890412	Be-7	*-1.09 E+01	1.71 E+01
		K-40	* 1.40 E+02	3.16 E+01
		Mn-54	* 1.51 E+00	1.91 E+00
		Co-58	*-5.45 E-01	1.79 E+00
		Fe-59	*-1.37 E+00	4.19 E+00
		Co-60	* 1.15 E+00	2.34 E+00
		Zn-65	*-1.58 E+00	4.52 E+00
		Zr-95	* 2.35 E+00	3.87 E+00
		Nb-95	* 1.09 E+00	1.91 E+00
		Cs-134	* 3.52 E-01	2.02 E+00
		Cs-137	* 3.18 E+00	2.03 E+00
		Ba-140	*-3.28 E+00	6.83 E+00
		La-140	*-3.94 E+00	3.58 E+00
		Ra-226	* 1.10 E+02	4.50 E+01
		Th-228	* 1.28 E+01	3.29 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	890412 to 890509(a)	Be-7	* 2.25 E+01	2.68 E+01
		K-40	* 1.12 E+03	6.25 E+01
		Mn-54	* 2.08 E+00	2.56 E+00
		Co-58	*-1.06 E+00	2.85 E+00
		Fe-59	* 1.85 E+00	6.76 E+00
		Co-60	* 0.00 E+00	2.65 E+00
		Zn-65	*-1.89 E+00	6.05 E+00
		Zr-95	* 2.20 E-01	5.65 E+00
		Nb-95	* 2.15 E+00	3.00 E+00
		Cs-134	* 2.37 E+00	2.78 E+00
		Cs-137	* 3.70 E+00	2.70 E+00
		Ba-140	*-1.71 E+00	1.80 E+01
		La-140	*-2.45 E+00	7.84 E+00
		Ra-226	* 1.23 E+02	4.73 E+01
		Th-228	* 1.79 E+01	4.10 E+00
	890606 to 890613	Be-7	*-5.24 E+00	2.08 E+01
		K-40	* 1.36 E+02	3.15 E+01
		Mn-54	* 4.97 E+00	2.44 E+00
		Co-58	* 1.59 E+00	2.43 E+00
		Fe-59	* 4.24 E+00	5.09 E+00
		Co-60	2.82 E+01	4.76 E+00
		Zn-65	2.92 E+01	8.86 E+00
		Zr-95	*-2.26 E+00	4.57 E+00
		Nb-95	* 1.58 E+00	2.34 E+00
		Cs-134	* 1.51 E+00	2.46 E+00
		Cs-137	* 1.48 E+00	2.38 E+00
		Ba-140	* 4.97 E-01	1.06 E+01
		La-140	*-7.52 E-01	4.70 E+00
		Ra-226	* 1.20 E+02	5.30 E+01
		Th-228	* 1.25 E+01	3.92 E+00

(a) Sampler not operational from 5/09 to 6/06.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	890613 to 890712 (a)	Be-7	* 1.33 E+01	1.77 E+01
		K-40	* 8.26 E+01	2.36 E+01
		Mn-54	* 2.03 E+00	1.85 E+00
		Co-58	* 3.94 E-01	2.02 E+00
		Fe-59	* 2.66 E+00	4.12 E+00
		Co-60	1.46 E+01	3.80 E+00
		Zn-65	1.60 E+01	5.62 E+00
		Zr-95	*-1.44 E+00	3.95 E+00
		Nb-95	* 1.65 E+00	1.96 E+00
		Cs-134	* 2.29 E+00	2.22 E+00
		Cs-137	* 1.53 E+00	2.14 E+00
		Ba-140	* 0.00 E+00	7.82 E+00
		La-140	* 6.73 E-01	3.59 E+00
		Ra-226	* 1.13 E+02	4.40 E+01
		Th-228	* 1.22 E+01	3.42 E+00
	890712 to 890815 (a)	Be-7	* 2.87 E+00	2.21 E+01
		K-40	* 3.89 E+02	4.20 E+01
		Mn-54	* 3.52 E+00	2.32 E+00
		Co-58	*-2.60 E+00	2.31 E+00
		Fe-59	* 1.08 E+00	5.07 E+00
		Co-60	1.16 E+01	3.93 E+00
		Zn-65	* 2.59 E+00	5.58 E+00
		Zr-95	*-2.17 E+00	4.70 E+00
		Nb-95	* 1.53 E+00	2.37 E+00
		Cs-134	* 9.98 E-01	2.51 E+00
		Cs-137	* 2.33 E+00	2.60 E+00
		Ba-140	*-4.32 E+00	9.22 E+00
		La-140	* 2.54 E-00	4.21 E+00
		Ra-226	* 1.60 E+02	5.56 E+01
		Th-228	* 7.32 E+00	4.07 E+00

(a) Sampler out of operation during part of this period.
 * Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	890815 to 890913 (a)	Be-7	* 3.51 E+00	1.71 E+01
		K-40	* 8.96 E+01	2.43 E+01
		Mn-54	* 2.10 E+00	1.87 E+00
		Co-58	* 8.99 E-01	1.96 E+00
		Fe-59	* 5.52 E+00	4.46 E+00
		Co-60	2.34 E+01	4.37 E+00
		Zn-65	* 9.40 E+00	5.03 E+00
		Zr-95	*-2.04 E+00	3.98 E+00
		Nb-95	* 1.75 E+00	1.98 E+00
		Cs-134	* 1.18 E+00	2.04 E+00
		Cs-137	* 1.86 E-01	2.00 E+00
		Ba-140	*-1.61 E-01	7.92 E+00
		La-140	*-1.11 E+00	3.42 E+00
		Ra-226	* 1.13 E+02	4.28 E+01
		Th-228	* 1.05 E+01	3.32 E+00
	890926 to 891011 (b)	Be-7	* 1.36 E-01	2.83 E+01
		K-40	* 9.77 E+02	6.63 E+01
		Mn-54	* 7.29 E-01	2.87 E+00
		Co-58	*-1.45 E+00	2.99 E+00
		Fe-59	* 2.95 E+00	7.00 E+00
		Co-60	* 8.38 E+00	3.57 E+00
		Zn-65	*-2.06 E+00	7.24 E+00
		Zr-95	* 3.09 E+00	6.06 E+00
		Nb-95	* 2.08 E-01	3.02 E+00
		Cs-134	* 1.13 E+00	3.10 E+00
		Cs-137	* 3.97 E+00	3.15 E+00
		Ba-140	* 8.66 E+00	1.56 E+01
		La-140	* 2.40 E+00	7.30 E+00
		Ra-226	* 8.44 E+01	5.33 E+01
		Th-228	* 1.11 E+01	4.51 E+00

(a) Sampler out of operation during part of this period.
(b) Sampler out of operation from 9/13 to 9/25.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Discharge		
27	891011 to 891107	Be-7	* 3.57 E+00	1.70 E+01
		K-40	* 1.37 E+02	2.56 E+01
		Mn-54	* 1.51 E-01	1.69 E+00
		Co-58	* 7.03 E-01	1.74 E+00
		Fe-59	* 2.88 E+00	3.82 E+00
		Co-60	* 3.09 E-01	1.85 E+00
		Zn-65	*-3.98 E-01	4.00 E+00
		Zr-95	* 5.94 E-01	3.59 E+00
		Nb-95	* 6.66 E-01	1.70 E+00
		Cs-134	*-2.16 E-01	1.72 E+00
		Cs-137	* 2.27 E+00	1.82 E+00
		Ba-140	* 4.29 E+00	8.10 E+00
		La-140	* 1.44 E+00	3.82 E+00
		Ra-226	* 6.65 E+01	4.48 E+01
		Th-228	* 1.18 E+01	3.23 E+00
	891108 to 891206	Be-7	* 1.98 E+01	2.71 E+01
		K-40	* 1.03 E+03	7.04 E+01
		Mn-54	* 3.47 E+00	2.96 E+00
		Co-58	*-1.08 E+00	2.98 E+00
		Fe-59	* 1.41 E+00	6.54 E+00
		Co-60	* 3.46 E+00	3.30 E+00
		Zn-65	* 4.66 E+00	7.12 E+00
		Zr-95	* 5.83 E+00	6.09 E+00
		Nb-95	* 3.55 E+00	3.09 E+00
		Cs-134	*-5.98 E-01	3.14 E+00
		Cs-137	* 2.99 E+00	3.14 E+00
		Ba-140	* 3.04 E+00	1.14 E+01
		La-140	*-6.98 E+00	4.97 E+00
		Ra-226	* 3.95 E+01	5.51 E+01
		Th-228	* 8.36 E+00	4.70 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	881214 to 890118	Be-7	* 6.11 E+00	2.14 E+01
		K-40	* 4.00 E+02	4.23 E+01
		Mn-54	* 3.78 E-01	2.22 E+00
		Co-58	* 1.54 E+00	2.36 E+00
		Fe-59	* 2.98 E+00	4.91 E+00
		Co-60	* 2.03 E+00	2.55 E+00
		Zn-65	*-1.42 E+00	5.46 E+00
		Zr-95	* 2.71 E+00	4.77 E+00
		Nb-95	* 3.84 E+00	2.41 E+00
		Cs-134	*-9.30 E-01	2.49 E+00
		Cs-137	* 3.11 E+00	2.57 E+00
		Ba-140	*-2.73 E-01	8.06 E+00
		La-140	*-9.85 E-01	3.50 E+00
		Ra-226	* 1.04 E+02	5.65 E+01
		Th-228	* 9.09 E+00	4.15 E+00
	890118 to 890215	Be-7	* 1.61 E+01	1.82 E+01
		K-40	* 9.81 E+01	2.84 E+01
		Mn-54	* 9.26 E-01	1.96 E+00
		Co-58	*-1.20 E+00	1.93 E+00
		Fe-59	* 5.94 E-01	4.16 E+00
		Co-60	* 1.19 E+00	2.13 E+00
		Zn-65	* 0.00 E+00	4.50 E+00
		Zr-95	* 1.46 E+00	3.67 E+00
		Nb-95	* 3.78 E-01	1.87 E+00
		Cs-134	* 1.08 E+00	2.02 E+00
		Cs-137	* 2.65 E+00	2.03 E+00
		Ba-140	* 4.38 E-01	7.13 E+00
		La-140	*-3.98 E+00	3.43 E+00
		Ra-226	* 7.63 E+01	4.81 E+01
		Th-228	* 1.03 E+01	3.66 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	890215 to 890315	Be-7	*-1.21 E+00	1.70 E+01
		K-40	* 8.85 E+01	2.77 E+01
		Mn-54	* 6.40 E-01	2.04 E+00
		Co-58	*-1.18 E+00	1.92 E+00
		Fe-59	* 1.56 E+00	4.24 E+00
		Co-60	* 3.83 E-01	2.35 E+00
		Zn-65	*-5.40 E+00	4.44 E+00
		Zr-95	*-1.33 E+00	4.04 E+00
		Nb-95	* 2.54 E+00	2.03 E+00
		Cs-134	*-3.46 E-01	2.26 E+00
		Cs-137	* 1.58 E+00	2.03 E+00
		Ba-140	*-2.37 E+00	6.45 E+00
		La-140	*-1.88 E+00	3.44 E+00
		Ra-226	* 9.43 E+01	3.91 E+01
		Th-228	* 9.90 E+00	3.18 E+00
	890315 to 890412	Be-7	* 9.22 E+00	1.73 E+01
		K-40	* 8.71 E+01	2.74 E+01
		Mn-54	* 1.19 E+00	1.71 E+00
		Co-58	* 1.16 E+00	1.88 E+00
		Fe-59	* 9.51 E-01	4.11 E+00
		Co-60	* 5.72 E-01	2.36 E+00
		Zn-65	*-2.92 E+00	4.33 E+00
		Zr-95	*-1.41 E-01	3.70 E+00
		Nb-95	* 2.19 E-01	1.89 E+00
		Cs-134	* 8.00 E-02	2.06 E+00
		Cs-137	* 1.11 E+00	2.01 E+00
		Ba-140	*-1.48 E+00	6.80 E+00
		La-140	*-3.58 E+00	3.56 E+00
		Ra-226	* 1.31 E+02	4.55 E+01
		Th-228	* 1.19 E+01	3.54 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	890412 to 890516	Be-7	*-4.77 E+00	1.74 E+01
		K-40	* 8.89 E+01	2.76 E+01
		Mn-54	* 9.14 E-01	1.90 E+00
		Co-58	* 7.98 E-01	1.96 E+00
		Fe-59	* 2.17 E+00	4.09 E+00
		Co-60	* 1.05 E+00	1.94 E+00
		Zn-65	*-1.99 E-01	4.25 E+00
		Zr-95	* 4.38 E-01	4.11 E+00
		Nb-95	* 1.13 E+00	2.03 E+00
		Cs-134	*-3.27 E-01	2.01 E+00
		Cs-137	* 2.76 E+00	2.11 E+00
		Ba-140	*-6.91 E-01	7.25 E+00
		La-140	* 6.88 E-01	4.02 E+00
		Ra-226	* 1.26 E+02	4.60 E+01
		Th-228	* 1.05 E+01	3.64 E+00
	890516 to 890613	Be-7	*-5.47 E+00	2.86 E+01
		K-40	* 2.86 E+02	4.21 E+01
		Mn-54	* 1.27 E-01	2.73 E+00
		Co-58	*-9.63 E-01	2.83 E+00
		Fe-59	*-2.08 E+00	6.01 E+00
		Co-60	* 2.89 E+00	3.05 E+00
		Zn-65	*-4.32 E+00	6.20 E+00
		Zr-95	* 1.01 E+00	6.32 E+00
		Nb-95	* 4.57 E-01	3.02 E+00
		Cs-134	* 2.18 E+00	2.94 E+00
		Cs-137	* 2.35 E+00	3.08 E+00
		Ba-140	*-7.16 E-01	1.43 E+01
		La-140	*-1.17 E+00	6.07 E+00
		Ra-226	* 1.95 E+02	6.32 E+01
		Th-228	* 7.16 E+01	5.87 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	890613 to 890712 (a)	Be-7	*-2.47 E+01	2.68 E+01
		K-40	* 2.73 E+02	4.18 E+01
		Mn-54	*-9.42 E-01	2.67 E+00
		Co-58	* 8.46 E-01	2.87 E+00
		Fe-59	* 5.21 E-01	5.86 E+00
		Co-60	* 6.45 E+00	3.31 E+00
		Zn-65	*-2.45 E+00	6.25 E+00
		Zr-95	*-3.23 E+00	6.05 E+00
		Nb-95	* 1.33 E+00	3.01 E+00
		Cs-134	* 5.20 E+00	3.15 E+00
		Cs-137	* 5.08 E+00	3.30 E+00
		Ba-140	* 3.68 E+00	1.15 E+01
		La-140	*-1.40 E+00	5.23 E+00
		Ra-226	* 1.62 E+02	6.46 E+01
		Th-228	* 7.04 E+01	5.99 E+00
	890712 to 890815	Be-7	* 0.00 E+00	2.89 E+01
		K-40	* 3.10 E+02	4.31 E+01
		Mn-54	* 1.30 E+00	2.86 E+00
		Co-58	*-5.08 E-01	2.91 E+00
		Fe-59	* 2.34 E+00	6.21 E+00
		Co-60	* 6.05 E+00	3.22 E+00
		Zn-65	*-5.90 E+00	5.95 E+00
		Zr-95	* 3.46 E+00	6.16 E+00
		Nb-95	* 2.40 E+00	2.96 E+00
		Cs-134	* 1.62 E+00	3.14 E+00
		Cs-137	* 4.08 E+00	3.24 E+00
		Ba-140	*-9.03 E+00	1.25 E+01
		La-140	*-1.08 E+00	5.30 E+00
		Ra-226	* 1.96 E+02	6.50 E+01
		Th-228	* 7.26 E+01	6.13 E+00

