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1999 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
SALEM AND HOPE CREEK GENERATING STATIONS
DOCKET NOS. 50-272, 50-311, AND 50-354

Gentlemen:

As required by Section 6.9.1.7 of Appendix A to Facility Operating Licenses DPR-70 and DPR-75 for Salem Generating Station, Unit Nos. 1 and 2, and Section 6.9.1.6 of Appendix A to Facility Operating License NPF-57 for Hope Creek Generating Station, Public Service Electric & Gas (PSE&G) hereby transmits one copy of the 1999 Annual Radiological Environmental Operating Report. This report summarizes the results of the radiological environmental surveillance program for 1999 in the vicinity of the Salem and Hope Creek Generating Stations. The result of this program for 1999 was specifically compared to the result of the pre-operational program.

If you have any questions or comments on this transmittal, please contact Brooke Knieriem at (856) 339-1782.

Sincerely,

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PSEG

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

For

Salem Generating Station, Unit 1: Docket No. 50-272
Salem Generating Station, Unit 2: Docket No. 50-311
Hope Creek Generating Station : Docket No. 50-354

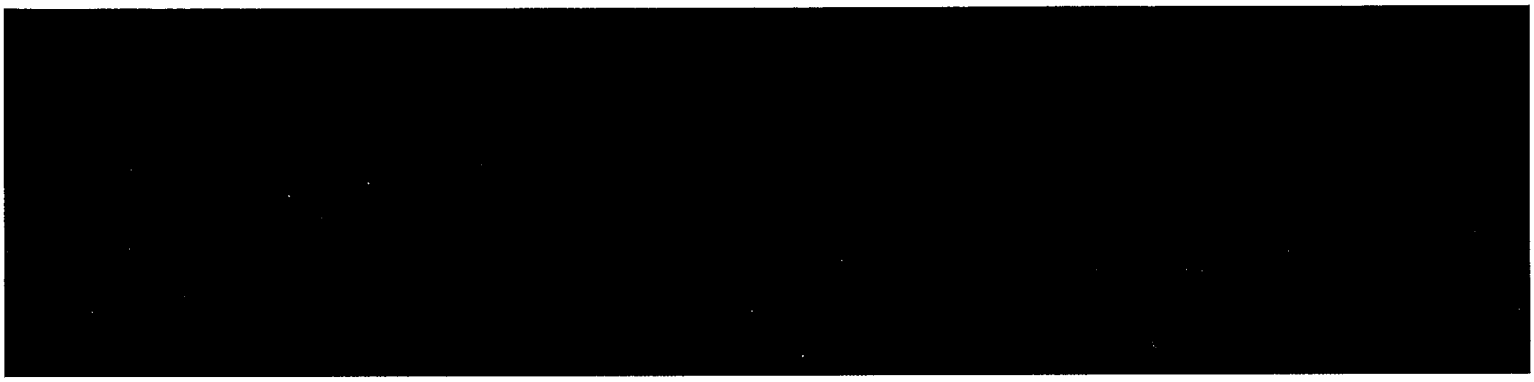
1999 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 1999

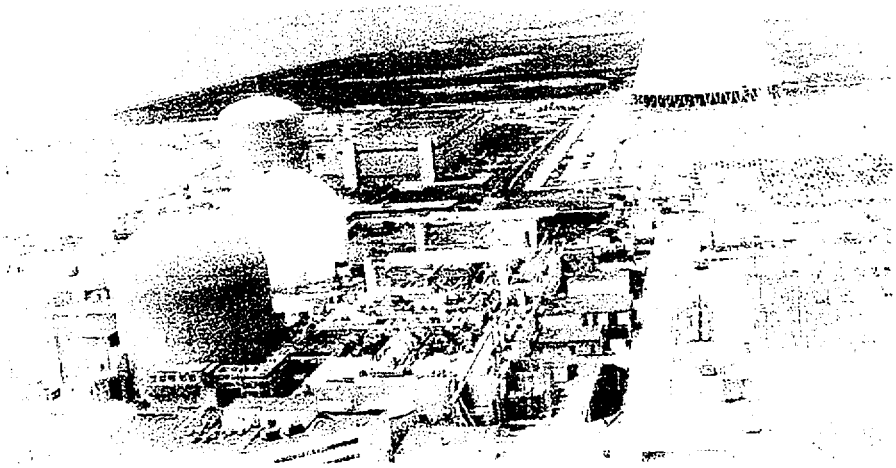
Prepared by

PSEG MAPLEWOOD TESTING SERVICES

APRIL 2000



RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM



SALEM & HOPE CREEK
GENERATING STATIONS

1999 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 1999

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SUMMARY

During normal operations of a nuclear power generating station there are releases of small amounts of radioactive material to the environment. To monitor and determine the effects of these releases a Radiological Environmental Monitoring Program (REMP) has been established for the environment around Artificial Island where the Salem Generating Stations (SGS) and Hope Creek Generating Station (HCGS) are located. The results of the REMP are published annually, providing a summary and interpretation of the data collected.

PSEG's Maplewood Testing Services (MTS) has been responsible for the collection and analysis of environmental samples during the period of January 1, 1999, through December 31, 1999, and the results are discussed in this report. The REMP for SGS/HCGS was conducted in accordance with the SGS and HCGS Technical Specifications/Offsite Dose Calculation Manual. The Lower Limit of Detection (LLD) values required by the Technical Specifications/ODCM were achieved for this reporting period. The objectives of the program were also met during this period. The data collected assists in demonstrating that SGS and HCGS were operated in compliance with Technical Specifications/ODCM.

Most of the radioactive materials noted in this report are normally present in the environment, either naturally, such as potassium-40, or as a result of non-nuclear generating station activity, such as nuclear bomb testing. Measurements made in the vicinity of SGS/HCGS were compared to background or control measurements and the preoperational REMP study performed before Salem Unit 1 became operational. Samples of air particulates, air iodine, milk, surface, ground and drinking water, vegetables, game, fodder crops, fish, crabs, and sediment were collected and analyzed. External radiation dose measurements were also made in the vicinity of SGS/HCGS using thermoluminescent dosimeters.

From the results obtained, it can be concluded that the levels and fluctuations of radioactivity in environmental samples were as expected for an estuarine environment. No unusual radiological characteristics were observed in the environs of SGS/HCGS during this reporting period. Since these results were comparable to the results obtained during the preoperational phase of the program, and with historical results collected since commercial operation, we can conclude that the operation of SGS and HCGS had no significant impact on the radiological characteristics of the environs of these stations.

To demonstrate compliance with Technical Specifications/ODCM (Sections 3/4.12.1 & 6.8.4.h -1,2,3), samples were analyzed for one or more of the following: gamma emitting isotopes, tritium (H-3), iodine-131 (I-131), gross beta and gross alpha. The results of these analyses were used to assess the environmental impact of SGS and HCGS operations,

thereby demonstrating compliance with Technical Specifications/ODCM (Section 3/4.11) and applicable Federal and State regulations, and to verify the adequacy of radioactive effluent control systems. The results provided in this report are summarized below:

- There were a total of 1172 analyses on 900 environmental samples during 1999. Direct radiation dose measurements were also made using 198 thermoluminescent dosimeters (TLDs).

- In addition to the detection of naturally-occurring isotopes (i. e. Be-7, K-40, Ra-226 and Th-232) trace levels of Co-60, Cs-134, and Cs-137 were also detected. The concentrations of these nuclides were well below the Technical Specification reporting limit.

- Dose measurements made with quarterly TLDs at 31 offsite locations around Artificial Island averaged 49 millirems for the year 1999. The average dose measurements at the control locations (background) was 54 millirems for the year. This was comparable to the preoperational phase of the program which had an average of 55 millirems per year for 1973 to 1976.

THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Lower Alloways Creek Township, Salem County, New Jersey is the site of Salem (SGS)and Hope Creek (HCGS) Generating Stations. SGS consists of two operating pressurized water nuclear power reactors. Salem Unit One has a net rating of 1115 megawatt electric(MWe) and Salem Unit Two has a net rating of 1139 MWe. The licensed core power for both units is 3411 megawatt thermal (MWt). HCGS is a boiling water nuclear power reactor which has a net rating of 1067 MWe (3293 MWt).

SGS/HCGS are located on a man-made peninsula on the east bank of the Delaware River. It was created by the deposition of hydraulic fill from dredging operations. The environment surrounding SGS/HCGS is characterized mainly by the Delaware River and Bay, extensive tidal marshlands, and low-lying meadowlands. These land types make up approximately 85% of the land area within five miles of the site. Most of the remaining land is used for agriculture [1,2]. More specific information on the demography, hydrology, meteorology, and land use of the area may be found in the Environmental Reports [1,2], Environmental Statements [3,4], and the Updated Final Safety Analysis Reports for SGS and HCGS [5,6].

Since 1968, a radiological environmental monitoring program (REMP) has been conducted at the SGS/HCGS Site. Starting in December, 1972, more extensive radiological monitoring programs were initiated. The operational REMP was initiated in December, 1976, when Salem Unit 1 achieved criticality. PSEG's Maplewood Testing Services (MTS) has been involved in the REMP since its inception. MTS is responsible for the collection of all radiological environmental samples and, from 1973 through June, 1983, conducted a quality assurance program in which duplicates of a portion of those samples analyzed by the primary laboratory were also analyzed by MTS.

From January, 1973, through June, 1983, Radiation Management Corporation (RMC) had primary responsibility for the analysis of all samples under the SGS/HCGS REMP and annual reporting of results. RMC reports for the preoperational and operational phase of the program are referenced in this report [7-9]. On July 1, 1983, MTS assumed primary responsibility for the analysis of all samples (except TLDs) and the reporting of results. Teledyne Brown Engineering Environmental Services (TBE), assumed responsibility for third-party QA analyses and TLDs. An additional vendor, Controls for Environmental Pollution Inc. (CEP), was retained to provide third-party QA analyses and certain non-routine analyses from May, 1988, until June 1, 1992. Currently, Duke Engineering and Services Environmental Laboratory (DE&SEL) is the third party QA vendor and the laboratory which performs the TLD analyses. MTS reports for the operational phase from 1983 to 1998 are referenced in this report [10].

An overview of the 1999 Program is provided in Table 1. Radioanalytical data from samples collected under this program were compared with results from the preoperational phase.Differences between these periods were examined statistically to determine the effects of station operations. This report presents the results from January 1 through December 31, 1999, for the SGS/HCGS REMP.

OBJECTIVES

The objectives of the Operational REMP are:

- To fulfill the requirements of the Radiological Surveillance sections of the Technical Specifications/ODCM for SGS/HCGS.
- To determine whether any significant increase occurred in the concentration of radionuclides in critical pathways.
- To determine if SGS or HCGS has caused an increase in the radioactive inventory of long-lived radionuclides.
- To detect any change in ambient gamma radiation levels.
- To verify that SGS and HCGS operations have no detrimental effects on the health and safety of the public or on the environment.

This report, as required by Section 6.9.1.7 of the Salem Technical Specifications/ODCM and Section 6.9.1.6 of the Hope Creek Technical Specifications/ODCM, summarizes the findings of the 1999 REMP. Results of the four-year preoperational program have been summarized for comparison with subsequent operational reports [8].

In order to meet the objectives, an operational REMP was developed. Samples of various media were selected for monitoring due to the radiological dose impact to human and other organisms. The selection of samples was based on: (1), established critical pathways for the transfer of radionuclides through the environment to man, and, (2), experience gained during the preoperational phase. Sampling locations were determined based on site meteorology, Delaware estuarine hydrology, local demography, and land uses.

Sampling locations were divided into two classes, indicator and control. Indicator stations are those which are expected to manifest station effects. Control samples are collected at locations which are believed to be unaffected by station operations, usually at 15 to 30 kilometers distance. Fluctuations in the levels of radionuclides and direct radiation at indicator stations are evaluated with respect to analogous fluctuations at control stations. Indicator and control station data are also evaluated relative to preoperational data. Appendix A describes and summarizes, in accordance with Section 6.9.1.7 of the Salem TS and Section 6.9.1.6 of the Hope Creek TS, the operational program as performed in 1999.

Appendix B describes the coding system which identifies sample type and location. Table B-1 lists the sampling stations and the types of samples collected at each station. These sampling stations are indicated on Maps B-1 and B-2.

DATA INTERPRETATION

Results of analyses are grouped according to sample type and presented in Appendix C. All results above the Lower Limit of Detection (LLD) are at a confidence level of 2 sigma. This represents the range of values into which 95% of repeated analyses of the same sample should fall. As defined in Regulatory Guide 4.8, LLD is the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability, with only 5% probability of falsely concluding that a blank observation represents a "real signal". LLD is normally calculated as 4.66 times the standard deviation of the background counting rate, or of the blank sample count, as appropriate; divided by counting efficiency, sample size, 2.22E6 (dpm per microcurie), the radiochemical yield when applicable, the radioactive decay constant and the elapsed time between sample collection and time of counting. The Minimum Detectable Concentration (MDC) is defined as the smallest concentration of radioactive material that can be detected at a given confidence level. The MDC differs from the LLD in that the MDC takes into consideration the interference caused by the presence of other nuclides while the LLD does not.

The grouped data were averaged and standard deviations calculated in accordance with Appendix B of Reference 16. Thus, the 2 sigma deviations of the averaged data represent sample and not analytical variability. For reporting and calculation of averages, any result occurring at or below the LLD is considered to be at that level. When a group of data was composed of 50% or more LLD values, averages were not calculated.

Grab sampling is a useful and acceptable procedure for taking environmental samples of a medium in which the concentration of radionuclides is expected to vary slowly with time or where intermittent sampling is deemed sufficient to establish the radiological characteristics of the medium. This method, however, is only representative of the sampled medium for that specific location and instant of time. As a result, variation in the radionuclide concentrations of the samples will normally occur. Since these variations will tend to counterbalance one another, averages based upon repetitive grab samples is considered valid.

QUALITY ASSURANCE PROGRAM

MTS has a quality assurance program designed to ensure confidence in the analytical program. Approximately 20% of the total analytical effort is spent on quality control, including process quality control, instrument quality control, interlaboratory cross-check analyses, and data review.

The quality of the results obtained by MTS is ensured by the implementation of the Quality Assurance Program as described in the Maplewood Testing Services Quality Assurance Plan [11] and the Environmental and Chemical Division Procedures Manual. The internal quality control activity of MTS includes the quality control of instrumentation, equipment and reagents; the use of reference standards in calibration, documentation of established procedures and computer programs, and analysis of duplicate and spiked samples. The external quality control activity is implemented through participation in the Analytics Interlaboratory Comparison Program. The results of the Interlaboratory Comparison Program are listed in Tables D-1 through D-4 in Appendix D.

PROGRAM CHANGES

The collection of TLDs from location 3H3 was discontinued after the end of the 3rd quarter. This location was 110 miles from the site and as the ODCM calls for the control locations to be situated 15 - 30 km from the site and in the least prevalent wind direction, location 3H3 was replaced. A new TLD location, 14G1 at 19 km (11.8 miles) was proposed as the replacement. All of our control stations are at sufficient distances from the site such that they are unaffected by plant operations. Current control station locations include stations 3G1, 3H1, 1G3, 10G1, 16G1 and 14G1.

RESULTS AND DISCUSSION

The analytical results of the 1999 REMP samples are divided into categories based on exposure pathways: atmospheric, direct, terrestrial, and aquatic. The analytical results for the 1999 REMP are summarized in Appendix A. The data for individual samples are presented in Appendix C. The data collected demonstrates that the SGS and HCGS REMP was conducted in compliance with the Technical Specifications/ODCM.

The REMP for the SGS/HCGS Site has historically included samples and analyses not specifically required by these Stations' Technical Specifications/ODCM. MTS continues to collect and analyze some of these samples in order to maintain personnel proficiency in performing these non-routine analyses. These analyses are referenced throughout the report as Management Audit samples. The summary tables in this report include these additional samples and analyses.

ATMOSPHERIC

Air particulates were collected on Schleicher-Schuell No. 25 glass fiber filters with low-volume air samplers. Iodine was collected from the air by adsorption on triethylenediamine (TEDA) impregnated charcoal cartridges connected in series after the air particulate filters. Air sample volumes were measured with calibrated dry-gas meters and were corrected to standard temperature and pressure.

Air Particulates (Tables C-1, C-2)

Air particulate samples were collected at 6 locations. Each of the 311 weekly samples collected were analyzed for gross beta. Quarterly composites of the weekly samples from each station were analyzed for specific gamma emitters. Total data recovery for the 6 sampling stations in 1999 was 99.7 percent.

- Gross beta activity was detected in 259 of the indicator station samples at concentrations ranging from 7 x 10^{-3} to 42 x 10^{-3} pCi/m^3 and in 52 of the control station samples from 8 x 10^{-3} to 42 x 10^{-3} pCi/m^3. The averages for the indicator and control station samples were 21 and 22 x 10^{-3} pCi/m^3, respectively. The maximum preoperational level detected was 920 x 10^{-3} pCi/m^3, with an average of 74 x 10^{-3} pCi/m^3. Results from 1973 to current year are plotted on Figure 1 as quarterly averages.

- Gamma spectroscopy performed on each of the 24 quarterly composite samples analyzed, indicated the presence of the naturally-occurring radionuclides Be-7 and K-40. All other gamma emitters searched for were below the LLD.

  - Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in all 20 indicator station composites that were analyzed, at concentrations ranging from 41 x 10^{-3} to 96 x 10^{-3} pCi/m^3, with an average of 70 x 10^{-3} pCi/m^3. It was detected in the 4 control station composites ranging from 47 x 10^{-3} to 79 x 10^{-3} pCi/m^3, with an average of 68 x 10^{-3} pCi/m^3. The maximum preoperational level detected was 330 x 10^{-3} pCi/m^3, with an average of 109 x 10^{-3} pCi/m^3.

  - Potassium-40 activity was detected in 18 of the indicator station samples, with concentrations ranging from 5 x 10^{-3} to 20 x 10^{-3} pCi/m^3, with an average of 14 x 10^{-3} pCi/m^3. K-40 was also detected in 2 control station samples, at concentrations of 12 x 10^{-3} pCi/m^3. No preoperational data is available for comparison.

Air Iodine (Table C-3)

Iodine in filtered air samples was collected at 6 locations. Each of the 311 weekly samples collected was analyzed for I-131.

Iodine-131 was not detected in any of the weekly samples analyzed. LLD sensitivities for all the stations, both indicator and control, ranged from <1.1 x 10^{-3} to <9.5 x 10^{-3} pCi/m^3. The maximum preoperational level detected was 42 x 10^{-3} pCi/m^3.

DIRECT RADIATION

Ambient radiation levels in the environs were measured with energy-compensated $CaSO_4$ (Tl) thermoluminescent dosimeters (TLDs) supplied and read by DE&SEL.

Packets containing TLD's for quarterly exposure were placed in the owner controlled area and around the Site at various distances.

Direct Radiation (Table C-4)

A total of 50 locations were monitored for direct radiation during 1999, including 12 on-site locations, 31 off-site locations within the 10 mile zone, and 7 control locations beyond 10 miles. Effort ws made to locate TLD's at schools and population centers in the area.

Five readings for each TLD (ie; 5 elements) at each location were taken in order to obtain a more statistically valid result. For these measurements, the rad is considered equivalent to the rem, in accordance with 10CFR20.1004.

The average dose rate for the 31 quarterly off-site indicator TLDs was 4.1 millirads per standard month, and the average control rate was 4.5 millirads per standard month. The preoperational average for the quarterly TLD readings was 4.4 millirads per standard month.

In Figure 2, the quarterly average radiation levels of the off-site indicator stations versus the control stations, are plotted for the period 1974 through 1999.

TERRESTRIAL

Milk samples were taken semi-monthly when cows were on pasture and monthly when cows were not grazing on open pasture. Animals are considered on pasture from April to November of each year. Samples were collected in new polyethylene containers and transported in ice chests with no preservatives added.

A well water sample was collected monthly. Separate raw and treated potable water samples were composited daily at the City of Salem water treatment plant. All samples were collected in new polyethylene containers.

Locally grown vegetable and fodder crops were collected at the time of harvest. Such samples were weighed and packed in plastic bags.

Game (muskrat) has been collected annually (time of year dependent on weather conditions, which affect pelt thickness) from local farms after being trapped, stripped of their pelts and gutted. The carcasses were packed in plastic bags and kept chilled in ice chests during transport.

Milk (Table C-5)

Milk samples were collected at 4 local dairy farms (2 farms in NJ and 2 in Delaware). Each sample was analyzed for I-131 and gamma emitters.

- Iodine-131 was not detected in any of the 80 samples analyzed. LLD sensitivities for both the indicator and the control station samples ranged from <0.1 to <0.3 pCi/L. The maximum preoperational level detected was 65 pCi/L which occurred following a period of atmospheric nuclear weapons tests. Results from 1973 to current year are plotted on Figure 3.

- Gamma spectroscopy performed on each of the 80 samples indicated the presence of the naturally-occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.

  - Potassium-40 was detected in all 80 samples. Concentrations for the 60 indicator station samples ranged from 1190 to 1470 pCi/L, with an average of 1370 pCi/L. The 20 control station sample concentrations ranged from 1170 to 1470 pCi/L, with an average of 1340 pCi/L. The maximum preoperational level detected was 2000 pCi/L, with an average of 1437 pCi/L.

  - Radium was not detected in any of the control samples. It was detected in one of the indicator station samples at a concentration of 5 pCi/L. LLD sensitivities for the remaining sample locations, both indicator and control, ranged from <2.3 to <6.8 pCi/L. The maximum preoperational level detected was 11 pCi/L, with an average of 3.8 pCi/L.

Well Water (Ground Water) (Tables C-6, C-7)

Although wells in the vicinity of SGS/HCGS are not directly affected by plant operations, water samples were collected monthly from one farm's well during January through December of the year. Each sample was analyzed for gross alpha, gross beta, tritium, and gamma emitters.

- Gross alpha activity was detected in 10 of the well water samples at concentrations ranging from 1.2 to 4.9 pCi/L and an average of 2.2 pCi/L. The maximum preoperational level detected was 9.6 pCi/L. There was no preoperational average determined for this analysis.

- Gross beta activity was detected in all 12 well water samples. Concentrations for the samples ranged from 9.7 to 11 pCi/L, with an average of 11 pCi/L. The 1999 gross beta results are comparable with the preoperational results which ranged from <2.1 to 38 pCi/L, with an average value of 9 pCi/L.

- Tritium activity was not detected in any of the well water samples. The LLD sensitivities ranged from <110 to <170 pCi/L. The maximum preoperational level detected was 380 pCi/L.

- Gamma spectroscopy performed on each of the 12 well water samples indicated the presence of the naturally-occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.

- Radium was detected in all 12 of the well water samples at concentrations ranging from 57 to 167 pCi/L with an average of 120 pCi/L. The maximum preoperational level detected was 2.0 pCi/L.

  These values are similar to those found in the past nine years. However, as with the 1989 through 1998 results, they are higher than those found in the preoperational program. The results are most likely due to a procedural change for sample preparation. The change results in less removal of radon (and its daughter products) from the sample. It is reasonable to conclude that values currently observed are typical for this region.

- Potassium-40 was detected in 6 of the samples at concentrations ranging from 43 to 68 pCi/L and an average of 58 pCi/L. The maximum preoperational level detected was 30 pCi/L.

Potable Water (Drinking Water) (Tables C-8, C-9)

Both raw and treated potable water samples were collected and composited by Salem water treatment plant personnel. Each sample consisted of daily aliquots composited into a monthly sample. The raw water source for this plant is Laurel Lake and adjacent wells. Each of the 24 individual samples was analyzed for gross alpha, gross beta, tritium, iodine-131 and gamma emitters.

- Gross alpha activity was detected in 10 raw water samples at concentrations of 0.6 to 2.2 pCi/L and in 7 treated water samples ranging from 0.8 to 2.1 pCi/L. The averages for both raw and treated water samples was 1.1 pCi/L. The maximum preoperational level detected was 2.7 pCi/L.

- Gross beta activity was detected in all 24 samples at concentrations ranging from 2.3 to 3.8 pCi/L for both the raw and treated water. The average concentration for both raw and treated was 3.1 pCi/L. The maximum preoperational level detected was 9.0 pCi/L, with an average of 4.2 pCi/L.

- Tritium activity was not detected in any of the raw and treated water samples. LLD sensitivities ranged from <110 to <170 pCi/L. The maximum preoperational level detected was 350 pCi/L, with an average of 179 pCi/L.

- Iodine-131 measurements to a sensitivity of 1.0 pCi/L were performed. Since the receiving water body (Delaware River) is brackish, the water is not used for human consumption. Drinking water supplies are not affected by discharges from the site. Iodine-131 measurements for all 24 samples were below the LLD sensitivities. The LLD sensitivities ranged from <0.1 to <0.3 pCi/L.

- Gamma spectroscopy performed on each of the 24 monthly water samples indicated the presence of the naturally-occurring radionuclides K-40 and Radium. All other gamma emitters searched for were below the LLD.

  - The radionuclide K-40 was detected in 11 of the raw potable water and 10 treated samples at concentrations ranging from 32 to 74 pCi/L. The combined average for both raw and treated samples was 44 pCi/L. There was no preoperational data available for comparison.

  - Radium was not detected in any potable raw samples and in only 2 of the treated samples at concentrations of 4.3 and 14 pCi/L, with an average of 9.2 pCi/L. LLD sensitivities for both raw and treated waters ranged from <1.6 to <6.4 pCi/L. The maximum preoperational level detected was 1.4 pCi/L. The higher results in the two measurable samples are most likely due to the procedural change for sample preparation, as discussed in the Well Water section.

Vegetables (Table C-10)

Although vegetables in the region are not irrigated with water into which liquid plant effluents have been discharged, a variety of food products grown in the area for human consumption were sampled at 7 indicator stations (15 samples) and 3 control stations (11 samples). The vegetables collected as management audit samples are analyzed for gamma emitters and included asparagus, cabbage, sweet corn, peppers and tomatoes.

Gamma spectroscopy performed on each of the 26 samples indicated the presence of the naturally occurring radionuclides K-40 and Be-7. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in all 26 samples. Concentrations for the 15 indicator station samples ranged from 1380 to 3190 pCi/kg-wet and averaged 2350 pCi/kg-wet. Concentrations for the 11 control station samples ranged from 1670 to 2730 pCi/kg-wet, and averaged 2380 pCi/kg-wet. The average concentration detected for all samples, both indicator and control, was 2360 pCi/kg-wet. The maximum preoperational level detected was 4800 pCi/kg-wet, with an average of 2140 pCi/kg-wet.

Beryllium-7 was detected in 1 indicator sample (cabbage) at a concentration of 127 pCi/kg-wet. It was not detected in any of the control station samples. No preoperational data is available for comparison.

Game (Table C-11)

Although not required by the SGS or HCGS Technical Specifications/ODCM, samples of muskrats, inhabiting the marshlands surrounding the site, are collected. This game is consumed by local residents.

The samples, when available, are collected from 2 locations once a year as management audit samples and analyzed for gamma emitters.

Gamma spectroscopy performed on the flesh indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in the indicator station sample at a concentration of 2940 pCi/kg-wet and the control station sample at 2700 pCi/kg-wet. The average for both muskrat samples was 2820 pCi/kg-wet. The maximum preoperational level detected was 27000 pCi/kg-wet, with an average of 4400 pCi/kg-wet.

Fodder Crops (Table C-12)

Although not required by the SGS or HCGS Technical Specifications/ODCM, eight samples of crops normally used as cattle feed (silage and soybeans) were collected from three indicator stations (6 samples) and one control station (2 samples). It was determined that these products may be a significant element in the food-chain pathway. Fodder crops are collected as management audit samples and analyzed for gamma emitters. All of the locations from which samples were collected this year are milk sampling stations.

Gamma spectroscopy performed on each of the 8 samples indicated the presence of the naturally-occurring radionuclides Be-7, K-40 and Radium. All other gamma emitters searched for were below the LLD.

Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in all 4 of the indicator silage samples at concentrations of 160 to 1090 pCi/kg-wet. It was detected in the control station silage sample at 370 pCi/kg-wet. The maximum preoperational level detected for silage was 4700 pCi/kg-wet, with an average of 2000 pCi/kg-wet. Be-7 was not detected in any of the soybean samples. LLD sensitivities for the soybean samples ranged from <17 to <73 pCi/kg-wet. The maximum preoperational level detected for soybean samples was 9300 pCi/kg-dry.

Potassium-40 was detected in all 8 samples. Concentrations for the 6 indicator station samples ranged from 1790 to 16500 pCi/kg-wet and for the 2 control station samples at 3300 and 16600 pCi/kg-wet. The average concentration detected for the silage samples (both indicator and control) was 4060 pCi/kg-wet Preoperational results averaged 7000 pci/kg-wet. Results for the soybean samples (both indicator and control) averaged 16200 pCi/kg-wet which is comparable to preoperational studies when the average wet/dry factor of 1.2 is used. Preoperational soybean results averaged 22000 pCi/kg-dry.

Radium was detected in one indicator soybean sample at a concentration of 11 pCi/kg-wet. It was not detected in either control station sample. LLD sensitivities for the remaining samples, silage and soybean, ranged from <5.4 to <11 pCi/kg-wet. The maximum preoperational level detected was 100 pCi/kg-dry.

AQUATIC

All aquatic samples were collected by Environmental Consulting Services, Inc. Surface water samples were collected in new polyethylene containers that were rinsed twice with the sample medium prior to collection. Edible fish and crabs are taken by net and then processed. In processing, the flesh is separated from the bone and shell and placed in sealed polyethylene containers and frozen before being transported in ice chests.

Sediment samples were taken with a bottom grab sampler and frozen in sealed polyethylene containers before being transported in ice chests.

Surface Water (Tables C-13, C-14, C-15)

Surface water samples were collected monthly at 4 indicator stations and 1 control station in the Delaware estuary.

One location is at the outfall area (which is the area where liquid radioactive effluents from the Salem Station are allowed to be discharged into the Delaware River), another is downstream from the outfall area, and another is directly west of the outfall area at the mouth of the Appoquinimink River. Two upstream locations are in the Delaware River and at the mouth of the Chesapeake and Delaware Canal, the latter being sampled when the flow is from the Canal into the river. Station 12C1, at the mouth of the Appoquinimink River, serves as the operational control. All surface water samples were analyzed monthly for gross beta and gamma emitters. Quarterly composites were analyzed for tritium.

- Gross beta activity was detected in all 48 of the indicator station samples ranging from 8.3 to 150 pCi/L, with an average of 66 pCi/L. Beta activity was detected in all 12 of the control station samples with concentrations ranging from 9.4 to 106 pCi/L, with an average of 60 pCi/L. The maximum preoperational level detected was 110 pCi/L, with an average of 32 pCi/L. Results from 1973 to the current year are plotted on Figure 4 using the quarterly averages for all the locations.

- Tritium activity was detected in 4 of the indicator station composites ranging from 110 to 200 pCi/L, with an average concentration of 160 pCi/L. Tritium was detected in one of the control station composites at a concentration of 240 pCi/L. LLD sensitivities for the remaining composites, both indicator and control, ranged from <120 to <170 pCi/L. The maximum preoperational level detected was 600 pCi/L, with an average of 210 pCi/L. Results from 1973 to the current year are plotted on Figure 5.

- Gamma spectroscopy performed on each of the 48 indicator station and 12 control station surface water samples indicated the presence of the naturally-occurring radionuclides K-40 and Th-232 plus the fission radionuclide Cs-137. All other gamma emitters searched for were below the LLD.

- Potassium-40 was detected in 45 samples from the indicator stations at concentrations ranging from 34 to 167 pCi/L and in all of the control station samples ranging from 41 to 150 pCi/L. The average for the indicator station locations was 95 pCi/L, while the average for the control station locations was 92 pCi/L. The maximum preoperational level detected was 200 pCi/L, with an average of 48 pCi/L.

- Thorium-232 was detected in one of the 48 indicator station samples with a concentration of 9.7 pCi/L and in one of the 12 control station samples at 9.9 pCi/L. LLD values for the remaining samples, both the indicator and control locations, ranged from <3.6 to <11 pCi/L. The maximum preoperational level detected was 4.0 pCi/L.

- Cesium-137 was detected in one of the 48 indicator station samples with a concentration of 7.4 pCi/L. It was not detected in any of the control station samples. LLD values for the remaining samples, both the indicator and control locations, ranged from <0.7 to <4.6 pCi/L. The maximum preoperational level detected was 0.9 pCi/L. The presence of Cs-137 in this outfall location (11A1) sample could be due to the presence of small amounts of flocculated river sediment in the surface water sample. This concentration is below the TS/ODCM required LLD of 18 pCi/l and well below the TS/ODCM reporting level for drinking water of 50 pCi/l.

Fish (Table C-17)

Edible species of fish were collected semi-annually at 3 locations and analyzed for gamma emitters (flesh), and for Sr-89 and Sr-90 (bones & flesh) in one location (11A1). This location was chosen since it is the outfall area for the Salem Station. Samples included catfish, weakfish, white perch and striped bass.

- Gamma spectroscopy performed on each of the 4 indicator station samples and 2 control station samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

  - Potassium-40 was detected in all 4 samples from the indicator stations at concentrations ranging from 3380 to 4000 pCi/kg-wet for an average of 3720 pCi/kg-wet. K-40 was detected in both samples from the control location at 3170 and 3770 pCi/kg-wet. The average for the control samples was 3470 pCi/kg-wet. The maximum preoperational level detected was 13000 pCi/kg-wet, with an average of 2900 pCi/kg-wet.

- Strontium-89 and strontium-90 analyses were performed by DE&SEL on one sample of the first semi-annual sample collection (location 11A1), and reported as MDC. These are management audit analyses which are performed in recognition of the high bioaccumulation factor of strontium in bone.

- Strontium-89 was not detected in the bone sample. The MDC value for the sample was <140 pCi/kg-dry. The maximum preoperational level detected was 100 pCi/kg-dry.

- Strontium-90 was not detected in the bone sample. The MDC value for the sample was <120 pCi/kg-dry. The maximum preoperational level detected was 940 pCi/kg-dry, with an average of 335 pCi/kg-dry.

- Strontium-89 was not detected in the flesh sample. The MDC value for the sample was <37 pCi/kg-wet. The pre-operational level ranged from <4.1 to <100 pCi/kg-wet.

- Strontium-90 was not detected in the flesh sample. The MDC value for the sample was <19 pCi/kg-wet. The maximum preoperational level detected was 67 pCi/kg-wet.

Blue Crab (Table C-18)

Blue crab samples were collected semi-annually at 2 locations, 1 indicator and 1 control, and the edible portions were analyzed for gamma emitters.

Gamma spectroscopy performed on the flesh of each of the 2 indicator station samples and 2 control station samples indicated the presence of the naturally-occurring radionuclide K-40. All other gamma emitters searched for were below the LLD.

Potassium-40 was detected in both indicator station samples at concentrations of 2930 and 3330 pCi/kg-wet and in both of the control station samples at 2900 and 3190 pCi/kg-wet. The average for both the indicator and control station samples was 3090 pCi/kg-wet. The maximum preoperational level detected was 12000 pCi/kg-wet, with an average of 2835 pCi/kg-wet.

Sediment (Table C-19)

Sediment samples were collected semi-annually from 7 locations, 6 indicator stations and 1 control station. Each of the 14 samples was analyzed for gamma emitters. Although trace levels of man-made nuclides were detected in some sediment samples, these levels were expected and well within the acceptable levels specified in section 3/4.12.1 of the Technical Specifications/ODCM.

Gamma spectroscopy was performed on each of the 12 indicator station samples and 2 control station samples. In addition to the detection of the naturally-occurring radionuclides Radium, K-40, Be-7 and Th-232, low levels of Cs-134, Cs-137, and Co-60 were also detected. All other gamma emitters searched for were below the LLD.

Cesium-134 was detected in 4 of the 12 indicator station samples at concentrations ranging from 9 to 68 pCi/kg-dry, with an average of 48 pCi/kg-dry. It was not detected in either control station samples.

LLD sensitivities for the other 10 station samples, both indicator and control ranged from <3.4 to <53 pCi/kg-dry. No pre-operational data is available for comparison.

Cesium-137 was detected in 11 indicator station samples at concentrations ranging from 7.3 to 160 pCi/kg-dry and an average of 74 pCi/kg-dry. It was detected in 1 control station sample at a concentration of 22 pCi/kg-dry. The maximum preoperational level detected was 400 pCi/kg-dry with an average of 150 pCi/kg-dry. Results from 1977 to the current year are plotted on Figure 6A.

Cobalt-60 was detected in 5 of the 12 indicator stations at concentrations ranging from 36 to 63 pCi/kg-dry, with an average of 52 pCi/kg-ry. It was not detected in either of the 2 control stations. LLD sensitivities for the other 9 samples, indicator and control, ranged from <5.7 to <15 pCi/kg-dry. No preoperational data is available for comparison. Results from 1977 to the current year are plotted on Figure 6B.

Potassium-40 was detected in all 12 indicator station samples at concentrations ranging from 1580 to 16700 pCi/kg-dry, with an average of 12760 pCi/kg-dry. Concentrations detected in both of the control station samples were at 9780 and 10300 pCi/kg-dry. The average for both the indicator and control station samples was 12400 pCi/kg-dry. The maximum preoperational level detected was 21000 pCi/kg-dry, with an average of 15000 pCi/kg-dry.

Radium was detected in all 12 indicator station samples at concentrations ranging from 140 to 760 pCi/kg-dry, with an average of 560 pCi/kg-dry. Concentrations detected in both of the control station samples were at 530 and 790 pCi/kg-dry, with an average of 660 pCi/kg-dry. The grand average for both the indicator and control station samples was 570 pCi/kg-dry. The maximum pre-operational level detected was 1200 pCi/kg-dry, with an average of 760 pCi/kg-dry.

Thorium-232 was detected in all 12 indicator station samples at concentrations ranging from 120 to 1150 pCi/kg-dry, with an average of 830 pCi/kg-dry. Concentrations detected in both of the control station samples were at 70 and 920 pCi/kg-dry, with an average of 490 pCi/kg-dry. The grand average for both the indicator and control station samples was 830 pCi/kg-dry. The maximum pre-operational level detected was 1300 pCi/kg-dry, with an average of 840 pCi/kg-dry.

Beryllium-7 was detected in 2 of the 12 indicator station samples at a concentration of 240 and 990 pCi/kg-dry, but not in either of the 2 control station samples. The LLD sensitivities for the remaining samples, both indicator and control, ranged from <60 to <170 pCi/kg-dry. The maximum preoperational level detected was 2300 pCi/kg-dry.

PROGRAM DEVIATIONS

A sample from location 5S1, 1.0 miles east of the vent was unavailable for 167.9 hours due to the malfunction of the automatic air sampler. The sampler's electrical breaker tripped shortly after being serviced. A field inspection was performed on all the air sampler locations with no equipment defects noted. All the breakers feeding the air samplers were tripped and reset without incident. Installation of new grounding rods (cathodic protection) at all locations will be completed during the 2nd quarter, 2000. The samplers operated normally during the next and all subsequent sampling periods. The total availability of all air samplers used in the program was 99.7%.

The TLD from location 11E2 was lost during the 4th quarter, 1999. The TLDs are located on a utility pole owned by the local utility Conectiv Inc. When the TLDs were being changed out during the last week of December, the empty packet of TLDs was found opened on the ground. Line crew personnel from the utility were interviewed and they indicated that the pole on which the TLD was installed was removed on November 24, 1999. Although our company's name and telephone number is listed on the TLD packet along with a request to notify us if the packet is found, no telephone calls were received. The utility personnel do not remember the ultimate disposition of the TLDs located on their pole and we have declared the sample as being lost. Since the contact information on the labels tend to fade after several months of rain and intense sunlight, we will replace all labels with new laminated labels which should be more water and fade resistant. The local utility was reminded to contact our company if they should find one of our TLD packets on one of their utility poles that they may need to remove.

CONCLUSIONS

The Radiological Environmental Monitoring Program for Salem and Hope Creek Generating Stations was conducted during 1999 in accordance with the SGS and HCGS Technical Specifications/ODCM. The LLD values required by the Technical Specifications/ODCM were achieved for this reporting period. The objectives of the program were also met during this period. The data collected assists in demonstrating that SGS and HCGS were operated in compliance with Technical Specifications/ODCM.

From the results obtained, it can be concluded that the levels and fluctuations of radioactivity in environmental samples were as expected for an estuarine environment. No unusual radiological characteristics were observed in the environs of SGS/HCGS during this reporting period. Since these results were comparable to the results obtained during the preoperational phase of the program, which ran from 1973 to 1976, and with historical results collected since commercial operation, we can conclude that the operation of the Salem and Hope Creek Stations had no significant impact on the radiological characteristics of the environs of that area.