(a) Sampler out of operation during part of this period.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	890815to 890913	Be-7	* 9.23 E+00	4.04 E+01
		K-40	* 8.96 E+02	8.86 E+01
		Mn-54	* 1.48 E+00	4.04 E+00
		Co-58	*-1.59 E+00	4.22 E+00
		Fe-59	*-3.06 E+00	9.36 E+00
		Co-60	* 3.13 E+00	4.38 E+00
		Zn-65	*-7.23 E+00	9.88 E+00
		Zr-95	*-2.59 E+00	9.10 E+00
		Nb-95	* 4.46 E-01	4.39 E+00
		Cs-134	* 2.97 E+00	4.54 E+00
		Cs-137	* 4.67 E+00	4.34 E+00
		Ba-140	* 1.56 E+01	2.07 E+01
		La-140	* 3.14 E+00	8.59 E+00
		Ra-226	* 1.84 E+02	1.09 E+02
		Th-228	* 3.82 E+01	7.98 E+00
28	890913 to 891011	Be-7	* 8.83 E-01	1.87 E+01
		K-40	* 1.43 E+02	3.06 E+01
		Mn-54	* 4.83 E-01	1.90 E+00
		Co-58	* 9.80 E-01	1.92 E+00
		Fe-59	* 1.58 E+00	4.50 E+00
		Co-60	* 1.30 E+00	2.35 E+00
		Zn-65	* 0.00 E+00	4.38 E+00
		Zr-95	*-1.10 E+00	3.89 E+00
		Nb-95	* 2.43 E+00	2.05 E+00
		Cs-134	*-2.19 E-01	1.93 E+00
		Cs-137	* 8.07 E-01	2.01 E+00
		Ba-140	*-8.24 E-01	9.97 E+00
		La-140	* 0.00 E+00	5.43 E+00
		Ra-226	* 1.51 E+02	4.61 E+01
		Th-228	* 1.22 E+01	3.34 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
28	891011 to 891107	Be-7	*-1.56 E+00	2.39 E+01
		K-40	* 3.10 E+02	3.69 E+01
		Mn-54	* 1.05 E+00	2.33 E+00
		Co-58	* 5.64 E-01	2.53 E+00
		Fe-59	* 4.37 E+00	5.18 E+00
		Co-60	* 4.92 E+00	2.62 E+00
		Zn-65	*-5.23 E+00	5.35 E+00
		Zr-95	*-1.60 E+00	5.31 E+00
		Nb-95	* 2.72 E+00	2.58 E+00
		Cs-134	* 2.35 E+00	2.66 E+00
		Cs-137	* 3.36 E+00	2.71 E+00
		Ba-140	* 6.31 E+00	1.20 E+01
		La-140	* 3.17 E+00	4.98 E+00
		Ra-226	* 1.68 E+02	5.41 E+01
		Th-228	* 7.80 E+01	5.16 E+00
	891108 to 891206	Be-7	* 1.44 E+00	2.07 E+01
		K-40	* 1.04 E+02	2.92 E+01
		Mn-54	* 5.33 E-01	2.06 E+00
		Co-58	*-1.59 E-01	2.10 E+00
		Fe-59	* 1.57 E+00	4.91 E+00
		Co-60	* 1.05 E+00	2.57 E+00
		Zn-65	*-2.98 E+00	4.68 E+00
		Zr-95	* 1.31 E+00	4.55 E+00
		Nb-95	* 1.13 E+00	2.21 E+00
		Cs-134	* 5.72 E-01	2.36 E+00
		Cs-137	* 1.84 E+00	2.30 E+00
		Ba-140	* 4.16 E+00	8.69 E+00
		La-140	* 0.00 E+00	4.04 E+00
		Ra-226	* 1.30 E+02	5.24 E+01
		Th-228	* 1.62 E+01	4.12 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	881214 to 890118	Be-7	* 8.17 E+00	1.70 E+01
		K-40	* 8.83 E+01	2.61 E+01
		Mn-54	* 1.66 E+00	1.76 E+00
		Co-58	*-6.18 E-01	1.83 E+00
		Fe-59	* 2.26 E+00	4.24 E+00
		Co-60	* 1.76 E+00	1.91 E+00
		Zn-65	* 0.00 E+00	4.35 E+00
		Zr-95	*-7.03 E-01	4.03 E+00
		Nb-95	* 8.73 E-01	1.95 E+00
		Cs-134	*-2.44 E-01	2.09 E+00
		Cs-137	* 3.23 E+00	2.15 E+00
		Ba-140	*-1.54 E+00	6.11 E+00
		La-140	* 2.72 E+00	2.85 E+00
		Ra-226	* 9.49 E+01	4.75 E+01
		Th-228	* 8.25 E+00	3.50 E+00
	890118 to 890215	Be-7	*-8.28 E+00	2.54 E+01
		K-40	* 9.63 E+02	6.68 E+01
		Mn-54	* 8.51 E-01	2.71 E+00
		Co-58	*-5.45 E-01	2.84 E+00
		Fe-59	* 1.66 E+00	6.42 E+00
		Co-60	* 8.90 E-01	2.97 E+00
		Zn-65	*-6.26 E+00	6.69 E+00
		Zr-95	*-2.00 E+00	5.72 E+00
		Nb-95	* 3.29 E+00	3.01 E+00
		Cs-134	*-2.19 E+00	3.02 E+00
		Cs-137	* 1.97 E+00	2.96 E+00
		Ba-140	*-2.28 E+00	1.06 E+01
		La-140	*-2.36 E+00	4.69 E+00
		Ra-226	* 7.83 E+01	5.40 E+01
		Th-228	* 1.20 E+01	4.51 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	890215 to 890315	Be-7	* 1.18 E+00	2.97 E+01
		K-40	* 1.76 E+03	9.11 E+01
		Mn-54	*-4.68 E-01	3.34 E+00
		Co-58	* 1.30 E+00	3.32 E+00
		Fe-59	* 2.88 E+00	7.49 E+00
		Co-60	*-2.12 E-01	3.74 E+00
		Zn-65	*-1.24 E+01	8.26 E+00
		Zr-95	*-3.96 E+00	6.63 E+00
		Nb-95	* 5.39 E+00	3.47 E+00
		Cs-134	* 4.31 E-01	3.57 E+00
		Cs-137	*-6.16 E-02	3.62 E+00
		Ba-140	* 3.52 E+00	1.12 E+01
		La-140	* 5.86 E+00	5.37 E+00
		Ra-226	* 9.69 E+01	6.94 E+01
		Th-228	* 2.11 E+01	5.44 E+00
	890315 to 890412	Be-7	*-6.03 E+00	1.63 E+01
		K-40	* 7.88 E+01	2.59 E+01
		Mn-54	* 0.00 E+00	1.90 E+00
		Co-58	*-7.81 E-01	2.01 E+00
		Fe-59	* 1.57 E+00	4.16 E+00
		Co-60	* 2.52 E+00	2.27 E+00
		Zn-65	*-1.76 E+00	4.75 E+00
		Zr-95	* 1.44 E+00	3.86 E+00
		Nb-95	* 0.00 E+00	1.90 E+00
		Cs-134	*-1.96 E+00	2.09 E+00
		Cs-137	* 1.60 E+00	2.16 E+00
		Ba-140	* 3.30 E+00	7.37 E+00
		La-140	*-3.57 E+00	3.50 E+00
		Ra-226	* 1.01 E+02	3.93 E+01
		Th-228	* 9.71 E+00	3.23 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	890412 to 890516	Be-7	* 2.04 E+01	1.75 E+01
		K-40	* 5.90 E+01	2.35 E+01
		Mn-54	* 1.41 E+00	1.87 E+00
		Co-58	* 0.00 E+00	2.00 E+00
		Fe-59	*-1.63 E+00	4.27 E+00
		Co-60	* 2.09 E+00	2.12 E+00
		Zn-65	*-1.31 E+00	4.29 E+00
		Zr-95	*-2.97 E+00	3.89 E+00
		Nb-95	* 1.91 E+00	2.14 E+00
		Cs-134	*-2.76 E-01	2.21 E+00
		Cs-137	* 0.00 E+00	2.04 E+00
		Ba-140	* 1.60 E+00	7.65 E+00
		La-140	* 3.33 E+00	3.73 E+00
		Ra-226	* 7.71 E+01	3.80 E+01
		Th-228	* 1.06 E+01	3.17 E+00
	890516 to 890613	Be-7	* 1.02 E+01	2.24 E+01
		K-40	* 4.36 E+02	4.26 E+01
		Mn-54	* 7.16 E-01	2.23 E+00
		Co-58	* 1.60 E+00	2.48 E+00
		Fe-59	*-2.82 E-01	5.23 E+00
		Co-60	* 3.16 E+00	2.53 E+00
		Zn-65	* 0.00 E+00	5.10 E+00
		Zr-95	* 2.92 E+00	4.93 E+00
		Nb-95	* 6.79 E-01	2.48 E+00
		Cs-134	* 0.00 E+00	2.35 E+00
		Cs-137	* 1.40 E-01	2.53 E+00
		Ba-140	* 2.44 E+00	1.18 E+01
		La-140	*-4.83 E+00	5.03 E+00
		Ra-226	* 1.37 E+02	5.53 E+01
		Th-228	* 1.20 E+01	4.07 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	890613 to 890712	Be-7	* 8.97 E+00	2.23 E+01
		K-40	* 3.94 E+02	4.30 E+01
		Mn-54	* 5.40 E-02	2.28 E+00
		Co-58	*-8.47 E-01	2.36 E+00
		Fe-59	*-7.06 E-01	5.09 E+00
		Co-60	* 1.85 E+00	2.51 E+00
		Zn-65	* 2.56 E+00	5.33 E+00
		Zr-95	* 1.13 E+00	4.89 E+00
		Nb-95	* 2.13 E+00	2.39 E+00
		Cs-134	* 5.79 E-01	2.49 E+00
		Cs-137	* 2.54 E+00	2.61 E+00
		Ba-140	* 8.02 E+00	9.53 E+00
		La-140	*-2.32 E+00	4.19 E+00
		Ra-226	* 1.12 E+02	5.66 E+01
		Th-228	* 5.71 E+00	4.10 E+00
	890712 to 890815	Be-7	* 1.72 E+00	2.31 E+01
		K-40	* 4.06 E+02	4.30 E+01
		Mn-54	*-9.37 E-01	2.36 E+00
		Co-58	* 1.05 E+00	2.45 E+00
		Fe-59	*-1.46 E+00	5.13 E+00
		Co-60	* 1.45 E+00	2.75 E+00
		Zn-65	*-3.49 E+00	5.66 E+00
		Zr-95	*-3.29 E+00	4.67 E+00
		Nb-95	* 4.94 E-01	2.42 E+00
		Cs-134	* 1.65 E+00	2.58 E+00
		Cs-137	* 1.87 E+00	2.57 E+00
		Ba-140	* 0.00 E+00	9.95 E+00
		La-140	* 0.00 E+00	4.29 E+00
		Ra-226	* 1.37 E+02	5.64 E+01
		Th-228	* 8.88 E+00	4.13 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	890815 to 890913	Be-7	* 0.00 E+00	1.46 E+01
		K-40	* 8.68 E+01	2.30 E+01
		Mn-54	* 3.59 E-01	1.56 E+00
		Co-58	*-1.19 E+00	1.56 E+00
		Fe-59	* 9.43 E-01	3.37 E+00
		Co-60	* 2.35 E+00	1.80 E+00
		Zn-65	*-3.22 E+00	3.35 E+00
		Zr-95	*-3.17 E+00	3.17 E+00
		Nb-95	* 6.14 E-01	1.62 E+00
		Cs-134	*-3.30 E-01	1.57 E+00
		Cs-137	* 2.33 E+00	1.71 E+00
		Ba-140	* 3.91 E+00	6.54 E+00
		La-140	* 1.94 E+00	3.18 E+00
		Ra-226	* 9.53 E+01	3.88 E+01
		Th-228	* 1.22 E+01	2.95 E+00
	890913 to 891011	Be-7	*-1.36 E+01	2.04 E+01
		K-40	* 1.06 E+02	2.93 E+01
		Mn-54	* 1.56 E+00	2.08 E+00
		Co-58	*-7.70 E-01	2.12 E+00
		Fe-59	* 8.76 E-01	4.46 E+00
		Co-60	* 1.42 E+00	2.21 E+00
		Zn-65	*-3.07 E+00	4.51 E+00
		Zr-95	* 5.03 E+00	4.66 E+00
		Nb-95	*-1.06 E+00	2.14 E+00
		Cs-134	* 3.33 E-01	2.15 E+00
		Cs-137	* 3.65 E+00	2.32 E+00
		Ba-140	*-5.47 E+00	1.12 E+01
		La-140	*-6.41 E-01	5.39 E+00
		Ra-226	* 5.75 E+01	4.82 E+01
		Th-228	* 1.13 E+01	3.76 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		River/Drinking		
29	891011 to 891107	Be-7	* 9.27 E+00	1.96 E+01
		K-40	* 3.87 E+02	3.57 E+01
		Mn-54	* 1.15 E+00	1.93 E+00
		Co-58	*-1.11 E+00	2.05 E+00
		Fe-59	* 1.88 E+00	4.58 E+00
		Co-60	* 1.31 E+00	2.18 E+00
		Zn-65	* 2.64 E+00	4.63 E+00
		Zr-95	* 2.40 E+00	4.30 E+00
		Nb-95	* 2.64 E+00	2.14 E+00
		Cs-134	* 4.09 E-02	2.05 E+00
		Cs-137	* 1.54 E+00	2.10 E+00
		Ba-140	*-8.04 E-01	9.33 E+00
		La-140	*-2.21 E+00	4.06 E+00
		Ra-226	* 8.36 E+00	4.62 E+01
		Th-228	* 5.23 E+00	3.40 E+00
	891108 to 891206	Be-7	* 0.00 E+00	2.02 E+01
		K-40	* 1.02 E+02	2.86 E+01
		Mn-54	*-5.95 E-01	1.97 E+00
		Co-58	* 2.26 E+00	2.20 E+00
		Fe-59	* 2.10 E+00	4.65 E+00
		Co-60	*-1.12 E-01	2.22 E+00
		Zn-65	*-9.63 E+00	5.03 E+00
		Zr-95	*-3.72 E+00	4.29 E+00
		Nb-95	* 7.39 E+00	2.51 E+00
		Cs-134	*-5.60 E-01	2.31 E+00
		Cs-137	* 6.96 E-01	2.23 E+00
		Ba-140	*-2.05 E+00	8.65 E+00
		La-140	*-6.56 E-01	4.08 E+00
		Ra-226	* 1.37 E+02	5.32 E+01
		Th-228	* 1.81 E+01	4.21 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
31	890315	Be-7	*-1.33 E+01	2.77 E+01
		K-40	* 3.21 E+02	4.33 E+01
		Mn-54	* 4.71 E-01	2.81 E+00
		Co-58	* 1.32 E+00	3.08 E+00
		Fe-59	*-1.69 E+00	6.12 E+00
		Co-60	* 7.82 E+00	3.25 E+00
		Zn-65	*-7.52 E+00	6.45 E+00
		Zr-95	*-2.92 E+00	6.08 E+00
		Nb-95	* 1.97 E+00	3.03 E+00
		Cs-134	* 5.44 E+00	3.36 E+00
		Cs-137	* 1.64 E+00	3.28 E+00
		Ba-140	*-2.96 E+00	1.09 E+01
		La-140	*-3.61 E-01	4.46 E+00
		Ra-226	* 1.68 E+02	6.78 E+01
		Th-228	* 7.49 E+01	6.25 E+00
	890613	Be-7	* 1.45 E+00	1.76 E+01
		K-40	* 9.88 E+01	2.90 E+01
		Mn-54	*-2.34 E-01	1.91 E+00
		Co-58	*-9.78 E-01	1.88 E+00
		Fe-59	* 0.00 E+00	4.01 E+00
		Co-60	* 2.16 E+00	2.15 E+00
		Zn-65	* 1.02 E+00	4.30 E+00
		Zr-95	* 1.49 E+00	3.83 E+00
		Nb-95	* 1.62 E+00	2.05 E+00
		Cs-134	*-4.18 E-01	2.00 E+00
		Cs-137	* 1.59 E+00	1.91 E+00
		Ba-140	*-4.19 E+00	7.18 E+00
		La-140	*-2.12 E+00	3.81 E+00
		Ra-226	* 9.97 E+01	4.81 E+01
		Th-228	* 1.15 E+01	3.60 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
31	890913	Be-7	* 4.41 E+00	2.05 E+01
		K-40	* 9.23 E+01	2.91 E+01
		Mn-54	*-6.22 E-01	2.07 E+00
		Co-58	*-2.25 E-01	2.17 E+00
		Fe-59	*-1.95 E-01	4.96 E+00
		Co-60	* 2.70 E+00	2.43 E+00
		Zn-65	*-2.95 E+00	4.98 E+00
		Zr-95	* 8.21 E-01	4.56 E+00
		Nb-95	* 1.92 E+00	2.23 E+00
		Cs-134	* 1.17 E+00	2.10 E+00
		Cs-137	* 3.00 E+00	2.31 E+00
		Ba-140	* 3.70 E+00	1.06 E+01
		La-140	*-1.97 E+00	5.39 E+00
		Ra-226	* 1.38 E+02	4.30 E+01
		Th-228	* 1.64 E+01	3.60 E+00
	891206	Be-7	*-2.99 E-01	1.50 E+01
		K-40	* 1.22 E+02	2.62 E+01
		Mn-54	* 3.95 E-01	1.62 E+00
		Co-58	*-2.60 E-01	1.67 E+00
		Fe-59	* 3.44 E+00	3.62 E+00
		Co-60	* 7.04 E-01	1.93 E+00
		Zn-65	* 1.45 E+00	4.03 E+00
		Zr-95	* 1.79 E+00	3.53 E+00
		Nb-95	* 2.50 E+00	1.81 E+00
		Cs-134	* 0.00 E+00	1.74 E+00
		Cs-137	* 2.47 E+00	1.90 E+00
		Ba-140	* 3.48 E+00	6.80 E+00
		La-140	*-1.15 E+00	3.46 E+00
		Ra-226	* 1.48 E+02	4.00 E+01
		Th-228	* 1.27 E+01	2.92 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
32	890315	Be-7	*-1.82 E+01	2.19 E+01
		K-40	* 4.65 E+02	4.47 E+01
		Mn-54	* 1.73 E+00	2.38 E+00
		Co-58	*-7.24 E-01	2.31 E+00
		Fe-59	*-1.79 E+00	4.81 E+00
		Co-60	* 1.86 E+00	2.55 E+00
		Zn-65	*-1.27 E+01	5.69 E+00
		Zr-95	* 0.00 E+00	4.64 E+00
		Nb-95	* 1.31 E+00	2.44 E+00
		Cs-134	* 4.06 E-01	2.56 E+00
		Cs-137	* 1.25 E+00	2.65 E+00
		Ba-140	* 4.35 E-01	8.77 E+00
		La-140	*-8.97 E-01	3.91 E+00
		Ra-226	* 1.09 E+02	5.74 E+01
		Th-228	* 9.59 E+00	4.22 E+00
	890728 (a)	Be-7	* 6.40 E+00	1.92 E+01
		K-40	* 5.24 E+01	2.15 E+01
		Mn-54	* 2.04 E-01	1.74 E+00
		Co-58	* 1.83 E-01	2.08 E+00
		Fe-59	* 4.89 E-01	5.18 E+00
		Co-60	*-8.09 E-01	2.01 E+00
		Zn-65	*-2.65 E-01	4.01 E+00
		Zr-95	*-2.40 E+00	4.15 E+00
		Nb-95	* 2.59 E+00	2.17 E+00
		Cs-134	*-2.10 E+00	1.93 E+00
		Cs-137	* 4.64 E-02	1.86 E+00
		Ba-140	* 7.76 E-01	1.69 E+01
		La-140	*-5.75 E+00	9.06 E+00
		Ra-226	* 1.17 E+02	3.38 E+01
		Th-228	* 1.15 E+01	2.85 E+00