TABLE 1

SALEM AND HOPE CREEK GENERATING STATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(PROGRAM OVERVIEW)

MEDIUM	STATION CODE INDICATOR	STATION CODE CONTROL	COLLECTION FREQUENCY	TYPE/FREQUENCY* OF ANALYSIS
I. ATMOSPHERIC ENVIRONMENT				
a. Air Particulate	5S1 5D1 16E1 1F1 2F6	14G1	Weekly	Gross beta/weekly Gamma scan/quarterly
b. Air Iodine	5S1 5D1 16E1 1F1 2F6	14G1	Weekly	Iodine-131/weekly
II. DIRECT RADIATION				
a. Thermoluminescent Dosimeters	1S1 2S4 3S1 4S1 2S2 5D1 2E1 1F1 5S1 10D1 3E1 2F2 6S2 14D1 13E1 2F6 7S1 15S1 16S1 4F2 10S1 16E1 5F1 6F1 11S1 7F2 11F1 13F4 4D2 9E1 2F5 3F2 11E2 15D1 12E1 3F3 16F2 10F2 12F1 13F2 13F3 14F2 15F3	3G1 3H1 3H3** 1G3 10G1 16G1 14G1	Quarterly	Gamma dose/ quarterly
III. Terrestrial Environment				
a. Milk	2F9 11F3 14F4	3G1	Monthly (when animals are on pasture) Semi-monthly (when animals are on pasture)	Iodine-131/monthly Gamma scan/monthly Iodine-131/semi-monthly Gamma scan/semi-monthly

TABLE 1 (cont'd)

SALEM AND HOPE CREEK GENERATING STATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(PROGRAM OVERVIEW)

MEDIUM	STATION CODE INDICATOR	STATION CODE CONTROL	COLLECTION FREQUENCY	TYPE/FREQUENCY* OF ANALYSIS
b. Well Water	3E1		Monthly	Gross alpha/monthly Gross beta/monthly Tritium/monthly Gamma scan/monthly
c. Potable Water (Raw & Treated)	2F3		Monthly (composited daily)	Gross alpha/monthly Gross beta/monthly Tritium/monthly Gamma scan/monthly Iodine-131/monthly
d. Vegetables	3E1 2F4 2F9 3F5 3F6 3F8 14F3	1G1 2G2 3H5	Annually (at harvest)	Gamma scan/on collection
e. Game (Muskrat)	11D1 3E1		Semi-annually	Gamma scan/on collection
f. Fodder Crops	2F9 11F3 14F4	3G1	Annually	Gamma scan/on collection
g. Soil	6S2 2F7 11F3 10D1 2F9 14F4 16E1 5F1	3G1	Every 3 years	Gamma scan/on collection

TABLE 1 (cont'd)

SALEM AND HOPE CREEK GENERATING STATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(PROGRAM OVERVIEW)

MEDIUM	STATION CODE INDICATOR	CONTROL	COLLECTION FREQUENCY	TYPE/FREQUENCY* OF ANALYSIS
IV. AQUATIC ENVIRONMENT				
a. Surface Water	11A1 7E1 1F2 12C1	16F1	Monthly	Gross beta/monthly Gamma scan/monthly Tritium/quarterly
b. Edible Fish	11A1 7E1	12C1	Semi-annually	Sr-89 & Sr-90 (bones)/on 1 loc.*** Sr-89 & Sr-90 (flesh/on 1 loc.*** Gamma scan (flesh)/on collection
c. Blue Crabs	11A1	12C1	Semi-annually	Gamma scan (flesh)/on collection
d. Sediment	11A1 6S2 7E1 15A1 16F1 16A1	12C1	Semi-annually	Gamma scan/on collection

* Except for TLDs, the quarterly analysis is performed on a composite of individual samples collected during the quarter.

** Location 3H3 TLD was removed from the program after the 3rd quarter analysis.

*** Management audit analyses, not required by Technical Specifications or by specific commitments to local officials.

FIGURE 1
GROSS BETA ACTIVITY IN AIR PARTICULATE
1973 THROUGH 1999

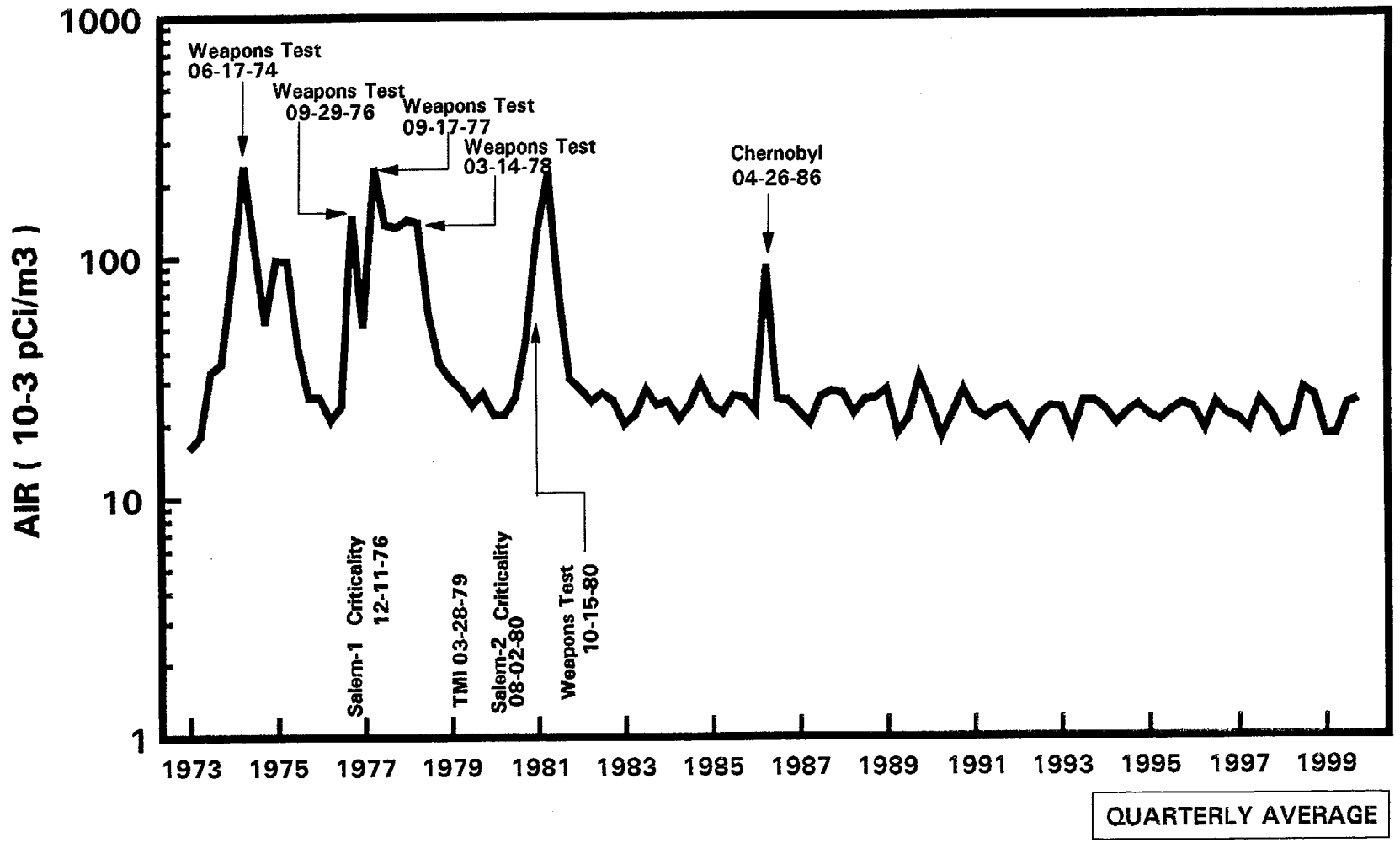


FIGURE 2
AMBIENT RADIATION - OFF-SITE vs CONTROL STATION
1973 THROUGH 1999

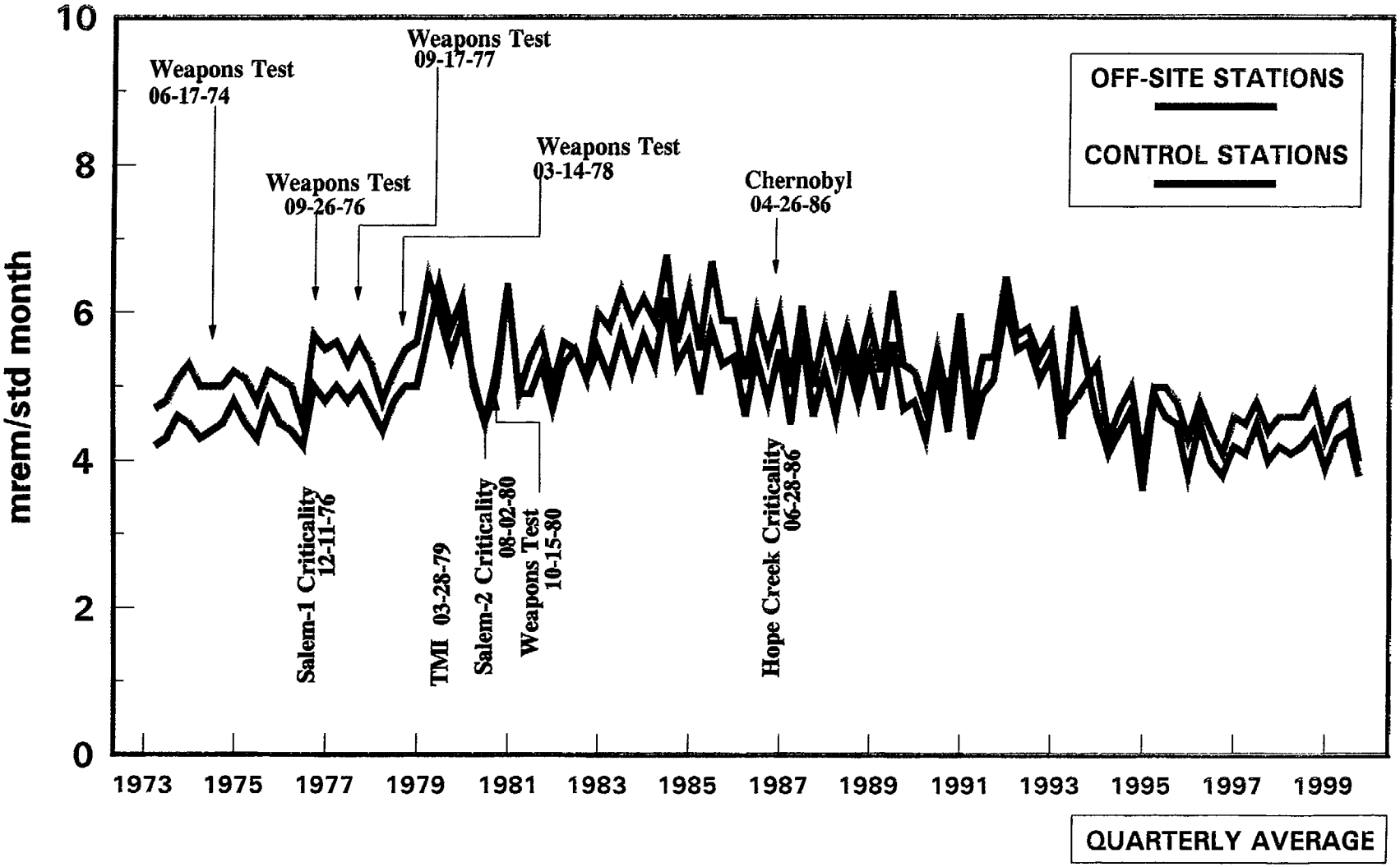


FIGURE 3
IODINE-131 ACTIVITY IN MILK
1973 THROUGH 1999

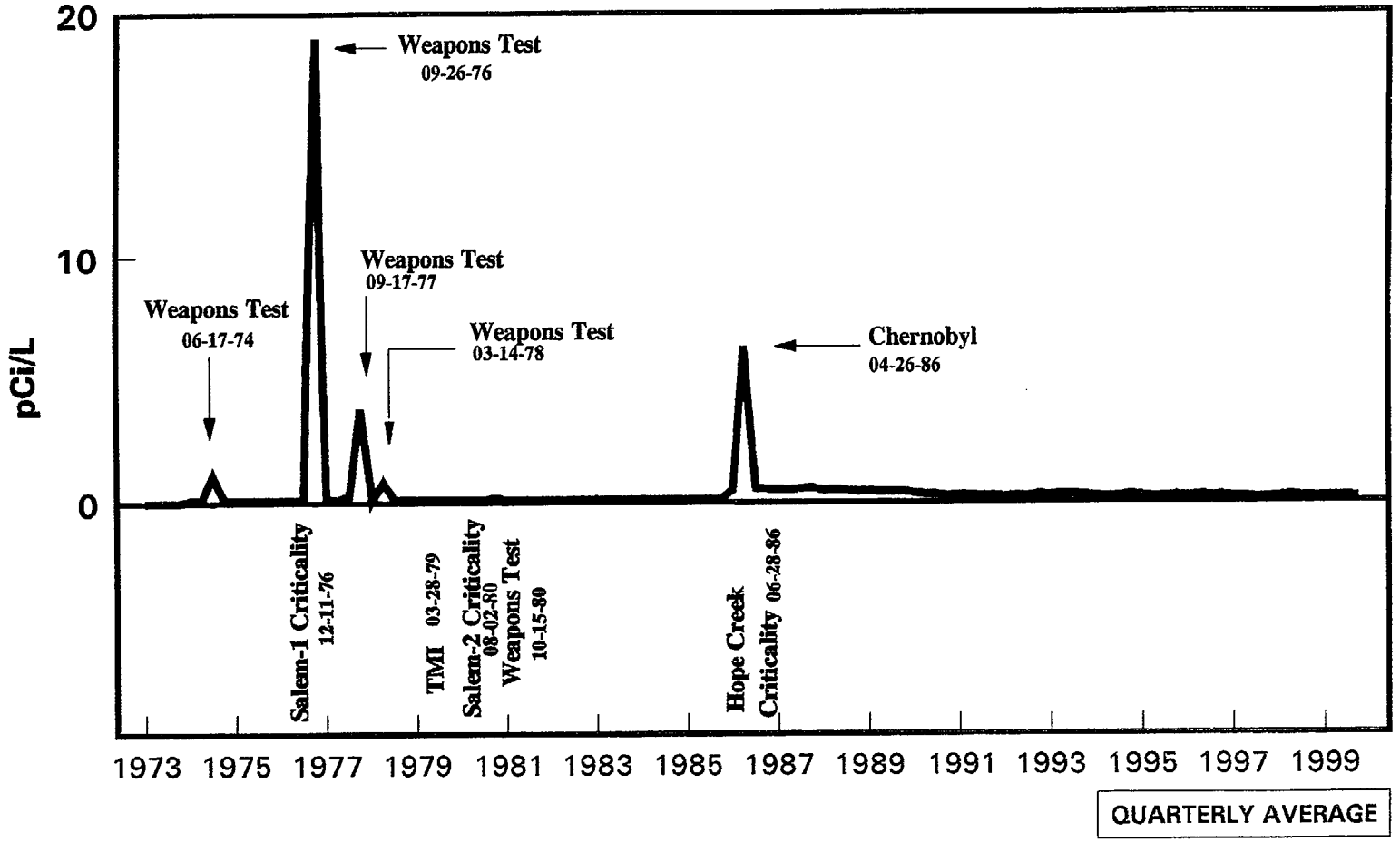


FIGURE 4
GROSS BETA ACTIVITIY IN SURFACE WATER
1973 THROUGH 1999

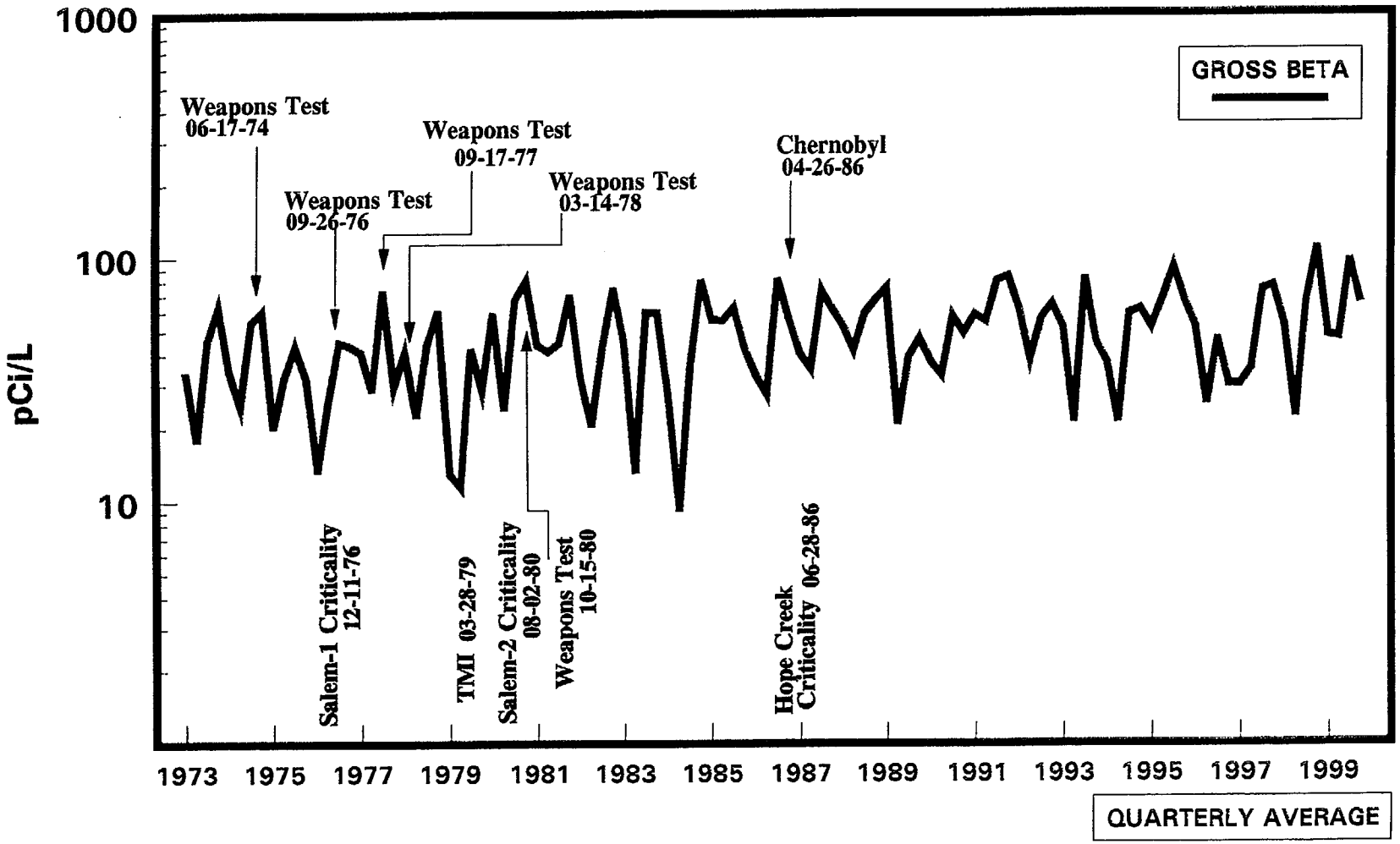


FIGURE 5
TRITIUM ACTIVITY IN SURFACE WATER
1973 THROUGH 1999

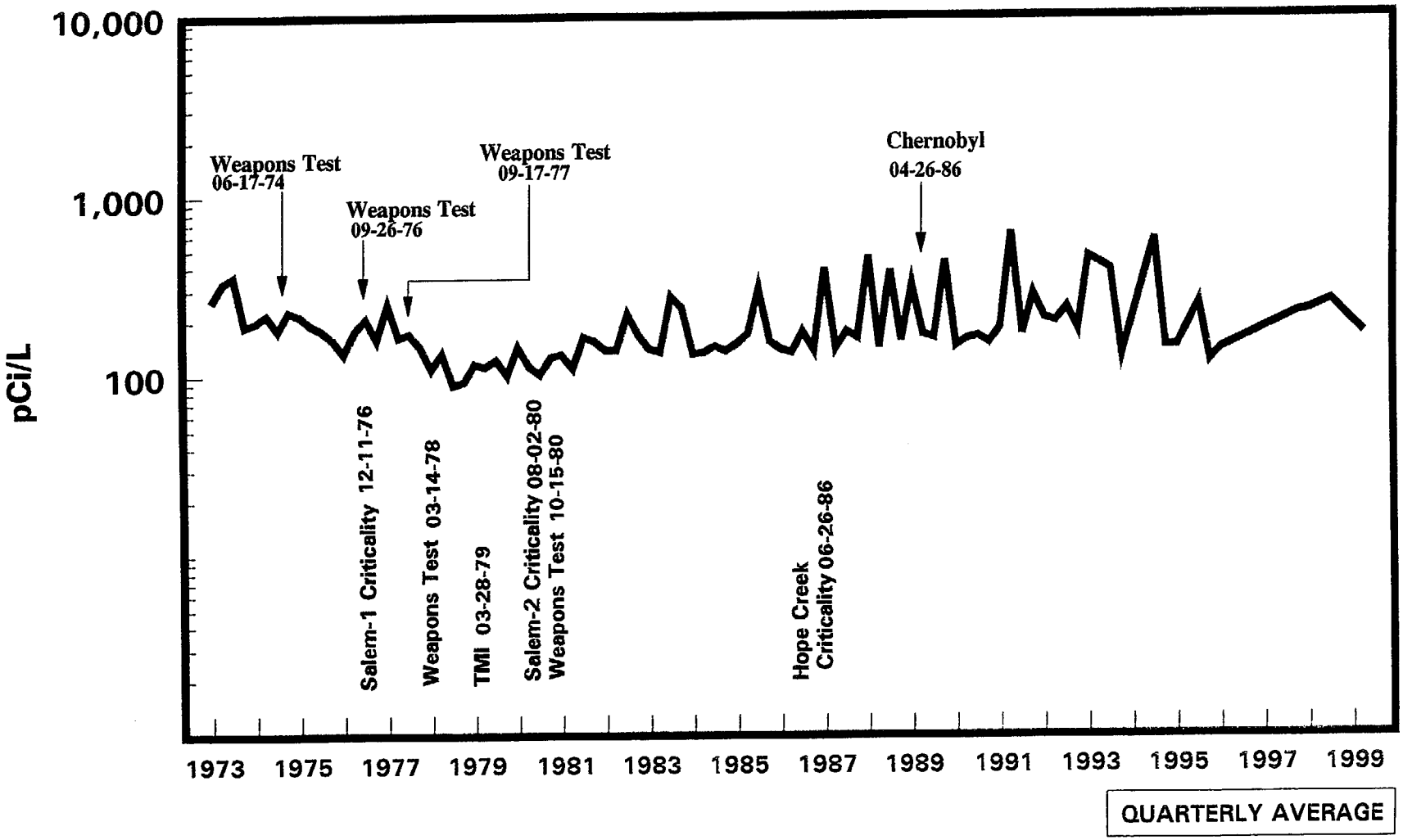


FIGURE 6A
CESIUM - 137 ACTIVITY IN AQUATIC SEDIMENT
1977 THROUGH 1999

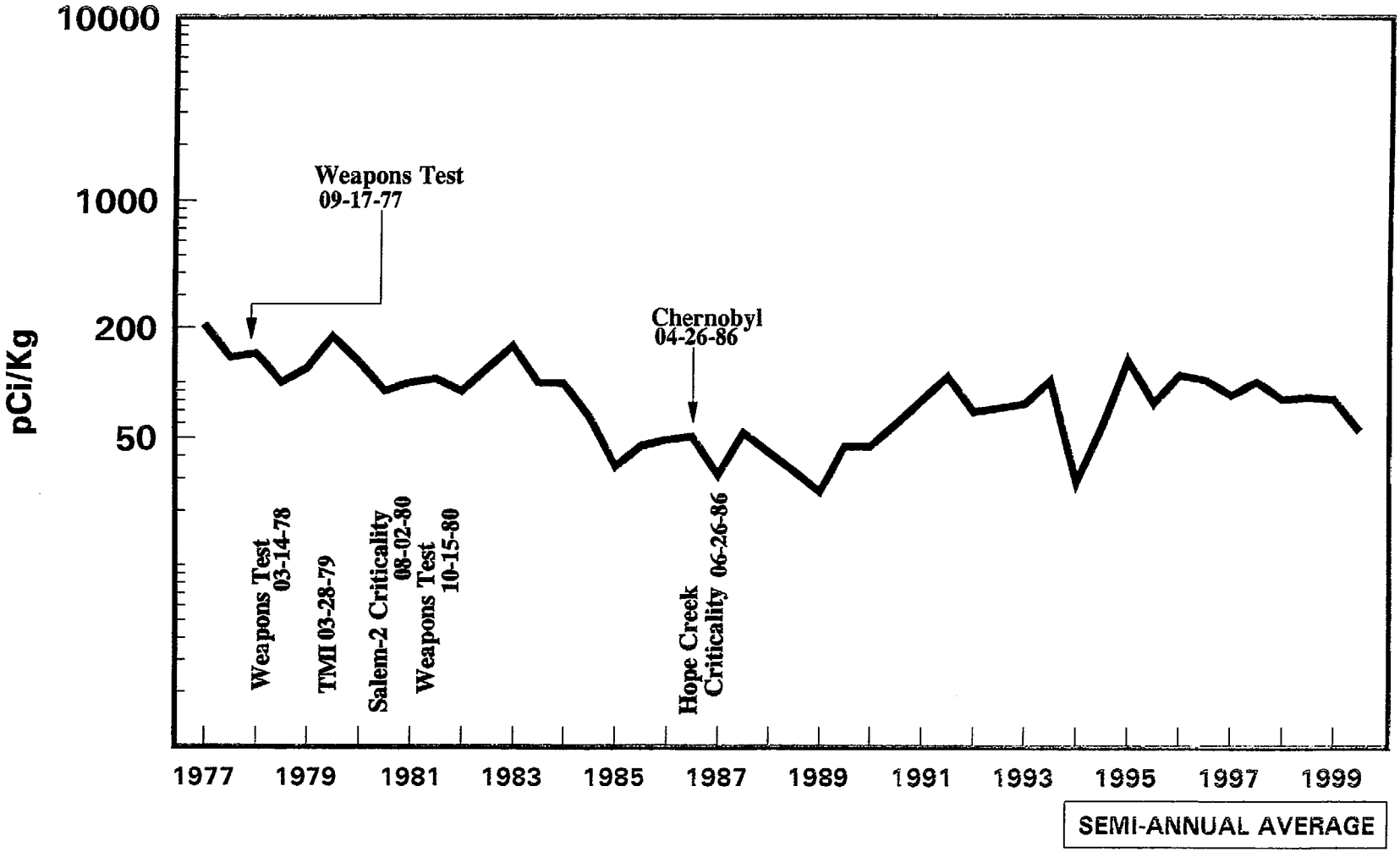
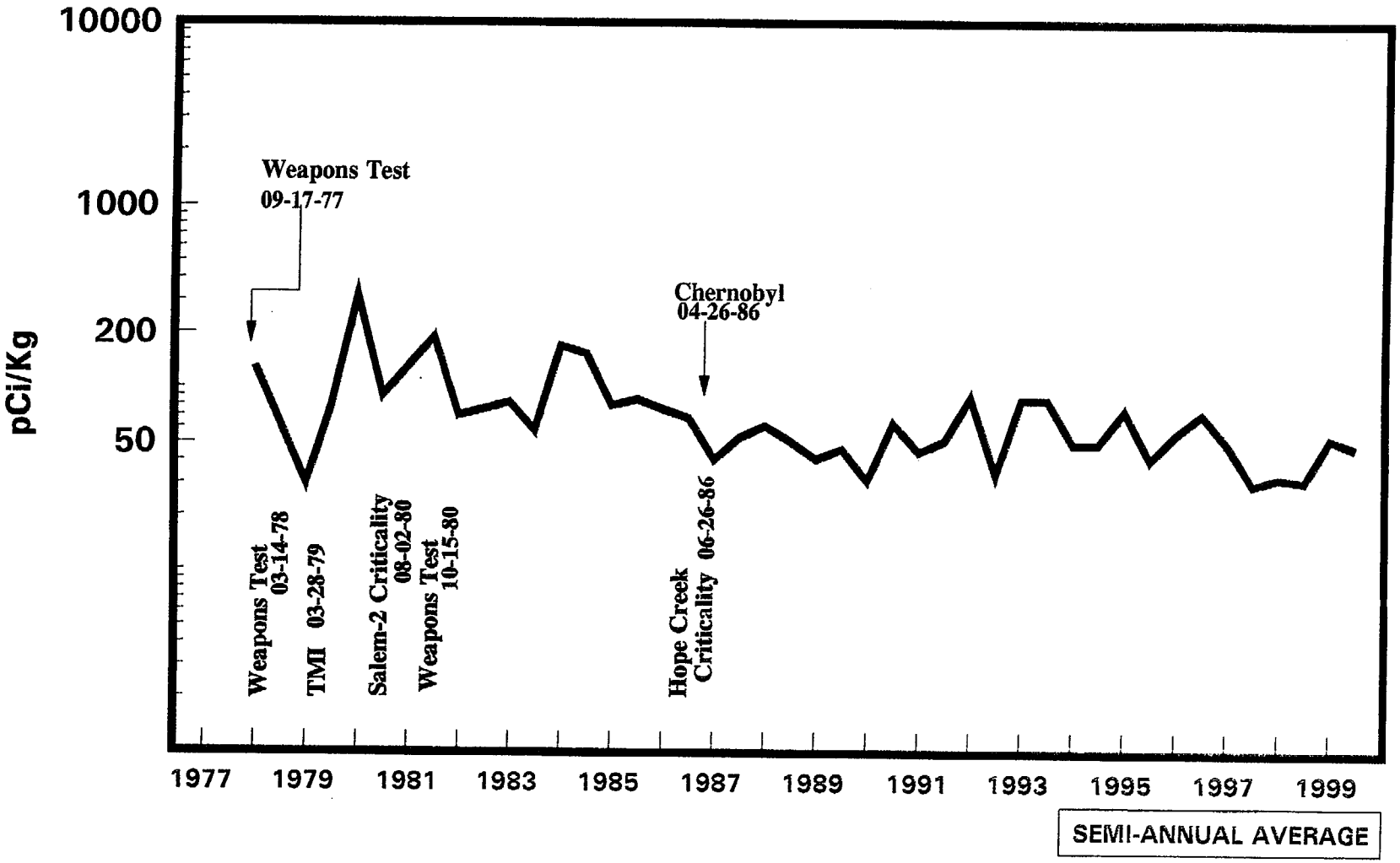


FIGURE 6B
COBALT - 60 ACTIVITY IN AQUATIC SEDIMENT
1977 THROUGH 1999



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[13] Public Service Enterprise Group . "Hope Creek Generating Station Technical Specifications", Appendix A to Facility Operating License No. NPF-57, 1986, Section 6.8.4.h - 1,2,3 and 6.9.1.6.

[14] Public Service Enterprise Group . "Offsite Dose Calculation Manual" - Salem Generating Station.

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APPENDIX A

PROGRAM SUMMARY

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SALEM GENERATING STATION DOCKET 50-272/-311
HOPE CREEK GENERATING STATION DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 1999 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
I. AIRBORNE								
Air Particulates (10^{-3} pCi/m^3)	Beta	311	6.0	21 (259 /259) (7-42)	16E1 4.1 mi NNW	23 (52 /52) (10-40)	22 (52 /52) (8-42)	0
	Gamma							
	Be7	24	7.2	70 (20 /20) (41-96)	16E1 4.1 mi NNW	78 (4 /4) (62-92)	68 (4 /4) (47-79)	0
	K-40	24	7.0	14 (18 /20) (5-20)	2F6 7.3 mi NNE	18 (3 /4) (17-20)	12 (2 /4) (12-12)	0
Air Iodine (10^{-3} pCi/m^3)	I-131	311	10	<LLD	-	<LLD	<LLD	0
II DIRECT								
Direct Radiation (mrad/std. month)	Quarterly Badges	198	-	4.1 (171 /171) (2.6-5.4)	7S1 0.12 mi SE	5.4 (4 /4) (5-5.7)	4.5 (27 /27) (3.2-5.3)	0
III TERRESTRIAL								
Milk (pCi/L)	I-131	80	0.5	<LLD	-	<LLD	<LLD	0
	Gamma							
	K-40	80	120	1370 (60 /60) (1190-1470)	11F3 5.3 mi SW	1400 (20 /20) (1340-1440)	1340 (20 /20) (1170-1470)	0
	RA-NAT	80	6.8	5 (1 /60) (5-5)	2F9 7.5 mi NNE	5 (1 /20) (5-5)	<LLD	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SALEM GENERATING STATION — DOCKET 50-272/-311
HOPE CREEK GENERATING STATION — DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY — JANUARY 1, 1999 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
III TERRESTRIAL								
Well Water (pCi/L)	Alpha	12	1.7	2.2 (10 /12) (1.2-4.9)	3E1 4.1 mi NE	2.2 (10 /12) (1.2-4.9)	No Control Location	0
	Beta	12	1.0***	11 (12 /12) (9.7-11)	3E1 4.1 mi NE	11 (12 /12) (9.7-11)	No Control Location	0
	H-3	12	170	<LLD	-	<LLD	No Control Location	0
	Gamma							
	K-40	12	20	58 (6 /12) (43-68)	3E1 4.1mi NE	58 (6 /12) (43-68)	No Control Location	0
	RA-NAT	12	6.4	120 (12 /12) (57-167)	3E1 4.1mi NE	120 (12 /12) (57-167)	No Control Location	0
Potable Water (pCi/L)	Alpha	24	1.0	1.2 (17 /24) (0.6-2.2)	2F3 8.0 mi NNE	1.2 (17 /24) (0.6-2.2)	No Control Location	0
	Beta	24	1.0***	3.1 (24 /24) (2.3-3.8)	2F3 8.0 mi NNE	3.1 (24 /24) (2.3-3.8)	No Control Location	0
	H-3	24	170	<LLD	-	<LLD	No Control Location	0
	Gamma							
	K-40	24	20	44 (21 /24) (32-74)	2F3 8.0 mi NNE	44 (21 /24) (32-74)	No Control Location	0
	I-131	24	0.3	<LLD	-	<LLD	No Control Location	0
	RA-NAT	24	6.4	9.2 (2 /24) (4.3-14)	2F3 8.0 mi NNE	9.2 (2 /24) (4.3-14)	No Control Location	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SALEM GENERATING STATION — DOCKET 50-272/-311
HOPE CREEK GENERATING STATION — DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY — JANUARY 1, 1999 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
III TERRESTRIAL								
Fruit & Vegetables (pCi/Kg-wet)	Gamma K-40	26	70	2350 (15 /15) (1380-3190)	3F8 5.1 mi NE	3190 (1 /1) (3190-3190)	2380 (11 /11) (1670-2730)	0
	Be-7	26	72	127 (1 /15) (127-127)	3F8 5.1 mi NE	127 (1 /1) (127-127)	<LLD	0
Game (pCi/Kg-wet)	Gamma K-40	2	70	2940 (1 /1) (2940-2940)	3E1 4.1 mi NE	2940 (1 /1) (2940-2940)	2700 (1 /1) (2700-2700)	0
	RA-NAT	2	8.2	<LLD	-		<LLD	0
Fodder Crops (pCi/Kg-wet)	Gamma Be-7	8	73	590 (4 /6) (160-1090)	2F9 7.5 mi NNE	1090 (1 /1) (1090-1090)	370 (1 /2) (370-370)	0
	K-40	8	70	8200 (6 /6) (1790-16500)	3G1 17 mi NE	9950 (2 /2) (3300-16600)	10000 (2 /2) (3300-16600)	0
	RA-NAT	8	11	11 (1 /6) (11-11)	11F3 5.3 mi SW	11 (1 /2) (11-11)	<LLD	0
IV AQUATIC								
Surface Water (pCi/L)	Beta	60	3.8	66 (48 /48) (8.3-150)	7E1 4.5 mi SE	94 (12 /12) (9-150)	60 (12 /12) (9.4-106)	0
	H-3	20	150	160 (4 /16) (110-200)	12C1 2.5 mi WSW	240 (1 /4) (240-240)	240 (1 /4) (240-240)	0
	Gamma K-40	20	42	95 (45 /48) (34-167)	11A1 0.2 mi SW	113 (12 /12) (55-158)	92 (12 /12) (41-150)	0
	Th-232	20	12.0	9.7 (1 /48) (9.7-9.7)	12C1 2.5 mi WSW	9.9 (1 /12) (9.9-9.9)	9.9 (1 /12) (9.9-9.9)	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SALEM GENERATING STATION DOCKET 50-272/-311
HOPE CREEK GENERATING STATION DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 1999 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
IV AQUATIC								
Surface Water (pCi/L)	Cs-137	20	4.6	7.4 (1 /48) (7.4-7.4)	11A1 0.2 mi SW	7.4 (1 /12) (7.4-7.4)	<LLD	0
Blue Crabs (pCi/kg-wet)	Gamma K-40	4	70	3130 (2 /2) (2930-3330)	11A1 0.2 mi SW	3130 (2 /2) (2930-3330)	3040 (2 /2) (2900-3190)	0
Edible Fish (pCi/kg-dry)	Sr-89 (bones)	1	2000	<LLD	-	<LLD	<LLD	0
	Sr-90 (bones)	1	200	<LLD	-	<LLD	<LLD	0
(pCi/kg-wet)	Sr-89 (flesh)	1	2000	<LLD	-	<LLD	<LLD	0
	Sr-90 (flesh)	1	200	<LLD	-	<LLD	<LLD	0
	Gamma K-40	6	70	3720 (4 /4) (3380-4000)	7E1 4.5 mi SE	3800 (2 /2) (3600-4000)	3470 (2 /2) (3170-3770)	0
Sediment (pCi/kg-dry)	Gamma Be-7	14	170	615 (2 /12) (240-990)	16A1 0.7 mi NNW	990 (1 /2) (990-990)	<LLD	0
	K-40	14	70	12760 (12 /12) (1580-16700)	15A1 0.3 mi NW	15950 (2 /2) (15200-16700)	10040 (2 /2) (9780-10300)	0
	Co-60	14	15	52 (5 /12) (36-63)	7E1 4.5 mi SE	63 (1 /2) (63-63)	<LLD	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SALEM GENERATING STATION DOCKET 50-272/-311
HOPE CREEK GENERATING STATION DOCKET NO. 50-354

SALEM COUNTY, NEW JERSEY JANUARY 1, 1999 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLE (UNIT OF MEASUREMENT)	Analysis And Total Number of Analyses Performed		Lower Limit of Detection (LLD)*	All Indicator Locations Mean (Range)	Location with Highest Mean Name Distance and Direction	Mean (Range)	Control Location Mean (Range)	Number of Nonroutine Reported Measurements
IV AQUATIC								
Sediment (pCi/kg-dry)	Cs-134	14	53	48 (4 /12) (9-68)	11A1 0.2 mi SW	68 (1 /2) (68-68)	<LLD	0
	Cs-137	14	16	74 (11 /12) (7.3-160)	15A1 0.3 mi NW	122 (2 /2) (83-160)	22 (1 /2) (22-22)	0
	RA-NAT	14	45	560 (12 /12) (140-760)	7E1 4.5 mi SE	750 (2 /2) (750-760)	660 (2 /2) (530-790)	0
	Th-232	14	50	830 (12 /12) (120-1150)	15A1 0.3 mi NW	1080 (2 /2) (1000-1150)	490 (2 /2) (70-920)	0

* LLD listed is the lower limit of detection which we endeavored to achieve during this reporting period. In some instances nuclides were detected at concentrations above the LLD values shown. All strontium results are reported by DESEL.

** Mean calculated using values above LLD only. Fraction of measurements above LLD are in parentheses.

*** Typical LLD values.

APPENDIX B

SAMPLE DESIGNATION

AND

LOCATIONS

APPENDIX B

SAMPLE DESIGNATION

The PSE&G Maplewood Testing Services identifies samples by a three part code. The first two letters are the program identification code. Because of the proximity of the Salem and Hope Creek Stations a common environmental surveillance program is being conducted. The identification code, "SA", has been applied to Salem and Hope Creek stations. The next three letters are for the media sampled.