(a) Pump failure; sample collection delayed.
* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
32	890913	Be-7	* 8.94 E+00	2.39 E+01
		K-40	* 4.22 E+02	4.37 E+01
		Mn-54	*-6.60 E-01	2.34 E+00
		Co-58	* 8.96 E-01	2.61 E+00
		Fe-59	*-6.15 E-01	5.64 E+00
		Co-60	* 2.46 E+00	2.55 E+00
		Zn-65	*-9.89 E+00	5.65 E+00
		Zr-95	*-1.20 E+00	5.04 E+00
		Nb-95	* 6.80 E-01	2.58 E+00
		Cs-134	* 1.87 E+00	2.49 E+00
		Cs-137	* 5.51 E-01	2.61 E+00
		Ba-140	* 4.48 E+00	1.28 E+01
		La-140	* 1.54 E+00	5.51 E+00
		Ra-226	* 1.12 E+02	5.74 E+01
		Th-228	* 1.21 E+01	4.21 E+00
	891206	Be-7	* 1.34 E+01	1.55 E+01
		K-40	* 1.11 E+02	2.42 E+01
		Mn-54	* 4.47 E-01	1.58 E+00
		Co-58	* 1.18 E-01	1.67 E+00
		Fe-59	* 2.20 E+00	3.63 E+00
		Co-60	* 1.62 E+00	1.81 E+00
		Zn-65	* 5.85 E-01	3.50 E+00
		Zr-95	*-1.51 E+00	3.36 E+00
		Nb-95	* 1.56 E+00	1.72 E+00
		Cs-134	* 4.79 E-01	1.76 E+00
		Cs-137	* 1.35 E+00	1.73 E+00
		Ba-140	*-3.37 E+00	6.93 E+01
		La-140	*-2.29 E+00	3.38 E+00
		Ra-226	* 1.51 E+02	4.10 E+01
		Th-228	* 1.46 E+01	3.15 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
52	890315	Be-7	*-4.14 E+00	1.71 E+01
		K-40	* 9.16 E+01	2.73 E+01
		Mn-54	* 4.53 E-01	1.77 E+00
		Co-58	*-1.56 E-01	1.94 E+00
		Fe-59	* 2.11 E+00	4.17 E+00
		Co-60	* 2.22 E+00	2.08 E+00
		Zn-65	*-1.39 E+00	3.98 E+00
		Zr-95	* 7.11 E-01	3.71 E+00
		Nb-95	* 6.62 E-01	1.85 E+00
		Cs-134	* 3.25 E-01	2.04 E+00
		Cs-137	*-3.51 E-01	1.99 E+00
		Ba-140	*-2.05 E-01	6.56 E+00
		La-140	*-2.49 E+00	3.33 E+00
		Ra-226	* 3.69 E+01	4.65 E+01
		Th-228	* 1.35 E+01	3.56 E+00
	890613	Be-7	*-2.01 E+01	2.00 E+01
		K-40	* 9.16 E+01	2.99 E+01
		Mn-54	* 9.12 E-01	1.91 E+00
		Co-58	* 3.19 E-01	2.03 E+00
		Fe-59	* 2.36 E+00	4.65 E+00
		Co-60	* 1.04 E+00	2.23 E+00
		Zn-65	* 0.00 E+00	4.54 E+00
		Zr-95	*-2.63 E+00	4.27 E+00
		Nb-95	*-8.29 E-01	2.18 E+00
		Cs-134	*-3.26 E-01	2.29 E+00
		Cs-137	* 1.27 E+00	2.32 E+00
		Ba-140	*-4.40 E+00	9.00 E+00
		La-140	*-1.60 E+00	3.91 E+00
		Ra-226	* 1.25 E+02	5.18 E+01
		Th-228	* 1.46 E+01	4.01 E+00

* Denotes a result less than the detection limit.

TABLE A-7.1 (Cont.)

GAMMA SPECTROMETRY OF WATER

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
		Ground		
52	890913	Be-7	*-5.21 E+00	2.73 E+01
		K-40	* 8.74 E+02	6.49 E+01
		Mn-54	*-4.91 E-01	2.71 E+00
		Co-58	* 1.37 E+00	3.07 E+00
		Fe-59	* 3.08 E+00	6.79 E+00
		Co-60	* 1.46 E+00	3.07 E+00
		Zn-65	*-5.09 E+00	6.68 E+00
		Zr-95	* 1.06 E+01	6.26 E+00
		Nb-95	* 2.62 E+00	3.17 E+00
		Cs-134	* 5.99 E-01	3.06 E+00
		Cs-137	* 3.89 E-01	3.03 E+00
		Ba-140	*-9.82 E+00	1.45 E+01
		La-140	*-5.63 E+00	6.86 E+00
		Ra-226	* 1.18 E+02	5.27 E+01
		Th-228	* 8.52 E+00	4.41 E+00
	891206	Be-7	* 6.50 E+00	1.59 E+01
		K-40	6.08 E+01	2.74 E+01
		Mn-54	* 1.13 E+00	1.73 E+00
		Co-58	*-7.96 E-01	1.78 E+00
		Fe-59	* 3.04 E+00	3.98 E+00
		Co-60	* 0.00 E+00	1.92 E+00
		Zn-65	*-2.05 E+00	4.03 E+00
		Zr-95	*-2.57 E+00	3.65 E+00
		Nb-95	* 1.89 E-01	1.84 E+00
		Cs-134	*-3.54 E-01	2.01 E+00
		Cs-137	*-5.30 E-01	1.86 E+00
		Ba-140	*-1.86 E+00	7.45 E+00
		La-140	* 4.31 E-01	3.54 E+00
		Ra-226	* 1.09 E+02	3.50 E+01
		Th-228	* 1.31 E+01	2.96 E+00

* Denotes a result less than the detection limit.

TABLE A-7.2

GAMMA SPECTROMETRY OF WATER - SUMMARY

Results in pCi/liter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
			River/Drinking			
Co-60	(I)	2.06E+00	-2.12E-01	6.45E+00	24	0
Co-60	(C)	7.07E-01	-1.05E+00	4.01E+00	12	0
Co-58	(I)	2.65E-02	-1.59E+00	2.26E+00	24	0
Co-58	(C)	-1.02E-01	-1.29E+00	1.39E+00	12	0
Cs-134	(I)	4.88E-01	-2.19E+00	5.20E+00	24	0
Cs-134	(C)	8.20E-01	-4.59E-01	4.22E+00	12	0
Cs-137	(I)	2.20E+00	-6.16E-02	5.08E+00	24	0
Cs-137	(C)	1.55E+00	-4.12E-01	3.41E+00	12	0
Nb-95	(I)	1.81E+00	-1.06E+00	7.39E+00	24	0
Nb-95	(C)	1.95E+00	1.03E-01	9.98E+00	12	0
Zr-95	(I)	-2.71E-01	-3.96E+00	5.03E+00	24	0
Zr-95	(C)	1.33E+00	-2.08E+00	3.60E+00	12	0
Zn-65	(I)	-3.08E+00	-1.24E+01	2.64E+00	24	0
Zn-65	(C)	-1.44E+00	-6.25E+00	6.70E+00	12	0

(I) Indicator Stations
(C) Control Station

TABLE A-7.2 (Cont.)

GAMMA SPECTROMETRY OF WATER - SUMMARY

Results in pCi/liter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
		River/Drinking			
Fe-59 (I)	9.83E-01	-3.06E+00	4.37E+00	24	0
Fe-59 (C)	1.32E+00	-2.84E+00	5.63E+00	12	0
Ba-140 (I)	1.06E+00	-9.03E+00	1.56E+01	24	0
Ba-140 (C)	-1.73E+00	-6.18E+00	2.96E+00	12	0
La-140 (I)	-4.09E-01	-4.83E+00	5.86E+00	24	0
La-140 (C)	-5.99E-01	-2.96E+00	1.71E+00	12	0

(I) Indicator Stations
(C) Control Station

TABLE A-7.2 (Cont.)

GAMMA SPECTROMETRY OF WATER - SUMMARY

Results in pCi/liter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Discharge					
Co-60 (I)	8.39E+00	0.00E+00	2.82E+01	12	3
Co-58 (I)	-4.07E-01	-2.60E+00	1.59E+00	12	0
Cs-134 (I)	8.94E-01	-9.08E-01	3.27E+00	12	0
Cs-137 (I)	2.39E+00	1.86E-01	4.23E+00	12	0
Nb-95 (I)	1.45E+00	-1.56E+00	3.63E+00	12	0
Zr-95 (I)	7.05E-01	-2.26E+00	5.83E+00	12	0
Zn-65 (I)	4.53E+00	-2.06E+00	2.92E+01	12	1
Fe-59 (I)	1.94E+00	-1.50E+00	5.52E+00	12	0
Ba-140 (I)	1.47E+00	-4.32E+00	8.66E+00	12	0
La-140 (I)	-8.14E-01	-6.98E+00	2.54E+00	12	0

(I) Indicator Station only.

TABLE A-7.2 (Cont.)

GAMMA SPECTROMETRY OF WATER - SUMMARY

Results in pCi/liter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
			Ground			
Co-60	(I)	1.94E+00	-8.09E-01	7.82E+00	12	0
Co-58	(I)	8.89E-02	-9.78E-01	1.37E+00	12	0
Cs-134	(I)	5.91E-01	-2.10E+00	5.44E+00	12	0
Cs-137	(I)	1.06E+00	-5.30E-01	3.00E+00	12	0
Nb-95	(I)	1.40E+00	-8.29E-01	2.62E+00	12	0
Zr-95	(I)	1.82E-01	-2.92E+00	1.06E+01	12	0
Zn-65	(I)	-3.23E+00	-1.27E+01	1.45E+00	12	0
Fe-59	(I)	1.04E+00	-1.79E+00	3.44E+00	12	0
Ba-140	(I)	1.16E+00	-9.82E+00	4.48E+00	12	0
La-140	(I)	-1.86E+00	-5.75E+00	1.54E+00	12	0

(I) Indicator Station only.

TABLE A-8.1

GAMMA SPECTROMETRY OF SOIL

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
1	890502	K-40	1.36 E+04	4.27 E+02
		Cs-134	* 2.53 E+01	1.13 E+01
		Cs-137	3.91 E+02	2.70 E+01
		Ra-226	7.27 E+02	2.44 E+02
		Th-228	7.50 E+02	3.52 E+01
7	890502	K-40	1.31 E+04	3.16 E+02
		Cs-134	* 2.27 E+01	7.81 E+00
		Cs-137	* 1.84 E+01	7.74 E+00
		Ra-226	6.62 E+02	2.33 E+02
		Th-228	5.39 E+02	1.58 E+01
9A	890502	K-40	1.15 E+04	4.27 E+02
		Cs-134	* 2.55 E+00	1.30 E+01
		Cs-137	3.69 E+01	1.99 E+01
		Ra-226	7.17 E+02	2.42 E+02
		Th-228	6.17 E+02	2.35 E+01
21	890502	K-40	1.32 E+04	3.11 E+02
		Cs-134	* 2.91 E+01	8.45 E+00
		Cs-137	2.14 E+01	1.03 E+01
		Ra-226	6.84 E+02	1.96 E+02
		Th-228	4.23 E+02	1.42 E+01
23	890502	K-40	1.35 E+04	3.37 E+02
		Cs-134	* 3.22 E+01	1.12 E+01
		Cs-137 (a)	5.32 E+02	1.82 E+01
		Ra-226	8.62 E+02	2.56 E+02
		Th-228	5.42 E+02	1.92 E+01

(a) This result exceeds the Cs-137 result for Station 9A, so a Sr-90 analysis was performed. The Sr-90 result was 96.0±20 pCi/kg..

* Denotes a result less than the detection limit.

TABLE A-8.2

GAMMA SPECTROMETRY OF SOIL - SUMMARY

Results in pCi/kilogram

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
K-40	(I)	1.34E+04	1.31E+04	1.36E+04	4	4
K-40	(C)	1.15E+04	1.15E+04	1.15E+04	1	1
Cs-134	(I)	2.73E+01	2.27E+01	3.22E+01	4	0
Cs-134	(C)	2.55E+00	2.55E+00	2.55E+00	1	0
Cs-137	(I) (a)	2.41E+02	1.84E+01	5.32E+02	4	3
Cs-137	(C)	3.69E+01	3.69E+01	3.69E+01	1	1
Ra-226	(I)	7.34E+02	6.62E+02	8.62E+02	4	4
Ra-226	(C)	7.17E+02	7.17E+02	7.17E+02	1	1
Th-228	(I)	5.64E+02	4.23E+02	7.50E+02	4	0
Th-228	(C)	6.17E+02	6.17E+02	6.17E+02	1	1

(a) This result exceeds the Cs-137 result for Station 9A, so a Sr-90 analysis was performed. The Sr-90 result was 96.0±20 pCi/kg.
(I) Indicator Station
(C) Control Station

TABLE A-9.1

GAMMA SPECTROMETRY OF SEDIMENT

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
33 (Upstream)	890411	K-40	1.60 E+04	5.56 E+02
		Co-57	* 5.18 E-01	1.76 E+01
		Co-60	* 1.66 E+01	1.63 E+01
		Cs-134	* 3.63 E+01	1.72 E+01
		Cs-137	9.06 E+01	2.46 E+01
		Ra-226	1.30 E+03	4.15 E+02
		Eu-152	* 1.36 E+01	8.16 E+01
		Th-228	8.38 E+02	3.26 E+01
34 (Downstream)	890411	K-40	1.37 E+04	5.68 E+02
		Co-57	* 2.97 E+01	1.34 E+01
		Co-60	* 3.30 E+01	1.84 E+01
		Cs-134	* 2.79 E+01	1.80 E+01
		Cs-137	2.25 E+02	3.26 E+01
		Ra-226	7.28 E+02	3.44 E+02
		Eu-152	* 1.82 E+01	9.13 E+01
		Th-228	6.98 E+02	3.14 E+01
33 (Upstream)	891019	K-40	1.37 E+04	7.16 E+02
		Co-57	* 1.20 E+01	1.82 E+01
		Co-60	* 4.57 E+01	2.20 E+01
		Cs-134	* 5.05 E+01	2.39 E+01
		Cs-137	1.30 E+02	2.44 E+01
		Ra-226	1.34 E+03	5.02 E+02
		Eu-152	* 1.36 E+02	9.60 E+01
		Th-228	1.39 E+03	5.35 E+01
34 (Downstream)	891019	K-40	1.52 E+04	7.40 E+02
		Co-57	* 2.90 E+01	2.34 E+01
		Co-60	* 3.46 E+01	2.28 E+01
		Cs-134	* 4.29 E+01	2.21 E+01
		Cs-137	1.69 E+02	3.39 E+01
		Ra-226	* 1.45 E+03	3.91 E+02
		Eu-152	* 7.83 E+01	1.00 E+02
		Th-228	1.07 E+03	4.50 E+01

* Denotes a result less than the detection limit.

TABLE A-9.2

GAMMA SPECTROMETRY OF SEDIMENT - SUMMARY

Results in pCi/kilogram

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
K-40	(I)	1.45E+04	1.37E+04	1.52E+04	2	2
K-40	(C)	1.49E+04	1.37E+04	1.60E+04	2	2
Co-57	(I)	2.94E+01	2.90E+01	2.97E+01	2	0
Co-57	(C)	6.26E+00	5.18E-01	1.20E+01	2	0
Co-60	(I)	3.38E+01	3.30E+01	3.46E+01	2	0
Co-60	(C)	3.12E+01	1.66E+01	4.57E+01	2	0
Cs-134	(I)	3.54E+01	2.79E+01	4.29E+01	2	0
Cs-134	(C)	4.34E+01	3.63E+01	5.05E+01	2	0
Cs-137	(I)	1.97E+02	1.69E+02	2.25E+02	2	2
Cs-137	(C)	1.10E+02	9.06E+01	1.30E+02	2	2
Ra-226	(I)	1.09E+03	7.28E+02	1.45E+03	2	1
Ra-226	(C)	1.32E+03	1.30E+03	1.34E+03	2	2
Eu-152	(I)	4.83E+01	1.82E+01	7.83E+01	2	0
Eu-152	(C)	7.48E+01	1.36E+01	1.36E+02	2	0
Th-228	(I)	8.84E+02	6.98E+02	1.07E+03	2	2
Th-228	(C)	1.11E+03	8.38E+02	1.39E+03	2	2

(I) Indicator Station
(C) Control Station

TABLE A-10.1

GAMMA SPECTROMETRY OF FISH

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
30 Whitefish	890509	K-40	4.60 E+03	2.03 E+02
		Mn-54	*-2.08 E+00	4.26 E+00
		Co-58	* 3.87 E-01	4.31 E+00
		Fe-59	*-2.96 E+00	1.15 E+01
		Co-60	* 1.94 E+00	5.15 E+00
		Zn-65	* 2.95 E+00	1.19 E+01
		Cs-134	* 3.80 E+00	4.43 E+00
		Cs-137	* 9.25 E+00	4.65 E+00
		Ra-226	* 2.52 E+02	8.80 E+01
		Th-228	* 2.47 E+01	6.64 E+00
Sucker	890503	K-40	4.26 E+03	1.83 E+02
		Mn-54	*-4.87 E-01	3.74 E+00
		Co-58	* 1.48 E+00	4.17 E+00
		Fe-59	*-1.04 E+00	1.16 E+01
		Co-60	* 1.84 E+00	4.56 E+00
		Zn-65	* 4.15 E+00	1.05 E+01
		Cs-134	* 3.88 E-01	4.32 E+00
		Cs-137	2.50 E+01	5.89 E+00
		Ra-226	* 9.20 E+01	7.83 E+01
		Th-228	* 1.66 E+01	6.32 E+00
Carp	890503	K-40	2.64 E+03	1.13 E+02
		Mn-54	*-2.92 E-01	2.64 E+00
		Co-58	*-5.64 E-01	2.81 E+00
		Fe-59	* 6.72 E+00	7.50 E+00
		Co-60	* 2.25 E+00	3.29 E+00
		Zn-65	*-2.06 E+00	7.22 E+00
		Cs-134	*-1.71 E+00	2.94 E+00
		Cs-137	1.70 E+01	4.13 E+00
		Ra-226	* 1.28 E+02	4.64 E+01
		Th-228	* 1.47 E+01	3.97 E+00
Salmon	890503	K-40	4.25 E+03	1.43 E+02
		Mn-54	* 1.18 E+00	2.90 E+00
		Co-58	* 7.56 E-01	3.36 E+00
		Fe-59	* 2.73 E+00	9.57 E+00
		Co-60	* 0.00 E+00	3.43 E+00
		Zn-65	* 5.91 E-01	8.27 E+00
		Cs-134	* 7.74 E-01	3.05 E+00
		Cs-137	1.16 E+01	4.23 E+00
		Ra-226	* 1.28 E+02	4.93 E+01
		Th-228	* 1.10 E+01	4.14 E+00

* Denotes a result less than the detection limit.

TABLE A-10.1 (Cont.)

GAMMA SPECTROMETRY OF FISH

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
30 Sucker	891005	K-40	3.35 E+03	1.18 E+02
		Mn-54	* 1.29 E+00	3.60 E+00
		Co-58	* 1.83 E-01	4.66 E+00
		Fe-59	*-3.66 E+00	1.30 E+01
		Co-60	* 1.54 E+00	3.85 E+00
		Zn-65	*-9.76 E+00	9.29 E+00
		Cs-134	*-4.45 E-01	3.75 E+00
		Cs-137	2.55 E+01	6.15 E+00
		Ra-226	* 3.54 E+01	5.99 E+01
		Th-228	* 1.07 E+01	5.18 E+00
Whitefish	891005	K-40	4.21 E+03	1.58 E+02
		Mn-54	* 1.96 E-01	3.36 E+00
		Co-58	*-1.82 E+00	4.04 E+00
		Fe-59	* 1.68 E+00	1.29 E+01
		Co-60	* 1.21 E+00	3.96 E+00
		Zn-65	* 4.34 E+00	9.61 E+00
		Cs-134	* 7.33 E-01	3.29 E+00
		Cs-137	1.70 E+01	4.70 E+00
		Ra-226	* 1.67 E+02	6.25 E+01
		Th-228	* 1.56 E+01	4.85 E+00
Carp	891005	K-40	2.69 E+03	1.32 E+02
		Mn-54	* 1.12 E+00	4.15 E+00
		Co-58	* 3.23 E+00	5.60 E+00
		Fe-59	*-4.37 E+00	1.62 E+01
		Co-60	*-2.12 E+00	4.61 E+00
		Zn-65	* 4.66 E+00	1.13 E+01
		Cs-134	* 1.73 E-00	4.51 E+00
		Cs-137	* 1.05 E+01	4.81 E+00
		Ra-226	* 2.34 E+01	7.13 E+01
		Th-228	* 1.06 E+01	6.15 E+00
Steelhead	891012	K-40	4.32 E+03	1.66 E+02
		Mn-54	* 3.74 E+00	4.81 E+00
		Co-58	*-1.03 E+00	5.91 E+00
		Fe-59	* 8.01 E+00	1.76 E+01
		Co-60	* 6.84 E-01	5.38 E+00
		Zn-65	*-1.20 E+01	1.30 E+01
		Cs-134	*-9.43 E-01	5.06 E+00
		Cs-137	1.38 E+01	6.79 E+00
		Ra-226	* 1.03 E+02	8.55 E+01
		Th-228	* 2.29 E+01	6.96 E+00

* Denotes a result less than the detection limit.

TABLE A-10.1 (Cont.)

GAMMA SPECTROMETRY OF FISH

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
38 Bass	890510	K-40	3.61 E+03	1.59 E+02
		Mn-54	*-1.18 E+00	3.30 E+00
		Co-58	*-2.39 E+00	3.37 E+00
		Fe-59	*-1.21 E+00	8.75 E+00
		Co-60	*-1.37 E+00	4.35 E+00
		Zn-65	* 3.08 E+00	9.66 E+00
		Cs-134	* 9.53 E-01	3.71 E+00
		Cs-137	2.52 E+01	5.74 E+00
		Ra-226	* 1.24 E+02	8.08 E+01
		Th-228	* 1.60 E+01	5.81 E+00
Salmon	890505	K-40	3.86 E+03	1.33 E+02
		Mn-54	* 1.67 E+00	3.73 E+00
		Co-58	* 1.97 E+00	4.16 E+00
		Fe-59	*-2.45 E+00	1.06 E+01
		Co-60	* 5.54 E+00	4.31 E+00
		Zn-65	*-5.94 E+00	9.81 E+00
		Cs-134	* 2.33 E+00	4.09 E+00
		Cs-137	* 1.00 E+01	4.30 E+00
		Ra-226	* 2.47 E+02	7.55 E+01
		Th-228	* 8.69 E+01	7.18 E+00
Carp	890505	K-40	3.85 E+03	1.40 E+02
		Mn-54	* 2.82 E+00	3.52 E+00
		Co-58	*-5.01 E-01	4.11 E+00
		Fe-59	* 5.30 E+00	1.04 E+01
		Co-60	* 2.15 E+00	4.04 E+00
		Zn-65	*-9.63 E+00	9.91 E+00
		Cs-134	* 1.02 E+00	3.97 E+00
		Cs-137	1.21 E+01	4.78 E+00
		Ra-226	* 2.31 E+02	7.97 E+01
		Th-228	* 1.40 E+01	6.03 E+00
Sucker	890505	K-40	4.06 E+03	1.57 E+02
		Mn-54	*-3.82 E-01	3.00 E+00
		Co-58	*-1.40 E+00	3.56 E+00
		Fe-59	*-2.83 E-01	1.05 E+01
		Co-60	* 7.22 E-01	4.11 E+00
		Zn-65	* 3.27 E+00	9.92 E+00
		Cs-134	* 2.42 E+00	3.52 E+00
		Cs-137	1.55 E+01	5.20 E+00
		Ra-226	* 1.12 E+02	6.47 E+01
		Th-228	* 1.54 E+01	4.95 E+00

* Denotes a result less than the detection limit.

TABLE A-10.1 (Cont.)

GAMMA SPECTROMETRY OF FISH

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
38 Bass	891009	K-40	4.13 E+03	2.22 E+02
		Mn-54	* 5.15 E+00	9.08 E+00
		Co-58	*-4.38 E+00	1.16 E+01
		Fe-59	*-1.87 E+01	3.06 E+01
		Co-60	* 1.62 E+01	9.29 E+00
		Zn-65	*-1.05 E+01	2.22 E+01
		Cs-134	* 4.70 E+00	9.85 E+00
		Cs-137	3.03 E+01	1.33 E+01
		Ra-226	* 3.49 E+02	1.81 E+02
		Th-228	* 2.04 E+02	1.74 E+01
Squawfish	891002	K-40	3.71 E+03	2.36 E+02
		Mn-54	* 7.55 E+00	9.10 E+00
		Co-58	* 5.97 E+00	1.22 E+01
		Fe-59	* 1.08 E+01	3.49 E+01
		Co-60	* 4.61 E+00	9.57 E+00
		Zn-65	*-5.87 E+00	2.26 E+01
		Cs-134	* 9.12 E+00	9.31 E+00
		Cs-137	* 2.46 E+01	9.74 E+00
		Ra-226	* 2.12 E+02	1.92 E+02
		Th-228	* 1.98 E+01	1.45 E+01
Carp	891009	K-40	3.64 E+03	2.02 E+02
		Mn-54	*-3.57 E+00	4.74 E+00
		Co-58	*-1.16 E+00	6.04 E+00
		Fe-59	* 3.36 E+00	1.90 E+01
		Co-60	* 7.67 E-01	5.39 E+00
		Zn-65	*-1.65 E+01	1.39 E+01
		Cs-134	* 1.29 E+00	5.40 E+00
		Cs-137	* 6.40 E+00	5.21 E+00
		Ra-226	* 3.07 E+02	9.74 E+01
		Th-228	* 3.43 E+01	8.79 E+00
Sucker	891002	K-40	3.94 E+03	1.48 E+02
		Mn-54	* 2.54 E+00	4.21 E+00
		Co-58	* 1.44 E+00	5.62 E+00
		Fe-59	*-8.30 E+00	1.74 E+01
		Co-60	* 2.59 E+00	4.57 E+00
		Zn-65	*-1.85 E+00	1.20 E+01
		Cs-134	* 2.69 E+00	4.29 E+00
		Cs-137	1.38 E+01	5.89 E+00
		Ra-226	* 7.81 E+01	6.84 E+01
		Th-228	* 8.87 E+00	6.00 E+00

* Denotes a result less than the detection limit.

TABLE A-10.1 (Cont.)

GAMMA SPECTROMETRY OF FISH

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE	RESULT	OVERALL UNCERTAINTY
38 Steelhead	891012	K-40	3.40 E+03	1.39 E+02
		Mn-54	* 2.97 E+00	4.15 E+00
		Co-58	* 0.00 E+00	5.07 E+00
		Fe-59	*-7.23 E+00	1.46 E+01
		Co-60	* 1.64 E+00	4.46 E+00
		Zn-65	*-1.18 E+01	1.14 E+01
		Cs-134	* 1.05 E+00	4.26 E+00
		Cs-137	1.29 E+01	5.38 E+00
		Ra-226	* 1.49 E+02	7.51 E+01
		Th-228	* 1.69 E+01	6.07 E+00

* Denotes a result less than the detection limit.

TABLE A-10.2

GAMMA SPECTROMETRY OF FISH - SUMMARY

Results in pCi/kilogram

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
K-40	(I)	3.79E+03	2.64E+03	4.60E+03	8	8
K-40	(C)	3.82E+03	3.40E+03	4.13E+03	9	9
Co-60	(I)	9.18E-01	-2.12E+00	2.25E+00	8	0
Co-60	(C)	3.65E+00	7.22E-01	1.62E+00	9	0
Fe-59	(I)	8.89E-01	-4.37E+00	8.01E+00	9	0
Fe-59	(C)	-2.19E+00	-1.87E+01	1.08E+01	8	0
Zn-65	(I)	-8.91E-01	-1.20E+01	4.66E+00	8	0
Zn-65	(C)	-6.19E+00	-1.65E+01	3.27E+00	9	0
Co-58	(I)	3.28E-01	-1.82E+00	3.23E+00	8	0
Co-58	(C)	-5.01E-01	-4.38E+00	5.97E+00	9	0
Cs-134	(I)	5.41E-01	-1.71E+00	3.80E+00	8	0
Cs-134	(C)	2.84E+00	9.53E-01	9.12E+00	9	0
Cs-137	(I)	1.62E+01	9.25E+00	2.55E+01	8	6
Cs-137	(C)	1.68E+01	6.40E+00	2.52E+01	9	6
Mn-54	(I)	8.03E-01	-2.08E+00	3.74E+00	8	0
Mn-54	(C)	1.95E+00	-3.57E+00	7.55E+00	9	0

(I) Indicator Station
(C) Control Station

TABLE A-11.1

I-131 IN MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	RESULT		OVERALL UNCERTAINTY	
9B	890110	*-3.1	E-02	1.18	E-01
	890207	*-8.2	E-03	9.72	E-02
	890314	*-4.4	E-03	1.25	E-01
	890404	*-4.2	E-02	1.03	E-01
	890425	* 7.7	E-02	1.24	E-01
	890509	* 1.6	E-02	1.16	E-01
	890523	* 3.3	E-02	9.44	E-02
	890606	* 1.7	E-01	1.25	E-01
	890627	* 5.6	E-02	1.15	E-01
	890711	* 4.8	E-02	1.14	E-01
	890725	*-6.6	E-02	1.25	E-01
	890808	*-3.5	E-02	1.26	E-01
	890829	*-7.5	E-02	1.61	E-01
	890912	*-9.3	E-02	1.43	E-01
	890926	*-1.0	E-01	1.60	E-01
	891010	* 7.2	E-02	1.22	E-01
	891107	*-3.8	E-02	1.18	E-01
	891205	* 0.0	E+00	2.54	E-01
36	890110	*-2.1	E-02	1.28	E-01
	890207	* 0.0	E+00	1.00	E-01
	890314	*-3.9	E-03	1.04	E-01
	890404	*-1.8	E-02	8.40	E-02
	890425	* 5.3	E-02	1.66	E-01
	890509	* 1.7	E-02	1.40	E-01
	890523	*-4.4	E-02	9.40	E-02
	890606	*-7.4	E-02	1.15	E-01
	890627	*-3.7	E-03	9.69	E-02
	890711	* 8.4	E-02	1.10	E-01
	890725	* 1.3	E-01	1.13	E-01
	890808	* 3.3	E-02	1.17	E-01
	890829	* 5.3	E-02	1.14	E-01
	890912	*-2.0	E-01	1.59	E-01
	890926	* 9.0	E-02	1.17	E-01
	891010	*-1.6	E-02	1.70	E-01
	891107	*-3.2	E-02	1.82	E-01
	891205	*-1.1	E-01	1.60	E-01

* Denotes a result less than the detection limit.

TABLE A-11.1 (Cont.)

I-131 IN MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	RESULT	OVERALL UNCERTAINTY
40	890110	*-4.0 E-02	1.12 E-01
	890207	7.5 E-01 (a)	1.20 E-01
	890314	* 8.4 E-02	1.22 E-01
	890404	*-1.8 E-02	1.06 E-01
	890425	* 2.3 E-01	1.50 E-01
	890509	*-4.1 E-01	1.54 E-01
	890523	*-1.2 E-01	8.91 E-02
	890606	* 1.1 E-01	1.99 E-01
	890627	*-2.5 E-02	9.22 E-02
	890711	*-5.0 E-03	1.34 E-01
	890725	* 3.3 E-02	1.14 E-01
	890808	*-7.9 E-03	1.08 E-01
	890829	* 2.9 E-02	1.17 E-01
	890912	*-8.5 E-02	1.43 E-01
	890926	* 1.7 E-02	1.56 E-01
	891010	* 1.2 E-01	1.40 E-01
	891107	*-9.1 E-02	2.69 E-01
	891205	*-9.0 E-02	3.05 E-01
59	890110	*-6.9 E-02	1.19 E-01
	890207	*-7.5 E-02	9.80 E-02
	890314	*-4.2 E-02	1.15 E-01
	890404	*-5.2 E-02	1.02 E-01
	890425	* 1.3 E-01	1.70 E-01
	890509	* 9.5 E-02	1.33 E-01
	890523	* 6.1 E-02	1.11 E-01
	890606	* 6.4 E-02	1.32 E-01
	890627	*-4.1 E-03	9.96 E-02
	890711	*-6.7 E-02	1.00 E-01
	890725	*-9.4 E-03	1.42 E-01
	890808	* 1.0 E-01	1.16 E-01
	890829	* 9.1 E-02	1.22 E-01
	890912	* 7.5 E-02	1.29 E-01
	890926	* 2.7 E-02	1.27 E-01
	891010	* 1.5 E-01	1.48 E-01
	891107	*-1.8 E-02	2.50 E-01
	891205	* 5.8 E-02	1.30 E-01

* Denotes a result less than the detection limit.
(a) Positive result confirmed by recount.

TABLE A-11.1 (Cont.)

I-131 IN MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	RESULT		OVERALL UNCERTAINTY
96	890110	*-7.9 E-03		1.09 E-01
	890207	*-4.0 E-02		9.80 E-02
	890314	*-2.5 E-02		1.16 E-01
	890404	*-7.3 E-02		1.28 E-01
	890425	* 1.9 E-02		9.50 E-02
	890509	*-9.8 E-02		1.80 E-01
	890523	*-2.9 E-01		1.42 E-01
	890606	*-4.3 E-02		1.07 E-01
	890628	* 2.0 E-02	(a)	9.18 E-02
	890711	*-1.5 E-01		1.38 E-01
	890725	* 3.4 E-02		1.23 E-01
	890808	*-1.1 E-01		1.30 E-01
	890829	*-2.7 E-02		1.31 E-01
	890912	*-1.4 E-01		1.25 E-01
	890926	*-1.4 E-01		1.44 E-01
	891010	*-8.6 E-02		1.34 E-01
	891107	* 3.8 E-02		2.39 E-01
	891205	*-1.4 E-02		2.28 E-01

(a) Sample delayed one day due to unavailability of milk.
* Denotes a result less than the detection limit.