AIO = Air Iodine	IDM = Immersion Dose (TLD)
APT = Air Particulate	MLK = Milk
ECH = Hard Shell Blue Crab	PWR = Potable Water (Raw)
ESF = Edible Fish	PWT = Potable Water (Treated)
ESS = Sediment	SOL = Soil
FPL = Green Leafy Vegetables	SWA = Surface Water
FPV = Vegetables (Various)	VGT = Fodder Crops (Various)
GAM = Game (Muskrat)	WWA = Well Water

The last four symbols are a location code based on direction and distance from a standard reference point. Of these, the first two represent each of the sixteen angular sectors of 22.5 degrees centered about the reactor site. Sector one is divided evenly by the north axis and other sectors are numbered in a clockwise direction; e.g., 2=NNE, 3=NE, 4=ENE, etc. The next digit is a letter which represents the radial distance from the reference point:

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

The last number is the station numerical designation within each sector and zone; e.g., 1,2,3,... For example, the designation SA-WWA-3E1 would indicate a sample in the Salem and Hope Creek program (SA), consisting of well water (WWA), which had been collected in sector number 3, centered at 45° (north east) with respect to the reactor site at a radial distance of 4 to 5 miles off-site, (therefore, radial distance E). The number 1 indicates that this is sampling station #1 in that particular sector.

TABLE B-1
SAMPLING LOCATIONS

Specific information about the individual sampling locations are given in Table B-1. Maps B-1 and B-2 show the locations of sampling stations with respect to the site. A Portable Global Positioning System (GPS) was used to provide the coordinates of sampling locations. The Datem used was WGS 84.

STATION CODE	STATION LOCATION	LATITUDINAL DEG. MIN. SEC	LONGITUDINAL DEG. MIN. SEC	SAMPLE TYPE
1S1	0.55mi. N of vent	39 - 28 - 16	75 - 32 - 15	IDM
2S2	0.4 mi. NNE of vent	39 - 28 - 07	75 - 31 - 57	IDM
2S4	0.59 mi. NNE of vent	39 - 28 - 16	75 - 31 - 55	IDM
3S1	0.58 mi. NE of vent	39 - 28 - 08	75 - 31 - 41	IDM
4S1	0.60 mi. ENE of vent	39 - 28 - 02	75 - 31 - 33	IDM
5S1	1.0 mi. E of vent; site access road	39 - 27 - 38	75 - 31 - 08	AIO,APT,IDM
6S2	0.2 mi. ESE of vent; observation building	39 - 27 - 43	75 - 31 - 55	IDM,SOL,ESS
7S1	0.12 mi. SE of vent; station personnel gate	39 - 27 - 44	75 - 32 - 03	IDM
10S1	0.14 mi. SSW of vent; inlet cooling water bldg.	39 - 27 - 39	75 - 32 - 10	IDM
11S1	0.09 mi. SW of vent; service water inlet bldg.	39 - 27 - 43	75 - 32 - 12	IDM
15S1	0.57 mi. NW of vent	39 - 28 - 10	75 - 32 - 32	IDM
16S1	0.54 mi. NNW of vent	39 - 28 - 13	75 - 32 - 26	IDM
11A1	0.2 mi. SW of vent; outfall area	39 - 27 - 59	75 - 32 - 25	ECH,ESF,ESS,SWA
15A1	0.3 mi. NW of vent; cooling tower blowdown discharge line outfall	39 - 27 - 67	75 - 32 - 19	ESS
16A1	0.7 mi. NNW of vent; south storm drain discharge line	39 - 28 - 24	75 - 32 - 58	ESS
12C1	2.5 mi. WSW of vent; west bank of Delaware River	39 - 27 - 22	75 - 34 - 08	ECH,ESF,ESS,SWA
4D2	3.7 mi. ENE of vent; Alloway Creek Neck Road	39 - 29 - 18	75 - 32 - 11	IDM
5D1	3.5 mi. E of vent; local farm	39 - 28 - 24	75 - 28 - 22	AIO,APT,IDM
10D1	3.9 mi. SSW of vent; Taylor's Bridge Spur	39 - 24 - 37	75 - 33 - 44	IDM,SOL
11D1	3.5 mi. SW of vent	39 - 24 - 49	75 - 34 - 26	GAM
14D1	3.4 mi. WNW of vent; Bay View, Delaware	39 - 29 - 02	75 - 35 - 31	IDM
15D1	3.8 mi. NW of vent; Rt. 9, Augustine Beach	39 - 30 - 08	75 - 35 - 02	IDM
2E1	4.4 mi. NNE of vent; local farm	39 - 31 - 23	75 - 30 - 26	IDM
3E1	4.1 mi. NE of vent; local farm	39 - 30 - 07	75 - 28 - 41	GAM,IDM,VGT,WWA,FPV

TABLE B-1 (cont'd)

STATION CODE	STATION LOCATION	LATITUDINAL DEG. MIN. SEC	LONGITUDINAL DEG. MIN. SEC	SAMPLE TYPE
7E1	4.5 mi. SE of vent; 1 mi. W of Mad Horse Creek	39 - 25 - 08	75 - 28 - 64	ESF,ESS,SWA
9E1	4.2 mi. S of vent	39 - 24 - 10	75 - 32 - 42	IDM
11E2	5.0 mi. SW of vent; Rt. 9	39 - 24 - 20	75 - 35 - 33	IDM
12E1	4.4 mi. WSW of vent; Thomas Landing	39 - 26 - 52	75 - 36 - 59	IDM
13E1	4.2 mi. W of vent; Diehl House Lab	39 - 27 - 59	75 - 36 - 44	IDM
16E1	4.1 mi. NNW of vent; Port Penn	39 - 30 - 47	75 - 34 - 34	AIO,APT,IDM,SOL
1F1	5.8 mi. N of vent; Fort Elfsborg	39 - 32 - 45	75 - 31 - 06	AIO,APT,IDM
1F2	7.1 mi. N of vent; midpoint of Delaware River	39 - 33 - 08	75 - 32 - 54	SWA
2F2	8.7 mi. NNE of vent; Corner of 5th & Howell, Salem	39 - 34 - 38	75 - 28 - 04	IDM
2F3	8.0 mi. NNE of vent; Salem Water Company	39 - 33 - 40	75 - 27 - 18	PWR,PWT
2F4	6.3 mi. NNE of vent; local farm	39 - 33 - 21	75 - 30 - 33	FPV,FPL
2F5	7.4 mi. NNE of vent; Salem High School	39 - 33 - 27	75 - 28 - 31	IDM
2F6	7.3 mi. NNE of vent; Southern Training Center	39 - 33 - 43	75 - 28 - 48	AIO,APT,IDM
2F7	5.7 mi. NNE of vent; local farm	39 - 32 - 40	75 - 30 - 53	SOL
2F8	5.3 mi. NNE OF vent; local farm	39 - 31 - 54	75 - 29 - 18	FPV
2F9	7.5 mi. NNE of vent; Tilbury Farms , 45 S. Tilbury Rd, Salem	39 - 33 - 55	75 - 29 - 30	MLK,FPV,VGT,SOL
3F2	5.1 mi. NE of vent;Hancocks Bridge Municipal Bld	39 - 30 - 25	75 - 27 - 36	IDM
3F3	8.6 mi. NE of vent; Quinton Township School	39 - 32 - 38	75 - 24 - 45	IDM
3F5	9.4 mi. NE of vent; Harris's Farm Market	39 - 33 - 29	75 - 24 - 54	FPV
3F6	6.5 mi. NE of vent; #324 Salem/Hancocks Bridge Road	39 - 32 - 03	75 - 28 - 00	FPV
3F8	5.1 mi. NE of vent; 33 Maple Ave., Hancocks Bridge	39 - 30 -25	75 - 27 - 37	FPV,FPL
4F2	6.0 mi. ENE of vent; Mays Lane, Harmersville	39 - 29 - 58	75 - 26 - 03	IDM
5F1	6.5 mi. E of vent; Canton	39 - 28 - 22	75 - 24 - 59	IDM,SOL
6F1	6.4 mi. ESE of vent; Stow Neck Road	39 - 26 - 24	75 - 25 - 09	IDM
7F2	9.1 mi. SE of vent; Bayside, New Jersey	39 - 22 - 56	75 - 24 - 17	IDM
10F2	5.8 mi. SSW of vent; Rt. 9	39 - 23 - 01	75 - 34 - 09	IDM
11F1	6.2 mi. SW of vent; Taylor's Bridge Delaware	39 - 24 - 44	75 - 37 - 37	IDM
11F3	5.3 mi. SW of vent; Townsend, Delaware	39 - 24 - 06	75 - 36 - 20	MLK,VGT,SOL
12F1	9.4 mi. WSW of vent; Townsend Elementary School	39 - 23 - 47	75 - 41 - 18	IDM
13F2	6.5 mi. W of vent; Odessa, Delaware	39 - 27 - 18	75 - 39 - 21	IDM
13F3	9.3 mi. W of vent; Redding Middle School, Middletown, Delaware	39 - 27 - 14	75 - 42 - 32	IDM

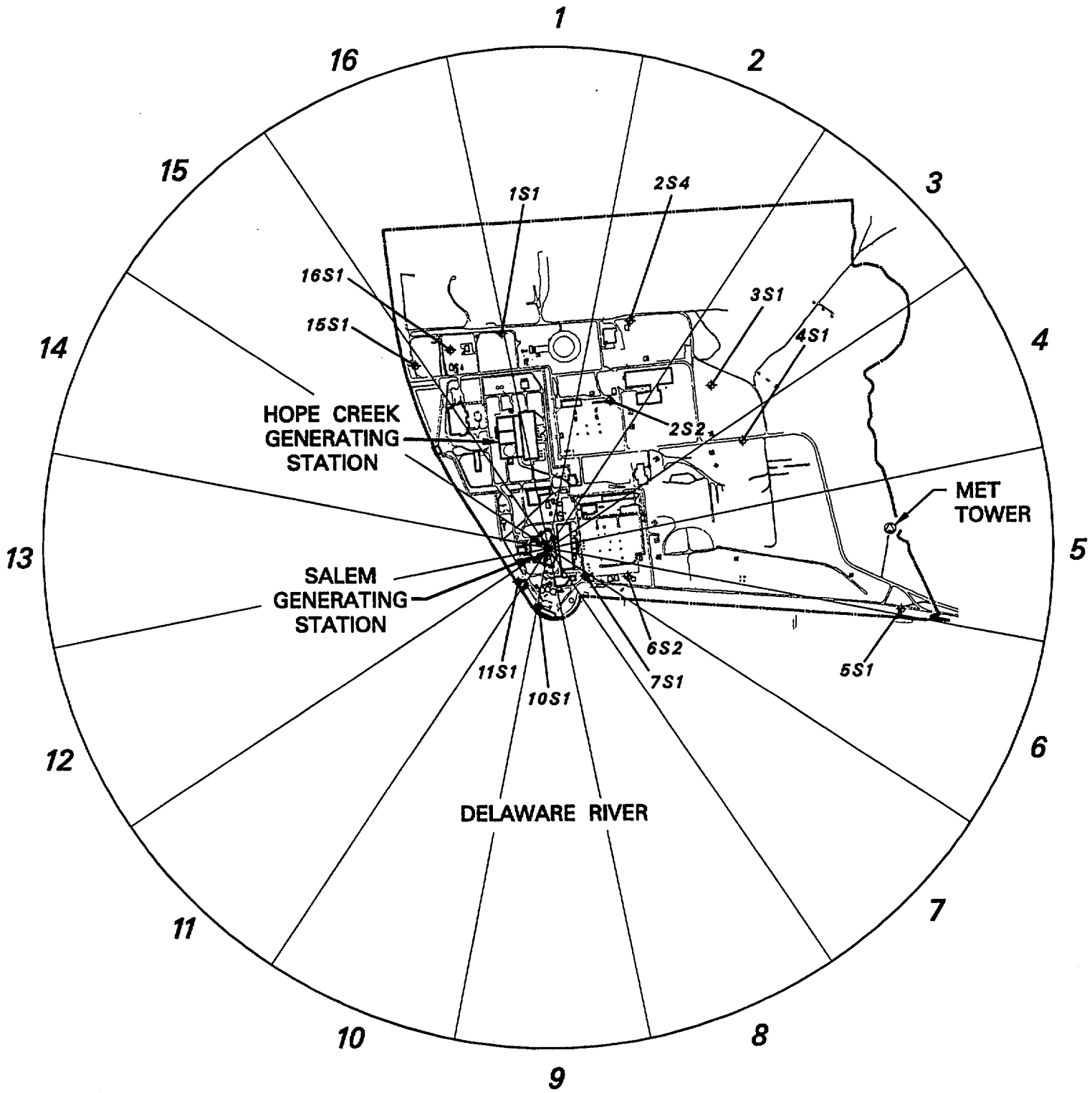
TABLE B-1 (cont'd)

STATION CODE	STATION LOCATION	LATITUDINAL DEG. MIN. SEC	LONGITUDINAL DEG. MIN. SEC	SAMPLE TYPE
13F4	9.8 mi. W of vent; Middletown, Delaware	39 - 26 - 51	75 - 43 - 07	IDM
14F2	6.6 mi. WNW of vent; Boyds Corner	39 - 30 - 00	75 - 38 - 59	IDM
14F3	5.4 mi. WNW of vent; local farm	39 - 29 - 33	75 - 37 - 55	FPV,FPL
14F4	7.6 mi. WNW of vent; local farm	39 - 30 - 44	75 - 40 - 52	MLK,VGT,SOL
15F3	5.4 mi. NW of vent	39 - 30 - 58	75 - 36 - 36	IDM
16F1	6.9 mi. NNW of vent; C&D Canal	39 - 33 - 55	75 - 34 - 25	ESS,SWA
16F2	8.1 mi. NNW of vent; Delaware City Public School	39 - 34 - 18	75 - 35 - 25	IDM
1G1	10.3 mi. N of vent; local farm	39 - 36 - 31	75 - 29 - 59	FPV,FPL
1G3	19 mi. N of vent; N. Church St. Wilmington, Del	39 - 44 - 16	75 - 32 - 31	IDM
1G4	10.8 mi. N of vent; (Dads Produce) Rte. 49, South Broadway, Pennsville	39 - 37 - 55	75 - 30 - 44	FPV
2G2	13.5 mi. NNE of vent; Moore's Market	39 - 38 - 19	75 - 26 - 10	FPV
3G1	17 mi. NE of vent; local farm	39 - 35 - 56	75 - 16 - 47	IDM,MLK,VGT,SOL
10G1	12 mi. SSW of vent; Smyrna, Delaware	39 - 18 - 13	75 - 36 - 05	IDM
14G1	11.8 mi. WNW of vent; Rte. 286; Bethel Church Road; Delaware	39 - 31 - 18	75 - 46 - 30	AIO,APT,IDM
16G1	15 mi. NNW of vent; Greater Wilmington Airport	39 - 40 - 32	75 - 35 - 45	IDM
3H1	32 mi. NE of vent; National Park, New Jersey	39 - 51 - 36	75 - 11 - 06	IDM
3H5	25 mi. NE of vent; Sorbello Girl's Market	39 - 41 - 02	75 - 12 - 23	FPL,FPV
3H3	110 mi. NE of vent; Maplewood Testing Services	40 - 43 - 25	74 - 15 - 09	IDM

NOTE: All station locations are referenced to the midpoint of the two Salem Units' Vents. The coordinates of this location are: Latitude N 39° - 27' - 45.3" and Longitude W 75° - 32' - 09.7".

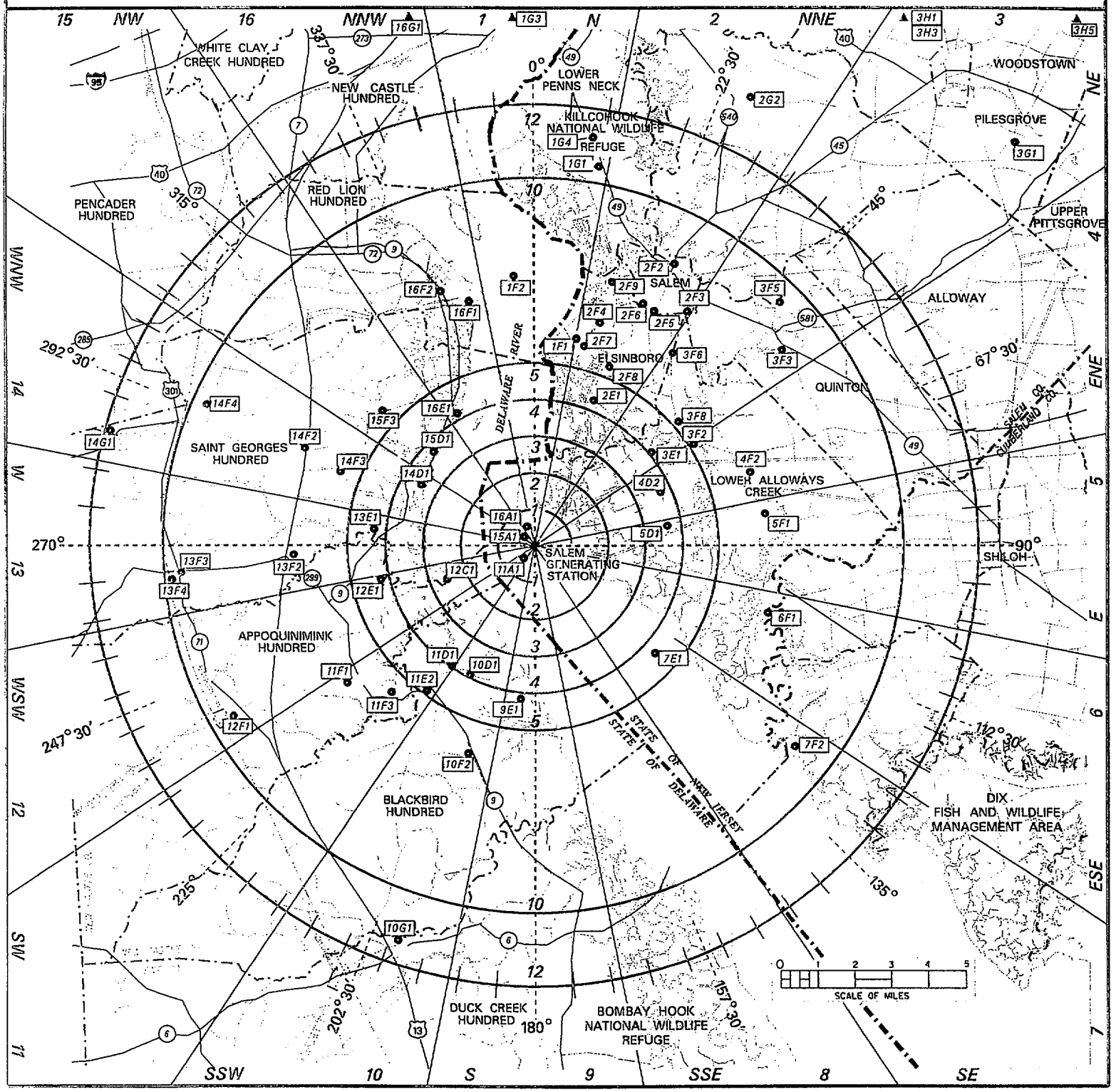
All Game (GAM), Vegetables(FPV & FPL) and Vegetation (VGT), are management audit samples. They are not required by the Salem & Hope Creek Stations' Tech Specs nor listed in the Station's ODCM. Vegetable samples are not always collected in consecutive years from the same farmer since they rotate the type of crop they grow.

MAP B-1
ON-SITE SAMPLING LOCATIONS



MAP B-2

SALEM AND HOPE CREEK GENERATING STATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OFF-SITE SAMPLING LOCATION



APPENDIX C

DATA TABLES

APPENDIX C

DATA TABLES

Appendix C presents the analytical results of the 1999 Radiological Environmental Monitoring Program for the period of January 1 to December 31, 1999.

TABLE OF CONTENTS

DATA TABLES (cont'd.)