TABLE A-11.2

I-131 IN MILK - SUMMARY

Results in pCi/liter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
I-131	(I)	1.27E-02	-4.10E-01	7.50E-01	72	1
I-131	(C)	-6.29E-02	-2.90E-01	3.80E-02	18	0

(I) Indicator Stations
(C) Control Station

TABLE A-12.1

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B	890110	K-40	1.46 E+03	8.93 E+01
		Cs-134	*-9.41 E-01	2.27 E+00
		Cs-137	* 3.19 E+00	2.25 E+00
		Ba-140	*-2.54 E+00	5.93 E+00
		La-140	*-1.44 E+00	2.67 E+00
	890207	K-40	1.36 E+03	7.39 E+01
		Cs-134	*-5.64 E-01	2.06 E+00
		Cs-137	* 1.58 E+00	2.12 E+00
		Ba-140	*-5.41 E-01	5.64 E+00
		La-140	*-1.96 E+00	2.75 E+00
	890314	K-40	1.27 E+03	8.27 E+01
		Cs-134	* 2.13 E+00	2.38 E+00
		Cs-137	* 1.96 E+00	2.43 E+00
		Ba-140	*-3.25 E+00	6.00 E+00
		La-140	*-2.41 E+00	2.90 E+00
	890404	K-40	1.41 E+03	8.58 E+01
		Cs-134	*-2.77 E-01	2.28 E+00
		Cs-137	* 4.51 E+00	2.39 E+00
		Ba-140	*-6.81 E-01	7.43 E+00
		La-140	*-7.26 E-01	3.42 E+00
	890425	K-40	1.40 E+03	6.96 E+01
		Cs-134	* 1.18 E+00	2.04 E+00
		Cs-137	* 1.94 E+00	2.02 E+00
		Ba-140	*-1.76 E+00	5.49 E+00
		La-140	* 0.00 E+00	2.53 E+00
	890509	K-40	1.53 E+03	8.67 E+01
		Cs-134	* 1.87 E+00	2.57 E+00
		Cs-137	* 1.85 E+00	2.57 E+00
		Ba-140	*-1.24 E+00	7.67 E+00
		La-140	*-3.77 E-01	3.59 E+00
	890523	K-40	1.38 E+03	8.61 E+01
		Cs-134	* 0.00 E+00	2.37 E+00
		Cs-137	* 1.20 E+00	2.28 E+00
		Ba-140	* 6.49 E-01	7.55 E+00
		La-140	* 8.74 E-01	3.59 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B	890606	K-40	1.43 E+03	8.62 E+01
		Cs-134	*-5.74 E-01	2.30 E+00
		Cs-137	* 9.80 E-01	2.24 E+00
		Ba-140	* 3.16 E+00	7.00 E+00
		La-140	*-3.80 E-01	3.33 E+00
	890627	K-40	1.39 E+03	7.23 E+01
		Cs-134	* 1.36 E+00	2.05 E+00
		Cs-137	* 1.57 E+00	2.03 E+00
		Ba-140	*-2.59 E+00	6.53 E+00
		La-140	*-1.38 E+00	2.98 E+00
	890711	K-40	1.48 E+03	8.67 E+01
		Cs-134	*-8.11 E-01	2.38 E+00
		Cs-137	*-4.42 E-01	2.40 E+00
		Ba-140	* 7.25 E-01	7.50 E+00
		La-140	*-2.71 E+00	3.59 E+00
	890725	K-40	1.31 E+03	8.33 E+01
		Cs-134	*-3.13 E-01	2.45 E+00
		Cs-137	* 2.45 E+00	2.41 E+00
		Ba-140	*-2.74 E+00	8.61 E+00
		La-140	*-2.83 E+00	3.29 E+00
	890808	K-40	1.29 E+03	8.43 E+01
		Cs-134	*-9.40 E-01	2.49 E+00
		Cs-137	* 2.73 E-01	2.47 E+00
		Ba-140	*-8.44 E-01	8.37 E+00
		La-140	*-4.25 E+00	3.60 E+00
	890829	K-40	1.30 E+03	8.38 E+01
		Cs-134	*-3.82 E-01	2.41 E+00
		Cs-137	* 2.09 E+00	2.47 E+00
		Ba-140	*-3.78 E+00	8.47 E+00
		La-140	* 2.24 E-01	4.28 E+00
	890912	K-40	1.23 E+03	8.17 E+01
		Cs-134	*-1.80 E+00	2.34 E+00
		Cs-137	* 1.37 E+00	2.36 E+00
		Ba-140	*-5.07 E+00	8.14 E+00
		La-140	* 2.23 E+00	3.69 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B	890926	K-40	1.28 E+03	8.10 E+01
		Cs-134	* 1.24 E+00	2.52 E+00
		Cs-137	* 2.82 E+00	2.51 E+00
		Ba-140	* 3.41 E+00	8.37 E+00
		La-140	* 1.21 E+00	3.65 E+00
	891010	K-40	1,30 E+03	8.70 E+01
		Cs-134	* 2.12 E+00	2.55 E+00
		Cs-137	* 1.81 E+00	2.36 E+00
		Ba-140	* 0.00 E+00	8.06 E+00
		La-140	* 0.00 E+00	3.90 E+00
	891107	K-40	1.55 E+03	9.00 E+01
		Cs-134	* 9.71 E-01	2.40 E+00
		Cs-137	* 2.23 E+00	2.45 E+00
		Ba-140	* 8.17 E-01	8.95 E+00
		La-140	*-2.18 E+00	3.96 E+00
	891205	K-40	1.50 E+03	8.86 E+01
		Cs-134	*-1.23 E+00	2.36 E+00
		Cs-137	*-7.29 E-01	2.29 E+00
		Ba-140	*-7.12 E+00	7.90 E+00
		La-140	*-2.72 E+00	3.69 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
36	890110	K-40	1.27 E+03	8.85 E+01
		Cs-134	*-4.59 E-01	2.48 E+00
		Cs-137	* 1.07 E+00	2.57 E+00
		Ba-140	*-1.10 E+00	6.41 E+00
		La-140	* 7.70 E-01	2.93 E+00
	890207	K-40	1.54 E+03	7.76 E+01
		Cs-134	* 7.54 E-01	2.08 E+00
		Cs-137	* 2.94 E+00	2.07 E+00
		Ba-140	*-1.16 E+00	5.72 E+00
		La-140	* 0.00 E+00	2.49 E+00
	890314	K-40	1.33 E+03	8.26 E+01
		Cs-134	* 2.09 E+00	2.33 E+00
		Cs-137	* 9.06 E-01	2.45 E+00
		Ba-140	*-1.51 E+00	6.25 E+00
		La-140	* 3.05 E-01	2.69 E+00
	890404	K-40	1.22 E+03	7.77 E+01
		Cs-134	* 2.91 E-01	2.40 E+00
		Cs-137	* 1.01 E+00	2.39 E+00
		Ba-140	* 7.10 E+00	7.69 E+00
		La-140	* 9.19 E-01	3.47 E+00
	890425	K-40	1.31 E+03	6.96 E+01
		Cs-134	*-8.75 E-01	2.00 E+00
		Cs-137	*-5.80 E-01	1.95 E+00
		Ba-140	*-2.44 E+00	5.63 E+00
		La-140	* 0.00 E+00	2.50 E+00
	890509	K-40	1.38 E+03	8.18 E+01
		Cs-134	* 8.31 E-01	2.37 E+00
		Cs-137	* 3.72 E+00	2.49 E+00
		Ba-140	*-4.36 E+00	7.80 E+00
		La-140	* 5.73 E-01	3.12 E+00
	890523	K-40	1.32 E+03	8.80 E+01
		Cs-134	* 4.79 E-01	2.64 E+00
		Cs-137	* 3.46 E+00	2.53 E+00
		Ba-140	*-1.71 E+00	8.72 E+00
		La-140	* 0.00 E+00	4.16 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
36	890606	K-40	1.32 E+03	8.38 E+01
		Cs-134	* 1.47 E+00	2.48 E+00
		Cs-137	* 2.47 E+00	2.37 E+00
		Ba-140	* 2.05 E+00	7.28 E+00
		La-140	*-1.84 E+00	3.11 E+00
	890627	K-40	1.34 E+03	7.09 E+01
		Cs-134	* 3.30 E-01	2.09 E+00
		Cs-137	* 3.32 E-01	1.98 E+00
		Ba-140	* 1.80 E+00	6.44 E+00
		La-140	*-7.00 E-01	2.92 E+00
	890711	K-40	1.40 E+03	8.53 E+01
		Cs-134	*-6.19 E-01	2.42 E+00
		Cs-137	* 1.74 E+00	2.54 E+00
		Ba-140	* 0.00 E+00	8.09 E+00
		La-140	*-2.15 E+00	3.54 E+00
	890725	K-40	1.57 E+03	9.94 E+01
		Cs-134	* 7.39 E-01	2.29 E+00
		Cs-137	* 3.49 E+00	2.41 E+00
		Ba-140	*-1.05 E+00	7.90 E+00
		La-140	* 1.16 E+00	3.95 E+00
	890808	K-40	1.43 E+03	8.55 E+01
		Cs-134	* 1.64 E-01	2.47 E+00
		Cs-137	* 2.66 E+00	2.35 E+00
		Ba-140	* 7.37 E+00	7.52 E+00
		La-140	* 2.32 E+00	3.89 E+00
	890829	K-40	1.47 E+03	9.50 E+01
		Cs-134	*-1.60 E-01	2.37 E+00
		Cs-137	* 2.42 E+00	2.30 E+00
		Ba-140	* 6.79 E-01	8.89 E+00
		La-140	* 2.51 E+00	3.94 E+00
	890912	K-40	1.36 E+03	8.97 E+01
		Cs-134	* 1.15 E+00	2.33 E+00
		Cs-137	* 1.26 E+00	2.24 E+00
		Ba-140	* 3.80 E+00	7.49 E+00
		La-140	* 0.00 E+00	3.25 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
36	890926	K-40	1.27 E+03	8.17 E+01
		Cs-134	*-6.14 E-01	2.49 E+00
		Cs-137	* 2.12 E+00	2.45 E+00
		Ba-140	*-5.48 E+00	8.01 E+00
		La-140	* 1.02 E+00	3.64 E+00
	891010	K-40	1.45 E+03	8.47 E+01
		Cs-134	* 6.12 E-01	2.44 E+00
		Cs-137	* 1.92 E+00	2.50 E+00
		Ba-140	* 1.82 E+00	8.22 E+00
		La-140	* 1.84 E+00	3.68 E+00
	891107	K-40	1.55 E+03	8.99 E+01
		Cs-134	* 8.62 E-01	2.47 E+00
		Cs-137	* 1.49 E+00	2.46 E+00
		Ba-140	* 7.87 E+00	8.87 E+00
		La-140	*-1.55 E+00	4.02 E+00
	891205	K-40	1.46 E+03	8.81 E+01
		Cs-134	* 2.91 E-01	3.64 E+00
		Cs-137	* 1.01 E+00	3.63 E+00
		Ba-140	*-1.85 E+00	1.19 E+01
		La-140	*-4.34 E+00	4.61 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
40	890110	K-40	1.52 E+03	8.57 E+01
		Cs-134	* 0.00 E+00	2.46 E+00
		Cs-137	* 4.78 E+00	2.61 E+00
		Ba-140	*-2.63 E+00	6.33 E+00
		La-140	*-7.40 E-01	2.84 E+00
	890207	K-40	1.26 E+03	7.06 E+01
		Cs-134	* 7.44 E-01	1.97 E+00
		Cs-137	* 1.93 E+00	1.92 E+00
		Ba-140	*-1.35 E-01	5.31 E+00
		La-140	*-2.49 E-01	2.42 E+00
	890314	K-40	1.14 E+03	7.99 E+01
		Cs-134	* 4.25 E-01	3.21 E+00
		Cs-137	* 2.97 E+00	3.33 E+00
		Ba-140	*-4.35 E-01	8.87 E+00
		La-140	* 1.56 E+00	3.62 E+00
	890404	K-40	1.42 E+03	8.53 E+01
		Cs-134	*-1.45 E-01	2.28 E+00
		Cs-137	* 8.65 E-01	2.26 E+00
		Ba-140	* 2.24 E+00	7.68 E+00
		La-140	*-2.43 E+00	3.59 E+00
	890425	K-40	1.27 E+03	6.86 E+01
		Cs-134	* 1.12 E+00	2.77 E+00
		Cs-137	* 1.87 E+00	2.76 E+00
		Ba-140	* 8.00 E+00	7.91 E+00
		La-140	* 2.09 E-01	3.24 E+00
	890509	K-40	1.51 E+03	9.03 E+01
		Cs-134	* 3.87 E+00	3.42 E+00
		Cs-137	* 3.61 E+00	3.31 E+00
		Ba-140	* 5.45 E+00	1.12 E+01
		La-140	* 5.69 E+00	4.66 E+00
	890523	K-40	1.38 E+03	8.45 E+01
		Cs-134	* 2.34 E-01	2.44 E+00
		Cs-137	* 2.65 E+00	2.42 E+00
		Ba-140	* 4.41 E+00	8.60 E+00
		La-140	* 3.02 E+00	3.53 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
40	890606	K-40	1.33 E+02	7.68 E+01
		Cs-134	* 0.00 E+00	2.51 E+00
		Cs-137	* 2.41 E-01	2.23 E+00
		Ba-140	*-3.56 E-01	7.63 E+00
		La-140	* 1.65 E-01	3.37 E+00
	890627	K-40	1.69 E+03	7.88 E+01
		Cs-134	*-2.92 E-01	2.07 E+00
		Cs-137	*-1.67 E+00	1.97 E+00
		Ba-140	* 4.27 E+00	6.24 E+00
		La-140	* 1.04 E+00	2.73 E+00
	890711	K-40	1.39 E+03	9.16 E+01
		Cs-134	* 0.00 E+00	2.26 E+00
		Cs-137	*-9.95 E-01	2.24 E+00
		Ba-140	*-1.65 E+00	7.10 E+00
		La-140	* 0.00 E+00	3.47 E+00
	890725	K-40	1.56 E+03	8.88 E+01
		Cs-134	*-5.77 E-01	2.48 E+00
		Cs-137	*-5.54 E-01	2.40 E+00
		Ba-140	* 2.36 E+00	8.50 E+00
		La-140	*-5.25 E+00	3.89 E+00
	890808	K-40	1.52 E+03	8.75 E+01
		Cs-134	* 0.00 E+00	3.29 E+00
		Cs-137	* 1.94 E+00	3.18 E+00
		Ba-140	* 6.21 E+00	1.09 E+01
		La-140	*-3.60 E+00	4.50 E+00
	890829	K-40	1.39 E+03	8.72 E+01
		Cs-134	* 5.63 E+00	3.49 E+00
		Cs-137	* 4.75 E+00	3.53 E+00
		Ba-140	* 3.04 E+00	1.23 E+01
		La-140	*-2.12 E+00	5.07 E+00
	890912	K-40	1.47 E+03	8.57 E+01
		Cs-134	*-1.48 E+00	2.41 E+00
		Cs-137	* 5.02 E+00	2.56 E+00
		Ba-140	* 1.99 E+00	8.75 E+00
		La-140	* 3.61 E+00	4.25 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
40	890926	K-40	1.40 E+03	8.61 E+01
		Cs-134	* 2.53 E+00	2.53 E+00
		Cs-137	* 4.86 E+00	2.46 E+00
		Ba-140	*-1.51 E+00	7.67 E+00
		La-140	* 6.54 E-01	3.22 E+00
	891010	K-40	1.28 E+03	8.87 E+01
		Cs-134	* 9.76 E-01	2.40 E+00
		Cs-137	* 8.43 E-01	2.33 E+00
		Ba-140	* 6.45 E-01	7.40 E+00
		La-140	*-2.17 E+00	3.54 E+00
	891107	K-40	1.26 E+03	8.91 E+01
		Cs-134	*-4.40 E-01	2.52 E+00
		Cs-137	* 3.51 E+00	2.39 E+00
		Ba-140	*-1.15 E+01	9.33 E+00
		La-140	*-5.09 E-01	4.07 E+00
	891205	K-40	1.21 E+03	7.46 E+01
		Cs-134	* 8.74 E-01	2.70 E+00
		Cs-137	* 1.20 E+00	2.74 E+00
		Ba-140	* 2.61 E+00	8.93 E+00
		La-140	* 2.39 E+00	3.91 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
59	890110	K-40	1.29 E+03	8.17 E+01
		Cs-134	* 9.83 E-01	2.34 E+00
		Cs-137	* 9.17 E-01	2.30 E+00
		Ba-140	* 1.38 E+00	5.97 E+00
		La-140	*-1.70 E+00	2.58 E+00
	890207	K-40	1.36 E+03	7.07 E+01
		Cs-134	* 1.12 E-01	2.09 E+00
		Cs-137	* 4.86 E-01	2.12 E+00
		Ba-140	* 2.43 E+00	6.22 E+00
		La-140	*-8.36 E-01	2.55 E+00
	890314	K-40	1.27 E+03	7.19 E+01
		Cs-134	* 2.10 E+00	2.62 E+00
		Cs-137	* 3.82 E+00	2.67 E+00
		Ba-140	*-1.03 E+00	6.96 E+00
		La-140	* 3.53 E-01	2.87 E+00
	890404	K-40	1.40 E+03	7.50 E+01
		Cs-134	* 1.77 E+00	2.69 E+00
		Cs-137	* 2.43 E+00	2.59 E+00
		Ba-140	* 6.32 E+00	8.65 E+00
		La-140	*-1.56 E+00	3.69 E+00
	890425	K-40	1.44 E+03	6.61 E+01
		Cs-134	* 3.13 E-01	2.29 E+00
		Cs-137	* 1.99 E+00	2.17 E+00
		Ba-140	* 4.19 E-01	6.34 E+00
		La-140	* 4.32 E-01	2.70 E+00
	890509	K-40	1.33 E+03	7.62 E+01
		Cs-134	* 1.26 E+00	2.74 E+00
		Cs-137	* 2.97 E+00	2.67 E+00
		Ba-140	*-9.99 E-01	8.74 E+00
		La-140	* 3.97 E+00	4.05 E+00
	890523	K-40	1.48 E+03	8.74 E+01
		Cs-134	*-4.31 E-01	2.27 E+00
		Cs-137	* 1.71 E+00	2.26 E+00
		Ba-140	*-9.26 E-01	7.29 E+00
		La-140	* 0.00 E+00	3.21 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
59	890606	K-40	1.46 E+03	8.78 E+01
		Cs-134	*-3.00 E-01	2.55 E+00
		Cs-137	* 3.71 E+00	2.49 E+00
		Ba-140	* 1.94 E+00	8.22 E+00
		La-140	*-2.07 E+00	3.58 E+00
	890627	K-40	1.32 E+03	7.38 E+01
		Cs-134	* 1.83 E+00	2.21 E+00
		Cs-137	* 3.07 E+00	2.12 E+00
		Ba-140	* 2.18 E+00	6.95 E+00
		La-140	* 2.86 E-01	3.35 E+00
	890711	K-40	1.39 E+03	8.59 E+01
		Cs-134	* 1.61 E+00	2.55 E+00
		Cs-137	* 3.76 E+00	2.69 E+00
		Ba-140	*-1.83 E+00	8.04 E+00
		La-140	* 1.40 E+00	3.89 E+00
	890725	K-40	1.46 E+03	9.50 E+01
		Cs-134	*-6.05 E-01	2.49 E+00
		Cs-137	* 1.50 E+00	2.44 E+00
		Ba-140	* 2.95 E+00	8.90 E+00
		La-140	*-2.13 E-01	3.98 E+00
	890808	K-40	1.50 E+03	9.32 E+01
		Cs-134	* 1.57 E+00	2.52 E+00
		Cs-137	* 1.08 E+00	2.60 E+00
		Ba-140	* 6.12 E+00	9.41 E+00
		La-140	* 2.03 E+00	4.15 E+00
	890829	K-40	1.34 E+03	7.76 E+01
		Cs-134	* 3.72 E+00	2.80 E+00
		Cs-137	* 2.62 E+00	2.72 E+00
		Ba-140	*-1.70 E+00	9.99 E+00
		La-140	* 2.99 E+00	4.48 E+00
	890912	K-40	1.19 E+03	8.67 E+01
		Cs-134	*-6.54 E-01	2.31 E+00
		Cs-137	* 2.29 E+00	2.33 E+00
		Ba-140	* 2.43 E+00	7.81 E+00
		La-140	*-3.41 E+00	4.02 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
59	890926	K-40	1.40 E+03	8.64 E+01
		Cs-134	* 1.40 E+00	2.41 E+00
		Cs-137	*-2.04 E-01	2.44 E+00
		Ba-140	*-1.89 E+00	8.58 E+00
		La-140	*-2.22 E+00	3.40 E+00
	891010	K-40	1.27 E+03	8.16 E+01
		Cs-134	* 0.00 E+00	2.48 E+00
		Cs-137	* 3.93 E+00	2.54 E+00
		Ba-140	*-1.06 E+00	8.56 E+00
		La-140	* 2.92 E+00	3.91 E+00
	891107	K-40	1.34 E+03	8.44 E+01
		Cs-134	*-7.32 E-01	2.48 E+00
		Cs-137	* 1.76 E+00	2.52 E+00
		Ba-140	* 5.73 E+00	9.21 E+00
		La-140	* 1.80 E+00	4.50 E+00
	891205	K-40	1.37 E+03	9.22 E+01
		Cs-134	*-1.06 E+00	2.29 E+00
		Cs-137	* 9.87 E-01	2.32 E+00
		Ba-140	*-4.50 E+00	7.32 E+00
		La-140	* 2.07 E-01	3.11 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
96	890110	K-40	1.38 E+03	8.15 E+01
		Cs-134	*-4.00 E-01	3.19 E+00
		Cs-137	* 3.38 E+00	3.21 E+00
		Ba-140	*-2.89 E+00	8.01 E+00
		La-140	*-2.76 E+00	3.55 E+00
	890207	K-40	1.52 E+03	7.37 E+01
		Cs-134	* 1.58 E+00	2.13 E+00
		Cs-137	* 1.43 E-01	2.07 E+00
		Ba-140	*-2.39 E+00	5.80 E+00
		La-140	*-2.29 E-01	2.56 E+00
	890314	K-40	1.15 E+03	8.26 E+01
		Cs-134	* 0.00 E+00	2.21 E+00
		Cs-137	* 0.00 E+00	2.19 E+00
		Ba-140	*-3.86 E+00	5.54 E+00
		La-140	*-1.14 E+00	2.42 E+00
	890404	K-40	1.53 E+03	8.85 E+01
		Cs-134	* 2.17 E+00	2.25 E+00
		Cs-137	* 1.80 E+00	2.25 E+00
		Ba-140	*-2.13 E+00	7.32 E+00
		La-140	*-2.35 E+00	3.20 E+00
	890425	K-40	1.45 E+03	7.28 E+01
		Cs-134	* 1.26 E+00	1.90 E+00
		Cs-137	* 2.28 E+00	1.90 E+00
		Ba-140	*-1.42 E+00	5.26 E+00
		La-140	*-8.35 E-01	2.13 E+00
	890509	K-40	1.52 E+03	8.82 E+01
		Cs-134	*-1.20 E+00	2.33 E+00
		Cs-137	* 1.94 E+00	2.30 E+00
		Ba-140	* 3.82 E+00	7.54 E+00
		La-140	*-8.14 E-01	3.42 E+00
	890523	K-40	1.38 E+03	8.60 E+01
		Cs-134	* 1.71 E+00	2.39 E+00
		Cs-137	* 3.60 E+00	2.40 E+00
		Ba-140	*-2.17 E-01	7.28 E+00
		La-140	* 2.16 E-01	3.37 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
96	890606	K-40	1.38 E+03	8.87 E+01
		Cs-134	* 3.93 E-01	2.48 E+00
		Cs-137	* 1.15 E+00	2.43 E+00
		Ba-140	* 6.03 E+00	8.63 E+00
		La-140	*-6.30 E-01	3.69 E+00
	890628	K-40	1.32 E+03	8.10 E+01
		Cs-134	*-2.32 E-01	2.01 E+00
		Cs-137	* 2.26 E+00	1.89 E+00
		Ba-140	* 1.03 E+00	6.38 E+00
		La-140	* 4.40 E-01	2.91 E+00
	890711	K-40	1.36 E+03	9.22 E+01
		Cs-134	* 7.94 E-01	2.37 E+00
		Cs-137	* 1.36 E+00	2.25 E+00
		Ba-140	* 7.06 E-01	7.04 E+00
		La-140	*-3.82 E-01	3.39 E+00
	890725	K-40	1.38 E+03	8.95 E+01
		Cs-134	*-1.13 E+00	2.37 E+00
		Cs-137	* 4.85 E-01	2.29 E+00
		Ba-140	* 2.47 E+00	7.90 E+00
		La-140	*-9.06 E-01	3.47 E+00
	890808	K-40	1.41 E+03	1.04 E+02
		Cs-134	* 1.30 E+00	2.43 E+00
		Cs-137	* 1.48 E+00	2.42 E+00
		Ba-140	* 1.88 E+00	7.75 E+00
		La-140	* 0.00 E+00	3.87 E+00
	890829	K-40	1.29 E+03	8.45 E+01
		Cs-134	* 1.71 E-01	2.35 E+00
		Cs-137	*-6.62 E-01	2.24 E+00
		Ba-140	* 2.87 E+00	8.28 E+00
		La-140	*-1.45 E+00	3.95 E+00
	890912	K-40	1.28 E+03	7.95 E+01
		Cs-134	* 8.38 E-01	3.19 E+00
		Cs-137	* 1.77 E+00	3.18 E+00
		Ba-140	*-3.01 E+00	1.11 E+01
		La-140	*-2.70 E+00	4.60 E+00