Table C-1

1999 CONCENTRATIONS OF GAMMA EMITTERS*
IN QUARTERLY COMPOSITES OF AIR PARTICULATES

Results in Units of 10^{-3} pCi/m^3 +/- 2 sigma

STATION ID	Sampling Period Start		Stop	<--- Gamma Emitters ---> Be-7	K-40
SA-APT-5S1	12/28/1998	to	03/29/1999	41 ± 3	5 ± 1
SA-APT-1F1	12/28/1998	to	03/29/1999	48 ± 5	<5.9
SA-APT-2F6	12/28/1998	to	03/29/1999	60 ± 4	<4.1
SA-APT-5D1	12/28/1998	to	03/29/1999	49 ± 3	10 ± 3
SA-APT-16E1	12/28/1998	to	03/29/1999	66 ± 5	14 ± 4
SA-APT-14G1(C)	12/28/1998	to	03/29/1999	47 ± 4	<5.4
SA-APT-5S1	03/29/1999	to	06/29/1999	77 ± 5	12 ± 3
SA-APT-1F1	03/29/1999	to	06/29/1999	96 ± 5	13 ± 3
SA-APT-2F6	03/29/1999	to	06/29/1999	78 ± 5	17 ± 6
SA-APT-5D1	03/29/1999	to	06/29/1999	83 ± 5	14 ± 4
SA-APT-16E1	03/29/1999	to	06/29/1999	92 ± 6	16 ± 4
SA-APT-14G1(C)	03/29/1999	to	06/29/1999	78 ± 4	12 ± 3
SA-APT-5S1	06/29/1999	to	09/27/1999	84 ± 5	10 ± 3
SA-APT-1F1	06/29/1999	to	09/27/1999	84 ± 5	12 ± 3
SA-APT-2F6	06/29/1999	to	09/27/1999	70 ± 6	17 ± 5
SA-APT-5D1	06/29/1999	to	09/27/1999	74 ± 5	10 ± 3
SA-APT-16E1	06/29/1999	to	09/27/1999	91 ± 6	17 ± 4
SA-APT-14G1(C)	06/29/1999	to	09/27/1999	79 ± 5	<7
SA-APT-5S1	09/27/1999	to	12/28/1999	66 ± 4	11 ± 3
SA-APT-1F1	09/27/1999	to	12/28/1999	66 ± 5	18 ± 4
SA-APT-2F6	09/27/1999	to	12/28/1999	58 ± 4	20 ± 3
SA-APT-5D1	09/27/1999	to	12/28/1999	63 ± 4	13 ± 3
SA-APT-16E1	09/27/1999	to	12/27/1999	62 ± 5	17 ± 5
SA-APT-14G1(C)	09/27/1999	to	12/27/1999	68 ± 5	12 ± 3
AVERAGE				70 ± 30	12 ± 9

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table 19.
(C) Control Station

TABLE C-2

1999 CONCENTRATIONS OF GROSS BETA EMITTERS IN AIR PARTICULATES

Results in Units of 10^{-3} pCi/m^3 +/- 2 sigma

	<---------- STATION ID ---------->						
MONTH	SA-APT-14G1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6	SA-APT-5D1	SA-APT-5S1	AVERAGE
January	19±2	18±2	22±2	22±2	18±2	19±2	20±4
	23±2	22±2	22±2	19±2	19±2	22±2	21±3
	17±2	23±2	17±2	22±2	16±2	17±2	19±6
	12±2	16±2	13±2	16±2	13±2	13±2	14±3
	21±2	22±2	22±2	22±2	22±2	22±2	22±1
February	19±2	19±2	16±2	14±2	15±2	17±2	17±4
	22±2	22±2	23±2	20±2	19±2	19±2	21±3
	20±3	25±3	27±3	21±3	24±3	24±3	24±5
	15±2	15±2	16±2	15±2	15±2	14±2	15±1
March	17±2	20±2	20±2	19±2	17±2	19±2	18±3
	8±2	10±2	11±2	12±2	7±2	10±2	10±4
	16±2	17±2	18±2	17±2	15±2	15±2	16±3
	24±2	24±2	21±2	20±2	21±2	(1)	22±4
April	24±2	20±2	19±2	21±2	19±2	18±2	20±5
	16±3	17±3	18±3	13±2	13±2	12±2	15±4
	17±2	19±2	16±2	17±2	16±2	17±2	17±2
	18±2	19±2	20±2	18±2	18±2	19±2	19±2
	15±2	19±2	18±2	17±2	16±2	17±2	17±2
May	18±2	18±2	15±2	16±2	14±2	12±2	15±5
	18±2	17±2	17±2	15±2	17±2	16±2	17±2
	15±2	21±2	16±2	16±2	14±2	16±2	16±5
	34±3	29±2	34±2	30±2	29±2	27±2	31±6
June	22±3	20±3	21±2	18±2	22±3	21±3	21±3
	17±2	18±2	17±2	15±2	15±2	13±2	16±4
	13±2	12±2	13±2	11±2	11±2	12±2	12±2
	22±2	21±2	22±2	16±2	20±2	18±2	20±5

TABLE C-2

1999 CONCENTRATIONS OF GROSS BETA EMITTERS IN AIR PARTICULATES

Results in Units of 10^{-3} pCi/m^3 +/- 2 sigma

	<---------- STATION ID ---------->						
MONTH	SA-APT-14G1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6	SA-APT-5D1	SA-APT-5S1	AVERAGE
July	17±2	28±3	26±3	24±2	27±2	29±3	25±9
	25±3	26±3	26±3	18±2	24±3	28±3	24±7
	23±2	22±2	20±2	10±2	16±2	18±2	18±9
	29±3	34±3	31±3	31±3	26±2	31±3	30±5
	29±3	38±3	31±3	26±2	31±3	32±3	31±8
August	25±2	27±3	24±2	26±2	25±2	28±2	26±2
	20±2	20±2	18±2	21±2	20±2	18±2	20±2
	24±2	26±2	22±2	23±2	21±2	20±2	23±5
	20±2	24±3	22±2	22±2	21±2	23±2	22±3
September	14±2	17±2	14±2	15±2	13±2	14±2	15±3
	39±3	37±3	29±3	24±3	28±3	29±3	31±12
	22±2	22±2	23±2	21±2	18±2	20±2	21±3
	27±3	27±3	29±3	25±2	25±2	28±3	27±3
October	29±3	29±3	30±3	31±3	26±3	30±3	29±3
	24±2	23±2	21±2	24±2	24±3	23±3	23±2
	17±2	20±2	16±2	15±2	16±2	13±2	16±5
	16±2	16±2	18±2	16±2	20±2	14±2	17±4
	35±3	35±3	32±3	30±3	32±3	28±3	32±5
November	31±3	33±3	32±3	28±3	37±3	33±3	32±6
	42±3	40±3	40±3	38±3	42±3	39±3	40±3
	20±2	17±2	20±2	20±2	17±2	16±2	18±4
	18±2	20±2	19±2	20±2	19±2	22±2	20±3
December	27±3	26±3	20±2	25±3	25±3	21±2	24±5
	27±3	23±2	24±2	26±2	26±2	25±2	25±3
	15±2	17±2	16±2	17±2	18±2	17±2	17±2
	29±2	31±2	27±2	28±2	29±2	28±2	29±3
AVERAGE	22±14	23±13	22±12	20±12	21±13	21±13	
					GRAND AVERAGE		21±13

(1) Sampler out of service for week. Results not included in any averages. (See Program Deviations).

TABLE C-3

1999 CONCENTRATIONS OF IODINE-131* IN FILTERED AIR

Results in Units of 10^{-3} pCi/m^3

	<---------- STATION ID ---------->					
MONTH	Control SA-AIO-14G1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6	SA-AIO-5D1	SA-AIO-5S1
January	<5.7	<2.2	<6.1	<3.6	<2.7	<2
	<3.2	<5.7	<2.3	<2.2	<3.8	<4.1
	<1.7	<2.7	<2.4	<3.8	<4.3	<3.7
	<2.2	<5.1	<7.8	<2.7	<5.5	<3.1
	<2.4	<4.1	<1.9	<4.1	<3.3	<2.2
February	<2.8	<4.8	<3.8	<3.4	<6.1	<1.2
	<1.1	<4.5	<2.2	<2	<4.4	<3.1
	<2.8	<7.7	<4.3	<2.5	<4.2	<7.8
	<2.7	<6.1	<3.2	<1.9	<2.1	<2.7
March	<3.7	<4.6	<3.1	<9.5	<2.2	<2.6
	<4	<1.2	<5.6	<4.2	<5.1	<6.4
	<3.3	<3.3	<1.8	<2.1	<2.2	<4.7
	<2.7	<7.9	<2	<7	<2.8	(1)
April	<5.5	<2.5	<2.4	<3.1	<1.6	<1.5
	<7.7	<7.5	<4.2	<2.4	<2.5	<3.1
	<4.8	<4.8	<2.9	<2.1	<1.7	<6.1
	<2.8	<3.1	<3.1	<4.2	<3.8	<1.7
May	<1.2	<4.1	<5.3	<3.7	<1.8	<3.6
	<3.6	<4.2	<1.7	<3.8	<5.8	<3.1
	<5.1	<3.6	<2.3	<3.1	<2.1	<1.7
	<3.1	<4.5	<1.6	<2.8	<1.4	<3.8
	<2.1	<2	<2.5	<5.9	<3.6	<2.5
June	<2.4	<4.6	<1.8	<5.1	<5.7	<2.5
	<3.1	<1.9	<2	<5.1	<3.4	<3.3
	<2	<3	<3.9	<4	<3	<2.9
	<1.5	<3.6	<3.2	<2.4	<4.5	<5.2

TABLE C-3

1999 CONCENTRATIONS OF IODINE-131* IN FILTERED AIR

Results in Units of 10^{-3} pCi/m^3

	<---------- STATION ID ---------->					
				Control		
MONTH	SA-AIO-14G1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6	SA-AIO-5D1	SA-AIO-5S1
July	<1.7	<4	<1.3	<1.9	<2.9	<9
	<2.8	<4.5	<3.2	<3.7	<2.3	<1.7
	<1.8	<4.5	<3	<2.7	<2	<2.6
	<4	<2.1	<2.9	<2.6	<2	<1.8
	<2.1	<2.2	<2.8	<3.5	<2.4	<1.8
August	<5	<2	<1.9	<4	<4	<5
	<3.4	<3.3	<2.7	<5.1	<1.8	<3
	<1.9	<6.9	<3.3	<5.5	<3.8	<3.9
	<3.4	<4.5	<2.6	<2.6	<4	<2.2
September	<3.2	<4.9	<1.6	<2	<2.2	<3
	<1.6	<3.1	<2	<2.2	<1.8	<4.3
	<3	<2.5	<4	<3.5	<2.1	<2.2
	<3.7	<3.5	<2.3	<7.2	<6.4	<3.6
October	<3.9	<5.4	<4.1	<3.3	<2.9	<2.8
	<3.4	<4.1	<1.6	<3	<4.7	<3.2
	<2.5	<2	<1.8	<4.3	<1.9	<2.4
	<4	<8.8	<1.4	<4.3	<3.7	<2.2
	<4	<8.2	<5.4	<5.4	<1.9	<3.7
November	<2.7	<3.5	<1.4	<3.5	<5.5	<2
	<4.6	<1.2	<3	<4.2	<3.1	<4.8
	<2.7	<3.3	<1.1	<1.6	<3.3	<3.1
	<2	<3.5	<3.7	<2.8	<6.9	<2.8
December	<2.3	<3	<2.6	<3.8	<3.7	<3.3
	<3.2	<5.2	<2.5	<4.2	<1.6	<2.5
	<3.4	<2.4	<2.6	<2.7	<4	<3.1
	<1.7	<2.5	<2	<1.8	<7.8	<3.1

* I-131 results are corrected for decay to sample stop date.

(1) Sampler out of service for week. Results not included in any averages. (See program deviations)

TABLE C-4

1999 DIRECT RADIATION MEASUREMENTS - QUARTERLY TLD RESULTS

Results in mrad/standard month* +/- 2 sigma

STATION ID	JAN to MAR	APR to JUN	JUL to SEP	OCT to DEC	QTR ELEMENTS AVG**
SA-IDM-2S2	3.9±0.6	4.5±0.9	5.8±0.7	5.4±0.6	4.9±1.7
SA-IDM-5S1	3.3±0.4	3.6±0.5	3.8±0.5	3.1±0.5	3.5±0.6
SA-IDM-6S2	4.7±0.6	5.0±0.7	5.3±0.6	4.8±0.6	4.9±0.5
SA-IDM-7S1	5.5±0.6	5.0±0.6	5.7±0.7	5.4±0.8	5.4±0.6
SA-IDM-10S1	4.1±0.6	3.7±0.6	4.3±0.6	3.9±0.5	4.0±0.5
SA-IDM-11S1	2.8±0.4	3.1±0.5	4.4±0.6	4.6±0.7	3.7±1.8
SA-IDM-4D2	4.3±0.5	4.8±0.8	4.7±0.7	3.9±0.5	4.4±0.8
SA-IDM-5D1	3.9±0.5	4.2±0.8	4.3±0.6	3.6±0.5	4.0±0.6
SA-IDM-10D1	4.4±0.6	4.8±0.7	5.1±0.6	4.3±0.6	4.6±0.7
SA-IDM-14D1	3.9±0.5	4.3±0.6	4.4±0.6	3.9±0.7	4.1±0.5
SA-IDM-15D1	4.4±0.6	4.7±0.6	5.1±0.6	4.4±0.6	4.6±0.7
SA-IDM-2E1	3.8±0.4	4.2±0.8	4.4±0.5	3.7±0.5	4.0±0.7
SA-IDM-3E1	3.4±0.5	3.7±0.5	4.0±0.5	3.1±0.5	3.5±0.7
SA-IDM-9E1	3.9±0.4	4.4±0.7	4.5±0.6	3.8±0.5	4.1±0.7
SA-IDM-11E2	4.3±0.5	4.6±0.6	4.9±0.7	(1)	4.6±0.7
SA-IDM-12E1	4.4±0.7	4.8±0.7	5.0±0.7	4.4±0.5	4.6±0.6
SA-IDM-13E1	3.7±0.5	3.9±0.7	4.1±0.5	3.5±0.5	3.8±0.5
SA-IDM-16E1	4.0±0.5	4.2±0.8	4.5±0.6	3.8±0.5	4.1±0.6
SA-IDM-1F1	4.1±0.6	4.4±0.6	4.6±0.7	3.7±0.5	4.2±0.7
SA-IDM-2F2	3.6±0.5	3.9±0.6	4.1±0.5	3.3±0.5	3.7±0.7
SA-IDM-2F5	4.0±0.6	4.5±0.7	4.6±0.6	3.9±0.5	4.2±0.7
SA-IDM-2F6	3.8±0.6	4.1±0.5	4.2±0.5	3.8±0.5	4.0±0.4
SA-IDM-3F2	3.5±0.6	3.9±0.6	4.0±0.6	3.2±0.4	3.7±0.7
SA-IDM-3F3	3.4±0.5	3.9±0.5	4.0±0.6	3.2±0.5	3.6±0.8
SA-IDM-4F2	3.5±0.6	3.8±0.4	3.9±0.6	3.3±0.5	3.6±0.6
SA-IDM-5F1	3.7±0.5	4.1±0.4	4.2±0.6	3.5±0.5	3.9±0.6
SA-IDM-6F1	3.0±0.6	3.3±0.4	3.5±0.5	2.8±0.4	3.2±0.6
SA-IDM-7F2	2.7±0.4	3.0±0.5	3.0±0.5	2.6±0.4	2.8±0.4
SA-IDM-10F2	4.3±0.6	4.7±0.5	4.7±0.6	4.3±0.7	4.5±0.5
SA-IDM-11F1	4.3±0.6	4.9±0.6	5.1±0.8	4.3±0.6	4.7±0.8
SA-IDM-12F1	4.1±0.5	4.5±0.6	4.6±0.6	4.1±0.5	4.3±0.5
SA-IDM-13F2	4.1±0.7	4.4±0.7	4.5±0.5	3.9±0.6	4.2±0.5
SA-IDM-13F3	4.0±0.6	4.6±0.6	4.7±0.6	3.9±0.6	4.3±0.7
SA-IDM-13F4	4.1±0.6	4.5±0.7	4.5±0.6	4.1±0.6	4.3±0.5
SA-IDM-14F2	4.5±0.6	5.2±0.6	5.3±0.7	4.7±0.6	4.9±0.7
SA-IDM-15F3	4.7±0.6	5.2±0.8	5.4±0.8	4.7±0.6	5.0±0.7
SA-IDM-16F2	3.7±0.5	4.1±0.7	4.2±0.6	3.6±0.7	3.9±0.6
SA-IDM-1G3 (C)	5.0±0.5	5.3±0.6	5.3±0.6	4.7±0.8	5.1±0.6
SA-IDM-3G1 (C)	4.2±0.5	4.6±0.6	4.9±0.6	3.9±0.7	4.4±0.8
SA-IDM-10G1(C)	4.3±0.5	4.7±0.5	4.8±0.6	4.1±0.6	4.5±0.6
SA-IDM-16G1(C)	4.6±0.6	5.0±0.8	5.1±0.7	4.0±0.7	4.7±1.0
SA-IDM-3H1 (C)	3.4±0.7	3.6±0.5	3.9±0.5	3.2±0.5	3.5±0.6
SA-IDM-3H3 (C)	4.4±0.7	4.8±0.6	4.7±0.7	(2)	4.6±0.4
SA-IDM-1S1	4.0±0.5	4.6±0.7	4.9±0.6	4.2±0.5	4.4±0.8
SA-IDM-3S1	2.9±0.5	3.4±0.5	3.6±0.5	2.9±0.6	3.2±0.8
SA-IDM-2S4	3.5±0.4	4.0±0.6	4.2±0.6	3.5±0.5	3.8±0.7
SA-IDM-4S1	3.8±0.4	4.2±0.7	4.2±0.6	3.5±0.6	3.9±0.7
SA-IDM-15S1	3.4±0.6	3.8±0.6	3.9±0.5	3.3±0.4	3.6±0.6
SA-IDM-16S1	3.9±0.7	4.4±0.8	4.6±0.6	4.0±0.6	4.2±0.6
SA-IDM-14G1(C)	4.1±0.5	4.8±0.7	4.9±0.6	4.1±0.6	4.5±0.8
AVERAGE	3.9±1.1	4.3±1.1	4.5±1.1	3.9±1.2	
			GRAND AVG		4.2±1.2

* The standard month = 30.4 days.

** Quarterly Element TLD results by DESEL.

(1) TLD missing from pole. See program deviations.

(2) Location 3H3 removed from program.