* Denotes a result less than the detection limit.

TABLE A-12.1 (Cont.)

GAMMA SPECTROMETRY OF MILK

Results in pCi/liter

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
96	890926	K-40	1.19 E+03	7.71 E+01
		Cs-134	*-1.67 E+00	3.22 E+00
		Cs-137	* 6.53 E+00	3.31 E+00
		Ba-140	*-9.36 E+00	1.09 E+01
		La-140	*-3.94 E+00	4.75 E+00
	891010	K-40	1.22 E+03	8.28 E+01
		Cs-134	* 5.04 E-01	2.21 E+00
		Cs-137	* 2.95 E+00	2.15 E+00
		Ba-140	*-4.31 E+00	7.76 E+00
		La-140	* 0.00 E+00	3.87 E+00
	891107	K-40	1.50 E+03	8.77 E+01
		Cs-134	* 1.19 E+00	2.52 E+00
		Cs-137	*-2.08 E-01	2.51 E+00
		Ba-140	* 1.58 E+00	9.10 E+00
		La-140	*-1.95 E+00	3.82 E+00
	891205	K-40	1.56 E+03	9.38 E+01
		Cs-134	* 7.96 E-02	2.56 E+00
		Cs-137	* 3.11 E+00	2.54 E+00
		Ba-140	* 1.01 E+00	8.63 E+00
		La-140	*-9.91 E-01	3.67 E+00

* Denotes a result less than the detection limit.

TABLE A-12.2

GAMMA SPECTROMETRY OF MILK - SUMMARY

Results in pCi/liter

NUCLIDE		AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
K-40	(I)	1.38E+03	1.14E+03	1.69E+03	72	72
K-40	(C)	1.38E+03	1.15E+03	1.56E+03	18	18
Cs-134	(I)	5.10E-01	-1.80E+00	5.63E+00	72	0
Cs-134	(C)	4.09E-01	-1.67E+00	2.17E+00	18	0
Cs-137	(I)	1.95E+00	-1.67E+00	5.02E+00	72	0
Cs-137	(C)	1.85E+00	-6.62E-01	6.53E+00	18	0
Ba-140	(I)	4.21E-01	-1.15E+01	8.00E+00	72	0
Ba-140	(C)	-4.55E-01	-9.36E+00	6.03E+00	18	0
La-140	(I)	-1.71E-01	-5.25E+00	5.69E+00	72	0
La-140	(C)	-1.13E+00	-3.94E+00	4.40E-01	18	0

(I) Indicator Stations: does not include the duplicate sample. Station 37.
(C) Control Station

TABLE A-13.1

GAMMA SPECTROMETRY OF ROOT

Results in pCi/kilogram (wet)

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B Onion	890627	Cs-134	* 1.22 E+00	4.26 E+00
		Cs-137	* 2.24 E+00	4.50 E+00
		I-131	*-1.29 E+00	8.73 E+00
9B Onion	890725	Cs-134	* 5.58 E+00	5.04 E+00
		Cs-137	* 6.82 E+00	5.21 E+00
		I-131	* 2.09 E+00	1.01 E+01
9B Potatoes	890829	Cs-134	* 6.12 E-01	4.06 E+00
		Cs-137	* 3.85 E+00	4.28 E+00
		I-131	*-8.49 E+00	1.25 E+01
9B Onion	890926	Cs-134	* 1.04 E+00	4.43 E+00
		Cs-137	* 1.54 E+00	4.37 E+00
		I-131	*-2.46 E+00	1.06 E+01
37 Onion	890627	Cs-134	* 5.58 E+00	7.39 E+00
		Cs-137	* 2.05 E+00	7.45 E+00
		I-131	* 1.08 E+01	1.48 E+01
37 Carrots	890627	Cs-134	*-5.37 E-01	5.05 E+00
		Cs-137	* 2.62 E+00	5.11 E+00
		I-131	* 1.03 E+00	1.07 E+01
37 Onion	890725	Cs-134	* 1.43 E+00	5.79 E+00
		Cs-137	* 3.06 E+00	5.93 E+00
		I-131	* 1.01 E+00	1.10 E+01
37 Onion	890829	Cs-134	* 3.49 E+00	5.11 E+00
		Cs-137	* 1.35 E+00	4.92 E+00
		I-131	*-3.04 E+00	1.09 E+01
37 Onion	890926	Cs-134	* 5.78 E+00	6.81 E+00
		Cs-137	* 5.40 E+00	6.98 E+00
		I-131	*-5.22 E+00	1.45 E+01

* Denotes a result less than the detection limit.

TABLE A-13.2

GAMMA SPECTROMETRY OF ROOT - SUMMARY

Results in pCi/cubic meter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Cs-134 (I)	3.15E+00	-5.37E-01	5.78E+00	5	0
Cs-134 (C)	2.11E+00	6.12E-01	5.58E+00	4	0
Cs-137 (I)	2.90E+00	1.35E+00	5.40E+00	5	0
Cs-137 (C)	3.61E+00	1.54E+00	6.82E+00	4	0
I-131 (I)	9.16E-01	-5.22E+00	1.08E+01	5	0
I-131 (C)	-2.54E+00	-8.49E+00	2.09E+00	4	0

(I) Indicator Stations
(C) Control Station

TABLE A-14.1

GAMMA SPECTROMETRY OF FRUIT

Results in pCi/kilogram (wet)

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B Cherries	890627	Cs-134	*-4.37 E+00	4.16 E+00
		Cs-137	* 5.32 E+00	4.20 E+00
		I-131	* 5.63 E+00	8.12 E+00
9B Peaches	890725	Cs-134	* 1.20 E+00	4.81 E+00
		Cs-137	* 1.07 E+01	5.13 E+00
		I-131	*-6.46 E-01	9.24 E+00
9B Pears	890829	Cs-134	* 2.97 E-01	4.29 E+00
		Cs-137	*-2.55 E-01	4.19 E+00
		I-131	*-1.91 E+00	9.18 E+00
9B Apples	890926	Cs-134	* 0.00 E+00	7.20 E+00
		Cs-137	* 1.96 E+00	7.14 E+00
		I-131	*-8.60 E+00	1.57 E+01
37 Cantaloupe	890725	Cs-134	* 3.39 E+00	5.77 E+00
		Cs-137	* 5.62 E+00	5.76 E+00
		I-131	* 5.39 E+00	1.23 E+01
37 Cantaloupe	890829	Cs-134	* 2.01 E+00	5.48 E+00
		Cs-137	* 6.25 E+00	5.45 E+00
		I-131	*-8.27 E+00	1.14 E+01
37 Apples	890926	Cs-134	* 1.98 E-01	5.61 E+00
		Cs-137	* 4.48 E+00	6.00 E+00
		I-131	*-3.93 E+00	1.19 E+01
91 Apples	890914	Cs-134	* 3.31 E+00	3.90 E+00
		Cs-137	* 3.09 E+00	3.57 E+00
		I-131	*-1.81 E+00	1.10 E+01

* Denotes a result less than the detection limit.

TABLE A-14.2

GAMMA SPECTROMETRY OF FRUIT - SUMMARY

Results in pCi/cubic meter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Cs-134 (I)	2.22E+00	1.98E-01	3.39E+00	4	0
Cs-134 (C)	-7.18E-01	-4.37E+00	1.20E+00	4	0
Cs-137 (I)	4.86E+00	3.09E+00	6.25E+00	4	0
Cs-137 (C)	4.43E+00	-2.55E-01	1.07E+01	4	0
I-131 (I)	-2.15E+00	-8.27E+00	5.39E+00	4	0
I-131 (C)	-1.38E+00	-8.60E+00	5.63E+00	4	0

(I) Indicator Stations
(C) Control Station.

TABLE A-15.1

GAMMA SPECTROMETRY OF VEGETATION

Results in pCi/kilogram (wet)

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
9B Asparagus	890425	Cs-134	*-8.73 E-01	4.28 E+00
		Cs-137	* 7.58 E+00	4.30 E+00
		I-131	* 1.76 E+00	5.68 E+00
9B Asparagus	890523	Cs-134	* 1.43 E+01	8.81 E+00
		Cs-137	* 9.37 E+00	8.37 E+00
		I-131	*-5.45 E+00	1.51 E+01
9B Cabbage	890627	Cs-134	* 4.14 E+00	3.73 E+00
		Cs-137	* 1.67 E+00	3.73 E+00
		I-131	*-4.70 E-01	8.31 E+00
9B Cabbage	890725	Cs-134	*-2.70 E+00	4.79 E+00
		Cs-137	* 6.33 E+00	4.92 E+00
		I-131	*-2.59 E+00	9.43 E+00
9B Peppers	890829	Cs-134	* 2.83 E+00	6.21 E+00
		Cs-137	* 3.14 E-01	5.88 E+00
		I-131	*-7.95 E+00	1.84 E+01
9B Tomatoes	890926	Cs-134	* 2.70 E+00	6.19 E+00
		Cs-137	*-1.62 E+00	6.02 E+00
		I-131	* 1.32 E+01	1.47 E+01

* Denotes a result less than the detection limit.

TABLE A-15.1 (Cont:)

GAMMA SPECTROMETRY OF VEGETATION

Results in pCi/kilogram (wet)

LOCATION	COLLECTION DATE	NUCLIDE	RESULT	OVERALL UNCERTAINTY
37 Asparagus	890426	Cs-134	* 7.98 E-01	4.47 E+00
		Cs-137	* 1.38 E+00	4.44 E+00
		I-131	* 2.01 E+00	6.07 E+00
37 Asparagus	890523	Cs-134	* 6.44 E+00	7.44 E+00
		Cs-137	* 1.39 E+00	7.42 E+00
		I-131	*-7.90 E+00	1.33 E+01
37 Lettuce	890627	Cs-134	* 0.00 E+00	4.77 E+00
		Cs-137	* 3.58 E+00	4.82 E+00
		I-131	*-1.94 E+00	9.64 E+00
37 Cabbage	890725	Cs-134	* 3.53 E+00	5.91 E+00
		Cs-137	*-1.13 E-01	5.98 E+00
		I-131	* 2.48 E+00	1.29 E+01
37 Cabbage	890829	Cs-134	*-5.29 E-01	7.89 E+00
		Cs-137	*-9.03 E-01	8.16 E+00
		I-131	*-2.35 E+00	1.63 E+01
37 Tomatoes	890926	Cs-134	* 5.18 E+00	8.16 E+00
		Cs-137	*-2.33 E+00	8.44 E+00
		I-131	* 7.49 E+00	1.52 E+01

* Denotes a result less than the detection limit.