TABLE C-5

1999 CONCENTRATIONS OF IODINE-131 * AND GAMMA EMITTERS ** IN MILK

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING PERIOD *** START	STOP	I-131	<------ GAMMA EMITTERS ------> K-40	RA-NAT
SA-MLK-2F9	01/03/1999	01/04/1999	<0.2	1300 ±70	<2.7
SA-MLK-11F3	01/03/1999	01/04/1999	<0.2	1440 ±80	<3
SA-MLK-14F4	01/03/1999	01/04/1999	<0.3	1330 ±70	<2.8
SA-MLK-3G1 (C)	01/04/1999	01/05/1999	<0.2	1410 ±60	<2.9
SA-MLK-2F9	01/31/1999	02/01/1999	<0.2	1350 ±80	<3.3
SA-MLK-11F3	02/01/1999	02/02/1999	<0.2	1340 ±70	<3.1
SA-MLK-14F4	01/31/1999	02/01/1999	<0.3	1370 ±60	<2.9
SA-MLK-3G1 (C)	01/31/1999	02/01/1999	<0.2	1370 ±60	<2.8
SA-MLK-2F9	02/28/1999	03/01/1999	<0.2	1440 ±80	<3.6
SA-MLK-11F3	02/28/1999	03/01/1999	<0.2	1360 ±80	<5.7
SA-MLK-14F4	02/28/1999	03/01/1999	<0.1	1380 ±90	<3.7
SA-MLK-3G1 (C)	02/28/1999	03/01/1999	<0.2	1380 ±70	<3
SA-MLK-2F9	04/05/1999	04/06/1999	<0.3	1290 ±80	<2.9
SA-MLK-11F3	04/05/1999	04/06/1999	<0.2	1410 ±90	<5.4
SA-MLK-14F4	04/05/1999	04/06/1999	<0.3	1380 ±70	<2.6
SA-MLK-3G1 (C)	04/06/1999	04/07/1999	<0.1	1470 ±70	<2.7
SA-MLK-2F9	04/19/1999	04/20/1999	<0.2	1410 ±60	<2.8
SA-MLK-11F3	04/18/1999	04/19/1999	<0.2	1340 ±70	<3
SA-MLK-14F4	04/18/1999	04/19/1999	<0.2	1470 ±70	<5.6
SA-MLK-3G1 (C)	04/18/1999	04/19/1999	<0.2	1390 ±80	<5.1
SA-MLK-2F9	05/02/1999	05/03/1999	<0.3	1400 ±80	<2.9
SA-MLK-11F3	05/02/1999	05/03/1999	<0.1	1370 ±60	<2.8
SA-MLK-14F4	05/03/1999	05/04/1999	<0.1	1360 ±70	<2.3
SA-MLK-3G1 (C)	05/02/1999	05/03/1999	<0.2	1420 ±70	<2.9
SA-MLK-2F9	05/17/1999	05/18/1999	<0.2	1380 ±80	<2.9
SA-MLK-11F3	05/16/1999	05/17/1999	<0.2	1440 ±70	<4.4
SA-MLK-14F4	05/17/1999	05/18/1999	<0.2	1320 ±90	<4.7
SA-MLK-3G1 (C)	05/16/1999	05/17/1999	<0.3	1330 ±80	<2.8
SA-MLK-2F9	06/06/1999	06/07/1999	<0.2	1350 ±80	<2.7
SA-MLK-11F3	06/06/1999	06/07/1999	<0.3	1440 ±70	<2.7
SA-MLK-14F4	06/06/1999	06/07/1999	<0.5	1320 ±70	<2.9
SA-MLK-3G1 (C)	06/07/1999	06/08/1999	<0.2	1320 ±80	<3.1
SA-MLK-2F9	06/20/1999	06/21/1999	<0.2	1300 ±80	<3.1
SA-MLK-11F3	06/20/1999	06/21/1999	<0.2	1390 ±80	<3
SA-MLK-14F4	06/20/1999	06/21/1999	<0.3	1250 ±60	<2.9
SA-MLK-3G1 (C)	06/21/1999	06/22/1999	<0.1	1360 ±60	<2.8
SA-MLK-2F9	07/05/1999	07/06/1999	<0.2	1370 ±80	<2.9
SA-MLK-11F3	07/06/1999	07/07/1999	<0.3	1440 ±70	<2.8
SA-MLK-14F4	07/06/1999	07/07/1999	<0.3	1360 ±90	<3.7
SA-MLK-3G1 (C)	07/05/1999	07/06/1999	<0.2	1410 ±80	<2.7
SA-MLK-2F9	07/18/1999	07/19/1999	<0.2	1360 ±80	<3.3
SA-MLK-11F3	07/19/1999	07/20/1999	<0.3	1410 ±80	<2.8
SA-MLK-14F4	07/18/1999	07/19/1999	<0.2	1310 ±70	<2.9
SA-MLK-3G1 (C)	07/18/1999	07/19/1999	<0.2	1250 ±80	<2.9

TABLE C-5

1999 CONCENTRATIONS OF IODINE-131* AND GAMMA EMITTERS** IN MILK

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING PERIOD*** START	STOP	I-131	<--- GAMMA EMITTERS ---> K-40	RA-NAT
SA-MLK-2F9	08/01/1999	08/02/1999	<0.2	1390 ±80	<2.9
SA-MLK-11F3	08/01/1999	08/02/1999	<0.2	1390 ±70	<2.6
SA-MLK-14F4	08/01/1999	08/02/1999	<0.3	1310 ±80	<2.8
SA-MLK-3G1 (C)	08/02/1999	08/03/1999	<0.3	1330 ±60	<2.6
SA-MLK-2F9	08/15/1999	08/16/1999	<0.1	1260 ±70	<2.5
SA-MLK-11F3	08/16/1999	08/17/1999	<0.2	1360 ±70	<3.1
SA-MLK-14F4	08/15/1999	08/16/1999	<0.2	1430 ±90	<4.1
SA-MLK-3G1 (C)	08/15/1999	08/16/1999	<0.1	1250 ±70	<3
SA-MLK-2F9	09/06/1999	09/07/1999	<0.1	1330 ±70	<3.1
SA-MLK-11F3	09/07/1999	09/08/1999	<0.2	1390 ±80	<2.3
SA-MLK-14F4	09/06/1999	09/07/1999	<0.3	1330 ±70	<4.2
SA-MLK-3G1 (C)	09/07/1999	09/08/1999	<0.2	1320 ±60	<2.7
SA-MLK-2F9	09/19/1999	09/20/1999	<0.2	1320 ±80	5 ±2
SA-MLK-11F3	09/20/1999	09/21/1999	<0.1	1420 ±70	<2.8
SA-MLK-14F4	09/20/1999	09/21/1999	<0.2	1410 ±80	<5.7
SA-MLK-3G1 (C)	09/19/1999	09/20/1999	<0.3	1300 ±70	<2.7
SA-MLK-2F9	10/03/1999	10/04/1999	<0.2	1300 ±80	<2.8
SA-MLK-11F3	10/04/1999	10/05/1999	<0.2	1400 ±60	<2.8
SA-MLK-14F4	10/04/1999	10/05/1999	<0.2	1380 ±70	<3.4
SA-MLK-3G1 (C)	10/03/1999	10/04/1999	<0.2	1290 ±70	<3
SA-MLK-2F9	10/18/1999	10/19/1999	<0.2	1440 ±70	<3.4
SA-MLK-11F3	10/18/1999	10/19/1999	<0.2	1350 ±60	<2.7
SA-MLK-14F4	10/18/1999	10/19/1999	<0.2	1270 ±80	<4.2
SA-MLK-3G1 (C)	10/17/1999	10/18/1999	<0.2	1170 ±70	<2.8
SA-MLK-2F9	11/07/1999	11/08/1999	<0.2	1450 ±80	<3
SA-MLK-11F3	11/08/1999	11/09/1999	<0.1	1370 ±70	<2.6
SA-MLK-14F4	11/07/1999	11/08/1999	<0.2	1400 ±80	<2.9
SA-MLK-3G1 (C)	11/08/1999	11/09/1999	<0.2	1320 ±70	<3
SA-MLK-2F9	11/21/1999	11/22/1999	<0.3	1370 ±80	<3.1
SA-MLK-11F3	11/22/1999	11/23/1999	<0.2	1440 ±70	<3
SA-MLK-14F4	11/21/1999	11/22/1999	<0.2	1390 ±90	<6.8
SA-MLK-3G1 (C)	11/21/1999	11/22/1999	<0.2	1310 ±70	<3.3
SA-MLK-2F9	12/05/1999	12/06/1999	<0.3	1190 ±60	<3.6
SA-MLK-11F3	12/05/1999	12/06/1999	<0.1	1440 ±80	<3.1
SA-MLK-14F4	12/05/1999	12/06/1999	<0.2	1450 ±70	<3.3
SA-MLK-3G1 (C)	12/06/1999	12/07/1999	<0.2	1320 ±70	<2.7
AVERAGE			-	1400 ±100	-

* Iodine-131 results are corrected for decay to midpoint of collection period & analyzed to a sensitivity of 1.0 pCi/L.

** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.

*** Monthly sample collected during Jan., Feb., March and Dec., when animals are not on pasture.

(C) Control Station

TABLE C-6

1999 CONCENTRATIONS OF GROSS ALPHA AND GROSS BETA EMITTERS, AND TRITIUM IN WELL WATER

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING DATE	GROSS ALPHA	GROSS BETA	TRITIUM
SA-WWA-3E1	01/25/1999	<1.7	11±0.8	<110
SA-WWA-3E1	02/22/1999	1.8±1.2	11±0.8	<120
SA-WWA-3E1	03/29/1999	4.9±1.5	11±0.8	<120
SA-WWA-3E1	04/26/1999	4.6±1.4	11±0.8	<120
SA-WWA-3E1	05/24/1999	2.4±1.1	11±0.8	<110
SA-WWA-3E1	06/29/1999	1.5±1.1	10±0.8	<120
SA-WWA-3E1	07/26/1999	<1.3	10±0.8	<120
SA-WWA-3E1	08/31/1999	1.3±1	11±0.8	<120
SA-WWA-3E1	09/27/1999	1.9±1	11±0.8	<120
SA-WWA-3E1	10/25/1999	1.2±0.9	10±0.8	<170
SA-WWA-3E1	11/30/1999	2.5±1.1	9.7±0.8	<160
SA-WWA-3E1	12/28/1999	1.5±0.9	11±0.8	<140
AVERAGE		2.2±2.5	11±1	-

TABLE C-7

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN WELL WATER

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING DATE	<-----GAMMA EMITTERS -----> K-40	RA-NAT
SA-WWA-3E1	01/25/1999	51 ± 15	135 ± 5
SA-WWA-3E1	02/22/1999	64 ± 21	166 ± 5
SA-WWA-3E1	03/29/1999	57 ± 22	137 ± 4
SA-WWA-3E1	04/26/1999	59 ± 23	163 ± 4
SA-WWA-3E1	05/24/1999	<17	135 ± 3
SA-WWA-3E1	06/29/1999	<17	97 ± 3
SA-WWA-3E1	07/26/1999	<18	111 ± 4
SA-WWA-3E1	08/31/1999	43 ± 11	90 ± 7
SA-WWA-3E1	09/27/1999	<20	57 ± 2
SA-WWA-3E1	10/25/1999	<17	92 ± 4
SA-WWA-3E1	11/30/1999	68 ± 27	96 ± 6
SA-WWA-3E1	12/28/1999	<18	167 ± 4
AVERAGE		-	120 ± 70

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.

TABLE C-8

1999 CONCENTRATIONS OF GROSS ALPHA AND GROSS BETA EMITTERS AND TRITIUM IN RAW AND TREATED POTABLE WATER

Results in Units of pCi/L +/- 2 sigma

TYPE	SAMPLING PERIOD	GROSS ALPHA	GROSS BETA	TRITIUM
RAW	1/1-31/99	1 ± 0.6	3.1 ± 0.5	<120
TREATED	1/1-31/99	<1.3	3.4 ± 0.4	<110
RAW	2/1-28/99	1 ± 0.6	3.2 ± 0.5	<120
TREATED	2/1-28/99	<1.2	2.9 ± 0.5	<120
RAW	3/1-31/99	2.2 ± 0.7	3.7 ± 0.5	<120
TREATED	3/1-31/99	2.1 ± 0.9	3.2 ± 0.5	<120
RAW	4/1-30/99	1.9 ± 0.6	3.4 ± 0.5	<130
TREATED	4/1-30/99	1.1 ± 0.7	3 ± 0.5	<130
RAW	5/1-31/99	1 ± 0.5	3.4 ± 0.5	<120
TREATED	5/1-31/99	1.1 ± 0.7	3.1 ± 0.5	<110
RAW	6/1-30/99	<0.6	2.7 ± 0.5	<120
TREATED	6/1-30/99	<1	2.8 ± 0.5	<120
RAW	7/1-31/99	<0.6	2.6 ± 0.5	<140
TREATED	7/1-31/99	<0.8	2.3 ± 0.5	<120
RAW	8/1-31/99	0.6 ± 0.4	2.7 ± 0.5	<120
TREATED	8/1-31/99	1.4 ± 0.8	2.7 ± 0.5	<120
RAW	9/1-30/99	1 ± 0.6	3.2 ± 0.5	<130
TREATED	9/1-30/99	0.8 ± 0.6	3 ± 0.5	<130
RAW	10/1-31/99	0.7 ± 0.5	3 ± 0.5	<170
TREATED	10/1-31/99	1 ± 0.7	3.1 ± 0.5	<170
RAW	11/1-30/99	1.2 ± 0.6	3.3 ± 0.5	<170
TREATED	11/1-30/99	<0.9	3.3 ± 0.5	<170
RAW	12/1-31/99	0.7 ± 0.4	3.3 ± 0.5	<150
TREATED	12/1-31/99	0.8 ± 0.6	3.8 ± 0.5	<140
AVERAGE				
RAW		1 ± 1	3.1 ± 0.6	-
TREATED		1.1 ± 0.7	3 ± 0.8	-
GRAND AVERAGE		1.1 ± 0.9	3.1 ± 0.7	-

TABLE C-9

1999 CONCENTRATIONS OF IODINE-131* AND GAMMA EMITTERS**
IN RAW AND TREATED POTABLE WATER

Results in Units of pCi/L +/- 2 sigma

TYPE	SAMPLING PERIOD	I-131	<-----GAMMA EMITTERS -----> K-40	RA-NAT
RAW	1/1-31/99	<0.2	35±13	<1.7
TREATED	1/1-31/99	<0.3	56±16	14±1.5
RAW	2/1-28/99	<0.3	46±21	<2.1
TREATED	2/1-28/99	<0.2	32±15	<4.3
RAW	3/1-31/99	<0.2	<15	<2
TREATED	3/1-31/99	<0.3	44±12	4.3±1.4
RAW	4/1-30/99	<0.3	55±18	<2.7
TREATED	4/1-30/99	<0.2	74±14	<2.5
RAW	5/1-31/99	<0.2	38±16	<1.8
TREATED	5/1-31/99	<0.2	43±12	<6.4
RAW	6/1-30/99	<0.2	50±17	<1.8
TREATED	6/1-30/99	<0.2	<14	<1.8
RAW	7/1-31/99	<0.3	64±17	<1.8
TREATED	7/1-31/99	<0.2	66±18	<1.9
RAW	8/1-31/99	<0.1	38±15	<1.8
TREATED	8/1-31/99	<0.2	40±13	<1.7
RAW	9/1-30/99	<0.1	54±15	<1.9
TREATED	9/1-30/99	<0.3	49±14	<1.8
RAW	10/1-31/99	<0.3	43±14	<1.7
TREATED	10/1-31/99	<0.3	<15	<1.6
RAW	11/1-30/99	<0.2	32±15	<6.1
TREATED	11/1-30/99	<0.1	44±18	<1.8
RAW	12/1-31/99	<0.3	45±16	<1.8
TREATED	12/1-31/99	<0.3	50±14	<2
AVERAGES				
RAW		-	43±26	-
TREATED		-	44±36	-

* Iodine-131 analyzed to a sensitivity of 1.0 pCi/L.
** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.

TABLE C-10

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN VEGETABLES

Results in Units of pCi/kg (Wet) +/- 2 sigma

STATION ID	SAMPLING DATE	SAMPLE TYPE	<--- GAMMA EMITTERS ---> K-40	Be-7
SA-FPV-2F9	05/03/1999	Asparagus	2220±140	<20
SA-FPV-3F6	05/04/1999	Asparagus	1830±130	<10
AVERAGE			2030±550	
SA-FPL-3F8	07/15/1999	Cabbage	3190±200	127±60
SA-FPL-1G1 (C)	07/14/1999	Cabbage	2730±130	<12
SA-FPL-3H5 (C)	07/13/1999	Cabbage	2510±140	<16
AVERAGE			2810±690	
SA-FPV-3E1	07/13/1999	Corn	2550±190	<39
SA-FPV-2F4	07/14/1999	Corn	2700±160	<29
SA-FPV-2F9	07/14/1999	Corn	2460±170	<17
SA-FPV-3F5	07/13/1999	Corn	2530±170	<36
SA-FPV-14F3	07/15/1999	Corn	2650±240	<72
SA-FPV-1G1 (C)	07/14/1999	Corn	2640±170	<31
SA-FPV-2G2 (C)	07/13/1999	Corn	2470±160	<16
SA-FPV-3H5 (C)	07/13/1999	Corn	2680±160	<31
AVERAGE			2590±190	
SA-FPV-2F4	07/14/1999	Peppers	2080±170	<31
SA-FPV-3F5	07/13/1999	Peppers	1380±140	<28
SA-FPV-14F3	07/15/1999	Peppers	2080±190	<30
SA-FPV-1G1 (C)	07/14/1999	Peppers	2330±210	<35
SA-FPV-2G2 (C)	07/13/1999	Peppers	1670±140	<21
SA-FPV-3H5 (C)	07/15/1999	Peppers	1890±160	<34
AVERAGE			1910±680	
SA-FPV-2F4	07/14/1999	Tomatoes	2530±170	<21
SA-FPV-2F9	07/14/1999	Tomatoes	2330±150	<14
SA-FPV-3F5	07/13/1999	Tomatoes	2460±170	<17
SA-FPV-14F3	07/15/1999	Tomatoes	2260±180	<14
SA-FPV-1G1 (C)	07/14/1999	Tomatoes	2380±140	<25
SA-FPV-2G2 (C)	07/13/1999	Tomatoes	2190±180	<26
SA-FPV-3H5 (C)	07/13/1999	Tomatoes	2640±180	<21
AVERAGE			2400±310	-
GRAND AVERAGE			2360±760	-

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19
(C) Control Station

TABLE C-11

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN GAME

Results in Units of pCi/kg (wet) +/- 2 sigma

STATION ID	SAMPLING DATE	SAMPLE TYPE	<-------GAMMA EMITTERS------> K-40	RA-NAT
SA-GAM-3E1	03/13/1999	Muskrat	2940 ± 150	<6.2
SA-GAM-11D1 (C)	3/4-5/1999	Muskrat	2700 ± 170	<8.2
AVERAGE		Muskrat	2820 ± 340	-

*All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.

TABLE C-12

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN FODDER CROPS

Results in Units of pCi/kg (wet) +/- 2 sigma

STATION ID	SAMPLING DATE	SAMPLE TYPE	<-------- GAMMA EMITTERS --------> Be-7	K-40	RA-NAT
SA-VGT-2F9	10/04/1999	Silage	1090 ± 120	3420 ± 190	<8.2
SA-VGT-11F3	10/04/1999	Silage	160 ± 80	5740 ± 280	<11
SA-VGT-11F3	10/19/1999	Silage	500 ± 80	6030 ± 330	<11
SA-VGT-14F4	09/21/1999	Silage	620 ± 60	1790 ± 110	<5.4
SA-VGT-3G1 (C)	09/20/1999	Silage	370 ± 70	3300 ± 200	<8.2
AVERAGE			550 ± 700	4060 ± 3580	-
SA-VGT-11F3	11/23/1999	Soybeans	<17	16500 ± 260	11 ± 5
SA-VGT-14F4	11/09/1999	Soybeans	<31	15500 ± 350	<7.4
SA-VGT-3G1 (C)	11/09/1999	Soybeans	<73	16600 ± 280	<6.2
AVERAGE			-	16200 ± 1200	-

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.
(C) Location 3G1 is the Control Station.