TABLE A-15.2

GAMMA SPECTROMETRY OF VEGETATION - SUMMARY

Results in pCi/cubic meter

NUCLIDE	AVERAGE	LOW	HIGH	NUMBER SAMPLES	NUMBER POSITIVE
Cs-134 (I)	2.57E+00	-5.29E-01	6.44E+00	6	0
Cs-134 (C)	3.40E+00	-2.70E+00	1.43E+01	6	0
Cs-137 (I)	5.01E-01	-2.33E+00	3.58E+00	6	0
Cs-137 (C)	3.94E+00	-1.62E+00	9.73E+00	6	0
I-131 (I)	-3.50E-02	-7.90E+00	7.49E+00	6	0
I-131 (C)	-2.50E-01	-7.95E+00	1.32E+01	6	0

(I) Indicator Station
(C) Control Station

APPENDIX B: TELEDYNE ISOTOPES 1989
EPA INTERCOMPARISON RESULTS

1989 EPA INTERCOMPARISON PROGRAM RESULTS

ISOTOPE	COLLECTION DATE	TI RESULTS (a)	EPA RESULTS (b)	OTHER LABS (c)
		MEDIUM - WATER (pCi/liter)		
Gr-Beta	890120	6.00 ± 0.00	4.00 ± 5.00	5.41 ± 1.78
Gr-Beta	890418	53.00 ± 3.61	57.00 ± 5.00	50.42 ± 7.45
Gr-Beta	890522	52.00 ± 1.73	50.00 ± 5.00	50.31 ± 8.02
Gr-Beta	890922	8.00 ± 0.00	6.00 ± 5.00	6.70 ± 1.83
Gr-Beta	891031	30.33 ± 0.58	32.00 ± 6.00	30.61 ± 3.99
Sr-89	890106	37.00 ± 2.65	40.00 ± 5.00	38.04 ± 7.54
Sr-90	890106	26.00 ± 2.00	25.00 ± 1.50	24.39 ± 1.97
Cr-51	890210	245.67 ± 11.72	235.00 ± 24.00	232.71 ± 20.25
Co-60	"	12.67 ± 1.53	10.00 ± 5.00	10.65 ± 2.09
Zn-65	"	181.33 ± 5.51	159.00 ± 16.00	160.15 ± 11.79 (d)
Ru-106	"	191.00 ± 9.85	178.00 ± 18.00	171.19 ± 15.12
Cs-134	"	10.33 ± 0.58	10.00 ± 5.00	9.73 ± 1.89
Cs-137	"	13.67 ± 0.58	10.00 ± 5.00	10.74 ± 1.89
I-131	890217	98.67 ± 0.58	106.00 ± 11.00	106.20 ± 7.19
H-3	890224	2866.67 ± 251.66	2754.00 ± 356.00	2722.79 ± 274.56
Ra-226	890310	5.07 ± 0.29	4.90 ± 0.70	4.70 ± 0.50
Ra-228	"	1.47 ± 0.29	1.70 ± 0.30	1.95 ± 0.61
Sr-89	890418	8.00 ± 0.00	8.00 ± 5.00	7.87 ± 1.90
Sr-90	"	7.67 ± 0.58	8.00 ± 1.50	7.78 ± 1.16
Cs-134	"	19.67 ± 1.53	20.00 ± 5.00	19.12 ± 2.71
Cs-137	"	20.00 ± 2.65	20.00 ± 5.00	20.24 ± 2.29

Footnotes are located at the end of table.

1989 EPA INTERCOMPARISON PROGRAM RESULTS (Cont.)

ISOTOPE	COLLECTION DATE	TI RESULTS (a)	EPA RESULTS (b)	OTHER LABS (c)
		MEDIUM - WATER (pCi/liter) (Cont.)		
Ra-226	890418	3.47 ± 0.23	3.50 ± 0.50	3.42 ± 0.48
Ra-228	"	3.60 ± 0.10	3.60 ± 0.50	3.82 ± 0.77
Sr-89	890505	6.33 ± 0.58	6.00 ± 5.00	5.90 ± 1.48
Sr-90	"	6.33 ± 0.58	6.00 ± 1.50	5.56 ± 0.85
Ba-133	890609	33.00 ± 3.61	49.00 ± 5.00	47.58 ± 5.12 (e)
Co-60	"	30.00 ± 2.65	31.00 ± 5.00	31.04 ± 2.88
Zn-65	"	165.33 ± 0.58	165.00 ± 17.00	166.87 ± 11.46
Ru-106	"	113.67 ± 17.50	128.00 ± 13.00	123.31 ± 13.64
Cs-134	"	34.00 ± 2.65	39.00 ± 5.00	37.26 ± 3.29
Cs-137	"	22.00 ± 3.61	20.00 ± 5.00	20.92 ± 2.23
H-3	890623	4466.67 ± 152.75	4503.00 ± 450.00	4491.17 ± 384.13
Ba-133	891006	51.00 ± 4.36	59.00 ± 6.00	57.72 ± 5.09 (f)
Co-60	"	30.67 ± 2.08	30.00 ± 5.00	30.49 ± 2.49
Zn-65	"	128.33 ± 2.89	129.00 ± 13.00	128.71 ± 8.78
Ru-106	"	139.00 ± 15.72	161.00 ± 16.00	152.74 ± 13.57 (f)
Cs-134	"	23.67 ± 1.15	29.00 ± 5.00	27.34 ± 2.83
Cs-137	"	61.67 ± 1.53	59.00 ± 5.00	61.37 ± 4.48
H-3	891020	3433.33 ± 57.74	3496.00 ± 364.00	3471.07 ± 369.08
Ra-226	891031	9.20 ± 0.46	8.40 ± 1.30	8.02 ± 1.40
Ra-228	"	4.00 ± 0.50	4.10 ± 0.60	4.23 ± 0.86
Sr-89	"	15.00 ± 3.46	15.00 ± 5.00	14.14 ± 2.97

1989 EPA INTERCOMPARISON PROGRAM RESULTS (Cont.)

ISOTOPE	COLLECTION DATE	TI RESULTS (a)	EPA RESULTS (b)	OTHER LABS (c)
		MEDIUM - WATER (pCi/liter) (Cont.)		
Sr-90	"	7.00 ± 0.00	7.00 ± 1.50	6.54 ± 1.14
Cs-134	"	5.33 ± 1.15	5.00 ± 5.00	5.51 ± 1.39
Cs-137	891031	7.00 ± 0.00	5.00 ± 5.00	5.93 ± 1.71
Ra-226	891110	8.47 ± 0.49	8.70 ± 1.30	8.39 ± 1.68
Ra-228	"	8.57 ± 1.46	9.30 ± 1.40	9.55 ± 2.19
		MEDIUM - AIR FILTERS (pCi/cubic meter)		
Gr-Beta	890331	65.67 ± 1.53	62.00 ± 5.00	63.14 ± 8.21
Sr-90	"	19.67 ± 2.08	20.00 ± 1.50	19.21 ± 2.75
Cs-137	"	18.00 ± 1.00	20.00 ± 5.00	21.31 ± 3.87
Cs-137	890825	12.00 ± 1.00	10.00 ± 5.00	10.79 ± 1.96
		MEDIUM - MILK (pCi/liter)		
Sr-89	890428	36.67 ± 1.15	39.00 ± 5.00	34.56 ± 8.78
Sr-90	"	56.33 ± 1.53	55.00 ± 3.00	53.07 ± 5.45
Cs-137	"	53.33 ± 2.31	50.00 ± 5.00	49.86 ± 3.14
K-40	"	1760.00 ± 113.58	1600.00 ± 80.00	1645.58 ± 119.14 (g)

Footnotes:

(a) Teledyne Results - Average ± one sigma. Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters

(b) EPA Results - Expected laboratory precision (1 sigma). Units are pCi/liter for water, and milk except K is in mg/liter. Units are total pCi for air particulate filters

(c) Average concentration plus or minus one sigma, based on range of values encountered.

(d) The three Zn-65 measurements were 184, 175, 185 pCi/l. These were measured on three detectors using the same aliquot. The other reported results (Cr-51, Co-60, Ru-106, Cs-134, Cs-137) were all within two standard deviations of the EPA results. This would indicate that the dilution made was correct (except that possibly the Zn-65 was not well mixed). Other parameters were investigated. The branching intensity, decay factor, and detection efficiencies were checked. Since one of the Co-60 gamma ray energies is only 60 KeV from Zn-65, the detector efficiencies must be correct. There is no obvious reason for the deviation. Another aliquot was counted yielding 165 pCi/l.

(e) There is no apparent reason why Ba-133 was low by 5.54 standard deviation while the other isotopes were within ± 2 standard deviations. The detector efficiencies and Ba-133 branching intensities were checked and found to be correct. On 10/31/89, 300 ml of the original, undiluted sample was counted giving 43.9 ± 5.8 pCi/l Ba-133.

(f) This EPA sample was counted in two geometries; one in diluted stage, the other undiluted. There was no significant difference. Comparing detector efficiencies between two annual sets did not reveal any significant difference. Thus there is no apparent reason why our results differed as much as they did.

(g) There is no apparent reason why the potassium was high. Three separate detectors were used and the K-40 value for each was correctly divided by 0.86 mg/l to convert to potassium in mg/liter.

APPENDIX C: SPECIAL SAMPLE RESULTS

Special Samples

Periodic inoperability of the composite water sampler on the intake line and the frequent inoperability of the flow-proportional water sampling system on the discharge line resulted in the need to collect water samples from these two locations using some alternate method. For this reason, grab samples were taken during some of the sampler outage periods from alternate sampling points providing access to the intake and discharge water. Because the grab samples were collected on a regular basis during sampler outages, they were combined into "composite" samples representing the outage periods.

These grab samples were taken as a matter of "good practice" and not to fulfill the Technical Specification requirements for flow proportional composite sampling. The focus of the Technical Specifications is on the timely repair of the samplers, so repeated efforts were made to put the samplers, and in particular, the discharge sampler, back into operation. The results of composites of grab samples taken during 1989 are presented in Table C-1. A discussion about these results is included in Subsection 4.3 of the report.

Table C-2 contains the results of special sediment samples taken in June 1989 to determine whether cobalt-57 was present in detectable concentrations. Cobalt-57 was not detected in these samples, although the gamma isotopic analysis of sediment collected at Station 34 indicated the presence of the 122 kev gamma peak characteristic of cobalt-57, in the absence of europium-152. Subsection 4.5 includes a discussion about these special samples.

The results of the milk, corn and hay samples collected as a part of the special investigation into the detectable iodine-131 in milk result for the February 7 sample from Station 40 are presented in Table C-3. Iodine-131 was not detected in any of these special samples. A discussion of the investigation is presented in Subsection 4.7 of the report.

TABLE C-1

RESULTS OF WATER GRAB SAMPLE COMPOSITES

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
26	890207 to 890208	H-3		3.0 E+01	8.2 E+01
		Gr-B		1.6 E+00	7.0 E-01
		Be-7	*	-5.8 E+00	2.2 E+01
		K-40	*	1.1 E+02	3.0 E+01
		Mn-54	*	-7.6 E-02	2.1 E+00
		Co-58	*	-1.1 E+00	2.3 E+00
		Fe-59	*	4.1 E+00	4.8 E+00
		Co-60	*	2.8 E+00	2.3 E+00
		Zn-65	*	-3.2 E+00	4.7 E+00
		Zr-95	*	0.0 E+00	4.7 E+00
		Nb-95	*	1.6 E-01	2.1 E+00
		Cs-134	*	6.5 E-01	2.1 E+00
		Cs-137	*	2.2 E+00	2.2 E+00
		Ba-140	*	6.0 E+00	1.3 E+01
		La-140	*	-1.0 E+00	6.2 E+01
		Ra-226	*	1.6 E+02	5.0 E+01
		Th-228	*	1.1 E+01	4.0 E+00
26	890217 to 890220	H-3		2.3 E+02	1.4 E+02
		Gr-B		1.4 E+00	8.0 E-01
		Be-7	*	8.0 E+00	2.7 E+01
		K-40	*	8.7 E+01	2.9 E+01
		Mn-54	*	1.2 E+00	2.2 E+00
		Co-58	*	-2.9 E-01	2.5 E+00
		Fe-59	*	4.5 E+00	6.4 E+00
		Co-60	*	2.3 E-01	2.2 E+00
		Zn-65	*	1.2 E+00	4.8 E+00
		Zr-95	*	3.4 E+00	5.5 E+00
		Nb-95	*	2.1 E+00	2.7 E+00
		Cs-134	*	3.7 E+00	2.4 E+00
		Cs-137	*	2.1 E+00	2.2 E+00
		Ba-140	*	-9.2 E+00	2.5 E+01
		La-140	*	0.0 E+00	1.3 E+01
		Ra-226	*	1.5 E+02	5.0 E+01
		Th-228	*	1.7 E+01	4.0 E+00

*Denotes a result less than the detection limit.

TABLE C-1 (Cont.)

RESULTS OF WATER GRAB SAMPLE COMPOSITES

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
26	890905 to 890913	H-3		8.5 E+00	1.2 E+02
		Gr-B		1.3 E+00	8.0 E-01
		Be-7	*	-4.3 E+00	1.5 E+01
		K-40	*	8.3 E+01	2.2 E+01
		Mn-54	*	7.8 E-01	1.6 E+00
		Co-58	*	-1.1 E+00	1.7 E+00
		Fe-59	*	-1.6 E+00	3.8 E+00
		Co-60	*	7.7 E-01	1.9 E+00
		Zn-65	*	5.5 E-01	3.7 E+00
		Zr-95	*	-1.5 E+00	3.4 E+00
		Nb-95	*	-2.2 E-01	1.8 E-01
		Cs-134	*	-1.5 E+00	1.9 E+00
		Cs-137	*	1.2 E+00	1.7 E+00
		Ba-140	*	2.1 E+00	6.6 E+00
		La-140	*	-2.1 E+00	3.6 E+00
		Ra-226	*	1.2 E+02	3.0 E+01
		Th-228	*	8.9 E+00	2.6 E+00
27	890510 to 890514	H-3		5.9 E+03	2.0 E+02
		Gr-B		1.1 E+01	1.0 E+00
		Be-7	*	1.3 E+00	2.0 E+01
		K-40	*	6.6 E+01	2.6 E+01
		Mn-54	*	0.0 E+00	2.0 E+00
		Co-58	*	-2.1 E-01	2.3 E+00
		Fe-59	*	5.4 E-01	5.1 E+00
		Co-60		5.6 E+00	2.7 E+00
		Zn-65	*	5.4 E+00	5.0 E+00
		Zr-95	*	-3.9 E-01	4.3 E+00
		Nb-95	*	-1.0 E+00	2.0 E+00
		Cs-134	*	-2.2 E+00	2.1 E+00
		Cs-137	*	5.1 E-01	2.1 E+00
		Ba-140	*	1.9 E+00	1.3 E+01
		La-140	*	-4.8 E+00	6.6 E+00
		Ra-226	*	9.2 E+01	3.8 E+01
		Th-228	*	9.3 E+00	3.2 E+00

*Denotes a result less than the detection limit.

TABLE C-1 (Cont.)

RESULTS OF WATER GRAB SAMPLE COMPOSITES

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
27	890517 to 890606	H-3		5.3 E+03	2.0 0+02
		Gr-B		1.5 E+01	2.0 E+00
		Be-7	*	-2.9 E+00	2.2 E+01
		K-40	*	7.6 E+01	2.5 E+01
		Mn-54	*	1.2 E+00	2.1 E+00
		Co-58	*	7.4 E-02	2.6 E+00
		Fe-59	*	-8.0 E-01	5.8 E+00
		Co-60		1.3 E+01	3.7 E+00
		Zn-65		2.1 E+01	7.6 E+00
		Zr-95	*	1.8 E+00	4.7 E+00
		Nb-95	*	5.0 E-01	2.4 E+00
		Cs-134	*	-1.3 E-01	2.2 E+00
		Cs-137	*	1.4 E+00	2.1 E+00
		Ba-140	*	1.1 E+01	2.1 E+01
		La-140	*	1.4 E+00	1.0 E+01
		Ra-226	*	9.6 E+01	3.8 E+01
		Th-228	*	9.1 E+00	3.1 E+00
27	890816 to 890913	H-3	*	7.7 E+01	9.3 E+01
		Gr-B		2.5 E+01	4.0 E+01
		Be-7	*	1.3 E+01	1.6 E+01
		K-40	*	7.7 E+01	2.3 E+01
		Mn-54	*	1.6 E-01	1.5 E+00
		Co-58	*	1.3 E+00	1.6 E+00
		Fe-59	*	1.6 E+00	3.6 E+00
		Co-60	*	2.4 E+00	1.7 E+00
		Zn-65	*	5.8 E-01	3.5 E+00
		Zr-95	*	0.0 E+00	3.1 E+00
		Nb-95	*	0.0 E+00	1.7 E+00
		Cs-134	*	-1.2 E-01	1.6 E+00
		Cs-137	*	1.9 E+00	1.7 E+00
		Ba-140	*	-5.5 E-01	7.0 E+00
		La-140	*	-5.6 E-01	3.3 E+00
		Ra-226	*	8.1 E+01	4.0 E-01
		Th-228	*	1.4 E+00	3.0 E-01

*Denotes a result less than the detection limit.

TABLE C-1 (Cont.)

RESULTS OF WATER GRAB SAMPLE COMPOSITES

Results in pCi/liter

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
27	890913 to 890925	H-3	*	1.8 E+01	8.1 0+01
		Gr-B		3.0 E+01	3.0 E+00
		Be-7	*	-2.8 E-01	1.7 E+01
		K-40	*	5.1 E+01	1.8 E+01
		Mn-54	*	-8.4 E-01	1.4 E+00
		Co-58	*	5.0 E-01	1.7 E+00
		Fe-59	*	2.4 E+00	4.2 E+00
		Co-60	*	1.5 E+00	1.7 E+00
		Zn-65	*	-3.7 E-00	3.3 E+00
		Zr-95	*	-2.4 E-01	3.3 E+00
		Nb-95	*	3.2 E-01	1.8 E+00
		Cs-134	*	-2.8 E+00	1.6 E+00
		Cs-137	*	1.8 E+00	1.5 E+00
		Ba-140	*	-1.6 E+01	1.7 E+01
		La-140	*	-4.0 E+00	9.3 E+00
		Ra-226	*	8.0 E+00	2.7 E+01
		Th-228	*	9.8 E+00	2.3 E+00

*Denotes a result less than the detection limit.