TABLE C-13

1999 CONCENTRATIONS OF GROSS BETA EMITTERS IN SURFACE WATER

Results in Units of pCi/L +/- 2 sigma

SAMPLING DATE	STATION ID SA-SWA-11A1	SA-SWA-12C1 (Control)	SA-SWA-16F1	SA-SWA-1F2	SA-SWA-7E1	AVERAGE
January	110 ± 9	96 ± 8	71 ± 6	56 ± 5	105 ± 8	88 ± 46
February	12 ± 3	9 ± 3	8 ± 3	10 ± 3	9 ± 3	10 ± 3
March	60 ± 7	44 ± 6	28 ± 5	33 ± 5	74 ± 8	48 ± 39
April	31 ± 4	34 ± 4	25 ± 3	13 ± 3	65 ± 5	34 ± 39
May	61 ± 5	52 ± 4	35 ± 4	40 ± 4	67 ± 5	51 ± 27
June	70 ± 6	43 ± 4	44 ± 4	35 ± 4	90 ± 7	57 ± 46
July	83 ± 6	75 ± 6	60 ± 5	49 ± 5	107 ± 7	75 ± 45
August	120 ± 8	106 ± 7	98 ± 7	81 ± 6	150 ± 9	111 ± 52
September	118 ± 8	97 ± 7	96 ± 7	94 ± 7	150 ± 9	111 ± 48
October	67 ± 8	50 ± 7	37 ± 6	21 ± 5	88 ± 9	52 ± 53
November	63 ± 7	48 ± 7	42 ± 6	34 ± 6	88 ± 9	55 ± 42
December	114 ± 10	70 ± 8	61 ± 7	57 ± 7	131 ± 10	87 ± 67
AVERAGE	76 ± 69	60 ± 58	50 ± 55	44 ± 51	94 ± 79	
				GRAND AVERAGE		65 ± 71

TABLE C-14

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING DATE	<---------- GAMMA EMITTERS ----------> K-40	Cs-137	Th-232
SA-SWA-1F2	01/09/1999	90 ± 20	<1.3	<8.8
SA-SWA-7E1	01/09/1999	126 ± 16	<1.1	9.7 ± 3.3
SA-SWA-11A1	01/09/1999	151 ± 26	<3.7	<6
SA-SWA-12C1(C)	01/09/1999	122 ± 22	<1	<5.8
SA-SWA-16F1	01/09/1999	133 ± 25	<2.8	<4.9
SA-SWA-1F2	02/02/1999	64 ± 20	<4.6	<5.3
SA-SWA-7E1	02/02/1999	47 ± 15	<0.9	<7.2
SA-SWA-11A1	02/02/1999	55 ± 16	<2	<3.6
SA-SWA-12C1(C)	02/02/1999	41 ± 15	<2	<5.5
SA-SWA-16F1	02/02/1999	66 ± 14	<1.4	<4.2
SA-SWA-1F2	03/02/1999	73 ± 18	<1.1	<4.9
SA-SWA-7E1	03/02/1999	94 ± 20	<1.1	<3.9
SA-SWA-11A1	03/02/1999	112 ± 17	7.4 ± 2	<5.2
SA-SWA-12C1(C)	03/02/1999	67 ± 20	<3.4	<5.5
SA-SWA-16F1	03/02/1999	79 ± 20	<0.8	<5.3
SA-SWA-1F2	04/06/1999	54 ± 20	<1.1	<4.6
SA-SWA-7E1	04/06/1999	81 ± 20	<2	<4.1
SA-SWA-11A1	04/06/1999	99 ± 16	<4.2	<5.9
SA-SWA-12C1(C)	04/06/1999	70 ± 18	<0.9	<11
SA-SWA-16F1	04/06/1999	76 ± 17	<1.2	<6.5
SA-SWA-1F2	05/06/1999	84 ± 20	<0.9	<6.1
SA-SWA-7E1	05/06/1999	69 ± 21	<1.3	<6
SA-SWA-11A1	05/06/1999	81 ± 24	<0.9	<6.3
SA-SWA-12C1(C)	05/06/1999	95 ± 21	<1.9	<4.3
SA-SWA-16F1	05/06/1999	77 ± 19	<2.6	<3.8
SA-SWA-1F2	06/08/1999	73 ± 17	<2.6	<4.3
SA-SWA-7E1	06/08/1999	150 ± 18	<2.5	<4.3
SA-SWA-11A1	06/08/1999	140 ± 23	<3.7	<8.9
SA-SWA-12C1(C)	06/08/1999	93 ± 20	<1	<7.2
SA-SWA-16F1	06/08/1999	72 ± 17	<1.5	<4.7
SA-SWA-1F2	07/06/1999	105 ± 19	<1.7	<7.2
SA-SWA-7E1	07/06/1999	116 ± 22	<1	<5.4
SA-SWA-11A1	07/06/1999	141 ± 17	<1.1	<4.2
SA-SWA-12C1(C)	07/06/1999	134 ± 24	<1.5	<3.8
SA-SWA-16F1	07/06/1999	129 ± 25	<1.9	<5.3

TABLE C-14

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/L +/- 2 sigma

STATION ID	SAMPLING DATE	<---------- GAMMA EMITTERS ----------> K-40	Cs-137	Th-232
SA-SWA-1F2	08/05/1999	71 ± 22	<1.4	<4.7
SA-SWA-7E1	08/05/1999	149 ± 24	<1.6	<6.4
SA-SWA-11A1	08/05/1999	102 ± 16	<1.5	<5.7
SA-SWA-12C1(C)	08/05/1999	150 ± 25	<1.1	<6.5
SA-SWA-16F1	08/05/1999	66 ± 19	<0.8	<6.2
SA-SWA-1F2	09/07/1999	94 ± 22	<1.4	<5.4
SA-SWA-7E1	09/07/1999	167 ± 25	<1	<5.9
SA-SWA-11A1	09/07/1999	158 ± 48	<1.5	<3.6
SA-SWA-12C1(C)	09/07/1999	111 ± 24	<1.9	<3.9
SA-SWA-16F1	09/07/1998	102 ± 25	<2	<5.6
SA-SWA-1F2	10/06/1999	<42	<1.7	<6.2
SA-SWA-7E1	10/06/1999	99 ± 24	<1.4	<5.8
SA-SWA-11A1	10/06/1999	75 ± 22	<0.9	<6.9
SA-SWA-12C1(C)	10/06/1999	66 ± 16	<1.1	9.9 ± 4.3
SA-SWA-16F1	10/06/1999	43 ± 20	<3.4	<4.2
SA-SWA-1F2	11/01/1999	<34	<1.6	<5.4
SA-SWA-7E1	11/01/1999	76 ± 22	<1.1	<6.2
SA-SWA-11A1	11/01/1999	96 ± 23	<1.1	<4.6
SA-SWA-12C1(C)	11/01/1999	51 ± 21	<1.3	<4.8
SA-SWA-16F1	11/01/1999	<34	<1.9	<5
SA-SWA-1F2	12/06/1999	98 ± 19	<1.4	<6.6
SA-SWA-7E1	12/06/1999	152 ± 24	<0.7	<6.1
SA-SWA-11A1	12/06/1999	147 ± 20	<1.8	<3.9
SA-SWA-12C1(C)	12/06/1999	105 ± 22	<1.2	<4.1
SA-SWA-16F1	12/06/1999	110 ± 23	<1.5	<5.5
AVERAGE		94 ± 70	-	-

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19.
C) Control Station

TABLE C-15

1999 CONCENTRATIONS OF TRITIUM IN QUARTERLY COMPOSITES OF SURFACE WATER

Results in Units of pCi/L +/- 2 sigma

SAMPLING PERIOD	<---------- STATION ID ----------> SA-SWA-11A1	SA-SWA-12C1 (Control)	SA-SWA-16F1	SA-SWA-1F2	SA-SWA-7E1	AVERAGE
01/09/1999 to 03/02/1999	<120	<120	<120	<120	<120	-
04/06/1999 to 06/08/1999	110±70	240±70	180±70	130±70	200±70	170±110
07/06/1999 to 09/07/1999	<120	<120	<120	<120	<120	-
10/06/1999 to 12/06/1999	<170	<170	<170	<160	<170	-

TABLE C-16

1999 STRONTIUM-89 90* AND GAMMA EMITTERS** IN EDIBLE FISH

Results in Units of pCi/kg (wet) +/- 2 sigma
(Strontium in bone is reported in pCi/kg (dry))

STATION ID	SAMPLING PERIOD	STRONTIUM <------ BONES ------> Sr-89	STRONTIUM <------ BONES ------> Sr-90	STRONTIUM <------- FLESH -------> Sr-89	STRONTIUM <------- FLESH -------> Sr-90	GAMMA EMITTERS (FLESH) K-40
SA-ESF-7E1	6/2/99	*	*	*	*	3600 ± 170
SA-ESF-11A1	6/2-3/99	<140	<120	<37	<19	3380 ± 170
SA-ESF-12C1 (C)	6/2-3/99	*	*	*	*	3170 ± 200
AVERAGE		-		-	-	3380 ± 430
SA-ESF-7E1	9/21-23/99	*	*	*	*	4000 ± 220
SA-ESF-11A1	9/21-23/99	*	*	*	*	3880 ± 190
SA-ESF-12C1 (C)	9/21-23/99	*	*	*	*	3770 ± 190
AVERAGE		-	-	-	-	3880 ± 230
GRAND AVERAGE				-	-	3630 ± 630

* Strontium results for one location for the first semi annual collection are analyzed and reported by Duke Engineering & Services Environmental Laboratory (DESEL) as MDC. This is done as a management audit sample.

** All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19

(C) Control Station

TABLE C-17

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN CRABS

Results in Units of pCi/kg (wet) +/- 2 sigma

STATION ID	SAMPLING PERIOD	GAMMA EMITTERS (FLESH) K-40
SA-ECH-11A1	6/28-7/6/1999	3330 ± 180
SA-ECH-12C1 (C)	6/28-7/6/1999	3190 ± 230
AVERAGE		3260 ± 200
SA-ECH-11A1	9/21-23/1999	2930 ± 190
SA-ECH-12C1 (C)	9/21-23/1999	2900 ± 150
AVERAGE		2920 ± 40
GRAND AVERAGE		3090 ± 420

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19
(C) Control Station

TABLE C-18

1999 CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT

Results in Units of pCi/kg (dry) +/- 2 sigma

STATION ID	SAMPLING DATE	GAMMA EMITTERS						
		Be-7	K-40	Co-60	Cs-134	Cs-137	RA NAT	Th-232
SA-ESS-6S2	06/11/1999	<60	1660±90	<5.7	9.1±4	7.3±3.6	140±10	120±20
SA-ESS-11A1	06/02/1999	<70	12100±400	<12	68±18	96±17	560±30	890±100
SA-ESS-15A1	06/02/1999	<100	16700±590	45±18	<18	160±20	630±40	1150±80
SA-ESS-16A1	06/02/1999	990±220	15900±460	<15	<6.2	130±30	560±20	770±90
SA-ESS-12C1(C)	06/02/1999	<140	9780±340	<7.7	<11	<16	530±20	70±6
SA-ESS-7E1	06/02/1999	<70	15900±420	63±20	62±23	65±26	750±20	1080±60
SA-ESS-16F1	06/02/1999	240±80	15400±430	<9.1	<7	42±10	530±30	830±80
AVERAGE		-	12500±10800	-	-	74±115	530±380	800±770
SA-ESS-6S2	10/11/1999	<90	1580±130	<4.3	<3.4	<4.6	200±10	220±30
SA-ESS-11A1	10/06/1999	<90	15500±480	51±22	<43	69±16	660±30	930±100
SA-ESS-15A1	10/06/1999	<100	15200±460	36±12	<6.8	83±24	690±30	1000±70
SA-ESS-16A1	10/06/1999	<170	13900±440	58±24	51±20	79±16	610±20	830±70
SA-ESS-12C1(C)	10/06/1999	<110	10300±290	<14	<9.7	22±7	790±20	920±50
SA-ESS-7E1	10/06/1999	<70	13600±350	<10	<10	45±18	760±20	500±60
SA-ESS-16F1	10/06/1999	<150	15700±730	<13	<53	34±14	580±30	1050±90
AVERAGE		-	12300±10100	-	-	48±60	610±400	870±400
GRAND AVERAGE		-	12400±10000	-	-	61±92	570±380	830±590

* All other gamma emitters searched for were <LLD; typical LLDs are given in Table C-19

(C) Control Station

TABLE C-19

1999 MAPLEWOOD TESTING SERVICES

LLDs FOR GAMMA SPECTROMETRY

SAMPLE TYPE:	<----------AIR---------->		<---------WATER--------->		<----------MILK--------->	
	IODINE	PARTICULATES	GAMMA SCAN	IODINE	GAMMA SCAN	IODINE
ACTIVITY:	10-3 pCi/m³	10^{-3} pCi/m³	pCi/L	pCi/L	pCi/L	pCi/L
GEOMETRY:	47 ML	13 FILTERS	3.5 LITER	100 ML	3.5 LITER	100 ML
COUNT TIME:	120 MINS	500 MINS	1000 MIN	1000 MINS	500 MINS	1000 MINS
DELAY TO COUNT:	2 DAYS	5 DAYS	7 DAYS	3 DAYS	2 DAYS	2 DAYS
NUCLIDES						
BE-7	-	7.2	14	-	19	-
NA-22	-	1.2	5.2	-	7.4	-
K-40	-	7.0	20	-	120	-
CR-51	-	2.0	16	-	17	-
MN-54	-	0.31	1.7	-	39	-
CO-58	-	0.36	2.6	-	5.7	-
FE-59	-	0.81	5.6		11	-
CO-60	-	0.46	2.0	-	6.4	-
ZN-65	-	0.66	4.0		14	-
ZRNB-95	-	0.76	3.6	-	6.1	-
MO-99	-	19	600	-	47	-
RU-103	-	0.26	1.5	-	2.9	-
RU-106	-	2.3	23	-	21	-
AG-110M	-	0.70	5.6	-	4.6	-
SB-125	-	0.72	2.9	-	9.9	-
TE-129M	-	11	82	-	133	-
I-131	9.5	0.82	4.9	0.3	2.2	0.5
TE-132	-	0.85	54	-	3.4	-
BA-133	-	0.23	1.4	-	2.1	-
CS-134	-	0.28	1.9	-	2.5	-
CS-136	-	0.47	3.9	-	7.0	-
CS-137	-	0.61	4.6	-	5.0	-
BALA-140	-	2.1	10	-	7.0	-
CE-141	-	0.21	1.7	-	2.7	-
CE-144	-	0.83	12	-	11	-
RA-NAT	-	0.77	6.4	-	6.8	-
TH-232	-	2.4	12	-	31	-

TABLE C-19 (Cont'd)

1999 PSE&G MAPLEWOOD TESTING SERVICES

LLDs FOR GAMMA SPECTROMETRY

SAMPLE TYPE:	FOOD PRODUCTS	VEGETATION	GAME	FISH	SEDIMENT
ACTIVITY:	pCi/kg WET	pCi/kg WET	pCi/kg WET	SHELLFISH	& SOIL
GEOMETRY:	500 ml	3.5 LITER	500 ml	pCi/kg WET	pCi/kg DRY
COUNT TIME:	500 MINS	500 MINS	500 MINS	500 ml	500 ml
DELAY TO COUNT	3 DAYS	7 DAYS	5 DAYS	500 MINS 5 DAYS	500 MINS 30 DAYS
NUCLIDES					
BE-7	72	73	17	31	170
NA-22	13	12	7.7	16	15
K-40	70	70	70	70	70
CR-51	34	34	33	29	123
MN-54	9.4	7.3	4.2	11	37
CO-58	8.6	5.5	4.0	9.4	13
FE-59	17	14	29	25	62
CO-60	10	8.9	5.5	7.2	15
ZN-65	15	21	9.8	16	30
ZRNB-95	24	11	8.5	16	49
MO-99	262	250	234	184	110000
RU-103	5.2	4.9	3.2	4.7	16
RU-106	70	42	29	33	99
AG-110M	21	8.3	13	6.3	23
SB-125	11	14	11	9.6	30
TE-129M	230	190	139	160	667
I-131	8.2	11	7.1	6.4	105
TE-132	16	47	78	11	4500
BA-133	5.2	5.8	3.7	4.0	24
CS-134	11	6.2	3.2	9.1	53
CS-136	8.8	7.0	15	6.8	92
CS-137	13	10	5.3	14	16
BALA-140	24	30	25	23	170
CE-141	6.1	5.7	3.5	4.2	24
CE-144	27	29	16	21	54
RA-NAT	17	11	8.2	11	45
TH-232	45	33	20	31	50

APPENDIX D

SUMMARY OF RESULTS FROM ANALYTICS INTERLABORATORY COMPARISON PROGRAMS

APPENDIX D

SUMMARY OF ANALYTICS INTERLABORATORY COMPARISON PROGRAM

Appendix E presents a summary of the analytical results for the 1999 Analytics Interlaboratory Comparison Program.

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TABLE D-1

RESULTS FOR ANALYTICS INTERLABORATORY COMPARISON PROGRAM

Gross Alpha and Gross Beta Analysis of Water (pCi/L)

DATE MM-YY	ENV SAMPLE CODE	MEDIUM	ANALYSIS	* PSE&G Mean ± s.d.	EPA/ANL Known	EPA/ANL Acceptance Criteria Lower Limit	EPA/ANL Acceptance Criteria Upper Limit
06-99	ANL-WAT-AB493	Water	Alpha	118±7	98	73	123
			Beta	310±5	290	200	380
12-99	ANL-WAT-AB500	Water	Alpha	58±6	45	33	57
			Beta	256±8	271	187	355

* s.d. - one standard deviation of three individual analytical results

TABLE D-2

RESULTS FOR ANALYTICS INTERLABORATORY COMPARISON PROGRAM

Gamma Analysis of Water and Milk (pCi/L)

DATE MM-YY	ENV SAMPLE CODE	MEDIUM	ANALYSIS	* PSE&G Mean ± s.d.	EPA/ANL Known	EPA/ANL Acceptance Criteria Lower Limit	EPA/ANL Acceptance Criteria Upper Limit
03-99	ANL-WAT-G489	Water	Cr-51	412±32	398	278	518
			Mn-54	159±2	152	104	200
			Fe-59	95±5	79	55	103
			Co-60	183±5	181	127	235
			Zn-65	213±10	195	135	255
			I-131	98±3	91	61	121
			Cs-134	107±4	114	78	150
			Cs-137	251±9	240	168	312
			Ce-141	181±7	177	123	231
03-99	ANL-MLK-G491	Milk	Cr-51	284±15	306	216	396
			Mn-54	119±2	117	81	153
			Fe-59	78±2	61	43	79
			Co-60	137±5	139	97	181
			Zn-65	159±5	150	102	198
			I-131	93±2	96	66	126
			Cs-134	77±3	88	64	112
			Cs-137	179±2	185	131	239
			Ce-141	132±3	136	94	178
12-99	ANL-WAT-G502	Water	Cr-51	297±40	290	200	380
			Mn-54	105±7	100	70	130
			Fe-59	114±10	94	64	124
			Co-60	140±5	132	90	174
			Zn-65	198±14	186	132	240
			I-131	99±9	96	66	126
			Cs-134	118±5	125	89	161
			Cs-137	102±7	96	66	126
			Ce-141	110±7	105	75	135

* s.d. - one standard deviation of three individual analytical results

TABLE D-3

RESULTS OF ANALYTICS INTERLABORATORY COMPARISON PROGRAM

Gamma Analysis of Soil (pCi/Kg-dry)
and Air Particulate Samples (pCi/m^3)

DATE MM-YY	ENV SAMPLE CODE	MEDIUM	ANALYSIS	* PSE&G Mean ± s.d.	EPA/ANL Known	EPA/ANL Acceptance Criteria Lower Limit	EPA/ANL Acceptance Criteria Upper Limit
03-99	ANL-SOL-G490	Soil	Cr-51	317±29	341	239	443
			Mn-54	130±6	131	89	173
			Fe-59	78±3	68	50	86
			Co-60	150±4	155	107	203
			Zn-65	148±6	167	119	215
			Cs-134	77±7	98	68	128
			Cs-137	331±5	333	231	435
			Ce-141	148±7	152	104	200
06-99	ANL-APT-G495	APT	Cr-51	245±15	215	149	281
			Mn-54	109±4	85	61	109
			Co-60	243±3	214	148	280
			Fe-59	68±4	48	36	60
			Zn-65	159±8	122	86	158
			Cs-134	110±2	115	79	151
			Cs-137	232±3	188	134	242
			Ce-141	209±3	168	120	216
09-99	ANL-SOL-G498	Soil	Cr-51	284±17	249	177	321
			Mn-54	283±24	284	200	368
			Fe-59	137±11	127	91	163
			Co-60	221±4	215	149	281
			Zn-65	272±33	273	189	357
			Cs-134	148±25	161	113	209
			Cs-137	463±23	490	340	640
			Ce-141	341±6	330	228	432

* s.d. - one standard deviation of three individual analytical results

TABLE D-4

RESULTS OF ANALYTICS INTERLABORATORY COMPARISON PROGRAM

Tritium and Iodine Analysis of Water (pCi/L)
and Iodine in Air Samples (pCi/m³)

DATE MM-YY	ENV SAMPLE CODE	MEDIUM	ANALYSIS	* PSE&G Mean ± s.d.	EPA/ANL Known	EPA/ANL Acceptance Criteria Lower Limit	EPA/ANL Acceptance Criteria Upper Limit
03-99	ANL-WAT-H488	Water	H-3	2784±21	2698	1888	3508
03-99	ANL-AIO-I492	AIO	I-131	99±2	90	60	120
06-99	ANL-AIO-I494	AIO	I-131	79±2	76	52	100
06-99	ANL-WAT-H496	Water	H-3	9447±91	9349	6547	12151
09-99	ANL-AIO-I497	AIO	I-131	69±1	61	43	79
09-99	ANL-WAT-H499	Water	H-3	4473±54	4534	3172	5896
12-99	ANL-AIO-I501	AIO	I-131	78±1	85	61	109
12-99	ANL-WAT-H503	Water	H-3	4899±77	8015	5609	10421

* s.d. - one standard deviation of three individual analytical results

APPENDIX E

SYNOPSIS OF LAND USE CENSUS

APPENDIX E

SYNOPSIS OF 1999 LAND USE CENSUS

A land use census was conducted to identify, within a distance of 8 km (5 miles), the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 50m^2 (500ft^2) producing broad leaf vegetation, in each of the 16 meteorological sectors.

Tabulated below are the results of these surveys:

Meteorological Sector	Milk Animal July, 1999 km (miles)	Nearest Residence July, 1999 km (miles)	Vegetable Garden July, 1999 km (miles)
N	None	None	None
NNE	None	None	None
NE	None	6.4 (4.0)	None
ENE	None	5.8 (3.6)	None
E	None	5.4 (3.4)	None
ESE	None	None	None
SE	None	None	None
SSE	None	None	None
S	None	None	None
SSW	None	5.5 (3.4)	None
SW	None	6.9 (4.3)	None
WSW	None	7.1 (4.4)	None
W	7.8 (4.9)	6.5 (4.0)	None
WNW	None	5.5 (3.4)	None
NW	None	5.9 (3.7)	None
NNW	None	6.8 (4.2)	None