TABLE C-2

RESULTS OF SEDIMENT SAMPLES TAKEN UPSTREAM AND DOWNSTREAM OF THE PLANT 2 DISCHARGE POINT

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
Station 33 (Upstream)	890607	Be-7	*	8.0 E+01	1.4 E+02
		K-40		1.4 E+04	1.4 E+03
		Mn-54	*	7.3 E+00	1.3 E+01
		Co-58	*	-1.0 E-01	1.5 E+01
		Fe-59	*	2.3 E+01	3.8 E+01
		Co-60	*	-4.9 E+00	1.2 E+01
		Zn-65	*	-1.8 E+02	4.0 E+01
		Zr-95	*	-4.3 E+01	3.2 E+01
		Nb-95	*	2.7 E+01	1.6 E+01
		Ru-103	*	-5.7 E+00	1.8 E+01
		Ru-106	*	1.4 E+01	1.1 E+02
		I-131	*	1.0 E+02	1.2 E+02
		Cs-134	*	6.0 E+01	1.4 E+01
		Cs-137		7.6 E+01	1.3 E+01
		Ba-140	*	-4.3 E+01	1.3 E+02
		La-140	*	6.6 E+01	6.1 E+01
		Ce-141	*	1.8 E+01	3.1 E+01
		Ce-144	*	-9.2 E+01	8.3 E+01
		Ra-226		1.2 E+03	3.3 E+02
		Th-228		9.8 E+02	9.8 E+01
Station 34 (Downstream)	890607	Be-7	*	7.9 E+01	1.7 E+02
		K-40		1.2 E+04	1.2 E+03
		Mn-54	*	4.4 E+00	1.6 E+01
		Co-58	*	-9.1 E+00	1.8 E+01
		Fe-59	*	0.0 E+00	4.6 E+01
		Co-60	*	1.5 E+01	1.7 E+01
		Zn-65	*	-2.2 E+02	4.0 E+01
		Zr-95	*	2.0 E+01	4.2 E+01
		Nb-95	*	2.7 E-01	2.0 E+01
		Ru-103	*	-2.3 E+01	2.3 E+01
		Ru-106	*	2.0 E+01	1.4 E+02
		I-131	*	4.1 E+01	1.5 E+02
		Cs-134	*	7.9 E+01	1.8 E+01
		Cs-137		2.3 E+02	3.1 E+01
		Ba-140	*	-1.3 E+02	1.7 E+02
		La-140	*	1.9 E+02	9.0 E+01
		Ce-141	*	1.3 E+01	3.5 E+01
		Ce-144	*	-2.1 E+02	1.0 E+02
		Ra-226		1.9 E+03	3.5 E+02
		Th-228		1.7 E+03	1.7 E+02

*Denotes a result less than the detection limit.

TABLE C-2 (Cont.)

RESULTS OF SEDIMENT SAMPLES TAKEN UPSTREAM
AND DOWNSTREAM OF THE PLANT 2 DISCHARGE POINT

Results in pCi/kilogram

LOCATION	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
Station 33	890607	Be-7	*	6.7 E+01	1.0 E+02
(Dunes)		K-40		1.4 E+04	1.4 E+03
		Mn-54	*	9.8 E+00	9.4 E+00
		Co-58	*	-1.4 E+01	1.1 E+01
		Fe-59	*	1.6 E+01	2.8 E+01
		Co-60	*	1.1 E+01	1.0 E+01
		Zn-65	*	-1.5 E+02	3.0 E+01
		Zr-95	*	1.3 E+02	3.0 E+01
		Nb-95	*	2.4 E+01	1.3 E+01
		Ru-103	*	1.0 E+01	1.3 E+01
		Ru-106	*	2.2 E+00	8.3 E+01
		I-131	*	1.2 E+02	9.0 E+01
		Cs-134	*	5.6 E+01	1.1 E+01
		Cs-137		7.0 E+01	1.0 E+01
		Ba-140	*	0.0 E+00	9.7 E+01
		La-140	*	-6.1 E+01	4.4 E+01
		Ce-141	*	6.5 E-01	2.4 E+01
		Ce-144	*	-1.3 E+02	6.0 E+01
		Ra-226		1.3 E+03	2.7 E+02
		Th-228		1.3 E+03	1.3 E+02

*Denotes a result less than the detection limit.

TABLE C-3

RESULTS OF SPECIAL SAMPLES COLLECTED AT STATION 40

SAMPLE MEDIA	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
Milk (pCi/liter)	890303	I-131[a]	*	8.4 E-02	1.2 E-01
		Be-7	*	2.3 E+00	1.9 E+01
		K-40		1.3 E+03	1.3 E+02
		Mn-54	*	8.6 E-01	2.1 E+00
		Co-58	*	-8.1 E-01	2.1 E+00
		Fe-59	*	8.3 E-01	5.1 E+00
		Co-60	*	-2.7 E+00	2.6 E+00
		Zn-65	*	-2.1 E+00	5.3 E+00
		Zr-95	*	-1.7 E+00	4.2 E+00
		Nb-95	*	6.9 E-01	2.1 E+00
		I-131	*	7.7 E-01	3.0 E+00
		Cs-134	*	1.2 E+00	2.4 E+00
		Cs-137	*	3.7 E+00	2.4 E+00
		Ba-140	*	2.7 E+00	6.8 E+00
		La-140	*	-2.0 E+00	2.9 E+00
		Ce-141	*	-4.9 E-01	4.0 E+00
		Ce-144	*	-6.0 E+00	1.6 E+01
		Ra-226	*	9.1 E+01	4.4 E+01
		Th-228	*	1.4 E+01	0.4 E+01
Corn (pCi/kilogram)	890303	Be-7	*	3.3 E+01	5.3 E+01
		K-40		6.4 E+03	6.4 E+02
		Mn-54	*	-1.7 E+00	6.3 E+00
		Co-58	*	4.1 E+00	6.3 E+00
		Fe-59	*	1.1 E+00	1.6 E+01
		Co-60	*	3.0 E+00	7.5 E+00
		Zn-65	*	0.0 E+00	1.8 E+01
		Zr-95	*	0.0 E+00	1.3 E+01
		Nb-95	*	4.1 E+00	6.5 E+00
		Ru-103	*	-2.4 E+00	6.5 E+00
		Ru-106	*	2.5 E+01	5.7 E+01
		I-131	*	-1.7 E-01	8.9 E+00
		Cs-134	*	3.2 E+00	6.9 E+00
		Cs-137	*	8.0 E-01	6.6 E+00
		Ba-140	*	-2.6 E+00	1.9 E+01
		La-140	*	-5.3 E+00	8.4 E+00
		Ce-141	*	3.1 E+00	1.2 E+01
		Ce-144	*	4.1 E+00	5.1 E+01
		Ra-226	*	2.8 E+02	1.4 E+02
		Th-228	*	4.4 E+01	1.1 E+01

(a)Resin method

*Denotes a result less than the detection limit.

TABLE C-3 (Cont.)

RESULTS OF SPECIAL SAMPLES COLLECTED AT STATION 40

SAMPLE MEDIA	COLLECTION PERIOD	NUCLIDE		RESULT	OVERALL UNCERTAINTY
Hay (pCi/kilogram	890303	Be-7	*	1.7 E+02	3.4 E+02
		K-40		3.7 E+04	3.7 E+03
		Mn-54	*	1.5 E+01	3.7 E+01
		Co-58	*	2.4 E+00	3.8 E+01
		Fe-59	*	0.0 E+00	9.0 E+01
		Co-60	*	3.6 E+01	4.3 E+01
		Zn-65	*	-6.1 E+01	9.8 E+01
		Zr-95	*	1.7 E+01	7.6 E+01
		Nb-95	*	2.2 E+01	3.9 E+01
		Ru-103	*	1.1 E+01	4.2 E+01
		Ru-106	*	3.7 E+02	3.5 E+02
		I-131	*	1.6 E+01	5.7 E+01
		Cs-134	*	6.7 E+00	4.4 E+01
		Cs-137	*	2.6 E+01	4.2 E+01
		Ba-140	*	-1.0 E+02	1.2 E+02
		La-140	*	-1.6 E+01	5.0 E+01
		Ce-141	*	-1.6 E+01	7.9 E+01
		Ce-144	*	-2.6 E+02	3.3 E+02
		Ra-226	*	1.8 E+03	8.0 E+02
		Th-228	*	1.4 E+02	6.0 E+01

*Denotes a result less than the detection limit.

APPENDIX D: SAMPLE DEVIATIONS

Sample Deviations

During 1989, the majority of deviations from the sampling requirements of Table 3.12-1 of the Technical Specifications and Table 1 of the Site Certification Agreement involved the inoperability of the flow-proportional composite water sampler at Station 27 (discharge line) and various air samplers. These deviations are listed in Table D-1.

The frequent inoperability of the flow-proportional composite water sampler at Station 27 during 1989 resulted in the issuance of two Problem Evaluation Requests (PERs) seeking resolution(s) to the numerous sampling problems (PERs 289-023 and 289-0705).

Three major sources of the operability problems were identified:

(1) Equipment failures, including the failure of pumps, relays and flow switches external to the composite sampler itself.

(2) A complex sampling system involving timed delays, relays, flow switches, flow meters, and the lack of familiarity with that system on the part of equipment operators and maintenance personnel.

(3) Confusion over responsibility for the repair, maintenance and calibration of the sampler and how the sampling system is affected by other plant systems.

The steps that were taken to eliminate these sources of the frequent periods of inoperability are:

(1) The sampling system components that have frequently failed, such as the positive displacement pump supplying water to the sampler, the flow switch controlling the initiation of sampling after blowdown flow is started, and the flow indicator controlling the rate at which samples are drawn, have been modified or replaced to permit better performance under

the operating demands of the sampling system. Two new flow-proportional composite water samplers, which do not require the external positive displacement pump, are being purchased to replace the sampler currently drawing samples from the discharge line. In addition, the flow indicator providing the pulse signal to the sampler, enabling flow-proportional sampling, has been modified to handle flow rates from 0-4000 gpm. This will permit flow-proportional sampling over the typical range of flow rates.

(2) A class on the operation of the discharge sampling system for equipment operators was implemented in September 1989. This class provides information on the licensing requirements and the operation of the sampler. In addition, the plant I&C group has assumed responsibility for maintaining the sampling system and has developed specialized knowledge of the sampler and sampling system. Applicable plant operations procedures have been modified to include steps relating to the samplers and sampler operation.

(3) The plant has made a commitment to support the repair and operation of the sampler. Through involvement in the issues surrounding the sampler and the effort spent troubleshooting the sampling, familiarity with the system and awareness of its relationship to other plant systems are growing.

The most frequent causes of air sampler failures were power outages and stalled pumps resulting from gummy lubricating oil or oil leaks. The frequency of air sampler failures observed during 1989 appears to be fairly typical, considering the continuous operation of the samplers. Measures taken to prevent air sampler outages due to pump failures include adding oil when needed during weekly filter exchanges and preventative maintenance every six months.

The problems encountered during fish sampling were, in general, related to the unavailability of fish, inclement weather and equipment malfunction. Although these problems are mostly unpreventable, two steps will be taken to lessen their effect: (1) the fall fish sampling will be started earlier when river level is higher and (2) the time spent fishing each day will be lengthened in order to complete the task while the equipment is operating and river and weather conditions are reasonable.

TABLE D-1

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Air Particulate/ Iodine	890116 TO 890123	Station 8	Power out about 70 hours due to a short in the line. Contacted property owner about electric fence.
	890125 to 890130	Station 8	Power out about 47 hours due to a short in the line. Recontacted property owner about electric fence. He discontinued use.
	890130 to 890206	Station 1	Pump malfunction due to extreme cold weather.
	890130 to 890206	Station 9	Pump malfunction due to extreme cold weather.
	890130 to 890206	Station 21	Power off short time due to transformer malfunction.
	890130 to 890206	Station 57	Power off short time due to transformer malfunction.
	890206 to 890208	Station 9	Location without sampler due to unavailability of replacement unit. Brought out replacement unit February 8.
	890221 to 890229	Station 9	Sampler malfunction; shortened sampling time.
	890306 to 890313	Station 6	Low cfm indicated and sampler replaced. No effect on sample results.
	890327 to 890403	Station 9	Power company maintenance; power out nearly a day.
	890417 to 890424	Station 57	Sampler malfunction for short period.
	890417 to 890424	Station 8	Sampler out of operation 1.4 hours due to power outage.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Air Particulate/ Iodine	890508 to 890515	Station 1	Power outage for 23.6 hours.
	890515 to 890522	Station 40	Power outage for about 10 hours due to blown fuse.
	890522 to 890530	Station 9	Blown fuse; very short sampling hours.
	890605 to 890612	Station 23	Slightly shortened sampling time; likely due to power outage.
	890612 to 890619	Station 4	Blown fuse; very short sampling period.
	890703 to 890710	Station 5	Blown fuse; very short sampling period.
	890710 to 890717	Station 7	Blown fuse; short sampling period.
	890710 to 890717	Station 5	Blown fuse; very short sampling period.
	890717 to 890724	Station 5	Sampler could not be replaced until July 18, so short sampling period.
	890717 to 890724	Station 4	Pumphead indicated out of calibration; returned for repair; actual readings found within calibration, so no effect on results.
	890717 to 890724	Station 21	Low cfm indicated on unit; low cfm rate verified and result from this period recalculated using lower air volume.
	890807 to 890814	Station 8	Sampler malfunction; slightly shortened sampling period.
	890807 to 890814	Station 23	Blown fuse; very short sampling period.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Air Particulate/ Iodine	890821 to 890827	Station 6	Blown fuse; no sample obtained.
	891016 to 891023	Station 4	Slightly shortened sampling period due to outages during construction work in the area.
	891023 to 891030	Station 4	Sampler malfunction; shortened sampling period.
	891127 to 891204	Station 21	Slightly shortened sampling period; cause of outage unknown.
	891204 to 891211	Station 7	Sampler malfunction; slightly shortened sampling period.
Fish	890425 to 890428	Stations 30, 38	Spring fish sampling was delayed until May 3, 4, 9, and 10 due to the lack of availability of salmonids.
	890914 to 890920	Stations 30, 38	Equipment failures and inclement weather delayed fish sampling until September 27, and October 2, 3, 9 and 10. Because of this extended sampling period, the REMP procedural requirement that the period between collection and shipment be no greater than ten days was not met for some samples.
	890927 to 891010	Station 38	The required 1.0 kg. of flesh from a third resident species was not obtained due to lack of availability of fish. Two smaller samples, one of squawfish weighing 0.40 kg and one of bass weighing 0.56 kg, were each submitted for analysis to cover this requirement.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Milk	890628	Station 96	Milk collection delayed one day due to unavailability of sample.
TLD	890630 to 890929	Station 42	This TLD was found missing in the field during the third quarter collection.
Water	890113	Station 27	PER 289-023 concerning frequent inoperability of the flow-proportional composite sampler was submitted.
	890124 to 890127	Station 27	Sampler inoperable due to pump failure; pump was fixed.
	890206 to 890210	Station 26	Sampler inoperable due to disconnection of temporary line supplying intake water to the sampler from the large tower makeup pump until the small pump, PWC-P-5, is repaired. Temporary line was entered into the lifted lead and jumper log and tagged.
	890214 to 890220	Station 26	Leak in bioassay trailer forces shutdown of the water line to the intake samples.
	890310 to 890313	Station 26	Sampler not operational due to burnup of the internal motor and a blown fuse.
	890406	Station 26	Sampler out of operation for five hours in order to repair a leak.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Water	890510 to 890604	Station 27	Sampler not operational due to the use of submersible pumps in the circulation water basin instead of activation of the blowdown valve and the sampler not receiving the signal to begin sampling. Also there was a power outage. Engineering and Plant I&C could find no way to supply the signal temporarily or to supply temporary power.
	890606 to 890616	Station 27	Flow indicator not operating so sampler operating in timed mode. Flow indicator repaired.
	890313 to 890727	Station 32	Pump for Well 2, WNP-1, is not operational so quarterly grab sample was delayed until July 27.
	890619 to 890621	Station 27	Proportional sampling logic board not functioning; board replaced.
	890712 to 890713	Station 27	Solenoid burned up; someone inadvertently set the time to "0", causing sampler to operate without water flow. Training class for operators was initiated.
	890712	Station 28	Water to the sampler had been turned off. Battelle Pacific Northwest Laboratories (PNL) was contacted about problem.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Water	890724 to 890801	Station 27	Blowdown valve was not working so there was no signal to start the sampling process. Technical Evaluation Request (TER) 89-0285-0 was submitted to request installation of a manual switch that could be activated when the blowdown valve cannot be activated. TERs 89-0287 and 89-0286 issued for installation of a backup sampler in the trailer and relocation of the Station 26 and Station 27 samplers to ground floor of the pumphouse.
	890818 to 890821	Station 27	Flow switch board and proportional sampling board burned out; sampler placed in timed interval sampling; ordered replacement flow switches.
	890821 to 890823	Station 27	Sample operated in timed interval mode only.
	890823 to 891005	Station 27	Sampler inoperable due to burned-out flow switch. New flow switch ordered and installed. PER 289-0705 submitted. This documented the frequent equipment problems.
	890905 to 890915	Station 26	Sampler inoperable due to motor that shorted out.
	890907	Station 28	Water line to the sampler found shut off so no water was reaching sampler. PNL was contacted and requested to inform its staff about the need to keep the line on.

TABLE D-1 (Cont.)

1989 SAMPLE DEVIATIONS

SAMPLE MEDIA	DATE	LOCATION	PROBLEM
Water	890920 to 891003	Stations 26, 27	Calibration of samplers delayed until October 3 due to sampler inoperability (Station 27) and inability to add sampler (Station 26) into the plant calibration schedule.
	891005 to 891107	Station 27	Sampler operating in timed interval mode due to problem with flow-proportional board. Plant I&C solved the problem that had recurred on each board installed.
	891129 to 891231	Station 26	A slow steady leak on this sampler resulted in a larger volume of water collected than usual. Sampler leak repaired.

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